RADIO AND ELECTRICAL Retailing

OCTOBER 1961

SERVICE ENGINEER

Radio, Television and Audio Servicing

SERVICE ENGINEER

Vol 4. No. 6 OCT., 1961

Edited by W. Norman Stevens

Issued as a special supplement with "Radio and Electrical Retailing"

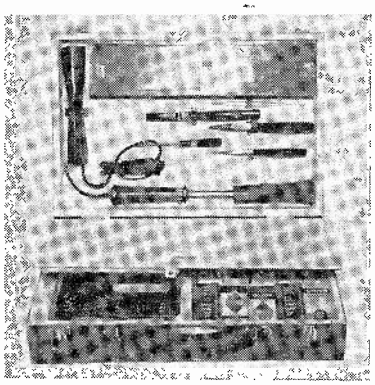
In this issue:

SERVICE DATA SHEETS

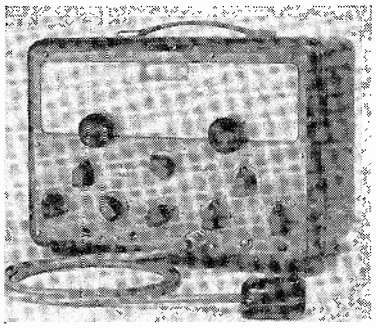
R155: H.M.V. 1639 series radiograms.
R156: Roberts R200 transistor portable.
TV186: Murphy V410/V420 series television receivers.

Service Data Sheets

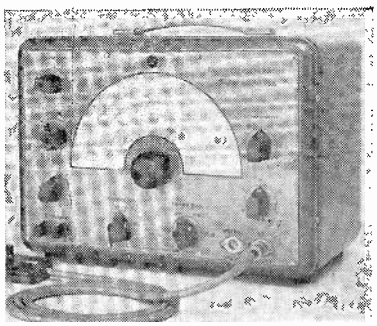
Due to an error, service sheet R156 was inserted with last month's magazine. We apologise to readers who may have been under the impression that we had increased the number of service sheets issued to four per issue.



The Geo-Pat *Specialsize* combined valve, components and tool box, as described in the September issue of *Service Engineer*.



Model 62A



Model 92B

TWO NEW TAYLOR INSTRUMENTS

A new signal generator and a new wobbulator are announced by Taylor Electrical Ltd. Model 62A is an a.m.-f.m. signal generator with sweep and crystal calibrator, and in conjunction with an oscilloscope provides complete facilities for the sweep alignment of the r.f., i.f. and discriminator stages of a.m. and f.m. receivers. Ratio detector alignment using simultaneous a.m. and sweep signals is available.

The a.m. generator covers the range 4-120 Mc/s in 5 bands, all on fundamentals, to a calibration accuracy of ± 1 per cent. The f.m. and sweep section also operates on fundamentals and cover the frequencies 4-24 Mc/s, 32-45 Mc/s and 70-120 Mc/s in 5 bands, to a calibration accuracy of ± 2 per cent. The a.m. generator may be used as a marker during sweep alignment. An internal switch is provided to allow blanked or unblanked operation. An internal phase control allows variation of external sweep phase over approximately 165 degrees with an output level of 8V peak-to-peak.

Deviation on f.m. is variable up to 100 kc/s from the mean carrier frequency at a modulation rate of 400 c/s. The sweep covers a total bandwidth of 1 Mc/s at power-line frequency. A crystal calibrator circuit, with switch selection at any one of three internally mounted crystals is incorporated, a 5 Mc/s crystal being supplied with the instrument.

A five-section attenuator with a non-inductive potentiometer is provided, in steps of 20dB, with a fine control of 0-20dB. R.f. leakage is reduced to a minimum by shielding of the attenuator sections. An added facility in the servicing of audio stages is provided by a variable level 400 c/s signal.

The r.f. output is 100mV and is monitored by a crystal diode voltmeter.

All the facilities offered in the Model 62A can be selected by internal switching and no cross connections external to the instrument are necessary. There is choice of c.w., a.m., f.m., sweep plus c.w., or sweep plus a.m., by internal switching. When using the sweep facility, the marker level may be continuously varied.

The signal generator is housed in the standard Taylor style casing and weighs 21 lb. Provisional price is £60.

The Model 92B is a wobbulator covering a range of 4-220 Mc/s in four bands, all on fundamentals, to a calibration accuracy of ± 5 per cent. A feature of the instrument is the high r.f. output available on all bands, ranging from 100-300mV. The sweep covers a total bandwidth of 10 Mc/s at power-line frequency.

Attenuation is by means of a variable control and a 5-step switched attenuator in steps of 20dB. A socket is provided for external marker signal. The specification gives radiation as not greater than $3\mu V$. Horizontal deflection is variable 20V r.m.s. and phase variable to 165 degrees. In a similar case to the 62A, the Model 92B is provisionally priced at £40.

Service Dept. Moves

ULTRA radio TV service department, under service manager J. S. Lawson, has moved to Eley's Estate, Angel Road, Edmonton, London, N.18. (*Telephone:* EDMonton 3060).

G.E.C., SOBELL & McMICHAEL, service departments, under the management of A. La Croix, have moved from their present addresses to Langley House, Hanger Lane, Ealing, London, W.5. Temporary telephone number is PERivale 6691.

Philips Awards

The City and Guilds of London Institute have accepted an offer from Philips Electrical Ltd. to present "Philips Awards", each consisting of a service kit, to the three candidates judged to be the most meritorious in the Institute's Final Examinations in Radio and Television Servicing.

Service Viewpoint

THE question of conversion is with us again. Since the Radio Show – not forgetting the "splinter shows"— many misgivings have haunted engineers. They remember the hectic days of early Band III and ask: "*Will it happen again?*"

Cause of these qualms is the readiness with which setmakers have plunged into the pool of new systems before the Pilkington committee have poured the water in. With three of the principal groups at open loggerheads, favouring (a) retention of existing standards, (b) add-on u.h.f. conversion nd (c) built-in switchability, and the RTRA roundly censuring them all, the retailer and his henchmen may well be forgiven for indulging in a little head-scratching.

We were surprised to read a dealer's comment in the responsible pages of *Electronics Weekly* a short while ago: "*Band III convertors were a compromise a few years ago, but they didn't really catch on. People preferred to wait. . .* "

Now that just isn't true, as any serviceman can tell you. Conversion swept the country like a forest fire, the sparks spreading from region to region as new ITV stations sprang up. Wait was just what the average customer was not prepared to do.

Even when brand-new 13-channel sets were tumbling off the production lines, many cautious folk preferred to bank on the bird-in-hand and have their old receiver converted. Others weighed up relative costs and decided it was worth while adding a tuner despite generous trade-in allowances. Yet others kept their old faithful sets for purely sentimental reasons. But few were content to sit back and wait until ITV was well under way.

Jumping the Gun

Service engineers found themselves scampering around with tuner units and aerials long before the stations opened—then wearily retracing their steps as signal conditions proved different from expectation.

Much the same thing is going to happen at u.h.f. Mark our words, these receivers that are presently prepared for dual-standard reception are going to be two or three years out-of-date before they come fully into use. By then, just about anything could happen.

Some genius may come out with "pickaback transmissions" or some other S-F method of band-saving. A gentleman from Tokyo, or Milan (or Dublin?) may present us with the "potted set" that renders the repairman redundant. At the existing rate of progress techniques are obsolescent almost before the ink is dry on those papers that entertain our learned societies.

But one thing is constant and certain. At the higher frequencies, those problems that perplexed us when we converted the older sets are going to be drastically multiplied.

Ghosting and erratic signal strength will only be a part of the problem. The questionable benefits of higher definition will be more than offset by these drawbacks, plus the difficulty of stable reception at the touchier higher frequencies.

We have deliberately ignored the added complication of colour. This will involve the setmakers in yet more gun-jumping, once the question of standards is resolved.

The sum total of this? Service engineers of quality are likely to be more than ever in demand as this radio year rolls on. Get yourself genned-up on dual-standard equipment by watching these pages for authentic technical news. We shall not be jumping the gun, but don't miss our reports. They, at least, will be right on target.

SERVICE EQUIPMENT FROM LAB-CRAFT

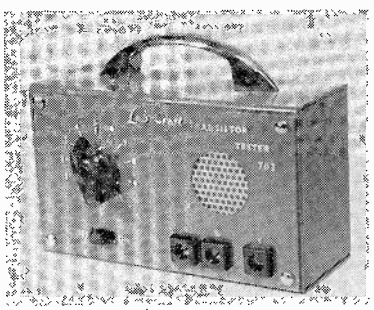
FIVE TRANSISTORISED UNITS

A range of transistored portable service equipment has been released by Lab-Craft Ltd., 83 Ilford Lane, Ilford, Essex. (Tel: Ilford 2576). Known as the 700 Range, it comprises five instruments housed in matching cases of the same size and finish (grey with chrome fittings) with carrying handle.

Model 701 is an inexpensive transistor tester which will detect high leakage currents, determine whether an unknown transistor is a p-n-p or n-p-n type, match transistor gains for push-pull circuits and test r.f., i.f. and a.f. transistors. Price is £6 19s. 6d. net trade.

The 702 is another transistor tester, but providing an in-circuit test for all types of p-n-p transistors. In-circuit tests available are—(a) to detect short circuit or open circuit transistors, (b) to compare transistor gains, (c) to test r.f., i.f. and a.f. transistors. Out-of-circuit tests available are (a) to check all types of p-n-p transistors, (b) to match transistor gains, (c) to detect noisy transistors. The net trade price is 9 gns.

Model 703 is a signal tracer which is essentially a 2-transistor transformer coupled amplifier providing adequate gain for signal tracing in the audio stages of a receiver. Provision is also made, by the addition of a diode detector, to trace signals in the i.f. and r.f. circuits of radio and TV receivers. It can be used as an audio amplifier when not required for signal tracing; a variable gain control is fitted. Output is 50mV. Input sensitivity is 20mV for full output. Overall power gain is 50dB. Used in conjunction with Models 704 or 705 it provides a comprehensive circuit analyser for fault finding on radio and TV by tracing the r.f. and a.f. signal from aerial to speaker. The price of the 703 is £7 17s. 6d. net trade.



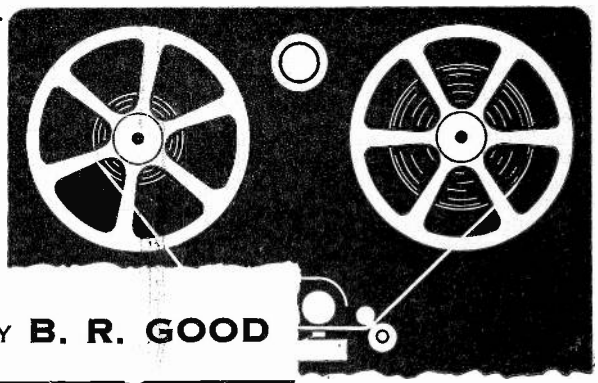
The model 702 transistor tester, one of the new range of instruments from Lab-Craft. All five units are in matching cases, similar to the one illustrated. Finish is in grey with chrome fittings.

Model 704 is a radio signal probe and functions as a wideband modulated signal generator emitting a signal rich in a.f., i.f. and r.f. components. Two outputs are provided, a direct output at the sockets and a radiated signal from a plug-in ferrite rod aerial. The amplitude of the direct output is controlled by an attenuator so that relative stage gains can be determined. Range is 2 kc/s to 25 Mc/s. It sells at £5 19s. 6d., net trade.

The final model in the range is the 705, a TV signal probe. The instrument functions (a) as a wideband modulated signal generator for fault-finding audio and radio circuits and (b) as a tuneable modulated signal generator for fault finding the i.f. channels of TV receivers. The instrument will produce a 2 kc/s tone in the speaker of the receiver under test when injected into any circuit of a radio set and the i.f. sound or audio circuits of a TV set.

When injected into television video i.f. circuits, a horizontal pattern is produced on the screen. The ranges are 2 kc/s to 25 Mc/s wideband and 30-40 Mc/s tuneable. Price is £6 19s. 6d. net trade.

Servicing the MODERN TAPE RECORDER



PART SEVEN OF A NEW SERIES BY **B. R. GOOD**

WITH a fine sense of telling publicity the British Ferrograph Recorder Company have appropriated to themselves the adjective "Incomparable". They might also have justifiably used the slogan, "First in the Field", for their original machine was the first entirely British design and manufacture to be marketed.

The adjectives are deserving. The current range of equipment is of a quality far in excess of the average domestic machine, at a slight increase in cost. Indeed, at the time of writing, the monaural version of the 4A/N is retailing at 81 gns. From this level, the price range goes up into the professional bracket until we come to the 3C/FNH, at £180.

WEARITE 4 DECK

The service engineer is unlikely to have to handle many of the better types, but there are many of the "4" range machines in use by enthusiasts and other private persons and companies. There are also a number of home-built machines that have been fashioned around the Wearite series 4 deck. We shall therefore concentrate on this model, and point out the differences from the costlier models in passing.

Main Tape Path

Reference to Fig. 1, which illustrates the general arrangement of the main tape path of the Wearite 4 deck and the function switches, will show that there are two or three features slightly different from normal.

First, it will be noted that there are three heads. The left-hand casing, A, shields the erase head and the auto-stop shorting device. B is the Record/Replay head, specified at 12,000 ohms impedance at 10 kc/s. (the erase head is, of course, low impedance, and the recommended bias and erase frequency is 53 kc/s at an erase voltage between 25 and 35 volts).

The third head, C, is actually a dummy in the standard model. Provision is thus made for the addition of a monitoring or stereo head. The stereo head suitable for addition is listed at 7 gns.

It should be noted that the provision for azimuth setting on the additional head is more complicated than the original head, which is adjusted by the alignment screw D. The triple-screw setting is, however, capable of more accuracy and less inclined to subsequent variation.

Between these two heads there can be seen a tape guide pin, E, with its associated bracket and bar. This item, and the moulded pressure arms F, is actuated by a leverage system above the sub-plate, but against the return pressure of springs beneath the main plate of the deck. Although there is normally plenty of clearance, a lack of pressure at head faces, causing loss of intimate tape contact, may be due to distortion or binding of individual levers. *When testing, always re-check after fixing the top-plate, and ensure that the ornamental fixing screws are securely seated.*

The pressure arms are hinged at the left-hand end. Note that the first arm (applicable to direction of tape travel) has a "finger" that moves inward to engage the tape, acting as a form of guide and emergency stop mechanism. Erratic tape transport may be due to slight variation in level of this arm: check the hinge point for vertical play.

The pinch wheel, G, moves in an arc to engage the tape with capstan H, carrying on its bracket a rocker arm J. This arm acts in conjunction with a press button on the head cover, providing a simple pause control by moving the pinch wheel away from the capstan.

Guide Post

The tape next runs over a guide post with a knurled nut stop-flange. The position of this post, K, in relation to the take-up spool is interesting. It allows for modification to endless loop and ciné attachments and is an easily recognisable feature of the Wearite deck.

Just above the assembly plate can be seen the speed change and equaliser switch, L. On the 4A/N the speeds are 3¾ and 7½ ips, and on the 4A/H, 7½ and 15 ips. Speed change is

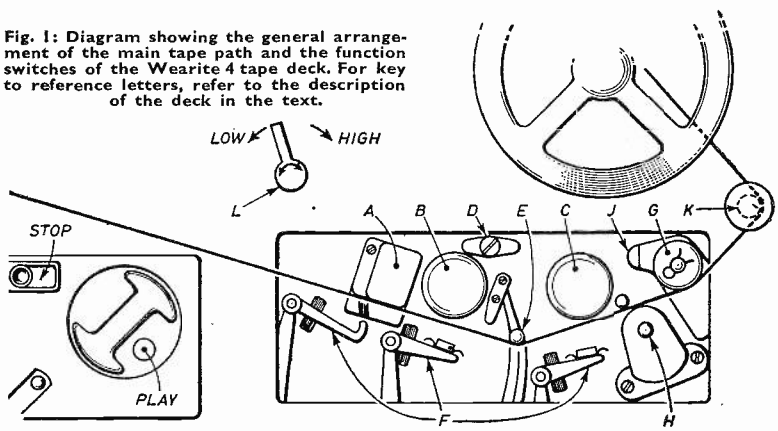


Fig. 1: Diagram showing the general arrangement of the main tape path and the function switches of the Wearite 4 tape deck. For key to reference letters, refer to the description of the deck in the text.

effected by selecting a step on the motor spindle capstan, which engages an idler pulley, in turn driving the heavy flywheel, with a direct shaft tape drive.

The rotary-to-vertical movement of this change is simply carried out by a slide bracket, and should present few problems.

Beneath the speed-change switch is a wafer which is used to select the appropriate equalisation network. This can be more clearly seen in Fig. 2, a view of the underside of the Wearite series 4 deck. Designated A.

Three Motors

There are three independent motors, two of which are induction type and the third, the main drive motor, B, a specially designed "Octoquad" synchronous motor.

The take-up motor is shown, C, and the reservoir spool is driven by motor D, which is operated on reduced power during Record and Playback functions to maintain tape tension.

Fast rewind is very fast, taking less than a minute for a 1200 foot reel of standard tape.

This can lead to complaints of loose re-spooling, and is hardly to be avoided: it is the price one has to pay for rapid operation. Its detrimental effect is somewhat cancelled by the reverse tension action during forward play.

At the top can be seen the clock-type tape position indicator, E, which is driven by a flexible drive and a worm gear from the shaft of the take-up motor. *It is capable of accuracy to within one turn of the reel.*

As the clock face is divided into ten sectors, each subdivided ten times, one complete revolution of the "second" hand indicates 100 revolutions of the spool, yet one rev. can easily be judged from the sweep of the hand.

Hold-in Solenoid

Other important items on this deck are the hold-in solenoid, F, and motor switch G, which combine to give a foolproof safety operation, preventing the user from leaving the machine in an "operating" condition when it is switched off.

Switching on involves the sliding of a knob in a diagonal groove toward the bottom left hand corner of the deckplate. This moves lever H, which cuts in the motor switches and releases the brakes. It also closes an auxiliary circuit to energise the hold-in relay. This retains the lever in its "On" position, against the tension of a return spring.

"Stop" action temporarily short-circuits this solenoid. The spring

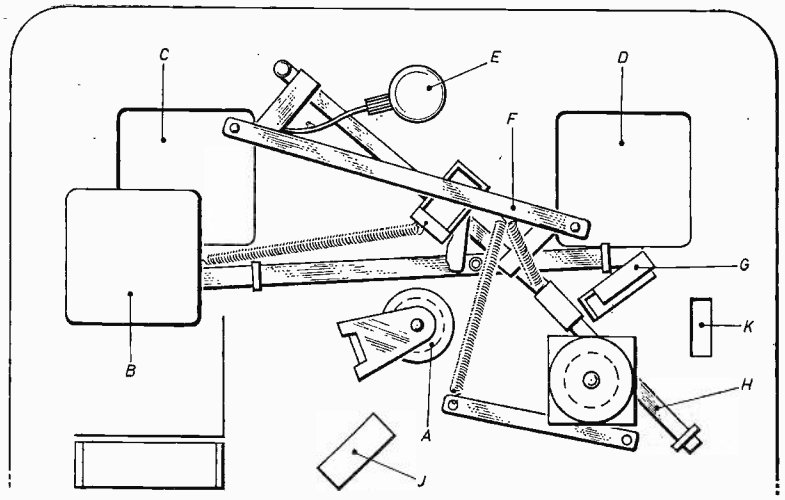


Fig. 2: Sketch showing a general view of the underside of the Wearite 4 tape deck. For key to reference letters, refer to text.

returns the start lever, applies the brakes and opens the motor switches. As can be seen from Fig. 2, the lever system is very simple, and, apart from the springs involved, should never give rise to faulty action.

Two more switches need to be mentioned, although their function is self-evident. These are the "Auto-stop", shown at J, and the "Manual Stop", K, whose action was described in the last paragraph.

The Auto-Stop

The auto-stop is a rather more elaborate device than found in the general range of tape recorders. It is so arranged that the groove in the erase head mounting, see Fig. 1, takes the finger of the left-hand pressure arm which is thus in tension against the tape. Any loss of this tension during record or playback causes the finger to contact the stop switch system and cut off the motor drive.

As the hold-in solenoid releases the main circuit, so the event of tape breakage, or a run-out of a spool with no leader, does not result in the usual frantic spinning of an unattended machine, or the occasional catastrophe of yards of tangled tape around the deck.

It will be appreciated from this that the pressure arm spring tension is rather important. Indeed, because of the reverse spool tension during forward play, only slight tension is necessary by the pressure pads against the head faces.

General Service

Repairing tape recorders of this quality inevitably demands a more thorough series of tests. When the mechanical aspect of the machine has been vetted and any necessary adjustments made for true running, a more detailed test for "wow" and "flutter". should be made.

These tests can be applied to all machines, but careful reference should be made to manufacturers' data before too stringent a limit is set. *Remember, also, that some figures, especially some response curve quotations, are improbably optimistic!*

Wow can be stated to be the variation in speed up to 10 cycles, and flutter a variation at higher frequencies. Some of the causes of each will be obvious; wow will usually be a cyclic variation of rotating components, such as pinch wheels, idlers, spool hubs, or capstans, where these are not directly driven; flutter may be due to a faulty motor, or to various tape effects, such as incorrectly tensioned guides, pressure pads, clutches, etc.

Wow by Ear

Detecting wow by ear can be a chancy business. The audible effect of a change in pitch of a test tone depends not only on the amount of variation but on the basic frequency of the test tone, its intensity and the rate of change.

The human ear is most sensitive, in this respect, in the 2,000 to 3,000 cycles range, and can detect as little as a 0·2 per cent change in pitch—if that change is sudden enough.

Wow testing can be carried out with the aid of an oscilloscope and a test tape. If a double beam 'scope is available a comparison of the output of the tape recorder (test tape track at a constant frequency of approximately 5 kc/s) and an accurately calibrated audio oscillator, can be made on each beam. Both traces

should be brought together, when wow will be shown as a wavering of the trace.

Constant Tone

A simpler test can be made by recording a constant tone (the television test tone will suffice) at a low speed and playing it back at a higher speed. Small variations become more easily discernible.

Variations at a slightly higher frequency, actually at 24 cycles/second, will be caused by faulty motor bearings or spindle, or by the drive or idler wheel, depending upon the capstan drive system.

Flutter at still higher rate can be caused by pressure variations of the transport system. Irregularities at guides, pressure pads, clutches, pinch wheel or capstan, or even loose spooling with resultant inconstancy of reverse tension, can cause slight, but annoying variations in tape speed.

The difficulty is that the effect of high-frequency flutter, during normal operation, can be an almost indefinable "hardness" of tone, rather as if the fault lay in the amplifier circuits.

Before making too dogmatic a decision try playing back an alternative tape, to check possible source variation. Then make a recording of several constant tones on the suspect machine, playing them back on a known good recorder.

If the fault lies in the transport system, the symptoms will be reproduced during this latter playback. If the fault is in the amplifier, it is unlikely that recording conditions will produce the same symptoms as on the original playback – although some discrepancy in recording may be noticeable.

As a final test of the playback circuits, feed a signal from an external source, such as another machine, at an input point as early as possible (i.e., to the pre-amplifier grid), when electronic distortion will once more be apparent.

Bias Distortion

A cause of distortion that is often overlooked is the bias, used both as erase source and signal bias at the recording head. Both frequency and voltage of bias are important, and there are so many variations in circuitry that it is difficult to give a common rule of guidance, except to say that manufacturers' data should be consulted before alteration of the h.f. oscillator is made.

When checking bias and erase currents, remember that the frequency must be correct before specified readings can be taken. Very often there is a resonant circuit arranged in such a way that adjustment for maximum current will ensure approximate frequency.

But remember that the recommended way of testing is by taking a voltage measurement across a series resistor, *not* by shunting a meter across the head itself.

In general, the process of testing and maintaining tape recorders is a matter of common sense. Although the preceding notes are far from comprehensive—largely because of the number of differing models on the market—it is hoped that some guidance may have been given.

To conclude, the author would like to thank the manufacturers of the various machines mentioned in all the previous articles, and their service departments, for the information willingly and unstintingly offered. He must also thank those readers who have commented kindly on the series of articles, and the Technical Editor, for allowing the space and encouraging their preparation.

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.

BBC Test Signals

ABOUT two months ago, I had an Ultra V815 in for repair but after the job had been done I noticed a series of white lines at the top of the picture. These appeared only on Band I but we checked the frame timebase circuits inside out without finding anything wrong. When the set was switched on the next day the lines were not present.

I had forgotten all about this until seven weeks later I was approached by a fellow engineer who was experiencing the same trouble on a Philips 1446U and had also tried everything in the frame circuits to no avail. We assumed it was something to do with the BBC transmission since no fault was present on Band III.

The same week I had the fault on several other receivers, the trouble being more severe on sets over four years old. This was put down to the longer frame flyback time on these sets and this brought back to memory a lecture on "The use of an oscilloscope in television testing" at the Institution of Electronics exhibition.

Here we were informed that on the 11th line of the 14 suppressed lines at the start of each frame was a test signal which, so far as I can remember, was something like that shown in the diagram. This test signal is used by the BBC, GPO and television set manufacturers.

With the signal it is possible to carry out a very good frequency and d.c. response check. The signal is fed through the equipment under test and the output is applied to a synchronised oscilloscope.

I am sure that this check is of great importance to all concerned, but the BBC have caused TV engineers a great deal of trouble by not publishing the facts.

The reason why the fault is more apparent on old sets is because they use the full 14 suppressed lines for frame flyback whereas more modern sets use only 4 or 5 lines and thus no fault appears on the picture.

I am wondering if the BBC would consider using the 13th or 14th line for their test putpose. This would allow just that little more time for the flyback.

It should be noted that the test signal has been transmitted in the evening as well as during the day. In writing these notes I hope I have saved some of my fellow engineers a lot of time spent in vain searchings for a receiver fault that doesn't exist.

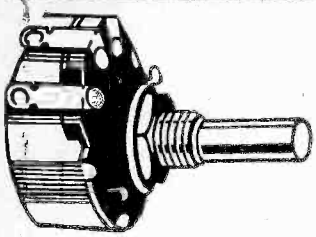
—**Barry Williams,** *Middlewich, Cheshire.*

The BBC explains that the test signal, to enable continuous checks to be made throughout the whole network in helping to maintain a high picture quality, was included in all TV programmes passing through the London switching centre from July 24-31 inclusive. Before the signal was transmitted, retailers associations and BREMA were informed, none of which raised any objection.

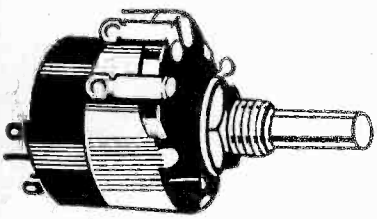
The BBC add: "It became clear, however, that there were still a number of receivers in use with a slow enough field flyback time to show this signal in the picture area and we therefore discontinued the signal during programme time from July 31. It is at present included in the morning trade test transmissions between 12 noon and 1 p.m. from Mondays to Fridays inclusive."

Volume Controls for Radio & TV

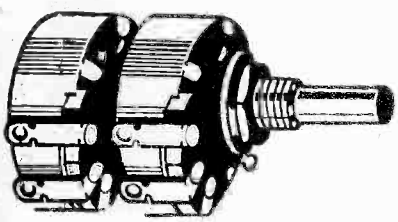
by return



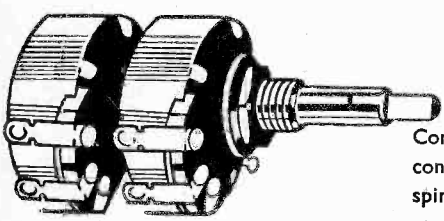
Type 'A' Controls
A standard Switch Control in all standard values.
Price 3/4d. Trade



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.
Price 7/0d. Trade



Type 'AM' Controls
Complete range of multi-controls with special dual spindles for replacement purposes on specific TV sets.
Price 10/- Trade

Morganite

'LAB' Volume Controls for low noise level, high quality performance, 3" standard spindles, fully flatted.

Replacements for all radio and TV sets are dispatched the same day that we receive your order or 'phone call. Illustrated data book and price list sent free on application. 'LAB' Volume Controls are available from all good wholesalers—in case of difficulty contact:

LAB TESTED

THE RADIO RESISTOR CO. LTD

PALMERSTON ROAD · WEALDSTONE · HARROW · MIDDX.

Telephone: HARrow 6347

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.

Ferguson 725

An A.G.C. Fault

This receiver came in with a negative picture. On test it was found that the contrast was at a maximum, and operation of the contrast control would have no effect. The control was checked, an open circuit being suspected, but found to be in order, also the potential derived from the h.t. supply to back off the a.g.c. line was varying by the correct amount at the wiper when the control was turned.

Attention was then turned to a.g.c. system itself. The control voltage in this receiver is obtained from the negative grid voltage developed in the sync separator. This was found to be present at the grid end of R58, a 680k Ω feed to the a.g.c. line, but not at the other.

The resistor was measured and found to be all right. A short circuit was then discovered on the a.g.c. line itself which was traced to C37 the line discoupling capacitor. Replacement effected a complete cure.—V.D.C., Bristol (1037).

Pye SP17

Unusual Line Trouble

No picture or brilliance in this case. A quick test confirmed that there was no e.h.t. A slight amount of a.c. was present on the anode of the e.h.t. rectifier and the heater was alight but glowing very dully.

Boost voltage was checked and found to be 400. All the usual valves were charged but with no effect. Screen volts were present on the PL81 and were also on the generator valve electrodes.

It was noticed that the PL81 screen resistor was a little discoloured but no notice was taken of this at the time as voltage was measured on the screen. An examination of the circuit diagram soon renewed interest in this part. The line generator is a multivibrator, of which the grid and screen of the output valve is used as one triode. The screen resistor therefore becomes the "anode" load.

A measurement revealed that the 3·9k Ω resistor had dropped to 300 Ω. A replacement confirmed the diagnosis. A rather unusual fault because a low screen resistor, which is quite common, usually has the reverse effect of excessive e.h.t. and overrunning of the output stage.—V.D.C., Bristol (1038).

Bush TR82C

Very Faint Whistles

The owner of this transistor set complained of low volume and a lot of very faint whistles on the mediumwave band. On putting an aerial to the testing point (the side of C3 remote from the OC44 base), the whistles began to come in much louder and were obviously caused by short-wave stations breaking through.

It was assumed, however, that the oscillator frequency had gone high. C8 was replaced without making any improvement, and although the oscillator coils appeared to be perfectly normal on d.c. resistance checks, it was decided to replace them. On doing so, the set functioned normally.—N.O'R., Fermoy (1069)

Items for publication

in this feature are welcome, particularly 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.

Philips 1458U

Sound Channel Fault

One of these sets came into the workshop with the complaint of no sound. The picture was normal. The sound valves were replaced, but to no avail. The audio stages were lively, so attention was turned to the i.f. stages.

The first i.f. amplifier seemed to be completely dead, and voltage checks on it revealed that the anode and screen voltages were present but there was no cathode voltage. Clearly, the valve was being cut off and a check on the grid confirmed the presence of a high negative voltage.

The first i.f. amplifier is controlled by the a.g.c. line and it was from here that the negative voltage originated. No sound signal was present but it was obvious that some signal of high magnitude was being rectified This suggested an oscillation and further checks showed that the second i.f. stage was in fact unstable.

The screen decoupling capacitor on this EBF80 valve was checked and found to be open-circuit. Replacement brought things back to normal. Thus, a fairly common fault was found in a rather round about fashion.—V.D.C., Bristol (1039)

Dynatron TP11

Excess Current Drain

The complaint was distortion. This set has a single-ended push-pull output stage and has two batteries. One supplies current to one output transistor and the other supplies current to the other output transistor and to the remainder of the receiver.

Current checks showed that drain on one battery was of the order of 100mA, far in excess of normal. Suspecting "thermal runaway" in the output transistors this battery supplied. the pair were replaced, but the fault remained. Further tests revealed a leak from one secondary to primary in the driver transformer, hence the heavy current drain.

(Continued on page 89)

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

SERVICE DATA SHEETS

THE DATA SHEETS LISTED BELOW ARE STILL AVAILABLE FROM STOCK TO SUBSCRIBERS, POST FREE, AT THE PRICES QUOTED. A COMPLETE INDEX TO ALL DATA SHEETS PUBLISHED UP TO DECEMBER 1960 IS AVAILABLE AT 9d.

Price 1s. each

Ace "Astra" Mk. II Model 553 (TV52, May, 54).
Alba T685 TV (TV130, Dec., 58).
B.S.R. UA8 autochanger (S7, March, 57).
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 TV94, TV95, TV96, (TV185, Sept., 61)
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).
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).
Ekco T368/T371 series (TV176, April, 61).
Ferranti T1002 series (TV154), April, 60).
Ferranti T1021, 1023, 1027 (TV157, June, 60).
Ferranti T1024 series (TV165, Oct., 60).
Ferranti T1046/T1049 series (TV176, April, 61).
Ferguson 204T series TV receivers (TV87, June, 56).
Ferguson 306T/308T TV receivers (TV97, Nov., 56).
Ferguson 506T, 508T, 546T (TV171, Jan., 61)
Ferguson 516T series (TV173, Feb., 61).
G.E.C. BT1252 series TV receivers (TV96, Oct., 56).
G.E.C. BT1746 series TV (TV81, Mar., 56).
Grundig 500L and 700L/C (S3, Dec., 53);
H.M.V. 1840 series TV receivers (TV109, Sept., 57).
H.M.V. 1890 and 1893 (TV171, Jan., 61).
H.M.V. 1892, 1896 (TV173, Feb., 61).
Invicta 538 series (TV168, Dec., 60).
Invicta 940, 941. (TV181, July, 61).
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. (TV84, May, 56).
Marconiphone VT163 (TV173, Feb., 61).
Marconiphone VT164 (TV171, Jan., 61).
McMichael 55 series TV receivers (TV79, Feb., 56).
Murphy V214/V216 TV receivers (TV78, Jan., 56).
Murphy V230 portable TV (TV103, April, 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).
Murphy V350 series (TV175, March, 61).
Pam 500 TV receiver (TV108, Aug., 57).
Pam 600S, 606S, 690 (TV144, Nov., 59).
Pam 800 series (TV168, Dec., 60).
Pam 119A, 120A, 123A, 1000A (TV181, July, 61).
Peto Scott TV 1411 series (TV65, Apr., 55).
Philco BT1412 and BT1551 (TV71, Sept., 55).
Philco 1000 *Slender Sevenieener* (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).
Phillips 100U/200U series (TV179, June, 61).
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).
Pye V210 series (TV168, Dec., 60).
Pye V700A, V830A (TV181, July, 60).
Regentone "Big 15/5," T and C (TV48, Feb., 54).
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).
Ultra 1780/82 series (TV177, May, 61).
Ultra 1781/83 series. (TV183, August, 61).
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 (TV119, May, 58).
Argosy Model T2 TV receiver (TV53, June, 54).
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).
Bush TV92 and TV93. (TV182, August, 61).
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).
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).
Ekco TC369, T370, T372. (TV180, July, 61).
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)
Ever Ready, *Sky Personal, Sky Leader* and *Sky Baron* (T150, April, 61).
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).
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).
Ferranti TC1047, T1048, T1050. (TV180, July, 61).
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).
Kolster-Brandes QV30FM series (TV184, Sept., 61)
Marconiphone T/C10A radio (R41, June, 53).
Marconiphone VT64/65DA (TV76, Dec., 55).
Masteradio D154 "Ripon" series (R84, Feb., 56).
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).
McMichael MP20 (TV 174, March, 61).
McMichael MP27 series (TV178, June, 61).
Murphy A146CM baffle radio (R75, June, 55).
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).
Peto Scott 732 series (TV172, Feb., 61).
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 TV94 series TV receivers (TV107, Aug., 57).
Pilot VS9 console TV receiver (TV34, Nov., 52).
Pilot PT451, PT651 (TV170, Jan., 61).
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 ARG81 series (R127, March, 59).
Regentone RT50 tape recorder (S14, Sept., 59).
R.G.D. T14 transportable VT (TV138, June, 59).
Sobell TS17 and T346 TV (TV94, Sept., 56).
Sobell 626 Series a.m.-f.m. radios (R102, June, 57).
Sobell TPS710, T192, T293 (TV174, March, 61).
Sobell TPS781 series (TV178, June, 61).
Sound A20 tape recorder (S9, Feb., 58).
Stella ST151A radio (R66, Jan., 55).
Stella ST8314U TV receiver (TV55, Aug., 54).
StradModel 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).
Ultra 1771 series (TV170, Jan., 61).
Vidor CN4228/9 TV receivers (TV136, May, 59).
Vidor CN4230/1 TV receivers (TV125, Sept., 58).
Waveforms *Radar* 405D (T.I.7, Apr., 56).

Price 6d. each

Alba 69 series radiograms (R120, Sept., 58).
Alba 3211 series (R126, Feb., 59).
Bush TC184 television tuner (TV75, Nov., 55).
Cossor Model 466 car radio (R71, Apr., 55).
Cossor radio Model 494U (R38, Mar., 53).
Cossor *Melody Portable* 543 (R92, Dec., 56).
Cossor 546 transistor portable (R115, May, 58).
Cossor 551/552 portables (R117, July, 58).
Cossor 575/579 (R142, June, 60).
Cossor 580 stereo player (S13, April, 59).
Cossor 581 and 569 portables (R137, Nov., 59).
Cossor CR1500A stereo radiogram (R147, Nov., 60)
Decca *Deccalian* 88 player (S10, March, 58).
Decca RG200 radiogram (R125, Jan., 59).
Deccalian Model 81 (R29, Apr., 52).
Defiant MSH953 AC radio (R40, May, 53).
Defiant RSGH89AC radio (R70, Mar., 55).
Dynatron TP11/TP12 (R141, May, 60).
Ekco BPT333 transistor portable R143, July, 60).
Ekco BPT351 transistor portable (R145, Sept., 60).
Ekco RT366 tape recorder (S17, June, 61).
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).
Ever Ready *Sky Baronet, Sky Countess* (R152, July, 61).
Ferguson 348BT portable (R151, April, 61).
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).
Ferranti TR1044 tape recorder (S17, June, 61).
G.E.C. BC501/BC502 portables (R146, Oct., 60).
G.E.C. BT306, BT308 (TV169, Jan., 61).
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).
H.M.V. 1417 transistor portable (R151, April, 61).
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, June, 59).
K-B RT20 tape recorder (S16, May, 61).
Marconiphone P17B portable (R49, Jan., 54).
Marconiphone T24DAB (R77, Aug., 55).
Marconiphone T82B portable (R151, April, 61).
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).
McMichael MT102 portable (R149, Feb., 61).
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).
Peto Scott MR60 *Fanfare* tape recorder S15, March, 61).
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).
Philips 301T and 395T (R148, Dec., 60)
Philips 493VT car radio (R154, Sept., 61)
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).
Pye TCR2000 car radio. (R153. August, 61).
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).
Sobell ST301 portable (R149, Feb., 61).
Taylor 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).

TECHNICAL GEN *continued*

Replacement of the transformer cured the distortion and restored battery drain to normal, quiescent 15mA or so (from each battery).—L.J., Croydon (1099)

Kolster-Brandes HF60

Band III Frame Foldover When the set was brought in the fault did not show. The fault seemed impossible, but two outside engineers actually saw it. After the set had been on for two days in the workshop, however, the fault appeared and the frame was folded over about one inch on Band III only.

Voltages were checked around the frame circuit and the cathode by-pass capacitor checked but the fault persisted. When changing channels it was noticed that there was foldover off station, but it varied at approximately 25 c/s. This appeared at the bottom only.

Checking the circuit diagram revealed that the anode of the frame output valve was fed from a separate h.t. supply. It was fed via a 1kΩ resistor from the h.t. rectifier and decoupled by an 8μF electrolytic. This was suspected and replaced, and the fault cleared.

The fault had never shown itself on Band I and was intermittent on Band III. The only conclusion I could draw was that the I.T.V. transmission must not be tied to the mains frequency so rigidly as that of the BBC.—T.P., Crewe (1079)

Pye VT17

Cramp on Right The trouble with this receiver was severe cramping on the right-hand side of the picture. If the amplitude was reduced drastically, the linearity returned to normal. This pointed to the output stage being overloaded, so firstly the output valve itself was changed and found to be satisfactory and secondly voltages were taken, but these also turned out to be normal.

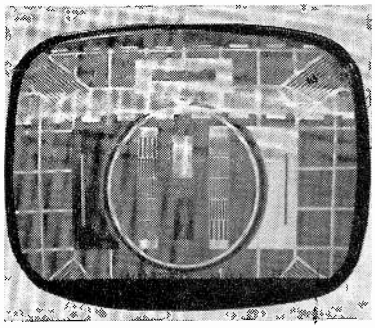
Other components in the output stage were checked and eventually a capacitor on the line output transformer (C109, 0·05μF) was substituted and the fault cleared. On a bridge, the old C109 gave a reading of 0·004μF The effect of the low value capacitor had been to lower the boost voltage, hence with the lower voltage on its anode the output valve overloaded when normal drive was applied—V.D.C., Bristol (1042)

Brainless Bertie

Autumn leaves are falling
The year is on the wing,
So are the TV aerials
Bertie put up in the spring.
Feste

Ferranti 17T4

Mixed up Frame The customer complained that there was "something queer" across the top of the picture and when viewed on a normal scene or close-up, it was not easy to spot exactly what it was. On Test Card C, however, it was plain that the "something queer" was the bottom 1½ in. of the frame which had somehow found its way near the top of the frame. See photograph.



Adjustment of the frame hold did nothing, neither did valve changing, so out came the chassis. A probe around underneath showed nothing until the 22kΩ resistor from the frame hold control to chassis was pushed, then the picture became normal. On examination, the soldered joint to chassis proved to be of the very dry variety.—.F.C., Crewe (1064)

Invicta 138W

Sync Circuit Trouble The trouble on this set was loss of line hold, coupled with lack of frame amplitude, maximum height being only three inches. Adjustment of the frame hold control

(continued on page 91)

● RECEIVER SPOT CHECKS ●

No. 73: BUSH TV92, TV92R, TV93

Poor or No Frame Sync: Check C104, C105A, C108, C270, R104, R105, R106, R107, R108, R117, R121, R126, R127, R129 for o/c; check C107, C113, C114 for s/c; check C101, C112 and diode CD101 for o/c or s/c.

Poor or No Line Sync: Check C115, C116, C118, C207, R126–138, R143, R151, R152, R162 for o/c; check C117, C119, C120, C121, C122, C105A and MR101/2 for o/c or s/c.

Poor Frame Linearity: Check C105A, C106, C107, R107, R112, R115, R118, R120, R121, R123 for o/c; check C108, C104 for s/c; check for o/c or s/c.

Reduced Width: Check C132 and MR102 for o/c; check C131 for s/c.

Poor Picture Quality: Check diode CD102 for s/c; check C264, C234, C280, R157, R233 for o/c; check C135 for o/c or s/c; check C139 for leakage.

Poor Video Response: Check C234, C265 for o/c; check C264 for s/c; check C135 for s/c.

Blanking on Raster Leading Edge: Check R150 for o/c.

Instability: For vision instability check C231, C246, C250 for o/c. For sound instability check R245 for o/c and C239 for s/c.

Brightness Faults: For uneven brightness, check C110, C133, C129, R153 for o/c. For low brightness level check R157 for o/c. For no control of brightness check R155, R154 for o/c.

Vision Faults: For low gain check C237, C248, C250 for o/c. For sound-on-vision check C244 for o/c or s/c. For patterning, check C256 for o/c. For negative picture, check C270 for s/c.

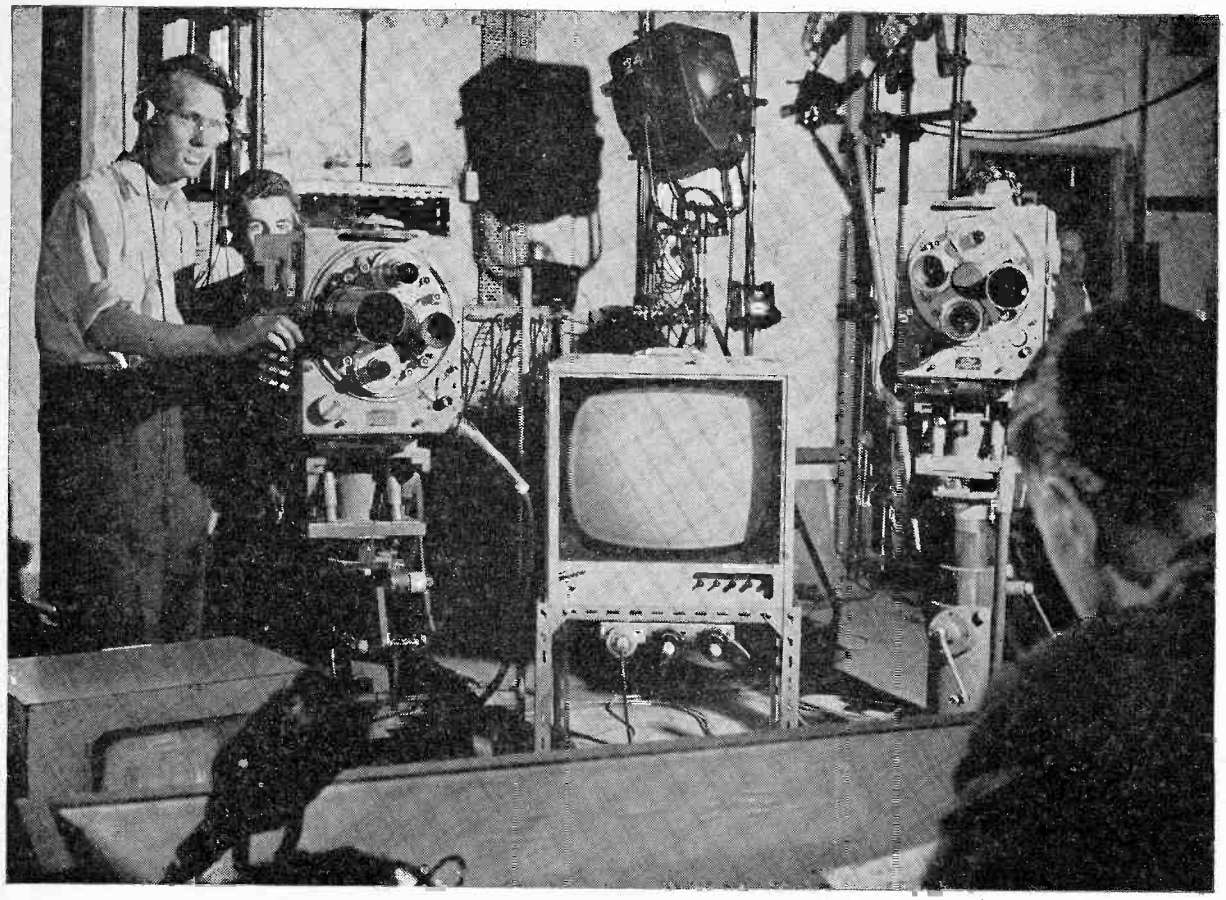
No A.G.C. Voltage: Check C249, C250, C230 for s/c; check R239 for o/c.

Buzz on Sound: Check C239 for o/c.

Flyback Lines Showing: Check C110, R122 for o/c; check for no earth connection to secondary of frame output transformer.

Weak Sound: Check C236, C264, C252, C257, C263 for o/c; check R232 for s/c; check C261 for o/c or s/c.

Contrast Faults: For excessive contrast check R157 for o/c. For poor contrast check C135, R102 for o/c.—D.C., London (1104).

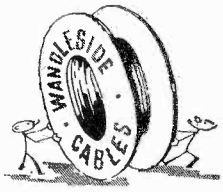


Photograph of television studio by kind permission of the B.B.C.

News from Wandleside . . .

Behind the smooth voice of the newscaster lies a daily miracle of organisation of lightning communication and technical efficiency. Under these exacting conditions, only the finest equipment is used, nothing can be left to chance. This is why you will find Wandleside Cables playing a major part in the programme. They supply the vital lines of communication in Television, Radio and every other industry where only the best is good enough.

Our comprehensive range of cables includes Miniature Coaxials, High Frequency cables, P.T.F.E. types, etc. A copy of our new Catalogue will be sent on request.



WANDLESIDE CABLES

In Association with: IRISH CABLES LTD, WANDLESIDE WARREN WIRE CO. LTD. & WANDLESIDE NATIONAL CONDUCTORS LTD.

WANDLESIDE CABLE WORKS LTD., 106 GARRATT LANE, WANDSWORTH, LONDON S.W.18
Telephone: VANdyke 7544 (7 lines) (in FALKS Group) Telegrams: Wandleside London S.W.18

TECHNICAL GEN *continued*

could restore normal height but adjustment of the line hold control could not resolve a single picture, the best that could be achieved was three pictures in a row.

This fault would occur sometimes when switched on and if left alone the set would correct itself without adjustment of controls and would stay normal until switched off. On other occasions the picture would come on immediately after warming up. In the workshop, after several switchings on and off the fault appeared.

It was obviously a flywheel sync fault, so the waveforms were checked with the 'scope. One half of the discriminator diodes was not receiving the opposite phase sync pulse but it was present the other side of the d.c. blocking capacitor C90. It was found that C90 occasionally went o/c when cold.

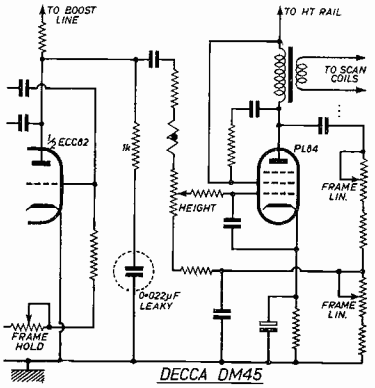
On another of these sets, in a case of low sound volume, it was found that the sound output transformer was o/c. Why sound it obtained at all under these circumstances is revealed by the circuit diagram. The secondary has feedback to cathode of the sound output valve, and with no voltage on the anode, sound is passed from grid to cathode and thence to the speaker via the output transformer secondary, though at a very much reduced volume.—S.W., Buckingham (1056)

Decca DM45

No Frame Hold

First impressions were of an obvious fault and a simple cure. The frame hold control was broken. This is a 1MΩ edge-type potentiometer and the rotor was unsecured, the spare fixing clip having come adrift and dropped into the bottom of the set.

Much fishing ensued and eventually the missing clip was found and replaced and the set switched on. To my dismay, the frame was as uncontrollable as before.



DECCA DM45

Close inspection of the raster showed that sync was arriving, and with reduced height it was possible to control the frame speed but not lock it. This indicated a disruption of the feedback circuit; see diagram. But all the components checked normally, as did those of the grid circuit of the PL84 output valve.

The significant clue was that the anode voltage of the second triode section of the ECC82 multivibrator was slightly—only slightly—low, reading about 65V. The trouble turned out to be a leaky 0·22μF capacitor, in series with the 1kΩ resistor and effectively across the oscillator output—hence the improvement with less height.—H.W.H., Bargoed (1035)

Pye V14C

Jumpy Gain Control

On this set, when the contrast or sensitivity controls were advanced, gain jumped up at a certain critical setting. Below this setting, there was poor sync and bent verticals. The first impression was of a fault in the a.g.c. line.

Batteries were inserted in the a.g.c. line and the line was disconnected at the junction of the delay diode V7 and delay diode V10. The set was then checked with the battery voltage at 4V and when the sensitivity was increased the fault was found to be still present.

The video amplifier was checked next, but no fault was found. The waveform was then checked at the vision detector. Above the critical setting level it was found to be normal, but below the setting the sync pulses were cut off. The vision detector was checked and found satisfactory.

But on checking the white spot suppressor, this was found to have a low backward resistance and was leaking a d.c. voltage on to the vision detector and causing all the trouble.—B.W., Middlewich (1046)

● odd spot

THE set was a Pye V4 and the location a houseboat moored in a layby in the Crinan Canal. The owner had a three-element aerial on a high hill nearby and the cable stretched for nearly 100 yards down a heavily wooded hillside. The complaint was no picture and on examining the set a very faint picture could be obtained after considerable adjustment.

The tuner valves were checked OK and attention was drawn to the aerial. On disconnecting the coaxial plug, a stream of water flowed from inside the air-spaced cable! This continued for some minutes, and after we had stopped laughing and had cleared up the mess, the cable was examined to find that near the aerial end a large slice of the outer covering and part of the braiding had been cut.

Rain had slowly filled the air-spaced coaxial cable up to this point. It was later discovered that a woodsman had been trimming the nearby trees and bushes with a sickle and had obviously included the cable in his programme.—D. McL., Lochgilphead (1054).

SERVICE BRIEFS

Pye FenMan 1: Fault was a noisy volume control. This was replaced, but the fault persisted. Another one was trued but it was still noisy in operation. Voltage checking showed nothing on the d.d.t. cathode and this was traced to the coupling capacitor C54, the cathode end of which was shorting to chassis. Repositioning components to clear the s/c cleared fault and increased gain, though no mention had been made of low gain. The valve was apparently undamaged.—F.E.R., St. Ives (833).

Murphy Car Radio: After installing this, and suppressing all the necessary parts of the vehicle as per instructions, we still found a great deal of interference – probably from plugs. It suddenly occurred to us that the car in question, having done a high mileage, may be in need of a plug check, so we had the plugs checked and sandblasted, correctly gapped and in one instance a new plug was fitted. The fault was cured.—N.A.B., Tadcaster (974).

G.E.C. BT5147: Complaint was no vision, sound being normal. The video signal was checked OK up to the grid of the video amplifier. On checking this stage the anode voltage was found to be higher than usual. It will be seen from the circuit diagram that the anode is fed through two 12kΩ resistors R81 and R44. One of these resistors was down to less than 100Ω and a replacement restored normal operation.—E.C.R., Blackpool (958).

New Books

★ *SERVICE ENGINEER REVIEWS OF THE LATEST TECHNICAL LITERATURE*

Radio Control Manual **by Edward L. Safford, Jr. Published by Gernsback Library, Inc., 154 West 14th Street, New York 11. (U.K. Agents: Modern Book Company, 19 Praed Street, London, W.2). 192 pages. Size 5½×8½ in. Price 25s. 6d.**

YOUR reviewer has always boggled slightly at the sight of middle-aged gentlemen tenderly nursing large, white, swan-like boats to the edge of the Round Pond. Such reverent delights in the vagaries of wind and weather seemed too esoteric for my lie-abed Sunday mornings.

Then the Editor passed me this book for review and I am unbending from my Bloot-like arrogance and begining to learn something of the challenge that is thrown to the model-maker. I can also appreciate something of the mentality of ageing generals stroking their missiles and longing to set them off.

The last remark is appropriate, for the author is engaged on research upon these most dangerous of toys. Mr. Safford is Training Supervisor of the Missile Science Division Electronics Department, Fort Bliss, Texas.

This experience of training personnel has come in useful to Mr. Safford, for he has an endearing way of creeping up on the reader. Example: ". . . *those hen-scratches called circuits—We don't have to understand them . . . but just so we won't be completely at a loss when someone refers to a circuit diagram, let's examine them.*"

He does examine them, quite thoroughly too. The book consists of fifteen well-packed chapters of information on building transmitters and receivers for models of all types, land, sea, air, or even space-based, it seems. There is nothing startlingly new about the circuits, but there is a refreshing forthrightness about the approach. No progressing from valves to transistors, for instance. Little of the expository padding we see in so many of our home-based model magazines.

In the blurb and in the body of the book, the author apologises for eschewing theory. He need not. Reading through this, the ninety-first in the Gernsback Library list, I was most impressed by his facility for imparting information both in an interesting and authoritative way.

Count this reviewer as a convert to model-making, and this volume as an excellent introduction.—*H.W.H.*

Literature Received

MULLARD have issued a booklet entitled "Mullard Magnadur Permanent Magnets", which contains information about the various types of Magnadur and their particular applications. Factors governing the length and cross-sectional area of any permanent magnet are discussed and some general rules are given for the guidance of designers using Magnadur. A useful table for converting c.g.s. units to rationalised m.k.s. units is also included. Copies of the booklet may be obtained from the Component Division, Mullard Ltd., Mullard House Torrington Place, London, W.C.1.

WILKINSONS have sent us their new 28-page catalogue of tools, which includes ranges of pliers, pincers and nippers as well as general information about the company itself. Of particular interest to the service engineer is the type 11009, a special purpose cutting and clinching pliers designed for use with printed circuits. Details of this and other tools may be obtain from Wilkinsons Tools Ltd., Kerfoot Street, Warrington, Lancs.

HEATHKIT have a new edition of their catalogue listing their complete range of equipment which now includes a wide range of test instruments such as a.f. and r.f. signal generators, r-c bridge, valve voltmeter, oscilloscope, electronic switch, wattmeter, millivoltmeter and multirange meter. Copies may be obtained from Daystrom Ltd. Gloucester.

BRIMAR have published their Valve and Teletube Manual No. 9, this latest edition listing 194 current equipment and maintenance valve and c.r.t. types in addition to abridged data on 126 obsolescent and obsolete types. The preferred lists shown by types and also by applications have been brought up to date. The new Brimar design data service, which supercedes the Brimar application report service is described, the service being intended to provide detailed information on all current Brimar types to designers in a flexible and up-to-date form at a nominal annual subscription of £1. The circuit section of the new manual contains many new and revised circuits for audio and stereo applications. The CV equivalents lists have also been revised to include all new CV number allocations and the expanded direct equivalents list gives the data page reference to the Brimar equivalent type. The manual may be obtained at 6s., through booksellers or direct from the Publicity Department, Brimar Ltd., Footscray, Kent.

RADIOSPARES September-October catalogue introduces many new additions to the range of components, including a 50+50+50μF 350V prong fitting electrolytic and a new transformer designed as a driver transformer coupling an OC81D transistor into OC81's in the single-ended push-pull mode. Also new is an "economy" coaxial cable for use in high signal strength areas and a screened jack plug with easy-to-assemble screw terminals. Copies may be obtained from Radiospares Ltd., 4-8 Maple Street, London, W.1.

NEW HEATHKITS

Daystron announce two new Heathkits of particular interest to service engineers. The Model AO-1U is an audio generator giving both sine and square wave outputs. Sine wave range is 20 c/s to 150 kc/s in 4-bands with output voltages of 0-100mV, 1V and 10V. Square wave range is 20 c/s to 50 kc/s with output voltages of 0-800mV, 8V and 80V.

The specification gives distortion as less than 1 per cent (100c/s to 20 kc/s), rise time of 3μS. A pre-set feedback control enables adjustment of the oscillator for minimum distortion. For sine wave outputs the output control is calibrated in r.m.s. volts; when switched to square wave the output range is up to 80V peak-to-peak, the increase in output voltage being due to the disconnection of the negative feedback loop when the amplifier valve is connected as a clipper. Complete with comprehensive instruction manual the kit sells at £12 18s. 6d.

The Model MSP-1 is a stabilised power supply, providing an output of 200-410V stabilised d.c. in three ranges. Output is 0-225mA. Unstabilised output of from 190-510V is obtainable depending on range and load. An a.c. output of 6·3V centre-tapped is available from the front panel. The stabilisation ratio is 500:1 at 300V output and the ripple and hum content is given as less than 1 mV at full load.

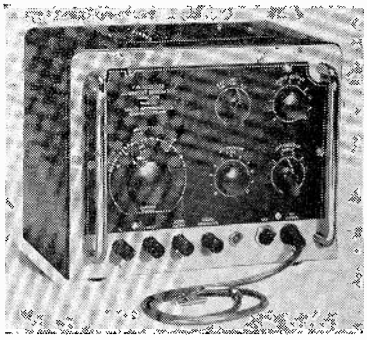
Overload protection is by means of 5A input fuses and a 250mA h.t. fuse located on the front panel. An Off-Standby-On switch is provided. Two versions are available—Model MSP-1M with two moving coil meters (voltmeter scaled 0-400V, milliammeter scaled 0-250mA) at £34 12s. 6d. and Model MSP-1W, without meters, at £27 17s. 6d.

Service Engineer special laboratory test

COSSOR

Model 1324
F.M. Alignment Generator

By Gordon J. King, Assoc. Brit. I.R.E.



NOW that v.h.f./f.m. reception is fully established, more and more service technicians are becoming increasingly aware that successful alignment of f.m. receivers is considerably simplified by the wobbulator/oscilloscope technique.

The high audio quality which is possible by this medium can be considerably impaired by faulty alignment or by a distorted i.f. or discriminator response which, incidentally, is sometimes promoted by valve replacement.

ALIGNMENT TESTS

To prove this point, a typical f.m. set was accurately aligned throughout by using a wobbulator and oscilloscope and then the f.m. tuner, i.f. and ratio detector valves were substituted with like valves and a second response display produced on the screen of the oscilloscope. The effect was startling.

Whereas the first display revealed a highly symmetrical i.f. response curve and a correctly balanced ratio detector, the second display with exactly the same alignment but with different valves was considerably asymmetrical.

The receiver worked, that is true, but extensive listening tests on "live" broadcasts indicated that something was lacking over the previous listening tests before the valves were changed.

The effect was less in evidence when only one valve was changed, but even in that case the response curve appeared to be influenced by the particular valve employed, and the use of a valve of slightly different type from the original had a marked effect on the response.

A further test was made by realigning a totally misaligned receiver by the "spot frequency" method and then checking the results with a wobbulator and oscilloscope. Several exacting attempts had to be made by using spot frequencies and output meter before a response which would normally be accepted on the "visual" set-up was achieved.

These tests point conclusively to the desirability of visual alignment, not only from the purely technical angle, but also from the time aspect, which is a direct function of service department economics. Moreover, as listeners are now becoming increasingly "hi-fi" conscious, there is always a possibility that they themselves will discern a shortcoming in performance following a repair.

BAND II AND FM IF'S

To help with these problems is the Cossor FM Receiver Alignment Generator, Model 1324. This is a highly functional instrument, very simple to use and set up, and suitable for use with almost any type of oscilloscope with "X" output terminals and a "Y" amplifier.

The generator output can be centred on any frequency in the ranges 7·5 to 17·5 Mc/s and 87·5 to 107·5 Mc/s. It thus embraces the whole of Band II as well as the spectrum normally adopted for f.m. intermediate frequencies.

Frequency-modulation of the carrier is accomplished by a reactance valve, which is fed either from an internally generated 1,000 c/s signal to provide an f.m. signal at ±75 kc/s deviation, for normal checking, or from the timebase of an oscilloscope, in which case a sweep of up to ±400 kc/s can be obtained, to display response curves in their entirety.

A continuously variable signal output (at 80 to 100 ohms impedance) from less than 5 microvolts to 50 millivolts is provided by coarse and fine attenuator controls, and an audio output at 1,000 c/s, variable up to 8 volts peak-to-peak is delivered to two terminals on the front panel. This signal is useful for checking the a.f. stages of receivers and for a.f. signal tracing, etc.

TWO OSCILLATORS

The r.f. output is obtained by mixing the voltages from two oscillators, their frequency difference providing the low-band coverage and their sum the Band II output. One oscillator is centred on a frequency of 57·5 Mc/s and is fixed tuned, while the other is variable over a range of 30 to 50 Mc/s and is tuned by a split-stator capacitor, which is the carrier tuning control.

The output of the variable oscillator is coupled to a buffer stage to avoid "pulling" between the two oscillators, and the two signals are mixed in a

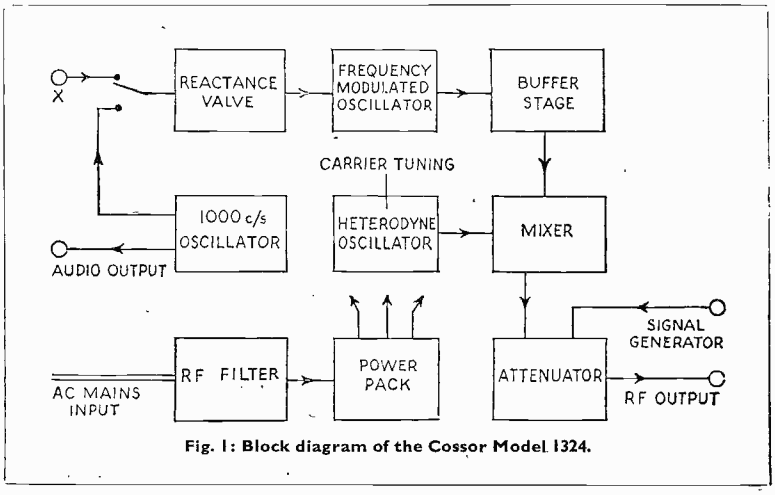


Fig. 1: Block diagram of the Cossor Model 1324.

triode stage with a common cathode circuit.

The reactance valve is in shunt with the tuned elements of the fixed-tuned oscillator and is made up of a double-triode valve with the two sections connected in parallel. The reactance valve, together with its associated capacitative and resistive branches, appears to the tuned circuit of the oscillator as a variable capacitive reactance whose value can be altered by changing the valve's gm or bias.

Cyclic changes in the effective capacitance of the oscillator, and hence like changes in the oscillator frequency, are provided by superimposing the modulation voltage on the grid of the reactance valve. In this way frequency-modulation is accomplished.

The internal modulation voltage is produced by the 1,000 c/s oscillator which consists of a pentode valve in a three-stage RC phase-shifting circuit. This stage is controlled by a systems switch, the modulation voltage being applied to the reactance valve on the "Int. FM" position, to the a.f. output terminals, via the audio output control, on the "AF" position and switched off on the "Ext FM" position.

In the latter position the modulation input to the reactance valve is switched to a terminal marked "X", which is for connection to the time-base of an oscilloscope for sweep alignment.

Pre-set adjustments are provided to set the oscilloscope's timebase voltage to produce the desired variations in sweep frequency and to attenuate the 1,000 c/s voltage applied to the reactance valve to give the required ±75 kc/s deviation.

From the block diagram in Fig. 1 it may be seen that an r.f. filter is incorporated in the power input circuit. This is a double section for both mains leads and is necessary to reduce oscillator radiation and ensure that a minimum r.f. output of 5 microvolts can be obtained. The diagram also shows a terminal for applying a marker signal from a signal generator.

ON TEST

The instrument is extremely simple to use, and for ordinary f.m. generator tests and a.f. tests the instrument is applied in the normal manner. For sweep alignment operations the instrument is coupled to an oscilloscope as shown in Fig. 2. The idea is to employ the oscilloscope so that the vertical deflection of the trace, in terms of amplitude, corresponds to the output voltage from the receiver's detector.

In other words, instead of using a meter to indicate increase in output signal, the trace is used; an increase in amplitude corresponding to an increase in output signal.

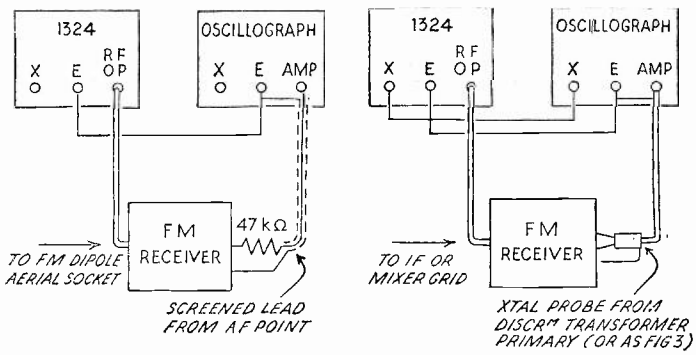


Fig. 2 (left): The set-up when the Y signal is extracted from the a.f. take-off point. Fig. 3 (right): The set-up when the crystal probe is used, and when it is required to investigate a response prior to the detector stage.

Horizontal deflection of the trace is also provided by the timebase, and the r.f. signal applied to the receiver or stage under adjustment is arranged to vary linearly in sympathy with the timebase over a range of frequencies embraced by the bandwidth of the receiver or circuit concerned. The Cossor 1324 handles this operation admirably. Thus, the output at the detector at *all frequencies* within the sweep range is displayed on the screen of the oscilloscope in the form of a response curve.

In order to identify vital frequency points on the displayed curve a separate r.f. signal, at the required frequency can be injected into the receiver along with the f.m. signal from the wobbulator. This produces a "pip" on the response curve, which, of course, can be made to traverse the display by altering the tuning of the "marker generator".

An ordinary signal generator is suitable for this purpose, and marker-signal input terminals are incorporated on the front panel of the 1324.

For discriminator or ratio detector adjustment, the "Y" signal for the oscilloscope can usually be picked up from the a.f. "take off" point—from across the volume control. However, for adjustment to the stages prior to the detector some method of rectifying the r.f. or i.f. signal is necessary before it can be applied to the "Y" amplifier. A crystal detector probe is provided with the 1324 for this purpose. The probe end can be connected, for example, to the anode connection of the discriminator transformer (see Fig. 3).

To avoid de-tuning the first stages of the set when the signal is applied an output coupling clip is also supplied with the instrument. This fits over the mixer valve envelope and the capacitance between the clip and the valve electrodes is usually sufficient to provide the required coupling to the receiver from the 1324. The accessories are conveniently housed beneath a trap door in the top of the instrument case.

A number of receivers and amplifiers were developed and serviced with the assistance of the 1324 and after 30 minutes or so getting used to the instrument it became indispensable to the work in hand. It is extremely well made and highly instrumentalised to the standard expected from Cossor equipment. It is robust and yet quite small and together with a 'scope like the Cossor 1039M, or equivalent, forms a compact unit for speedy and accurate alignment of broadcast receivers.

The instrument is mains operated 105-130V and 200 to 255V 50-100 c/s, with a consumption of approximately 30 watts. Its vital statistics are Height 8¼ in. (21 cm.); Width 10½ in. (26·7 cm.); Depth 7½ in. (19·1 cm.); Weight 11 lb. 5 oz. (5·14 kg.). Nett price is £18 0s. 0d.

Talking Book Library

The Nuffield Talking Book Library for the Blind appeals for more volunteers to instal and service the machines used by their members throughout the country. There are many areas where no volunteer is available and with an expanding Library service the need for more is very great.

The equipment provided consists of a modified record player or a simple reproducer for tape recordings housed in a specially designed cassette. No financial obligation is involved in undertaking this service, spare parts being supplied from the Library.

Repairs are mostly simple ones, like replacing a volume control or valve, and circuit diagrams and technical data are provided. Generally, the time required from a volunteer does not exceed one evening in two months.

Readers interested in helping in this valuable work should write to Mr. D. Finlay-Maxwell, A.M.I.E.E., Hon. Organizer of Servicing Volunteers, c/o Messrs. John Gladstone & Co. Ltd., Galashiels, Scotland.

SERVICE WITH A GRIN

by H. W. HELLYER

Throw me some lines

IS it too late to jump on the wagon? Too late to add my small voice of comment to the thunderous rumble of the guns of big business bombarding the Pilkington stronghold?

Every week we read fresh news of the onslaught; every day startling reports of pressure groups from the outer regions of Culturia or the boardrooms of Vested Ints. Ltd., putting their closely reasoned views before that hardly worked committee.

Never before were so few assailed by so many with—apparently—so little effect. One imagines the committee members a-snooze behind a growing pile of evidence and argument. Anon a dusty Civil Servant tiptoes in with another folio—the submission by the Lesser League for. Off-shift Employees.

The chairman puts down the pipette he has been toying with, smiles wanly and gestures to the pile.

Meanwhile, in the outer regions, the productive giants build up preparatory stocks. If a changeover is to come, they say, we shall be ready. More than that, they are demonstrating, by their "readiness", that a changeover should, nay *must*, come.

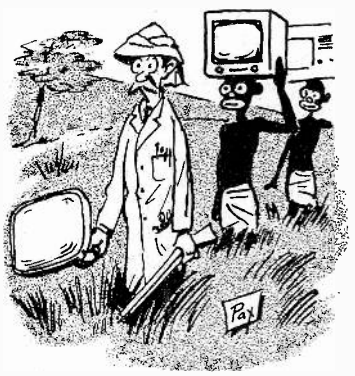
Take for example that letter to the dealer that one leading manufacturer sent around just before the Radio Show. There was no hesitating in those choice sentences. No "I presume" It was "You, Mr. Dealer, are Livingstone, and this is the way up the Nile".

On the debit side there are still those critics who assert that any change, with its attendant "parallel" working for ten years or so, would be financial suicide for the radio industry. That the cost of convertible sets would effectively dampen the market. That it was not so much an increase in lines as a sharpening of picture we wanted. Or an improvement in the material being broadcast.

Which reminds me of the schoolmaster's complaint that an improvement in Tommy's writing only served to reveal he couldn't spell. If we better the clarity of our pictures by multiplying the elements only to see more clearly the inane offerings of some of our package-deal film companies, then I vote we get back to Baird and the feeble flicker on the wall.

Talking of flickers on the wall, did you notice, Joe, that among the convertibility and compatibility at Earls Court, with the R.I.C. jostling our elbows, winking at the Common Market, very little was said about the flat tube? Remember how, four years ago, it was predicted that by now we should have a "picture-frame television—possibly coloured"?

At a recent Welsh display of closed circuit colour, sponsored by the enterprising local programme company,



You, Mr. Dealer, are Livingstone.

the question most often asked was: "How long?" Mr. and Mrs. Dai Bach were not interested in the number of lines, the standards, the bandwidths, the carrier frequency, not even the compatibility. Their only concern was when this multi-hued marvel was going to be put on the market.

After all, they argued, it was perfectly possible. Hadn't they seen it with their own eyes?

The service engineer is getting tired of being asked: "*Well, what of the future?*" If he answers honestly, he is likely to be drummed out by his boss, the dealer, for "prejudicing sales"—which is the most heinous crime he can commit.

My own view of the future is that it will bring the serviceman the opportunity of new status. With the trade in the free-wheeling state that it has been lately, and only the small stimulus of the transistorised portable radio upon us, the engineer has grown slack. Many muddlers are managing to coast along, their indiscretions undiscovered, or at least, temporarily overlooked.

A-snooze behind a growing pile of evidence.

Drummed out by the boss.

But the changeover that is likely to come will mean more than learning which valve does what. New principles will bring new circuitry (if Transatlantic example is our guide) and the need for re-thinking. Test procedures will be different, even the equipment may have to be modified. It's going to be fun.

Among our other duties will be the unenviable task of reassuring Mrs. Twitch. She is going to be immovably convinced that the introduction of 625 lines, etc, will mean that her gorgon on the sideboard is soon to sit there, bereft of its *raison d'être*.

Anyway, lads, take heart. For some people, like Miss Joan Littlewood, have stated that "the telly" is on its way out. ". . . a dying thing, panting out its pathetic last in the backstreets and parlours . . ." as one respected critic has it.

Maybe that is why the Welsh programme company bought up the rights in a number of struggling repertory theatres. If you can't beat 'em, eat 'em.

That's the way it seems to be going, too, in the radio and electronics business. What with take-overs, mergers, trade at sixes and sevens, we shall soon not know whether to call the boss, Sir, Herr Plonk, M'sieu, or Hi Mac! Sammy is getting quite worried about it all; but really there is no need. Haven't you noticed the modern trend towards "building for obsolescence?"

If things progress in their Gadarene way, we can change our wavering status once again—to installation engineers. That will be one way of getting into line. Perhaps it will be the chance to dress like a stockbroker, in pinstripe and Old Pilkingtonian tie, calling on the customers to advise on the state of the "electronic development market". "*Oh yes, madam a lovely new u.h.f. filter today.*"

My only fear is that by the time this appears in print, it, too, will be obsolescent. Out of line, so to speak.

Published by the Proprietors, Fountain Press Ltd., 46–47 Chancery Lane, London, W.C.2, and printed by Bournehall Press Ltd., Bushey, Watford, Herts

Complete Coverage from 7·5 Mc/s to 230 Mc/s

fm

am

TYPE SG. 63A FM/AM SIGNAL GENERATOR

Here, within this one modestly priced instrument, are the essential facilities and the essential accuracy demanded for servicing radio and television receivers on Bands I, II and III. The SG. 63A provides

- **Frequency range 7·5 Mc/s-230 Mc/s**
- **F.M. at 1000 c/s fixed ±22·5 kc/s and ±75 kc/s**
- **Crystal Calibrator checks at 5 Mc/s points (accuracy ±0.03%)**
- **Wide deviation at line frequency variable 0 to ±200 kc/s**
- **A.M. at 1000 c/s fixed 30 %**

This instrument is also available with output impedance of 50 ohms

Full technical details in Leaflet D.61 available on request.

NETT PRICE IN U.K.

£98

by **Advance** *– to be sure!*

Advance COMPONENTS LIMITED

INSTRUMENTS DIVISION

ROEBUCK ROAD • HAINAULT • ILFORD • ESSEX TELEPHONE : HAINAULT 4444

IT/GD87

Every Service Department

ESSENTIAL SERVICING DATA

VOL. 1

Television Receivers

saves time with

E. S. D.

the radio and television engineer's first reference

Compiled by GORDON J. KING

ESSENTIAL SERVICING DATA

VOL. 2

Radio Receivers and Radiograms

Volume One has 142 pages of information on TV receivers, of immediate practical value to the television service engineer, both in the workshop and in the field. Details are given of valve complement, c.r.t., i.f.'s, controls, electrolytics, metal rectifiers and diodes, thermistors, surge limiters and mains droppers, mains input, fuses, e.h.t., aerial inputs, together with servicing notes or special remarks.

A special section deals in detail with Band III converters and conversion.

Valves: 1 ECH35; 1 EF39; 1 EB34; U107.
Inter. Freq.: 460kc/s.
Pilot Bulb: 6.5V 0.3A M.E.S.
SPECIAL REMARKS: The radio section has its own power pack, but uses the a.f. amplifier of the TV sound channel.

T141 (12*in. table model*), **TC138** (12*in. console model*), **TRC139** (12*in. console with pre-set radio*)
Valves: 5 6F1; 2 6D2; 4 SP61; 1 6P28; 1 U24; 1 PY31; 1 6P25; 1 6K25; 1 PZ30.
C.R.T.: Mazda CRM121B.
Inter. Freq.: Sound 19.7 Mc/s; Vision 16.2 Mc/s.
Channels: All in Band I—lower sideband.
Band III Tuner: Type TT234.
Controls: Contrast 5k w/w; Brightness 100k DP switch; Volume 20k w/w.
Electrolytics: 100+50μF 350V kwg. common negative.
Aerial: 70–80 ohms unbalanced.
Mains: 200–250V a.c. only live chassis.
Fuses: Two 1.5 amp.
E.H.T.: 7kV (line flyback).
SPECIAL REMARKS: For fringe areas a single-valve pre-amplifier is available, and a slot is provided to hold it on the back of the cabinet. The amplifier is powered from a socket on the back of the chassis. SP41s may be found in place of the SP61s; and one 6F1 may be replaced by a 6C9.

—osc. high.
Channels: All fiv
Band III Tuner TT0258.
Controls: Bright Volume 25k w./w.
Electrolytics: 12 commo egat
Aerial: 70 0 ol
Mains: AC nly d.c.).
Fuses: Two 1
E.H.T.: 8kV (
SPECIAL REMA a sound i.f. of 19 16 Mc/s.
SERVICING NO adjustment occurs check the 2.7-m between the cent blocking oscillat in value.

T217 (17i ta
also late ver.
and T20
Valves: 6 10F1 2 1 13; 1 2 1 282; 1 U (spot-wobble
C.R.T.: Mazda
Inter. Freq.: So 16 Mc/s.
Channels: All fi
Band III Tuner:
Controls: Volur

Extract from Vol. 1 showing typical entry.

Volume Two has 190 pages of information on radio receivers and radiograms of equal value to the field engineer and the man at the bench. Details are given of valve complement, mains input, i.f.'s, electrolytics, pilot lamps, controls, mains droppers, waveband coverage, speaker, fuses, and in the case of radiograms or record player unit, pick-up.

Notes on aerial inputs, and provision of extension speaker and pick-up sockets are also given.

There are also sections on tuners and notes on transistors and printed circuits.

Volume I covers the basic circuit specifications of the vast majority of post-war TV receivers and includes a section on Band III converters. Volume 2 deals similarly with radio receivers and radiograms and includes a section on tuners. Both volumes are packed with data, invaluable in the service workshop, essential to the outside engineer.

Vol. 1—(Television Receivers) **10/6** post paid

Vol. 2—(Radio Receivers and Radiograms) **13/6** post paid

from

Radio and Electrical Retailing, 46 Chancery Lane, London, W.C.2