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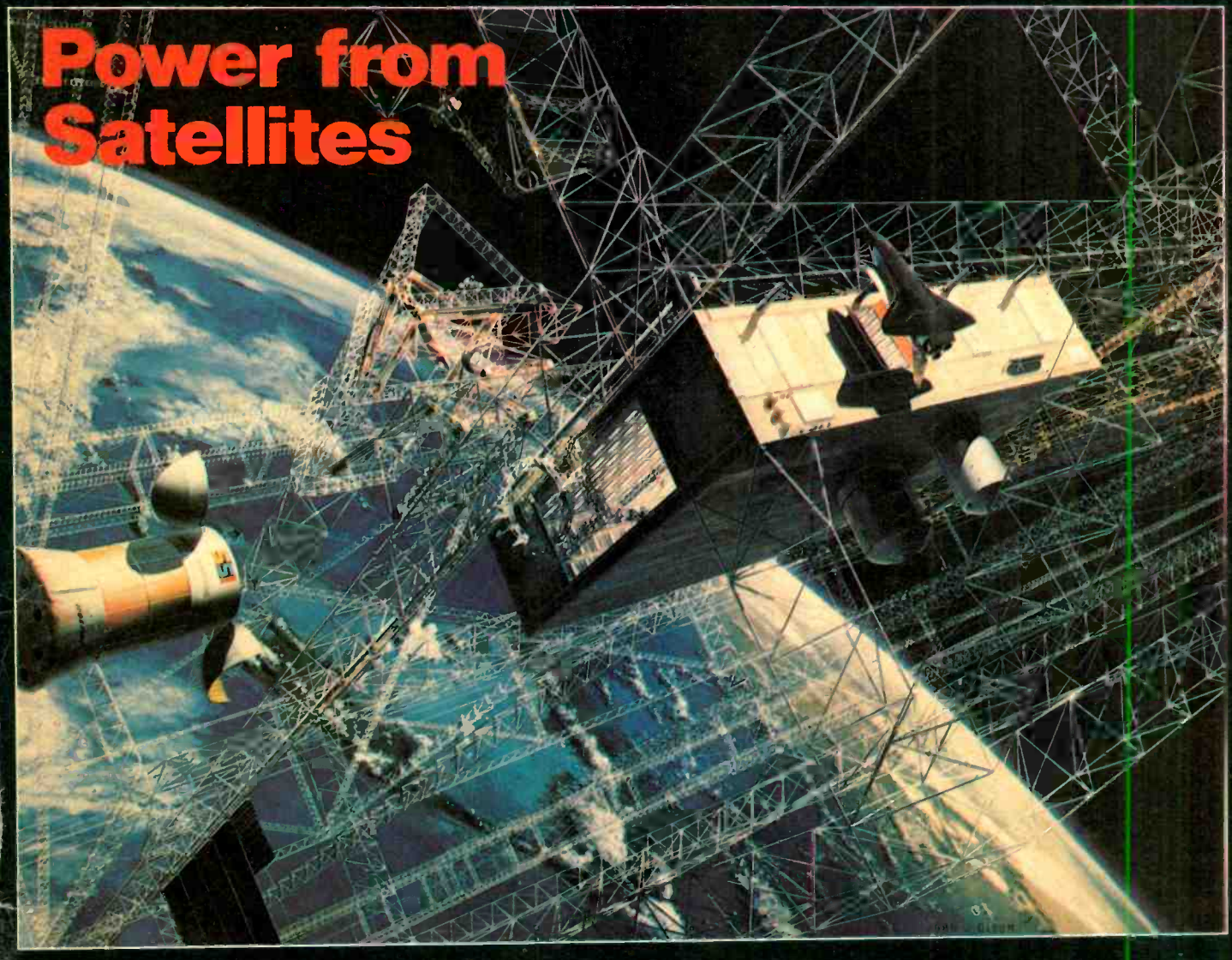

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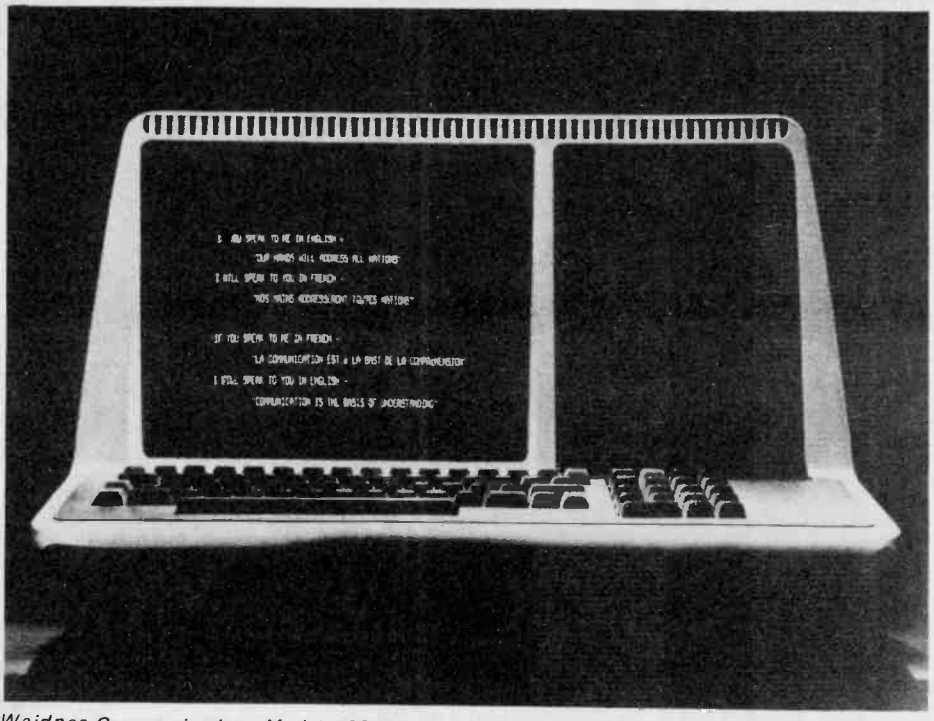
NEWS DIGEST



Weidner Communications Model 100 Translator. Comprehensive editing facilities are designed to aid the human translator, not replace him. The device is aimed at small companies which do large amounts of business in two languages.

English/French Translation System

Weidner Communications has recently demonstrated a computerized language conversion system that instantly translates written documents from English to French and French to English in this country.

The translation system has been developed and is now being marketed by Weidner Communications Inc. of La Jolla, Calif.

The Weidner system, introduced in New York last fall with an English/Spanish capability, supplements rather than replaces the work of the human translator, enabling him to function as an editor, devoting his time and attention to the few words that need refinement.

The Weidner 100, as the English/French system is called, is designed to be cost effective for any firm that has as few as two translators on staff. The system can translate raw data from a source language to a target language at a speed of 20,000 words an hour.

The Weidner system reserves the human translator's skills for the refinement of the raw text that the system rapidly translates and projects on the CRT screen. A computerized word finder provides a selection of words at the top of the screen when a word being translated could have more than one meaning in the output language. The translator selects the appropriate word and pushes a button to insert it into the translation. He can also rearrange the sentence as desired. Once he is finished with this refinement process, the translation comes out of the system via the printer in camera-ready form.

The idea of using computers in translation is not new. A variety of experiments in this field have been made for almost 30 years, but none has proved commercially feasible.

Error-Proof Data System For Milk Tankers

A new electronic data collection system built specifically for bulk milk tank trucks is claimed to virtually eliminate errors in recording the quantities of milk picked up from local farms and processing plants.

Already test marketed under adverse conditions, the new "RMO Data System" produced by Enraf Nonius N.V. of the Netherlands, will be introduced soon in North America. By using the well-known Hamming Code, the system unscrambles and corrects errors caused in the machine itself.

The heart of the system is a mobile unit mounted on a tanker. This unit supervises the loading and discharging procedure and checks the data collected. A keyboard is not required for data input. Rather, part of the data is preprinted, such as the supplier's number, on magnetized code cards, and part is fed in automatically, as for example, the volume and temperature of the milk intake.

After electronic checking, the data are stored in a plug-in type of data carrier which has a solid-state memory and does not require batteries. Consequently, the chance of accidental memory loss is eliminated.

The mobile unit on the tanker may contain a printer so that the information in storage can be printed for each milk supplier, with or without a copy for a milk sample.

The RMO System complies with standards laid down by weights and measures authorities in the Netherlands. Modular design of the unit makes it possible to fulfill specific requirements of individual customers.

For further details, please write to the Royal Netherlands Embassy, ConGill Building, 275 Slater Street, Ottawa K1P 5H9, Ontario, Canada.

RMO Data System provides a means of accurately measuring quantities of milk.

Computer Catalog Feedback

Dan O'Hara of CompuShop Canada in Alberta sends along some corrections for our Apple write-up in June '79 ETI. Specifically that Integer BASIC requires 7K bytes and that Apple Soft need ten and a half. Also all units sold in the last year have six colours in high resolution instead of four.

He also noted that prices quoted were 20% higher than those in Alberta. A 16K Apple II is priced at $1775 as opposed to the $2200 we quoted.

For more information, write to CompuShop Canada Ltd., #107 Atrium Square, 4014 Macleod Trail South, Calgary, Alberta T2N 0W2. Tell them ETI sent you.

Austin Hook of The Computer Shop also sends along some information/corrections. First, the first phone number listed should be 403-265-1911. They also have a new store at 330 Ninth Ave. S.W., Calgary, Alta. Both shops are located in Calgary.

Scanner Club

Formed less than a year ago, the Scanner Association of North America (SCAN) reports that it now has a membership approaching 20,000. The club, which is sponsored as a public service by Electra Company, the manufacturer of Bearcat scanners, is the first national organization of its kind. Among the membership services is an informative quarterly magazine, "Scanning Today", which features technical tips, stories on exciting new listening activities and information on professional public safety organizations.

More information about Scanner Association of North America is available by writing directly to: SCAN, Suite 1212, 111 East Wacker Drive, Chicago, Illinois, USA, 60601.

Expose Yourself

News digest is a regular feature of ETI Magazine. Manufacturers, dealers, clubs and government agencies are invited to submit news releases for possible inclusion. Submissions, or questions about material, should be sent to: News Digest, c/o ETI Magazine Unit 6, 25 Overlea Blvd., Toronto, Ontario, M4H 1B1.

Audio products news will be directed to Audio Today's product department, and similarly Shortwave news will appear in Shortwave World. Sorry, submissions cannot be returned.

More Info For Readers: ETI Introduces Reader Service Cards

The advertisers in this magazine are interested in talking to you about their products or services. That is, of course, why they are advertising. But they can't necessarily say all they would like, and besides, they can't anticipate all your questions. So you may be left wanting more information.

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The Reader Service Card will also provide advertisers with useful information about what products interest readers, and how best to present their advertisements. The end result is a better response to customer desires, and better business.

Finally, the card will help keep us in touch with our readers, and thus help us to serve and interest you best.

More details on page 54!

NEWS DIGEST

Saudi Telecom System

RIYADH, SAUDI ARABIA, July 5, 1979 — Saudi Arabia's new telecommunications system has set another world cutover record — the second in a time span of six months. A total of 97,000 local lines and 17,200 new long distance circuits have been placed into service within the last three weeks in 16 switching centres and 11 cities across the Kingdom.

"Bell Canada's role in this expansion is multi-faceted", explains D. W. Delaney, the company's vice-president (International), "but most important is our job of managing the operation and maintenance of the entire system, especially after all new equipment is installed and operating."

"The addition of 3,500 new long distance circuits and seven new and upgraded switches, in association with the microwave, coaxial cable and satellite systems, will provide a national long distance network infra-structure base for the Kingdom's telecommunications needs for years to come," Mr. Delaney explained. "Along with additional trunk circuits, this improved national long distance network will mean improved long distance service and better access to international circuits for Saudi Telephone subscribers," he said.

"This sophisticated technology is helping the Kingdom on its way to another "first" scheduled for 1981, when Saudi Arabia will become the first nation in the world to have an all-electronic telephone system."

The final additions to the system during this cutover cover the entire Kingdom. Riyadh gets 40,000 switching lines and 1,600 trunk lines; Jeddah — 13,000 and 6,600; Mecca — 20,000 and 4,000; Dammam — 14,000 and 3,000; Medina — 9,000 and 2,000; and Qasim — 1,000.

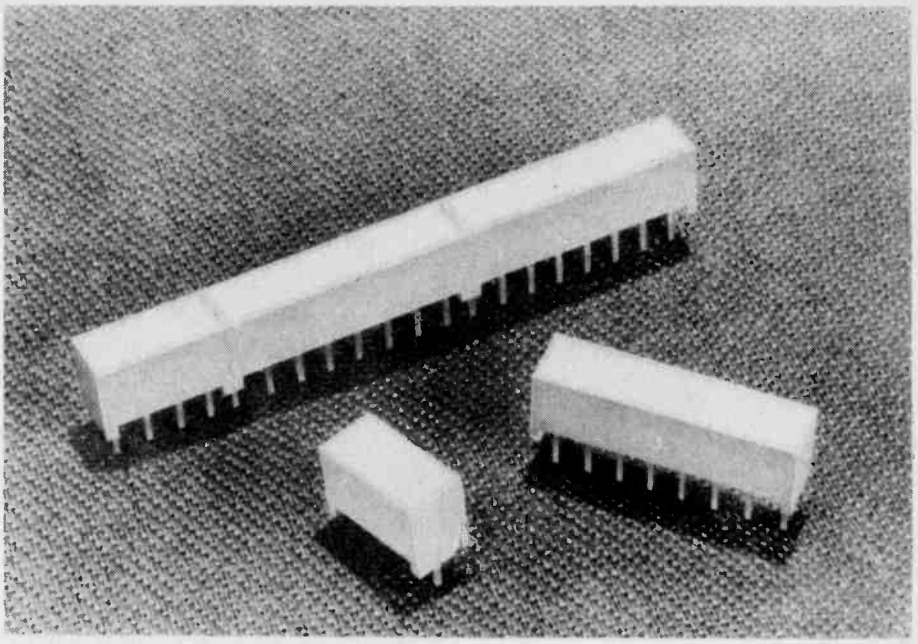
Graphics Printer

Now available from Webster Instruments Limited, Mississauga is Gulton's new GAP-101M fixed head digital thermal printer mechanism. It utilizes a printhead with a single row of 101 thick film dot elements to simultaneously print graphics, grid patterns and alphanumerics (10 columns 7x9 or 14 columns 5x7) on a moving tape. The ability to print grid patterns means that preprinted graph paper is not required. Printing rate is up to 30 dot lines per second and life expectancy is 100 million dot lines MTBF.

The fixed head approach to thermal printing produces essentially noiseless printing, while providing the reliability of solid state switching. There is only one moving part — the paper tape drive. Complete independence from ink supplies and ribbon mechanisms is achieved by the Gulton printing technique.

Applications are diverse, and include printing of gas and liquid chromatograph patterns, oscilloscope wave forms, spectrographic analyses, and many other variables. In medical use, the GAP-101M records EKG, patient number, pulse rate, blood pressure, and other patient data.

For more information, please contact Mr. Roger Webster, Webster Instruments Limited, P.O. Box 427, Port Credit P.S., Mississauga, Ontario L5G 4M1.



HP Light Bars are intended to provide high reliability lighting at low cost. The larger one is roughly the size of a 14 pin DIP package.

LEBs (Light Emitting Bars)

A new family of light emitting diode light bar modules designed for use as backlighting sources for display panels for electronic instruments, computers and office equipment and automobiles was introduced today by Hewlett-Packard.

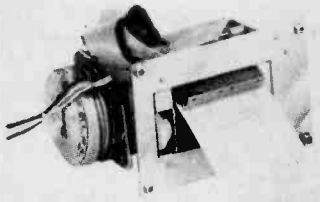
The new light bar modules provide large, bright, uniform light emitting surfaces, are suitable for multiplex operation, and mount easily on P.C. boards or sockets. They are X-Y stackable and may be mounted flush.

The rugged devices come in two sizes (8.89 mm x 3.81 mm and 19.05 mm x 3.81 mm) and three colours; red, yellow and green. They provide the largest continuous illuminated surfaces using LED technology ever offered by HP.

The modules are expected to find application in illuminated legends, indicators, bar graphs and lighted switches.

The new lamps are priced at $1.49 and $2.27 CDN in quantities of 1000, for each respective package size. They are available through HP franchised component distributors.

Readers inquiries will be assured by mailing them to Inquiries Manager, Hewlett-Packard (Canada) Limited, 6877 Goreway Drive, Mississauga, Ontario L4V 1M8.



New Distributors

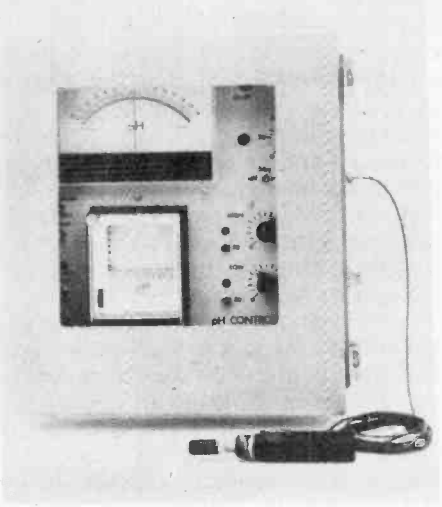
Dynalogic Corp. has appointed Webster Instruments as exclusive distributors for Canada for Laboratory Microcomputer System and related products. Write to Webster Instruments Ltd., P O Box 427, Port Credit P.S., Mississauga, Ontario L5G 4M1.

pH Controller Recorder

A new line of economical, accurate pH Controller-Recorder Units has been introduced by A.I.S. in Mississauga, Ontario. Designed to monitor and maintain acceptable pH levels of waste liquids containing acids, alkalis and organic solvents entering sewer systems or reservoirs, the compact units sense pH levels and activate neutralizing solutions automatically if normal levels are exceeded.

Sensitive electrodes monitor pH at the input source and if levels exceed the pre-set high/low limits, they will automatically signal solenoid-activated pumps to increase or reduce neutralizing solutions.

An additional electrode monitors and automatically records pH on a continuous printout tape, with a capacity up to 30 days providing processors with evidence their waste water has been regularly maintained within legally-acceptable safe limits.



The A.I.S. Controller-Recorder units combine pH measurement, control functions and printout recording in a single cabinet. The units also have a safety alarm connected to a run-out timer which audibly signals if pH levels are not corrected within a given time.

A free, 12-page booklet, "pH Control is Easy" together with literature and prices is available by writing Analytical Services Limited, 1601 Matheson Blvd., Mississauga, Ontario L4W 1H9.

Lectra Saver

Lectra Saver is a uniquely designed system that utilizes the rejected heat from the air conditioning system to heat water for residential, commercial, or industrial use.

Not only does Lectra Saver conserve energy normally used to heat water, it also increases the efficiency of the refrigeration unit by reducing the power usage by 8% or better! This is accomplished by an 18 to 20 PSI reduction of compressor head pressures which improves the efficiency of the refrigeration system.

Lectra Saver is a refined heat exchanger that utilizes the waste heat from the super heated gas of the refrigeration system with a double wall construction which protects the warranty of the air conditioning system.

A residence with a three ton air conditioner could expect from 15 to 25 gallons of hot water to be raised from 70°F to 140°F every hour the air conditioner is running. With a five ton air conditioner, a possible 25 to 40 gallons could be recovered during the summer months when the air conditioner is running fairly constantly. As the outdoor temperature decreases,

Continued on page 8.

More Cases

Just after we put the August issue away, Harry Davies Molding, Chicago announced their new line of Phenolic Instrument Cases and Covers.

Available in 5 different sizes and over twelve styles these new instrument cases and lids are ideal for hobbyists and engineers alike.

The cases range in size from Model 220 (4 x 3 x 2) to Model 280 (8 x 7 x 3). Complimentary Lids are available.

Harry Davies Molding is represented in Canada by Atlas Electronics Limited, Toronto, Canada. 50 Wingold Avenue, Toronto, Ontario M6B 1P7, New telephone (416) 789-7761.

ARRL Publication

The ARRL ANTENNA ANTHOLOGY has just been released by the American Radio Relay League. This book is a compilation of antenna construction articles directed toward the beginner and experienced radio amateur interested in maximum performance for minimum expense. With the aid of clear, precise photographs and diagrams, it conveys, in layman's terms, all the necessary information for building, tuning, and installing over 2 dozen antennas. There is also a section of the construction of related equipment: bridges, transmatches and VU meters.

All antennas covered have been installed and tested by radio amateurs known for their technical expertise.

For more information contact Lorry Evans, Publication Sales, 225 Main, Newington, CT 06111.

NEWS DIGEST

Continued from page 7.

the air conditioner will run less, making less hot water available. With a heat pump, hot water from the heat recovery system is available during the winter, as well as the summer months.

Even greater savings can be realized in some types of commercial establishments where the hot water requirements are heavy and there is high internal heat gain from lights and people in the public area which causes the air conditioner to run during the winter months. For example, some restaurants have been able to obtain up to fifty percent of their hot water annually from this heat recovery system.

The Lectra Saver is available in Canada from Findlay Comfort Systems who are the licensee of Lectra Saver for the British Commonwealth countries. Findlay Comfort Systems are at 60 Otonabee Drive, Kitchener, Ontario N2C 1L6. Telephone: (519) 893-6531.

OSI's Home Computer

Ohio Scientific unveiled 'The Home Computer Of The Future', (the C8P DF) at the Chicago Consumer Electronics Show announcing it as the world's first true home computer.

The C8P DF includes a full keyboard, BASIC language, video display of 2048 characters, up to 16 colors, high resolution graphics, sound output, a D/A converter for voice and music, joystick interfaces and a large library of software for entertainment, education and personal finance.

This Home Computer Of The Future utilizes two 8 inch floppies and has an AC control interface to inject control signals on the AC power lines of a home to control remotely placed switches and dimmers.

At a press conference, the computer demonstrated its ability to turn lights on and off, interface with wireless home security systems involving smoke detectors, door contact switches, an automobile burglar alarm and auxiliary devices.

This Home Computer Of The Future will have a suggested starting retail price of $2,597 US. The computer system is based on mainframe architecture which has open slots for additional expansion as Ohio Scientific creates more capabilities to add to the home computer.

Move News

As of May 30 Cominco Ltd. will have moved to 130-7330 Fisher St. S.E., Calgary, Alta. T2H 2H8.

RF Load Resistor

Bird Electronic Corporation, of Cleveland, Ohio, has announced a new TERMALINE® RF Load Resistor for use with low power transmitters. Featuring a rugged, highly efficient thermal design, the new Series 8860 will terminate 1000 watt AM transmitters under full modulation in high ambient temperature or otherwise hostile environments, or can act as a load for 1500-watt CW or FM transmissions.

The new rhombic shape permits size and material savings which are passed on to the end user. Models in this series are available with 1-5/8" or 3-1/8" flanged or unflanged input or with any of Bird's two dozen Quick-Change QC cable connectors. VSWR is a low 1.1 from dc to 1000 MHz.

Complete technical and price information is available from the exclusive Canadian representative and distributor, National Electrolab Ltd., Toronto and Vancouver.

For further information, please contact National Electrolab Ltd., 1536 Columbia Street, North Vancouver, B.C. V7J 1A4.

New Distributor News

The Compar® Division of Weber Electronics Inc., appoints Electronic Packaging Systems Limited, Kingston, Ontario, as an authorized distributor for Compar edge connector products.

For further information please contact Compar Div. of Weber Electronics Inc., 105 Brisbane Rd., Downsview, Ontario.

News Release

Weber Electronics Inc., representatives for Robinson Nugent Inc., have also appointed Semad Electronics Ltd. as their stocking distributor.

Semad Electronics will carry inventory in Montreal, Toronto, and Ottawa, in the full line of IC sockets, IDC connectors, and interconnecting systems.

For further information contact Weber Electronics Inc., 105 Brisbane Rd., Downsview, Ontario M3J 2K6.

Rental Electronic Ltd.

Rental Electronics Ltd. has moved its Eastern Canada Rental Office to a new location. They can now be reached at the following address, Rental Electronics Ltd., 5855 Bessette, Ville St-Laurent, P.Q. H4S 1P1.

An inventory of the latest in electronic test equipment, desk top computers, and terminals will be available for immediate delivery on short or long term rent from this facility.

Audio Today

Developments in audio reviewed by Wally Parsons

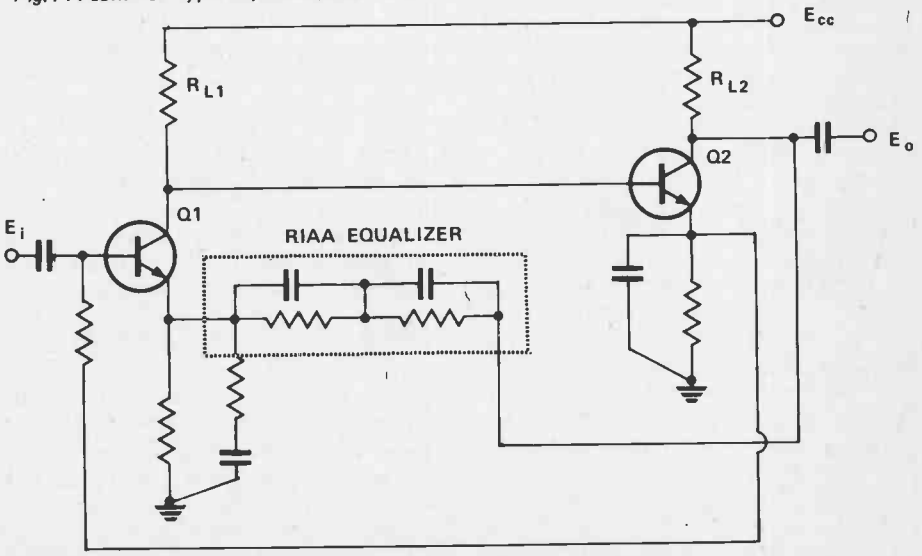
MOST PEOPLE, including many engineers, are inclined to consider signal handling ability only with regard to high level signal and power amplifier stages. Low level stages and pre-amplifiers are paid little attention beyond ensuring adequate signal-to-noise ratio. Indeed, many designers seem so unconcerned that they think nothing of sacrificing signal handling ability for the sake of an adequately and even unnecessarily low noise figure.

Much of this goes back to tube days, when it was fairly easy to obtain at least moderate signal outputs from a tube stage while optimizing operating conditions for minimum noise, yet having to fight for the last volt of output to drive a power output stage. For example, a type 6550A Beam Pentode operating in Ultra-linear mode requires nearly 50 V of drive to achieve full output. With fixed bias the maximum grid resistance is 50 k ohms. If drive was supplied by a 12AU7A (a fairly common choice) operated in the common cathode mode, the driver would start to clip above 38V peak. Yet a 12AX7A, a higher gain tube with similar output capabilities can still deliver at least 5V under very low load and voltage conditions and is still used in tube-type pre-amps. (We're dealing here with supply voltages of around 300V down to 90V, and using standard tube manual data.)

Remember, amplifiers do not create voltage and current into a load, they merely deliver it from the power supply. Just as no amplifier stage can deliver more current to a load than the power supply can provide, so it is impossible to develop a peak signal voltage greater than the supply voltage to the stage, and in fact it is often considerably lower.

Consider the rather common type of phono pre-amp shown in Fig. 1. This is fairly representative of many low to medium priced units, can be found in any number of collections of basic circuits, either in this form or some variation of it, as well as in many commercial amplifiers and receivers. Ideally it is possible to drive the output stage, Q2 such that collector voltage swings from a maximum equal to supply voltage when the base is cut off, down to a value close to zero at some value of base drive determined mainly by the load resistance. This is the peak-to-peak output voltage, and if the stage is biased such that the collector voltage under zero signal conditions is half way between the two extremes, the peak signal output is exactly half the peak-to-peak output, and the RMS output equals Eo peak $/\sqrt{2}$ or .707 times the peak output. If the idling voltage is *not* centred, maximum output will be equal to either the supply voltage minus idling voltage, or idling voltage minus the lowest voltage which can be obtained under base drive conditions. This is illustrated in Fig. 2 which shows a typical family of curves for a signal transistor, along which has been plotted a load line.

Fig.1 A common type of phono preamplifier.



MAXIMUM OUTPUT

The purpose of this discussion is to consider, not the design of output stages for maximum output, but rather to consider the implications of the limitations which are imposed by the design.

Suppose that the circuit in Fig. 1 is powered by a supply of 10V. Suppose further that output current can be swung high enough to swing the output voltage down to +1V. Let us further assume that the bias is such as to produce a collector voltage, under zero signal, of 5.5V. Under these conditions output can swing from 5.5V to 10V, a swing of 4.5V, and from 5.5V to 1 V, also a swing of 4.5V, for a total of 9V,p-p. An output of 4.5V peak equals 3.18V rms. If

gain at 1000 Hz is 40 dB, this output will be achieved with an input of 45 mV peak, or 31.8 mV rms. Most good phonograph pickups have an output rating of around 2 mV to 5 mV, so this should give plenty of headroom, right?

Wrong!

PICKUP OUTPUT

The trouble with pickup output ratings is that they are so meaningless as to be useless. The blame for this must be laid right on the doorstep of the manufacturers and/or their representatives. For example, one directory, in common with many others, list output level in "mV/cm/sec". So what do we see listed? Although such listings as Stanton and AKG show entries such as .9 and .7, and .82, many others show ratings of 5, 6.2, even 8. Surely this is not output in millivolts per centimeters per second stylus velocity. No, it is an output level at some unspecified value of velocity.

However, we must start somewhere, so we will limit our discussion to situations in which we know the actual output of a pickup in mV/cm/sec.

As it happens, several pickups deliver an output of 1 mv/cm/sec, which makes life convenient for us. RIAA standards attempt to limit mid-range velocities to about 25 cm/sec, which would result in an output from our reference pickup of 25 mV, and if connected to the preamp of Fig. 1 with 40 dB gain, the output would be 2.5 V. Since we've established that our preamp can deliver a peak output of 4.5V we still have an extra 5 dB of headroom.

REAL WORLD

If groove velocities are so low, how come many pickups have run into tracing problems, and Shure Bros make such a big deal of some of their models' ability to trace velocities of over 40 cm/sec.? Simple; groove velocities *aren't* held to such low velocities. Research published by the nice people at Shure Bros have indicated velocities as high as 80 cm/sec at 4500 Hz. This translates to an output from our Fig. 1 preamp of 8 V, which is 5dB *above* the maximum undistorted output capability.

But if a pickup is limited to tracing velocities of 40 cm/sec, how does it manage to trace a velocity twice as great? Simple. It doesn't. But just because the stylus doesn't maintain intimate contact with the groove wall we cannot assume that it doesn't at least describe something vaguely resembling the groove path. Of course it does, and as a result of mis-tracking distortion components are generated which can indeed result in very high input voltages, and output overload.

EFFECT OF EQUALIZATION

Readers interested in pursuing further the subject of groove velocities would not be misled in studying Shure's current brochure dealing with the V-15 Type IV pickup. Distribution by frequency of peak velocities dovetails nicely with the RIAA curve. Thus, where we indicated that 80 cm/sec would overload our Fig. 1 preamp, this does not take into account the fact that equalization reduces gain by about 6 dB at 4500 Hz, so output is reduced by the same amount, which leaves 1 dB headroom. This isn't much, but it's something.

This is of even less value if we decide that we need even more mid-band gain. Assuming the same pickup, doubling the gain to 46 dB results in doubling the peak output capability required at all frequencies. The only way to do that is to increase the supply voltage.

POWER SUPPLY

Good design practice dictates that an amplifier should have at least 10 dB headroom above the maximum output which it is intended to deliver. Returning then to our pickup with an output of 1mV/cm/sec, and a preamp with 40 dB gain at 1000Hz which with RIAA equalization results in a gain of 32.2 dB at 4500 Hz., an input of 80 mV at 4500 Hz would result in an output of 3.25 V. An additional 10 dB would require an output capability of slightly over 10 V. To achieve this with Fig 1 requires a peak-to-peak capability of 20V, and since we're not really likely to be able to swing the collector voltage below about 2V, then our minimum supply requirement is for 22V. Using standard components, then, we would likely design for a 24 V supply.

If we wish to have twice as much gain for use with the same pick-up, then all the above voltages must be doubled. Similarly if we wish to use a pick-up with twice as much output. But if we are using an IC such as an LM381A or a uA739, we are limited by the maximum ratings of the devices, that is 40 V and 36 V respectively.

This should quite clearly show the folly of expecting to use one preamp with a wide variety of pickups.

PREAMP INPUT RATINGS

Obviously, it's most unlikely that an input stage itself will overload; after all, it's no great trick to arrange input bias to handle a couple of hundred millivolts. However, low noise design often dictates very high gain for the input stage coupled with a low supply voltage. Under feedback conditions the

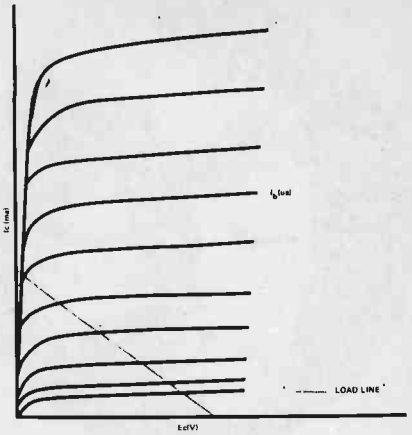


Fig. 2 Typical transistor characteristic curves.

input voltage is in fact reduced by an amount determined by the feedback, but under transient conditions it is possible for the input stage to be driven beyond its output capabilities. The result is a phenomenon often referred to as Transient Intermodulation Distortion (T.I.D.), a term which gets the idea across, but not with the greatest precision. It's only mentioned here in passing as a teaser, because it will be dealt with separately at a later date.

What is misleading about most preamp input overload specifications is that the wrong specification is given. It would be more accurate to specify the input level vs. frequency which will produce *output* overload. Even more useful would be the practice of designing preamps in such a manner that the actual gain can be adjusted over some reasonable range so that they may be matched to individual pickups.

SOME TENTATIVE CONCLUSIONS

A remarkably large number of what should be first rate pickups seem to deliver performance quality lower than anticipated when connected to preamps which can reasonably be expected to be first rate. Much of this can be attributed to output stage overload and is not at all difficult to avoid. I expect to return to this over the next few months from a slightly different point of view, with a dissection of a couple of circuits familiar to readers. Also to be presented will be a circuit which I am presently using which solves all of the above mentioned problems, as well as a few others.

Audio Today Letters

Want to express your views or report on news? Write to Audio Today, ETI Magazine, Unit Six, 25 Overlea Blvd., Toronto, Ont. M4H 1B1.

TIME COMPENSATION

I am a recent reader of ETI magazine, and before I get into the subject of my letter, I would like to commend you on your excellent magazine.

It was only several months ago that I discovered that ETI existed. How unfortunate for me, when I think of all the great issues I have missed.

Your projects are useful and entertaining, and your features and columns interesting and informative. You can be sure I will look forward to every new issue with anticipation and enthusiasm.

Getting on to the subject of my letter, I am another who enjoys building my own speaker systems. (I also enjoy saving lots of $ in the process). I have built several systems, all using Philips Deforest speaker components and crossovers. I am ready to sell again and build a bigger and better system, again using Philips drivers.

Lately, there has been a lot of talk about "time compensated" speaker systems, where the acoustic centre of each driver is aligned, resulting in the drivers being mounted in different vertical planes. It is said, by allowing the sounds from each of the drivers to reach your ear simultaneously, it is claimed that this design gives better depth, better stereo imaging, and improved transient response. I would appreciate any information, thoughts, comments, etc., as to the relevence and performance of this design. (Is it worth the extra trouble to construct this type of speaker system?)

I am also yet another, requesting a column on the topic of speaker systems. This is an area where almost anyone can get involved in, and provide one with a rewarding project, and save money too, over manufactured systems.

Again, I commend you on an excellent magazine, of which your column is one of the better parts. Keep up the good work, and thanks for your trouble.

J.C. Toronto

Is it worth the trouble? My big transmission lines are time aligned by means of drive placement and cross-over design. In addition, the phase response of the electronics is carefully controlled and matched between channels, right back to and including the phono pre-amp. Yes I do consider it to be worthwhile. What I don't consider worthwhile is fussing around with time alignment and ignoring all the other anomalies such as distortion, bandwidth, frequency contour, dispersion, efficiency, power handling, dynamic linearity, secondary radiation effects, etc. The benefits of time alignment vary considerably from one programme source to another. Recording in which little care has gone into preserving phase accuracy will not benefit, nor will broadcasts from most FM stations, who seem to have enough trouble keeping styli clean. But with good material the results can be stunning.

I must say I've heard some pretty terrible speakers, many of them boasting time-alignment.

MORE TUNER

In December I saw your ETI tuner offer and bought it. In March I learned more about it and that will be very helpful. You know the tuner is still in my wardrobe in its first package. I am able to build that project, I have a D.E.C. in electronics and I built a preamp, a tone control, a power amplifier. My last project, active filters work very well. Now you talked about a frequency counter (digital meter). Since I saw the new Radio Shack receiver with the frequency counter, I think that would be a better project than connecting my tuner watching it without any dial, only a knob tight on the variable capacitor. So we are in June and you didn't talk any more about that circuit. So if you have some news (a perfect stabilized circuit and diagram to connect it, pieces available on market) I would appreciate it, if not say at what time it will appear in ETI.

L.G. Montreal

A project for a digital readout for this tuner will appear in ETI as soon as somebody develops one. Maybe you or some other reader with a D.E.C. in electronics would care to submit such a project. All I said was that a digital readout would be a good idea, but the layout doesn't allow convenient access to the tuner section. In the meantime, why not try building your own slide dial mechanism, or use a suitable vernier. Several appear in the Electro Sonic catalogue (e.g. Pages 197 and 1125). Or you can get the Radio Shack unit. It'll cost a bit more.

BITUMINOUS WHAT?

I am having trouble finding what are called "BITUMINOUS FELT PADS". These are hardened felt pads used mainly by British Speaker manufacturers to deaden panel resonances in speaker systems. Some of these manufacturers include Splendor and Rogers. Do you know where I can get these? Is there a brand name for these things? I have been told they are used to reduce vibrations in car doors, etc., but no auto dealer seems to know what they are. Could you please help. Thanks

M.H. Ottawa, Ont.

Audio Today

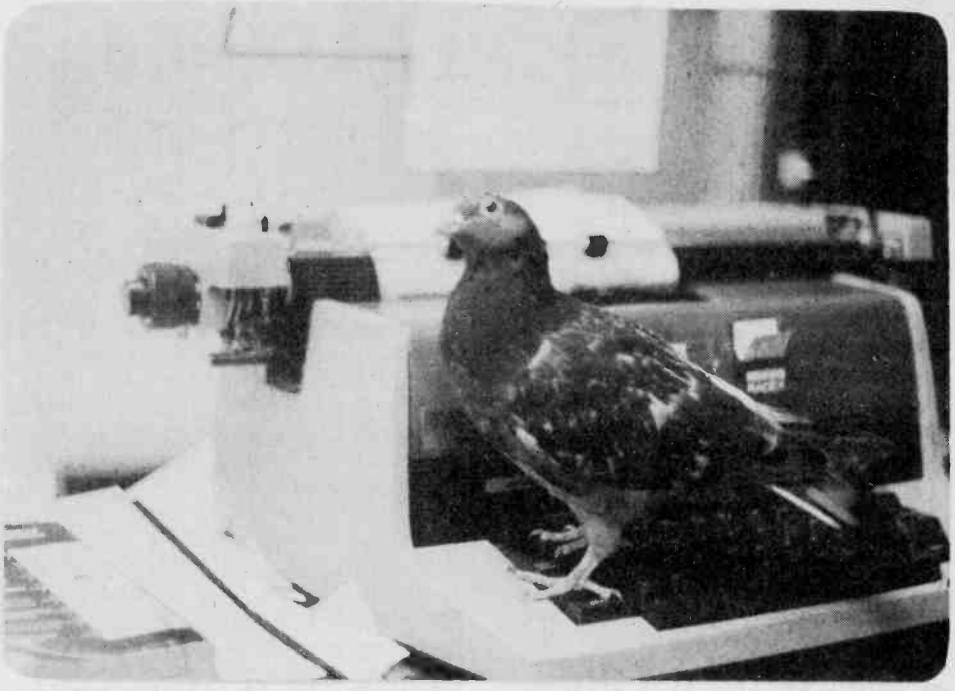
Bitumen is a solid or semi-solid substance the best known form of which is asphalt. It occurs naturally, but is usually distilled from coal tar or petroleum, and is commonly used for road surfacing, impregnated into a fibre, as in tar-paper, and is the basis of roofing tiles and automotive undercoating, among other things. I'm familiar with the speakers to which you refer, and should point out that this technique is most useful when applied to small speakers.

I don't know of a specific source of these pads, but would suugest an automotive body shop supply house or someone who specializes in customizing or in materials for customizing. Some of this material is also used in the hood for the same purpose, but I believe that glass fibre or asbestos is used as the fibre material due to the high temperatures.

I accomplish the same thing with automotive undercoating, available in gallon cans or in spray form. It has the disadvantage of requiring about a week to dry and it smells of petroleum during this period. Try your nearest Canadian Tire store. You might also try roofer's patching compound. You have to use a brush in a trowel-like fashion, because of its consistency, and you can clean up with petroleum distillate, such as Varsol.

You can also use this guck as an adhesive for felt or sisal padding, and then coat over the padding.

By the way, have you ever thought of using lead foil?



"When times get tough we all pidg-eon." Gaylord, WP's typist.

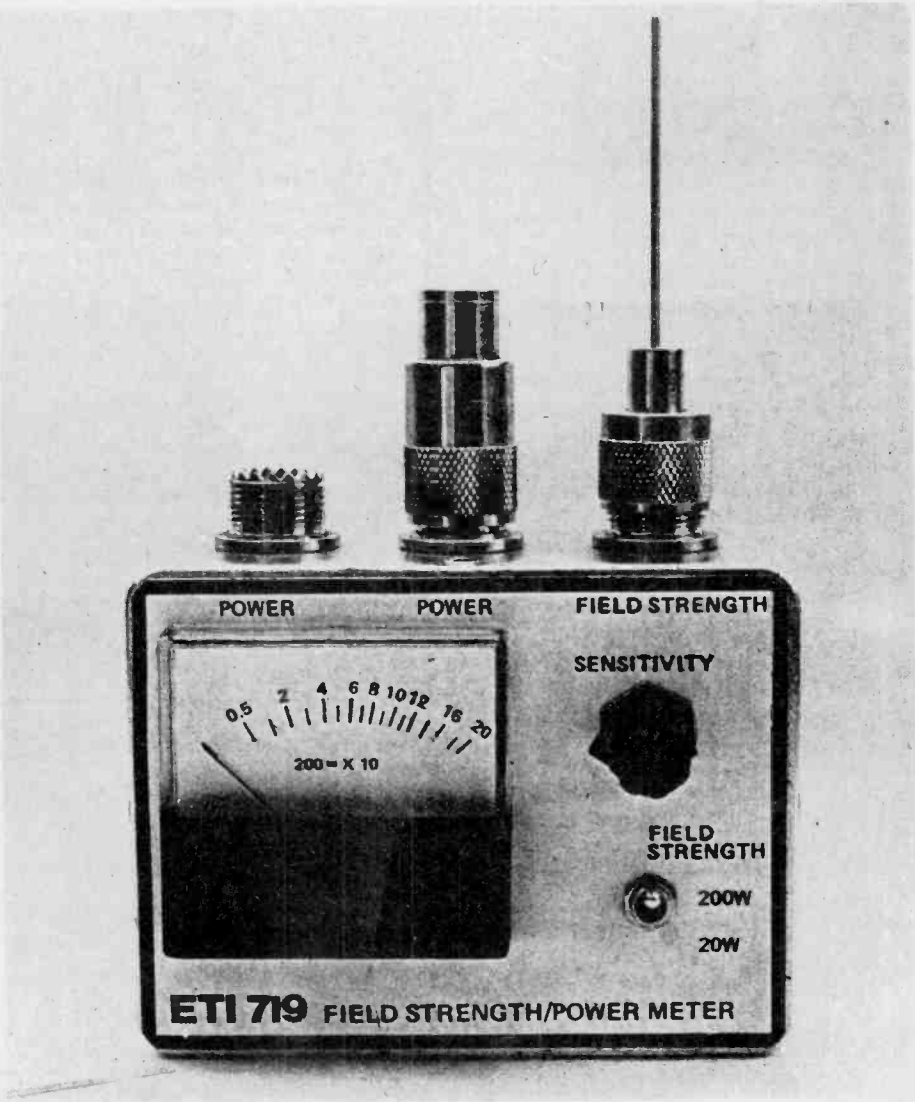
Field Strength Power Meter

Versatile unit indicates transmitter tune-up.

TWO PIECES OF equipment which are almost essential to the CB'er, novice, or amateur alike, are a field strength meter and a power meter. This design combines the two in a simple easy to construct circuit comparable to equipment many times its cost.

Measurement of field strength is useful for antenna tuning, especially where an antenna tuning unit is used, or for checking the radiation pattern of a directional antenna. If the meter is left in a fixed position well away from but at the same height as the antenna, and the antenna rotated, a circular plot of the antenna radiation pattern can be drawn up. When tuning an antenna the meter should be placed in a convenient position where it can be seen and the tuning adjusted for maximum reading.

The power meter is used to tune the output of a transmitter, or can be left in the transmission line as a monitor of power output. The reading on the meter will only be accurate if the antenna has low VSWR. For accurate power measurement, and for transmitter tuning, a dummy load should be connected to one of the power sockets. If only the 20 watt range is used a small CB dummy load is suitable, a larger load of course being necessary for the 200 watt range. Table 1 gives the power calibration for both ranges for a 50 μA meter.



CONSTRUCTION

Figure 2 shows the wiring layout for the unit. This layout should be strictly adhered to, otherwise performance may

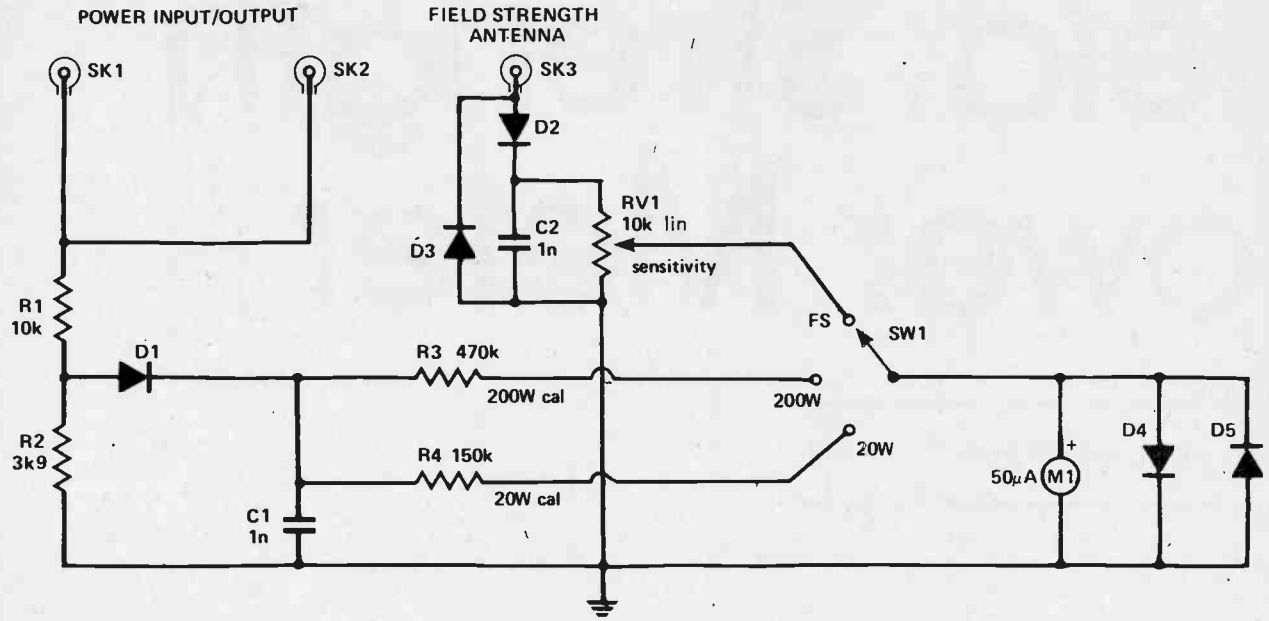


Fig. 1. Circuit of the Field Strength/Power meter.

be affected. All leads, especially the ground leads, should be kept short.

Components for the power meter are assembled on a small piece of perf board, which is then held in place by the meter terminal screws.

The meter should be built in a metal enclosure. Our prototype measured 75x100x50 mm deep.

A whip antenna for the field strength meter was made by soldering a length of brazing rod into a PL259 UHF plug and filling the space with epoxy. The sensitivity of the meter will increase with the length of the antenna.

HOW IT WORKS

Let's look at the field strength meter first.

Some signal is picked up by the whip antenna and is detected by D2 and C2. The capacitor, C2, charges to a voltage proportional to the field strength of the signal. A return path for the charging of C2 is provided by D3. The sensitivity control, RV1, varies the current fed from C2 to the meter, via the function switch SW1. The meter will give a reading proportional to the field strength of the signal. The diodes D4 and D5 provide meter overload protection by conducting when the voltage across the meter terminals exceeds about 0.7 volts.

The power meter is similar in operation to the field strength meter, but instead of taking the signal from the antenna it measures the voltage on a 50 ohm transmission line. R1 and R2 form a voltage divider to reduce the voltage to be measured and to provide isolation between the measuring circuit and the transmission line. The RF signal is then detected by D1 and C1, the voltage across the capacitor being proportional to the voltage on the transmission line. The power in the line is then proportional to the square of this voltage ($P = V^2/R$ and $R = 50\Omega$). This voltage is measured by a dual range peak reading voltmeter formed by R3, R4 and M1. The meter is calibrated for 20 watts and can also be used for the 200 watt range. The voltmeter gives an accurate reading for both carrier power (AM), and peak envelope power (PEP).

METER CALIBRATION

Power	Scale		
0.5	8	9	33.5
1	11	10	35
2	16	11	37
3	19	12	38.5
4	22	14	42
5	25	16	44.5
6	27.5	18	47.5
7	29.5	20	50
8	31.5		

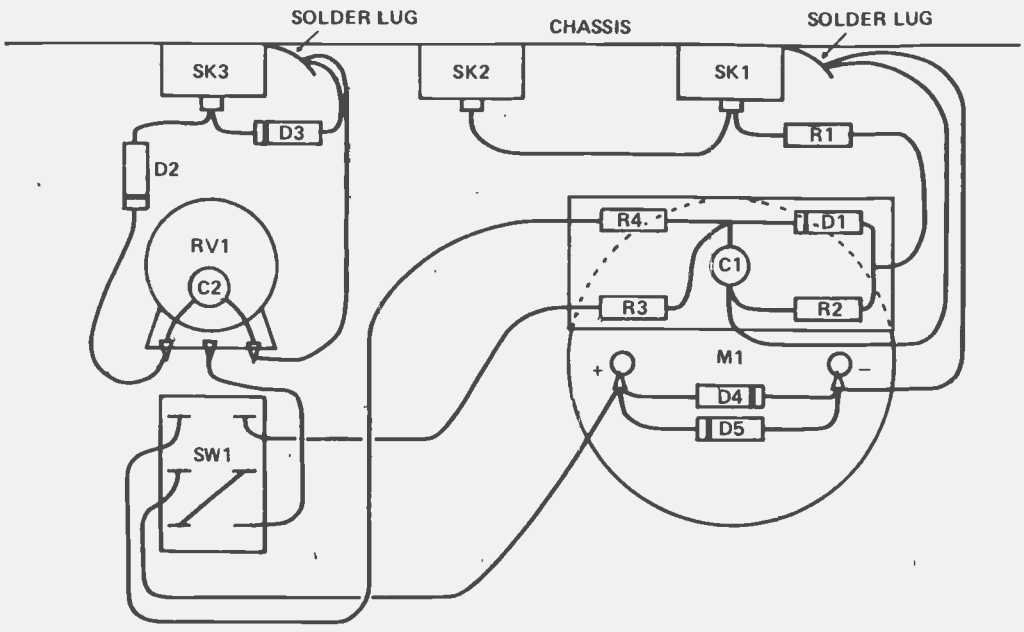
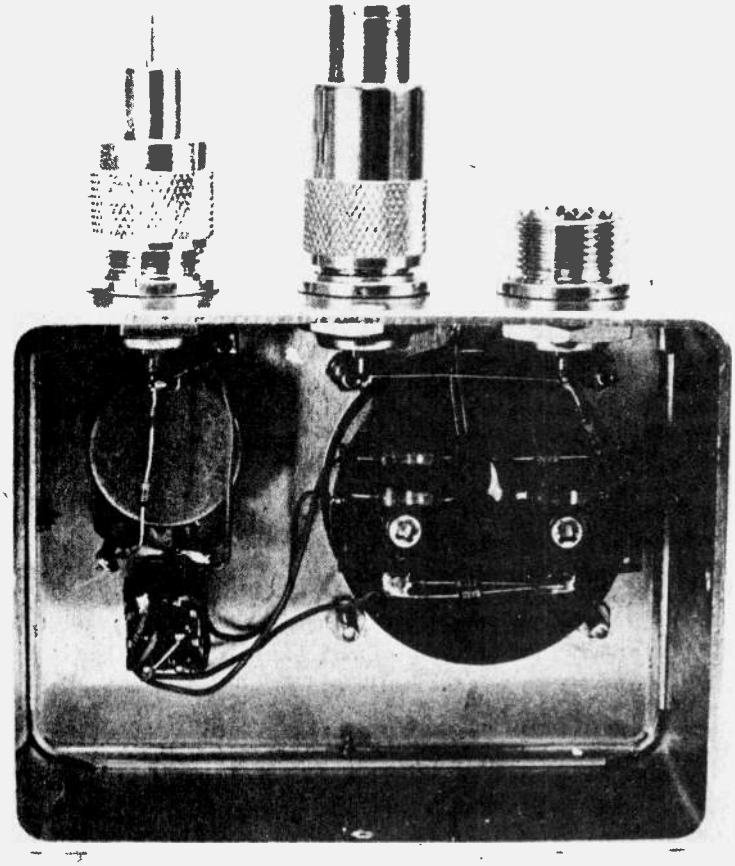


Fig. 2. Wiring layout of the unit. Perf board is used to mount the components for the power meter.



The completed meter. All leads, especially the ground leads, should be kept as short as possible.

PARTS LIST

RESISTORS all ¼W 5% except R1

R1	10k 5% ½W
R2	3k9
R3	470k
R4	150k

POTENTIOMETERS

RV1	10k lin.pot.

CAPACITORS

C1, 2	1n ceramic

DIODES

D1 – D5	1N914

MISCELLANEOUS

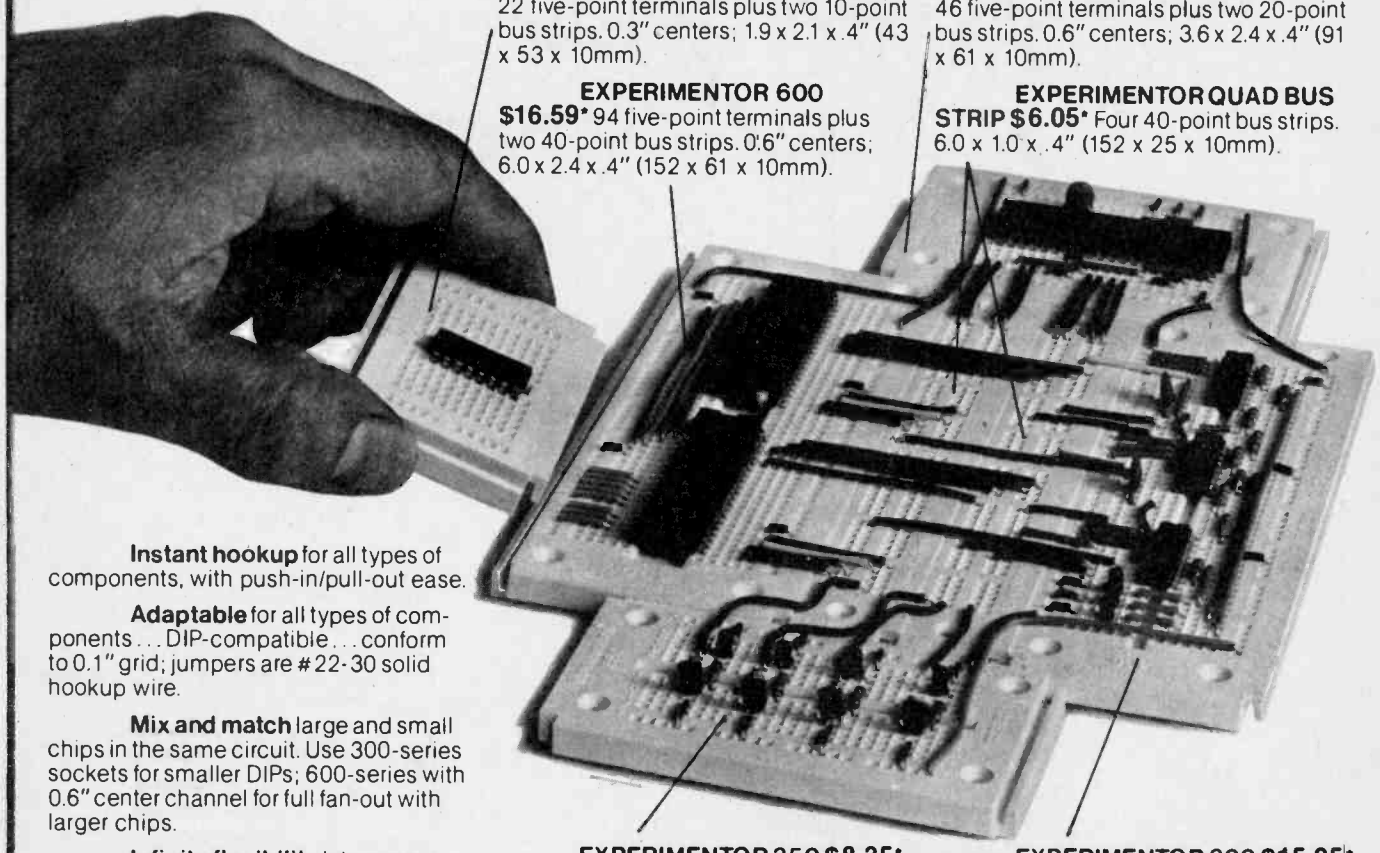
SW1	DPDT Toggle Switch
SK1 – SK3	S0239 UHF socket
M1	50 μa 50 mm meter

Accessories

50ohm CB load
PL259 UHF

C2	1000u 25VW electro
SW1	SPDT min. toggle

A breadboard as big as your ideas.



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EXPERIMENTOR 650 $9.50* 46 five-point terminals plus two 20-point bus strips. 0.6" centers; 3.6 x 2.4 x .4" (91 x 61 x 10mm).

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Infinite flexibility lets you expand and modify circuits vertically and horizontally, simply by snapping sockets together.

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NEED MORE INFORMATION?

*Manufacturer's suggested list.

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Road Runner

Sound effects from outer space to put in your car, desk, brief case.....

ODDLY ENOUGH, most electronic hobbyists are unable to produce odd electronic sounds on demand. Anybody can produce an oscillator or a gated multivibrator, but what about sirens, horns or those 'weird space type' sounds you hear on Star Trek?

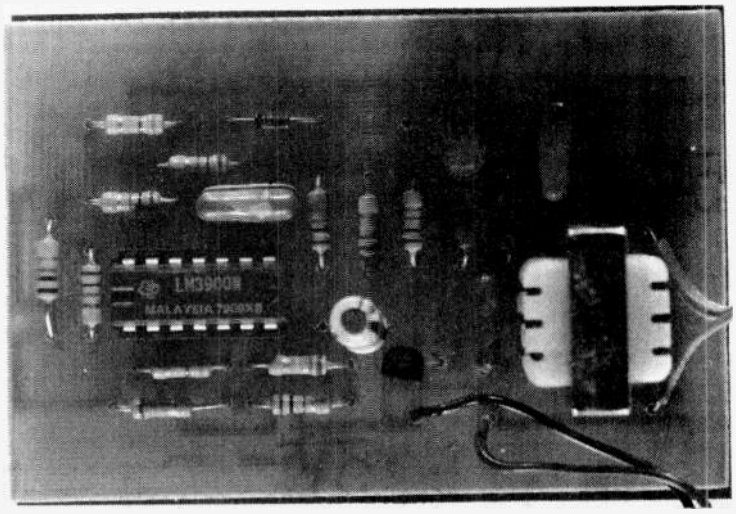
While our Road Runner is not as versatile as most music synthesizers, it is a relatively simple circuit that will deliver good results.

This circuit was originally intended for automotive use and to this end you will require an additional power horn and amplifier (such as the one in Mar '77 ETI Tech Tips). The Road Runner will work quite happily on 12 Volts.

Additional sound effects can be achieved by various modifications to the basic circuit. Try joining points A & B with a 330n capacitor. Alternatively, use a 330n capacitor to join point A to pins 1,3,4,5,7,8,9,10,11,12,13, & 14 on the IC, or point B to pins 1,2,3,6,8, 11, & 13. Some connections will only produce a change in pitch, while others will produce a distinctive warble or other variation of the modulation.

To simplify assembly, we recommend you use the pc pattern shown, but Veroboard or perforated board work just as well. It is also advisable to use a socket for the IC to prevent heat damage during soldering.

All parts can be assembled using the component overlay given. Needless to say, you should check the orientation of the IC, transistors and any other polarized components before applying power to the circuit.



HOW IT WORKS

Before we even get started on the circuit itself, it's important to understand how the "op amps" in the LM3900 work. They are not ordinary op amps in that the input signals are currents rather than voltages. This is shown in Fig. H1. There, we see the amp as it appears from the outside. The inputs look like diodes connected to the negative (or ground) supply. The output voltage is : $Vo = A(i_+ - i_-)$, where A is very large. In otherwords, if Vo is to be any reasonable value (between the two supply voltages) the two currents must be about equal. Which leads us to the revelation that this amp is almost always used with feedback circuitry such that the output voltage adjusts to the point where the feedback makes the currents equal, or , as with regular op amps, the feedback circuit is really what determines the overall circuit action. The other way of operating this circuit is as a "comparator", that is to say, if i_+ is more than i_- the output is high (+ Supply −0.8V), and vice versa: output "low" (−Supply +0.2V).

Finally, since most people are unfamiliar with currents as signals, it's convenient to use voltages as inputs by putting a resistor in series with the inputs. This may seem a little hard to grasp at first, but you can see that (Fig. H2) the input currents will be proportional to the input voltages (less 0.6V).

SOUND EFFECTS

Starting with an overview of the circuit we have something like Fig.H3. The voltage controlled oscillator (Q2 and T1) produces the basic tone you hear, and it is frequency modulated by the input voltage from the wandering voltage generator (IC1b,c) which in turn is varied by the low frequency oscillator IC1a.

Looking at IC1a, C1 will initially be discharged, hence current will not be flowing into pin 3, but only into pin 2. This means pin 4 will be "up", in turn attempting to charge C1. Consequently, the voltage across R1 will rise, increasing the current into pin 3. Eventually , it will rise to equal or excede the current into pin 2, at which point the output (pin 6) will go low. (Note that as this happens R4 previously contributing current to pin 2 is now diverting it away. This action makes the transitions quick and sharp. It is positive feedback, and is an example of "hysteresis".) Now it will be seen that the opposite happens, R2 discharging C1 and so forth. So we have an approximately square wave generator, with output swing of about 8V.

IC2b acts as an "integrator". The easiest way to think of this is to say that the difference in input currents ends up in C2, so that the output voltage is $Vo = (i_+ - i_-)\, t/C2$. Obviously this can't go on for ever, as after a certain length of "t" Vo would try to excede the power supply voltage, hence the purpose of IC1 c.

Initially, suppose the output of IC1b is high, IC1c output will be low and thus Q1 will be off. Also assume that IC1a output is high. Current thus passes from IC1a through both R5 and R6, into + and − inputs of IC1b. Since R6 is half the value of R5, twice the current flows into the − input, and the output of IC1b will ramp down until it reaches the point where IC1c output goes high. Now Q1 turns on diverting the current which was going to pin 11. Thus IC1b will start to ramp up, and so on.

The amplitude at the output of IC1b is obviously determined by the turn on and off points of IC1c. The appropriate current values at the + input to IC1c are (with 9V supply) 8.4V/1M and 8.4V/1M + 7.6V/510k which are: 8.4uA and 23.3uA (note the hysteresis action again!). These will be provided through R8 (330k) when the voltage at pin 10 is 2.8V and 7.7V.

The actual output waveform from IC1b is a ramp when IC1a is high, and "hold" (flat) when IC1a is low (no input current to IC1b). IC1a has to go high about five times to take IC1b from one threshold point to the other. So, overall, the output from IC1b looks like a series of ramp and holds up, then another series down etc, with repetition every second or so.

This voltage is buffered by IC1d, and then used to control the base current of Q2. Q2 is an oscillator with feedback via the "top" half of T1, C4, C3, and R14. Frequency is controlled by the base current. Finally, the speaker is driven from the secondary of T1.

Many strange sounds can be made by this device by connecting wires, capacitors, resistors or fingers between varous points in the circuit. The basic action is to alter the shape of voltage "sequence" which controls the frequency. (Care should be taken not to directly connect IC outputs to either supply line, each other or to the IC inputs, and IC inputs must not be directly connected to the + supply.

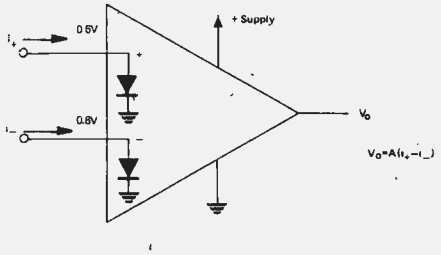


Fig. H1. How the LM3900 type op-amp looks to the outside world.

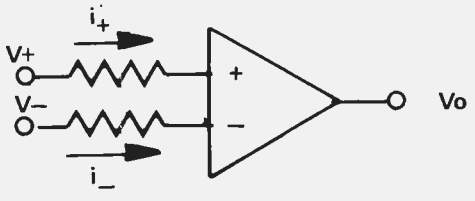


Fig. H2. Input resistors turn input voltages to input currents.

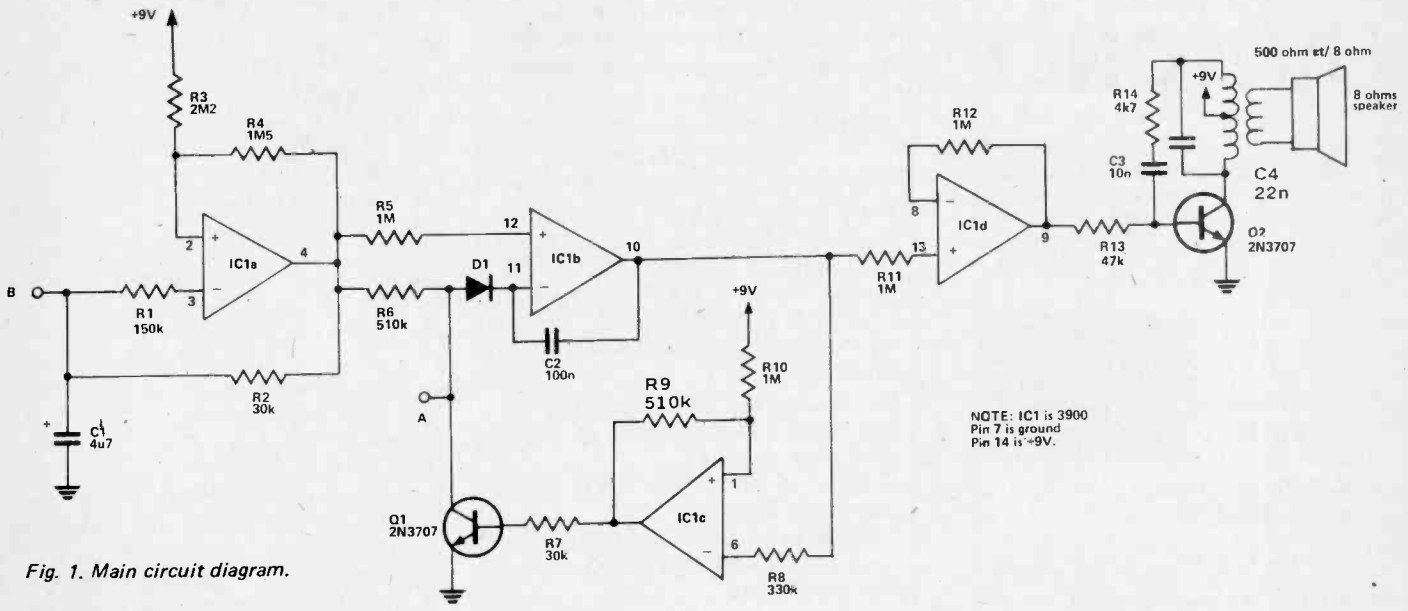


Fig. 1. Main circuit diagram.

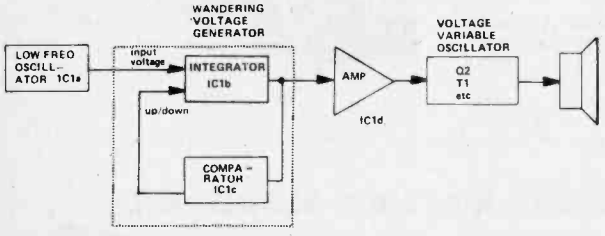


Fig. H3. Block diagram showing functional sections of circuit.

PARTS LIST

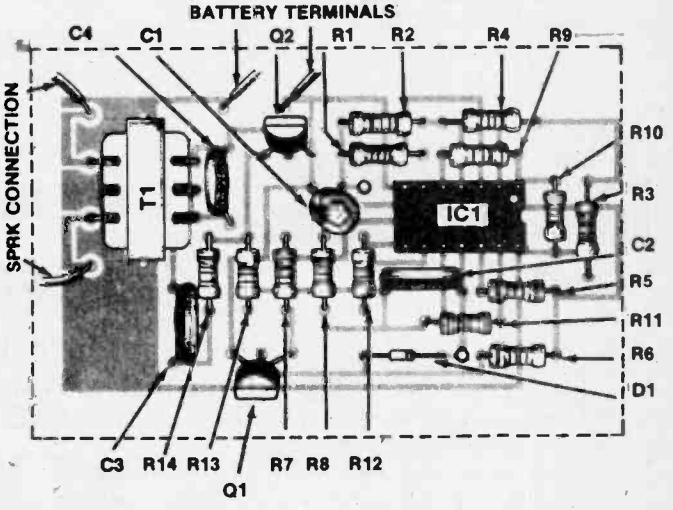
ROAD RUNNER
PARTS LIST

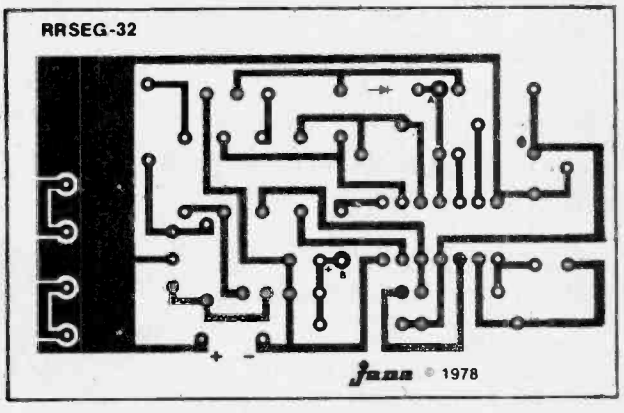
RESISTORS		
R1	150k	¼W
R2,7	30k	¼W
R3	2M2	¼W
R4	1M5	¼W
R5,10,11,12	1M	¼W
R6,9	510k	¼W
R8	330k	¼W
R13	47k	¼W
R14	4k7	¼W
CAPACITORS		
C1	4u7 16V electrolytic	
C2	100n mylar	
C3	10n	
C4	22n	
SEMICONDUCTORS		
IC1	LM3900	
Q1,2	2N3707	
MISCELLANEOUS		
T1	audio transformer 500R CT pri. to 8R sec.	

case, solder, wire, earplugs, etc.
8 ohm speaker.

This project is available as part of the Jana line of kits. See page 67 for details.

Component layout





Printed circuit board foil pattern.

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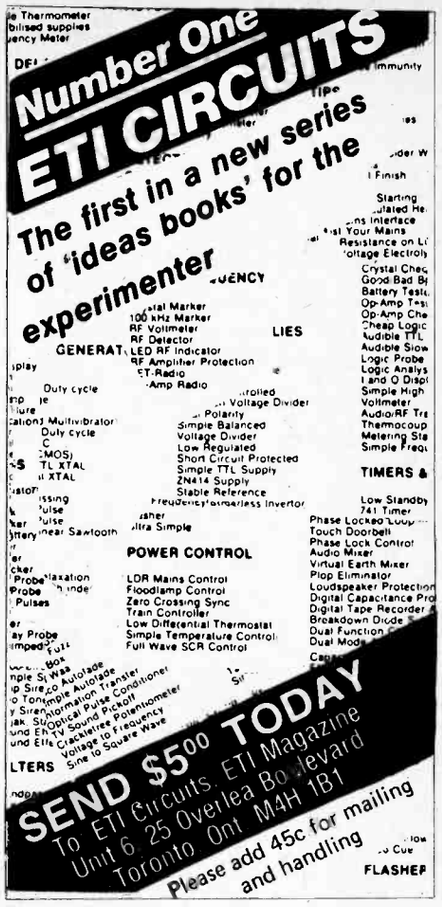

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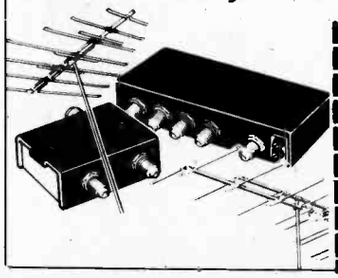

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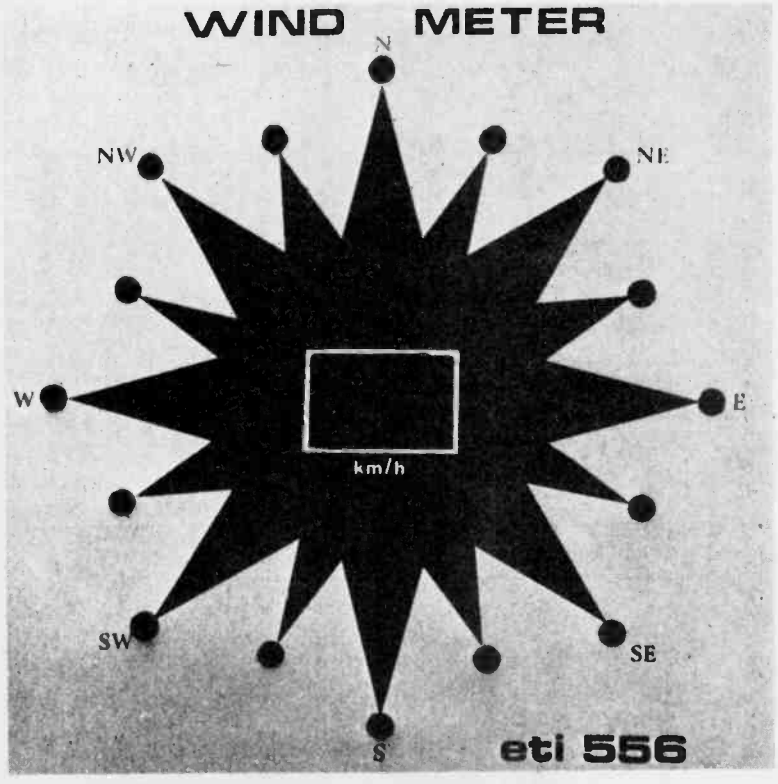
Circle No. 10 on Reader Service Card.

Wind Meter

Stay indoors and play "Wind Roulette".



TRADITIONALLY, THE FOUR primary elements are fire, earth, water and air. At ETI, we've designed projects concerned with the first three (temperature meters, soil moisture indicators, rain alarm), but not much for the last. The major property of the air, apart from the fact that it is necessary to support life, is the movement of the air – wind. Light winds generally aren't of terribly much significance except to meteorologists, but stronger winds can be useful as a source of power; for traditional milling, for electricity generation or as a means of propulsion for sailing yachts. Stronger winds such as hurricanes, can be destructive, causing damage to life or property.

So for all the private pilots, yachtsmen, amateur meteorologists and general weather watchers who read ETI, here is a device which will tell you the wind's speed and direction, with a remote indication of both quantities. Our design is, we'd like to think, both stylish and unusual, but there are simpler methods of mechanical construction which you can follow if you wish.

HOW IT WORKS

Wind Direction

Wind direction is indicated by a series of 16 equally spaced LEDs around a circle. These represent the main points on the compass. These are controlled by IC2 and IC4 which are in turn controlled by the direction sensor head.

The sensor head, which is described in fig. 3, consists of a disc which has four optical tracks and four lights and phototransistors. The phototransistors sense either a clear disc (logical "1") or a black disc (logical "0") and thus control IC2 and IC4. The code used is a special one called a "grey" code and is special in that only one bit is changed at each location eliminating gross errors which occur with the binary code if the heads are not perfectly aligned. An example of this is going from location 7 (0111) to location 8 (1000). If this is not done simultaneously almost any location can be specified. With the grey code the same change is from 0100 to 1100. Here there can be no ambiguity as only one bit is changed. Remember these bits are *not* weighted similarly to binary and a lookup table must be used to decide what number (decimal) a particular code is.

The decoder, IC2, is an eight output analogue demultiplexer with the common line joined to the +5v line. When a particular 3 bit code is presented to its control inputs one of the eight outputs will be joined to the +6v line. The fourth output from the sensor head controls IC4 which gives two, inverted, outputs to drive either bank of LEDs. The complete four bit code therefore specifies a particular LED to be lit. By placing the LEDs correctly around the circle the grey code is decoded.

Wind Speed

This is a simple frequency counter measuring pulses from the sensor head. The head consists of a disc with eight holes which breaks a light beam to its associated phototransistor. The output of this phototransistor is squared up by a schmitt trigger formed by IC5 c, d.

The counting is done by IC8a and IC8b (a dual decade counter) with IC6 and IC7 providing the store and LED drivers necessary to drive the seven segment display. Time base is provided by IC3 which gives a 7 ms wide negative pulse about every one second. We say about as it is adjustable by RV1 as individual heads will have different responses and calibration will be necessary.

This negative pulse opens the store to allow the number reached by the counters to be displayed while simultaneously stopping any further counting by disabling the schmitt trigger. On the completion of the 7 ms pulse IC5 a, b generate a 50μs wide pulse which resets the counter ICs to recommence the sequence.

Power Supply

This is simply a full wave rectified supply with IC1 giving a regulated +6v output. This regulation is needed to ensure that the time base (IC3) remains accurate).

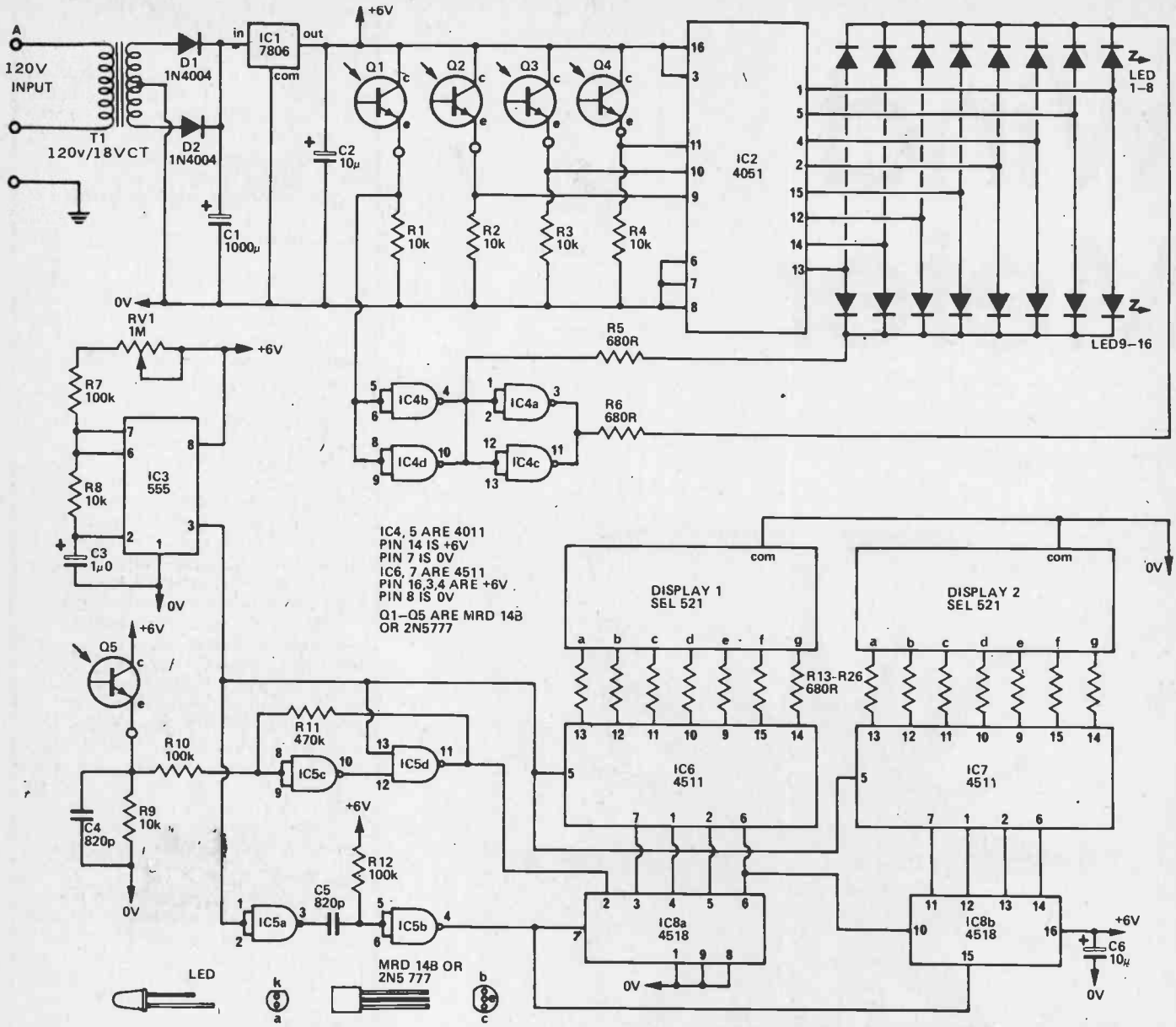


Fig. 1. The circuit diagram of the wind meter.

SPECIFICATIONS

Wind speed	
Speed range	0 – 99 km/h, knots or mph
Resolution	1 km/h, knot or mph
Display	2 digit LED
Direction	
Resolution	22½°
Display	16 LEDs
Power supply	120VAC or 8 to 14VDC at 350mA

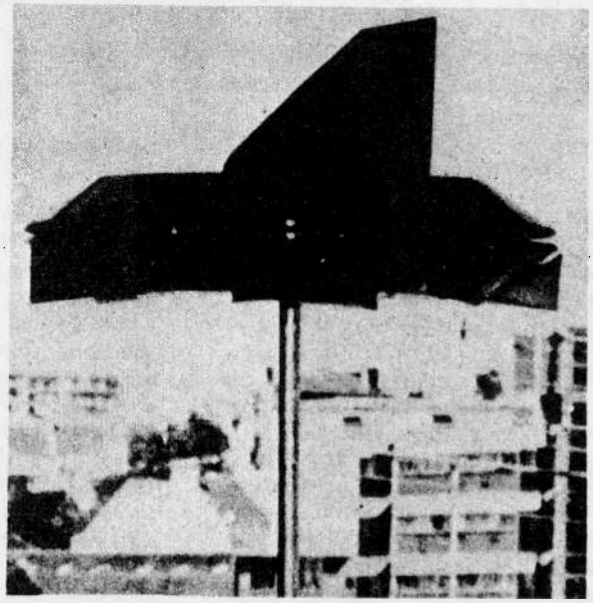


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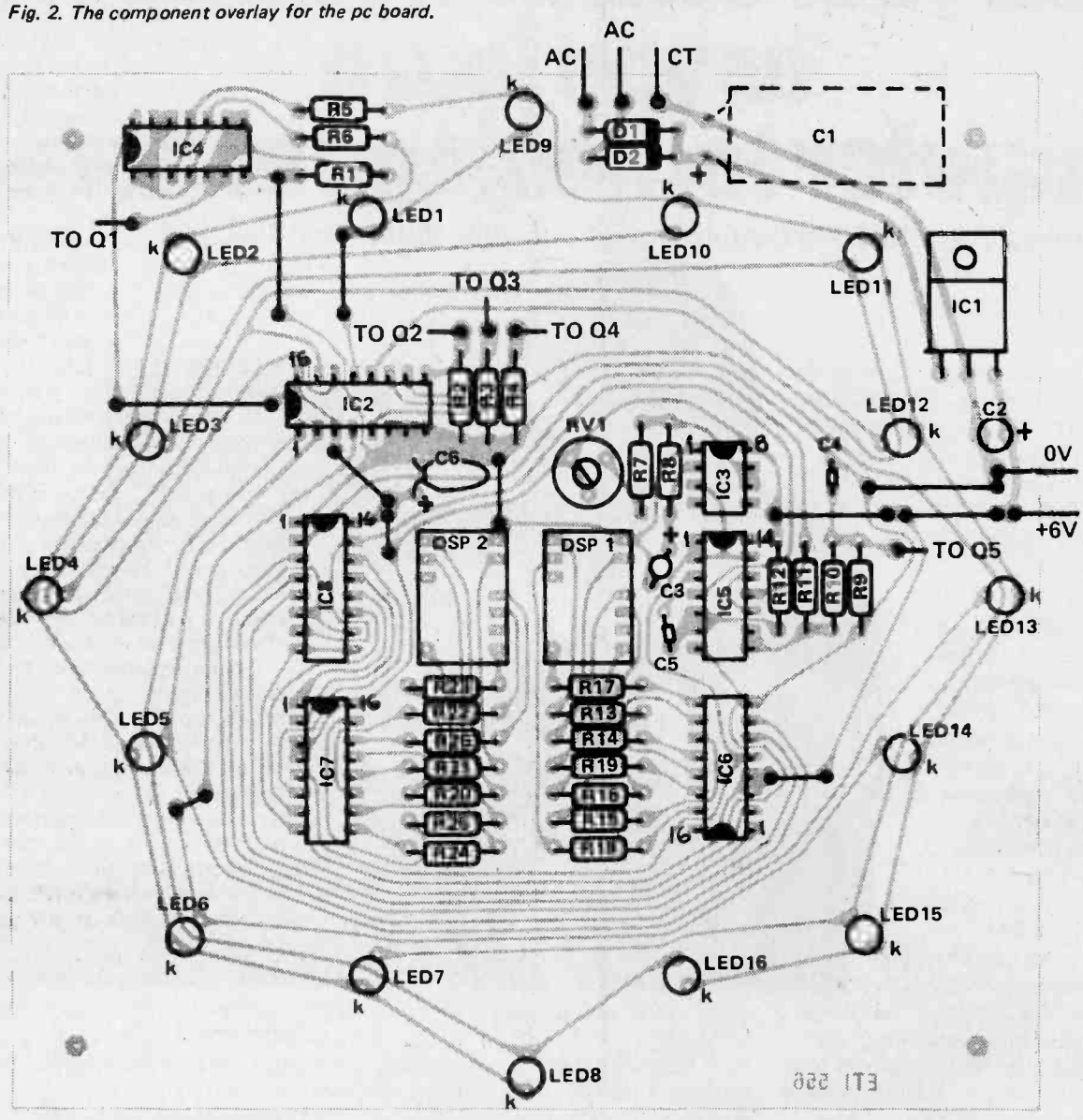
Fig. 2. The component overlay for the pc board.



PARTS LIST

RESISTORS — all ½W, 5%
- R1–R4 . . . . . 10k
- R5,6 . . . . . 680R
- R7 . . . . . 100k
- R8,9 . . . . . 10k
- R10. . . . . 100k
- R11. . . . . 470k
- R12. . . . . 100k
- R13–R26 . . . . 680R

POTENTIOMETERS
- RV1 . . . . . 1M trim, type VTP

CAPACITORS
- C1. . . . . 1000µ 16V electrolytic
- C2. . . . . 10µ 25V "
- C3. . . . . 1µ0 25V "
- C4,5 . . . . . 820p ceramic
- C6. . . . . 10µ 25V electrolytic

SEMICONDUCTORS
- IC1 . . . . . 7806 regulator
- IC2 . . . . . 4051 multiplexer
- IC3 . . . . . 555 timer
- IC4,5 . . . . . 4011 NAND gates
- IC6,7 . . . . . 4511 decoder-driver
- IC8 . . . . . 4518 dual counter
- Q1–Q5. . . . . 2N5777
- D1,2 . . . . . 1N4004
- LED1–LED16 . . Red LEDs
- Disp. 1,2 . . . . . SEL521

MISCELLANEOUS
- PC board ETI 556
- four minature 12V light bulbs
- 120V/18V CT transformer
- head assembly
- front panel and box

For pcbs for this project please contact: Spectrum Electronics, 38 Audubon St. S., Hamilton Ont. L8J 1J7, or B & R Electronics, P. O. Box 6326F, Hamilton, Ont. L9C 6L9.

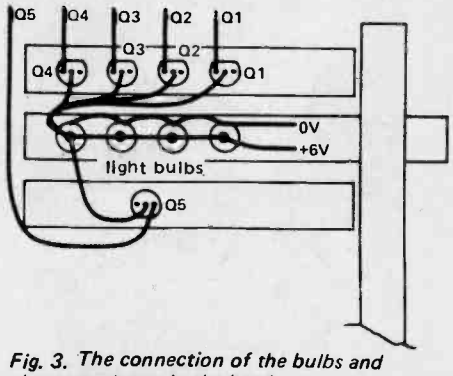


Fig. 3. The connection of the bulbs and phototransistors in the head.

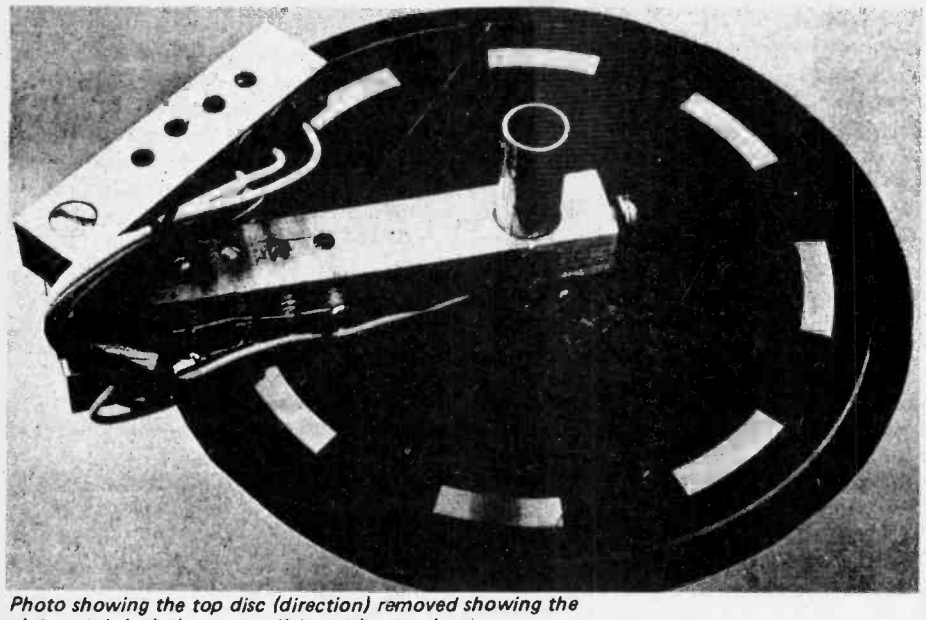
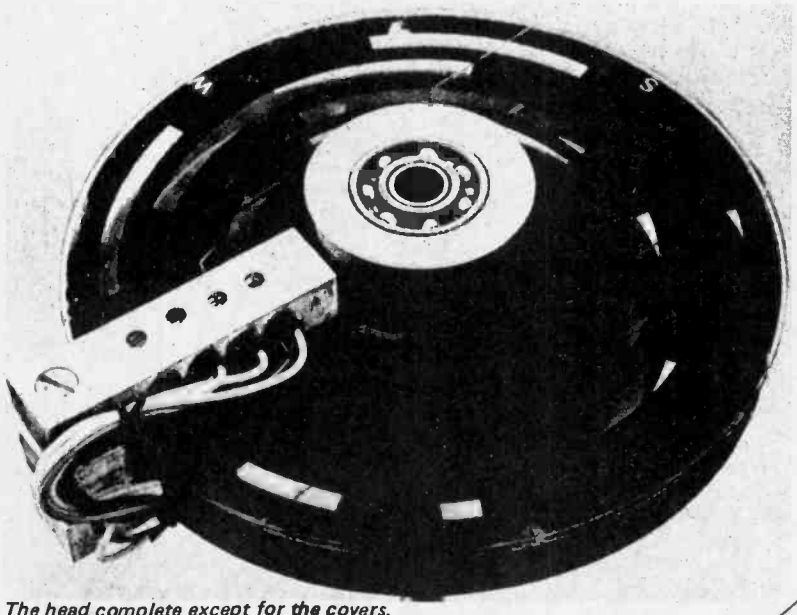


Photo showing the top disc (direction) removed showing the globes and the holes to pass light to the transistor.



The head complete except for the covers.

THE HEAD

The drawings along with the photos will give the general design that we used. The actual dimensions have to be left to the individual constructor as components such as the ball races and light bulbs may vary in size.

While we used a single head for both speed and direction, it may be simpler to use separate heads.

The discs we used were 1.5mm thick clear plastic with a piece of photographic film glued onto it. It may be easier to make it out of thin aluminum and cut out the slots. For the speed disc simply drilling holes will suffice.

The most important part of the design, apart from ensuring that the discs rotate with a minimum of friction, is the shielding of the light and preventing light scatter striking a transistor which should be dark. As can be seen from the photos and diagram the globes and transistors are imbedded in aluminum blocks with small holes providing a passage for the light beam.

The wiring of the head is shown in fig. 3. Note that the base lead is not used and can be cut off close to the body. Insulate the joints onto the transistors to ensure that they do not short on the aluminum blocks. The bulbs may touch the block with their outer connection but this is the 0 volt line and does no harm. In fact it provides some electrical shielding for the leads. The lights we used were 12V but they were bright enough on 6V giving a much longer life.

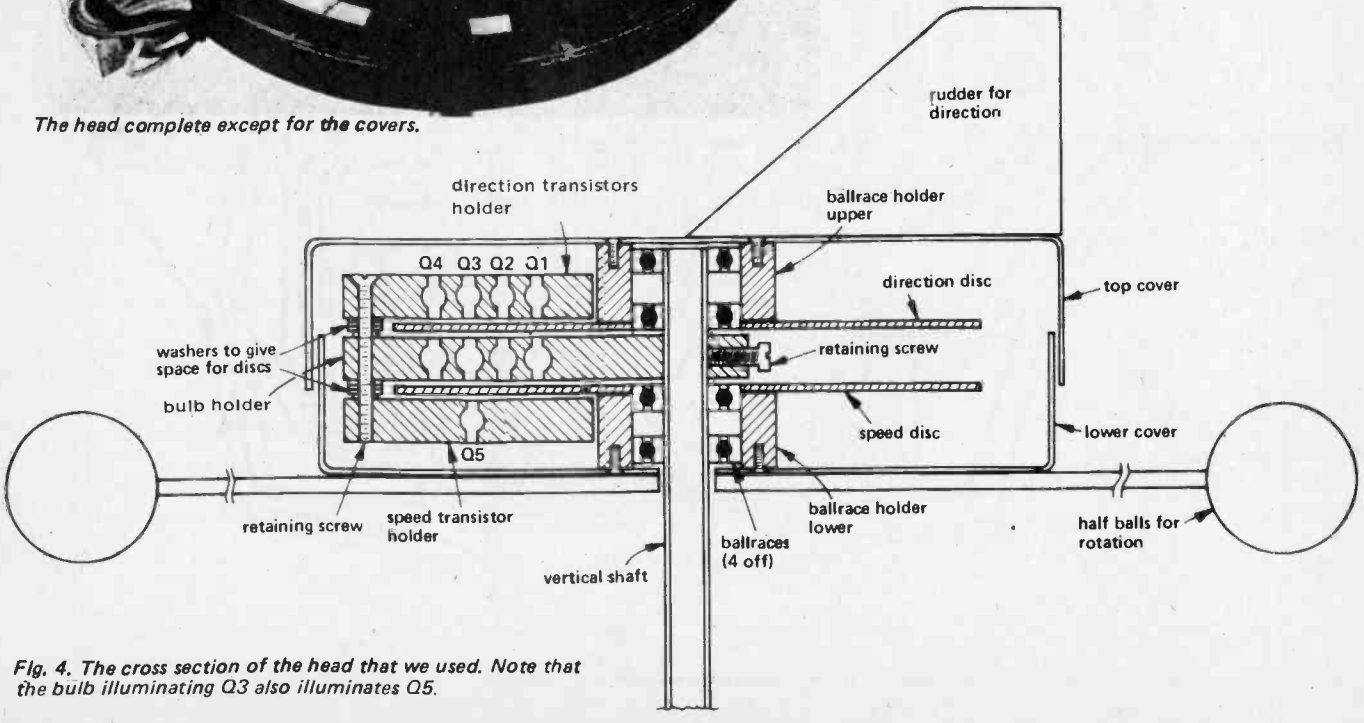


Fig. 4. The cross section of the head that we used. Note that the bulb illuminating Q3 also illuminates Q5.

DESIGN FEATURES

When we started design on this project it was to have a digital readout of wind direction with a resolution of either one or two degrees. This would also make it useful in a sailing boat to tell the wind direction relative to the heading.

Difficulties however soon became apparent. The first of these was the sensor head. The only accurate method is a digital head, probably optical. Two methods could have been used, one using a disc with a single optical track of 360 slots and an updown counter and the second using eight or nine tracks in a grey code. The first is simpler in head design but the second is less prone to error. The problem, and the reason for rejecting both, is that with such resolution, the reading would move around so much when the wind is gusty to be unreadable. What is needed is an averaging circuit which unfortunately becomes difficult when the wind is changing from just west of north to just east of north, i.e. 355 to 005. How do you average these (use a microprocessor?).

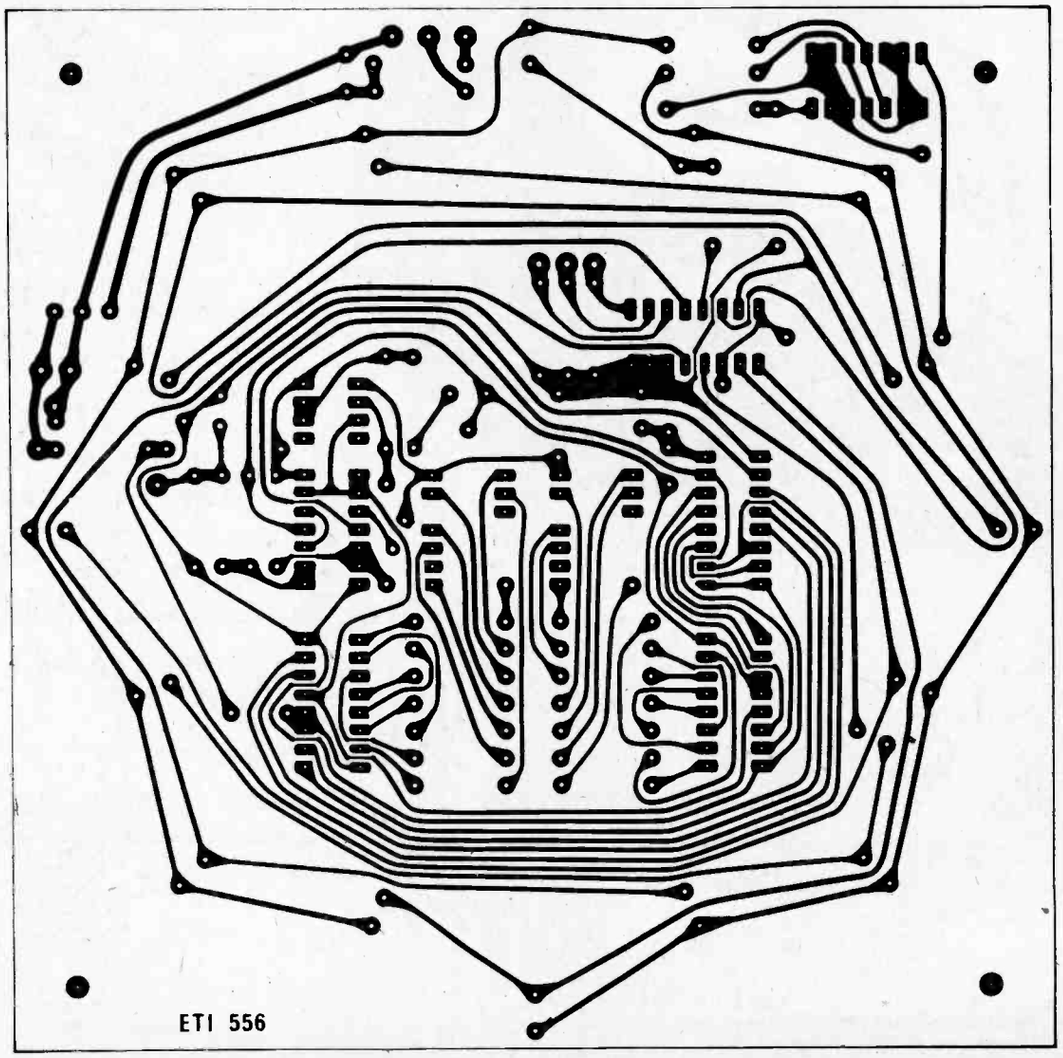
As this was intended to be a simple project we relaxed our original specification, deleting the use in a boat (we may get back to this problem. A four track 'Grey' scale allows the wind to be given to within 11° of its true heading, without the complexity of a nine track one, and the use of LEDs to give direction solves the problem of averaging as the variations can be seen and averaged by the brain.

CONSTRUCTION

The electronics is relatively simple provided the pc board described is used. Due to a height limitation C1 should be mounted on the rear of the board. The LEDs should be mounted about 7 mm from the board with care being taken not to damage them as the leads have to be bent out slightly. The regulator also has to lie down to give clearance.

We mounted the unit behind an aluminium front panel with the LEDs protruding through holes. If this is to be done it is preferable not to solder the LEDs until after alignment with the front panel.

The head is more difficult as some mechanical ability is necessary to ensure good results. The requirements are basically simple. A disc is to be allowed to rotate, either continuously with the wind or aligning it to the wind, with lights on one side and phototransistors on the other.



ETI 556

The method used by us is shown in fig 4 with the aluminium blocks providing the shielding necessary to give accurate results. As the unit will be exposed to the weather it must be made waterproof otherwise the ball races will corrode. The races used will normally have to be washed out to give low enough friction with a light spray of WD40 or similar to give some protection.

While our housing is a little ornate, it did work but the more usual half ping pong balls may be more suitable.

CALIBRATION

Wind Speed.

The easiest method for wind speed calibration is to provide the unit with a dc supply (via the common and one of the ac inputs) and to take a drive in the car with the unit supported above the vehicle. Providing there is no wind the potentiometer should be adjusted until the reading corresponds to the speedo.

Direction alignment is simply a matter of aligning the vertical rod so that it gives the correct results.

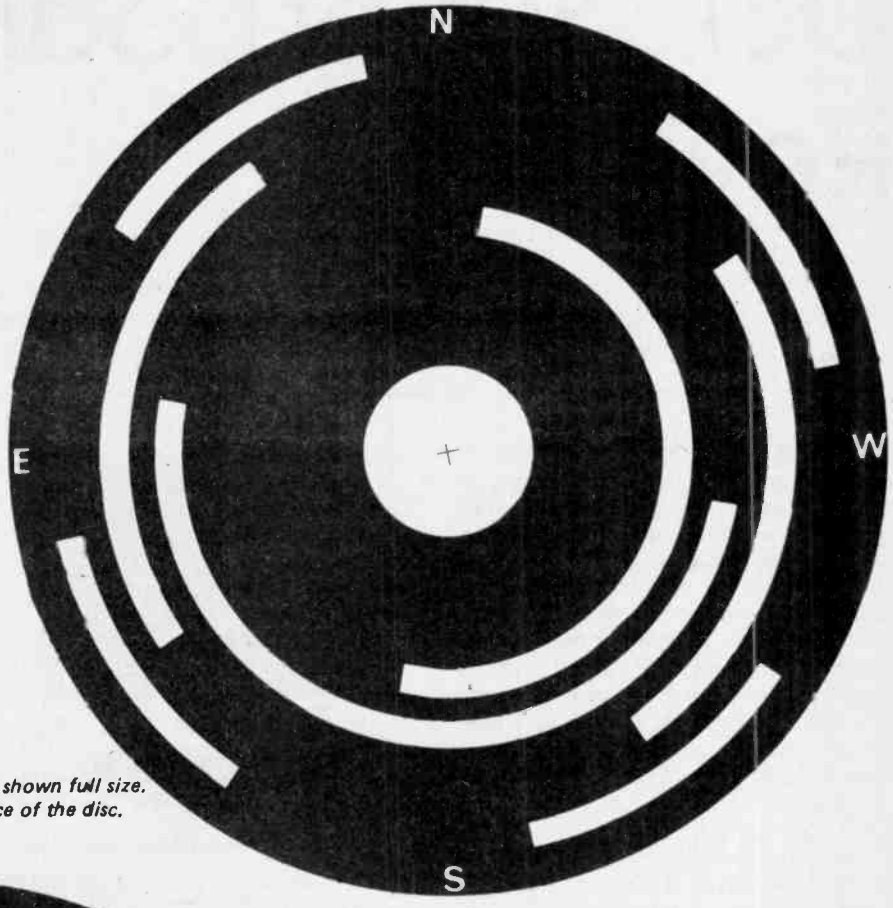


Fig. 5. The direction disc used shown full size. Note that this is the top surface of the disc.

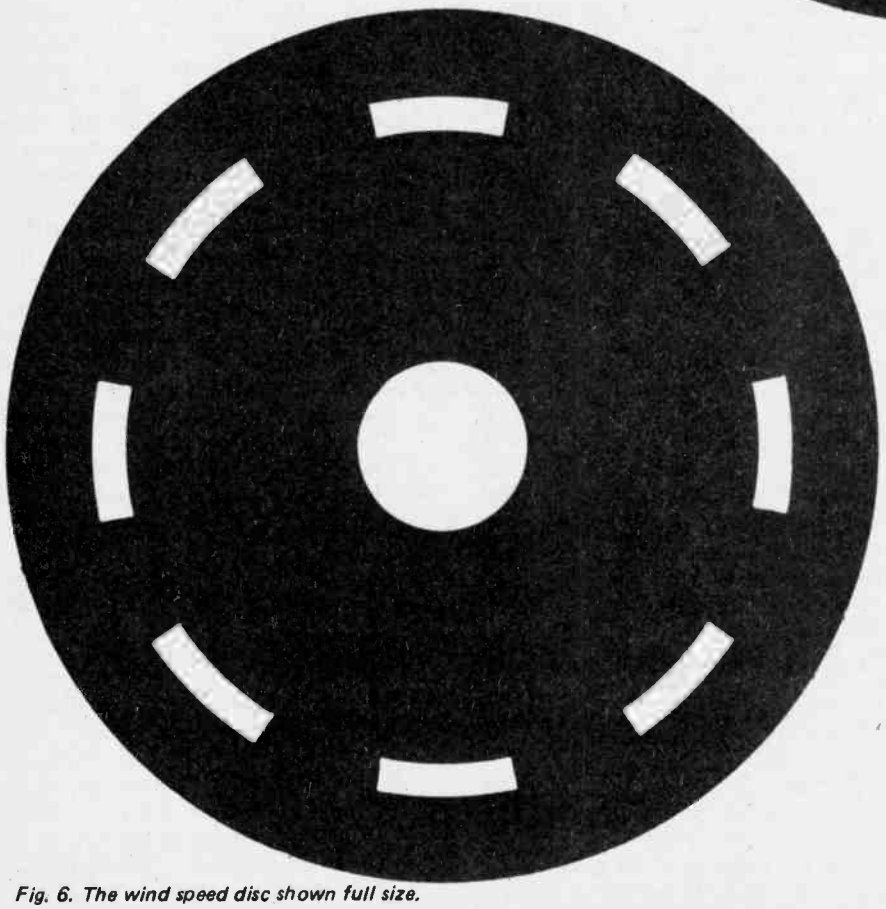
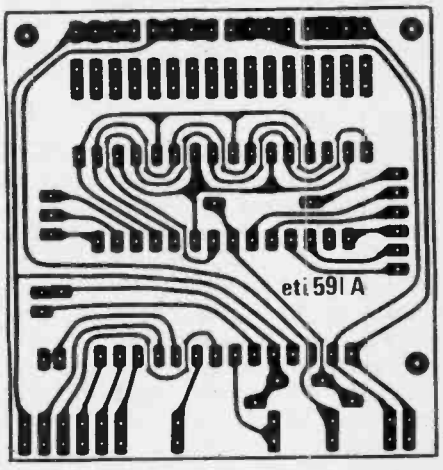
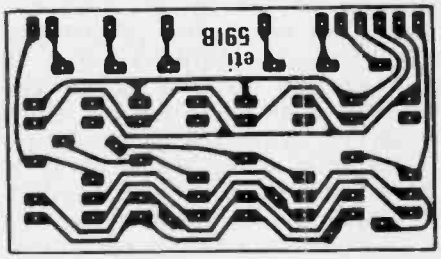


Fig. 6. The wind speed disc shown full size.





These are the pcb patterns for the Up/Down Counter on page 56.

OSI Superboard Review

Another ETI Computer Review. This time Ohio Scientific's much talked about Superboard/Callenger is under scrutiny.

IT WAS WITH great excitement that we drooled over the first press release on Ohio Scientific's Superboard II, which appeared in our November 78 issue. Quickly we contacted OSI's PR people and asked for a unit to borrow. "As soon as we have one available" they said. Well, we haven't heard from them since. And that's about all most people know about this product, that it's probably exciting, and it's very hard to get. In fact, because it's so unavailable nobody really knows much about the machine, so they don't know how exciting it really is, or isn't.

It just so happened though that we know somebody at OSI's Canadian representatives (Omega Computing) who sneaked us one, so we've finally played with the real thing. (Omega apparently don't realize that to have magazines review their products is good business.)

THE FAMILY

First let's talk about what's what in the Superboard-based family. There's the "Superboard II" which is a pc board holding the keyboard, BASIC-in-ROM, 4K or 8K of RAM, cassette I/O and video output. This is also known as the "600" board. Then, there's the Challenger 1P, which is a Superboard-in-a-cabinet, with power supply. After that comes the 610 expansion board which mounts above or below the Superboard, and will fit into the Challenger box. This board incorporates up to 24K additional RAM, real time clock, controller for two mini-floppy disk drives, and finally an expansion interface to the 620. What's a 620? Just a piece of pcb (with no active components) and a ribbon cable to interface the Challenger to the OSI "standard" 48 line BUS. The 610 can run directly from the Challenger power supply, but if populated with lots of RAM chips, some fudging around may be required, ie adding an on-board regulator circuit in

Fig. 1. Challenger 1P, with converted TV used for display

the space provided.

Needless to say, dual min-floppy disks are the next touch to the system, in cabinets which neatly attach on top of the Challenger. Remember when a calculator didn't make it unless it was pocket size? Well, OSI claim that the small size of Challenger + dual mini-floppies make it a 'Truly portable under one arm' computer system".

PRICE?!

Normally, we don't discuss price before features, but in this case it's one of the features so we'll talk about it first. Unfortunately, we can't say too much about the Canadian price, since very few of these machines have actually been sold here. Currently advertised Canadian prices are: 4K Superboard II at $420; 4K Challenger 1P at $520. It is with these low prices in mind that one can better weigh up the merits of this computer series.

ENCOUNTER WITH CHALLENGER

OK, we got our hands on a Challenger IP 4K model, and then of course we needed a monitor, modulator, or converted TV to get the video signal from the computer onto a screen. (It's not clear exactly why a modulator is *not* provided, but they are only $10 to $20 if you don't have a monitor, and don't wish to butcher your TV.) Our friend at Omega came to the rescue again and so we were all set.

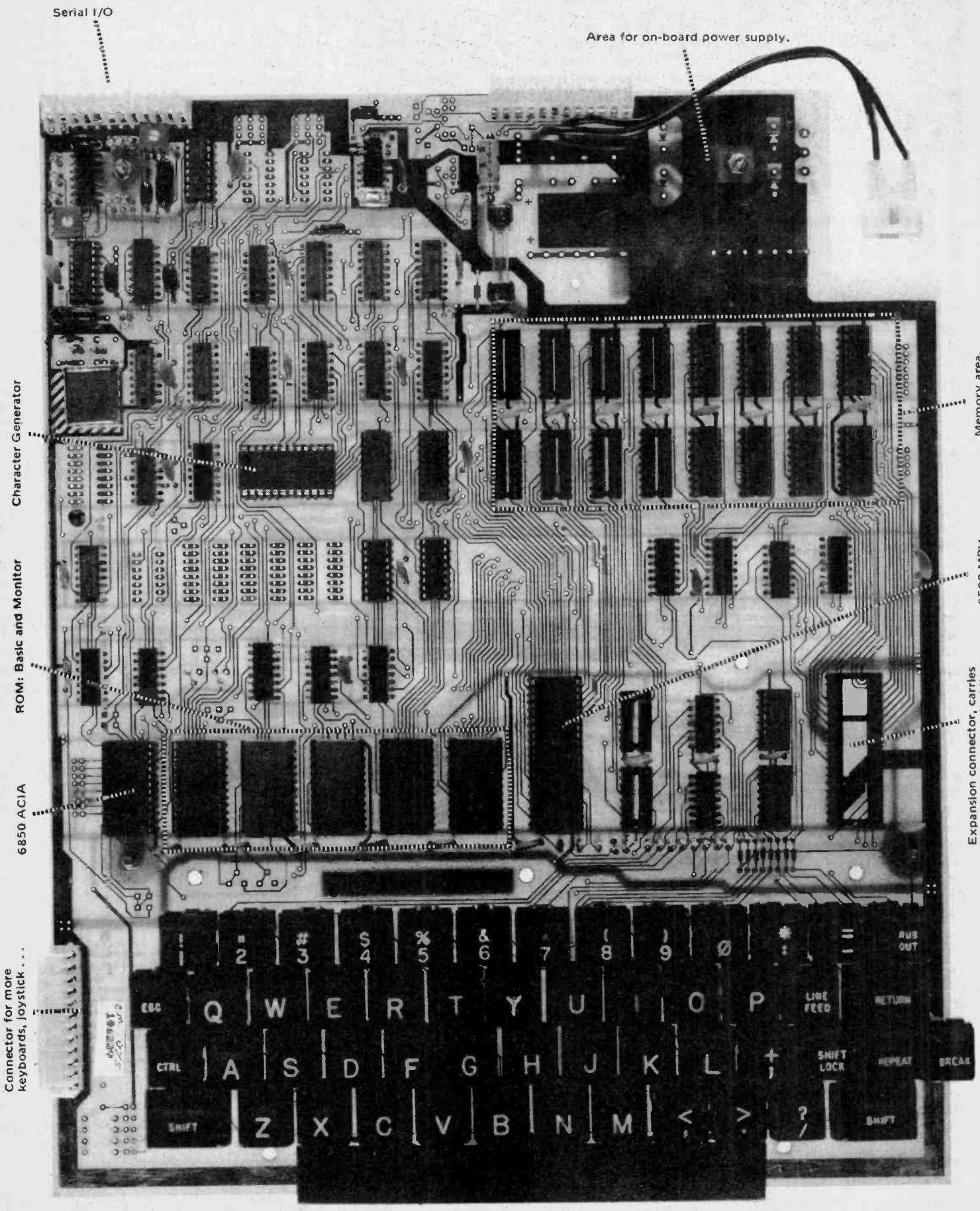
Aside from this, setting up the Challenger was very easy. One line cord each for monitor and computer, and one cable from computer to monitor. If you are using a cassette recorder, then you've got two more cables to connect.

Switching the machine on usually presents a screen full of interesting (but meaningless) characters. Pushing "BREAK" resets the machine. At this point you have to learn about the "SHIFT LOCK" key. It doesn't have anything much to do with the SHIFT key. To operate the computer normally the SHIFT LOCK key is clicked down. Then the keyboard will give you upper case letters and numbers, or if you hold the SHIFT key down you get the upper case punctuation, etc. If the SHIFT LOCK key is up, the keyboard acts as a regular typewriter keyboard to give you lower and upper case letters and punctuation. This is useful for entering text. As previously stated, since computer programs and commands must be upper case, the SHIFT LOCK key is normally in the down position. So, think of the SHIFT LOCK key as a "mode switch".

BREAK. . .

After operating the BREAK key, the computer gives you the choices: D/C/W/M which are to select Disk, Cold start, Warm start, Machine code Monitor. For normal BASIC operation select C, which clears the memory and asks you two "setting up" questions: the available terminal display width (normally 24 characters) and how much memory the user wishes to reserve for machine code (ie: instead of *for* BASIC) use. For successive restarts, pressing W will skip the questions and maintain whatever is in memory. (Believe us, you

Fig. 2. What's what on the Superboard board.



need this option! It's *far* too easy to push the BREAK key by mistake; it's next to the RETURN Key. If you don't want to become frustrated put a shield over the key, or disconnect it and put a break button around the back somewhere.)

Figure 3 gives a comprehensive summary of the functions and commands available in this pleasingly sophisticated version of BASIC (written of course by Microsoft!). Execution speed appears very (by micro standards) fast for the 6½ digit precision BASIC. A prospective buyer of a small computer would do well to compare a typical program they might have in mind on this machine and other potential purchases. It might make the difference for useable real time graphics, or satisfactory response times, (This is particularly the case with math-intensive programs.) Additionally, we have heard that some Challengers and Superboards are supplied with 2 MHz "A" version 6502 microprocessors, yet have their clocks set to just 1 MHz, allowing obvious room for "souping up".

There is ONE beef that we have with OSI on convenience of use, and that's the TERRIBLE effort required to delete a mistakenly typed character. There's no backstep feature to allow moving the cursor back over the boo-boo, you have to type a SHIFT–O, which appears as an underline character, the same as the cursor. That's not too bad for disposing of one character, but for a whole string it's very poor. (Fig. 4)

While we realize that it's not realistic to expect full line editing capabilities in this size of machine, this one shortcoming makes typing a pain rather than a pleasure, especially with the multi-function (multi-mistake possibilities!) keyboard.

DISPLAY

Again and again we return to the theme of compromise as we look at the 1P. OSI has packed alot of capability in, at the expense of allowing some not-so-nice behaviour. A prize example is the display. The program listing in Fig. 5. illustrates the hard-to-read, closely packed lines, and also the closeness to the edge of the screen.

The reason that the lines appear closely packed is because each character

```
100 GOTO 126_              (Mistake, wanted 226)
100 GOTO 126____           (Three deletes and the cursor)
100 GOTO 126___226 (Return)  (The final appearance of the line)
```

Fig. 4. Typo disposal made difficult.

Fig. 3. A couple of pages from the supplied Basic-in-ROM manual.

Commands

CONT LIST NEW NULL RUN

Statements

CLEAR	DATA	DEF	DIM	END	FOR
GOTO	GOSUB	IF...GOTO	IF...THEN	INPUT	LET
NEXT	ON...GOTO	ON...GOSUB	POKE	PRINT	READ
REM	RESTORE	RETURN	STOP		

Expressions

Operators

-, +, *, /, ↑, NOT, AND, OR, >, <, <>, >=, <=, = RANGE 10^{-32} to 10^{+32}

Variables

A, B, C, . . ., Z and two letter variables
The above can all be subscripted when used in an array
String variables use above names plus $, eg. A$

Functions

ABS(X)	ATN(X)	COS(X)	EXP(X)	FRE(X)	INT(X)
LOG(X)	PEEK(I)	POS(I)	RND(X)	SGN(X)	SIN(X)
SPC(I)	SQR(X)	TAB(I)	TAN(X)	USR(I)	

String Functions

ASC(X$)	CHR$(I)	FRE(X$)	LEFT$(X$,I)	LEN(X$)	MID$(X$, I, J)
RIGHT$(X$,I)		STR$(X)		VAL(X$)	

Basic commands, statements etc. In some ways the real thing's not quite like this, but it's pretty close.

CODE		DEFINITION
DD	D	Double Dimension: Variable dimensioned twice. Remember subscripted variables default to dimension 10.
FC	F	Function Call error: Parameter passed to function out of range.
ID	I	Illegal Direct: Input or DEFIN statements can not be used in direct mode.
NF	N	NEXT without FOR:
OD	O	Out of Data: More reads than DATA
OM	O	Out of Memory: Program too big or too many GOSUBs, FOR NEXT loops or variables
OV	O	Overflow: Result of calculation too large for BASIC.
SN	S	Snytax error: Typo, etc.
RG	R	RETURN without GOSUB
US	U	Undefined Statement: Attempt to jump to non-existent line number
/Ø	/	Division by Zero
CN	C	Continue errors: attempt to inappropriately continue from BREAK or STOP
LS	L	Long String: String longer than 255 characters
OS	O	Out of String Space: Same as OM
ST	S	String Temporaries: String expression too complex.
TM	T	Type Mismatch: String variable mismatched to numeric variable
UF	U	Undefined Function

Error messages: some of the codes are unpronounceable.

STAND ALONE VIDEO TERMINAL KIT

SPECIFICATIONS

DISPLAY: 64 char per line x 16 line per fram of 5x7 dot matrix, 64 ASCII char

VERT SYNC: 60 Hz XTAL controlled

HOR SYNC: 15.840 KHz XTAL controlled

VIDEO O/P: IV P-P composite video

I/O: Parallel port to ASCII keyboard +20ma current loop + RS232 IO

BAUD RATE: 110 to 9600 Baud remote sel

MISC: Full/half duplex, break, display all (transparency) mode

POWER: 5v 1A DC + +12VDC for RS232 (power supply option does not supply +12)

RE6416 . . . . . $169.95

LOWER CASE OPTION . . . **$16.95**

POWER SUPPLY OPTION . . . **$16.95**

WIRED and TESTED **$239.00**

NOTE: The manual, parts list and schematic of the RE6416 are available for $5.00 which is refundable upon purchase of an RE6416. Dealer inquiries invited.

ARKON CP-IO

The ARKON CP/IO-1 is an S-100 card that has all the CPU, Disc control and IO capability needed to construct a disc based microprocessor system for business, hobby or scientific system. Features are:

- 2 Mhz 8080-A, fully buffered S-100.
- EIA-RS232 port, 110 to 76,000 baud.
- Fully vectored interrupt (TMS-5501).
- 5 Interrupt controlled timers.
- EIA port for printer up to 9600 baud.
- Disc controller on board (1771).
- Shugart 400, 800, Memorex 550, plus.
- On board digital data separator.
- 2K bytes EPROM.
- 24 fully handshaked IO lines.
- Dual mapped IO.
- MWRITE generation on board.
- Software driven cassete interface.

ARKON CPIO $650.00

ASCII KEYBOARD KIT

The ARKON KB-1 keyboard has been developed for use with many popular microprocessors using the standard ASCII code.

- TTL/DTL/MOS Comp
- Odd/even parity
- 2 Key rollover
- N Key lockout
- Debounced
- Plus/minus logic

The kit is easy to build, uses tested prime parts and fits a Hammond box.

COMPLETE KIT & DATA $69.95

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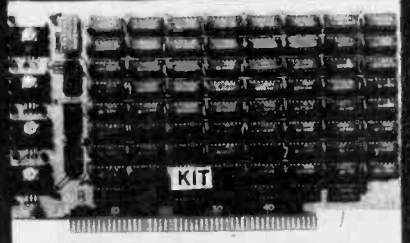

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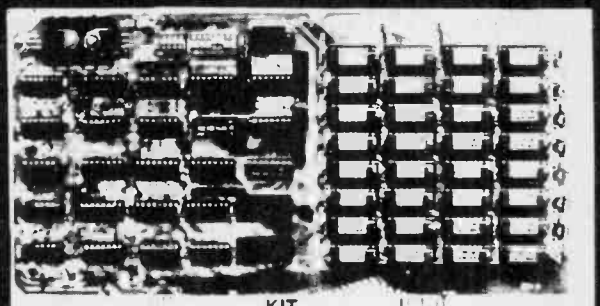

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is based on an 8 by 8 dot pattern, with no space between lines. Most characters are 7 dots high, so there is one dot worth of space, still not very good for readability.

OSI did this, however, in order to produce beautiful pictures such as in Fig. 8. Some of the "characters" are small lines and blocks which can be placed next to one another to make drawings of quite striking detail.

In addition, the individual 8 by 8 squares have been made as large as possible in order to make an individual character a useful picture, such as a tank, arrow, house or race car. (Some of the diagraming and picture characters are shown in Fig. 7.) This strategy however, brings the text area unfortunately close to the edge of the screen. In our case, it results in the text being a little too close, primarily due to this overscan on the inexpensive modified TV used for diplay. That is to say, the picture width appearing on the screen is only say 80% of the full picture available. This is done because it's difficult to make the edges of the picture on the TV undistorted.

Therefore, this problem could be avoided if an expensive video monitor was used. However, it seems more

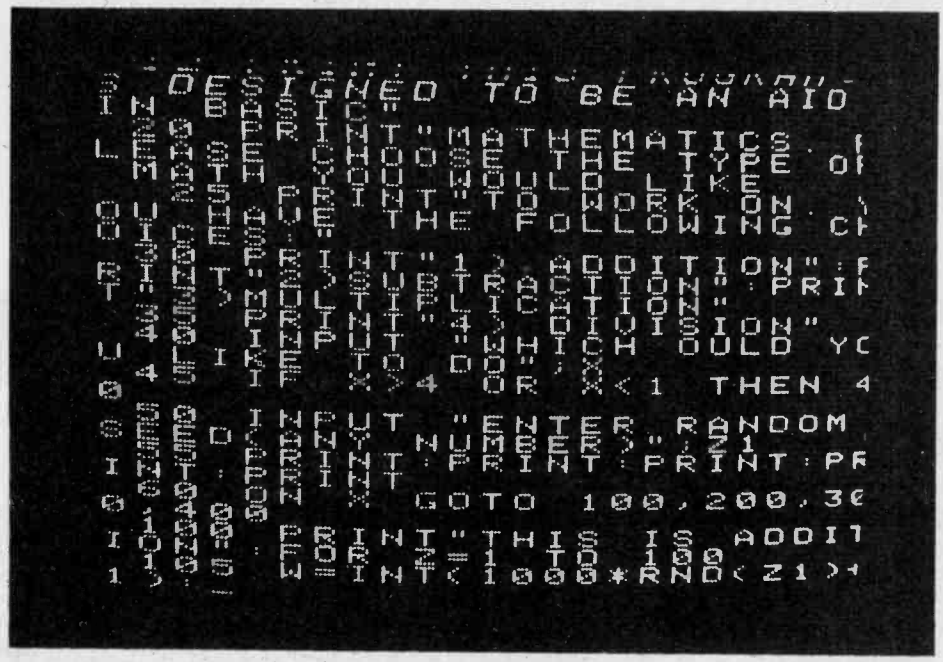


Fig. 5. Appearance of screen with progra ⁊ displayed.

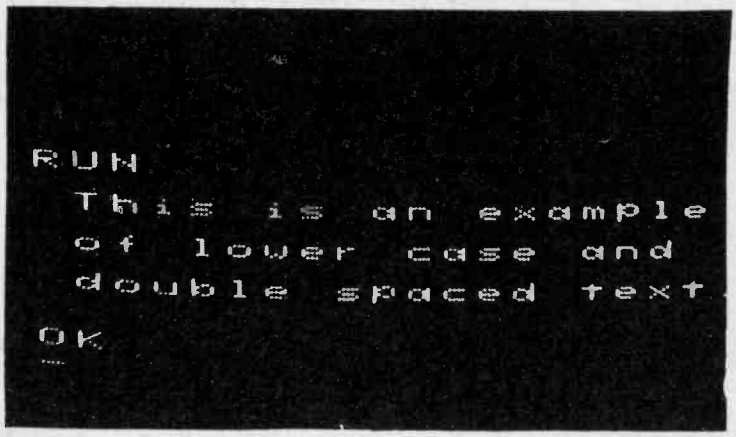
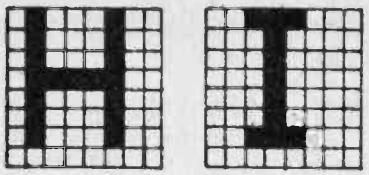


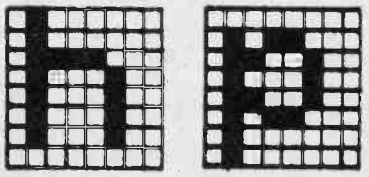
Fig. 6. This is an example of lower case, and double spaced text.

Fig. 7. Examples of characters.



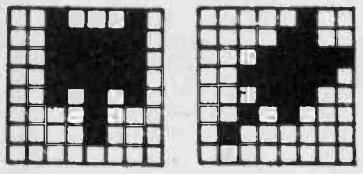
72 $48 73 $49

Upper case letters.



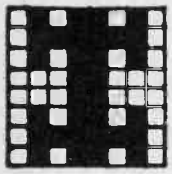
104 $68 112 $70

Lower case letters.

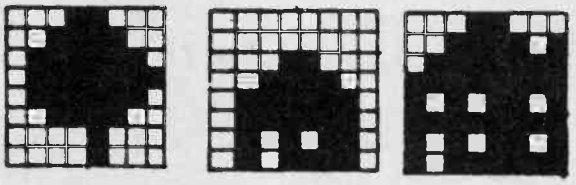


252 $FC 253 $FD

Tank is available at various angles.

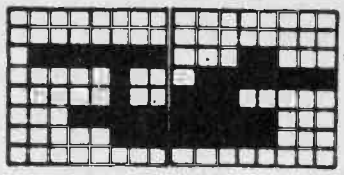


0 $0 Race car.



13 $D 14 $E 15 $F

Assorted immovable objects.



9 $9 10 $A

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reasonable that the buyer of an inexpensive computer will also use an inexpensive display.

We feel that both of these problems could be eliminated by the user familiar with the circuits involved, so that screen format could be switchable between graphics and program listing modes, appropriate to whatever display is to be used. (Full schematics of the computer are included, by the way.)

As can be seen from Fig. 6. lower case letters are available and look quite nice. These cheat a little bit, since in accommodating the "descenders" on letters such as "y", "g", etc, the body of the letter is raised higher than normal. This trick has actually been frequently used in the past and detracts very little from readability.

The display memory is a part of the addressable memory of the 1P. Hence, characters are put "onto" the screen by using the POKE statement, giving location and character number. The screen is set up as about 25 by 32 "slots" although only about 20 by 25 are visible. The screen memory can also be PEEKED to see what's at a specific location.

The chief advantage of this "screen-in-memory" type system is to allow quick screen changing, for real-time graphics. BASIC can change the entire screen very quickly, around two seconds, while a machine code program will do the job almost instantly. A blanking circuit minimizes the visual disruption when any character(s) are changed. (That is, while it is the computer that is accessing screen memory rather than the video circuits.).

TAPE I/O

The ability to be able to record and recall programs is a very important feature, without which no one would do much programming. All personal computers we have looked at include this feature, and always the first storage medium is the cassette tape. Ideally, storing or retrieving programs should be instant, unfortunately, thus has yet to be achieved. The floppy disk system gets close, but is a relatively expensive piece of machinery. So the cassette tape is "everyman's" storage unit.

The Challenger / Superboard Tape I/O standard is the well known "Kansas City" system, running at 300 baud. Since no clock signal is recorded on the tape with the data, replaying a previously recorded program from the tape relies upon both the tape recorder and the computer's interface circuitry running at the same speed as before. While

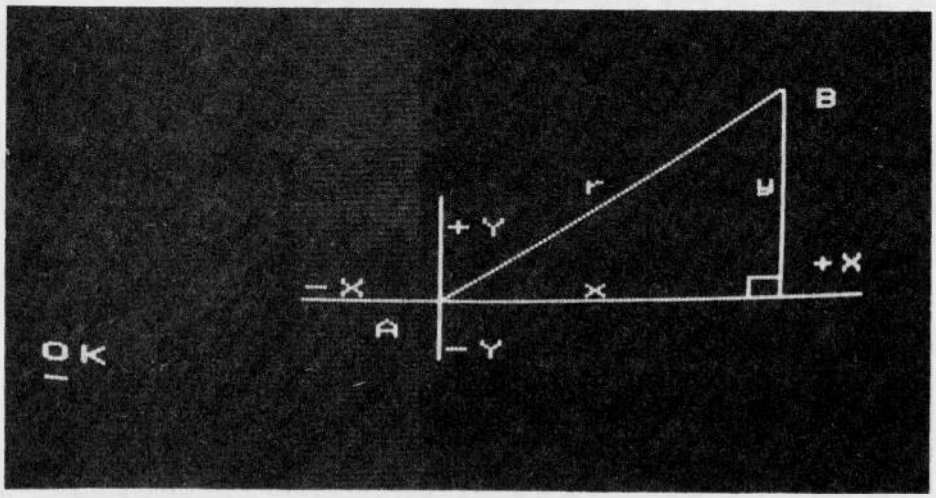


Fig. 8. Nice picture!

the computer's interface (a 6850 ACIA) is crystal controlled, one must ensure that the recorder is of high enough quality to maintain fairly constant speed, and to record and replay data with reasonable fidelity.

Using a cassette recorder is very simple. First, 2 cables must be attached between computer and recorder. Then for saving a program, start the recorder, type SAVE and hit the return key. When the computer has finished, it lets you know. To retrieve a program, type LOAD, hit the return, and start the cassette. As the program plays in it appears on the video screen, just as though someone with very fast fingers was typing it in. In fact this feature has a number of implications.

It's great for seeing where you are on the tape, no codes are required by this computer to start inputing, and so it'll display on the screen whatever is coming off the tape. Thus, you can easily locate the program, on even program segment you want.

On the other hand there appears to be no protection against errors if the recorded or replayed signal gets messed up. Some other computers work out a "checksum" and thus, know at the end of a LOAD if the program went in error free. This one can't tell. This emphasizes the need for reasonable quality recorder and tape. Our $14 special did not work very well, but our $27.95 job did excellent work. At best you should use a recorder with volume and tone controls. Then observe the ranges on these controls over which error-free replay results. (This is easy since sense, or nonsense, is immediately visible on the screen.) Set them to the middle of these ranges and weld them in place!

HARDWARE HOOK-UPS

When we saw the original news release on the Superboard we immediately thought that here at last was a nifty bare-bones controller board, but with the sophistication and convenience of full keyboard, video, and BASIC. Well, controller it's not really, but you can add on hardware devices.

If you really want to get into alot of interfacing with model trains, industrial machines, the dishwasher and the porch lights, (oh yes, and D/A and A/D convertors!) then you are supposed to buy the appropriate interface boards in OSI's line, and the adaptor board (620) to put the whole set up on the OSI 48 line "BUS", however, there are a few tricks you can do without that.

First, since the keyboard is just an array of switches that are "polled" by software using an 8-line-output, 8-line-input matrix, you can use these some lines for your own use. Twelve of the positions on the matrix are not even used for the keyboard, so right away you can use these for switches which won't even interfere with normal keyboard operation. Alternatively, you can add more switches in parallel with keyboard switches, if the application you have in mind doesn't need use of those particular keys.

Logic inputs can be input using 4066 switches as interfaces, instead of the above mentioned switches.

Outputs can be connected directly to the keyboard scan output lines (up to 8 connections) but of course your add-ons will be activated every time the keyboard is scanned, not a problem if your program doesn't need to look at the keyboard.

All the above mentioned schemes are easily implemented through the connector near the keyboard, which was presumably intended for adding more keyboards in parallel, and perhaps a joystick.

Somewhat more elegant would be the possibility of adding one or more 6820 Parallel Interface Adaptors. These provide 16 I/O lines and require very little more hardware then simply same ribbon cable and a plug to couple onto the 40 pin interface IC socket. (Some advantage can be taken of the address decoding that has already been done on-board.) Out with the Veroboard and soldering iron, or wire wrap or ...!

MACHINE CODE MONITOR

The computer allows you the capability to program directly in "machine language" if you wish. This is tedious, but it can result in very fast programs for special purposes such as loading the screen, or particular routines that you use repeatedly in your Basic programming. Additionally, it is very educational in seeing how a microprocessor, or indeed any computer, works. Finally, if you are contemplating hardware look-ups, manipulation of input and output data is often easier in machine code. This is done via the "monitor", simply a program already in the computer which helps you by taking your keystrokes, putting them in memory and displaying them on screen.

On screen you see six hexadecimal digits, four give the memory address and the last two tell the memory contents. (8 bits= 2 hex digits). So you can look, and if desired you can change those contents, thus, making your own program. Finally, you can tell the machine to start at a certain location and execute all those "statements", ie run your program.

The monitor is not very sophisticated, just enough to get you by. For example, you can only see one address and contents at a time, instead of a whole screen-height-full which would be convenient for easy reading and reference.

But, at least there's something there, and it's useable, how many other of the machines you might consider actually come with a machine code monitor?

MANUAL

Our demo unit came with four main booklets of documentation: "Superboard II Challenger 1P User's Manual", "Challenger 1P Technical Report", "The Challenger Character Graphics Reference Manual", " The 8K Basic-In-ROM Reference Manual". Together they provide most of the information you would need to know about this machine if you were stuck on a desert island with it. (With electricity etc.). They are by no means learners' manuals on Basic or computers, just as a typical car owner's manual will not teach you how to drive, nor combustion engine principles. That is not to say a relative beginner will not enjoy this machine simply that other books may be found useful additions.

Beware however! Not all is contained in manual! Some very useful bits are omitted, such as how exactly to use LIST, so keep in touch with your dealer if you have questions.

See if you can get a read of these manuals before you buy.

Commands

```
Address Mode Commands:
/ - Change to Data Mode
G - Go -- Jump to location seen on screen and execute program found there.
L - Transfer control to audio cassette.

Data Mode Commands:
. - Change to Address Mode
RETURN - Open next address.  In other words, increment location pointer by 1.

If the 65V is in address mode, typing 0 - 9 or A - F will cause that number
to be rotated into the LSD of the location pointer.  Typing a 4 causes 0123
XX to become 1234 XX.
```

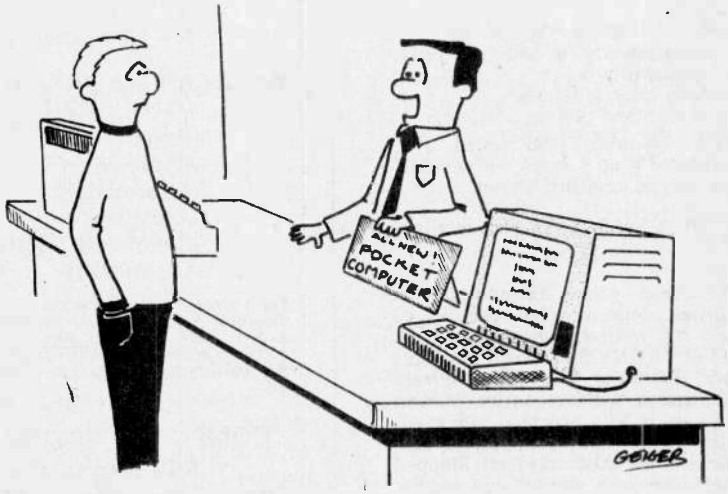
Fig. 9. Summary of machine code monitor features.

CONCLUSIONS

Superboard or Challenger, either is a very interesting piece of electronics. They offer a combination of features and price at least different from all other current machines. Advanced features have been incorporated at some expense to convenience, and this must be borne in mind. But, if it offers the capabilities you're looking for, and you can accept the minor shortcomings, then these products are to be recommended, as products.

We had good fun using the 1P's lower case and graphics in such memorable programs as: "Automatic Cheap Paperback Passionate Scene Writer" (got naughtier as the night progressed, the randomer the better!), "Tank Remodels Downtown Calgary" (Rampaging tank blows up buildings to make way for cars), and "Rats Try To Find Way Out of Rosedale". (Well, did you ever get lost there?) (There aren't really any rat characters, but you can make the fat arrows look and act like them.)

One thing we haven't mentioned is warranty and service, something we leave to the reader to investigate in his own area of the country.



"Of course, it may not look pocket-size now, but when you buy one we include a size 456 pair of pants absolutely free."

OSI Superboard

AVAILABILITY

As we go to press the availability problem has not been solved. But there are indications that by the time you read this you will be able to walk into a local computer shop and at least play with one, (For example, deliveries to the UK are in good shape, it appears).

There's a good possibility that 1Ps will be held up while it's CSA approved (it's got a built in power supply) and that if you want a unit quickly, you should go for a Superboard and stick on your own box and supply. (We wonder whether US manufacturers are actually using lock of CSA approval as an excuse not to deliver when they have short supply of machines. A similar hold up occured for both PET and TRS 80. Not that the manufacturers are all to blame, there is a worldwide shortage of critical parts, like LS chips with deliveries quoted in numbers such as 40 or 50 weeks!)

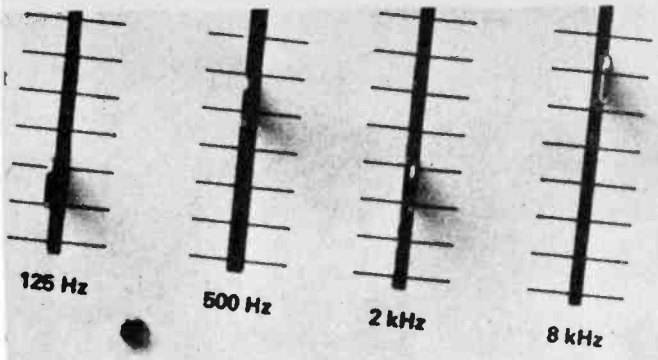
A number of dealers have contacted us, saying they will have the Superboard/Challenger, but we have yet to see this happen. Instead, if you want to know your nearest dealer, write to OSI's Canadian representative: Omega Computing, PO Box 220, Station P, Toronto, M5S 2S7, phone (416) 491-4317.

The mini floppy disk (system shown) has 39 tracks of 2K each, although a small part of this is needed for "housekeeping". There is some merit to having even an additional drive, since it allows copying parts of one disk to the other, without the exchanging of disks in the drive.

The publications applying to the Disk Basic and the disk operating system are: "Ohio Scientific Disk Basic Reference Manual", and "OS65D V3.0 User's Manual". The potential user should be forewarned that the use of this, or any disk is not as straightforward as a cassette but once the concepts are understood it's a heck of a sight more fun.

AFTER YOU'VE USED a disk with a micro, you'll wonder why you ever used a cassette. "Instant" access to large areas of memory – 9 digit "Disk Basic" (8K) and associated software loads in around 5 seconds.

We were only able to have a play with this machine for a very short while, (it was probably the only one of this type in Canada at the time) but it was impressive for around C$1.5k (12K memory) which includes all but the monitor or other display. By the way, Disk Basic has proper backstepping of the cursor for mistakes, and is extended in many ways primarily of course related to the disk.

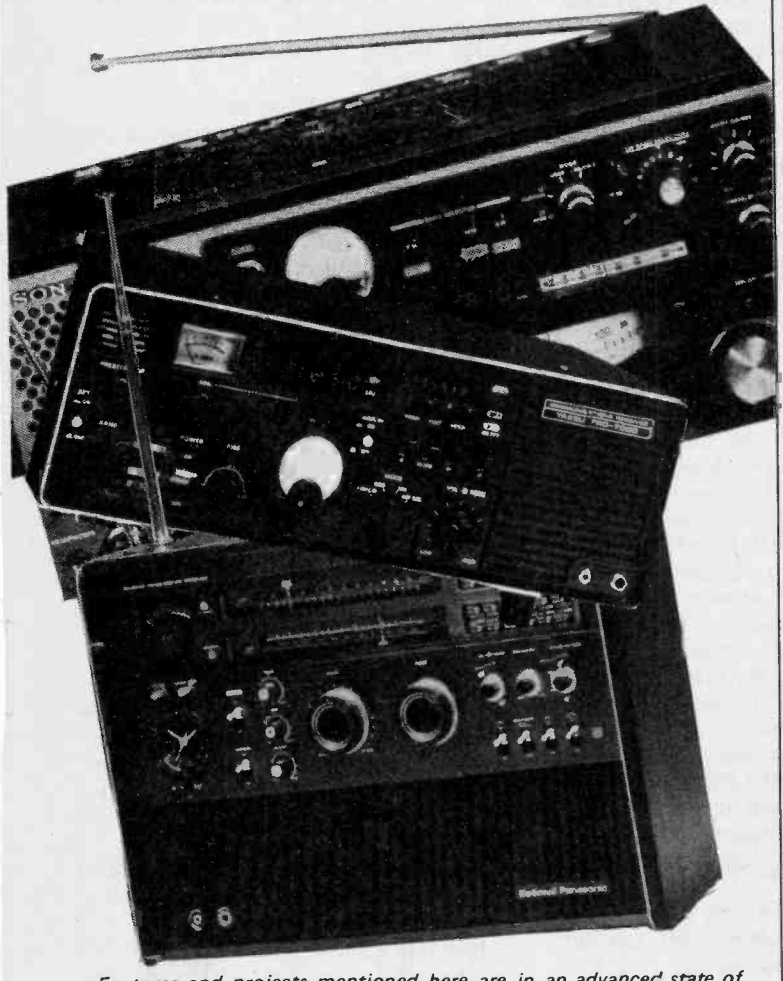


Between the 5 Band Audio Equalizer project, and the Shortwave Receiver Survey, next month's issue promises to be pretty exciting.

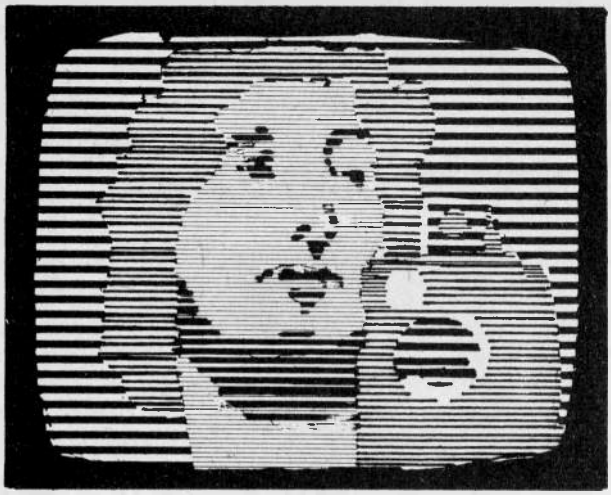
In addition, there are other projects, including a Windshield Wiper Control Unit —— just in time for autumn rain. You can use the Up/Down Counter presented this month to add a digital readout to your radio.

We also take an in-depth look into the concepts of ultra high-fidelity, and the different approaches taken to achieve it.

Integrated Injection Logic, IIL, has been w th us for some time now, but it hasn't made much noise for itself. It's in a lot of products, and it's going to be in a lot more —— here's how it works.



Features and projects mentioned here are in an advanced state of preparation. Circumstances may, however, require change of contents.



WHAT'S ON

This month Steve Rimmer discusses the finer points of video cameras and how to buy one.

AS MENTIONED IN the VCR survey in the July issue, all of the new home video recorders are capable of accepting video signals from an external source. There are quite a number of things around these days which can emit video, when properly stimulated, including pattern generators, Pong games and micro computers. However, the entertainment value in a cross hatch, even an uninterrupted, four hour display of one, may not quite be up to that of live TV . . . although it would be a considerable improvement over "Mork and Mindy". No, if you're really bent on destroying your mind with your own programmes, instead of using somebody else's, what's called for here is a television camera.

Realizing, perhaps, that a bit of Fellini would live on in every mad soul with a video machine if, in fact, Fellini were dead, the VCR manufacturers have all recently put the machinery in motion to come up with their own home cameras. With the, the intrepid film maker can sally forth, or Wanda or Bertha forth, as the case may be, and create beautiful vistas of spectacular living colour on the living room screen to be enjoyed for years to come. Or, he can just take pictures of the kid's birthday party. If this does not satisfy the creative urges, it should be noted that most of the cameras to be discussed herein are capable of focussing in at distances less than the length of the average human ulna, permitting them to be held at arm's length and directed toward the owner/cameraman/filmstar, creating beautiful vistas of said film maker. . . the last word in electronic narcissism.

Unlike the VCRs themselves, which are, by and large, all about the same, there is a bit more variety to choose from amongst the current crop of cameras. Many are versatile and well designed. There are a few that fit into the same category as the modern box Brownie and the Jiffy Quik home atom smasher, to be sure . . . guaranteed to work first time and then never again . . . but, in the discussion to follow, the footprints of said beasties should become clear to you, and you should be able to fend them off, should a salesman spring one upon you.

THE BASIC THING

Let us begin with the basic black and white camera. Several manufacturers have variations on the monochrome "cheapie", including RCA, Toshiba and Zenith. In the simplest version of this type of system, the lens focuses, but has no iris, by which the light falling on the camera pick up tube may be controlled for proper exposure. Instead, the target current of the vidicon tube, which translates the light image into an electrical signal, is used to operate an Automatic Level Control circuit, so that, in effect, as the illumination on a scene gets brighter, the sensitivity of the camera drops off correspondingly, so that a proper level of exposure is maintained. This system, while cheap and simple to use, has two inherent problems.

The first is the same hassle that plagues 35mm cameras with certain types of through the lens metering. For example, if the camera is aimed at a subject, behind which is a bright, sunny sky, the camera will adjust itself to correctly expose the sky. The subject will show up as a black silhouette. This is only really useful if the subject is either, in fact, a black silhouette, or is extremely ugly.

The second difficulty in this system is the lack of depth of field that goes along with a lens that is always wide open. This means a lot of re-focusing, even in brightly lit situations.

The viewfinder on the average black and white home camera is usually a telescope-like affair, with one or more little boxes printed on the eyepiece to give the camera operator some idea of what will be in the camera's field. On some models, a strategically placed LED is visible while one is peering through the finder to indicate when the VCR associated with the camera is recording. This is actuated by a button in the hand grip, which also turns the machine's "Pause" control on and off.

Most of the monochrome cameras have built-in microphones of some sort protruding from above the lens.

While the lenses on most of the black and white cameras are pretty dismal, it should be kept in mind that they are simply C mount movie camera lenses, and can be replaced at any time with something a bit more versatile, including a full range zoom, should such insanity move you.

The simple black and white cameras have one major advantage over their more elaborate, and expensive, full colour relations. They are considerably more sensitive to light, which lets one use them in considerably murkier surroundings.

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AMPLIFIER MODULES
CROSSOVERS, SWITCHES
CHEMICALS, CASSETTES
CONTROLS, SOLDERING IRONS

DOMINION RADIO
& ELECTRONICS COMPANY

A Division of Dreeco Electronics Ltd.

535 YONGE STREET
TORONTO, ONTARIO
M4Y 1Y5

AUTOMOTIVE
GRAPHIC
EQUALIZER/
BOOSTER

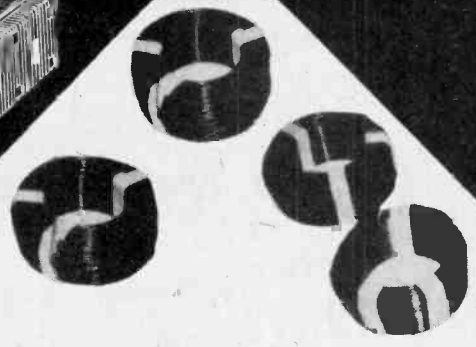
No. CEO 101
$129.95

AUDIO REFLEX
you'll hear a lot from us ...

Melt the miles with an Audio Reflex CEQ-101

25 WATTS/CHANNEL
4 OR 8 OHMS
7 BANDS

PHILIPS, FUJI, JANA, ELNA
MICRO, UNGAR, ULTRAFLEX
PEERLESS, CHEMTRONICS
DYNATRONICS, SPECTRO
METROSOUND, SINCLAIR
ULTRAFLEX, TENCO
WINEGARD, ILP
INJECTORALL
JBT, C&K
LEADER
CERES
BASF
AGS



NEW!

CROSSOVER COILS

.33 Henry	.5 Henry	1 Henry	1.5 Henry	2.5 Henry
$3.95	$4.35	$4.85	$5.25	$6.95

Included in Electronics Today Magazine, September, 1979 Issue.

Index on page 2.

SEMICONDUCTOR SPECIALS

1N4005 DIODE

22¢

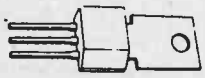
1 AMP 600 PIV

1N5000 DIODE

39c

3 AMP 600 PIV

C 106B SCR



99c

2.2 A 200 PIV

3.95 TRIAC SC146B

10 AMP 200 PIV

ZENER DIODES

YOUR CHOICE

.49 ea.

IN757A	9.1V	500MW
14-516-33	22V	500MW
IN4623	4.3V	1W
IN751A	5.1V	1W
IN4734A	5.6V	1W
14-515-04	6.2V	1W
514-35	6.8V	1W
3E216D5	14V	1W
1N966	16V	1W
IN4751A	30V	1W
IN4764A	100V	1W
IN55938	183V	1W
IN5045	56V	5W

BUY 10 OF ANY 1 TYPE
AND GET 1 FREE

BRIDGES

W2

69¢

1.5 Amp
200 PIV

FO1

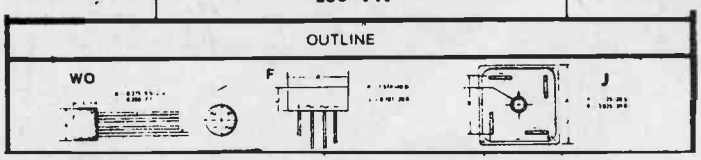
$1.69

5 Amp
100 PIV

JO1

$3.50

10 Amp
100 PIV



Power Transistors

NPN	PNP
2N3055	MJ2955
$1.49	$1.59

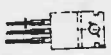
Metal can
15 Amp
60 Volts

Bargain Transistors

2N2221	2N3708
2N2222	2N3900
2N3565	2N3904
2N3703	2N4058
2N3704	2N5172
2N3707	2N5526

POWER TRANSISTORS

95c ea



95c

NPN TIP 31 PLASTIC TIP 32 PNP

INDEX

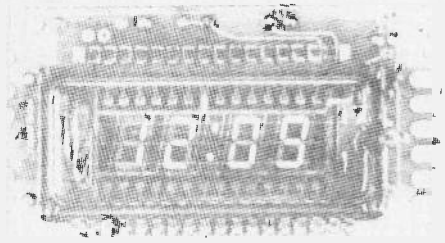
Dominion Radio and Electronics Company, A Division of Dreeco Electronics Ltd., 535 Yonge Street, Toronto Ontario M4Y 1Y5.

LED PRODUCTS

AUTOMOTIVE CLOCK MODULE

FEATURES

- Ideal for automotive applications
- Operates from 12 VDC supply
- Internal crystal timebase
- ± 0.5 second/day accuracy
- Complete—just add switches
- Low standby power consumption

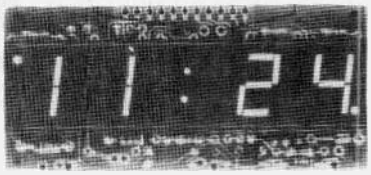


$29.95

MA1003

CRYSTAL CONTROLLED

MA1002 LED display digital electronic clock module



features

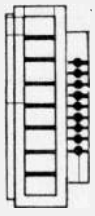
- Bright 4 digit 0.5" LED display
- Complete – add only transformer and switches
- Alarm clock and clock radio version
- 12 or 24 hour display format
- 50 or 60 Hz operation
- Power failure indication
- Brightness control capability
- "Sleep" and "snooze" timers
- Alarm "on" and PM indicators
- Direct drive – no RFI
- Fast and slow set controls
- Low cost, extremely compact design

$14.95

SPECIAL!

SPECIAL PRODUCT
MLEV 80

RECORD-LEVEL INDICATOR FIELD STRENGTH METER DISPLAYS



5 GREEN AND 3 RED SEGMENTS

- Multiple cavities
- Multiple color combination
- High Intensity
- Common cathode/anode
- Wide viewing angle

$3.95

FEATURING!

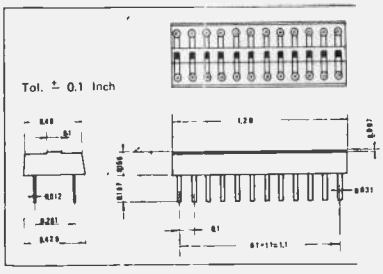
MLA 12

LADDER LED INDICATOR

MULTIPLE SEGMENT BAR LED LADDER

- Red epoxy encapsulated
- High brightness
- 10 X 40 mil segment bar
- Wide viewing angle
- 0.1 inch pitch connection pin

$4.95



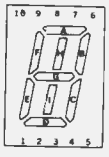
MID 162 series

RED LED
SINGLE DIGIT DISPLAY

Nine Segment ALPHANUMERIC DISPLAY

$3.95

- 0.6 inch character height
- High contrast
- Common cathode/anode direct drive
- Continuous uniform segments
- Wide viewing angle

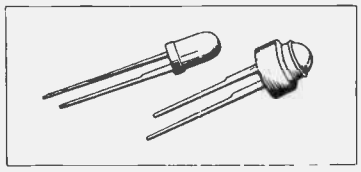


MIL 50 series

RED LED LAMP

MIL 50R	RED	$ 29
MIL 50G	GREEN	$ .39
MIL 50Y	YELLOW	$ .39
MIC 50	MOUNTING HARDWARE	$ .12

QUANTITY PRICING
40–100 pcs –10%
100 up pcs –20%



GENERAL DESCRIPTION

The "MIL 50" series lamps are GaAsP solid state LEDs encapsulated in a plastic package. They are electrically identical but optically different owing to different lens designs. These devices are panel mountable with plastic popin clip MIC-50. They are circuit-board mountable and have wire-wrappable leads, see physical dimensions drawing A,B

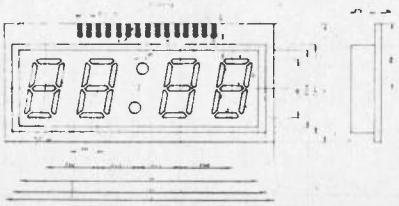
MP 463
SEVEN SEGMENT DISPLAY

FOUR DIGIT MULTIPLEX DISPLAY

SEVEN SEGMENTS

- High efficiency red GaAsP
- 0.6 inch character height
- High contrast
- Wide viewing angle
- 0.1 inch pitch edge–connector or connection pin compatible

$6.95

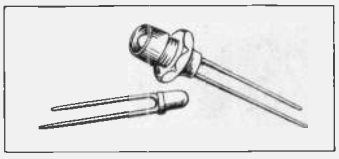


MIL 30

RED LED LAMP

MIL 30R	RED	$ 29
MIL 30G	GREEN	$ .39
MIL 30Y	YELLOW	$ .39
MIC 30	MOUNTING HARDWARE	$ .15

QUANTITY PRICING
40–100 pcs –10%
100 up –20%



GENERAL DESCRIPTION

The "MIL 30" series lamps are GaAsP solid-state LEDs encapsulated in a plastic package. They are electrically identical but optically different owing to different lens designs. These devices are panel mountable with plastic adaptor clip MIC-30. They are circuit-board mountable and have wire-wrappable leads, see physical dimensions drawing.

New Products. From: SGS-ATES SEMICONDUCTOR CORPORATION

LINEAR INTEGRATED CIRCUITS

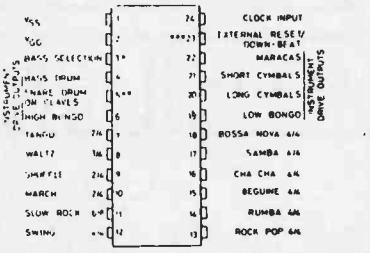
Voltage regulators

TYPE	V_o (V)	REGULATED I_o (mA)	PACKAGE	PRICE EA.
L 129	5	850	TO-126 (1)	$ 1.95
L 130	12	720	TO-126 (1)	1.95
L 131	15	600	TO-126 (1)	1.95

L200 ADJUSTABLE MONOLITHIC VOLTAGE & CURRENT REGULATOR
OUTPUT VOLTAGE 3 – 30 VOLTS
OUTPUT CURRENT 1.8 AMPS 4.95
PACKAGE Pentawatt ®

M 253 29.75

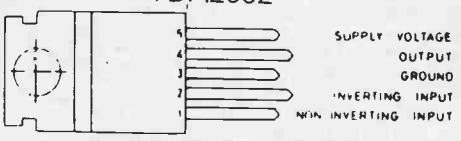
RHYTHM GENERATOR
M 253 B1AA for standard music content



IC Power Amplifiers $2.95

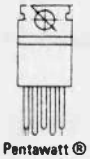
SPECIAL!

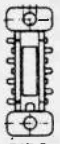
CONNECTION DIAGRAM
TDA2002



	TDA2010	TDA2002	TDA2020
Type	TDA2010	TDA2002	TDA2020
Vs max (V)	+/– 18	18	+/– 22
Voltage Gain (dB)	100	–	100
Po (W) @	12 (9)	8 (9)	20 (16.5)
Distortion (%) and	1 (10)	10	1 (10)
RL (ohms) and	4 (8)	2 (3.2)	4 (2)
Vs (V)	+/– 14	14.4	+/– 18
Output Current (A)	3.5	3	3.5
Package	DIP C	Pentawatt	DIP C
Notes	Fully Protected	Thermally Protected	Fully Protected
Price	$8.95	$2.95	$9.95


DIP C with spacer


Pentawatt ®


DIP C with spacer

POWER TRANSISTORS

Epitaxial-base


TO-126


TO-220 AB


TO-3

Plastic

TYPE NPN	TYPE PNP	V_{CEO} (V)	h_{FE} min/max	$V_{CE(SAT)}$ (V)	I_C max (A)	P_D (W) @ T_C = 25°C	PACKAGE	PRICE EACH
BD437	BD438	45	40	0.6	4	36	TO-126	$ 1.30
MJE223	MJE233	60	20	2.5	4	15	TO-126	1.30
TIP31A	TIP32A	60	25	1.2	3	40	TO-220	.95
BD709	BD710	80	15-150	1	12	75	TO-220	1.50

Metal can

TYPE NPN	TYPE PNP	V_{CEO} (V)	h_{FE} min/max	$V_{CE(SAT)}$ (V)	I_C max (A)	P_D (W) @ T_C = 25°C	PACKAGE	PRICE EACH
2N3055		60	20-70	1	15	117	TO-3	$ .95
2N3055U		70	20-70	0.5	15	150	TO-3	1.95
2N3442		140	20-70	1	10	117	TO-3	2.50
BDW51C	BDW52C	45	20-150	3	15	125	TO-3	2.75

Epitaxial-base darlingtons - Plastic

TYPE NPN	TYPE PNP	V_{CEO} (V)	h_{FE} min/max	$V_{CE(SAT)}$ (V)	I_C max (A)	P_D (W) @ T_C = 25°C	PACKAGE	PRICE EACH
2N6037	2N6034	40	750-15000	2	4	40	TO-126	$ 1.59
2N6038	2N6035	60	750-15000	2	4	40	TO-126	1.79
2N6039	2N6036	80	750-15000	2	4	40	TO-126	2.25
BDX53A	BDX54A	60	750	2	8	60	TO-220	2.95
BDX53C	BDX54C	100	750	2	8	60	TO-220	3.25

Metal can

TYPE NPN	TYPE PNP	V_{CEO} (V)	h_{FE} min/max	$V_{CE(SAT)}$ (V)	I_C max (A)	P_D (W) @ T_C = 25°C	PACKAGE	PRICE EACH
2N6057	2N6050	60	750-18000	2	12	150	TO-3	$ 3.25
2N6059	2N6052	100	750-18000	2	12	150	TO-3	3.95

High voltage - Plastic

TYPE	POLARITY	V_{CBO} (V)	h_{FE} min	$V_{CE(SAT)}$ (V)	I_C max (A)	P_D (W) @ T_C = 25°C	PACKAGE	PRICE EACH
BU407	NPN	330	30	1	7	60	TO-220	$3.00

Metal can

TYPE	POLARITY	V_{CEO} (V)	h_{FE} min/max	$V_{CE(SAT)}$ (V)	I_C max (A)	P_D (W) @ T_C = 75°C	PACKAGE	PRICE EACH
BUX97	NPN	350	10	3	6	90	TO-3	$4.95

ME MICRO ELECTRONICS LTD.

SEMICONDUCTOR PRODUCTS

HIGH SPEED SWITCHING TRANSISTORS

TYPE NO. NPN	Maximum Ratings PD @ TA+25°C	IC	Electrical Characteristics @ TA=25°C	hFE mm/max	ton toff max	CASE	PRICE EA.	TYPE NO. PNP	Maximum Ratings PD @ TA+25°C	IC	Electrical Characteristics @ TA=25°C	hFE min/max	ton toff max	CASE	PRICE EA.
2N2221A	500mW	500mA	40V	40/120	35ns 285ns	TO-18	$.29	2N3905	310mW	200mA	40V	50/150	70ns 260ns	TO-92A	$.33
2N2222A	500mW	500mA	40V	100/300	35ns 285ns	TO-18	.32	2N3906	310mW	200mA	40V	100/300	70ns 300ns	TO-92A	.36
2N3904	310mW	200mA	40V	100/300	70ns 250ns	TO-92A	.25	2N3136	400mW	600mA	35V	100/300	75ns 100ns	TO-18	.29
								2N4403	310mW	60mA	40V	100/300	35ns 255ns	TO-92A	.37

SMALL SIGNAL TRANSISTORS

TYPE NO. NPN	Maximum Ratings PD @ 25°C	I_C	LV CEO	Electrical Characteristics @ TA=25°C H_{FE} min/max	f_T min	NF max	CASE	PRICE EA	TYPE NO. PNP	Maximum Ratings PD @	I_C	LV CEO	h_{FE} min/max	f_T min	max	CASE	EA.
2N2482	360mW	50mA	60V	100/150	60MHz	3dB	TO-18	$.38	BC557B	500mW	200mA	45V	220/475	150MHz	4dB	TO-92F	$.25
2N3565	200mW	—	25V	150/600	40MHz	—	TO-106	.25	MA0462	—	40V		100/300	500MHz	—	TO-18	.32
2N3707	250mW	30mA	30V	100/400	—	—	TO-92B	.25		300mQ	200mA	50V	200/400	200MHz	10dB	TO-92B	.32
2N3825	250mW	100mA	15V	20/-	800MHz	—	TO-92B	.28	BC251	300mW	100mA	45V	125/900	130MHz	10dB	TO-92F	.25
2N5172	200mW	—	25V	100/500	—	—	TO-106	.25									
BC107	300mW	200mA	45V	125/500	300MHz	10dB	TO-18	.29									
BC182LB	375mW	200mA	50V	200/450	150MHz	10dB	TO-92B	.32									

GENERAL PURPOSE TRANSISTORS

2N3019	800mW	1A	80V	100/300	100MHz	—	TO-39	$.59	2N3703	300mW	500mA	30V	30/150	100MHz	—	TO-92B	$.24
2N3706	350mW	800mA	20V	30/600	100MHz	—	TO-92B	.29	2N4033	800mW	1A	80V	100/300	150MHz	—	TO-39	.59
BC337-25	500mW	500mA	45V	160/400	70MHz	—	TO-92F	.29	BC327-25	625mW	500mA	45V	160/400	100MHz	—	TO-92F	.29
BC547B	500mW	100mA	45V	200/450	300MHz	10dB	TO-92F	.25									
BC548	500mW	100mA	20V	110/800	300MHz	10dB	TO-92F	.25									
MH8213	2.5W	2A	80V	100/240	50MHz	—	TO-220B	.75									

DARLINGTON AMPLIFIERS

2N5308	600mW	300mA	30V	30000/-	60MHz	—	TO-92F	.50	BC516	500mW	300mA	30V	30000/-	—	15dB	TO-92F	.46
MPSA13	500mW	300mA	30V	10000/-	125MHz	2dB	TO-92A	.33									
BC517	500mW	300mA	30V	30000/-	—	15dB	TO-92F	.45									

GENERAL PURPOSE FIELD EFFECT TRANSISTORS

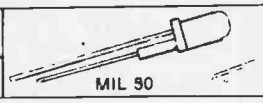
SWITCH AND CHOPPER

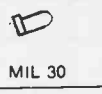
TYPE NO.	BV_{GSS} min	I_{DSS} min/max	Y fs min/max	VGS (off) max	PRICE EA.	TYPE NO.	BV GSS min	I_{DSS} min/max	rds (ON) max	ID (OFF) max	ton	t off	PRICE EA.
MEF 3819	25V	2.0/20.0mA	2000/6500	8.0V	$.45	MEF 4391	40V	50/150mA	30 ohms	0.10nA	20ns	35ns	$.65
HEF 4341	50V	3.0/9.0mA	2000/4000	6.0V	.52	HEF 4393	40V	5/30mA	100 ohms	0.1nA	20ns	80ns	.60

PROGRAMMABLE UNIJUNCTIONAL TRANSISTORS

TYPE NO.	IA max	BV KAD min	VT max	IP max	IV max	PRICE EA.
2N6027	20mA	40V	1.6V	200nA	70uA	$.75
2N6028	20mA	40V	0.6V	1500nA	25uA	.80

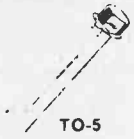
RED LED





	PRICE EA.
MIL50, 30 Hardware	$.29
MIC 51	.08
MIC 31	.10

PACKAGES



RECTIFIERS

1.0 AMP SILICON RECTIFIER DIODE

TYPE NO.	VRRM Volts	IFSM Amps	IO Amps	PACKAGE	PRICE EA.	TYPE NO.	VRRM Volts	IFSM Amps	IC Amps	PACKAGE	PRICE EA.
IN4002	100	35	1.0@75°C		$.15	IN5401	100	200	3.0@50°C		$.29
IN4003	200	35	1.0@75°C		.16	IN5402	200	200	3.0@50°C		.31
IN4004	400	35	1.0@75°C		.20	IN5404	400	200	3.0@50°C		.36

BRIDGE RECTIFIERS

TYPE NO.	V RRM Volts	V rms Volts	I FRM Amps	IO r Load Amps	PRICE EA.	OUTLINE
WO 02	200	140	15	1.5	$ .82	WO
WO 04	400	140	15	1.5	.95	
F 01	100	70	40	5.0	$1.95	F
F 02	200	140	40	5.0	2.15	
K 01	100	70	60	25	$7.50	K
K 02	200	140	60	25	8.95	

Prices Subject to Change Without Notice.

POWER SUPPLY KITS FOR ILP AMPLIFIERS

ALL POWER SUPPLIES ARE FOR STEREO APPLICATIONS EXCEPT THE HY-120K.

THE HY-5 PRE-AMP WILL WORK WITH ALL POWER SUPPLIES.

USE FOR	POWER TRANSFORMER	FILTER CAPACITOR UF	BRIDGE RECTIFIER	COMPLETE KIT
HY 50	HY 50T 36 VCT 3A 19.95	2 x 7000 50V 4.95	BR 3A1 3A 100V 1.95	HY50K 26.85
HY 120	HY 120T 50VCT 2A 18.95	2 x 7000 50V 4.95	BR 3A1 3A 100V 1.95	HY120K 25.85
HY 200	HY 200T 64VCT 4A 29.95	2 x 7000 50V 4.95	BR 4A1 4A 100V 5.95	HY200K 39.95
HY 400	HY400T 64VCT 8A 44.95	2 x 7000 50V 4.95	BR 8A1 8A 100V 7.95	HY400K 54.95

- 5% DISCOUNT ON ALL COMPLETE MONO SYSTEMS
- 10% DISCOUNT ON ALL COMPLETE STEREO SYSTEMS

Integrated Circuits

TTL IC'S

SN7400	.69
SN7401	.69
SN7402	.30
SN7403	.69
SN7404	.69
SN7405	.69
SN7406	.89
SN7407	.89
SN7408	.89
SN7409	.89
SN7411	.89
SN7412	.99
SN7413	.99
SN7420	.69
SN7423	.69
SN7425	1.39
SN7426	.69
SN7427	.69
SN7430	.69
SN7442	2.99
SN7446	1.99
SN7447	1.99
SN7448	1.79
SN7460	.69
SN7472	.40
SN7474	1.50
SN7475	.89
SN7476	1.60
SN7486	.89
SN7490	2.30
SN7491	.89
SN7492	.99
SN7493	.89
SN74100	2.99
SN74121	.45
SN74125	1.20
SN74141	1.99
SN74150	1.79
SN74151	2.95
SN74154	2.95
SN74160	1.49
SN74164	1.49
SN74177	3.95
SN74190	1.50
SN74193	1.40

LINEAR

LM301	1.10
LM311	1.95
LM339	2.25
LM555	.79
LM556	1.89
LM741	.79
LM747	1.95
LM748	1.69
LM709	1.50
LM1458	2.25
LM4136	2.50
LM3900	2.25

CMOS IC'S
(PRIME STOCK)

CD4000	.45
CD4001	1.00
CD4002	.70
CD4006	1.95
CD4007	.45
CD4008	3.95
CD4011	1.15
CD4013	1.79
CD4014	2.95
CD4015	2.25
CD4016	.65
CD4017	3.95
CD4018	2.95
CD4020	4.95
CD4021	3.95
CD4024	1.00
CD4025	.95
CD4027	.70
CD4028	1.40
CD4029	3.95
CD4030	1.35
CD4033	1.50
CD4037	.50
CD4040	2.70
CD4041	4.95
CD4043	1.70

Terminal Strips

1 Terminal..... 2¢
2 Terminal..... 4¢
3 Terminal..... 6¢
4 Terminal..... 8¢
5 Terminal.....10¢
6 Terminal.....12¢
7 Terminal.....14¢
8 Terminal.....16¢
9 Terminal.....18¢
10Terminal.....20¢
11Terminal.....22¢

SCREW TERMINAL STRIPS

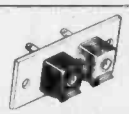
TERMINAL BOARD. High insulation bakelite with twin screw terminals. Standard replacement for most TV sets, and many other applications.

2 SCREW TERMINAL.....15¢
3 SCREW TERMINAL.....20¢
4 SCREW TERMINAL.....25¢

FLEXIBLE TERMINAL BLOCKS

99¢

FLEXIBLE TERMINAL BLOCKS WILL CONFORM TO IRREGULAR SURFACE AND CAN BE EASILY CUT TO SIZE. LONG LEAKAGE PATHS ARE PROVIDED BY THE MOULDED POLYETHELENE INSULATION. BOLTS AND SLEEVES ARE OF BRASS WHICH HAS BEEN NICKEL PLATED.



2 TERMINAL..$ .75
4 TERMINAL..$1.50
8 TERMINAL..$2.95

5136. **SPEAKER TERMINALS.** Spring loaded, push-button terminals mounted on bakelite strip for positive and instant connect/disconnect.

PANEL LIGHTS

120V PANEL LAMP
JJ-10027R — Red
JJ-10027A — Amber
Built in resistor for 120VAC
Head diameter ½"

$1.19

$1.49 EA

PANEL LAMP FOR BAYONET BASE LAMPS
JJ-10018 — Red Dome
JJ-10019 — Green Dome
JJ-10020 — Amber Dome

MINIATURE DELAY RELAY

$1.98

AMPERITE 6 VOLT 60 SECONDS

ILP ELECTRONICS LTD

High Power
Ultra Low Distortion
Amplifier Modules

UP TO 240 Watts!

HY5
Preamplifier
$21.99

The HY5 is a mono hybrid amplifier ideally suited for all applications. All common input functions (mag Cartridge, tuner, etc) are catered for internally, the desired function is achieved either by a multi-way switch or direct connection to the appropriate pins. The internal volume and tone circuits merely require connecting to external potentiometers (not included). The HY5 is compatible with all I L P power amplifiers and power supplies. To ease construction and mounting a P C connector is supplied with each pre-amplifier.

FEATURES: Complete pre-amplifier in single pack — Multi function equalization — Low noise — Low distortion — High overload — Two simply combined for stereo

APPLICATIONS: Hi-Fi — Mixers — Disco — Guitar and Organ — Public address

SPECIFICATIONS:

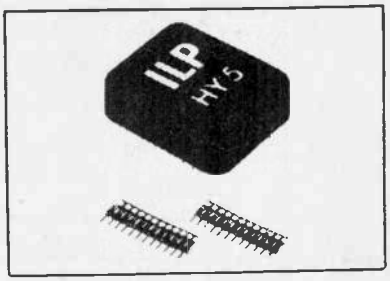
INPUTS Magnetic Pick-up 3mV Ceramic Pick-up 30mV. Tuner 100mV Microphone 10mV Auxiliary 3-100mV, input impedance 47kΩ at 1kHz

OUTPUTS Tape 100mV, Main output 500mV R M S

ACTIVE TONE CONTROLS Treble ± 12dB at 10kHz, Bass ± at 100Hz

DISTORTION 0.05% at 1kHz Signal/Noise Ratio 68dB.

OVERLOAD 38dB on Magnetic Pick-up SUPPLY VOLTAGE ± 16-50V



HY50
25 Watts into 8Ω
$28.95

The HY50 leads I L P 's total integration approach to power amplifier design. The amplifier features an integral heatsink together with the simplicity of no external components. During the past three years the amplifier has been refined to the extent that it must be one of the most reliable and robust High Fidelity modules in the World.

FEATURES: Low Distortion — Integral Heatsink — Only five connections — 7 Amp output transistors — No external components

APPLICATIONS: Medium Power Hi-Fi systems — Low power disco — Guitar amplifier

SPECIFICATIONS: INPUT SENSITIVITY 500mV

OUTPUT POWER 25W RMS into 8Ω LOAD IMPEDANCE 4-16Ω DISTORTION 0.04% at 25W at 1kHz

SIGNAL/NOISE RATIO 75dB FREQUENCY RESPONSE 10Hz-45kHz-3dB

SUPPLY VOLTAGE ± 25V SIZE 105 50 25mm

HY120
60 Watts into 8Ω
$57.50

The HY120 is the baby of I L P 's new high power range designed to meet the most exacting requirements including load line and thermal protection this amplifier sets a new standard in modular design.

FEATURES: Very low distortion — Integral heatsink — Load line protection — Thermal protection — Five connections — No external components

APPLICATIONS: Hi-Fi — High quality disco — Public address — Monitor amplifier — Guitar and organ

SPECIFICATIONS

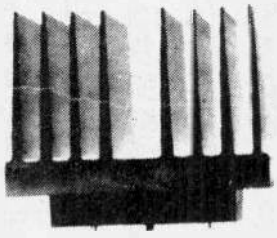
INPUT SENSITIVITY 500mV

OUTPUT POWER 60W RMS into 8Ω LOAD IMPEDANCE 4-16Ω DISTORTION 0.04% at 60W at 1kHz

SIGNAL/NOISE RATIO 90dB FREQUENCY RESPONSE 10Hz-45kHz -3dB SUPPLY VOLTAGE ± 35V

SIZE 114 50 85mm

HY120 HY200 HY400



Fully protected against:—
- short circuit
- open circuit

and
- thermal shutoff

HY200
120 Watts into 8Ω
$79.50

The HY200 now improved to give an output of 120 Watts has been designed to stand the most rugged conditions such as disco or group while still retaining true Hi-Fi performance.

FEATURES: Thermal shutdown — Very low distortion — Load line protection — Integral heatsink — No external components

APPLICATIONS: Hi-Fi — Disco — Monitor — Power slave — Industrial — Public Address

SPECIFICATIONS

INPUT SENSITIVITY 500mV

OUTPUT POWER 120W RMS into 8Ω LOAD IMPEDANCE 4-16Ω DISTORTION 0.05% at 100W at 1kHz

SIGNAL/NOISE RATIO 96 dB FREQUENCY RESPONSE 10Hz-45kHz — 3dB SUPPLY VOLTAGE - 45V

SIZE 114 100 85mm

HY400
240 Watts into 4Ω
$99.50

The HY400 is I L P 's 'Big Daddy' of the range producing 240W into 4Ω. It has been designed for high power disco or public address applications. If the amplifier is to be used at continuous high power levels a cooling fan is recommended. The amplifier includes all the qualities of the rest of the family to lead the market as a true high power hi-fidelity power module.

FEATURES: Thermal shutdown — Very low distortion — Load line protection — No external components

APPLICATIONS: Public address — Disco — Power slave — Industrial

SPECIFICATIONS

OUTPUT POWER 240W RMS into 4Ω LOAD IMPEDANCE 4-16Ω DISTORTION 0.1% at 240W at 1kHz

SIGNAL/NOISE RATIO 94dB FREQUENCY RESPONSE 10Hz-45kHz - 3dB SUPPLY VOLTAGE - 45V

INPUT SENSITIVITY 500mV SIZE 114x100x85mm

DOMINION RADIO & ELECTRONICS COMPANY

A Division of DREECO Electronics Limited

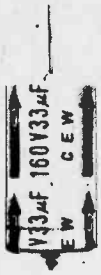
NEW! 5 YEAR GUARANTEE

Prices Subject to Change Without Notice.

ELNA

ELECTROLYTIC AND TANTALUM CAPACITORS

AXIAL LEAD

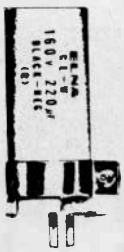


uf C \ wv (sv)	16 (20)	25 /32)	50 (63)	80 (100)
1			.25	
2.2			.25	
3.3			.25	
4.7			.25	
10	.25	.25	.30	.35
22	.30	.30	.35	.40
33	.30	.35	.30	.40
47	.35	.35	.30	.40
100	.35	.40	.50	.60
220	.35	.40	.60	.70
330	.40	.50	.70	
470	.45	.60	.80	1.00
1000	.60	.70	1.00	1.25
2200	.75	1.00		
3300	1.00	1.35		
4700	1.55	1.80		

RADIAL LEAD

uf C \ wv (sv)	16 (20)	25 (32)	50 (63)	80 (100)
1			.25	
2.2			.25	
3.3			.25	
4.7		.25	.25	
10	.25	.25	.25	.30
22	.25	.25	.25	.30
33	.25	.25	.30	.30
47	.25	.30	.35	.40
100	.30	.30	.35	.40
220	.30	.35	.45	.60
330	.35	.40	.60	
470	.40	.50	.85	
1000	.60	.75		
2200	.90			

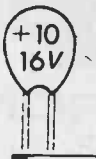
POWER SUPPLY TYPE



uf C \ wv (sv)	16 (20)	25 (32)	50 (63)	100 (125)
2200		3.75	5.00	8.80
3300	3.75	4.85	6.30	11.70
4700	4.15	5.25	7.40	14.40
6800	5.25	6.30	9.40	21.60
10000	6.65	7.25	13.50	
15000	7.50	9.80	21.60	
22000	9.20	13.50		
33000	13.50			
47000	15.30			

PRICE INCLUDES MOUNTING CLAMPS

DIPPED SOLID TANTALUM



Capacitance Tolerance -20 +20%

DC Leakage Current(uA) 0.02 or 1.0

uf C \ wv (sv)	16 (20)	25 (32)	35 (46)
0.22			.40
0.33			.40
0.47			.40
0.68			.40
1.0			.40
1.5			.40
2.2			.40
3.3			.40
4.7	.40		.45
6.8	.40		.45
10	.50	.55	.60
15	.55	.60	.95
22	.60	.75	1.56
33	.75	1.20	2.40
47	1.50	2.40	
68	2.40		
100	3.00		

ATTENTION !

SAVE MONEY ON VOLUME BUYS

RADIAL & AXIAL LEAD ELECTROLYTIC CAPACITORS

100 of each value - LESS 10 %
1000 mixed values - LESS 15 %
1000 of each value - LESS 20 %

POWER SUPPLY CAPACITORS

25 of each value - LESS 10 %
100 mixed values - LESS 15 %
100 of each value - LESS 20 %

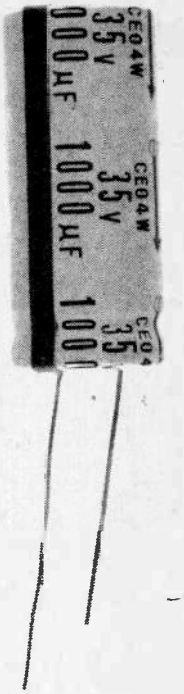
TANTALUM CAPACITORS

50 of each value - LESS 10 %
100 mixed values - LESS 15 %
100 of each value - LESS 20 %

ALL ABOVE ARE PER UNIT PRICES

RPE Series

Uni-Directional Leads Aluminum Electrolytic Capacitors (Type RPE)



Upgraded in Characteristics, with New Reduced Case Sizes

The RPE Series of capacitors are much smaller than the conventional industry standard series, and lighter too. Also upgraded in characteristics, RPE capacitors can be used for a wider range of applications.

The series also includes models which used to be available only with lug terminals.

FEATURES:

- New reduced base sizes.
- Now offering a capacitance range to 22,000 *u*F.
- Standard capacitance tolerance of ±20%.
- Leakage current reduced to less than 0.02 CV or 3 mA.
- Dissipation factor reduced 20 or 30%.

NEW!

RANGES OF RPE SERIES

Rated Voltage	6.3~100V DC
Capacitance	470~22,000μF
Dimensions	φ22.4x25 φ30x50 (φ30x63)
Standards	JIS C 5141-1976 Characteristics W

V / μF	16	price	35	price	63	price	100	price
470	—	—	—	—	—	—	.88x1.22 22.4x31.5	$4.40
1,000	—	—	—	—	.88x1.22 22.4x31.5	$2.50	.99x1.57 25x40	$4.90
2,200	—	—	.88x1.22 22.4x31.5	$2.80	.99x1.57 25x40	$3.50	1.18x1.97 30x50	$5.90
3,300	.88x1.22 22.4x31.5	$2.50	.88x1.57 22.4x40	$3.50	.99x1.97 25x50	$4.30	—	—
4,700	.88x1.22 22.4x31.5	$2.90	.99x1.57 25x40	$3.90	1.18x1.97 30x50	$5.20	—	—
6,800	.88x1.57 22 4x40	$3.50	.99x1.97 25x50	$4.30	—	—	—	—
10,000	.99x1.57 25x40	$4.40	1.18x2.48 30x63	$4.90	—	—	—	—
15,000	1.18x1.97 30x50	$4.90	—	—	—	—	—	—
22,000	1.18x2.48 30x63	$5.90	—	—	—	—	—	—

NEW!

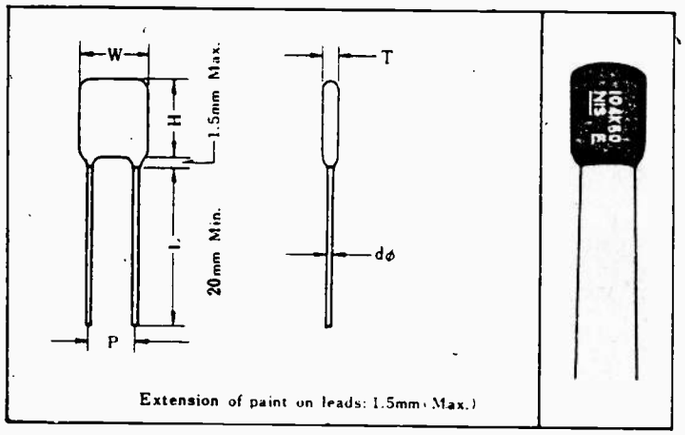
Prices Subject to Change Without Notice.

TYPE AMS

NISSEI

POLYESTER FILM CAPACITORS

Epoxy dipped
(GREEN)



Characteristics

Operating temperature range	−40° ~ +85°C
Rated voltage	100V.DC
Standard capacitance value	0.001μF~.22 μF
Standard capacitance tolerance	±10%
Insulation resistance	20,000MΩ Min.
Dissipation factor	1.0% Max.

Features

★Lead wire being electrically welded to the electrode, steady equal dissipation factor can be obtained.

★Completely protected against moisture by thorough coating of epoxy resin, done by fully automatic vacuum dipping machine.

★Highly reliable capacitors, produced by our special way and technique.

★Very light miniature type.

CAP uf	PRICE EA.	CAP uf	PRICE EA.	CAP uf	PRICE EA.
.0010	$ .15	.0068	$ .15	.047	$ .25
.0012	.15	.0082	.15	.056	.25
.0015	.15	.010	.15	.068	.25
.0018	.15	.012	.15	.082	.25
.0022	.15	.015	.15	.10	.25

CAP uf	PRICE EA.	CAP uf	PRICE EA.	CAP uf	PRICE EA.
.0027	.15	.018	.20	.12	.30
.0033	.15	.022	.20	.15	.35
.0039	.15	.027	.20	.18	.40
.0047	.15	.033	.20	.22	.45
.0056	.15	.039	.20		

NON-POLARIZED CAPACITORS

RADIAL LEAD

1 uf	63V	$ .39
2.2uf	63V	.49
3.3uf	63V	.49
4.7uf	63V	.59
6.8uf	63V	.59
10 uf	63V	.69
15 uf	63V	.79
22 uf	63V	.89

AXIAL LEAD

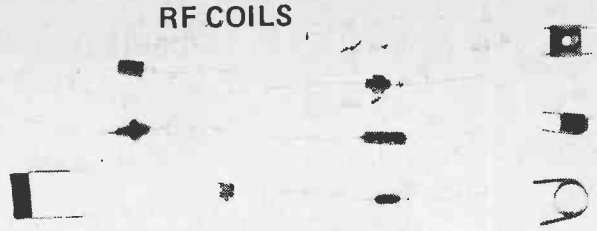
1uf	50V	$ .39
2.2uf	50V	.49
3.3uf	50V	.49
4.7uf	50V	.59
6uf	50V	.59
8uf	50V	.69
10uf	50V	.69
12uf	50V	.79
16uf	50V	.79
22uf	50V	.89
25uf	50V	.89
33uf	50V	.99

TRIMMER CAPACITORS

SINGLES
0-100pf 25c
5-75 pf 25c
5-80 pf 25c
7-85 pf 25c
20-130 pf. 25c
40-300 pf. 25c
0-50 pf
AIR TYPE. 79c

DUALS
0-100 pf 0-200 pf . . . 35c
6-220 pf 6-220 pf . . . 35c
15-120 pf 15-120 pf . . 35c
20-200 pf 200 pf 35c
20-130 pf 30-200 pf . . 35c
350-500 pf 75-110 pf. . 35c

RF COILS



0.25uh 25c
0.37uh 25c
0.52uh 25c
0.7uh 25c
0.83uh 25c
0.9uh 25c

2.0uh 25c
4.25uh 25c
6.8uh 25c

10.0uh 25c
20.0uh 25c
27.0uh 25c

30.0uh 25c
40.0uh 25c
50.0uh 25c
100.0uh. 25c
180.0uh. 25c
225.0uh. 25c

TWIST PRONG CAPACITORS

470 uf-150V
470 uf-150V **$1.25**

800 uf-200V **$2.50**

400 uf-350V **$2.50**

200 uf-175V
60 uf-175V
60 uf-175V
500 uf-40V **$3.50**

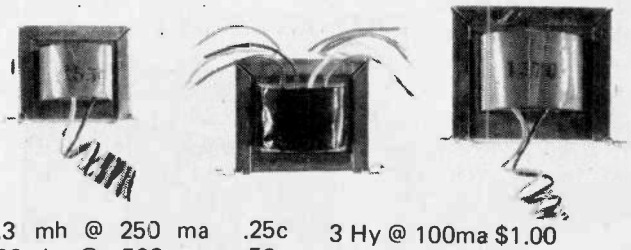
250 uf-75V
250 uf-75V
1000 uf-40V **$3.50**

1000 uf-35V
1000 uf-35V
2000 uf-35V **$3.95**

250 uf-35V
250 uf-35V
4000 uf-35V **$4.50**

1000 uf-50V
500 uf-50V
1000 uf-35V
1000 uf-35V **$3.50**

FILTER CHOKES



3.3 mh @ 250 ma .25c
500mh @ 500ma .50c
700mh @ 500ma .50c
750mh @ 250ma .50c
1Hy @ 250ma 1.00
2.2Hy @ 100ma 1.00

3 Hy @ 100ma $1.00
3.5 Hy @ 100ma $1.00
4 Hy @ 100ma $1.00
25 Hy @ 100ma $1.00
50 Hy @ 50ma $1.00

SURPLUS DEAL

PHILIPS AXIAL LEAD ELECTROLYTICS

3.3 uF–25V	15c	100uF–63V	25c
10uF–6V	15c	125uF–16V	20c
15uF–16V	15c	150uF–16V	20c
65uF–3V	15c	150uF–63V	25c
68uF–63V	25c		

BUY 10 OF 1 TYPE – GET 2 FREE

COMPUTER GRADE
SURPLUS
7000uF @ 50V
MADE BY PYE

$4.95

DISC CERAMICS

10¢ ea.

3	500v	13.5	500v	30	500v	47	1Kv	70	500v	120	6Kv				
3.3	500v	15	500v	33	500v	47	2Kv	80	500v	121	500v	370	500v		
5.6	500v	17	500v	33	500v	51	6Kv	82	100v	127	500v	390	1.5Kv		
6	500v	18	500v	33	1Kv	56	500v	82	1Kv	130	4Kv	660	500v		
6.8	500v	18	2Kv	39	5Kv	56	2.5Kv	82	6Kv	135	500v	680	500v		
6.8	3Kv	20	6Kv	39	500v	58	200v	91	500v	150	500v	882	500v		
7	500v	22	500v	39	2Kv	62	500v	91	500v	160	500v	1000	200v		
8	500v	22	500v	39	3Kv	68	500v	95	3Kv	170	100v	1200	500v		
8.2	500v	24	1Kv	40	6Kv	68	500v	100	500v	180	200v	2200	200v		
9	500v	27	500v	43	500v	68	500v	100	1.4Kv	200	500v	2200	500v		
10	500v	27	200v	47	500v	68	1Kv	110	4Kv	210	500v	2500	500v		
12	500v	27	500v	47	100v	68	3Kv	110	6Kv	320	500v	3900	500v		
13	500v	29	5Kv	47	500v	68	4Kv	120	5Kv	330	2.5Kv	.005	500v		

Prices Subject to Change Without Notice.

PRECISION-METAL-FILM RESISTORS

± 100 ppm/°C 1%
Equivalent to MIL-R-22684B Type MFS

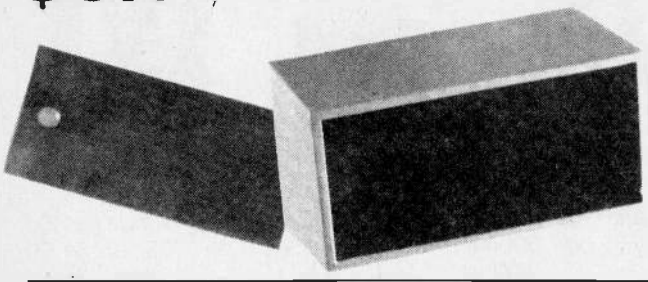
39¢

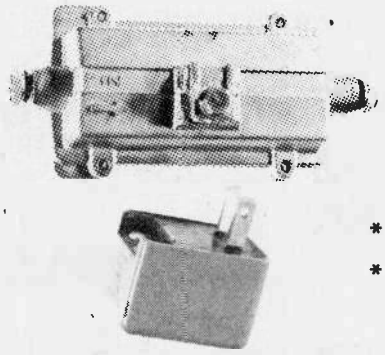
* High stability
* Low Noise
* Excellent Temperature Coefficient
* ¼ watt

47	150	430	820	2.2k	5.6k	15k	43k	100k	330k
56	180	470	910	2.7k	6.2k	18k	47k	120k	390k
68	220	510	1k	3.3k	6.8k	22k	56k	150k	430k
82	270	560	1.2k	3.9k	8.2k	27k	62k	180k	470k
100	330	620	1.5k	4.3k	10k	33k	68k	220k	500k
120	390	680	1.8k	4.7k	12k	39k	82k	270k	

CLOCK MODULE BOX

$6.95 *BRUSHED ALUMINUM FINISH
*DIFFUSED BEZEL





$14.95

* 75 ohm
* Complete with AC Power Supply

PIHER SLIDER CONTROLS

60mm Travel

Available in
10 K ohms
50 K ohms
100 K ohms
log or linear taper
Matching Knob

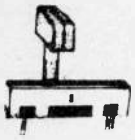
$2.95 ea.

59¢ ea

INDUCTION PICK UP COIL

$1.39

Just snaps over mouth piece!



jana CONTROLS

MODEL		TRAVEL
JJ-10006	- 10K	30mm
JJ-10006B	- 100K	30mm
JJ-10006C	- 500K	30mm
JJ-10006D	- 1 MEG	30mm

$1.49 EA

Available in log taper only.

JJ-10007	10K	45mm
JJ-10007A	- 50K	45mm
JJ-10007B	- 100K	45mm
JJ-10007C	- 500K	45mm
JJ-10007D	- 1 MEG	45mm

$1.89 EA

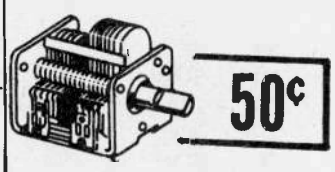
ZENON STROBE

$39.95

The longest lasting, most dependable strobe ever developed.

We unconditionally guarantee everything including flash-tube for 6 months. (And we're the only ones to do so!).

No-drift feature controls flash-rate up to 10 flashes per second.



50¢

2 GANG SUPERHET VARIABLE CONDENSER

Antenna Section 350 PF
Oscillator Section 125 PF,
w/trimmer
Counter-Clockwise Rotation

THE HOME OF RADIO & ELECTRONIC SUPPLIES

DOMINION RADIO & ELECTRONICS COMPANY

A Division of DREECO Electronics Limited

controls

SINGLE CONTROLS
100
360
470
500
750
1K
2K
5K
10K
20K
25K
50K
200K
1Meg
2Meg

DUAL CONTROLS	
Front	Rear
200	5K
500	5K
5K	500
5K	5K
10K	500
10K	5K
15K	250K
20K	200
20K	20K
20K	200K
47K	47K
50K	500
100K	500
200K	200K
250K	15K
500K	500

Front	Rear
650K	750K
1M	200
1M	500
1M	50K
1M	500K
1M	1M
2M	250
2M	50K
2M	2M

SINGLE w/Sw.
500 ohm
10K ohm
50K ohm

TRIPLE CONTROLS		
200	10K	10K
10K	10K	500
500K	5M	500
1M	1M	1M

DUAL w/Sw.	
50K	10K
50K	500K
300K	100K
1M	500K
1M	3M
5M	1.5M

TRIMMER POTS
100
220
470
1K
2.5K
5K
10K
20K
50K
100K
500K
1Meg

CONTROL PRICES

Trim Pots. . . . . 39¢ ea.
Singles. . . . . 49¢ ea.
Single with switch . . . . . 59¢ ea.
Duals . . . . . 69¢ ea.
Dual with switch . . . . . 79¢ ea.
Triples. . . . . 69¢ ea.

¼ WATT

We have a full line of ½ watt resistors that are mostly 5% tolerance.

Cost per unit . . . . . 3½¢ ea.
Cost per 100 of type $3.20
Cost per 1000 of type $30.00

RESISTORS

EMITTER RESISTORS

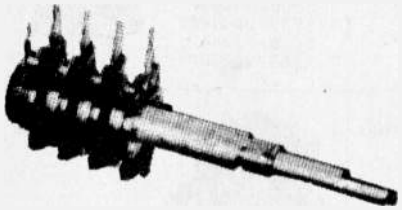
.47 ohms	2 Watt. . . . . 59¢ ea.
1.0 ohm	2 Watt. . . . . 49¢ ea.
.39 ohms	3 Watt. . . . . 59¢ ea.
1.5 ohms	3 Watt. . . . . 59¢ ea.
.2 ohms	5 Watt. . . . . 59¢ ea.
3.3 ohms	5 Watt. . . . . 49¢ ea.

½ WATT

We have a full line of ¼ watt resistors that are mostly 5% tolerance.

Cost per unit . . . . . .3½¢ ea.
Cost per 100 of type $3.20
Cost per 1000 of type $30.00

4 SECTION CONTROLS



Your Choice
20 M
25 k
100 K

$1.39 ea.

1W
3.3
10
33
56
82
100
220
270
330
390
470
560
680
1.5k
2.7k

3.9k
4.7k
5.1k
5.6k
7.5k
8.2k
12k
15k
16k
18k
20k
22k
27k
33k
39k
47k

56k
68k
150k
180k
390k
820k
1Meg
1.2Meg

1.5Meg
1.8Meg
2.2Meg
2.7Meg
4.7Meg
5.6Meg
15Meg

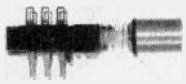
2W
33
39
47
82
100
180
270
330
560
680
820
1k
1.5k
1.8k
2.2k
2.7k

3.3k
4.7k
5.6k
6.2k
6.8k
8.2k
13k
15k
16k
18k
22k
33k
82k
820k
1.8Meg
2.7Meg
4.7Meg

1 & 2 WATT PRICES

Cost per unit 05
Cost per 100 of type . . .4.50
Cost per 1000 of type .41.00

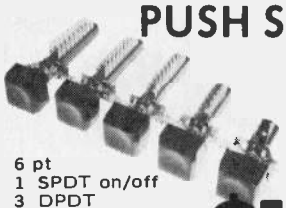
SWITCHES



DPDT Momentary Switch

.69

5 SECTION
PUSH SWITCH

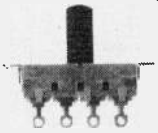


6 pt
1 SPDT on/off
3 DPDT
WITH KNOBS

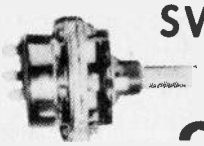
$1.95

DP3pos Slide Switch

.49

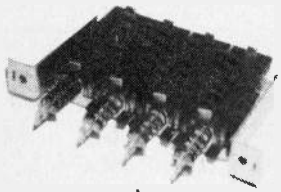


3 POSITION – 2 POLE
ROTARY SWITCH



35¢

4 SECTION
PUSH SWITCH



95¢

MINI MICRO SWITCH

.79

SPST Illuminated Slide Switch **1.49**

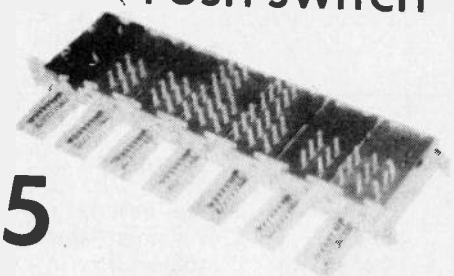
110 VAC lamp

2 POSITION – 2 POLE
ROTARY SWITCH

25¢

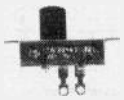
7 SECTION
PUSH SWITCH

1 DPST on/off
1 DPDT
1 DPDT
1 5PDT
1 5PDT
1 DPDT
1 3PDT



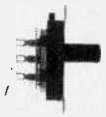
$1.75

SPST spring return slide switch



normally open

.35



.35

SPDT SLIDE SWITCH

Standard Micro Switch

NO or NC

$.99

Push–push Switches

SPST $1.49
SPDT $1.59
DPDT $1.69

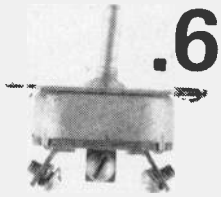
3 POSITION

ROTARY SWITCH

25¢

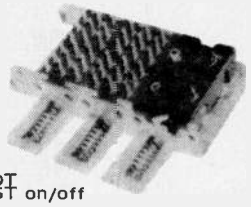
HEAVY DUTY
SPDT C/O Toggle Switch

spring return, 1 way to center



.69

75¢ 3 SECTION **PUSH SWITCH**



2 6PDT
1 DPST on/off

ROTARY SWITCHES

¼" D, 1¼" long shaft. Ideal for audio projects.

$1.89

5201. 11posSP
5202. 12posSP
5203. 5pos2P
5204. 6pos2P
5205 3pos3P
5206. 4pos3P
5207. 2pos4P
5208. 3pos4P
5209. 2pos6P

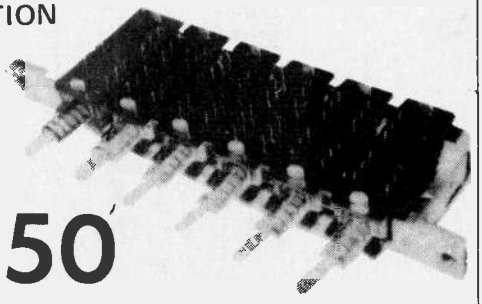
LIGHTED RESET SWITCH

$1.50

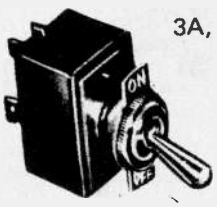
DPST
BULB NOT INCLUDED

PUSH SWITCH
6 SECTION

1 DPDT on/off switch
5 4PDT



$1.50



3A, 125VAC

TOGGLE SWITCHES

SPST $1.39
DPDT $1.59
DPDTc/o $1.99

Miniature Switches

SPDT TOGGLE SWITCH

$2.95

* 90 degree PC mount
* 2 amp 125 VAC
* PC terminals
* mfg by JBT

SPDT CENTRE OFF TOGGLE SWITCH

$3.49

*spring return jn one direction only
* 5 amp 125 VAC
* solder terminals
* mfg by JBT

DPDT TOGGLE SWITCH

$3.75

* 6 amp 125 volt
* solder terminals
* mfg by C H

DPDT CENTRE OFF TOGGLE SWITCH

$3.75

* 5 amp 125 volt
* solder terminals
* mfg by C&K

DPDT CENTRE OFF TOGGLE SWITCH

$3.75

* spring return to centre in one direction only
* 5 amp 125VAC
* solder terminals
* mfg by JBT

DPDT SPRING RETURN BAT HANDLE TOGGLE SWITCH

*5 amp 125 volts
* solder terminals
* mfg by JBT

$3.95

DPDT CENTRE OFF SPRING RETURN BAT HANDLE TOGGLE SWITCH

$3.95

* 5 amp 125VAC
*spring return to centre in both directions
* solder terminals
* mfg by JBT

3PDT BAT HANDLE TOGGLE SWITCH

$5.95

* amp 125VAC
* solder terminals
*mfg by JBT

DOMINION SPECIAL

THIS SPECIAL PURCHASE OF HIGH QUALITY PRECISION SWITCHES(MOSTLY US MADE) WILL NOT LAST VERY LONG ONLY 10,000 PIECES AVAILABLE ALTOGETHER, SO HURRY AND FILL UP YOUR STOCK BINS NOW. THIS NUMBER OF SWITCHES NORMALLY LASTS FOR ONLY TWO MONTHS.

3PDT TOGGLE SWITCH

$5.95

* 5 amp 125 volts
* solder terminals
* mfg by C&K

3PDT CENTRE OFF SPRING RETURN TOGGLE SWITCH

* spring return to centre in both positions
* 5 amp 125VAC
* solder terminals
*mfg by JBT

$5.95

3PDT CENTRE OFF TOGGLE SWITCH

$5.95

* spring return to centre in one direction only
* 5 amp 125 volts
* solder terminals
*mfg by C&K

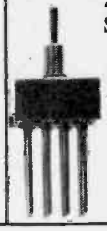
4PDT TOGGLE SWITCH

$6.95

* 5 amp 125VAC
* solder terminals
* mfg by JBT

4PDT CENTRE OFF TOGGLE SWITCH

$6.95

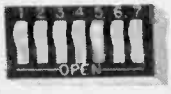


* 6 amp 125VAC
* gold PC leads
* mfg by C H

DIP SWITCHES

4 X SPST SLIDE	$2.50
5 X SPST SLIDE	$2.75
6 X SPST SLIDE	$3.00
7 X SPST SLIDE	$3.25
8 X SPST SLIDE	$3.50
9 X SPST SLIDE	$3.75

7 X SPST ROCKER DIP SWITCH



$1.95

LIMITED SUPPLY

SUPER SPECIALS

SPST GLASS REED SWITCH COMPLETE WITH MAGNET

89¢ each

Wire and Cable

SPEAKER WIRE

22 GAUGE
AVAILABLE IN BEIGE,GREY,CLEAR
500 ft spool $12.50
3 cents per foot

NEW
14 GAUGE
CLEAR ONLY
500 ft spool $85.00
20 cents per foot

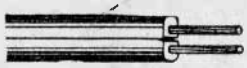
NEW
12 GAUGE
CLEAR ONLY
500 ft spool $125.00
30 cents per foot

ALL SPEAKER WIRE IS POLARIZED

TRY OUR NEW 12 AND 14 GAUGE WIRE FOR RUNNING YOUR HIGH POWER AMP WITH LESS LOSS!

PARALLEL LAMP CORD

Colors: Black, Brown, White.



18 GAUGE
CSA APPROVED

6
cents per foot
250 ft spool $12.50

SHIELDED WIRE

ONLY **10** cents per foot

QUANTITY PRICE

500 ft $30.00 1000 ft $45.00

HIGH QUALITY SHIELDED CABLE DESIGNED TO PROVIED NOISE FREE SERVICE FOR ALL MICROPHONE AND PA APPLICATION. SHEATHED IN GREY VINYL COVERING AND SPIRAL WRAP SHIELDING.
YOUR CHOICE 3mm or 4mm OUTER DIAMETER

CO-AXIAL CABLE

RG-58U
250 ft spool $25.00
50 ohm-ideal for CB
12 cents per foot

RG-59U
250 ft spool $25.00
75 ohm-ideal for TV
12 cents per foot

RG-8U
250 ft spool $62.50
50 ohm-ideal for HAM and CB
30 cents per foot

HOOK-UP WIRE

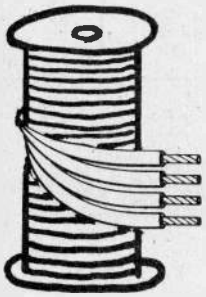
.75
per 100 foot Hank

$1.95 for 3 X 100ft

HOOK-UP WIRE COMES IN A VARIETY OF COLOURS AND COULD BE 20,22, OR 24 GAUGE STRANDED OR SOLID. JUST LET US KNOW WHAT YOU WANT AND WE WILL FILL IT AS CLOSELY AS POSSIBLE.

PLEASE NOTE: IN VIEW OF CANADA'S NEW METRIC CONVERSIONS, ALL WIRE AND CABLE WILL BE SHIPPED IN ITS METRIC EQUIVALENT IE 500 ft = 150 METERS

TV ROTOR WIRE



7
cents per foot
250 ft spool $15.00

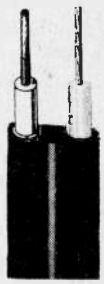
STANDARD 4 WIRE ROTOR WIRE WITH 1 CONDUCTOR POLARIZED FOR IDENTIFICATION

300 OHM TWIN LEAD

5
cents per foot
250 ft spool $10.00

STANDARD TWIN LEAD USED FOR TV SETS ETC

DELUXE 300 OHM POLYFOAM

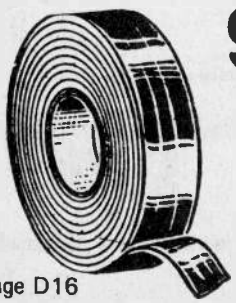


8
cents per foot

250 ft spool $17.50

DELUXE 300 OHM POLYFOAM WIRE USED IN TV INSTALLATION – LESS LOSS – WILL NOT CRACK IN COLD

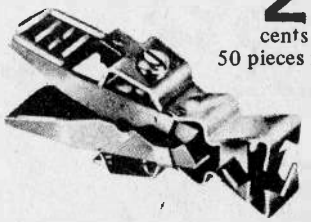
CSA TAPE



99 cents each

* 66 ft rolls
* LOW COST
* CSA AND UL APPROVED
* BLACK ONLY

TV QUICK CLIPS



22
cents each
50 pieces for $8.00

3 WAY - FOR QUICKLY ATTACHING AND DISCONNECTING ANTENNA WIRE TO BACK OF SET

HIGH VOLTAGE WIRE

6
cents per foot
100 ft spool $4.95

20 KV HIGH VOLTAGE WIRE SUITABLE FOR TV REPAIR ETC.

SPECTRO

Single Contact Bayonet Base

Volts	Amps. or Watts	Candle-power	Average Life	Bulb	Lamp No.	
2.4	.80	1.3	75	G-8	1491	.30
3.7	2.75	11.0	100	T-5	1874	4.80
5.0	.60	2.5	20	S-8	1651	.80
5.5	6.25	50.0	100	RP-11	1183	1.35
6.2	3.91	32.0	200	RP-11	1133	.60
6.4	2.63	21.0	200	S-8	1129	.40
6.4	2.69	21.0	200	S-8	1605	.25
6.5	1.02	6.0	500	G-6	81	.70
6.5	2.75	25.0	125	T-5	1489	3.65
6.7	1.90	15.0	500	S-8	1619	1.55
6.8	1.91	15.0	300	S-8	87	.40
7.0	.63	3.0	1000	G-6	63	.30
12.5	1.98	32.0	400	RP-11	1143	.80
12.5	3.0	50.0	300	RP-11	1195	1.55
12.8	1.04	15.0	500	S-8	93	.35
12.8	1.35	22.0	500	S-8	1161	.70
12.8	1.44	21.0	500	S-8	1141	.35
12.8	1.80	32.0	200	S-8	1073	.35
13.0	.58	6.0	750	G-6	89	.35
13.0	20 W.	—	300	R-12	1383	4.00
13.5	.59	4.0	L.L.	G-6	67	.35
28.0	.17	3.0	500	G-5	301	.65
28.0	.30	6.0	500	G-6	303	.70
28.0	.37	6.0	1000	G-6	623	.75
28.0	.51	15.0	300	S-8	305	.80
28.0	.67	21.0	300	S-8	307	.70
28.0	1.29	50.0	300	S-11	311	.85
28.0	20 W.	—	300	R-12	1385	5.95
34.0	.16	3.8	275	G-6	1223	1.35

Midget Flanged Base

Volts	Amps. or Watts	Candle-power	Average Life	Bulb	Lamp No.	
1.35	.06	.01	500	T-1¾	331	.60
2.7	.06	.04	6000	T-1¾	338	.75
6.0	.04	.03	10,000	T-1¾	345	.70
6.0	.20	.10	50,000	T-1¾	332	.85
6.0	.20	.34	1000	T-1¾	328	.65
6.3	.20	.40	50,000	T-1¾	381	.65
10.0	.014	.008	10,000	T-1¾	344	.75
14.0	.08	.50	750	T-1¾	330	.60
28.0	.04	.30	25,000	T-1¾	387	.60
28.0	.04	.34	1000	T-1¾	327	.60

Midget Grooved Base

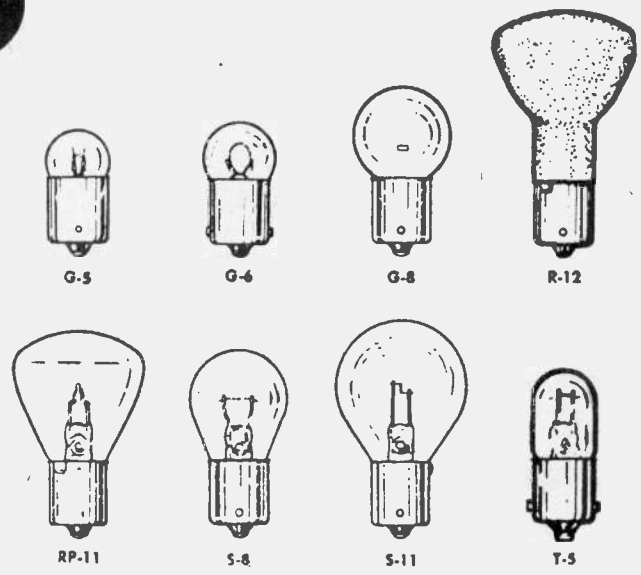
Volts	Amps. or Watts	Candle-power	Average Life	Bulb	Lamp No.	
2.5	.35	.21	10,000	TL-1¾	253	3.25
6.0	.20	.34	1000	T-1¾	337	.70
14.0	.08	.50	750	T-1¾	336	.75
28.0	.04	.34	1000	T-1¾	334	.65

Midget Screw Base

Volts	Amps. or Watts	Candle-power	Average Life	Bulb	Lamp No.	
2.5	.20			T-1¾	1767	.70
6.0	.04	.03	10,000	T-1¾	342	.85
6.0	.20	.34	1000	T-1¾	1768	.70
6.3	.075	.22	500	T-1¾	1775	.75
28.0	.04	.34	1000	T-1¾	333	.65

Sub-Midget Flanged Base

Volts	Amps. or Watts	Candle-power	Average Life	Bulb	Lamp No.	
5.0	.06	.029	100,000	T-1	682	1.05
5.0	.115	.132	40,000	T-1	718	1.25



Candelabra Screw Base Lamps

Volts	Amps. or Watts	Colour	Bulb	Lamp No.	
6	6 W.	Clear	S-6	656-6V	.70
12	6 W.	Clear	S-6	656-12V	.70
24	17 A.	Clear	T-4	1841	1.05
24	6 W.	Clear	S-6	656-24V	.70
32	6 W.	Clear	S-6	656-32V	.65
48	6 W.	Clear	S-6	656-48V	.65
60	6 W.	Clear	S-6	656-60V	.65
120	3 W.	Clear	S-6	356/5-120V	.65
120	6 W.	Clear	S-6	656-120V	.65
120	6 W.	White	S-6	656/W-120V	.65
120	6 W.	Red	S-6	656/R-120V	.65
120	7 W.	Clear	C-7	7C7-120V	.60
120	7 W.	White	C-7	7C7/W-120V	.65
120	10 W.	Clear	C-7	10C7-120V	.65
130	6 W.	Clear	S-6	656-130V	.65
145	6 W.	Clear	S-6	656-145V	.60
230	10 W.	Clear	S-6	1056/10-230V	1.20
250	10 W.	Clear	S-6	1056/10-250V	1.20

Telephone Slide Base

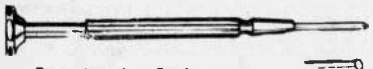
Volts	Amps. or Watts	End Ft. Can.	Average Life	Bulb	Lamp No.	
4.0	.19	850	L.L.	T-2	4A	.95
6.0	.14	900	L.L.	T-2	6A	1.00
6.0	.040	100	L.L.	T-2	6C	1.00
12.0	.035	200	L.L.	T-2	12B	1.00
12.0	.10	900	L.L.	T-2	12A	1.00
18.0	.040	500	L.L.	T-2	18A	1.00
24.0	.073	1900	L.L.	T-2	24C	1.00
24.0	.10	2200	L.L.	T-2	24D	1.00
24.0	.035	500	L.L.	T-2	24E	1.00
24.0	.035	500	L.L.	T-2(S)	24X	.95
35.0	.040	750	L.L.	T-2	35A	1.10
48.0	.10	3800	L.L.	T-2	48B	1.10
48.0	.035	700	L.L.	T-2	48C	1.15
48.0	.021	200	L.L.	T-2	48D	1.10
55.0	.053	2200	L.L.	T-2	55C	1.05
60.0	.050	2200	L.L.	T-2	60A	1.15
120.0	.025	1500	L.L.	T-2(S)	120PSB	1.30

Prices Subject to Change Without Notice.

PRECISION MINIATURE TOOL SETS

$4.95

PHILLIPS DRIVERS & ALLEN WRENCH SET.



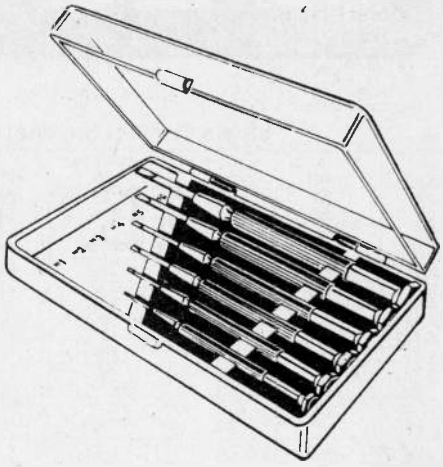
Popular size 5-piece set with two mini Phillips drivers and three mini Allen wrenches.

MINIATURE NUTDRIVER SET.

Five pieces: 5/64", 3/32", 7/64", 1/8", 5/32"

MINIATURE WRENCH SET.

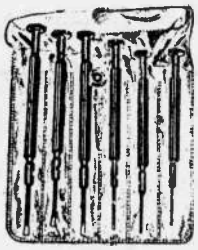
5-piece open end type. 1/8", 5/32", 3/16", 1/4", 5/16".



Top quality nickel plated and tempered blades are used in all models. Each set is packaged in a durable, clear plastic case.

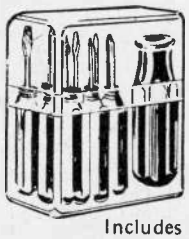
6-PIECE JEWELLER'S KIT. Finely crafted drivers of tempered steel with free-turning barrels. Includes transparent vinyl carrying case.

$3.95



$4.50

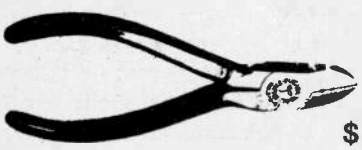
PROFESSIONAL TOOL KIT. Finest quality workmanship has been built into this miniature 6-piece kit. Swivel type jeweller's barrel is highly polished steel with precision chuck, blades are hardened and tempered carbon steel. Kit consists of three miniature drivers, one Phillips driver and one needle-nose awl. Permanent plastic stand with transparent top.



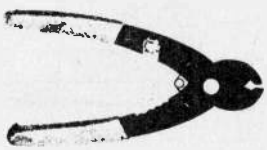
$2.25

Includes 3 standard drivers in small, medium and large sizes; 3 Phillips drivers; one special tool with awl tip; and one special tool with 'corkscrew' tip. All tools measure 3¾" long and have colour coded hex handles. Torque amplifier handle is 3" long. Complete with unbreakable plastic carrying case.

4" DIAGONAL SIDECUTTERS. Quality drop-forged steel with insul-grip handles.

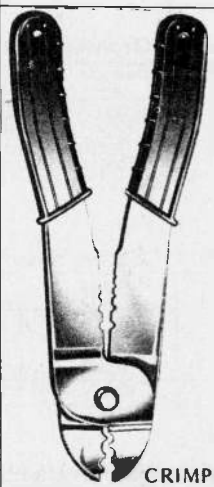


$4.95



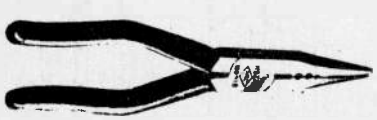
$4.95

Cuts or strips at any point. Tempered steel, insulated handles. Pawl lock for wire sizes 12 through 22.



$6.95

CRIMP/STRIP TOOL. Tempered steel with insulated handles, this handy tool will cut and strip all popular wire sizes from 10 to 22, and will crimp on solderless lugs. 7¼" length, assortment of lugs included.



$2.95

4" LONGNOSE PLIERS, with sidecutters. Drop-forged steel with tempered nose and cutting edges. Precision ground for close tolerance. Insul-grip handles.

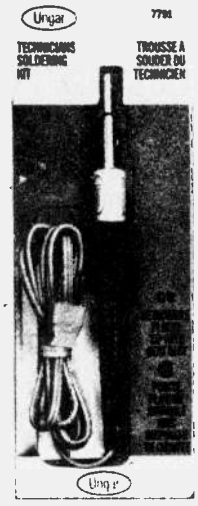
SOLDERING & DE-SOLDERING EQUIPMENT

27 Watt
Soldering Iron

$5.95

7365 is an excellent soldering iron for beginers and occasional hobbyists. A variety of replacement tips are available.

No.7365

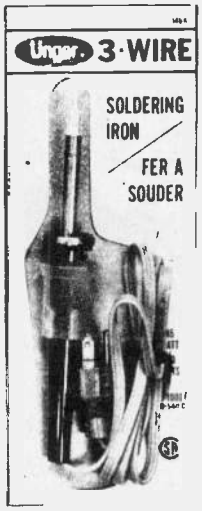


42 Watt
Soldering Iron
$9.95

$9.95

This sturdy iron is an excellent soldering iron for students and the more serious user. A variety of elements & tips are available.

No.7791



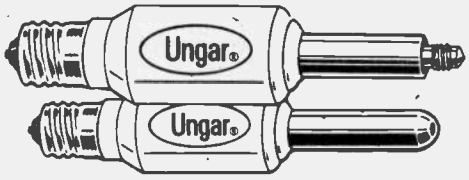
45 Watt
3 Wire
Soldering Iron

$14.95

The 145K is a high quality, 3 wire soldering iron that is a must for the professional. Tips & elements are available.

No.145K

THREAD-IN HEATING UNITS



FOR 7791 IRON

LOWER TEMPERATURE APPLICATIONS APPROX. 600°-650°F, 27W-120V.	INTERMEDIATE PERFORMANCE APPROX. 700°-750°F, 42W-120V..	HIGH PERFORMANCE APPROX. 800°-850°F, 50W-120V.
#7535, 1/8" unit for thread-in tips. 1.175"L, 312"D. For temperature sensitive areas. Uses lowest cost tips.	**#7235,** 1/8" unit for thread-in tips. 1.175"L, .375"D. Higher performance; uses lowest cost tips.	**#7435,** 1/8" unit for thread-in tips. 1.175"L, .375"D. For heavy loads and high rate soldering.
$4.59	$7.75	$9.49

TIPS FOR 7365/7791(IRON CLAD ONLY)

7151/PL331 $1.69
1"L Pencil, 1/8"D.

7153/PL333 $1.69
1"L Chisel, 1/8"D.

7154 $1.69
3/4"L Pencil, 1/8"D stepped to .068"D. Iron-clad, silver-pltd.

7155 $1.69
3/4"L Chisel, 1/8"D stepped to .068D. Iron-clad, silver-pltd.

#6943 for 8, 10 or 12 lead IC's in TO configuration. Tip temp. approx. 700°F at 18W — .600"D. $4.95

#6948 New Slotted Bar design melts solder on up to 16 pin dual in-line IC's simultaneously. Approx. 570°F at 18W. Iron-clad, nickel-plated, pre-tinned. $5.95

SLOTTED BAR FOR IN-LINE IC'S

TIPS FOR145K(IRON CLAD ONLY)

#PL-111 and #111 $2.56
Pencil, 3/4"L, 1/8"D.

#PL-113 and #113 $2.56
Chisel, 3/4"L, 1/8"D.

#PL-114 Micro-spade, $2.56
1/8"D stepped to .056"D.

#PL-133 and #133
Long Taper Chisel, $2.96
3/4"L, 5/16"D, 150"P.

NEW

#PL-138 Tapered Needle $2.56
3/4"L, 1/8"D.

#PL-151 Screwdriver $2.56
3/4"L, .130"D, .130"P.

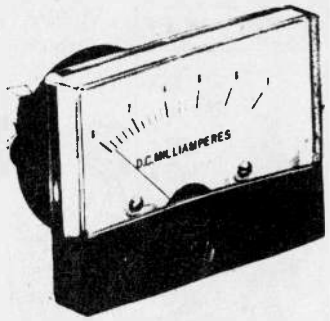
#PL-153 Chisel $2.56
5/8"L, 3/16"D, .140"P.

#PL-155 Chisel $2.56
3/4"L, 1/8"D. stepped to .060"D.

Prices Subject to Change Without Notice.

jana

WIDE—VIEW PANEL METERS



RANGE	MODEL No	IMPEDANCE	PRICE
	DC MICRO AMMETER		
50-0-50 uA	HJ 8803	700 (ohms)	$11.95
0-100 uA	HJ 8804	700	$11.95
	DC MILLI AMMETERS		
0-1 mA	HJ 8811	100	$11.95
0-10 mA	HJ 8813	6	$11.95
0-100 mA	HJ 8814	0.4-0.5	$11.50
0-200 mA	HJ 8815	0.4-0.5	$11.50
	AC VOLTMETERS		
0-15V	HJ 8821	18k	$11.50
	DC VOLTMETERS		
0-10V	HJ 8831	10k	$11.50
0-15	HJ 8832	15k	$11.50
0-100V	HJ 8834	100k	$11.50
0-500V	HJ 8836	500k	$11.50
	'S'-METER		
	HJ 8841	200	$11.50
	ILLUMINATED 'VU' METER		
	HJ 8851	7.5k (3.9k)	$12.95
	DC AMMETER		
0-15A	HJ 8861	0.4-0.5	$11.95

SPECIFICATIONS:

ACCURACY:	±2.5% at full scale
DUMPING FACTOR:	Max. +10% Overshoot
COIL SUSPENSION:	Pivot & Jewel Screw
DEFLECTION ANGLE:	90°
BALANCE:	±1% (Position Influence)
MA & A METER WORKING FALL:	Horizontal to Vertical
IMPEDANCE :	60mV
	1,000 ohm/volt

DOMINION RADIO & ELECTRONICS Co. has a meter for almost any application.

MULTITESTERS

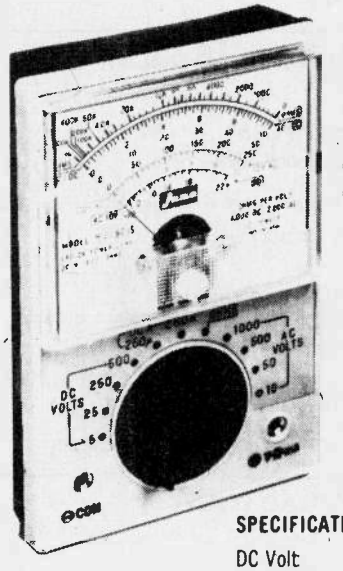
250 MV and 50 uA DC ranges for transistor circuitry.

The HJ 8081 fills the need for a general purpose VOM in the medium price category. Sturdy construction and an easy to read meter face make this an ideal meter for school use.

HJ 8081 $39.95

SPECIFICATIONS

DC Voltage	:	0.25, 2.5, 10, 50, 250, 1000 volts.
AC Voltage	:	10, 50, 250, 500, 1000 volts.
DC Current	:	50 uA, 25 mA, 250 mA.
Resistance	:	7 KΩ, 700 KΩ, 7 MΩ.
Decibels	:	-10dB + 22dB + 20dB + 36dB.
Accuracy	:	DC ± 3%, AC ± 4%.
Batteries	:	1.5 V (UM -3) × 2.
Size & Weight	:	130 x 86 x 38 mm, 400 g.
Accessory	:	1 pair test leads.



- IDEAL FOR THE HOBBYIST
- 4K OHM/VOLT DC
- 2K OHM/VOLT AC
- 11 RANGES
- 2 JEWELS
- WHITE EASY TO READ FACE
- COMPLETE WITH TEST LEADS

HOBBYIST MULTITESTER

HJ 8015 $26.95

SPECIFICATIONS:

DC Volt:	0 - 5 - 25 - 250 - 500
AC Volt:	0 - 10 - 50 - 500 - 1000
DC Current:	0 - 250uA, 250mA
Resistance:	0 - 600K (7000 ohm center)
Decibels:	— 10 dB to + 22dB
Dimensions:	2¼" - 3-9/16" x 1-1/16"

$1078.00

LBO 508A
20MHz DUAL TRACE OSCILLOSCOPE

The LBO 508 is a 20 MHz oscilloscope with a 10 mV/cm - 20 V/cm sensitivity in 11 calibrated steps. The high intensity CRT delivers excellent contrast while the regulated high voltage supply provides stable brightness.

- Compact lightweight, horizontal package
- Add and subtract mode
- Beam Rotation
- Front panel x-y one touch operation
- Intensity Modulation
- Automatic and T.V. sync. triggering

The applications for this new outstanding oscilloscope are limitless. The LBO 508 is ideally suited for research and development, production, quality control, education and servicing.

LBO 520
30MHz DUAL TRACE OSCILLOSCOPE

with signal delay line and post deflection acceleration C.R.T.

The newest addition to a growing family of Leader Oscilloscopes. This 30MHz dual trace oscilloscope has good bandwidth without sacrificing the high sensitivity - 5mV/cm. It is specially suited for display of wave forms generated in "high speed" digital circuits such as those used in computer equipment. The cathode ray tube is the high brilliancy type using the post deflection acceleration voltage. The vertical amplifier includes a delay line - a convenience in observation of the pulse leading edge. Other features are provided for a wide range of applications.

$1635.00

- Wide band - High Sensitivity
- Possible to observe the high speed pulse
- Large clear display with high brightness
- Portable compact type and improved facility
- Equipped with various functions

LBO-310A

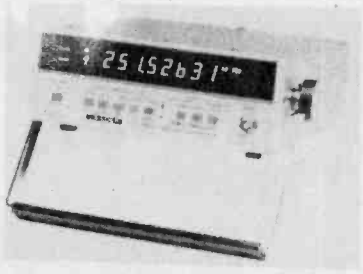
$315.00

LBO-310A
3" SOLID STATE OSCILLOSCOPE WITH 4MHz BANDWIDTH

An unprecedented Leader value...in a high quality, rugged, low cost scope especially useful for in-shop service, on-line production & short wave enthusiasts, too. Offering AC/DC coupled vert. and h'z't'l inputs, it monitors waveforms to 450MHz on direct connection. Sweep range is 10Hz to 100KHz, 4 ranges, cont. adjustable between steps. There's also a DC to 4MHz vert. bandwidth and there's a provision for DC voltage level checks. Use in multiples, to view several phenomena simultaneously.

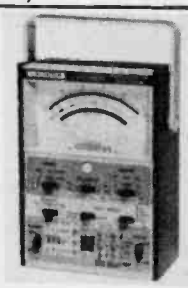
LDC-823
DIGITAL COUNTER $675.00

LDC-823 is a digital frequency counter timer designed to measure the frequency and period of a signal, featuring a wide frequency range 10Hz-250MHz, a high input sensitivity (20mV) rms, and high resolution to 8 digits. The period function makes the unit outstanding for video tape recorder service applications. This instruments can be used for adjustment, test and repair of audio instruments, AM FM radios, TVs, CB radios, computer clocks, amateur-radios, electronic watches, and musical instruments, etc. The LDC-823 is small and portable. A big bright fluorescent display assures easy readability of values. The green display does not include eye fatigue even after an extended period of viewing. Readout miscounts are reduced by zero-blanking, unit-display (kHz, MHz mS) and overrange display. The use of LSI and MSI in the internal circuits assures reliable performance and less power consumption.



LDC-823

$270.00

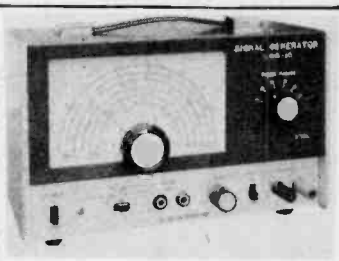


LTC 906
TRANSISTOR CHECKER

At last! A portable transistor checker that automatically identifies emitter, base and collector and gives an absolute meter readout of gain and leakage. All these tests are done electronically without multiple button pushing or lead switching.

The 906 also checks for good bad transistors in circuit and provides an audible tone indication.

Its small size allows the unit to fit in pocket or tool case. Battery operation gives it portability and line isolation.



LSG-16

$199.00

LSG-16
RF WIDE BAND SIGNAL GENERATOR *solid state*

Our newest, most versatile solid state signal generator that's perfect for service, hobby, education or industrial use. Features an FET oscillator circuitry for high stability performance plus an accurately calibrated frequency dial. Frequency range is 100KHz to 100MHz and up to 300MHz on harmonics. The LSG-16 will also function as a marker generator, when used in conjunction with a sweep generator, for checking and aligning RF and IF circuits in TV, FM and communication-type receivers and transmitters. The use of the LSG-16 is further extended by provisions for accommodating a 1-15MHz range crystal.

LAG-26

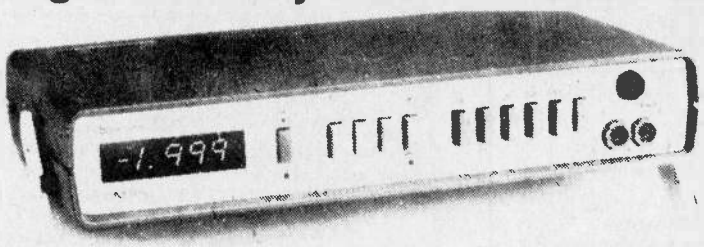
$222.00

LAG-26
SINE/SQUARE WAVE GENERATOR

Here's a thoroughly reliable, advanced design sine/square wave generator for audio and supersonic frequency range testing. It offers a low distortion sine wave and a fast rising (0.5us) square wave to test transient response. Modulation and distortion checks are made possible by the square and sine wave outputs that this instrument provides. It also synchronizes signals from an external source and has a frequency range that extends to 200KHz in 4 decade bands. Output impedance is 600Ω, unbalanced, while calibration accuracy is at ±3%. It's a compact, useful instrument that proudly carries the Leader name.

New from Sinclair — DM350 and DM450 Professional Digital Multimeters.

High Accuracy and Resolution at Outstandingly Low Prices.



DM350 $239.95 3½ DIGITS

DM450 $339.95 4½ DIGITS

DM350 3½ DIGIT

- Six Functions in 34 Ranges
- Accuracy to 0.1%

$239.95

DM450 4½ DIGIT

- Six Functions in 34 Ranges
- Accuracy to 0.05%

$339.95

OUTSTANDING FEATURES INCLUDE:—

- *Lab quality specifications
- *Lightweight and rugged construction
- *Battery powered for portability
- *Bench power supply optional
- *Amazingly low cost through innovative design
- *Six functions in 34 ranges
- *8 mm LED Displays
- *Fully protected
- *High accuracy and stability
- *Pushbutton range selection

Both multimeters provide a total of 34 ranges with features unavailable on many high cost laboratory multimeters. In addition to standard 10 MOhm input impedance, the basic DC range can be selected with an impedance greater than 1000 MOhm — invaluable for work with micro power and MOS circuitry. Ultra wide current handling provides 1 nA resolution, and measurements up to 10A (20A intermittent). A diode test facility gives direct reading of forward voltage drop. AC frequency response up to 20 KHz copes with audio testing and design.

Very high accuracy and stability — Guaranteed for 12 months. The 3½ digit DM350 has a basic accuracy of 0.1%. The 4½ digit DM450 has basic accuracy of 0.05%. Both use high stability A to D conversion technique with a minimum of preset adjustments, enabling calibrational stability to be guaranteed for 12 months.

Fully protected: Against accidental overload including AC line voltages (except 10A). The high impact case provides protection and ruggedness. All components are solid state and vibration-resistant.

Slim styling for portability: Both feature a forward facing display, tilt handle, and push button selection. Only 1¼" thick and less than 1½ lbs. Easy to slip into tool kit or briefcase. Basic operation from C cells.

The DM350 and DM450 represent a breakthrough in Digital Multimeter Development. Their design utilizes many state-of-the-art techniques for circuit component design, such as the use of thick and thin film resistors and analogue and digital processing sections using latest mixed integration techniques whereby cmos, pmos and Bipolar circuit elements can be produced on the same IC substrate. The combination of improved circuit components with creative circuit design has enabled Sinclair to achieve lower assembly costs, lower test costs, higher inherent reliability, resulting in instruments of quality previously unattainable at this price level.

Making a Choice. The Sinclair DM350 has been designed to provide the accuracy, resolution and dynamic range needed for most lab and field requirements. When even higher performance is required the DM450 offers more — and its 4½ digit scale length virtually eliminates the last digit resolution errors.

Each unit is supplied complete with a set of test leads and users manual.

Technical Specifications

Range	DM450 Accuracy	DM450 Resolution	DM350 Accuracy	DM350 Resolution
DC — VOLTAGE				
200mV	0.05%r ±0.02%fs	10µV	0.1%r ±0.1%fs	100µV
2000mV	0.05%r ±0.01%fs	100µV	0.1%r ±0.05%fs	1mV
2V	0.05%r ±0.01%fs	100µV	0.1%r ±0.05%fs	1mV
20V	0.1%r ±0.01%fs	1mV	0.25%r ±0.05%fs	10mV
200V	0.1%r ±0.01%fs	10mV	0.25%r ±0.05%fs	100mV
1200V	0.1%r ±0.01%fs	100mV	0.25%r ±0.05%fs	1V
AC ~ VOLTAGE 50/60Hz			DM450 displays only 3½ digits on 200mV range	
200mV	0.2%r ±0.1%fs	100µV	0.25%r ±0.2%fs	100µV
2V	0.2%r ±0.02%fs	100µV	0.25%r ±0.1%fs	1mV
20V	0.25%r ±0.1%fs	1mV	0.4%r ±0.2%fs	10mV
200V	0.25%r ±0.02%fs	10mV	0.4%r ±0.1%fs	100mV
750V	0.25%r ±0.02%fs	100mV	0.4%r ±0.1%fs	1V
DC — CURRENT				
2µA	0.15%r ±0.1%fs	0.1nA	0.2%r ±0.1%fs	1nA
20µA	0.15%r ±0.02%fs	1nA	0.2%r ±0.1%fs	10nA
200µA	0.15%r ±0.02%fs	10nA	0.2%r ±0.1%fs	100nA
2mA	0.15%r ±0.02%fs	100nA	0.2%r ±0.1%fs	1µA
20mA	0.5%r ±0.02%fs	1µA	0.5%r ±0.1%fs	10µA
200mA	0.5%r ±0.02%fs	10µA	0.5%r ±0.1%fs	100µA
2000mA	0.5%r ±0.02%fs	100µA	0.5%r ±0.1%fs	1mA
10A	2.0%r ±0.1%fs	1mA	2.0%r ±0.1%fs	10mA
AC ~ CURRENT 50/60Hz				DM450 displays only 3½ digits
2µA	0.3%r ±0.2%fs	1nA	0.35%r ±0.2%fs	1nA
20µA	0.3%r ±0.15%fs	10nA	0.35%r ±0.15%fs	10nA
200µA	0.3%r ±0.15%fs	100nA	0.35%r ±0.15%fs	100nA
2mA	0.3%r ±0.15%fs	1µA	0.35%r ±0.15%fs	1µA
20mA	0.65%r ±0.15%fs	10µA	0.65%r ±0.15%fs	1µA
200mA	0.65%r ±0.15%fs	100µA	0.65%r ±0.15%fs	100µA
2000mA	0.65%r ±0.15%fs	1mA	0.65%r ±0.15%fs	1mA
10A	2.5%r ±0.15%fs	10mA	2.5%r ±0.15%fs	10mA
RESISTANCE				
200Ω	0.1%r ±0.1%fs	10mΩ	0.2%r ±0.1%fs	100mΩ
2kΩ	0.1%r ±0.02%fs	100mΩ	0.2%r ±0.05%fs	1Ω
20kΩ	0.1%r ±0.02%fs	1Ω	0.2%r ±0.05%fs	10Ω
200kΩ	0.1%r ±0.02%fs	10Ω	0.2%r ±0.05%fs	100Ω
2000kΩ	0.1%r ±0.02%fs	100Ω	0.2%r ±0.05%fs	1kΩ
20MΩ	1.0%r ±0.1%fs	1KΩ	1.0%r ±0.1%fs	10kΩ
DIODE TEST				
1mA				

Optional Accessories

Carrying Case	$32.50
AC Adapter	$13.50
Rechargeable Battery	$21.95
30KV High Voltage Probe	$45.00
DM350/450 Service Manual	$T.B.A.

All Sinclair Digital Multimeters are fully guaranteed for 12 months from date of purchase against factory defects.

The Sinclair PDM35 personal digital multimeter.

10—DAY FREE TRIAL
Your money refunded if you are not totally satisfied!

ONLY
89.95

- 3½ Digits
- 21 Ranges
- Pocket Size
- 5 Functions
- Weighs 6½ oz.
- Low Cost

The Sinclair PDM35 gives you all the benefits of an ordinary digital multimeter – quick clear readings, high accuracy and resolution, high input impedance. Yet it costs less than you'd expect to pay for an analogue meter!

With its rugged construction and battery operation, the PDM35 is perfectly suited for hand work in the field, while its angled display and optional AC power facility make it just as useful on the bench.

Features of the PDM35

3½ digit resolution.
Sharp, bright, easily read LED display, reading up to ± 1.999.
Automatic polarity selection.
Resolution of 1 mV and 0.1uA.
Direct reading of semiconductor forward voltages at 5 different currents.
Resistance measurement up to 20 MΩ.
1% of reading accuracy.

Compare it with an analogue meter

The PDM35's 1% of reading compares with 3% of full scale for a comparable analogue meter. That makes it around 5 times more accurate on average.

The PDM35 will resolve 1mV against around 10mV for a comparable analogue meter – and resolution on current is over 1000 times greater.

PDM35 Technical Specifications

19°C – 23°C

DC ⎓ VOLTAGE

Range	Resolution	Accuracy	Protection	Input Impedance
× 1V	1mV	1.0% ± 1 Count	240V	10MΩ
× 10V	10mV	1.0% ± 1 Count	1000V	10MΩ
× 100V	100mV	1.0% ± 1 Count	1000V	10MΩ
× 1000V	1V	1.0% ± 1 Count	1000V	10MΩ

AC ∿ VOLTAGE

Range	Resolution	Accuracy	Protection	Freq. Response
× 1000V	1V	1.0% ± 2 Counts	500V	40Hz – 5kHz

DC ⎓ CURRENT

Range	Resolution	Accuracy	Protection	Voltage Burden
× 0.1μA	0.1nA	1.0% ± 1nA	240V	1mV per Count
× 1μA	1nA	1.0% ± 1 Count	240V	1mV per Count
× 10μA	10nA	1.0% ± 1 Count	240V	1mV per Count
× 100μA	100nA	1.0% ± 1 Count	120V	1mV per Count
× 1mA	1μA	1.0% ± 1 Count	30mA	1mV per Count
× 100mA	100μA	1.0% ± 1 Count	500mA	1mV per Count

RESISTANCE

Range	Resolution	Accuracy	Protection	Measuring Current
× 1kΩ	1Ω	1.5% ± 1 Count	15V	1mA
× 10kΩ	10Ω	1.5% ± 1 Count	120V	100μA
× 100kΩ	100Ω	1.5% ± 1 Count	240V	10μA
× 1MΩ	1kΩ	1.5% ± 1 Count	240V	1μA
× 10MΩ	10kΩ	2.5% ± 1 Count	240V	0.1μA

Automatic over-range indication by horizontal bars.
Accuracy is quoted as a percentage of reading.
All ranges except × 1000V can be used up to ±1.999 without loss of accuracy. Resistance ranges provide a diode test facility at 5 decade steps of current.

Dimensions 6″ × 3″ × 1¼″ (155mm × 75mm × 35mm)

Weight 6½oz (180 gms)

Supplied with test leads, instructions, carrying wallet.

PDN 35 ACCESSORIES

9-volt AC Adapter (PDM35PS)	$9.95
9-volt Duracell battery	$2.85
Deluxe padded carrying wallet	
30KV high voltage probe	$44.95

The PDM35's DC input impedance of 10MΩ is 50 times higher than a 20kΩ/volt analogue meter on the 10V range.

The PDM35 gives precise digital readings. So there's no need to interpret ambiguous scales, no parallax errors. There's no need to reverse leads for negative readings. There's no delicate meter movement to damage. And you can resolve current as low as 0.1nA and measure transistor and diode junctions over 5 decades of current.

The Sinclair DM235 digital multimeter

ONLY
149.95

Features

- 3½ digit resolution
- Large, bright, wide angle LED display reading to ±1999
- Automatic polarity selection
- Industry standard 10MΩ input impedance
- 0.5% of reading basic accuracy
- Full multimeter facilities including AC∿ current
- Resistance measurement up to 20MΩ
- Direct reading of semi-conductor forward voltages at 5 different currents
- Simple, unambiguous controls with readings always in volts, mA or kΩ
- Selection of all functions from a single input terminal pair
- Automatic decimal point placement
- Automatic overrange indication
- Operation from disposable or rechargeable cells, or from AC adaptor/charger

- 3½ Digits
- Fully Portable
- 6 Functions
- 10-Day Trial

Up till now, choosing a meter suitable for use on the bench *and* in the field hasn't been easy. Either you bought a bulky, bench instrument that was awkward to carry around, or a hand-held portable that was difficult to use on the bench. The Sinclair concept is different – by keeping the thickness down to only a fraction over 1½″ (40mm) and the weight down to under 1½lbs (650gms), we've produced an instrument that has all the advantages of conventional bench meters, but packs neatly into any tool kit or brief case.

DM235 Technical Specification

19°C – 23°C

DC ⎓ VOLTAGE

Range	Resolution	Accuracy	Protection	Input Impedance
2V	1mV	0.5% ± 1 Count	250V	10MΩ
20V	10mV	1.0% ± 1 Count	1000V	10MΩ
200V	100mV	1.0% ± 1 Count	1000V	10MΩ
1000V	1V	1.0% ± 1 Count	1000V	10MΩ

DC ⎓ CURRENT

Range	Resolution	Accuracy	Protection	Voltage Burden
2mA	1μA	1.0% ± 1 Count	1A Fused	1mV per Count
20mA	10μA	1.0% ± 1 Count	1A Fused	1mV per Count
200mA	100μA	1.0% ± 1 Count	1A Fused	1mV per Count
1000mA	1mA	1.0% ± 1 Count	1A Fused	1mV per Count

AC ∿ VOLTAGE (Input impedance 10MΩ/<50pF)

Range	Resolution	Accuracy	Protection	Frequency Response
2V	1mV	1.5% ± 2 Counts	250V	30Hz – 10kHz
20V	10mV	1.5% ± 10 Counts	750V	30Hz – 2kHz
200V	100mV	1.5% ± 2 Counts	750V	30Hz – 800Hz
750V	1V	1.5% ± 2 Counts	750V	30Hz – 800Hz

AC ∿ CURRENT

Range	Resolution	Accuracy	Protection	Frequency Response
2mA	1μA	1.5% ± 2 Counts	1A Fused	30Hz – 10kHz
20mA	10μA	1.5% ± 2 Counts	1A Fused	30Hz – 10kHz
200mA	100μA	1.5% ± 2 Counts	1A Fused	30Hz – 10kHz
1000mA	1mA	1.5% ± 2 Counts	1A Fused	30Hz – 10kHz

RESISTANCE

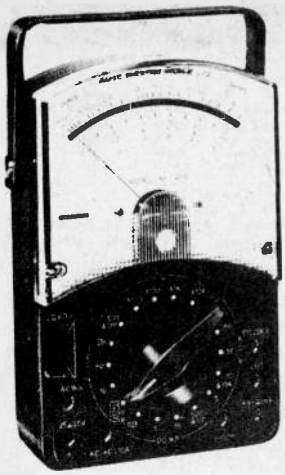
Range	Resolution	Accuracy	Protection	Measuring Current
2kΩ	1Ω	1.0% ± 1 Count	250V	1mA
20kΩ	10Ω	1.0% ± 1 Count	250V	100μA
200kΩ	100Ω	1.0% ± 1 Count	250V	10μA
2000kΩ	1kΩ	1.0% ± 1 Count	250V	1μA
20MΩ	10kΩ	2.5% ± 2 Counts	250V	0.1μA

Supplied Complete with test leads and prods, and operator's instruction manual

AC Adapter 235AC-1	$9.95
Carrying Case -235	$32.50
30KV High Voltage Probe	$44.95
NC-1 Rechargeable Batterypack	$21.95

SCHOOLS — INDUSTRIALS — F.S.T.E. PRICING AVAILABLE. QUANTITY PRICING ON REQUEST.

Prices Subject to Change Without Notice.



NEW

LABORATORY MODEL

50 K OHM/V DC 10 AMP DC SCALE

HJ 8080 **$64.95**

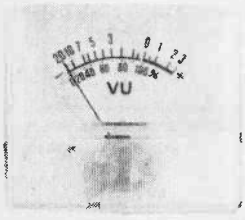
Wide range settings allow professional performance in lab as well as field work. High internal resistance minimizes the loading effect of the circuit under test for more accurate readings.

SPECIFICATIONS

DC Voltage	:	.25, 2.5, 10, 50, 250, 500, 2500 volts (50 K /volt).
AC Voltage	:	5, 10, 50, 250, 500, 1000 (10 K /volt).
DC Current	:	25 uA, 250 uA, 1 mA, 50 mA, 500 mA, 10 A.
Resistance	:	5 K, 500 K, 5 M, 50 M (60 center scale).
Decibels	:	-20dB, + 16dB, + 22dB, + 36dB, + 50dB, + 56dB.
Accuracy	:	DC ± 3%, AC ± 4%.
Batteries	:	Penlite (1.5 V), BLW10 (15 V).
Size	:	170 x 110 x 50 mm (6.7" x 4.4" x 2").
Weight	:	600 g (1.3 lbs).
Accessory	:	Flexible Banana type test leads.

SQUARE VU METER

$4.95



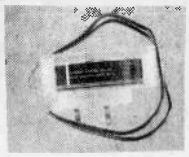
Perfect for the hobbyist who is building small amplifiers. Sturdy plastic case and screw adjustment.

* 1½" square

EDGEWISE S METER

$1.95

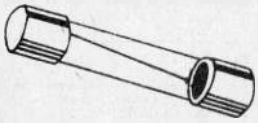
BASIC 1 mA meter movement can be rescaled to meet almost any need. This meter is illuminated and comes with 12V bulbs and wiring harness.



Fuses

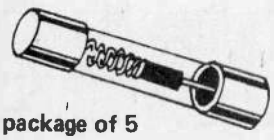
Jana fuses are high quality protection devices. Two series of fuses are presently available but we can offer on special order all services and amperages of fuses presently available in North America. Both series are 1¼" x ¼" and 250 VAC.

$.79 package of 5



FAST BLOW

CJ 3170	.5A
CJ 3171	1A
CJ 3172	2A
CJ 3173	3A
CJ 3175	5A
CJ 3179	10A



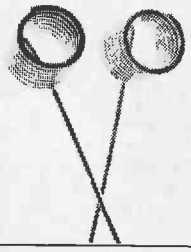
$1.89 package of 5

SLOW BLOW

CJ 3180	.5A
CJ 3181	1A
CJ 3182	2A
CJ 3183	3A
CJ 3185	5A

Spring Fuse Clip

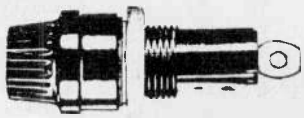
$.10 ea.; $.49 pack 6



CJ 3306.

This is in a low cost, multi-use fuse clip for standard ¼" diameter fuses. Ideal for all Printed Circuit Board applications. Bulk or package of 6.

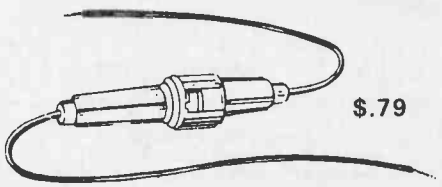
PANEL MOUNT FUSE HOLDER



CJ 3300 **$.99**

Bayonet type, mounts in ½" (12.7 mm) panel hole. Accepts all 1¼" x ¼" (31.7 mm x 6.3 mm) fuses.

INLINE FUSE HOLDER

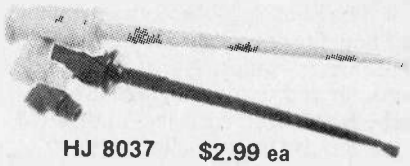


$.79

CJ 3302

Automotive type accommodates all ¼" (6.3 mm) fuses from ⅝" (15.9 mm) to 1¼" (31.7 mm).

Test Clip Probes



HJ 8037 **$2.99 ea**

Another handy technician's or design engineer's tool for working on complex circuitry in difficult to reach spots. Bulk or one red and one black per package. About 5¼" long (135 mm).

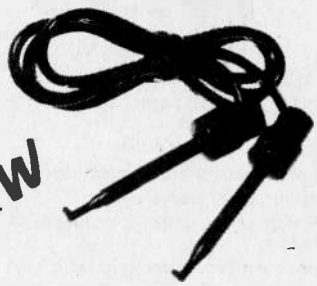
HEAVY DUTY SOLDERLESS TEST PROBE

$1.95 pair

NEW **CJ 3334-B2**
1 red & 1 black per pkg

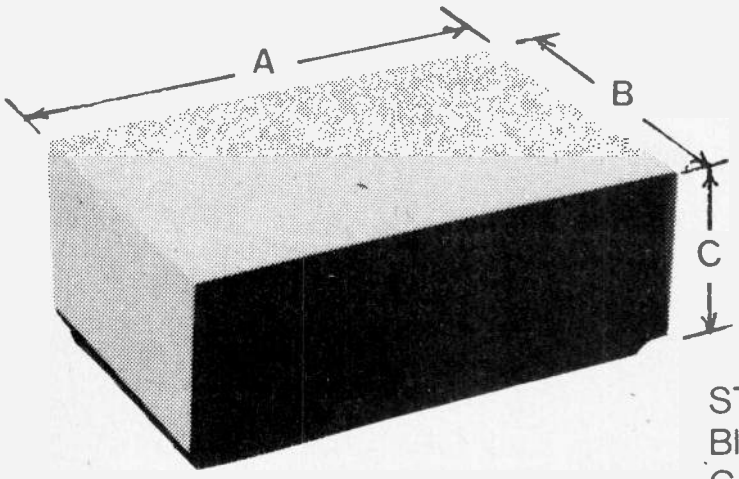
$3.95

NEW



HJ 8034-B2 — 1 red & 1 black per pkg

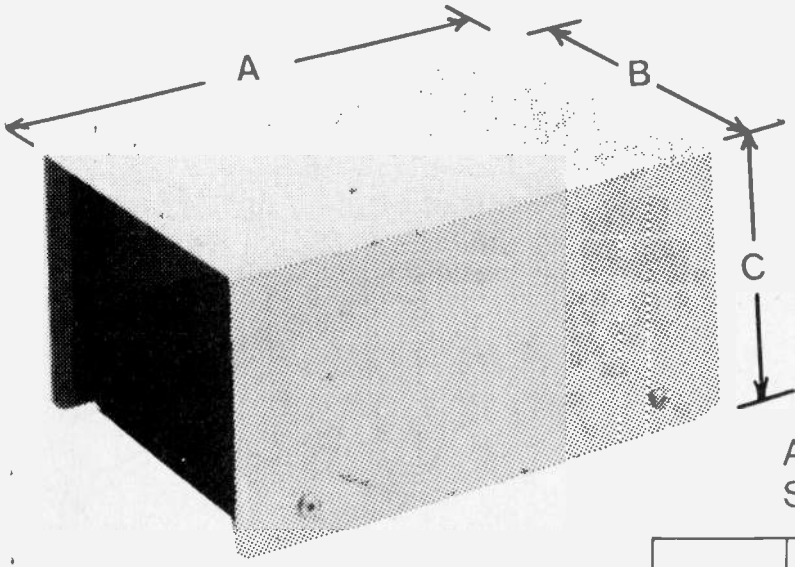
Jumper clip assembly. 24" (61 cm) long allows uses in many applications. The probe clips are long enough to reach the most difficult spots. Lead wire is very flexible.



6000 SERIES

STEEL CABINET.
Black Chassis, Text Grey Cover.
Gauge: Chassis 18 GA, Cover 20 GA.

Number	A mm	A inches	B mm	B inches	C mm	C inches	
6000-1	177.8	7	101 6	4	63 50	2½	**$5.49**
6000-2	203.2	8	139 7	5½	66 68	2⅝	**$6.49**
6000-3	254 0	10	165 1	6½	79.38	3⅛	**$7.95**
6000-4	304 8	12	177 8	7	101.60	4	**$8.95**



1000 SERIES

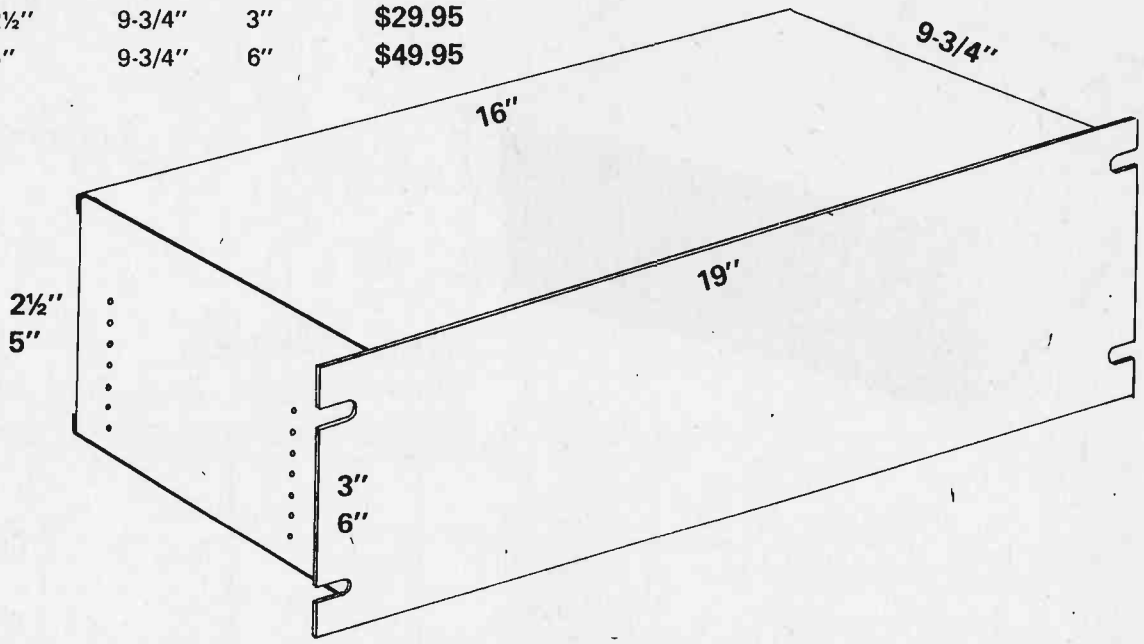
ALUMINUM CHASSIS. Painted Grey.
Steel Cover: Text Grey.

Number	Gauge	A mm	A inches	B mm	B inches	C mm	C inches	
1000-1	20	101 60	4	80 96	3³⁄₁₆	50 80	2	**$3.95**
1000-2	20	149 20	5⅞	101 60	4	63 50	2½	**$4.95**
1000-3	20	152 40	6	133 35	5¼	69 85	2¾	**$5.95**
1000-4	20	184 15	7¼	158.75	6¼	66.68	2⅝	**$7.49**

RACK MOUNT CABINETS

Sturdy rack mount cabinets steel constructed (satin black finish) c/w 19" front panel.
EC-18 Cabinet comes complete with adjustable chassis.
EC-16 Cabinet comes complete with brackets for mounting P.C. Boards.

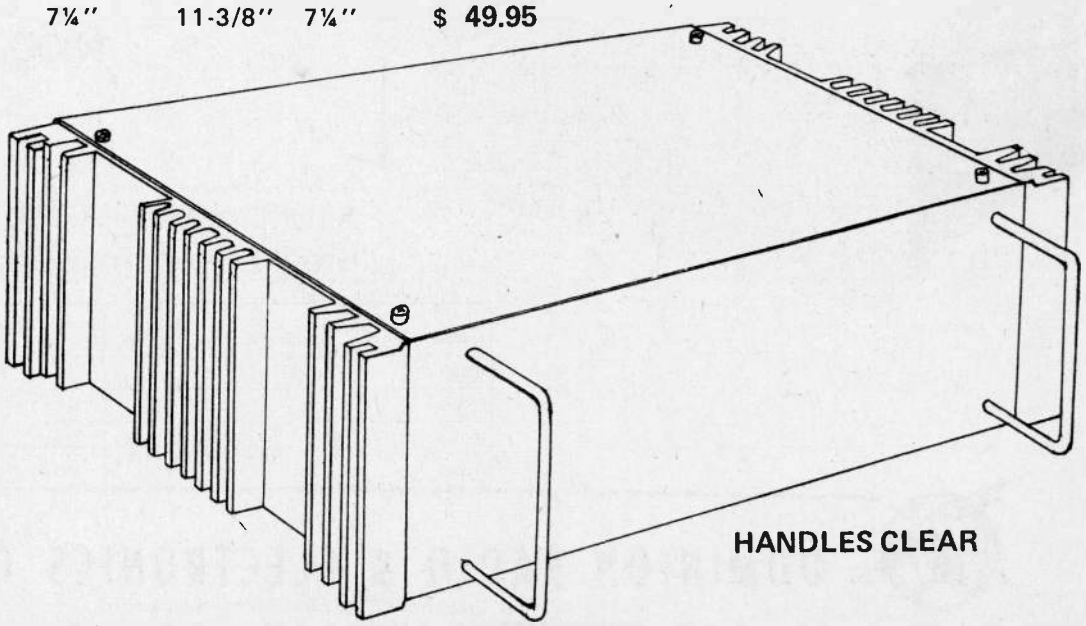
Part No.	Width	Height	Depth	Panel	Price Each
EC-16	16"	2½"	9-3/4"	3"	**$29.95**
EC-18	16"	5"	9-3/4"	6"	**$49.95**



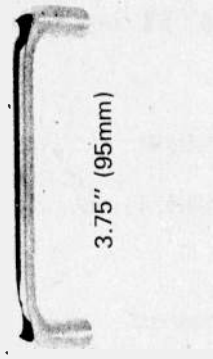
STURDY POWER SUPPLY OR INVERTOR CABINETS

Sturdy 16 Ga. steel constructed cabinets (satin black) with 1 heat sink on each end. Size 7-1/8" x 4½" x 1-3/8". Each heatsink is drilled for 2-TO3 size transistors. Dissipation of 100W each. Available in two sizes.

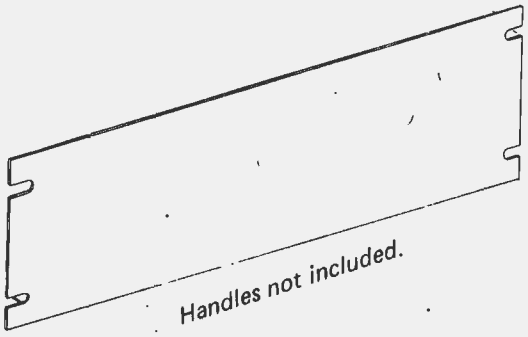
Part No.	Front	Height	Depth	Inside Width	Inside Depth	Price Each
TC1001	9-3/8"	4½"	7¼"	6½"	7¼"	$ **44.95**
TC1002	13-3/8"	4½"	7¼"	11-3/8"	7¼"	$ **49.95**



19" RACK MOUNTING PANELS



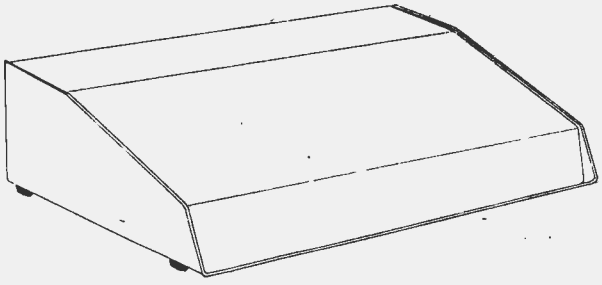
Available in Silver "S series" and Black "B series". Anodized.

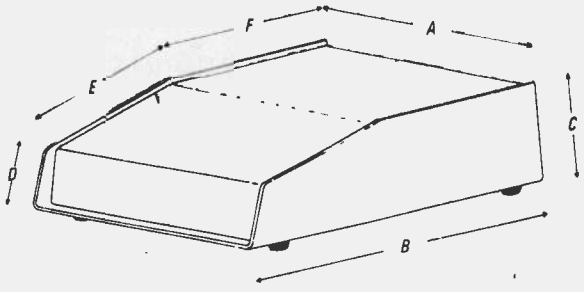


1935S	19" x 3.5"	**$2.25**
19525S	19" x 5.25"	**$2.59**
1970S	19" x 7.0"	**$2.95**
1935B	19" x 3.5"	**$3.95**
19525B	19" x 5.25"	**$4.95**
1970B	19" x 7.0"	**$5.95**

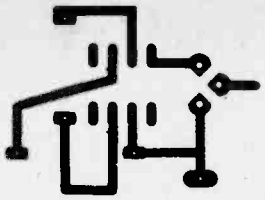
Handles for 19525 and 1970 series only **$1.95** *pair chrome.*

CABINETS





Number	A mm	A inches	B mm	B inches	C mm	C inches	D mm	D inches	E mm	E inches	F mm	F inches	Price Each
5-3	165.1	6.5	215.90	8.5	50.8	2.0	27.94	1.1	83.82	3.3	132.08	5.2	**$12.95**
5-5	254.0	10.0	210.82	8.3	76.2	3.0	33.02	1.3	160.02	6.3	55.88	2.2	**$14.95**
5-7	355.6	14.0	210.82	8.3	76.2	3.0	33.02	1.3	160.02	6.3	55.88	2.2	**$19.95**
5-8	355.6	14.0	287.02	11.3	76.2	3.0	33.02	1.3	160.02	6.3	132.08	5.2	**$22.95**



CERESIST

3-WAY TRANSFERS

CERESIST is the sensational new 3-way material which takes the frustrations out of making PCB layouts.

1 - only PCBs. Apply CERESIST directly to the PCB, buffing smoothly with ballpoint pen where you desire the pattern to be transferred. Lift the CERESIST sheet gently, and firm down work with fingerpad. Lines etc. can be broken, butted, overlaid to meet your requirements. The PCB can now be etched directly in ferric chloride bath.

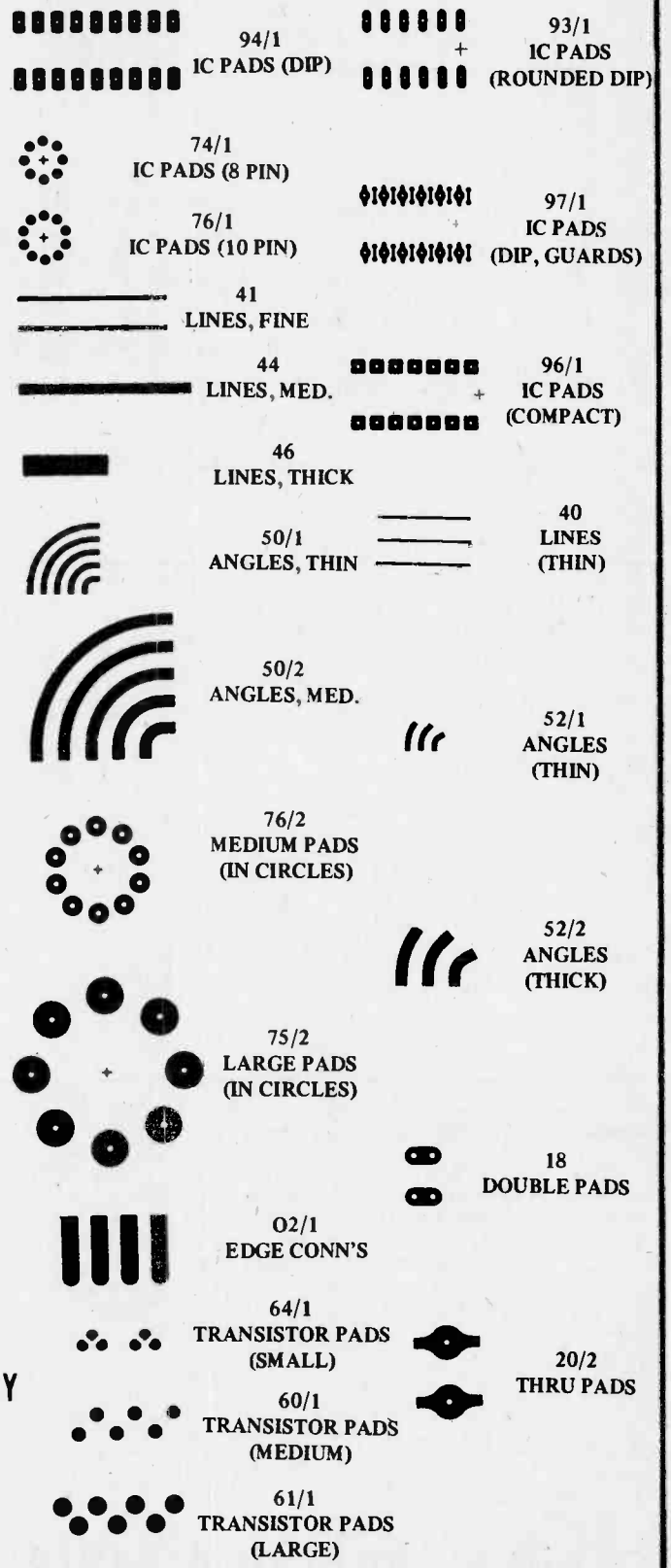
Applied to paper, CERESIST renders excellent "artwork" originals for negative making. CERESIST also transfers well to clear films for positive transparancies & overlays.

There is no problem combining CERESIST with other media (tapes ink, lacquer etc.) if desired.

$1.99 Per Package

QUANTITY DISCOUNT:

FOR EVERY 10 CERESIST PACKAGES YOU BUY, YOU GET 1 FREE



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THE HOME OF RADIO & ELECTRONIC SUPPLIES
A Division of DREECO Electronics Limited

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CHEMTRONICS

TUN-O-WASH
HEAVY-DUTY TUNER DEGREASER
The most popular tuner degreaser used by servicemen.
- Leaves no residue
- Safe for plastics
- Non-drift

$6.85

Cat. No. 2400 24 oz. Aerosol

COLOR TUNER CLEANER
CLEANER & LUBRICANT FOR TV TUNERS
- Specifically formulated for color tuners
- Non-flammable
- Non-drift
- Safe for plastics

Cleans dirty tuners thoroughly, leaving a thin film of silicone lubricant on tuner contacts. Keeps tuners working smoother and longer, because the lubricant will not dry out. Protects contact surfaces against corrosion.

Cat. No. TC-6 6 oz. Aerosol **$2.10**

SUPER FROST AID
LOCATES THERMAL INTERMITTENTS
- Cools to -65°F
- Leaves no liquid residue
- Safe for plastics
- Non-flammable

$4.95

Cat. No. 1550 15 oz. Aerosol

NO ARC
HIGH-VOLTAGE ALL-PURPOSE INSULATING SPRAY
- Stops arcing and corona shorts
- Withstands up to 25,000 RF volts
- No valve clogging

Cat. No.

501-1	2 oz. Bottle	$2.79
630	6 oz. Aerosol	$5.19

SILICONE SPRAY LUBRICANT
- Retains lubricity, even at high temperatures
- Provides long-lasting protection
- Will not "gunk-up"

A premium-quality all-purpose lubricant with thousands of uses. Low-viscosity formula... ideal for control shafts, pivots, small bearings, etc. Provides corrosion protection. Also helpful in reducing squeaks and rattles in vehicles and has many household applications.

$3.25

Cat. No. SL-6 6 oz. Aerosol

SILICONE HEAT SINK COMPOUND
- Efficiently transfers heat from power transistors to chassis.
- High heat conductivity

Chemtronics Silicone Heat Sink Compound is a very effective heat-conductive silicone material used on power transistors and other semiconductors in television, radio and high fidelity circuits. It provides maximum heat transfer between semiconductors and heat sinks, for maximum heat dissipation.

$4.75

Cat. No. SL-1 2 fl oz. Tube

LUBRIPLATE **Cat. No. 105** 1¾ oz. Tube
WHITE GREASE LUBRICANT
High-grade, industrial lubricant in a handy tube for motors, gears, and bearings of all kinds. **$2.50**

DOMINION RADIO & ELECTRONICS COMPANY

A Division of DREECO Electronics Limited

THE HOME OF RADIO & ELECTRONIC SUPPLIES

Prices Subject to Change Without Notice.

PHOTO RESIST SPRAY

For Sensitizing Boards A Negative Acting Resist

For coating printed circuit boards. Photo Resist is a high quality resist which will cause less pin-holing and has less sensitivity to white light exposure than other resists.

PHOTO RESIST

No. PC194-3	• 3 oz. spray can	$6.25
No. PC194-16	• 16 oz. spray can	$17.50
No. PC194G	• 1 gallon	$260.00
No. PC194S-8	• STRIPPER 8 oz. can	$3.50
No. PC194S-G	• STRIPPER 1 gallon	$27.95
No. PC187-3	• POSITIVE PHOTO RESIST • 3 oz. spray can	$6.70

RESIST INK PEN

For Printed Circuit Boards

Injectorall's felt-tip RESIST INK PEN makes resist circuits directly on printed circuit boards. Injectorall's pen enables the application of resist ink as easily as if using any felt marker pen. It is available in black only, in fine and medium widths. Dries instantly and remains until removed with any resist ink remover or fine steel wool. Blister-packed.

RESIST INK PEN •

No. PC195	• Black-fine tip, blister-packed	$2.20
No. PC196	• Black-medium tip, blister-packed	$2.20

RESIST INK SOLVENT

For Printed Circuit Boards

RESIST INK SOLVENT is an excellent solvent for removing inks, markings and surplus flux. It is non-flammable, non-toxic and evaporates quickly after use.

RESIST INK SOLVENT •

No. PC198-2	• 2 oz. glass bottle	$2.45

POLY SPRAY

Polyurethane Insulator For Coating Printed Circuits

POLY SPRAY is a polyurethane resin for application to printed circuit assemblies. When sprayed on printed circuits, it forms a smooth, homogeneous transparent coating so as not to obliterate color coding of electronic components. It has excellent resistance to moisture and abrasion and is suitable for continuous operation up to 125°C. Used by original equipment manufacturers, it should be used by all servicemen after a printed circuit repair to insure satisfactory performance.

No. 65-16	• POLY SPRAY 16 oz. spray can	$5.95
No. 65-2G	• POLY SPRAY 2 gallon kit	$68.25

PHOTO RESIST DEVELOPER

For Photo-Sensitized Boards For Negative Acting Resist

PHOTO RESIST DEVELOPER is a specially prepared solvent for developing photo resist images. It can be used for printed circuits, semiconductor parts and electroplating stopoff. Compatible with Kodak KPR resists.

PHOTO RESIST DEVELOPER FOR NEGATIVE ACTING RESIST

No. D2-8	8 oz. can	$4.95
No. D2G	1 gallon can	$28.50

PHOTO RESIST DEVELOPER FOR POSITIVE ACTING RESIST

No. D3-2	2 oz. bottle	$4.30
No. D3-G	1 gallon	$77.50

KIT 500

For Printed Circuits

KIT 500 is a low cost kit that comes complete with all materials to make a printed circuit board. Consists of two copper clad boards, a resist ink pen, resist ink solvent, a 6 oz. bottle of etchant, a 1/16" drill bit and a 5 x 7 x 2" plastic case in which the boards are etched. Comes with complete directions. Packaged on a display card. Weight 2 lbs.

No. 500	• Printed circuit kit	$14.25

KIT 650

Photo-Etch Kit for Printed Circuits with Negative Acting Resist

KIT 650 is a complete kit using a photographic method to produce professional quality printed circuits. No dark room is necessary. Contains 2 photo-sensitized 3 x 4" phenolic boards, a photographic test negative & an ultraviolet light source. Materials are included to make negatives of magazine layouts. Also contains exposure glass, clamps, developer, etchant, trays, resist remover, drill and complete instructions. Ideal for solid-state and integrated circuits. Packed in a display box. Weight 3 lbs.

$31.95

No. 650Kit • Photo-Etch Kit for single-sided boards with negative acting resist

KIT 750

Photo-Etch Kit for Double-Sided Boards with Negative Acting Resist

KIT 750 is a complete kit using a photographic method to produce professional quality double-sided printed circuits. No dark room is necessary. Contains two photo-sensitized, double-sided 3x4" glass epoxy boards. Also contains exposure glass, light source, developer, etchant, trays, resist remover, a .040 drill bit, flanged pins for registration of negatives and complete instructions. Packed in a display box. Weight 3 lbs.

$47.50

No. 750Kit • Photo-Etch Kit for double-sided boards with negative acting resist

KIT 850 NEW

Photo-Etch Kit for Printed Circuits with Positive Acting Resist

KIT 850 is a complete kit using a photographic method to produce professional quality printed circuits. Artwork made on clear mylar film may be exposed directly on the sensitized boards to produce an image. No reversal is necessary. Kit 850 contains one 3x4½" and one 4x6" single-sided sensitized boards, developer, exposure glass, clamps, etchant, trays and instruction sheet. Also included is a 4x6" clear mylar, and a combination of pressure sensitive 16, 24 and 40 pin IC pads, donuts, tape and one etch resist pen with which to make artwork. KIT 850 IS COMPLETE INCLUDING A U.V. LIGHT SOURCE.

$31.95

No. 850Kit • Photo-Etch Kit for single-sided boards with positive acting resist

DREECO etchant is specially formulated for all types of copperclad pc boards. Ideal for hobbyists and technicians alike. Available in 16 and 32 oz. bottles.

16oz	$2.25
32oz	$4.25
160oz	$14.95

PRINTED CIRCUIT BOARDS

***CEM COPPER-CLAD COMPOSITE EPOXY LAMINATES**

PC1-CEM	1/16"	1 oz.—one side copper	3" x 4½"	1.65
PC2-CEM	1/16"	1 oz.—one side copper	4" x 6"	2.20
PC3-CEM	1/16"	1 oz.—one side copper	6" x 9"	3.95
PC4-CEM	1/16"	1 oz.—one side copper	12" x 18"	13.95
PC5-CEM	1/16"	2 oz.—one side copper	3" x 4½"	1.65
PC6-CEM	1/16"	2 oz.—one side copper	4" x 6"	2.75
PC7-CEM	1/16"	2 oz.—one side copper	6" x 9"	5.60
PC8-CEM	1/16"	2 oz.—one side copper	12" x 18"	18.50
PC9-CEM	1/16"	1 oz.—two sides copper	3" x 4½"	1.95
PC10-CEM	1/16"	1 oz.—two sides copper	4" x 6"	3.75
PC11-CEM	1/16"	1 oz.—two sides copper	6" x 9"	7.50
PC12-CEM	1/16"	1 oz.—two sides copper	12" x 18"	19.95

1 oz. COPPER CLAD BAKELITE LAMINATES—one side copper

PC1	1/16"	XXXP bakelite	3" x 4½"	1.40
PC2	1/16"	XXXP bakelite	4" x 6"	1.85
PC3	1/16"	XXXP bakelite	6" x 9"	3.50
PC4	1/16"	XXXP bakelite	12" x 18"	12.95
*PC5	1/16"	FR4 epoxy glass	3" x 4½"	1.95
PC5A	1/16"	FR4 epoxy glass	3 3/16" x 6"	2.95
PC5B	1/16"	FR4 epoxy glass	6" x 9" with 3 3/16" edge	8.95
PC6	1/16"	FR4 epoxy glass	4" x 6"	2.95
PC7	1/16"	FR4 epoxy glass	6" x 9"	5.95
PC8	1/16"	FR4 epoxy glass	12" x 18"	20.95

***2 oz. FR4 EPOXY GLASS BASE LAMINATES—one side copper**

PC9	1/16"	FR4 epoxy glass	3" x 4½"	1.95
PC10	1/16"	FR4 epoxy glass	4" x 6"	3.50
PC11	1/16"	FR4 epoxy glass	6" x 9"	6.95
PC12	1/16"	FR4 epoxy glass	12" x 18"	23.50

***1 oz. FR4 EPOXY GLASS BASE LAMINATES—two sides copper**

PC39	1/16"	FR4 epoxy glass	3 3/16" x 6"	4.95
PC39A	1/16"	FR4 epoxy glass	6" x 9" with 3 3/16" edge	12.95
PC40	1/16"	FR4 epoxy glass	3" x 4½"	2.60
PC41	1/16"	FR4 epoxy glass	4" x 6"	4.95
PC42	1/16"	FR4 epoxy glass	6" x 9"	9.50
PC43	1/16"	FR4 epoxy glass	12" x 18"	22.95
PC44	1/32"	FR4 epoxy glass	3" x 4½"	1.65
PC45	1/32"	FR4 epoxy glass	4" x 6"	2.95
PC46	1/32"	FR4 epoxy glass	6" x 9"	5.75
PC47	1/32"	FR4 epoxy glass	12" x 18"	15.40

1 oz. COPPER CLAD BOARD ASSORTMENT

PC652	3 boards, packed in a hanging package.	3.15

LIGHT SENSITIZED COATED BOARDS

NEGATIVE ACTING RESIST

1 oz. COPPER-CLAD BAKELITE LAMINATES—one side copper

PC13	1/16"	XXXP bakelite, sensitized	3" x 4½"	1.95
PC14	1/16"	XXXP bakelite, sensitized	4" x 6"	2.95
PC15	1/16"	XXXP bakelite, sensitized	6" x 9"	5.75
PC16	1/16"	XXXP bakelite, sensitized	12" x 18"	20.95

***1 oz. FR4 EPOXY GLASS BASE LAMINATES—one side copper**

PC5AS	1/16"	FR4 epoxy glass, sensitized	3 3/16" x 6"	4.50
PC5BS	1/16"	FR4 epoxy glass, sensitized	6" x 9" with 3 3/16" edge	11.00
PC17	1/16"	FR4 epoxy glass, sensitized	3" x 4½"	2.75
PC18	1/16"	FR4 epoxy glass, sensitized	4" x 6"	4.95
PC19	1/16"	FR4 epoxy glass, sensitized	6" x 9"	9.25
PC19A	1/16"	FR4 epoxy glass, sensitized	12" x 18"	31.95

***2oz. FR4 EPOXY GLASS BASE LAMINATES—one side copper**

PC9S	1/16"	FR4 epoxy glass, sensitized	3" x 4½"	2.95
PC10S	1/16"	FR4 epoxy glass, sensitized	4" x 6"	5.10
PC11S	1/16"	FR4 epoxy glass, sensitized	6" x 9"	12.95
PC12S	1/16"	FR4 epoxy glass, sensitized	12" x 18"	34.95

***1 oz. FR4 EPOXY GLASS BASE LAMINATES—two sides copper**

PC39S	1/16"	FR4 epoxy glass, sensitized	3 3/16" x 6"	7.95
PC39AS	1/16"	FR4 epoxy glass, sensitized	6" x 9" with 3 3/16" edge	15.95
PC40S	1/16"	FR4 epoxy glass, sensitized	3" x 4½"	3.75
PC41S	1/16"	FR4 epoxy glass, sensitized	4" x 6"	6.50
PC42S	1/16"	FR4 epoxy glass, sensitized	6" x 9"	13.50
PC43S	1/16"	FR4 epoxy glass, sensitized	12" x 18"	41.50
PC44S	1/32"	FR4 epoxy glass, sensitized	3" x 4½"	2.50
PC45S	1/32"	FR4 epoxy glass, sensitized	4" x 6"	4.75
PC46S	1/32"	FR4 epoxy glass, sensitized	6" x 9"	9.50
PC47S	1/32"	FR4 epoxy glass, sensitized	12" x 18"	31.95

POSITIVE ACTING RESIST —1 oz.—one side copper
POSITIVE SENSITIZED

PC17P	1/16"	FR4 epoxy glass, sensitized	3" x 4½"	2.75
PC18P	1/16"	FR4 epoxy glass, sensitized	4" x 6"	4.95
PC19P	1/16"	FR4 epoxy glass, sensitized	6" x 9"	9.25
PC19AP	1/16"	FR4 epoxy glass, sensitized	12" x 18"	27.95

*CEM can be cut without heating. Has 3 times the flexural strength of XXXP.
*FR4 is flame retardant G-10.

NEW LIGHT SENSITIZED COATED BOARDS

NEGATIVE ACTING RESIST

***CEM COPPER-CLAD COMPOSITE EPOXY LAMINATES**

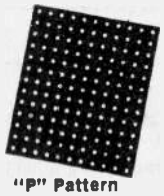
PC1-CEMS	1/16"	1 oz.—one side copper	3" x 4½"	$2.25
PC2-CEMS	1/16"	1 oz.—one side copper	4" x 6"	$4.15
PC3-CEMS	1/16"	1 oz.—one side copper	6" x 9"	$8.25
PC4-CEMS	1/16"	1 oz.—one side copper	12" x 18"	$24.70
PC5-CEMS	1/16"	2 oz.—one side copper	3" x 4½"	$2.55
PC6-CEMS	1/16"	2 oz.—one side copper	4" x 6"	$4.75
PC7-CEMS	1/16"	2 oz.—one side copper	6" x 9"	$9.60
PC8-CEMS	1/16"	2 oz.—one side copper	12" x 18"	$27.45
PC9-CEMS	1/16"	1 oz.—two sides copper	3" x 4½"	$3.60
PC10-CEMS	1/16"	1 oz.—two sides copper	4" x 6"	$6.00
PC11-CEMS	1/16"	1 oz.—two sides copper	6" x 9"	$12.70
PC12-CEMS	1/16"	1 oz.—two sides copper	12" x 18"	$40.30

BREADBOARDS

PERFORATED PLASTIC BOARDS

Made of 1/16" XXXP bakelite with holes either regularly spaced or staggered for transistors.

	HOLE	PATTERN		
No. B653	.062	alternate	3x4"	2.50
No. B655	.062	alternate	3x6"	3.25
No. B656	.062	alternate	4x8"	4.15
No. B657	.093	straight	3x4"	2.25
No. B658	.093	straight	3x6"	2.95
No. B659	.093	straight	4x8"	3.95
No. B663	.042	IC Breadboard	3x4"	2.40
No. B664	.042	IC Breadboard	3x6"	2.50
No. B665	.042	IC Breadboard	4x6"	3.15
No. B668	.042	IC Breadboard	4x8"	3.95



"P" Pattern

NEW • PERFORATED COPPER-CLAD BOARDS

Glass epoxy, "P" pattern, .042 holes .1"x.1", 1/16" thick, 1 oz. 1 side copper.

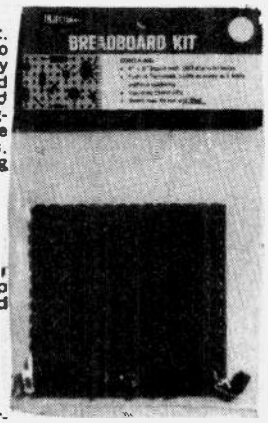
	size	no. of holes	
No. B3418	3x4½"	29x44	$4.15
No. B3419	4½"x6"	44x59	$8.25
No. B3421	4½"x8½"	44x84	$9.60
No. B3423	6x17"	59x169	$24.70

BREADBOARD KITS

• KIT 651

No. B651 5.50

With KIT 651 you can build a low-cost circuit. The perforated phenolic board allows you to make circuit and component changes quickly and easily. Contains one unclad punched board, 4 x 6 x 1/16", push-in terminals and mounting feet. Hole spacing on board is staggered to fit standard transistor leads. The board may be cut and filed to fit I.C. sockets. Punched with .062 holes. Packed in a hanging display package. Weight 1 lb.



• KIT 654

No. B654 5.50

Contains one 4x4" board with .093 diameter holes. Insulated stand-offs and springclip push-in terminals. Board may be cut and filed to size.

• KIT 671 (IC)

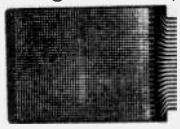
No. B671 5.60

Contains one 4x6" perforated epoxy paperboard with .042 holes, 4 plastic stand-offs, 4 screws and ten .042 flea clips.

NEW • UNIVERSAL IC BOARDS WITH FINGERS

Pre-punched grids of .042" diameter holes on .1"x.1" centers for IC's. Glass epoxy 1/16" board to fit 22/44 pin edge connector with .156 center to center.

No. B3424	4½"x6½"	$27.45
No. B3425	4½x9½"	$40.10

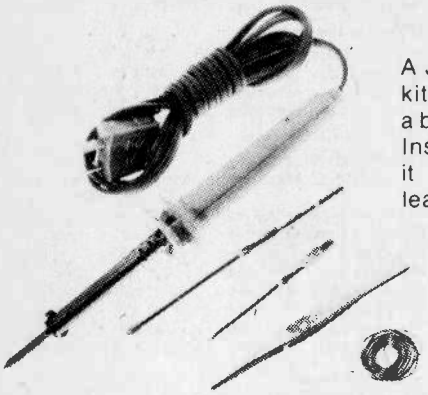


Prices Subject to Change Without Notice.

jana ELECTRONIC PROJECTS

HOBBYIST and SCHOOL LEARNING BY DOING and LOTS OF FUN

30 Watt Soldering Iron Kit

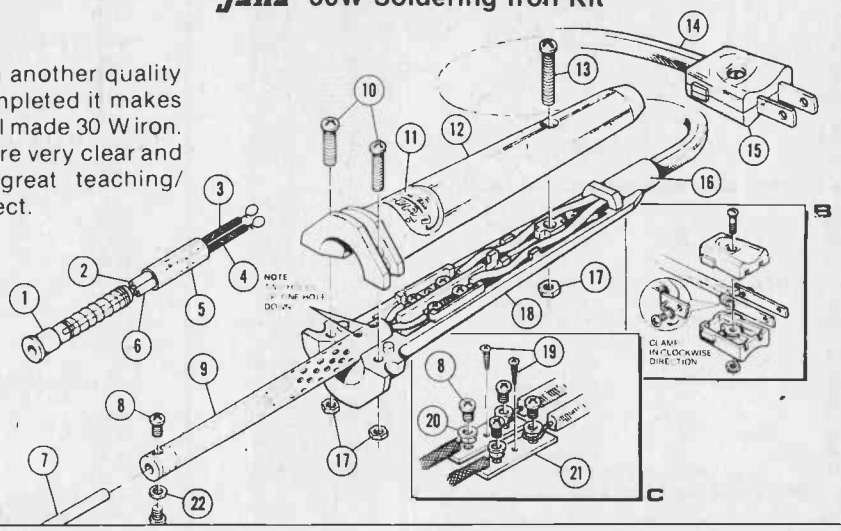


A Jana first in another quality kit. When completed it makes a beautiful well made 30 W iron. Instructions are very clear and it makes a great teaching/learning project.

Order Jana Project Kit No. 34 **$7.95**

INSTRUCTION MANUAL

***jana* 30W Soldering Iron Kit**



1.	**AUTOMATIC HEADLIGHT REMINDER** Novel circuit to remind you to turn your headlights off if they are left on when the ignition is off.	$ 4.25
2.	**BATTERY OPERATED FLORESCENT LIGHT KIT** Useful circuit that can be built into small (20 W max) fluorescent fixture in mobile vans & campers for 12 VDC	$14.25
3.	**BUG SHOO** Produces a sound to keep annoying bugs away.	$ 5.25
4.	**CODE OSCILLATOR** Practice up your "Morse Code" with this simple project.	$ 5.55
5.	**CRYSTAL RADIO** Crystal radio receiver picks up local AM radio stations.	$ 4.95
7.	**CURIOSITY BOX II** Great for parties — a novelty electronic item.	$ 7.25
8.	**DALLY LIGHTER** Time delay circuit for turning a light circuit off after a predetermined length of time.	$ 5.75
9.	**DECISION MAKER** Novelty item — great for the junior electronic enthusiast.	$ 4.25
11.	**HI POWER 12 V DC FLASHER** Electronic signal flasher circuit for warning lights, etc.	$ 7.25
12.	**PHOTO ELECTRIC NIGHT LIGHT** Night watchman — turns lights on at dusk and off at dawn.	$ 5.50
16.	**SINGLE CHANNEL COLOR ORGAN** Dancing lights are possible by connecting this to your HiFi and adding a light bulb.	$ 5.75
17.	**ELECTRONIC SIREN** Police siren simulator.	$ 4.59
18.	**SHIMMER STROBE LIGHT** Shimmer light is great for special lighting effects.	$ 6.25
19.	**TONE GENERATOR** Audio tone generator produces different tones by "waving your hand".	$ 5.59
26.	**ELECTRONIC SKEET GAME.** Test your skill at shooting the "bird". Random flight speed makes it impossible to "Fix the System".	$37.95
27.	**ELECTRONIC DICE.** Throw those dice. Instead of rolling dice now you can push a button. Do it by use on electronic circuits.	$25.95
28.	**SUPER ROULETTE.** Improved, upgraded version of roulette wheel II. Simulates gradual slowing down action of a real roulette wheel.	$18.95
29.	**F.M. MINI BROADCASTER.** Works well as a baby-watcher, eavesdropper or operating amplifier remotely from source without interconnecting wires.	$21.95

Neon Filament LAMP

RELAY

A A—Ammeter V—Voltmeter METER

MOT MOTOR

MICROPHONE

K A G SCR

PHONO PICKUP

LOUD SPEAKER

HEADPHONE

GROUND

GEN GENERATOR

FUSE

DRE Kits

COLOR ORGAN KIT

COMPLETE KIT COMES WITH:
- CIRCUIT BOARDS
- ALL ELECTRONIC PARTS
- LINE CORD
- KNOBS
- FUSES
- NEW INSTRUCTION SHEET

500 WATT SCR **$19.95**

1500 WATT TRIAC **$29.95**

5 TRANSISTOR AMPLIFIER

This five transistor amp puts out 1 watt &runs on a 9V battery. Ideally suited to the beginner on a limited budget.
Complete with pc board. **$9.95**

LIGHT CHASER

Our latest kit,sixteen LEDs that sequence in an up, down, or up-down motion.
Complete with pc board. **$24.95**

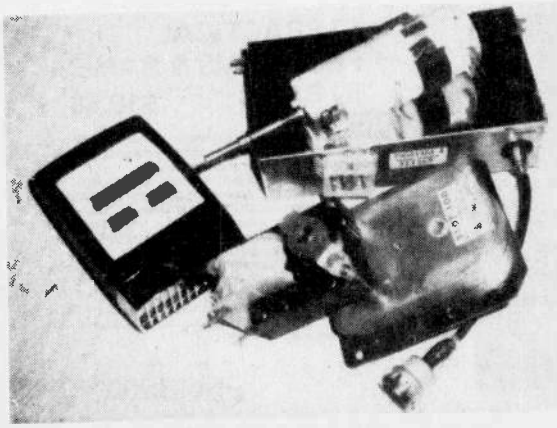
0–24 V, 1 AMP POWER SUPPLY

This regulated power supply has hundreds of uses and is easy to build.
Complete with pc board. **$19.95**

STROBE LITE

Be the disco king in your neighbourhood
Easy to build. Control allows you to vary the flash rate.
Complete with pc board. **$16.95**

ULTRA SONIC REMOTE CONTROL



$39.95

Ideal for converting your TV to remote or just as a general purpose remote control (3 channels).

COMPLETE WITH:
- RECEIVER — 110VAC
- TRANSMITTER — 9VDC
- REMOTE TUNER MOTOR 110VAC
- REMOTE MOTORIZED POT 110VAC
- SCHEMATIC DIAGRAM

Prices Subject to Change Without Notice.

TAB BOOKS

YOUR BEST BUY IN ELECTRONICS AND DO-IT-YOURSELF BOOKS

HOW TO DESIGN, BUILD, & TEST COMPLETE SPEAKER SYSTEMS

If you've always wanted to build your own speaker system, here's a book crammed with everything you need to know to do it right...the first time! It contains a variety of ready-to-build speaker system projects, from simple speaker-in-a-box setups to complex multi-driver systems, plus all the information even a beginner needs to design and build his or her own.

This clear guide shows you exactly how a speaker works, how its power and resonance are attained, and how speakers may differ from one another. The author also reveals details on single and multiple drive systems, crossover frequencies and networks, parallel networks, and voice coil inductance.

There are chapters on testing speakers and components, speaker boxes, closed box systems, reflex systems, labyrinths and transmission lines, omnidirectional speakers, multiple speaker arrays, and much more. It's as thorough a book as you'll find on the complete subject of speakers, speaker systems, and enclosures.

The author is a freelance writer whose articles have appeared in all major electronics magazines.

No. 1064

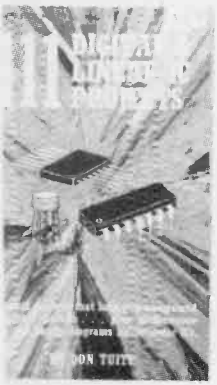
$8.95

MASTER TRANSISTOR/IC SUBSTITUTION HANDBOOK

$10.50

MASTER TRANSISTOR/IC SUBSTITUTION HANDBOOK, by TAB Editorial Staff. A giant 518-page one-stop, easy-to-use manual that gives you commonly available replacements for over 80,000 U.S. and foreign transistors and ICs—all listed alphanumerically—plus basing diagrams. Now you can quickly look up virtually ANY part number and immediately find which of the six major manufacturers of general replacement parts makes it. And you can also check out the basing diagrams for all listed units. It's a must to help you keep abreast of the ever-increasing number of new transistors and ICs, plus those foreign parts numbers, equipment manufacturer's parts numbers, and "in-house" parts numbers...all those specialized transistors and ICs on which you can spend hours looking for a substitute.

No. 970

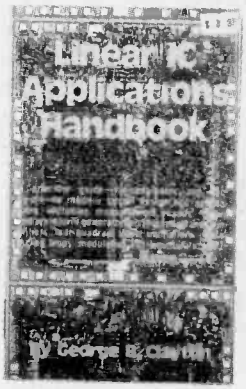


111 DIGITAL & LINEAR IC PROJECTS

$7.95

111 DIGITAL & LINEAR IC PROJECTS, by Don Tuite. A practical sourcebook of circuits for every taste—digital and linear—using off-the-shelf components. Complete specs and clear layout drawings are provided for every IC (including phase locked loop IC's) featured, and detailed applications info including all the values needed to make it work, accompanies each circuit project. The projects themselves, too numerous to mention, cover a broad spectrum that touches every phase of electronics—audio, computers, radio, test instruments, power supplies and regulators, and MANY more. Includes an Appendix providing basic performance data and basing diagrams on 50 common and uncommon IC's. 210 p., 275 ill. 1975

No. 780



LINEAR IC APPLICATIONS HANDBOOK

$8.95

LINEAR IC APPLICATIONS HANDBOOK, by George Clayton. A practical, data-packed manual that's chock-full of applications and design data on hundreds of linear ICs...with special emphasis on those used in signal measurement and processing systems. It's full of authoritative info on operational amplifiers, active filters, waveform generators, monolithic IC modulators and demodulators, transconductance and variable-gain amplifiers, four-quadrant multipliers, timers, phase-locked loops, etc. If you're a technician, engineer, or hobbyist who's serious about keeping up in electronics, and if you want practical data showing you how linear ICs work, and down-to-earth data on how to use them in solving real-world problems, then you just can't go wrong with this new guidebook. 280 p., 184 ill. 1977

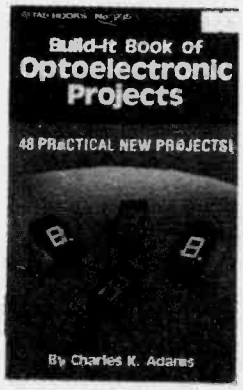
No. 938

88 PRACTICAL OP AMP CIRCUITS YOU CAN BUILD

$6.95

88 PRACTICAL OP AMP CIRCUITS YOU CAN BUILD, by George B. Clayton. Amplifiers to integrators, log converters to function generators—here's a comprehensive design digest of working circuits for the 741 op amp...for signal generation, for measurement, for signal-processing, for switching...even for timing. Covers loop gain, properties of op amps, resistive feedback circuits, operational integrators, operational differentiators, logarithmic converters, antilog converters, multiplier/dividers, power generators, and all kinds of log circuits. There are easy-to-follow directions on how to build hard-working op amp circuits like phase-sensitive detectors, precise rectifiers, comparators, free-running multivibrators, timing circuits, sinusoidal oscillators, base function generators, triggered function generators, and many more. 140 p., 120 ill. 1977

No.912



Build-it Book of OPTOELECTRONIC PROJECTS

$7.95

BUILD-IT BOOK OF OPTOELECTRONIC PROJECTS, by Charles K. Adams. A 48-project learn-by-building guide to the super-practical world of optoelectronics...with thoroughly readable instructions on how to create everything from an LED circuit monitor to an electronic stopwatch to an ultrasophisticated pulse stretcher, from a digital tachometer to a two-level logic probe to a garage nightlight. You'll build state-of-the-art optoelectronics packages loaded with goodies...like LEDs, LCDs, photodetectors, optoisolators, and photodiodes. Every project is original and unique, and comes with complete parts lists, detailed circuit descriptions, circuit options, and loads of schematics...plus complete data on all mechanical assemblies. Most of the circuit components are standard—and can be used in project after project. 238 p., 175 ill. 1977

No. 935

24 TESTED, READY—TO—RUN GAME PROGRAMS IN **BASIC**

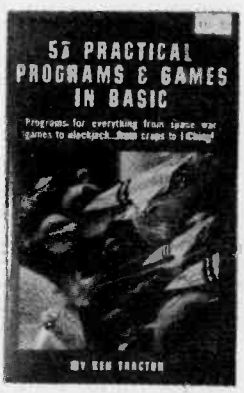
$7.95

Here is a unique collection of challenging and enjoyable games which can be played on microcomputers as well as on larger machines. All the items listed at left are included; they're designed to improve your reaction, calculation ability, logical reasoning, the use of mathematical ideas, and for just plain fun!

Each game is written in BASIC and is accompanied by a detailed description and a complete flow chart to make it easy for even a beginner to run it.

Ken Tracton is the author of several previous TAB computer games books as well as others on electronic circuitry.

No. 1085



57 PRACTICAL PROGRAMS & GAMES IN **BASIC**

$10.50

From arithmetic progression to statistical permutations to one-arm bandits, here are 57 practical, useful and fun programs designed to help you really put your minicomputer to work!

Game programs include blackjack, one-arm bandit, craps, and two space war games. Math and accounting programs include compounding, straight-line depreciation, statistical permutations, instant derivatives, and solutions for integrals—even a whole section of geometric solutions for modern-day Euclids. For history buffs, there is a Day-of-the-Week program for any date back through 1753.

Each program begins with an introductory paragraph describing its capabilities, and continues with a typical program sequence and flowchart. All programs will run on any floating point BASIC.

The author is a veteran computer programmer with extensive experience in developing software in various languages for a wide range of hardware systems.

No. 1000

6 VOLT BATTERY CHARGER

- CSA approved
- 600 mA output

$4.95

This unit is designed to work with the battery in the next column, but don't let that stop you. It can also be used as a 6 Volt, 600 mA power supply, or a 5 Volt regulated power supply if you add a No. L129 regulator chip.

6 Volt, 15 Amp/hr. Battery

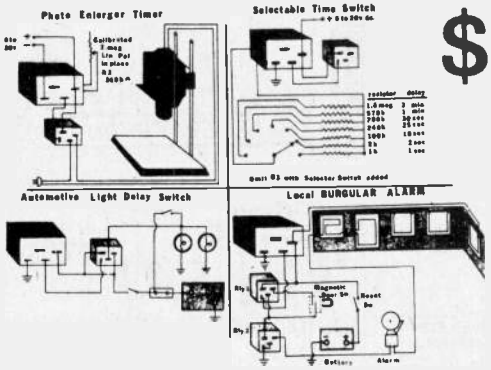
- Rechargeable
- 6 Volts, 15 A/hr.
- Complete with acid
- Needs only charging
- Full instructions

$14.95

This 6 volt battery is perfect for motorcycles, scooters, portable tools, toys, garden equipment, CB's, TV's, and a thousand other things. Comes with the acid in a dry state and must have distilled water added.

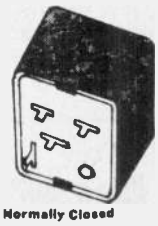
FOR THE HOBBYIST SOLID STATE TIMERS

APPLICATIONS



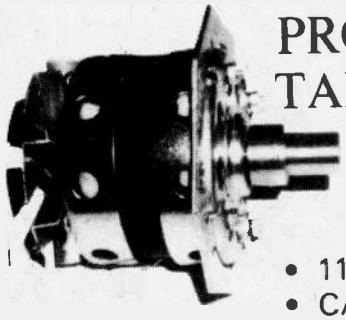
$3.95 pr.

25 Second Turn On SOLID STATE AUTO TIMER



Normally Closed SPST Relay

PROFESSIONAL TAPE MOTORS



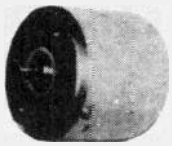
$5.95

- 110 VAC.
- CAPACITOR START
- REVERSIBLE
- 3¼" DIAX 4¼" H.
- 5/8" SHAFT

CASSETTE MOTOR

* OPERATES FROM 6–12 VDC

$3.95



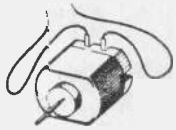
This small motor is not only useful as a cassette replacement motor, but is an excellent all-purpose hobby motor.

MINIATURE HOBBY MOTOR

.49 ea.

25 for $10.00
50 for $18.00

Small and compact, but with very high torque for its size. Has a million uses. Operates from 1.5 – 9VDC.

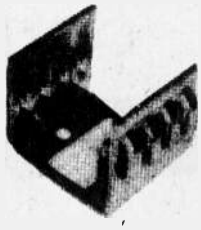


SOLDERLESS BANANA PLUG

.49¢ pr.

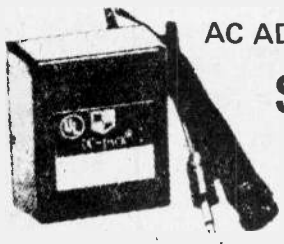
1 red - 1 black

DIP IC HEAT SINK



.25¢ ea.

AC ADAPTORS



$3.95 ea.

YOUR CHOICE
6V 100mA
9V 100mA

Prices Subject to Change Without Notice.

Power Transformers

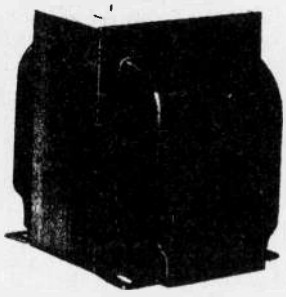
#24-10182-1
Pri. 110V
Sec. 56VCT 8 A.
24V 2 A.
6.3V 4 A.

#24-10182-2
Pri. 110V
Sec. 58VCT 10 A.
24V 2 A.
6.3V 4 A.

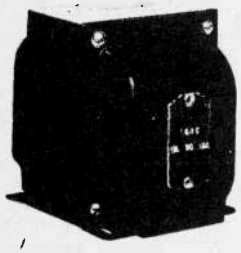
#24-10182-3
Pri. 110V
Sec. 64VCT 10 A.
24V 2 A.
6.3V 4 A.

YOUR CHOICE

$14.95



These transformers are surplus from a large manufactuer. They were originally used in high power amplifiers and stereo receivers. Many more uses as well stock up now.



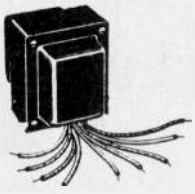
$8.95

#88015
Pri. 110V
Sec. 700V 150ma.
250V 50ma.
13.5V 1.5 A.

This transformer was specifically manufactured to match specifications with the 7984 transmitting compactron tube. Perfect for hams and general experimentors.

2826500

$3.95



28V
6V

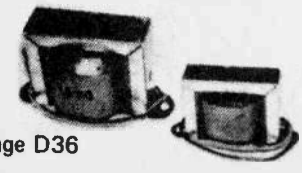
2A
500mA

Originally used in small receivers, these transformers are ideal for small amplifier projects and general power suplies.

FILAMENT TRANSFORMERS
CENTER TAPPED

MAX. CURRENT	VOLTAGE PRIMARY	VOLTAGE SECONDARY	
1A	117	6.3 CT	$4.95
1A	117	12.6 CT	$5.95

FILTER CHOKES

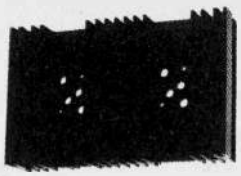


$ .99

#157Q 3.5H 150ma.
#155H 5H 50ma.

DUAL HEAT SINK

$3.95



7" X 4¼" X 1½"

PREDRILLED FOR 2 TO-3 TRANSISTORS

This heat sink was used in the same amplifiers as the transformer in the next column.

COMPACTRON TRANSMITTING TUBE

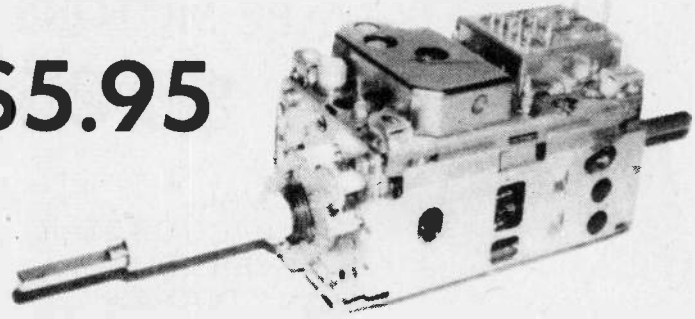
$3.50

MATCHES WITH #88015 TRANSFORMER ON THIS PAGE

TYPE	DESCRIPTION	Base Connections	Dimensions In Inches: Length	Dimensions In Inches: Diameter	Cathode: Volts	Cathode: Current Amps.	Cathode: Type	Class and Type of Service	Plate Input Watts
7984	Beam Power Amplifier	12EU	2.875	1.562	13.5	0.58	CU	Class A Amplifier	25
								Class C Amplifier	81

VHF TV TUNER

$5.95



ADMIRAL No. 94C476 1

TAPE RECORDER CONTROL CENTRE

$1.99

This unit was originally used as a remote control for custom instalation of tape recorders. The most useable parts are the three flexable shaft extensions and knobs.

CADMIUM SULPHIDE

PHOTO RESISTIVE PHOTO CELLS

$2.95 400ohms-50k
SEMICOM No. 54-2A

$1.25
500ohms-5k ohms
CLAIREX No. 705L

$1.25
100ohms-3kohms
CLAIREX No. 505 L

$1.25
1kohms-10k ohms
No. CSD3

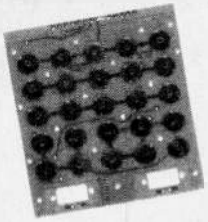
---

12 DIGIT DISPLAY

$3.95

THESE DISPLAYS HAVE 12 DIGITS AND OPERATE FROM A LOW VOLTAGE. A SURPLUS DEAL FROM A CALCULATOR COMPANY THAT'S A REAL BARGAIN.

SUPER DEAL

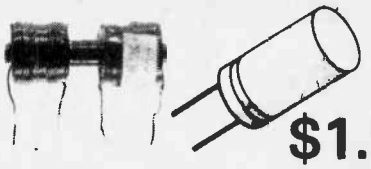


KEY BOARD

99¢ ea.

A 25 SWITCH KEYBOARD THAT HAS A VERY LIGHT TOUCH. YET CLICKS WITH A SOLID CONTACT. EASY TO CUSTOMIZE WITH DECALS.

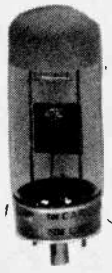
AUTOMOTIVE NOISE FILTER KIT



$1.95

A HEAVY DUTY DUAL COIL AND A CAPACITOR MAKE A FANTASTIC NOISE FILTER. COMPLETE WITH INSTRUCTIONS.

110V PROJECTION LAMP



$1.95 ea.

150W.
No. CAR

CANDELABRA BULBS.

39¢
40WATT ONLY

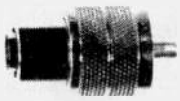
CANDELABRA BULBS.

39¢ ea.

TWO TYPES AVIALABLE
110V 15 WATT
or
110V 25 WATT

SPECIAL

PL-259 CONNECTOR

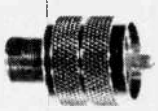


89¢

* CAN BE SOLDERED OR SOLDERLESS
* INCLUDES ADAPTOR FOR RG-58

SPECIAL

PL-259 CONNECTOR



89¢

* CAN BE SOLDERED OR SOLDERLESS
* INCLUDES ADAPTOR FOR RG-8

PILOT LIGHT

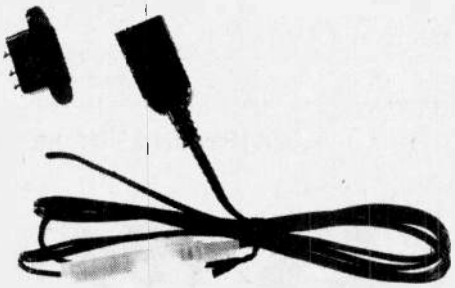
$1.49

* 110- NO RESISTOR NEEDED
* SNAP-IN MOUNT

POLARIZED 12 VOLT CABLE ASSEMBLY

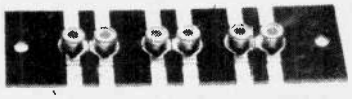
* INCLUDES RECPTICAL
* INCLUDES FUSE HOLDER & 2 AMP FUSE

$2.49



THIS CABLE ASSEMBLY IS VERY COMMON IN A LOT OF CB & 12 VOLT COMMUNICATIONS EQUIPMENT COMPLETLY READY TO GO.

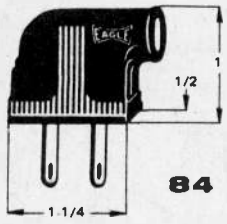
6X RCA PHONE JACK AUDIO TERMINAL



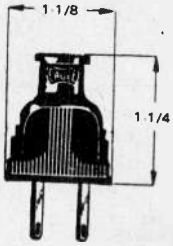
PERFECT FOR ANYONE BUILDING AMPLIFIERS, TUNERS ETC. **$1.19**

Prices Subject to Change Without Notice.

ELECTRICAL PRODUCTS



84



183

183 Flat rubber cap plug, dead front construction. $.65

84 Flat rubber cap plug, side outlet, dead front construction. $.65

86

$1.29

86 Flat rubber cord connector matching caps.

264

273

259

25¢ for 12

264 Painted insulated staples, size no 5 only. B-brown W-white.

273 Coppered insulated Staples, size no 5 only.

259 Coppered insulated staples, size no 7 only.

471

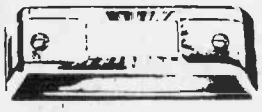
$1.29

471 Outlet winker-red bakelite 15- 1500 watts, 110-125 VAC.

600

$9.75

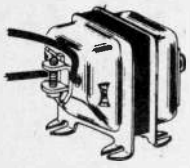
600 S.P. 600 W electronic Dimatrol.



137

$4.95

137 Lighted metal pushbutton, insulated. Anodized gold.



285

$6.95

285 Handy mount transformer 10V, 5VA. 115 V Primary.

296

292

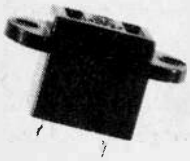
292 Double coil bell. Uses 6-10V AC transformer or 3-6 V battery. $5.95

296 Double coil buzzer. uses 6-10 VAC transformer or 3-6 V battery. $5.95

2 WIRE CHASSIS MOUNT AC RECEPTACLE

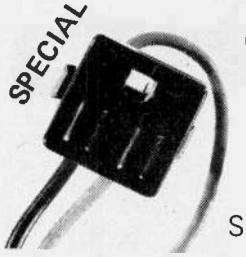
29¢ ea.

SPECIAL



3 WIRE CHASSIS MOUNT AC RECEPTACLE

SPECIAL



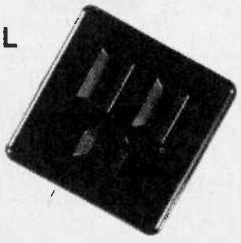
79¢ ea.

SNAP-IN MOUNT

SNAP-IN MOUNT

SPECIAL

89¢ ea.



jana

POPULAR ACCESSORIES

$16.95

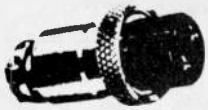
STEREO PHONO PREAMP
AJ 1306

Jana Stereo Phono Preamplifiers enable the Hi Fi enthusiast to use his magnetic cartridge with an amplifier that has only crystal or ceramic phono inputs.

SPECIFICATIONS

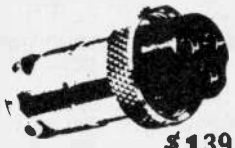
Frequency Response	— 30HZ to 20KHZ (RIAA)
Input Impedance	— 50K ohms
Max Input	— 30mv
Max Output	— 1.8V (at 1% H.D.)
Gain	— 10mv at .5V output
S/N Ratio	— better than 60db
Transistors	— 2SB175B x 4
Power Input	— 117VAC
Dimensions	— 4¾ in. (12cm) H x 2⅝ in. (6.6cm) W x 1½ in. (3.8cm)

CB CONNECTORS and ADAPTERS



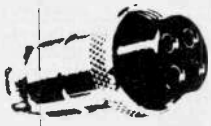
$1.29

2 CONDUCTOR INLINE MICROPHONE CONNECTOR
CJ 3154



$1.39

3 CONDUCTOR INLINE MICROPHONE CONNECTOR
CJ 3152

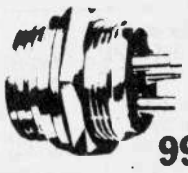


$1.49

4 CONDUCTOR INLINE MICROPHONE CONNECTOR
CJ 3150

99¢

2 CONDUCTOR CHASSIS MICROPHONE CONNECTOR
CJ 3155

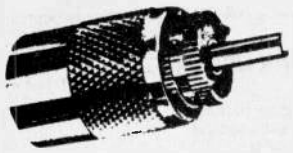


99¢

3 CONDUCTOR CHASSIS MICROPHONE CONNECTOR
CJ 3153

99¢

CONDUCTOR CHASSIS MICROPHONE CONNECTOR
CJ 3151



99¢

CABLE CONNECTOR
CJ 3800 (PL-259)

99¢

CHASSIS CONNECTOR
CJ 3804 (SO-239)

29¢

ADAPTER FOR (RG-58/U)
CJ 3801

ADAPTER FOR (RG-59/U)
CJ 3802

REPLACEMENT CASSETTE POWER CORD
AJ 1530

1.95

6 foot long, black line cord is the exact replacement for the most popular type. These cords are used in millions of portable tape recorders and phonos which are both battery and electric operated. Hard to find, but always needed.

POWER SOCKET
AJ 1529

79¢

Chassis Jack to mate with AJ 1530. Ideal for replacement in cassette recorders and for new installations in projects. Simply strip the insulation from the wire ends, insert into the hollow pins on the AJ 1529 and apply solder.

TAPE PLAYER WIRING HARNESS

4 MODELS

CJ 3402

CJ 3404

CJ 3401

CJ 3403

STEREO HARNESS CABLE

Stereo harness cables for use with your auto tape player, when connected to external power supply (base diagrams and stock numbers above). **$2.95**

UNIVERSAL MODEL

CJ 3096 Fits all tape players with pin type plugs (4 and 5 pin). Complete with instructions. **$3.95**

DOMINION RADIO & ELECTRONICS COMPANY

A Division of DREECO Electronics Limited
THE HOME OF RADIO & ELECTRONIC SUPPLIES

Prices Subject to Change Without Notice.

MOBILE and BASE MICROPHONES

Booster Rooster

Amplified Base Station Microphone
AJ 1009A

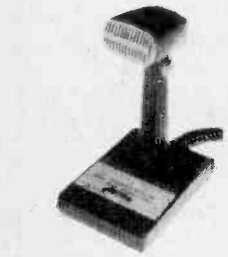
New top performance, amplified base station microphone. The Jana Booster Rooster has variable gain and allows manual control of volume by adjusting the control on the mic base. Push to talk and talk-lock applications. 600 ohm impedance matches Hi or Lo impedance transceivers or amplifiers. Ideal for PA systems of all types.

SPECIFICATIONS

Frequency Response	— 100 Hz - 8 KHz
Output Level	— -35 db - 1 KHz
Maximum Output	— 1.5 V
Amplifier Voltage Gain	— 0-30 db
Power Source	— 9 V battery (MN 1604)
Cable	— 6 feet (1.8 m) coiled (3 wire, 1 shield)
Battery Life	— 300 hours (continuous)
Dimensions	— 9" (23 cm) high and 5-3/4" (15 cm) x 3-11/16" (9 cm) base size
Net Weight	— 2 lbs (0.9 Kg)
Cable	— 4 wire (plus shield) coiled mic cable

NEW

$29.95

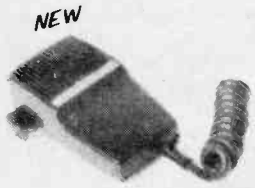


DYNAMIC MICROPHONE
Feature-Packed Base Station Microphone
AJ 1011A

This new microphone is at present, the top feature-packed base station mike, making it ideal where applications demand a table top microphone. Will match all PA applications. Relay or electronic switching. Hi or Lo impedance, press-to-talk button with locking position. Ideally suited for all types of communications equipment. Finished in black and chrome. Complete with cable. Install with CJ 3150 or CJ 3152 connectors.

$24.95

NEW



Maxi-Mod Power Mic
AJ 1055

100% modulation is now possible for all CB transceivers with our AJ 1055. 600 (low impedance) omni-directional condenser element is designed to produce the gain most sets require. The gain is fully adjustable with the semi-recessed volume control. Powered by 9 V battery (MN1604).

$9.95

NEW

Low Impedance Mobile CB Microphone
AJ 1007

$4.95

An economical replacement for transceivers requiring a 600 ohm microphone. Tests have proven this mic to be superior to those within a similar price category. Supplied without connector, so you can install your own to match your set. For both electronic and relay switching.

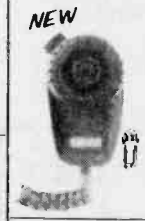
Mobile Dynamic CB Mic
AJ 1008

This microphone performs under the same conditions as the AJ 1012. It is an exact replacement for those used with the Jana KJCB-32 transceiver series. The case is made of high-impact molded plastic. Impedance 50 K ohms. Cable terminated by a 3 conductor phone plug.

FACTORY INSTALLED PLUG AS SHOWN

$4.95

NEW



Condenser Mic
AJ 1050

$5.95

Better gain and sensitivity compared to regular CB mics. Omni-directional condenser element. For relay or electronic switching. Packaged with a 4 pin plug (Jana CJ 3150) for most radios.

Sensitivity	— -70 db @ 1 KHz
Response	— 300 Hz — 5 KHz
Impedance	— 600 ohms
Cable	— 4 conductor plus 1 shield
Power	— 1.5 V penlite (MN1500 Mallory)

PACKAGED WITH PLUG AS SHOWN

NEW

Noise Cancelling Mic
AJ 1051

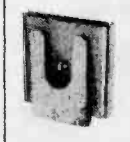
$5.95

Designed for use in high background noise level areas like 18 wheelers, boats, etc. Dynamic 50 K ohm mic element. For electronic or relay switching. Package with a 3 conductor phone plug (Jana CJ 3022) for easy assembly to our Aggressor KJ CB-32 radio.

SPECIFICATIONS

Sensitivity	— -57 db @ 1 KHz
Response	— 300 Hz — 5 KHz
Impedance	— 50 K ohms
Cable	— 4 conductor plus 1 shield

FACTORY INSTALLED PLUG AS SHOWN



MAGNETIC MIC HOLDER WITH DOUBLE SIDED ADHESIVE TAPE
KJ 11300

Mount your CB microphone on anything, wood, metal, glass or plastic. Powerful magnet clamps onto metal surfaces without the use of the tape so easy removal is possible but the double-sided tape makes it great for your padded vinyl dash.

$0.69

KJ 11101

$19.95

BASE STATION POWER SUPPLY
KJ 11101

13.8 V. AC Adapter for use with the KJ CB-32 Transceiver (or any 12 Volt DC operated equipment). Precision regulated and filtered circuitry is built in for constant current and no AC Hum. Converts 110 VAC to 12 VDC @ 1.5 Amps. On-off switch on the front end, two 5-way binding posts on the rear.

$2.95

SOLID STATE
DC — DC CAR CONVERTER

JJ 10529 — DC 9V 300MA

Now you can run your transistorized equipment from your 12 volt car battery! Just plug into your cigar lighter and is ready to run your tape cassette recorder, radio, phono or transceiver.

SWR FIELD STRENGTH METER
HJ 8017A

Our most popular model. Measures SWR to 3:1. When using the supplied antenna, you can determine the best antenna location on a vehicle and relative R.F. power output to ensure adequate transceiver performance. Supplied complete with instructions.

$9.95

KJ 11173

$24.95

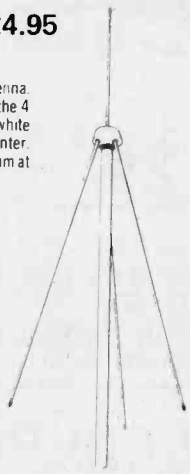
KJ 11500

"Big John" is our new 1/2 wavelength fiberglass antenna. Installation is completed in a matter of minutes. Each of the 4 elements is 106" (2.7 m) and constructed of solid white fiberglass with the copper conductor embedded in the center. These elements are tapered from 6 mm at the bottom to 3 mm at the top to reduce wind resistance. 5.0 db gain.

KJ 11173

"Shot Gun" is a unique antenna providing the best features of fiberglass and stainless steel antennas. The loading coil, located at the top of the fiberglass portion was specially designed to provide a flat SWR curve across the entire 40 channel band. The antenna is tuned in length and inductance simultaneously by adjusting the top stainless steel whip. The Shot Gun is packaged with a swivel adapter to enable vertical mounting on any surface. 50" (1.27 m) long. It will blast your signal all over the country. Designed to accept all Jana mounts (see pages 53 and 52) or other 3/8" or 1/2" hole mounts. Use KJ 11172 coax assembly.

$9.95



KJ 11500

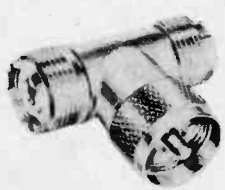
EXACT REPLACEMENT TRANSCEIVER ANTENNAS

Made to exact manufacturers' specifications for replacement purposes. All have top quality brass sections and chrome plating for maximum durability.

$1.95

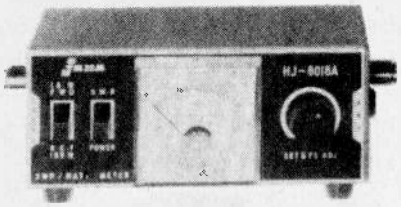
SPECIFICATIONS	KJ 11203
Longueur Maximum Length	52"
Longueur Minimum Length	6-5/8"
Sections Qty Qtée	9
Base Dia. Dia. de Base	7/16"

$1.19



TEE CONNECTOR
CJ 3805 (M-358)

TRANSCEIVER ACCESSORIES



$14.95

FIELD STRENGTH — SWR — WATTMETER
HJ 8018A

A handy unit to leave in your antenna line at all times to ensure adequate transceiver and antenna operation. Measures R.F. power output in 2 convenient scales, 10W and 100W. Relative R.F. power output and field strength readings can be easily determined when meter is used with supplied antenna. SWR measurements from 1:1 to 3:1 with a frequency range of 1.5 MHz to 144 MHz. Supplied complete with instructions.

$5.50

ALTERNATOR/GENERATOR ELECTROMAGNETIC FILTER
KJ 11297

The most wanted item amongst our noise suppression products. Eliminates unwanted noise, caused by Alternator/Generator systems. Specially designed, built-in, capacitive and inductive devices cut-off noise pulses above 30 MHz. Installed inline on the positive output terminal of the Alternator/Generator. Rated at 100 amperes for 90% of the charging systems used on cars and trucks on the road today. Complete instructions provided.

COAXIAL LIGHTNING ARRESTOR
KJ 11290 **$1.99**

Designed to fit any coaxial cable. KJ 11290 employs a unique disc filter to drain off static charge and lightning induced voltage, continuously. There is no effect on RF transmission up to the highest power while static noise and voltage breakdown is eliminated.

LIGHTED CB DUMMY LOAD
KJ 11298 **$1.49**

Determines the presence and strength of RF Power easily by the brightness of the light. Also enables you to make comparisons between transceivers without actually going "on air".

KJ 11172

16.4 feet (5 m) of RG-58 coax cable terminated with a CJ 3800 (PL 259) on one end and lugs on the other. Specifically designed for our Shot Gun (KJ 11173) but it will work with any antenna.

$4.50

POWER SOCKET **$0.17**
AJ 1529

Chassis Jack to mate with AJ 1530. Ideal for replacement in cassette recorders and for new installations in projects. Simply strip the insulation from the wire ends, insert into the hollow pins on the AJ 1529 and apply solder.

BACK AGAIN BY POPULAR DEMAND

$34.95

CITIZEN BAND CHECKER
HJ 8022

This tester has been made to allow easy checking of transceivers, operating in the 27 MHz citizen band. The compact design of this tester makes it ideal for use by mobile stations.

SPECIFICATIONS:

Frequency:	27 MHz citizen band
Impedance:	50 - 52 ohms
Connector:	CJ 3804 (SO-239) UHF type
Meter:	100 uA moving coil (pivot) Type 52 (25A)
Battery:	006P (9V) 1 ea
Dimensions:	81 x 117 x 179 mm
Weight:	780 g

MEASURE RANGE:

Wattmeter (POWER).	0-5 watts (average power) 10%
Standing wave ration (VSWR)	1.1-3:1
Modulation degree meter 0-100% (average modulation degree):	10% (measurable power 1 watt min)

Relative field strength meter (RFS)
27 MHz band ratio frequency oscillator Output 300 mV min (at no load)
Crystal activity test (Good or Bad method)
27 MHz band oscillator with audio frequency Modulation (RF with AF oscillation about 1000 c/s).
Low frequency oscillator freq. about 1000 Hz Output 1 V min. (at no load)
5 watt dummy load built-in.

CB FILTERS and SWR BRIDGES

$9.95

MINI-METER
HJ 8024

Outstanding for in-line mobile operation as well as base station use. Scaled to read SWR from 1:1 to 3:1 as well as percentage of reflected power. Includes calibration adjust knob, forward or reflected reading switch and mounting bracket for mobile installation. Measures only 4¼"W x 2¼"H x 2⅜"D, weighs 7 oz

WITH CAR MOUNTING BRACKET

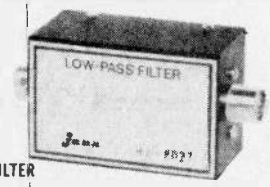
$6.95

ANTENNA MATCHER
HJ 8025

Designed to help you radiate all the power your CB transceiver is delivering to your antenna. Tuning your transmission line to a standing wave ratio (SWR) of 1:1 gives improved overall operation. Helps reduce harmonic radiation and television interference (TVI). Power rated at 100 watts. Tunable antenna impedance from 35 to 150 ohms. Dimensions 3¼"W x 2¼"H x 2¾"D, weight 7 oz.

WITH CAR MOUNTING BRACKET

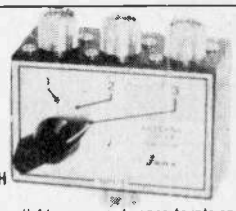
$4.95



LOW PASS FILTER
HJ 8027

An excellent accessory item to reduce television interference (TVI) which may be caused by your CB transceiver. Sharply cuts off frequencies above 30 MHz. Power rated at 150 watts. Measures just 4¼" W x 1⅝" H x 2¼" D. Weight — 6 oz.

$7.95



ANTENNA SWITCH
HJ 8026

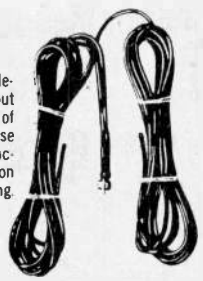
Coaxial switch allows the transceiver to operate into one, two or three antenna systems. Power rated at 150 watts. SWR at 27 MHz is less than 1.2:1.0 for CB use. Dimensions — 3¼"W x 2½" H x 3¼" D. Weight — 7 oz.

NOTE: It may also be used for 3 transceivers and 1 antenna.

$4.95

KJ 11170

Co-phasing harness specially designed for 2 — KJ 11125 but works well with other makes of antennas. Made from low noise RG-59/U. CJ 3800 (PL 259) factory installed on the common end. Each side is 5 m (16.4') long.



$4.95

KJ 11171

Co-phasing harness specially designed for 2 — KJ 11173 Shot Gun antennas but works well on other makes of antennas. Made from low noise RG-59/U. CJ 3800 (PL 259) factory installed on the common end and lugs installed on the end of each leg of the harness. Each side is 4 m (13.1') long.

$0.79

4 CONDUCTOR INLINE MICROPHONE CONNECTOR
CJ 3150

PLUGS JACKS & ADAPTERS

RCA PHONO PLUG

$.10
A1

INSULATED RCA PHONO PLUG

$.20
A2 Red or Black

FINGER-GRIP RCA PHONO PLUG

$.15
A3

INSULATED RCA PHONO PLUG

$.35
A4

SHIELDED RCA PHONO PLUG

$.45
A5

RCA PHONO JACK

$.15
A6

CHASSIS MOUNT RCA PHONO JACK

$.30
A7

INLINE RCA PHONO JACK

$.35
A8

DUAL RCA PHONO JACKS

$.30
A9

SHIELDED INLINE RCA PHONO JACK

$.45
A10

ULTRS MINI ATURE PLUG

$.15
A11

ULTRA MINIATURE LONG BARREL PLUG

$.25
A12

MINIATURE PLUG

$.20
A13

MINIATURE PLUG

$.35
A14

CHROME MINIATURE PLUG

$.50
A15

ULTRA MINIATURE CHASSIS MOUNT JACK

$.15
A16

ULTRA MINIATURE INLINE LONG BARREL JACK

$.35
A17

CHASSIS MOUNT JACK

$.20
#901 Closed Circuit
#902 Open Circuit

MINIATURE INLINE JACK

$.35
A19

CHROME MINIATURE INLINE JACK

$.50
A20

STANDARD PHONE PLUG

A21 Black $.55

SHIELDED PHONE PLUG

$1.49
A22

90 STANDARD PHONE PLUG

$1.29
A23

90 SHIELDED PHONE PLUG

$1.29
A24

CHROMED BARREL PLUG

$1.99 A25

INLINE PHONE JACK

$.55
A26

SHIELDED INLINE PHONE JACK

$1.49
A27

CHASSIS MOUNT PHONE JACK

$.40
A28 Closed Circuit

CHASSIS MOUNT PHONE JACK

$.40
A29 Open Circuit

CHROMED BARREL INLINE JACK

$1.99
A30

STEREO PHONE PLUG

$.89
A31

90 STEREO PHONE PLUG

$1.49
A32

SHIELDED STEREO PHONE PLUG

$1.89
A33

STEREO PHONE JACK CIRCUIT CLOSING

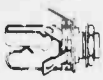
$.50
A34

36 STEREO Y ADAPTOR

$2.49

INLINE stereo PHONE JACK

$.99
A35

STEREO PHONE JACK

$.55
A36

SHIELDED STEREO INLINE JACK

$1.49
A37

EPOXY STEREO PHONE JACK

$.99
A38 CIRCUIT CLOSING

STEREO Y ADAPTOR

$3.95

MINIATURE MALE INLINE MIKE CONNECTOR

$.99
A39

MALE INLINE MIKE CONNECTOR

$.99
A40

MIKE CONNECTOR TO PHONE PLUG ADAPTOR

$.99
A41

SHIELDED PHONO JACK TO PHONO JACK ADAPTOR

$.99
A42

PHONO JACK TO PHONO JACK ADAPTOR

$.89
A43

MINIATURE MALE CHASSIS MOUNT MIKE CONNECTOR

$.59
A44

MALE CHASSIS MOUNT MIKE CONNECTOR

5/8 - 27 thread $.59
A45

MIKE CONNECTOR TO PHONE JACK ADAPTOR

$1.49
A46

PHONO PLUG TO PHONE PLUG ADAPTOR

$.99
A47

PHONO JACK TO PHONO JACK ADAPTOR

$.99 A48

MINIATURE FEMALE INLINE MIKE CONNECTOR

$.89
A49

FEMALE INLINE MIKE CONNECTOR
5/8-27 thread

$.89
A50

MIKE CONNECTOR TO PHONE JACK ADAPTOR

$.99
A51

PHONO JACK TO MINIATURE PLUG ADAPTOR

$.89
A52

ULTRA MINIATURE JACK TO MINIATURE PLUG ADAPTOR

$.99
A53

MINIATURE JACK TO ULTRA MINIATURE PLUG

$.99
A54

MINIATURE JACK TO PHONE PLUG ADAPTOR

$.99
A55

MINIATURE JACK TO PHONO PLUG ADAPTOR

$.99
A56

PHONE JACK TO ULTRA MINIATURE PLUG ADAPTOR

$.99
A57

ULTRA MINIATURE JACK TO STANDARD PHONE PLUG

$.99
A58

PHONE JACK TO MINIATURE PHONE PLUG

$.99
A59

PHONE JACK TO PHONO PLUG ADAPTOR

$.99
A60

PHONE JACK TO PHONE JACK ADAPTOR

A61 $.99

PHONE PLUG TO PHONE PLUG ADAPTOR

A62 $.99

MIKE CONNECTOR TO PHONO JACK ADAPTOR

$.99
A63

Here are the latest additions to our line of Hi-Fi and P.A. cable assemblies :

RCA plug - Bare Wires
W1 36" $1.09
W2 72" $1.49
W3 120" $1.79

RCA plug - Spade lugs
W4 36" $.99
W5 72" $1.49

RCA plug - Alligator clips
W7 72" $1.49

RCA plug - RCA plug
W8 36" $1.19
W9 72" $1.49
W10 120" $1.79

RCA plug - 90 RCA plug
W11 72" $1.49
W12 120" $1.89

RCA plug - RCA jack
W15 36" $1.09
W16 72" $1.49

2 RCA plugs - 2 RCA plugs
W17 72" $2.49

RCA plug - ¼" phone plug
W18 36" $1.09
W19 72" $1.49

RCA plug - ¼" phone jack
W22 72" $1.79

MINI plug - Bare wires
W23 72" $1.49

MINI plug - Alligator clips
W24 72" $1.49

MINI plug - RCA plug
W25 72" $1.49

MINI plug - RCA jack
W26 72" $1.49

MINI plug - Mini plug
W27 72" $1.49

MINI plug - Mini jack
W28 72" $1.49

MINI plug - ¼" Phone plug
W29 72" $1.49

MINI plug - Phone jack
W30 72" $1.49

¼" Phone plug-RCA Jack
W31 72" $1.49

5 PIN ACTUAL SIZE

ALLIGATOR CLIPS

RCA PHONO PLUG

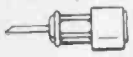
MINI PLUG

¼" PHONE PLUG

3 PIN ACTUAL SIZE

SPADE LUGS

RCA PHONO JACK



MINI JACK

¼" PHONE JACK

Complete Cable Assemblies for Hi-Fi

with European connectors

NO.	CONNECTOR	CABLE	CONNECTORS	PRICE
W40	3 PIN DIN PLUG	6' 2 COND & SHIELD	2 PHONO PLUGS	$3.95
W41	3 PIN DIN PLUG	6' 2 COND & SHIELD	2 PHONO JACKS	$3.95
W42	3 PIN DIN PLUG	6' 2 COND & SHIELD	2 MINI PLUGS	$3.95
W43	3 PIN DIN PLUG	6' 2 COND & SHIELD	3 PIN DIN PLUG	$3.95
W44	3 PIN DIN PLUG	6' 2 COND & SHIELD	3 PIN DIN JACK	$3.95
W45	5 PIN DIN PLUG	6' 2 COND & SHIELD	2 PHONO PLUGS	$3.95
W46	5 PIN DIN PLUG	6' 4 COND & SHIELD	4 PHONO PLUGS	$4.95
W47	5 PIN DIN PLUG	6' 4 COND & SHIELD	4 MINI PLUGS	$4.95
W48	5 PIN DIN PLUG	6' 4 COND & SHIELD	5 PIN DIN PLUG	$4.95
W49	5 PIN DIN PLUG	6' 4 COND & SHIELD	5 PIN DIN JACK	$4.95
W50	4 RCA PLUGS	6' 4 COND & SHIELD	4 RCA PLUGS	$4.95

FLEXIBLE "Y" CONNECTORS

W51	1 RCA PLUG	-	2 RCA JACKS	$1.49
W52	1 RCA JACK	-	2 RCA PLUGS	$1.49
W53	1 RCA PLUG	-	2 RCA PLUGS	$1.49
W54	1 MINI PLUG	-	2 RCA PLUGS	$1.49
W55	1 MINI PLUG	-	2 MINI JACKS	$1.49

3 WAY "Y" ADAPTERS

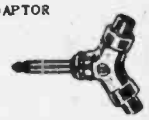
SHIELDED "Y" ADAPTOR $.89

2 RCA jacks parallel connected to one RCA plug.

SHIELDED "Y" ADAPTOR $.89

3 RCA jacks parallel connected

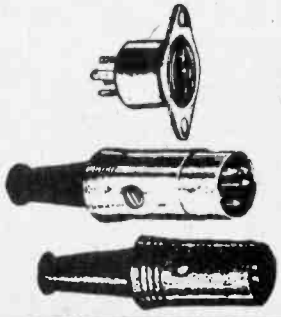
SHIELDED "Y" ADAPTOR $.89



2 RCA jacks parallel connected to one ¼" phone plug.

NEW

CONTINENTAL CONNECTORS



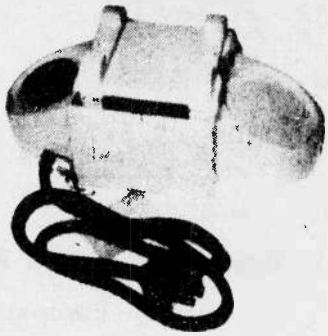
	PINS	MALE	INLINE FEMALE	CHASSIS MOUNT
	2	$1.69 72M Metal	$1.89 73F Metal	
	2	$.69 56M Plastic		$.69 57C Plastic
	3	$.99 58M Plastic	$.99 59F Plastic	$.69 66C Plastic
	5	$.99 60M Plastic	$1.19 61F Plastic	$.69 67C Plastic
	5	$2.29 76M Metal	$2.29 77F Metal	
	6	$2.39 70M Metal		$89 71C Metal

DOMINION RADIO & ELECTRONICS CO

A Division of DREECO Electronics Limited

Telephone Adapters and Extension Equipment

TELEPHONE INDUCTION BOX



COMPLETE WITH:
Solenoid
Speaker
Microphone
Ring detector

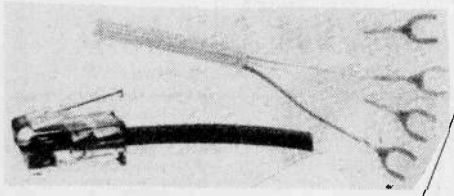
$5.95

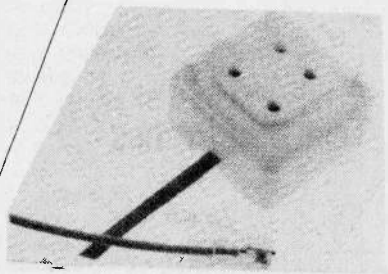
This unit comes from a telephone answering machine. It is ideal for hams , CB, & hobby applications where you wish to connect to the telephone without direct wiring.

Telephone Replacement Cable

GJ 7034 — 6 ft (1.8m) $2.59
GJ 7035 — 25 ft. (7.6m) $4.95

Exact replacement cables for telephone related equipment. Modular plug on one end and 4 spade lugs (color coded) on the other.

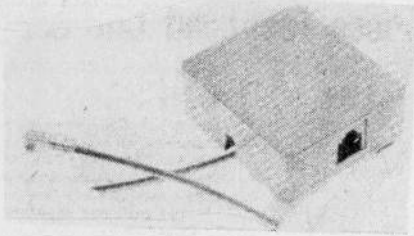




Modular Telephone Adapter

GJ 7033 $3.49

This 50 cm cable adapter allows older style equipment to be connected to the new style modular jacks.



Modular Telephone Extension Cable

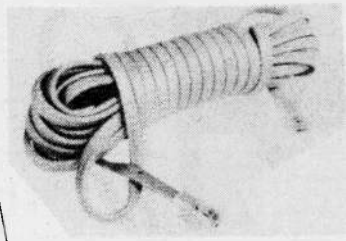
GJ 7036 — 10 ft. (6.m) $4.49
GJ 7037 — 25 ft. (7.6m) $5.95

The GJ 7036 and GJ 7037 can be used for portable and permanent installations. Both models will also allow 2 telephones to be connected (or one telephone and one answering machine).

Modular Telephone Cable

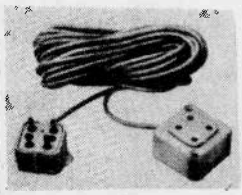
GJ 7038 — 15 ft. (4.58m) $4.95
GJ 7039 — 25 ft. (7.6m) $6.49

Designed for connecting telephone related equipment. Modular plugs on each end.



TELEPHONE JACK
GJ 7007 — Telephone Jack, Ivory **$1.19**
To be used with telephone plug shown at left. Permits telephone to be used in several rooms. Four-prong jack with screw-type terminals and two mounting screws.

TELEPHONE PLUG
GJ 7006 — Telephone Plug, Ivory **$1.29**
Gives standard telephone much greater mobility in the home. Four-prong male plug has screw terminals for fast convenient installation. Supplied with mounting screws.



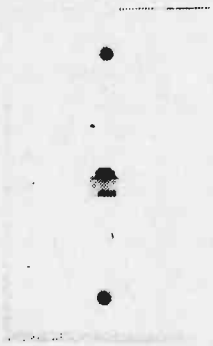
30 FT TELEPHONE EXTENSION CORD
GJ 7005 **$5.95**
Plugs into standard telephone equipment or jacks and plugs shown below. 30 ft color-coded cable has telephone jack on one end, plug on the other. Ivory.

Modular Telephone Adapter NEW!

GJ 7032 **$1.95**

The GJ 7032 allows existing older style wall jacks to be converted to the new style modular jack so equipment using new style plugs can be connected.

Flush Mount Wall Jack

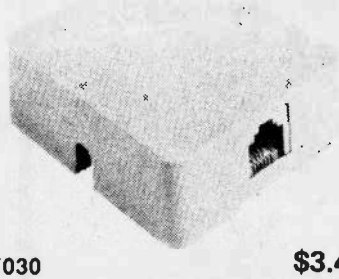


NEW!

GJ 7031 **$2.49**

A must for new installations (rec rooms, etc.) or conversion from old to the new. Ivory colour, matches any decor. Very easy to install.

Surface Mount Wall Jack NEW!



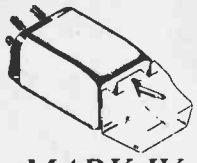
GJ 7030 **$3.49**

Designed to allow connection of 2 phones. Simple to install and small enough to be hidden out of sight. Grey color.

EMPIRE

MAGNETIC CARTRIDGE

$24.95



Frequency Response	18-22,000 Hz 20-20,000 Hz ± 3 dB
Output Voltage Per Channel at 5cm/sec groove velocity	7.1 mv
Channel Separation 20Hz-10 KHz 10 KHz-20 KHz	25 dB 15 dB
Tracking Force in Grams	1¼ to 2½

MARK IV ELLIPTICAL STYLUS CARTRIDGE

BSR CARTRIDGES

MONO CERAMIC #X5H

[redacted] $3.95

STEREO CERAMIC #5X6M

$4.95 [redacted]

PROFESSIONAL TAPE SPLICER

CASSETTE and 8 TRACK DRIVE BELTS

FLAT 8 TRACK BELTS

GJ7080
330 mm, (13 in.) dia. - ¼" wide (6.4 mm)

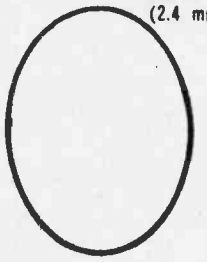
GJ7081
280 mm, (11 in.) dia. - 3/16" wide (4.8 mm)

GJ7082
280 mm, (11 in.) dia. - ¼" wide (6.4 mm)

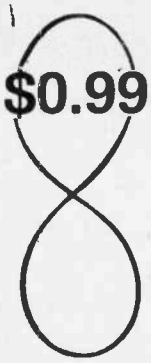
$1.69

ROUND CASSETTE DRIVE BELT
GJ7075

150 mm (5.9 in.) dia. - 3/32" (2.4 mm) round



$0.99



$0.99

SQUARE CASSETTE DRIVE BELTS

GJ7070
280 mm (11 in.) dia. - 1/16" (1.6 mm) square

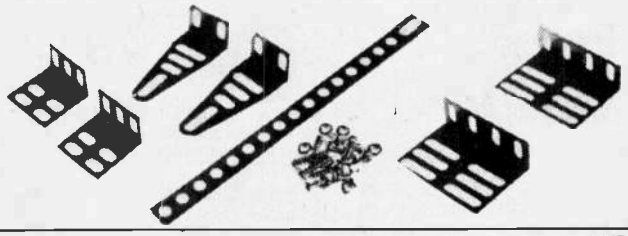
GJ7071
150 mm (6 in.) dia.

GJ7072
240 mm (9.4 in.) dia.

GJ7073
230 mm (9.0 in.) dia.

GJ7074
255 mm (10 in.) dia.

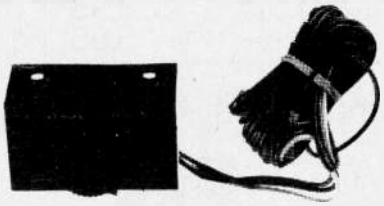
GJ7076
220 mm (8.8 in.) dia.



UNIVERSAL MOUNTING KIT **$2.95**
FJ 6001
This mounting kit is specially designed for versatility when mounting CB transceivers or car stereos. The kit contains: 6 brackets, 1 adjustable bracket strap, 6 bolts, nuts and washers, 4 lock washers and 4 sheet metal screws.

SPEAKER FADER KIT

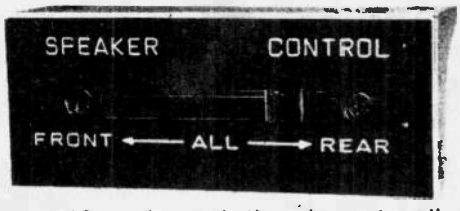
$1.19



FJ 6050
For controlling any one of 2 speakers or both, such as auto radios and stereos. Rated at 1.2 watts continuous, 3.5 watts audio peak. Complete with hook-up wires already soldered. Controller is mounted on a deep etched plastic plate, c/w split knurled knob, self-tapping screws for installing & instructions.

SLIDE TYPE FADER CONTROL

$3.95



FJ 6071
For controlling any one of 2 speakers or both such as auto radios and stereos, by adjusting moving horizontal slider. Rated at 1.2 watts continuous, 3.5 watts audio peak. Complete with hook-up wires already soldered. Controller is mounted on a deep etched plastic plate c/w knob, self-tapping screws for installing and instructions.

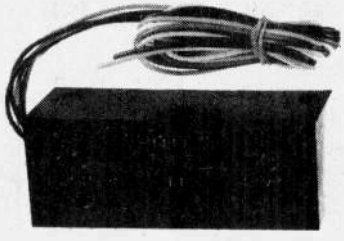
RADIO—TAPE SWITCH

NEW $4.95

FJ 6051
Exclusive to us. Many switches look like ours but won't do the same job. For all applications: AM, AM-FM, 8 Track, Quad (discrete and matrix), 2 speakers or 4 speakers and you can use this for systems that cannot use the vehicle ground. Complete instructions included for all types of installations.

DELUXE FADER CONTROL

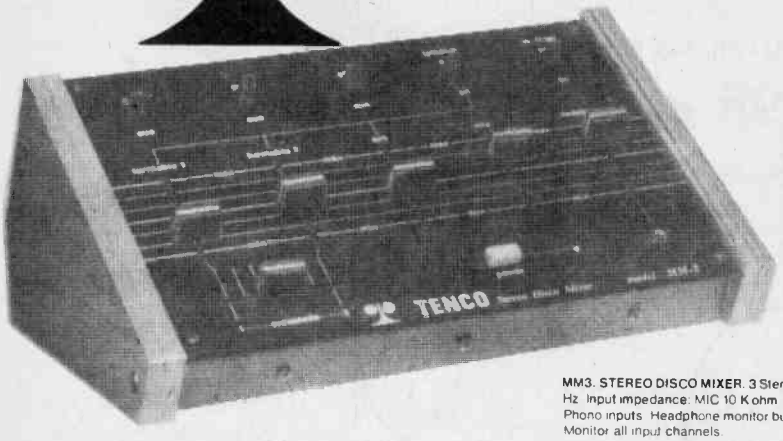
$5.95



FJ 6070
QUAD SPEAKER CONTROL
For controlling any two of 4 speakers or all such as 4 speakers system of auto stereos, by adjusting two moving horizontal sliders. Rated at 1.2 watts continous, 3.5 watts audio peak. Complete with hook-up wires already soldered. Two controllers are mounted on a deep etched plastic plate, c/w two knobs, spare wires, self-tapping screws for installing and instructions.

Prices Subject to Change Without Notice.

TENCO
ELECTRONICS LTD



$169.95
MM3 STEREO DISCO MIXER

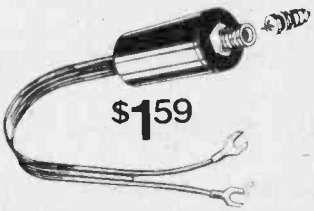
MM3. STEREO DISCO MIXER. 3 Stereo sources and one microphone. Slide volume controls. Power Supply AC 117 V - DC 9 Volts 60 Hz. Input impedance: MIC 10 K ohm. PHONO 47 K ohm. AUX 100 K ohm. MIC talkover reduces music by 10 dB. Cross fade between Phono inputs. Headphone monitor built in. Dimensions 260 mm W X 186 mm D X 115 mm H. Net weight 2 Kg. Built in rumble switch. Monitor all input channels.

ROTARY SWITCHES

5201. 11 position, single pole.
5202. 12 position, single pole.
5203. 5 position, 2-pole.
5204. 6 position, 2-pole.
5205. 3 position, 3-pole.
5206. 4 position, 3-pole.
5207. 2 position, 4-pole.
5208. 3 position, 4-pole.
5209. 2 position, 6-pole.

$1.89

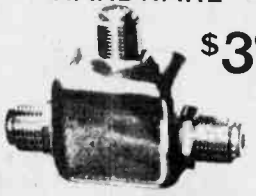
CATV MATCHING TRANSFORMER



$1.59

N-9065. CATV MATCHING TRANSFORMER. Now you can match the impedance of any CATV co-axial line to the impedance of your TV or FM receiver.
N-9066. Same as above but with slimline ½" casing.

CATV/MATV HARDWARE



$3.95

N-9067. 75 OHM SPLITTER. Splits incoming 75 ohm line to dual 75 ohm outputs, for use with TV-FM combination, etc. Standard F-61 connectors, all-metal casing.
N-9068. As above, 3 outputs. 4.95
N-9069. As above, 4 outputs. 5.95

N-F59. **25¢**

N-F59. MALE CONNECTOR. For use with RG-59/U cable. Fits F-61, F-61A, F-81 and F-81B Connectors. Ferrule supplied.

49¢ N-F61A.

N-F61A. FEMALE CONNECTOR. Fits F-59, F-59A and F-56 connectors. Complete with nut and washer.

N-F81. **69¢**

N-F81. FEMALE ADAPTOR. Mates with F-59, F-59A and F-56 connectors.

A MONO 8 OHM L PAD

$3.95

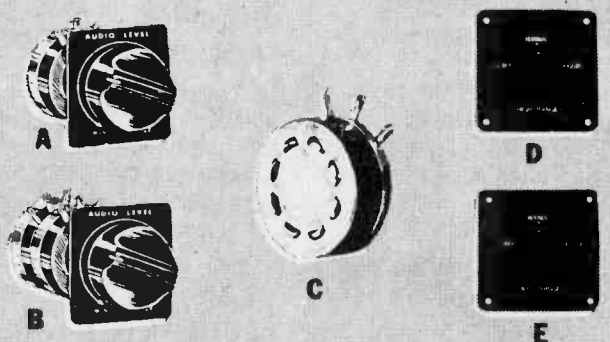
10 WATTS

B STEREO 8 OHM L PAD

$4.95

10 WATTS

8 OHM AUDIO PADS



C HEAVY DUTY MONO 8 OHM L PAD

100 WATTS

$9.95

D TWEETER CONTROL

$5.95

20 WATTS

E MID RANGE CONTROL

$5.95

20 WATTS

DOMINION RADIO & ELECTRONICS COMPANY

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THE HOME OF RADIO & ELECTRONIC SUPPLIES

WINEGARD TELEVISION SYSTEMS

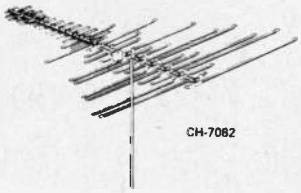
ANTENNAS

CH 7080

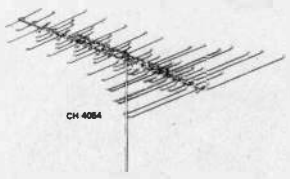
	CH-7082
TOTAL ELEMENTS	37
VHF ELEMENTS	16
UHF ELEMENTS	21
BOOM LENGTH	108"
TURNING RADIUS	70"
MAXIMUM WIDTH	108"
ACCEPTS MODEL CH-0820 POWER PAK	YES

Features Winegards exclusive Silver Anodizing to protect from corrosion and fading.

$99.50



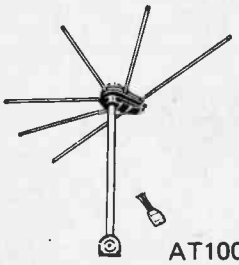
	CH-4054
TOTAL ELEMENTS	35
BOOM LENGTH	157"
TURNING RADIUS	93"
MAXIMUM WIDTH	108"



CH 4054

$127.50

The remarkable new mini-size 2020 WINEGARD ELECTRONIC TV ANTENNA



$44.25

AT1000

Basic Antenna Without Rotor or Signal Amplifier

Recommended for: Locations with strong signals on all channels *and* no ghosting problems, *and* all stations in the same basic direction.

Carton includes: • Antenna • 3' Mast and clamp • UHF-VHF Band Separator • Mounting hardware for indoors or out.

AT4000

$147.25

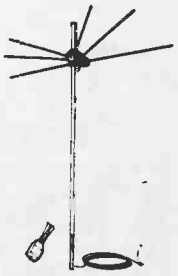
With Electronic Rotor and Signal Amplifier

Recommended for: Locations with weak signals on one or more channels *and* ghosting problems, *or* stations in different directions.

Carton includes: • Antenna with built-in signal amplifier and rotor • Rotor control box • 3' Mast with clamp • 3' cable with UHF-VHF Band Separator • Mounting hardware for indoors or out.

$57.50

AT5000



AT-5000

Recommended for: Indoor apartments or home use up to 25 miles from stations.

Carton includes: • Antenna • Floor-to-ceiling pole assembly extends 7½' to 9' • 25' cable with connectors • UHF-VHF Band Separator.

FM BOOSTER

$44.50

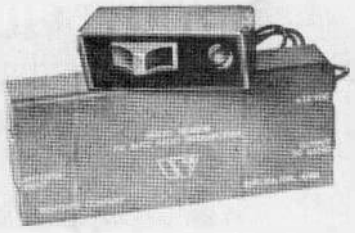
FM-3400: Soild state, 300 ohm FM booster increases FM signals 15dB for improved FM and FM stereo reception. Housed in rugged steel housing input and output thru no strip screw terminals.

AUTO FM BOOSTER

BF-8809

- ○ Increases signals an average of 18 dB!
- ○ Amplifier hides away under dash.
- ○ On/Off switch and indicator mounts on dash.

$38.25



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AudioMagnetics

CASSETTE TAPES

BUY 2, GET 1 FREE

ULTRA II C 60 **$3.95 ea.**
ULTRA II C 90 **$4.95 ea.**

THE FINEST TAPE AVAILABLE.
HIGH BIAS, STATE-OF-THE-ART.

BUY 2, GET 1 FREE

XHE C 60 **$3.35 ea.**
XHE C 90 **$3.95 ea.**

EXTRA HIGH ENERGY.
FINEST FERRIC-OXIDE FORMULATION.

NEW SUPER HIGH DENSITY MUSIC QUALITY

SUPER C 60 **$2.35 ea.**
SUPER C 90 **$2.95 ea.**

BUY 2, GET 1 FREE

CASSETTE DEAL **69¢ ea.**

C-60 AUDIO MAGNETICS

SPECIAL PURCHASE **89¢ ea.**

C-90 AUDIO MAGNETICS

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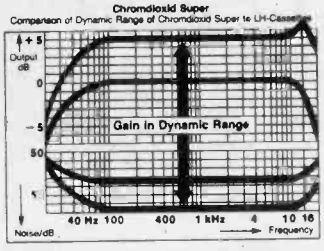
BASF

CHROMDIOXID SUPER



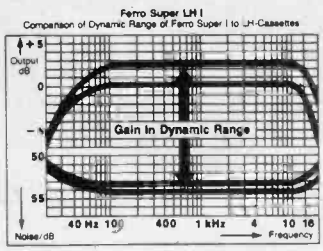
The absolute peak of present-day cassette technology!

- an even bigger gain in dynamic range for low and high frequencies
- a gain of up to 6 dB between 10000 and 20000 Hz
- extremely low modulation noise, typical for CrO_2
- full advantage on every recorder with CrO_2 switch

	REG. MSL	OUR PRICE
C–60	$6.49	$5.99
C–90	$7.99	$6.49

FERRO SUPER LH *I*

For best results on machines which have been factory-adjusted with tapes primarily of japanese origin.



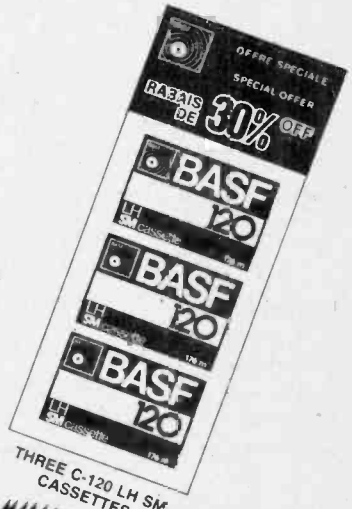
	REG. MSL	OUR PRICE
C–60	$5.49	$4.95
C–90	$6.49	$5.95
C–120	$7.49	$6.75

THREE C-60 LH SM CASSETTES

Special
NOW!
3 BASF LH SM C-60 Cassettes
in a bag!
$4.70

THREE C-90 LH SM CASSETTES

Special
NOW!
3 BASF LH SM C-90 Cassettes
in a bag!
$6.05



THREE C-120 LH SM CASSETTES

Special
NOW!
3 BASF LH SM C-120 Cassettes
in a bag!
$7.40

Prices Subject to Change Without Notice.

FUJI CASSETTE TAPES

FX-I

The Superior Pure-Ferrix, Low Noise, High Output, Normal Bias, 120μs EQ Tape

	REG.	OUR PRICE
C46	$4.95	$4.45
C60	$5.95	$5.35
C90	$7.94	$7.15

FX-II BERIDOX

The Superior High Bias 70μs EQ Tape

Complete compatibility with every tape deck's chrome position

In spite of general industry standardization, there are still slight but noticeable differences between "chrome position" bias settings on the equipment of different manufacturers. Thanks to the relatively broad bias curve of Fuji FX-II Beridox (Graph 6) you will get optimum performance from any tape deck set in the chrome position: and, if you have a tape deck with automatic chrome switching capability, you'll be glad to know that FX-II cassettes are built with the necessary detection recess.

	REG.	OUR PRICE
C46	$5.25	$4.75
C60	$6.25	$5.60
C90	$8.45	$7.60

Specifications

		FX-I (Normal bias, 120 μs EQ)	FX-II (High bias, 70 μs EQ)
Available Length			
		C-46: 68m (223 feet)	C-46: 68m (223 feet)
		C-60: 90m (295 feet)	C-60: 90m (295 feet)
		C-90: 135m (443 feet)	C-90: 135m (443 feet)
Physical Properties			
Backing Material		Tensilized Polyester	
Thickness: Backing		12μ (0.47 mil)	12μ (0.47 mil)
Coating		6μ (0.24 mil)	6μ (0.24 mil)
Overall		18μ (0.71 mil)	18μ (0.71 mil)
Magnetic Properties			
Intrinsic Coercivity (Hc)		345 Oersteds	550 Oersteds
Retentivity (Br)		1520 Gauss	1400 Gauss
Squareness Ratio		0.84	0.88
Electromagnetic Properties			
Operating Bias Current	(4,000Hz)	100%	155%
Sensitivity	(333Hz)	+1.5 dB	+2.0 dB
Sensitivity Uniformity	(333Hz)	0.3 dB	0.3 dB
Relative Frequency Response	(8,000Hz)	+2.0 dB	0 dB
	(10,000Hz)	+2.5 dB	+0.5 dB
Output Fluctuation	(8,000Hz)	0.3 VU	0.3 VU
MOL	(333Hz)	+4.0 dB	+4.0 dB
S/N	(1,000Hz)	57 dB	61 dB
Erasure Effect	(1,000Hz)	74 dB	70 dB
Print-through	(1,000Hz)	54 dB	54 dB

DISCOUNTS

Buy 10 assorted, DEDUCT 5 %!

Buy 20 assorted, DEDUCT 10%

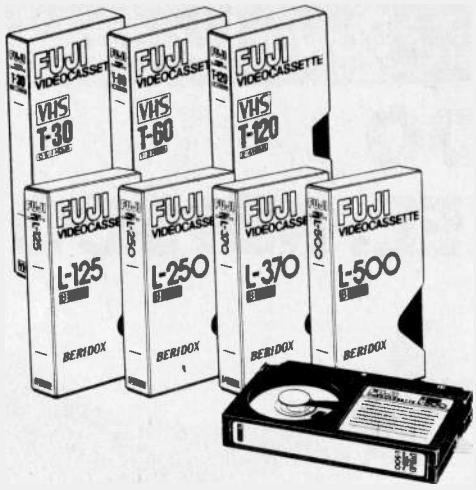
DISCOUNTS APPLY TO AUDIO TAPE ONLY

FUJI FILM

FUJI PHOTO FILM

Magnetic Tape Division

FUJI videocassettes



Fuji Videocassette Specifications*

Physical properties:	
Color	Shiny Black
Backing material	Polyester
Thickness – Backing	15μm (0.59mil)
– Coating	5μm (0.20mil)
Total	20μm (0.79mil)
Width	12.65 ± 0.01 mm
Width tolerance	less than 6μm pp
Breaking strength	more than 4.0kg
Yield strength	more than 2.5kg
Residual elongation	less than 0.1%
Coating resistance	less than 1 x $10^{10}\,\Omega$/sq
Magnetic properties:	
Orientation	Longitudinally
Intrinsic coercivity (Hc)	700 Oe
Maximum retentivity	1,800 G
Squareness ratio	0.82
Electro-magnetic properties:	
Video optimum recording current	± 10%
Video sensitivity	± 2 dB
B/W video S/N	more than −2 dB
Color sensitivity	± 2 dB
Color S/N	more than −2 dB
Audio sensitivity	± 2 dB
Audio frequency response	± 2 dB
Audio output uniformity	less than 1 VU
Leader, trailer tapes:	
VHS	
Color	Transparent
Material	Polyester
Length Leader & trailer	
T-120 (Sm. hub)	170 ± 15 mm
T-60, T-30 (Lge. hub)	150 ± 15 mm
BETA	
Color	Silver
Material	Polyester-coated aluminum foil
Length Leader tape	250 mm
Trailer Tape	70 mm
Thickness	less than 45μm
Cassettes:	
Material	High-impact ABS
Size	VHS: 188 x 104 x 25 mm (7-13/32" x 4-3/32" x 63/64")
	BETA: 156 x 96 x 25 mm (6-9/64" x 3-25/32" x 63/64")

Models:

VHS Format

T-30	68m (223.1ft)	30min.
T-60	128m (419.9ft)	60min.
T-90	188m (616ft)	90min.
T-120	248m (813.6ft)	120min.

BETA Format

L-125	42 m (125 ft)	30/15 min.
L-250	78 m (250 ft)	60/30 min.
L-370	114 m (370 ft)	90/45 min.
L-500	150 m (500 ft)	120/60 min.

Note *Specifications subject to change without notice

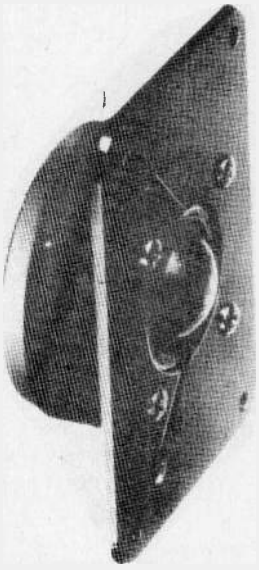
VHS Beridox

T-30	30 min. - 60 min.	$21.95 ea
T-60	1 hr. - 2 hr.	24.95
T-90	1 ½ hr. - 3 hr.	29.95
T-120	2 hr. - 4 hr.	35.95

β type Beridox

L-125	30/15 min.	$16.95 ea
L-250	60/30 min.	19.95
L-370	90/45 min.	22.95
L-500	120/60 min.	25.95

Peerless Audio



$24.95

KO10DT
DOME TWEETER

The KO10DT is designed specifically for use in loudspeaker systems where the highest accuracy of reproduction is essential.

The performance of the KO10DT is characterized by:

- very wide frequency range
- smooth sound pressure response and excellent dispersion
- high efficiency
- high power handling capacity
- very low distortion
- excellent durability

SPECIFICATIONS

Magnet:	9 oz. ceramic
Voice Coil:	1 inch Aluminum Former
Impedance:	*8 ohms
Resonant Frequency:	1000 Hz.
Sound Pressure Frequency Range:	1500-20,000 Hz.
Sensitivity:	92 dB SPL for 1 watt, 1 M.
Power Handling:	10 watt sine wave above 1500 Hz.**

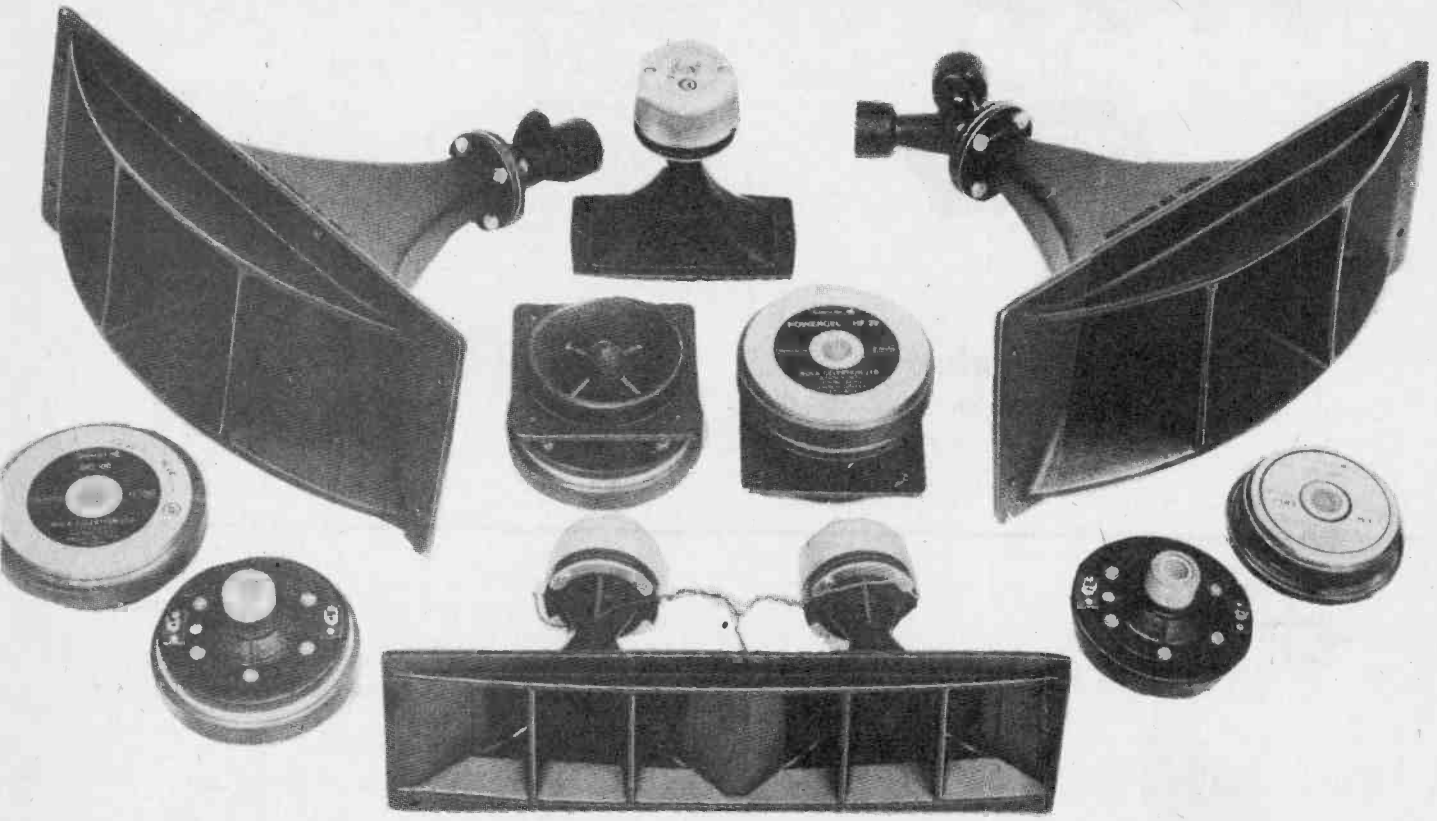
Prices Subject to Change Without Notice.

Celestion

Celestion

Power Loudspeakers

HF20. MH1000
DC50/100. HICEL. MH500



Model	Impedance Ohms	Power handling Watts	Free air resonance Hz	Frequency response Hz	Sensitivity* SPL in dB at 1 metre for 1 watt input White Noise dB	Pink Noise dB	Average Sensitivity dB	EIA Sensitivity SPL in dB at 30 feet for 1 mW input dB	Voice Coil Diameter IN	MM	Price
DC50	8 or 16	50		100 8000	97.2	98.7	101	51.8	2	51	$79.50
DC100	8 16	100		100-8000	99.3	100.2	103	53.8	2	51	$109.50
HF20	8 16	100		3000 20000	100.2	97.1	101	51.8	2	51	$129.50
MH1000	8 16	25		800 10000	97.5	96.5	101.5	52.3	1.62	42	$59.50
HiCEL	8 16	2 x 25		800 10000	98.4	98.6	103		2xMH1000 units		Price available on request.
MH 500											$129.50

	Magnet System: Ferrite Weight LB	KG	Motor Unit Weight LB	KG	Flux Density Gauss	Total Flux Maxwells	Weight LB	KG	Dimensions Diameter IN	MM	Height IN	MM	Primary Applications
DC50	1.00	0.4	3.75	1.60	11000	56000	5.00	2.30	4.60	117	3.30	85	Used in conjunction with MH500 horn to reinforce mid range and highs for Guitar and PA use
DC100	2.50	1.4	7.00	3.10	17000	87000	8.00	3.60	5.50	140	3.75	95	
HF20	2.50	1.4	7.00	3.10	17000	87000	9.00	4.10	5.125	130	6.50	166	High frequency reinforcement for high power two and three way systems
MH1000	0.75	0.35	1.50	0.70	12000	70000	2.50	1.30	6.75 x 3.6 x 6.8				Upper mid and high reinforcement for Guitar PA and Disco Systems
HICEL							6.60	3.00	172 x 92 x 168				
MH 500							7.50	3.50	17.5 x 5.5 x 7.5 445 x 140 x 190 18.0 x 8.0 x 22.0 458 x 204 x 560				Mid range horn

HICEL
PRICE AVAILABLE
ON REQUEST

2WX
2 WAY 800Hz
100 WATTS @ : **$39.50**

3WX
3 WAY 800Hz + 3000Hz
250 WATTS WITH
LEVEL CONTROL @
$69.50

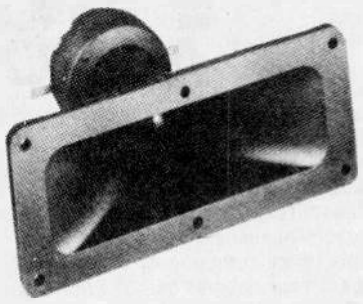
Notes
Cones have paper edge unless otherwise stated
PE — Paper edge cone
CE — Cambric edge cone
TC — Twin cone with cambric edge
All Powercel models have cambric edge cones.

***Sensitivity**
All loudspeakers tested in sealed enclosures
10" models 3400 cubic inches — 55 litres
12" models 3900 cubic inches — 63.9 litres
15 and 18" models 10000 cubic inches — 163.8 litres
DC50 and DC100 drive units tested on MH500 horns.

MOTOROLA

Piezo Ceramic Speakers

2" x 6" WIDE DISPERSION HORN



KSN 1025A **$24.95**

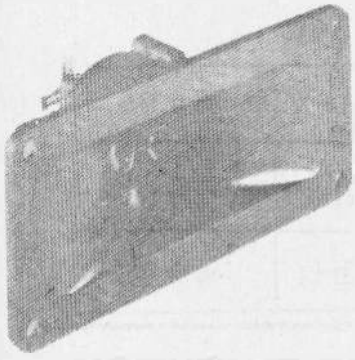
FREQUENCY RESPONSE	1.9—40kHz
SOUND PRESSURE LEVEL	103 db

3½" SQUARE SUPER HORN

KSN 1005A **$14.95**

FREQUENCY RESPONSE	4—27kHz
SOUND PRESSURE LEVEL	103 db

2" x 5" WIDE DISPERSION HORN



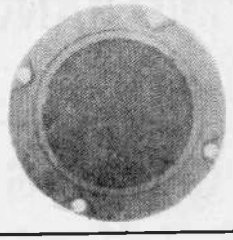
KSN 1016A **$21.95**

SOUND PRESSURE LEVEL 102 db

3½" ROUND PIEZO TWEETER

$11.95

KSN 1036A



FREQUENCY RESPONSE	2—40kHz
SOUND PRESSURE LEVEL	97db

THE FACTS ABOUT PIEZO CERAMIC SPEAKERS

Bulky Magnet Structure Eliminated by the use of a piezo ceramic driver, thereby reducing the problems caused by size, weight, and stray magnetic fields.

No Voice Coil — since the piezo ceramic driver uses no voice coil, the reliability is greatly improved; there are no rubbing voice coils from warped cones or from contaminants in the air gap. The low dynamic mass of the drive mechanism gives the piezo ceramic speaker a better transient response than can be obtained with a conventional dynamic speaker.

Excellent Transient Response — relatively pure response with minimum of ringing provides "clean," pure sound with low distortion.

Low Harmonic Distortion—average harmonic distortion of less than 1.5% contributes to the delivery of superior sound fidelity.

High Impedance — over 500 ohms at 1 kHz, and still above 20 ohms at 40 kHz, the piezo ceramic speaker presents no added load to the amplifier and rejects low frequency power without requiring a crossover network.

Long Term Stability — new, improved drivers used in Motorola piezo ceramic speakers are impervious to normal humidity variations, stable to temperatures of 240°F (115°C), and durable under a variety of external shock, vibration, and stress conditions. As a result of these driver improvements, Motorola piezo ceramic speakers are capable of quality performance as long as these devices are operated within their design specifications.

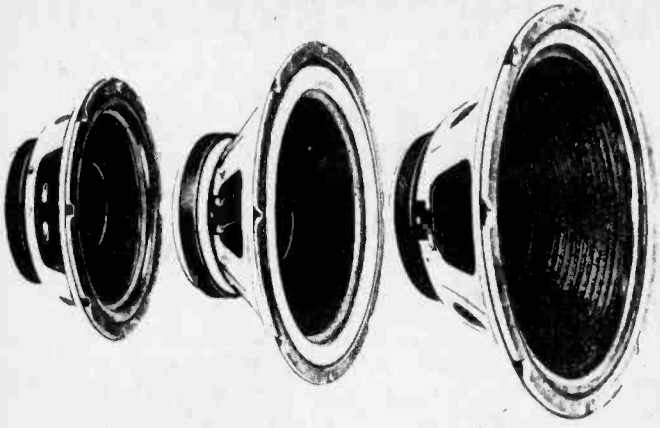
Design Specifications — electrically, these piezo ceramic speakers appear as 0.34 mfd capacitors and exhibit high efficiency (40-50%) in converting electrical energy into acoustical energy.

As capacitive devices, piezo ceramic speakers have sufficient voltage sensitivity to be wired directly to, and matched with, high quality dynamic speakers.

Prices Subject to Change Without Notice.

ULTRAFLEX LOUDSPEAKERS

RSC AUDIO



800W8 1000W8 1200W8

hi-compliance woofers

These driver units by RSC have been designed for use in sealed enclosures in order to achieve optimum response and power handling. To take full advantage of the five years of research designing these speakers, you are advised **not** to mix these components with any others. Specifications should not be changed. Your cabinet must have no air leaks . . . caulk all seams and speaker frames. Speakers are to be mounted from the front and flush with the face of the baffle. The grille cloth should be an open weave material that you can breathe through easily . . . make sure the grille clears the speakers by at least 3/8". Follow these specifications . . . and you'll have speakers offering you acoustical excellence.

NUMBER	TYPE	SIZE	RMS POWER	RES.	PRICE
800W8	WOOFER	8"	35W	55Hz	34.95
1000W8	WOOFER	10"	40W	47Hz	49.95
1200W8	WOOFER	12"	45W	42Hz	49.95

MID RANGE

400 - 7000 Hz
40 Watts

$16.95 **5"**

DOME TWEETER

3000 - 20000 Hz
40 Watts

4" **$11.95**

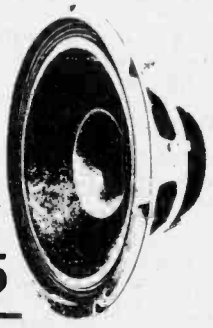
FULL RANGE

These driver units by RSC have been designed for use in reflex enclosures for optimum response and power handling. Specifications should not be changed. Your cabinet must have no air leaks other than the vent . . . caulk all seams and speaker frames. Speakers are to be mounted from the front and flush with the face of the baffle. The grille cloth should be an open weave material that you can breathe through easily . . . make sure the grille clears the speaker by at least 3/8". We suggest you line the cabinet with two inches of damping material making sure the front and vent are clear. Follow these specifications and you'll have speakers delivering you acoustical excellence.

8" **$22.95** **20 WATTS RMS**

DRE DC8

8 OHM **12"** **$34.95**



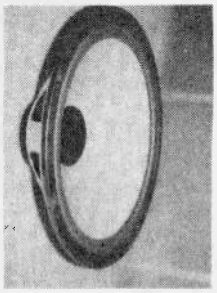
DRE DC12

ULTRAFLEX LOUDSPEAKERS

15" WOOFERS AIR SUSPENSION

60 WATTS RMS

A very economical woofer with a very good sound. A 1.5" 60 Watt voice coil and foam surround make for an exceptionally smooth bass response as low as 18 Hz.



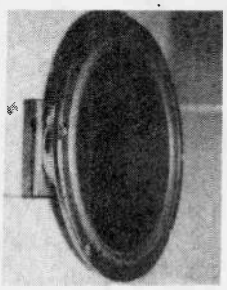
20oz. MAGNET

39.95

No 1520

100 WATTS RMS

A brute for power! Heavy-duty 2" voice coil packs a real wallop. Frequency response from 1Hz to 4kHz, Resonance at 18 Hz. Get that disco sound in your own home.

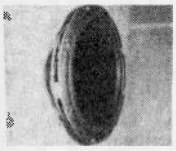


69.95

54oz MAGNET

No 15540

10" AIR SUSPENSION WOOFER

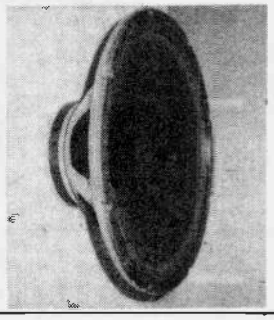


29.95

*20oz Magnet
*60 Watts RMS
*1.5" Voice Coil
1020B

18" HIGH POWER PROFESSIONAL. BASE REFLEX DRIVER 300W. RMS

Our very best. Giant 3" phosphor-bronze voice coil and massive 78oz magnet combine with a sturdy ribbed surround, all mounted in a die-cast aluminium frame for the finest bass sound of all. Write for complete specs.

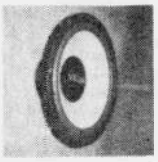


78oz Magnet

239.95

No SHP 1878

12" AIR SUSPENSION WOOFER



49.95

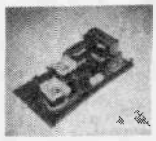
*40 oz Magnet
80 watts RMS
2" voice coil

VULTAN 12

ULTRAFLEX CROSSOVERS

2 WAY
40 WATTS
$11.95

CUT OFF....2400 HZ
SLOPE 6db/OCTAVE
POWER.....40 WATTS RMS
IMPEDANCE..8OHMS
2WX-6-40



3 WAY
40 WATTS
$19.95

CUT OFF.....700-2400 Hz
SLOPE.....6db/OCTAVE
POWER.....40 WATTS RMS
IMPEDANCE..8 OHMS
3 WX-6-40

3 WAY
100 WATTS
$29.95

CUT OFF....800-4000 Hz
SLOPE.....12db/OCTAVE
POWER .....100 WATTS RMS
IMPEDANCE ...8 OHMS
3 WX-12-100

2 WAY 35 WATT BASS REFLEX

1 DRE–DC8 8" WOOFER .....reg. $24.95
1 ULTRAFLEX TWEETER.....reg. $11.95
REGULAR TOTAL $ 36.90

PACKAGE PRICE **29.95**

COMPLETE WITH INSTRUCTIONS

3 WAY 50 WATT AIR SUSPENSION

1-1020B 10" WOOFER	$29.95	PACKAGE PRICE
1-M8 5" MID. RANGE	$16.95	
1-ULTRAFLEX TWEETER	$11.95	
1-3WX-6-40 CROSSOVER	$19.95	
REGULAR TOTAL	$78.80	**69.95**

COMPLETE WITH INSTRUCTIONS

3 WAY 70 WATT AIR SUSPENSION

1-VULTAN 12 12" WOOFER	$49.95	PACKAGE PRICE
1-M8 5" MID RANGE	$16.95	
1-ULTRAFLEX TWEETER	$11.95	
1-3WX-12-100 CROSSOVER	$ 29.95	**94.95**
	$ 108.80	

COMPLETE WITH INSTRUCTIONS

150 WATT DISCO SYSTEM

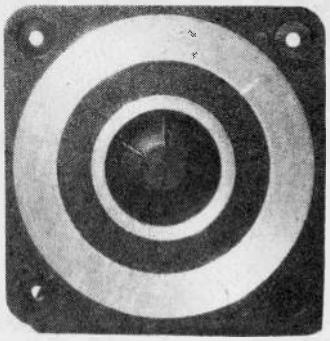
1-15540 15" WOOFER	$69.95	PACKAGE PRICE
4-M8 5" MID RANGE	$67.80	
2-2X5" PIEZO TWEETERS	$39.90	
1-AD3WXSP	$ 48.00	**189.95**
	$225.65	

COMPLETE WITH INSTRUCTIONS

Prices Subject to Change Without Notice.

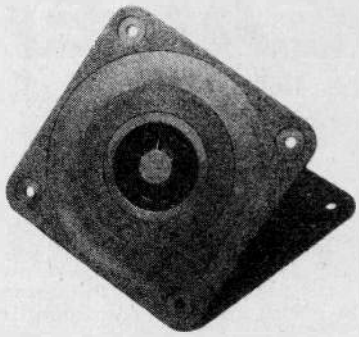
PHILIPS

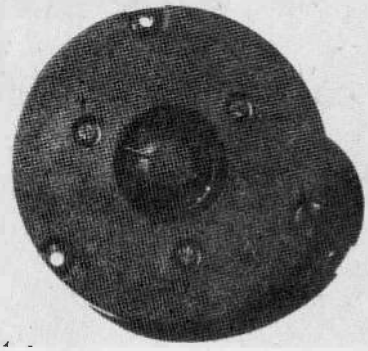
Loudspeakers



AD0163/T8

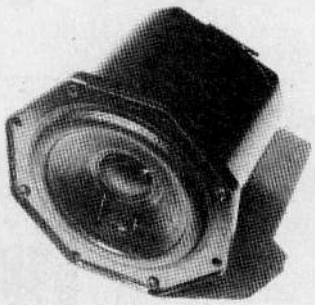
AD01630T8



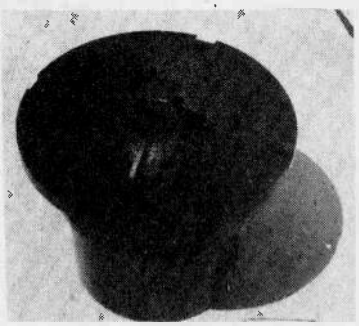


AD016378

Type Number	Impedance Availability (Ω)	Resonant Frequency (Hz)	Voice Coil System Dia. (mm)	Voice Coil System Material Type	Magnet System Weight (oz/kg)	Magnet System Material Type	Max. PHC	Dome Material		Overall Weight (lbs/kg)	Price
AD0140/T	4/8	1200	25	Alum/Copper	5/.1	FXD 300	10W 20W* 40W†	Polycarbonate		.6/.25	$13.50
DOME TWEETERS											
AD0162/T *Over 2000 Hz	8/15	1000 †Over 4000 Hz	25	Alum/Copper	10/25	FXD 300	10 20* 50†	Polycarbonate		1.1/.5	$17.00
AD0141/T *Over 2000 Hz	4/8	1200 †Over 4000 Hz	25	Alum/Copper	5/.1	FXD 300	10 20* 40†	Textile		6/.25	$15.00
AD0163/T *Over 2000 Hz	8/15	1000 †Over 4000 Hz	25	Alum/Copper	10/.25	FXD 300	10 20* 50†	Textile		1.1/ 5	$18.50
AD0140/T *Over 2500 Hz	4/8	1200 †Over 4000 Hz	25	Alum/Copper	5/.1	FXD 300	10W 20W* 40W†	Polycarbonate		.6/.25	$13.50
CONE TWEETERS											
AD2290/T	4-8 4-8	1300	18	Copper	.95/.027	Ticonal	10	Paper	No	.22/.1	$9.95
AD2295/T8	4-8	1400Hz	14.5	Copper	0 5/.013	Ticonal	10	Paper	No	.15/.07	$9.95
AD0211SQ *Over 800 Hz	4/8	370	35	Alum/Copper Vented Form	16/.42	FXD 300	60W*	Textile Rim Textile Dome	NA	2.2/1.0	$24.00
DOME MID RANGE											
AD0211SQ *Over 800 Hz	4/8	370	35	Alum/Copper Vented Form	16/.42	FXD 300	60W*	Textile Rim Textile Dome	NA	2.2/1.0	$36.00
AD5060/SQ	4/8	210Hz	25	Copper	10/.25	FXD 300	40*	Textile	NA	1.8/.8	$24.95
AD5061/SQ *Over 1300 Hz	4/8	680	25	Copper	10/.25	FXD 300	30*	Textile	NA	1.5/.8	$19.00
4" WOOFER											
AD4050/W	4/8	60	25	Alum/Copper	3/.06	Ticonal	15	Buytl Rubber	NA	.9/.42	$27.00
5" WOOFER											
AD5060/W	4/8	60	25	Copper	10/.25	FXD 300	10	Buytl Rubber	NA	1.5/.7	$17.00
AD5061/M	4/8	85	25	Copper	10/.25	FXD 300	10W	Textile	NA	1.47/.67	$19.00
7" WOOFER											
AD7066/W	4/8	45	25	Alum/Copper	16/.42	FXD 300	40	Buytl Rubber	NA	2.5/1.15	$20.00
AD7062/M	8	45	25	Alum.	11/.26	FXD 300	30	Buytl Rubber	NA	1.5/.68	$16.50
8"											
AD9710MC	8	50	25	Alum/Copper	14/.40	FXD 300	20	Treated paper with whizzer	No	2.5/1.3	$45.00

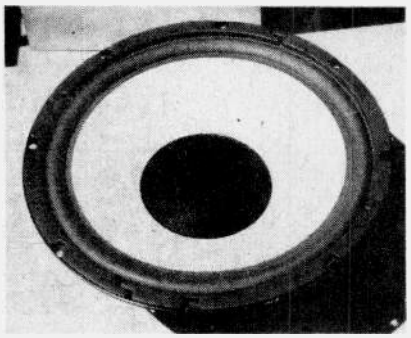


AD5060SQ8

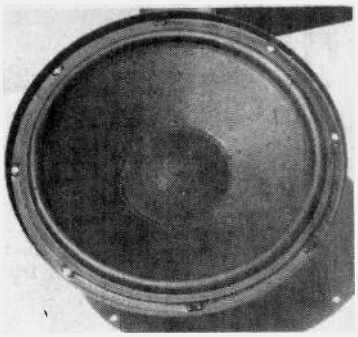


AD0211SQ8

AD1260W

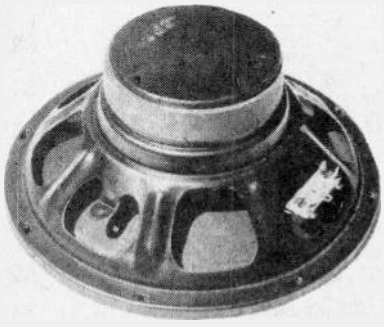


AD80100W



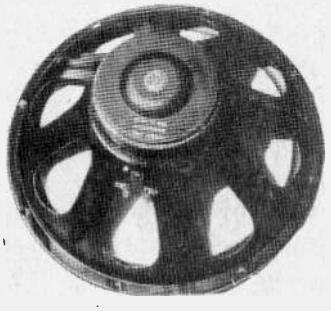
AD70601W

Type Number	Impedance Availability (Ω)	Resonant Frequency (Hz)	Voice Coil System Dia. (mm)	Voice Coil System Material Type	Magnet System Weight (oz/kg)	Magnet System Material Type	Max. PHC	Cone Rim	White Cone Avail.	Overall Weight (lbs/kg)	Price
8" WOOFERS											
AD081020/W	8	45	25	Copper	10/.25	FXD 300	20	Treated Fabric	Yes	2.0/.9	price not available
AD8061/W	4/8	42	25	Alum/Copper	11/.26	FXD 300	30	Buytl Rubber	NA	1.5/.8	**$24.00**
AD8066/W	8	39	25	Alum/Copper	16/.42	FXD 300	40	Buytl Rubber	NA	2.5/1.15	**$28.50**
AD8067/W	4/8	32	35	Alum.	16/.42	FXD 300	40	Buytl Rubber	NA	2.9/1.3	**$38.00**
AD80100/W	8	30	37.9	Alum/Coppe	20/.566	FXD 300	40	Foam	Yes	5/2.25	**$36.00**
AD8067MFB	4	38	34	Copper	16/.42	FXD 300	50	Butyl Rubber	No	2.9/1.3	**$38.00**
10" WOOFERS											
AD1065/W	8	20	25	Copper	16/.42	FXD 300	30	Buytl Rubber	NA	4.0/1.8	**$53.00**
AD102050/W	8	25	35	Copper	20/.566	FXD 300	50	Foam	Yes	5/2.3	price not available
AD10100/W	4/8	25	50	Copper	37/1 05	FXD 300	40	Buytl Rubber	NA	6.6/3.0	**$75.00**
AD10240/W	8	25	50	Alum/Copper	40/1.13	FXD 300	70	Foam	Yes	7.9/3.6	**$80.00**
AD1065/M	8	55	25	Copper	16/.45	FXD 300	20	Accordian paper with whizzer	No	3.3/1.5	**$53.00**
12" WOOFERS											
AD12600/W	8	25	25	Alum/Copper	11/.30	FXD 300	40	Foam	NA	3.3/1.5	**$45.00**
AD12100/HP	8/15	60	50	Copper	37/1	FXD 300	50	Textile with	NA	7.2/3.27	**$75.00**
AD12100G	8	45	50	Alum/Copper	40/1.13	FXD 300	75	Treated Paper	NA	8/3.6	**$75.00**
AD1265/M	8-15	45	25	Copper	16/1.5	FXD 300	25	Accordian paper with whizzer	No	4/1.8	**$48.00**
AD12100M	8	45	35	Copper	37/1	FXD 300	30	Accordian paper with whizzer	NA	7.3/3.3	**$75.00**



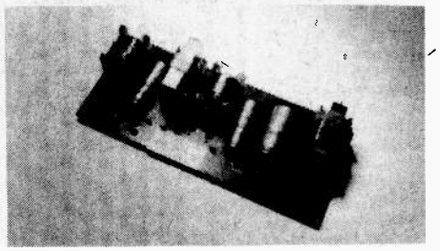
AD0601

AD10240W

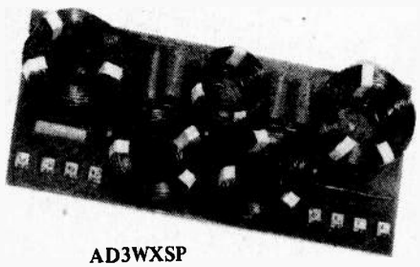


AD15240

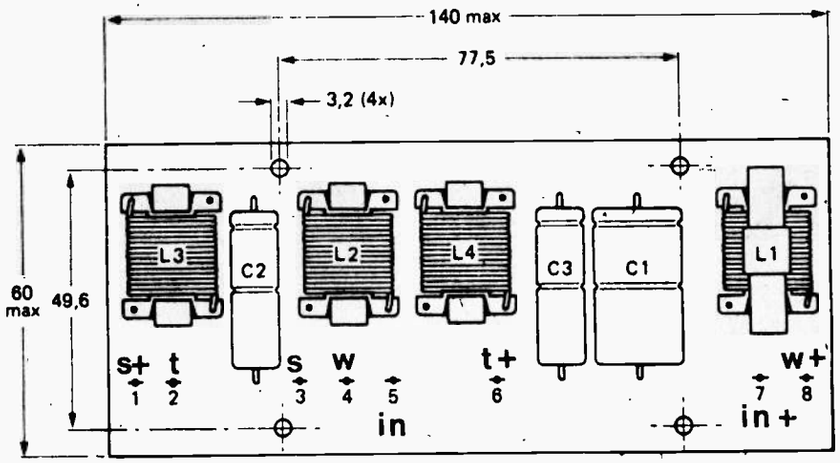
PHILIPS



ADF700



AD3WXSP
(150W)



THREE-WAY CROSSOVER NETWORK CONNECTIONS (Use for systems with woofers 8" through 15".

Connections shown at right are for

ADF500/4500/8 (ADWXA) Use 8 ohm tweeter, 40W system.

ADF700/3000/8 Use 8 ohm tweeter, 60W system

ADF700/2600/8 Use 15 ohm tweeter, 8 ohm mid-range and woofer, 80W system.

Type Number	Impedance Availability (Ω)	Resonant Frequency (Hz)	Voice Coil System Dia. (mm)	Voice Coil System Material Type	Magnet System Weight (oz/kg)	Magnet System Material Type	Max. PHC	Cone Rim	White Cone Avail.	Overall Weight (lbs/kg)	Price
AD12650/W	8	20	35	Alum/Copper	20/.56	FXD 300	60	Butyl Rubber	NA	4.0/1.8	$52.00
AD122050/W	8	19	35	Copper	20/.566	FXD 300	50	Foam	Yes	4.0/1.8	$75.00
AD12100/W	4/8	19	50	Copper	37/1.05	FXD 300	40	Buytl Rubber	NA	7.0/3.2	$80.00
AD12240/W	8	20	50	Alum/Copper	40/1.13	FXD 300	70	Foam	Yes	8/3.62	$80.00
12" WOOFER (Special motional feedback system application)											
AD12100/MFB	4/8	19	50	Copper	37/1.05	FXD 300	60	Buytl Rubber	NA	7.0/3.2	$75.00
15" WOOFER											
AD15240/W	8	19	50	Alum/Copper	40/1.13	FXD 300	80	Foam	Yes	90/4.08	$80.00

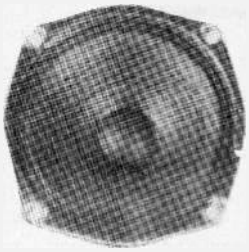
PASSIVE RADIATORS

Type	Size	Surround	Cone Mass	Added Mass	
AD10000	10"	Foam Roll Up	14 gr.	55 gr.	$16.50
AD12000	12"	Foam Roll Up	24 gr.	40 gr.	$20.00
AD8000	8"	Roll Up	7 gr.	24.3 gr.	$13.50

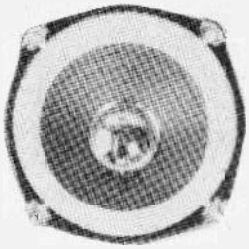
CROSSOVER FILTERS

Type Number	Crossover Frequencies	Impedance (Ohms)	Slope/Octave Lo	Slope/Octave Med.	Slope/Octave High	Features	Rating (Watts)	Price
TWO WAY								
AD2WXA also ADF2400/8	2400Hz	8	6dB		6dB		40	$9.00
AD2WXB also ADF1600/8	1600Hz	8	6dB		12dB		40	$11.75
ADF3000/8	3000Hz	8	6dB		12dB		70	$11.75
ADF1500/8	1500Hz	8	6dB		12dB		70	$11.75
THREE WAY								
AD3WXA also ADF500/4500/8	500/4500Hz	8	6dB	6dB	12dB		40	$21.00
ADF600/4000/8	600/4000Hz	8	18dB	12dB	12dB	Variable controls	60	$21.00
AD3WXSP	700/3600Hz	8	12dB	12dB	12dB	All air coils, polyester capacitors	150	$48.00
ADF700/2600/8	700/2600Hz	8	12dB	12dB	12dB		100	$22.50
ADF700/3000/8	700/3000Hz	8	12dB	12dB	12dB		100	$22.50

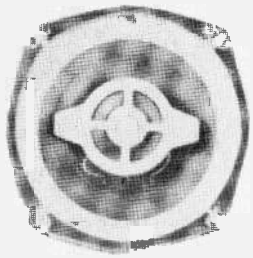
DYNATRONIC®



BS–514–3



BS–514–6
BS–514–12

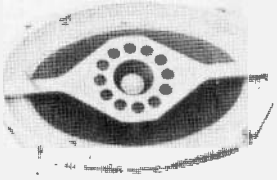


BS–514–12 CX
BS–515–20 CX

MODEL NO.	SPEAKERS	CERAMIC MAGNET	VOICE COIL	MAXIMUM OUTPUT (WATTS)	IMP. (OHMS)	Price
BS-514-3	5¼" In-door	3 oz	¾"	5	8	$4.50
BS-514-6	5¼" In-door AIR SUSPENSION	6 oz.	1"		4-8	$6.50
BS-514-12		12 oz	1"	20	4-8	$9.95
BS-514-12CX	5¼" CO-AXIAL AIR SUSPENSION 2-way (5¼" woofer 2" tweeter)	12 oz CO-AXIAL	1"	25	4-8	$15.95
BS-514-20CX		20 oz CO-AXIAL	1"	35	4-8	$21.95

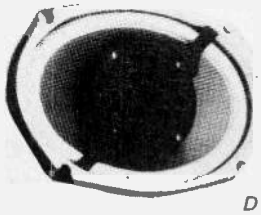
A

B

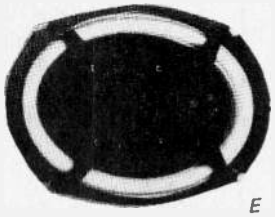


C

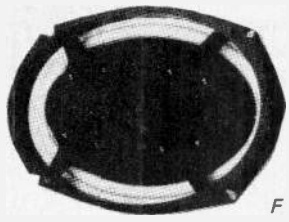
	MODEL NO.	SPEAKER	MAGNET	IMP. OHMS	AIR SUSPENSION	OUSTCOVER	MAXIMUM OUTPUT (WATTS)	Price
A	BS-6903	6" x 9" replacement	3 oz	8	no	yes	5	$6.50
A	BS-6903-4	6" x 9" replacement	3 oz	4	no	yes	5	$6.50
A	BS-6906	6" x 9" replacement	6 oz	8	no	yes	10	$7.95
B	BS-6910	6" x 9" deluxe	10 oz.	8	yes	no	15	$11.50
C	BS-6912CX	6" x 9" CO-AXIAL	12 oz.	8	yes	no	25	$15.95
C	BS-6920CX	6" x 9" CO-AXIAL	20 oz.	8	yes	no	35	$19.95



D



E



F

	MODEL NO.	SPEAKER	MAGNET	IMP. OHMS	AIR SUSPENSION	OUSTCOVER	MAXIMUM OUTPUT (WATTS)	Price
D	BS-6920FX	6" x 9" deluxe CO-AXIAL with urethane foam edge and black wrinkle finish	20 oz	4-8	yes	no	35	$25.95
E	BS-6920T	6" x 9" deluxe 3-WAY speaker with woofer, tweeter and mid-range, urethane foam edge, black wrinkle finish.	20 oz	8	yes	no	45	$32.95
F	BS-6920Q	6" x 9" super deluxe 4-WAY speaker with woofer, mid-range and 2 tweeters, urethane foam edge, black wrinkle finish	20 oz	8	yes	no	50	$44.95

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SUPER SPECIAL!

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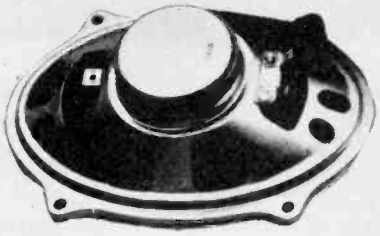
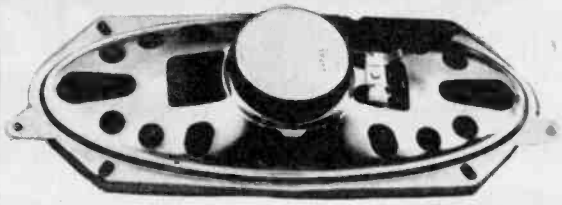


5 x 7"

6 oz. ceramic magnet.

8 ohms



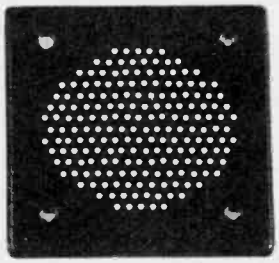
4 x 10"

$2.95

6 oz. ceramic magnet.

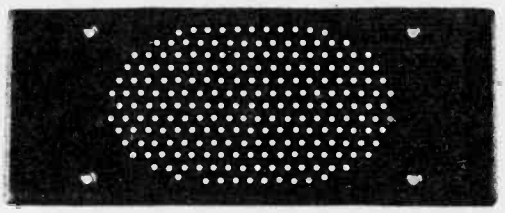
8 ohms

Auto Speaker Baffles



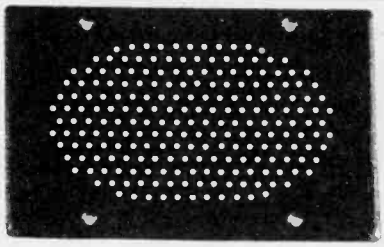
5¼" METAL

$2.50



4 x 10" METAL **$2.50**

Deluxe metal grille coated with a flat black vinyl for the sporty look.

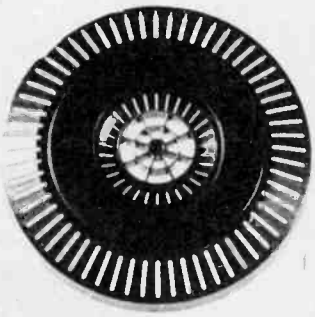


5 x 7" METAL

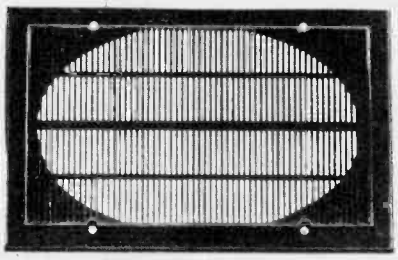
$2.50

5¼" PLASTIC

$2.25



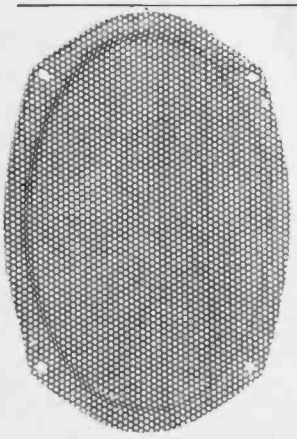
Super deluxe snap-on black plastic soft pad with specially designed chrome tweeter opening. For 5¼" speakers.



5" x 7" PLASTIC

$1.95

For the economy minded, a flat surface mounting grille, black in colour. For 5" x 7" speakers.



Flat, black, economic, low profile grille made of painted metal for 6" x 9" speaker.

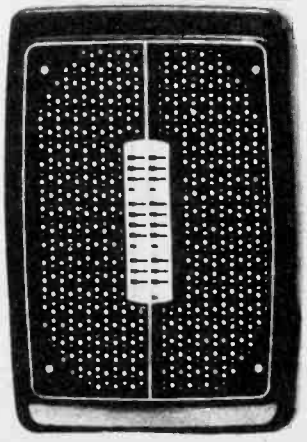
6" x 9" METAL

$1.95

6" x 9" PLASTIC

$3.50

Custom super-deluxe durable plastic with soft vinyl padded surface and specially designed chrome-plated opening for the tweeter in co-axial speakers. For 6" x 9".



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MS-8540

IN-DASH CASSETTE STEREO TAPE PLAYER WITH BUILT-IN AM/FM-FM MULTIPLEX RADIO

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PLL PHASE LOCK LOOP IC CIRCUITRY

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$249.95

- **ADJUSTABLE SHAFTS - 5 POSITIONS**
- 6 Watts RMS Per Channel - 35 Watts Music Power
- Frequency Response — 50 - 10,000 Hz
- Size: 7" W x 1¾" H x 5¾" D

MS-7350

THE REWIND ONE

REGULARLY $199.95

OUR PRICE **$169.95**

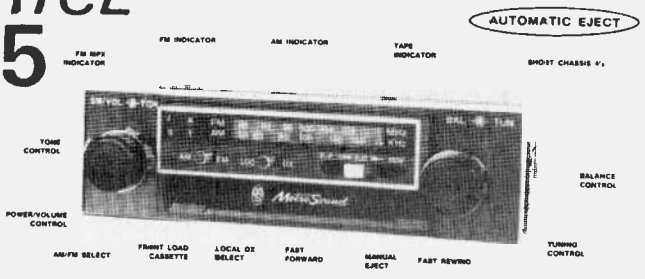
IN-DASH CASSETTE STEREO TAPE PLAYER WITH BUILT-IN AM/FM-FM MULTIPLEX RADIO

FAST REWIND

AUTOMATIC EJECT

SPECIFICATIONS:

- 30 Watts Music Power — 5 Watts RMS per Channel
- Frequency Response — 50 - 10,000 Hz
- Size: 6¾" W x 1¾" H x 4⅞" D
- Automatic Stop and Eject at End of Tape
- Automatic Switch-over to Radio Mode at End of Tape
- Adjustable Shafts



MS-7260

THE COMPACT ONE

REGULARILY $199.95

OUR PRICE **$149.95**

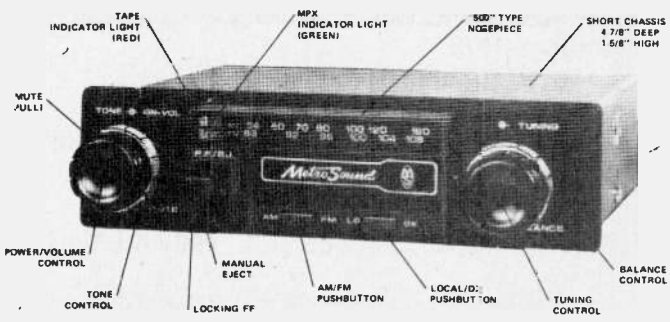
SWITCHABLE MUTE

PLL PHASE LOCK LOOP MPX IC CIRCUITRY

SHORT CHASSIS

SPECIFICATIONS:

- 33 Watts Music Power — 5.5 Watts RMS Per Channel
- Frequency Response — 50-10,000 Hz
- Size: 6-3/4" W x 1-5/8" H x 4-7/8" D
- Automatic Stop at End of Tape
- ADJUSTABLE SHAFTS



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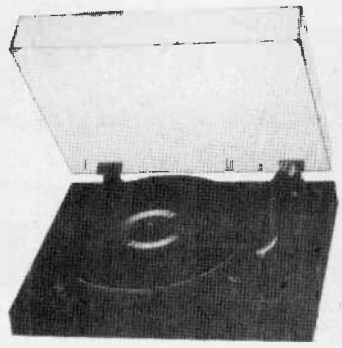

SPECIFICATIONS

MOTOR	8 pole DC coreless	POWER SOURCE	:	120 V AC, 60 Hz
WOW AND FLUTTER	: Less than 0.08% WRMS	POWER CONSUMPTION	:	5 Watts
RUMBLE	Better than 65 dB (Din B)	DIMENSIONS width	:	440 mm
		depth	:	350 mm
		height	:	131 mm
		WEIGHT	:	6.5 Kg

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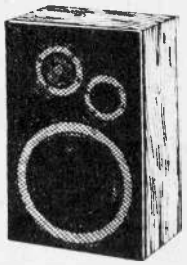
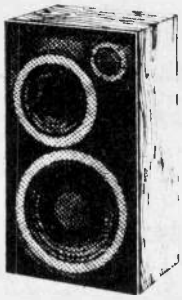


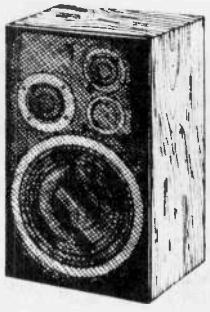
The SB-410 is a two way bass reflex system incorporating a 10" long throw woofer and a 3" tweeter for a balanced, musical output. The system is rated at 40 watts

$179.95pr



A passive radiator supplements the bass output of this 50 watt two way system. The SB-510 has a 10" long throw woofer, an 8" passive radiator and a 3" tweeter to cover the extreme fringes of the musical spectrum

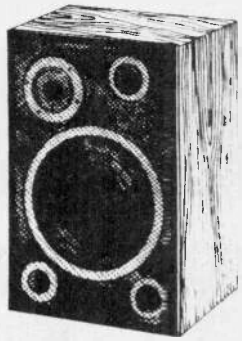
$229.95pr



The SB-610 packs the big sound of the 710 into a more compact box with a power rating of 60 watts. The unit has a low resonance 12" woofer and a 5" midrange and 3" tweeter for an uncompromising high end.

$299.95pr

$429.95pr



The SB-710 is Audio Reflex's top of the line model featuring a 15" high compliance woofer and a 100 watt power rating. A cloth edged midrange and a tweeter with a lightweight diaphram combine to provide a clean, transparent response

	Power Handling	Frequency Response	Cabinet Dimensions	Finish
SB-710	100 watts	35 - 20,000 Hz ± 3 dB	27½" x 18½" x 14½"	All units
SB-610	60 watts	45 - 18,000 Hz ± 3 dB	25" x 14¾" x 11⅜"	have durable
SB-510	50 watts	55 - 18,000 Hz ± 3 dB	25" x 13¾" x 9½"	simulated wood
SB-410	40 watts	55 - 18,000 Hz ± 4 dB	21¼" x 13½" x 9⅞"	finishes

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POWER BANDWITH:	20 Hz to 40 KHz
TONE CONTROLS:	± 10db at 100 Hz ± 10db at 400 Hz ± 10db at 1 KHz ± 10db at 4 KHz ± 10db at 10 KHz
FILTERS:	High: 8db at 10 KHz Low: - 8db at 100 Hz
LOUDNESS:	+ 8db at 100 Hz, + 4db at 10K Hz
INPUT: (Sensitivity/Impedance)	PHONO (CERAMIC) 250 mV 1M ohm PHONO 2.5mV 50K ohms AUX 150 mV TAPE 150 mV MIC: 2.8 mV
OUTPUT: (Sensitivity/Impedance)	TAPE 700 mV 80K ohms
SPEAKER:	A, B, A + B, PHONES

FM TUNER SECTION

TUNING RANGE:	88 MHz to 108 MHz
FM PRE-SET:	5 stations + manual
SENSITIVITY:	1.9uV
CAPTURE RATIO:	1.5db
SIGNAL TO NOISE RATIO:	60db (98 MHz)
SELECTIVITY:	80db
IMAGE REJECTION:	50db
IF REJECTION:	50db
STEREO SEPARATION:	38db (1 KHz)
AUTOMATIC FREQUENCY CONTROL:	± 150 KHz

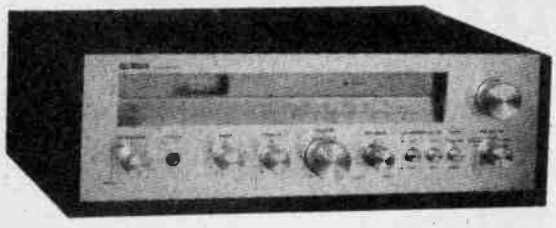
AM TUNER SECTION

TUNING RANGE:	525 KHz to 1650 KHz
SENSITITVY:	250uV
IF REJECTION:	30db
SIGNAL TO NOISE RATIO:	50db

GENERAL

POWER SOURCE:	120 volts 60 Hz
DIMENSIONS:	W 20-7/8" (531 mm) H 5-3/4" (146 mm) D 13-3/8" (340 mm)
WEIGHT:	24 lbs. (10.9 kg.)

AR-620 A highly musical receiver finished in brushed aluminium with a wood grain sleeve



$289.95

AUDIO REFLEX
you'll hear a lot from us...

SPECIFICATIONS

AMPLIFIER SECTION

Power output per channel	—	20W for 1K Hz both channels driven, 8 ohm load
T.H.D. at rated output	—	Better than 0.2%
I.M. distortion at rated output	—	0.15%
Damping factor into 8 ohms	—	35
Signal to noise ratio	Phono	— 80 db
	Aux	— 95 db
Channel separation — 1K Hz		— 50 db
— 10K Hz		— 45 db

AM TUNER SECTION

Usable sensitivity	— 300 μV
Selectivity	— 30 db
Signal to noise ratio	— 50 db

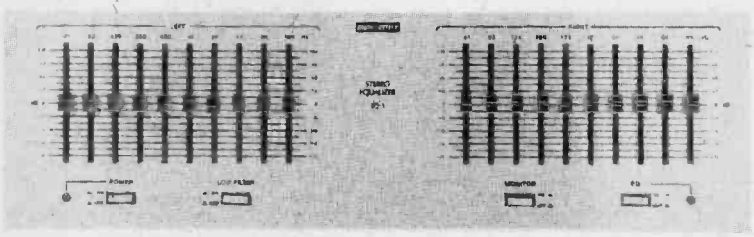
FM TUNER SECTION

Usable sensitivity (30 db S/N)		— 2.0 μV
Capture ratio		— 1.5 db
Separation @ 1K Hz		— 40 db
Selectivity		— 65 db
T.H.D. @ 1K Hz	Mono	— 0.15%
	Stereo	— 0.25%
Signal to noise ratio	Mono	— 68 db
	Stereo	— 65 db

GENERAL

POWER SOURCE:	120 volts 60 Hz
DIMENSIONS:	17" W x 5¼" H x 14⅛" D
WEIGHT:	18 lbs

EQ–1 10 CHANNEL GRAPHIC EQUALIZER FOR ABSOLUTE CONTROL OF YOUR SOUNDS



$229.95

Specifications

Frequency Response	10 Hz — 50 KHz + 1 dB
Signal to Noise Ratio	85 dB
Total Harmonic Distortion	0.05%
Intermodular Distortion	0.1%
Rated Output	2 volts RMS
Maximum Output	9 volts RMS before clipping
Output Impedance	600 unbalanced
Input Impedance	100 K unbalanced
Octave Centres	31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2 KHz, 4 KHz, 8 KHz, 16 KHz
Maximum Cut	12 dB
Maximum Gain	+ 12 dB
Inputs/Outputs	2 in, 2 out, tape in, tape out
Power Requirement	120 volts, 60 Hz
Consumption	15 watts max
Dimensions	16⅝" x 11½" x 5⅛"

AVAILABLE IN BLACK OR SILVER

To date, none of the monochrome cameras which have emerged specifically for home use have been terribly well designed. None are available with electronic viewfinders, which would employ a cathode ray tube in the eye piece, instead of simply an auxiliary lens, making them rather difficult to use unless one is filming right beside the TV set. Even at that, a tightly framed shot is largely a matter of luck. The one stop lenses usually found on these cameras are all but useless if one wishes to use exposure creatively. The intent with these cameras appears to have been to sell something to the VCR owner who would like to do some of his or her own programming, but can't get a third mortgage on the dog to spring for a full colour system.

COLOUR YOUR WORLD

The colour cameras, at least one seems to be available from every VCR manufacturer, are full featured, high performance systems in many ways comparable to professional-type portable cameras. Most are relatively small and light, and much has been copied from industrial designs to make them very "humanly engineered". You won't see the CBC shooting the national news with them . . . because they won't let anyone into the studio while they're at it . . . but most of these "home" systems are capable of results every bit as good as those that come over the airwaves.

If you remember to take the cap off the lens.

There are two distinct groups of colour cameras: those with optical viewfinders, more sophisticated versions of the types found on the monochrome models, and those with full electronic finders, which is the arrangement found, in the industry, on anything other than a surveillance camera. One thing to keep in mind, though . . . something which all the ad literature fails to make mention of . . . while the camera tube sees in colour, the recorded image is in colour, and your set may be in colour, the viewfinder CRT is black and white. This poses a few immediate problems, for while you can use the finder to get things composed, exposed and focussed up, you can't tell if the colours are right, and the delicate green of great Aunt Remora's charming countenance may wind up a shocking flesh tone on playback.

The reason that the camera cannot always get the colour right on its own is largely due to the ambient light in which it is being used. Very few light sources actually produce pure white light. We may see it as white, because the human eye quite regularly "fools" itself for convenience sake. However, common incandescent light is slightly orange, sunlight is tinged with varying degrees of blue, depending upon the atmospheric conditions and the time of day, and the standard "cold white" fluorescent mind sterilization tubes are a bit on the green side. The tint of the light, naturally, will shift the colours of a subject around slightly, as far as the camera is concerned.

To compensate for the variations in lighting colour, most cameras are equipped with some sort of colour temperature control. The simplest is just an "Indoor-outdoor" switch. Those with a bit more control are continuously variable pots. If a wider range or more accurate control of the colour temperature is required, filters can be screwed into the front of a camera's lens; however, these are a drag, because they are quite expensive and usually forgotten on or off the camera at a critical moment. If the colours are not "just so", they can be compensated for with the TV set's adjustments on playback.

Having worked remote camera now and then, there is one feature which seems worth more than just a passing mention. Most of the current crop of colour cameras look like over grown super eight movie sets, with the lenses and finders in the usual places. However, there are a few, puzzling though they may seem, with the finders up front. Witness the JVC G-71US as an example. Now, if you have ever been the victim of the screening of a home movie, you may have noticed that one of the more interesting things it did for you was to make you slightly sea sick, because most home make flicks jump all over the place. Inherent in the "super eight" style of camera is the latent inability of most people to keep the nasty things steady. If you want to prove this to yourself, take a couple of bricks and hold them in front of your face while walking around. This should illustrate two important points. One, that you can't see through bricks, and two, that there is little mechanical stability in ones arm when it is in this particular position.

The best place to put a camera if it must be "hand held" is on the shoulder. With a bit of practice, a camera thus supported can be held almost as steady as if it were atop a tripod, even while walking around. However, this does present a slight problem if one is to peer through a conventional, rear mounted view finder. Hence, the front mounted eye piece. . . . a very valuable feature if you plan to do a great deal of hand held camera work.

GET YOUR OWN

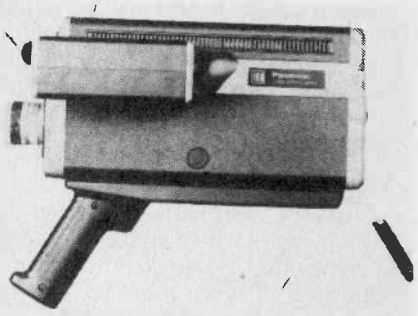
Most of the cameras listed here actually work with a single, low voltage power supply. Some do not. This is very important if you plan to use your camera with a portable VCR in the future. While only a few manufacturers have released portables for the ½" cassettes to date, undoubtedly most of the others will have done so within the next year or so. Since the portables run entirely on batteries, if your camera needs a bunch of different voltages to operate, voltages usually supplied by the AC powered circuitry in the power supply box, they won't be at all happy together.

By the time this column wends its way through the editing staff, the deletion dart board and the printers, this list may well have been rendered incomplete. The VCR manufacturers are churning out new models so fast that many are actually obsolete by the time they reach the ends of their production lines. However, here is what exists at the moment . . . that is, my moment, which is actually your moment as it was three months ago, before your moment was . . oh, never mind.

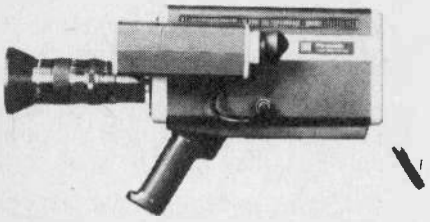
TOSHIBA

The TA-11 is a black and white camera with a zoom lens, and a peculiar sort of optical finder. An internal mirror arrangement permits actual through the lens viewing, in a system similar to that used in a thirty five millimeter still camera. The only negative aspect of this is that the optics siphon off some of the light that would otherwise be bound for the pick up tube. A microphone is built into the camera, right above the lens. One interesting point: while the lens does not have a full set of stops, its usual f/2.5 aperture can be closed down to f/8 or f/11 for shooting in bright light.

The IK-12 is a full blown colour system. It comes with an optical finder, but this can be replaced by a fully electronic one, if desired, at any time. The standard lens is a 25 mm f/1.9, with stops, and a variety of other lenses can be had, including a 18 to 108 mm zoom. There is a built-in mike in the usual spot. The detachable hand grip is one of the better designs for a camera having a front mounted finder. A meter on the rear panel indicates whether sufficient



Panasonic's PK200



The PK300 is similar to the 200 model except it offers zoom.

light is available for automatic shooting at any given aperture. A "HUE" pot and a two position lighting switch are provided to set the colours up to suit the user's taste.

If He had meant for us to have green faces, He would have given us a Tory government sooner.

Toshiba also has the IK-1610, which appears to be designed for use with its V-5530 portable Beta recorder. Presumably, it will work with any machine. Physically, it resembles a large movie camera, with a rear mounted finder. Its features are similar to the IK-12, and the available options include an auto iris zoom and an electronic finder.

HITACHI

Hitachi has one camera, the GP-5, but its several available options make it quite versatile. The rear mounted viewfinder can be either of the optical or electronic type. If a simple lens is used, the automatic sensitivity control will adjust the camera for an acceptable picture. Those wishing a bit more of a hand in the destiny of their tapes can install a more elaborate lens, complete with full iris and zoom. A directional mike is mounted on the front of the camera, over the lens. The colour temperature adjustment is a continuously variable control.

PANASONIC

Panasonic's line of cameras includes two colour machines, the PK-200 and PK-300. Both have front mounted finders, optical for the 200 and electronic for the 300. Both cameras have built-in light meters, externally accessable colour controls, and three position colour temperature switches. Built-in mikes are also among the features. The major difference between the two units is the lenses provided: a simple 25 mm f/1.8 for the PK-200, and a television type 6:1 zoom for the PK-300.

RCA

RCA has four (count 'em) cameras, two monochrome and two colour. The BW003 is an ultra simple black and white, with non-adjustable lens and a flip-up optical finder. Both beasties have built-in mikes, and moulded on hand grips.

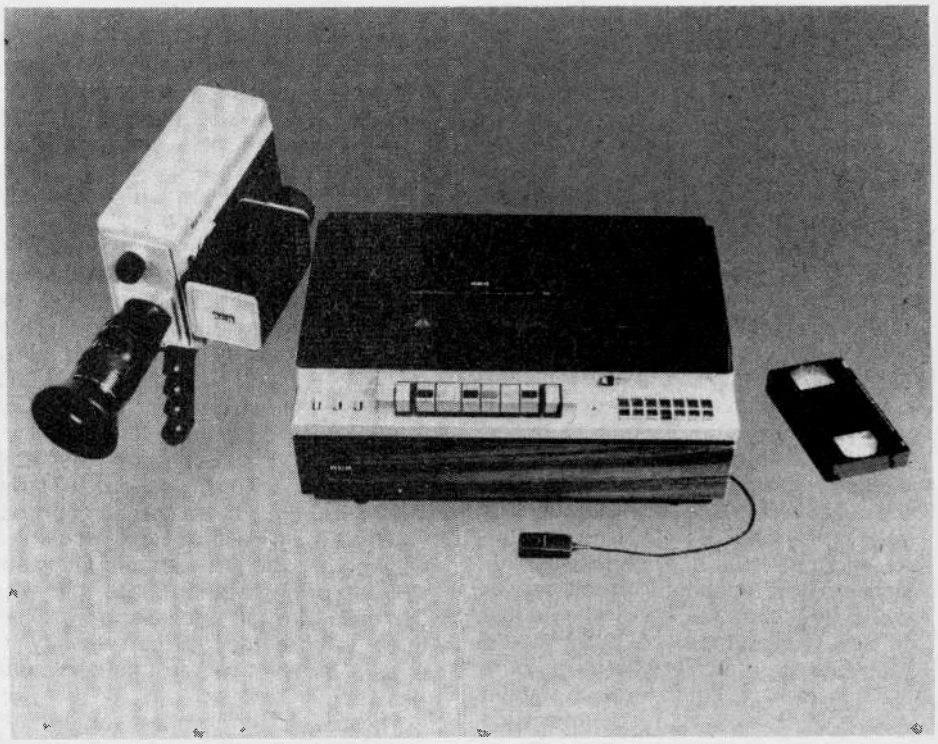
The CC001 is a full colour job, with a standard lens and optical finder, which is front mounted. There is a two position colour switch, and a pair of knobs to adjust the overall hue. The traditional condenser mike protrudes from the front of the camera, above the lens. This camera is also available as the CC002, which has a 6:1 zoom lens and an electronic finder.

JVC

The daddy of the VHS system has two colour cameras available, the G-31US and the G-71US (Who comes up with these numbers?). Both are usable with either console or portable recorders, and can be used with their own 12 volt rechargeable battery packs. The hand grip is similar to TOSHIBA's, and is somewhat easier to use than the conventional pistol type. The finders on both models are front mounted. A switch is provided to defeat the age circuitry, for complete manual control of exposure. The G-31US has an optical finder and a fixed focus, 25 mm f/1.8 lens. The G-71US has an electronic viewfinder and an auto iris 6:1 17 to 102 mm zoom. Both the zoom and the finder can be added to the G-31US at a later time if desired.

ZENITH

Zenith has three cameras available. The basic monochrome unit is undoubtedly the simplest of the lot. It does not have an internal mike, but a separate hand mike is available as an option. The lens is un-stoppable: one



RCA's deluxe home video kit, a Selectavision VCT400 and CC002 colour camera, and of course, cassette to record on.

G–71US colour camera with electronic viewfinder.

size fits all. The rear mounted finder is of the flip-up, optical variety.

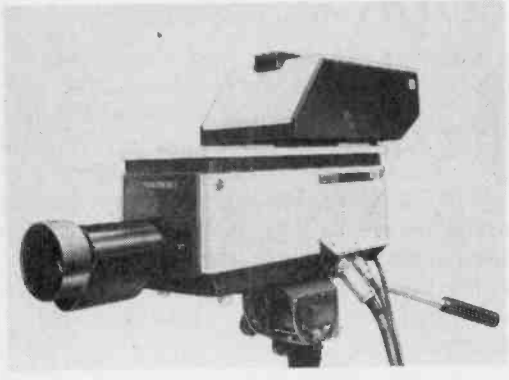
The two colour cameras, KC-1000 and KC-1250 appear identical to the two versions of the HITACHI GP-5 camera, except for all brown cases, as opposed to the latter's black and silver. This is handy if you want to fashion co-ordinate your video apparatus.

SONY

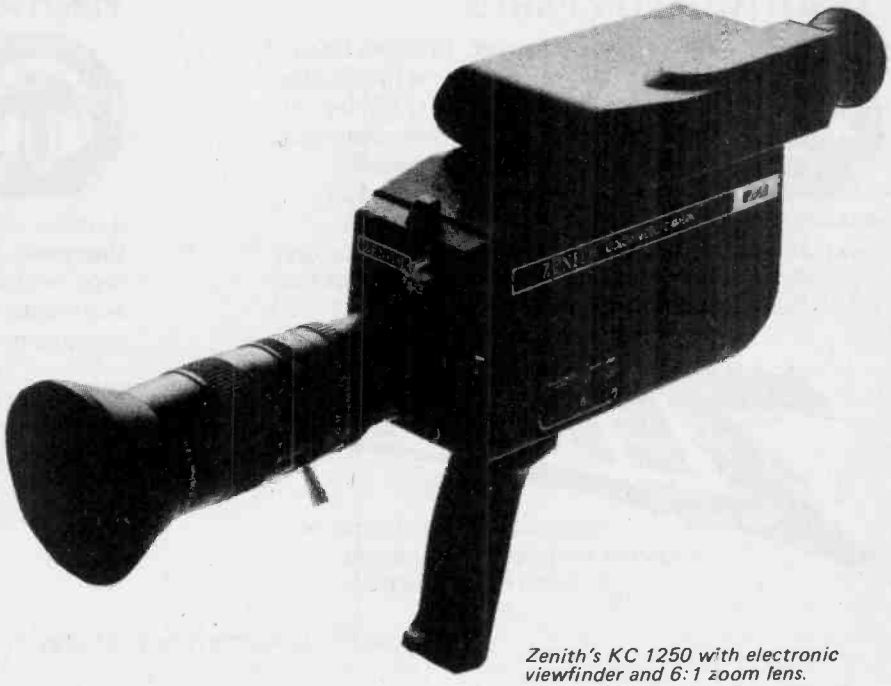
Sony undoubtedly has a camera about somewhere, but, to date, it has proven a bit elusive. Upon requesting some data concerning it, I received the photo of the hand held portable shown, a full colour unit designed especially for use by people who are two separate gorillas. More on this as it develops.

While they have their place, many of the consumer cameras are a bit disappointing. For one thing, they are very expensive, and, over all, are not as well engineered as they might be. This is especially true of the black and white models, most of which are simple enough to be used by an eight year old, and may well have been designed by one. As such, one of the things you can expect to see in this column in the upcoming months will be a bit on rejuvenating some of the less expensive industrial cameras for home use.

Next month, a quick look at video discs: stereo for the deaf. Until then, stay tuned.



Sony's camera



Zenith's KC 1250 with electronic viewfinder and 6:1 zoom lens.

Your Zenith Distributor has the parts and accessories you need in one convenient place — your Zenith One-Stop Shopping Center.

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Famous Super Chromacolor® picture tubes in a range of sizes to replace a total of 80 industry types. Plus Sunshine® and Cinebeam picture tubes to fit almost any brand of color TV. And Zenith black & white picture tubes to replace 401 other types of B & W tubes.

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Dick Cartwright comments on Zenith technical hints and CEASA's Planned Protection Programmes.

ON JUNE 11-13 the Zenith Radio Corporation held their June Open House with the new line introduction. As usual with these Zenith get-togethers the dealers present were most enthusiastic. As always Zenith put on an incredible spread. The main course, courtesy of the Holiday Inns, was good. The desert table was delectable. I now know why a large proportion of Zenith dealers are a fraction overweight. I was tempted, but I turned away. It is quite obvious that the System 3 had been a great success. How else could they have afforded such a presentation? (Burp-p-p)

I spent a considerable amount of time with Mr. Glen Andrews (Service) and Mr. Hall (President), but by mutual agreement it was decided that I should go back on the following Monday (the 18th) to discuss in detail the techniques of the new System 3. On June 18th I arrived with screwdriver in back pocket and was quickly transferred to an old friend, George Hess, who promptly wafted me into the Service Dept. (a credit to Zenith — roomy, airy, well lighted, well staffed, and a most congenial and relaxed working atmosphere).

George pointed out to me the major differences between the first and second System 3 chassis, and the more this extremely talented technician described the new circuitry, the more I realized that the state of the art was not just advancing, it was progressing by giant leaps, leaving your reporter way behind.

It was suggested to me by Glen Andrews and seconded by George Hess, that the magazine should print, perhaps under another by-line, the technical hints published regularly by the Zenith Radio Corporation, and I can assure readers that these tips, carefully filed, can save the practicing bench technician many hours of diagnostic research. I have to agree with Mr. Glen Andrews and George that they could be of great assistance to the independent technician. Unfortunately, the usual restrictions on space prevent us from printing them.

ONTARIO ELECTRONIC TECHNICIANS ASSOCIATION (OETA) NEWS:

The Annual Convention of OETA was held on June 15-17 at the Downtown Holiday Inn, London, Ontario. I unfortunately was unable to attend, but reports received from one of the directors informed me that there had been only one change in the Board of Directors — Mr. Van Ihinger was elected as the new Treasurer of the organization, replacing Mr. Hans Kupfer. I have had no news release on this Convention, but Mr. Len Longman, upon being queried about possible association with CEASA (Canadian Electronic Appliance Service Association) stated that no direct association is planned at this time, however they are prepared to recognize CEASA and co-operate in any way that will be beneficial to the industry.

TORONTO NEWS:

The MTTSA (Metropolitan Toronto Television Service Association — Toronto Chapter of OETA) have announced a General Meeting will be held at the Airport Holiday Inn, Toronto, on September 26. This meeting is open to all interested technicians. Philips will demonstrate their video disk and a new TV converter. For further information please contact MTSA. This should be an extremely informative meeting, as believe it or not,

ZENITH FALL SEMINARS — NATIONWIDE: THE DIRECT ACCESS TUNER AND THE ELECTRONIC POWER SENTRY (K LINE)

Calgary, Alta.	Sept. 10-11
Victoria, B.C.	Sept. 17
Kelowna, B.C.	Sept. 19
Vancouver, B.C.	Sept. 24 thru 28
Edmonton, Alta.	Oct. 1-2
Sudbury, Ont.	Oct. 10
Toronto, Ont.	Oct. 22 thru 26 (There will be an audio lab in the evenings of these days. This will be hands-on seminar.)
Windsor, Ont.	Oct. 29-30
St. Catharines, Ont.	Nov. 1-2
Kitchener, Ont.	Nov. 5 thru 9
Regina, Sask.	Nov. 12-13
Saskatoon, Sask.	Nov. 15
Winnipeg, Man.	Nov. 19 thru 23
Toronto, Ont.	Nov. 26 thru 30

These seminars will be conducted by our old friend George Hess, who is nationally recognized as one of the finest educators in the field of domestic electronic servicing.

It is possible that times and dates will be changed. Contact your local Zenith representative for up to date information.

the video disk will in the foreseeable future be in an extremely competitive position with the video cassette recorder.

CEASA ANNOUNCES PLANNED PROTECTION PROGRAMMES

A few months ago Mr. Bill White, General Manager of CEASA, hinted to me that an income protection, old age security, pension plan was in the works. He asked me to keep it confidential as the plan at that time had not been finalized. However a few days ago Mr. White informed me that the plan was now ready for presentation, and in view of the great interest that this plan should generate in the independent service field I have decided to quote him almost verbatim.

"Over the years the security of the Independent Electronic and Appliance Service Technician in Canada has become more precarious. Company health, sickness, disability and pension plans are not available to the technician who decides to 'go it alone' nor to the small service businesses serving the many towns and cities of Canada. Recognizing this situation, the Canadian Electronic and Appliance Service Association is introducing Planned Protection Programmes to its members (including Provincial Service Associations) this Fall. Taking full advantage of group purchasing power, CEASA will start off the programme with four distinct security offerings.

(1) Planned Income Protection

"Available to CEASA members and their employees, the benefits include a monthly income of up to $1,500 for life, if necessary, when injury prevents the member from working. Returning to work on a part-time basis (half regular time or less) after receiving benefits for injury, a member will receive half his regular salary for up to six weeks. When sickness prevents a member from working, a monthly benefit of $1,500 maximum will be paid for up to five years.

(2) Life, Accident and Family Life Insurance.

"This policy covers association members, their spouses, employees and children. Maximum insurance coverage is $100,000.

(3) Legal Fee Insurance.

(4) Group Pension Plans.

"Financial consultation and individual planning for retirement are part of the plans. Flexibility is the keynote. Portability is built into every pension programme. Continuous monitoring of the overall group pension programme is carried out by financial consultants — experts in the pension field. There are no lock-in provisions and contributions can vary from $25 to $9,000 per person per year.

"All contributions and earnings in a pension plan are deductible from personal income tax. The tax write-offs to an employer company may be greater than those for a standard pension plan.

"Provisions can be made under Group Deferred Profit Sharing plans whereby separate plans may be provided to cater to the different needs of the participating member companies. The member can select his own retirement date (not necessarily 65). The younger the participant, the greater the amount of pension provided by the plans.

"Because of the flexibility, CEASA members have both the opportunity and facility to personally arrange their own retirement security. This is not so in company pension plans where the maximum pension is decided by the management.

"The company selected to underwrite the CEASA pension plans has extensive experience in the group pension field with responsibility for hundreds of pension plans.

Look at the benefits

"An annual contribution of $2,500 to a CEASA pension plan starting at age 35 will pay the member an annual pension for the rest of his life, (starting at age 65), of a minimum of $30,019. A person receiving this pension to age 90 will in those 25 years receive over $750,475 for an original investment of $75,000 — a 10-fold increase. A nice return on investment!

"Smaller annual contributions and shorter time periods yield comparable annual pensions."

For information regarding this protection plan, please contact: Mr. Bill White, General Manager, Canadian Electronic & Appliance Service Association, Suite 804, 45 Wynford Heights Cres., Don Mills, Ont. M3C 1L3.

COMMENTS

As a retired TV serviceman I am delighted that at long last a nation-wide organization has inaugurated a protection plan for the independent service technician.

I personally know a number of technicians who are approaching retirement age and are beginning to wonder how they will manage on the Canada and Old Age pensions. Congratulations to CEASA for taking the initiative.

All the best.

Richard Cartwright.

Just a small sample of Zenith's technical tips.

CHANNEL SELECTOR ROTATION SLUGGISH: S1986 HOSPITAL RECEIVER

To ensure smooth rotation of the channel selector at low line voltages, production has added a ¼-watt, 10 ohm resistor (63-10559-24) and a 47 mFd, 25-volt electrolytic capacitor (22-7152-07) in the control section A-7562 power supply as indicated in the partial schematic below. The added capacitor provides additional filtering, thus raising the average DC voltage output to the motor control relay. The resistor added reduces the charge surge current. These components may be added in the field as indicated in the pictorial diagram, if a fix is required. Except for a small quantity of reworked power supplies which will resemble the pictorial, production models will have a different printed circuit board layout, and will be labeled A-7562-04.

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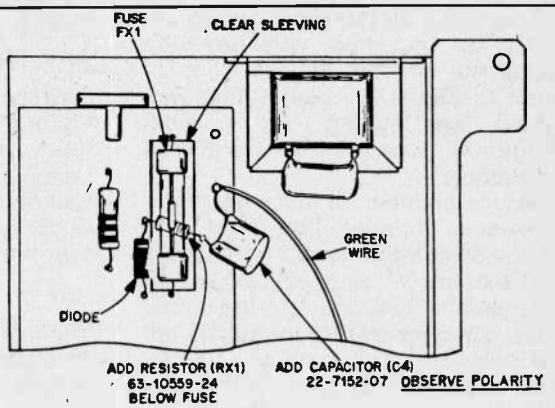
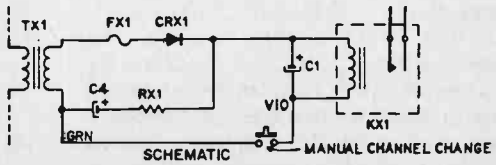
DRAWINGS ARE ON THE FOLLOWING PAGE



A-7562 POWER SUPPLY



SCHEMATIC

SPECIAL $149

MODEL 244 MOBIL/COMM POWER SUPPLY

COMMUNICATIONS POWER WITH MORE THAN YOU EXPECTED.

Duty & FST Included. Chargex (Visa) accepted.
Ont. residents add 7% Sales tax. Shipping extra.

Hickok has made available a lab-quality, regulated power supply with the heavy duty-capability required for transceiver service. Over design in construction, and human engineering guarantees long service life and ease of use not available in cheap power supplies..

The Hickok Model 244 Mobil/Comm Power Supply features:

- **Full voltage range — 10.5 to 14.5 Vdc.**
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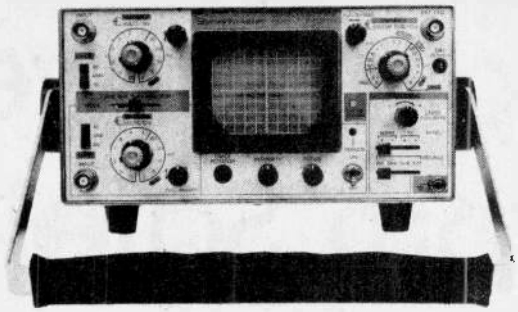

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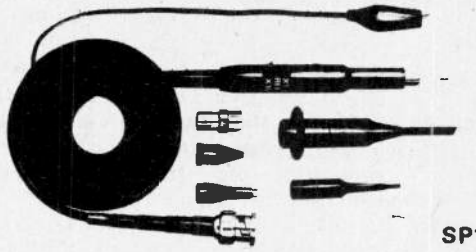

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Solar Power From Satellites

Solar power satellites could provide a real alternative to ground-based solar collector arrays as an infinitely renewable energy source. Brian Dance studies the possibilities.

WORLD-WIDE DEMAND for energy is growing at around 5% per year. Although conventional power stations using fossil fuels (coal and oil) are now backed-up by nuclear power stations, both fossil fuels and our supplies of fissionable isotopes are being depleted. Some action must be taken to provide for our energy requirements during the next century fast breeder reactors have been suggested since they generated fissionable fuel, but some people think the associated environmental hazards are unacceptable.

Controlled nuclear fusion produces little radioactive waste and could use readily available hydrogen from the sea. This method is attractive in principle but despite twenty years scientific study has not yet produced useful power.

SOLAR SATELLITES

Other sources of power, such as the waves of the sea, geothermal sources, photoelectric converters etc have been suggested but the most ambitious proposal yet made is for a number of huge satellites (often called 'Powersats' or 'Sunsats') to be assembled in space. They would convert the energy of sunlight into electrical energy which would be sent to the earth as a microwave beam. At the receiving station the energy would be converted into power suitable for feeding to our electricity grid.

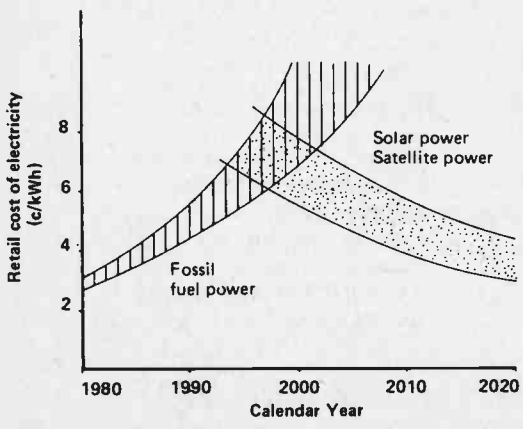
This solar power satellite idea is perhaps the most complex and expensive proposal yet made by our civilization.

US WORK

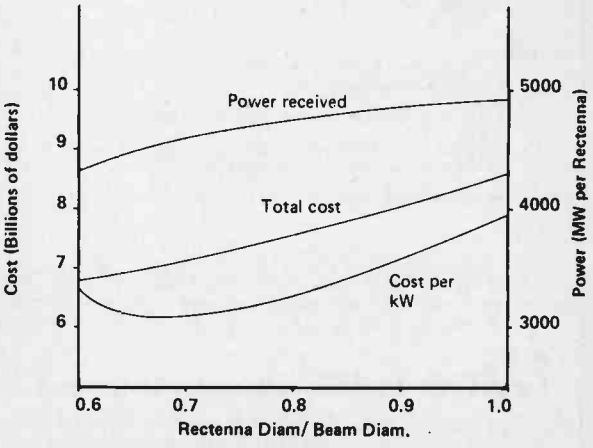
Some immediately obvious difficulties include the problem of converting many megawatts of power into a focussed microwave beam, the possible effects of the beam on people, animals and plants and its effect on the ionosphere and our weather. But the potential benefits are so great that the United States National Aeronautics and Space Administration (NASA) and the US Department of Energy have provisionally allocated 15.6 million dollars for work on the project up to 1980, at which time it will be compared in detail with other possible energy sources. Now a bill is being considered by Congress which would increase the amount by 25 million dollars for the fiscal year beginning in October 1979.

Boeing Aerospace, Varian Associates, the Jet Propulsion Laboratory of California and the Raytheon Company of Waltham, Massachusetts are some of the companies contracted to work on the project.

Although the US Department of Energy actually manage the funds for the Solar Power Satellite project, NASA is deeply involved with the development of new launch vehicles required for putting huge payloads into orbit. NASA has already established a Solar Power Satellite Office.



The graph at left shows how the cost of electricity generated from the burning of fossil fuels (coal, oil) will increase over the next two decades. The cost of solar power derived from the proposed satellites is likely to become an economic alternative within 15 years.
The graph at right indicates how the cost of a solar power satellite system varies depending on the diameter of the receiving antenna (Rectenna) on earth. Optimum cost per kW is obtained from an antenna of about 700 m diameter.



Solar Power From Satellites

The idea of a solar power satellite was first proposed just over ten years ago by Dr. Peter E. Glaser. His suggestion was not taken very seriously at first, but NASA investigations in 1971/2 showed that it would be a feasible project. At the present time there is enormous interest in the USA in solar power satellites and campaigns are being organised to encourage the Government to proceed with the work with great haste. Peter Glaser leads a group of industrialists known as the "Sunsat Energy Council"; this Washington based Council was formed on solar power satellites. Naturally electronics manufacturers are well represented on this Council (including General Electric, RCA and Westinghouse), since such a project could bring a vast amount of work to the electronics industry.

CURRENT IDEAS

The proposals currently being considered are for a number of huge solar power satellites each providing a power level of some 10 000 MW and weighing some 10^8 kg (100,000 tonnes) with an area of about 100 km^2.

In order to place such an amount of material in orbit, it has been estimated that one would require a few launchings per day of huge Space Shuttle type vehicles over a period of a year or so. Boeing Aerospace are studying the possible effects of such launchings on the environment which will far outweigh the flights of Concorde. Launch and recovery problems may be considerable and the choice of rocket fuel may be limited by considerations of the resultant atmospheric pollution.

A solar power satellite would operate in geosynchronous orbit: this means orbiting at a rate calculated to keep the satellite apparently stationary above a point on the earth's surface. The receiving station would always be in a direct line-of-sight from such a satellite which could supply microwave energy for over 99% of its operational life. The other part of the time is spent with the satellite in the shadow of the earth, so it cannot supply power at this time. However, such eclipses of a power satellite would occur only for short periods when it is late at night in the region of the earth being served when electricity demand would normally be quite low.

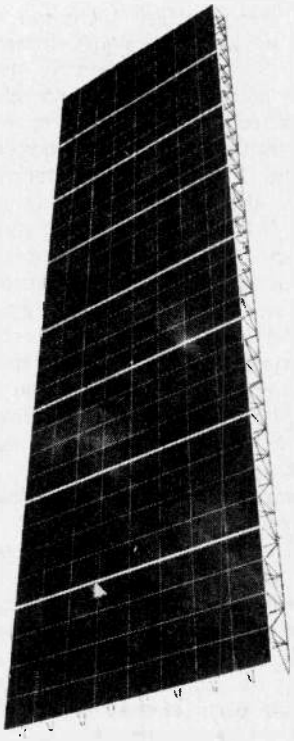
A satellite in geosynchronous orbit receives at least six times as much solar energy as a similar collector on earth (although a figure of nearly twenty times is more typical). A 10,000 MW solar power satellite could supply all of the electricity requirements of New York City. About forty-five such satellites would be required to match the present electrical generating capacity of the USA. Smaller satellites providing outputs down to 2500 MW could be economical propositions for some areas.

If it is decided to proceed with the construction of one or more solar power satellites, hundreds or even thousands of people will be working in space on the project.

ENERGY CONVERSION SYSTEMS

A number of forms of energy conversion have been studied for possible use in a power satellite, but two basic forms seem to be currently in favour. In the photovoltaic type of satellite, an array of perhaps 14×10^9 solar cells would be employed with a total area of about 24.8 km in length by 5.2 km in width (129 km^2). These cells would convert the energy radiated from the sun into a direct current.

Another possible system is known as the Brayton heat engine satellite; it would employ a series of four huge parabolic-dish reflectors, each about 5.6 km in diameter and similar to the reflectors used with conventional microwave aerials. The whole satellite would stretch some 23.7 km across space. The parabolic reflectors would collect the energy from the sun and would direct it into a 'solar furnace'. Each reflector would consist of thousands of steerable, extremely thin plastic reflectors which would direct the energy into a dome-like cavity absorber or solar furnace located near each dish.



Solar-cell power arrays may be inefficient

Helium gas operating in a closed loop could be heated in the solar furnace cavity so that it passes through gas turbines and would then flow through a space radiator where the heat from the gas would be passed to the radiator for dispersion into space. The space radiator could employ a liquid metal loop with a helium/liquid metal heat exchanger. A liquid alkali metal, such as potassium, would suffer little contamination in space. The gas turbines would drive a dynamo. As there would be no gravitational force in the region, the turbo-generators could be entirely supported by gas bearings.

Power satellites using other types of conversion are possible. The possibility of using thermionic electricity does not seem to be in the running at the moment owing to low efficiency, waste heat rejection and the cost of the materials.

Both the photovoltaic and heat engine systems seem to be possible, although each has its own advantages and disadvantages. In both systems the electricity produced would be beamed to the earth as microwaves. The Boeing study concluded that the weight of either type of satellite would be of the same order, namely 80,000 to 110,000 metric tonnes for a 10,000 MW satellite.

Although the photovoltaic system is less complex, the currently available solar cells are expensive to produce and are believed to be less efficient than thermal cycle engines. In addition, Brayton heat engines have already been operated very successfully on the earth using 7 m diameter reflectors to generate large amounts of electrical energy.

At the present time it seems that a photovoltaic system using silicon cells is most in favour. Unfortunately they are subject to radiation degradation, but this can be corrected by suitable annealing. It seems likely that silicon solar cells which have spent much time in the region of the Van Allen radiation belt would require re-annealing before use in their geosynchronous orbit.

MICROWAVE POWER GENERATION

The conversion of some 10,000 MW of power fed in as a direct current into the required 2.45 GHz microwave beam is no easy task. Varian Associates are basing their plans on the use of 70 kW klystrons cooled by heat pipes for microwave power generation in the satellite. It has been estimated that each satellite transmitter would employ some 250,000 70 kW-klystons in its 1 km diameter transmitting array. However, Raytheon favour the use of 5 kW "amplitron" devices which are crossed field amplifiers of the magnetron type.

Solar Power From Satellites

The power transmitter design is largely dictated by the fact that it has been decided to limit the maximum power intensity in the ionosphere to 230 W/m^2 (23 mW/cm^2), since this is the best estimate of the limit below which localised heating of the ionosphere by the power beam can not exceed the heating occasionally produced by natural effects. Incidentally, the fraction of the complete atmosphere heated by the combined power beams of even a large number of solar power satellites will be extremely small.

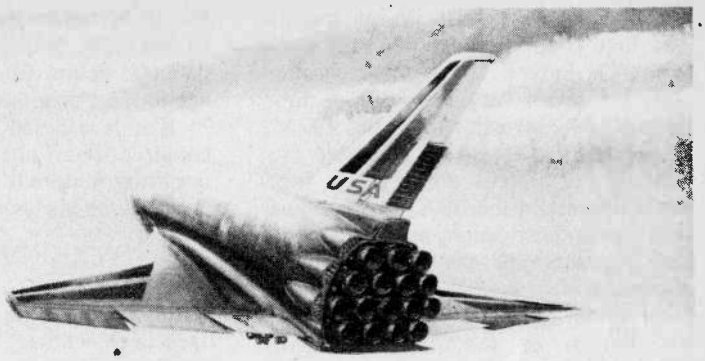
THE MICROWAVE BEAM

It is intended that the microwave power beam from the satellite used to convey energy to earth would use a frequency of 2.45 GHz and would be focused on an array of receiving aerials on the earth over an elliptical area of some 12 km by 8 km in size. The receiving area would resemble a chain link fence mounted in stripes high enough above the ground to allow agriculture and animal grazing beneath the aerials.

It has been suggested by Ralph Chernoff of the Jet Propulsion Laboratory that a phased array of aerials on a satellite of a diameter of about 1 km could produce a suitable beam to the earth. Large phased transmitter arrays are required in order to produce a narrow beam which can be accurately directed. There may be two transmitters per satellite.

At the receiving station the microwave beam would be converted into direct current. A grid interface converter would then change this current into a high voltage alternating current of the mains frequency used in that region. It is probable that part of the power would be used to electrolyse water at the receiver site so as to generate the oxygen and hydrogen required for liquefaction for use as rocket fuel.

Earthbound experiments at the Jet Propulsion Laboratory have used a conventional communications receiver operating at 2.45 GHz as a beam source to direct power onto a tower at a distance of over 1.6 km. A receiving antenna was mounted on the tower; it consisted of a phased array of dipoles with each dipole connected to a diode rectifier and smoothing capacitor, the output being connected to a direct current load. An efficiency of 82.5% was obtained at a level of over 30 kW, the efficiency being defined as the direct current power delivered divided by the rf power transmitted. These experiments, which were performed a few years ago, almost abolished any doubts about the feasibility of obtaining high efficiency power transfer through the use of a microwave beam.



Space Shuttle type vehicles may be used to ferry materials to a 'factory' in a near earth orbit constructing a power satellite, the completed structure being moved later to a geosynchronous orbit.

A solar power satellite receiving station could also use a suitable array of dipoles and diode rectifiers; such a system is often referred to as a 'rectenna' or 'rectifying antenna'.

Accurate direction of the power beam from the satellite is essential for optimum efficiency. An error of only 1 second of arc in the direction of the beam will produce an error of about 174 m at the ground from a satellite in a geosynchronous orbit at 36,000 km above the earth.

A "retrodirective" technique is employed in which a signal transmitted from the ground station is used to measure and correct for any mechanical inaccuracies in the transmitting antenna. It is desirable that the wavefront emitted from the 1 km diameter transmitting antenna should be planar to within ±3 mm (±10° phase error) for optimum efficiency. It is probably impossible to obtain such mechanical perfection, but the phase front can be electronically controlled by distributing a reference phase synchronisation signal to all of the sub-arrays from a common source on the antenna and comparing this signal with the signal transmitted from the ground.

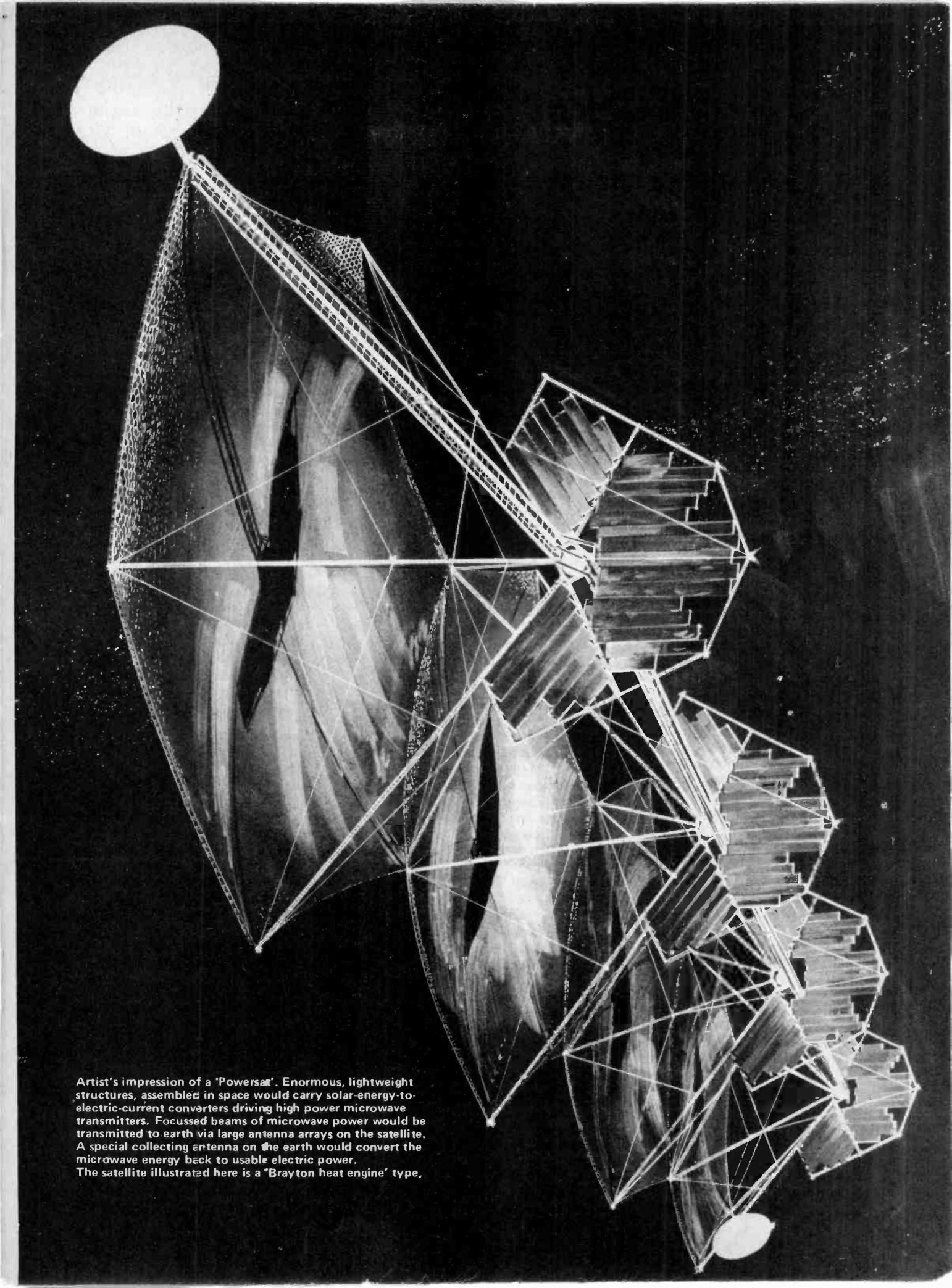
Rectenna costs have been found to be a major factor in the overall cost of transmitting the power from the satellite to the grid. Owing to the shape of the beam intensity pattern on the ground, one can reduce the size of the antenna array somewhat in order to reduce the cost per kW collected. In other words, the outer parts of the beam contain so relatively little energy that one cannot collect it economically. The graph on the right (page 11) shows a definite minimum in the cost per kW of the collected power for various rectenna dimensions.

ASSEMBLY LOCATION

Boeing Aerospace have studied the possibility of assembling the parts of the solar power satellite in low earth orbit and then using the power available from the satellite itself to provide electric propulsion into a geosynchronous orbit. The main advantage of an assembly in low earth orbit is the reduction in rocket fuel requirements from 2.1 tons per ton delivered to a geosynchronous orbit to a mere 0.25 tons per ton. This greatly reduces the cost of launching the solar power satellites.

However, there are quite a number of disadvantages of assembly in low earth orbit, some of which are not easy to quantify. Boeing Aerospace feel the main disadvantage of low earth orbit assembly is the relatively long time (about 6 months) required for moving the satellite assembly from low earth orbit into geosynchronous orbit. This delay represents interest chargeable on the cost of the satellite assembly, etc. and interest charges on such enormous amounts of money cannot be ignored. Nevertheless Boeing feel that the reduction in the rocket fuel costs make assembly in low earth orbit the best technique.

Other problems associated with assembly in low earth orbit include the radiation damage of the solar power satellite components and solar cells during the relatively long time they remain in the Van Allen radiation belts, the problem of converting the assembled satellite into an electrically propelled unit, the risk of collisions with man-made objects in the low earth orbit and



Artist's impression of a 'Powersat'. Enormous, lightweight structures, assembled in space would carry solar-energy-to-electric-current converters driving high power microwave transmitters. Focussed beams of microwave power would be transmitted to earth via large antenna arrays on the satellite. A special collecting antenna on the earth would convert the microwave energy back to usable electric power.
The satellite illustrated here is a 'Brayton heat engine' type,

Solar Power

during the relatively slow spiralling passage from low earth to geosynchronous orbit, the upper atmosphere drag affecting the construction work.

HAZARDS

The proposed 10,000 MW beam directed onto the receiving antenna should produce an intensity of some 230 W/m^2 (23 mW/cm^2) at the centre of the rectenna and about 10 W/m^2 at the edge of the ellipse. It is rather surprising that the 230 W/m^2 level corresponds to about the level of natural radiation incident upon the ionosphere. Investigations have been made into techniques for reducing the amount of radiation in the side lobes by some 45 dB so that the intensity outside most of the main rectenna area is seldom more than 0.1 W/m^2. Offshore rectennas have been proposed for use in areas of high population density.

It is claimed that birds and aeroplane passengers would be able to pass directly through the main beam without any harm, owing to the low beam intensity. Presumably aeroplane passengers would be fairly well screened from microwave radiation anyway by the metal body of the craft. Peter Glaser has commented: 'I have made a standing offer to provide the wine and salad to anyone who promises to eat that duck that flies through the beam – cooked or not!'

Biological tests are to be conducted to ascertain if a microwave beam of 230 W/m^2 produces any effect on birds and flying insects at the 2.45 GHz frequency. Similar tests will be performed at 10 W/m^2 on plants and animals. One wonders whether biological tests at much higher intensities have yet been performed.

Perhaps it is rather remarkable that the rectenna arrays will be suitably elevated to permit frost-free farming or other re-use of the land area. The field strength below the rectenna should be less than the currently recommended maximum US exposure level of 0.1 W/m^2.

Experiments are planned to test the effect of very high power microwave beams from the huge Arecibo antenna on the ionosphere. These experiments will be carried out with the express purpose of checking that the solar power satellite beam will not produce any deleterious environmental effects.

HEAVY LIFT VEHICLES

The cost of the launch vehicles for placing heavy parts in low earth orbit ready for assembly forms one of the major items of a solar power satellite budget. The Boeing study assumed that a new launcher known as the 'Heavy Lift Vehicle' will be developed which should be able to put material into earth orbit for a cost of about 20 dollars per kg. Without such a heavy lift vehicle, the whole solar power satellite project would become economically impossible. The enormous fall in the cost of putting material into earth orbit is well illustrated by the table above.

Rocket type	Time	Dollars/kgm	Typical load
Vanguard	late 1950's	1.1×10^6	9 to 14 kg
Thor	1960's	22×10^3	450 kg
Saturn	early 1970's	1.4×10^3	110,000 kg
Space Shuttle	1980's	330	
Heavy Lift Vehicle	?	20–30	500,000 kg

Approximate cost of lifting material into earth orbit at various times.

The heavy lift vehicle could either have wings like the Shuttle (in which case it could land on the ground like an aeroplane even without using any of its motors) or alternatively it could be a vehicle without wings rather like the Saturn rocket which would have to return to earth by splashing down in the sea. It seems likely that the type of vehicle without wings will be favoured for heavy loads according to current ideas. The Boeing report shows a Saturn type vehicle 72.98 m in height and 32.68 m in diameter at its base.

THE EUROPEAN OUTLOOK

The energy requirements of Europe have been studied by the OECD and it is felt that about fifteen 10 000 MW solar power satellites could supply all of Europe's requirements for 1980. (The total number required for the world has been estimated as about sixty-nine.) The total *developmental* cost (not including operation) of a solar power satellite has been estimated as being of the same order as the total investment already made in North Sea oil by European nations.

The problems in Europe associated with a solar power satellite programme are not identical with those in the USA, largely owing to the different population densities. In the highly industrialised regions of Europe (where power consumption and population densities are greatest), there is normally little land to spare for the huge rectenna arrays together with any surrounding safety areas which may be desirable. The low electrical power demand in rural areas and the high cost of conveying power over large distances may render it uneconomic to place rectenna arrays in these rural areas, so some compromise must be sought in choosing the optimum regions for the siting of rectennas.

It is, perhaps, quite amazing that the USA has set a limit of 10 mW/cm^2 as the maximum safe exposure of people to microwave radiation, whereas the upper limit in the USSR is one thousand times smaller, namely 0.01 mW/cm^2. It is certainly true that exposure to intense, non-ionising radiation at radio frequencies can produce internal heating of biological tissue and this can produce damage if the heat cannot escape rapidly enough for a reasonable equilibrium temperature to be obtained. However, scientists are not yet certain whether other adverse effects than those due to mere heating are also present when personnel are exposed to intense microwave beams. In Western Europe the US standards are applied in radar stations, etc., but it would seem to be highly desirable that the biological effects of microwaves be more intensively investigated so that various countries no longer have a factor of one thousand differences in their safety standards.

INTERNATIONAL ENTERPRISE

Work on solar power satellites is one of those major technological enterprises which should stimulate international participation and co-operation. The microwave beams can be received in all countries with latitudes between about 65°N and 65°S without any great loss of efficiency. The beam is virtually unaffected by even the heavy rain clouds so often found over many parts of the earth.

One may feel that the use of solar power satellites would not be an economical proposition in countries where the population density is not very high. However, one should remember that once a number of solar power satellites have been placed in geosynchronous orbit, the cost of placing any other such satellites in orbit will be much reduced.

One must not forget the disadvantages of establishing a world-wide solar power satellite system. Such a system would inevitably cause interruption of communications on the 2.45 GHz frequency. However, the enormous power radiated from a power satellite would result in considerable interference not only in the 2.45 GHz band, but also in a relative-

Continued on page 64 . . .

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IC 555 Projects

■ Every so often a device appears that is so useful than one wonders how life went on before without it. The 555 timer is such a device.
■ It was first manufactured by Signetics, but is now manufactured by almost every semiconductor manufacturer and is inexpensive and very easily obtainable.
■ Included in this book are Basic and General Circuits, Motor Car and Model Railway Circuits, Alarms and Noise Makers as well as a section on the 556,558 and 559 timers.
■ An invaluable addition to the library of all those interested in Electronics.

Price $4.30 including 30¢ postage and handling.

52 Projects Using IC741

■ IC741 is one of the most popular, inexpensive and easily obtainable devices available to the home constructor. It is also extremely versatile and can be used in a great number of various applications.
■ This unique book, originally published in Germany, shows fifty-two different projects that can be simply constructed using only the IC741 and a few discrete components.
■ An invaluable addition to the library of all those interested in electronics.

Price $2.70 including 30¢ postage and handling.

Mobile Discotheque Handbook

■ The vast majority of people who start up "Mobile Discos" know very little about their equipment or even what to buy. Many people have wasted a "small fortune" on poor, unnecessary or badly matched apparatus.
■ The aim of this book is to give you enough information to enable you to have a better understanding of many aspects of "disco" gear.
■ The approach adopted is to assume the reader has no knowledge and starts with the fundamentals, hopefully the explanations given are simplified enough for almost anyone to understand but please not that this is by no means the full story.
■ The book is divided into six parts — Basic Electricity, Audio, Ancillary Equipment, Cables and Plugs, Loudspeakers, Lighting Equipment and the information has been considerably sub-divided for quick and easy reference.

Price $4.80 including 30¢ postage and handling.

28 Tested Transistor Projects

■ Mr. Richard Torrins is a well experienced electronics development engineer and has designed, developed, built and tested the many useful and interesting circuits included in this book.
■ Some of the circuits are completely new and, to the best knowledge of the author, unlike anything previously published while others many bear similarity to more familiar designs.
■ The projects themselves can be split down into simpler building blocks, which are shown separated by boxes in the circuits for ease of description, and also to enable any reader who wishes to combine boxes from different projects to realise ideas of his own.
■ Most of the circuits are very economical on the use of components and in many cases the semiconductors employed are non-critical, commonly available and inexpensive types.

Price $3.15 including 30¢ postage and handling.

First Book of Transistor Equivalents and Substitutes

■ Shows alternatives and equivalents to many popular transistors made in Great Britain, U.S.A., Europe, Japan and Hong Kong etc.
■ Companion Volume to BP1 — SECOND BOOK OF TRANSISTOR EQUIVALENTS AND SUBSTITUTES.
■ An invaluable addition to the library of all those interested in Electronics be they amateur or professional.

Price $2.30 including 30¢ postage and handling.

Second Book of Transistor Equivalents and Substitutes

■ Shows alternatives and equivalents to many popular transistors made in Gt. Britain, U.S.A., Europe, Japan and Hong Kong etc.
■ Companion Volume to BP1 — FIRST BOOK OF TRANSISTOR EQUIVALENTS AND SUBSTITUTES.
■ All invaluable addition to the library of all those interested in Electronics be they amateur or professional.

Price $3.55 including 30¢ postage and handling.

Radio Circuits Using IC's

■ This book describes integrated circuits and now they can be employed in receivers for the reception of either amplitude or frequency modulated signals. The chapter on amplitude modulated (a.m.) receivers will be of most interest to those who wish to receive distant stations at only moderate audio quality, whilst the chapter on frequency modulation (f.m.) receivers will appeal to those who desire high fidelity reception of local v.h.f. stations possibly with stereo (and even quadrophony at some future date). Stereo decoder circuits and the devices available at present for quadrophonic circuits are discussed. Voltage regulator devices are also covered because they are so convenient in all varicap tuned receivers and because they have so many applications in all types of circuit.
■ Brian Dance is a highly experienced author who regularly contributes to many of the popular electronic magazines that are available both in the U.K. and overseas.
■ An extremely valuable addition to the library of all Electronics enthusiasts.

Price $4.80 including 30¢ postage and handling.

50 (FET) Field Effect Transistor Projects

■ Field effect transistors (F.E.T.'s) find application in a wide variety of circuits. The projects described here include radio frequency amplifiers and converters, test equipment and receiver aids, tuners, receivers, mixers and tone controls, as well as various miscellaneous devices which are useful in the home.
■ It will be found that in general the actual F.E.T. used is not critical and many suitable types will perform satisfactorily. The F.E.T. is a low-noise, high gain device with many uses, and the dual gate F.E.T. is of particular use for mixer and other applications.
■ This book contains something of particular interest for every class of enthusiast — short-wave listener, radio amateur, experimenter or audio devotee.
■ A valuable addition to the library of all electronic enthusiasts.

Price $3.85 including 30¢ postage and handling.

Popular Electronic Projects

■ Included in this book are a collection of the most popular types of projects which, we feel sure, will provide many designs to interest all electronics enthusiasts.
■ All the circuits utilise modern, inexpensive and freely available components.
■ The 27 projects selected cover a very wide range and are divided into four basic areas. Radio Projects, Audio Projects, Household Projects and Test Instruments.
■ An interesting addition to the library of both the beginner and more advanced constructor.

Price $5.10 including 30¢ postage and handling.

Electronic Music and Creative Tape Recording

■ Electronic Music is the new music of the 20th Century. It plays a large part in "Pop" and "Rock" music and, in fact, there is scarcely a group without some sort of electronic synthesiser or other effects generator.
It is possible with relatively simple apparatus to create complete compositions using electronic and sometimes non-electronic musical sources.
■ This book sets out to show how Electronic Music can be made at home with the simplest and most inexpensive equipment. It describes how the sounds are generated and how these may be recorded to build up the final composition.
■ With the constructor in mind, several ideas are given to enable a small studio to be built including a mixer and various sound effect units.
Circuits are included for VCOs, VCAs, Envelope Shapers, VCFs, Active and Passive Mixers, Fuzz, Noise Generators, Metronomes and a 10-Note Programmable Sequencer etc.
All the units shown have been successfully built and used by the author and most of the projects can be built by the beginner.
■ An unusual, fascinating and highly rewarding application of electronics.

Price $4.50 including 30¢ postage and handling.

IC LM3900 Projects

■ The purpose of this book is to introduce the LM3900 to the Technician, Experimenter and Hobbyist. It provides the groundwork for both simple and more advanced uses and is considerable more than just a collection of simple circuits or projects.
■ The LM3900 is different from conventional 'Op-Amps', it can be used for many of the usual applications as well as many new ones. It is one of the most versatile, inexpensive and freely available devices on the market today.
■ The book is divided into six basic sections —
Introduction
Audio Applications
Simple Linear Applications
Simple Digital Applications
Signal Generator Circuits
Special Applications
■ The LM3900 can do much more than is shown here — this is just an introduction. Imagination is the only limitation with this useful device, but first the reader must know the basics and that is what this book is all about.

Price $4.80 including 30¢ postage and handling.

1st Book of Hi-Fi Loudspeaker Enclosures

■ Contains 26 practical designs and over 40 drawings to enable the enthusiast to construct his own Hi-Fi Loudspeaker enclosures.
■ Includes the following types of enclosures: —
Corner Reflex, Bass Reflex, Exponential Horn, Folded Horn, Tuned Port, Klipschorn, Labyrinth, Tuned Column, Loaded Port, Multispeaker Panoramic etc.
■ Also covers general construction hints and embellishing of cabinets as well as a considerable amount of other useful information.
■ A must for the library of all audio enthusiasts.

Price $3.05 including 30¢ postage and handling.

50 Simple L.E.D. Circuits

■ The author of this book, Mr. R.N. Soar, has compiled 50 interesting and useful circuits and applications, covering many different branches of electronics, using one of the most inexpensive and freely available components — the Light Emitting Diode (L.E.D.).
■ Also includes circuits for the 707 Common Anode Display.
■ A useful book for the library of both beginner and more advanced enthusiast alike.
■ Companion volume to book No. BP36 — 50 CIRCUITS USING GERMANIUM, SILICON & ZENER DIODES by the same author.

Price $3.05 including 30¢ postage and handling.

Handbook of IC Audio Preamplifier & Power Amplifier Construction

■ Shows what audio IC's are, as well as how to use them.
■ Includes practical constructional details of various IC and Hybrid IC/Transistor designs of about 250mW to 100W output.
■ This book is written by the very experienced and popular author Mr. F.G. Rayer who deals with the subject in four parts.
Part I Understanding Audio IC's
Part II Preamplifiers, Mixers and Tone Controls
Part III Power Amplifiers and Supplies
Part IV Hybrid Circuits
■ An ideal book for both beginner and advanced enthusiast alike.

Price $3.15 including 30¢ postage and handling.

50 Projects Using Relays SCR's & Triacs

■ Relays, silicon controlled rectifiers (SCR's) and bi-directional triodes (TRIACs) have a wide range of applications in electronics today. These may extend over the whole field of motor control, dimming and heat control; delayed, timing and light sensitive circuits and include warning devices, various novelties, light modulators, priority indicators, excess voltage breakers etc.
■ In this book, the very experienced and popular author — Mr. F.G. Rayer — has given tried and practical working circuits which should present the minimum of difficulty for the enthusiast to construct.
■ In most circuits there is a wide latitude in component values and types, allowing easy modification of circuits or ready adaption of them to individual needs.
■ An ideal book for both beginner and advanced enthusiast alike.

Price $4.05 including 30¢ postage and handling.

50 Projects Using IC CA3130

■ The CA 3130 is currently one of the more advanced operational amplifiers that is available to the home constructor. This means that it is often capable of a higher level of performance than many other devices and that it often needs fewer ancillary components.
■ In this book Mr. R.A. Penfold has designed and developed a number of interesting and useful projects which are divided into five general categories:
I Audio Projects
II R.F. Projects
III Test Equipment
IV Household Projects
V Miscellaneous Projects
■ An ideal book for both the beginner and more advanced enthusiast alike.

Price $3.15 including 30¢ postage and handling.

Electronic Projects for Beginners

■ In this book the newcomer to electronics will find a wide range of easily made projects, many complete with actual component and wiring layouts. Furthermore, a number of projects have been arranged so that they can be constructed without any need for soldering and, thus, avoid the need for a soldering iron.
■ This book which is written by the very experienced author Mr. F.G. Rayer is divided into four sections —
1. "No Soldering" Projects
2. Miscellaneous Devices
3. Radio and Audio Frequency
4. Power Supplies
■ An absolute 'must' for all beginners in electronics.

Price $4.60 including 30¢ postage and handling.

50 CMOS IC Projects

■ CMOS IC's are probably the most versatile range of digital devices for use by the amateur enthusiast. They are suitable for an extraordinarily wide range of applications and are now also some of the most inexpensive and easily available types of I.C.
■ In this book Mr. R.A. Penfold has designed and developed a number of interesting and useful projects which are divided into four general catagories.
I Multivibrators
II Amplifiers and Oscillators
III Trigger Devices
IV Special Devices
■ An ideal book for both the beginner and more advanced enthusiasts alike.

Price $3.10 including 30¢ postage and handling.

Electronic Calculator Users Handbook

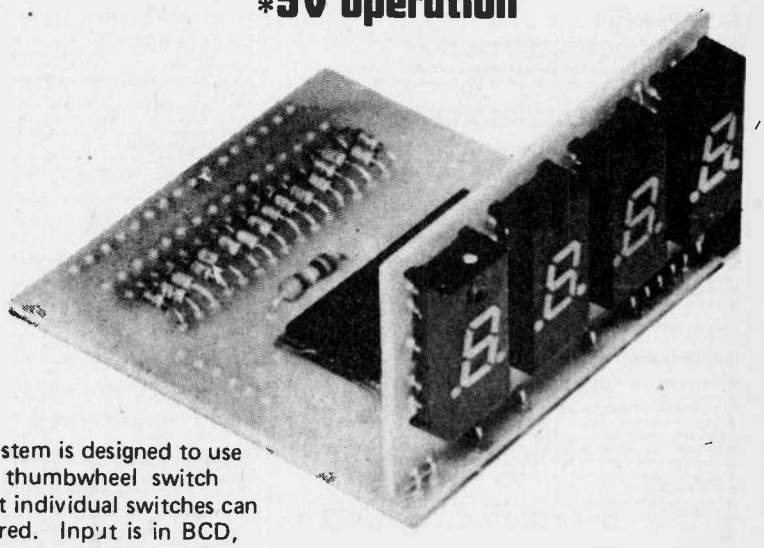
■ An invaluable book for all calculator users whatever their age or occupation, or whether they have the simplest or most sophisticated of calculators.
■ Presents formulae, data, methods of calculation, conversion factors etc with the calculator user especially in mind, often illustrated with simple examples.
Includes
■ The way to calculate using only a simple four function calculator.
Trigonometric functions (sin, cos, tan)
Hyperbolic functions (sinh, cosh, tanh)
Logarithms, square roots and powers.
■ A comprehensive section of conversion factors covering such common conversions as length, area, volume and weight etc through to more specialised conversions such as viscosity, illumination, and cargo shipping measures etc.
■ Formulae and data for VAT, discounts and mark up, currency conversion, interest, solutions of equations, binary and octal numbers, areas and volumes, statistics and mathematics etc.

Price $3.20 including 30¢ postage and handling.

Up/Down Presetable Counter

- *4 digit
- *up/down counting
- *drives LEDs directly
- *latch
- *presettable
- *second register
- *equal and zero outputs
- *DC to 2MHz
- *5V operation

ONE DIGIT LESS THAN YOUR HAND, BUT IT CAN STILL COUNT MORE.



WITH A LITTLE thought you can dream up endless applications for our little counter. The most opvious is using it as an event counter, and in this respect it is without peef. In addition, you can add suitable gating to make frequency counters, timers, tachometers and so on.

We chose Intersil's ICM7217 A because of the options and features it offers the user.

Apart from being a 4-digit counter-latch-decoder driver needing no external components except the displays, it also is an up-down counter and can be preset to any number. In addition, it has a separate register which also can be set to any number and comparators which give outputs when the counter is equal to the register and when it is zero - all in one IC!

The preset system is designed to use a 4 digit BCD thumbwheel switch (closed = '1') but individual switches can be used if required. Input is in BCD, therefore the switches will have the weighted values 8, 4, 2 and 1. If the preset is not needed then the diodes can be left out. If a preset is needed, but always to a fixed number, links can be inserted to replace the "on" switches and the other diodes left out.

For pcbs for this project please contact: Spectrum Electronics, 38 Audubon St. S., Hamilton Ont. L8J 1J7, or B & R Electronics, P. O. Box 6326F, Hamilton, Ont. L9C 6L9. A parts-only kit is available from Northern Bear Electronics, P. O. Box 7260, Saskatoon, Sask. S7K 4J2.

CONSTRUCTION

The unit is built on two small pc boards which are connected together with short links of tinned copper wire. Be careful to orientate the IC correctly as it is expensive!

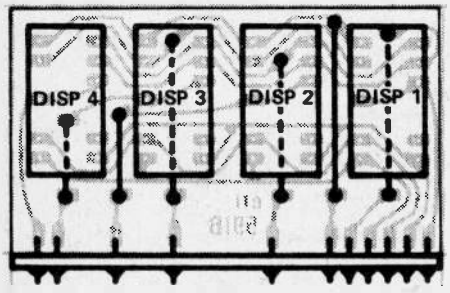


Fig. 1. The positioning of the displays and the links which must be installed before the displays.

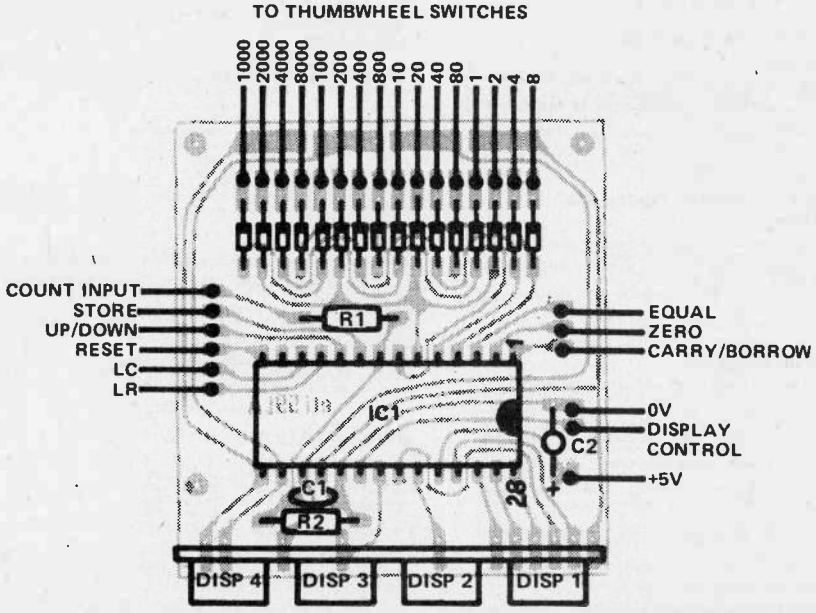


Fig.2. The component overlay for the main board. The common connection from each of the thumbwheel switches goes to the track next to the other connections.

HOW IT WORKS

This section is normally How it Works but as it is only one IC there is not much to be said!

Count Input - Pin 8
The counter is incremented or decremented on the leading edge of this input. A schmitt trigger is provided with a 500 mV hysteresis on a 2V trigger point. For high speed operation, or operation from a digital output, delete R2 and C1 and short out R1. Maximum frequency of operation is about 2 MHz.

Up-Down - Pin 10
If this pin is left open or taken to +5V the counter will be incremented by the count input. If it is taken to 0V the counter will be decremented by the count input.

Reset - Pin 14
If this pin is left open or taken to +5V the counter is free to be incremented or decremented. If it is taken to 0V the counters will be reset to zero and held there until reset is taken high again.

Store - Pin 9
If this input is left open or taken to +5V the latches are "closed" and the information which was in the counters at the time the store input went high will be remembered, decoded and displayed. The counters can be reset, incremented or decremented without affecting the display.

If it is taken to 0V the counter contents will continuously be displayed for as long as this input is at 0V. Any change in the counter contents will be shown on the display.

Load Counter - Pin 12
This is a 3 level input. If it is left open the counter works normally. If it is taken to +5V the counter is loaded with the BCD data which is set on the thumbwheel switches. If the latch is open, this number will also be displayed. If this input is taken to 0V the BCD I/O pins become high impedance. If a 3 level input is to be controlled by other logic outputs they must be tristate devices.

Load Register - Pin 11
This is also a 3 level input. If it is left open the counter works normally. If it is taken to +5V the register is loaded with the BCD data. If taken to 0V the circuit goes to a low power state with the multiplexing oscillator stopped, the display off and the BCD I/O pins in a high impedance state. The operation of the counter is unaffected except that there is no display.

Display Control - Pin 20
This is also a 3 level input. If it is left open, leading edge blanking occurs. If all digits are zero then all are blanked. If it is connected to +5V the display is completely blanked irrespective of the value. If taken to 0V all digits are ON irrespective of value.

SPECIFICATIONS

Number of digits	4
Readout	LED
Maximum frequency	2MHz
Input impedance	100k
Output drive	1 TTL load
Supply voltage	4.5 – 5.5V
Supply current	
low power mode	500μA
all eights	100mA

PARTS LIST

RESISTORS all ¼W, 5%
R1 . . . . . 100k
R2 . . . . . 1M

CAPACITORS
C1. . . . . 33n polyester
C2. . . . . 1μ0 35V tantalum

SEMICONDUCTORS
IC1 . . . . . ICM 7217A
D1–D16 . . 1N914
DISPLAYS. DL704

MISCELLANEOUS
PC boards ETI 591A, ETI 591B

PCB patterns for this project on page 27.

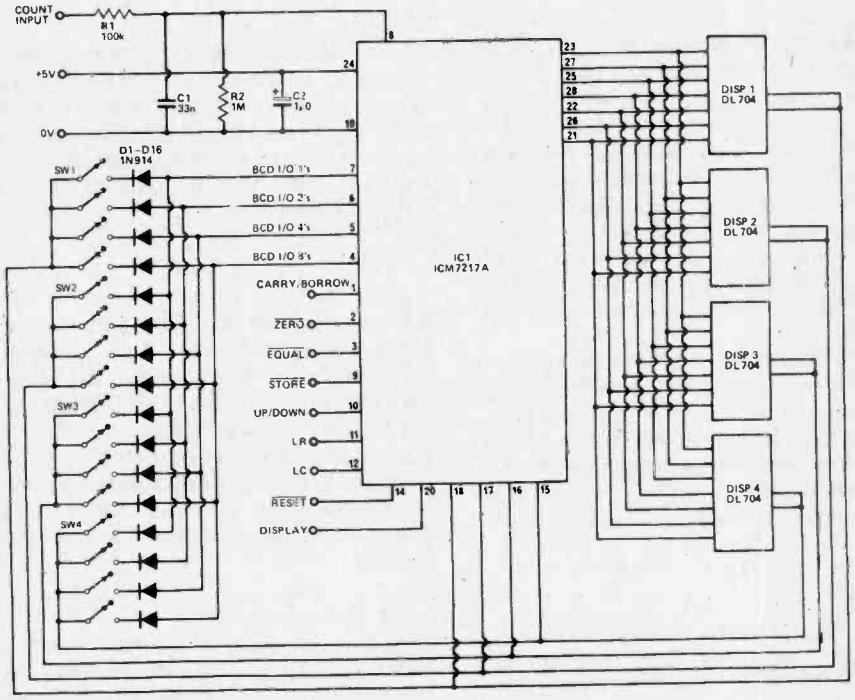


Fig. 3. The circuit diagram for the counter board.

Scan - Pin 13
The internal multiplexing frequency is nominally 10 kHz giving a digit repetition rate of 2.5 kHz. With a 20 pF capacitor from this point to 0V the frequency drops to 5 kHz and with 90 pF it is about 1 kHz.

BCD I/O - Pin 4-7
This is a multiplexed data port, normally an output which can drive 1 TTL load. It becomes an input when either LC or LR is at +5V. Pin 7 is the least significant bit.

Digit Drives - Pins 15-18
These are used both to drive the LEDs and to provide data indicating which digit is being presented at the BCD I/O port. Pin 18 is the least significant digit.

Zero - Pin 2
If the value of the counter is zero this output will be at 0V.

Equal - Pin 3
If the value of the counter is equal to the value of the register this output will be at 0V.

Carry/Borrow - Pin 1
When the counter goes from 9999 to 0000 or from 0000 to 9999 a 500 ns positive pulse occurs on this output. This is connected to the count input of a second unit when an eight digit display is needed.

Far East Listening

Tune in the Far East now that conditions are best. John Garner tells where to look.

THIS MONTH WE WILL give some times and frequencies for shortwave stations broadcasting from Asia. Some of these stations are fairly easy to log but many of them will be quite difficult to catch. West Coast listeners will have a much easier time hearing some of these than those living in the East. Since propagation conditions are now at a peak, it would be a good idea to try and hear some of these now. In a couple of years they will be much more difficult to pick up.

As I mentioned in the European country survey a few months ago, stations often change frequencies, so by the time you read this, some of the stations may have switched bands. All frequencies given are in kilohertz and all times are in GMT.

BANGLADESH

Radio Bangladesh, Research Wing, Directorate General, 23/7 Shamali (B-Block), Dacca 7: or P.O. Box 2284, Dacca. English language broadcasts at 0445-0515 on 15402, 17890, 21685; at 1230-1300 on 15285 and 21670; at 1815-1915 on 11765 and 15285.

BHUTAN

Radio National Youth Association of Bhutan (NYAB), P.O. Box 1, Thimtu. This is a very low powered station and is one of the difficult ones to log. They have English at 0840-0930 on Sunday on 7040 (1st Sunday of the month 0900-0930); and at 1315-1330 on Wednesday on 4690. Good luck with this one.

BRUNEI

Radio Brunei, Department of Broadcasting, Brunei Town. Radio Brunei has an English Service at 0300-0500; 1200-1430; and 2200-0030 on 7215 kHz. This is only a 10 kW station so it also is quite difficult to receive.

BURMA

Burma Broadcasting Service (BBS), Director, General Information and Broadcasting Department, BBS Building, Prome Road, Rangoon. 50 kW stations broadcast in English at 0200-0230 on 7185; 0700-0730 on 9730; and 1430-1600 on 5985.

CAMBODIA

Voice of the United Front of Kampuchea, 28 Av. Sandech Choun Nath, Phnom-Penh. This station broadcasts in Cambodian at 0400-0500; 1100-1500; and 2300-2400 on 4908 and 11950v (Note: v after a station's frequency indicates that the frequency varies). They also broadcast in Vietnamese on the same two frequencies at 1030-1100 and 2230-2300.

CHINA

People's Republic of China — Radio Peking, Peking. You should have no trouble hearing this powerhouse. Their English transmissions to North America are on the air at 0000-0100 and 0100-0200 on 15115, 15520 and 17680; at 0200-0300 on 15115, 17680 and 17855; 0300-0400 and 0400-0500 on 11685, 12055, 15300 and 17680; 1200-1300 on 11685.

CHINA

Republic of, (Taiwan) — Voice of Free China, Broadcasting Corporation of China, P.O. Box 24-38, Taipei. This station is quite well heard here at times. English is broadcast at 2130-2230 on 9510, 9600, 11860, 15225, and 17720; at 2140-2240 on 9685, 11825, and 17890.

INDIA

All India Radio (AIR), P.O. Box 500, New Delhi 11000. This station is usually best heard in the middle of winter but with the improved propagation conditions lately it has been heard in the spring and fall as well. There are also a number of domestic services of All India Radio but they are much more difficult to hear than the external service shown here. English is broadcast at 1000-1100 on 11770, 15190, 15205, 17705, and 17387; 1330-1500 on 11810, and 15335; 1745-1945 on 9715, 11620, 15165, and 15190; 1945-2045 on 9912, 11620, 15165, 9755 and 11875; 2045-2230 on 9912, 11620, 15165, 9535 and 11740; and at 2245-0115 on 7215, 9525, 9535, 11770, 11815, 15110, and 15235. The best frequency I have found is 11620 between 1745 and 2045.

INDONESIA

Voice of Indonesia, P.O. Box 157, Jakarta, Jawa. The Foreign Service transmits in English from Jakarta at 0100-0200 on 11790 and 15200; also from 0800-0900 on the same frequencies as well as 1400-1500. There are also very many regional stations in Indonesia which many DXers like to try to pick up. There are enough stations in Indonesia to fill a whole column — perhaps we will attempt to this at a future date.

JAMMU & KASHMIR

(Indo-Pakistan disputed territory)

A couple of toughies here but perhaps with excellent reception conditions and a lot of luck you might hear something from these two stations. Radio Kashmir, Srinagar, Kashmir, India; or P.O. Box 38, Post Office Tawi, Jammu, India. The Home Service is in Urdu/Kashmiri and English. Try at 0100-0200 and 1230-1700 on 3277; 0215-0430 on 4860; and 0700-0930 on 6110. Jammu also relays All India Radio at 0100-0215 and 1130-1734 on 3345; 0230-0430 on 4950; and 1030-1200 on 5960.

Continued on page 69 . . . .

QRM QRM QRM

Why are so many people failing the Ham test? Bill Johnson, VE3APZ discusses.

A few months ago I complained that not enough people were writing to me to let me know what they think of this column. Reader's letters are always welcome at this desk, because, without them, I don't know whether my words are falling on deaf ears, apathetic ears, or no ears at all, or whether they are viewed as being so far off the mark that they aren't even read. Well, you readers have certainly made your views clear. It seems that, of those who have written, the majority look for QRM first when ETI lands on their doormat. Those who complained were in the minority, and I'll do my best to see that they are satisfied in the future. The majority of criticism received was from the RSO and affiliated societies.

Interestingly enough, most of the commentary received on the air at my station has been highly complimentary. I don't know whether this is due to the fact that people feel they must be polite when addressing an audience or whether it reflects the activity status of those that are with me versus those against. Certainly saying something to somebody in a letter is much easier than direct confrontation, even if separated by the ether.

A refreshingly different approach to the criticism that I have received was taken by one local amateur. He said that I was too kind to those I have previously criticized, that I didn't speak out at the issues hard enough. My intention here is not to irk those whose actions I feel are wrong, but to offer constructive comments to all members of the amateur fraternity.

ABOUT NEW AMATEURS

It is to the general amateur fraternity that I am addressing myself this month. The topic is the extremely high failure rate of new candidates for amateurdom. Recent results from Toronto sittings of the amateur, advanced amateur, and digital amateur examinations have shown that something is very wrong in the way we are training the newcomers to our hobby.

Amateur radio is one of the very few hobbies that can be found in this world of ours that require specific examination of its participants by a government agency before they can become active participants. Other such hobbies include shooting, flying and driving (to most people the latter is a form of survival, not a hobby). Let us take shooting as an example. Here, the consequences of somebody doing it without the required training and testing could be a corpse. It is not nice to be killed by a rifle, especially if the person pointing it didn't really mean to harm you. Flying has its safety requirements also, and there is a larger amount of pure skill required to fly a plane than shoot a gun. Therefore a higher degree of training and examination. In flying, you basically have to convince a flying instructor to certify you as fit to display your capabilities to a government inspector. If you crash and kill the government inspector during your flight test, it won't look good for the flying club. As far as driving goes, it seems that all you have to do to get a driving license is to write English and convince a government inspector that you are no worse than other people already on the road.

So we see that the degree of testing varies directly as the risk to the general public's safety. There is, however, another element involved. As radio amateurs, we have the power to cause transcontinental interference of a gigantic scale. We could make broadcasting impossible, render spy communications unreliable, or cause satellites to go out of control, simply by misadjustment of our transmitters. An amateur sitting at the end of a busy runway in thick fog could cause a jetliner crash of such proportions as to cause the grounding of all such planes pending the finding of a solution to amateur radio (probably closing us all down). The same effect could be had by thoughtless use of portable transmitting equipment while a passenger in a big aircraft. The problem is, amateur radio is everywhere.

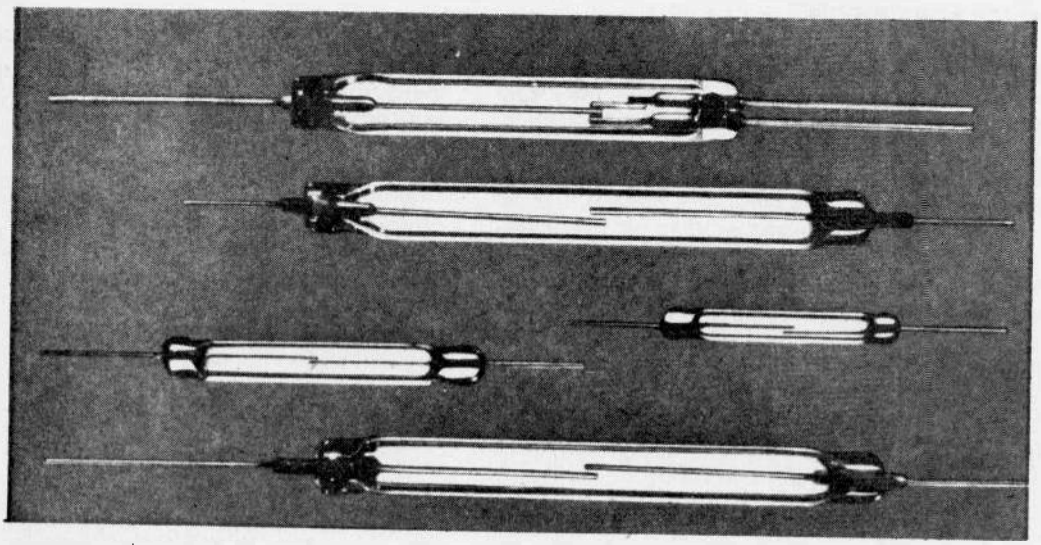
So governments have a right to expect amateurs to be a fairly competent bunch of individuals. And radio clubs should present their students to the DOC with a feeling of pride, knowing that they have done a thorough job of training them. Something is wrong. If the radio inspectors of late had been flying inspectors, they would all be unentwining themselves from sheets of bent aluminum.

Who is to blame? Can it be that the radio inspectors are asking too many technical questions? Or are the radio clubs failing to properly prepare their fledglings? The answer can easily be determined by listening to the newcomers on the air. I still remember the first time I went on the air, very nervous, and made lots of mistakes. But I listened to what everybody did, and followed suit. Soon I was one of the crowd. It seems that today, most newcomers getting on the air for the first time haven't got a clue how to operate an amateur station. Their operating procedure is atrocious, their manners sadly lacking. They really don't know what it is all about. As far as technical ability goes, some of them would find it hard to know which way to turn the knurled ring on their mike connector to disconnect it! It seems that they are all CBers that saw the greener pasture on the amateur bands, and just wanted the quickest route to it. The clubs, innocently enough, saw this tremendous increase in the popularity of amateur radio as some kind of a reawakening, and beefed up the seating accommodation accordingly. The radio club code and theory class is now a huge room filled with people hardly paying attention, and those that are there with a sincere interest can't get the attention they need. From my visits to various amateur radio clubs last fall during code and theory sessions, it seems that, as far as morse code training goes, only lip service is paid to it. All I can say is, thank God we still have the code requirement, because it really separates the ones who just go to the classes from those who persevere at home with their own oscillator. At one class I visited, only 30 characters were sent in an entire two hour class.

Some mention has been made of the accoustics of the hall where the DOC recently held a Toronto examination. The code received by the students was so echo-filled that the poor students could not understand it! Little was said by this commentator about the

Continued on page 63 . . .

Reed Switches III



Final article in this three-part series describes reed switch applications.

Reed switches can be combined with solid-state electronic components to provide extremely reliable and maintenance free circuitry.

REED SWITCHES AS LOGIC ELEMENTS

The reed relay is almost an ideal buffer between solid state devices and higher power output elements. The winding impedance and current levels are well suited for the collector or emitter circuits of standard transistors, and it can also be driven by many IC elements.

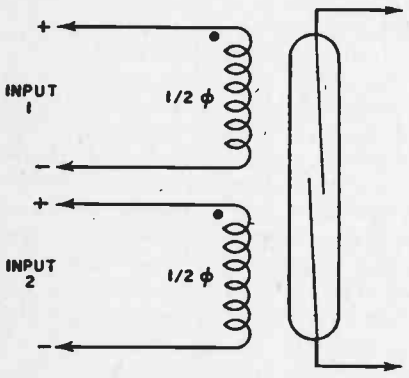


Fig. 19. The reed relay as an AND gate. Each coil can produce ½ a 'flux unit', and an output is obtained only when voltages are applied to inputs.

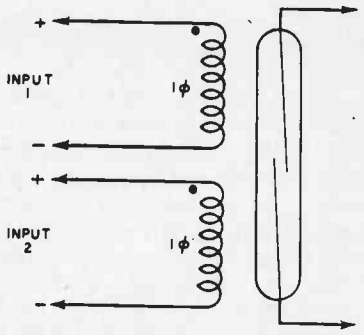


Fig. 20. Reed relay OR gate. Either coil can close reed switch.

With the "pico-reed" switch, a single pole relay is available in a dual-in-line package, making it both physically and electrically compatible with integrated circuit components. And as reed relays become smaller their operating speeds increase, so that a pico-reed relay can be made to follow 1kHz pulses.

Reed switches find use as logic elements for adverse environments. They are capable of a wide variety of logic functions including AND, OR, EXCLUSIVE OR, and NOT operations. The relays can be used to construct flip-flop circuits, and these can be used in binary, binary coded decimal and decimal counters, ring counters, up-down counters and shift registers.

Whilst operating speed is very considerably slower than with solid state logic elements, there is not the same necessity for precise voltage and frequency regulation, nor the susceptibility to voltage transients. And for these reasons reed relay logic circuits are becoming increasingly used in industrial equipment.

An extensive range of reed relay logic elements have been available. Each individual reed switch is surrounded by bias coils, and these in turn share a reed switches are surrounded by bias coils, and these in turn share a common input winding coil. By adjusting the ampere turns level to both input winding and the individual bias windings, a multiplicity of functions can be obtained. A permanent magnet can also be used in this type of logic element to provide memory or latching functions.

Practical Guide to Reed Switches Part III

When designing reed relays as logic elements, the amount of magnetic flux that is required to close the relay is regarded as one flux unit. Thus a two input AND gate consists of one reed switch surrounded by two windings each of which can generate one half a 'flux unit'. (Fig. 19).

It is possible to expand the concept to produce three, four or five input AND gates by providing a separate winding for each input, such that each winding provides $\frac{1}{n}$th of the total required flux.

An OR gate is produced by providing two windings either of which can be energised to the level of one flux unit, (Fig. 20). Thus a voltage in either winding can cause the relay to close. Again, as with the AND gate, a number of windings may be used provided each one can provide one full flux unit.

The basic OR gate can be used as an exclusive OR gate simply by reversing the direction of one winding. In this application if either one or the other winding is energised then the relay will close, but if both are energised then the resultant magnetic fields will cancel out and the relay will remain open.

Inverted operation is provided by using relays that are magnetically biased into normally closed operation.

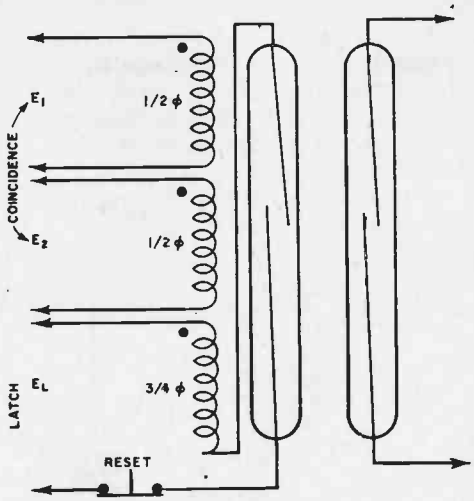


Fig. 22. How a 'memory' may be incorporated in a matrix element.

Cross-bar matrix switching is readily achieved by using a double wound relay, in which each winding provides half a flux unit, at each selection point, i.e., A1, A2, A3, etc., (Fig. 21).

The appropriate relay will close whenever both coils of any given relay are coincidentally energized.

The cross bar switching system may be used with a magnetic or electrical memory if required. Fig. 22 shows how two reed switches can be used, together with a latching winding, to provide an electrical memory in a reed relay cross bar switching system. In this form the matrix will remember the inputs after they have been removed, until the latching power supply is interrupted.

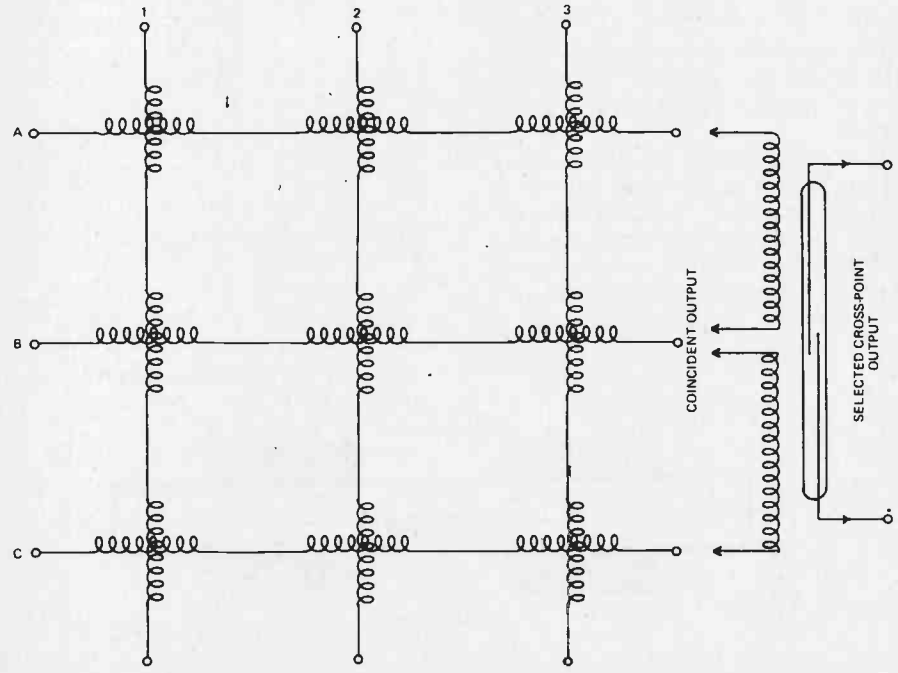


Fig. 21. Cross-bar matrix switching, the appropriate relay will close whenever both coils of any given relay are coincidentally energised.

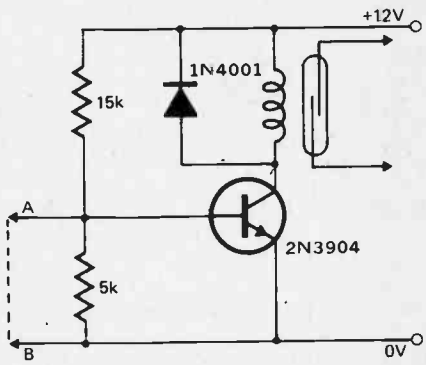


FIG. 23

The low operating current of the actuating coil is well within the collector current rating of practically any transistor (and most linear integrated circuits). Many simple practical circuits can be constructed using a single transistor and a reed switch.

The circuit shown in Fig. 23 is commonly used to open or close a relay when an external circuit is made or broken. It is commonly used in simple burglar alarm installations.

In operation, the transistor is cut off by a short circuit across points 'A' and 'B' (shown as dotted lines). Because the transistor is cut off, the reed relay operating coil in the transistor's collector circuit is not energized, and the relay contacts are open.

If the short circuit is removed from points 'A' and 'B', the transistor is biased on via the 15k resistor, the relay coil is energized and the reed switch is closed. Current consumption of this circuit — whilst the relay is de-energized — is less than one milliamp.

The circuit shown in Fig. 24 has a similar function to that of Fig. 23, except that the relay will close when a

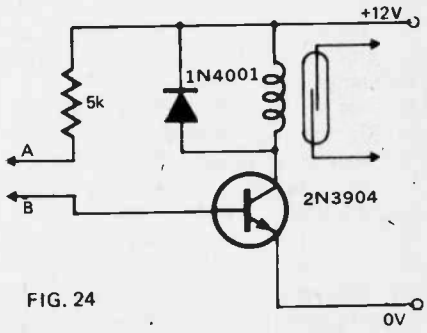


FIG. 24

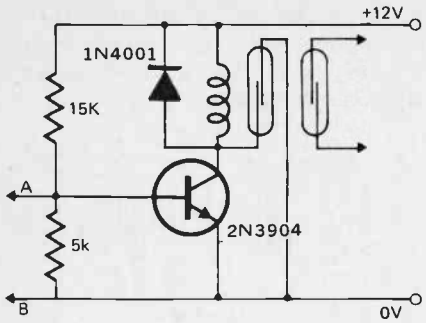


FIG. 25

short is placed across points 'A' and 'B'.

It is often necessary to arrange for the relay to remain closed even though the actuating signal is only momentary. This can be done by using an actuating coil containing two reed switches, and using one of the reed switches to short out the transistor the moment the coil is actuated – Fig. 25 refers.

A very sensitive circuit that can be used as a moisture sensing switch is shown in Fig. 26. This circuit has a gain of well over 2500.

The relay will close whenever the resistance between points 'A' and 'B' falls below a few hundred thousand ohms. The 100k potentiometer is not

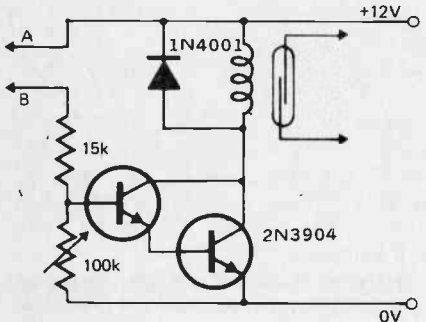


FIG. 26

an essential part of the circuit, but may be included as a 'sensitivity' control. The current consumption of this circuit, when the relay is de-energized, is less than one micro-amp.

Any of these circuits (Figs. 23, 24, 25, 26) may be combined with the Triac actuating circuit shown in Fig. 27 and used to switch very high current loads.

For example the moisture sensing circuit shown in Fig. 26 can be combined with the Triac switching circuit to energize a large motor driven pump. If necessary, three reed switches may be combined in one energizing coil to switch three Triacs in a three phase circuit. Using this principle loads of several hundred Amps may be switched without using a single contactor.

An unusual application for a pair of reed switches is shown in Fig. 28.

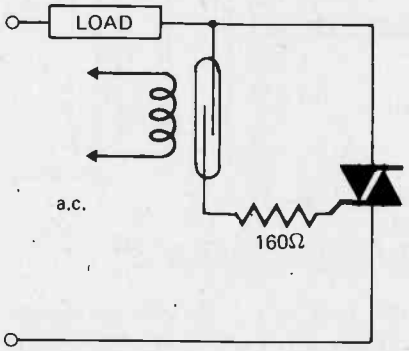


FIG. 27

This circuit can be used to switch a common antenna to either a transmitter or receiver. As the capacity between the contacts on the open reed is less than 0.2 pF, the system may be used at very high frequency.

Time delays of up to 10 seconds can be obtained using the simple circuit shown in Fig. 29. The delay is adjusted by the 50k potentiometer. It is not practicable to obtain longer delays than 10 seconds by increasing the size of the capacitor.

MERCURY WETTED CONTACT REAYS

The mercury wetted contact relay overcomes the problem of contact bounce that is inherent in the dry reed switch.

The construction of the mercury wetted switch is shown in Fig. 30. It consists of a glass encapsulated reed which has one end immersed in a pool of mercury. The other end of the reed is capable of moving between two sets of stationary contacts. The mercury

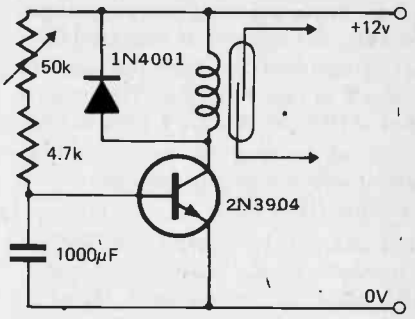


FIG. 29

flows up the reed by capillary action and wets the surface of the fixed and moving contacts. Thus a mercury to mercury contact is maintained whilst the contacts are closed.

The resistance of mercury is very low and contact to contact resistances of mercury wetted switches rarely exceed 50 milliohms. This is somewhat less

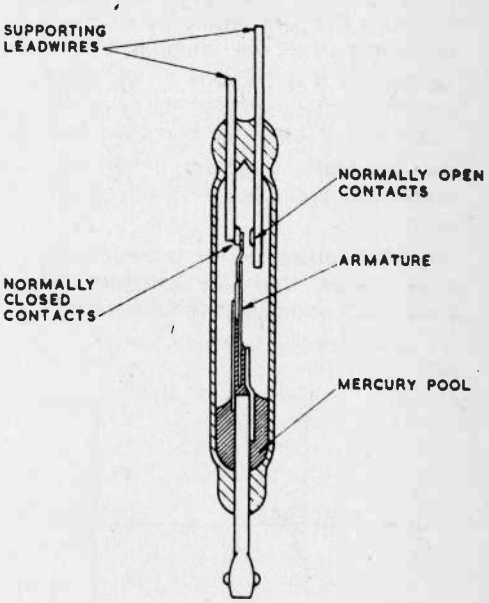


Fig. 30. Construction of a mercury wetted reed switch.

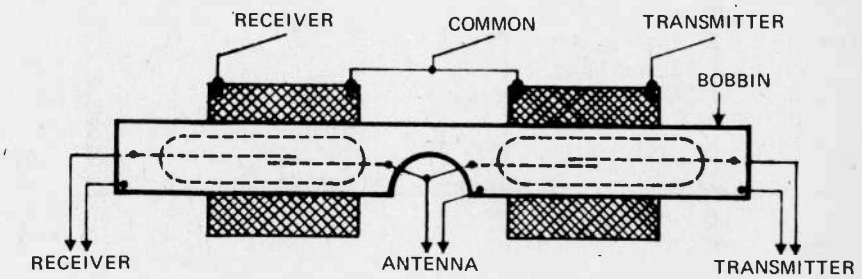


Fig. 28. Here reed relays are used to switch a common antenna to either a receiver or transmitter. As the capacitance between the reeds is less then 0.2pF, the arrangement may be used at very high frequency.

Practical Guide to Reed Switches III

than if the contacts were permanently soldered together!

The mercury wetted switch may be opened and closed in a similar fashion to its dry reed counterpart. Operating times are typically 10 milliseconds at normal coil current, falling to three milliseconds at twice the normal ampere-turn rating. The release time is typically four milliseconds under any conditions.

Apart from their high current carrying capacity, mercury wetted reeds have extremely long life since contact erosion is eliminated.

The disadvantages of mercury wetted reeds are poor resistance to shock and vibration, and the need to mount the reed vertically..

DEVELOPMENTS

A lot of sophistication has gone into reed switches, particularly towards the use of plated material.

Nickel-iron reeds combine optimum magnetic characteristics with the high internal damping that is required to minimize contact bounce; but the material is by no means an ideal conductor, and because of this, high resistivity losses within the switch are appreciable at high current loadings.

Plating with gold or copper substantially reduces many of the undesirable characteristics of the nickel-iron reeds. This plating reduces the effect of skin resistance which can be appreciable at high frequencies, and if the plating is continued right to the ends of the external lead-outs – it virtually eliminates the thermal emfs generated when a copper wire is soldered to a nickel-iron reed in a conventional reed switch.

Another problem is that of reed switch contacts failing to separate, especially after they have been held closed for long periods at high temperatures. This is caused by molecular migration and the resultant metallic bond cannot be broken by the low separating force available.

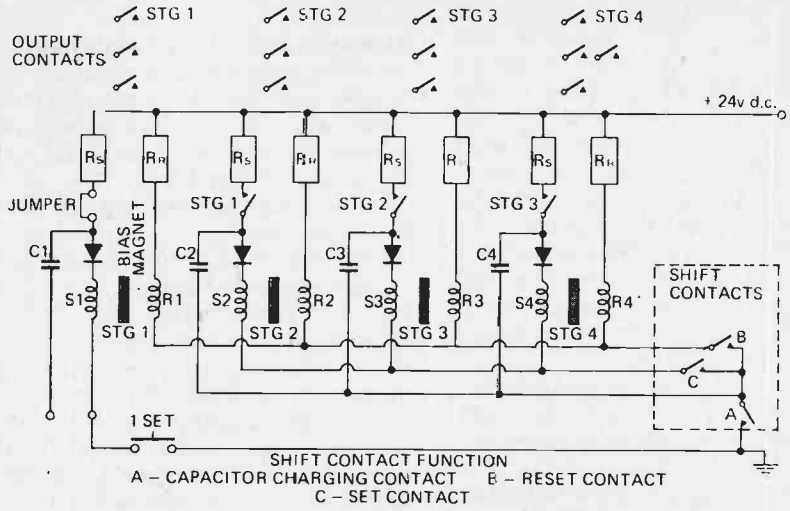


Fig. 31. How to make a four stage shift register if you were stuck on a desert island with only reed relays.

Reed switches are in use in a variety of industries. The auto industry in particular has used reed switches in fuel injection and ignition systems. The security industry appreciate the reliable maintenance-free service that can be uobtained. Machinery manufacturers use reed switches in applications in which adverse environments preclude open switch contacts.

For what other type of switch can remain static for twenty years and then work perfectly the first time that it is actuated? ●

. . . continued from page 59.

problems that daily plague the CW operator — static, QRM, etc, that were well tested at this examination! Any DX operator will tell you the difference between perfect sounding CW and DX CW!

It appears that the clubs have been caught off-guard by the DOC's policy of preparing each examination afresh. Instead of programming the students for the correct answers, they must be taught to think for themselves, because that is what amateur radio is all about. Sometimes there are no textbook answers, just grounds for experimentation. And if all we have for amateurs in twenty years from now are the programmed learners that are now graduating (sic) from amateur classes, who will do the experimenting?

LESSON OF THE MONTH

Notice to all Amateurs: This is YOUR column. If there is a point of technical interest, operating practice, etc. that you think would be of benefit to amateurs in general, please feel free to send it in to ETI at the address at the end of this article.

Q: Why can I sometimes hear another two metre repeater coming through our local machine?

A: In 99.99 per cent of the cases where another conversation appears on the local repeater, the incoming station is not another repeater, but another user's direct transmission to a distant repeater. Unless a repeater owner has deliberately put up a station with its transmitter on another's input frequency, it is not physically possible for a repeater to repeat another repeater. (The above incident could only happen if adjacent repeated councils assigned according to different plans, but this is almost never the case). In all the years I have been an amateur I have only heard of this happening once, and that was between two 450 MHz repeaters that were in different jurisdictions and on opposite sides of a mountain range. There was also no firm plan for the 450 band at the time. At present, 146, 220, and 450 all have well-standardized plans.

What you are actually hearing then, is the distant station's signal which was intended for reception by his local repeater. It arrives at your repeater by some strange propagation phenomenon, and appears as a regular signal. During reception of these signals, you will usually only hear one signal, as the other may be in a different enough location not to benefit from the propagation. On rare occasions, you can hear both sides of the conversation.

QRM LETTERS

Thanks to T.F. of Mississauga who wrote to say hi. Hope you get your ticket soon. How about trying the digital exam first?

Also to the Georgian Bay Amateur Radio Club, whose monthly publication "Feedback" was very interesting. It didn't list their regular meeting nights, but you can get more information if you are interested in amateur radio and live in the Georgian Bay area by writing to: — Georgian Bay Amateur Radio Club, PO Box 592, Owen Sound, Ontario. N4K 5R1.

Please send your comments, letters of encouragement, poison pen letters, etc, to QRM Letters, ETI Canada, Unit 6, 25 Overlea Blvd., Toronto, Ontario M4H 1B1.

73 'till next month.

Solar Power From Satellites

. . . continued from page 50.

ly wide frequency band around this region and in frequencies which are harmonics of 2.45 GHz. Apart from this problem, increased radio frequency noise is likely to be produced by the microwave energy absorbed by the ionosphere which results in a raised electron temperature in this region. There would also be interruptions in the radio frequency communications links with aeroplanes or satellites whilst they cross the microwave beams from the power satellites, but doubtless other frequencies or laser beams could be used to overcome this problem.

It seems likely that the equivalent of 1000 or more Saturn V launches would be needed to place one solar power satellite into geosynchronous orbit. The total mass sent into space in a project of this type would easily exceed an astounding 10^6 tonnes/year!

It has even been advocated (by the *L-5 Society, 1620 N. Park Av., Tucson, Arizona, 85719)* that the materials already in space should be used to make most of a solar power satellite in order to minimise transport costs.

OTHER REQUIREMENTS

A maintenance vehicle would be needed to maintain and re-supply solar power satellites in geosynchronous orbits – possibly a couple of journeys to each satellite per year. If many solar satellites were in use, a maintenance base in geosynchronous orbit would be justified – especially as it could be used to maintain communications satellites and other non-power craft.

During the construction phase of a solar power satellite (either in low earth orbit or in a geosynchronous orbit) living accomodation must be provided in space for the workers. As the cost of human labour in space will be exceedingly high, intensive studies are in progress to promote the automatic assembly of large structures in space.

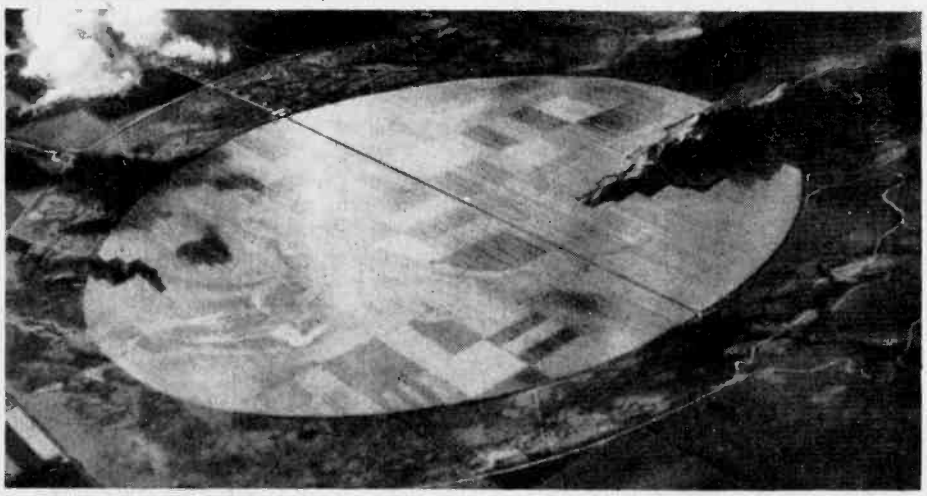
MICROWAVES FROM ICELAND?

The Icelandic Government are currently looking into the possibility of marketing electrical energy generated from their abundant geothermal sources. This energy would be converted into microwaves and distributed to the industrial nations by satellite. A consultant with Rockwell International, Dr. Krafft Ehriche, proposed this idea in 1969, but objections to its development include the high incidence of earthquakes in Iceland and the fact that the country cannot itself pay for the developmental work involved.

In order to develop this system, Iceland would require a primary energy power plant, a transmitter array system, a power relay satellite and distributed receiving plants. A transmitter power of 3,000 MW is proposed with a possible expansion to 7,000 MW. Perhaps it is rather amazing that the use of underground nuclear explosions has been suggested for increasing the amount of hot rock for steam production.

A transmission frequency of 2.4 GHz is planned with phase shifters to maintain beam coherence in the event of thermal stresses or minor earth perturbations. More than 67 million antenna elements would be required extending over a 65 km^2 area. The satellite would be positioned over the equator directly south of Iceland in geosynchronous orbit. It would have a surface area of 1.5 to 4 km^2 consisting of finely polished surfaces which would act as passive reflectors of the microwave energy. The transmitted beam would be only 16.4° above the horizon, but the satellite could relay energy to Western Europe, Africa, nearly all of South America and the Eastern coast of the United States. Rectenna systems of some 25 km^2 area located near industrial centres would receive the power. An end-to-end transmission efficiency of between 51% and 67% has been predicted.

Artists impression of a 'Rectenna' used to receive and convert the microwave energy, from the power satellite, to usable electric power.



CONCLUSIONS

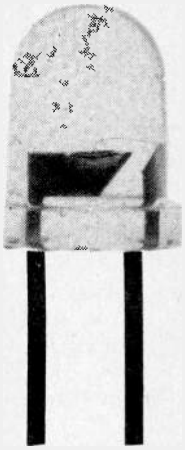
The need for a non-depletable energy source for the next century is undisputed. Many scientists believe that if the necessary funds are made available quickly, energy could be provided by solar power satellites by about the mid-1990's. The estimated cost of solar satellite produced power is 1700 dollars /kW as against 1400 dollars/kW for power from conventional nuclear power generators. However, the effective cost of satellite generated power will decrease with time, since solar satellites require no fuel and relatively little maintenance. In addition, the cost of fossil fuels will doubtless continue to rise as sources are depleted. The trend of rising fuels costs and falling solar satellite power costs is illustrated in the graph, but obviously all cost estimates are subject to wide variations.

The possibility of power transfer over large distances by satellite is well illustrated by the Iceland geothermal power example. However, one of the objections to power satellites is that of security. If a nation relies on solar power satellites for a major part of its energy, how could its factories operate if its power satellites were destroyed in a war? At the present time the main objection to the speeding up of the solar power satellite programme seems to be environmental health and safety considerations together with the problems associated with rocket launching and recovery operations and the enormous cost of the complete project.

The construction, in space, of equipment the size of a city is quite beyond our present experience. It is not, however, so very far beyond the present state of our art as to be a practical impossibility. No new technological developments are required – only an expansion of current technologies. First of all we must break through the psychological barrier which has convinced us that it is virtually impossible to put a satellite the size of a city and the weight of a battleship into orbit.

If *you* had perhaps 1,000,000 million dollars to spend, would you choose to use it on a multi-solar satellite power project, relief for the underdeveloped countries, cancer work or perhaps some other project? Sooner or later decisions of this type must be made about the solar power satellite work. It seems likely that many vital decisions will be made in the USA when the results of the 1980 status report requested by NASA and the US Department of Energy are known.

The author is indebted to Mr. William A. Rice of Boeing Aerospace, Seattle, for the information and photographs which he has kindly provided for this publication.



Teachers' Topics

A philosophical discussion: are CMOS and students compatible.

THIS MONTH we'll deal with a topic brought up by several teachers who have written at various times wanting to know whether it was a good idea to get into using CMOS ICs for laboratory demostrations and experiments by students. They recognize that students are going to give them casual handling, and worry whether the famous static sensitivity of CMOS will result in piles of blown chips.

BLOW THAT MYTH

First, let's get rid of the myth that a CMOS IC will have its inputs damaged by static. It won't! All commonly available chips have input diodes for protection against this problem. (Fig.1) What you can do is blow the input diodes by connecting a low impedance source (can supply lots of current) to a CMOS input, the voltage of which source is outside the power supply range. For example, suppose you have a CMOS circuit running on a 10 V supply, and you connect a12V supply to one of the inputs, you blow one diode. The most frequent mistake in this respect is to turn off the power supply to a CMOS chip before a signal generator has been disconnected (see Fig. 2.) Anyhow, if you knew you had blown the diode(s) at that stage you might as well throw the chip away before it mysteriously dies from static and causes much puzzlement. Since you generally don't know, it would be much more beneficial to take pains not to blow the diodes in the first place, and spend only a little energy worrying about static-concious handling.

CMOS – YES!

On the other side, CMOS has many great benefits over all other logic technologies in teaching purposes. Continuing with the previous depressing but important matter of damage, CMOS is actually extremely forgiving and flexible. Power supplies from 3 to 18V are fine (at very low current too), and CMOS outputs can be shorted to one another and to either supply with generally no ill effects: That's robust!

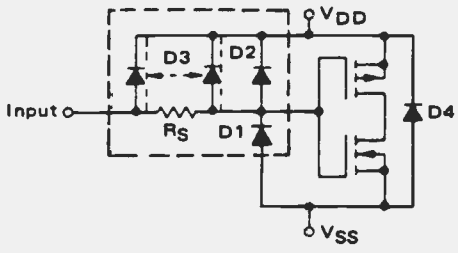


Fig. 1. CMOS input static protection.

PHILOSOPHY: INFORMATION PROCESSING

It is my personal conviction that the most pressing task in teaching electronics is to do so from the angle of "information processing". From lowly crystal radio to complex computer, there's always some information going through the circuit as a voltage, current, or represented as 1s and 0s (in turn voltages or currents), and the function of the circuit is to process the information. One could go so far as to say that "electronics" is used only incidentally, although currently we have no other vehicle for such "processing".

The importance of such an angle in teaching is apparent when looking back over the developments of say the last three or four decades. It may be seen that the commonly used devices have changed from those requiring alot of attention just to make them do one simple thing (tubes: needed biasing, correct plate voltage etc, just to amplify a voltage) to multi-function components nearly foolproof to apply to complex tasks. Engineers constantly are working towards more and more ideal devices. That is to say devices that behave in some straightforward manner, with as few practical limitations as possible. This thinking has brought us the op-amp which has *nearly* infinite input impedance, *nearly* zero output impedance, and is *nearly* oscillation proof. Stay away from "non-nearlies" and anyone can design with op-amps. So the trend is toward ideal components, and towards components which are "sub-systems", and even systems in themselves.

Taking another approach, "information processing" teaching is important for it's ability to take into account the future. Suppose 30 years ago you learned about tubes and tube circuits. Now you are confronted with a two-chip superheterodyne radio to try and figure out. Is it understandable? So much better insight would have been

gained if provided with the "information" or "signal processing" aspect of the superhet principle, with tubes, (being the amplification devices of the day) used as examples.

CMOS—THE PURE

Today's example of this very phenomenon is the task of teaching students about logic. Let them learn the principles of Boolean algebra, gates, flip-flops, etc, uncomplicated by what voltages are what. CMOS used for experimention provides the least added complexity, its logic levels are 0V for '0' and the positive supply for '1', there are no fan-out considerations, and no noise problems. Additionally, CMOS' low power consumption has allowed much higher function densities, ie: more amazing feats per chip, compared, for example, to TTL. Complex counting, arithmetic, keyboard, latch and display functions are available as single chips enabling better visualisation of overall system operation, and fewer interconnections.

CMOS also interfaces nicely with linear ICs (op amps etc), especially the 4016/4066 and related analog switches, which make fascinating experiments. Digital to analog (and A/D) convertors are easily implemented with the aid of a handful of resistors, a counter and an op-amp.

MORE INFORMATION

Three major "standard" lines are available, RCA's 4000 series, Motorola's 14500 series and National's 74C00 (same functions and pins as 7400 TTL) series. All are of course made by other manufacturers, including each other for many parts. Each of the above companies has a very complete CMOS Databook, which include applications notes and "how-to" tips. National's book is also available at Radio Shack.

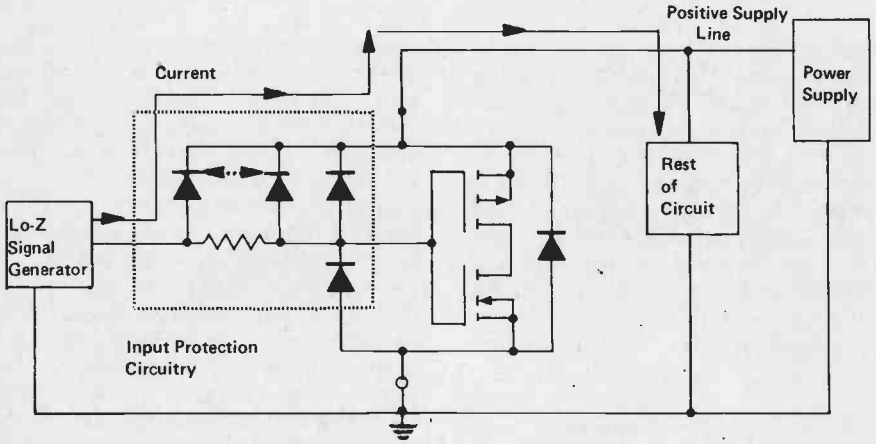
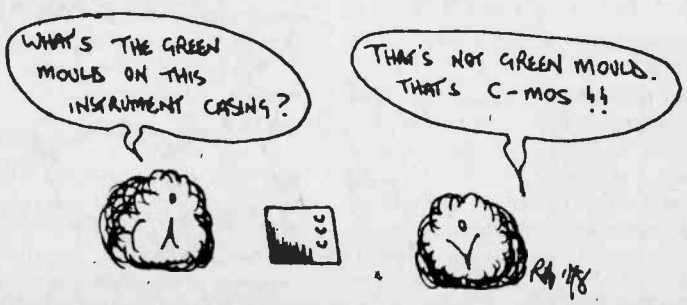


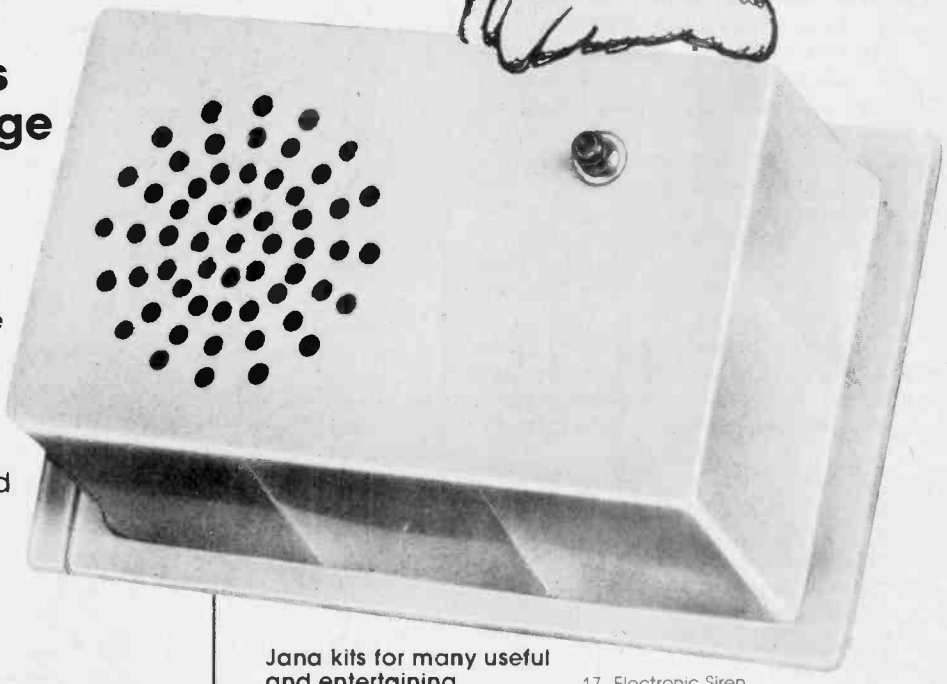
Fig. 2. How to destroy protection diodes by mistake.

Write to Teachers' Topics, Electronics Today Magazine, Unit 6, 25 Overlea Blvd., Toronto, Ontario, M4H 1B1.

All letters we publish will receive a free subscription (or extension) to ETI for the school library or department of your choice.



Jana ROAD RUNNER



You can master complex electronics and mimic the strange bird's erratic sound with this complete Jana kit!

You can duplicate the cry of the Road Runner and create many other unusual audio effects with the Jana Road Runner kit.

All the necessary control parts for the Road Runner sound effects generator are in the Jana kit, including some that are not commonly available. Clear, step-by-step instructions help you become an expert electronics technician.

After building several Jana kits, you may become good enough to design your own devices. But even advance students will have trouble duplicating the functions of the Road Runner and some other Jana projects without obtaining Jana's unique, very ingenious chips, diodes, and other tiny marvels.

Check out Jana's growing list of electronic projects that are entertaining, useful...and always instructive.

Jana kits for many useful and entertaining purposes.

1. Automatic Headlight Reminder
2. Battery Operated Fluorescent Light
3. Bug Shoo
4. Code Oscillator
5. Crystal Radio
7. Curiosity Box II
8. Daily Lighter
9. Decision Maker
10. Fish Caller
11. Hi Power 12V DC Flasher
12. Photo Electric Night Light
13. 6V Power Supply
14. 9V Power Supply
15. 0-20V Power Supply
16. Single Channel Color Organ
17. Electronic Siren
18. Shimmer Strobe Light
19. Tone Generator
20. 5 Transistor 1 Watt Amplifier
21. Tube Continuity Checker
22. Xenon Strobe
23. 3 Channel Color Organ
24. Loudmouth Siren
25. Roulette Wheel
26. Electronic Skeet Game
27. Electronic Dice
28. Super Roulette
29. FM Mini Broadcaster
31. Shoot Out
32. Road Runner
33. Love-O-Meter
34. Soldering Iron Kit
35. Audio Power Watt Meter

Jana Electronic Projects are available through Cam Gard Supply and other distributors across Canada (partial list on facing page).

CAM GARD SUPPLY LTD.

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Saskatoon • Winnipeg • Halifax • Fredericton • Moncton

For institutional inquiry contact

Jana Industrial

1777 Ellice Ave., Winnipeg, Man. R3H 0W5 Phone: (204) 786-3133

Circle No. 17 on Reader Service Card.

Calculator Football

A football simulation program from Les Schweitzer in Surrey, BC.

SINCE I AM an avid football fan, I developed a football game simulation for both the HP9831A (which operates in 12k BASIC), and the Commodore PR100. Needless to say, the Commodore version is somewhat simplified.

In essence this program uses a random number generator to decide yards gained by a team. After sixty 'plays' the game ends and you can determine the score by accessing the proper memories.

Each team gains possession of the ball at the thirty yard line and has five downs to score a touchdown. A touchdown is scored when the ball has been carried to the 110 yard line. The two teams are designated '1' and '-1'.

As stated there are sixty plays, these can be altered in lines 44 and 45 of the program. Similarily the offensive factor can be changed in lines 22, 23 and25.

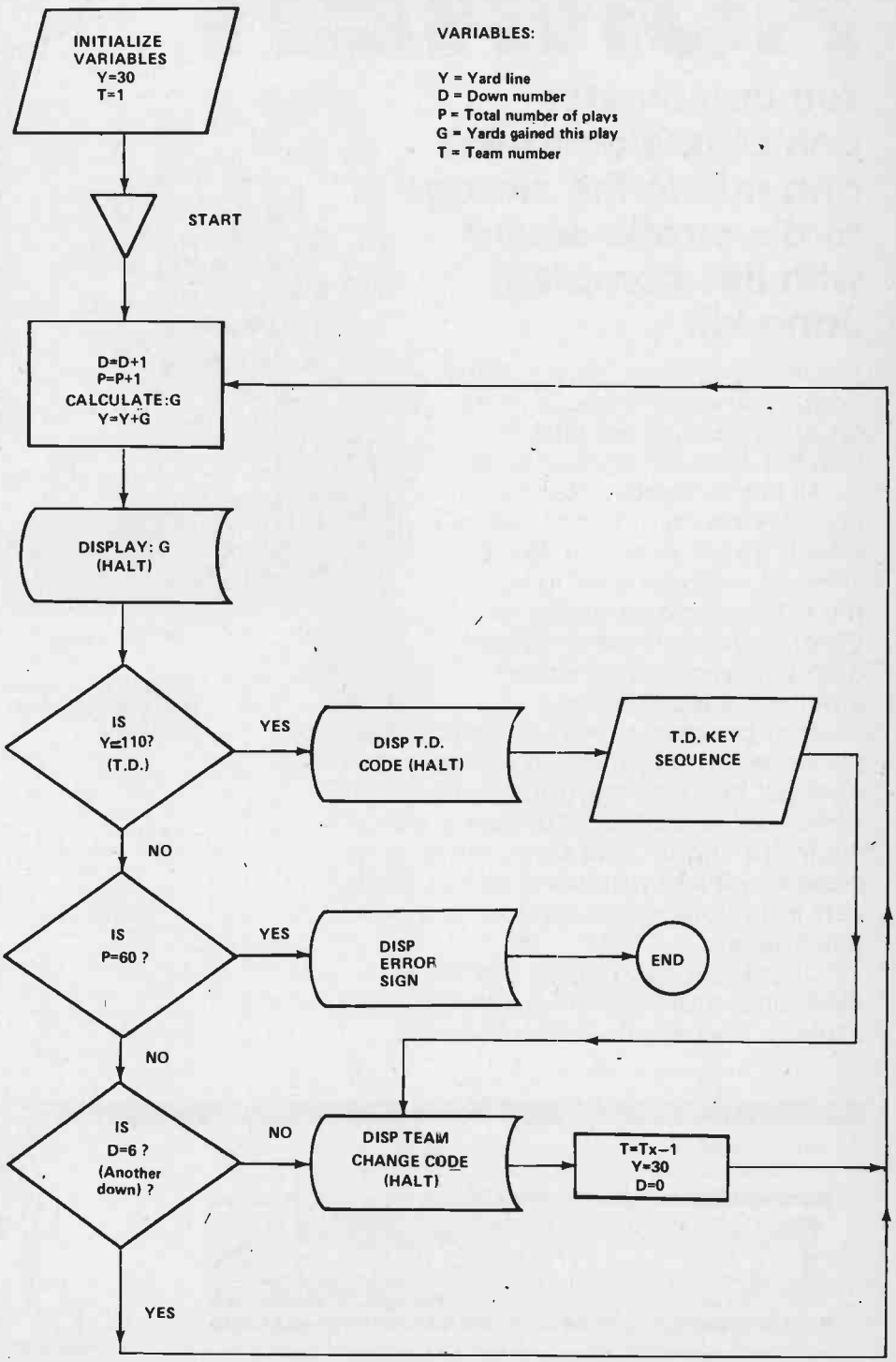
EXECUTION

1.Key;
  i) F FP 0
  ii) F CA
2. Load program;
  (lines 00 to 70)
3. Initialize;
  i) 110 M5
  ii) 7 EE 77 M7
  iii) 9 EE 99 M9
  iv) 1 M8
  v) log (date (ie DDMM.YYYY)) M0
4. Run program;
  i) GO TO 00
  ii) R/S

Display will indicate net yards gained or lost. At this point the following information can be retrieved;
MR 2 yard line of scrimmage
MR 1 down no.
MR 6 total number of plays
MR 8 team in possession (1 or -1)
MR 3 1 team score
MR 4 -1team score

R/S will continue game.
iii) Touchdown code;
Display will show 7 EE 77
For MR 8 = 1 key 7 F M+ 3 R/S
For MR 8 = -1 key 7 F M+ 4 R/S
iv) Team change code; display will show 9 EE 99
Key R/S to continue.
v) End of game code; display will show error sign. Winner determined by recalling scores.

FLOWCHART



Calculator Football

PROGRAM

DISP		KEY
83	0	3
91	1	0
51	2	M
82	3	2
81	4	1
51	5	M
81	6	1
21	7	F
84	8	M+
81	9	1
21	10	F
84	11	M+
73	12	6
52	13	MR
91	14	0
21	15	F
33	16	10↑x
21	17	F
51	18	FRAC
51	19	M
91	20	0
74	21	x
72	22	5
91	23	0
85	24	-
63	25	9
95	26	=
21	27	F
84	28	M+
82	29	2
13	30	R/S
52	31	MR
82	32	2
85	33	-
52	34	MR
72	35	5
95	36	=
15	37	SKIP
14	38	GOTO
73	39	6
81	40	1
52	41	MR
73	42	6
85	43	-
73	44	6
91	45	0
95	46	=
15	47	SKIP
33	48	log
52	49	MR
81	50	1
85	51	-
73	52	6
95	53	=
15	54	SKIP
14	55	GOTO
73	56	6
71	57	4
14	58	GOTO
91	59	0
73	60	6
52	61	MR
61	62	.7
13	63	R/S
52	64	MR
62	65	8
94	66	+/-
51	67	M
62	68	8
52	69	MR
63	70	9

. . . continued from page 58.

Azad Kashmir Radio, Muzaffararabad, Azad Kashmir, via Pakistan. This one broadcasts in Urdu and Kashmiri at 0100-0434, 1415-1834 on 3915; 0600-0934 on 7625; and 1200-1400 on 5950. Lots of luck.

JAPAN

Nippon Hoso Kyokai (NHK), 2-2-1 Jinnan, Shibuya-ku, Tokyo 100. Well, after a couple of very difficult stations we come now to a very easy one to hear and one with some interesting programming in English. Radio Japan broadcasts in English to North America at 0130-0230 on 15270, 17725, 17825, and 21640; and at 2345-0045 on 15270 and 17825. They also have a General Service with English for 15 or 30 minutes every hour on the hour. Some of the evening frequencies for this service are at 2200, 2300 and 0000 on 15195, 15310 and 17755; 0100, 0200, 0300, and 0400 on 17755, 17810 and 17880.

KOREA

(Democratic People's Republic)
Radio Pyongyong, Korean Central Broadcasting Committee, Pyongyang. This North Korean station has English transmissions to North America at 1100-1250 and 2300-0050 on 3890, 9977 and 11532.

KOREA

(Republic Of)
Radio Pyongyang, Korean Central (KBC), P.O. Box 150, Seoul. You can hear English from South Korea at 0730-0800 on 7275, 9640, 11810, 15350 and 15570; 1000-1030 on 9580 and 11725; 1600-1630 on 6480, 9720, 9870 and 11830; 1800-1830 on 11830 and 15255; and 0230-0300 on 7275, 9640 and 15350. Both Korean stations are heard in North America with some degree of regularity.

LAOS

Lao National Radio, Royaume de Laos, B.P. 310, Vientiane. This country's English transmissions are aired at 0100-0130, 0600-0630 and 1330-1400 on 7145. This is a 10 kW station and is heard from time to time here.

MALAYSIA

The best bet here is Radio Malaysia, Head of General Services, Department of Broadcasting, Angkasapuri, P.O. Box 1074, Kula Lumpur 22-10. They have English at 0625-0855 on 6195, 9750 and 15295. It is heard quite often.

MALDIVES

Radio Maldives, Maldive Islands Broadcasting Service, Department of Information, Male. This is another difficult catch with English aired at 1500-1730 on 4740.

MONGOLIA

Radio Ulan Bator, CPO Box 365, Ulan Bator. The Foreign Service to S.E. Asia and the Far East is on at 1220-1250 on 6383, 12010, and 12070; at 1715-1745 on 8890, 17785 and 17860. This one won't be easy.

NEPAL

Radio Nepal, Department of Broadcasting, Kathmandu. With a great deal of luck and good propagation you might hear this one in English at 1435-1520 on 3425 and 5005.

PAKISTAN

Radio Pakistan, World Service, P.O. Box 443, Karachi. This one is a fairly easy catch with English at 0230-0245 on 17830 and 21590; 1100-1115 on 17662 and 21655; 1600-1615 on 17640, 17665, 21485, 21545 and 21755. Included in these programs is a slow speed English news broadcast.

PHILIPPINES

There are three good stations in the Philippines which are heard here quite often. — Far East Broadcasting Co (FEBC), Box 2041, Manila. The FEBC has English at 0000-0300 on 11855 (to 0045), 17810 and 21515; 0800-1000 on 11765; 1245-1530 on 15440; and 2300-2400 on 11890, 15450, 17810 (from 2345), and 21515.

Radio Veritas, P.O. Box AC-373, Quezon City; or P.O. Box 939, Manila. This is a religious broadcaster with English at 0000-0030 on 15135, 15275 and 17710; 0300-0330 on 15260, 15275, 17710; 1130-1200 on 9590, 11805 and 15165; 1300-1330 on 9590, 11955 and 15165.

The Voice of America, Public Information Office, Washington, D.C., 20547, USA also broadcast from the Philippines on a number of frequencies. They usually identify with "You are listening to the Voice of America from the Philippines".

SINGAPORE

Radio Singapore, Department of Broadcasting, Ministry of Culture, GPO 1902, Singapore. English is broadcast from 2230-1630 on 5010, 5052 and 11940.

SRI LANKA

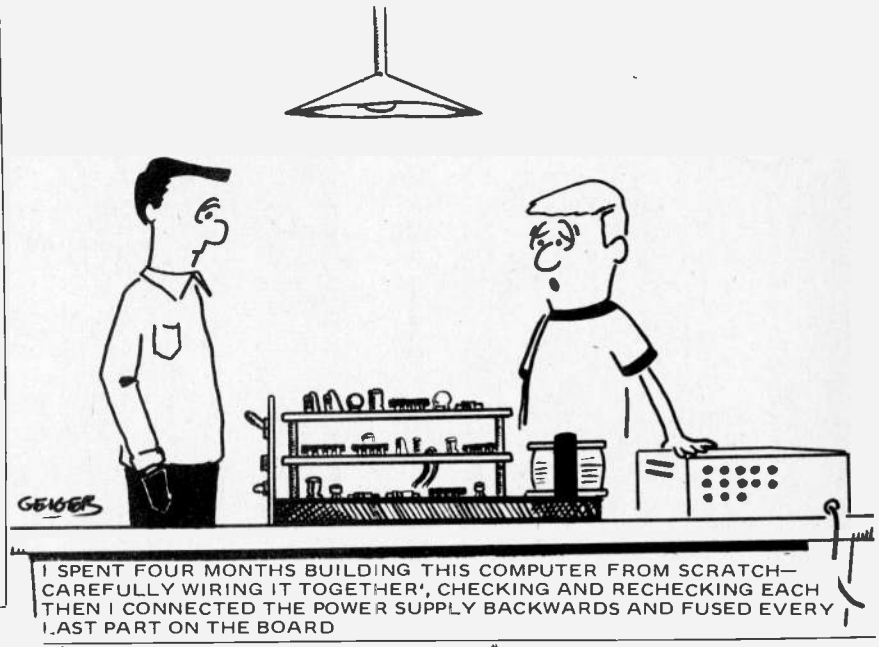
Sri Lanka Broadcasting Corporation (SLBC), Superintendent of Engineering, Transmitters, Sri Lanka Broadcasting Corporation, Overseas Service, P.O. Box 1510, Torrington Square, Colombo. Usually best heard in the winter, the SLBC has English at 0030-0230 on 6005, 9720, and 15425; 0230-0430 on 9720 and 15425; 1030-1130 on 11835, 15120, and 17850; 1230-1500 on 6075, 9720 and 15425; and 1845-1915 on 11800, 15120 and 17850. The Voice of America also broadcasts from Sri Lanka.

THAILAND

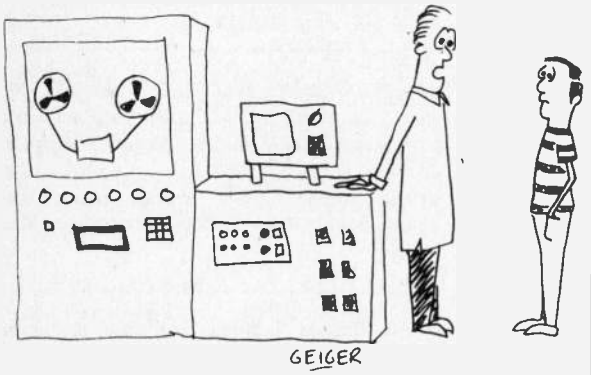
Radio Thailand, Thai National Broadcasting Station, Public Relations Department, Bangkok. Another rare one. Radio Thailand has English

Continued on page 73 . . . . . .

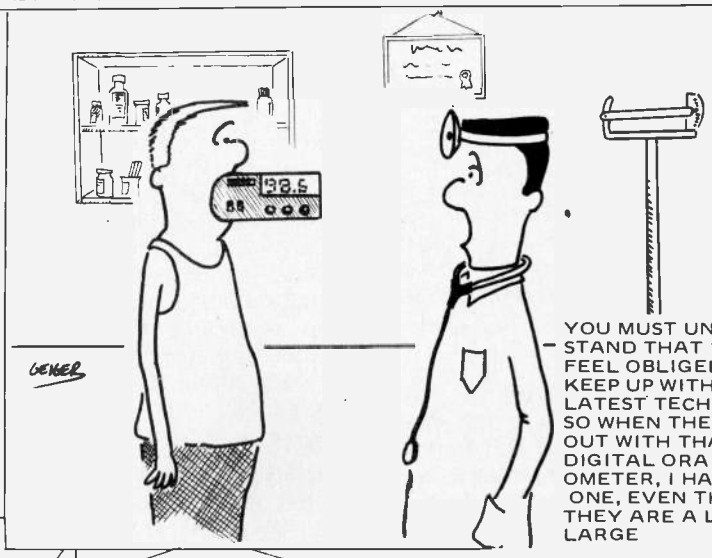
The Fun of Electronics



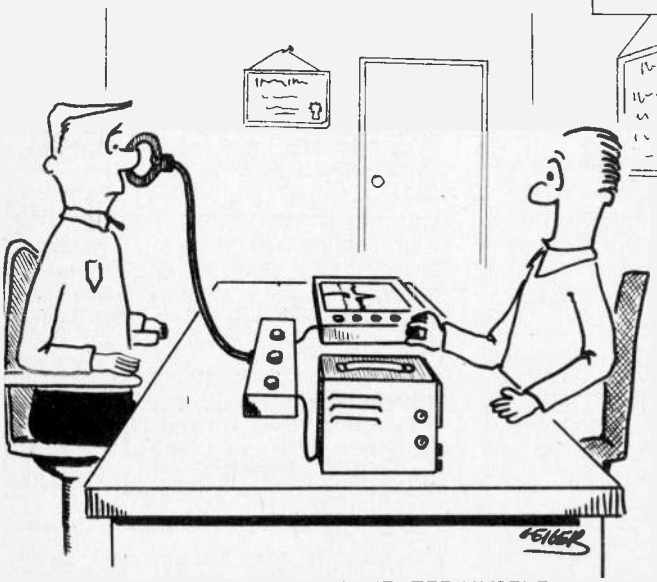
I SPENT FOUR MONTHS BUILDING THIS COMPUTER FROM SCRATCH— CAREFULLY WIRING IT TOGETHER', CHECKING AND RECHECKING EACH THEN I CONNECTED THE POWER SUPPLY BACKWARDS AND FUSED EVERY LAST PART ON THE BOARD



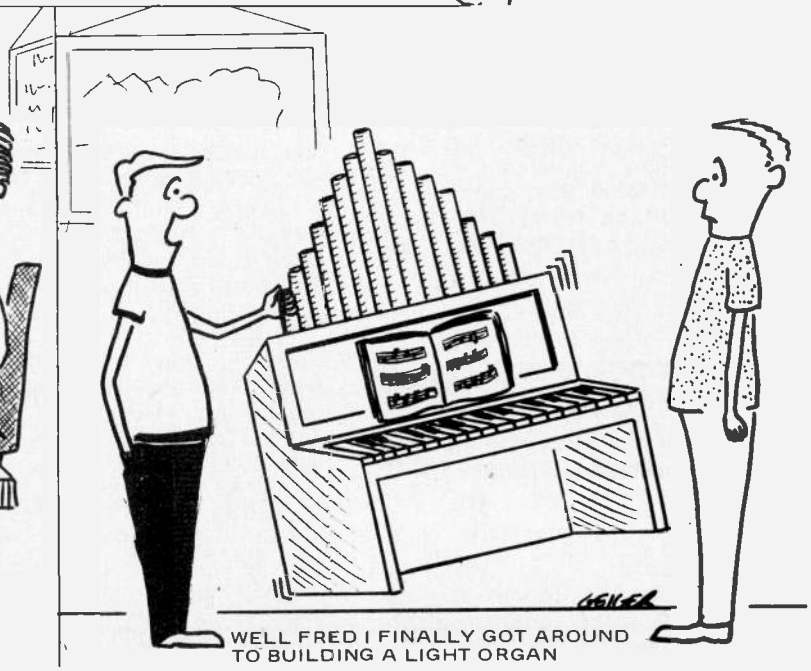
'WHAT DOES IT DO?!! WHAT DO YOU MEAN WHAT DOES IT DO? WHY, OBVIOUSLY IT.....EH.....AH.....COMPUTES!! THAT'S WHAT IT DOES.



YOU MUST UNDER— STAND THAT I FEEL OBLIGED TO KEEP UP WITH THE LATEST TECHNOLOGY SO WHEN THEY CAME OUT WITH THAT DIGITAL ORAL THERM— OMETER, I HAD TO GET ONE, EVEN THOUGH THEY ARE A LITTLE LARGE



IT'S A NEW LIE DETECTOR I I INVENTED MYSELF IT MAKES USE OF THE WELL— KNOWN "PINOCCHIO EFFECT" AND MEASURES MINUTE CHANGES IN THE LENGTH OF YOUR NOSE THAT OCCUR WHEN YOU LIE'



WELL FRED I FINALLY GOT AROUND TO BUILDING A LIGHT ORGAN

You can write for Eti

75 cents per word

ETI's new classified advertising section allows you to reach 30,000 readers nation-wide. For as little as $15 (there's a 20 word minimum) you can promote your business from coast to coast.

WHAT DO YOU DO?

Send us your typewritten or clearly printed words, your permanent address and telephone number, and your money (no cash please). Make your cheque or money order payable to 'ETI Magazine'. We're at Unit 6, 25 Overlea Blvd, Toronto, Ontario, M4H1B1.

There's no charge for including your postal (or zip) code. If you want to test reader reaction you can include 'Dept. ETI' as part of your address (free of charge).

WHAT DO WE DO?

We typeset your words (and put the first word and your company name in bold capital letters).

If we get your message by the 14th of the month, it will appear in ETI 1½ months later. For example, if we receive it by November 14th, you (and thousands more) will see it in the January issue.

NORTHERN BEAR ELECTRONICS, Box 7260, Saskatoon, SK. S7K 4J2. ETI 591: UP/DOWN COUNTER (parts only) $39.95 Add $1.00 P/H. Sask. add tax. FREE Flyer.

SPECTRUM ELECTRONICS; Quality pcbs & Complete kits; Ont. Res. add 7% PST; Box 4166D, Hamilton, Ontario, L8V 4L5; ETI 593 kit: $33.20; 812 kit: $10.55; 490 kit: $21.55; 603 kit: $24.55; ETI Wet: $3.90; 591 A&B: $3.70; 138: $11.35; 556: $11.10; Write for free price list.

AMPLIFIER KITS: 140W Class AB Stereo w/Pre-Amp. and power supply $129.00; 60W Class A Mono $58.00; 70W Class AB Mono $41.00; I.C. Stereo Pre-Amp. W/Mic Mixer $43.00. L.E.D. Power Level Indicator: 10 Steps: $26.00, 18 Steps: $56.00. Free Flyer: **AUDIOVISION**, Box 955, Stn. B, Willowdale, Ont. M2K 2T6.

SPECIAL! 1000 pieces for $10.00. Choke - capacitor - diode - hardware insulator - rectifier - relay - resistor - transistor - speaker - switch - transformer - zener - etc. Money back guarantee. Free flyer & sample on request. **SURPLUS ELECTRO-QUEBEC**, 2264 Montee Gagnon, Blainville, P.Q., J7E 4H5.

J&J ELECTRONICS LTD., P.O. Box 1437 E, Winnipeg, Manitoba R3C 2Z4. Surplus Semiconductor Specialists. Do you get our bargain flyer? Send $1.00 to receive the current literature and specials and to be placed on the mailing list for future publications.

$1.00 Unusual Canadian and American parts and surplus catalogs. Hundreds of bargains. **ETCO**, Dept 087, 183G Hymus, Pointe Claire, Que.

CIRCUIT boards etched drilled plated, delivery from stock. 555-6.50; 072-2.45; 650A-8.10; 650B-3.00; 650C-1.85; 138 -9.25; ETI WET -2.95; 591A-3.10; 591B-1.65; 556-10.85 We carry boards from February 1977, write for full list. Terms:- 50c post & pack; 7% Ont. Tax; Cheque or M.O. with order, no C.O.D. **B&R ELECTRONICS**, Box 6326F, Hamilton, Ontario. L9C 6L9.

EPOXY Caps -100/1.50, Slide Switches- 5/1.00. $10 Min. + .50 P&H. S.A.S.E for list. **ELECTRONICS**, Att. C. Musott, Box 68, Whitecourt, AB. T0E 2L0.

HOBBY Services. Novel construction plans, P.C. boards, complete kits and all associated services. Write for free information. **TEKNIKIT** Associates, 301 Flora St., Carleton Place, Ontario. K7C 3M8.

WSI RADIO – SWL Radios – Ham radios - 18 Sheldon Avenue North, Kitchener, Ontario N2H 3M2. Telephone (519) 579-0536. Write for giant catalog, free of course!! (VE3EHC)

ETI Project File

Updates, news, information, ETI gives you project support

PROJECT FILE is our department dealing with information regarding ETI Projects. Each month we will publish the Project Chart, any Project Notes which arise, general Project Constructor's Information, and some Reader's Letters and Questions relating to projects.

PROJECT NOTES

Since this magazine is largely put together by humans, the occasional error manages to slip by us into print. In addition variations in component characteristics and availability occur, and many readers write to us about their experiences in building our projects. This gives us information which could be helpful to other readers. Such information will be published in Project File under Project Notes. (Prior to May 78 it was to be found at the end of News Digest.)

Should you find that there are notes you wish to read for which you do not have the issue, you may obtain them in one of two ways. You can buy the back issue from us (refer to Project Chart for date of issue and see also Reader Service Information on ordering). Alternatively you may obtain a photocopy of the note free of charge, so long as your request includes a self addressed stamped envelope for us to mail it back to you. Requests without SASE will not be answered.

Write to: Project File
Electronics Today International
Unit 6, 25 Overlea Blvd.,
TORONTO, Ontario
M4H 1B1

PROJECT CHART

This chart is an index to all information available relating to each project we have published in the preceding year. It guides you to where you will find the article itself, and keeps you informed on any notes that come up on a particular project you are interested in. It also gives you an idea of the importance of the notes, in case you do not have the issue refered to on hand.

Component Notations and Units

We normally specify components using an international standard. Many readers will be unfamiliar with this but it's simple, less likely to lead to error and will be widely used sooner or later. ETI has opted for sooner!

Firstly decimal points are dropped and substituted with the multiplier, thus 4.7uF is written 4u7. Capacitors also use the multiplier nano (one nanofarad is 1000pF). Thus 0.1uF is 100n, 5600pF is 5n6. Other examples are 5.6pF = 5p6, 0.5pF = 0p5.

Resistors are treated similarly: 1.8M ohms is 1M8, 56k ohms is 56k, 4.7k ohms is 4k7, 100 ohms is 100R, 5.6 ohms is 5R6.

Kits, PCBs, and Parts

We do not supply parts for our projects, these must be obtained from component suppliers. However, in order to make things easier we co-operate with various companies to enable them to promptly supply kits, printed circuit boards and unusual or hard-to-find parts. Prospective builders should consult the advertisements in ETI for suppliers for current and past projects.

Any company interested in participating in the supply of kits, pcbs or parts should write to us on their letterhead for complete information.

READER'S LETTERS AND QUESTIONS

We obviously cannot troubleshoot the individual reader's projects, by letter or in person, so if you have a query we can only answer it to the extent of clearing up ambiguities, and providing Project Notes where appropriate. If you desire a reply to your letter it must be accompanied by a self addressed stamped envelope.

ETI Project Chart

PROJECT CHART

This chart is an index to all information available relating to each project we have published in the preceding year. It guides you to where you will find the article itself, and keeps you informed on any notes that come up on a particular project you are interested in. It also gives you an idea of the importance of the notes, in case you do not have the issue refered to on hand.

ISSUE DATE	ARTICLE
June 78	Audio Analyser
June 78	Ultrasonic Switch & Neg.
June 78	Phone Bell Extender & Neg.
July 78	Proximity Switch
Aug 78	Neg.
July 78	Real Time Analyser MK II (LED)
Aug 78	Neg.
July 78	Acc. Beat Metronome
Aug 78	Neg.
July 78	Race Track
Aug 78	Neg.
Aug 78	Sound Meter & Neg.
Dec 78	Note: N
Aug 78	Porch Light & Neg.
Aug 78	IB Metal Locater & Neg.
Aug 78	Two Chip Siren & Neg.
Sept 78	Audio Oscillator
Nov 78	Neg.
Sept 78	Shutter Timer
Nov 78	Neg.
Sept 78	Rain Alarm
Oct 78	CCD Phaser
Nov 78	Neg.
Oct 78	UFO Detector
Nov 78	Neg.
Sept 79	C,D
Oct 78	Strobe Idea
Apr 79	Note:N
Nov 78	Cap Meter &Neg.
Nov 78	Stars & Dots
Nov 78	CMOS Preamp & Neg.
Dec 78	Digital Anemometer
Feb 79	Neg
Mar 79	Note:C. D
Dec 78	Tape Noise Elim
Feb 79	Neg
Dec 78	EPROM Programmer
Feb 79	Neg
Jan 79	Log Exp Convert.
Feb 79	Neg
Jan 79	Digital Tach.
Feb 79	Neg
Jan 79	FM Transmitter
Feb 79	Neg
Feb 79	Phasemeter & Neg
Feb 79	SW Radio
Feb 79	Light Chaser & Neg
Mar 79	Tape-Slide Synch
Mar 79	Synth. Sequ.
Mar 79	Dual Dice
Apr 79	Solar Control
Apr 79	Audio Compressor
Apr 79	Wheel of Fortune
May 79	Light Controller
May 79	AM Tuner
May 79	VHF Ant.
June 79	Easy Colour Organ
June 79	LCD Thermometer
June 79	Light Show Seq.
July 79	Note C
June 79	VHF Ant. 2
June 79	Bip Beacon
July 79	STAC Timer
July 79	Two Octave Organ
July 79	Light Activ. Tacho
Aug 79	Audio Power Meter
Aug 79	Two Octave Organ
Aug 79	Light Act Tacho.

Canadian Projects Book

Audio Limiter
5W Stereo
Notes N, D May 79
Overled
Bass Enhancer
Modular Disco
G P Preamp
Bal. Mic. Preamp
Ceramic Cartridge Preamp
Mixer & PSU
VU Meter Circuit
Headphone Amp
50W-100W Amp
Note N May 79
Metal Locator
Heart-Rate Monitor
GSR Monitor
Phaser
Fuzz Box
Touch Organ
Mastermind
Double Dice
Reaction Tester
Sound-Light Flash
Burglar Alarm
Injector-Tracer
Digital Voltmeter

Key to Project Notes

C:- PCB or component layout
D:- Circuit diagram
N:- Parts Numbers, Specs
Neg:- Negative of PCB pattern printed
O:- Other
S:- Parts Supply
T:- Text
U:- Update, Improvement, Mods

. . . continued from page 69.

UFO DETECTOR: OCT 78

Some comfusion arose in transcribing the authors original manuscript. The schematic and parts list are correct, but the pcb overlay is not. R19 and R20 on the overlay should be R3 and R4, respectively.

On the overlay replace R2 and R3 with jumper wires. R1 and R4 on the overlay are R1 and R2 in the schematic (36k).

PCB NEGATIVES

In 1978 we ran a centre section in the magazine covering PCB negatives, every once in a while. Although a few readers appreciated this effort, on the whole we felt that the cost of this special section was better applied to other areas. Hence we will not be continuing this series.

PLEASE NOTE: WE CANNOT ANSWER PROJECT QUERIES BY TELEPHONE.

MARKETPLACE: ETI's space for free advertising from readers will return next month. For details on how to get your ad into ETI please refer to previous issues.

programming at 0415-0515 on 9655, 11905; 1055-1155 on 9655 and 11905; and 2330-0155 on the same frequencies.

VIETNAM SOCIALIST REPUBLIC

Radio Hanoi (Viet Nam Radio-TV Commission), 58 Quan-Su Street, Hanoi. This station is heard quite frequently here. They have English on the Voice of Vietnam at 0900-0930 on 7470, 10040 and 12035; 1530-1625 on 7470, 10040 and 12035; 1800-1855 on 10040 and 15008; and 2030-2125 on 10040 and 15008.

So there you have twenty-four Asian countries to try for. I have not included countries in the Near East or Middle East. These will be treated in a separate column. Also stations in the Asiatic portion of the USSR have not been included. Radio Moscow has a number of transmitter sites throughout Asia. Listening to the Soviet Union will also be reserved for another column. Good luck with your attempts to log the above stations.

There will not be a receiver review this month. However next month we will have survey of all shortwave receivers available. So stay tuned to ETI.

Until next month 73 and good listening.

General Information For Readers

Editorial Queries

Written queries can only be answered when accompanied by a self-addressed, stamped enveloped, and the reply can take up to three weeks. These must relate to recent articles and not involve ETI staff in any research. Mark your letter ETI Query.

Projects, Components, Notation

For information on these subjects please see our Project File section.

Sell ETI

ETI is available for resale by component stores. We can offer a good discount and quite a big bonus, the chances are customers buying the magazine will come back to you to buy their components. Readers having trouble getting their copy of ETI could suggest to their component store manager that he should stock the magazine.

Back Issues and Photocopies

Previous issues of ETI-Canada are available direct from our office for $2.00 each. Please specify issue by the month, not by the features you require. The following back issues are still available for sale.

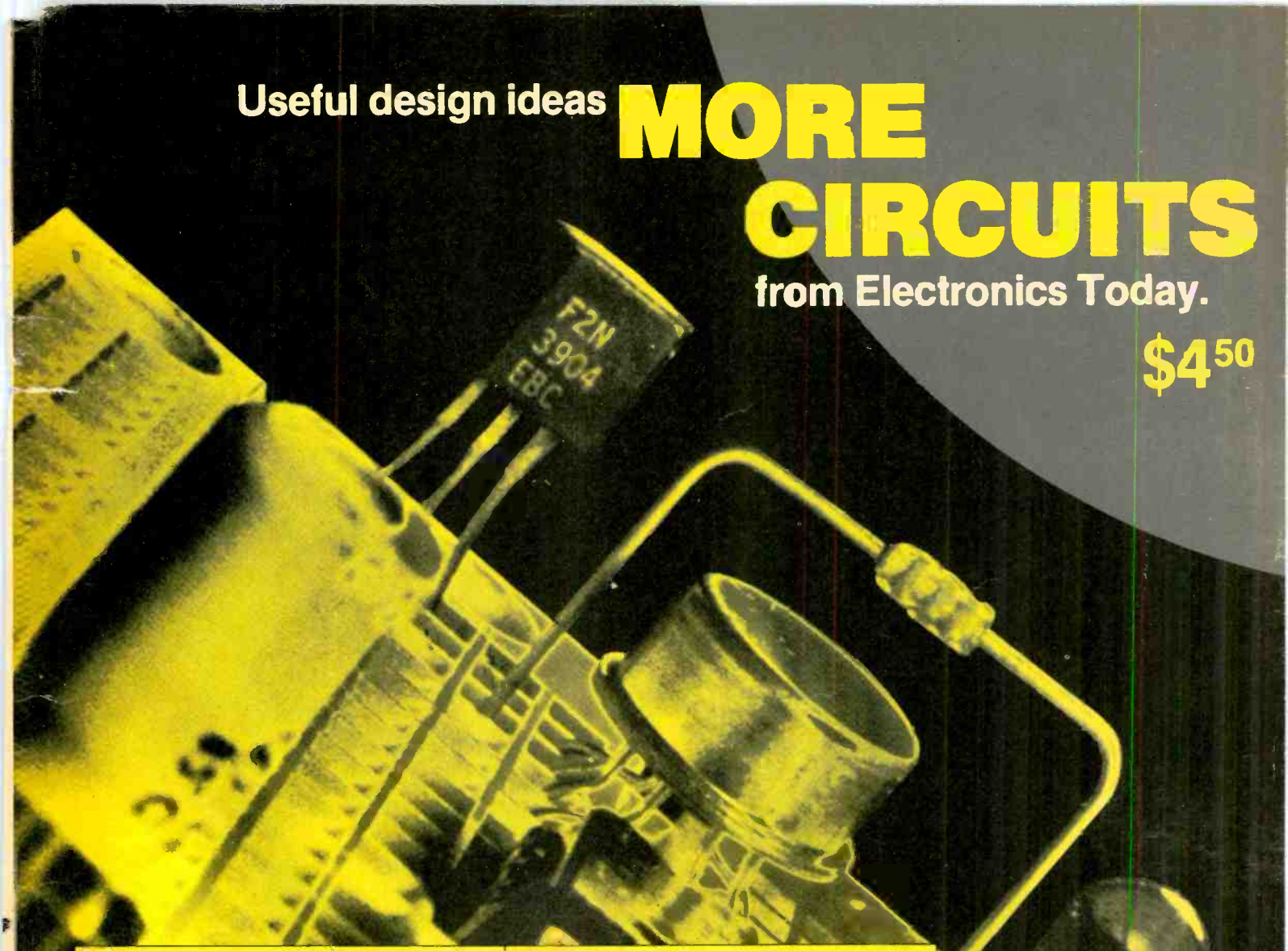
1977	1978	1979
February	~~January~~	January
May	February	February
June	March	March
July	April	April
September	May	May
November	June	June
	July	July
	August	August
	September	
	October	
	November	
	December	

We can supply photocopies of any article published in ETI-Canada, for which the charge is $1.00 per article, regardless of length. Please specify issue and article. (A special consideration applies to errata for projects, see Project File.)

Advertisers' Index

Useful design ideas MORE CIRCUITS from Electronics Today.

$4.50



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