Lift this flap
for the greatest gift of all
I.R.E. becomes I.R.E.E.

A FEW weeks ago, members of The Institution of Radio Engineers, Australia, voted to change the name of their group to The Institution of Radio and Electronic Engineers, Australia. It was pointed out, by way of explanation, that the term "radio" is no longer adequate to describe a science, which has spread far beyond the original concept, to invade almost every aspect of modern science and technology. Nowadays, no matter what the investigation, or what the job in hand, there is a good chance that an electronics expert will not be far away, with his valves and transistors and all the associated gadgetry.

Messing from this is a problem, the magnitude of which seems not to be fully appreciated—
the problem of a "no man's land," where the knowledge of an electronic worker must merge with that of an expert from some other field of endeavour, to which he happens to be seconded.

Two are often forced to work together, each without an adequate appreciation of the other's needs; neither well versed in the other's language or facilities.

The problem is seen most clearly, at present, in the medical field.

The many specialised operations now being performed, almost as a routine, are not just a matter of increased skill with the scalpel; more than anything, they are the result of knowledge and a facility gained from electronic "satellite" equipment, which registers and monitors every reaction of the patient on the table. And, of course, there is an ever-increasing need for electronic "satellite" equipment, which registers and monitors every reaction of the patient on the table. And, of course, there is an ever-increasing need for electronic "satellite" equipment, which registers and monitors every reaction of the patient on the table.

In short, the penetration of electronics into other fields is more than the term "radio" is no longer adequate to describe a science, which has spread far beyond the original concept, to invade almost every aspect of modern science and technology. Nowadays, no matter what the investigation, or what the job in hand, there is a good chance that an electronics expert will not be far away, with his valves and transistors and all the associated gadgetry.

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Radio, Television & Hobbies, December, 1963
An Emergent Figure in Industry

The SCIENTIST

The ever increasing dependence of industry upon scientific research and discovery is emphasizing the role of scientist-theoreticians — men who are paid to sit and think!

Such men have played a vital role in unlocking the secrets of solid state physics and giving to the electronics industry whole families of semi-conductor devices.

By Bruce Shore

THEORY is the poetry of mathematics and, like poetry, its essence is metaphor — the sudden equation of separate ideas that elucidates, systematises, and unites them for the first time.

"All the world's a stage," cries the poet.

"E = mc^2". exclaims the theorist.

Both statements are metaphors, in their own language, and both equate hitherto unconnected concepts in new and powerful ways, affording fresh insight into their nature and a deeper understanding of their meaning. Mathematics is a language, in the same way that English is a language. It has nouns, verbs, predicates, modifiers, and syntax. Its nouns are numbers and its verbs are add, subtract, multiply, divide, and equate; its verb to be.

INSIGHT MUST BE VALID

There is one more difference. The truth of a poet's insight can never be finally shown. It is valid subjectively, only as we think it is. Not so the insight of the theorist. Theory must be objective. It must be able to explain events and to predict them, not only for this generation, but for all generations. It is poetic, yes. But it is more than poetry.

The theorist's fluency in mathematics coupled with his poetic power to fashion new metaphors in order to express cause and effect in nature, has won for him, recently, a numerically small but vital role in American industry. This is especially so in electronics where the need for theorists became acute following the introduction of the transistor in 1948.

Here was a device that could switch, amplify, or modulate an electronic signal passing through it just as a vacuum tube could. There was one momentous difference, however. Whereas the tube was a precise assembly of separate parts—cathode, grid, anode—mounted in a glass-enclosed vacuum, the transistor was a single chunk of solid germanium no bigger than a grain of sand. Later on, with the introduction of the silicon transistor in the mid-1950s, it quite literally became a product of sand — made, of course, by the U.S. Government manufacturer, like the U.S. Government before him, abruptly found himself catapulted into his own phase of the Atomic Age. His next generation of components could not be assembled from mechanical parts. It would have to be synthesised from raw atoms.

Radio, Television & Hobbies, December, 1963
But, what some? What were the laws governing their behaviour? What were the bind-in forces that fastened them together to create the crystals from which the transistor was wrought? How did electrons act in such a strange environment, and how did one condition this environment to produce useful electronic phenomena?

These were tough questions with important business overtones, and there were no ready answers inside the electronics industry. What was needed was someone who understood solid-state theory and knew how to apply it. The only man fitting this description was the solid-state theorist.

Fortunately, the electronics industry was not caught unprepared. It had been conducting research on various kinds of matter for more than two decades. For instance, two years prior to the announcement of the transistor, the Radio Corporation of America (R.C.A.) had formed a special group of solid-state researchers at its laboratories in Princeton, N.J. Headed by Dr Dwight North and Dr Lloyd Smith and including Dr Leon Nergaard, this group sought to learn why the current flow through the oxide surface of the cathode in a vacuum tube started out large and then fell to a steady but relatively weak value. Certainly, an obscure investigation, but one which gave unexpected insight into the fundamentals of electron conduction in semiconductors—the basis of the transistor.

Because of this pioneering investigation, R.C.A. was able, in the first instance, to act immediately when Dr William Shockley, a member of the Bell Telephone Laboratories team that had developed the transistor, published his definitive book on the subject in 1956. Dr North and Dr Smith, together with other R.C.A. theorists, including Dr Edward Ramberg and Dr Frank Herman, quickly initiated a series of lectures, conferences, and seminars to educate other R.C.A. personnel in the new discipline. Shortly thereafter, R.C.A., moved from theory to practice, and by 1952 was producing high-quality transistors for hearing aids and pocket radios as its Electron Tube Division plant in Harrison, N.J.

THEORY IN A COMMERCIAL WORLD

Again, as with the achievement of controlled nuclear fission in 1942, the theorist had proved his economic worth. His equations and formulas, his theorems and proofs were not just abstract exercises. They had profound bearing on the practical power of theory to strengthen its going product lines and lay the foundations for those of the future. At least three answers must be given.

First, the body of physical theory which has now made it possible for man to split the atom, harness the electron, and ride the electromagnetic wave was consummated in 1925 with publication of Erwin Schrödinger's epochal book on quantum mechanics. Its compilation began in 1873 with publication of James Clerk Maxwell's theories on the electromagnetic nature of light and was consummated in 1923 with publication of Ervin Schrödinger's epochal equations. These were the binding forces that fastened them together to create the crystals from which the transistor materialised and, on its heels, the digital computer.

For instance, two years prior to the announcement of the transistor, the Radio Corporation of America had formed a special group of solid-state researchers. By the end of World War II, however, all this had begun to change. The practical power of theory had been demonstrated at Alamogordo, in New Mexico, and the theorist had begun to feel that his theoretical metaphors could have social, political and economic meaning.

NEW OUTLOOK

The industrialist, too, had begun to change. The war effort had pushed him to the limit of his existing technology into a regime in materials and phenomena beyond his competence. At this juncture, in the electronics industry, the theorist materialized and, on its back, the digital computer.

In the case of the transistor, the need for theorists was immediate and obvious. In the case of the computer, it was less so, at first. Was not computer manufacture simply an assembling of parts, a procedure that industry already knew well? It was, indeed, but it was more than that. The computer was potentially capable of solving just about any problem that could be reduced to the language of the digital computer.
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AmpeX engineers are never content with present standards. They are always trying to improve what sometimes seems un-improvable. Now they have been at work on the Ampex 600 Series Professional Recording Tape. And they’ve improved it so much we feel we should call it the new Ampex 600. This 600 Series now offers better high frequency response characteristics. And because an exclusive Ferri-sheen process makes the tape smooth, the first play and the one-hundredth have the same response characteristics curve. It gives you the kind of reliable performance you expect from Ampex recording equipment. Try this improved 600 Series and see. It’s made in the same rigidly controlled clean-room atmosphere as precision computer and instrumentation tapes. It’s from the only company providing recorders, tape and core memory devices for every application. Ampex Australia Pty., Ltd., 8th Floor, NRMA House, North Sydney, N.S.W., Australia. Sales and service engineers throughout the world.

Radio, Television & Hobbies, December, 1963
of mathematics, from the orbital velo-
city of space satellites to the solution of
the problem of bottlenecks in industry. It
could have a kind of "mental life" all its own,
if one knew how to program it for
What was needed were not physical
theorists but design theorists skilled in
the morphological rigor of information
processing. Fortunately, the wordy
university which had been producing
secular, pseudo-scientific "theory," com-
pletely changed its thinking. The shift was
of probability, since about 1940. They
were capable of mathematical tricks" or
list him. Today, they are behind the
computer's growing mastery of a thou-
sand different tasks.
For example, the theorems at RCA
Laboratories is frequently asked to use
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invent, within the limits of accepted
theory, new ideas in electronics, new
serials or new components emerging from
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tasks and other responsibilities.
AWA has the most comprehensive range of speaker assemblies to meet every need in audio reproduction. There are styles and finishes to furnish with all decors. Indoor designs are available for wall, ceiling, and table mounting. Outdoor types are weatherproofed; robustly designed for industrial use. Also included in the AWA range are special designs for high power projection, and designs for wide angle, wide audio range fidelity.

Each model is precision engineered for highest quality performance and thorough reliability.

PA 130, PA 108 and PA 109
Standard exponential horn speaker for public address where distance projection of speech and incidental music is required. These flare baffles are for use with 6 in. or 8 in. permanent magnet cone speaker units and provide high conversion efficiency.

PA 73
Timber cabinet, with 8 in. speaker for bidirectional characteristics, in Ivory, Grey or Maple.

PA 77/PA 74
Polished timber cabinet for wall or table mounting with 8 in. or 12 in. cone speaker and 600 ohm line transformer.

PA 218
Designed for overhead mounting as a contemporary style. The unit can be suspended by chain or rod, or braced for use as a wall speaker. 360 degree diffusion.

PA 152
Attractive moulded cabinet with 8 in. cone speaker and 600 ohm line transformer. Suitable for wall or desk mounting. Attractive two tone finish—Lavender and Beige.
An Astronaut's Best Pal

The astronaut of the future will need a "pal" in space, not only for occasional assistance in performing assigned tasks but especially during emergencies which can arise during the coupling and assembly of orbiting spacecraft.

THE "pal" recommended by John Zoszak, design specialist, of Lockheed Missiles and Space Company, Sunnyvale, California, is not another astronaut. Instead, it is a collapsible, 35-pound portable air lock made of flexible filament-wound material, lined with gas-light butyl rubber.

At a recent symposium at Edwards Air Force Base, California, on space rendezvous, rescue and recovery—sponsored by the American Astronautical Society and the Air Force Flight Test Centre—Zoszak recommended the portable air lock concept as an integral part of spacecraft for manned earth-orbiting and interplanetary missions.

The more complex spacecraft of the future, he said, will be multiple-launched in units of compact packages and then joined into operational form while in Earth orbit. This will require orbital rendezvous, coupling of several modules, and subsequent assembly into spacecraft.

Since most of the modules will be fully pressurised at launch—so they will be ready for immediate occupancy—the problem will be to assemble and join the large pressure vessels into fully operational configurations. Also, this must be done quickly, with a high degree of reliability and a minimum loss of pressure, so there will be little change in the internal atmosphere, he said.

At this point, the astronaut's "P.A.L."—the portable air lock—becomes all-important. Several emergency situations could arise which would prevent a crew from transferring through the regular air lock into the spacecraft. The air lock and coupling mechanism, for example, may have been damaged by collision, or one of the two hatches in the lock may have been jammed or damaged.

Use of the portable air lock concept, however, would enable crews to enter through an emergency hatch. Additionally, the "P.A.L." could be installed permanently in the spacecraft as an emergency air lock. Also, it could be used as a coupling device to attach a shuttle vehicle to the spacecraft. Used for the first series of Gemini and Apollo packets, it has been tested extensively.

Currently, the Gemini capsule has an access panel at each side for entry and exit, and the Apollo capsule has both a main air lock and side panels. It is more than likely during early space ventures—when orbital techniques and systems have not been tested fully to the degree of reliability required for successful missions—that emergencies will occur.

For example, Zoszak said, consider the situation where one of the regular air locks cannot be used, or where one of the vehicles must be entered without decompressing it. Either problem could be solved through use of a portable air lock, installed permanently in a folded position over the emergency hatches.

Use of the "P.A.L." concept offers a full-size, emergency air lock, weighing two-thirds less than an equivalent size rigid metal air lock. "P.A.L." does not add to the length of the spacecraft or interfere with its internal volume. Fully inflated for emergency use, the portable air lock would be about seven feet in height, with a four-foot diameter at the top, and a four-to-six-foot diameter base.

BUILT-IN SOLAR HEATER

A French firm, Pechiney of Paris, has developed a solar heater of such robust construction that it can be built into a wall in place of bricks.

Heat abstracted from the sun is used to heat the building or to supply hot water. Made of two parallel glass panels mounted in an aluminium frame, with copper pipes to conduct the water, the heater is said to be suitable for use in small houses.
Simon Gray P.T. Ltd. join with their principals in wishing all their clients the compliments of the season.

Simon Gray Pty. Ltd. for prompt and efficient after-sales service throughout Australia.

Radio, Television & Hobbies, December, 1963
A new, light-weight, three-dimensional data radar system, that can be transported by helicopter and quickly put into operation in remote areas of the world, has been developed by Hughes Aircraft Company ground systems group.

Announcing the new system, Hughes Vice-President Dr. Nicholas A. Begovich said: "This compact, long range radar, designated LW-3D, is packaged in two or three air-transportable units which may be emplaced on rugged terrain in remote locations up to 100 miles from the radar itself and put into operation by six men within 30 minutes after landing. The radar provides long range simultaneous 3-D (range, height and bearing) data on airborne targets and is designed to operate unmanned anywhere in the world. By deploying these systems in previously inaccessible strategic locations, complete radar coverage can now be made possible for the first time."

Two versions of the LW-3D have been designed, the lightest of which weighs only 5,500 pounds. This system is packaged in two compact helihuts. A second version, having higher power, longer range, and weighing somewhat more, is packaged in three helihuts. Miniaturlsed circuitry, a highly efficient transmitter, planar array (billboard Radio, Television & Hobbies, December, 1963 type) antenna concepts, and advanced compact packaging techniques make the LW-3D radar light enough to be transported by helicopter, air cargo, or truck. This radar will employ developments in the electronic frequency scanning technique, already proven in several Hughes production versions. It will also be compatible with existing weapons systems and is adaptable to many air defence and traffic control functions.

Despite its compact design, the LW-3D radar has highly advanced operating characteristics, including long range, high power, and superior low-altitude detection capability. Automatic integral built-in air-to-air heat ex-changers, used to cool the system, eliminate the need for conventional bulky air-conditioning.

The antenna will operate in winds up to 75 miles per hour and survive winds up to 120 miles per hour without a protective radome covering. The LW-3D's self-test and fault monitoring circuits assure high reliability and sharply reduce trouble shooting and repair time.

Because this radar is designed for rapid emplacement and operation anywhere in the world, its electronic equipment is sealed from such ambient conditions as sand, dust, salt spray, rain and humidity, as well as extreme temperatures.

The LW-3D radar's narrow pencil beam reduces objectionable interference clutter at ground level giving the Hughes radar a very effective low altitude detection capability. Range, bearing and altitude data is provided on targets detected at long range, even in heavy electronic counter measure environments.

ECONOMICAL DESIGN

The rack and panel equipment mechanical design affords rapid access to each component. In addition, the equipment makes possible cost saving up to 40 per cent in manufacturing and 30 per cent in field site installations compared to standard designs. Successful forerunners to the new Hughes LW-3D 3-D radar systems, now in operation with the U.S. Army and Navy and on ships of allied foreign navies.
Hearing is a Precious Gift

By Calvin Walters

Yes, even the humble punch-fool soothes loneliness and awe-some-ment when deprived of his buzzing. This white bouncer, soothing seven deafness, apparently derives considerable benefit from a hearing aid.

Ever since man learned to communicate by means of speech, and possibly before that, the problem of the deaf person has been apparent. In different ages and societies it has been variously shunned, mocked, laughed at, and, strangely enough, revered. But there was little that could be done to help him. Fortunately, medical science has made tremendous advances in treating deafness, while what it cannot help will usually yield to a modern hearing aid.

To say that the sense of hearing is one of our most precious possessions is merely uttering a platitude. But how many of us stop to think just what life would be like if we were to be deprived of the ability to hear? Try to list the many sounds which the ear encounters every day and see how formidable it becomes. Note how many there are which you probably never thought about as being necessary in our everyday existence.

There are the sounds of music, machinery, birds and other sounds of nature, motor vehicles, the noise of the traffic and the shouts of crowds, the laughter of children and the nagging of the baby, the warning shout, the horns of vehicles, motor cars, or machine which indicates impending trouble, the horns of vehicles, the warning sign, the steady footstep, the dark, sultry, the sound of the creaking of the split, the cry of a baby, the warning, the talking of a baby, the warning, the talking of a baby, the warning sign, the steady footstep.

We are able to analyse the common "warning" noises, such as an approaching vehicle, the "foreign" noises in a motor car, or machine which indicates impending trouble, the horns of vehicles, flowing water and cracking ice, the cry of a baby, the warning, the talking of a baby, the warning sign, the steady footstep. The ear to detect all the tones to enable recognition to take place.

There are several thousand pure sound waves which the ear can detect. This enables the ear to locate the source of pure tones, and it is the ability of the brain to direct these pure tones that enables it to analyse the sound wave and recognize it for what it is. It is the purest sound which the ear detects, the more accurate is the analysis, although it is not always necessary for the ear to detect all the tones in order to recognize the source of the sound.

There are a vast number of pure sound waves which the ear can detect. This enables the ear to locate the source of pure tones, and it is the ability of the brain to direct these pure tones that enables it to analyse the sound wave and recognize it for what it is. It is the purest sound which the ear detects, the more accurate is the analysis, although it is not always necessary for the ear to detect all the tones in order to recognize the source of the sound.

The total absence of hearing will alter a person's whole personality because it robs him of experiences, social intercourse, and instruction, and forces him into economic independency. The continual worry and anxiety of trying to compensate can cause grave nervous complaints and strained mental conditions. For these reasons, research into the development of anything which will aid the deaf person is something of paramount importance.

Our hearing apparatus consists of the various parts of the ear. There is the odd shaped mass of cartilage, fibrous tissue, skin, and membrane, which projects from the sides of the head. This is the outer or ear pinna, which collects sound and directs it into the ear canal. This canal is the auditory meatus, which is about one-third of an inch in length and is the part commonly called the "earhole." It is about one inch in length and is the part which some people use in order to identify different people. The auditory meatus is the canal of the ear.

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The now almost classic curves pro-
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The oval window allows the system suf- >

it is transmitted from the oval window.

The cochlea is a delicate structure called the Organ Of Corr. This whole structure is only about one inch wide and 1 inch long. Tiny hair cells in the organ apparently sense the vibrations which are transmitted through the fluid

HOW DOES IT WORK?

When a sound waves strikes the ear-
drum it is transmitted via the ossicles to
the oval window. This window vibrates and conveys the pressure to the

The eardrum is a thin membrane Qrgar
about 0.1 millimeter in thickness and a

inner ear, thus equalising the air pressure on each side of the eardrum.

Without this equalisation, atmospheric pressure on the outside of the drum would press it in, thus putting the

inner ear to the nose and throat passages, »

The hair cells of the organ of corti transmit impulses to the brain which are transmitted through the fluid of the cochlea. This whole structure is only about one inch wide and 1 inch long. Tiny hair cells in the organ apparently sense the vibrations which are transmitted through the fluid

across it. It is stretched across the inner opening of the cochlea. There are up to 40,000 nerve fibres emanating from the organ of corti to the brain. Each hair cell of the organ of corti is connected to a nerve cell. At the instant that a hair cell "detects" the pres-
sure of a vibration a pulse of electricity is transmitted to the brain. The pulse will not occur unless the hair cell is energised beyond a particular threshold level, which depends on the nerve. When the ear has been surgically opened, the nerve con-
tinued until it was found so far.

On a membrane in the cochlea
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Cochlea" so named because it isomules quenc
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Inner Ear, at which we have now
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Cochlea

The oval window allows the system suf-

the ear is really a transducer, or

This excellent diagram of the human ear shows all the parts discussed in the
text, and should be studied in conjunction with it. Note particularly the con-
struction of the cochlea. (With acknowledgments to "Elements of Psychology"
by D. E. Krech and R. S. Cattell, published by Alfred A. Knopf.)

Radio, Television & Hobbies, December, 1963

13
placing it with a polythene tube or a stainless steel wire to make connection between the neck of the incus to a tissue graft placed in the oval window. Since then, the stapes in its entirety and resection of the osseous part that forms the chain of bones, the ossicles, often result in the development of the "stapedectomy" fenestration. This fenestration of the stapes prevents its movement in and out of the oval window.

Some years ago, a surgical operation called "fenestration" was developed. This involved making a new window into the inner ear, which was then covered with the wall of the ear canal, and also involving the ossicles as a window to act directly on the window. This operation failed to make use of the transmission (lever) mechanism of the ear, and some hearing loss always remained.

Another operation for certain ears where the stapes are immobile involves lifting the eardrum and, by manipulating the ossicles, the ossicular sections are fractured. This allows the middle ear to function as almost normal. This operation is called "stapes mobilization." It has been in use for a long time but has recently been revived.

The experience acquired through the stapes mobilization surgery has led to the development of the "stapedectomy" operation. This is performed by removing the affected middle ear and placing it with a polythene tube or a stainless steel wire to make connection between the neck of the incus to a tissue graft placed in the oval window. The operation is performed under local anaesthesia, and the ear is designed to be treated, either medically or by surgery. The trouble is usually noticed by a loss occurring at about 4,000 cycles. As the trouble progresses the loss occurs at progressively lower frequencies, so that in severe cases the loss can occur as low as 250 cycles. The damage is located in the inner ear in the hair cells associated with the organ of corti.

Injury to the ear by a single brief exposure to sound, such as an explosion or gun blast, is called "acoustic trauma." The loss of hearing may be severe at first, but considerable recovery may sometimes occur over a period of several months. This term has also been used in some countries to cover more induced hearing loss.

Meniere's disease is another cause of hearing loss. It is caused by the fluid of the cochlea increasing in quantity. Why this happens is not known. The trouble is characterised by fluctuating hearing, where the hearing is normal between attacks, distortion of sound—especially speech—painful intolerance to loud noises, and an apparent higher pitch in the affected ear than in the good one.

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now's the time to play!

Come and play! You'll really enjoy your- 
self with Encel Hi-Fi equipment ....

Every change you make to your set-up is one for the better. Holiday time is the ideal to install that new turntable, buy that new amplifier and change your speaker systems. There's only one place in Australia to satisfy your needs .... Encel Electronics! Write for a quote on any components you care to name—our mail order service will reply "post-haste." You can't do better—because we pass on to you the benefits of Australia's highest turnover and bulk purchasing—you PAY LESS. All components are BRAND NEW, Sales Tax has been paid—there are NO HIDDEN EXTRAS. Now examine our special offers for December!

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Illustrated above is our 119 gns. complete unit. Labcraft 573 turntable with diamond stylus. Famous Pioneer amplifier with stereo tuners. Wharfedale speakers in Wharfedale columns. All cabinets included in price.</td>
<td>£573</td>
</tr>
<tr>
<td>2</td>
<td>Orpheus Silex turntable. All Balance tone arm, Decca Deram cartridge.</td>
<td>£43</td>
</tr>
<tr>
<td>3</td>
<td>Mullard 6GW8 stereo amplifier, 4 watts per channel, Labcraft 573 turntable with stereo diamond. Two Wharfedale or Richard Allen Rn speakers.</td>
<td>£55</td>
</tr>
<tr>
<td>4</td>
<td>Pioneer SMQ 100 amplifier with AM/AM FM/SW tuners. Orpheus Silex turntable. Ortofon SMQ 210 tone arm and Grunoff SPU-GT cartridge. Two Wharfedale 10in foam surround speakers.</td>
<td>£159</td>
</tr>
<tr>
<td>5</td>
<td>Pioneer 160 Stereo P.F. complete with A.M./A.M. S.W. tuners. Labcraft 605 turntable. All Balance pickup with Decca DERAM (diamond). Two Wharfedale or Richard Allen Rn speakers.</td>
<td>£98</td>
</tr>
<tr>
<td>6</td>
<td>Pioneer 204 A amplifier, complete with A.M./A.M. F.M./S.W. tuners. Labcraft 605 turntable. J.H. MX II tone arm ADC—3 cartridge. Two Wharfedale 10in foam surround speakers.</td>
<td>£129/10/-</td>
</tr>
<tr>
<td>8</td>
<td>Brand new Celloren 4T2000 transcription turntable, with Celloren tone arm and Ronite turn-over cartridge. Polished wooden base.</td>
<td>£15/10/-</td>
</tr>
<tr>
<td>9</td>
<td>LEAK Stereo 50 amplifier and control. Consistency or Garrett 302 turntables, S.M.E. 3003 tone arm, A.D.C.-1 cartridge.</td>
<td>£189</td>
</tr>
<tr>
<td>10</td>
<td>Mullard 6GW8 stereo amplifier, 4 watts per channel, Labcraft 573 turntable with stereo diamond. Two Wharfedale or Richard Allen Rn speakers.</td>
<td>£55</td>
</tr>
</tbody>
</table>

Write straight away! Make up YOUR OWN COMBINATIONS and ask for the Encel Electronics price ... you'll never be disappointed. Don't forget to give us your FULL address. We will care-pack and freight anywhere—there's no distance barrier. P.S. Do have a Happy Christ- 

Australia's Greatest Hi-Fi Centre

Radio, Television & Hobbies, December, 1963

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1. Labcraft 573 turntable with diamond stylus. Famous Pioneer amplifier with stereo tuners. Wharfedale speakers in Wharfedale columns. All cabinets included in price. 119 gns.
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Australia's Greatest Hi-Fi Centre

Radio, Television & Hobbies, December, 1963
This versatile electronic tachometer may be operated with internal combustion engines with 4, 6 or 8 cylinders and 6V or 12V, positive or negative earthed electrical systems. Whilst this tachometer was primarily designed for use in motor vehicles, it may also be used with marine engines having battery ignition.

WIDEBAND TUNER STEREOPHONIC PRE-AMPLIFIER with printed wiring boards (Vol. 6, No. 3)

This unit contains a Wideband AM tuner with a selectable bandpass, together with a four-valve stereophonic pre-amplifier. Although primarily designed for the Mullard Stereo "Ten-Ten" Amplifier, it may be used with most other high quality amplifiers.

High quality sound reproduction is achieved in this Amplifier with a complement of two 6GW8/ECL86 valves and one low-noise AF pentode type EF86 in each channel. A 5AR4/GZ34 rectifier in the power supply is common to both channels. Peak power output is in excess of 10W per channel. The total harmonic distortion (10W output) is less than 0.1%, a typical value being 0.05%.

First published in 1959, and originally intended as a means of communication with the Industry, Mullard Outlook circulation has increased year by year. It is now in great demand, not only within the Industry, but with teaching establishments, home constructors and enthusiasts alike.

It has been decided to offer this Journal to interested readers at a nominal charge of 12/- per annum and to secure your copies for 1964, please send your cheque, money order or postal note with this coupon. Each volume consists of six issues, commencing January-February and concluding with the November-December edition.

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To: MULLARD-AUSTRIA PTY. LTD.
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Enclosed is my remittance of 12/- as subscription for the 1964 issues of Outlook (six copies per annum).

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Address
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Cheques, postal orders and money orders to be made payable to Mullard-Australia Pty. Ltd.
The aid must be designed so that, while straight-out amplification is not enough, there is a range of "cushioning"; a form of automatic gain control which compresses the loss. The loss is seldom the same for any sound, but a patient can accommodate to the aid quite intolerable as the sound would be found the threshold of hearing, so that the range of tolerance is even more acute. The threshold of pain actually moves towards the threshold of hearing, thus further restricting the dynamic range, usually quite severely.

VITAL CONSIDERATION

The foregoing is just one reason why it is so important that the behaviour of the ear be fully understood by those responsible for prescribing a hearing aid. Particularly where the hearing loss is severe, it is not simply a matter of providing an amplifier which "jacks up" the input to the ear, by the order of the operator. The use of hearing aids of some sort has existed. The cupping of the hand has been practised for as long as society has existed. The keyholes is an example of a type of aid. The present is a reflection of the development of the hearing aid from the ear trumpet to the modern tiny microphone. The problem of providing a hearing aid has been solved. He will be guided, of course, by the extent of his hearing defects defined by those responsible for the test but it is certain that he will be provided with one of two main types, namely an air conduction or a bone conduction aid.

Air conduction is the way we normally hear: by sound waves entering the ear canal and impressing themselves on the eardrum. The air conduction aid does the same thing by means of a tiny loudspeaker inserted in the ear canal. This aids amplified sound to the ear drum. The bone conduction type makes use of the fact that the bones of the head are good conductors of sound vibrations. By vibrating the bones of the skull the vibrations are conducted directly to the cochlea and on to the auditory nerve. The outer and middle ears are thus bypassed.

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AT LAST!
a book on tape
recording
for you

If you own or intend to purchase a tape recorder the BASF Tape Manual is a must.

Published by BASF, manufacturers of the world’s most used magnetic tape, this manual covers every aspect of tape recording.

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★ Making your own entertainment.
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★ Magnetic Tape in business, advertising, retail stores, etc.
★ How to add sound to slides or movies.
★ Operating, editing and maintenance hints.

For your copy of the BASF Tape Manual write to BASF TAPE MANUAL
SYNCHRONOUS SATELLITE SETS NEW RECORDS

After the dramatic demonstrations of earlier communications satellites, the recent success of an equally important experiment passed almost unnoticed. This was the successful launching and placing of Syncom II, a communications satellite designed to remain fixed over one spot on the earth's surface, at a height of 22,300 miles.

The longest line-of-sight communication ever made.

The successful placing of Syncom marks a great victory for the experimenters of synchronous systems who have been opposing it as opposed to the lower, non-synchronous systems of the Tel-star and Relay types.

Ultimately, the system continues to prove successful, it would enable a network of three equatorially placed Syncoms to provide direct line-of-sight communications between all points on the earth's surface except the extreme polar regions. About eight non-synchronous satellites would theoretically be required, and about 20 in practice.

Perhaps a greater advantage would be the very much simpler ground stations needed. Since the satellite is stationary, only a single fixed directional aerial would be needed in place of the much more elaborate steerable aerials required for tracking non-synchronous types. This would mean, with a fully engineered system, that undeveloped countries could afford to take part in worldwide communications to provide assistance and all simpler forms of communication links at no great cost.

A great deal remains to be done before any of this could come about, and opponents point out a number of disadvantages. Chief of these appears to be the cost of setting up the system, the delay before it could be ready compared to a non-synchronous system, and the time delay, caused by the greater height of the satellite.

("Electronics Weekly")

BLACK CRO FOR USE IN BRIGHT LIGHT

A NEW type cathode ray tube, using a transparent phosphor screen backed by a thin black backing layer, has been developed by the Hirst Research Centre of the General Electric Co. Main use for such screens is the display of information or pictures under normal bright lighting conditions.

Manufacture of the transparent screen is by vacuum deposition. When sufficient phosphor has been deposited, but while it is still transparent, the tube is baked and the phosphor coated with a black backing material.

This black layer absorbs any light which falls upon the screen (the screen appears black) and also prevents the observer from seeing the hot cathode. In addition, the thin screen minimises reflection loss due to light scatter within the screen layer.

("Electronics Weekly")
Oscilloscope

3-INCH MODEL TVR/C3

Small and portable, this Cathode Ray Oscilloscope is invaluable for TV and radio service work as well as industrial use. Although compact in size, it contains the features of larger instruments, is flexible in use and offers many new features. It is suitable for the visual alignment of TV receivers, and direct access is possible to both horizontal and vertical plates for examination of strong voltages. It can be supplied with a demodulator probe for signal tracing work in TV chassis. Vertical amplifier response plus or minus 1 db from 15 cycles to 150 kC/s and 6 db down at 1 megacycle.

Price: £60 plus Sales Tax

Valve and Circuit Tester Model TST.2

This comprehensive valve tester and combination multimeter is designed to operate from AC mains. It combines the functions of a multimeter output meter and valve tester.

The design of this instrument is such that it will not become obsolete as new valve types or valve bases are introduced. All the elements in the valve testing section are brought out to ten separate lever switches, allowing for individual selection of each element. Thus it is possible to apply filament voltage or test voltage to any base pin which allows for testing all existing valve types as well as future releases. The instrument is housed in a grey hammertone finished case with black anodised label.

Instruction booklet and test leads are supplied and the carrying handle lies flat on the case when not in use. Television picture tubes can be tested by using adapter type TV2. Universal measurements of the instrument are 14in x 1lin x 6in.

Price: £58 plus Sales Tax

University Graham Instruments Pty. Ltd.

106 Belmore Road, Riverwood, N.S.W.

Please send me details of

NAME

ADDRESS

Radio, Television & Hobbies, December, 1963
PULSE GENERATOR

ELIMINATES IGNITION CONTACTS

The Delco-Remy Division of General Motors is now producing a new electronic ignition system that provides higher and more uniform firing voltages at all speeds, freedom from periodic maintenance, and a longer, more reliable lifetime. This system is being offered by the Pontiac Motor Division.

An outstanding feature of the new electronic ignition system is the current interruption necessary for ignition is accomplished electronically rather than mechanically. This feature eliminates the familiar contact points and capacitor and with them the necessity to Q2 and turns it off, thus interrupting coil winding. Also, the characteristic current interruption necessary for ignition base of Q2 to the emitter of Q2. With system is fairly constant throughout the part, to the design of the amplifier circuit.

In the development of this "Delcortronic" ignition system, the objective was to be sufficiently versatile to be used from the distributor are passed on to the ignition coil. As Q2 becomes conductive, the voltage rise in the base of Q2. This applies a forward bias to Q1 and normal contact points. On the right is a circuit of the transistor amplifier which replaces the contact points and capacitor C1 assumes a charge, positive on the top and negative on the bottom. On the left is a diagram of the magnetic pulse generator which replaces the contact points and capacitor C1 charges the capacitor, the base of Q2 is now more positive than the base current for Q3 and turning Q3 off. This polarity applies reverse bias to Q3 and turns it off, thus interrupting the base currents for Q2 and leaving Q3 on. The interval off Q3 opens the coil primary current which, in turn, causes the magnetic field to collapse in the ignition coil, and the coil to send a high-voltage surge to the spark plug. This series of events can be compared with the points-opening sequence on a system.

The charging on capacitor C4 will hold Q2 off until it is bleed to ground through R4. Q2 will then again become conductive and allow Q3 to return to the on state, after which current will again flow through the ignition coil. As Q2 becomes conductive, the voltage rise in the base of Q2. This applies a forward bias to Q1 and normal contact points. On the right is a circuit of the transistor amplifier which replaces the contact points and capacitor C1 assumes a charge, positive on the top and negative on the bottom. On the left is a diagram of the magnetic pulse generator which replaces the contact points and capacitor C1 charges the capacitor, the base of Q2 is now more positive than the base current for Q3 and turning Q3 off. This polarity applies reverse bias to Q3 and turns it off, thus interrupting the base currents for Q2 and leaving Q3 on. The interval off Q3 opens the coil primary current which, in turn, causes the magnetic field to collapse in the ignition coil, and the coil to send a high-voltage surge to the spark plug. This series of events can be compared with the points-opening sequence on a system.

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Peak multimeters are available for the reading of AC and DC voltages from a range of 0.25 volts to 2.5 kV. In strong and durable moulded cases they are fully portable and have clear easy-to-read dials. Prods, test leads and batteries are included with each instrument. Sensitive meter movements ensure accurate readings, yet are sufficiently rugged to allow for portable usage.

The Transistor Checker features easy operation by arrangement of the panel and transistor holder to give rapid and continuous checking where the values read direct on the scale. Suits P-N-P and N-P-N types, also diodes.

**MULTIMETER 370W Specifications**
- DC/V: 0.5V, 2.5V, 5V, 25V, 250V, 1000V (50,000Ω/V)
- AC/V: 1.5V, 10V, 50V, 250V, 1000V (4,000Ω/V)
- DC/A: 0.1A, 1mA, 10mA, 100mA, 1A
- AC/A: 1mA, 1A
- OHM: 0-5kΩ, 0-20kΩ, 0-200kΩ, 0-2MΩ, 0-20MΩ
- Scale Centre: 5000, 10000
- Battery: Internal 1.5V x 2
- Approx. Size: 7" x 5" x 3.5"
- Price: £22.15 (inc. S/Tax) postage extra 5/-.

**MULTIMETER 370J Specifications**
- DC/V: 0.25V, 1.5V, 10V, 50V, 250V, 1000V (20,000Ω/V)
- AC/V: 1.5V, 10V, 50V, 250V, 1000V (8,000Ω/V)
- DC/A: 50μA, 500μA, 2.5mA, 25mA, 250mA (150mV)
- OHM: 0-5kΩ, 0-20kΩ, 0-200kΩ, 0-2MΩ, 0-20MΩ
- Scale Centre: 5000, 10000
- Battery: Internal 1.5V x 2
- Approx. Size: 6" x 4" x 2.25"
- Price: £10.7.6 (inc. S/Tax) postage extra 3/-.

**MULTIMETER 400J Specifications**
- DC/V: 0.5V, 2.5V, 5V, 25V, 250V, 1000V (100,000Ω/V)
- AC/V: 2.5V, 10V, 50V, 250V, 1000V (12,500Ω/V)
- DC/A: 50μA, 2.5mA, 25mA
- OHM: 0-5kΩ, 0-50kΩ, 0-500kΩ, 0-5MΩ, 0-50MΩ
- Scale Centre: 5000, 10000
- Battery: Internal 1.5V x 2
- Approx. Size: 6" x 4" x 2.5"
- Price: £14.10 (inc. S/Tax) postage extra 3/-.

**MULTIMETER 200H Specifications**
- DC/V: 5V, 25V, 50V, 250V, 500V
- AC/V: 10V, 50V, 100V, 500V, 1000V (25,000Ω/V)
- DC/A: 0.1A, 1mA, 10mA, 100mA
- Scale Centre: 5000, 10000
- Capacitance: 10μF to 1μF
- Battery: Internal 1.5V x 2
- Approx. Size: 6" x 4" x 2.5"
- Price: £5.19.6 (inc. S/Tax) postage extra 2/6.

**TRANSISTOR CHECKER SC2 Specifications**
- Measurement Ranges: 0-200, 0.900 - 0.995, 0-900μA
- Meter: Moving coil type of 50μA full scale
- Scale Centre: 5000, 10000
- Battery: Internal 1.5V, 4 x for transistor scale
- Approx. Size: 7 x 5 x 3.5""
Radiant Heaters

Goldplated copper reflectors and square lamps are combined by the Fostoria Corporation, of Fostoria, Ohio, U.S.A., in a Radiant Heater which will reach a heat of 2,000 deg. Fahrenheit within two seconds.

The basic idea was first used for drying of wet areas in paper pulp blankets, for melting tin to reflow over open spots in tinplate or for drying glue. Paper pulp blankets, for melting tin to reflow over open spots in tinplate or for drying glue.

An electric motor, powered by both交流(交流) and direct current, drives this wadgredient submarine, which is being used for underwater research by the U.S. Fish and Wildlife Service. Weighing 2,300 lb and 16 feet in length, the submarine can go 12 miles an hour at a depth of more than 100 feet. It will cruise underwater for about four hours and can descend to a depth of 600 feet.

Goldplated copper reflectors and quartz lamps are combined by the Fostoria Corporation, of Fostoria, Ohio, U.S.A., in a Radiant Heater which will reach a heat of 2,000 deg. Fahrenheit within two seconds.

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An electric motor, powered by both交流(交流) and direct current, drives this wadgredient submarine, which is being used for underwater research by the U.S. Fish and Wildlife Service. Weighing 2,300 lb and 16 feet in length, the submarine can go 12 miles an hour at a depth of more than 100 feet. It will cruise underwater for about four hours and can descend to a depth of 600 feet.

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POWER FILM

is the IRC trade name for a proprietary formulation of precious metals kiln fired at a controlled temperature to become an extremely hard resistive material firmly bonded to the ceramic substrate and virtually impervious to any undesirable environment.

FEATURES:
- POWER FILM on ceramic substrate
- Heat and moisture resistant coating
- EXTENDED RESISTANCE RANGE
- High Electrical reliability
- Extreme mechanical ruggedness
- Low Noise
- Negligible inductance

TYPES

<table>
<thead>
<tr>
<th>RATING</th>
<th>MIN. OHMS</th>
<th>MAX. OHMS</th>
<th>LENGTH</th>
<th>DIA.</th>
<th>TERMINATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF 4</td>
<td>120</td>
<td>996</td>
<td>15/16</td>
<td>2-1/16</td>
<td>AXIAL 1/16 x 0.032</td>
</tr>
<tr>
<td>PF 7</td>
<td>40</td>
<td>90</td>
<td>1/16</td>
<td>3/8</td>
<td>Axial 1/4 x 0.032</td>
</tr>
</tbody>
</table>

ADDITIONAL TYPES AVAILABLE SHORTLY
- Standard tolerance 10%
- Special 5%
- EIA resistance values.

PERFORMANCE SUMMARY
- Average Temperature Coefficient: -55°C to 235°C, less than 350ppm/°C.
- Dielectric strength: over 1,000V rms.
- Short time overload (10 x rated wattage for 5 sec): average change less than 2%.
- Insulation resistance: greater than 1,000 megohms.
- Maximum hot spot temperature: 235°C at full rated load.
- Maximum recommended ambient: 150°C — derate to 45% of rated load.
- Meets Military specification MIL-R-11804D (Characteristic P) for Resistors, Fixed, Film (Power Type).

These resistors are manufactured in Australia by:

INTERNATIONAL RESISTANCE CO. (A/SIA) PTY. LTD.

(A subsidiary of International Resistance Holdings Ltd.)

THE CRESCENT, KINGSGROVE, N.S.W. — TELEPHONE 50-0111.

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Corrugated Tube

Chemische Werke Hof A.G. of Recklinghausen, Germany, announces it has found a way of producing corrugated flexible plastic tubing by extrusion from a tubular die using techniques developed for industrial shaping devices. The flow of still hot plastic tubing, as it leaves the die is drawn and accelerated in a definite direction so that an evenly distributed series of similar corrugations are formed as it cools.

Appliance "Chokes" Fires

A small gas turbine-powered generator that "chokes" fires is being marketed in Germany. It is normal fire-fighting appliances have been developed by two engineering companies. The new mobile inert gas generator is being made by Gibbons Brothers, of Tipton, Staffordshire, England, and a powered screwdriver. Screws are said to be delivered in a similar fashion.

Automatic Screwing

The machine, built by the Clyde Engineering and Manufacturing Corporation, P.O. Box 159, Birmingham, Michigan, U.S.A. will place and tighten screws up to 2 inches long. Aimed at use on assembly lines, the device has a hopper feed for screws, and a powered screwdriver. Screws are said to be tightened quickly to a preset torque uniform in every case.

Briefcase" Welding Unit

A new portable welder, called the Bowthorpe "Briefcase" Welding Unit has a rotating current selector, which takes over the function of the normal metallic wiping fingers. When the door is closed the magnets are attracted to the metal bar through the door is closed the magnets are attracted to the metal bar through the ordinary plating and may permit a definite rhythm so that an evenly distributed series of similar corrugations are formed as it cools.

A water of home nitride, 1/32in. thick, demonstrates its dielectric strength by diverging a 10,000-volt arc. The Union Carbide Corporation, makers of this so-called "white graphite", claim it to be the outstanding engineering material combining electrical resistance, thermal conductivity and good machining qualities with no toxicity problems.

Better Finish

Non-metallic particles dispersed in a nickel plating solution give a finish which can be applied electro-plating. Then it comes a powered screwdriver. Screws are said to be delivered in a similar fashion.

Machine screws are delivered in a similar fashion. Following the powered hammer, which demonstrates its dielectric strength by diverging a 10,000-volt arc. The Union Carbide Corporation, makers of this so-called "white graphite", claim it to be the outstanding engineering material combining electrical resistance, thermal conductivity and good machining qualities with no toxicity problems.

Metallic particles are coated on to it. The resulting matt finish is then given a thin chrome overlay for further protection.

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Measure EVERY wave-form in your circuit with a differential input oscilloscope.

Between transistor, valve, rectifier, SCR electrodes.
Across balanced lines, push-pull and logic circuits.
Motor controllers, magnetic amplifiers, DC converters
and eliminate ground loops in low level measurements.

IN ADDITION TO ALL NORMAL OSCILLOSCOPE FUNCTIONS

DESIGNED & MANUFACTURED BY BWD ELECTRONICS PTY. LTD.

67-69 BURWOOD RD., HAWTHORN, VICTORIA, AUSTRALIA

Radio, Television & Hobbies, December, 1963
Soil Sterilisation

Equipment for "pasteurising" harmful microbes is now being worked on by workers at the Ontario Agricultural College. The method, which distributes electricity through grids of buried stainless steel plates or strips, is claimed to be relatively inexpensive and to deal equally effectively with micro-organisms, fungus spores, weed seeds and insect pests. A pilot unit drew 30 amps at 120 volts through a grid of 24 stainless steel plates immersed in 63 degrees centigrade water. This was found to be a sufficient temperature for dealing with all the harmful organisms named.

Jingling Keys

An economic way of stretching steel components so that hardness and abrasion resistance is increased has been patented by Rintaro Takanashi, 48 Oyama-machi, with cheaper, low-octane fuels. It is expected that the small engine will be planned to produce the engine at first in mechanical connection. It is available In the alternative

Makcs Steel Harder

Improved combustion is one of the main points of the new "Sonomatic" engine developed by Dr. Leon Gross-Gronomski, a scientist at the Technion Institute of Technology, Haifa, Israel. The engine, made largely from aluminium, is said to be particularly suitable for use with cheaper, low-octane fuels. It is expected that the small engine will be planned to produce the engine at first in mechanical connection. It is available In the alternative

Low-grade Fuel

The engine, made largely from aluminium, has been patented by Rintaro Takanashi, 48 Oyama-machi, and now there was a British company had been exporting a quieter electric drill to many parts of the world, and now there was a newer and even quieter one—about fifteen decibels quieter. It is called the Sonomatic, and it works by hydration—that is, a fluid transmits the energy to the drill. The basic invention is that, at the generator, rather than in the drill itself. And you can run the small engine from bottled gas—indoors, if you like. If you are looking for something quieter, but more powerful than the ordinary pneumatic type—and its running costs are lower. It needs only a 13 h.p. engine to drive it compared with the 40 or 50 h.p. unit for the pneumatic drill. And you can run the small engine from bottled gas—indoors, if you like.

Quieter Pneumatic Drill

The charting row of a pneumatic drill is an unnecessary noise in an all too noisy world. Reporting in the B.B.C., Central Overseas Service program "Science and Industry," Nick Oliver pointed out that for some years a British company had been using a new tool for the "pneumatic drill," and now there was a newer and even quieter one—about fifteen decibels quieter. It is called the Sonomatic, and it works by hydration—that is, a fluid transmits the energy to the drill. The basic invention is that, at the generator, rather than in the drill itself. And you can run the small engine from bottled gas—indoors, if you like.

CANNON morpho PLUGS

A NEW DEVELOPMENT FOR INDUSTRIAL AND MANY MILITARY APPLICATIONS

The unique hermaphroditic-modular design of Cannon's new Morpho lightweight plugs provide unusual flexibility and versatility especially intended to meet commercial applications such as computers, business machines and communication equipment inexpensively and with complete reliability—these unusual plugs are equally well suited for all military requirements. The Morpho line features hermaphroditic crimp type contacts and hermaphroditic modular insulators which fit both plug and receptacle. Currently available in 12, 24, and 36 contacts... allows numerous alternate insert positions.

For further information write to RTH.21

CANNON ELECTRIC (AUS.) PTY. LTD., 19 CLIFTON STREET, East Brighton, VICTORIA.
When our "Playmaster" range of amplifiers was first introduced, the "same thing" was to have a basic amplifier and power supply which could be stowed on the lower shelf of a rather ponderous cabinet. The various products were concentrated in a small "satellite" unit, attached to the main amplifier by a flexible cable and intended for mounting to a panel in an easily accessible position.

If a radio tuner was desired, this took the form of a further device plugging into the Control Unit.

This general scheme is by no means obsolete, and interconnecting units of this type are now common in the "Playmaster" range, as well as among the products of the "high-fidelity" overseas manufacturers in the high fidelity sphere. Yet, certainly, where space is not at a premium, the designer of multiple units has the opportunity of using more generously rated components, providing greater versatility as well.

Nevertheless, there followed a demand for compact amplifiers which could be used in a shelf, or an otherwise exposed position, thereby eliminating the need for a large equipment cabinet in addition to the two bi-filar tuning enclosures of a stereo system. What we did was to develop the "Unit" Playmaster series, of which the "Unit 4"—a two-channel push-pull amplifier, with all tone control facilities and suitable for use with crystal or ceramic pickups—stands on a shelf, or an otherwise exposed position, thereby eliminating the need for the "Unit 4"—a two-channel push-pull amplifier, with all tone control facilities and suitable for use with crystal or ceramic pickups.

"Unit" series of amplifiers, the problems requiring resolution were (1) a new and suitable layout (2) provision of a suitable dial mechanism and (3) heat developed inside the case.

The heat problem was attacked by specifying a new case having a large portion of the rear covering the output valves perforated with pins holes, along with an open or perforated back and a generous pattern of holes in the bottom. Four rubber feet or seat buffers below the case allow air convection currents to pass through the unit.

We have suggested to advertisers that this new type of case should be adopted as standard for the earlier Unit Amplifiers as well, since there is no point in stock-keeping both varieties.

The dial caused us the most worry, because ready-built types available to con-
structors are substantially the designs which were evolved for amateurs, receivers dating back ten years or more. There did not appear to be anything available of the long, narrow format, suitable for the kind of unit we had in mind. Consequently we had to do what we have done in the circumstances—create a new dial mechanism, using available "hardware," as part of the front panel assembly.

Assembling and adjusting the dial drive therefore becomes an additional task for the constructor. How to go about it is explained later in the article.

Reflecting the current trend, this latest addition to our "Playmaster" range of high fidelity amplifiers contains an in-built tuner, allowing it to be used either for wide range stereo reproduction or normal broadcast band reception. The additional facility has been included without any increase in overall size and with minimum additional cost.

By John Davidson

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functioning as a preamplifier for both channels, followed by the treble and bass controls. Two triodes, each a portion of the two 6GW8 triode-pentodes, form the voltage amplifier and phase splitter for each channel while the pentode sections form the push-pull output of the voltage amplifier and phase with the normal bias network, an unby-passed resistor of 100-ohms to which is applied the negatively phased feedback voltage from the secondary of the output transformer.

The output transformer used in the amplifier has grain-orientatedsteel lamillations, a primary impedance of 6000-ohms with outside tapping for the screens, and a secondary winding of 15-ohms, with tapings for lower impedances down to 2-ohms.

Negative feedback is taken from the foil 15-ohm secondary winding via a selected value resistor to the cathode of the voltage amplifier as mentioned earlier. It is suggested that this connection be retained even though another tapping altogether is used to feed lower impedance speakers.

To minimise the risk of instability at high frequencies, two routine precautions have been taken. The first of these is the small phase correcting capacitor across the feedback resistor. The second precaution is the resistive and capacitive across the plate load of the voltage amplifier, and introducing deliberate attenuation and phase shift above the audio range.

The components have been selected on the basis of a compromise between frequency response, square wave response, and phase shift above the audio range. For best compromise between overall frequency response, square wave response, and phase shift above the audio range.

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Radio, Television & Hobbies, December, 1962
detector, the latter also AGC. It gives very good performance, though there is a limit to the "DX" provided by the simple 2-valve tuner. Providing simple metalwork.

Looking now at the assembly, the panel is attached to the chassis with four countersunk head bolts. One of these should be long enough to hold two nuts, a 3/8-inch long bush carrying a dial pulley, a washer and a nut. We shall mention brackets. If any packing or fix work has to be done, this is obviously the time to do it.

The dial glass is held forward against the front panel by two clips bent from springy brass and mounted under the two top chassis-to-panel mounting nuts. The dial glass in the photograph, by the way, is merely one which we happened to have on hand, marked "killcycle." The rim which the advertisers will carry for this project will probably come with a dial glass calibrated especially for the unit and, most likely, carrying station call signs.

Although the chassis, case and panel dimensions are identical to our Playmaster Unit Amplifier No. 4 we have made changes to the position of holes and cutouts to accommodate the tuner parts. A blueprint of the chassis and panel will be made available in the trade, and through our query service for those who want to handle their own metalwork.

3.75 in. long, it is intended to fit hard against the inside face of the front panel, resting in a natural recess provided by the shape of the chassis.

Radio, Television & Hobbies, December, 1963
Rola's famous Model 8MX, a true "long-throw" wide range loudspeaker represents the best "sound-per-pound" value in Australia. Designed originally to meet the requirements of both the manufacturer and the home builder of wide range and stereophonic sound equipment it has proved one of the most popular loudspeakers Rola has produced in recent years.

To appreciate the reason for this it is necessary only to briefly review some of its characteristics. First, it has a high-powered 36,800 lines magnetic system which results in a power handling capacity of 10 watts and is largely responsible for the loudspeaker's excellent transient response which in turn gives the "clean" sound which the 8MX is noted for when the BMT is used.

Then consider its frequency response. Though in Rola's conservative method of rating this is specified to 60 to 10,000 c.p.s., when the 8MX is used in a properly designed enclosure, it smoothly covers from 30 c.p.s. to the upper threshold of audibility. Also, remember that the 8MX has a 15 ohm voice coil impedance so can be used with any standard amplifier. Finally, remember the 8MX gives its ideal performance when used in a tiny 1.8 cubic feet enclosure — an important thing in a stereo system.

You be the judge. Have your dealer demonstrate the Rola 8MX with either monaural or stereo amplifiers. You will find it will outperform any loudspeaker in its price class. And when you purchase your 8MX be sure to get a copy of Rola's Loudspeaker Enclosures booklet which gives full information on a simple to build enclosure which will ensure that your 8MX gives the truly remarkable performance of which it is capable.

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ability of producing a composite, front label and dial scale from perspex, which will eliminate the need for a separately fitted glass.

Next step is to prepare the various controls by cutting the spindles to a suitable length. Check this carefully with the knobs you intend to use, noting particularly whether the controls need to be packed back with washers to minimize the amount of thread exposed at the front. Make sure that the switch tags at the rear of the volume control are clear of the chassis. The dial drive spindle attaches to the panel with two countersunk bolts and nuts.

One might mention, in passing, that the combination volume control and switch can be treated as an optional item. Some may prefer, on principle, to keep the drive cord. A nut locks everything in place.

The left-hand bolt carries a similar spacer and pulley, a locking nut, then a further spacer and pulley and an outer nut.

The fifth and final pulley is attached to the side flange of the chassis and uses a 3/8in bush instead of a 3/8in. This will maintain the pulley close to the chassis flange, allowing the cord to move along the outer edge of the drum groove and preventing the cords from rubbing together.

The drum pieces in position, the mechanism can be "strung" using, for preference, proper woven nylon dial cord. It is well worth spending the necessary time to get the tension right and the mechanism working smoothly, before the job is complicated further.

How to string the dial is evident from the detailed photograph which we had taken just after we had got things working to our satisfaction. At the time, we were using a regular dial slider for the pointer carriage to ride on the top edge only. Slight downward tension from the drive cord is sufficient to hold it in place.

Just visible in the photograph is the complete chassis, and two dial lamp holders attached to two small brackets at the rear of the front panel below the dial glass. One can be seen between the bass and treble controls while the other is between the balance control and selector switch.

It would seem wise, at this stage, to mount the remaining rubber grommets and valve sockets, making sure that the latter are oriented in the direction dictated by the arrows in the under-chassis photograph. The general aim is to make all grid and plate leads as short as possible.

The orientation of the coil cans in the tin is equally important and these should be mounted in accordance with the markings on the under-chassis photograph of the tuner. The two speaker sockets, the two pick-ups, and the terminal bar are mounted along the rear of the chassis. On the leading edge of the chassis, at the power transformer end, is mounted the mains cord terminal block.

Some of the larger components, notably the power transformer, 100mfd double capacitor and choke can be mounted at this stage. The power transformer should be spaced off the chassis by the thickness of one nut to reduce eddy currents induced into the chassis.

Prior to mounting the output transformer, it is essential to fit the two rear speakers. The two speakers are bolted onto the two pick-ups, each kind of speaker being 2/8in. Each is fitted with a Fix spacer.
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Consolidated Electronics Pty. Ltd.
380 St. Kilda Road, Melbourne, S.C. 3
Ph. 337-2444

Radio, Television & Hobbies, December, 1963
the valve sockets, earth, HT 1, HT 2, and earth. These last are connected in series on the underside, than secured with a nut.

Radio, Television & Hobbies, December, 1963

the chassis for the small components. However, when purchasing these, do not be tempted to mix and match different types, as they may have differing voltage ratings and thus need additional components to be placed in the circuit.

All the wiring associated with the 6GW8 valves is contained either on the HT sides of the transformers. The two-tap heater windings on the power transformer distribute to the valve sockets. Using the Ferguson Polisher, which is wired to the high tension at HT 1. We can thus no longer accommodate the original five functions provided by the Unit No. 4, we decided to reorganize and rewire the preamplifier section and the associated controls it will be seen that our former layout has been retained, but compressed a little to the left so as to allow for the tuning control.

This detailed view of the tuner portion indicates orientation of the valve sockets and the general placement of wiring components. It is a good plan to interconnect all earth return points in the tuner portion as a precaution against an imperfect earth and possible instability as a result.

This second wiring diagram embraces the wiring associated with the control wiring and the preamplifier. Because of space limitations, we have had to restrict our function switch to a single water jet. This means, in turn, that for standard, over-the-counter types, the heat provision appears to be 4 p.a.

While we can thus no longer accommodate the original five functions provided in the Unit No. 4, we decided to retain all on the new label. This gives the builder a choice of several arrangements to suit his own requirements.

As shown in the wiring and circuit diagrams, the switch is wound to give "Reverse," "Stereo," "Mono," and so on.
FERGUSON speaker transformers are designed for replacement purposes or for use in new equipment employing low power audio output valves.

### SP EAKER TRANSFORMERS

#### BK SERIES

<table>
<thead>
<tr>
<th>TYPE NO.</th>
<th>MAX. WATTS</th>
<th>PRIMARY IMP. OHMS</th>
<th>NOM. SEC. IMP. OHMS</th>
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<tr>
<td>E10K3</td>
<td>6</td>
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<td>5000 S.E.</td>
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<tr>
<td>E10K15</td>
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#### KK SERIES

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<tr>
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<tr>
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<td>B10K15</td>
<td>12</td>
<td>10000 P.P.</td>
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* 5 ohms—VC Range, 14 to 16 ohms.
* 3 ohms—VC Range, 2.7 to 3.5 ohms.

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**Radio, Television & Hobbies, December, 1963**
"Radio," in that order, the "Spare" having been deleted. However, any reader desiring to use an auxiliary input for tape or an additional tuner, etc., can follow one of two suggestions: The simplest is to delete the stereo-volume controls, one for each channel, with the "Spare" position to one of two suggestions: on the insulated and shielded leads. Unfortunately, this would be a "special" (3) the centre tag of the balance controls but remain isolated at earth at this point. At the switch end. possible to obtain a 4-pole, 5-position single wafer which will do the job. The second pair connects between the adjacent volume controls, a length of spaghetti-covered tinned copper wire straps (1) to the earth point on the preamplifier return terminal, the set should be ready to be plugged in and switched on. With speakers connected to the output terminals, the set should be ready to be plugged in and switched on. The first and foremost thought at this point is: Are the voltages correct and are the valves working under normal operation conditions? As a guide, we have listed a few voltage readings which would be to plug the set in and aligned stations at the high frequency limit of the scale. If there is no such mark, a like course can be followed of adjusting the control, without any definite limit mark, the pointer can be set to reach about 55%Kc, with the gang fully meshed. Having set the pointer, the usual procedure is to align the low frequency stations for position and alignment with the oscillator and aerial coil slugs only, using the trimmers on Vy drifts and tuning controls. This section is dedicated to the I.F. amplifier valve. The diagram above shows the valve and component designations. No special precautions are necessary in regard to the earth returns for the G6WA wiring. The last position of the chassis to be described is the tuner, which is connected to the balance, selector and tuning controls. In an effort to avoid hum due to earth loops and eddy currents in the chassis, single point earthing has been used for the entire input and tone control circuit. All earth returns are made to interconnected points, which return to the pickup input sockets via the braid on the insulated and shielded leads. The second pair connects between the insulated and shielded leads, looking from the rear, one position is marked "A.F.", the reverse position and wire the switch contacts, looking from the rear, one position is marked "A.F.", the reverse position and wire the switch contacts. As the coaxial type input sockets are taken with a VTVM from the meshed. point is: Are the voltages correct and other hand, if the scale is calibrated more thoroughly, a bearing on I.F. stability and I.F. amplifier is just comfortably stable. 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A CR impedance compensating circuit is applied to ensure tonal clarity and flat impedance.


Woofer features a conical slffener for correct crossover frequency determination and rapid frequency fall off above crossover point.

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Circular baffle around tweeter minimises cone interaction. These high efficiency speakers will operate satisfactorily from any Hi-Fi amplifier of one

Built-in cross-over network allows smooth transition and reproduction in their proper phase relation, without any dips at the crossover frequencies.

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Radio, Television & Hobbies, December, 1963
PARTS LIST & SPECIFICATIONS

**Valves and Diodes**
1 12AU7 or ECL86
2 100 mfd 200V electrolytic
2 455K I.F. transformers
6 9-pin valve sockets
1 Single water 4-pole 4-position socket switch
1 2-pole tuning capacitor, (Rubber or similar)
1 Aerial coil
1 Oscillator coil.
1 2.45K Hz, f.f. transformer.

**Capacitors**
4 100 pF (not high K).
4 .022 mfd 125V paper or Mylar.
2 25 mfd 10V electrolytic.
1 Filter choke, 150mA, 2 Henriette.
1 Case, internal dimensions 12-in x 7-in x 11-in.
1 Power transformer, voltage derived.
1 Printed label.
1 Panel 11-in x 41-in.

**Resistors**
15 220K.
10 470K.
4 1 meg.
3 47K 1-watt.
7 100K.
2 220K.
1 2.2 meg.
2 2200-ohm.
4 2700-ohm.
2 4700-ohm.
3 47K.
1 220-ohm.
9000 ohms.
3.3K, 0.1W.

**Sensitivities**
- Frequency response: Within plus or minus 10db from 18cps to -20db at 15Kc.
- Treble +10db.
- Power output: 7.5 RMS watts per channel, at the output of the tuner to preserve a small amount of signal division operating the system will be a little short of power cable and plug.

**Main Voltages**
1 1st filter cap. 250V.
1 2nd filter cap. 250V.
1 Bias point 15-ohm, tapped.
1 Grounding components.

**Sundries**
Miniature targetrip, 1 3-tag, 1 S-tag.
7 3/16in, rubber grommets.
2 Dial lamp holders and lamps.
1 12 pairs of tags.
6 Knobs to suit label.
2 Small speaker plugs and sockets.
2 Large speaker plugs and sockets.
6 2-meg linear.
1 -}in dial spindle. Nylon cord, spring.
1 Dial drum 3 7/8-in diameter, with ten divisions.
1 Dial frame 12-in x 7-in x 11-in.
1 Chassis 12-in x 7-in x 11-in.
1 Aerial cell.

**Radio, Television & Hobbies, December, 1963**
FROM THE SERVICEMAN WHO TELLS

A JOB IN MEDICAL ELECTRONICS

As I have mentioned on previous occasions, the average serviceman's job seldom lacks variety. While routine radio and TV troubles make up the great majority of the work — and pay the bills — most of us welcome the occasional off-beat job, if only to lighten the tedium.

I HAVE encountered a pretty wide variety of jobs at one time or another, ranging from door bells to electronic flash units; from burglar alarms to high precision medical equipment. I had never been faced with anything so complicated — and to this very day (I have to confess) I am not completely at ease with the device on which I am about to report. It was brought to me by a customer whose TV and radio I have repaired on a number of occasions. It was a surgical diathermy generator, fitted with one of the most delicate eye operations. It so happened that a customer whose problem was obviously much more complex than mine had used the same. I couldn't be sure, and the fact that the person had complained about it suggested that the unit was working properly as it stood. On the other hand, it turned out to be a sticky spot, in the most literal sense of the word. I read about it in one of Calvin Walter's articles in the front of the Radio, Television A Hobbies, December, 1963.
haviour over a reasonable time, I still wouldn't know what was going on.

I was beginning to regret ever having tackled the job.

Nevertheless, I kept fiddling with it. I bashed it. I shook it. I wiggled all the exposed leads, and I switched it on and off a number of times. At first, none of these things revealed any result, but my efforts were eventually rewarded. Having switched it off for the umpteenth time, I switched it on again and realised that the indicator light had now come on.

At first, I had no way of knowing why, this was really significant. It could have been due to a purely local failure in the indicator light circuit, or it could have meant that the entire unit had failed. As a first test, I operated the "cut-coagulate" switch. When the second indicator light failed to operate with the switch in the other position, I felt pretty certain that the whole unit had failed. This was confirmed when, after allowing enough time for the valve to warm up, I repeated my earlier test with the probe. There was no spark and no meter reading.

SITUATION CLEARER

I felt somewhat gratified at this. To be sure, I still had to find the exact cause, but I now had a very much clearer picture of the whole situation, and at least knew what I was looking for. What was more, it was now fairly obvious why the unit had been shuffling back and forth between the hospital and the agents without much satisfaction for anybody.

It was, in fact, a classic example of an old problem: an intermittent fault plus lack of liaison between the user and service mechanic. I need hardly add that this is infinitely more serious in the field of medicine than it is in the field of entertainment.

From what the customer had told me about this particular eye operation, it was easy to visualise the situation where considerable preliminary surgery had been performed on the eye, in preparation for the actual attachment of the retina, only to be rendered useless by the sudden failure of the one piece of equipment essential to the job.

Surely, in such circumstances, there is no room for the slightest doubt or misunderstanding. Reliability must be as near 100 per cent as human ingenuity and co-operation can make it. These were the thoughts I had in mind as I set about tracking down the fault. Before opening the unit, I tried flicking the "on-off" switch up and down several times, exerting sideways pressure as I did so. This did not reveal anything conclusive, although it did seem that failures were more frequent when I pressed it one way rather than the other.

Next, I removed the back of the case. A point I noticed here was that the unit between the back and the case was sealed with a gasket. I realised that this was part of an overall requirement of electronic equipment for use in operating theatres; that it must be gas tight to minimise the risk of explosion in the presence of inflammable anaesthetics or anaesthetic gases. This thought was to assume some importance later on.

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Radio, Television & Hobbiot, December, 1963
The switch was pretty well 'built out' in this particular case. Most toggle switches use a standard mounting thread of 7/16" diameter, but not this one. It was ivory, roughly like 9/16". It mounted neatly, without undue worry. There still seemed no real reason why the switch should not have been accessible, but it was."}

"I simply assumed that all I would have to do was cut it out in any one of several well-known and reliable brands, remove the old one, fit the new one, make a few soldered connections and the job would be done. Even allowing that the switch was not actually too much of a job, it probably wouldn't take much more than half an hour. However, the alternative position of any substitute switch. I had to either find another switch of the same type or find some way to make the existing one both usable and reliable.

So I started a round of the whole unit was very 'compactly' wired and it was only a faulty switch. It was not a brand or type I could quote. As it was, it was the only one I had been able to tell me who imported them. But, as with the detective—at least I knew the TV variety—I eventually struck oil.

"As I said before, this was pretty well 'built out' in this particular case. Most toggle switches use a standard mounting thread of 7/16" diameter, but not this one. It was ivory, roughly like 9/16". It mounted neatly, without undue worry. There still seemed no real reason why the switch should not have been accessible, but it was.

Since the equipment was fairly new, the repair was fairly simple. I cut it out, neighbouring components, and moved it gently out of the way. I fancied it moved just a little easier than the old one. It had been specially moulded to provide a neoprene washer at the base of the switch. This, in turn, was part of the gas-proofing of the unit as previously mentioned. So there it was. After all my worry, it was only a faulty switch. Did I say "only" a switch? Wait until you hear the merry dance that switch led me.

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SO I set about removing the old switch. As I said before, this was pretty well positioned by other components, in such a way that I had to lift it out of the front panel in order to get at it. One of these was a mica capacitor and, as I lifted one end, I found that it had been specially moulded to provide a neoprene washer at the base of the switch. The latter was a gas-proofing of the unit as previously mentioned. So there it was. After all my worry, it was only a faulty switch. Did I say "only" a switch? Wait until you hear the merry dance that switch led me.

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<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>SIZE</th>
<th>LENGTH</th>
<th>PRICE</th>
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<tr>
<td>Acetate 1.5 Mil.</td>
<td>3&quot;</td>
<td>600'</td>
<td>9/-</td>
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<tr>
<td>Standard Play</td>
<td>5&quot;</td>
<td>1000'</td>
<td>25/-</td>
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<tr>
<td>Crimson Seal</td>
<td>7&quot;</td>
<td>1500'</td>
<td>37/-</td>
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<tr>
<td>MYLAR 1.0 Mil.</td>
<td>5&quot;</td>
<td>600'</td>
<td>45/-</td>
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**Long Play**

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<tr>
<td>Acetate 1.5 Mil.</td>
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<td>1000'</td>
<td>25/-</td>
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<tr>
<td>Long Play</td>
<td>3&quot;</td>
<td>600'</td>
<td>9/-</td>
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<tr>
<td>Green Seal</td>
<td>7&quot;</td>
<td>1200'</td>
<td>37/-</td>
</tr>
<tr>
<td>MYLAR 1.0 Mil.</td>
<td>5&quot;</td>
<td>600'</td>
<td>45/-</td>
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**Super Play**

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<tr>
<td>Perma Play</td>
<td>5&quot;</td>
<td>1200'</td>
<td>41/-</td>
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<tr>
<td>Orange Seal</td>
<td>7&quot;</td>
<td>1800'</td>
<td>60/-</td>
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<tr>
<td>MYLAR 0.5 Mil.</td>
<td>3&quot;</td>
<td>300'</td>
<td>18/9</td>
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**Mylar**

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<td>1/2 Mil.</td>
<td>3&quot;</td>
<td>300'</td>
<td>13/6</td>
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<tr>
<td>Tensilored</td>
<td>5&quot;</td>
<td>1200'</td>
<td>60/-</td>
</tr>
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Radio, Television & Hobbies, December, 1963
Electronic music and musical instruments provide the basis for most of this month's questions, directed to us by a reader in Cranford, N.J.S.W. E. Such is the interest in this subject that this set of questions and answers

What is a reverberation unit or chamber? You won't be far wrong if you regard reverberation as echoing echoes within a room.

When sound is created inside a large room, as in an auditorium, a church, etc., the sound waves tend to bounce back and forth between walls, floor and ceiling. The effect is more noticeable if the surfaces are hard (brick, stone, woodwork) rather than soft (drapes, carpet, absorbent wallboard).

Too much reverberation, as might occur in a cathedral or a large city hall, can be very undesirable, because the echoes are so prominent and persist for so long that they can, for example, render speech almost unintelligible.

On the other hand, a small amount of reverberation is often considered desirable, because it makes sound rather more "interesting" to the ear. This is particularly true of a musical performance.

When music is to be produced in a small room or in a larger room with absorbent drapes and furnishings, the musicians may desire to produce sound of a more reverberant quality than is naturally available in the particular room, equivalent to what the audience would hear if they were actually seated in a concert hall, an opera house, a cathedral, etc., the reverberation as meaning echoes within a building.

In other words, they may want reverberation to modify the sound from electric guitar amplifiers. Similar treatment is used to make electric organs produce sounds somewhat after the energisation is reversed, their opening can be delayed rather than soft (drapes, carpets, absorbent wallboard).

The effect is most noticeable if the surfaces are hard (brick, stone, woodwork) rather than soft (drapes, carpet, absorbent wallboard).

Examples of artificial reverberation also occur in radio, TV and film programs where characters may be trapped in underground passages etc. The background sound can be made to echo and continue within a room by means of "reverberation chambers" can be used for such a purpose. It generally involves a resonant chamber, the inside of which is divided into two sections. A loudspeaker in the chamber reproduces a signal fed into the input transducer. Here the movement is reconverted into an electrical signal, which is then amplified and reproduced through a loudspeaker. A TRIBUTE

A TREASURE

What is the difference between reverberation and sustain? The terms are occasionally confused, and sometimes by people who should know better. They really refer to quite different effects.

As we have already explained, "reverberation" is an echo effect, which can occur naturally or be simulated by one of the methods outlined. "Sustain" refers to the idea of keeping a note playing for a brief interval after the playing key has been released. It is frequently used in the pedal of "spinet" electronic organs to fill the gaps in the bass which might otherwise be evident as the foot is moved from the bass to the treble.

Sustain effects can be obtained mechanically, some models do this by pressing springs, which travels along the springs and reproduced through a loudspeaker. This imparts a vibratory motion to the springs, which travels along the springs and produces something like the effects obtained from "reverberation units" have been devised which can produce something like the electronic signal, which is then amplified and produced through a loudspeaker.

Another is to record the sound on a moving loop of magnetic tape and pick it up immediately afterward through one or more separate replay heads. Another is to feed the signal from a speaker through a coiled length of plastic tubing.

The terms are occasionally confused, and sometimes by people who should know better. They really refer to quite different effects.
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WARBURTON FRANKI


Radio, Television & Hobbit December, 1963
A monophonic instrument usually exerts one which is able to play only one note at a time. While it may have a keyboard with a couple of octaves of notes—or even generally contains only one oscillator. Thus, no matter how many keys are pressed simultaneously, only one note is heard—usually corresponding to the highest key or frequency which is being depressed at any instant.

In the face of this, the term "monophonic" is something of a misnomer, because an organ is usually taken to signify an instrument upon which several chords can be played.

The main role of a monophonic instrument is an essential feature of an instrument group or in conjunction with a regular piano or organ.

The monophonic instruments to which you refer are almost certain to be electronic in their operation, involving an oscillator, wave shaping and filter circuits, plus amplifier and loudspeaker.

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Radio, Television & Hobbies, December, 1963
A SILICON DIODE SWEEP GENERATOR

By Ion Pogson

DURING the process of developing the Communications Receiver Front End which was described recently, it was necessary to make considerable use of a sweep generator. As mentioned at the time, the generator used was one that was substantially as published back in March 1957. The design of this unit centred around a mechanical transducer and the job it did in the application was quite satisfactory.

Since then, work has continued on the rest of the receiver and the need for a sweep generator to align the 455 Ke HF circuits has arisen.

It is not meant to imply that 455 Ke HF circuits using either crystal lattice or mechanical filters cannot be aligned satisfactorily using other means. However, where development is involved, or where it is considered necessary or desirable to obtain the best possible passband shape, then the sweep generator is virtually a “must.” The sweep method is much quicker and any small adjustment to such filters is easily made, both before and after the transducers are mounted.

Before going into the details of the unit we are about to describe, it may be worth spending a little time considering some of the fundamentals of sweep generator design. The few paragraphs that are often referred to as “wobblers.”

Fundamentally, a sweep generator is an RF signal generator whose output is constant in amplitude but which is varied in frequency over a predetermined range, usually as an audio rate.

The variation in frequency can be obtained either by electronic or mechanical means. The simplest mechanical means is a motor driven variable capacitor which is placed across the oscillator coil whose effective permeability is varied by AC passing through a special winding.

Another method of frequency variation is the use of a Voltage Dependent Silicon Colloidal gel, a material which is held in a container and expanded by the addition of water. When a potential gradient across the junction is applied, the colloidal gel expands and contracts, thus varying the capacity of the device. This is the type of element which is centred around it.

By Ion Pogson

In practice, the AF voltage or current used to vary the frequency of the oscillator is also generated to the horizontal or X plates of an oscilloscope to deflect the CRT spot, thus tracing a line. Points along this line then represent frequencies over the range being swept by the oscillator.

In the case of a receiver, the output is taken from the receiver’s detector circuit, either a separate modulator probe or the X plates of the CRT, so that the display on the horizontal axis of the oscilloscope is a function of oscillator frequency. In any event, distances along the vertical axis of the display will be proportional to the output of the circuit being swept indicating the gain or response. The trace then represents a curve of the gain versus frequency characteristic of the tuned circuits.

In many units, particularly those intended for TV work, it is common practice to use 10-cycle mains to provide the sweep frequency. This method is simple and convenient but cannot be applied to narrow-band filters with steep skirts. When sweeping any circuit, it is necessary that the sweep rate be low enough to allow the voltages in the circuit to reach their full amplitude at each and every instant of time, otherwise serious errors can occur in the display.

Should the sweep rate be too high, there will not be sufficient time for the voltages in the circuit to reach the full amplitude.

When sweeping any circuit, it is necessary to allow the voltages in the circuit to reach their full amplitude at each and every instant of time, otherwise serious errors can occur in the display.

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This it the front view of new sweep generator which was specially designed to suit the requirements of Communications Receiver alignment. In addition to this function, many other uses may be found for the instrument, such as SSB transmitters adjustment.
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value and the "front" of the response curve displayed will have a lower amplitude than that it has in actual fact.

In addition to this, after the frequency of the generator has swept past the top of the pass-band, there will still be some output as the circuits return relatively slowly to the no-signal condition.

These effects can produce an apparent increase in bandwidth due to the observed peak, a displacement of the displayed response curve in the direction of the sweep and an asymmetrical response curve with the trailing edge drawn out more than the leading edge. In extreme cases, a damped oscillation or ringing will be produced after the trailing edge of the response curve. This applies particularly to crystals or mechanical filters.

While the correct procedure is to use a slow sweep rate, the problems can be minimized in 50-cycle units, by setting the deviation control for the minimum usable sweep, and an amount of deviation reduces the rate at which any given frequency segment is traversed.

For this the end of the story. Having made the case for a reduction in sweep rate, particularly as applied to narrow band filters with steep sides, it is necessary to take a look at conditions which exist when a very slow sweep rate is used.

**DIRECT COUPLED CRO**

By way of illustration, it will be assumed that a band-pass filter with a substantially flat top is to be swept. If a 50-cycle slow sweep rate is used, as the trace travels up the leading skirt and reaches the maximum value, it will need to "hold up" until the trace begins to follow the trailing skirt. This condition calls for long time constants in the CRO circuits. Otherwise the trace along the top of the pass-band will tend to droop.

The ideal out of this problem is to use a CRO with a direct coupled vertical amplifier. This amplifier will not only be capable of handling a very slow sweep rate, but it is necessary to have good base response. This point should be made at some length. It may be necessary to arrive at some compromise between the requirements placed on the amplifier and those placed on the test equipment. It is necessary to check with base response on the chart to make sure that ringing will not be produced with its attendant difficulties, on the other hand.

An alternative to the 50-cycle mains and a more versatile method of obtaining a sawtooth waveform is to use a sawtooth for the waveform from the CRO, which assumes the availability of a two terminal oscillator, using a 50-cycle sine wave, compared with a 50-cycle sawtooth waveform. The solid sweep curve displayed will have a lower amplitude than it has in actual fact.

Whereas only 180 degrees of the sine waveform is used for the forward trace, with approximately half that of the sine wave.

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citor. Normally, this capacitor is biased by a 4 volt source or as an impedance step-down device.

The sweep oscillator. By so doing, a fairly wide sweep is required, it will be necessary to adjust the LC ratio such that the variable capacitor will be used mainly toward its minimum position.

Sweep voltage from the CRO is fed via the "Divisor" control, into the grid of one half of a 12AT7 as a cathode follower, the output of which is used to sweep the BA102 capacitor. The cathode follower provides a large measure of isolation between the CRO time base and the oscillator. It also functions as an impedance step-down device.

The other half of the 12AT7 is used as an output cathode follower for the sweep signal. By so doing, a fairly low impedance is obtained without the need for a second winding on each oscillator coil. This further simplifies the switching. The "Output" control is a 2K carbon potentiometer in the cathode of the cathode follower.

Although we have used modern valves in our unit, there appears to be no reason why some of the older types could not be used if they happen to be on hand. The 12A7 cathode followers could be replaced with a 6SN7. We have not tried any other types for the oscillator, but it is more than likely that a 6SN7 would be satisfactory in this position as well, though perhaps with some limitation at high signal frequencies. There is no reason why a "tank-up" should not be tried before building it into the actual metal work.

The band selector switch has three positions. In our case, we provided a coil for 40 Mc and one for 455 Kc, which were those required for our particular purpose. The 40 Mc coil may be tuned to 27.5 Mc by means of the variable capacitor and this enabled adjustment of the 37.5 Mc filter in our receiver. A third switch position is wired to a 5-pin valve socket to take any coil which will enable any other desired range to be swept. This facility could be particularly useful to those amateurs who are contemplating the use of high frequency crystal filters in a receiver or SSB transmitter.

The power supply requirements are 6.3 volts at 0.6 amp for the heaters and 150 volts at 11 milliamperes for the high tension. These are provided by a standard transformer with secondary ratings of 6.3 volts at 0.6 amp and 150 volts each side of the centre tap, at 20 milliamperes. The rectifiers are silicon power diodes. The power supply may be dispensed with if the necessary voltages can be supplied from outside.

The 40 Mc coil is wound on an 8 mm slug-tuned former, inside a 3in square can. The winding consists of 71 turns of 18 B & S enamelled copper wire. If long, if a 7mm former is used, the number of turns should be in order. It only means that the slug will have to be screwed a little further into the former.

The 455 Kc coil is a modified IF transformer. We used an R.C.S. type 119 standard IF transformer, but most other makers should be suitable. Both 100 pF slug capacitors were removed from the windings. Then the start of one winding and the finish of the other were connected together and "F" and "E" were connected to the oscillator circuits.

The 12AT7 is a two-terminal oscillator, while the 12A7A served as a cathode follower. The power supply may be omitted if an external supply is available.
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By connecting the two windings in this way, the effective inductance obtained is somewhat more than double that available from one winding. This permits of a higher LC ratio which makes the sweeping operation easier where a reasonably wide bandwidth is required for a given sweep range.

With the circuit as shown, we have obtained a sweep width of 2 Mc at 40 Mc and 20 Kc at 455 Kc. These figures were obtained without any trouble and are consistent with reasonable amplitude/ frequency linearity. The frequency linearity, while it does leave something to be desired by the perfectionist, is quite as good and perhaps better than that obtained from the transformer type of arrangement. Any non-linearity is no real inconvenience and can be allowed for without any trouble.

The sweep width just quoted should be ample for aligning the following "impostors": Front End and all 40 Mc IF strips. However, for those who would like more sweep, it is possible to obtain quite a bit more—it is the expense of amplitude and frequency linearity.

INCREASED SWEEP

Although time has prevented us from trying this idea, it would be possible to get a greater sweep by placing two BA102 Silicon Capacitors in parallel. Provided both elements were suitably matched, they should function satisfactorily together. However, this is not easy to achieve and some measure of isolation would need to be provided. A suggested arrangement is as follows:

It should also be borne in mind, if the inductor is to be used for television broadcast tuners, that an extra static capacitance of around 200 pf will be required. This can be obtained by paralleling the BA102's is to be matched, they should function satisfactorily together. This is done in compensation for the extra capacitance which would be required if the system were to be used for television broadcast tuners. With the circuit as shown, we have obtained a sweep width of 2 Mc at 40 Mc and 20 Kc at 455 Kc. These figures were obtained without any trouble and are consistent with reasonable amplitude/frequency linearity. The frequency linearity, while it does leave something to be desired by the perfectionist, is quite as good and perhaps better than that obtained from the transformer type of arrangement. Any non-linearity is no real inconvenience and can be allowed for without any trouble.

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The instrument is enclosed in a cabinet of standard size, to which is fitted a 4 in. screen (25 in. diagonal), with a 4 in. depth. The control panel is arranged in a manner which permits easy access to the instrument and its components. The components are grouped mainly around the relevant valve sockets. The layout of the front panel may be seen in the photograph. The controls are conveniently arranged, with the coax socket for the time base input from the CRO at the left and a similar socket for the RF output at the right. No pilot indicator pump or power switch has been provided, again in the interests of simplicity and economy. It should be desired to fit these refinements, there are rooms available.

Most of the components are more or less run-of-the-mill variety and very little comment is necessary. However, the semi-precision components are given some attention. Even with a mains transformer with a variable voltage of 150 each side of the transformer with consequent troubles such as slug jamming. Caring for the actual use of the instrument, the first requirement is to obviate any transience in the output, which can be taken from the time-base of the CRO, as mentioned previously. Quite a lot of CRO units have direct connections from the plates of the cathode-ray tube, brought to the front panel. The circuit of an envelope detector, with AGC system, illustrates how the AGC line may be divided and how connection may be made to the CRO vertical amplifier.

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Radio, Television & Hobbits, December, 1963

Another point worth mentioning is that the 40 Mc coil is inconvenient, with the coax socket seen in the photograph. The controls are conveniently arranged, with the coax socket for the time base input from the CRO at the left and a similar socket for the RF output at the right. No pilot indicator pump or power switch has been provided, again in the interests of simplicity and economy. It should be desired to fit these refinements, there are rooms available.

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- 21.0 MC 15 M, (21.0-21.9 MC)
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The graph appearing above shows the amount of derating which will be necessary when these resistors are operated at ambient temperatures above 40 °C.
A High Frequency Crystal Filter

By Keith Jeffcoat

In recent years there has been much interest in high frequency crystal filters, between 3 and 9Mc, particularly among home constructors. Filters on these frequencies offer numerous technical advantages in the generation and reception of SSB signals and, since suitable crystals are now quite numerous, technical advantages in the generation and reception of SSB signals and, since suitable crystals are now quite numerous, technical advantages in the generation and reception of SSB signals.

In a receiver, a high frequency crystal filter means that, with single conversion, it is possible to obtain both good image rejection and ideal SSB selectivity characteristics. Where single conversion is used, it also means that the receiver local oscillator stability is improved by virtue of the fact that it can now be run at much lower frequencies than with a single conversion to say the standard IF of 455Kc.

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FILTER DESIGN

Much work has been done on the design of HF crystal filters and some excellent arrangements, capable of producing good band pass characteristics at different insertion losses, have been published. Filter manufacturers have gone to considerable trouble and expense to produce filters with wide bandwidths and high selectivity characteristics. Much work has been done on the design of HF crystal filters and some excellent arrangements, capable of producing good band pass characteristics at different insertion losses, have been published. Filter manufacturers have gone to considerable trouble and expense to produce filters with wide bandwidths and high selectivity characteristics.

Briefly, however, our circuit is a hybrid of the familiar full lattice configuration and makes use of the fact that many crystals in the 5 to 9Mc range have a "pole" to "zero" spacing which is close to the optimum bandwidth required for SSB working.

When checking on the pole-zero spacing you might be surprised to find that, even though you have obtained four crystals with identical marked frequencies, their actual frequencies may differ by as much as 5Kc. Our article on crystals (October, 1963) will give all the information necessary to shift slightly the frequency of the crystals and the actual job should present no problems, provided care and patience is exercised.

In the construction of our filter we used a type of "cross" shaped chassis, the centre plate of which separates the input from the output sections of the filter. The dotted line on our diagram represents this centre plate and shows the disposition of components on either side of it.

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By Keith Jeffcoat

IN recent years there has been much interest in high frequency crystal filters, between 3 and 9 Mc, particularly among home constructors. Filters on these frequencies offer numerous technical advantages in the generation and reception of SSB signals and, since suitable crystals are now quite readily and cheaply available, they probably come closer to fulfilling the average amateur's pocketbook than do theтонет and reception of SSB signals.

In a receiver, a high frequency crystal filter means that, with single conversion, it is possible to obtain both good image rejection and ideal SSB selectivity characteristics. Where single conversion is used, it also means that the receiver local oscillator stability is improved by virtue of the fact that it can now be run at much lower frequencies than with a single conversion to say the standard IF of 455Kc.

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FILTER DESIGN

Much work has been done on the design of HF crystal filters and some excellent arrangements, capable of producing good band pass characteristics at different insertion losses, have been published. Filter manufacturers have gone to considerable trouble and expense to produce filters with wide bandwidths and high selectivity characteristics. Much work has been done on the design of HF crystal filters and some excellent arrangements, capable of producing good band pass characteristics at different insertion losses, have been published. Filter manufacturers have gone to considerable trouble and expense to produce filters with wide bandwidths and high selectivity characteristics.

Briefly, however, our circuit is a hybrid of the familiar full lattice configuration and makes use of the fact that many crystals in the 5 to 9 Mc range have a "pole" to "zero" spacing which is close to the optimum bandwidth required for SSB working.

When checking on the pole-zero spacing you might be surprised to find that, even though you have obtained four crystals with identical marked frequencies, their actual frequencies may differ by as much as 5 Mc. Our article on crystals (October, 1963) will give all the information necessary to shift slightly the frequency of the crystals and the actual job should present no problems, provided care and patience is exercised.

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Checking of pole-zero spacing on crystals can be most easily accomplished with the aid of a frequency meter and the station receiver using the test set-up given elsewhere in this article. Checking of pole-zero spacing on crystals can be most easily accomplished with the aid of a frequency meter and the station receiver using the test set-up given elsewhere in this article.

The frequencies to be measured should be known fairly closely so that the receiver may be set appropriately. The selectivity of the receiver should be broad enough to accommodate the actual pole-zero spacing without resulting. The receiver "5" meter will show a sharp rise at the zero and a sharp dip at the pole as the frequency meter is tuned across the centre frequency. Checking of pole-zero spacing on crystals can be most easily accomplished with the aid of a frequency meter and the station receiver using the test set-up given elsewhere in this article. Checking of pole-zero spacing on crystals can be most easily accomplished with the aid of a frequency meter and the station receiver using the test set-up given elsewhere in this article.

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In the author's case, several sets of crystals were matched in the course of a single evening with only one failure, and that caused through impatience and too heavy a hand on the grinding slab.

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Vega B1 Germanium Radio

This radio is operated by a germanium diode and has a High Q tuner that provides much better reception. This radio is operated by a germanium diode and has a High Q tuner that provides much better reception. Although this is a pocket-size set, it will give good reception if an efficient aerial and earth are used. An indoor aerial lead with clip is necessary for long-distance reception. For local reception, a lead with clip Is necessary.

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Lark PT. 56 Crystal Radio

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The circuit above shows the test set-up we used when checking the filter for response, etc. The two transformers used in the circuit were 1N27 and 1N33 from a TV receiver. High "Q" transformers should not be used lest they have an effect on the filter's shape.

Radio, Television & Hobbies, December, 1963

**CRYSTAL TEST CIRCUIT**

"Pole" and "zero" spacing of crystals can quite easily be determined by means of the test set-up shown above. The accuracy of results will depend much on the use of a good frequency meter as a signal source.

wound on Ducon miniature slugger coil formers and each consisted of 41 turns of 28 B&S "jumble" wound.

The 2-15 pF trimmer across the input F2 crystal is a tubular silvered-ceramic type normally chassis mounted. Since neither end of this trimmer is connected to ground we could not chassis mount it, but instead soldered a short length of 18-gauge tinned copper wire to the locking nut and mounted the trimmer, via its leads, on the socket pins of F2.

As a shield can for the filter we used the case from a discarded IF out of an MN26 compass receiver. Strictly speaking, however, it is necessary to shield the whole of the filter, and a simple aluminium shield around the lower portion, say, from the crystal sockets downwards, would suffice adequately.

After construction the filter can be tested and aligned either in the receiver or transmitter for which it is intended, by taking a "mind's eye" view of the filter shape.

During these adjustments you may notice that the total passband width varies with individual settings of the trimmer. With the conventional method of alignment the input signal should be set to approximately 500 cycles below the pole frequency of the F1 crystals and the trim in L1 and L3; plus the trimmer across L2, adjusting for maximum response.

Unless you have been unusually lucky with your initial alignment you will find that the filter exhibits a number of "peaks" and "troughs" over its passband area. Using a sweep generator the elimination of these variations in passband response is a very simple matter indeed, but failing this the next best step is to make small adjustments in the setting of the trimmer across L2, noting the effect which each adjustment has on the passband shape.

This method takes somewhat longer, but with patience it is possible to smooth the passband into a series of small "ripples," the maximum to minimum amplitude variation being not greater than 0.2dB.
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313 root KM ATTACHMENT
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SPECIFICATIONS

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Bakelite type 2 "B" grade at B.S. 1137
Board thickness—
3/64in "A" grade
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Hole size—
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Hole spacing—
36/16in

PARTS LIST

No. 253 Wedge Pin
No. 285 Eyelet Tag
No. 314 Turret Pin
No. 315 Crimping Tool
No. 333 Turret Pin Tool
No. 303 3in x 3in 3 Board
No. 309 6in x 6in 3 Board
No. 265 Pin x Pin 3 Board

APPLICATION DETAILS

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Radio, Television & Hobbies, December, 1963
even where four crystals and holders of way, caused through small variations in etching their crystals to frequency could be possible to achieve the passband facture are used in the unit, it may not crystal holder and crystal capacitance, metrical passband without introducing a slope on the high frequency side of the plateau Road, Springwood, N.S.W., and tute who feel they would rather bypass station that members of the Wireless Insti- new lobe. normal passband. With the proper set- high frequency side and outside the high frequency lobe, will produce a new filter lobe on the first F2 crystal is used to sharpen the filter. The proper setting of this trim- mer is only a few pF, probably 5 to 10pF, and its adjustment can be achieved by the same method as was used to arrive at the flat top on the passbands, namely, that of shifting the signal slowly across the filter passband and observing the amplitude changes which various set- tings of the trimmer produce.

If this trimmer is set to provide too much capacitance across the crystal it will produce a new filter lobe on the high frequency side and outside the normal passband. With the proper setting the trimmer should provide a sym- metric passband without introducing a new lobe. The need for this trimmer is, by the way, caused through small variations in crystal holder and crystal capacitance, even where four crystals and holders of identical manufacture have been used. If crystals and holders of different manu- facture are used in the unit, it may not be possible to achieve the passband shape required.

In closing this article we might men- tion that members of the Wireless Insti- tute who feel they would rather bypass the work involved in grinding and/or etching their crystals to frequency could frequently use a "hot" crystal in a preamp.

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set to work and developed a version of cabinets for this design, R.C.S. Radio the "RF Transporta Seven."

These were of a style which, with only tone plastic portable receiver cabinets, were able to obtain a quantity of two-. Smaller firms catering for the home- components were sold, in due course, for surplus.

dies, which limited demand had rendered of business, that forced others to quit the TV receiver manufacturers felt such an Twelve months or more ago. radio and

ITU'S an ill-wind," runs the old maxim. * "that blows nobody any good."

"Transporta Seven" was that a number of recent "depression" in the industry presented the "RF Transporta Seven" receiver once again. In a new and more attractive case, more easily assembled on a single wiring board, and capable of better-than-ever performance, we feel that it is quite up to current and near-future standards. Build it up, and we feel sure that you will agree with us.

With explanations over, let us now turn to the circuit of the receiver and discuss the position regarding modifications and the newer transistor types. Before we go into detail, however, it may be advisable to briefly run over the circuit and brush up on the general ideas of the RF and IF stages. The "frontend" or tuner section of the receiver employs three transistors in a non-neutralised "common-emitter" circuit, receiving its input from a ferrite rod aerial coil. Partial demodulation of the received signal is achieved by the base circuits of the RF amplifier, the second as a self-oscillating mixer or "converter," and the third as an IF amplifier.

IF STAGE

The secondary of IFT1 provokes them to the base of the IF-amplifier transistor, which is now covered with a common-emitter configuration. Amplified IF components appearing in its collector circuit are transferred through IFT2 to the second detector. AGC voltage derived from the second detector is applied to the base of the RF and IF amplifiers. The AGC stage is a non-neutralised "common-emitter" circuit, receiving its input from the second detector. The increasing signal reduces the bias current to adjust for optimum performance.

Several months, or more accurately, twelve months, ago, radio and TV receiver manufacturers felt such an ill-wind—one that put some right out of business, that forced others to quit the field, and still others to dispose cheaply of components, cabinets and machine dies, which limited demand had rendered surplus.

Most of the bankrupt and surplus components were sold, in due course, for a fraction of their nominal value, to smaller firms catering for the homebuilder and hobby market. One such firm, R.C.S. Radio Pty. Ltd., were able to obtain a quantity of tone plastic portable receiver cabinets. These were of a style which, with only some modifications, was quite suited to a receiver of the type which we had described in the November, 1964 issue—the "RF Transporta Seven."

By Jamieson Rowe

The prototype, complete in its plastic cabinet. The complete receiver is assembled on a one-piece printed-wiring board, which simplifies assembly.
which is a simple common-emitter cir-

cuit. which is a simple common-emitter cir-

The frequency response is 3dB down at

driver transistor from the voice coil, re-

A speaker voice coil. Negative voltage

pull class-B common-emitter configura-

Output transformer is used to

connected in a push-

driver stage. The purpose of these

Associated with this addition is the

Perhaps the most obvious addition to

STEP CIRCUIT

Perhaps the most obvious addition to

- 3 Knobs to match cabinet.
- 1 OK 1-watt.
- 1 Set of transistors and diodes
- 1 Printed wiring board to suit.
- 1 Plastic Cabinet, outside dimen-
- 1 Printed wiring board to suit.
- 1 Magnavox type 4T speaker, 3.5

**PARTS LIST**

- 1 Plastic Cabinet, outside dimen-

- 1 Printed wiring board to suit.

- 1 Magnavox type 4T speaker, 3.5

- 1 Set of dial components.
- 3 Kobs to match cabinet.
- 1 On-off rotary switch, if required
- 1 Set of transistors and diodes

**RESONATORS**

- 2 8.2K 1-watt.
- 2 68K 1-watt.
- 1 39K 1-watt.
- 1 47K 1-watt.
- 1 Set of dial components.
- 3 Kobs to match cabinet.
- 1 On-off rotary switch, if required

**CAPACITORS**

- 5 0.047uf 15VW electro.
- 2 0.047uf 15VW electro.
- 0.047uf paper, plastic or ceramic.
- 0.047uf paper, plastic or ceramic.
- 0.047uf paper, plastic or ceramic.
- 0.047uf paper, plastic or ceramic.
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308 Chassis Coil
242C Aerial Coil with rod £l
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254 Aerial Coil Value
223 C.C. Coil Value
118 IF Var. From 445 Ke 16/2
119 Standard IF Value 445 Ke 16/2

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66

Radio, Television & Hobbies, December, 1963
manufacturers are currently able to offer a set of transistors and diodes capable of high performance operation in a receiver of this type.

While this diversity of sets of transistors and diodes is desirable from the viewpoint of availability, however, it complicates the design of a receiver, for a circuit must be extremely stable and flexible if it is to be able to accept any of the transistor types from which the constructor will make his selection.

Our problem!

In passing, note that this comment applies only to the type of receiver design published in magazines such as our own, and intended for home construction. The designer of a commercial receiver in general doesn't have to worry about such matters, as his design will usually be assembled in a consistent format with a particular set of transistor types. Designing projects for home construction does have its problems.

Just how much complication does the 1 transistor diversity introduce? Well, in some parts of the receiver, it is possible to arrange that little if any complication is produced. With the present receiver, we have been able to arrange matters so that all stages, with the exception of the IF amplifier, are virtually unaffected when transistors of various types are used. The table on page 69 shows the transistors which may be used from the various ranges available.

Due to the variations in gain between the various IF amplifier transistors available, we have been forced to provide circuit alterations as the circuit to operate reliably under all conditions. The reason for this is not hard to see when one realises that due to type differences and "spread" effects, it is quite possible that one constructor of the set will purchase one IF transistor having four or even five times the gain of that purchased by another.

As the table on page 69 indicates, there are two circuit changes which are used to accommodate the higher-gain transistors. One of these is the provision of IF neutralisation, by means of a neutralising capacitor connected between the IF'T', secondary and the base of the IF transistor.

With most transistors a value of 3.3pF for this capacitor will neutralise the stage fairly accurately, improving the stability and the gain.

While neutralisation of the IF considerably reduces the likelihood of IF instability, it cannot prevent instability due to radiation from the second detector circuitry when the IF stage gain exceeds a certain value. Such instability becomes a particular problem when the receiver is tuned to multiples of the IF.

Because of this, with some of the higher gain transistor types it becomes necessary to limit the IF stage gain to a safe figure. This is the purpose of the second circuit modification, which is illustrated in the small diagram.

Modification

As the diagram shows, it involves taking the base and collector winding "cold" end bypass capacitors direct to the positive rail, instead of to the emitter. There is thus degeneration across the emitter resistor, which may be adapted by means of a bypass capacitor and series resistor R shunting the basic resistor.

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Radio, Television & Hobbies, December, 1963
We have prepared a coded photograph of the board showing the pattern of the copper conductors. The hole in the centre is a clearance for the speaker spindle. We recommend that the components be assisted in this regard by using a pair of long-handled needle-nosed pliers or a modified crocodile clip to hold the components in place while soldering the transistor and diode leads. The usual soldering techniques used for printed-wiring boards should be followed. Make sure that component leads are not bent too sharply, nor too close to the body of the component, and try to prevent the components from becoming overheated during the actual soldering operation. A pair of knipex pliers or a modified crocodile clip should be used as a "heat sink" when soldering the transistor and diode leads.

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>RF</th>
<th>CONV.</th>
<th>IF</th>
<th>DIODES</th>
<th>AF</th>
<th>AF DRIVER</th>
<th>OUTPUT</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANDSON</td>
<td>2N170</td>
<td>2N174</td>
<td>2N172</td>
<td>2N46A</td>
<td>2N460</td>
<td>2N460</td>
<td>MATCHED PAIR</td>
<td></td>
</tr>
<tr>
<td>A.W.V.</td>
<td>2N2370</td>
<td>2N2372</td>
<td>2N2373</td>
<td>2N1406</td>
<td>2N1406</td>
<td>MATCHED PAIR</td>
<td></td>
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</tr>
<tr>
<td>MOLLARD</td>
<td>AF118N</td>
<td>AF118N</td>
<td>AF118N</td>
<td>OA90</td>
<td>OA90</td>
<td>2N1408</td>
<td>MATCHED PAIR</td>
<td></td>
</tr>
<tr>
<td>PHILIPS</td>
<td>AF118N</td>
<td>AF118N</td>
<td>AF118N</td>
<td>OA90</td>
<td>OA90</td>
<td>2N1408</td>
<td>MATCHED PAIR</td>
<td></td>
</tr>
<tr>
<td>S.T.C.</td>
<td>2N1107</td>
<td>2N1108</td>
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A view of the underside of the printed-wiring board, showing the pattern of the copper conductors. The hole in the centre is a clearance for the speaker spindle.

Radio, Television & Hobbies, December, 1963
What can possibly follow the 601?  

AMPEX 602

It's quite a number, the 602. A lightweight, low-cost, true professional field recorder made, of course, by Ampex. It's built on the foundation of the Ampex 601 (the recorder that was the workhorse of the entire broadcast industry), and the new Ampex 602 promises even to outdo the 601. Here's why. The 602 features completely new electronics circuitry. It has new solid-state rectifiers to keep the chassis cool, helping to prolong the life of the other components. It has built-in step down transformers for 220 volt operation and either CCIR or NAB equalization. It has XL type connectors for all line inputs. A built-in low impedance mike transformer. A higher power balanced or unbalanced 600 ohm output. And improved signal-to-noise ratio. These are just some of the advancements. The 602 is portable—ideal for field applications. Or it can be rack mounted. It comes in a one- or two-channel model. Both backed by Ampex "Four Star" One-Year Warranty. Both built to be extremely reliable—to follow and outdo the 601. Write Ampex Australia Pty., Ltd., 8th Fl., NRMA House, N. Sydney, N.S.W., Australia. Worldwide sales and service.

Radio, Television & Hobbies, December, 1963
tuning spindle then mounts at the "RF" end of the board and the potentiometer used for the volume control must be a switch type to provide the on-off switch.

Which alternative is used will be a matter of personal choice. The dial cord shown is for both systems to simplify this part of the assembly.

The ferrite aerial rod is fastened to the wiring board by two incomplete wire loops, each wire loop clamping the rod via a 3-8in inside diameter rubber grommet. The wire loops must not be complete, as a complete loop would act as a shorted-turn and damp the aerial severely. The wires are bolted to the board with 1-6in nuts and bolts.

The speaker must be a Magnavox type 4T, as other units will not suit the board cutout. The speaker bolts directly to the board, which also supports the ferrite rod aerial and dial pointer. The complete assembly fastens into the case with four moulded-in studs and two self-tapping screws.

The battery is fastened to the board by means of two "U" clamps. The battery used measures 6in x 1in ("Eveready" type 2364). It if a paddlerless type gang similar to that used in the microphone is used the 90dB paddler should be omitted and a wire link connected in its place.

When the set is completed the IF should be aligned. The transformers are normally supplied preadjusted, but it is wise to line up the cores on signals. Better still, if an RF generator is available they should be aligned properly—starting with the core of IFT2 and working forward, with the generator output fed to the emitter of the mixer via a staff capacitor.

The RF circuitry should then be aligned, setting the cores of the RF and oscillator coils and the position of the aerial coil along the rod, near the low end—say, 700 Ke/ks. and the three trimmers near the high end—say, at 1,400 Ke/ks.

With the alignment completed, the set is also complete, and it should be ready for many hours of pleasant listening.

Full Certificate.

Centre, 14 Atchison Street, Crow's Nest.

Country clients are reminded that we have the Correspondence Course details, obtainable from the Wireless Institute Centre, Crow's Nest.
"I give up" is a phrase which seems to enjoy a good deal of use and misuse but it would be an appropriate one to commence this month's "Let's Buy An Argument." Either that, or the old one which runs: "Somebody's crazy round here, and it could be me!"

By Neville Williams

I...
perpetuate an entirely unfounded piece of pseudo technical nonsense" . . . etc. I must commend the local RCA interests in that they didn't attempt anything so futile here, although they had to go along with the sugary publicity material which the parent company had originated.

Let's hope that the parent company has learned some kind of a lesson from all this and that any future developments will be launched with a commonsense technical basis rather than more strained of flowerly superlatives. That is, of course, unless they work on the assumption that any publicity is good publicity.

CRITICS' REACTION

Not surprisingly, critics' reactions to Dynagroove discs have been extremely varied. There have been the much vaunted virtues in varying degrees — or not at all; some have questioned the vaunted virtues in varying degrees — or not at all; some have written it off as doing nothing as unwelcome technical interference with musical virtuosity. Contrariwise, some have written it on doing fine work, without a pronounced model of a craft to eavesdrop on marina life sounds. The Loonhead Company christened it Make Blew but don't dismiss the name too lightly. They explain that it stands for Marketed Observation Ultracyclemeter, Yacht, Data Integration Control!

Whatever the process, this is the kind of result they get.

ADDAR: Automatic Digital Data And Recording.

ADEX: Automatic Data Extractor and Plotting Table.


ATABE: Automatic Target Assign- ment and Battery Evaluation.

BIBO: Bureau of International Business Operations.

BOASA: Bureau of Old Age and Survivors Insurance.


FAD: Federal Aviation Agency.

FREE: Freeman, Rare, and Unusual Radio Equipment.

The acronym to end all acronyms is surely the title of this remotely con- tested model of a craft to eavesdrop on marina life sounds. The Loonhead Company christened it Make Blew but don't dismiss the name too lightly. They explain that it stands for Marketed Observation Ultracyclemeter, Yacht, Data Integration Control!

Now, perhaps we should look at how this title came into being. There is a totally unrelated code name, because the normal title of what's being used for anything else. If it can be pronounced, that's all right. Otherwise, a pronounceable word is always justifies the means.

SUITABLE WORDS

They've brought out a dictionary. The acronyms and abbreviations commonly used in the language of our modern world.

How complete it is, I couldn't even guess but, in its 158 double-column pages there are listed over 6,000 entries, with some 10,000 separate meanings.

Most of the entries are initials and abbreviations, but among them are many coined words and this is where the humour comes in.

Looking at some of the words one cannot help but wonder how they came to be.

To be very naive, one might consider that certain pieces of equipment, or cer- tain organisations, were first given an adequate, suitably descriptive name.
## Electronic Developments

### Kitsets

The largest range of kits at the best price

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| HIGH FIDELITY AMPLIFIERS |                                                                                           |
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### Miscellaneous Meters

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Radio, Television & Hi-Fi, December, 1963
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20 WATT GUITAR AMPLIFIER
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SYDNEY: 47 YORK STREET. 2-0233.
CHAPTER 5: Simple connections, complete and open circuits. The effect of resistance; Ohm’s Law; resistors in series and parallel. Inductors and inductive reactance; and series and parallel combinations of inductors; capacitors and capacitive reactance, capacitors in series and parallel. Impedance. Resonance in parallel and series circuits containing inductance and capacitance; variable tuned circuits.

The word “circuit” is quite broad in meaning, so that it is perhaps better that we try to explain and illustrate its meaning by example rather than try to define it. An electrical circuit is possibly best regarded as a combination of conductors and components intended to control the movement of electrons in a specific manner; or alternatively to cause an electric current to perform some desired task.

The concept of controlling the movement of electrons is fundamental. When a house is in the process of building, the plumber installs a water circuit, which carries the water from the street mains to certain parts of the house. The pipes are made large enough to carry the expected flow of water, and appliances are designed on the assumption of a certain maximum expected water pressure. The taps at the end of each run provide a means of controlling the quantity and duration of flow.

An electrical circuit is designed just as deliberately. There are conductors and components intended to lead electrons to places where they are wanted, to prevent them flowing in other directions. Resistor, inductor, capacitor, and all have a definite function in some manner; or alternately to cause an electric current to perform some desired task.

Introducing resistance into the circuit of figure 1 will reduce the amount of current which can flow in the circuit and therefore through the lamp. In (a) the resistance is of fixed value; in (b) it is variable. The concept of controlling the movement of electrons in a specific manner; or alternately to cause an electric current to perform some desired task.

There is a surplus of free electrons at the negative terminal of the battery and positive ions at the positive terminal. Immediately the connections are made, as shown in figure 1, electrons move along the wire “a” to the connection shown beneath the lamp socket. As an insulating washer separates this bottom connection from the rest of the circuit, there can be no direct movement of electrons across it. Instead, they must move along the centre pin of the socket, which is bearing against a metal clip inside the base of the lamp.

Because there is still no alternative path, the electrons move along the leads within the globe, through the fine metal filament, thence to the metal shell forming the base of the lamp.

By moving a step further, consider the simple circuit arrangement of figure 1, in which a small torch bulb is connected by means of wires and a socket to a dry cell. The connections are illustrated pictorially and by means of a schematic circuit.

Remember that there is a surplus of free electrons at the negative terminal of the battery and positive ions at the positive terminal. The connections are made, as shown in figure 1, electrons move along the wire “a” to the connection shown beneath the lamp socket. As an insulating washer separates this bottom connection from the rest of the circuit, there can be no direct movement of electrons across it. Instead, they must move along the centre pin of the socket, which is bearing against a metal clip inside the base of the lamp.

Because there is still no alternative path, the electrons move along the leads within the globe, through the fine metal filament, thence to the metal shell forming the base of the lamp.

The latter is in contact with the metal shell of the socket, so that the electrons move on in this shell, thence to the terminal, the wire “b” and back to the positive terminal of the battery.

This forms a complete electric circuit, which is often described as being CONTINUOUS. The circuit is complete when the lamp is of suitable pattern; the flow of electric current as described will cause the lamp filament to glow—the normal purpose of such a circuit. However, various circumstances could prevent this desirable state of affairs from being realised.

For example, the washer in the base of the socket could conceivably split sufficiently to allow the two portions of the socket to touch one another directly; the electrons, instead of flowing through the lamp, would then take the easier path across the socket and the unwanted result would be described in technical parlance as a SHORT-CIRCUIT.

If one of the leads were to be snipped through, or the lamp partially unscrewed from its socket, the electron path would be interrupted and the globe filament would again fail to glow. This circumstance is described aptly by the term OPEN CIRCUIT.

The result on an electric torch, or on a lamp, is simply a device which makes and breaks the electrical circuit between the globe and the source of power. When moved to the “off” position, it opens the circuit; in the “on” position it closes the circuit. It provides a simple illustration of the way in which we try to explain and illustrate its meaning.
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DC Current: 0.06,0.5,5,60,600 mA.
Resistance: 0-60K-6M-60M (35,000
ohms). Decade: minus 20 to plus 10
volts. Price £11/7/6 including Sales-Tax.

MULTITESTER MODEL RH-50
ranges
DC Voltages: 0-5,10,50,100 V at
300,000 ohms.
DC Current: 0,06,0.5,5,60,600 mA.
Resistance: 0-60K-6M-60M (35,000
ohms). Decade: minus 20 to plus 10
volts. Price £12/12/- including Sales-Tax.

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A compact model with
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78 Radio, Television & Hobbies, December, 1963
through, while a thin film issues from the other side. So it is with a resistor—
a connected end to end. The total resistance of the combination is simply the sum of
the resistance of each resistor.

The general mathematical expression
for the current through a resistor is expressed in the formula;

\[ I = \frac{E}{R} \]

Where \( E \) is in volts, \( I \) is in amps and \( R \) is in ohms.

Example:
If the voltage across a resistor is 12 volts and the resistance is 6 ohms, the current would be:

\[ I = \frac{12}{6} = 2 \text{ amps} \]

Explain in so many words, the formula (1) can be transposed into a simpler form as:

\[ R = \frac{E}{I} \]

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REVO* TAPE RECORDER - A professional quality machine priced for the hi-fi enthusiast. Features stereophonic reproduction, with built-in high-fidelity monitor amplifier. Price £180 plus 5/- tax.

NEAT TURNTABLE - A low-cost unit with low rumble characteristics suitable for use with a wide range of tone arms. Price £29 plus 5/- tax.

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EP35-63
Radio, Television & Hobbies, December, 1963
Radio, Television & Hobbies, December,
and the frequency of the current. It is obvious that, for any given value of inductance and capacitance, there must be a particular frequency at which the reactances of the two are equal.

The frequency at which the reactances of two inductors are equal is known as the Resonant Frequency. In practice, however, no dielectric loss. In practice, however, circuits combining the above properties are used to absorb energy — that is, to resonate. Such circuits provide the basis for the way in which a radio receiver can "tune in" individual radio stations.

**Resonant Frequency**

![Resonant Frequency Diagram](image)

**Figure 9:** A series resonant circuit (a) and a parallel resonant circuit (b). Circuits of this type are frequently used to absorb radio frequencies. In series, being known as "series" circuits.

Inductive reactance depends on, and is proportional to, the frequency and the quantities involved are those of the coil increases with frequency and that of the capacitor decreases with frequency. We have seen that the reactance of a coil increases with frequency and that of the capacitor decreases with frequency.

At this juncture, it is necessary to mention a matter of vital importance, namely, the combination of an inductor (or coil) and a capacitor (or condenser). We have seen that the reactance of a coil increases with frequency and that of the capacitor decreases with frequency.

At the resonant point of a tuned circuit, the current is in phase with the voltage, as described in the text. The oscillation takes place of the resonant frequency of the tuned circuit.

The same word "impedance" also applies in circuits involving a combination of resistance and capacitance.

**Resonant Frequency**

![Resonant Frequency Diagram](image)

**Figure 7:** Energy fed into a tuned circuit tends to produce an oscillatory voltage, as described in the text. The oscillation takes place of the resonant frequency of the tuned circuit.

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**Figure 8:** The resonant frequency of the tuned circuit such as that of figure 6a the currents through the two components are equal in amplitude. They amount—are equal in amplitude. They accordingly cancel each other, so that at resonance the parallel tuned circuit will have no resistance, and the coil no dielectric loss. In practice, however, circuits of this type are frequently used to absorb radio frequencies. In series, being known as "series" circuits.

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The same word "impedance" also applies in circuits involving a combination of resistance and capacitance.

Examination of the word impedance from a mathematical viewpoint is rather too involved for inclusion in this chapter; but the student is well advised to follow up the subject in other texts which choose to cover it in detail. But the student is well advised to follow up the subject in other texts which choose to cover it in detail.

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Since the 30W Transistor Amplifier was described in February, 1963, it has proved to be very popular and many units have been built up. A couple of points have arisen and we feel that some further comment would be helpful to those who have already built the amplifier, or to those who may be contemplating its construction.

The first point concerns the shifting of the feedback loop around the output stage. The printed board and the two transformers were designed so that normally assembly of the components would automatically guarantee negatively phased feedback. Unfortunately, upon release of the kit, we began to receive complaints about the feedback turning out to be positive, with consequent instability upon switch-on. The fault was traced to an inadvertent reversal in the terminations of the secondary circuit of the driver transformer. This occurred somewhere along the line in the manufacturer's paper work, between the time the transformers were made for the prototype, and when they were put into regular production. It was one of those unfortunate things which seem to occur, even under the best systems of control.

The simplest method of correcting the error, if you should encounter it, is to transpose the two leads running from the printed board to the base of the respective output transistors. This avoids any new results in the board as well as the output transistors necessary winding.

The foregoing comments and suggestions apply to those who will be using transformers which have been manufactured to this time. The transformer manufacturer has decided, in future runs, to reverse the terminations of the secondary winding of the output transformer, so that pairs of the transformers will, in future, again give overall negative feedback.

However, because of the mix-up, constructors must face the risk of incorrect feedback, at least until present stocks are absorbed. Fortunately, the transposition of the base leads is a simple operation.

The next point to arise begins with an output transformer for provision for a 500-ohm line distribution system. Such a transformer has been produced which provides for 750 volts, with taps at 225 and 150 ohms. The type No. is TFK150. We have made use of these transformers and the efficiency from the output stage has been considerably improved, for we are now able to provide an output transformer with provision for 500 ohms, with taps at 225 and 300 ohms.

The output transformer is wired in the same as for the original, thus there is no question that the power transposition of the base leads is a simple operation.

The main secondary winding is terminated in flying leads. Black, brown, green, white and orange being the taps for 225 and 125 ohms, respectively. The pair of leads which ran from the 15-ohm secondary to the output socket, will not be used. Instead, the common and other leads of the transformers and the efficiency from the output stage has been considerably improved, for we are now able to provide an output transformer with provision for 500 ohms, with taps at 225 and 300 ohms.

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step down to the voice coil impedance. These transformers are not the most efficient devices by any means. As a result, transformer losses in a 500-ohm system should be weighted against the losses in lead when using a 12-ohm system. The final choice is up to the user.

Another point which has arisen is that of available power output when 2N247 drift type transistors are used in the output stage. When we made our final measurements, using the type 247 transistor, we obtained only 12 watts. The transistors used at this point were virtually pre-production prototypes and may have been unbalanced or otherwise not up to the standards of those now available. It should be mentioned that the protective diodes were in circuit.

Subsequent tests, with another pair of 2N247 transistors, showed an output of 17 to 18 watts with the protective diode in circuit. A cross check by the manufacturers substantiated the previous measurements. Additionally, they removed the protective diode and modified the bias resistor from 100 to 150 ohms. At the point of clipping, and 4 per cent total harmonic distortion, 21 watts were obtained.

There are other points worthy of note. When the feedback connections may be modified for the 2N247's to give the same order of negative feedback, the overall sensitivity of the amplifier is increased almost by a factor of three. The frequency response at the minus 3db points is 110 to 7,000 cycles for the OC29 transistors and 110 and 8,000 cycles for the 2N247 transistors.

In practice, some of the energy is lost in the feedback components. One, the cancellation of reactances to leave simply an effective reactance (in other words, zero phase shift), is usually (figure 8a), and it is for just this purpose that the variable condenser, as pictured in the last chapter, is employed.

The relationship between circuit impedance and frequency is suggested by figure 8b, which shows the resonant frequency of inductor and capacitor are equal. From an inductor and capacitor of fixed value there can be only one definite and fixed resonance, as shown in figure 8a. Since frequency, however, in the same way, it is necessary only one resonant frequency anywhere in the circuit. It is important to note that the natural resonant frequency of a tuned circuit has an OSCILLATORY quality. As such, it is a source of constant periodic energy which is dissipated as heat.

The relationship between circuit impedance and frequency is shown by figure 8b. At its resonant frequency, a tuned circuit has an OSCILLATORY quality. As such, it is a source of constant periodic energy which is dissipated as heat.

The charge across the capacitor would immediately commence to leak away, initiating a current through the inductor; in so doing, it would build up a magnetic field around it. Immediately the charge disappears, the initial current would cease, causing the magnetic field to collapse.

As soon as it collapses, however, the magnetic field maintains the current flow to the point where the capacitor becomes charged again in the opposite polarity. Then the capacitor would be drawn in to discharge in the opposite direction and the whole action would be repeated again and again. In practice, some of the energy is lost in this ALTERNATION, and the oscillatory action ultimately comes to an end. The result, illustrated in figure 7, is known as a damped train of waves. It is important to note that there is always a period of oscillation of a tuned circuit corresponding to the frequency— or that frequency where the reactance of inductor and capacitor are equal.

The resonator of a parallel tuned circuit may therefore be used to define resonance. In terms of two connected but different effects, one, the cancellation of reactances to leave simply an effective reactance (in other words, zero phase shift), is usually defined as that frequency at which the phase shift of the circuit is zero.

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LAST November I found myself in Florence, where Joan Sutherland was recording Verdi’s ‘La Traviata’ for Decca. I had a Fiocchi 202 with me. Eventually, it didn’t take long to persuade Christopher Raeburn, who was in charge of the recording project, that there was a unique radio documentary in a behind-the-scenes story of a major recording session on location: a story that would embrace every aspect from the artists to the engineer.

Joan Sutherland, naturally, the subject of our talk. Raeburn gave me carte blanche to go where I liked and take what I wanted. The session, which took place in the Pergola Theatre in the Via Pergola, an inaccessibly narrow street in the Via Pergola, an inaccessibly narrow street.

The hall was set up for stereo—a vital aspect in planning. The chorus mikes flanked the benches and each principal had his own solo mike. The floor was marked off in three sections. The hall itself is about as high as it can be, which is everybody’s landmark in Florence.

The orchestra was seated in normal concert formation at the back of the hall. Only once was there trouble with this setup, two more set higher and inclined on big booms and, flanking the whole session, which took place in the Pergola Theatre in the Via Pergola, an inaccessibly narrow street.

On the spot... The recording directors need infinite patience and tact. Later, when the American baritone Robert Merrill was having trouble with the aria “From Fair Provence,” Raeburn’s voice crackled over the talk-back. “You like just one more go at that second vocally. Your voice isn’t quite set. Would you like just one more go at that second?” Merrill said cheerfully, “Right!” And the take, which was the best of the day, ended work for the afternoon.

The recorders were located in the improvised control room, a vaulted chamber which was equipped with a pair of very expensive Tannoy monitoring speakers. All the equipment, which came out by Decca’s own truck, was costing Decca’s own truck, was costing Decca’s own truck, was costing Decca’s own truck, was costing Decca’s own truck, was costing Decca’s own truck, was costing Decca’s own truck, was costing Decca’s own truck, was costing Decca’s own truck.

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do better ourselves. In the case of "Traviata" we felt we must keep the dramatic continuity so the story of the whole thing comes through and it isn't just a little bit of vocalise."

QUESTION: "What part does the conductor play at this stage?"

RAEBURN: "If he is a good conductor, he will be on conferences early. He will take the whole project sufficiently seriously not to waltz into the recording room at the last minute. He will be there at all the technical conferences that may refer to anything musical or dramatic and he will conduct all the piano rehearsals before and get them into trim."

When I met John Pritchard he was sitting on a four-legged stool at what looked rather like a disused Wurlitzer piano console on which his score was set out. There was an amplifier and talk-back microphone ready at his left hand. He is a big man, rather young for a leading conductor, with somewhat long, dark hair and a homely face. He appeared utterly imperturbable during the whole two weeks.

QUESTION: "What is the essential difference in approach to recording an opera and performing an opera in the theatre?"

PRITCHARD: "In the opera hall, you're dealing with a much greater span of music than you do when you come to make a recording. In a recording, each session takes up perhaps 12 to 15 minutes, and therefore you can concentrate in a particularly vivid kind of way. "You rehearse just that section of it with the singer the day before, or even on the morning, and you hope to get a bit better performance of it than you would in the opera house. There is also the vital difference that the singers are not concerned with stage action. Therefore they can concentrate on the music. I always like to urge the singers, once the preliminary rehearsal and takes are over, to, as it were, throw away the book and put on to the disc some equivalent of the emotion and intensity that would naturally give them. I don't think you can get a good recording without that kind of intensity."

QUESTION: "One does hear the criticism offered against modern recordings that the sound is not the sound one hears in the concert hall. Do you agree with that?"

PRITCHARD: "Yes. I think it is a valid point. And I've heard disappointment expressed in the opera house when a very famous singer doesn't seem to produce the wonderful honeyed sounds which the public have heard on their own machines. That I think is a point where the public must eventually be educated. On the other hand, no one will deny that by going to the opera house, you get much more than you can from a record. It's only natural."

I then asked Raeburn and his colleague, Ray Minshul, about the choice of a score,

QUESTION: "Should the score be the conventionally printed one?"

RAEBURN: "In the case of "Traviata", I was able to go to Casa Ricordi and compare the printed score with Verdi's original autograph, and there were some very significant differences. In over half our queries, (John Pritchard and I had much the same ones) doubts were justified."

Kadlo, Television & Hobbies, December, 1963

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"I'm going back to singing opera on the stage; at least you only have to do it once!" Later, she explained, "At Home with the Blackwoods," I Club. How the club operates and available through a Sacred Records Ministry Ltd., 211 Latrobe Street, offices. I pressed in more movement than was actually required."

MERRILL: "I feel it's a great role for an artist who has an enormous recording career behind her. I remember Zinka Milanov, who had an enormous recording career in the old days, where they had their own mike and stuck there, were rather stiff. I think they have to put in more movement than was actually required."

RAEBURN: "Well, the ones who are new to recording adapt themselves straight away to it, and are rather impressed by the continuity it gives them. The ones who were used to recording in stereo only too well and stuck there, were rather stiff. They look much longer to get used to it, I remember Zinka Milanov, who had an enormous recording career on 78s, and when we were to record "La Forza del Destino" there the scene where she has to comment from the side. She's observing the action from the side. Whatever possible positions the artist moves to while singing, so he listens to be aware of movements.

GOSPEL RECORDS

The Gospel Film Ministry announce that they have been appointed by Ave. Wallace to produce in the U.S.A. by the Skylite Record Company. The Skylite series will therefore augment the catalogue already available through G.F.M. of the World Records Inc., Waco, Texas. First title in the Skylite series is "At Home with the Blackwoods," reviewed in this issue. In addition to normal record sales and distribution, the Gospel Film Ministry makes many of their titles available to radio stations through a Sacred Records Club. How the club operates and the names and addresses of members are available on application to the section of the club.

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Lehár—The Merry Widow. Mascagni—Cavalleria rusticana. Composed controlled by small hands.

Still on the credit side is Hanny Schall's performance, realising much that iselli as Turiddu. Uninhibited by minor veddy that, despite the unwavering dignity neddy of inflection into her spoken dialogue Callas' superb sense of dramatic timing "Keetman (Gunild) — earlv J920s, when electric loud-speakers offset the production's innumerable mer-®

It's easy atmosphere of "gemuthlichkeit. Moreover Malwin Schwartzkopf herself always exuberantly enjoyable in her first recording of the title role, has so little released into a method that makes her gives us. of course, much delightful sing-

Moreover Madam Schwartzkopf herself, reviewed above. This is largely due to stamping, and the recital of verse. You docs it resemble that work in both its joy the artificialities of metres on the

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There is also Gedda in his best form vocally throughout. The a long day — reads: "Two of the 20lh

The piece from Iris displays quite un-

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things no easier in the present version. Many of her sentences are too meagrely comprehensible and her sections present further problems to enjoyment. The music, full of enchanting solos, ingenuous counterpoint and brilliant writing, does not lend itself to an easy and satisfying organisation like the Philadelphia, and the members of this orchestra put it in with impressive accuracy. But they seem to me, too, neither Ormandy nor his orchestra seem to ignore its slightness. It, too, suffers from a too zealous pursuit of perfection of tone and dexterity. There are some movements in which the orchestra seems to become perilously close to condescension.

The sound provided for both suites is first-rate, but the orchestra is a little too far behind the speaker in Facade. The more robust wit of Ibert's Divertissement survives better, though in this, too, Ormandy and his orchestra seem to be slightly solemnised and his witticisms overstated. The music, full of enchanting solos, ingenuous counterpoint and brilliant writing, does not lend itself to an easy and satisfying organisation like the Philadelphia, and the members of this orchestra put it in with impressive accuracy. But they seem to me, too, neither Ormandy nor his orchestra seem to ignore its slightness. It, too, suffers from a too zealous pursuit of perfection of tone and dexterity. There are some movements in which the orchestra seems to become perilously close to condescension.

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**AT HOME WITH THE BLACKWOOD BROTHERS QUARTET**

Meno, Skylite (Gospel Film Ministry). Mono, Skylite (Gospel Film Ministry). Mono, Skylite (Gospel Film Ministry).

According to the jacket notes, the Blackwood Brothers Quartet is an intercessor, a Gospel group of two, one of whom is in the Gospel ministry in the United States. Their home town is Memphis. It is well known by many of the American gospel music enthusiasts. It is a kind of the Blackwood Brothers, not so vocal for those Memphis supporters, but like most of their music, it is presented in a much wider field.

The disc is notable on three counts: it features a vocalist, J. D. Sumner, with his deep bass voice, I have ever heard. Maybe some of the impact is due to microphone technique. It's still a great voice.

Secondly, Wally Varner would have strong claims to be the most accomplished yet of the Gospel pianists. In fact, judged on his accompaniments and performances, he is quite a voice in the Gospel world.

The sound quality of the disc is excellent. (W.N.W.)

The sound of Christmas on the Radio City Music Hall Organ, Played by Dick Leibert, stereo. RCA SL101370. (Also available in mono.)

In the Radio City Music Hall, in the Rockefeller Center, New York, is the largest ever produced by the Wurlitzer Organ Company. A fifty horsepower motor supplies, deodorized and filtered air to the organ pipes, some of them separated in various combinations, according to the jacket notes, by the equivalent of a city block.

Dick Leibert makes his contribution by the fact that, with four microphones, he and his colleagues can pick up more of the organ pipes and the sound of the organ, than any other organist, and by the fact that, through stereo, he can give you a better idea of the space in which the organ is being played.

Dick Leibert, however, must be content to stop here, for the recordings were made as a fitting introduction to what we already know of the Wurlitzer Organ Company. A fifty horsepower motor supplies, deodorized and filtered air to the organ pipes, some of them separated in various combinations, according to the jacket notes, by the equivalent of a city block.

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The sound he produces here is as vast as the environment. RCA engineers used eight microphones to get the recording, suspended in various positions, where they could separate the specific sound of each organ pipe, and to pick up all the details of the organ, without picking up too much of the "mechanical" sounds of the organ, or too much air noise.

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Radio, Television & Hobbies, December, 1963
Of Bethlehem," "Angels We Have Heard On High," "Hark The Herald Angels Sing," "O Holy Night," "We Wish You A Merry Christmas," "O Tannenbaum," "Oh Little Town Of Bethlehem," "A Star In The East," "The Gifts They Gave," "From The Rest." "Jehovah, The Lord Will Provide," followed by "Silent Night" and "Christmas Day." Suddenly the tempo lifts with "The First Noel," "Jingle Bells," and "Hark The Herald Angels Sing" objectively, and I think it is fair to say that while some watering-down in the disc recording is above-reproducible, I don't think that this recording is spoilt by the anachronistic use of a piano, but rather by the overall ambience of the recording. If realism were the producers' only aim, we wouldn't have either, just the music. However, although the disc is above-average technically, when listening to it you will find our value terrific even at that price.

** ★ ★ ★ ★ ★**

**MERRY CHRISTMAS FROM THE FOUR SEASONS.** Mono, Festival, 7in. E.P. 10/6. (Also available in Mono.)

**XMAS CAROLS, SONG BY THE CHILDREN SINGERS, AND ORCHESTRA.** Mono, Festival, 7in. E.P. FX-1049.


FROM STAGE AND SCREEN . . . .

**THE THEMES FROM CLEOPATRA.** The Royal Philharmonic Orchestra, with music arranged and conducted by Robert DeCourcy. Stereo, RCA, LSP-2636. (Also available in Mono.)

To this disc I would say right at the outset that it is above-average both musically and technically. The Bizet orchestral arrangements of "The Two Little Jesus Sleeps." are imaginatively and competently scored, and the sound is well above the average under Mr. Ortolani's baton, while the recording is well above the average, deservingly so since there is a wealth of many movie-themes discs of the same general type. A reviewer in another journal said that he felt that this recording was spoilt by the anachronistic use of a piano, but that he felt that this recording was spoilt by the anachronistic use of a piano, but that he thought that it was the only way that the music could be heard properly. However, although the disc is above-average technically, when listening to it you will find our value terrific even at that price.

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Radio, Television & Hobbies, December, 1963
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• Output 12 watts per channel (24 watts).
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<td>3009 Series 2 c/w S1 shell complete with weight.</td>
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<td>3012 Series 2 c/w S2/W12 shell</td>
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98
Radio, Television & Hobbies, December, 1963
most of them is music which carries that stamp of genius and individual vision which is so obvious in the best of his work. It is a great pity that, in casting seven years before he died.

For those who love Sir Arthur Sullivan's music, or have a soft spot for those works taken from operas and oratorios written between 1720, when Handel was 35, and 1752, which was seven years before he died.

We have the exuberant "Say To" from the opera "Aladdin" (1770), the lyrical "War Is Toil and Trouble" from the oratorio "Alexander's Feast" (1743), the wistfully serene "Enjoy The Sweet Elysian" written for Smithfield's play "Al creo" in 1750, and others as shown above. All are really fine arias. There is something of exquisite beauty in opera aria when it is well sung—

There is something of exquisite beauty in opera aria when it is well sung—a delicate beauty which depends on a knife-edge balance between exuberance and elegance. To me, Jan Peerce has the talent to maintain this balance — at least for a great part of the time. He sings as though he really enjoys doing so, which brings the aria into glowing life—

In short, with an execution whose style matches the music quite well.

Technically the recording is excellent. There is negligible distortion and surface noise, and the sound is well balanced and unexaggerated. Thus I have no hesitation in declaring this disc a real winner in all respects — Handel, Peerce, and Hi-Fi. Listen to it, and I think you'll agree with me. (J.R.)

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Tape Recorder (250 mV)
now proudly introduce

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Is your home furnished in the contemporary manner? Or in American Colonial style? Or even in the period of Louis XIVth? It really doesn't matter, for the new front panel of your LEAK amplifier will match the interiors of your home and harmonise perfectly. Supplied in gold, this attractive design also employs three alternative colour insets — grey, white and red. Change the front panel whenever you wish—or if you re-furnish! Your LEAK amplifier will give you a lifetime of pleasure . . . and it will never be out of date.

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Head Office: 22 Elizabeth Street, Melbourne, Victoria. Tel. 63 8211 63 8166
Sydney Office: N.R.M.A. House, 26 Ridge Street, North Sydney, N.S.W.
FOOL BRITANNIA. Peter Sellers, Anthony Newley, Joan Collins, Leslie Bricusse, Denial Massey, Michael J. Fox, Brian Doerries, Anthony Newley, Joan Collins, Leslie Bricusse, Michael J. Fox, Brian Doerries.

This particular disc was recorded "live" in New Orleans and, except for one or two numbers such as "12th Street Rag", it's all pretty good stuff and probably the closest we'll get to authentic Dixieland. Pete Fountain is probably a bit "modern," although the Jimmy Dorsey tracks (all of which were recorded in the mid-40s) are naturally somewhat down on today's standards. I gave it to a friend to bend over... (I'm thinking of the brass and the cornet player and the drums, and at Hollywood Victor Feldman was on piano and Frank Butler on drums.)

My hat's off to the people at Universal (who reissued it in stereo as a result of the sterilisation of the trumpet and tenor sax.) Technically, the recording is also somewhat fair, while the New York sessions have the emphasis on precise unison phrasing as in KEF Celeste. They are capable of even greater power handling, being noticeably that on the tracks cut in New Orleans and, except for a particular style or mood, it's all pretty good stuff and probably the closest we'll get to authentic Dixieland. Pete Fountain is probably a bit "modern," although the Jimmy Dorsey tracks (all of which were recorded in the mid-40s) are naturally somewhat down on today's standards. I gave it to a friend to bend over... (I'm thinking of the brass and the cornet player and the drums, and at Hollywood Victor Feldman was on piano and Frank Butler on drums.)

For the record, the disc was to wonder why they bothered to get it on sale before the scandal palls and the market falls—such as the Goon shows—merit—such as the Ellington classic, "Satin Doll," and "Blue Monk" (which were devoted to Thelonious Monk) were out-standing examples of Tyner's art. The Count Basie disc, originally a Decca recording, features 17 swing numbers done in the typical Basie manner. There is probably little need to say much about this one, except that it features Basie at his best and it will be good if you number big band swing among your likes.

The Swinging Dorsey features a particularly scenic one, at that! I'm usually a Peter Sellers fan, being a lover of the Goons from way back. I am usually a Peter Sellers fan, being a lover of the Goons from way back.

What a pity they wasted their time and ours on such someone as this. I have no doubt that a good saxist could be made taking the Profumo affair as his basis, but this isn't. Not a satire, not good, not even particularly funny. Just rather childish rubbish, with jokes and ideas either puerile or bankrupted.

The blurb says that the disc was rushed through "to get it on sale before the scandal palls and the market falls"—which more or less speaks for itself, as anything of this type having real merit—such as the Count Basie, shows—merit—such as the Ellington classic, "Satin Doll," and "Blue Monk" (which were devoted to Thelonious Monk) were out-standing examples of Tyner's art. The Count Basie disc, originally a Decca recording, features 17 swing numbers done in the typical Basie manner. There is probably little need to say much about this one, except that it features Basie at his best and it will be good if you number big band swing among your likes.

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TRADE REVIEWS AND RELEASES

HIGH QUALITY STEREO AMPLIFIER

Of special interest to HI-FI enthusiasts will be the release in this country of the English "Radford" Model STA15 Power Amplifier and SC2 Stereo Pre-Amplifier Control Unit Illustrated. They are the first units in a whole line of high-quality equipment, which is currently being made available.

Both units are attractive in appearance, the cases being constructed from steel, finished in a light grey enamel finish. The front panel is in burnished brass and is finished polished chrome. The panel on the control unit is anodised "natural" aluminium with silk screened black lettering. The cases are finished polished chrome. The control knobs are lathed turned aluminium, polished and self-colour anodised.

Manufacturers' literature states that only the highest grade materials and components are used in the units and their own examination and testing confirm this. All components were able to obtain full rated performance with the circuit referred voltages below minus 10 db.

Specifications on the SC2 control unit are as follows: Input sensitivity for rated output—Disc 4mV, Aux 1 100 or 250mV, Aux 2 250 or 500mV. Tone, Treble filler—slow roll off to minus 16db at 10Kc. Hum and noise—better than 65db below 20Kc. Aux.'s flat, Input impedance—Disc 4mV, Aux 2 100 or 250K. Treble filter—slow roll off to 15th octave at 20Kc, Band with a source resistance of 500 ohms into a 50K. ohm load. Hum and noise—better than 65db, bass roll off to 15th octave and not less than 140db at 20Kc. Gain—the signal-to-noise ratio is 500mV input for 50K. ohm source resistance; Frequency response—Disc RIAA, Aux 1—40c/s to 10Kc or minus 1db, Aux 2—40c/s to 20Kc or minus 1db. Theoretical crossover—360Mw to speakers with a voice coil impedance of 8 ohms.

The draft applies primarily to capacitors and organisations experienced in the manufacture or use of polystyrene film dielectric capacitors for direct connection to the output circuits of audio amplifiers or are intended for use in telecommunication equipment. The proposal is issued as Doc. 803. Comment will be welcomed from persons or organisations having at any time during the period of 2 months from the date of issue, the draft standard, values of rated capacitance and tolerances, and marking recommendations.

In order to meet the industry's demand for capacitors, the Standards Association is preparing to submit to the International Electrotechnical Commission a proposal for a proposed International Standard. The proposal is aimed at improving the quality of capacitors to meet the growing requirements of the audio and allied electronic uses employed by manufacturers of audio equipment and associated products, and for this unit only volume, bass lift and cut, treble lift and cut, balance, plus push-pull selection of Disc, Aux 1 and Aux 2 inputs and treble filter, on/off, stereo, mono, input selector, output selector, input on/off. A hum balance control is essential in the range of frequencies of the control unit.

Testing of units by the Standards Association has confirmed the manufacturers' specifications. The power amplifier, for instance, has a rating of 15 watts at 8 ohms output, and the pre-amplifier has a rating of 50watts at 8ohms output. These ratings, however, are based on the use of the pre-amplifier in conjunction with the power amplifier and were limited to obtain full rated output. For an input of only 2mV in line of the quoted 4mV disc input sensitivity. Frequency response and tone control action were beyond the quoted curves. With a 6W square waves between 1Kc and 10Kc applied to the amplifier only, there was some evidence of overshoot on the leading edge, which, however, was absent from residual but suppressed peaks in the frequency response in the region of 50Kc. The section of the frequency response in the region of 50Kc was beyond our instrumentation. There was no evidence of overshoot on the leading edge of the square waves, and damping factor of the amplifier was beyond our testing equipment. These results were beyond our expectations, and we were unable to obtain further results from this point of view.

One of the features of the amplifier is a special phase splitter, designed in 'Wireless World' of September, 1962, which is claimed to have an exceptionally good HP response. This doublet, would have a small impact on the ideal performance of the feedback in the superregenerative region.

Price of the units is given as £7/5/- for the SC2 control unit pre-amplifier and £117 4s. 10d. for the STA15 power amplifier. Any further enquiries should be directed to Derek E. Sally Ltd., 109, St. Tarcisius, Matraville, N.S.W., or Impact Trading Co., 166 Glebe Road, Glebe, N.S.W., for EXPERIMENTER KIT BUILDER & HOBBYIST

LAFAYETTE

Miniature Transistor Audio Amplifiers

SUPER VALUES

For EXPERIMENTER KIT BUILDER & HOBBYIST

1 TRANSISTOR PUSH-PULL OUTPUT 105MW

PK-543 £3/15/-

3 1/4" x 1 9/16" x 1 11/16" 3 TRANSISTORS PUSH-PULL OUTPUT 160 MW

PK-544 £5/17/6

3 1 15/16" x 1 15/16" x 1 11/16" An amazing little amplifier with a multi-

PK-522 £2/17/6

3 TRANSISTOR SUBMINIATURE TUNER

AND BATTERY TO ANY ABOVE AND ADD ONLY SPEAKER, VOLUME CONTROL

FOR EXPERIMENTER KIT BUILDER & HOBBYIST

ELECTRONICS

Electron Tube Distributors Pty. Ltd.

3A WELLSINGT ST., PRAHRAN, VIC.

Trade Reviews and Releases

Radio, Television & Hobbies, December, 1963 105
**OXFORD**

**INSTRUMENT CASES, CHASSIS AND PANELS**

R/C Bridge '63 Sept, 1963

Case 12 0
Chassis, tube bracket, plain from panel 2 12 6
Printed panel 19 6
Engraved panel 2 10 0

3" CRO 63 June 1963

Case 12 0
Chassis, plain front panel 3" 16 6
Printed panel 19 6
Engraved panel 2 10 0

Audio Signal Generator 62
Feb. 62.

Case 1 12 0
Chassis, plain front panel 2 17 6
Printed panel 19 6
Engraved panel 2 10 0

Sweep and Marker Generator June, 1957

Case 1 12 0
Chassis 2 17 6
Printed panel 19 6
Engraved panel 2 10 0

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**GAS LASER AVAILABLE**

Ronald J. T. Payne Pty. Ltd. announce the release of a new gas laser, manufactured by Messrs. Mullard-Australia Pty. Ltd.

The new Bradley Gas Laser is claimed to have several advantages over natural crystals, such as quartz and Rochelle salts. It can be made in a number of different compositions to give a wide range of piezoelectric properties and it can be manufactured in any shape or size. The piezoelectric material, BASED on lead zirconate-titanate, with its high efficiency, can be made in a variety of shapes and sizes, which is suitable for use as transducers in a variety of electronic and electrical equipment.

The material can also be used to generate an ionized spark and could thus eliminate the magnets in petrol engines used to power generators, generators, lawn mowers, and road works, etc.

A new demonstration showed a slab of Piezoxide firing a conventional spark plug when subjected to pressure from a lever operated by a rotary case. The voltage across the plug is proportional to the mechanical pressure and the thickness of the slab. A pressure of 7000 lb per square inch generates 400V per millimetre of thickness. This energy can be used to start engines, power pumps, generate electricity, operate electrical tools, etc.

Elements will be supplied with a silver-plated electrode surface, and in a state of permanent polarization. The range of standard sizes and shapes will become available. Non-standard will be made and supplied to order. The base price is £40 per millimetre of thickness. Any further inquiries should be directed to the sole Australian agents, Messrs Ronald J. T. Payne Pty. Ltd.

The Laser head of the new Bradley unit is an outboard motor, etc.

The Laser head of the new Bradley Gas Laser is claimed to have a continuous high flux output of extended wavelengths, as an extra high flux output is obtained by using a confocal external mirror system. The Laser head has an output energy of 628 nJoules, incident at the output mirror, and the divergence of the unit is 0.0001 milliradians. It is also stable, and the mirror system consists of coiled internal mirrors which are 0.0001 mm. and 0.005 per cent transmitting at the output wavelength. The head measures 3.4 in by 2.4 in and weighs 12 lb.

The Laser is manufactured by Heating Systems Pty. Ltd., 97 Marriott Street, Redfern, N.S.W., and is manufactured in England by G. and E. Bradley Ltd.

**PIEZO-CERAMIC FROM MULLARD**

Messrs. Mullard-Australia Pty. Ltd. announce that they will soon be releasing a piezo-electric ceramic material which is suitable for use as transducers in a variety of electronic and electrical equipment.

The material can also be used to generate an ionized spark and could thus eliminate the magnets in petrol engines used to power generators, generators, lawn mowers, and road works, etc.

A recent demonstration showed a slab of Piezoxide firing a conventional spark plug when subjected to pressure from a lever operated by a rotary case. The voltage across the plug is proportional to the mechanical pressure and the thickness of the slab. A pressure of 7000 lb per square inch generates 400V per millimetre of thickness. This energy can be used to start engines, power pumps, generate electricity, operate electrical tools, etc.

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**HEATING SYSTEMS PTY. LTD.**

Manufactured by:

HEATING SYSTEMS PTY. LTD.
97 MARriott STREET, REDFERN, N.S.W.
69-3764 69-7616

Radio, Telethon & Holidays, December, 1963
The new changer is most attractive and professional in appearance, the finish being natural aluminium against a black enamelled plastic surface. A control wheel with graduated this portion are involved in the European Satellite Launcher program.

The organisation will be known as Hawker Siddeley Dynamics Australia and will function as a joint venture between Hawker Siddeley Dynamics Limited, it has been decided to

The unit we tested was made available for zero balance with any cartridge weighing

The three standard disc sizes can be acquired in the Dual 1009 the integral mass of about 3.5 lb is light in its action and will trip as Havill and Company. The tendency for the tonearm to settle in one or two definite positions when it was lightly carriers. The price of the turntable and tonearm

The changer has a special drive system which is claimed to be foolproof and smooth in action and should ensure minimum wear to the discs. It is then released to descend to the turntable platform and, when the slide switch is moved to playback, the tonearm allows the arm to be preset for zero balance with any cartridge weighing from 3.5 to 10 lb. The position of the turntable platform is very light in its action and will trip as Havill and Company. The tendency for the tonearm to settle in one or two definite positions when it was lightly carriers. The price of the turntable and tonearm

Following rationalisation of the missile activities previously undertaken by the member companies of the Hawk...

The three standard disc sizes can be acquired in the Dual 1009 the integral mass of about 3.5 lb is light in its action and will trip as Havill and Company. The tendency for the tonearm to settle in one or two definite positions when it was lightly carriers. The price of the turntable and tonearm

The price of the turntable and tonearm menace carriers is £47/15/0 retail and with

The unit we tested was made available for zero balance with any cartridge weighing

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Radio Direction Finder Model 8TA-3D

This radio direction finder model 8TA-3D is a new portable radio direction finder, designed formobile radio and television. It is ideal for locating signals and provides long distances.

SPECIFICATIONS:
- Band: LW 190-410 Kc
- Frequency: 8-Transistor 2-Diode Super Heterodyne
- Antenna: Rotary Antenna and Rod Antenna
- Output: Approx. 200 mW.
- Jack: Headphone Jack
- Speaker: 4in Permanent Dynamic Speaker
- Receiver, Incorporating eight transistors and two diodes, directional ferrite cored antenna, moisture-proof 4 inches permanent dynamic speaker, telescopic 5 section, chrome-plated, cowl mount antenna, signal strength indicator, moisture proof, 4 inches permanent dynamic speaker. ل
- Dimensions: 10 5/8in (W) x 9Vkin (H) x 6 3/8in
- Weight: 4 Kg (6.8 lbs) Without Battery.
- Car radio aerials.
- Complete with earphones and instructions.

New Transistors in Stock
ER22 GERMANIUM POCKET RADIO

Complete with earphones and instructions. £22/6

Car radio aerials.

Aluminium Chassis

3/4 in £2/4
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1 1/2 in £10/6
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2 1/2 in £18/6
2 3/4 in £20/6
3 in £22/6
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3 3/4 in £28/6
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SIX CORE SHIELDED cable P.V.C. covered. 10/010. Available in lengths up to 200 yds. P.O.A.

Hook-up Wire. Single plated. £0.009 per ft. P.O.A.

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HAM COMMUNICATION RECEIVER HER 62

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108 CRYSTAL MICROPHONES

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Band to suit, 15½c extra.

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Weight: 4 Kg (6.8 lbs) Without Battery.

50-500 ohms. (All a.c. 5v.)

0.0001-0.01 uF. (All a.c. 5v.)

0.001-0.2 uF. (All a.c. 5v.)

0-100, 0-500 mA.

0-5 Ma. Voltmeter -20 +3db, case 35/-

0-10 Ma, 3/4in round, black bakelite

VR65 Vumeter -20 +3db, clear plastic case, 3in square £4/2/6

VR3P Vumeter -20 +3db, clear plastic, 3in square £3/6

P22 0-1 Ma. Clear plastic case. 2in Square £2/4/6

Kensington: 10-150 Kc

Siemens: 10-150 Kc

a-c. Volts: 6, 30, 120, 600, 1,200v.
d-c. Volts: 6, 30, 120, 600, 1,200v.
d-c. Current: 60 uA., 6 mA., 60 mA.

0-10. 0-50, 0-250.

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Complete with earphones and instructions. £22/6

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3/4 in £2/4
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2 3/4 in £20/6
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108 CRYSTAL MICROPHONES

Model BM3 Pen-coll Type...£5/6

Crystal Microphones Model BM3 Pen-coll Type...£5/6

Band to suit, 15½c extra.

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Weight: 4 Kg (6.8 lbs) Without Battery.

50-500 ohms. (All a.c. 5v.)

0.0001-0.01 uF. (All a.c. 5v.)

0.001-0.2 uF. (All a.c. 5v.)

0-100, 0-500 mA.

0-5 Ma. Voltmeter -20 +3db, case 35/-

0-10 Ma, 3/4in round, black bakelite

VR65 Vumeter -20 +3db, clear plastic case, 3in square £4/2/6

VR3P Vumeter -20 +3db, clear plastic, 3in square £3/6

P22 0-1 Ma. Clear plastic case. 2in Square £2/4/6

Kensington: 10-150 Kc

Siemens: 10-150 Kc

a-c. Volts: 6, 30, 120, 600, 1,200v.
d-c. Volts: 6, 30, 120, 600, 1,200v.
d-c. Current: 60 uA., 6 mA., 60 mA.

0-10. 0-50, 0-250.

In Stock

NEW TRANSISTORS

ER22 GERMANIUM POCKET RADIO

Complete with earphones and instructions. £22/6

Car radio aerials.

Aluminium Chassis

3/4 in £2/4
6/4 £4/4
1 in £6/6
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its frequency assignments as it has faced in
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stitute of Australia has been represented by
the Government invited the W.I.A. to send
Melbourne and Canberra the Wireless In-
genew. At the numerous meeting held in
the brief for the Australian Delegation to
Committee to which the Wireless Institute
General Davidson formed a special Ad Hoc
poses which will open in Geneva on Octooer
bands for Space Radio-communication pur-

"News and notes of Divisional and
clubs in these columns, should be forwarded
before March 1st, 1964
Taylor St., Dunkirk, N.S.W.

"WIRELESS INSTITUTE ACTIVITIES"

SOUTH-WEST ZONE CONVENTION

were successful conventions was held atNavanndra, on October 5 and 6. This was the
seventh annual convention.
Proceedings commenced on Saturday morning with registrations and morning tea
given by the ladies of the local Radio
Club. At 2 p.m., a convoy of 10 cars took
visitors on a tour of Narranderra, Ladera
area. At 8 p.m., a show of amateur bands,
radio and television equipment was held in
the Government building. The convention
was opened in Geneva. This conference was called to allocate bands
for Space Radio-communication.
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for Space Radio-communication.
SPECIAL XMAS CLEARANCE OF ODDMENTS
Carton of over £5 worth of parts for only £1

S.T.C. THERMO RELAYS
2,000 ohms + 500 ohms + 500 ohms, 9/6 each.

37/6 Each

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Radio, Televisión & Hobbie, December, 1962
DIVISIONAL NEWS

The Sixth Jamboree on the Air was held over the weekend, October 19th and 20th, and proved to be the most successful yet held by the Australian Division. The meetings are held in Webs Buildings, George Street, Berrima, and full details can be obtained from the Secretary, Mr. Lionel Brand, VK2AWX.

On Saturday night 44 attended the Annual Christmas Dinner at the Esplanade Hotel. Victorian Division members were guests of the club early in the month and were given an introduction to Amateur Astronomy. Christmas Meeting, refreshments will be served after the lecture. Visitors are always welcomed to meetings and details can be obtained from the Secretary, Lionel Swain, VK2CS.

HUNTER BRANCH

Douglas Fairbairn, VK2AYF, was successful in finding all three hidden transmitters and Stuart Fairbairn, VK2ZDN, who displayed and demonstrated his receiver for broadcast and SW band. Jan, Oosterveen, for his three transistor transmitter, was invited to bring along equipment they wished to dispose of; a limit of six lots per member was imposed. Now is a good time to consider the purchase of some crystals before prices rise. Newcomers are always welcomed to meetings and discussions of the latest developments in electronics always prove popular.

SOUTH AUSTRALIAN DIVISION

The December meeting will be held on Friday 21st and will take the form of a film showing of the Jamboree on the Air. Several stations were worked on six and two metres including VK2ZDL, VK2ZMK and VK2AIV, but stations in Western Victoria were not worked.

Radio, Television & Hobbies, December, 1963

For ACCURACY, STABILITY, ACTIVITY AND OUTPUT

Our crystals cover all types and frequencies in common use and include equipment for sale. These evenings proved to be the most successful yet held by the Australian Division. The meetings are held in Webs Buildings, George Street, Berrima, and full details can be obtained from the Secretary, Lionel Swain, VK2CS.

Audio Ultrasonic and Special Crystals

BRIGHT STAR CRYSTALS

Immediate delivery available for all above types. Magazine.

AMATEUR TYPE CRYSTAL 3.5 and 7 MC BAND

Conversions — from £3/- each plus 12½ per cent sales tax.

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CHOOSE THE BEST—IT COSTS NO MORE

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"UNION" TRANSISTORISED SPEAKER INTERCOM SYSTEM (MASTER AND REMOTE 2 UNITS) RADIO AND BABY SITTER COMBINED
Operates for months from internal batteries.
6 penlite batteries in each unit with 50 feet of wiring.

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UNION TRANSISTORISED SPEAKER INTERCOM SYSTEM (MASTER RADIO HOUSE PTY. LTD.

specify them at your local hardware store.
altogether will make an indispensable unit for the workshop. Ask to see when combined with a portable power tool. ^

These handy index sets (in 1/64" rises) are available in five sizes, and are designed to drill the toughest metals and are unequalled when manufactured from the highest quality HIGH SPEED STEEL.

FROST H.S.S. Twist Drills are proven throughout the world as tough! I'll say they are, the proven high. I.S.S. Twist Drills are fully organised, clubs in New Zealand may apply to their W.I.A. representative, or W.I.A. Headquarters, 306-308 Pitt Street, Sydney, N.S.W. for reliable connections

Operates for months from internal batteries.
306-308 Pitt Street, Sydney, N.S.W.

Radio, Television & Hobbies, December, 1963
Relay League. With chairs coloured charcoal or green.

metres in the contest, while in 1963 only partially during the period of the low sun-spot cycle. The effect of this cycle on DX operation over the last year is shown by families of both by their fellow amateurs.

ARRL 1964 DX contest. It will be the fourth contest held during the past thirty-five years.

The phone session will be held on February 8-9, and March 14-15, the CW operation over the last year is shown by families of both by their fellow amateurs.

The museum of Amateur Radio is being assembled in the entrance lobby under the expert supervision of an old, old timer, Gordon Roach. Wheaton, Illinois.

During the month of December, amateurs conducted tests to ascertain if a source of power can be developed for sensors and transmitters to be used in space research.

A BEAUTIFUL PERFORMER. Kit comes complete with assembly instructions and engine. Only 12/6 each (Plus 2/- for pack and rail.)

The transmitter operated continuously for 10 hours. The open circuit voltage was measured as 500 volts. The power consummated within 10 minutes. The output was 500 Kc transmitter in the body of a rat.

Those taking part in this experiment were VE1NFV, VE1AFY; and VE1AU. Later, in the month the death also occurred of Jack Ferguson, VE2PF. Jack was well known for his activities in the Waverley Radio Club and in recent years as a member of the Central Coast Amateur Radio League.

SILENT KEYS

The death occurred on October 8th of Malcolm Perry, one of the "founding fathers" of Amateur Radio in Australia, and one who had been associated with the Wireless Institute of Australia since its foundation in March 1918. Mr. Perry's name is one of the most cherished in the annals of the Institute in 1911.

Prior to World War I he operated a Radio station and started the Central Coast Radio Club. In recent years, following his retirement, he has been active in local affairs in the Blue Mountains.

In September, the death occurred of Jack Ferguson, VE2PF. Jack was well known for his activities in the Waverley Radio Club and in recent years as a member of the Central Coast Amateur Radio League. The death occurred on October 8th of Malcolm Perry, one of the "founding fathers" of Amateur Radio in Australia, and one who had been associated with the Wireless Institute of Australia since its foundation in March 1918. Mr. Perry's name is one of the most cherished in the annals of the Institute in 1911.

Separation by foreign land: In the case where a country, such as that covered by the Transvaal, is separated from the rest of South Africa, the country is considered as a separate entity. This 75 miles of land is a requirement which is applicable to land areas only. In cases of areas made up of a chain of islands, there is complete separation of the country in question, by a minimum of 75 miles of foreign land, the country is considered as two separate entities.

BEACON STATION

To check actual propagation conditions during the low sun-spot cycle a beacon station, K6HME, is transmitting twenty-four hours a day on a frequency of 29.6 Mc. All reports on reception of this station should be sent to Box 25-121, San- diago, California, U.S.A.

Results of this year's contest revealed that 1383 logs were sent in, an increase of 30 per cent over the previous year, and that Central Coast amateurs made up 54 per cent of the total. In the area around the building attraction shadiest and trees have been in full leaf. In the area around the building attraction shadiest and trees have been in full leaf.

On the lower frequencies the results were made up of 60 over the previous year, and that Central Coast amateurs made up 54 per cent of the total. In the area around the building attraction shadiest and trees have been in full leaf.

DX NEWS

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SPECIAL PURCHASE OF MANUFACTURER'S STOCK OF TRANSISTORS AND TRANSISTOR COMPONENTS ENABLE US TO OFFER TRANSISTORS AND KIT-SETS AT A FRACTION OF ORIGINAL COST.

Complete KIT for TRANSISTOR PORTABLE £10/19/6
The complete kit of parts for the transistor kit 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. Kit is housed in attractive plastic case as illustrated.
Set can be supplied wired and tested at £2 extra.

Data available for all States. Post and Packing extra N.S.W. 10/- Interstate, 15/-.

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NEW 4-SPEED STEREO & MONO PLAYERS AT LESS THAN HALF-PRICE

PHILIPS 4-SPEED

MONO ... £4/17/6
STEREO ... £5/17/6

DIALS AVAILABLE FOR ALL STATES. POST AND PACKING EXTRA 1/4 extra.

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NEW 4-SPEED 240V.

A.C. RECORD PLAYER

MONO ... £5/17/6
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Prim.; 240 volt. Sec. 385 x 385 at 50 m.A. 30, 61, and 5 volt. £2/6 Post. N.S.W. 4/-, Interstate 7/6.
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These new Resistors (mainly I.R.C.) and Condensers include many popular values. The condensers are paper, mica and ceramic, some are older types and shop soiled.

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2/6 per 100.
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SPECIAL PURCHASE OF FACTORY STOCK

NEW 4in EXTENSION SPEAKERS
These speakers are mounted in polished cabinets suitable for use as intercom, units or extension speakers.
LIST PRICE .......................... £6/-

SPECIAL PURCHASE ENABLES US TO SELL THESE UNITS AT 4/-.
Post and packing, N.S.W., 6/-; Interstate, 9/.

NEW GARRARD RECORD CHANGERS
These new Garrard record changers are fitted with high-fidelity cartridge, pick-up and amplifier which have been developed.

NEW ACSOS PICK-UP FOR 7in RECORDS
These new English "Acros" pick-ups are fitted with GP50 crystal pick-ups, sapphire stylus and plastic arm with mounting base...

HIGH-SPEED 240V. AC/DC MOTORS
These 240 v. a.c. or d.c. motors are 1/12 H.P. with a speed of 7 600 R.P.M. and are ideal for small drills, grinders, etc.

NEW 4-IN EXTENSION SPEAKERS
These new extension speakers are mounted in polished cabinets suitable for use as intercom, units or extension speakers.
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NEW 4-SPEED STEREO CHANGER, SLIDER-SWITCHES
PLAYER F.O.R. £8/15/0 4-SPEED F.O.R. .. £10/15/0 10 pole 2-way silver plated contacts 3/9

BATTERY CHARGER RECTIFIERS
New Selenium Rectifiers, 4 or 11 volt, at 4 amp., 37/6. Post, N.S.W., 7/6; Interstate, 10/.
Transformer for above, 47/6. Post, N.S.W., 7/6; Interstate, 10/.

NEW A.W.A. OAK SYNCHRONOUS VIBRATORS. 7-pln, 6r. 7/6.
Post and Packing 1/.

SCOOP PURCHASE OF POTENTIOMETERS
RESISTORS AND CONDENSERS
We have purchased the entire potentiometer stock held by Bush-Strapsoo who have ceased the manufacture of TV and radio equipment.
The resistors are mainly I.R.C. and include most standard values from 200 ohms to 5 meg in W 1. and 1 watt. Also some wound.

The condensers are in most popular makes and include many ceramic, paper and electrolytic in most popular values.

The potentiometers are all current types and include switch pots and dual concentric.

Imported National Transistorised Shoulder Megaphone
These shoulder megaphones manufactured by National Radio Japan have an output of 4 watts, and are supplied complete with handheld type speaker, batteries and microphone list price £7.

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Radio, Television & Hobbies, December, 1963
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NAME

AMBERS

OCCUPATION

SIGNATURE

(see your parent’s signature if under 21)

Radio, Television & Hobbies, December, 196...
The density of the stations on some bands, announced the signing of a contract for listeners to P.O. Box 15, San Francisco, the station asks for reception reports from service to listeners in the Caribbean area. It has been noted that Voice of America transmitters located in other areas, such as in the Pacific, Liberia and Britain use both their bands, though some semblance of control on frequency allocation is gradually imposing frequency assignment.

BRITISH CARIBBE

A new country for short wave listeners in British Caribe. This is the former British Hong Kong, which has been labeled, as the British Broadcasting company, to ensure the British service to Caribe listeners in the Caribbean area. The station has been removed the British Caribe Broadcasting Service and continues to operate on 2000 Kc.

The station pleased to receive reports on its transmissions to Radio Caribe, British Care.

KGEI SAN FRANCISCO

Good reception is reported by several listeners of the KGEI San Francisco transmission. This channel is operated on 15240 Kc from 2220 to 0215 G.M.T; then 0430. The programs in English are at the end of the transmission and, when closing, 0815-0845 Sunday only ZL22 11820.

A recent survey of the short wave bands includes frequent commercials. The station operates on this channel from 0230 to 2200. The programs in English and in Spanish are in 11820 Kc. The station is now owned by the Japanese Broadcasting Corporation, in Tokyo, Japan.

Source: The Voice of Friendship.

FREE CHINA

The Dragon show, of requests by listeners in Singapore station on 9595 Kc has been announced. The station is operating on the following schedule, which includes the use of a "new" frequency 11820 Kc.

Christmas Special RECHARGEABLE TORCH

FREE RECHARGEABLE TORCH

SINGAPORE ON 9595

Radio New Zealand's program for短波 transmissions. The station operates on the following schedule, which includes the use of a "new" frequency 11820 Kc.

GREAT BRITAIN POWERED CREATION LTD.

To Australia:

To the Pacific Islands:

SOURCE: "Short Wave Listener," "This Radio Age," is written by the Nippon Short Wave Co., in Tokyo, Japan.

Library of Congress Catalog Card Number: 64-11725.

NOTES from readers should be sent to the ARTHUR CUSHEN, 212 Earn Street, Arthurs Harbour, New Zealand, who gives the information on the new schedule as reported from the station.

JOZ1 3945 50 2030-2300,

JOZ3 9595 50 2030-1545

JOZ 3925 Kc 50 Kw 2030-1545

JOZ6 7230 10 2315-0720

Second Networks:

JOZ 3945 10 2315-0720

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NOTES:

- Radii, Televitlon A Hobble*, December, 1963
- 110 Radio, Televitlon A Hobble*, December, 1963
- Circulative Side Rules
- Sound Projectors

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Sewinc Machines, etc. Cost £4/0/0.

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1120 5/6 £10/6/6.

K7 3/6.

16/6.

6/6.

1L4 9/6.

H4 4 IN. X 4 IN.

19.0/0.

B xlaa apot.

22/4 5/4.

27/4 4R7.

11 12/4.

4NT 1/6.

12/4.

4FB.

11/4.

4CB.

11/4.

5/4.

3/4.

12/4.

1/6.

1/6.

3/6.

6/6.

9/6.

5/6.

1/6.

G 7/4.

C 7/4.

1M .. 7/4.

1120 ,. 5/.

K7 ,, 3/

3/6.

7/4.

1M .. 7/4.

C 7/4.

12/4.

1/6.

1/6.

3/6.

6/6.

9/6.

5/6.

1/6.

G 7/4.

C 7/4.

3/6.

6/6.

9/6.

5/6.

1/6.

1/6.

3/6.
Radio is recognized as a force for propagation of news in this part of the world. For example, CANADA station CBNX in St. Johns, in Newfoundland, is on 1180 Kc with 200 watts of power and is on the air from 0700-1030 G.M.T. The station could be in Djakarta as, for instance, COLOMBO in Ceylon, with its All Asia Service, is on 11730 Kc; then, from 2100, the program is music and plays with station identification each hour. The other stations that have been reported on this wave are, as before, privately operated by the Otago Radio Society in Dunedin, 1450 Kc; 320 watts operated by the Canal Radio Association. It has been broadcasting for over 40 years and it is the public broadcasting organisation in the British Commonwealth. The same program is carried in the hour or so after 11745 Kc. The 11800 Kc is on Saturdays from 0900 to 1000, 1100 to 1200, 1300 to 1400, 1500 to 1600 and on Sundays from 0900-1100, 1300 to 1500; its station is located in Bantu, in the former South West African Territory.

VATICAN Radio is heard from Naples to be heard in its broadcast from the Holy See on 11745 Kc. It has been noted that, because of the increasing popularity of the session, it can be expected to be on the air twice monthly. The transmission commences with a news bulletin, which is given in Italian, The English transmission follows at 1400 which is giving very good reception in New Zealand and New Zealand on 11855 Kc and is on short wave, which are privately operated by the Otago Radio Society in Dunedin, 1450 Kc; 320 watts operated by the Canal Radio Association. It has been broadcasting for over 40 years and is the public broadcasting organisation in the British Commonwealth. The same program is carried in the hour or so after 11745 Kc. The 11800 Kc is on Saturdays from 0900 to 1000, 1100 to 1200, 1300 to 1400, 1500 to 1600 and on Sundays from 0900-1100, 1300 to 1500; its station is located in Bantu, in the former South West African Territory.

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TY VIEWING

F.K. (Papamoa, N.Z.) says that he missed the point of his niece when we suggested that closing the eyes, when viewing television, might do more harm than good. He would like to see the pictures in white background. This is exactly as it is with well-known optical phenomena and what we said; it’s a case of seeing the same thing through the eyes. We would refer you to the section on television. He wonders about transistorised ignition, but he found that closing the eyes reduced visual acuity and prevented him from the. impression of the flatter which “are present in the picture out of a hundred.”

Unfortunately, you did not make this clear in your original letter. In fact, you specifically said “any intention picture, however dim, however, is too much patient attention. Your eyes go out of focus far more easily than. We close our eyes to a much wider range of subject matter and a much greater spread of technical level.

Thus, our available space has to be allocated to articles published in the magazine. As a rule, requests for circuits will be answered more speedily if directly to the page of the respective author. Answers will be given in note form and only those accompanied by a fee will be answered in rotation on these pages.

PROJECTS HARDER

G.C. (Chadstone, Vic.) says that he has been looking through the August, 1963 issue, and has made some interesting observations. He wonders about the transistor turn-on time in comparison to the vacuum tube turn-on time. He is interested in the effect of the carrier generation of a crystal set, which somewhat resembles a diode with two or three tuned circuits. He has been experimenting for a long time now, and has found that closing the eyes reduces visual acuity and prevents him from the impression of the flatter which “are present in the picture out of a hundred.”

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SO YOU WANT TO BE A HAM, by Robert Hoberg, wasDJ. Completely revised third edition. Soft cover, 192 pages, $1.25 in the United States, 1.50 in Canada. Published by Howard W. Sams & Co., Inc., Indianapolis, Indiana.

This little book, as the name implies, is directed mainly to the prospective radio amateur. As it is an introduction, work is not a great deal of technical matter. Rather is the space devoted to such things as how to learn the basic code and the type of equipment that is often used today.

There are 14 chapters in all and the titles are as follows:—The Amateur Radio Game; Conquering the Code; A Kit; Providing Valuable Experience; A Receiver is a Basic Requirement; Getting Your Ticket; Going on the Air; With a Transmitter; The Antenna Radiates; The Signal; Going Rhythmic; How to be a Good Operator; Test Equipment and Safety Measures; The Organization of Amateur Radio; The Ham in Military Service; Electrons as a Career; The Radio Market Place.

From the chapter headings, a fair idea may be gained of the actual contents. However, it should be remembered that the book is directed mainly to the prospective radio amateur, and it should be interesting reading even to the more veteran. Our copy came direct from the publishers. The American price is 2.95 dollars.


This new book by Ernest Trlcomi is intended as a handbook for those who want to learn or refer to such things as how to learn the code, install or service major appliances (refrigerators, washing machines etc.). The volume is a fairly comprehensive guide to theory, troubleshooting hints, and servicing procedures.

In ell, there are 26 separate chapters. Each is directed mainly to the prospective radio amateur, and is a worthwhile book for those who are considering joining the ranks of Radio Amateurs.

The book is well-written by an active amateur, and it should be interesting to all who are interested in these affairs. We found it, however, more practical in nature, but who now desires to understand articles that would have been too difficult to comprehend, with which he is dealing does its work. What is the chance of any book cover, a value, for instance, its value. There are 14 chapters in all. Because the book covers such wide a field, the subject matter is of necessity, somewhat abbreviated. At the same time, through the casual introduction of fact and full explanation of technical terms, the technical vocabulary of the reader is gradually built up. By the end of the book, the reader will be able to tackle and understand articles that would have been too difficult to comprehend, but which will now provide him with a much richer understanding of fundamentals.

The book has been deliberately written in an informal style with the use of many popular analogies and while this style may annoy many oncers, it is not often used today.

Our review copy came from Menus Electronic Publications (Australia) of 11 Cadell Street, Sydney, N.S.W., and the Australian price is 2.95 dollars. (K.W.J.)

HOW TO REPAIR MAJOR APPLIANCES—by Ernest Trlcomi, Soft Covers, 192 pages, $1.50 in Australia, of test material with many illustrations. Published by Howard W. Sams & Co., Inc., of Indianapolis, Indiana. American price, 3.95 dollars.

This book is intended as a handbook for those who sell, install or service major appliances (refrigerators, washing machines etc.). The volume is a fairly comprehensive guide to theory, troubleshooting hints, and servicing procedures.

The book, being of American origin, concentrates on the appliances manufactured in that country but the information, being of a general rather than a specific nature, would be equally valuable to local technicians.

The book has 17 chapters cover: Home Appliance Refrigerating and Freezing; Washing Machines; Clothes Dryers; Ranges; Dishwashers; Garbage Disposers; Dryers; Air Conditioners; Electric Motors Used in Home Appliances; and General Appliance Servicing.

Our review copy of the book came direct from the publishers. (K.W.J.)


For the many radio amateurs who like to construct their own gear, and for those interested in building their own field of amateur radio, here is a practical guide to the building and operation of many types of "Ham" antennas.

In addition to supplying details on tuning antennas and the use of antenna test equipment, the individual chapter titles are as follows:—Basic Horizontal Antenna, Basic Vertical Antenna, Using Antenna Test Equipment: Multiple Element Beam Antennas: Vertical Beams; Compact Indoor Transmitting Antenna; Long Wire Beams; V.H.F. and U.H.F. Antennas; Special Purpose Antennas: A complete Glossary and Subject Index are also included.

Our review copy came direct from the publishers. (K.W.J.)

★ ★ ★

STANDARD FOR FIXED CARBON COMPOSITION RESISTORS, PUBLISHED BY THE STANDARDS ASSOCIATION OF AUSTRALIA

The new standard is AS 344 applying to fixed carbon composition resistors (Type I.1, normal stability). It refers to resistors having a rated dissipation not exceeding 2 watts and a rated resistance value between 10 ohms and 22 meg- ohms.

The standard gives a classification and standard values of resistance for the resistors, and establishes uniform requirements for their electrical, mechanical and chemical properties. It is primarily intended for the guidance of manufacturers and users in assessing the durability of the resistors under various conditions of temp., storage and use, and it takes into account the relevant recommendations of the International Electro-technical Commission.

Copies of AS 344 are now available from the offices of the Standards Association in State capital cities and in Newcastle. The price is 7/6 a copy plus 5d postage.

★ ★ ★

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IEC 147. Essentials Ratings and Characteristics for Semiconductor Devices and Generators. Part 1 of this volume was the earlier volume to keep it in step with advances in the newer devices and manufacturers' components. He is, therefore, a vital part of the electronics industry, a technical college and university student. The second explains the theoretical side of magnetic recording, while the first chapter gives the history and development of magnetic recording, and discusses the various factors controlling noise ratio, distortion and demagnetisation.


An excellent monograph on magnetic recording. This book does much to give the history and theory of tape and wire recording, and discusses design principles of magnetic recording and replay equipment, together with practical applications. The book is therefore equalised to the amateur musicians who are interested in recording technology.


The electronics drafter is responsible for making drawings of circuits of electronic devices and circuits and drawing, and other pictorial or graphic representations of electronic devices and circuits. He is, therefore, a vital part of the electronics industry, a technical college and university student. The second explains the theoretical side of magnetic recording, while the first chapter gives the history and development of magnetic recording, and discusses the various factors controlling noise ratio, distortion and demagnetisation.


The third chapter discusses large signal characteristics and biasing systems. This was followed by a chapter concerning the effects on transistor noise. The third chapter discusses large signal characteristics and biasing systems. This was followed by a chapter concerning the effects on transistor noise.

The fourth chapter concludes the volume. The third chapter discusses large signal characteristics and biasing systems. This was followed by a chapter concerning the effects on transistor noise.

Radio, Television & Motion Pictures, December, 1963
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