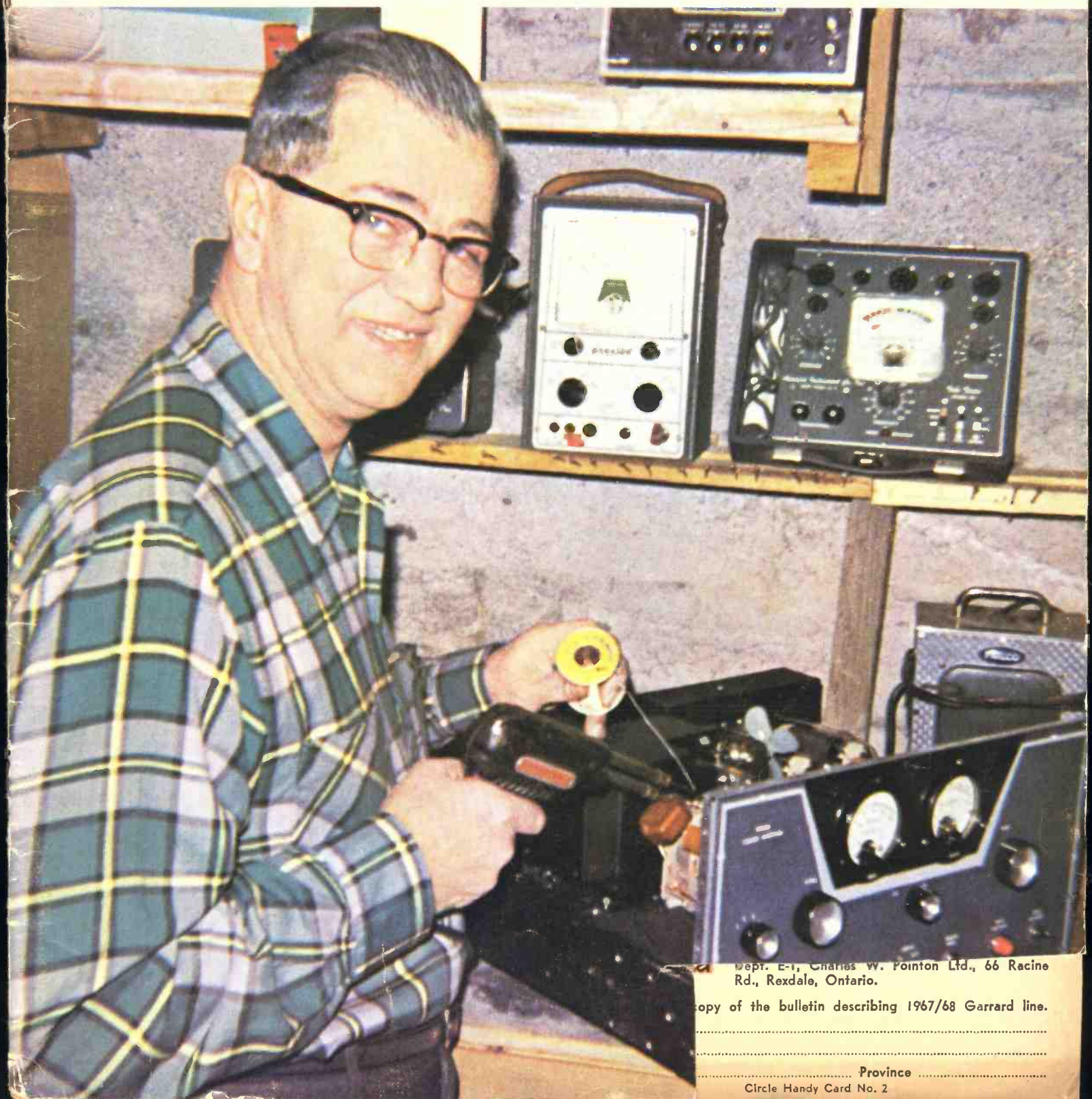
june 1968 — 50¢

electron

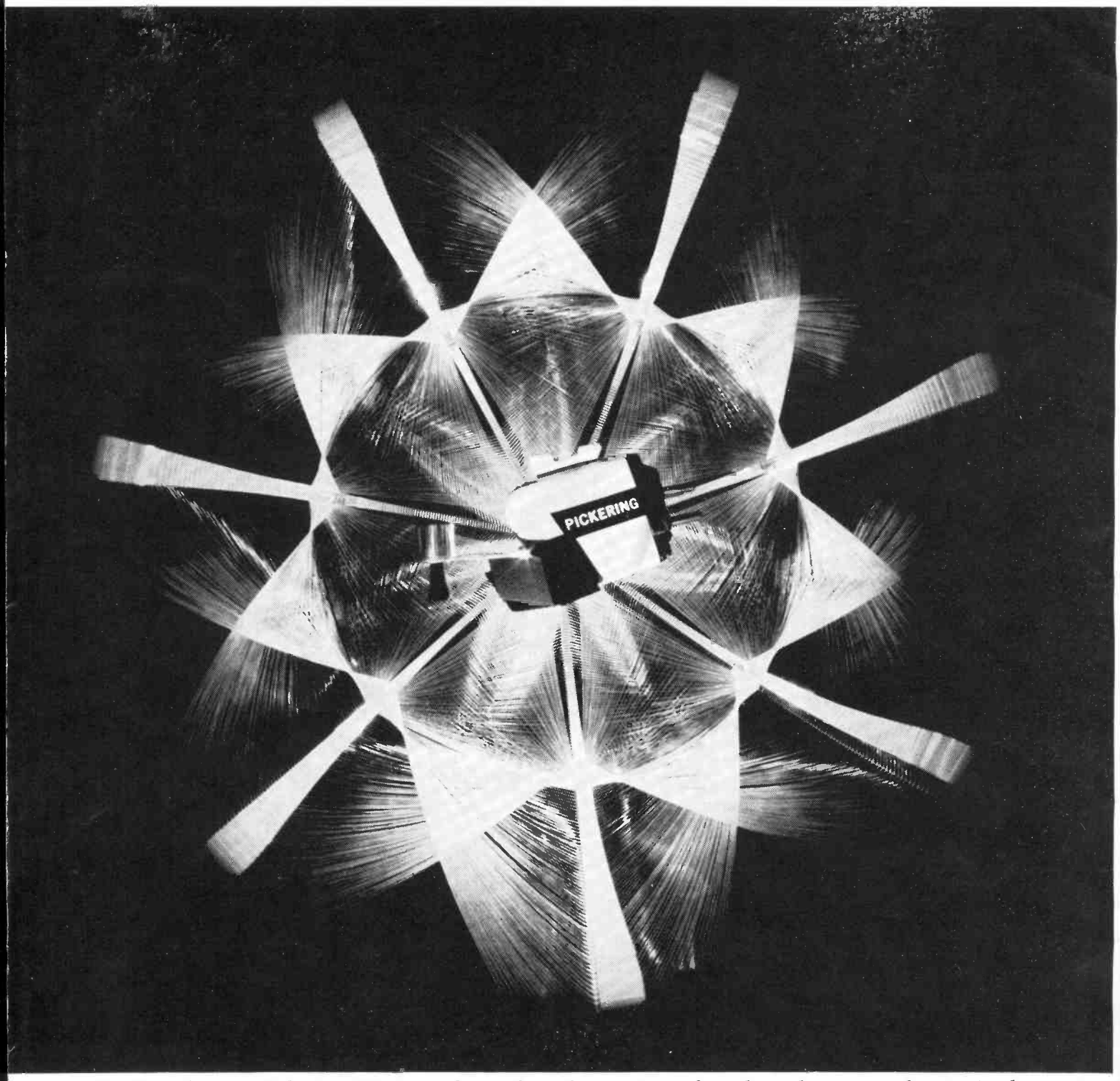
canadian electronics: hi-fi, hobby, servicing

Linear amplifier for amateurs — also:

more on GRS — transistors ? they're simple — a 15" color portable — readers react to controversial cover — TV DXing



The X factor in the new Pickering XV-15.



The X in the new Pickering XV-15 stands for the numerical solution for correct "Engineered Application." We call it the Dynamic Coupling Factor (DCF).[SM]

DCF is an index of maximum stylus performance when a cartridge is related to a particular type of playback equipment. This resultant number is derived from a Dimensional Analysis of all the parameters involved.

For an ordinary record changer, the DCF is 100. [illegible] DCF is 400. [illegible]ems, such as the egg, the end result can be presented quite simply. So can the superior performance of the XV-15 series. Its linear response assures 100% music power at all frequencies.

Lab measurements aside, this means all your favorite records, not just test records, will sound much cleaner and more open than ever before.

All five DCF-rated XV-15 models include the patented V-Guard stylus assembly and the Dustamatic brush.

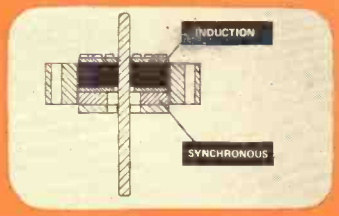
For free literature, write to Pickering & Co., 11 Louvain St. West, Montreal, P.Q.

[illegible]upling Factor and DCF are service marks of Pickering & Co.

Circle Handy Card No. 1

a quick summary of the four new Garrard®

SYNCHRO-LAB™ models and their differences

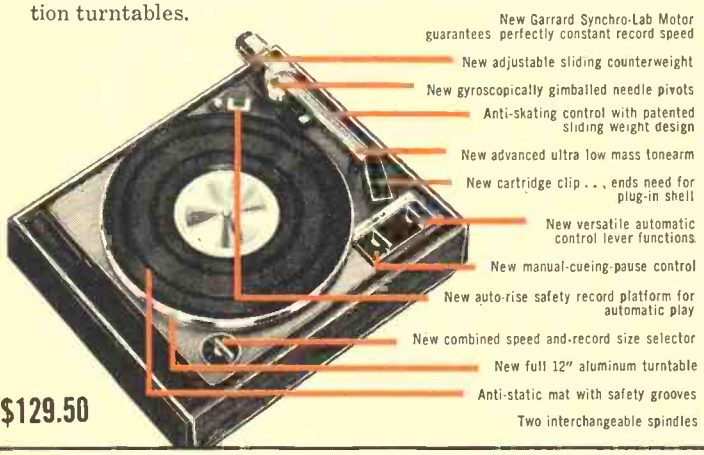


New Garrard Synchro-Lab Motor™ Cannot Vary in Speed . . . Locks In to Cycles of Electric Current!

A revolutionary advancement with the best features of both induction and synchronous types. Induction feature provides high starting torque, instant acceleration; synchronous action insures perfect record speed, regardless of variations in voltage, temperature, stylus pressure or turntable load – plus freedom from rumble. Now, enjoy a quality of performance never achieved before in automatic turntable motors!

SL 95

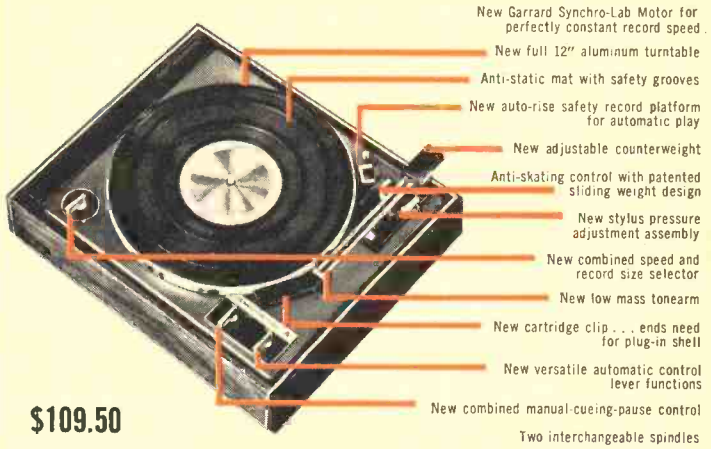
Superb leader of the line. In addition to the Synchro-Lab synchronous motor, it features the most advanced ultra-low mass tone arm system yet produced for an automatic turntable, with gyroscopically gimballed pivots for absolute minimal friction, Afrormosia wood inset for most effective low resonance damping. New safety suspension system for automatic play drops records perfectly every time; platform disappears when not in use. Adjustable counterweight, built-in stylus pressure gauge and patented anti-skating control, simplified cueing-and-pause system, and many other advanced features—the ultimate in automatic transcription turntables.



$129.50

SL 75

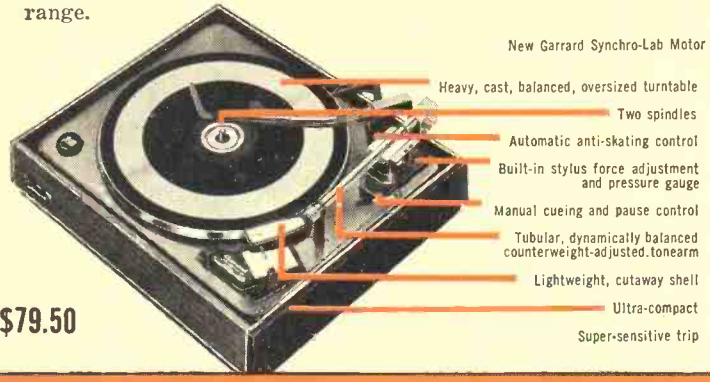
Companion to the SL 95. Has the same Synchro-Lab Motor, turntable, foolproof Auto-Rise two-point suspension system for automatic play, and beautifully simple controls, but a unique tone arm system all its own, with twin braced, extruded aluminum construction for light weight precision tracking. Fully adjustable counterweight, patented anti-skating device and optical type stylus pressure adjustment assembly. The aristocrat of its field.



$109.50

SL 65

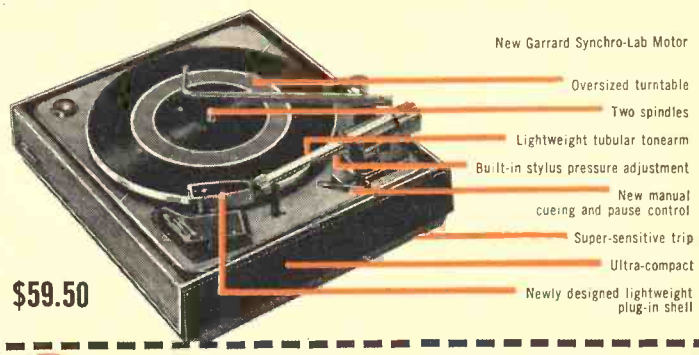
A high performance unit, with Synchro-Lab synchronous motor and completely adjustable, dynamically balanced tone arm, fully capable of the finest sound reproduction; will track flawlessly at as low as 1/2 gram. Has built-in stylus pressure gauge, anti-skating and cueing features, with popular over-arm record changing system. Outstanding value in its price range.



$79.50

SL 55

Lowest priced model in the Synchro-Lab Series™. Synchronous motor makes it incomparable in its field. Has light weight tubular arm, manual cueing and pause lever, low mass shell, and stylus pressure adjustment. The ideal automatic turntable for medium cost music systems.



$59.50

A bulletin fully describing the 1967/68 Garrard line is available by writing to Garrard Division Charles W. Pointon Ltd., 66 Racine Rd., Rexdale, Ontario.

Garrard® Dept. E-1, Charles W. Pointon Ltd., 66 Racine Rd., Rexdale, Ontario.

Please send my copy of the bulletin describing 1967/68 Garrard line.

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Address .....

City ..... Province .....

Circle Handy Card No. 2

electron

canadian electronics: hi-fi, hobby, servicing

VOL. 5 No. 6 — JUNE 1968

FEATURES

DEPARTMENTS

COVER STORY . . . Building equipment is still an important part of amateur radio although probably not as widespread as it once was. Amateur radio clubs often have contests for 'home-brew' gear — the Hamilton Radio Club for example recently awarded the Crawford Radio Trophy to the winner of such an event. VE1KK's linear amplifier, shown on our cover, would stand a pretty good chance in a contest like that, we think. Details are on p. 20.

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Queries. We regret that we are unable to answer queries other than those arising from articles appearing in this magazine nor can we advise on modifications to equipment.
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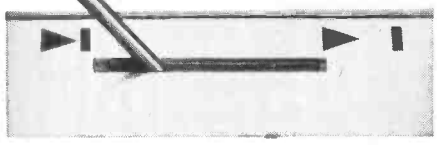
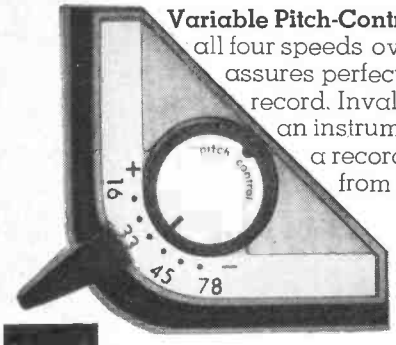
DUAL.
The most advanced thinking in automatic turntables today.

Dual's Tracking-Balance Control (anti-skating) equalizes tracking force on each wall of the stereo groove, eliminating distortion and uneven wear on stylus and record that result from skating. The direct-dial anti-skating control is applied in a continuously variable range and is numerically calibrated to the tracking force dial. You don't undercompensate or overcompensate. This precision is in keeping with the extremely low bearing friction (under 40 milligrams) of Dual tonearms, which can thus skate freely even when tracking as low as ½ gram.

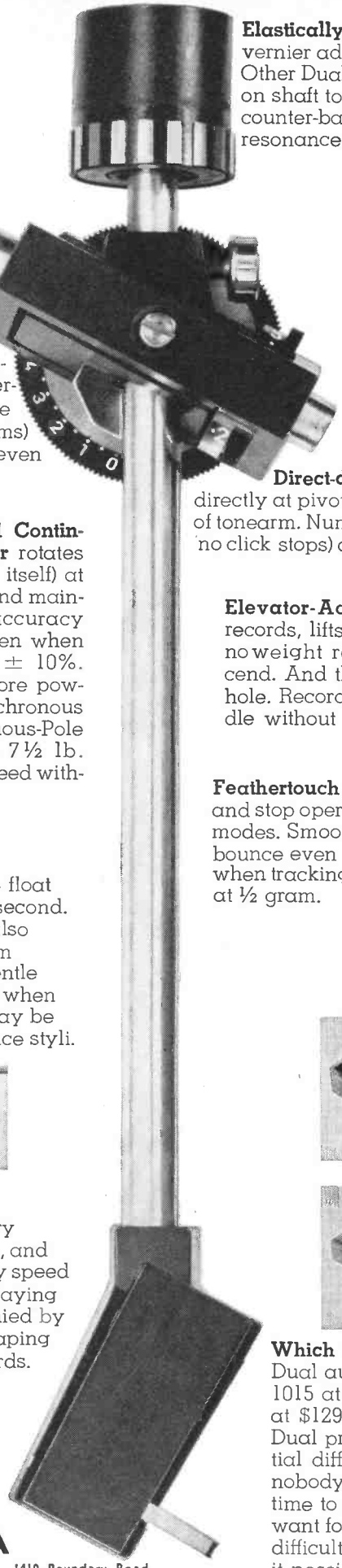
Constant-speed Continuous-Pole motor rotates platter (not just itself) at exact speeds, and maintains speed accuracy within 0.1% even when voltage varies ± 10%. Quieter and more powerful than synchronous types. Continuous-Pole motor brings 7½ lb. platter to full speed within ¼ turn.

Feathertouch cueing system for manual or automatic start releases tonearm to float down at controlled rate of 3/16" per second. Silicon damping and piston action also prevent side-shift of tonearm from anti-skating control. The ultra-gentle cueing system can also be used when starting automatically as may be desired with high compliance styli.





Variable Pitch-Control lets you vary all four speeds over a 6% range, and assures perfect pitch with any speed record. Invaluable when playing an instrument accompanied by a recording or when taping from off-speed records.



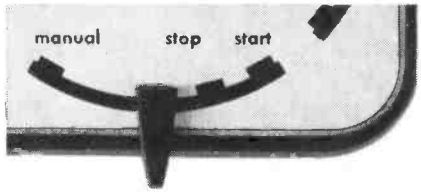
Elastically damped counterbalance with vernier adjustment for precise zero balance. Other Dual refinements include nylon braking on shaft to prevent slippage, and damping between counter-balance and shaft to reduce tonearm resonance to below 8 Hz.

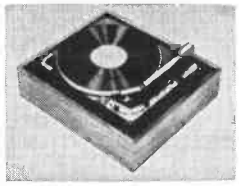
Rotating single play spindle. Integral with platter and rotates with it, a professional feature that eliminates potential record slip or bind.

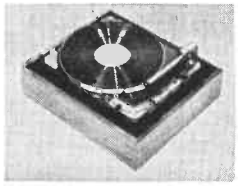
Direct-dial stylus force adjustment, applied directly at pivot to preserve perfect dynamic balance of tonearm. Numerical dial is continuously variable (no click stops) and accurate to within 0.1 gram.

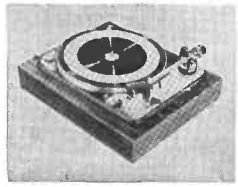
Elevator-Action changer spindle holds up to ten records, lifts entire stack off bottom record so that no weight rests on it before it's released to descend. And there's no pusher action against center hole. Records can be removed from platter or spindle without need to remove spindle itself.

Feathertouch master slide switch controls all start and stop operations in both automatic and manual modes. Smooth sliding action prevents stylus bounce even when tracking at ½ gram.









Which three Duals won't you buy? There are four Dual automatic turntables: the 1010S at $69.50, the 1015 at $89.50, the 1009SK at $109.50 and the 1019 at $129.50. Each is in every respect a Dual, with Dual precision engineering throughout. The essential difference is in features and refinements that nobody else has anyway. It may take you a little time to select the one Dual with the features you'd want for your system. But by making it a little more difficult for you to choose one, we've at least made it possible for everyone to own one. **A DUAL**

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Circle Handy Card No. 6

Most Sylvania Gold Brand tubes will remain unchanged this year.

(when a tube is so good it lasts 10,000 hrs., why change)

At 10,000 hours, most Sylvania Gold Brand tubes are just getting ready to enjoy the best hours of their life. (The hours that count most.) That's why GB long-life tubes can save you maintenance expense, down time costs, and unnecessary worry about the operation of your critical equipment.

GB tube quality standards are so rigid that one in every three of our plant employees works at quality control. And we consider it time well spent. It's our way of making sure you get 10,000 hour tube life, exceptional stability, automated product uniformity, and extreme physical ruggedness in every Gold Brand tube. (In many cases GB tubes are ruggedized to military standards.)

If you need tubes you can count on at any hour, give your Sylvania representative a call—for complete technical data on Gold Brand Commercial and Industrial tubes.

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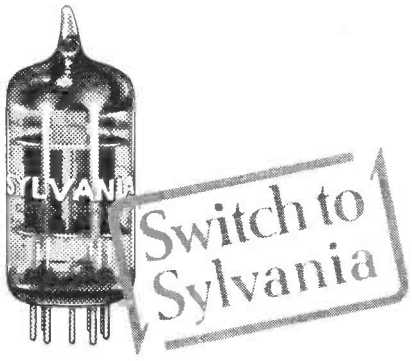

Switch to Sylvania

Circle Handy Card No. 3

We take great pride in introducing the Sansui 5000, a new 180 watt AM/FM Multiplex Stereo Tuner Amplifier that is at once the most powerful and complete solid state receiver ever to carry our name. Incorporating every major advancement in stereo engineering made to date, including FET and IC circuitry, the Sansui 5000 establishes new standards of stereo reproduction throughout a 15 to 30,000Hz bandwidth, while holding distortion to a negligible 0.8% or less. It also offers a wide range of exclusive performance features, including the ability to handle up to four tape recorders and three speaker systems simultaneously, a Stereo Only circuit, double tuning meters and double volume controls. The Sansui 5000 is now available through Sansui dealers worldwide.

Sansui 5000 The Complete Receiver

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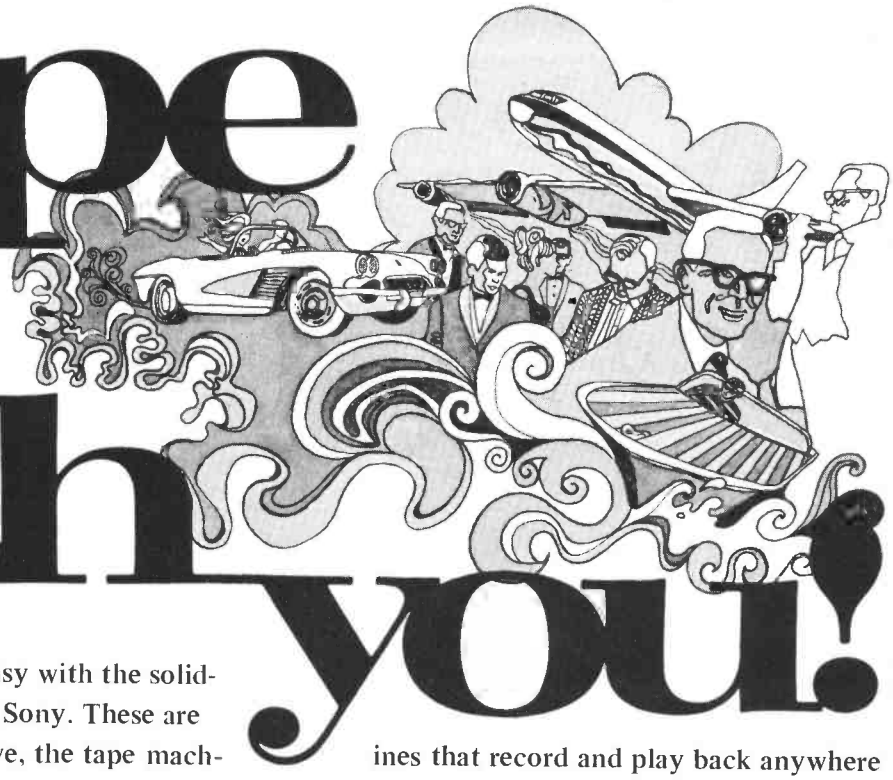
Tape it with you!



Tape it along with you. And tape it easy with the solid-state, fully portable tapecorders from Sony. These are the tapecorders for people on the move, the tape machines that record and play back anywhere anytime. So, just for the record, see your Sony dealer.

He'll show you how you can
tape it with you!

SONY TC-100 CASSETTE: Electron Magazine says . . . "Sony wins again". Truly compact – weighs just three pounds – the TC-100 is a solid state dual track monophonic portable tape recorder. With fine tone response, the TC-100 features piano key control, and two-way operation, flashlight battery or household current. Tape speed is 1 7/8 ips; frequency response 50 - 10,000 cps. Complete with Sony dynamic microphone, carrying case, accessory case and batteries. $139.95

SONY TC-800: Solid state portability in a fully professional Sony tapecorder. The TC-800 features a Sony servo-controlled motor which automatically corrects for speed variations to maintain precise timing, accuracy and exceptionally low wow and flutter. With piano keyboard controls, the TC-800 is dual track, three speed (1 7/8, 3 3/4 and 7 1/2 ips). AC/DC operation. Stop/Start switch on Sony cardioid microphone, Sony-O-Matic automatic recording adjustment. Frequency response: 50 - 18,000 cps at 7 1/2 ips. Complete with Sony microphone and batteries. $259.95

SONY TC-900S: A sound assistant for sales meetings, lectures, conferences, interviews, home or office, the TC-900S has a completely automatic recording level control system, two-way operation, flashlight battery or house current. Weighs only six pounds. Two speeds (1 7/8 and 3 3/4 ips). Playback tone control. Stop/Go switch on microphone for remote control. Complete with carrying case, Sony dynamic microphone and batteries. $95.00

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Circle Handy Card No. 7

TECHNIGUIDE

ZENITH 15" COLOR TV CHASSIS 15Y6C15

by Bill Beresford

Several manufacturers are now marketing small-picture portable color sets. *Techni-Guide* has already looked at the GE Portacolor, the RCA 15" and the Philco 17". This month we examine the Zenith entry in this field, but before doing so we would like to discuss the question of color portables and their position in the market place.

We find ourselves at variance with many manufacturers in their use of the word portable. Many refer to 19" models as portable and even provide a carrying handle as if to back up their claim. Our experience is that some of the sets for which portability is claimed can be lifted and carried with one hand only at the risk of incurring medical expenses. Our criterion of portability is whether the lady of the house can carry the set from room to room reasonably easily.

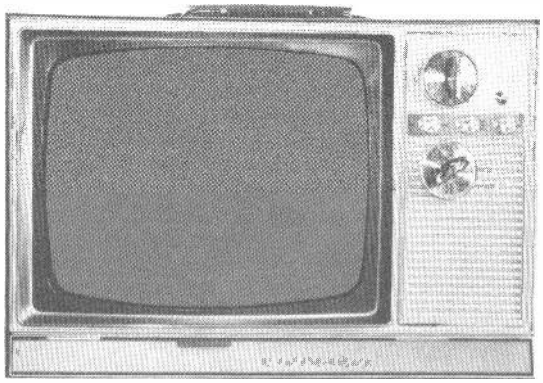
We might also add that weight is not the only problem — just as important is the shape of the set and the presence of control knobs or other protuberances in awkward places. Some sets which can be lifted reasonably easily will almost certainly do their best to extract small portions of your flesh as you carry them about. So, if anybody is listening out there; please make portables light enough for the average healthy housewife to carry, make them as narrow as possible (front to back) and use recessed control knobs. Remember when the car manufacturers said that recessed controls and handles couldn't be done?

Another question that we would ask concerning portables is just what is portability worth to a potential customer in terms of picture size and/or price? The point is this: 19" sets can be trundled about the house on a movable stand and they fall in the price range $500 to $700. Color sets with a smaller picture may or may not be hand-portable and fall in the price range $400 to $600. Most members of both classes fall in the $500 to $600 bracket. Can it be said that the true aim of the manufacturer is portability or is he reacting to the general consumer resistance to current prices for color TV?

Having said all this we hasten to point out that our questions were not stimulated by this month's featured set alone but by our general view of this type of set.

Turning now to the Zenith 15Y6C15, we found its general performance to be quite satisfactory though we believe it to be a little less sensitive than some models we have examined. Given a good transmitted signal, color rendering was quite pleasing while black and white pictures were reproduced with better than average clarity and sharpness. We had some problems with drift in the fine tuning setting after several hours of operation and possibly this is related to the fact that the set runs very hot.

Front panel controls are provided for on/off/volume, tuning, color and hue. Less frequently used operating controls are concealed behind a magnetic latching panel located below the picture tube. These include vertical hold, linearity and size, horizontal hold, contrast, brightness and sound tone. At the rear of the set, some preset adjustments are accessible without removing the cabinet back and these include the normal/setup switch, the color screens, the color drives and focus. The cabinet back is easily removed and replaced and is secured by six slotted hex-head screws. The cabinet, by the way is of all metal construction and a dipole antenna is incorporated in the back.



Maintenance work is facilitated by several features. The tube filaments are paralleled, the chassis is liberally equipped with feed through terminals, and the high voltage rectifier can be removed after simply lifting the top of the cage. Access to the underside of the chassis is provided by an easy-to-remove service plate. The convergence panel has sufficient cable attached to allow it to sit on top of the set while the convergence adjustments are made.

IF AMPLIFIERS

The three stage transistor IF strip is a separate shielded chassis with all external connections of the plug-in type. Agc is applied to the first stage, TRI, and ranges from 4.5 volts for a weak signal to 7.0 volts for a strong signal. The circuit includes traps for adjacent sound (L4) and adjacent video (L1B). The coupling circuit between TR1 and TR2 is specially designed to boost the sound carrier in very weak signals. Detector X1 provides an output of about 4vpp to the video circuits while detector X2 provides about 2vpp to the sync and sound circuits.

VIDEO AMPLIFIERS

The three stage video amplifier chain begins with cathode follower V1A which is actually a split-load stage. The output from its plate is used for noise suppression in sync-agc tube V4. Output from its cathode is used to feed the luminance delay line L18 and thence video driver TR4. Vertical blanking is applied to TR4 emitter via clamping diode X3 so that the picture tube is cut off during the vertical interval. Signal output from TR4 is further amplified through Y amplifier V2A before application to the picture tube cathodes and this stage includes the contrast and brightness control networks. Separate preset adjustments are provided for the amplitude of the signals applied to the blue and green guns.

COLOR AMPLIFIERS

A video output from the detector circuit following 4.5 mHz trap L15 is taken to the grid circuit of first color amplifier V1B. Output from V1B is fed to burst amplifier V14 and to the hue and color control networks. After these adjustments of phase and amplitude the signal is amplified by second color amplifier TR6 and third color amplifier V6B before being applied to the color demodulators. Horizontal blanking is applied to the cathode of V6B from the cathode of blanker tube V6A.

COLOR CONTROL

Burst amplifier V14 is gated at its grid by a horizontal flyback pulse so that only the color burst portion of the signal appears in burst transformer L45. The amplitude of the burst is compared with a local subcarrier output from oscillator V15B in the ACC-killer detector X10 and X11 whose output is applied to the grid circuit of first color amplifier V1B, where it acts as a color agc input. This voltage is also amplified and inverted through the screen grid of V1B and is then applied as a color killer voltage to the grid circuit of third color amplifier V6B.

COLOR DETECTION

The phase of the incoming burst is compared with that of the local subcarrier by X12 and X13 and the resultant output used to control the local oscillator via reactance tube V15A. The oscillator itself, V15B, is crystal controlled by X14, and its output is fed to the ACC-killer detector, AFC detector and to the color demodulators via suitable phasing networks. The B-Y and R-Y demodulators receive amplified color signals at their control grids and local subcarrier at their screen grids. The demodulated outputs are then fed to the difference amplifiers via 3.58mHz traps to minimize remaining traces of the subcarrier. The input to the G-Y amplifier is actually a small portion of the output from the B-Y demodulator and this is combined with the signal appearing across common cathode resistor R68 to obtain the G-Y output. Plate to cathode feedback resistors are used to establish the required frequency response of 0 to 500 kHz. The outputs of the difference amplifiers are then applied to the grids of the picture tube.

SYNC AND AGC

The output from sync and sound detector X2, which has sync negative, is amplified in V3A before application to the sync-agc tube V4. In V3A plate circuit, 4.5mHz transformer L23 provides an output to the sound circuit via C64. The signal input to V4 is combined with the noise suppression input from V1A previously mentioned and separated sync is obtained from V4 plate at pin 8. The agc section is gated by a pulse from the horizontal oscillator V10B and the resultant agc output is coupled directly to the rf amplifier in the tuner. This voltage must be inverted before application to the first IF amplifer, which is an npn transistor, and the inversion is accomplished by transistor amplifier TR5. The range of the agc voltage applied to TR1 is adjusted by agc delay preset R44.

SOUND CHANNEL

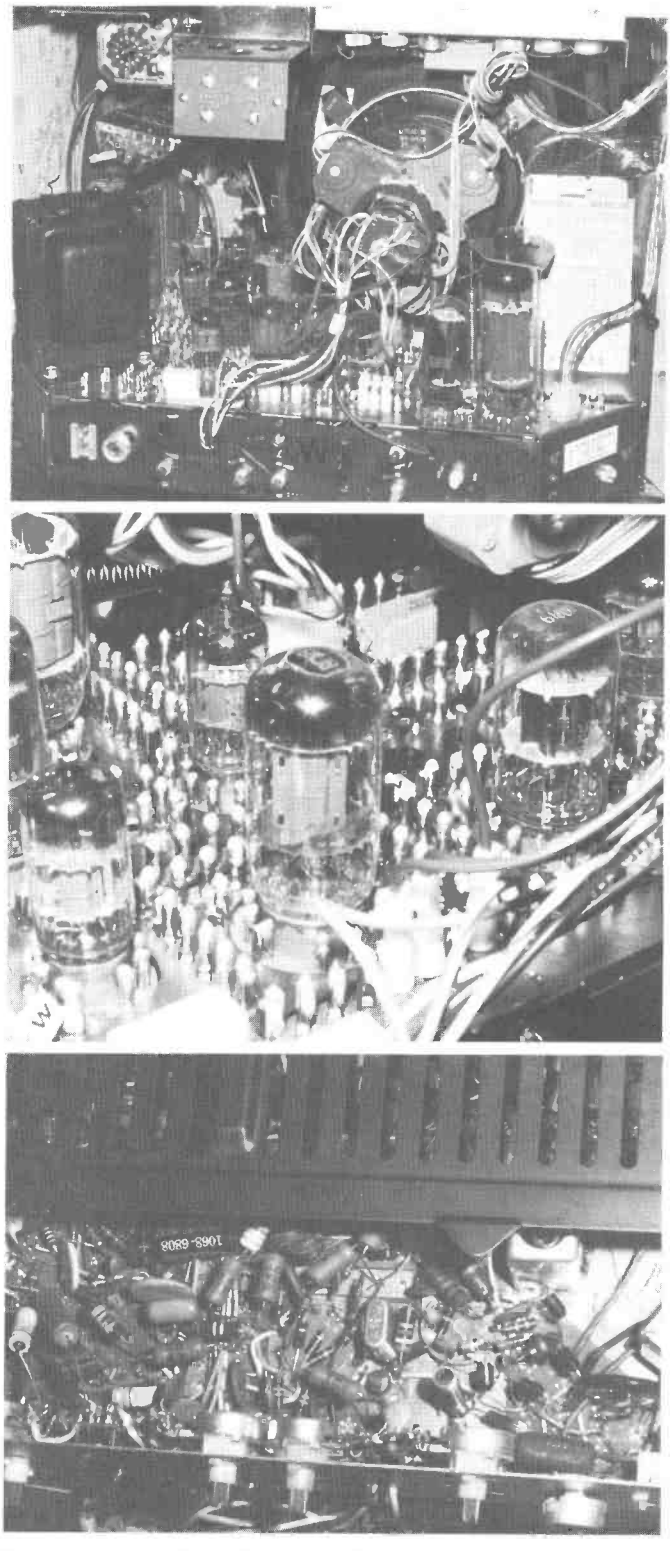
The 4.5mHz output from L23 is amplified and limited by V3B and applied to quadrature detector V9A where buzz is minimized by the adjustment of cathode bias by R78. The audio signal is amplified by V9B to drive the 3.2 ohm speaker. Coupling between V9A and V9B includes the volume and tone controls.

HORIZONTAL DEFLECTION

Separated sync from V4 is coupled to phase detector X8 via vertical sync filter C140. Any phase error results in a control voltage to reactance tube V10A which then corrects the phase of horizontal oscillator V10B. The oscillator cathode delivers outputs to discharge tube V10C and to the agc tube. The spiked sawtooth waveform obtained from the discharge tube feeds driver V11 and thence the flyback transformer T6. This results in the production of 21.5Kv for the picture tube through V12, 780v boost and 720v filtered boost. High voltage regulation is achieved through a pulse feedback circuit via C153. This capacitor charges via X17 during the flyback pulse and discharges through R85 between pulses. Thus R85 produces a voltage whose net average value is proportional to the flyback pulse amplitude and hence to the load on the high voltage supply. The output from R85 is therefore used to control the bias on driver V11 to compensate for load variations.

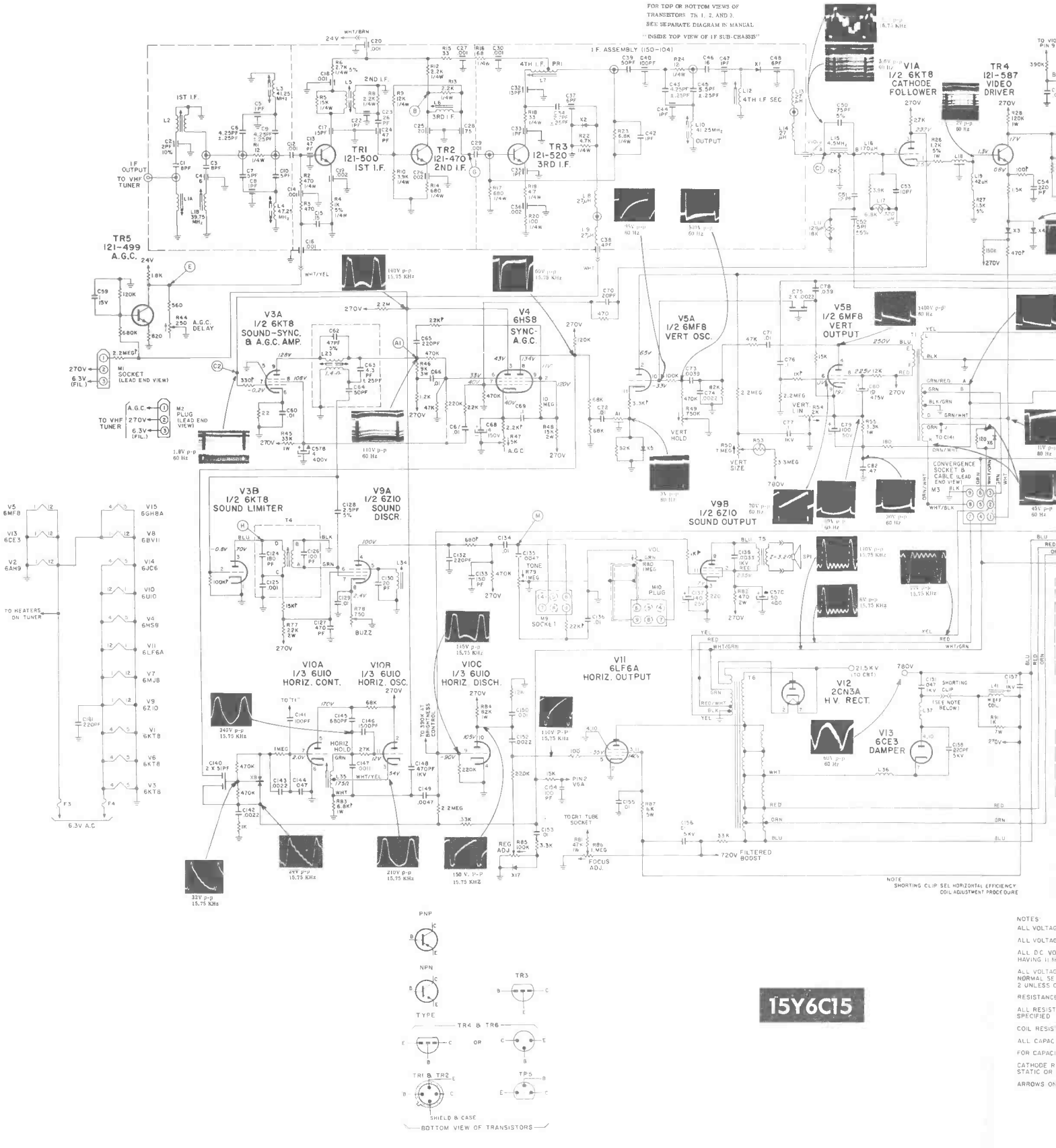
VERTICAL DEFLECTION

Separated sync is filtered by integrator A1 to obtain negative-going vertical sync at V5A cathode. The oscillator is essentially a mutivibrator type formed by V5A and V5B, the latter also serving as the output driver stage. Signals from output transformer T1 are used for sweep, pincushion correction, convergence and blanking. Pincushion correction, is achieved through V2B which combines a 60 Hz sawtooth with a 15kHz parabola to produce the required correction signal in T2.



Top: The layout is fairly conventional. Note the convergence panel at the top right. Middle: Accessibility of tube base connections and other circuit points from the top of the chassis is a Zenith feature. (See Techni-Guide *for August 1966). Bottom: Some parts of the under-chassis are exposed when the back is removed. The rest is reached by removing a base plate.*

electron TECHNI-GUIDE



15Y6C15

NOTES:
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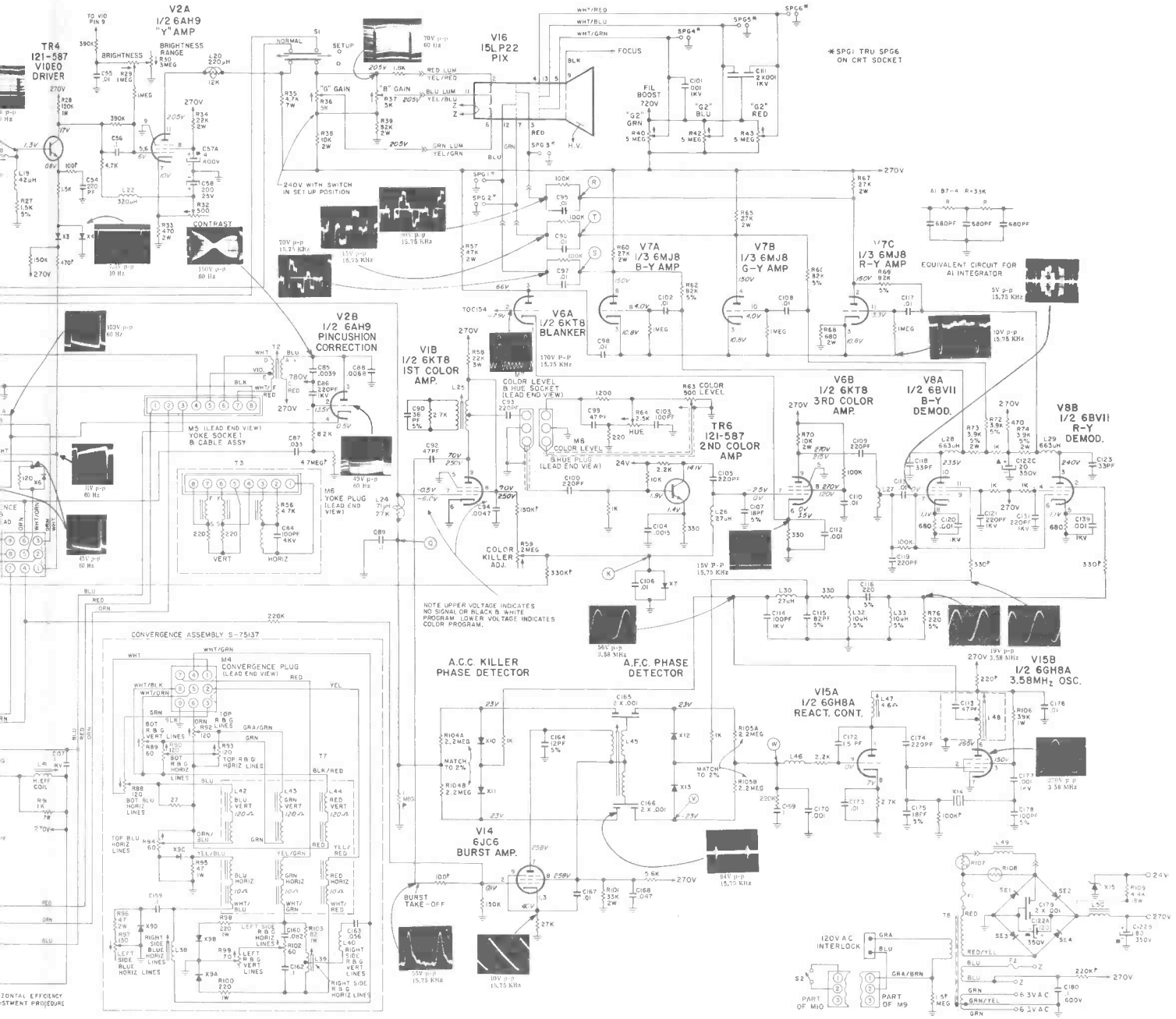
ZENITH 15" COLOR TV CHASSIS 15Y6C15



NOTES

ALL VOLTAGES MEASURED FROM CHASSIS TO POINTS INDICATED.

ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.

ALL D.C. VOLTAGES TO BE MEASURED WITH A VACUUM TUBE VOLTMETER HAVING 11 MEGOHM INPUT RESISTANCE.

ALL VOLTAGE MEASURMENTS TO BE MADE WITH NO SIGNAL PRESENT AND NORMAL SETTING OF CONTROLS AND CHANNEL SELECTOR SET TO CHANNEL 2 UNLESS OTHERWISE SPECIFIED.

RESISTANCE MEASUREMENTS SHOWN WITH COILS DISCONNECTED FROM CIRCUIT.

ALL RESISTORS ARE ±10% TOLERANCE, CARBON, 1/2 WATT UNLESS OTHERWISE SPECIFIED.

COIL RESISTANCE NOT GIVEN UNDER ONE OHM.

ALL CAPACITOR VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

FOR CAPACITOR TOLERANCE SEE LEGEND.

CATHODE RAY TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTRO-STATIC OR 20K OHMS MIN. PER VOLT HIGH VOLTAGE METER.

ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.

◯— INDICATES ALIGNMENT & TEST POINT

PF = PICOFARAD MH$_z$ = MEGAHERTZ = MEGACYCLE

* INDICATES ±20% MAY BE USED

⏚ INDICATES CHASSIS GROUND

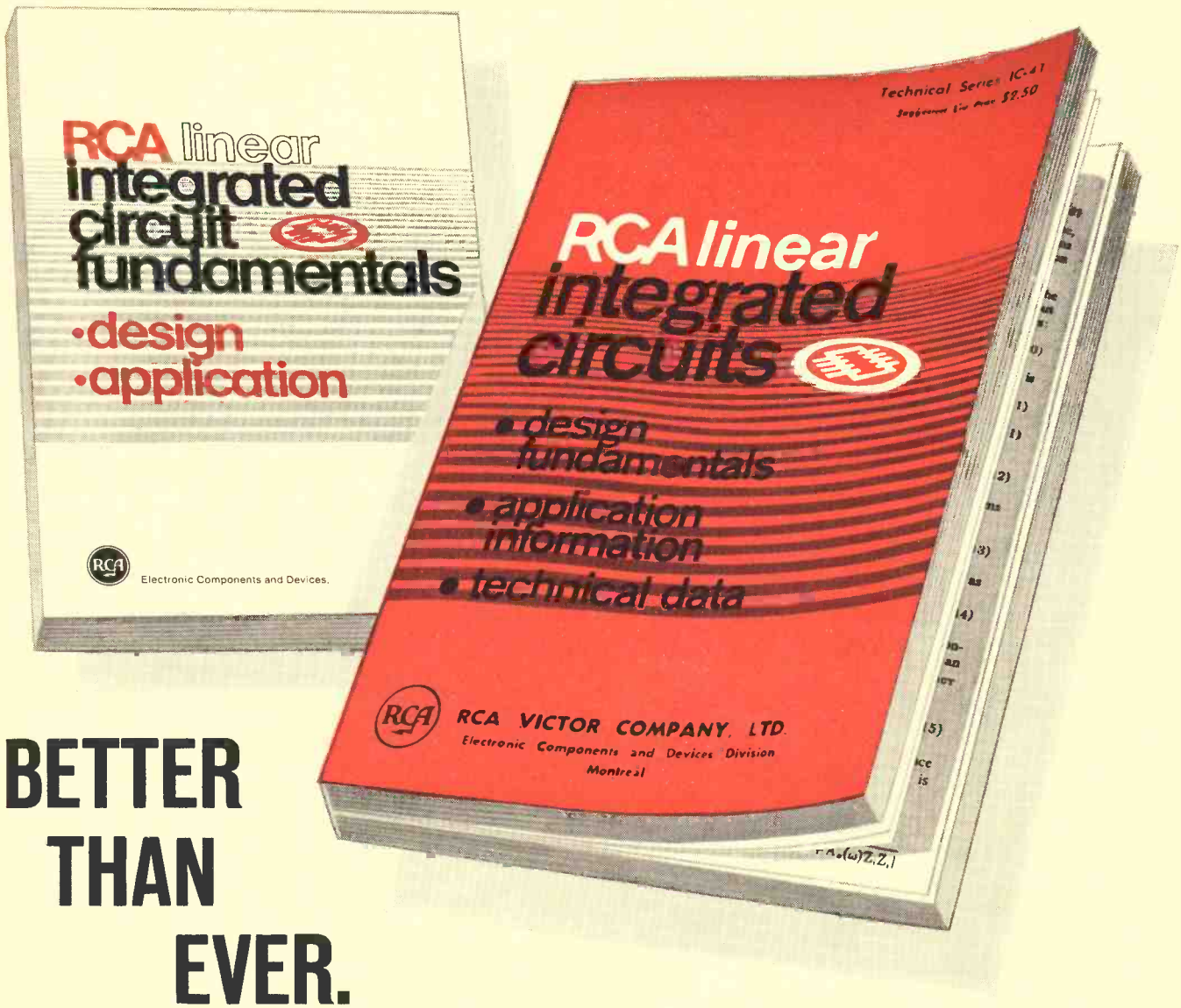
TEST POINTS:

A1	SOUND-SYNC-AGC AMP. OUTPUT	M	SOUND OUTPUT
B	SECOND I.F. COLLECTOR	Q	A.C.C. VOLTAGE
C1	PICTURE DETECTOR OUTPUT	R	R-Y GRID OF CRT
C2	SYNC-SOUND DETECTOR OUTPUT	S	B-Y GRID OF CRT
E	I.F.-A.G.C.	T	G-Y GRID OF CRT
G	3RD I.F. ALIGNMENT	V	COLOR A.F.C. DETECTOR
H	SOUND LIMITER PLATE	W	3.5MH$_z$ COLOR A.F.C. DETECTOR
K	KILLER VOLTAGE (GROUND TO OPEN COLOR CHANNEL)		

PHOTOGRAPHS TAKEN ON A 90% MODULATED STANDARD COLOR BAR SIGNAL WITH THE COLORS, READING FROM LEFT TO RIGHT, OF BLUE, MAGENTA, RED, YELLOW, WHITE, CYAN, GREEN, BLACK & WHITE, THE HUE SETTING WAS ADJUSTED FOR PROPER COLOR. THE WAVE SHAPES AT THE RED, GREEN AND BLUE GRIDS OF THE PICTURE TUBE DEPEND UPON THE HUE SETTING.

○— INDICATES VOLTAGE SOURCE

⊕ INDICATES CERAMIC TIE POINT (ZENITH PART NO. 22-4731)



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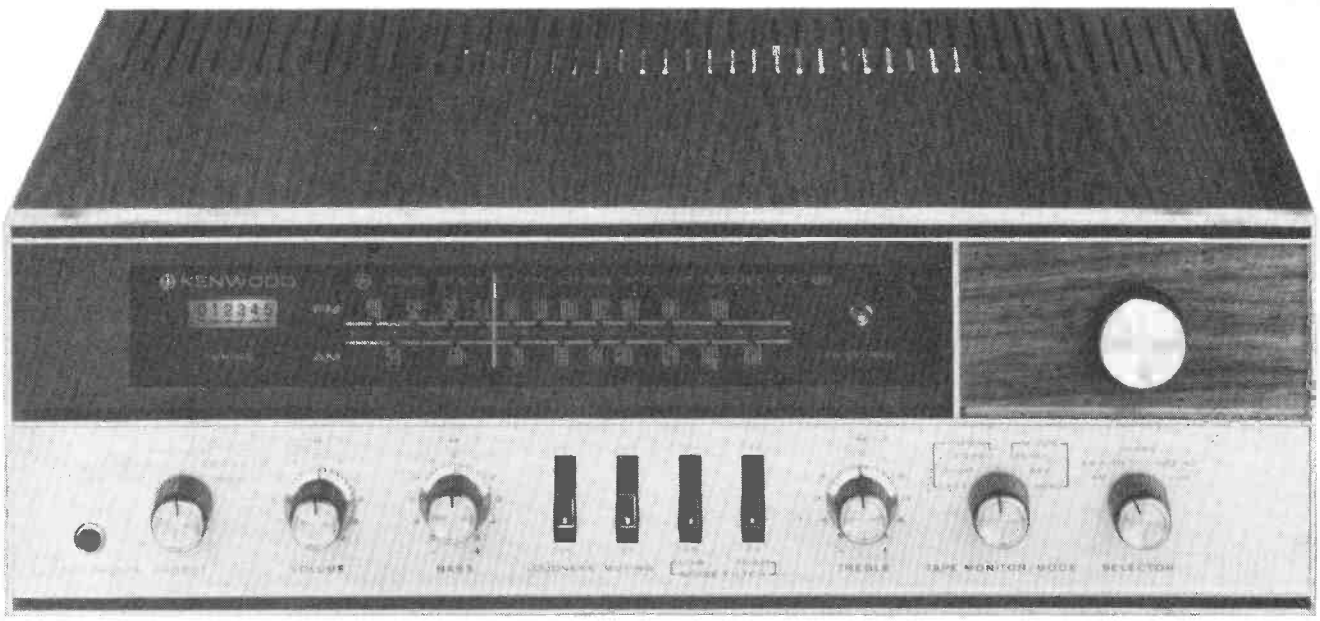

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Truly the most complete feature for feature AM-FM 60 watt stereo receiver at **$420.00** *(including cabinet)*

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1. F.E.T. (Field Effect Transistor) 4 gang tuning condenser front-end provides FM 2 microvolts sensitivity, and 66 dB image rejection.
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6. Illuminated pinpoint AM/FM tuning meter.

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7. 60 watt IHF standard total music power to drive even low efficiency Hi Fi speakers.
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10. Very low IM distortion for exceptional, clear, low level to high level listening.
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12. 4 sets of output speaker terminals (2 sets of stereo speakers) and front panel speaker selector switch (A speakers, B speakers, A + B speakers head phones).
13. 5-position program source selector permits AM, FM AUTO, PHONO, TAPE HD, AUX.
14. 3-position MODE switch for STEREO, REVERSE, MONO.
15. Direct tape monitor switch for tape monitoring without changing cable connection.
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17. Dual knobs bass and treble controls may be used to regulate each channel, separately or simultaneously.
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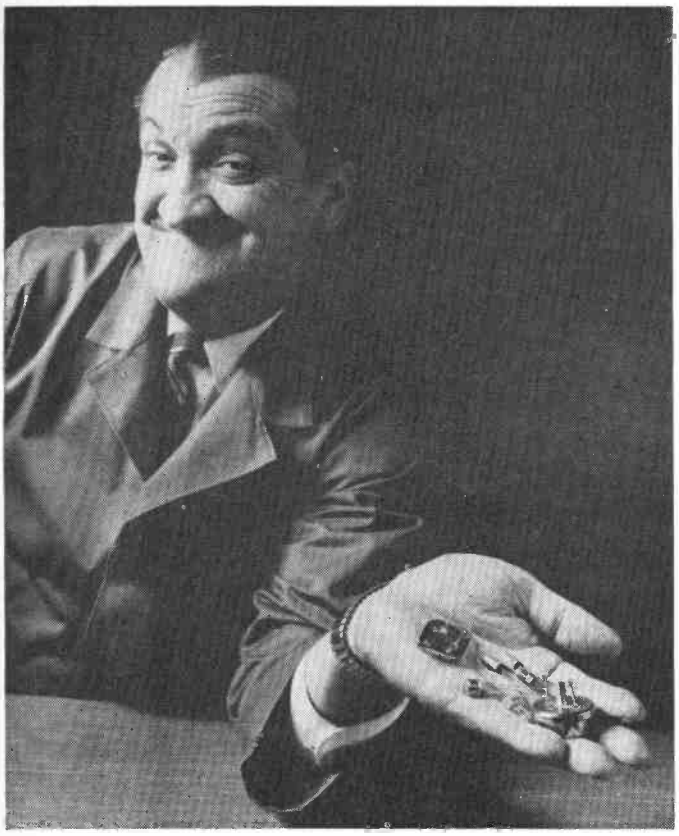

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That should make life a little simpler, Harry. 10 universal type semiconductors to replace the over 6,000 you had to search through before.

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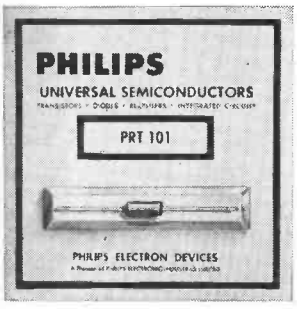
There are seven transistors and three diodes. And to round out the package two integrated circuits... selected for performance and a wide range of applications. It's another way, Harry, that Philips makes servicing easier for you.



Philips has got a book out showing what replaces what. You can get it from me, or write Philips for a copy.

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"The Revox 77A is a completely new design . . . an excellently conceived and executed piece of equipment. During the period of tests I have unconsciously come to regard the 77A as a professional studio recorder rather than a high quality domestic machine. The Revox 77A is one of the best value for money recorders I have handled and frankly, I do not think it could be produced at anything approaching its price in this country. All the electronics are solid state, the components are conservatively rated, servicing is easy and the machine should have a long and useful life"

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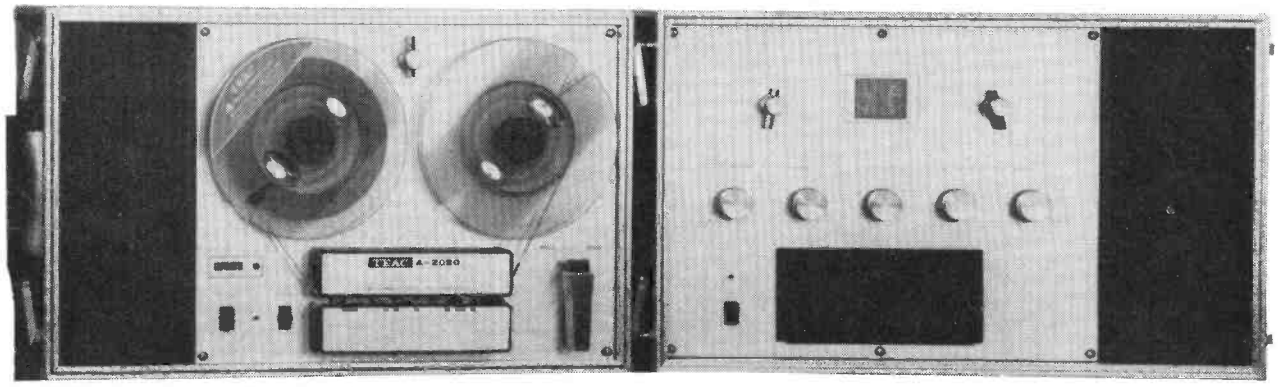
TEAC® 2020
"the tape recorder with 20/20 sound"*



* like 20/20 vision. the sound is perfect.

The AGS TEAC 2020 is a remarkable innovation in tape recorders with the controls and amplifiers in the break-away section which allows enough room in both halves of the stereo ensemble to allow for a set of really good speakers in each section for perfect portable stereo.

Features :

Automatic reverse record and playback mechanism: Can record and playback in either direction. Tape can be reversed at any point where sensing foil is placed on the back side of the tape thus providing eight hours of continuous play without touching.
Complete symmetrical control : Easy-to-operate forward and reverse direction for playback, fast winding and stop because of symmetrical control lever and center capstan system. Tape running is truly stabilized.
Outer rotor synchronous motor : Four-pole hysterisis synchronous outer rotor motor provides stability for tape running.
Four precision heads : Two record-playback heads and two erase heads were specially made to give the finest performance. Also, tape does not touch the other directional heads when tape is running so life of heads should be twice as much as ordinary type. Tape lifts from unnecessary head when tape is running.
Enjoy professional stereo sound with 20 watt total power output.
Pause button : for short interruptions on recording or playing back.
Headphone amplifier : Enables use of 8-ohm impedance headphones.
Tone Control : can give any kind of tone desired.
Monaural recording : If necessary, each single channel can be recorded individually.
Monaural playback : When playback is operated, both speakers are normally used but both right side channel and left side channel can be reproduced together through either speaker.
Speakers : Both speakers are completely separated and have elliptic shape which provides the highest quality sound and stereo effect.
Dual easy-to-read VU meter : Shows the sound level for recording and playback; stereo balance is easily made.
Recording button : Has feather-soft touch and is locked electrically to prevent malfunction.
100 kHz bias oscillator : for elimination of stereo beat and less distortion.
Sound monitoring : Through speakers or headphones.
Professional standard : On wow and flutter, speed accuracy, frequency response, signal to noise ratio, etc.
Vertical or horizontal operation.
Automatic shutoff for automatic stop of tape travel on finish of playback.
Beautiful wooden cabinet is available to complement your entire stereo ensemble.

Specifications :

Head — Four, 4 track 2 channel, Forward : Erase, Record-playback. Reverse: Erase, Record-playback.
Reel Size — 7" maximum.
Tape Speed — 7½, 3¾ and 1⅞ ips.
Wow and Flutter — 7½ ips 0.12%; 3¾ ips 0.15%; 1⅞ ips 0.2%.
Fast Winding Time — Approximately 90 seconds per 1,2000 feet.
Frequency Response — 7½ ips 30 to 20,000 Hz. 3¾ ips 40 to 12,000 Hz. 1⅞ ips 40 to 7,000 Hz.
Signal-to-Noise Ratio — 50 db.
Crosstalk — 50 db channel to channel at 1,000 Hz / 40 db between adjacent tracks at 100 Hz.
Input — Microphone : 600 ohms / Line : 100,000 ohms, 0.1 V minimum.
Output — Line : 50,000 ohms minimum (Load impedance), 0.5 V / Speaker : 16 ohms 20 watts (Music power)
Monitoring Headphones — 8 ohms.
Power Requirement — 100/110/115/200 VAC, 50/60 Hz, 70 W
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TAP-OFFS AND OUTLETS

"ULTRA TAP" TV OUTLETS

Jerrold "Ultra Tap" television signal tap-offs are the finest on the market for master antenna systems in hotels, motels, schools, apartment houses, or other commercial and industrial buildings. Each model is a precision unit designed to insure the absence of discontinuities which might create standing-waves and degrade the overall system performance. Equipped with "Gamma" receptacles, units accept Jerrold 75 and 300-ohm push-on plugs. Simple crimp-on bushings and positive-gripping clutch permits fast solderless connections to the feeder. Units can be flush mounted in standard 2" x 4" (or combination) wall boxes and used with Jerrold UT-PI or UT-PS cover plates. Design is such that standard electrical outlet cover plates can be used to meet the requirements of special decor. A housing, Model UT-SH is available for surface mounting of outlets where required in existing construction.

ALL-CHANNEL TAP-OFF UNITS FOR VHF/UHF-TV AND FM, MODELS UT-82-59, UT-82-CAC

Jerrold "Ultra Tap" Models UT-82 are all-channel (20 to 890 MHz) tap-off units which provide a choice of three isolation and feed-thru values, each color-coded. Two models for either RG-59 (UT-82-59) or Jerrold "CAC" Cable (UT-82-CAC). Simple crimp-on bushings and positive-gripping clutch permits fast solderless connections to the feeder. The tap terminal accepts G-59, PG-59 and G-56 push-on connectors. Specifications are shown in the table.

BASIC TAP-OFF UNIT FOR VHF-TV OR FM, MODEL UT-22

This VHF-TV or FM unit provides a choice of three isolation and feed-thru values (color-coded) and is used to tap signals from RG-59 type feeder cables. Provides a single "Gamma" receptacle which can be used to connect a TV or an FM receiver. The tap terminal accepts G-59, PG-59 and G-56 75-ohm, and G-300 75-300 ohm adapter, push-on connectors. Specifications are shown in the table.

COVER PLATE, MODEL UT-PI

Single outlet cover plate of sturdy molded plastic, ivory color.

COVER PLATE, MODEL UT-PS

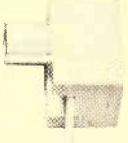
Single outlet cover plate of brushed stainless steel.

OUTLET SURFACE MOUNTING BOX MODEL UT-SH

Single outlet surface-mounting housing for use with Ultra Tap Units, Models UT-12 and UT-22. Made of sturdy molded plastic, ivory color.

G-300 MALE CABLE ADAPTER— 300-OHM

This 75/300-ohm adapter combines G-59 type push-on fitting with "no-strip" type crown washer terminals. Provides quick connection or disconnection of 300-ohm twinlead to "G" type chassis fittings. A resistor converts 75 to 300 ohms. Tap isolation is the ratio of 75-ohm feeder voltage to 300-ohm tap voltage.



ALL-CHANNEL WALL TERMINAL UNIT FOR VHF/UHF-TV AND FM, MODEL UT-18*

Model UT-18 is an "Ultra Tap" all-channel TV feed-thru unit (dc to 890 MHz). It provides a flush-mounted terminal outlet for splitter or tap-off units (such as Jerrold Models 1405, 1406, 1407) located elsewhere. Input terminal is "F" type; output "G" type. Male cable connectors are not supplied and may be purchased separately for cable type used. The tap terminal accepts G-59, PG-59 and G-56 push-on connectors.

*Not to be used as a line termination.

COMBINATION TAP-OFF UNIT FOR VHF-TV AND FM, MODEL UT-33

Available in the same isolation and feed-thru values as Model UT-22, this unit has additional isolation to separate TV and FM signals for simultaneous connection of both a TV and FM receiver.

WALL TERMINAL UNIT FOR SEPARATE VHF-TV AND FM, MODEL UT-13*

Similar to Model UT-12 except provides an additional FM outlet attenuated 10 dB below the TV signal level.

*Not to be used as a line termination.

ISOLATION AND FEED-THRU LOSS CHART

A = Isolation B = Feed-Thru Loss (values in dB)

FREQUENCY	CHANNEL NUMBER		WHITE (W)	RED (R)	YELLOW (Y)
ULTRA-TAP, MODELS UT-22 AND UT-33					
55.25 MHz	2	A	35.0	27.0	22.5
		B	0.2	0.4	0.2
83.25 MHz	6	A	34.0	25.0	19.0
		B	0.2	0.4	0.3
175.25 MHz	7	A	31.0	21.0	13.0
		B	0.25	0.5	0.4
211.25 MHz	13	A	30.0	20.0	11.5
		B	0.25	0.5	1.0
ULTRA-TAP, MODELS UT-82-CAC AND UT-82-59					
55.25 MHz	2	A	34.0	26.5	22.0
		B	0.5	1.0	1.25
211.25 MHz	13	A	29.5	25.5	20.5
		B	0.5	1.0	1.25
471.25 MHz	14	A	29.5	24.0	17.0
		B	0.5	1.0	1.25
801.25 MHz	69	A	29.5	21.0	14.0
		B	0.5	1.0	1.25
885.25 MHz	83	A	29.5	21.0	14.0
		B	0.75	1.0	1.5

Contact your local distributor or for further information write:
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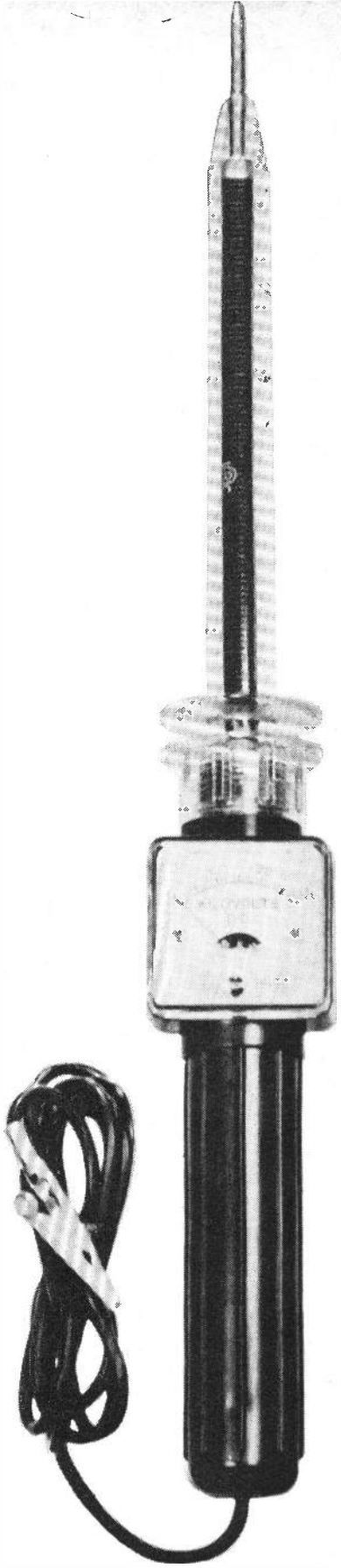
NEW FROM POMONA ELECTRONICS

CRT MODEL 2900

30 KV TEST PROBE

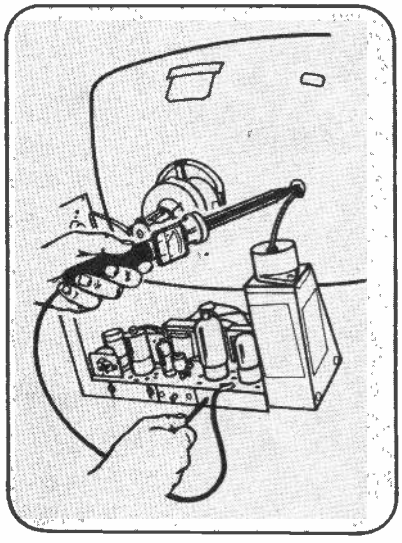
with built-in meter



New self-contained unit — small enough to carry in a tube caddy — tests high voltage on any color or black & white television set.

The CRT High Voltage Test Probe built by Pomona Electronics is the most advanced instrument of its kind on the market; the only test probe featuring a built-in voltmeter. It is easy to make high voltage adjustments in the home because the unit is small enough to fit in a tube caddy. You don't need large, bulky, multi-unit test equipment. You save repeated call-backs, and keep your customers happy.

Easy to operate! Just ground the test probe instrument by attaching alligator clip to chassis, contact test probe tip to high voltage anode, read voltage from the built-in meter, and adjust as required. No warm-up time. No batteries.



Patent Pending

SPECIFICATIONS

Range: 30,000 volts DC. Sensitivity: 20,000 ohms/volt (50 μa) movement. Accuracy: ±3% full scale. Multiplier Resistance: 600 Megohm ±2%. Material: Handle — high impact thermo plastic. Probe — high impact polystyrene. Length: 14¾″ overall. Weight: 8 ounces.

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ripple

from the 'scope of Tom Graham

Being part of the fast moving electronics industry, we have often had discussions about the possible grim future in store as computors, invade, and even regulate our private lives. Any steps that can be taken to prevent the occurrence of such an 'Orwellian' future are important. The following news release is in this category:

Lawyers and legislators were recently urged to plan safeguards against the threat of a rapid increase in public access to private information now being posed by computer technology. Addressing a meeting of the Boston Bar Association Committee on Automation, lawyer and management consultant Richard I. Miller of the international consulting firm, Harbridge House, Inc., warned that developing techniques in data storage and retrieval have already dangerously outdistanced legal provisions to control the misuse of such information.

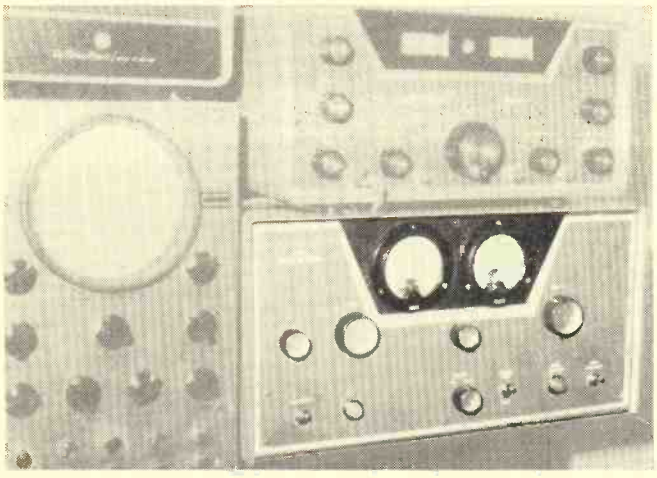
Calling first for a "reexamination of the entire concept of 'privacy'," Mr. Miller cited the ease with which the public can presently gain access to personal information. Every individual, he pointed out, is daily compiling an electronic book of life. We leave a trail of records behind us from the moment our birth is happily recorded on our parents' income tax return until the day when the Social Security death benefit is paid. In addition to such nongovernmental files as those maintained by banks, credit services, insurance investigations and the like, local, county, state and federal agencies have our school records, property holdings and assessments, licenses — for dogs, businesses and marriages, military records, income, public claims and court records. And because the prospect of a machine which knows all and never forgets fills us with dread, that is quite enough to compel a reexamination of the entire concept of "privacy."

Mr. Miller stated that it was "no" longer a question of 'whether' total documentation on the lives of every individual in the country will be quickly and inexpensively available, but 'when,' 'by whom,' and 'under what circumstances.' " Although computer experts are quick to differentiate statistical information from intelligence systems, and to assert that present systems do in fact protect the individual, such securiy is, by the nature of any developing technology, short lived, according to Mr. Miller

To assure protection for the individual as the state of the art advances, Mr. Miller proposes that both technological and legal controls be initiated. The technological developments he suggests would be contained in modified computer design to limit information in form and use by incorporating: (1) a cryptographic device for transmission lines carrying personal information; (2) security measures for data storage; (3) regular audits of storage contents; and (4) devices to record the sources of requests for personal facts.

After these minimum technical safeguards are assured, the computer further challenges the law to protect the individual from any inaccuracies or misuse of information that may have been nevertheless more or less freely gained. These laws, Mr. Miller point out, must fill the gap between existing legislation protecting an individual from information access and that pertaining to privileged communication and defamation.

Mr. Miller suggested three possible areas for this legislation: (1) requiring of agencies or individuals requesting information, both a notice to the persons involved, and access to them of information gained for verification; (2) preventing public authorities from purchasing or using equipment to store or distribute personal data to third parties unless for public necessity as ascertained in public hearings; and (3) establishing liability for the dissemination of false information or true information for defamatory purposes.



The completed linear amplifier on the operating desk at VE1KK. Design matches the Hallicrafters SR-150 used as an exciter, and the oscilloscope beside it keeps constant watch on linearity. Controls from left to right are: Top row-coarse loading, fine loading, bandswitch, and plate tuning. Bottom row-filament switch, filament pilot light, Linear In-Out, plate voltage High-Low, plate voltage pilot light and plate voltage switch.

A Homebrew Linear Amplifier

by George Cousins, VE1TG

During recent years, commercial SSB transceivers and transmitters have almost succeeded in pushing home construction into the dim mists of time. The complexities of building and aligning an all-band SSB unit do indeed present some problems, but it's a somewhat different story when one considers the boost to high power which sooner or later becomes the desire of most operators. Whether justified or not, most of us would like to have that little extra punch which a good linear amplifier will provide.

So what course is open? We can buy one of many manufactured units, or we can choose one in kit form and capture at least a fragment of the enjoyment of actually building a piece of equipment. Or we can study circuitry, heed the advice of those who know, look at the work of others, and then sit down and create our own. At the same time we'll have immeasurable satisfaction from doing a good job.

Doing a good job requires some careful forethought and even more careful construction, and the unit I'm going to describe has been given large doses of both. It was designed and built by Wilbur "Bill" Hills, VE1KK, of Moncton, N.B., and the care which went into it is apparent in both appearance and performance. The linear uses standard parts readily available anywhere in the country, and can be built for a price directly proportional to one's junk box and horse-trading ability.

Design

The circuit is a grounded-grid amplifier using two old reliable 813 tetrodes in parallel. Any of the usual 100-200 watt transceivers or transmitters on the market will drive it to full output. A rather unusual screen circuit is used, plus a self-contained solid state power supply with provision for low or high power operation. The complete unit fits into a cabinet for table-top use beside the exciter and receiver.

Construction

Most of the construction details will be obvious from the photographs and schematics. The chassis is a standard 17″ x 14″ x 3″ (Hammond 1440-38), which allows plenty of room for both RF and power supply sections. The two 813s are mounted horizontally, with their sockets sub-mounted ½ inch into a small 8″ x 4″ x 2″ chassis (Hammond 1440-10) with its bottom panel (1430-10) providing easy access to the sockets and their associated wiring. The filament, grid and screen by-pass capacitors are wired with the shortest possible leads directly to the socket pins. This, plus heavy bus wiring and the shielded enclosure, ensures good isolation between grid and plate circuits as well as aiding in TVI prevention.

The plate choke and bypass are also mounted horizontally and placed carefully to ensure short leads. The choke may be the familiar National R-175A used here, or may be home-made as described in the parts list. The plate tuning capacitor shown has been cut down by removing about half the plates. This was done deliberately to get a better L/C ratio in the plate tank, but does not allow enough tuning capacitance for 80 and 40 meters. Therefore, an additional 100 pf. capacitor is switched in parallel with the tuning capacitor when these bands are selected. This is done by one deck of the bandswitch, the second deck being used to select the correct tap on the pi-network output coil. This is a combination of commercial coil stock and home-wound inductance and mounts on small standoffs parallel to the front panel.

Output tuning of the pi-network is a combination of fixed capacitors, selected by a front panel switch, and a three-section broadcast type variable unit. This allows matching to a very wide range of line impedances. Finally, the output RF lead is fed to a Linear In-Out switch on the front panel. This allows instant selection of either the exciter alone or the combination of exciter-plus-linear for immediate power increase or decrease. The Linear In-Out switch is a heavy duty ceramic affair with two poles and two positions.

The bandswitch is made from two separate wafers of different characteristics. The section which selects the coil taps is a 5-position continuously shorting type, while the other section is a 5-position non-shorting type. This was made up from wafers of two switches which were dis-assembled and re-assembled on one set of shafts and spacers. This was necessary because of switching in the extra capacitor on 80 and 40 meters, but might not be required if a different final tank design were used.

The two meters are enclosed by a home-made sheet metal box (a small chassis would be suitable), which is well grounded along its perimeter and effectively shields the meters from the strong RF field around the plate coils. Finally, a small cooling fan is mounted in the centre of the chassis on a small metal plate, with the airflow directed at the tube envelopes. Originally mounted firmly on the chassis, the fan caused some noise so the plate was remounted on rubber grommets. The fan used is a small Japanese unit distributed by Temco.

The only part of the RF section which is somewhat unusual is the screen circuit. Note that there is no DC screen supply, as such. Instead two 6X5 rectifiers are connected between the screen grids and ground, with the screens being held at zero potential for both DC and RF. As soon as an SSB signal is applied to the input connector, a portion of it is fed to the 6X5s, which rectify the signal voltage and apply it as a DC potential to the screens. Of course, the stronger the input signal, the higher the screen voltage, so that the screens are controlled in exact phase with the input signal. On AM or CW, the same thing happens, except that the screen voltage becomes steady due to the constant amplitude of the carrier.

The remainder of the amplifier is straightforward. The output pi-network tank may be any of the commercial types now available or may be home-made. However, some instability may occur on 10 and 15 meters if the tank circuit is not designed and positioned carefully, and neutralization of the tubes may be necessary.

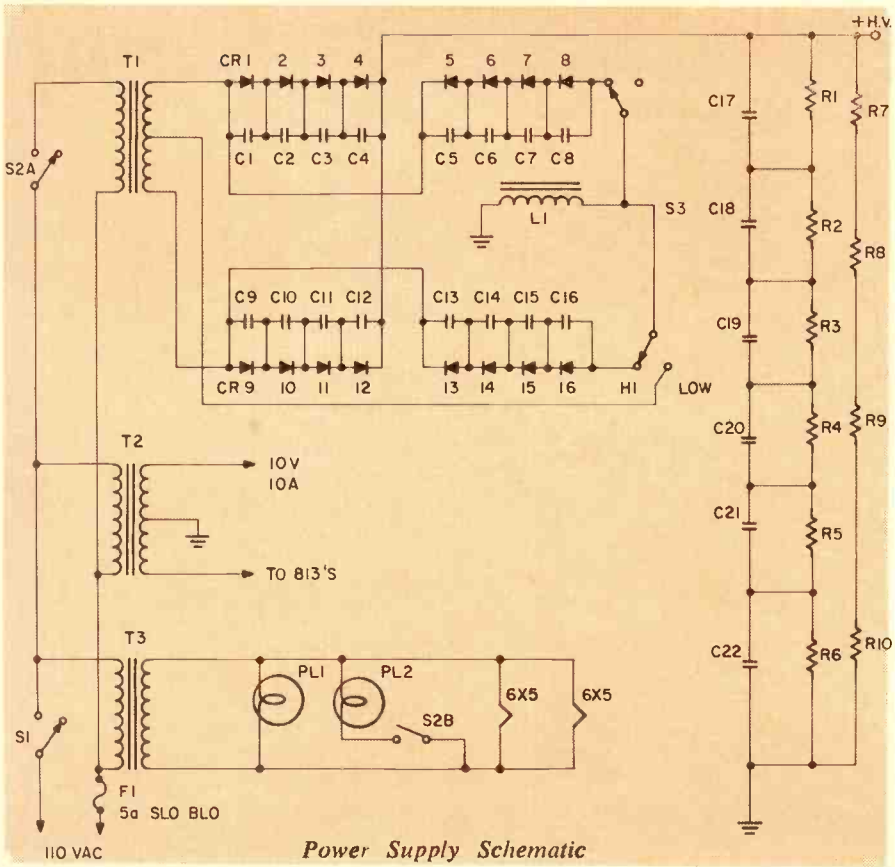
Power Supply

The power supply components above the chassis are the high voltage transformer (anywhere from 600 to 1200 volts each side of center tap), the high voltage choke, and the 813 filament transformer. Solid state circuitry eliminates bulky rectifier tubes and their associated filament transformers, though of course if these are available and cost is a vital factor they could be used. Space limitations would probably necessitate a separate power supply chassis, however.

Now let's look underneath, referring to the photo as we go along. In the lower left corner are the two 6X5 tubes mounted horizontally on a small plate. The long black cylinder is the 813 filament choke, home-made by double-winding #14 wire on a ferrite rod. Plexiglass mounting brackets hold the choke securely in place. The RF output connector is mounted under the choke on the rear wall of the chassis. Along the far wall, a bakelite terminal board holds the 16 silicon diodes on the side visible in the photo. On the underside of the board are the 16 associated disc ceramics used for balancing and spike elimination. The entire board can be quickly removed by unsoldering five wires and removing two screws in the standoff insulators.

Adjacent to the diode board is the small 6.3 volt filament transformer for the 6X5 tubes, and the filament wiring to the 6X5s is shielded and well bypassed. Along the front wall are the various filament and plate switches, pilot lights, and the Linear In-Out switch. There is also a High-Low power switch but more about this in a moment. Finally, in the foreground is the 80-40 meter extra plate padding capacitor mentioned earlier. Though a variable was used in this linear, a fixed capacitor would be equally suitable and would take less space.

Two more plexiglass boards occupy the middle of the chassis and hold the



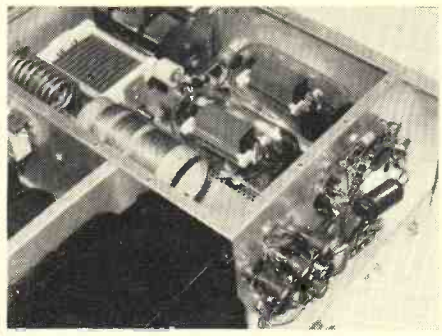
Power Supply Schematic

Linear Amplifier Kit

The kit referred to in the accompanying article is the Heath SB-200. A self-contained desk-top unit weighing 35 pounds, it is capable of the legal limit on cw and 1200 watts pep on ssb.

The size and simplicity of the SB-200 centres round the two carbon anode triodes (572-B/T-160L). Two of these in parallel provide 320 watts of plate dissipation with only a moderate amount of envelope cooling.

A standard grounded grid arrangement is used with a fixed tuned cathode circuit for each band. Any 100 watt class exciter will provide sufficient drive. The RF enclosure is shown below.

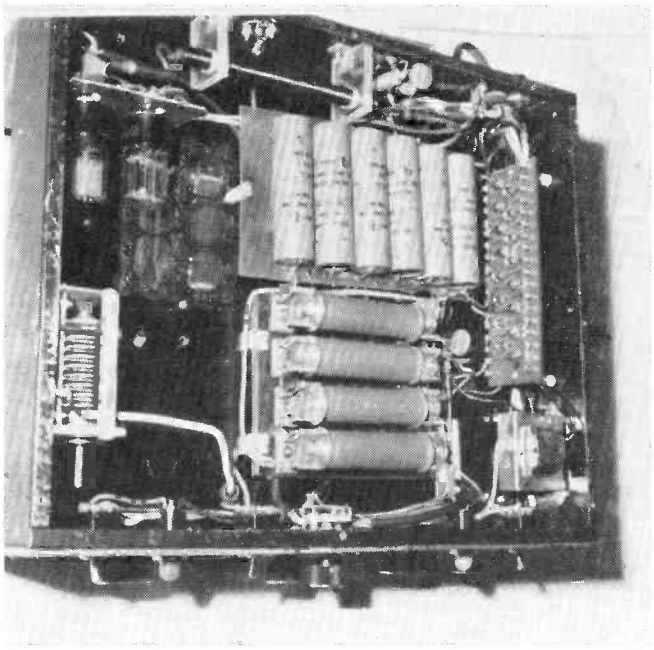


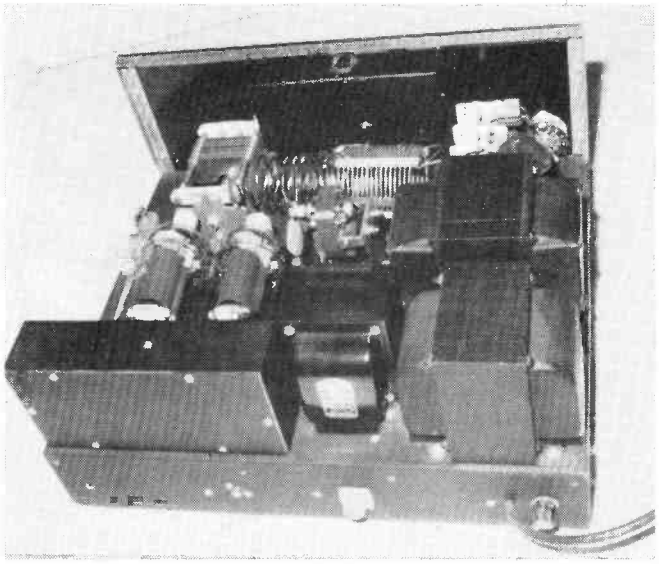
Front panel controls are, left to right, plate loading, plate tuning, band selection. Meter switching selects grid, plate, forward power, reverse power, and high voltage. The on-off switch puts the linear into instant operation as the tubes have directly heated filaments and a transfer relay takes care of the input/output switching.

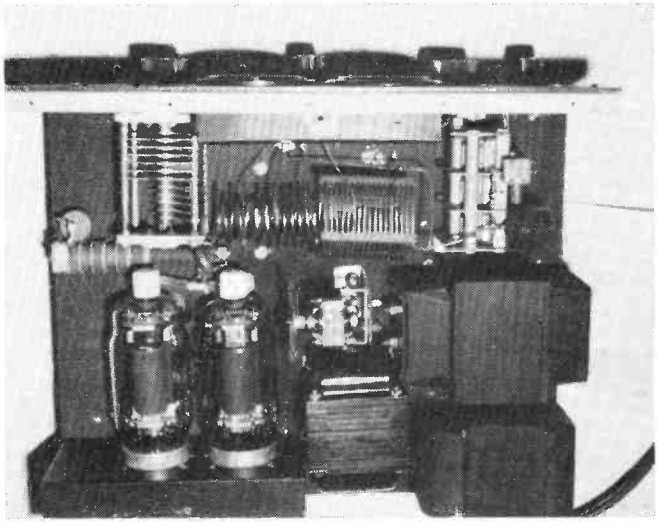
Either 110 or 240 vac line input can be used by changing taps on the power transformer and circuit breakers are installed in the primary. Plate voltage of about 2400 is supplied by a silicon diode voltage doubler. Most of the power supply components are assembled on a printed circuit board. The RF compartment is fairly well shielded although not as tightly as some situations might require.

It is not a difficult kit and assembly takes only a few evenings. When complete there are no adjustments to make although an oscilloscope is desirable to check the waveform for various conditions of load and drive.

The SB-200 matches the other components in the Heath line. It is priced at $335 direct from Heathkit, 1480 Dundas Highway East, Cooksville, Ontario. *(E. W.)*



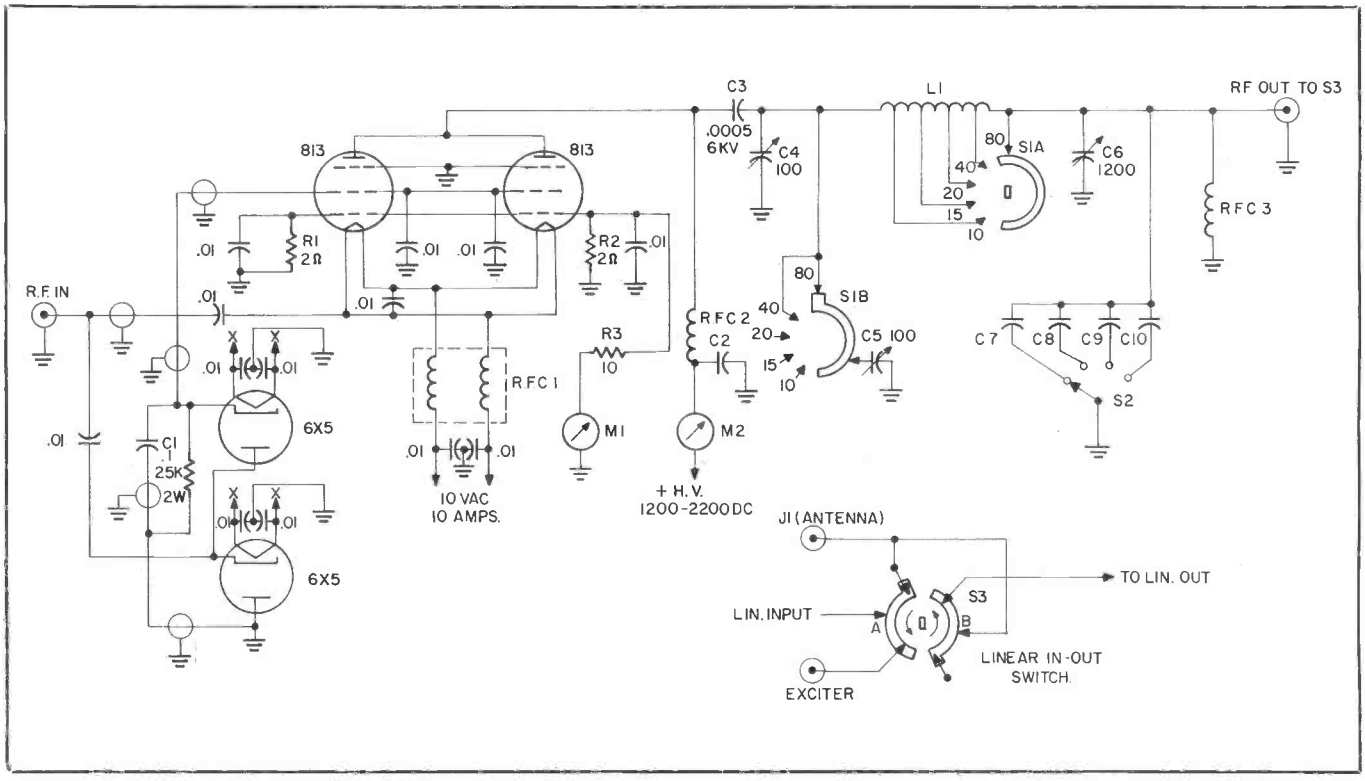




Underneath the chassis (above). In foreground, the 80/40 meter capacitor and 6X5 tubes. Filter capacitors and bleeders occupy the centre space, with the silicon diodes at the right. The Linear In-Out switch is on the front panel adjacent to the bleeders.

In the top right view the cabinet mounting strips can be seen around the front panel, as well as the input and output connectors on the rear of the chassis. The 813 input enclosure has its cover in place.

Top view of the amplifier (right) shows power supply components in the lower right hand corner. The 813s plug into the small chassis at the left, and the various RF tank components occupy the remainder of the chassis. Note the cooling fan, meter enclosure, and combined fixed and variable loading capacitors at the upper right.



filter capacitors and the bleeder resistors. Here again, some variation in components would do no harm but might not fit in the available space, whereas by using the diodes in combination with the six low-voltage high-capacitance capacitors a very compact power supply can be built.

The power supply circuit uses a full-wave OR a bridge configuration, selected by the High-Low switch, with either full or half voltage output depending upon the switch position. Notice that the switch and the filter choke are both placed in the ground return line; therefore low voltage (and low cost) components can be used. This voltage selection also permits the use of a smaller plate transformer and permits low power operation of the 813s during initial tune-up.

The filter capacitors are all in series and with 100 mfd, units there is a total effective capacitance of about 16 mfd, across the high voltage output. The balancing resistors across each filter are physically mounted under the filter board. A single 100,000 ohm 50 watt bleeder resistor could be used in place of the four smaller units shown here.

The primaries of the filament and plate transformers are controlled by S1 and S2A, which are arranged to prevent high voltage application until the filaments are lit. A second section of S2 is used to operate a pilot light for high voltage indication, obtaining power from the 6.3 volt filament transformer.

Tune-Up

SSB tune-up is quite simple. Select the band of operation, then advance the RF level of the exciter until 15 ma. of grid current is shown on the 813 grid meter. The loading should be set to minimum and the final dipped to resonance with the High-Low switch set to Low to make initial familiarization less hazardous to the tubes. The exciter level, plate tuning and loading must all be adjusted simultaneously to obtain a plate current of 200 ma. approximately with a grid current of about 12 to 14 ma. If the plate current exceeds 200 ma., reduce the loading until this figure is attained. On 80 meters, it may be necessary to switch in one or two of the fixed loading capacitors. Voice peaks will drive the plate current to about 400 ma. For AM operation the loading should be set to 150 ma. plate current and 12 ma. grid current. These values are for the best linearity with plate voltages of about 1200 to 1500 DC. However, higher plate voltages and heavier loading may be used if some linearity is sacrificed. This is especially the case when the amplifier is used for cw.

Finish

The cabinet was made from sheet metal in a metal working shop, then primed and sprayed with metal lacquer. The front panel was designed to match the Hallicrafters SR-150 used as an exciter, with gray and white lacquer for the panel and trim, and black lacquer around the meters.

In addition to being a professional appearing unit, the linear has operated in VE1KK's station for several years without maintenance of any kind. The enjoyment of building a similar unit can be yours, and wouldn't you like to point it out to friends and say, "The linear? Well, ah, I built it myself". ◙

PARTS LIST

Power Supply

C1 to C16	.001 disc ceramic 1 kv.
C7 to C10	100 mmfd mica 2.5 kv
C17 to C22	100 mfd. 450 vdc. filter capacitor.
R1 to R6	40,000 ohm 10 watts.
R7 to R10	25,000 ohm 50 watts.
T1	Plate transformer, from 600-0-600 to 1200-0-1200 vac.
T2	Filament transformer, 10 V. 10 amp. Hammond 1144X60 or similar.
T3	Filament transformer, 6.3V. 2 amp., Hammond 167D or similar.
L1	Filter choke, 30 henries, 300 ma. Hammond 30-300X or similar.
PL1, PL2	¼ amp. dial light, 6.3 volts.
S1	SPST toggle switch 115 vac 10 amp.
S2, S3	DPDT toggle switch 115 vac 6 amp.
CR1 to CR16	silicon diodes, 800 p.i.v., 1 amp.

Linear Amplifier

S3	2 Pole 2 Position Ceramic. Switch shown in linear OUT position. Output from exciter switched direct to antenna by wafer A
S1A	5 position continuous shorting.
S1B	5 position non-shorting.
C1	.1 mfd. 400 V. moulded
C2	500 mmfd. doorknob 10 kv.
C3	500 mmfd. disc ceramic 6 kv. All other capacitors are 1 kv. discs.
R1, R2	2 ohm 1 watt.
R3	10 ohm carbon or suitable value to measure voltage drop across R1 and R2. M1 should read full scale with 150 ma. through R3 to ground.
RFC1	15 amp. filament choke, or 32 turns #14 double wound on ½" x 7" ferrite rod.
RFC2	National R175A or 220 turns #24 formex close wound on ⅝" x 4" ceramic form.
RFC3	2.5 mH — National R100 or equivalent
M1	0-150 ma. with internal shunt removed.
M2	0-500 ma.

Note: filament and signal leads to 6x5 tubes are shielded and filament leads also bypassed.

He Won A Trip Around the World

The happy Ham pictured above is the winner of the "Tam-Tam" contest organized by the Canadian Broadcasting Corporation, in collaboration with Radio Amateur du Quebec Inc. (RAQI), and the Youth Pavilion at Expo 67, (*electron*, July 67, p. 31). His name — C.E. Aimar, K4ZVQ, of Darlington, South Carolina; his prize — a trip around the world, lasting 30 days, with all expenses paid (the contest prize remitted to R.A.Q.I. by Lufthansa with CBC covering the travel expenses).

The contest's radio message consisted

EEETT TTTTT TTEEE TTTTT TEEEE ETEEE TTETT TETTT ETTTE TTEET TTETE
TETET ETTTT TETET ETTET TTEEE TETET ETTTT TETET ETTET TTETE TTETT
ETTTT TETTE TTETT TTTET EEEEE TETTT ETEEE EETTT TTTTT TEEET ETEEE
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ETTTT TTTTT TEEET TTTET TTTET ETTTT TTTTT ETTTE TTTTT TTETT TETTT
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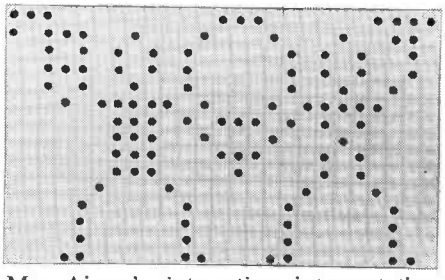
of 375 bits of information (in morse, either letter E or T) and was transmitted from the Youth Pavilion for the duration of Expo-67. The contestants were required to decipher the message and submit a graphic symbol deduced from the message. Mr. Aimar's interpretation was selected as the most accurate and logical of the more than 30 correct answers submitted from many parts of the world.

Marking the message on a chart. Mr. Aimar divided the 375 individual signs into 15 lines of 25 characters each using the E as a dot and the T as a space and he came up with the following picture :



Mr. Aimar's interesting interpretation was based on the picture's suggesting that the "Inhabitants of the (outer space) world are bisexual man-like creatures. Probably mammalian. They walk upright . . . have prehensile hands. ◙

THE GRS PICTURE

by M. Ronald

PART 3

Servicing

Servicing of GRS equipment can be divided into three categories; initial checkout and adjustment, routine maintenance, and emergency servicing. As mentioned previously, most transceivers are prealigned at the factory to operate properly into an antenna load of approximately 50 ohms. If your antenna has the proper impedance and if the feedline is not shorted or open then no initial adjustment should be necessary. However most installers do make a check with an SWR meter and peak the final output circuits for a maximum reading. Most SWR meters designed specifically for the 27 MHz band have a power scale calibrated in watts, so a power output check is usually carried out as well.

Netting to frequency of the transceivers in any given installation is usually not required since the channel crystal accuracy insures that the transmitted signal falls into the receiver passband. It is usually later that netting is required as crystals age and IF transformers move off frequency. For prolonged testing of the transmitter section, a "dummy" load such as shown in Figure 1 should be used. A dummy antenna is just a resistive load placed across the antenna terminal of the transceiver to simulate an actual antenna. It dissipates the output of the transceiver without putting any appreciable signal on the air.

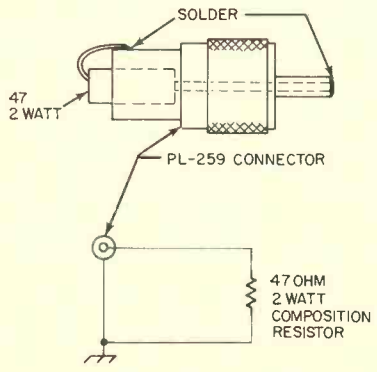


Figure. 1 Simple dummy load for intermittent use with GRS transceivers.

The second category, routine maintenance, is best carried out every 12 to 24 months depending on the type of gear and the severity and degree of usage. Tube transceivers in mobile service should be checked out every year; the vibrator, modulator and RF tubes being replaced most often in the author's experience. Routine maintenance should include the following checks; transmitter — a frequency check of each channel crystal, a power output check, a check of coil and trap adjustments and a check of the modulation percentage with an oscilloscope or GRS test set.

In the receiver — check sensitivity with a noise generator or metered signal generator, and with an accurately calibrated signal generator check alignment of the IF stages. It goes without saying that servicing of this nature should be done only by a fully qualified serviceman. Most servicemen find a GRS test set such as the one shown at the end of this article to be capable of making many of the tests. The usual radio and TV alignment generators do not have the accuracy needed for GRS work, but a system such as that shown in Figure 2 will give the required accuracy.

Emergency servicing of tube transceivers normally involves vibrator or tube troubles. Occasionally a speaker becomes defective. The author has also encountered such troubles as a broken conductor in a microphone cable and a blown filter capacitor, the latter resulting from someone putting in a solid state rectifier replacement for a 6X4 rectifier. Fortunately these troubles don't occur too often. The solid state transceivers are much more reliable than tube sets and thus require less servicing and maintenance. About the only trouble one hears of is failure of the output transistor in the transmitter section because someone pressed the microphone button with no antenna connected!

In summary then, the initial adjustments are easy to make but the more complicated servicing and adjustment should be left to a technician with adequate equipment and knowhow.

Accessories

Many of the accessories offered for GRS transceivers will do little for you. Accessories such as RF preamplifiers, compressors and external noise limiters will do nothing for the modern well-engineered GRS transceiver. However, an accessory such as a tone call system has much merit. And don't hesitate to spend some money on noise elimination in your mobiles; those noise elimination kits really work and can be removed if the vehicle is traded or sold. Keep in mind that there are special kits available for alternator equipped cars as well as for the older generator equipped type.

As mentioned in August '67 *electron* the DOT is preparing a specification for the introduction of single sideband (SSB) transmission to the GRS band. This type of transmission effectively increases the range while at the same time eliminating the annoying heterodynes caused by AM transceivers. Furthermore there is quite an increase in

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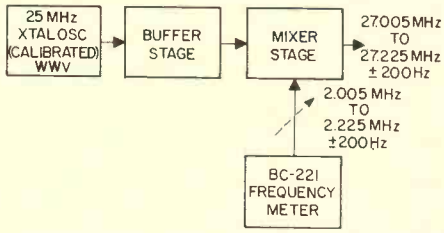
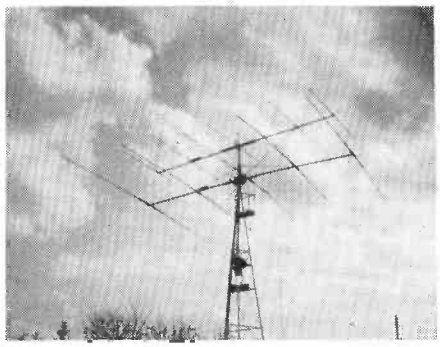


Figure. 2 System used by the author for accurate frequency measurement in the GRS band. Accuracy to .0002% or better is possible.

BIG BEAM FOR 20



by George Cousins, VE1TG

Part 2

Matching

The last step is the construction of the matching assembly for the feedline. Because the radiation resistance goes down as the number of elements goes up, the actual value at the centre of the driven element will be probably around 20 ohms or so. Regardless of what it actually is, it will certainly be much lower than the impedance of either 52 or 75 ohm coaxial cable. The most satisfactory method of matching the line to the driven element is the gamma match, and it is also the easiest to construct. However, the gamma rod (Figure 4) will be fairly long even if 52 ohm cable is used. Because I wanted to run my coax underground, and having considerable quantities of 75 ohm cable available, something else had to be done. In series with the end of the coax, between it and the gamma match, I inserted a quarter-wave (electrical) length of 52 ohm RG-8 coax. This results in a terminal impedance at the end of the RG-8 of about 27 ohms. This is, of course, a much simpler matter to match to the driven element.

The basic gamma match is a simple device, and can be built in a number of ways depending upon the ingenuity of the builder. However, I wanted to be able to adjust the match when the beam was in its final position, and naturally, I couldn't reach the thing. Therefore, I built it to be operated remotely. All that is needed is a pair of standard selsyn motors and some five wire control cable. The motors should be 110 volt 60 cycle units to avoid messing around with step-down transformers, dropping resistors, and to avoid heat and torque losses. Such units are available at many surplus stores for a couple of dollars each. One motor has its shaft coupled to the shaft of the gamma capacitor by an INSULATED coupling. The capacitor itself is about 150 mmfd. in value, and although any small spacing will handle the power, I always use a fairly wide-spaced unit to prevent moisture from shorting the plates.

The selsyn and capacitor were mounted in a section of aluminum pipe used for venting clothes dryers. This pipe can be opened to install the units and then sealed by a locking lip built right into it. The motor may have to be wedged into place to prevent it from slipping around. Two discs are cut from ¼ inch thick plexiglass and the capacitor is mounted on one of them, which is then fitted into the end of the pipe. The gamma rod connection also passes through this disc, via a plated bolt, and a coax cable connector is also mounted on it. The other disc seals the opposite end of the pipe, and has a small hole cut in it to pass the control cable from the motor. The whole affair is clamped tightly together

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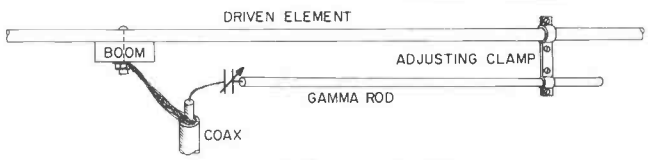
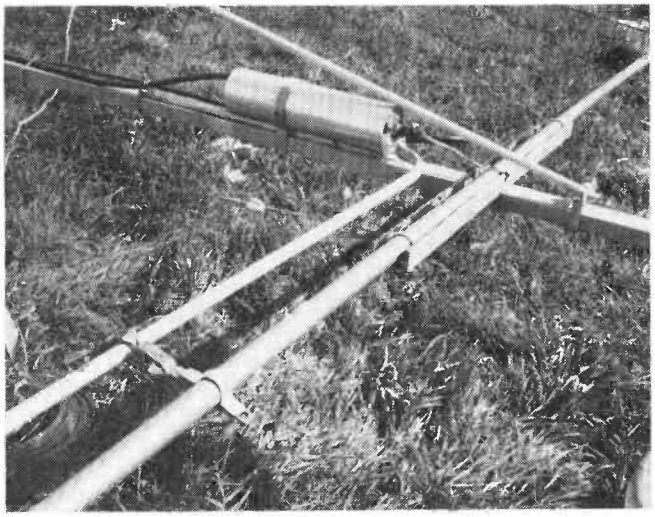
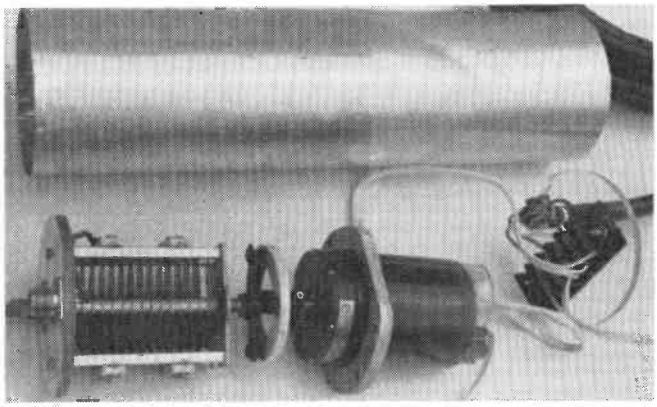


Figure 4 Gamma match



Gamma match, showing the match housing mounted on the boom, with the gamma rod extending outward parallel to the driven element. The adjusting clamp is made from a heavy battery clip and two galvanized pipe straps mounted back-to-back. One of the conduit struts is shown, as well as the strap which connects it to the boom. The element is mounted in a channel aluminum support, and held by small U-bolts.



Construction of the gamma match, showing the gamma capacitor coupled to the selsyn motor. Plexiglas discs are mounted on the end of the capacitor and on the small terminal board which connects the selsyn wires to the control cable. The aluminum pipe housing is in the background.

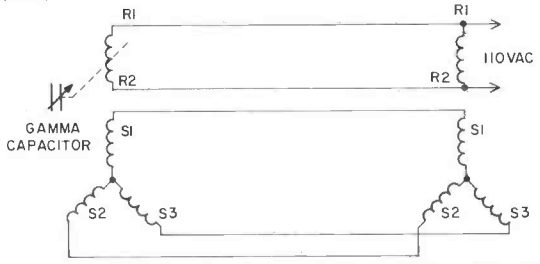


Figure 5 — Wiring hook-up of the selsyns. The left hand unit is mounted on the mast and coupled to the gamma capacitor. The right hand unit is in the operating room, preferably mounted in some sort of control box with a dial for easy manipulation.

TRANSISTORS? THEY'RE SIMPLE!

by E. Aisberg

Translated for *electron* by Gérard W. Matte from the book *Le Transistor? . . . Mais C'est Très Simple*

This is the sixth instalment in our series on transistor principles. Mr. Aisberg's popular book, published by Société des Editions Radio *in Paris, is in its fifth edition and has been translated into nine languages. This is its first appearance in English.*

Our characters are:

Curiosus, a young electronics instructor who is always ready to satisfy the inquisitive mind of his friend

Ignotus, who was his first pupil and is employed as a technician by a radio receiver manufacturer.

Fifth Conversation: A Bit Of Technology

Initial Purification

Ig. — I think you know, Curiosus, that I never attempted to manufacture electronic tubes myself. The need to develop a high vacuum in the bulb has always been an obstacle I couldn't overcome with my inadequate bicycle pump. But I think I can easily make a few transistors for my own use. Can I find the things I need at a drug store: pure germanium, antimony for the N region and indium for the P region?

Cur. — Are you serious?

Ig. — Is it *that* difficult?

Cur. — Well, yes! First of all, the germanium has to be sufficiently refined: the so-called "pure" germanium available commercially is not purified enough. Then, it has to be given a uniform crystalline structure by growing a single crystal out of it. Afterwards, the P and N impurities have to be inserted to create two junctions separating the three transistor regions. Finally, these have to be provided with leads and the whole assembly mounted and sealed in a can. Only properly equipped plants can successfully perform all those operations.

Ig. — I am discouraged. I never knew it's so difficult to refine germanium.

Cur. — Don't forget we need *pure* germanium, in which, for one billion atoms, there shouldn't be more than 10 impurity atoms — even less than one in certain cases.

Ig. — I guess a chemical process must be used to free germanium of foreign matter.

Cur. — Chemistry has some value but it's not sufficient. The method employed is physical process involving electronics and called zone refining. The germanium to be refined is heated in a very clean elongated crucible made of quartz or graphite, which is kept in a nitrogen or hydrogen atmosphere to prevent total oxidation. The germanium is molten in a narrow zone which is slowly displaced from one end of the bar to the other.

Ig. — That way, impurities are burned, I suppose.

Cur. — You are wrong. This process is based on the fact that impurities have a tendency to remain in the molten zone, leaving them out of the solidified section. Thus, the impurities are gradually carried from one end of the germanium bar to the other until, after repeating the process several times, the end containing all impurities is cut off.

Ig. — And thrown away?

Cur. — No. Germanium is very expensive. It is used again in a different refining batch.

Ig. — I see. This reminds me that yesterday we submitted Gora to a refining zone . . .

Cur. — What's this all about? Who — or what — is Gora?

Ig. — Gora is our cat — half angora. Normally very clean, she had caught several fleas. presumably from some dirty friends. We got rid of those impurities by combing her from head to tail. But what fills the function of the comb with the germanium? I mean, by what means is melting restricted to a narrow zone?

Electronic Furnace

Cur. — By using high frequency induction heating. A coil of a few turns encircles the fusion zone and carries a heavy current at high frequency. The induced currents in the germanium body produce enough heat to melt it.

Ig. — Gee — This is exactly what is happening to Uncle Jules!

Cur. — Now, what has your uncle got to do with this? Has he become infested with fleas too?

Ig. — No, but he has "synovitis" in one knee, the result of a bad fall. So he is being treated with high frequency diathermy.

Cur. — I see. Imagine it works like this: his knee is placed between two well insulated electrodes energized with high frequency voltages; the resulting electrical field produces heat by dielectric losses inside the damaged limb. However, with induction heating as used in zone refining, a magnetic field generates heat in the semiconductor stock through induced currents. What is remarkable with the R.F. heating action — whether it is by electric fields (used with insulators) or magnetic fields (used with conductors) — is the fact that heating is developed *within the whole body* and not by thermal conduction from the skin to the core as recommended for steaks . . .

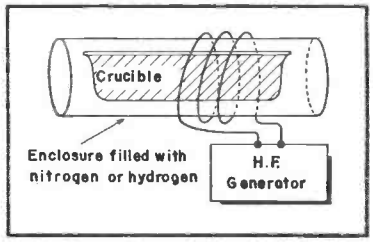


Figure 34: Zone refining of germanium is obtained by the heating action of H.F. currents in a coil being displaced slowly along a crucible containing the metal.

Ig. — In short, to come back to our germanium, the coil slowly passes from one end of the crucible to the other . .

Cur. — . . . unless the crucible itself is moved slowly along the axis of a fixed coil, which amounts to the same thing. In fact, several coils are used and spaced so as to obtain in one operation several fusion zones alternating with cooling zones. This is as if a single molten zone progressed along the crucible several times. The crucible moves very slowly: one millimeter per minute.

Ig. — A thought: how is silicon treated?

Cur. — The same way, but at a higher temperature because it melts at 1420°C as compared to 940° for germanium.

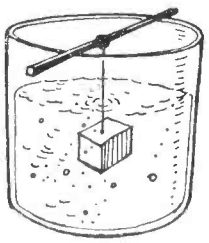
Crystallization Follows Zone Refining

Ig. — Why is it that the semiconductor thus refined can't be used directly to manufacture transistors? Isn't it crystallized?

Cur. — It is, but not properly. The crystals are put together in a haphazard way. What is needed is a regular crystalline network with a known orientation. This is obtained by growing a single regular crystalline network, known as a monocrystal, around a small crystal called "seed".

Ig. — I used to like making nice crystals by dissolving some table salt in a glass of water and by soaking a thread with a minute salt crystal stuck at the end in it. Within a week, the crystal had grown into a nice transparent cube. Is this how semiconductors are processed?

Cur. — The same principle applies. But, instead of a solution, molten metal is used. The seed fastened at the end of a rod is lowered into it and while rotating, is withdrawn slowly. That way, germanium (or silicon) atoms align themselves around the seed according to the structure of the crystalline network. The metal solidifies around the seed. Finally, after a few hours, a bar 20 to 30 centimeters long is obtained with a diameter of several centimeters and a weight of a few kilograms. Enough for thousands of transistors!



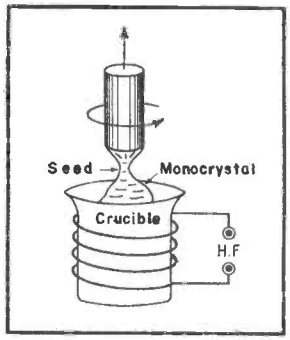
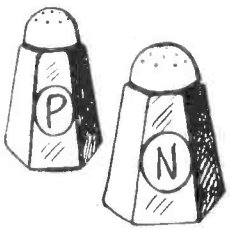


Figure 35: Drawing of the monocrystal. The semiconductor metal in the crucible is molten by H.F. induction heating.



Ig. — This monocrystal must be a high purity semiconductor.

Cur. — Not quite. I neglected to mention the addition to the molten metal of P or N type impurities, depending on whether the base is to be of one type or the other. This is because, in the later manufacturing stages, it is the base which generally retains the character of the monocrystal.

Mechanics At Play

Ig. — You were saying that thousands of transistors could be obtained from a single monocrystal. I suppose this is done by cutting it up in small pieces.

Cur. — Yes. To start with, the crystal is sliced like a bologna in slabs or thin lamellae 0.1 to 2 mm in thickness. Diamond-tipped circular saws are used for this precision work. A "band saw" made of tungsten wires with abrasive coating is also used. Next each lamella, in turn, is split in small squares of a few millimeters on each side. Such a chip, measuring 2 x 2 cm with a thickness of 0.5 mm. weighs only one hundredth of a gram. This means that a 5 Kg monocrystal would yield theoretically half a million transistors. In actual fact, during manufacture, there is appreciable wastage which reduces the quantity of pieces produced.

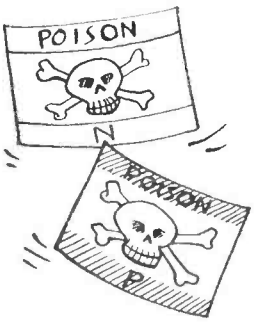
Successive "Doping" At Work

Ig. — This waste is not too bad, all things considered, even if it amounts to half. But how is it possible to make whole transistors solely from base material?

Cur. — By "doping" its two faces with impurities of a type opposite to the chip. For example, with a type N wafer, P impurities are introduced on both sides so as to

make up the emitter and the collector of a PNP transistor.

Ig. — I have an idea, Curiosus. Why not manufacture "ready made" transistors during the drawing stage of the monocrystal? For example, at the start, type P impurities like indium could be introduced in the molten semiconductor. A 'P' zone would be formed and would rise first out of the melt; then N impurities such as arsenic would be inserted to give a type N zone. Next, enough indium would be added to make the acceptors majority carriers, which would produce a new P zone and so on. Finally, a germanium bar would be obtained with P and N zones interleaved. Slicing this bar lengthwise with a P or N zone in the middle would give respectively NPN or PNP transistors respectively. You will admit, Curiosus, that sometimes I come up with the ideas of a genius!



Cur. — What I admire in you, above all, is your modesty! Unfortunately, my friend, your idea is not a novelty. This is called the drawn junction process. This method is not economical because the zones obtained that way are relatively thick. Moreover, with the impurities being added every time, of one kind and then of another, the

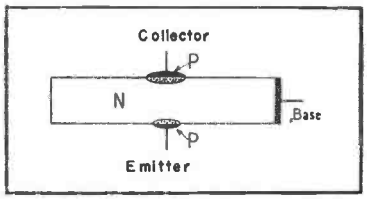
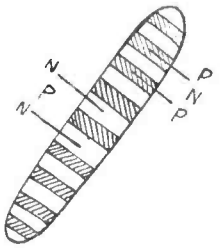


Figure 36: Cut view of PNP alloy transistor.

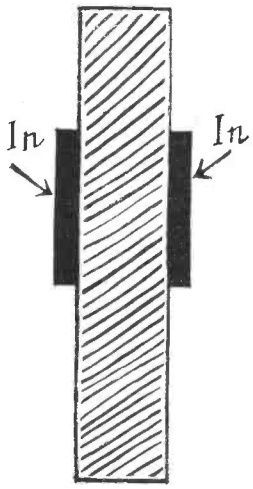


outcome is that the doping increases with successive zones, and that's not so good. Nevertheless, the drawn junction technique is still being used, especially with silicon.

Ig. — Once again, I can see I was born too late . . . let's return to our small wafers and you explain to me how the emitter and the collector are formed.

Alloy Transistors

Cur. — Several processes are used, depending on the type of transistor one is looking for. What is needed is to "dope" the base material with impurities of the opposite kind. The simplest and most common method is to place indium dots on both faces of a type P base and heat them quickly up to approximately 600°C. Indium melts at that temperature and its atoms penetrate the germanium fairly easily because of the resulting increased thermal motion, even though germanium melts only at 940°C. Thus a PNP transistor is obtained. Note that the collector dot is bigger than the emitter because, as we have seen, most power is dissipated in the collector. By a proper combination of temperature and heating time, the impurities penetration is sufficient to reduce the remaining thickness of the base to about one twentieth of a millimeter. The alloy transistors thus obtained are suitable for most applications, except those at high frequencies.



Ig. — You are talking again about those two difficulties represented by semiconductor operation at high power and at high frequencies. Please explain further.

A Diffusion Process

Cur. — Let's begin by considering power. Watts are equivalent to calories. To supply sufficient power at the low voltages used with semi conductors, high currents are required.

Ig. — Obviously, since Power = Voltage × Current.

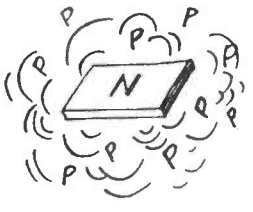
Cur. — Correct. But those currents, while flowing through junctions whose resistance is relatively high, generate some heat. Also, you know how badly semiconductors tolerate a temperature rise.

Ig. — How do we overcome this difficulty?

Cur. — First of all, increase the area of the semiconductor, producing transistors with a bigger surface, thereby reducing their resistance. Then, help the heat escape by mounting the collector on a large metallic plate acting as a heat radiator. For that purpose copper, being an excellent thermal conductor, is recommended.

Ig. — It's beginning to seem as though I will have to study thermodynamics, if I want to understand the subject of transistors thoroughly!

Cur. — Don't panic, Ignotus. The same rules governing current flow in electrical circuits may be applied to heat conduction, with convincing results. But, to come back to power transistors, I should point out they are made by the diffusion process. Semiconductor wafers are brought up to a temperature just below the fusion point in a gaseous atmosphere containing impurity vapours suitable for collector and emitter formation. Impurity atoms diffuse slowly in the semiconductor for several hours. That way, by controlling the impurity dosage and diffusion duration, the depth of foreign atoms penetration can be determined precisely, thereby defining the thickness of the base. Moreover, this process lends itself very well to the wide surfaces of emitter and collector required by power transistors.



Ig. — I see. But then, what prevents transistor operation at high frequencies?

The Two Obstacles

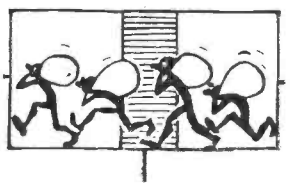
Cur. — Two factors: transit time and capacitance.

Ig. — Transit of what?

Cur. — The crossing of charge carriers through the base from the emitter to the collector. It takes some time, because, as I mentioned before, electrons and holes are travelling at a limited speed. Let's consider the case of the electrons travelling 40 meters per second. Let's assume that a base $1/10$ millimeter thin can be obtained. Then, an electron will need 2.5 microseconds to cross it.

Ig. — A mere trifle.

Cur. — And yet for a signal at 1 megahertz this is too much, as the duration of a complete cycle is only 1 microsecond. This way, while our clumsy electron slowly moves across the base, it would have to change its pace more than twice. So the transistor is not usable at frequencies higher than a few hundred kilohertz.



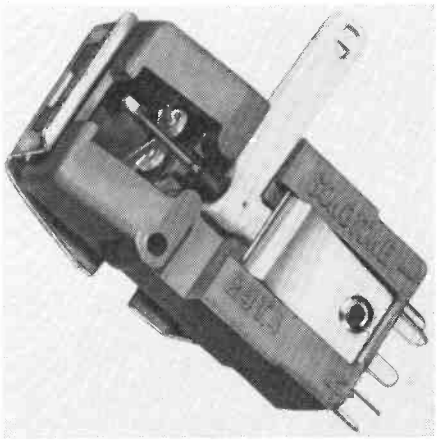
Ig. — Too bad. I can see only one solution: to reduce the base thickness. Is that possible?

to be continued

NEW PRODUCTS

Cartridge

Sonotone's new stereo model 24TA cartridge has the patented Sono-Flex feature and can be flexed 180 degrees. Response is 20 to 15,000 Hz; output voltage 0.28 volt; compliance 3 x 10-6 cm/dyne; separation 25db at 1000 Hz; tracking force 4 to 7 grams; capacitance 4,100 pf. Weight is 3.5 grams and it mounts on standard ½" mounting centres.



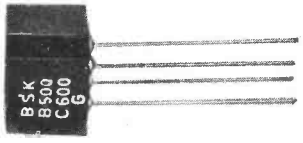
Recommended load is high impedance but can work into a low impedance load with an RC matching network. For further information contact Atlas Radio Corporation, 50 Wingold Avenue, Toronto 19, Ontario.

Circle Handy Card No. 90

Guitar Kit

Ebonized fingerboard with 24¼" scale is a feature of the easily-assembled single cutaway TG-36 "Rocket" model electric guitar kit. Two Harmony golden tone pickups with individually adjustable pole-pieces under each string add emphasis and balance. Harmony type "W" vibrato tailpiece. Size 15¾" x 40½" x 2". Kit $142.00. From Heathkit, 1480 Dundas Highway East, Cooksville, Ontario.

Circle Handy Card No. 91



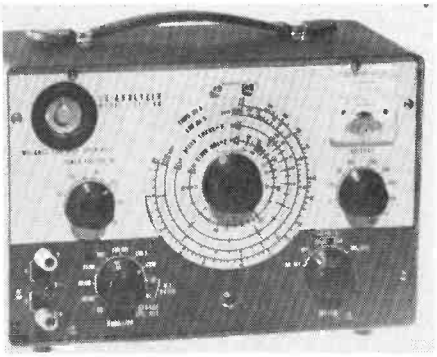
Silicon Rectifiers

Semikron full wave bridge rectifiers in the BSK B..C600 series are rated at 4 amperes and 1000 piv. They are small and particularly suitable for printed circuits. ⅜" high x ½" wide x 7/16" deep. For further information contact Payette Radio Limited, 730 St. James St. West, Montreal 3, Que.

Circle Handy Card No. 92

Capacitance-Resistance Analyzer

The Model TE-46 Capacitance-Resistance Analyzer, is a compact multi-purpose instrument for general laboratory and service work for checking resistors and capacitors. It incorporates a 4-range capacitance and resistance bridge covering 20pF to 2000 microfarads, and 2 ohms to 200 megohms, on a bridge with self-contained power supply



and null indicator of the "magic-eye" type. In addition, power factor over the range O/75% can be measured, as well as leakage of capacitors at 12 voltages ranging from 3 to 600 volts D.C. An unusual feature of the TE-46 is provision for measuring transformer ratios of from 1:1 to 1: 10,000, and transformer impedence ratios of 1:1 to 1: 40,000. The analyzer is housed in an attractive steel cabinet, 193 x 265 x 150mm, weighing only 4 kilograms, and is for operation on 115 volts 60 cycle, consuming 20 watts. The instrument is available from stock. Further information from Canadian Research Institute, 85 Curlew Drive, Don Mills, Ont.

Circle Handy Card No. 93

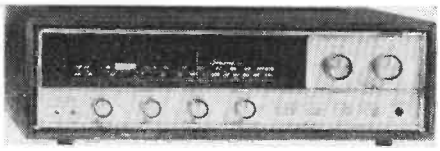
Solid-State Relay

Low-cost completely solid-state relays (no mechanical contacts), produced by Relex Corp., Phoenix, Arizona, are encapsulated, making them shock, vibration, and water resistant. Performance features include the use of low-power ac- or dc- control voltages, to switch 120- or 240-volt ac loads, with load currents ranging from 1 to 40 amps. They provide transient-free operation, with current flow interrupted at the zero current point. These relays are being handled in Canada by Tritronic Industries Ltd., Box 5116, Postal Stn. E., Edmonton, Alberta.

Circle Handy Card No. 94

AM-FM Receiver

Sherwood's Model S-7800 is a 140 watt am-fm receiver using micro-circuits in a new symmetrical differential FM limiter and FM

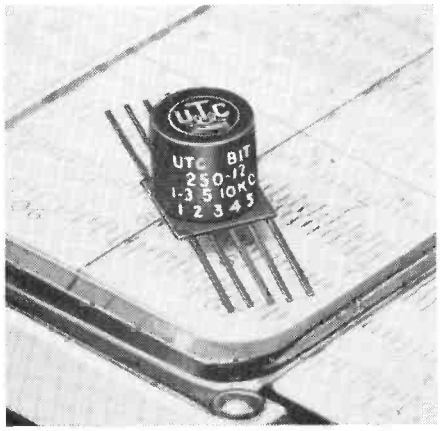


detector. Specifications include 2.0 db capture ratio; 0.15% distortion at 100% modulation; —55db AM rejection; 0.6% harmonic distortion at 140 watts into 4 ohm load; 0.1% IM distortion at normal listening levels. The S-7800 has a three year warranty. Chassis size is 16½" x 14" x 4½". Further information from A. Allen Pringle Ltd., 1027 Yonge St., Toronto 5, Ontario or Electro-Tec Marketers Ltd., 1624 W. 3rd Ave., Vancouver 9, B.C.

Circle Handy Card No. 95

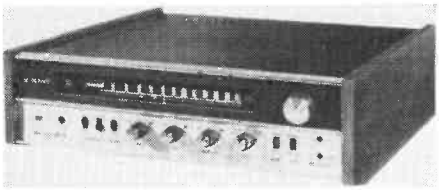
Ultraminiature Transistor Transformers

United Transformer Company announces the availability of a new line of ultraminiature transistor transformers and inductors. The BIT-250 line are the smallest metal encased transformers available. The line contains 17 stock units and characteristics and range of parameters are: Primary Impedance, 150 ohms to 25,000 ohms center tapped; Secondary Impedance; 3 ohms to 10,000 ohms; Power Level, 45 to 80 milliwatts; Frequency Range ± 2 db; 300 hertz to 250,000 hertz; Size, .250" high x .250"



diameter; Weight, 1.1 grams; special custom-designed BIT-250's not found in the stock line are available to customer's requirements. Further information from A.C. Simmonds and Sons Ltd, 285 Yorkland Blvd, Agincourt, Ont.

Circle Handy Card No. 96



FM Stereo Receiver

The new Scott HHS-20 has the following specifications:

Music power rating at 0.8% harmonic distortion, at 4 ohms loads, 40 watts; frequency response: (Hz) ± 1 dB, 18-25K; power bandwidth: (Hz) 30-20K; hum and noise: (phono) (dB) —55; cross modulation rejection; (dB) 80; usable sensitivity: (uV), 2.3; Selectivity: (dB), 40; Capture Ratio: dB), 3; Signal to Noise Ratio: (dB), 60; Dimensions: 17½" W x 5½" H x 15¼" D. For further information contact Atlas Radio Corporation, 50 Wingold Avenue, Toronto 19, Ontario.

Circle Handy Card No. 97

Pocket VHF Receiver

Hallicrafters' model CRX-101 is a small pocket receiver which operates from a 9v transistor battery and has a built in antenna. It covers 108-135 MHz and covers business and private aircraft frequencies, ILS, beacons, radar GCA intercom, unicom and omni. RF stage; 3 IF stages; an output power of 150 milliwatts from a 15 microvolt signal; two controls-on/off/volume and tuning; noise

limiter. Size 6" x 2¾" x 1⅝" and weight approx 1 pound. Price $48.50. Further information from E.S. Gould Sales Co. Ltd., 11 Louvain St. West, Montreal, Que.

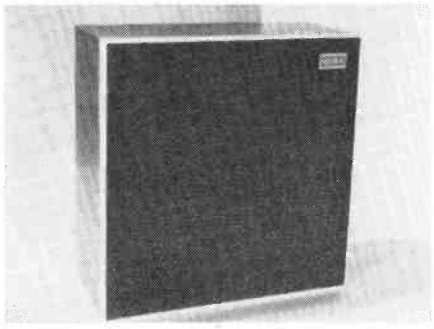
Circle Handy Card No. 98

AUDIO SHOP TALK

DAVE WILSON

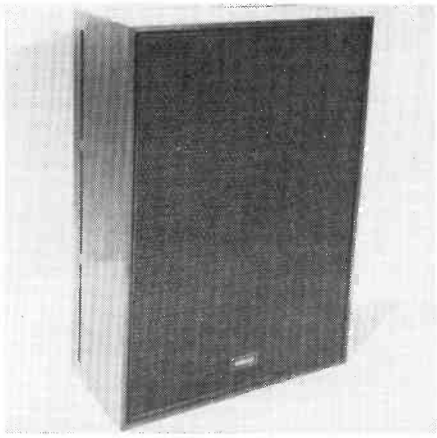
In the past, although I've had a pretty healthy respect for most Japaneses high fidelity products, Japanese loudspeakers have always left me cold. All the ones I was exposed to sounded rough and lacked the consistency stereo reproduction demands. In short, i was pretty negative about Japanese loudspeakers. In the last two months all that has changed. I've heard a couple that really get up and go!

First was the new Sony Model SS-103. This little box — 16½" x 16½" x 7½" — has remarkable bass, smooth midrange and a fair top end, all for



less than $50.00 per copy. What's more, it seems to be consistent, sample for sample, so that it produces good stereo.

The other interesting one is the Yamaha model NS-15. This unit is one of the three new speakers this giant organization has just put on the market, all of which employ a new (to me) type of woofer, made of polystyrene, rigidly mounted around a non-circular periphery. The shape of these woofers is much the same as a grand piano viewed from above, and, according to the literature, the design is based on similar concepts. Yamaha has gained wide acceptance in the musical instrument business (they are the largest piano maker in the world) with this speaker in their electric guitar amplifier/speakers and electric organs, so it's not a new untried principle. The model NS-15 measures 16½" x 23¼" x only 7½ deep, so occupies little space. But the sound is something else again. At under $150.00 each, it will give some



of the U.S. originated imports a run for the money at twice the price. Enough said.

Question: Why are most of the loudspeakers used with automobile radios oval? What units do you think do the best job?

Answer: They're oval because the space in the dashboard is usually more limited from front to back than from side to side. As far as which units give best results, I don't really know. I had a great big heavy oval unit I took out of an old RCA broadcast monitor receiver once, and it worked fine, but I've never been able to find another. A lot of people I know think the Marsland Princess 6x9 is the best and I have no reason to doubt them. Tried a Bozak eight inch wide range in an enclosure that took up all the space behind the rear seat of a Volkswagen once, and the results were fabulous, although I understand the man's wife left him. Maybe some readers have had some good (or bad) experiences you could let us hear about.

Question: Do you believe hearing can be damaged by the the loud sounds being played by the bands currently popular with teen-agers?

Answer: I am absolutely convinced that serious hearing impairment is taking place regularly. We hope to publish more specific data soon.

Question: I want to hook up two eight ohm speakers to each channel of my transistor amplifier. Its output is specified as eight ohms only and the power output is cut in half if I connect a four ohm or sixteen ohm load. Is there any way I can hook this up without losing half of the power?

Answer: Altec Lansing make a matching transformer model 15067, with power handling capacity of over 50 watts and a loss of less than half a decibel. It will give you a wide range of impedance ratios including the one you need, namely, two to one.

Question: Why does it always seem to take so long for Canadian distributors to get the new models in stock? Is it, as I suspect, that they are trying to get rid of old stock first?

Answer: There are many reasons. Sometimes your suspicions are the reason, but more often than not, it is because of the necessity for CSA (Canadian Standards Association) approval. This often isn't taken into consideration by foreign manufacturers, and the Canadian importer is then faced with the costly and time consuming process of getting the approval before he can sell the product in economically feasible quantities. You can be glad of this, in fact, because CSA is probably the strictest testing organization in the world. It is so well accepted now that claiming for fire damage can be difficult if the fire can be shown to have been started by a non-CSA-approved appliance.

Another problem is that many U.S. manufacturers tend to forget all about the Canadian market until the entire first production run is sold to domestic (U.S.) customers. Canada often gets classed as "foreign" — because export papers have to be completed before shipment — and the engineering department says: "ah, well, we'll worry about the modifications needed for the foreign markets on the second run." Result: delay in getting the thing into your local high fidelity house.

So be patient, and have a heart. Your friendly local dealer is probably even more frustrated by it all than you are.

RECORD COLOR TV SALES

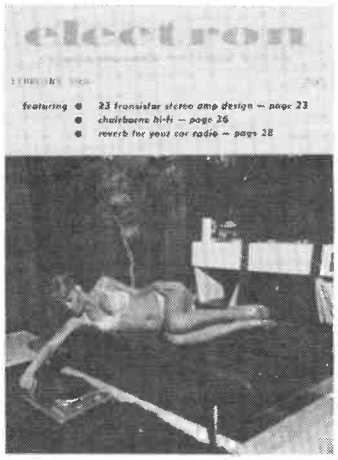
Color TV sales were running at an unprecedented clip during the first quarter of the year. Sales are up 68.8 percent compared with the same period in 1967, reports the Electronic Industries Association of Canada.

"Set makers are now bracing themselves for this same momentum to carry on right through the first half of this year", says an industry spokesman.

Some 220,000 color TV sets were in operation in Canada on January 1. During 1967 a total of 120,000 color TV sets were sold.

LETTERS

That Cover — Again!



Dear Sir,
As an electronic nut and a pretty girl watcher, I appreciated your Feb. cover, but your April letters column was too much. No choice of words can convey my sympathy for these poor 'sick' people. However, all is not lost! I have forwarded copies of this page to my M. P., John Addison, and to the Postmaster General requesting a full investigation as I believe these people are tampering with the mail or stealing from it.
Our official censors do enough harm without a group of self-appointed do-gooders infringing on the rights of the individual.

R. G. Blacklock
Gormley, Ontario

Dear Sir:
Somehow I missed getting February's edition of *electron*. Please accept the enclosed 50¢ and send me a copy. May I add that I want it not for the allegedly 'pornographic cover', but for the Transistor course. I had not realised that there were so many puritanical prudes left in Canada!

Norman Riggs
Powell River, B.C.

Dear Sir,
. . . I hope those who found themselves so shocked stay out of art galleries, and more emphatically, away from the beaches this summer. Otherwise, we'll have a nation of nervous wrecks by Fall. Hang the covers, just keep up the good work inside .

A. R. Cory
Windsor, Ontario

Dear Sir,
. . .Besides, the covers added life, color, and form to *electron* and we all know that electronics must be dry and boring.

H. Morrill
Mallaig, Alberta

Dear Sir,
I was sorry to see you castigated for your February cover. I think it was mainly because you were easy to hit out at. One has only to walk past any number of movie theatres to see pictures of scantily clad girls . . .
When you think of people cutting the cover from or hiding one magazine, so the kids won't see it, it seems pretty ridiculous!

R. C. Beasley
New Westminster, B. C.

Dear Sir,
. . . . Demoralizing young Canadians — RUBBISH !!! Have these "poor dear pure untainted little darlings" (who must be all of 16-18 years of age) never seen some of the television commercials, or looked at a catalogue where bras, girdles, swim suits are illustrated, never read Star Weekly or any of the Home Journals, or local paper? Believe it or not people these same so-called DISGRACEFUL pictures appear in them all! . . . I enjoy your magazine very much, please continue the good work with an occasional modern advertisement. It shows you are modern and keeping up with the young and young modern ideas, not mid-victorian as some subscribers appear to be.
Note to Ursuline College: In this country it is a federal offense to tamper with mail (respectable girls boarding school or not.) addressed to a said person! therefore I strongly suggest that said girl receive the continuing issues of *electron* regardless of cover feature or contents.

Mrs. David W. Green
Winston, Alberta

Dear Sir,
Congratulations on your ingenuity, What an excellent ploy to arouse reader interest and response. I'm making reference of course, to the seven letters appearing on pages 36 & 37 of your April 1968 issue, written in the idiom and at a level of development and understanding from which we thankfully evolved around the turn of the century. . .
May I suggest that in the future you exercise your editorial perogative and print only real letters from real people. People who read your magazine are for the most part very real people who, while I hesitate to generalize, are probably of higher than average intelligence and are ready, willing and able, to give full recognizance to the factual world in which we live.

John Wellington
Winnipeg, Man.

Dear Sir,
I was surprised to read so many bitter denunciations of your February cover. Some of the writers even seemed to imply you were leading a conspiracy to corrupt the youth of this country.
I did not particularly *enjoy* your cover. and it did strike me as a big change from your usual subjects; but I did not find it any more objectionable or unacceptable than many things which would be reformers apparently take in their stride. In fact, I found it more acceptable than some of those things. .

Carolyn Long,
Montreal, 25.

Dear Sir,
Cheers for your Feb. cover. Hats off for your April cover too.
Anyone who can provide a little loveliness in this head scratching, frustrating, hair pulling trade deserves a few bouquets, not bricks.
I noticed 6 of the 8 brick letters were from southern Ont. — that figures! For 14 years I've pulled tubes and twisted screws, as far east, west, north and south as you can go, in this most wonderful country of ours.
At least 6 out of 8 backward old fogies and better-than-thou stuffed shirts, come from, or are in, southern Ont. They obviously have one foot in the last century — why don't they move the other one back there too!. .
Anyhow, keep up the good work — I enjoy reading the Canadian viewpoint on things .

M. V. Taft
Sault St. Marie, Ont.

Dear **Sir,**
I have been buying *electron* since its first issue several years ago. At first I did so merely because it was a "Canadian" magazine, but now it certainly rates with the most popular electronics publications from the States.
However I feel there is one minor drawback about your magazine, that is the narrow-mindedness of some of your subscribers. . . . I might also point out to these people, who can probably find something pornographic anywhere, that on page thirty-four of your April issue, there is a picture of two men holding hands — isn't that disgusting! . .

Edward Dylan
Beaconsfield, Que.

Dear **Sir,**
I was shocked to find out from protests printed in April *electron* that you fellows have published a "dirty" cover . . . As an electronics enthusiast and a ham I am far more concerned with what is inside of your magazine, and find the material highly interesting and informative. Keep up the good work.

T. Mochoruk, VE7BWP,
Prince George, B.C.

Dear Sir,
I can see nothing wrong with your February cover. It was certainly more interesting to look at than a bunch of tubes. May I suggest a Miss Electron of the Month.

Doug Hill,
N. Vancouver, B. C.

Dear **Sir,**
Concerning " Letters" in your April edition; I would like to express my disgust for the readers who wrote concerning the February cover. I feel the quality of a magazine is expressed through its contents, not its cover, and any readers who are so concerned with the cover of this issue are not as interested in electronics as they claim to be.
I also feel that anyone who thinks that a photograph of this type is pornographic, obscene, disgraceful, or demoralizing is ignorant and narrowminded. . .

R. J. Savlov
Toronto, Ontario

Dear Sir,
. . . I don't know whether I'm most annoyed at the priggish prudes and prunes who wrote to protest because a woman wearing a bathing suit appeared on your magazine cover — or is it the editor that I should direct my criticism at for printing such narrow minded nonsense.
There are people, unfortunately, who would write letters protesting the second coming of the Lord if they objected to the manner in which He was attired . . . In a sense I admire you for publishing the letters without making any editorial comment which shows commendable restraint. I suppose once you start answering idiots you are embarking on an educational program beyond the scope or intent of your publication. .

J. W. Percival
Winnipeg, Man.

Dear Sir,
After reading the "Letters" in the April issue regarding the February cover, I could not help but wonder the complete narrow minded thinking of people in this modern age . . . A great many of my friends and associates who have seen this cover could only comment favorably and express appreciation of a beautiful girl on the front cover of a normally strictly technical magazine. Perhaps this departure was too much for some people.
Regardless, this is a fine electronic magazine which we find very helpful to us. Keep up the good work.

George Clare
Vancouver 15, B. C.

Dear Sir

Regarding *electron's* February cover and the letters of protest printed in your April issue, I am writing on behalf of those people who had no objections.

I am sure that the greater majority of people, including myself, remained quite calm about the photograph and, hence, were not motivated to write, simply to tell you they did not object. Consequently, the only comments you could have received were from those few people, who, for some reason, were disturbed and objected.

The point I would like to make is that we are a democracy where, in theory, the majority rules, yet, because the majority of people don't voice their opinions, we are dominated by a small minority whose ideas are not necessarily right. A good example of this was prohibition.

I trust that you will take this into consideration when choosing the covers and contents of your fine magazine.

John G. Desmarais
Brockville, Ont

Dear Sir:

In view of the one-sided reaction to your February cover, perhaps a few comments are in order. The late J. B. McGeachy once remarked that "lewd material does not create libertines", and this is a thesis that I support. It seems rather unlikely that one such picture could "demoralize" anyone. In addition, the loaded words "pornographic picture" are quite open to individual interpretation; with the amount of similar material appearing in more widely circulated newspaper supplements, on television, and elsewhere, one is liable to become somewhat immune to "pornography" of this kind.

Nevertheless, it must be conceeded that pretty girls have little to do with electronics, and are therefore expendable...

R. J. Robinson,
Montreal, 9.

Dear Sir:

The utter nonsense displayed in the letters column of the April issue reflect all the Victorian prudery still latent in too many Canadians. The covers on the November 1967, February 1968 and April 1968 issues of *electron* have my unqualified approval. Please do not apologize for or discontinue your policy of choosing interesting and imaginative articles *and* covers. Electronics is highly esoteric and any attempt to popularize the field all too rare...

Gordon H. Kushner
Saskatoon, Sask.

Dear Sir:

By now you are probably wondering what you've gotten yourselves into with that February cover. I, too, was completely shocked, not by the cover, but by the flood of letters condemning it that appeared in the April issue. It is indeed difficult to believe that there are still so many people who think this way; the opinions they express would have been at home in the darkest days of the Victorian area. . .

K. R. Thomas,
Sackville, N.B.

We have now published letters representing, both in quantity and range, the views of readers on what has turned out to be our most controversial cover.

The letters above leave us with little to say. We're not a bit sorry about our February cover — in fact we rather liked it. Neither do we believe that it is a breach of presently accepted standards of decency. We're not surprised that it didn't appeal to some readers: it is ancient wisdom that "he that publishes a book runs a very great hazard, since nothing can be more impossible than to compose one that may secure the approbation of every reader". We do not expect to do the impossible.

Unfortunately space will not allow us to publish further letters on this subject.

sw lingo

FRED WOODLEY VE3-9301

A few weeks ago we received a letter from a reader who started large scale TV DXing as a direct result of a column we published last year on VHF-UHF DXer Wayne Plunkett in Toronto. We feel this young man has shown so much DX know-how in the year that has elapsed that he deserves a column on his own DXing exploits. So . . . meet Mark Lewis, 224 Honiton St., Downsview, Ontario . . . TV DXer extraordinaire!

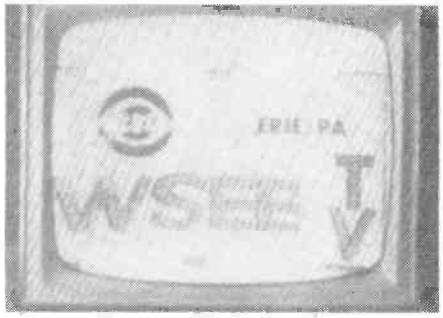
Mark is a high-school student, interested in electronics and radio DXing, as well as the TV DX hobby. His first interest, as with so many of us, was the short-wave broadcast bands, followed by an interest in TV DXing two summers ago. As a result of our column last year, Mark contacted Wayne Plunkett, and it seems as if Wayne convinced him that TV DXing was the 'only' real DXing. Last summer Mark installed a new antenna system with both color reception and DXing in mind, and from the results he has had, it might serve as a guide for anyone else thinking of new TV systems this summer.

The antennas break down like this: a Channel Master 22-element Crossfire color head, mounted on a roof mast at 65 feet fed to a Delta Splitter (to provide feeds to both the living room and Mark's bedroom) for VHF, and a Jerrold Jup-4 Cylindrical parabolic feeding a Blonder Tongue Splitter on UHF. The Jup-4 is approx. 6′ by 3′ and is mounted above the VHF antenna on the mast. Both are rotated by a Channel Master Automatic rotator, and both feeds are foam lead (300 ohm). Mark uses a 19″ Philco portable and the family color set, a Clairtone 25″ with built-in UHF tuner. A new 40 foot tower was recently installed replacing the earlier roof mount, and signals seem to be stronger, despite the loss of height.

Mark has been concentrating on UHF DX since the above was installed, but also does a little VHF TV DX as well. In his own words . . . "On VHF, my luck hasn't been too bad. Although I have not dethroned Canada's champ, Wayne Plunkett, my results are quite good". UHF is another story, though, and I'm afraid that Wayne, old friend that he is, is going to have to take a back seat to Mark's accomplishments in 12 short months. As this article is being written, Mark has logged a total of 27 different UHF stations. Just fantastic! Many of them have been received well enough that their signals are coming in with full color, a most unusual situation for UHF DXers, and an indication of just how well Mark's gear is pulling them in. The list of loggings reads like this:

WICA-15-Ashtabula, Ohio
WNEP-16-Scranton, Pa.
WNED-17-Buffalo, NY
WJAN-17-Canton, Ohio
WFAM-18-Lafayette, Ind.
WSYE-18-Elmira, NY
WXXI-21-Rochester, NY
WFJM-21-Youngstown, Ohio
WDAU-22-Scranton, Pa.
WAKR-23-Akron, Ohio
WCNY-24-Syracuse, NY
WDHO-24-Toledo, Ohio
WJET-24-Erie, Pa.
WKNX-25-Saginaw, Mich.
WVIZ-25-Cleveland, Ohio
WNYP-26-Jamestown, NY
WKBN-27-Youngstown, Ohio
WBRE-28-Wilkes-Barre, Pa
WYTV-33-Youngstown, Ohio
WBJA-34-Binghampton, NY
WIMA-35-Lima, Ohio
WINR-40-Binghampton, NY
WLBC-49-Muncie, Ind.
WKBD-50-Detroit, Mich.
WQLN-54-Erie, Pa.
WTVS-56-Detroit, Mich.

Continued overleaf



and . . .

WSEE-35-Erie, Pa.

I think you will agree that this is a most impressive list and Mark has proven he has the knack for UHF TV DXing. WLBC on Ch. 49, in Muncie, Indiana has got to be Mark's best catch to date. They run only 142 kw to a 500 foot tower and this is the only reception report that they have received from Canada, and they began broadcasting back in May of 1953. A similar story came back from WJAN on 17 in Canton, Ohio . . . Mark's was the first Canadian report they had ever received also. Word from WNED, Buffalo, on Ch. 17 is that this 150 kw station is negotiating to move their transmitter and increase power to over 1,000,000 watts ERP, providing the CRTC and FCC authorize it. If this all comes off, it will provide an opportunity for many Ontario UHF DXers to get a logging on them.

Radio Canada recently did a program on Mark's achievements. It was also carried by the CBC in German and Mark is being flooded by a pile of mail from Germany as a result. If any *electron* readers in the Toronto area who are fluent in German, care to contact Mark, I'm certain that he'd be grateful for any assistance with this mail!! He is also interested in hearing from any English-speaking TV DXers. Contact him at the address given above.

As one final note, Mark passes along a reminder on taking photo verifications from your TV set. This is a point that has been made many times before, but someone always forgets and spoils all their efforts. NEVER USE A FLASH to take photos or station identifications as they appear on your screen. The flash will be reflected back into the camera, and you'll end up with either a blank screen or a hot white spot just where the call letters should be. The best bet is to darken the room, position yourself 4 or 5 feet from the set, and work with the light from the screen. Mark and a friend are now working on a method of predicting best conditions for UHF TV DX, approx 2-3 days in advance and he has promised to share this news with us when it is perfected.

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6AU6A
6AV6
6AX4GTB
6BA6
6BE6
6BF6
6BZ6
6C4
6CB6A
6CG7
6CS6
6DE6
6DK6
6DT6A
6FQ7
6S4
6X4
6X5GT
7AU7
8CG7
8FQ7
12AL5
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1J3
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3BC5
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3CS6
3DK6
3V4
4AU6
4AV6
4BC5
4CB6
4CS6
4CY5
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12AD6
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12AT7
12AX4GTB
12AX7A
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4BN6
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4BS8
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4BZ7
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4EW6
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5T8
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6AK5
6AU5GT
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6AV5
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6BG6GA
6BH8
6BL7GTA
6BQ6GTB
6BX7GT
6BZ8
6CD6GA
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6CN7
6CQ8
6CU8
6CX8
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6DJ8
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6ET7
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6FS5
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6LC8
6L6
6LM8
6LQ8
6LU8
6SA7GT
6SK7GT
6T4
6U10
6Z10
8AW8A
10EG7
10EW7
11CY7
11JE8
11KV8
12AF3
12AU11
12AY7A
12BQ6GTB
12BZ7
12DL8
12DQ6B
12DS7
12FX8
12GE5
12J8
12SA7GT
12SK7GT
12SQ7GT
13DR7
13EM7
13GF7
13J10
13Z10
15KY8
17BF11
17C9
17DQ6B
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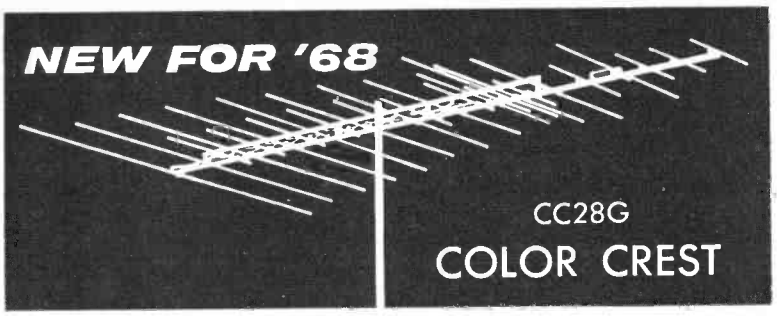

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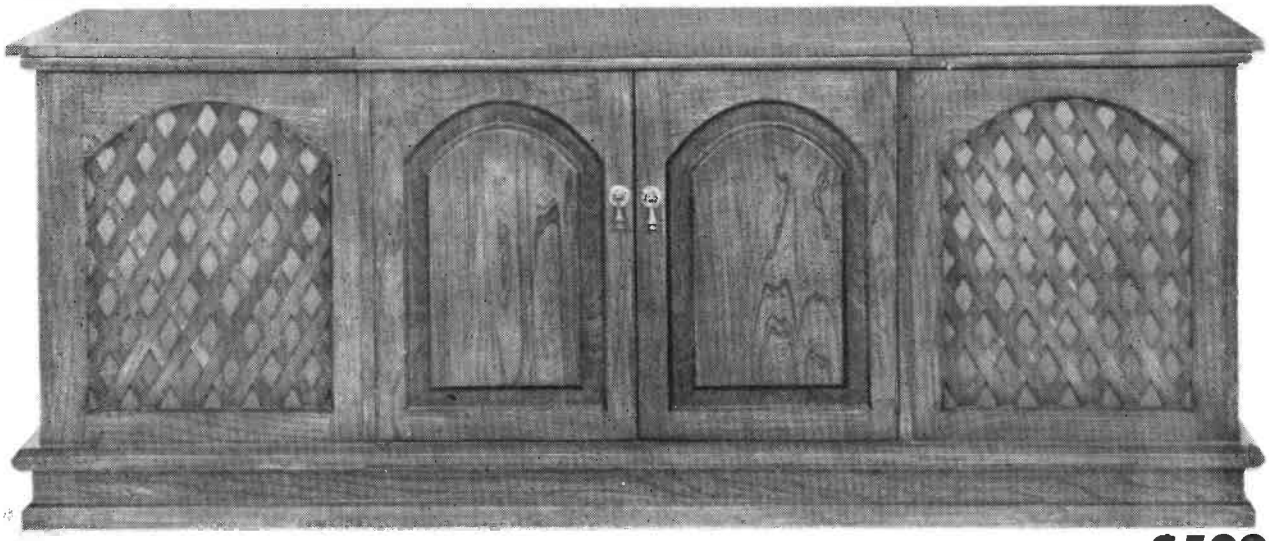

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VE.....

Comment on the
Canadian amateur radio scene.

Ernie Welling, VE2YU

Licence Fees

Official news of the increase in fees came just too late for our May column although there were rumours floating around. What we heard rumoured was just plain ridiculous — after all, who would have believed us? Would any right-minded politician, even if he was embroiled in a leadership contest, endorse such a massive increase in a so-called nominal licence fee? Would a Minister run the risk of permanently changing the attitude of an important group of licencees towards his Department — a group who traditionally have made the least demand on that Department's services — for a few thousand dollars? We ignored the rumours. Well, we have to believe them now. Apparently in Ottawa nothing matters but the money. Never mind the bruises — collect, collect, and make a speech now and then about restraint and holding the line.

The increase in the amateur licence fee from $2.50 to $10.00 (with a $6.00 charge for changes) is an outrage. It has been forced on the licencees without consultation; it is visited upon a group who are not using radio for profit or reward; it penalizes a large number of non-wage earners; it will seriously affect the growth of the hobby among the young, where the country needs it most, and it does not correspond to any increase in services by the Department of Transport. We will obviously have to stop thinking of this as a licence fee because what we now have on our hands is a tax — "a contribution levied for support of the government."

We've got it now — it's law, — but it doesn't have to remain so. A couple of months ago in this column we said that "taxes are burdens from which any energetic citizen is entitled to free himself — if he can." Here's a fine opportunity to see if we can before this tax solidifies into a nasty precedent. Already groups and individuals are making angry noises. ARRL Canadian Division officials and representatives of the Radio Society of Ontario and Radio Amateur du Quebec have already visited Ottawa and lodged a complaint with DOT officials. The Department claims it can do nothing now without Cabinet approval. These three bodies are therefore preparing briefs to be submitted to the Minister of Transport. Obviously, the more complaints the better and it is to be hoped that every amateur radio organization will take part. **Make your feelings known.** If you haven't a club or group write the Minister in your most impressive capacity — Mr. Voter. Hold on to a copy of your letter until after June 25 and then send it to your new MP.

Some amateurs have already gone it alone. An example is this letter to Prime Minister Trudeau, sent in late April by VE3DJE;

"How can a 'Just Society for Canada' be realized?

The first step, it seems to me, is to make right any injustices already in existence.

An example of one injustice occurring in recent weeks, is the increase in the annual licence fee for the Amateur Experimental Station from $2.50 to $10.00. This represents a 400% increase to all kinds of radio amateurs; such as high-school students, blind operators, members of Amateur Radio Emergency Corps, old-age pensioners and War Veterans and many others who perform valuable services for their country. From many examples of such services, I would like to mention two: (1) During a time of war, radio amateurs form the nucleus of trained instructors in electronics for communications and other services required by the Military; (2) Examples occur daily where radio amateurs relay messages from Canadians stationed in remote Arctic outposts to other Canadians in different parts of Canada, where no other form of rapid communication is available.

I suggest that such an austerity program on the part of the Canadian Government directed against the Amateur Experimental Station is an injustice and that his service to Canada be recognized by a complete removal of all licence fees rather than to the present 400% increase. I respectfully request that order in council SOR/68-109-110 be amended accordingly."

Amen.

Novice Licence for G's

Britain's Postmaster-General made a surprise announcement in the House of Commons on March 11th. In reply to another matter he added, "I have also decided to introduce a Beginner's Licence to encourage interest in radio by people not yet possessing the qualifications needed for a full Amateur licence. The details are still being worked out, but I expect to have it on issue by the Autumn of this year".

Everyone will be anxious to see just how novice licencing is to be handled in the UK. Perhaps its introduction in the old country is the stamp of approval needed to persuade Canadian authorities to get moving on this long-needed change to our regulations.

Technical Book Service

From time to time *electron* reviews technical books of interest to electronics hobbyists and technicians. As a service to readers, we will handle orders for any of the books we review by rerouting the order to a suitable supplier. Orders should be accompanied by a cheque or money order with postage included.

Power Supplies for Electronic Equipment by Leo G. Sands. Published by John F. Rider, Publisher Inc. 187 pages. Paperback. Price $4.70

It's always refreshing to find a technical book which is not only very readable, but packed with information of great practical value. Mr. Sands has taken the vast and often complex subject of electronic power supplies and presented them in a clear, profusely illustrated text which is a welcome addition to any technical library.

All aspects have been covered, ranging from a detailed discussion of batteries on through the entire gamut of vacuum tubes and solid state supplies. Other chapters are devoted to dynamotors, inverters, A. C. and D. C. generators, regulators and also railroad, automotive and utility power systems which seem to receive very little coverage in other texts.

Mathematics is kept to a minimum, with much more emphasis placed on graphs, charts and schematics, (all well explained in the text), as well as many references to well-known commercial equipment. The book should appeal to almost any technical person from the radio servicing trainee to the commercial or military technician, and on up to the design engineer.

Circuit Problems and Solutions by Gerard Lippin. Published by Hayden Book Co., Inc., New York. 190 pages. Paperback. $4.35

As its title might suggest, this book is devoted to mathematics associated with modern electronics. Author Gerard Lippin has gathered a wide selection of basic electrical laws, theorems and formulas and presented them in a highly practical manner.

Each section of this profusely illustrated book covers one phase of basic electronic theory, such as Ohm's Law, Series- Parallel Circuits, R-L-C Circuits, Magnetism, etc. A brief explanation of the theory is given first, followed by a number of problems and their solutions. At least several are presented, ranging from simple one step problems to more complex ones, which guide the reader through a carefully planned progression of ideas and methods. Altogether, nearly 300 such problems have been incorporated in the text.

Other complete chapters are assigned to meters, resonant circuits, and trigonometry, plus an appendix containing conversion factors, wire tables, trigonometrical ratios and four-place logarithms.

The book is intended primarily for use by technicians or students at the technical school or junior college level, and to be used in conjunction with regular text books. However, it is also valuable as a handy day-to-day reference book and as a quick refresher for basic theories which are all too soon forgotten unless in constant use.

Ideas in Exile — A History of Canadian Invention by J. J. Brown. Published by McClelland and Stewart Limited, Toronto. 372 pages. Hardback. $15.00.

Books that fill the proverbial 'long felt want' do not come along too often. You probably won't feel that you've wanted *Ideas in Exile* until you've dipped into it a little. Then perhaps some of those random thoughts and misunderstandings about Canadian technology will come into focus and you'll find it a fascinating story, packed with information.

Dr. Brown's considerable achievement is twofold. First he has researched, interviewed, collected, reported and written on every important Canadian invention up to the present time. Second, he has provided a forthright and often amusing commentary on the timid and the stupid who have turned Canadian invention into "a melancholy procession of golden opportunities which we have let slip through our fingers". This is not a casual conclusion; it is arrived at with extensive documentation and a tremendous amount of detail.

Our history in electronics and communications begins with "Canada's greatest inventor", Alexander Graham Bell, and gradually merges with other technologies until, in our own time, the fate of projects like the Arrow interceptor aircraft and the HARP gun-fired missile have had a significant effect on our electronics industry. We were pleased to see Fessenden, whose story was related in *electron* in July 1967, included in this history although unfortunately lacking the prominence we feel he deserves. One of the difficulties in dealing with Canadian inventors is highlighted by the author's doubts as to whether Fessenden, who was educated in Canada, should be in a history of Canadian invention because "there is no evidence that any of his inventions were conceived when he was living in Canada" (p. 185). Elsewhere (p. 4) his "working definition of 'a Canadian invention' is that *either* the inventor was educated here *or* the basic concept of the invention came to him while he was living in Canada" (italics ours).

This book is strongly recommended to anyone with the slightest interest in Canadian achievement. It is highly readable and will, we hope, find its way into the hands of many high school and university students. A more popular form of some of the contents has been published as *The Inventors: Great Ideas in Canadian Enterprise*, a volume in the Canadian Illustrated Library series. *(E.W.)*

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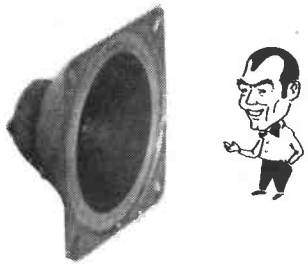

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Beam *(Cont'd from p. 25)*

with large hose clamps, and the discs sealed to the metal pipe with waterproof cement.

The assembly is then fastened to the boom adjacent to the driven element, using clamps made from light aluminum strapping. The gamma rod is made from small diameter tubing, with one end flattened and a hole drilled in it to attach to the feed-through bolt in the disc. The other end is attached to the driven element by an adjustable clamp which can be slid along the element and also along the rod.

Adjustment

When the coax is attached, the beam should be raised at least 10 feet above ground for initial tune-up. It's well worthwhile at this point to temporarily connect the control cable to the other selsyn in the shack. This will enable the gamma match to be adjusted remotely. For those not familiar with selsyns, when they are connected as shown in Figure 5, the two shafts will synchronize, and when one shaft is turned, the other one will follow exactly. This of course will also turn the capacitor out on the antenna.

Connect an SWR indicator into the line, and feed a few watts to the antenna. First the gamma capacitor is set to half-mesh, then the rod's sliding clamp is set to a point about 3 feet out along the driven element. Then turn on the transmitter, resonate it, and take an SWR reading. The clamp should be slid along the element until the point of minimum SWR is reached. Then the gamma capacitor should be adjusted to further minimize the SWR. It should be possible to combine these adjustments to produce an SWR of 1:1 at the design frequency. This will change somewhat when the beam is on top of the tower, but the gamma capacitor will be able to compensate for this. Here is where the remote feature comes in; if it were not for this, the SWR would have to go where it wanted to as the transmitter is tuned across the band, but with this gadget the capacitor can be tuned to readjust the SWR whenever it tries to climb. In practice, I find I can control the SWR to a maximum of 1.4:1 across the band, with most of it being down close to 1:1, and all this in my shirtsleeves on a stormy night!

Installation

Getting the beam to the top of the tower is dependent to a large extent on the design of the tower and the facilities available. The method I used was this: two guy wires were installed from the top of the tower to the ground. A light block and tackle was fastened to a piece of pipe on top of the tower. The boom-to-mast plate was removed from the boom and installed on the mast, and two strong shelf brackets were bolted to it. The tackle was attached to the beam, and the center element removed completely. Two small cords were looped over the ends of the boom and the boom was then laid across the guys. The whole affair was then hoisted up, with the antenna sliding very nicely up the guys, and two lads applying just enough tension to the end ropes to prevent the antenna from tilting. When it reached the top of the tower, two other fellows already there slid it onto the shelf brackets and then proceeded to bolt it into place. In an installation of this size, careful preparation ahead of time will make the whole thing go very smoothly and with no strained muscles or injury to anyone. All that is left is to route the feedline and the control cable for the match, leaving sufficient slack to enable the beam to rotate the full 360 degrees plus a few degrees overswing. Finally, feed power into the coax line and readjust the SWR, and all that remains is to call CQ and wait for that first glowing report!

Results

Measurements made on the beam indicate a front-to-back ratio in the order of 35 db., and a front-to-side ratio of about 20 db. Proper facilities for measuring gain were not available but it appears a figure of at least 9 db. would be reasonable. In the first 4 months of operation, 122 countries were worked on 20 meter SSB which proves the performance is quite good.

GRS *(Cont'd from p. 24)*

talk power as compared to the conventional transceiver. Expect to see a trend toward SSB operation. Other future trends will include a switch to the solid state type of transceiver and a wider use of the 19 channel type of solid state transceiver which is just beginning to appear on the Canadian market. Also expect to see more powerful hand-held transceivers introduced.

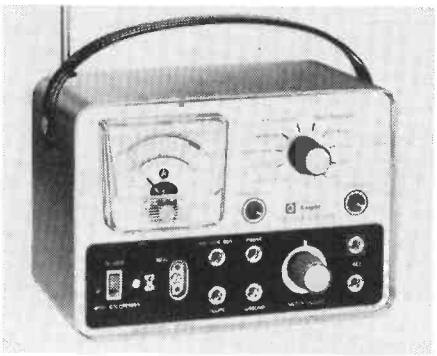
Your Obligations

Lastly, let's take a look at some of the legal aspects of GRS operation. Remember that the DOT requires you to maintain your transmitter within certain frequency limits. Power input must not exceed 5 watts and your antenna structure must adhere to the DOT regulation regarding height. There are also rules and regulations concerning channel use and call sign identification. These are all spelled out in the handy General Radio Service Handbook available from the DOT.

If you erect a tower in an urban area it is wise to protect yourself to some degree against unwitting trespassers. A barrier to prevent children from climbing the tower is desirable. Slipping garden hose over the lower portion of guy wires will give some protection from injury and if painted white will give some warning in the dark. Carrying liability insurance on the tower is also desirable — think of the consequences if the tower came down on your neighbour's roof during an ice storm.

Suggested Reading

1. General Radio Regulations, Parts I and II. Available from the Queen's Printer, Ottawa, Ont.
2. Radio Amateur's Handbook, ARRL Staff. Publisher — American Radio Relay League, Newington, Conn.
3. Citizens Band Radio (Revised), Lytel. Catalog No. 5737 from Charles W. Pointon Ltd., Rexdale, Ont.
4. Citizens Band Radio Handbook, David E. Hicks. Cat. No. CBH-2 Sam's Books. From A. C. Simmonds & Sons Ltd., Agincourt, Ont.
5. CB Radio Antenna Guidebook, David E. Hicks. Cat. No. CAH-1 Sam's Books. From A. C. Simmonds & Sons Ltd., Agincourt, Ont.
6. CB Radio Servicing Guide, Leo G. Sands. Cat. No. CRS-1 Sam's Books. From A. C. Simmonds & Sons Ltd., Agincourt, Ont.



This Knight Ten-2 G. R. S. test set will check out antenna and transmission line, and the modulation index and power output of a transceiver. It is transistorized and fully portable. (Available from Radio Trade Supply, Toronto).

Advertisers Index

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an editorial

For an interesting contrast we recommend two pieces of current literature.

First, there is the outspoken new book, *Ideas in Exile: A History of Canadian Invention,* reviewed on page 40 of this issue. Many conclusions can be drawn from this history of our technology and one of them, backed with impressive evidence, is that we have not been short of good creative ideas but have tended to make a mess of turning them into industrial successes. The result of each failure is to further perpetuate our role as suppliers of raw material and distributors of imported products. And don't forget to include people among the raw material. Dr. Brown, the author, comments at one point that "our leading tax supported industry is the education business, which consists of training young people to the point where their services are valuable to an American corporation."

Second, there is a new and important White Paper called *A Domestic Satellite Communication System for Canada.* It argues clearly and persuasively that Canadian industry should get on with the job. It talks about "the real advantage (of) being amongst the leaders in the field". It understands the brain-drain problem and claims that "programs such as this . . . attract and hold scientists, engineers and others, and cause them to identify their own aims with those of Canada . . .". It quotes a substantial record in satellite technology which has led one U. S. expert to rate this country as number three in space (*electron*, March, p. 43). The White Paper suggests building on this base not only to provide our own system but to improve industry's position in seeking other work of this nature. Considerable advantages could occur all round because there is bound to be side effects that will, in the words of the White Paper, "diffuse advanced technologies into many sectors of Canadian manufacturing industry". It all sounds wonderful.

***Ideas in Exile* concludes that "the story of Canadian invention and technology can be seen as a melancholy procession of golden opportunities which we have let slip through our fingers". Perhaps it's finally going to be different, although White Papers, like dreams, don't always come true. Let's hope that things really have changed and that the Domestic Satellite Communication System isn't going to join the procession.** ■

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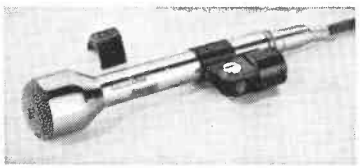

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