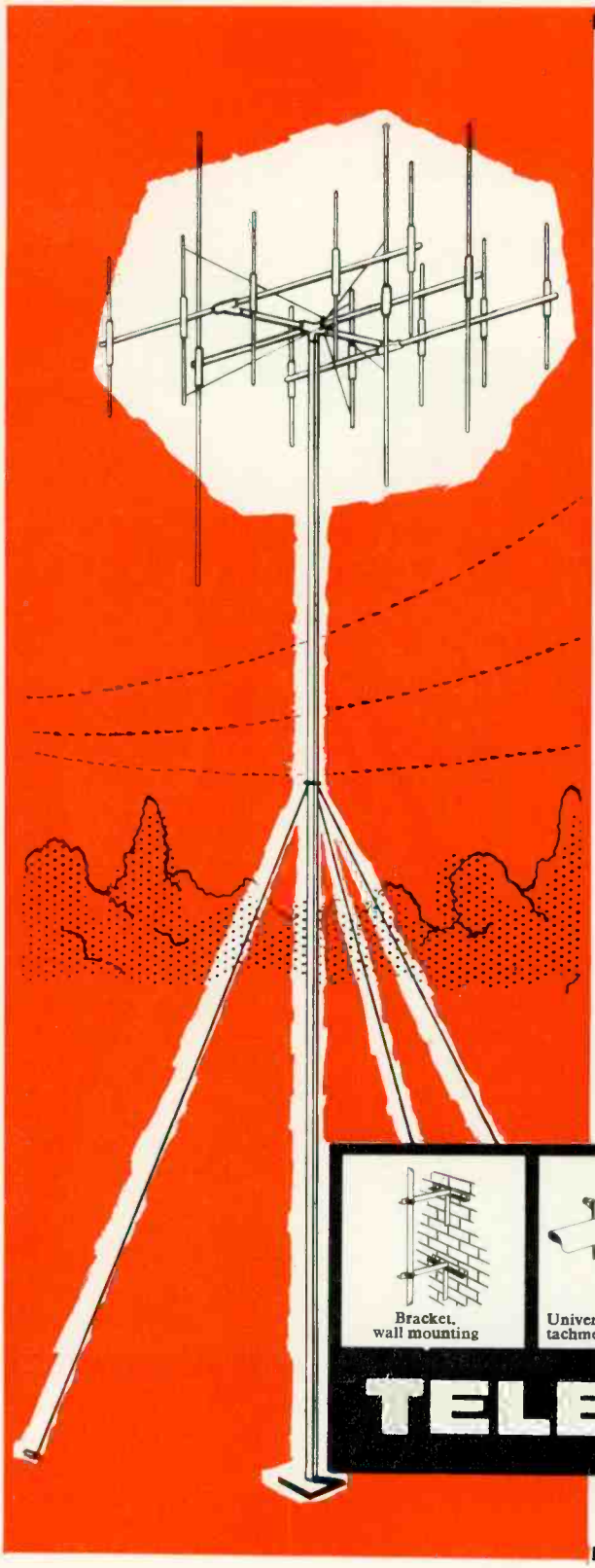
DECEMBER 1960

RADIO Retailing

SERVICE ENGINEER

Radio, Television and Audio Servicing



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Base Plates garden 1½ in. & 2 in.	8	0
Guy Ring Securing 2 in. & 1½ in.	2	0
Guy Strainers	3	6
Pickets Base Plate Securing	1	0
Guy Wire 50 ft. length	10	6
Coupler 2 in.	8	0
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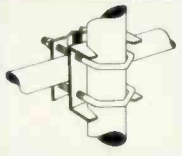
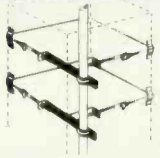
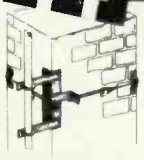


Universal mast attachment unit (dble.)



Lashing Kit L6



Lashing Kit L10

TELERECTION

Telerection Ltd., Antenna Works, Lynch Lane, Weymouth, Dorset. Tel: 2140

SERVICE ENGINEER

Vol 3. No. 8 Dec., 1960

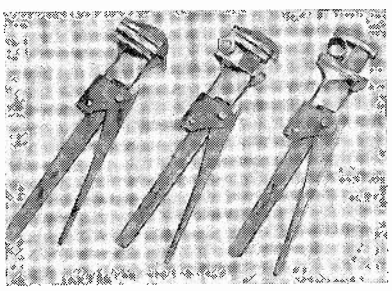
Edited by W. Norman Stevens

Issued as a special supplement with "Radio Retailing"

In this issue:

Bowthorpe Introduce Multi-Purpose Tool

A new multi-purpose tool is now available from Bowthorpe Electric Co. Ltd., Crawley, Sussex. It can be used as a spanner on nuts up to 2 in. in size, as a pipe wrench and as a wire-cutter for wires up to ¼ in. diameter. It is made of chrome vanadium, is 12 in. long and weighs 2½ lb. This new tool should have a wide appeal throughout industry and in particular where heavy work calls for long lasting tools. Price on application.



The new Bowthorpe tool shown used as wire-cutter, spanner and pipe-wrench.

Nashton Extend Range

TRANSISTOR TESTER AND PREFERRED VALUES BOXES

Several new items have been added to the Nashton range, manufactured by Nash and Thompson, Oakcroft Road, Chessington, Surrey. First is the Type T14, lightweight transistor tester which enables the small signal current amplification factor Alpha and the collector-emitter leakage current I'co of p-n-p and n-p-n transistors to be measured quickly and to a reading accuracy of ±5 per cent.

The tester is powered by a small 6V battery and is suitable for germanium junction transistors up to 250mW dissipation. It is also suitable for comparative measurements with silicon junction transistors. Since the gain figures with silicon transistors will be less than actual when tested on this instrument it cannot be used for direct measurements.

The meter has a 3 in. scale length and the three input terminals are spring loaded for easy connection of the transistor leads. A spring loaded push button is depressed for the most sensitive ranges in order to ensure that accidental overloading does not occur. Alpha ranges are 50 and 150 f.s.d., and the I'co ranges are 0·5 and 1·5mA.

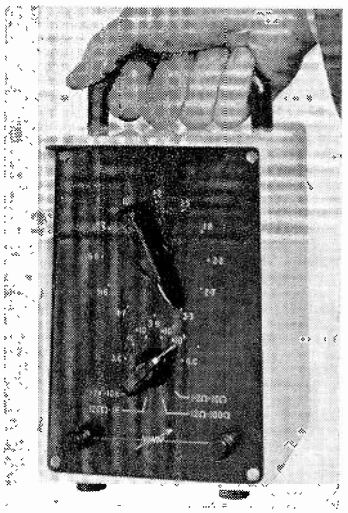
The T14 measures 8×5×5 in. and is housed in a standard Nashton case. Price is £27 5s.

Also released are the preferred values resistance boxes, Types P2 and P3, which provide resistance steps in the preferred values instead of the conventional decade system. The movement of the switch by one position either way will indicate the effect of using the next available resistor, or the circuit parameter changes that may result from a variation in resistor value during life.

Type P2 covers the range of 1·2 to 10k-ohms in all the preferred values (1·2, 1·5, 1·8, 2·2, 2·7, 3·3, 3·9, 4·7, 5·6, 6·8, 8·2, and 10) with range multiples of $\times 1$, $\times 10$, $\times 10^2$, and $\times 10^3$. Type P3 covers the range of 1·2k-ohms to 10 Megohms with range multiples of $\times 10^3$, $\times 10^4$, $\times 10^5$, and $\times 10^6$.

Accuracy is ±5 per cent or 0·5-ohms (whichever is the greater) of value, selected. Maximum dissipation is 1 watt. The standard Nashton case measures 8×5×5 in. and both the Type P2 and P3 cost £9 10s. each.

Also released is a preferred values capacitance box which provides capacitances of all the preferred values between 0·005 and 2μF with an accuracy of ±5 per cent and suitable for 250V working. A switch is incorporated to bring the selected capacitor into circuit or to open circuit the box terminals. Price is £11 10s.

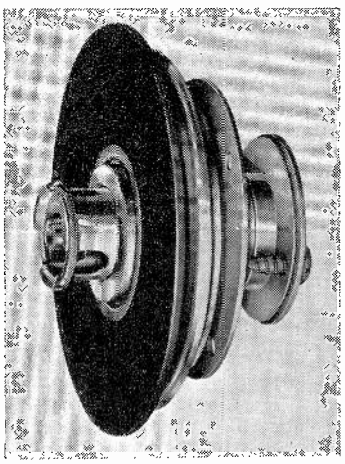


One of the new Nashton preferred values resistance boxes.

NOVEL AERIAL ISOLATOR BY EGEN ELECTRIC

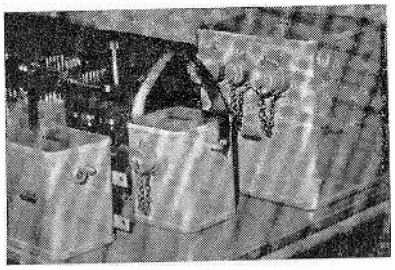
Egen Electric Ltd. have introduced a new aerial isolator Type 364. It provides aerial isolation on a.c.-d.c. TV receivers in a single compact unit which complies with the requirements of BS415. Insertion loss is very low and its electrical specification ensures maximum performance at all frequencies envisaged for domestic receivers.

It is completely coaxial, with full screening of the inner conductor. The series inductance of the feed-through



Egen aerial isolator Type 364.

capacitor in the outer conductor is very low; the feed through capacitance being 470pF in both conductors, tested to 3kV d.c. Provision is made for direct mounting to chassis on separate bracket. The external socket accepts a standard coaxial plug to RECMF specification.



Gresham LV Transformers

To meet the increasing demand for safe working voltages in commerce and industry, Gresham Transformers Ltd. have developed a range of low voltage transformers complying with BS794 for use with such applications as electric drills, inspection lamps, soldering irons, etc.

Voltage ranges are 55–0–55V (portable tools, etc.) or 25–0–25V (low voltage lighting etc.), though other voltages and sizes can be supplied to individual requirements. The three sizes are 50VA, 250VA, and 900VA. All have primaries tapped 10–0–200–220–240V.

The transformer is totally enclosed with tinned sheet steel case and can be adapted for floor mounting, wall fixing or for indoor use as a portable unit. It can be supplied weatherproofed when the basic unit is modified for conduit or cable gland entry or fitted with Reyrolle plugs and sockets or a combination of all three. Prices range from £2 11s. (50VA) to £11 5s. (900VA).

FLORA NYLON SCREW

Flora Plastics Ltd. introduce a new nylon screw which incorporates some novel features. At the head of the screw is a cross-slot similar to that of a normal screw but it is not open at the ends. At the top of the head, and adjacent to the shank, is a narrow bore opening from the centre of the cross-slot.

The screwdriver recommended for use with this screw is similar to a conventional 'driver but has a spigot projecting from the centre of its blade which fits into the central bore of the screw, so that the driver can act as a carrier for the screw while the hole is being located. With this screw a self-threading action is obtained.

AMPROBE RANGE

The range of American test instruments marketed under the name Amprobe will be handled in this country by Pyramid Instrument Corporation, H. J. Baldwin & Co., Ltd., 221 Grand Buildings, Trafalgar Square, London, W.C.2, and Victoria Mills, Gamble Street, Nottingham.

New from Radiospares

The latest supplement contains further additions to the range of replacement parts. Three new sub-miniature electrolytics (250μF, 500μF, and 1000μF, at 15V working, 2s. each) and a 47pF lead-through ceramic are announced, together with two new slider presets of 10Ω and 25Ω (at 1s. 4d. each).

The recently introduced range of stereo (tandem) controls are augmented by V152 (1M+1MΩ) for K-B PG20, PRP20, PG30, etc., and the V153 (250kΩ+250kΩ) for Decca SG188. Both are 6s. each. Also new are two anti-surge fuses for Continental receivers and tape recorders (300mA and 500mA) and one rated at 600mA for Bush receivers.

Radiospares announce that line output transformer LOP104 and special pilot bulbs 10V 0·2A have been discontinued.

Service Viewpoint

THIS, in case you hadn't noticed it, is the season of goodwill to all men, when right-thinking service engineers are full of good cheer and worrying themselves sick about what to get the Service Manager for Christmas (or what the S.M. is going to give *them*).

Normally we leave the bonhomie department in the capable hands of colleague Hellyer. But faithful followers of the last page will note that this month our resident jester has discarded his bladder for a bludgeon, his gentle grin for a sour smile. We feel that this metamorphism has occurred at a very inconvenient time.

Party Piece

It falls to other hands, therefore, to provide (for one month only) some measure of good cheer. And what better, at this time of year, than to suggest a few hilarious games that you can play when the guvnors put on funny hats and blow up balloons at the fabulous party they are sure to give their staff for a Christmas treat.

Blind Man's Bluff: For this game you need a radio set with six faults. Three service engineers are then blindfolded with service sheets and their index fingers dipped in a bottle of switch cleaner. The engineer who first fixes the six faults with no tools other than his dampened digit and an india rubber is awarded a bound volume of Trainer-Testers.

Sardines: Give each competitor a radio chassis. The aim is to rearrange the components to see how many more can be wired in. Score of one is fair, two is average, four excellent and six impossible. In another version of this game the object is to see how many designers you can get in a stereo radiogram console.

Hunt the Oscilloscope: This is the same as Hunt the Thimble except that it is more technical and whereas there are numerous possibilities with a thimble, the oscilloscope, on account of its size, presents greater difficulties in the number of places it can be put. A good scheme is to hide it on the workbench; few will think of looking for it there.

Dumb Crambo: An old favourite with a servicing twist. One team leaves the room, having first been granted permission, and one team remain. Anyone left over can go home and watch the telly. At a given signal, usually 400 c/s modulated 30 per cent, the emigrants return and gaze at the home team a little sheepishly. The home team then mime simple technical expressions such as "negative feedback", "gated video a.g.c.", "continuously variable volume control" or "try the PL81". If the interogators guess right, the teams change places. If not the whole gruesome business must be re-enacted until either (a) they manage by a fluke to guess right or (b) everyone goes mad.

Murder: This is an extremely satisfactory game and consists simply of getting the sales staff into a corner and beating them senseless with rolled up copies of *Service Engineer*.

Find the Lady: The most popular of party games and subject to many local variations. If in doubt, just let nature take its course. Unsuitable for apprentices who have not passed the RTEB.

Specifications: A modern radio game. Competitors are given the circuit of a typical 2-valve record player and asked to write the sales specification. Marks are awarded for ingenuity, taking into account the correct use of phrases like "acoustically designed cabinet," "extra-large 4 inch speaker", "powerful half-watt output" and "separate volume and tone controls." The papers are then compared with the original advertising material. The competitor most nearly approaching the copy-writer's prose is immediately promoted to sales director. Anyone exceeding the original is awarded the O.B.E., with bar.

Mergers: A very up-to-date party game. Each member represents a radio and TV company. In turn each contestant challenges someone else to turn out his pockets, the winner being adjudged on the homely old basis of "show most, take all". In this way competitors are gradually eliminated (or "merged"). The last one left is the winner, who goes home, a complacent smile on his face and a pocketful of lolly.

Trade Winds: Another new one. Simple, too. Competitors are shown by the sales staff the stockpile of TV sets they can't sell, and asked what to do with them. Prizes are given only for original suggestions.

Seasonal Greetings *to our readers* ***from "Service Engineer"***

TECHNICAL GEN for SERVICING MEN

RADIO, TELEVISION and AUDIO FAULT FINDING

PRESENTING DETAILS OF FAULTS ENCOUNTERED, DIAGNOSED AND CURED BY SERVICE ENGINEERS ON RADIO, TELEVISION AND AUDIO EQUIPMENT, TOGETHER WITH HINTS AND TIPS OF USE TO OTHER SERVICEMEN IN DEALING WITH DAY-TO-DAY SERVICE WORK.

Ultra "Twin"

Audio Stage Unstable

The fault on the receiver caused it to produce a continuous loud a.f. oscillation, evidently due to instability in the audio stages and it was confidently supposed that the h.t. decoupling was defective at some point.

Accordingly the h.t. smoothing and a.f. amplifier anode and screen decoupling components were checked in turn, but all were perfectly OK and electrode voltages were normal. Next a new a.f. amplifier valve was tried and at first seemed to cure the fault. On further listening tests, however, the set still gave indications of incipient instability when detuning from a station, and on switching off produced a dying burst of oscillation.

During the subsequent pondering over the circuit diagram, inspiration finally dawned on seeing a 100μF capacitor in the list of component values. This was C19, a valve filament decoupling capacitor, which had not been noticed in the set due to its small size. It proved to have decreased in capacitance. Replacement cured the trouble and the set remained stable when the original valve was refitted.—E.L., Blackburn (853).

Sobell T172

Loss of Picture

The symptoms were loss of picture after about an hour, the raster then exhibiting vertical bars similar to those generated by a simple type pattern generator. This condition would exist until the set was switched off and allowed to cool, after which the picture would last for another half to one hour before fading out.

A check on voltages while the picture was off revealed that the common i.f. amplifier V3 was OK but that the vision i.f. amplifier V4 had reduced anode and screen voltages. The cathode resistor R29 (180Ω) was discoloured and the reading here was less than 1V. A resistance check on R29 found it only 47Ω.

R29 was replaced and the valve was checked for emission and leakage and found normal. The set was switched on, hopeful that the replacement had done the trick, and it was seen that the picture was clearer, but in about an hour it vanished again. The bars, however, were weaker this tmie.

A check with an oscilloscope showed that, at the V4 anode, the valve was oscillating weakly. The cathode decoupler C36 (0·001μF) was bridged, and the picture was restored. Replacement of C36 cleared the trouble for good. —S.W., Buckingham (830).

Ekco T231

Band Down Raster

Although the picture was good, and the sound was normal, at the extreme left-hand side of the screen (actually just behind the mask edge) ran a whitish moving narrow band similar to the "rope effect" in appearance. It was experienced on both Bands I and III.

Disconnecting the aerial had the effect of removing the "rope" but introducing on the left-hand side of the raster, near the raster centre, an inch-wide shadow down the screen. Also the frame flyback lines were visible and broken halfway across the screen, to continue across but lower down.

The appearance of the frame flyback lines gave the clue to the cause, which proved to be the 0·001μF flyback suppression capacitor C104 which had decreased in value to about 100pF. —G.H., Harrogate (857).

Items for publication

in this feature are welcome, particulary in regard to the more unusual type of faults. All contributions used will be paid for at our usual rates.

When sending in items for Technical Gen, please write (or type) on one side of paper only, adding rough sketches (where considered necessary) on a separate sheet of paper. Correspondence should be addressed to — RR Service Engineer, 46 Chancery Lane, London, W.C.2.

Alba T744FM

Loss of Sync

This one was suffering from cogging, which sometimes developed into complete loss of line sync, accompanied by frame rolling. At first the sync separator stage was quite naturally investigated, but everything was in order.

It had been noticed that advancing the contrast control to the point of overload would lock the picture solidly. It was also discovered that a light tap anywhere on the chassis would clear the fault temporarily. We left the set running for two hours undisturbed to see what effect this would have in the fault and at the end of this time the trouble was very pronounced and the picture definition was very poor, pointing to a video stage fault.

On checking, the 400μF cathode bypass capacitor, which is common to both line output and video amplifier valves, was open circuit, and replacement of this component cured the fault. As a matter of interest, the faulty capacitor was tested on the bridge, when it was found to be o/c. It was left to cool for half an hour, when it measured 50μF.—G.C., Boroughbridge (864).

Pam 600 Series

No Contrast Control

On this set the picture was overloaded and the contrast control ineffective in reducing signal level. The video amplifier valve grid was red hot, symptomatic of excessive grid current. On measuring the grid voltage, sure enough a positive reading of 15V was present.

As the contrast control setting had no effect on the picture, the associated circuitry was checked and it was found that as the contrast control was advanced, a positive voltage appeared on tag point 11 on top of the i.f. strip. This is the junction of R38 and R40 in the a.p.c. delay circuit. Tag point 11 is connected to the sync separator grid via a 680kΩ resistor.

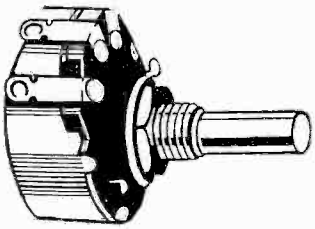
The sync separator/line oscillator PCF80 was changed and this cleared the fault. The original valve had a screen grid to control grid leak on the pentode

(Continued on page 117)

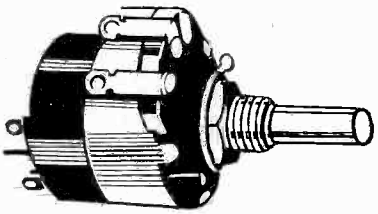
The Editor does not necessarily endorse the views expressed by contributors to this feature

Volume Controls for Radio & TV

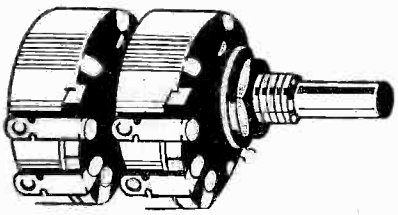
by return



Type 'A' Controls
A standard Switch Control in all standard values.
Price 3/4d. Trade



Type 'ADP' Controls
A standard Double Pole Control in all standard values.
Price 5/4d. Trade



Type 'AG' Controls
(Ganged) control designed for stereo work, two controls on one spindle.
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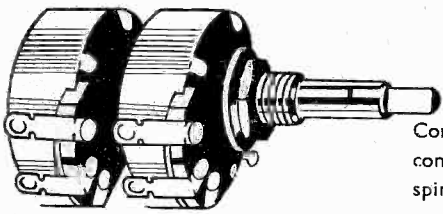

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TECHNICAL GEN *continued*

sync separator section. It had been noted that sync was rather poor but had put this down to the video amplifier being over-run; the video amplifier anode voltage was down to 40V when the fault was present.—G.C., Boroughbridge (862).

H.M.V. 1890

Double Frame Fault

This receiver had two faults apparent. The main one was very critical frame locking and when locked some of the scanning lines were pairing. The secondary fault, which was only noticeable due to some experience with this range of receivers, was that the maximum height obtainable was below the maximum generally expected in a good receiver.

Oscilloscope tests showed that the frame sync pulses were normal at the frame oscillator injection point. Also, the sync separator valve voltages were normal.

The frame multivibrator coupling capacitors were checked and found OK, but on checking the frame oscillator-amplifier (PCL82) cathode bias decoupling capacitor (100μF) this was found to be open circuit. Replacement cured both faults.—G.H., Harrogate (858).

Decca DM22/C

Some Recent Faults

Here are several faults encountered on this model. In the first one, after running the set on soak test for some hours, the fault was established to be intermittent line wavering. The trouble was eventually traced to the line multivibrator circuit where it was found that the 47pF capacitor C54, coupling grid to anode of the ECC82, was varying in capacitance.

On another set the trouble was very intermittent interlace and repeated adjustment of controls. This was due to C96 (0·2μF) in the frame multivibrator circuit, going o/c.

Another fault which has caused some trouble on this receiver has been C49 (0·001μF) in the integrator circuit going s/c and causing loss of frame sync.

In a case of loss of line sync, the trouble was found to be due to C51 (0·05μF), part of the anti-hunt circuit, becoming o/c.—A.A.S., Mansfield (822).

Philco 1019 and 1021

Faint Negative Picture

Trouble here was negative picture at low settings of the contrast control. It came in with a complaint of no brilliance, but on test it was found that a faint negative picture could be obtained about the midway position of the brightness control.

A video fault was suspected but all components checked O.K. in this circuit. The c.r.t. voltages were then checked and here it was found that on pin 3 there was no reading at all. This is fed from the boost h.t. line via a 2·2MΩ resistor and decoupled by a 0·25μF 600V capacitor C66. The capacitor was s/c. It is located at the rear of the bottom chassis and is accessible without removal of the chassis.—K.P., Stockport (873).

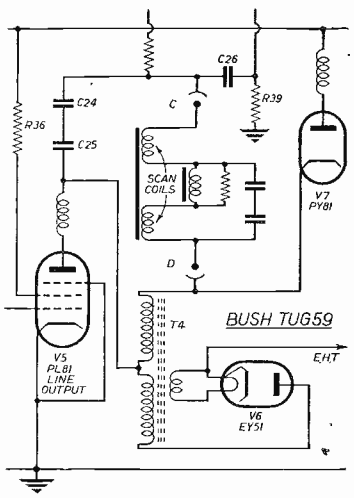
Bush TUG59

Scan Circuit Fault

On this set there was no e.h.t., although the line whistle could be heard. The line output valve and efficiency diode were changed but found satisfactory. In this set the scan coils are connected to their respective circuits via single plugs and sockets, the line coils being connected via points C and D (see diagram).

On removing lead D, e.h.t. was restored at the e.h.t. rectifier V6. It was presumed that there was a line-to-frame scan coil circuit in the assembly and the set was removed to the workshop.

On examining the scan coils they seemed to be in order. With both line scan connections disconnected e.h.t. was present. On reconnecting lead D, leaving C disconnected, e.h.t. was



still present. Our attention was turned to the lead C part of the circuit. On connecting this lead e.h.t. vanished.

Measuring from this point to chassis revealed a resistance reading of 12 ohms, the value of R39. It was then found that C26 was short circuit.—D.McL., Lochgilphead (844).

Grundig TK5 and TK20

Tape Recorder Faults

Although the TK5 and TK20 differ in layout, both series have recurrent trouble of original components causing a condition of no record, low volume on playback, with high background noise.

In my experience this trouble has been caused by the capacitor coupling the

(Continued on page 119)

RECEIVER SPOT CHECKS

No. 63: H.M.V. 1890

No Vision: Check R47, R48 or R56 for o/c and C45, C46, C53, C54 or C56 for s/c. Check for faulty W3 diode. Check L38, L39, L40 for o/c.

No sound: Check R92 or R94 for o/c and C75 or C79 for s/c. Check for faulty W4 diode. Check R105 and T2 for o/c. Check for o/c or s/c.

Low Distorted Sound: Check R101 for o/c or h.r.

No Sound or Vision: Check R146, R31, R8 and R11 for o/c and C10, C21, C31, C11 or C13 for o/c. Check for leakage and C33 for leak or s/c.

Low Gain: Check R6 for h.r. or C8 for leakage.

Low Brightness: Reset ion trap and check C112 for leakage or s/c.

Line Timebase Inoperative: Check C66 for o/c or s/c, C65 or C61 for leakage, T4 primary for o/c, C64 for o/c or s/c and R84 for o/c.

Wrong Line Speed: Check C66 for leakage or R73 for h.r.

Frame Timebase Inoperative: Check C91, C92 or C93. Check C84, T3 or R119 for s/c.

Insufficient Height: Check C63 for s/c or leakage and C98 for leakage.

Poor Frame Linearity: Check C96 for o/c or low capacitance. Check C94, C97 or C98 for leakage.

Negative Picture: Check C38 or W2 for s/c.—(869B, E.L., Long Eaton).

Brainless Bertie

Smoke poured from the tape recorder,
Gave the user quite a scare,
Bertie's open-circuit heat-fuse,
Had a "plumber's joint" repair.

Feste

Heathkit
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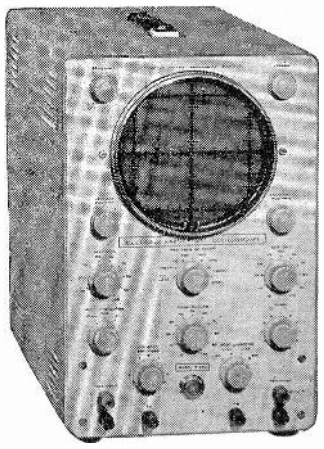
The kit-sets which give you the Best Possible Servicing Equipment at Absolutely Minimum Cost!



Heathkit 'Scope

PORTABLE 2¾" SERVICE 'SCOPE, Model OS-1
The OS-1 uses a 2¾" cathode ray tube and is a compact portable oscilloscope ideal for servicing and general laboratory work. Y amplifier sensitivity 10mV/cm; response ±3dB 10 c/s–2·5 Mc/s. Time base 15 c/s–150 Kc/s. Features include Int. Ext. and 50 c/s sync; Sine sweep; time base output for wobbulator; X amplifier socket; 1, 10 and 50 volt calibrator. Uses printed circuit board for consistency and ease of assembly. Case 7⅜" × 4 11/16" × 12½" long. Weight only 10½ lbs. ..... **£18. 19. 6.**

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Laboratory instrument at utility 'scope price. Exceptionally wide-range time-base (10 c/s to 500 Kc/s) "Y" frequency range 3 c/s to over 5 Mc/s, sensitivity 10mV RMS/cm. Electronically stabilised. Output for Wobbulator. Voltage Calibrator (1 volt pk. to pk. source). Instantaneous shift, drift free. Automatic lock-in synch. Rise time 0·08μ secs or less. "Z" modn. facilities. 2-gold-plated printed-circuit boards and pre-cut cable wiring harness greatly facilitate assembly. ..... **£34. 15. 0.**

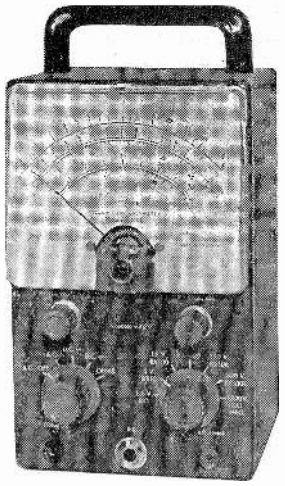
Besides this test equipment, we have a full range of "HAM" and HI-FI equipment including AMPLIFIERS, SPEAKER SYSTEMS and CABINETS.

VALVE VOLTMETER, Model V-7A

Because of the accuracy, reliability and sheer value of the Model V-7A it is outselling all other VVM's. The precision and quality of its first-class components cannot be duplicated elsewhere at this price. Indication is by a large 4½" 200μA meter clearly calibrated for all ranges. The voltage divider networks use 1% precision resistors. A gold-plated printed-circuit board simplifies the assembly, saves time and eliminates the possibility of wiring errors. It also ensures duplication of laboratory performance.

This multi-function VVM measures A.C. Volts (RMS and pk. to pk.), D.C. Volts and Resistance. The 7, A.C. (RMS) and D.C. ranges are 1·5, 5, 15, 50. 150, 500 and 1500. The 7, A.C. pk. to pk. Voltage ranges are 4, 14, 40, 140, 400, 1400 and 4000. D.C. input impedance is 11MΩ. Seven Ohm-meter ranges have multiplying factors of X1, X10, X100, X1000. X10K, X100K and X1MΩ. Centre-scale resistance readings are 10, 100, 1000, 10K Ohms, 1MΩ and 10MΩ. A centre-zero dB scale is provided also for measuring audio amplifier performance. Test leads, prods and battery are included in the kit..... **£13. 0. 0.**

PROBES: R.F. **£1. 5. 6.**, H.V. (30kV d.c.) **£2. 7. 6.**



V-7A

Other Models Include :

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TECHNICAL GEN *continued*

ECC81 twin triode sections (0·025μF, C14, in the TK5; 0·022μF, C20, in the TK20) going short circuit or developing a leak.

Another fault experienced on the TK20 gave the symptoms of correct recording but going unstable with hum when switched to playback, as would be expected if a smoothing or decoupling capacitor had gone o/c. I have found that this trouble is usually due to the 10kΩ resistor R43, which feeds the record/playback relay operating coil, going o/c.

This leaves the machine with the audio section input and output cross-coupled when the function switch is in the playback position due to the record/playback relay being left permanently in the record position. Normally, the c/o relay is energised on playback and de-energised on record.—G.M., Smethwick (877).

Cossor 948F

Loss of Sound

Trouble was intermittent loss of sound, accompanied by a crackling noise which sounded as though it were due to a dry joint. The set gave us a lot of trouble because of the intermittent nature of the fault. At times it would run for several weeks without trouble, then, for no apparent reason, the fault would appear and last until switched off. The next day it would be normal again and maybe run for several weeks before trouble.

Consequently we had the set in for a prolonged soak test. After running for about a week, the fault occurred and a quick check with substitute valves (already heated by a valve tester to working temperature) eliminated valve trouble. A signal generator test, however, revealed loss of sound between the i.f. test point 19 and the volume control tags, thus eliminating the output panel.

The i.f. panel voltages seemed to be correct and capacitors C49, C50, C51, C53, and resistors R56, R57, R58, R59, R61 and R62 were eliminated by substitution. A check on the sound interference limiter control R60 showed this was satisfactory.

The sound interference limiter rectifier W6 was then replaced, and the fault was cleared. The faulty rectifier was inserted in another receiver, as a check, and this introduced the fault in that set.

On these receivers poor picture has often been found due to a faulty PL36 line output valve and before delving too deeply into the vision i.f. panel it is well to check the PL36.—S.W., Buckingham (880).

Ekco TC165

Sound, Vision Unstable

When the volume control was advanced to the half-way position and beyond, the picture broke up and the sound went unstable. Voltage checks around the components and valves common to sound and vision revealed no faults. So the sound instability was tackled first by checking decoupling capacitors and it was found that the 0·003μF first sound i.f. amplifier screen decoupling capacitor C20 was o/c.

Replacing this cured the vision instability completely but the sound instability was not entirely eliminated. To do this it was necessary to replace the 0·003μF capacitor C31, decoupling the second sound i.f. amplifier screen, which was also o/c. I should point out that the volume control in this set is in the cathode circuit of the first sound i.f. amplifier.—G.H., Harrogate (855).

Murphy B385

Trouble with Battery

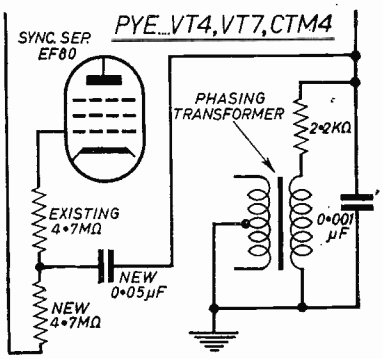
One of these transistor radio receivers was returned to us, the customer complaining of loss of volume. Checking the batteries, we found one of these to be flat, so replaced it, only to find that this had no reading. On opening the set and removing the battery boxes we found that the wire connecting the two batteries via the switch had been trapped between the battery box and the metal frame of the speaker and was therefore shorting out the battery which is between one side of the speaker and chassis.

We would not consider this fault out of the ordinary if we had not found yet another receiver (from stock, by the way) suffering from exactly the same complaint, which possibly means that other dealers will be experiencing the same trouble.—N.B., Tadcaster (875).

Pye VT4 Series

Better Line Lock

I have found that on these receivers after some years of use a troublesome fault occurs on quite a number of them. This fault is shown by a partial loss of line lock when the contrast control is adjusted a little below normal and in areas of poor reception is plainly evident.



A positive cure for this is to change the grid resistor to the sync separator for two 4·7MΩ resistors in series, instead of one single 4·7MΩ resistor. The junction of the two resistors is taken via an additional 0·05μF capacitor to the junction of the 0·001μF capacitor and 2·2MΩ resistor which are across the phasing transformer. All other components remain as before.

This simple modification allows the contrast control to be adjusted almost to loss of picture content without loss of lock in the majority of cases.—H.A., Corfe Mullen (854).

Pam 765

Sound I.F. Fault

The customer complained of no picture on Channel 11. Sound was normal, and the Band I sound and picture were normal. A check on the site confirmed this but fault could not be found. Set was left switched to Band I, and collection was arranged for the next day.

On collecting the set, the customer reported that Band I had also disappeared after two hours running, leaving a blank raster with no modulation. Vision strip was checked for instability, with no results, but a check on the a.g.c. line revealed a fairly strong

(Continued on page 121)

Queer Customers

THE sexy customer is a popular topic of conversation among outside engineers. I thought I had met one the other day when Mrs. X answered my knock with a sidelong glance and the remark: "I'm so glad you've come. My husband's away and I do miss it so . . ."

I followed her into the lounge reflecting that although she was by no means a pin-up, there were worse ways of spending the firm's time. Then came the denouement—a six-year-old Philips TV set with screwdriver adjustment controls. The line hold pot was chewed up and only her husband knew the secret of adjusting it. And, as she repeated with a smile as prim as a Sunday School teacher, he was away.

I replaced the potentiometer and left, feeling vaguely cheated.—H.W. Plymouth (889)

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Bush T36 series TV receivers (TV83, Apr., 56).
Bush TV22 series TV receivers (TV67, Jun., 55).
Bush TV53 series TV receivers (TV101, Feb., 57).
Bush TV63 series TV (TV118, April, 58).
Cossor 927 television receiver (TV42, July, 53).
Cossor 930 series TV receivers (TV62, Feb., 55).
Cossor 937, 938 and 939 (TV90, July, 56).
Cossor 943 TV (TV127, Oct., 58).
Cossor 945 (TV112, Nov., 57).
Cossor 946 TV (TV104, May, 57).
Cossor 947 TV receiver (TV114, Jan., 58).
Cossor 948, 949 series (TV133, Jan., 59).
Decca DM35/45/55 (TV155, May, 60).
Ekco T330/331 series (TV154, April, 60).
Ekco T342/344/348 (TV157, June, 60).
Ekco T345 series (TV165, Oct., 60).
Ferranti 14T2 and 1225 (TV45, Nov., 53).
Ferranti T1002 series (TV154), April, 60).
Ferranti T1021, 1023, 1027 (TV157, June, 60).
Ferranti T1024 series (TV165, Oct., 60).
Ferguson 204T series TV receivers (TV87, June, 56).
Ferguson 306T/308T TV receivers (TV97, Nov., 56).
G.E.C. BT1252 series TV receivers (TV96, Oct., 56).
G.E.C. BT1746 series TV (TV81, Mar., 56).
G.E.C. BT7092 and BT7094 (TV44, Oct., 53).
Grundig 500L and 700L/C *Reporter* tape recorder (S3, Dec., 53).
H.M.V. 1840 series TV receivers (TV109, Sept., 57).
Kolster-Brandes FV30, FV40, FV50 (TV23, Feb., 52).
Kolster-Brandes HF40 series TV (TV70, Aug., 55).
Kolster-Brandes MV30 and MV50 (TV91, Aug., 56).
Kolster-Brandes NV40 series (TV115, Feb., 58).
Kolster-Brandes OV30 series (TV148, Jan., 60).
Marconiphone VC/VT59DA (TV100, Jan., 57).
Marconiphone VC60DA (TV61, Jan., 55).
Marconiphone VT68DA/VT69DA.
McMichael 55 series TV receivers (TV79, Feb., 56).
Murphy V214/V216 TV receivers (TV78, Jan., 56).
Murphy V230 portable TV (TV103, April, 57).
Murphy V240/V250 TV (TV105, June, 57).
Murphy V270/V270C TV (TV120, May, 58).
Murphy V270A TV receiver (TV140, July, 59).
Murphy V280/V300C TV (TV124, Aug., 58).
Murphy V280A series (TV134, March, 59).
Murphy V310 TV receiver (TV145, Dec., 59).
Murphy, V320 series (TV159, July, 60).
Murphy V330 series (TV167, Nov., 60).
Pam 500 TV receiver (TV108, Aug., 57).
Pam 600S, 606S, 690 (TV144, Nov., 59).
Peto Scott TV 1411 series (TV65, Apr., 55).
Peto Scott 1412 and 1712 (TV54, July, 54).
Peto Scott 1418T receiver (TV106, July, 57).
Philco BT1412 and BT1551 (TV71, Sept., 55).
Philco 1000 *Slender Seventeener* (TV139, June, 59).
Philco A1960/1, A2060/1 (TV137, May, 59).
Philco A1962M/A1967M (TV142, Oct., 59).
Philips 1458U series (TV129, Nov., 58).
Philips 1756U series TV (TV111, Oct., 57).
Philips 1768U/2168U (TV117, March, 58).
Philips 1796U/2196U (TV152, Mar., 60).
Pilot PT450 series (TV161, Aug., 60).
Pilot TV84/87 television series (TV59, Nov., 54).
Pye PTV portable TV (TV113, Dec., 57).
Pye CW17 series TV (TV122, June, 58).
Pye CTL58VS series (TV150, Feb., 60).
Pye CTM17S series (TV131, Feb., 59).
Pye V200/V400 series (TV163, Sept., 60).
Regentone "Big 15/5," T and C (TV48, Feb., 54).
R.G.D. 1455 and 1456 TV receivers (TV99 Dec.,56).
Ultra VA72, YA72/73 series (TV38, March, 58).
Ultra V84 and Y84 TV receivers (TV47, Jan., 54).
Ultra 81 series TV receivers (TV74, Nov., 55).
Ultra 915 and 917 TV receivers (TV93, Sept., 56).
Ultra 50 series TV (TV123, July, 58).
Ultra 52 series TV (TV135, April, 59).
Ultra 60 series TV (TV126, Sept., 58).
Ultra 62 series TV receivers (TV141, Sept., 59).
Ultra V1770 series (TV161, Aug., 60).
Vidor CN4217/8 TV receivers (TV57, Oct. 54).

Price 9d. each

Alba T717 and T721 (TV143, Nov., 59).
Alba T744FM TV series (TV121, June, 58).
Alba T766 TV receiver (TV166, Nov., 60).
Ambassador-Baird TV 19–20 series (TV119, May, 58).
Ambassador TV4 and TV5 (TV32, Sept., 52).
Argosy 1412L/1412B (TV19, Aug., 51).
Argosy Model T2 TV receiver (TV53, June, 54).
Baird TV receivers, P/T 167 (TV35, Dec., 52).
Beethoven B94, 95, 98 and 99 (TV92, Aug., 56).
Bush BE15 battery radio (R51, Mar., 54).
Bush RC94 AC radiogram (R34, Nov., 52).
Bush VHF54/VHF55 receivers (R94, Jan., 57).
Bush VHF61 a.m.-f.m. radio (R134, Oct., 59).
Bush VHF64/RG66 radios (R116, July, 58).
Collaro RC54 record changer (S6, Oct., 55).
Cossor 500 series radios (R95, Feb., 57).
Cossor 522/523 a.m.-f.m. radio (R72, May, 55).
Cossor 524 *Melody Maker* (R85, Mar., 56).
Cossor TV Model 926 (TV37, Feb., 53).
Decca SG177/SG188 Stereograms (S12, Oct., 58).
Decca *Double Decca* Model 51 (R65 Dec., 54).
Deccalian radiograms 91 and 92 (R23, Dec., 51).
Deccalian Model 90, radiogram (R21, Nov., 51).
Dynatron TV38 series (TV151, Mar., 60).
Etronic ECS2231 projection TV (TV46, Dec., 53).
Etronic ETA632 radio receiver (R43, Aug., 53).
Ever Ready *Sky Monarch* (R104, July, 57).
Ever Ready *Sky King, Queen, Prince* (R106, Sept., 57).
Ferguson TV tuner units (TV85, May,56).
Ferguson 300RG autogram (R78, Aug., 55).
Ferguson 382U series (R124, Jan., 59).
Ferguson 341BU portable radio (R67, Jan., 55).
Ferguson 968T series TV (TV60, Dec., 54).
Ferranti 005, 105 and 405 (R36, Jan., 53).
Ferranti 147 series radio receivers (R81, Nov., 55).
Ferranti 255, 355, 455, radios (R107, Oct., 57).
Ferranti 1325/1825 TV receivers (TV95, Oct., 56).
G.E.C. BT302-5 (TV160, Aug., 60).
G.C.E. BT1449/BT2448 (TV102, March, 57).
G.C.E. BT2155/8149 (TV156, June, 60).
Kolster-Brandes HG30 radiogram (R53, April, 54).
Kolster-Brandes QV20/1 series (TV162, Sept., 60).
Marconiphone T24A series (R98, April, 57).
Marconiphone T/C10A radio (R41, June, 53).
Marconiphone VT64/65DA (TV76, Dec., 55).
Masteradio D154 "Ripon" series (R84, Feb., 56).
Masteradio Model T853 (TV36, Jan., 53).
Masteradio TD4T and TD7T/C (TV58, Nov., 54).
Masteradio TE series (TV128, Nov., 58).
McMichael *Clubman* Model 535 (R62, Oct., 54).
McMichael FM55 a.m.-f.m. radio (R82, Dec., 55).
Murphy A146CM baffle radio (R75, June, 55).
Murphy V114C/V118C TV (TV98, Nov., 56).
Murphy V200 TV receiver (TV72, Sept., 55).
Pam 701, 702, 714, radios (R100, May, 57).
Peto Scott 16 series TV receivers (TV86, June, 56).
Peto Scott 19 series TV (TV116, March, 58).
Peto Scott 1722/1723 (TV149, Feb., 60).
Peto Scott 1730 and 2128 (TV158, July, 60).
Peto Scott 1731/2131 (TV164, Oct., 60).
Philips 141U portable radio (R56, June, 54).
Philips 643 series a.m.-f.m. radio (R87, July, 56).
Philips G62A series (R131, July, 59).
Pilot TM/CM54 TV receiver (TV41, June, 53).
Pilot TV94 series TV receivers (TV107, Aug., 57).
Pilot VS9 console TV receiver (TV34, Nov., 52).
Pye P23CR and P24CR (R48, Jan., 54).
Pye P29UBQ (R37, Feb., 53).
Pye *Fen Man* I and IRG (R109, Nov., 57).
Pye *Fen Man* II and IIRG (R112, Jan., 58).
Raymond F46 radio receiver (R69, Feb., 55).
Regentone TR177 series (TV132, Feb., 59).
Regentone ARG81 series (R127, March, 59).
Regentone RT50 tape recorder (S14, Sept., 59).
R.G.D. T14 transportable VT (TV138, June, 59).
Sobell 516AC/U radio (R57, July 54).
Sobell TS17 and T346 TV (TV94, Sept., 56).
Sobell 626 Series a.m.-f.m. radios (R102, June, 57).
Sound A20 tape recorder (S9, Feb., 58).
Stella ST151A radio (R66, Jan., 55).
Stella TV receiver ST1480U (TV25, Apr., 52).
Stella ST8314U TV receiver (TV55, Aug., 54).
Strad Model 510 table receiver (R35, Dec., 52).
Taylor testmeter Type 171A (T16, Aug., 54).
Ultra ARG891 "Ultragram" (R83, Jan., 56).
Ultra "Troubadour" U696 (R44, Aug., 53).
Ultra "Twin" portable radio (R55, June, 54).
Ultra U930/U940 *Minstrels* (R119, Aug., 58).
Ultra V1763 TV receiver (TV 147, Jan., 60).
Ultra VP14/1753 series (TV153, April, 60).
Vidor CN4213 and CN4215 TV (TV28, June, 52).
Vidor CN4228/9 TV receivers (TV136, May, 59).
Vidor CN4230/1 TV receivers (TV125, Sept., 58).
Waveforms *Radar* 405D (T.I.7, Apr., 56).

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Alba 69 series radiograms (R120, Sept., 58).
Alba 3211 series (R126, Feb., 59).
Baird baffle radio receiver (R61, Oct., 54).
Bush TC184 television tuner (TV75, Nov., 55).
Cossor Model 466 car radio (R71, Apr., 55).
Cossor radio Model 494U (R38, Mar., 53).
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Cossor 546 transistor portable (R115, May, 58).
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Decca RG200 radiogram (R125, Jan., 59).
Deccalian Model 81 (R29, Apr., 52).
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Ekco BPT333 transistor portable (R143, July, 60).
Ekco BPT351 transistor portable (R145, Sept., 60)
English Electric *Rotamatic* TV tuner (TV82, Mar.,56).
Etronic EPZ4213 portable radio (R52, Mar., 54).
Etronic radio Model ETU5329 (R39, Apr., 53).
Ever Ready Model "C" radio (R50, Feb., 54).
Ever Ready *Sky Baby, Sky Princess* (R99, May, 57).
Ferranti 13-channel TV tuner (TV73, Oct., 55).
Ferranti 525 radio receiver (R58, Aug., 54).
Ferranti Model 546 radio (R45, Sept., 53).
Ferranti U1003/RP1008 (R123, Dec., 58).
Ferranti PT1010 transistor portable (R143, July,60).
Ferranti PT1030 transistor portable (R145, Sept.,60).
G.E.C. BC501/BC502 portables (R146, Oct., 60).
H.M.V. radio Model 1122 (R54, May, 54).
H.M.V. radio Model 1356 (R42, July, 53).
H.M.V. 1252 f.m. adaptor (R111, Jan., 58).
Invicta 26 "Vicki" portable (R93, Jan., 57).
Invicta 33 series radio receivers (R89, Sept., 56).
Invicta Models 37 and 59RG (R86, May, 56).
Invicta Model 55 portable (R46, Oct., 53).
Kolster-Brandes TV converter (TV77, Jan., 56).
Kolster-Brandes FB10 portable (R32, Sept., 52).
Kolster-Brandes MP151/2, PP251 (R135 Oct., 59).
Kolster-Brandes NG20/NR30 (R113, Feb., 58).
Kolster-Brandes OP21 (R122, Nov., 58).
Kolster-Brandes PP11, PP21, PP31 (R130, Jun.e, 59).
Marconiphone P17B portable (R49, Jan., 54).
Marconiphone T2211 converter (TV30, Feb., 56).
Marconiphone T24DAB (R77, Aug., 55).
McMichael 153 table radio (R75, July, 55).
McMichael 493 portable radio (R47, Nov., 53).
McMichael 554 radiogram (R96, Feb., 57).
McMichael 855 table radio (R91, Nov., 56).
Masteradio D155 series (R108, Nov., 57).
Murphy V310 modifications (TV146, Jan., 60).
Pam 111 transistor portable (R140, April, 60).
Pam 706 *Pixie* portable (R97, March, 57).
Pam 710 portable (R90, Oct., 56).
Pam 955 series radios (R103, July, 57).
Pam TB59 (R138, Feb., 60).
Portogram "Junior 8" reproducer (S5, July, 54).
Portogram "Preil 20" amplifier (S4, May, 54).
Philco A 536 W/M radio receivers (R68, Feb., 55)
Philips television tuners (TV88, June, 56).
Philips G77B, G81U, G83B (R137, Dec., 59).
Pilot television tuners (TV89, July, 56).
Pilot PR251 transistor portable (R144, Aug., 60).
Pye HF25/25A hi-fi amplifiers (S11, June, 58).
Pye P131MBQ portable (R121, Oct., 58).
Pye P43 radio receiver (R63, Nov., 54).
Pye 13-channel tuner unit (TV66, May, 55).
Pye *Pipers* P115U/P116U (R110, Dec., 57).
Pye *Black Box* record reproducers (S8, Sept., 57).
Pye 841130 series TV tuners (TV110, Oct., 57).
Raymond F55 table radio (R74, June, 55).
Regentone PRG1 and Five-18 (R139, Mar., 60).
R.G.D. B56 portable radio (R132, July, 59).
Roberts CR portable radio (R80, Oct., 55).
Roberts "Junior" portable (R26, Reb., 52).
Roberts P5A portable radio (R73, May, 55).
Roberts R66 portable radio (R88, Aug., 56-.
Roberts R77 portable (R105, Aug., 57).
Roberts RT1 transistor portable (R118, Aug., 58).
Sobell FMG57/FMG708 radios (R114, April, 58)
Taylor Electrical "Windsor" circuit analyser Model 20B (T.I.5, Sept., 52).
Ultra 101 transistor portable (R144, Aug., 60).
Ultra FM950 f.m. radio (R129, May, 59).
Ultra TR100 portable (R128, March, 59).
Ultra U960 portable radio (R133, Sept., 59).
Vidor Model CN414 portable (R28, Apr., 52).
Vidor CN420A portable radio (R64, Dec., 54)
Vidor CN421 portable radio (R79, Sept , 55)

RADIO RETAILING, 46 Chancery Lane, London, W.C.2

TECHNICAL GEN continued

negative voltage. Checking back showed that the negative potential was being fed from the sound a.g.c. line.

The sound strip had high gain due to an i.f. decoupling capacitor losing value from 0·001μF to 0·0003μF. On replacing this component the set worked normally for a quarter of an hour, after which the original fault reappeared. The trouble was finally cleared completely by replacing the first sound i.f. amplifier. In this way, a seemingly crazy fault proved in the end to be quite logical.—W.H.B., Sutton Bridge (882).

Philco 1019

Very Weak Picture

One of these receivers came in with very weak picture, the picture "ballooning" if the brightness control was turned above the halfway position. The field engineer had replaced the EY86 e.h.t. rectifier, with no improvement. The c.r.t. was the obvious suspect as, when the brightness control was turned down, a mauve patch could be seen around the gun assembly, symptomatic of a soft tube.

However, before replacing the c.r.t., we checked operating voltages on the tube base and found no voltage on the anode, pin 3, where a reading of some 500V should have been obtained, this voltage being derived from the boost h.t. line via a 2·2MΩ resistor (R69).

Tracing back, this resistor was found to be o/c and rather heat blackened. Further, C66 (0·25μF) which is connected between the junction of R69/Anode of c.r.t. and chassis, was s/c. The resistor and capacitor were both replaced and this cleared the fault. Incidentally, the faulty capacitor was rated at 500V and since the voltage on the first anode is given as 515V this was working rather on the limit. We replaced it with one of 1kV rating to be safe.

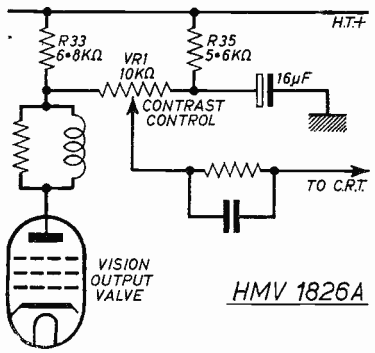
Since first encountering this fault we have had three more of these sets in with identical trouble and have notified the manufacturers.—G.C., Boroughbridge (865).

H.M.V. 1826A

Half and Half

The fault on this receiver gave the picture a very odd appearance in that the top half of the picture had the peak whites cut off, the lower half being normal. Tests around the vision limiter circuit showed nothing unusual.

In this receiver the circuitry is unusual in having the vision limiter control and



contrast control in a rather complex arrangement around the video amplifier stage. The anode voltage for this valve was checked and thought to be somewhat low, but this was dismissed as of little consequence.

However, when the cause of the trouble was nowhere in sight, the maker's specified voltages were checked and compared with those obtained on the receiver. The video anode voltage was then seen to be definitely somewhat below normal. As R33 is a 5W wirewound resistor (6·8kΩ) this was measured and found to be o/c. Replacement cured the fault, giving normal pictures.

It just goes to show that one should always check voltages carefully against the maker's specification and not assume that everything is in order because a reading is obtained.—G.H., Harrogate (856).

Stella ST8917U

50 c/s Hum Effect

This receiver was brought into the workshop with a rather unusual set of symptoms in that the top half of the picture was blank, the bottom half showing the top half of the test card. There was also a heavy hum on sound. After a check on the smoothing of the h.t. circuits had proved fruitless, it was thought advisable to check the valves in the tuner and i.f. circuits as the hum suggested a 50 c/s a.c. source being present in the h.t. supply.

On checking the tuner it was found that downward pressure on the PCF80 frequency changer V302 cleared the fault momentarily. The tuner was opened up and it was then found that there was slight arcing on the uninsulated wiring at the PCF80 valve holder.

On tracing out the wiring, it was seen that the arc was between the wiring to pin 3 (screen of pentode section) and pin 4 (heater), these wires being almost touching. Slight displacement of this wiring cleared the fault, removing the 50 c/s a.c. from the h.t. circuit and proved a simple cure for this unusual fault.—J.R.A., Peterhead (884).

SERVICE BRIEFS

HMV 1824A: The fault of no vision and no sound looked simple when the set was switched on and only some heaters lit up, especially since V15 had a cathode-heater s/c and a replacement restored sound and vision. However, the frame scan was considerably cramped and another V15 (frame output) was tried, to no avail. Component check revealed that the 1kΩ cathode resistor R65 was reading about 150Ω. It was presumed that since the original V15 had a s/c cathode-heater all the heater current passed through R65, damaging it.—D.McL., Lochgilphead (714).

Vidor CN4213/5: There was normal sound and vision modulation, good vertical lock, horizontal hold control locked in the middle of its travel, but the line was squegging 3-5 c/s tearing bottom half of the picture. Appropriate valves checked normal, but it was found that the cathode resistor of the sync diode V6 had increased in value from 3.3MΩ to 8.2MΩ. Replacement restored normal operation.—E.L., Long Eaton (711).

Philips 1768U: Picture and sound would drop to a very low level at odd intervals, sometimes after long periods of satisfactory working. This was a very elusive fault since on the rare occasions it occurred, switching the tuner restored normal working. Eventually, by elimination when the fault was on, the field was narrowed to the PCC84 base and the culprit turned out to be the neutralising capacitor C307, one end of which was lightly pressing against an earth tag. It must have been insulated only by its red paint.— W.D.G., Prestwick (815).

Ekco T231: Bad, complete changing of tuning on both channels with vibration of channel selector knob indicated a turret service. After this, the fault remained and the interior of the tuner was probed with an insulated rod. The stiff wire connection to the ceramic collar leading the live end of fine tuner capacitor to the variable vane. This is plated on the side adjacent to the vane and the lead is soldered to it. A dry joint here was repaired and cleared the fault.—L.E.H., Edgware (792).

Bush TUG36/TUG34A: Complaint was distorted picture. The shape was very unusual, namely with normal scan at the top but gradually tapering down to a couple of inches at the bottom, an effect usually associated with faulty scan coils. In this case the scan coils were O.K. Line oscillator and output valves, and efficiency diode, were checked and found O.K. A component check, however, revealed that the 8μF boost h.t. smoothing capacitor C21 had developed an o/c. Replacement restored normal line scan.—E.L., Long Eaton (767).

Cinderella Rides Again

or

A Service Engineer's Nightmare

Dreamed up by W. D. GRAHAM

ONCE upon a timebase, in the land of Tran, lived the *New Queen Special*. Her castle was a fairy-tale place of cupolas and towers, buttresses and battlements; a veritable dentifrice edifice. It was the *Zenith* of luxury.

One Christmas Eve, the snow was falling gently, like interference on a fringe area screen, and making dipole polar diagrams in the moat. Inside, the Queen stood by a roaring electric fire scowling at her greetings cards. Suddenly she uttered a word very appropriate to her surroundings (it was the Great Blue Room), for her rival the *Queen Elizabethan* had written a rather naughty greeting.

Four Letters?

This startled her ambassador, the *Prince Regentone*, who was playing bridge in a corner with three Hibernian friends, (*McMichael, Ferguson and Peto the Scott*). He trumped his partner's *Ace*, then, with his friends, hurriedly left the room.

"I must fix that flap", murmured the Queen, gazing absently down the open trap door. Then with a shrug she walked over to a larger mirror-like object hanging on the wall. It glowed with inward phosphorescene and strange patterns of mist swirled across it. The Queen gave a command and there was a subdued hum which was due (if she had but known it) to the automatic audio-sensitive receptor triggering the reflex homing equipment. A man's head faded into view.

All Good Stuff

"Good evening, friends", it greeted. "This is the Eavesdrop Network from Slime Cove, the scandal station which sees all and stops at nothing to keep you in the murky picture. Tonight we have another instalment of *This was your wife*, followed by *Candid Camera* in which we'll visit *Lady Alba* in her boudoir to see how she keeps her slimline. Then a visit to Merlin's Cave in Black Mountain where we'll see a performance of Walpurgis Night. And finally, in the series *Back to Back* our interviewer will insult *King Ferranti* till he blows his fuse.

"Before we start let me introduce our resident dischord group from the land of Tran—the *Transistor Six*, led by the notorious semi-conductor *Crystal Diode*. They will regale you with their special *Multimusic*, featuring the new *Ekco* chamber. The first number is *Boil, Boil, Toil and Trouble Cha-cha*, hit song from the musical *Son of Macbeth*".

Dig that Distortion

Six wizened hags appeared on the mirror-vision screen and began dispensing diabolical music which sounded almost as rough as that obtained from a transistor portable radio set. But hardly had the Queen settled back on her favourite sofa, stuffed with gramophone stylii and old ECL80's, than with a howl and a flash the fiendish entertainment fizzled out.

She jumped up crying "Mirror, Mirror, bring back the Transistors and their blasted heath" but though she raged and ranted the mirror remained *Defiant*. She began to *Advance* on it, goblet in hand, then dropped it remembering that the mirror was not under guarantee.

That's Telling Her

At that moment, her beautiful daughter the *Princess Pam* opened the door, stood aside to let the goblet run off to join his big brothers the *Goblins*, then tripped into the room. The sight of her spreadeagled on the floor enraged the Queen.

"Get up, daughter. You're not a wrestler. Get back to your room".

"But, mother. I'm tired of listening to ping pong and trains on my extra-wide-range, superlative, unbelievable, twenty-guinea stereo record player of advanced design and separate continuously variable tone control. I want to go to the Ball at Crystal Palace with my handsome P.C."

"Not that 49 fellow?"

"No. My Prince Charming. I call him 49 like they do in the commercials—if you see what I mean."

"I don't. But my Magic Mirror's gone bust and if I can't see Merlin's Cave you can't go to the ball. So there."

She shooed the princess out, which didn't please Pam seeing that they were hobnailed shoes, then despatched runners to all corners of the land to find an *Expert* wizard capable of making the mirror come to life.

Brief Encounter

Meanwhile, the Princess returned to her tower and wandered despondently over to the mullioned window where she leant out and gazed across the moat. And there was her Prince Charming, the epitome of *Fidelity* standing just left of a *Thorn Bush* and looking like an abominable snowman. She told him the sad news, that she was C.B. until the mirror was repaired.

The Prince turned sadly on his heel. Finding this made progress difficult he turned on the other heel, then strolled disconsolately down *John Street* to the village of Meldrum, to drown his sorrows at the Three Megacycles Bar.

Technical Gen

Some hours later, a tall wizard in flowing robes decorated with schematic diagrams and *Waveforms*, was ushered into the presence of the Queen.

"I am *EMI*", he announced. "Electronic Mirrors Inc. I am *Ever Ready* to assist you."

"Then get weaving, great wizard, and restore my mirror. You will be handsomely rewarded. It is over there—let me *Pilot* you to it."

The wizard waved his four-element rod and demanded to inspect the skeleton in the cupboard. Noting the Queen's bemusement he explained that he meant the skeleton slot indoor beam. Moments later he pronounced "It is in order. Your gain is my loss. I must seek another solution."

He drew a large scroll from his robes and unrolling it began to chant magic spells . . . "Capacitor C3 connects to anode load of sync separator . . . resistor R9 goes to reactance oscillator tuned to three kilocycles . . . alignment of stagger tuned circuits . . . "

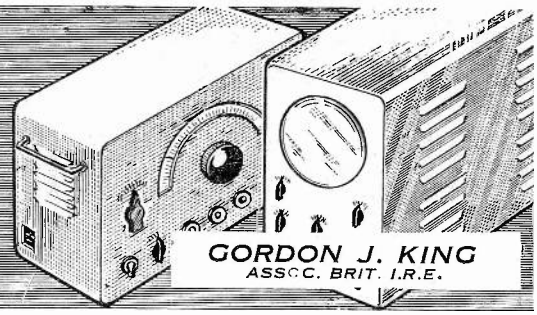
Clever Lad

Thus he chanted, all the while making strange gestures in the air with a steaming soldering iron. Finally he stood back and commanded the mirror to come to life. Miracle of miracles (for he had never even heard of the RTEB) it obeyed his command and the Queen saw swirling patterns

(Continued on page 126 —if you can take it)

Modern Test Instruments

FOR THE SERVICE DEPARTMENT



GORDON J. KING
ASSOC. BRIT. I.R.E.

TO conclude this series on modern test instruments we now investigate some of the many miscellaneous instruments which are designed exclusively to make the life of the service technician less frustrating and to provide speedy and accurate analysis of hosts of fault conditions.

These range from capacitor and resistor decade boxes to transistor testers. We commence with the Signal Strength Meter which, although really a microvolt meter of very high sensitivity, can be classified under the above heading so far as the service man is concerned.

PART SEVEN

Miscellaneous Test Instruments

J. S. Fielden Signal Strength Meter VSM2

This manufacturer produces a range of signal strength meters which are marketed through Viewline (Sales) Limited of Paignton, South Devon. The most popular from the service engineer's point of view is the Type VSM2. This is a mains-powered model which is continuously tuneable over Bands I, II, and III.

The tuning is directly calibrated in frequency and in addition the various channel ranges are indicated throughout the bands. The meter is calibrated in microvolts, but Type VSM2D is calibrated in decibels, with zero dB scaled to 500μV.

A gain-stabilized two-stage amplifier tuned to 33 Mc/s is preceded by a triode-pentode frequency changer tuneable from 40 to 70 Mc/s on Band I, 80 to 120 Mc/s on Band II and 180 to 220 Mc/s on Band III. The signal is measured on a milliameter which has overload protection in the event of too great a signal being applied to the instrument. The minimum reading is 5μV and the maximum 10mV by use of a X10 (20dB) attenuator. A phone jack is incorporated on all models for signal identification and interference tracing.

The instrument is contained in a case of medium gauge steel in blue/grey hammer finish and measures 10×5¾×6 in. high. The weight is approximately 5¾ lbs. and a carrying handle allows easy transportation. Both VSM2 and VSM2D are mains operated, 200–250 volts, 50 c/s (110V, 50–60 c/s to order).

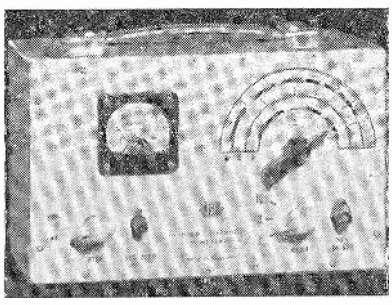
Battery operated Models, VSM4 (microvolts scale) and VSM4D (decibel scale), are also available. A Type FSMC carrying case and 6-volt accumulator make the battery models completely self-contained.

Fielden Signal Strength Meter Type FSM6

This is a 19 in. rack-mounting instrument designed particularly for wired television systems. The 6 in. meter is calibrated in both microvolts and decibels, with 0dB scaled to 500μV.

The dB scale gives from −30dB to +40dB, and there is also a separate input socket via an inbuilt −40dB attenuator which is used when signals in excess of +40dB are to be measured. There are separate input sockets for measuring in microvolts and decibels.

The instrument also contains a jack-socket for connecting an external meter or signal recording unit, and an audio amplifier and small loudspeaker for monitoring the signals being measured and for checking interference. The tuning scale is calibrated in frequency and the various television channels are marked. A Perspex indicator arm with an engraved cursor is coupled to a slow-motion drive.



The VSM2, one of a range of signal strength meters manufactured by *J. S. Fielden*. It is continuously tuneable over Bands I, II and III.

The instrument is mains-operated, 110V and 200–250V, 50–60 c/s, and tunes from 41·5 Mc/s to 67·75 Mc/s on Band I, from 75 Mc/s to 118 Mc/s on Band II and from 170 Mc/s to 230 Mc/s on Band III. The measurement range is from 5μV to 10mV or from +40dB to −30dB, with extension by inbuilt −40dB attenuator. The panel size is 19×8⅝ in. and the overall depth 6 in.

Type FSM6P is basically equivalent to the FSM6, but is built in a carrying case, complete with battery and converter.

Beulah Transistor Test Set Type D900

This is a small mains-operated instrument which conforms to the standard practice by measuring in the common emitter configuration. The unit provides for the measurement of a.c. gain, d.c. gain, leakage currents and in addition gives a power supply for the normal servicing of a transistor receiver.

The a.c. gain is read off a calibrated control in conjunction with a neon indicator which is extinguished immediately the above control coincides with the gain figure. The same control is also used to measure base input current, etc.

Two terminals on the front panel provide a means of measuring (with an external voltmeter) the voltage supply to the transistor under test. The instrument can also be used as an audio generator for signal continuity tests in audio circuits.

Labgear Signal Strength Meter Model E5107/A

This instrument covers Bands I, II, and III by means of a standard TV tuner, and the signal intensity is directly calibrated on a 4 in. meter movement. A 20dB attenuator pad is also suppled which (when fitted) multiplies the scale reading by 10 times, so giving a total signal range of from 10μV to 10mV.

Labgear Transistor Tester

This instrument provides for the measurement of the d.c. characteristics, signal current gain, collector leakage current and collector turnover voltage.

The unit is designed primarily for the radio and TV service department, but it will also give a useful laboratory facility, especially for matching pairs of transistors for push-pull stages and d.c. differential amplifiers and measurement of current gain fall-off.

Grundig Grid Dip Meter Type 701

This instrument consists of a compact mains-operated oscillator covering the range of 1·7 Mc/s to 250 Mc/s with six plug-in coils. The coils are designed to enable easy coupling to the test circuit, and an inbuilt meter indicates the oscillator grid current.

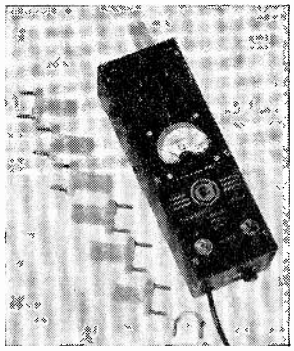
A four-position switch changes the function of the instrument to (1) a receiver supplying an a.f. signal to a pair of 'phones connected to the "Phone" sockets; (2) a wavemeter; (3) grid dip oscillator; (4) modulated signal generator.

The instrument is mains-operated, 200–240V, 40–60 c/s, 10 watts, and is housed in a steel, silver grey case measuring $8 \times 3 \times 2\frac{1}{2}$ in., and the weight is $2\frac{3}{4}$ lbs.

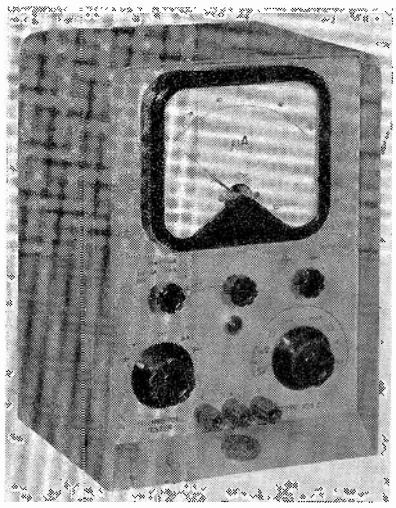
Q-Max Grid Dip Oscillator Type GD02

The grid dip oscillator is a versatile instrument and can prove very useful to the service engineer in determining such things as the resonant frequency of tuned circuits and aerials, inductance, capacitance and strays of these components. It can also be used as an absorption wavemeter, phone monitor, oscillating detector and simple-type signal generator.

The Q-Max Model *GD*02 has a frequency range of 1·5 to 300 Mc/s covered by a series of eight plug-in inductors, which may also be used as probes to couple to the test circuits. The instrument is mains powered, and is housed in a black crackle steel case measuring $8\frac{1}{2} \times 3\frac{1}{2} \times 2\frac{3}{4}$ in.



The *Q-Max* grid dip oscillator GDO2 which covers the range of 1·5–300 Mc/s using eight plug-in coil units.



The *Labgear* transistor tester designed primarily for use in the radio and TV service workshop.

The circuit is built around a double-triode valve, one half of which is employed as a Colpitts oscillator with a metered grid circuit, and the other half as h.t. rectifier. Two toggle switches give h.t. on/off and mains on/off, and a phone jack is incorporated for monitoring purposes.

The tuning capacitor is driven by a 5–1 slow-motion drive with hair-line cursor, direct calibration being provided on each range, together with a logging scale enabling rapid resetting.

Pye High Resistance Test Set

This instrument comprises a sensitive valve voltmeter in conjunction with a precision reference resistor giving an exceptional and highly useful range of high resistance measurements. The circuit allows for the indication of current passing through an unknown resistor when the test voltage is applied.

This is achieved by amplification of the voltage drop across a relatively low value reference resistor connected in series with the unknown resistance. The amplifier uses two subminiature valves in a d.c. feedback circuit of good linearity and gain stability.

The instrument is housed in a robust oiled hardwood case with high quality non-ferrous fittings, measuring $10 \times 9\frac{1}{2} \times 7$ in., and is powered from two 1·5V batteries and nine 22·5V batteries which are stored internally.

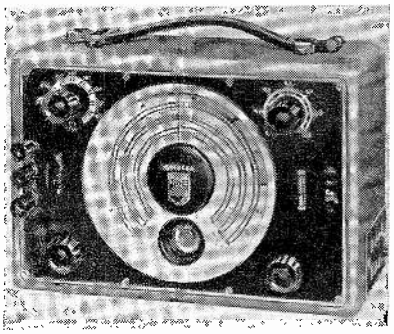
The range is from 3 megohms to 2 million megohms in five ranges selected by a panel switch, and the indication is provided by a $3\frac{1}{2}$ in. anti-parallax meter movement, scaled in two ranges, a red scale for 3 to 200 megohms and a black scale for 30 to 2,000,000 megohms. A test voltage at 100V nominal is available from the internal batteries.

Philips Universal Measuring Bridge Type GM4144

This instrument is suitable for the measurement of capacitors, including electrolytics, resistors and the comparative measurement of inductors. The principle of measurement is based on the Wheatstone bridge, but the usual galvanometer is replaced by an electronic circuit comprising an amplifier and an electronic indicator (tuner indicator).

The instrument also provides for the testing of the insulation resistance of paper capacitors, measurement of loss angles and direct measurement of percentage differences of coils, resistors and capacitors from −20 to +25 per cent. The instrument can also be used in the "open bridge" position.

The ranges are capacitance from 10pF to 100μF on six ranges; loss angle, tan of 0·01 to 0·6 for capacitors of 1 to 100μF; resistance from 0·5 ohm to 10 megohm on six ranges; percentage differences from −20 to +25 per cent. Voltages of 10, 25, 50, 100 and 250 d.c. are available for reforming electrolytic capacitors, and also is a capacitor "leak test" of 200 megohms.



This is the *Philips* GM4144 universal measuring bridge, suitable for measuring capacitance, resistance and inductance.

The instrument is housed in an attractive metal cabinet, and is mains powered, 110–245V, 40–100 c/s.

Beulah Decade Capacitor Unit DC-1U/F

Such decade boxes are ideal for all types of design and development work and can also save a lot of time in day-to-day servicing.

The Beulah unit provides capacitance values from 100 pF to 0·11 μF in steps of 100pF so that exact capacitor values are readily available for determination of capacitor values in compensating networks, filters, bridge impedances, tuned circuits, etc.

Precision 1 per cent silver-mica

capacitors are employed for high accuracy. Switches are ceramic wafer type for minimum loss, and feature smooth action and positive detent.

Grundig Capacitance Decade Type CD1

The sole distributors for Grundig instruments is Wolsey Electronics Limited, and one of the new range is the capacity decade. This provides a range from 0 to 1μF, in steps of 1000pF. The maximum operating voltage is 500V d.c. or 250V a.c., and the accuracy is better than ±2 per cent.

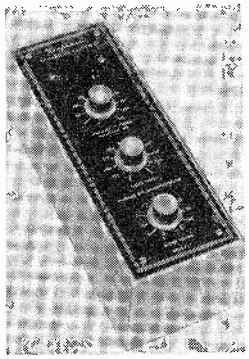
The instrument is built into a steel silver grey case of dimensions $7\frac{1}{2}\times 5\frac{1}{4}\times 4$ in., and weighs $2\frac{1}{4}$ lbs.

Grundig Resistance Decade Type RD1

This is the twin of the capacitor decade, and provides a range from 0 to 11·1k-ohms in increments of 10 ohms. *Model RD2* gives from 0 to 11·1 megohms in increments of 10k-ohms. The resistance elements are of the carbon film type and inductive and capacitive effects have been minimised, allowing the units to be used over a wide frequency range from d.c. to the frequency where the capacitive effects become significant.

The maximum frequency is approximately inversely proportional to the resistance setting; e.g., at 1k the maximum frequency is 10 Mc/s and at 1 megohm 10 kc/s.

The terminal arrangement permits ready access to any one of the three range multipliers. This facility is very useful for some bridge applications. The resistance accuracy is ±1 per cent,



The *Beulah* decade capacitor unit, DC-1U/F, provides capacitor values from 100 pF to 0·11 uF. It is available in a *Heathkit* version

the temperature co-efficient less than 3 per cent per 100°C. and the maximum power 1 watt. The instruments are housed in a steel, silver grey case measuring $8\times 5\frac{1}{4}\times 3\frac{1}{4}$ in., and the weight 2 lbs.

Dawe Decade Inductometer Type 230

This firm also markets a Logarithmic Resistor Box, a Decade Potentiometer, a Compensated Decade Resistance Box, a Decade Condenser and Ratio Arm Box. The Inductometer is, in effect, a four-dial decade inductor having a total inductance of 111·1 millihenries sub-divided to 10 microhenries, and is directly calibrated.

Each section of the complete inductor assembly consists of four inductors selected by a wafer switch in such a manner as to provide a decade unit. The instrument is housed in a metal cabinet of dimensions $10\frac{3}{8}\times 9\frac{3}{8}\times 7$ in. deep, and weighs 10 lbs.

Maker	Instrument	Net Price
J. S. Fielden	Signal Strength Meter VSM2	On Application
J. S. Fielden	Signal Strength Meter VSM2D	On Application
J. S. Fielden	Signal Strength Meter VSM4	On Application
J. S. Fielden	Signal Strength Meter VSM4D	On Application
J. S. Fielden	Carrying case and VSMC battery for VSM4/D	On Application
J. S. Fielden (distributor Viewline Sales)	Rack Mounted Signal Strength Meter FSM6	On Application
Q-Max (Electronics) Limited	Grid Dip Oscillator GD02	£15 15s. 0d. (extra coils 7/6d.)
Beulah (distributor Direct TV Replacements)	Capacitor Decade DC-IU/F	*£9 0s. 0d.
Grundig (distributor Wolsey Electronics)	Capacitor Decade CD1	£27 0s. 0d.
Grundig	Resistance Decade RD1/RD2	£22 10s. 0d.
Grundig	Grid Dip Meter Type 701	£22 10s. 0d.
Pye	High Resistance Tester	On Application
Labgear	Signal Strength Meter E5107/A	£35 0s. 0d.
Labgear	Transistor Tester	£26 5s. 0d.
Beulah	Transistor Tester D900	£10 0s. 0d.
Philips	Universal Bridge GM4144	£45 0s. 0d.
Dawe	Decade Inductometer Type 230	On Application

* In kit form £5 18s. 6d. (*Heathkit*).

SUMMARY TABLE OF INSTRUMENTS DESCRIBED IN THIS ARTICLE

Cinderella —*continued*

indicating that the genii of the mirror was stirring.

"Forsooth", she cried. "You are a wondrous wizard. How can I reward you? Name your *Philips*".

The wizard smiled. "I need none of those, being *Ultra* altruistic. But you can reward me by forsaking your evil ways. Stop viewing *that* Network and use the mirror to better advantage. Also, you must let your daughter marry the Prince".

"Yes, yes. I could not be without the mirror. It is like death in the castle when it fails. From now on, I'll only watch the Schools programmes and Little Noddy. And my daughter can marry who she likes."

Look Who's Here

The wizard, obviously a devotee of Alfred Hitchcock, tore off his whiskers, threw off his robes and uttered a loud cry. There was a roll of thunder, lightning flashes and corona discharges all round the room. And when this *Stella* display was over, there stood the Prince.

"My hero", chirruped the Princess, running into the room. "You know all the *Trix*."

"Shucks", he said modestly. "It was easy as *Pye*".

A week later they were married in the Kirk O' Shotts and lived happy as the Huggetts.

★

Service manager Aesop closed the book. "Now, every service engineer should see the moral of this story," he said. "You all have to be Prince Charmings and Wizards rolled into one. Unfortunately, you should not always expect to land a Princess. Although," he admitted thoughtfully, "It's an idea. I'll drop a line to the RTRA tonight".

STANLEY CATALOGUE

A new and revised catalogue of Stanley tools has been produced. It gives full details of a very wide range of tools, including planes of all types, spokeshaves and scrapers, shapers, braces and drills, vices, rules, hammers, squares, and bevels, screwdrivers, and complete tool kits. All new lines added in the last year are included.

The contents also include information on the correct use and maintenance of tools and over a hundred photographs and instructional drawings. The catalogue, No. 26, fourth edition, is available free of charge from Stanley Works, Rutland Road, Sheffield, 3.

SERVICE SHEETS

With this issue is published a complete index of all service data sheets printed to date.

We ask all readers wishing to obtain back numbers of service sheets to carefully read the notice on the first page of the index.

TRADE TOPICS *Letters to the Editor*

The Editor welcomes letters on subjects of technical or trade interest, but does not necessarily endorse the views or opinions expressed by correspondents.

Too Much Theory?

BEFORE Messrs. E. L., W. Booth and N. R. Stride get too waxed up, let me nip in smartly with the observation that manufacturers of radio and television sets take a lot of trouble in designing their sets.

Much work that the ordinary engineer never knows about takes place before the set is ever released for sale. Genuine modifications are usually the result of new techniques. But, by and large, a set should work satisfactorily as designed and should not need the "home-made mod".

Where an engineer who is obviously experienced, as E. L., finds a way of improving reception under particular conditions, there is no objection to a mod that does no harm to the set. What must be deprecated, however, is the "handyman mod", such as the altered mains tap to improve emission by increasing heater and h.t. voltage, the shorting of cathode bias to bump up the gain, the "peaking-up" and so on.

As a final observation, most manufacturers are interested in mods that have to be carried out, especially on their current models.—**Production Manager.** *(Name and address supplied).*

Apprentice Prospects

AS an "old-timer" who has served a long apprenticeship in all sections of the radio industry and retail trade, may I answer your October *Service Viewpoint* and reader J. Smith?

The key word in the latter's remarks was "glamorous". Apprentices today do not want to buckle down to real work. They are attracted by the theory side of things and forget that radio repair calls for a good measure of handiwork, general mechanics, some drawing and a good deal of diplomacy.

Modern youth disdains this approach and deserts the trade for the sheltered jobs in electronics, having once got a grip of the theory.—**B. Smithson,** *Hull.*

MR. J. SMITH appears to have spotted one of the reasons for the radio trade's apalling lack of suitable new blood (*Letters, p. 111 November*). As he says, our problem is not to *get* apprentices, but to *keep* them.

May I suggest the fault lies in the attitude of so many employers who treat radio service as the "Cinderella Dept." of the establishment. What apprentice, working under current conditions with most retailers, will fail to be attracted by the "glamour of electronics"?

Until there is a change toward more "service-mindedness" in the trade generally, I fear we shall have to put up with what Mr. Smith describes as the "not-so-bright youngsters and old-timers".—**H. Maxwell,** *Ashton-under-Lyne.*

Service Sheets

I WONDER if it would be possible to review the position of your policy regarding the issue of service data sheets to include some on electrical appliances and audio equipment instead of television and radio every month?

I am sure that if you could include this type of service sheet your circulation would increase. As you know, domestic appliances play a most important part in all dealer businesses and I think many readers would appreciate more service sheets on all types of amplifiers and tape recorders, etc. I hope you will consider this suggestion.—**E. Curbishley,** *Northwich.*

(The reason for the predominance of radio and television service sheets—particularly transistor radios and TV—is a simple one. We find that most readers require information on these sets above other types of equipment. However, should sufficient readers express a need for service sheets on domestic appliances and audio equipment we would be willing to provide them—at, of course, the expense of radio and TV sheets.—*Editor.*)

New Books

***Reference Manual of Transistor Circuits.* Published by Mullard Ltd., Mullard House, Torrington Place, London, W.C.1 Size 8½×5½ in. 308 pages. 241 illustrations. Price, 12s 6d.**

NO technical book ever made light bedtime reading. Nor is it possible, in just over three hundred pages of legible type to transform the novice into a fully fledged circuit designer.

These are the opening words in the preface to the first edition of this excellent publication and it sets the tone and defines the broad limits of a book presenting the most important information on the subject to the largest possible number of users in a way that can be assimilated as readily as possible.

It is not intended for the senior engineer. He will not need to use it except, the publishers slyly hint, when nobody else is looking! But for those below this category, the manual offers in a concise, clearly readable form, a great deal of information on transistors and their applications. A subsidiary aim is to help the non-specialist reader to a better appreciation of transistor data and to this end the first chapters contain general background on the properties of transistors including notes on construction and manufacturing techniques.

The first third of the book contains data on characteristic curves, basic a.c. circuits, bias and stabilisation, equivalent circuits, limiting values, and similar theoretical aspects. These first nine chapters provide a background with the main emphasis on small signals and audio frequencies.

The remainder of the book is more practical and contains details and explanations of more than 60 circuit designs using semi-conductor devices. Of these, about a dozen are new circuits and some 25 are made generally available for the first time. They range from circuits for use in domestic radio and audio equipment to pulse circuits, d.c. amplifiers, converters and others.

Short chapters on semiconductor diodes and the OCP71 photo-transistor are included, but aspects such as some switching applications and electronic computers have been deemed too specialised for inclusion. No circuits are given for the relatively new alloy-diffused transistors, though basic techniques are discussed.

The manual has a wide appeal to all who come into contact with transistors but is primarily meant as a reference source of ci rcuits. As usual, the presentation leaves nothing to be desired—and mathematics where introduced are in logical sequence and are not over-predominant. The approach is fundamentally practical. Highly recommended.—*D.C.*

***Transistors, Circuits and Servicing,* by B. R. A. Bettridge, M.Brit.I.R.E. Published by Trader Publishing Co. Ltd., Dorset House, Stamford Street, London, S.E.1. Size 8¾×6 in. 27 pages. 12 figures. Price 3s. 0d.**

THIS is another publication dealing with the applications of transistors, actually the second edition of a booklet derived from material first published in *Wireless and Electrical Trader.*

It is inevitable that a comparison should be drawn between this and the larger one reviewed above. Although the material of the Trader booklet is well presented and written and the information slanted towards the service engineer, there are but 20 pages and 12 figures, less than one tenth of that of the Mullard book. It cannot therefore be as comprehensive, nor is it intended to be so.

The Trader booklet has six chapters, dealing with transistor theory, modes of operation, a.f. amplifier, description of a complete radio receiver and general servicing notes, the treatment being almost entirely descriptive, mathematics being avoided.

Difficult to sum up. Perhaps the fairest comment is that for those requiring a brief general outline the Trader's three-shilling booklet represents a natural choice, whereas for those needing a more comprehensive coverage the Mullard's book is the obvious selection.—*D.C.*

SERVICE WITH A GRIN — by H. W. HELLYER

Those December Doldrums

THE chap who said that life was just a bowl of cherries was talking through his infantile hat. Life is a veritable cornucopia of all the fruits, from the exotic mystery of the pomegranate to the small sour lemon.

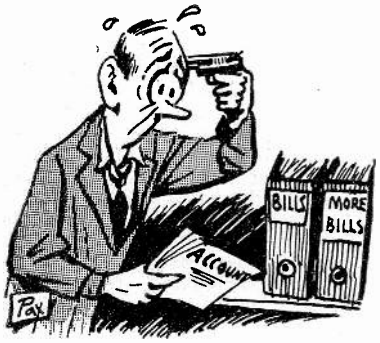
Cause of this unseasonal bitterness is an equally unseasonal slump in trade. This has had the usual repercussions. Along the High Street we witness the shutters going up as some small trader resigns the unequal struggle. The commercial wind blows cold.

Yet, though we expect the shorn lambs to feel the cruel blast, what of the roaring bulls of business, the multiples, the stores groups? The innocent bystander might expect them to have grown a thick enough fleece to withstand the icy economic draughts. But in truth they are the first to falter.

When a large store that sells radio as a sideline is hit by the lessening of business, it is the radio section that feels the edge of the axe, and the service department, inevitably, that first comes under the blade. Service is seen as a necessary evil, like the maggots in a gorganzola cheese. Costs must be cut, say the moguls. The poor service manager finds his expenses pruned back to painful inadequacy. Engineers catch themselves conning the adverts in search of a better 'ole.

Take a typical example. A large trade service organisation has in the past few years built up a reasonably efficient chain of repair depots and secured a number of important contracts. Of late they have become ambitious and started to serve all-comers, including some of their rivals.

Then comes the chopper. In an opulent city office a telephone is lifted: "*Better take a couple of thou' from the servicing budget, Parkinson*". On the floor below, Parkinson thinks "make it nearer five thou' for safety—let's see, that's X per cent. If we cut out overtime, lessen the bonus, sack one engineer per branch . . ." In no time at all the budget is streamlined. Protests from the intermediate bosses are lulled. "The order came from the top."



Some small trader resigns the unequal struggle.

At the lowest level—yours and mine, Joe—this edict means more running about to absorb the missing man's work. For service requests still roll in heavily, despite the slump in selling. In turn, this leads to some customers being kept waiting longer than they would like. As usual, the chap who knocks on the door takes the blame for the delay.

Next come howls of wrath from the salesmen, who have promised their customers service by "yesterday evening, at the latest". Charges of inefficiency

. . . out in the cold, alone.

are levelled at the local service manager, who is already growing additional grey hairs, worrying about his slashed orders for replacements.

These complaints by the merchandise wallahs filter to the top, allied to grumbles about the rising cost of repairs. Parkinson nibbles his pen, assures the telephone that "*the matter is being attended to—slight reorganisation. Why not get someone else to do the service, eh? Someone more economic?*"

The store managers look at their servicing invoices and growl assent. It is even more obvious that service is the maggot in the cheese. When sales were healthy, the stores were wealthy, but not wise enough to stockpile the maintenance money to offset future costs. Now, every penny is grudged.

The next step is to sub-contract service. Get the little chap around the corner to do it for half-a-crown an hour less. No matter that the little chap, rubbing his hands with glee, puts in a lot more hours for the same amount of work and sells them his stock at retail prices. The reckoning will come later, in the meantime they are satisfied with service.

My side of the High Street . . .

Parkinson, still nibbling his pen, thinks up another idea. If the service department, as such, cannot cope, why not split it up—decentralise? That's a lovely word, decentralise. It usually means operating at minimum efficiency for maximum cost. Each engineer is allotted to a shop. He comes directly under the shop manager's control, at the beck and call of every salesman. When Mrs. Grizzle complains, off he goes, immediately.

Or, at least, that is the theory. In practice, he is usually up to his neck with a dozen other grizzles. He has to carry more stock, is out in the cold, alone. He runs more miles, crossing with his erstwhile mates as the trails to the customers tangle. He has nobody on which he can unload his teasers, cannot afford the benchtime to tackle the long job, skates around the thin ice of the intermittent fault and falls headlong into the recall trap, with no service manager to act as a buffer for him. His ulcers grow ulcers.

In time, even Parkinson admits that service is costing more. This time he blames it on the crass inefficiency of the individual engineers. So a new arrangement is born. They shall be supervised. A kind of roving service manager comes into being—and slowly a service department is welded together, more primitive than before. It runs on a shoestring. Perhaps when sales pick up it will be allowed more financial freedom. In the meantime, it has cost a small fortune to "reorganise" and "decentralise", and Parkinson is counting his grey hairs. Do I hear the mutter: "Sour grapes". For this "typical example" is a company I have known for a number of years.

There's one consolation. If I get the sack for saying this I shall not have lost a lot. And, though the prospect of job-hunting does not appeal to my hardened arteries, there is plenty of work around. My side of the High Street has not been swept in weeks.

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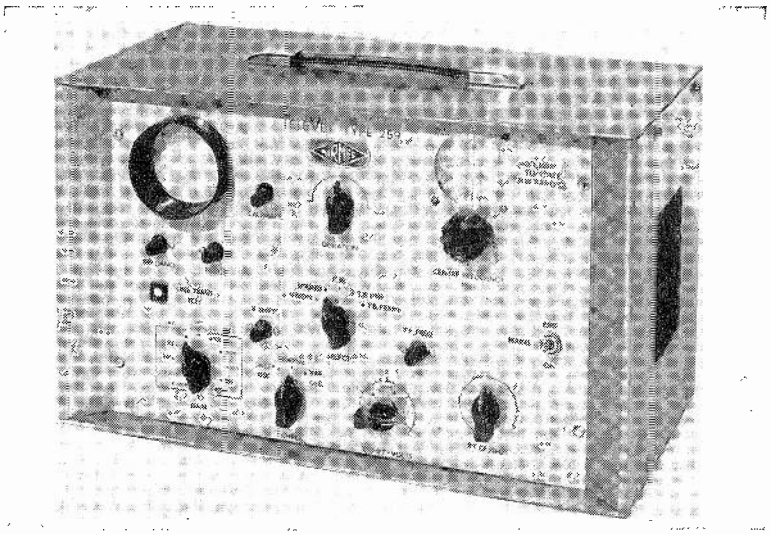

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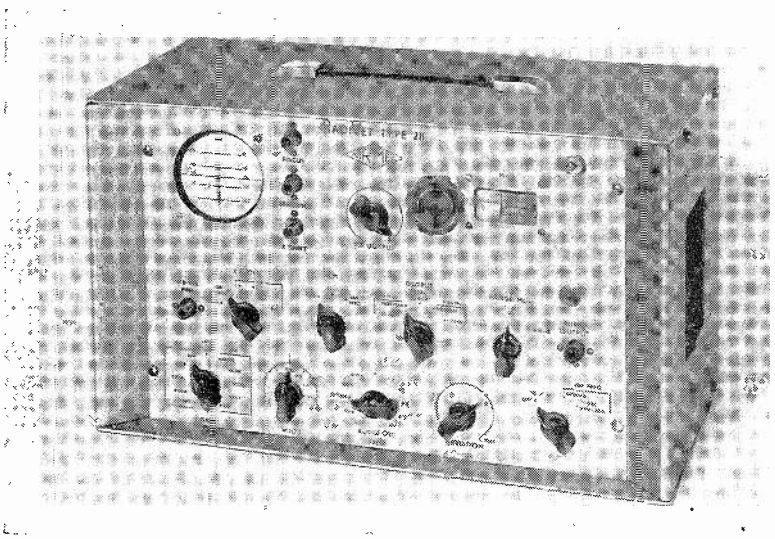

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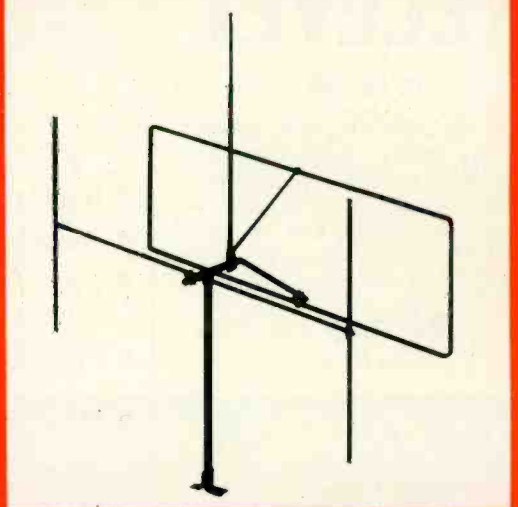

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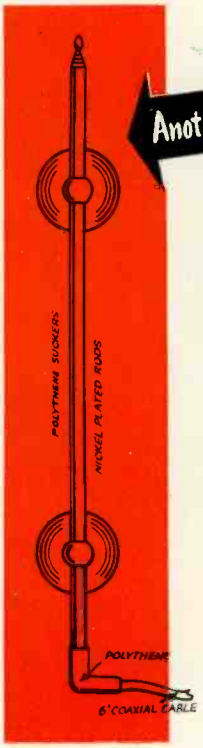

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