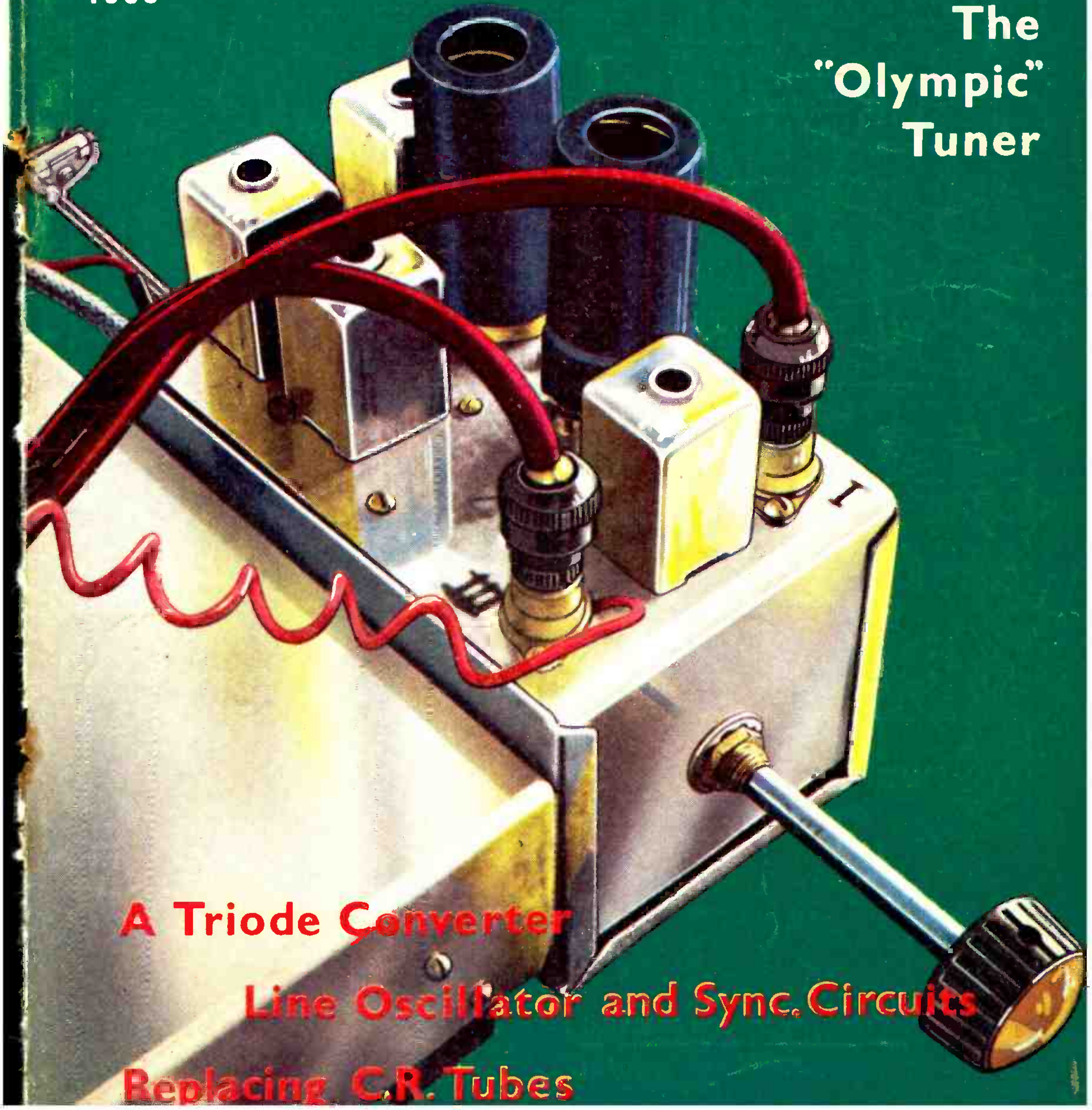
Practical Television

1'6

AND TELEVISION TIMES

DECEMBER 1960



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6F13	11/6
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6F15	15/3
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6J7G	6/-
6J7GT	10/6
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12BA6	8/-
12BE6	9/-
12BH7	21/3
12E1	30/-
12J5GT	4/6
12J7GT	9/6
12K5	17/11
12K7GT	5/6
12K8GT	14/-
12Q7GT	5/-
12SA7	8/6
12SC7	8/6
12SG7	7/-
12SH7	8/6
12SJ7	8/6
12SK7	6/-
12SQ7	11/6
12SR7	8/6
12Y4	10/6
14S7	27/10
18	23/3
19AQ5	10/6
19H1	10/-
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20P1	26/6
20P3	23/3
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CIC	12/6
CBL1	26/6
CBL31	23/3
CCH35	23/3
CK506	6/6
CL33	19/3
CV63	10/6
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DAF96	8/6
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DET25	7/6
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DF66	15/-
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DF96	8/6
DF97	9/-
DH63	6/6
DH76	5/-
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DH101	28/6
DH107	13/11
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DK40	21/3
DK91	6/6
DK92	9/-
DK96	8/6
DL33	9/6
DL66	17/6
DL68	15/-
DL82	46/5
DL92	7/-
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DL96	8/6
DM70	7/6
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EAF42	9/-
EB34	2/6
EB41	8/6
EB91	4/-
EBC3	23/3
EBC33	5/-
EBC41	8/6
EBC81	8/-
EBF80	9/-
EBF83	13/11
EBF89	9/6
EBL21	23/3
EBL31	23/3
EC52	5/6
EC54	6/-
EC70	12/6
EC92	13/3
ECC32	5/6
ECC33	8/6
ECC34	24/7
ECC35	8/6
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ECC83	7/6
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ECF82	10/6
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EF89	9/-
EF91	4/6
EF92	4/6
EF97	13/3
EF98	13/3
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EL32	5/-
EL33	12/6
EL34	15/-
EL38	26/6
EL41	9/-
EL42	10/6
EL81	12/6
EL83	19/11
EL84	7/6
EL85	13/11
EL86	17/3
EL91	5/-
EL95	10/6
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EM71	23/3
EM80	9/-
EM81	9/-
EM84	10/6
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EZ40	7/-
EZ41	7/-
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EZ81	7/-
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GZ33	19/11
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HL42DD	19/3

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KT33C	10/-
KT36	29/10
KT41	12/6
KT44	12/6
KT61	12/6
KT63	7/-
KT66	15/-
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KTW61	6/6
KTW62	7/6
KTW63	6/6
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L63	6/-
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MU12/14	8/-
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PCC88	18/-
PCC89	11/6
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PCL84	12/6
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PEN25	4/6
PEN40DD	25/-
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PEN45	19/6
PEN45DD	26/6
PEN46	7/6
PEN383	23/3
PEN453DD	33/2
PEN/DD 4020	33/2
PL33	19/3
PL36	12/-
PL38	26/6
PL81	10/6
PL82	7/6

PL83	9/-
PL84	12/8
PL820	18/7
PM2B	12/6
PM12	6/6
PM12M	6/6
PM24M	21/3
PX4	10/6
PX25	59/8
PY31	16/7
PY32	11/6
PY80	7/6
PY81	8/6
PY82	7/-
PY83	8/6
PZ30	19/11
QP21	7/-
QP25	14/6
QS150/15	10/6
R12	9/-
R18	14/-
R19	19/11
RK34	7/6
S130	15/-
SP4(7)	14/6
SP41	3/6
SP42	12/6
SP61	3/6
SU25	26/6
SU61	9/-
T41	23/3
TDD4	12/6
TH41	26/6
TH233	33/2
TH2321	20/-
TP22	15/-
TP25	15/-
TP2620	33/2
TY86F	13/3
U12/14	8/6
U16	10/-
U18/20	8/6
U22	8/-
U24	29/10
U25	17/11
U26	10/-
U31	9/6
U33	26/6
U35	26/6
U37	26/6
U43	9/-
U45	9/-
U50	6/6
U52	6/6
U54	19/11
U76	6/-
U78	5/-
U107	16/7
U191	16/7
U201	16/7
U251	14/-
U281	19/11
U282	22/7
U301	23/3
U329	14/-
U339	16/7
U403	16/7

U404	8/6
U801	29/10
U4020	16/7
UABC80	9/-
UAF42	9/6
UB41	12/-
UBC41	8/6
UBC81	11/4
UBF80	9/-
UBF89	9/6
UBL21	23/3
UCC84	14/7
UCC85	9/-
UCF80	16/7
UCH21	23/3
UCH42	9/6
UCH81	9/6
UCL82	11/6
UCL83	19/3
UF41	9/-
UF42	12/6
UF80	10/6
UF85	9/-
UF86	17/11
UF89	9/-
UL41	9/-
UL44	26/6
UL46	14/6
UL84	8/6
UM4	17/3
UM80	15/3
URIC	9/-
UU6	19/11
UU7	16/7
UU8	26/6
UU9	7/6
UYIN	18/7
UY21	13/11
UY41	7/6
UY85	7/-
VMS4B	15/-
VP2(7)	12/6
VP4	15/-
VP2B	14/6
VP4B	23/3
VP13C	7/-
VP23	6/6
VP41	6/-
VR105	8/-
VR150	7/6
VT61A	5/-
VT501	5/-
W61M	26/6
W76	5/6
W81M	6/-
W107	18/7
W729	18/7
X24M	24/7
X31	26/6
X41	15/-
X61(C)	12/6
X61M	26/6
X63	9/-
X65	12/6
X66	12/6
X76M	14/-
X78	21/3
X79	21/3

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Practical Television

AND TELEVISION TIMES

VOL. 11, No. 123, DECEMBER, 1960

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Contents

THE REPORT OF THE BBC

THE report of the BBC which was published in October gave rise to a great deal of comment in the daily Press, and the statements concerning the views of the BBC on the future of television were given particular prominence. Under the heading "Tasks for the Future", the report states that the Corporation sees as its first task the need to extend the coverage of its transmitters to those areas which at present lack a television service or do not possess a satisfactory service. The BBC has in mind especially the need in the remoter parts of Scotland and Wales. This policy statement shows that the Corporation is aware of the limitations of the present service and, sensibly, intends to improve it before, or together with, the introduction of an alternative service. It must be remembered that where the coverage is at present poor—in remote areas—the need for a television service is great owing to the lack of other forms of entertainment.

Where the introduction of another service is concerned, and it is decided that the uncommitted channels in Band III should be used for an additional television service instead of being employed to extend the present coverage, the report states that "the BBC would wish to provide the additional service". The report continues, "It remains the BBC's objective to provide the public with a planned choice between two different television programmes as soon as possible. This is necessary to the proper fulfilment of the Corporation's obligations as a public service.". The BBC considers that this second service would enable it to "increase the number of serious, cultural and informational programmes; cater more fully for regional needs than is possible at present; extend educational broadcasts; provide more opportunity for programmes of an experimental nature".

Of the two alternative uses of the remaining channels in Band III, we think that the proposal to use them to increase the coverage of existing transmitters is the better. As the BBC points out, television in Bands IV and V is all the more likely to succeed if a completely new programme is transmitted to give viewers an incentive to purchase new receivers or the new equipment necessary to receive the transmission.

The report states that the BBC would also be prepared to introduce colour television in any band when the time comes. The point is made that the studios at the Television Centre have been designed so as to be suitable for the introduction of colour at any time.

This latest report of the BBC has already given rise to many comments and we consider that, so far as the future of television is concerned, a number of factors have been mentioned which are worthy of more attention than has so far been bestowed upon them.

Our next issue, dated January, 1961, will be published on December 22nd.

A.M. Radio from Spare Turret Coils

RETUNING THE LOCAL OSCILLATOR TO 38 MC/S

By L. E. Higgs

UNUSED channel coils that are fitted in many TV receivers can be modified, in many cases, to tune down to the local broadcast radio station frequencies. The convenience of changing from either channel to A.M. (amplitude modulation) radio for a quick news check, or to listen to a short item, without switching off the TV and waiting for the radio to warm up is one advantage. The other is that all modifications are made on detachable spare coils from the turret, without interfering in any way with the circuit of the receiver. If a mistake is made, only a coil is spoiled.

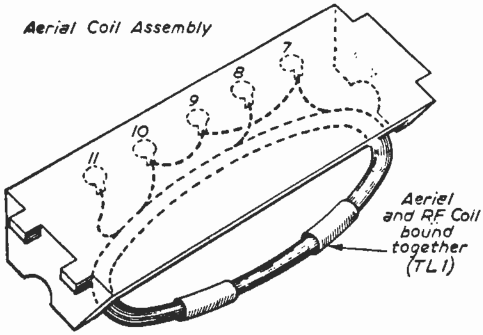


Fig. 1.—Aerial coil assembly.

Coil Information

Since about 1955, most thirteen channel receivers use the standard intermediate frequencies of 35Mc/s vision and 38·15Mc/s for sound. This makes the coil information similar for a whole range of sets. Added to this, the turrets fitted in a large range of sets are similar, and often originate from the same factory. These turret types are still being incorporated in sets today, and can be identified by the shaped coil mouldings (Fig. 1). Almost any set with this type of coil and standard I.F.'s should function on radio from the modifications given here.

Receivers using different types of turrets, converted sets with the old low I.F., in fact almost any tuner with detachable coils can be modified using this procedure as a guide. Switch tuners, continuously tuned front-ends, and incremental inductance tuners are not suitable.

Briefly then, the oscillator coil has additional turns added to bring its frequency down to around the 38·15Mc/s sound I.F. The mixer grid coil is replaced with a M.W. pre-tuned coil. The cascode anode coil is dispensed with and replaced by a resistor and coupling capacitor. The aerial coil is replaced by another M.W. pre-tuned coil but with a coupling winding.

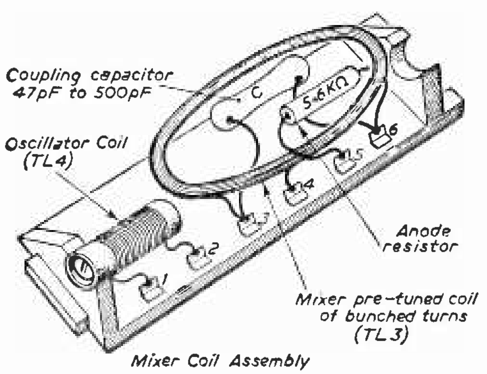


Fig. 2.—Mixer coil assembly.

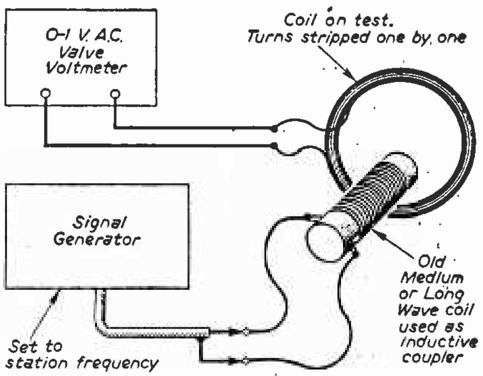


Fig. 3.—Pre-tuning the coils.

The Modifications

Remove all the windings from a spare mixer coil except the slug-tuned oscillator winding. Rewind the oscillator section, tags 1 and 2 (Fig. 2), until, after trial and error guided from the coil table, the oscillator runs at the sound I.F. and can be tuned off on either side of this point. When the oscillator passes through the sound I.F. a hum and rushing noise is heard accompanied by disturbances of the brilliance of the unsynchronised raster. The coarse-tuning slug decides this frequency. Coat this winding with cellulose cement to fix the turns, and improve frequency stability. Cut off the remaining length of paxolin tube (Fig. 2) and solder a 5·6k resistor ½W with short ends across the cascode output anode coil contacts. In Fig. 2 these are shown as pair 5 and 6, but check the circuit of the turret in question as it may differ from the examples shown. Now connect a capacitor from the anode contact of the

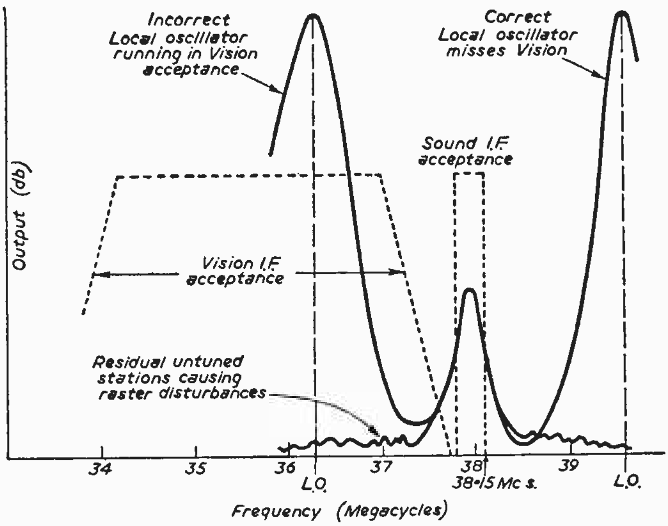


Fig. 4.—Correct and incorrect local oscillator settings.

cascode to the mixer grid contact (6 and 3 in the particular example). This capacitor is not critical. Try 500pF at first until a good signal strength is obtained and then reduce it to improve selectivity compatible with output—47pF is about the lowest tolerable

Wind a medium wave coil to fit between the mixer grid and the bottom contact of the grid circuit (the pair of contacts from which the original grid winding was removed) 3 and 4 in Fig. 2. This coil is quickly hand-wound on the can of one of the turret valves, slipped off, tested and adjusted to one of the required stations and bound with tape in three places in a circular bundle winding. The whole coil is shaped into an ellipse and wired on to the coil holder and cemented with an adhesive. Do not cement it until all the adjustments have been completed. The problem with these coils is to obtain a good Q in a small space and yet leave them easy to adjust, and the rough coils shown here work well, although time and patience spent with alternative arrangements and miniature screened dust-cored M.W. types would probably give better efficiency.

Pre-tuning the Coils

The method of pre-tuning the M.W. coils will depend on the equipment available. A signal generator and a valve voltmeter were used by the author (Fig. 3). Good positive peaks were obtained with the signal generator set to the station frequency. The turns are removed one by one until resonance shows as a peak reading on the valve voltmeter, and are then bound with tape, soldered on to coil former, and checked again.

When no equipment is available, the coils can be tuned by substituting them for the medium wave coil in a TRF radio and adjusting for maximum volume on the required station. It is important to remember to keep the tuning condenser vanes fully out of mesh during this operation, which is repeated until optimum results are obtained. A superhet would not be suitable owing to the ganging between the oscillator and the R.F., which would prevent keeping the R.F. vanes open.

The Aerial Coil

A check should be kept of the number of turns needed for the mixer coil as this saves time when winding the aerial coil. For this repeat the winding but this time use exactly the same number of turns as were found to be needed for the mixer. Do not remove it from the screening can when completed, but wind another coupling winding of 25 per cent of the turns just fitted and bind the two coils with a couple of layers of tape and remove from the can used as a former. Make sure that the ends do not become mixed. Now fit on to a stripped-aerial-coil former.

The way these four connections are made to the contacts will depend upon the reader's particular turret circuit. Generally, after a study of the stripped winding connections and the circuit, the small 25 per cent aerial coupling winding goes between the aerial inner and the coaxial outer (not always the chassis), and the tuned R.F. coil between the lower cascode grid and the chassis or old winding connection, whichever is better.

Make the tests for performance described below and when satisfied with one station, repeat for the other station. Make sure that the aerial socket does not become connected to the mains via direct chassis connection.

COIL DETAILS

Oscillator: ¼in. dust-core tuned, 17-25 turns (strip off from 25 turns), 32s.w.g.
M.W. mixer coil:
247m. ⅞in. in diameter air core "bundled" winding, 47 turns 32s.w.g.
330m. 47 turns. 32s.w.g.
R.F. and aerial coils: as for mixer but with 25 per cent additional winding. 32s.w.g.

The information above can only be approximate and should only be used as a guide. This is due to the circuit variations and coil positioning, the turns spread, and the dielectric effect of adhesive soaked into windings.

Testing and Adjusting

It cannot be overstressed that the turret wiring must not be altered. To do so can spoil the TV reception. Manufacturing experts leave this section well alone while it is working, especially the trimmers. Use a long aerial plugged into the inner only at the start. With the set on, select the newly fitted radio coil pair and, with the volume full up, tune the oscillator slug slightly above or below the I.F. and several stations should be heard; the pre-tuned should be loudest. Watch

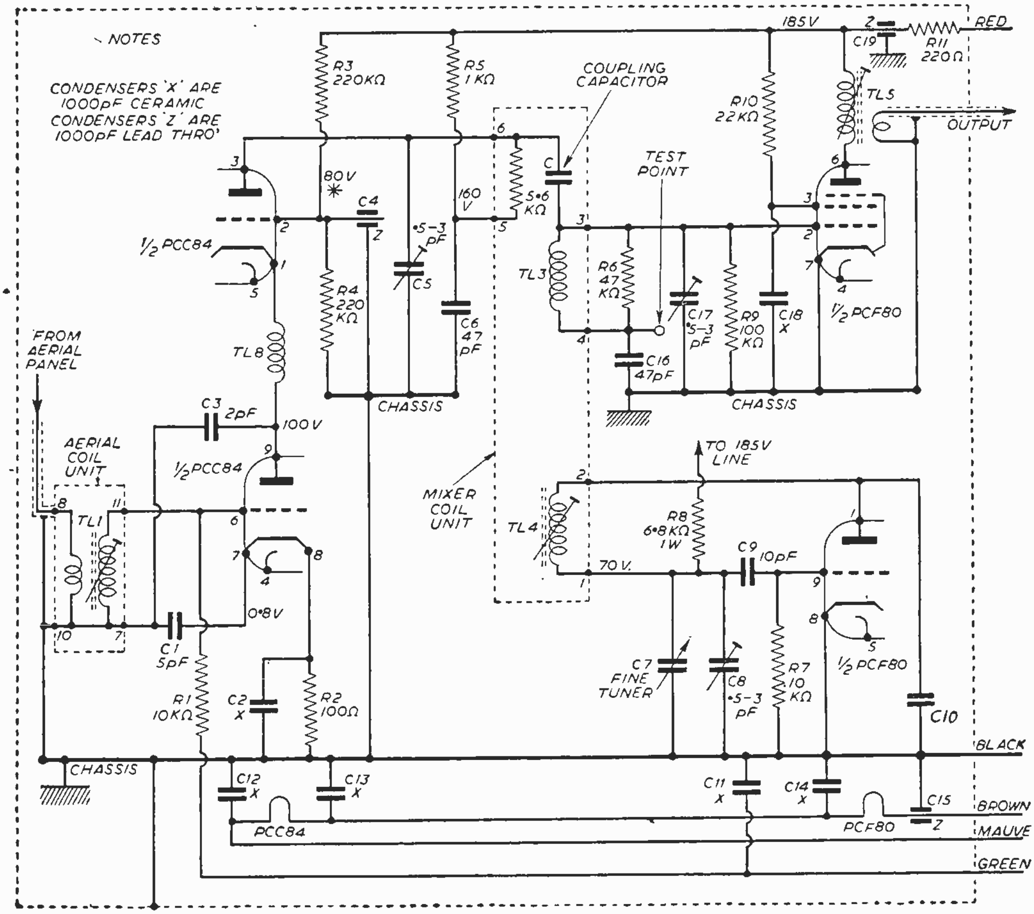


Fig. 5.—A typical turret tuner circuit.

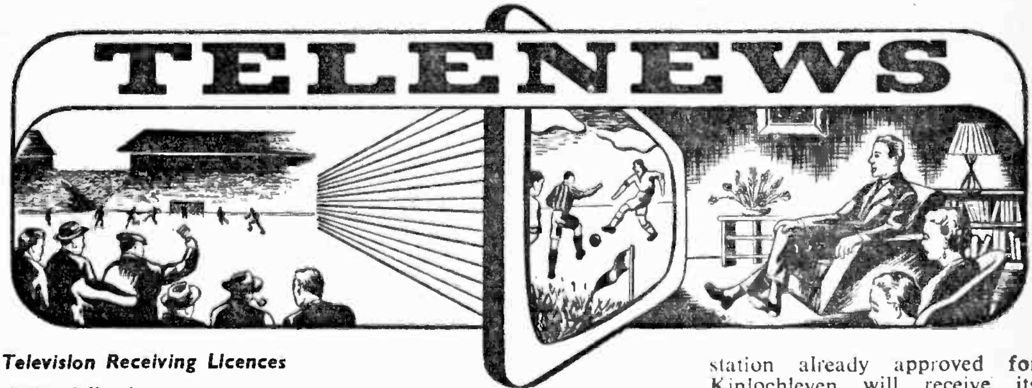
the screen when adjusting because there are two places that the selected station can appear owing to the sum and difference hetrodyning of the local oscillator. Between these two points the described effects will occur as the oscillator runs at the I.F. It is important to chose the highest oscillator setting as this lies outside the vision I.F. acceptance band. The wrong setting can be seen in Fig. 4, and shows up on the screen as a strong brightening of the raster while the correct setting leaves the raster at "no signal" illumination but slightly rippled and torn by other signals.

When the station is tuned in, try the normal TV aerial. This will probably give weaker reception, and a loft or outside aerial is essential for a good signal. If a good result is obtained, the next pair of station coils can be made. However, if the selectivity is poor, then reduce the size of the coupling capacitor until the best result compatible with good volume is obtained. The setting of the contrast and sensitivity controls will affect the signal output and, in the absence of AVC on some models, any overloading, choking, sound can be cured by slight oscillator detuning or by reducing the number of turns on the aerial coupling winding. It is assumed that the alignment of the vision I.F. is reasonably accurate. Because prolonged running of the oscillator at the intermediate frequency can overrun the video output valve, or possibly affect the vision detector if it is a crystal type, it is wise to short the vision I.F. out with a 1000pF capacitor from the last I.F. valve anode to chassis while tests are made. This can be removed for a second or two when the screen has to be observed and, of course, when the work is finished.

Curing Instability

The many things that cause frequency shift in a turret would in a good proportion of cases make the local oscillator "pull into the I.F." and the powerful signal, greatly amplified, could radiate back into the whole of the turret and I.F. stages,

(Continued on page 152)



Television Receiving Licences

THE following statement shows the approximate number of Television Receiving Licences in force at the end of September, 1960, in respect of television receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland.

Region	Total
London Postal	1,874,893
Home Counties	1,480,283
Midland	1,647,057
North Eastern	1,759,871
North Western	1,439,379
South Western	911,883
Wales and Border Counties	653,255
Total England and Wales	9,766,621
Scotland	961,786
Northern Ireland	152,063
Grand Total	10,880,470

French Television

MR. H. A. RICHARDSON of Ingoldmells, Skegness, Lincolnshire, has been supplied by Aerialite Ltd. with the television aerials necessary for his experiments and these have proved very successful in receiving French Television Services at Skegness.

Tests have also been carried out on the French channel eleven station at Bouvigny and the French channel 8A, Lille and Paris.

The receiver being used was a standard British model, but Mr. Richardson proposes acquiring a set suitable for the French Service.

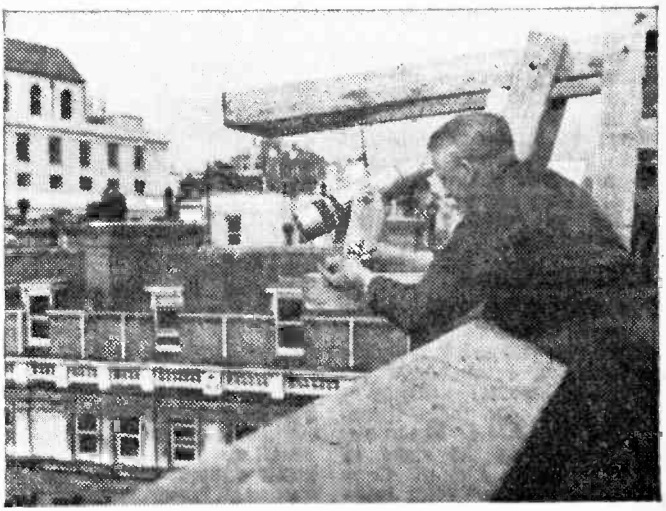
New Survey of British Electronics Industry

TODAY, over 1,700 firms in Britain employing more than 350,000 people operate within the broad field of electronics. Value of the gross output is around £475 million and exports this year are expected to exceed £100 million.

These and a mass of other facts are brought out in "The Structure and Future Prospects of the Electronic-based Industries in the United Kingdom", a new 54-page survey by Cyril C. Gee, managing editor of "British Communication and Electronics" and the recently launched newspaper "Electronics Weekly".

Low Power Television Station for Ballachulish

THE Postmaster General has approved in principle a proposal by the BBC to build a low-power television station near Ballachulish, Argyllshire. The station already approved for Kinlochleven will receive its television programme from the existing BBC station at Rosemarkie via the satellite station to be built at Fort William. This plan necessitates the use of a relay point at Ballachulish to feed the programme to the Kinlochleven station. The BBC has decided that, rather than provide a point-to-point link over this part of the route, it would be better to build a small satellite station at Ballachulish that would not only serve the main purpose of providing the feed of the programme to Kinlochleven, but would also give direct television reception to some 1,500 people in



Taylor Woodrow Ltd. have installed Marconi closed circuit television on the site of the new building they are erecting at the junction of Gracechurch Street and Fenchurch Street. The installation enables the public to watch building operations in progress on a 21in. monitor fitted in a public observation platform. This illustration shows a Marconi engineer fitting the closed circuit television camera on the roof of a building adjoining the site.

the immediate neighbourhood of Ballachulish.

The new station, the site and technical details of which have not yet been authorised, is to be built concurrently with the other satellite stations in Stage I of the BBC's scheme, all of which are scheduled for completion by March 1962.

TV as a Public Observation Aid

THE first public "televiewing" platform at a building site in this country is now in use at Gracechurch Street, London.

Taylor Woodrow Construction Ltd. have installed Marconi closed-circuit television on the site of the new building they are erecting at the junction of Gracechurch Street and Fenchurch Street, E.C.3.

A Marconi 21in. monitor installed on an observation platform at Gracechurch Street enables the public to watch work in progress in areas which would otherwise be hidden from view. A control unit mounted near the monitor enables the public to move the camera in bearing and elevation to view different parts of the site.

An industrial camera complete with a remotely controlled pan/tilt head has been fitted on premises overlooking the site, where work will be completed by autumn, 1961.

The TV installation is a development of the public observation platforms first introduced to building operations in this country by Taylor Woodrow in 1955. "Televiewing" will prolong the life of observation platforms, which are normally dismantled as building progress screens the view.

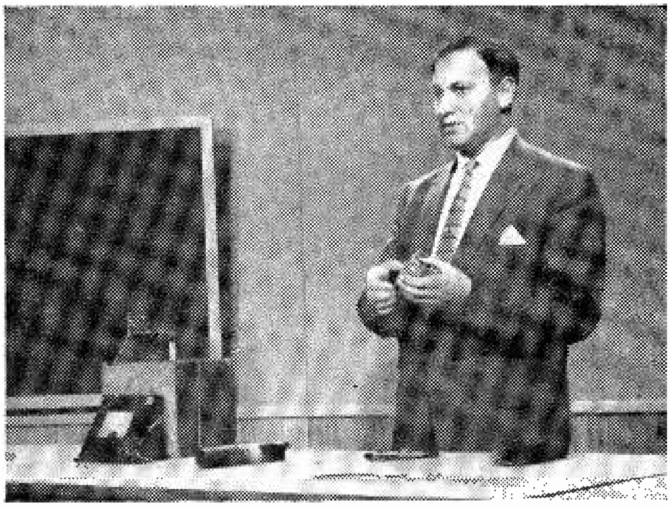
Stockholm Exhibition

PHOTOMULTIPLIER tubes, of the type used in space rockets for measuring radiation hundreds of miles above the earth, were among the display of special valves and tubes, manufactured by E.M.I. Electronics Ltd., shown on the stand of Swedish SAAB Aircraft Company, at the recent Fifth International Instruments and Measurements Exhibition in Stockholm.

A vidicon television tube which can "remember" a transient picture for up to two minutes after the subject has passed out of camera range, and microwave klystron valves of the type used by the Eurovision network of radio links, for televising such events as the Olympic Games to Stockholm and other cities of Europe, were also shown.

Visitors to the exhibition were able to see the latest E.M.I. closed-circuit television equipment. This system, which is being used for applications as varied as police control of traffic and auditioning of television artistes, has recently been installed in the offices of a leading Wall Street stockbroker to show busy executives a continuous picture of the latest ticker-tape price changes.

During the Exhibition, the SAAB Company also showed a range of E.M.I. stroboscopes and oscilloscopes in their Stockholm offices. These included E.M.I.'s latest high-power industrial stroboscope which "freezes" fast-moving mechanisms for observation and critical adjustments without interrupting production. This stroboscope, which uses an ultra-high intensity Xenon discharge tube, has a flash rate of up to 60,000 flashes per minute.



Dr. H. K. Henisch, of the Department of Physics, Reading University, lectures in the first of the new series of Discovery, Granada TV's schools programme for sixth formers. Every Thursday at 11.40 a.m. Granada TV's Discovery can be seen in the North and Wales and the West. Dr. Henisch's subject: "Semi-Conductors".

Appointment

MR. Michael Clark, Director of the Electronic and Equipment Group of The Plessey Company Ltd. announces the appointment of Mr. George A. Smith as Commercial Executive of that Group.

This Plessey Group includes the Telecommunications, Electronics and the Domestic Equipment Divisions and Hagan Controls Ltd., with a total pay-roll of over 4,000 people. In this appointment he will be responsible for the co-ordination of the four sales organizations within the Group.

British Instrument Display in Germany

THE Board of Trade and the Scientific Instrument Manufacturers Association (S.I.M.A.) co-operated for a second time in the organisation of a collective display of British scientific instruments at the triennial International Congress and Exhibition of Measuring Instruments in Dusseldorf, which was held this year from October 19th to 26th.

This year's collective British display followed a successful combined effort by the Board of Trade and S.I.M.A. similar to the first event of the same exhibition in 1957. Twenty-five firms have displayed their products on the official stand, which covered an area of 5,000sq ft.

EHT Generation

By G. K. Fairfield

No. 1—THE USE OF THERMIONIC VALVES

THE need for a compact unit capable of providing the EHT required for television equipment often arises where servicing or experimental work is undertaken. Safety requirements demand that the type of EHT unit chosen should not be capable of giving a lethal shock as very high voltages are in use. Consequently a simple transformer system for increasing the A.C.

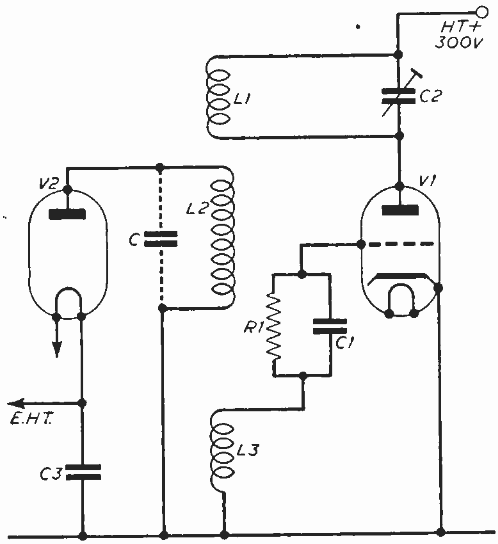


Fig. 1.—R.F. oscillator circuit (grid-leak bias).

mains potential to a high voltage, followed by a rectifier or voltage-doubling circuit may not be used and therefore one of the various types of high-frequency circuits that are available must be employed. In addition to its use as a test source, the provision of EHT independently produced, will simplify the design of the line scanning section of the television receiver, which usually provides, by line-flyback action, the EHT for the CRT. The brightness of the screen will not then depend on the action of the time-base, and since the separate EHT unit can have better regulation, then defocusing on high-lights can be avoided and improved picture definition results.

Methods of EHT Production

Two general methods are possible to produce the high voltage required and both lead to a compact unit being produced which is quite safe to use. The first of these is the R.F. Oscillator system in which a class C oscillator, containing a high-Q tuned circuit resonating at a radio frequency provides an oscillatory voltage which may be stepped up by transformer action and subsequently rectified.

Since the resonant frequency is high, only small smoothing capacitors are necessary in the rectifying system and these cannot contain enough energy to give a lethal shock. In addition their smaller size, compared with those necessary for mains EHT production, allows a much more compact unit to be designed.

The second method is similar to the way in which the line timebase transformer operates to provide a high potential from the flyback pulse appearing across the deflection coils.

The principle is to "shock-excite" a tuned circuit by passing a large pulse of current through it at a repetition frequency that is low compared with its self-resonant frequency. This current pulse sets up a train of high frequency oscillations in the tuned circuit which are then transformed to a higher voltage and rectified in the same manner as the R.F. oscillator system. This arrangement is known as the "Ringing Choke" or "Pulsed EHT System."

In addition, circuits may be used where a transistor acts as a very effective switch and converts a D.C. voltage into a square wave, also at a frequency high compared with the mains supply frequency. This waveform can also be increased in amplitude by transformer action to a high voltage. The use of transistors for this purpose is very attractive owing to the high efficiency of conversion, and a future article will be devoted to a description of their operation, and practical designs will be discussed.

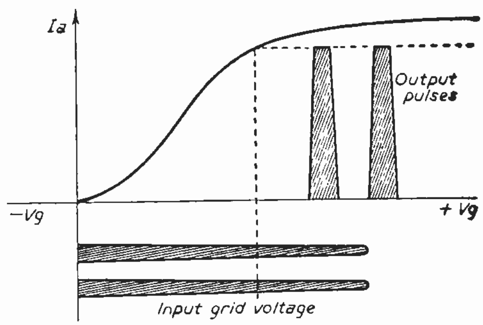


Fig. 2.—Generation of current pulses.

In this article it is intended to describe both types of thermionic valve circuits and show how the regulation of such circuits may be improved very considerably by the use of negative feedback.

R.F. Oscillator

This method consists of an R.F. oscillator having a large secondary winding tightly coupled to its anode "tank" circuit.

For maximum efficiency a class C oscillator is used, the grid leak being of such a value that the minimum anode potential is small compared with the anode supply potential.

Assuming an anode supply of 300V, let the minimum anode potential be 50V. Then the peak

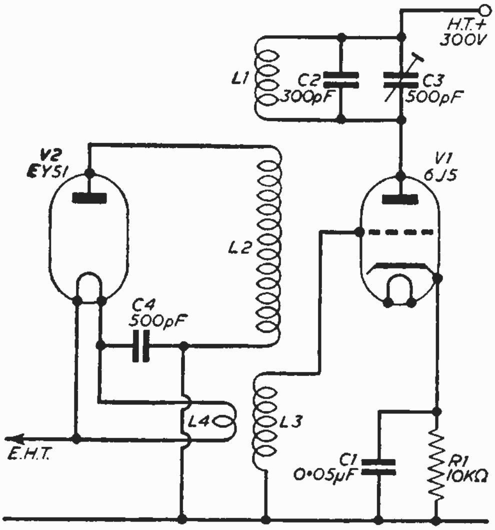


Fig. 3.—Circuit of the R.F. oscillator EHT unit.

A.C. potential developed across the tank winding will be 250V. In order to have, say, 5kV across the secondary winding the transformation ratio must be 20:1. In practice a ratio of 25:1 is necessary to take into account coil losses etc., and this corresponds to a transformer ratio of 15:1. This winding will be so large relative to the grid and tank coils that the frequency of operation will be governed by the inductance of this coil together with its self and stray capacitances to earth. The frequency will be found to lie between 100 and 300kc/s.

R.F. Oscillator Circuit

A circuit of such an R.F. oscillator is shown in Fig. 1. The circuit oscillates by virtue of the positive coupling that exists between the anode and grid coils L1 and L3. Oscillation build-up, at a frequency determined by the tank or anode-tuned circuit, occurs until grid current is drawn by V1. This flows through R1, bypassed by C1 to radio frequencies, and builds up a negative bias which limits the action of the valve. After a few oscillations the bias increases to a maximum where V1 only conducts for each half cycle as shown in Fig. 2, with the anode passing pulses of current at oscillation frequency.

In the circuit shown in Fig. 1, the anode inductance L1 is tuned by C2 to the frequency of the circuit L2 and stray capacitances, shown dotted as C. L3 is the grid coupling coil and need not be tuned.

To prevent the tuning of the tank coil with C2 becoming too broad, L1 can be made about 600μH, with C2 as a parallel combination of fixed and pre-set capacitors of 600pF maximum capacitance. L2 must then have 15 times the number of turns as L1, and due to the large potential developed, it is usually constructed in sections to avoid insulation breakdown. The Q-factor of this coil is most important and if this falls much below 450 then excessive power will be dissipated in the coil, the overall efficiency will fall, and the protective coating of wax given to the completed coil will melt, increasing the danger of breakdown between windings. Filament current for the high voltage rectifier V2 can be obtained by an extra winding on the former which must be suitably spaced or insulated from other windings since it is at EHT potential.

Disadvantage

A disadvantage of the arrangement shown in Fig. 1 is that, should the valve cease to oscillate for any reason, the large negative bias is removed,

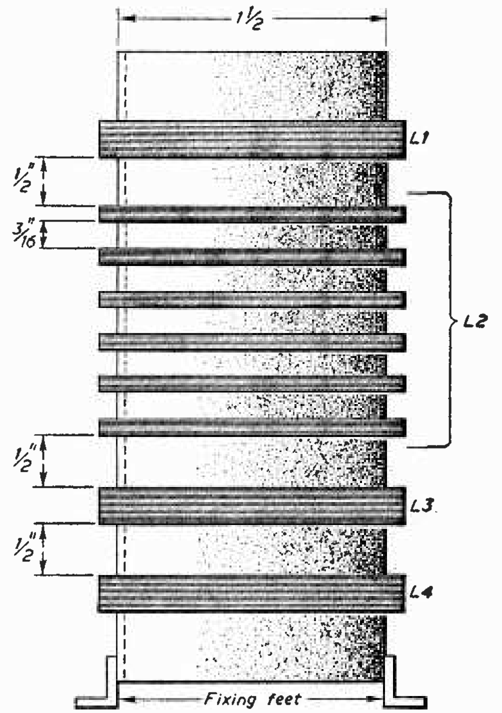


Fig. 4.—R.F. oscillator coil construction.

and the resulting large cathode current may damage the valve through excessive anode dissipation. Using cathode bias as shown in Fig. 3, the anode current is actually reduced on cessation of oscillations and no power is being delivered to the external circuit.

Choice of V1 is governed by consideration of the EHT required, peak anode dissipation at this value of EHT, and peak A.C. potential. The latter is important as the peak voltage between the anode and grid is twice this peak voltage across L1, hence the valve chosen must have adequate grid-anode spacing to avoid internal "flashover" For EHT potentials below about 7-8kV then a medium impedance triode, such as a 6J5 can be used.

Varying the EHT Value

The value of EHT produced can be varied over small limits by tuning the tank circuit. If this process is carried too far then poor regulation of the output results. A better method is to adjust the cathode bias resistor and maintain the tuning capacitor at optimum setting where a maximum EHT is produced.

With any design a value of EHT will be found corresponding to peak efficiency of operation. Above this value the efficiency of conversion drops and high anode dissipation results. With the design described, this optimum EHT is about 6kV at a load current of 100μA.

Practical Design

Suitable component values are given in Fig. 3 for an EHT unit giving up to 7kV EHT, at a load current up to 100μA—usually quite adequate for most cathode-ray tubes.

A diagram of the oscillator coil is shown in Fig. 4. L1 is the anode tank coil and consists of 100 turns of 30/48 Litz wire either wound between insulating cheeks or preferably wave-wound so as to be self-supporting. L2 is the main EHT winding and is found in six sections each of 250 turns. Thinner wire is chosen to avoid excessive bulk and 6/5 Litz wire will be suitable. Litz wire is used to give a high Q-factor by avoiding "skin effect"—that is the high R.F. resistance that occurs in solid wire owing to the high frequency currents travelling only at the surface of the wire. L3 is the feedback winding and need only have about 50 turns of 38s.w.g. wire to couple sufficient energy into the grid circuit. Fairly tight coupling is required but this is limited by the nearness to which L1 can approach the high potential end of L2. A satisfactory arrangement is to wind L1 and L3 on either side of L2 as shown in the diagram.

The filament winding L4 will depend on the requirements of V2—the high voltage rectifier. Using an EY51, 24 turns of 23s.w.g. polythene covered wire will suffice. To avoid "tracking"—a gradual breakdown of the paxolin former due to the voltage stress across it—the completed coil is given a fairly thick coating of soft wax.

Screening of the complete oscillator is necessary, both from the point of view of interference with neighbouring broadcast receivers. and avoidance of interference patterns on the screens of the television receiver which is being supplied by the unit. A close mesh wire screen will be necessary to enclose the coil completely or complete circuit, care being taken to ensure that adequate clearance is maintained between the screen and the high potential points.

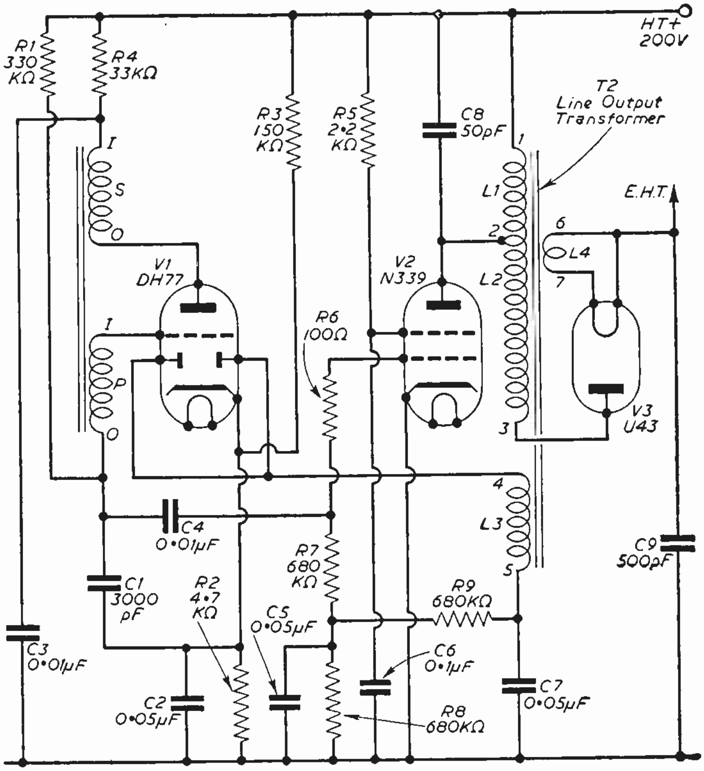


Fig. 5.—Ringing choke circuit.

Ringing Choke Unit

The ringing choke system is rather elaborate but has the advantage that it is easier to modify the circuit to produce control over the regulation of the EHT produced.

The principle has been stated earlier in that a valve is pulsed repetitively into current which flows through an inductive circuit, thus setting up a large resonant voltage across it. To pulse this valve a sawtooth generator is used and it is convenient to make this a blocking oscillator similar to that used in the time-base sections of the television receiver.

If an additional winding is placed on the output transformer core then the voltage developed across this may be rectified and fed to the driven valve as a controlling bias and in this way any increase in load current can be made to cause an increase in the amplitude of the current pulse, thus maintaining the EHT voltage constant. A circuit of the type is shown in Fig. 5.

The triode section of V1 functions as a blocking oscillator and provides a sawtooth driving waveform to the grid of V2. This has an inductance L1 tuned by C8 in its anode circuit and by auto-transformer action provides a large pulse voltage across the EHT winding L2. Rectification of this pulse voltage is carried out by V3 which develops the EHT voltage across the smoothing capacitor C9.

Feedback Action

Feedback action is carried out by coupling winding L3 to the diode of the double-diode triode V1. This rectifies the pulse voltage induced in L3 and develops a D.C. voltage across the diode load R9 proportional to the peak value of the EHT pulse. Controlling action is obtained by feeding this as bias to V2 such that as the load across C9 increases, then this bias is reduced, allowing V2 to supply more current to the transformer windings. If the load is reduced then the bias is proportionally reduced and less current is supplied by the valve.

Thus the EHT potential tends to remain constant irrespective of the load current supplied. To render this action more effective a fixed voltage is added in series with the peak rectified voltage so that as the load varies then the percentage variation of the resulting control is greater than that of the induced peak.

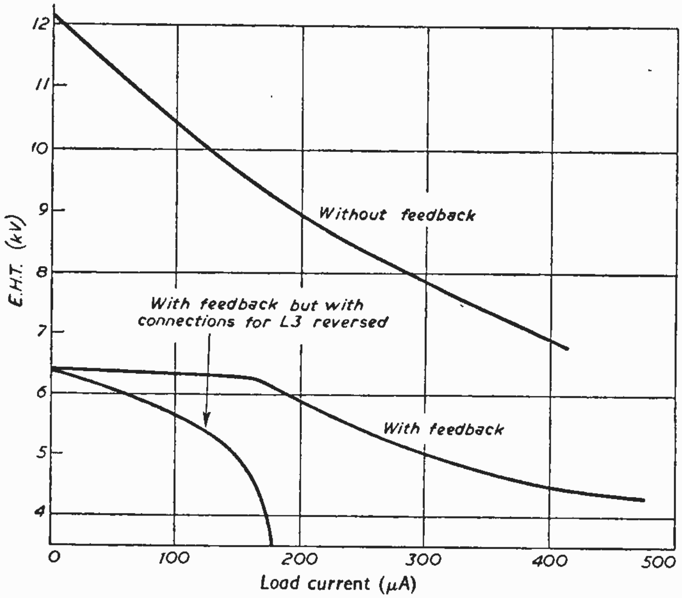


Fig. 6.—Regulation of ringing choke system.

Consider a change in rectified bias of from 12 to 15V due to a change in load current. This represents a change of 25per cent in bias value. Now if 10V of fixed bias is deduced from this then the change is from $12-10=2V$ to $15-10=5V$, i.e. a 150per cent change thus rendering the arrangement much more sensitive to changes in load.

The effect of this feedback on regulation of the supply is illustrated in Fig. 6 which shows the change in EHT output with and without the feedback circuit connected.

Transformer Design

A blocking oscillator transformer as used in line timebase operation may be used for T1. A suitable design has been described in the October 1957 issue (now out of print). The output transformer is wound on a paxolin former ½in. in diameter with the turns given in Fig. 7. Windings L1 and L2 should preferably be wavewound and the gear ratios for a Douglas wave-winding machine are given in the diagram. A satisfactory coil may be obtained by winding this between thin perspex cheeks cemented on to the former. These cheeks should be separated by a gap of ⅛in. and the 1,500 turns pile-wound between them. The whole coil should be impregnated in soft wax for insulation purposes.

A ferrite core is used for the transformer consisting of two U-shaped cores (Mullard type FX1336) with a 0·003in. paper spacer in each gap. The heater winding for the EHT rectifier can consist of six turns of 20s.w.g. polythene covered wire, (the "inner" of television coaxial cable will be found quite satisfactory for this purpose) wound on one of these limbs as shown in Fig. 7.

It is important to connect the feedback winding in the correct sense to obtain best regulation and Fig. 6 shows the effect of incorrect connections.

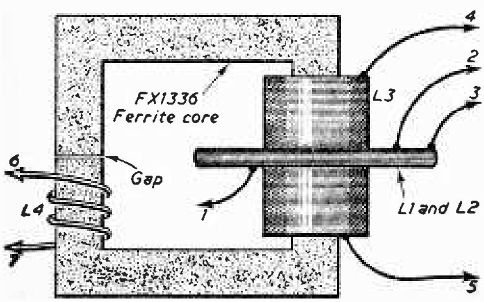


Fig. 7.—Construction of the transformer.

Performance

With this design a regulated supply of 6kV is obtained adequate for supplying currents up to 200μA.

Higher voltages than this can be supplied by adjustment of the fixed potentiometer R8R9 with, of course, reduced regulation performance. The limit being reached at 11-12kV with this design.

(To be continued)

WINDING DATA FOR FIG. 7

Winding	No. of turns and wire gauge
4/5	40 turns of 0·026 enamelled copper wire.
1/2	500 turns of 0·0058 enamelled and single-silk wire (wavewound).
2/3	1,000 turns of 0·0048 enamelled and single-silk wire (wavewound).
6/7	6 turns of polythene-covered wire.

	A	B	C	D	E	F
Gears for windings 1/2 and 2/3 (Douglas machine)	42	31	36	48	80	40

A BAND III LOFT AERIAL

A 10-ELEMENT DIRECTIONAL ARRAY

By A. R. Richards

MANY articles have appeared in *Practical Television* from time to time on how to construct a suitable array for Band III transmissions.

Substitute for Metal Elements

Nothing basically new is offered in this article, other than to introduce a suitable substitute for the normal metal elements, and which should simplify the construction, even for the very inexperienced constructor.

The whole array is constructed with a length of 1in. × ⅜in. timber, a dozen ⅜in. × 3ft dowelling rods, and a box of aluminium cooking foil. The total cost amounts to less than 10s.

There is no real need for perfection in placing the foil on the dowel rods, and wrinkles will not impair the efficiency of the array. Cut 3in. wide strips of foil to length and roll around each element lengthwise. Any method can be used to hold the foil such as glue, elastic bands, cotton, thin wire, etc. The directors are then nailed to the main support with panel pins, taking care that the centre of each director is properly in line (Fig. 1).

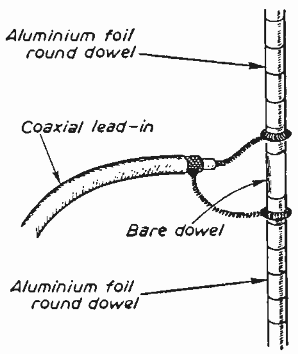
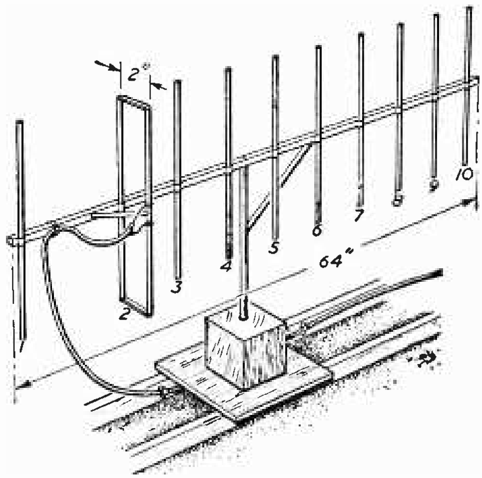


Fig. 2.—The method of making the elements from aluminium foil.

Connecting the Feeder

The two main lengths of the folded dipole are wrapped with foil in a similar manner to the directors and reflector, with the exception that the wrapping on the one length allows for a ⅜in. to ½in. gap at the centre. Two 2in. lengths of dowelling rod are then cut and these are nailed to the ends to form the folded dipole, and over these ends are wrapped more foil taking care to bond this with the foil on the main elements. The folded dipole is then nailed in the appropriate position on the main support, and if thought necessary, further short pieces of dowelling rod can be used as struts for the outer element of the dipole to give additional support. These are easily nailed *in situ* providing reasonable support is made beneath the dowelling rod when being nailed. Bare lighting flex wire is wound firmly around the ends of the foil at the gap of the folded dipole outer element, and to these ends are soldered the co-axial down lead (Fig. 2). A 1in. wide strip of foil is attached to the centres of all the directors thus connecting them together.



Spacing between each Director is 6", between Dipole and Director, 6" and between Dipole and Reflector, 12"

Fig. 1.—The construction of the aerial.

Mounting

It is necessary to stress that the array must be sited in the loft with the maximum available space above and to the sides.

Mounting can be carried out by placing a board across two rafters, to which has been nailed a 6in. cube of wood suitably drilled to receive the ⅜in. vertical dowelling-rod mast. An elastic band will effectively hold the co-axial down lead to the horizontal support, and the lead can also be anchored to the rafters when the correct positioning of the aerial has been obtained.

This aerial is highly directional, and a deviation of 1in. to 2in. will appreciably vary the signal strength. However, no real difficulty should be experienced in swinging the aerial to the best position to receive maximum signal.

Band I aerials or V.H.F. aerials generally can be constructed quite simply with this method of construction, and many experiments can be carried out cheaply and without waste, as the dowelling rods can easily be spliced to make them longer should an aerial for other frequencies be required.

ELEMENT DIMENSIONS

Channel	Reflector (1)	Dipole (2)	Director (3)
	ft in.	ft in.	ft in.
8	2 7	2 5½	2 2
9	2 6½	2 5	2 1½
10	2 5½	2 4	2 1
11	2 5	2 3½	2 0

Directors numbered 4 to 10 may each be ½in. shorter than their predecessor; for example, for channel 9, director No. 4 would be 2ft 1in. long and director No. 5 2ft 0½in. long, etc. (Note that the number of directors may be varied to suit the available space.)

Replacing CR Tubes—13

R.G.D. AND REGENTONE RECEIVERS

By H. Peters

(Continued from page 85 of the November issue)

HAVING dealt with unboxing and removal of the CRT in the R.G.D. Deep 17, we now deal with the boosting and focusing procedure.

Boosting

Use a 6·3V CRT transformer and connect the boosted secondary to pins 1 and 12 of the tube, having removed the previous two leads from these pins, and joined them together to complete the heater chain. Mains voltage for the transformer may be obtained from between the set side of the mains fuse and chassis.

Screen Cleaning

In all cases the chassis is removed from the cabinet to clean the screen as outlined in "Unboxing."

Focusing

"The 17", "The 21", and earlier models have a magnetically focused tube which has as its picture shift device a shuffle plate just forward of the focus magnet adjustable by a bent metal strip at the top. The tube neck is centred within the focus magnet by a wedge-shaped rubber ring which should be removed with the ion trap magnet when replacing the tube.

On electrostatic models, focus is adjusted by touching the lead attached to pin 6 on to various other electrodes around the tube base, and fixing it to the one which gives the best focus. This adjustment seldom needs altering when a tube is replaced.

MODEL T14 Transportable

Unboxing

Remove the main control knobs (the inner two are grubscrewed in, and retain the outer two) and the cabinet back. Take off the two rear rubber feet and the green earth wire. Remove the handle, which is held by two screws located beneath the plastic trim over the handle support, and which should be picked out to gain access. Remove the two insulated spacers from the lower chassis securing screws and withdraw the chassis.

Changing the CRT

Discharge and remove the EHT cap, CRT base, ion trap magnet and picture shift magnet, keeping these latter two in a safe place away from strong magnets and each other. Remove the four self-tapping screws holding the tube support board to the top edge of the chassis and the two diagonal support struts to the side of the chassis and withdraw the CRT assembly. Clean all parts thoroughly before reassembling.

Setting Up

Ensure that the scanning coils are seated well forward on the tube neck, adjust ion trap and picture position magnets in turn for the brightest possible picture centrally placed on the screen.

The ion trap magnet should not be used to position the picture at the sacrifice of brightness. Focusing is adjusted by the small pre-set resistor mounted on the tube base.

Boosting the Tube

This is performed in exactly the same way as on the Deep 17, detailed above.

Models 605. 590. 610. 611. etc,

Warning; 110deg tubes are used.

All the above receivers use a wide angle 110deg tube. It should be realized that the more the shape of a tube departs from the traditional goldfish bowl the greater are the stresses set up in the glass under high vacuum. The risk of implosion when handling is therefore theoretically greater than with earlier shapes of CRT.

Unboxing Model 605/590

Lay face down on a soft cloth, remove two back screws and lift off the cabinet.

(Continued on page 148)

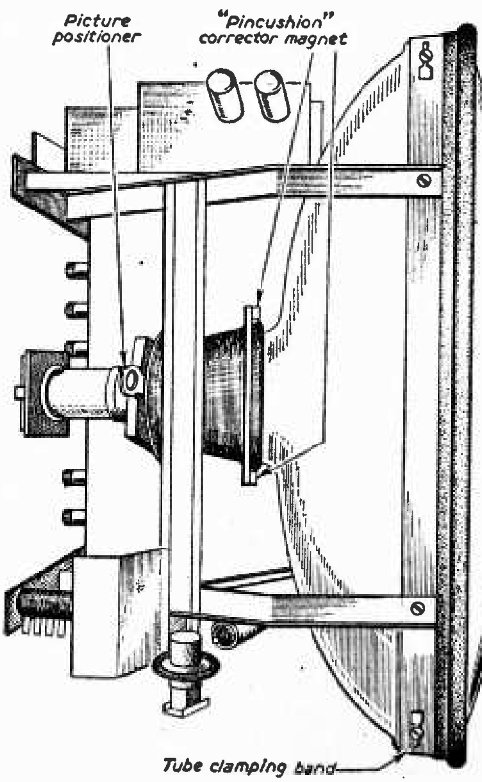
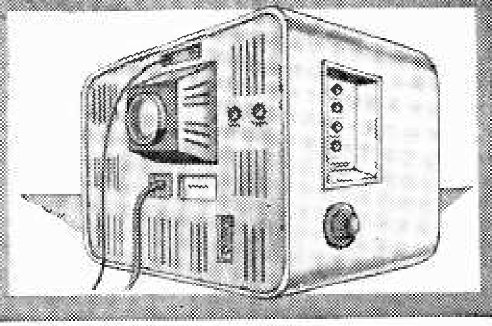


Fig. 5.—R.G.D. 605/610 series—plan view.

Servicing Television Receivers



No. 62—THE DEFIANT TR1456T AND TR1756T SERIES

By L. Lawry-Johns

THESE receivers bear a close resemblance to several other receivers of well-known makers. Probably the closest relative is the Regentone 143T, and these notes may be used in cautious conjunction with these models. There is, however, absolutely no resemblance between this range and the R.G.D. 1455-1456 series, the chassis and circuit being completely different. Defiant models covered by these notes are, in addition to those above, TR1456TL, TR1456C, TR1456CT, TR1756TD and TR1756C. Three types of tube are fitted, a Mazda CRM171 17in. rectangular, CRM141 14in. circular (actually 13½in.) and CRM143 14in. rectangular.

The electrical shift controls are fitted in 17in. models only and there are minor component differences.

Common Faults

The most common fault encountered by the writer is failure of the metal rectifier, especially when the original 14RA1-2-8-2 (short) or 14RA1-2-8-3 (long) is fitted. The normal symptoms are no sound, no vision, valves light up but no raster or hum from the speaker. This generally only necessitates replacement of the contact cooled rectifier, MR1, which, as shown on the chassis layout diagram, is bolted on the front centre of the chassis. A replacement, FC101 (short) or FC31 (long) should be fitted. Occasionally the H.T. fuse, 500mA, or 1A on some models, will be found blown, due to a short on, or in, the rectifier, and this can blow the 1·5A mains fuse at times.

Dull Negative Picture

When the picture lacks brilliance or what may be termed crispness, having a uniform grey appearance with silvery highlights, worsening when the controls are advanced, the tube may be assumed

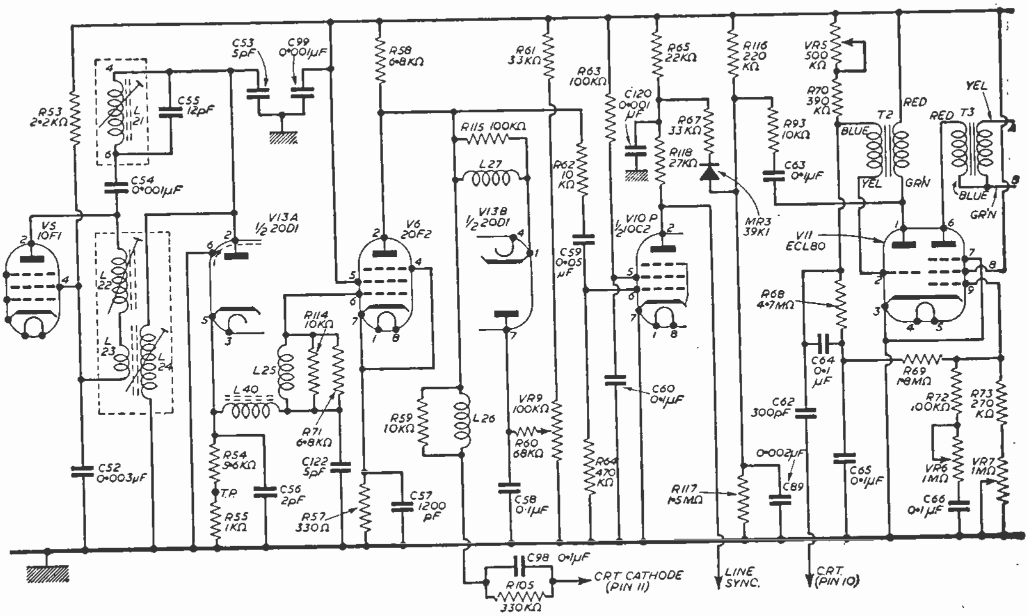


Fig. 1.—The video amplifier, sync separator and frame timebase circuits.

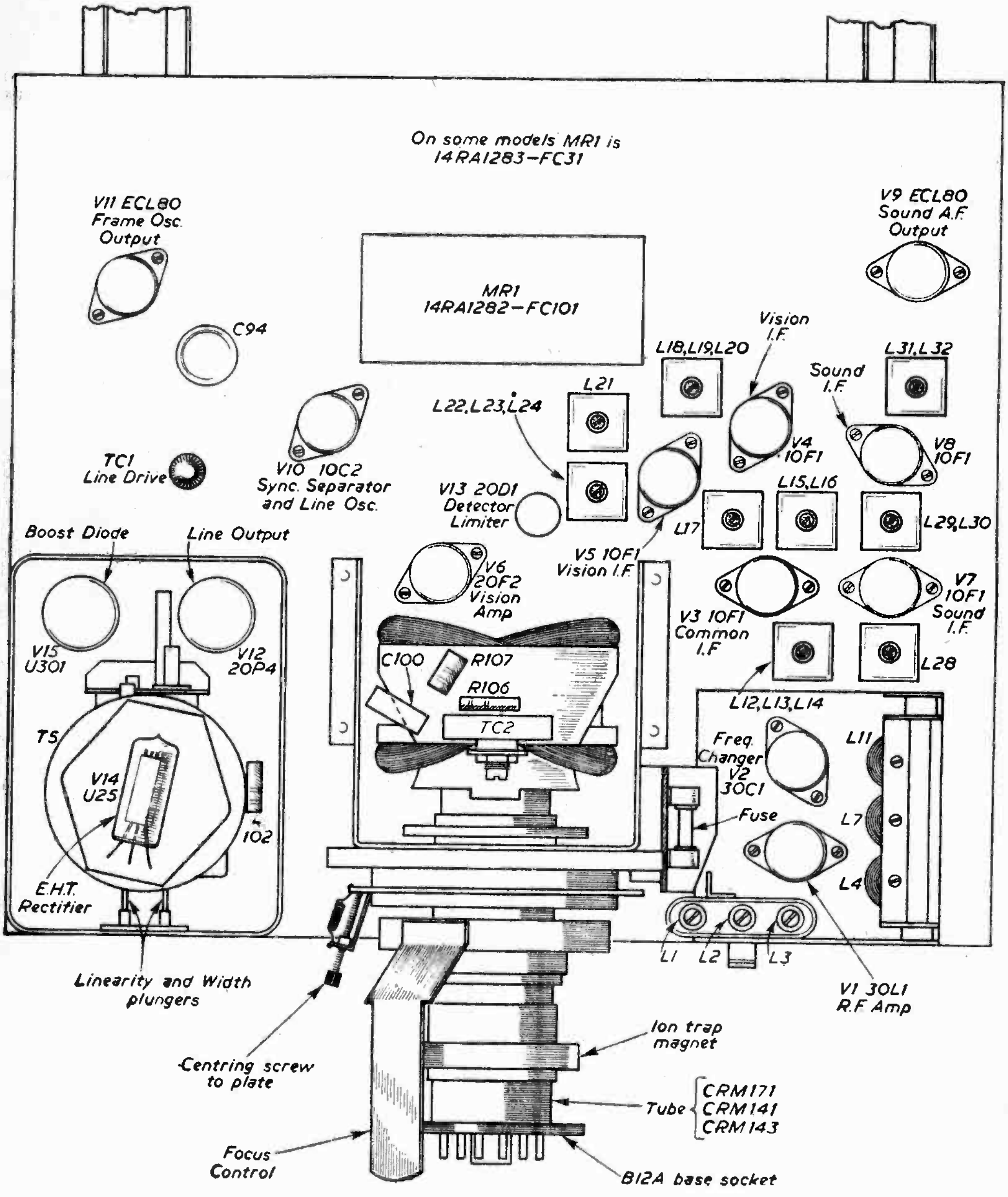
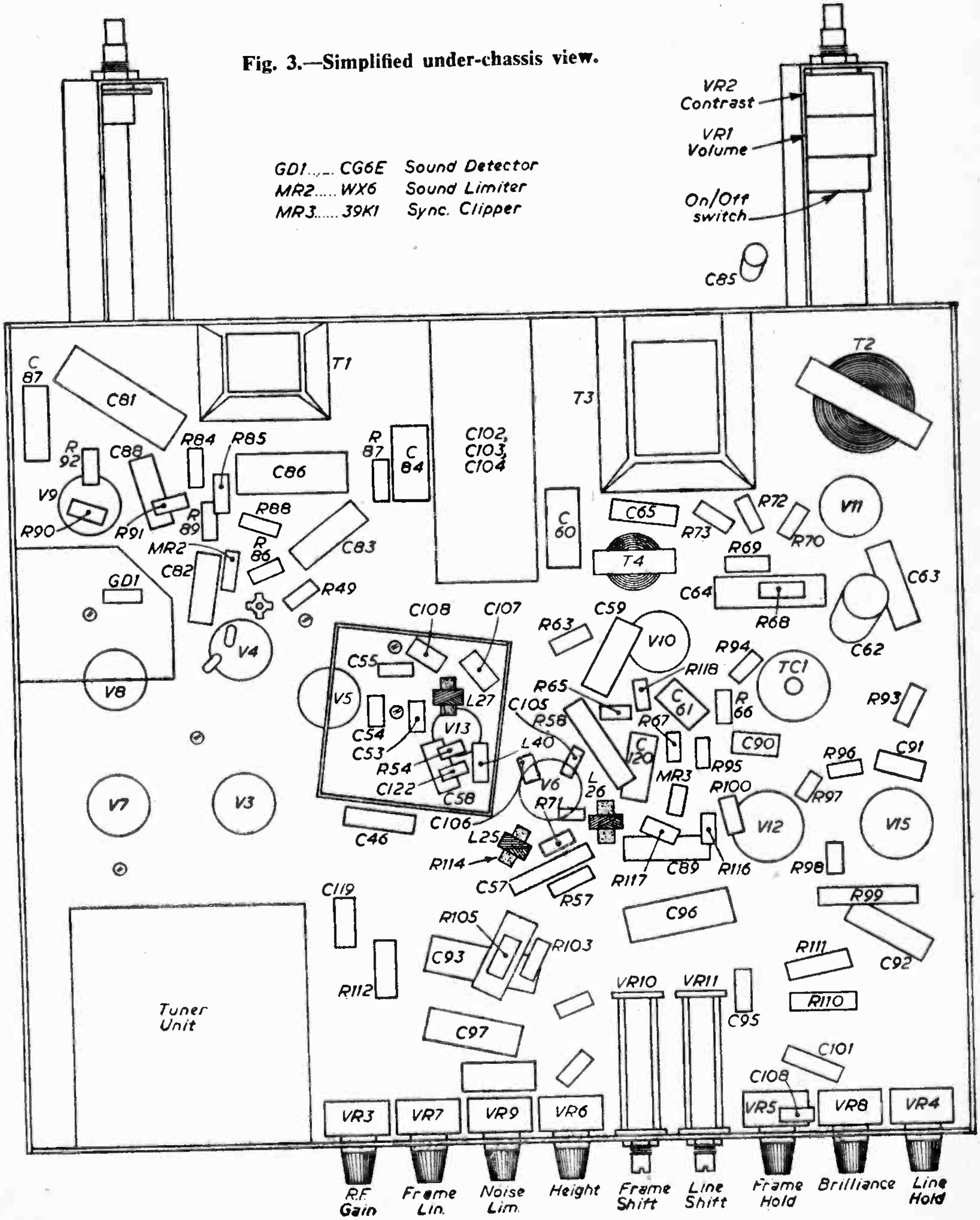


Fig. 2.—The above-chassis layout.

to be losing emission. Check the setting of the ion trap magnet on the rear of the tube neck (set for maximum brilliance), and make a voltage check across the heater pins 1 and 12. In some cases these tubes seem to lose some heater resistance, thus causing the voltage drop across the heater to fall. Even though the cathode may be in good order, its temperature is lower than that specified and the beam current is correspondingly less. The provision of a 12·6V heater transformer (13V is usually supplied) will overcome this trouble and restore the emission if the cathode is in good condition. When this is done, remove the original heater leads from pins 1 and 12, connect these leads together and shift the green lead on the mains voltage adjustment one letter up, e.g. C to D. The mains supply for the transformer may be obtained with a lead to the chassis and a lead to the main 1·5 fuse.

There are occasions, however, when the symptoms are misleading unless carefully studied. When the brilliance control produces a fairly bright raster although the contrast only shows a negative or thin picture when advanced, check the V6 20F2 anode load resistor 6·8k, the cathode 330Ω, and the video choke L25-L40, R54, etc. The video

Fig. 3.—Simplified under-chassis view.



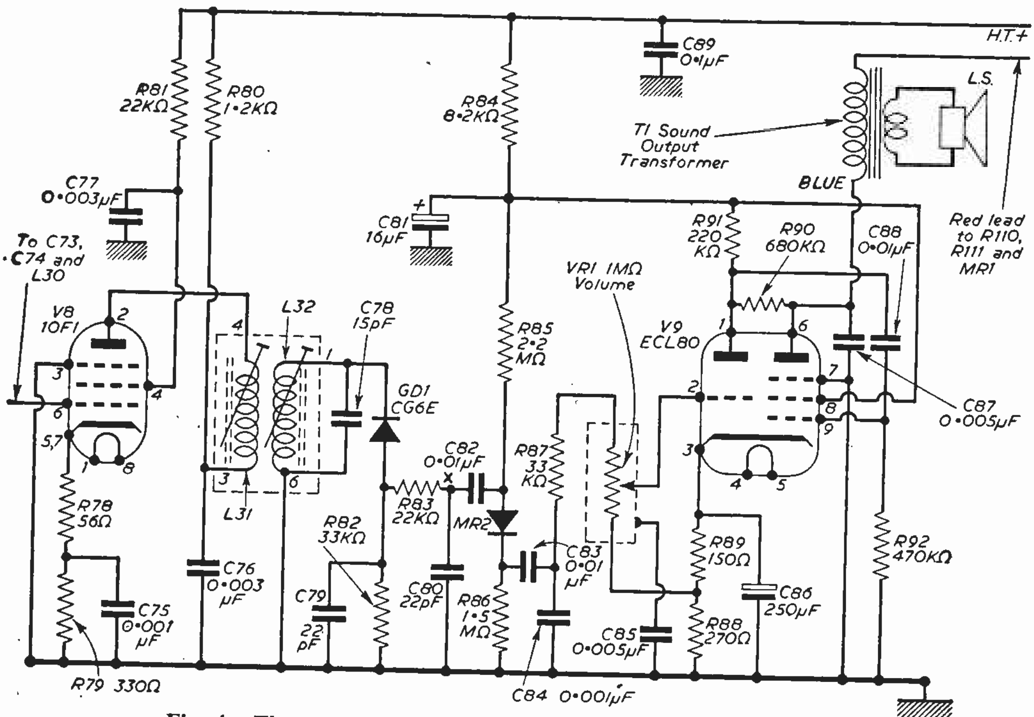


Fig. 4.—The sound detector, limiter and A.F. output stage circuits. ('X' marks a test-point)

coupling capacitor C98 may occasionally be found o.c.

Frame Faults

The most common frame trouble is compression at the bottom of the picture. This is usually due to a failing V11 ECL80. Replacement of this normally restores full height and linearity once the controls have been reset. If, however, valve replacement fails to cure the condition, attention should be directed to the biasing, which is unusual. It will be seen from the circuit that the cathode is returned to the chassis with no bias resistor. The bias is applied to the control grid pin 9 from the oscillator which when the stage is working is a source of heavy negative potential, via R68 (4·7M) and R69 (1·8M). The actual bias applied depends upon the value of these resistors, C65 (0·1μF) and the linearity network R73 270k and VR7.

Complete Loss of Frame Scan

When only a bright horizontal line is visible across the screen, V11 should be checked and if this is in order a voltage check made on pins 1 and 6. Full H.T. should be present at both these pins, allowing for a slight drop across the transformer windings. If there is no voltage at pin 6, check the blue lead H.T. If H.T. is present here, the transformer T3 has an o.c. primary winding. A cold resistance check should record about 750Ω between the blue and red leads. If the voltage is present at pin 6, check pin 1, where the same remarks apply to T2, green and red resistance reading about 780Ω.

If these voltages are present and V11 is in order, check C65, which may be shorted.

Frame Hold

If the picture rolls with the hold control set at one end of its travel for the best condition without locking, check V11, R70 and C64. Alternatively if the picture rolls up or down but will not lock, check MR3 (39K1), R116, R117 and C63. If both line and frame holds are critical or cannot be obtained at all, check V10, R63, C59 and C102 (250μF H.T. decoupling). If this capacitor is open circuited the loss of hold will be accompanied by hum, sound on vision and other symptoms, depending upon the setting of the various controls.

Intermittent Sound

This normally shows as a sudden drop in volume or sometimes complete loss which is restored just as suddenly, sometimes by the operation of a light switch in the house, by switching channels or even by removing and replacing the aerial plug. This should immediately direct attention to C82 and C83, both 0·01μF audio coupling capacitors. Firmly moving each will usually show which is the culprit. It is pointed out, however, that C88, 0·01μF, could equally be at fault, as could a poor connection anywhere in the V7-V8-V9 stages, and GD1 should not be neglected in this respect.

(To be continued)

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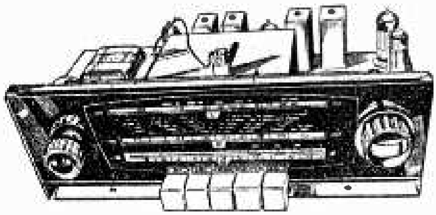

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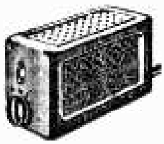

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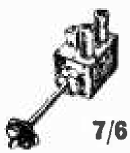

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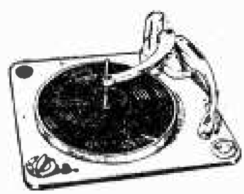

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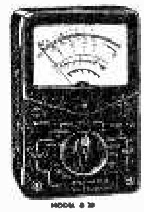

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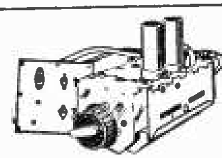

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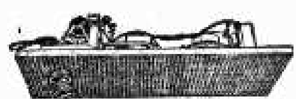

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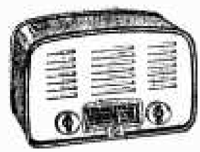

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Line Oscillator and Sync Circuits

By A. G. Priestley

No. 2—SYNCHRONISATION PROBLEMS

(Continued from page 94 of the November issue)

HAVING dealt with the basic requirements of line oscillator stages, the next step is to discuss the circuits involved in line sync separators and pulse-forming stages. First, however, the effects of variations of H.T. and of component tolerances must be considered.

Change of Oscillator Frequency with Picture Brightness

If the oscillator is fed from the boost H.T. line, or if the main feedback is obtained from a tap on the line transformer, the frequency may change as the picture brightness is increased or decreased either by means of the control or due to a change of programme or scene. This is because any change of brightness alters the loading on the line output circuit and thus affects the amplitude of the boost H.T. voltage and the pulse fed back to the oscillator.

An exception to this occurs when a stabilised line output circuit is used, where the voltages change only a very small amount over a wide range of loading. These circuits are uncommon at present but will probably become more popular in the near future.

The change of frequency is undesirable because the hold range has to be increased correspondingly, to the detriment of the sync performance, and even then the picture may break sync when the brightness is changed, if the hold control happens to have been adjusted near the end of its range.

If the trouble is due to changes of boost H.T., the obvious cure is to return the oscillator to ordinary H.T. instead, if the other circuit characteristics permit. Changes of feedback amplitude are not easy to compensate because they are inherent in the circuit, and if the fault is serious it is probably best to use a different type of oscillator, unless the time and equipment necessary for a full-scale investigation are available to the reader, in which case the aim should be to alter the circuit so that another frequency change is induced of the opposite sense to cancel out the first one.

Circuit Tolerances and Component Ratings

The commercial setmaker has to take a great deal of trouble to investigate the effects of component tolerances on the working of a circuit. This is necessary to avoid making a large number of reject receivers which have failed to pass the stringent production tests because the tolerances added up the wrong way. Fortunately the home constructor is not much affected by tolerances, since he is only making one receiver, and he can afford to ignore this aspect of the task.

In the case of component ratings the setmaker is again vitally interested, because any carelessness in the specification of components will cause a lot of unnecessary and premature failures in customers' sets. The home constructor is also concerned, although not quite so seriously, because he does not want any unnecessary faults either.

The thing to do here is to measure or calculate the currents, voltages and powers in each part of the circuit and then to make sure that components of the correct rating are used. This applies particularly to valves, and great care should be taken to avoid exceeding any of the published limits, as this invites an early failure, and will prove expensive. Valve makers do not want to limit the usefulness of their valves, but they are forced to do so in order that their products shall give good service.

It is as well to bear in mind, too, that resistors of over 1M and of small size and wattage rating do not always take kindly to pulses; even quite small ones. In such cases it is best to err on the side of safety and use 1W types where a ½W component would be adequate in theory. They are also easily damaged by too much soldering.

Pulsed applications commonly occur in the frequency controlling circuits of line and frame oscillators, and also in the feedback stages of the frame output valve. This is a good point to bear in mind when servicing a receiver, since by replacing a ½W resistor by a 1W type, you may prevent repetition of the fault.

Line Synchronisation

In an ideal receiver, fed from a perfect transmission, the sync pulse always arrives at exactly the correct moment and triggers the oscillator so that the next line of the picture starts in precisely the right place. This means that the edge of the raster will be perfectly straight, and any vertical line will appear "clean". (Fig. 4.) This is what we mean by good synchronisation.

In practice, however, electrical noise is generated in both the aerial and the receiver circuits and this, added on to the sync pulses, causes them to trigger slightly too early or slightly too late. As a result the individual lines of the picture will be displaced, and vertical lines will appear ragged. (Fig. 5.)

In areas close to the transmitter (called the service area) the signal picked up by the aerial is so large that the noise forms only a very small proportion of it.

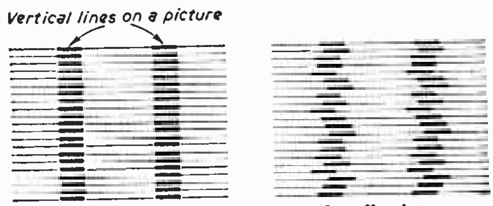


Fig. 4 (left)—Part of a "clean" picture. Fig. 5 (right)—Part of a "ragged" picture. Note the random displacement of the lines.

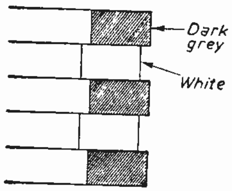
Consequently with almost any type of synchronisation arrangement the displacement of the lines in the picture will be so small that the picture detail will look clean.

In the outer region of the service area the signal is not so strong and the noise forms an appreciable part of the total signal; consequently care is needed in the design of the sync circuits.

In the fringe area the signal-to-noise ratio is so poor that special synchronisation circuits have to be used in order to obtain a stable picture, and these are usually of the so-called flywheel type. Often the entertainment value is small, even if the picture is steady, because the detail tends to be lost amongst noise.

Other Causes of Poor Synchronisation

When considering the causes of poor synchronisation in general, the electrical noise generated in the



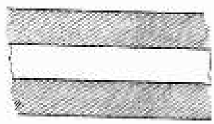


Fig. 6 (left)—Squaring.
Fig. 7a (right)—Part of a picture comprising dark grey and white horizontal bars.

aerial or receiver circuits is only one of the hazards. Other sources of trouble include:

impulse interference;
squaring;
self-generated oscillation in the line transformer;
spurious line hold characteristics;
interaction of line and frame sync.

Impulse Interference

This is the kind radiated by electric motors, thermostats and arcing in faulty connections. Cars, electric hair dryers and razors, immersion heaters and old power points are often the culprits, although most of these should have suppression devices. The effect is to swamp the sync pulses so badly that several lines of the picture may be hopelessly displaced, and since the interference is also fed to the cathode ray tube, the picture is affected by black or white spots and streaks.

Squaring

This is the term given to a fault which causes groups of lines in a picture to be displaced towards the left-hand side. On looking more closely it will be found that this only happens where a white portion of the scene occurred at the end of the line before. Fig.6.) The reason for this is shown in Figs. 7a-e. Diagram (a) shows a picture comprising dark grey and white horizontal bars; (b) is the corresponding video signal for a dark grey line and (c) for a white line. Note particularly the so-called "front porch", which is an interval to give the signal time to fall from white to black level before the sync pulse comes along.

Supposing that there is a long time constant in, say, the sync separator, then the signal will take too long to fall from white to black level and it will not have reached it by the time the sync pulse arrives. This state of affairs is illustrated in Fig. 7d, and it should be compared with the dark grey line in (e). It can be seen that in case (d), for a white line, the oscillator will be triggered too late, causing the next line to start too late also, i.e. this line, and any subsequent white ones, will be displaced towards the left and in bad cases with a picture of the appropriate pattern, the whole scene appears almost to be built up from a number of squares, like a chess board.

Sometimes the trouble is aggravated by a faulty transmission which has an unusually short front porch. This is easily tested by switching over to another channel and seeing if the fault persists. If it does, then the fault lies in the receiver, and may be due to valve or component failure in the sync separator or video circuits, or to incorrect tuning of R.F. or I.F. circuits causing poor H.F. response.

Another way in which this peculiarity can arise is when video information reaches the line sync pulse more directly. If a video voltage is added to the sync pulse, the size of the pulse, and hence the time of firing of the oscillator varies with the picture content. This is basically the same mode of action as in the previous case, but the means by which it comes about are different.

If the sync separator fails to separate completely the video information from the sync pulses, i.e. its

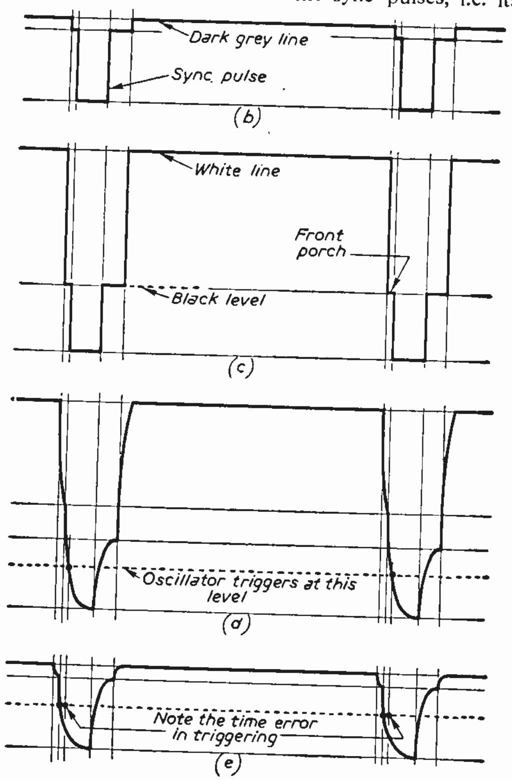


Fig. 7b—Ideal signal waveform corresponding to the dark grey lines of Fig. 7a.
7c—Ideal signal waveform corresponding to the white line of Fig. 7a.
7d—Video signal with a long time constant giving a white line.
7e—Video signal with a long time constant giving a dark grey line.

clipping action is inadequate, squaring will occur. Alternatively, if a lead carrying line sync pulses passes too close to one carrying video information, the mixture will be passed to the oscillator, with the same results. This mixture is shown in Fig. 8 (a) and (b).

Spurious Oscillations

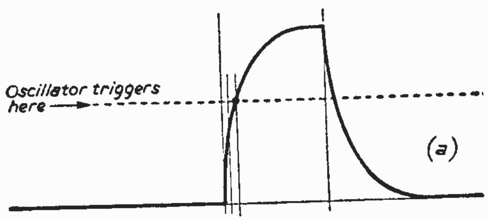
Another form of bad synchronisation is due to a spurious oscillation (ringing) in the line transformer. This gives rise to the trouble illustrated in Fig. 9, where the vertical lines on a picture tend to form a zig-zag with two or three lines at a time. It only occurs in circuits where a capacitor is used in series with the deflection coils, and these two components may resonate at a frequency corresponding to a few lines of the picture. This condition is easy to recognise because the quality of synchronisation is worse on the right-hand side of the picture than near the beginning of each line.

There is no cure for this trouble except to change the circuit for a less efficient one, but it can be improved by good design of the sync circuits.

In some circuits ordinary line transformer ringing, characterised by vertical bars on the raster, can be fed back to the oscillator, and this causes the output pulses to vary in a regular pattern with the result that the raster has a wavy edge, as shown in Fig. 10.

Spurious Locking

If you turn the line hold control of an ideal receiver the picture should remain in perfect synchronisation over the whole of the hold range, and should break up smoothly at each end. Most receivers, however, show some slight peculiarities. In some cases the



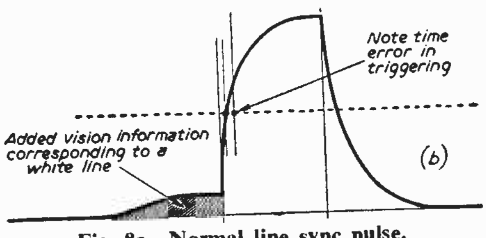
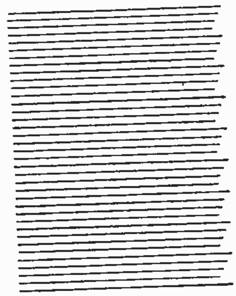


Fig. 8a—Normal line sync pulse.
Fig. 8b—Normal line sync pulse with added video information.

picture does not immediately break up at one end of the control range, but first slips sideways. The last half of the picture then appears at the left-hand side of the screen followed by a broad vertical bar and then by the first half. The black bar in the middle is the sync pulse and blanking period, illustrated earlier in Fig. 7, and this can be seen in detail by turning up the brightness. Further rotation of the hold control then causes the picture to go out of sync in the usual way.

This spurious hold position can hardly be classified as a fault, but it is an interesting peculiarity, and provides an easy means of looking at the transmitted blanking times and sync pulse widths. Incidentally, the actual times can easily be measured and then



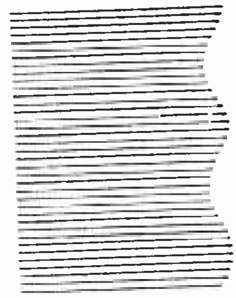


Fig. 9 (left)—A form of poor sync which may occur when a capacitor is used in series with the deflection coils.

Fig. 10 (right)—The raster may have a wavy edge when line transformer ringing is fed back to the oscillator.

compared against the transmission standards. Day to day variations can be recorded as well. How to do this will be described in a future article.

Another phenomenon which may as well come under this heading is backlash in the hold control. This is very much akin to lost motion in the steering wheel of a car, which makes it difficult to set the road wheels in the right direction. When the hold control is adjusted so that the picture just breaks lock, it has to be rotated back again quite a long way before the picture is resynchronised. This characteristic must be classified as a design fault because it makes the control difficult to adjust to its best position, and makes a larger hold range necessary.

The third peculiarity is that of the picture jumping sideways slightly when passing through a certain critical setting of the hold control. This, too, is a slight fault since it makes it more difficult to choose a mean position of the control when centring the picture on the screen of the CRT. *(To be continued)*

The Practical Television OLYMPIC

CONSTRUCTING THE I.F. TRANSFORMERS AND THE TUNER

Continued from page 98 of the November issue

By D. R. Bowman

THE layout is also complicated to some extent by the need to keep line and frame time-bases well separated. It is not always realised that in places very heavy pulse currents flow, and that the large magnetic field associated with them can induce quite high voltages in adjacent high-impedance circuits. If this happens, interlace may be seriously affected. As extremely good interlace is a feature of this receiver, care must be taken not to spoil it through thoughtless location of components.

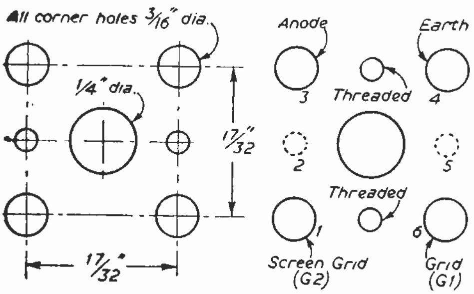
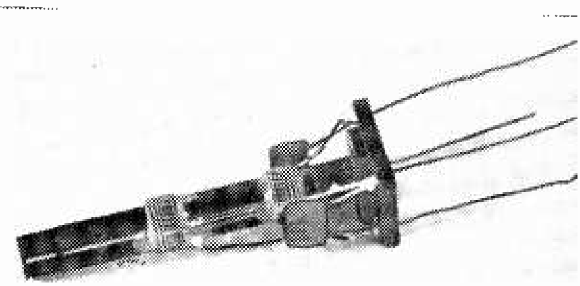


Fig. 4.—(left) Chassis drilling details for the I.F. transformers, and (right) the coil connections.



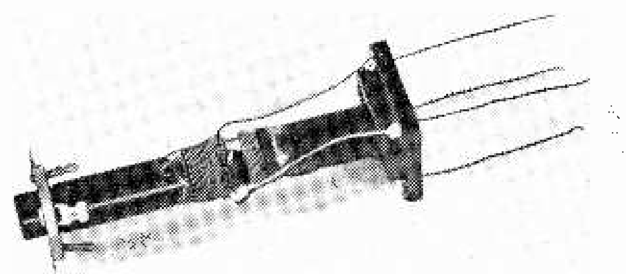
The internal construction of a sound I.F. transformer.

The last components to be fitted to the chassis will be the I.F. transformers and R.F. chokes, because these are to be home-constructed and are moreover not very robust. Among these is classed the sound-I.F. rejector which is of the same physical form. The data for winding these components was given on page 80 of the previous issue.

The coil forms for these transformers are made of bakelite, a substance of very satisfactory resistance to temperature. It is, however, not particularly easy to wind on it a coil which will not slip or deform as time goes on. The vision I.F. coils are of finer wire than the sound I.F. coils because more turns have to be accommodated. These are prepared in the following way.

A piece of adhesive cellulose tape is wound once round the coil former, sticky side on the bakelite, with an overlap of about ¼in. The wire is looped several times through one of the fixing holes, and is wound quite tightly on to the tape, as many turns as are required. Another piece of sticky tape is placed carefully over the wound coil and pressed down firmly. The ends are now cleaned of enamel and soldered into the eyelets, leaving about 4in. as leads. The tape is then carefully trimmed to the size of the coil with a sharp penknife or razor blade.

In order to obtain the correct spacing between the coils it is best to mark off a strip on a long piece of drawing paper, and cut it to precisely the width required. A long piece is needed of uniform width. This is now wound round the former several times in close contact with the coil already wound, and secured with waterproof cement. When dry the next coil is wound in the same way as the first one beginning close up to the paper spacer, and finished off as before. The paper spacer can now be stripped off, and the relative spacing of the coils preserved by a further layer of adhesive tape.



A vision I.F. transformer.

The presence of large quantities of a material of unknown dielectric properties matters very little in the vision amplifier because the coils are heavily damped in any case to obtain the necessary bandwidth.

Before closing up the coils in their cans, the damping resistors are soldered into place. These are very small items and if they are arranged neatly in the corners no difficulty will be found in accommodating them. Fig. 4 shows the recommended connections to the eyelets.

This system separates anode and grid leads as far as possible and is convenient for the EF80 valves. It should be noted that the centre ends of the windings are screen or earth connections to reduce the capacitance coupling between the primary and secondary of the transformer. Fig. 5 shows this. The two coils are both wound in the same direction on the former.

The sound I.F. transformers are of somewhat different construction, because of the need to avoid losses. A heavier gauge wire is used, and this is wound direct on to the former. When wound the turns are cemented together with polystyrene cement (plastic model aircraft cement). The cement may appear to stick the coil to the former, but it does not do so. It does fix the turns very firmly together however. The wire ends are then cleaned off and soldered into the eyelets, making sure that they are not under tension. In this way the coil holds together very well, and the stiff leads automatically ensure that correct spacing is maintained. Spacing is arranged by eye and ruler in this case, as it is much larger and is not critical. No damping resistors are used, but tuning capacitors are soldered across the coils and closed up in the can, together with the 1pF top-coupling capacitors. These will go in with ease, but there is not a great amount of room.

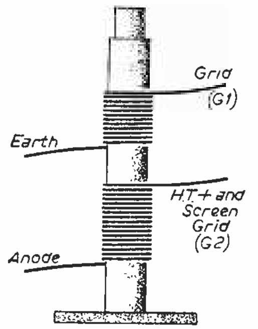


Fig. 5.—Winding details for the I.F. transformers.

The sound I.F. trap is constructed in the same way, except that there is no necessity to put the tuning capacitors in the can; but they may be included with the phase-correcting resistor if the constructor desires.

When polystyrene formers are used, as in the tuner and the pre-video stage I.F. filter, polystyrene cement may be used to secure the turns. Here it is essential to do the sticking with a core slug in place, and to leave the component at least overnight to harden. The slug in position prevents warping of the former, and the long drying time is necessary because the cement solvent penetrates the former deeply. Artificial drying by heat is not advised as warping will almost certainly take place. There is some tendency to soften on heating for a week after sticking, but this only means that soldering the ends should be done with a "heat-sink"—a pair of pliers to grip the wire — between the soldered wire and the former. It schould be realised that before the knack is obtained, one polystyrene former will probably have to be sacrificed!

The tuner is next to be tackled. This is a critical item, and even

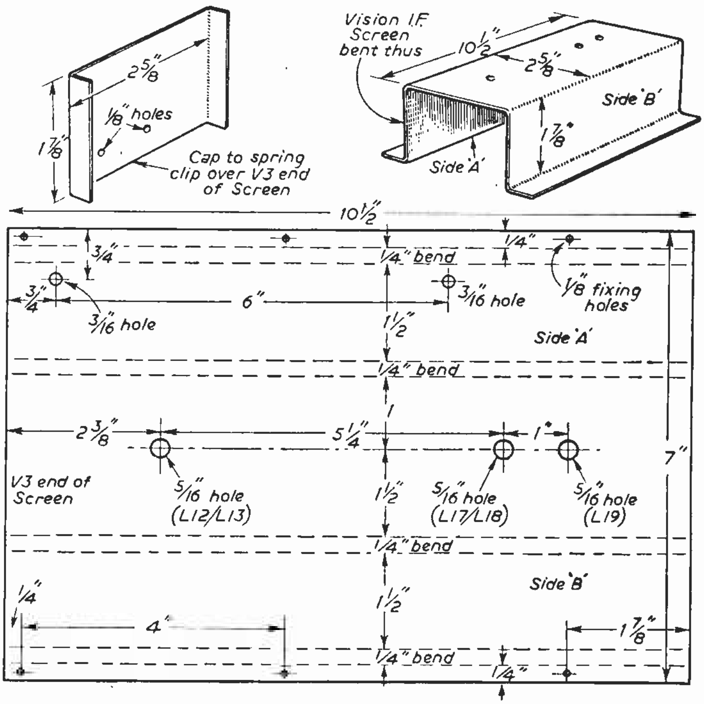
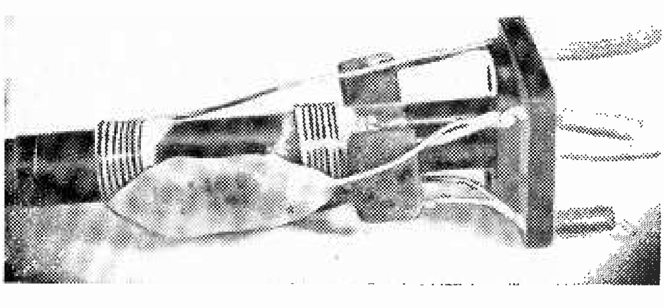


Fig. 6.—Dimensions of the vision I.F. screen or attenuating waveguide.



(left)—Another view of a sound I.F. transformer.

if the layout given is followed accurately, different constructors will probably obtain different circuit capacitances. The chief difficulty is in the Band III oscillator, and to obtain a stable oscillator of large (and therefore less critical) dimensions a tuned-lines oscillator is specified.

The very much increased physical size of the inductors of a tuned-lines oscillator also enables a quite large temperature-compensating capacitor (Ck) to be included in the circuit. This should be soldered very close to the ends of the lines, care being taken not to let its temperature rise appreciably during the operation. This precaution is necessary whenever a negative temperature coefficient capacitor is soldered in. This is because any overheating may, and usually does, impair the negative temperature coefficient quite seriously.

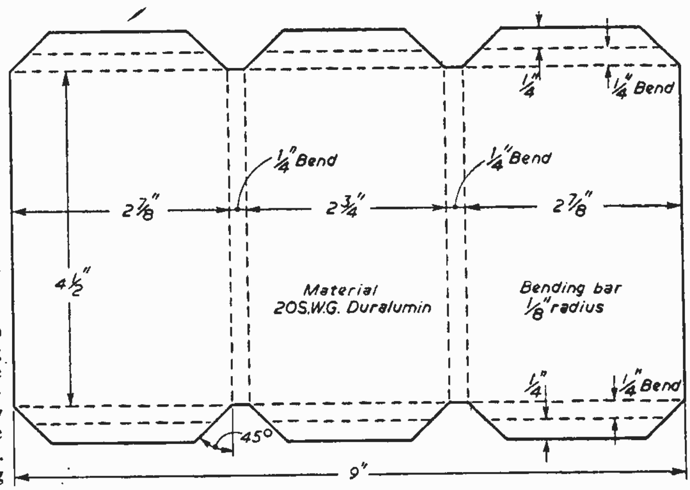


Fig. 7.—The containing screen of the tuner unit.

Provided the dimensions given are adhered to reasonably closely there should be no difficulty encountered in covering the range of frequencies needed. The aerial and inter-stage circuits are heavily damped by the input resistance of the valves, and are not critical.

With the frequency changer, temperature rise is minimised by running it at reduced anode and screen voltages, and the gain improved by using an inductance in the screen lead to neutralise cathode lead inductance. The screen inductance consists of 0·9in. of lead between the valve pin and the decoupling capacitor. More length than this may lead to instability; less length will reduce the conversion conductance, but if the receiver is to be used in an area of high signal strength the length may be reduced at will.

The Band III oscillator lines are constructed from ¼in. outside diameter copper tubing, which

(*Continued on page 168*)

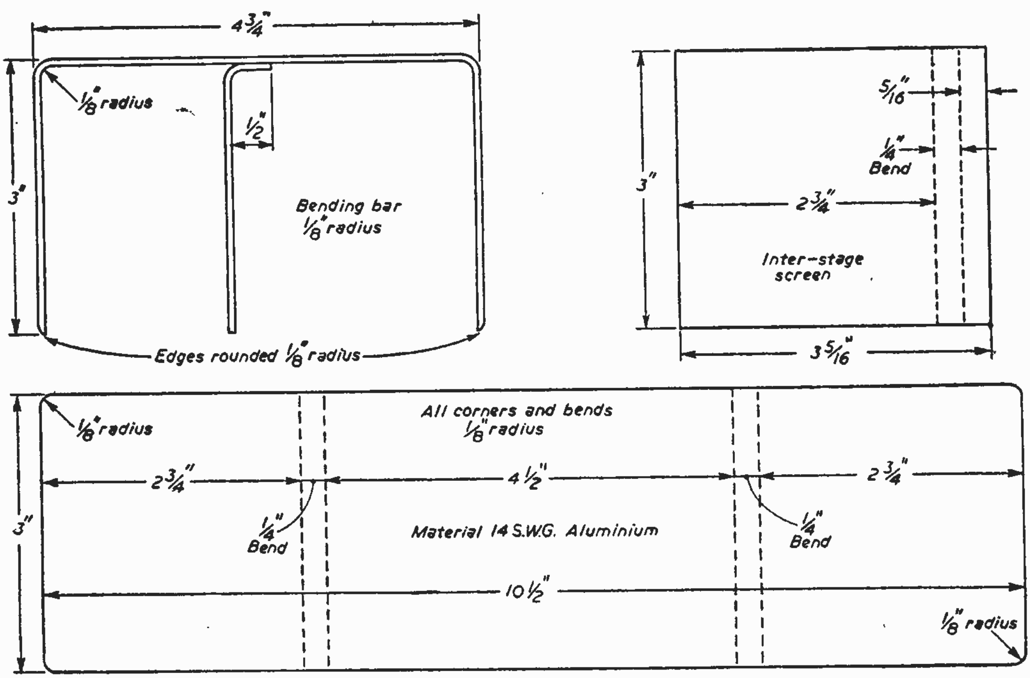


Fig. 8.—Dimensions of the chassis of the tuner and inter-stage screen.

It will need servicing!

USEFUL HINTS ON WIRING AND CONSTRUCTION

By R. B. Archer

WHETHER you build for yourself or for your friends—**it will need servicing.** Here are some hints for cutting down the need to a minimum, and to ensure simple repair when the need does arise.

Soldering

Learn to solder perfectly. A good iron is the best investment in the world—except a pair of good irons, one large for heavy soldering and an instrument type for small components. Scrupulous cleanliness and the use of a good cored solder (e.g. Ersin Multicore) are the next requirements, and then commonsense.

In the realisation that short leads to condensers and resistors are needed at the higher frequencies, some constructors try to cut the wire ends too short. This often causes a component to become overheated during soldering and defects easily arise. A useless component is still useless even if it is soldered in with very short leads. The "thermal shunt" is often advocated to minimise this trouble, and it can help a great deal to hold the wire, between the component body and the soldering point, with a pair of pointed pliers. What is more effective, often, is to dip the pliers into water first so that water is held in contact with the wire being soldered. If this precaution is taken the component is very unlikely to be overheated, especially if a really hot iron is used. A cool iron means long contact with the soldering point and much heat can travel along the wire in such circumstances.

Avoid, too, the use of a mechanical joint as a preliminary to soldering. A wire looped through the hole in a valveholder tag and bent round on itself, or twisted round the tag, makes a sound joint, but if later the component has to be removed—especially if the space is confined—neighbouring components can easily be damaged and the last state can be worse than the first. If a "lying side by side" joint is not good enough, better soldering technique is needed!

Solder tidily: loose blobs usually end up in very tiresome positions—for example, between anode and suppressor grid conections. The decoupling resistor will probably burn out, but even if it does not, the anode still will be deprived of H.T. and the valve will be overheated by excessive screen current.

Components

Component reliability is high these days—except for volume controls. This does not mean that one can take liberties. A 450V condenser may cost a shilling more than one rated at 350V, but if it saves a replacement it pays for itself when it is soldered into place. The rule should always be to work well within the rating of all components, including valves. However, in this latter connection, it is better to overrun heaters than to underrun them, if the choice has to be made.

If you rely on "surplus" resistors and condensers—or those stripped from ex-government equipment—always test them before use. While resistors are not too bad for reliability, they are often different in actual value from that colour-coded on them. Many people will not employ condensers taken from such a source; they are often very unreliable. If you do use them, test the insulation resistance first. Fig. 1 shows the simple apparatus needed. V is a neon lamp—any type will do. R1 is about 50,000Ω. C is a first-rate mica condenser of about 0·01μF capacitance. X is the condenser to be tested. H.T. should be about 250 volts. Comparative tests with components known to be good are the best guide to the rate of flashing of the neon which should be tolerated. In any case, never test by connecting a delicate milliammeter in series with a doubtful component and H.T. The sudden demise of the meter, if one's fears are found to be well-grounded, is not amusing and costs more than buying a new condenser of reliable make in the first place.

Ex-government and manufacturers' surplus valves are defective often enough to warrant testing each one before use. Test the cathode-heater insulation, and do not be content with the 9V or so of an ohmmeter—use 50V in series with a 10k resistor. The neon tester is of little use for this purpose. If any component is found to be seriously defective, destroy it—if you put it back in the box you will use it some time and probably regret it!

Layout

This is just as important a matter as good soldering or watchfulness over components. The rules are simple enough: they are these. Economise in space, but not to the extent that components are rendered inaccessible by others being put on top of them. A logical order is important—a valveholder the wrong way round will cause endless difficulties with crossing wires. Always leave room for the soldering iron between components and don't pack them so close that heat radiated from the iron causes wax to drip or insulation to be charred. It is sound practice to do development work on a skeleton chassis, where different

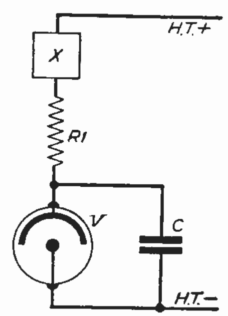


Fig. 1.—Simple neon tester for capacitors.

arrangements can be tried out. When the circuit is satisfactory, the layout can then be considered carefully before actual construction begins.

Always use enough components. This may sound strange advice, but I have seen many chassis where the H.T. wiring is insecure for want of a few stand-off insulators or insulated tag-strips. Such economy may be all right in a development chassis, but in a receiver itself it must be assumed that shaking and bumping will inevitably occur. If the H.T. leads are loose, trouble can then be expected with some confidence. Clips to hold down bulky components with wire ends can be manufactured easily enough by anyone with a broom handle, tin-snips and a drill; and so there is no excuse for unstable components waggling about and not supported properly.

Mount condensers, resistors, etc., so that their value can be read without taking half the set to pieces.

Circuit Diagram

Always have an accurate circuit diagram inside the instrument itself. If modifications are carried out, enter them on the diagram as amendments in a different-coloured ink. This saves endless bother and is well worth the trouble. If you are making a set for a friend, give him a circuit diagram and keep a copy yourself. It is hardly fair if he is deprived of the use of a receiver for want of a diagram, if you are in hospital, or Africa. Make sure that relevant voltages, wave-forms and the like, together with component resistances, and tolerances on condensers, etc are recorded. If you cannot service the thing yourself, make sure that somebody else can.

A circuit diagram ought to be kept carefully. Usually they are not, but if you make the diagram an awkward thing to handle the chances are that it will survive. If it is drawn large, in Indian ink and pasted on to a piece of plywood, or stuck to the inside of an instrument case, and varnished over, its chances of being available when needed are improved.

These four factors more than anything else contribute to ease and efficiency to servicing and maintenance. There is a fifth—the "savvy" that comes with experience and knowledge which is in effect an eye for a good design. But perhaps that is just another way of saying—"design for future servicing".

REPLACING CR TUBES

(Continued from page 134)

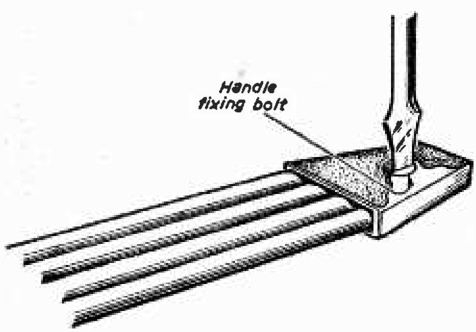


Fig. 6.—Removal of the carrying handle (and chassis) on the T14 transportable.

Unboxing Model 610/611

Remove the four front control knobs and the cabinet back, disconnect and remove the loudspeaker by taking out the wing nut and spring clip. Remove the base fixing screws from the side brackets at the rear of the chassis and withdraw the chassis backwards.

Replacing the CRT

Discharge the EHT cap and remove it. Disconnect the wires from the deflector coils, having marked their position, and withdraw all units from the tube neck. Remove the clamping band around the tube bowl and withdraw the tube from its harness. The setting up follows the previous models, with a tapping system for the adjustment of focus on the 605, and a small pre-set potentiometer on the 110deg models.

NOTE ON THE FOCUSING OF ELECTROSTATIC TUBES

Two methods of adjusting the focus on electrostatic tubes are commonly employed by R.G.D. One is to have a short flying lead permanently connected to pin 6 of the tube (the focusing electrode), the other end of which may be taken to any of the other tags around the tube. An H.T. feed is brought up to pin 9 and, because pin 12 is the earthing end of the heater chain, the voltages available are thus:

Pin 9	—	200
Pin 10	—	400
Pin 11	—	100
Pin 12	—	0

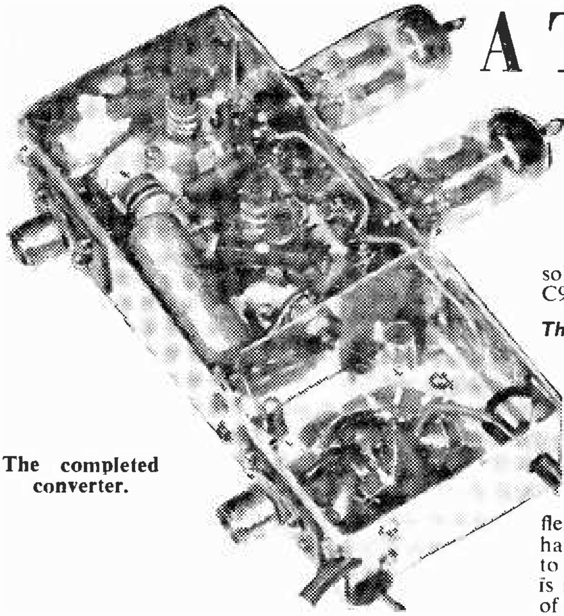
On other models a small 2M pre-set resistor is connected between A1 and chassis providing a continuously variable voltage on the focus electrode of between 0 and 400.

A Triode Converter

COMPLETING THE WIRING AND TESTING THE UNIT

(Continued from page 89 of the November issue)

By H. G. Underwood



The completed converter.

Remaining Wiring

BEFORE proceeding with the remaining wiring, make sure that all the necessary earth connections have been made from the valve-holders and taken to the star-shaped tags mounted as shown (Fig. 2. last month). Note that capacitors C7 and C11 must be positioned near the valveholders, as close to the chassis as possible.

Mount the fine tuner (C14), after modifying it as shown in Fig. 5. Connect the moving vane to the second star-tag and solder a wire connecting the two fixed vane pillars and connect with an insulated lead to pin 7 on V2. Bolt the L5 oscillator coil former into place. Wind L5 (turning up the bottom end lead as shown to meet pin 7 of V2) on a ¼in. drill shank and press carefully in position on the former, using a small screwdriver to feed the coils over the top rim of the former. Solder the bottom end lead to pin 7 of V2 and solder C13 between the top lead and pin 6. If one is available, it is advantageous that C13 should be of the negative temperature coefficient type to minimise tuning drift.

Attaching the Formers

Now attach former L1 and wind the coil as shown. The primary is a piece of p.v.c. covered wire, wound once round the former between the bottom turn of the secondary, then twisted and taken to the input socket connections. Solder the top lead of the secondary to pin 2 of V1, and solder C2 and R1 to the bottom, followed by C3.

Now L3 and L4 formers must be fixed so that their centres are approximately ½in. apart. Wind L3 and L4 (both in the same direction), press them on to the formers and solder the top end of L3 to pin 6 of V1, and the bottom end of L4 to the second star-tag. Solder R5 and connect the free end of C6, which should already have been soldered to the first star tag. Now solder C8 and C9 into position.

The Band-Switch Installation

This completes the main circuit wiring, and the band-switch can now be installed. Cut down all the tags on this component and the centre pin of the coaxial Band I input socket, leaving about $\frac{1}{32}$in. for soldering. This is essential to prevent patterning from BBC on the ITV signal.

Pass the end of a piece of p.v.c.-covered twin flex (approximately 2ft long) through the right-hand hole in the chassis end and solder one lead to the heater section of the switch. The other lead is secured by loosening the bolt holding the corner of the chassis, tucking the bared end of the lead in and tightening the bolts again. Wire the remainder of the switch as shown in the layout diagram and solder in C15 and C16. Allow about 2ft of coaxial lead for the output to the receiver for preliminary testing and fix a coaxial plug on its further end. Finally solder a 2-3ft length of black p.v.c.-covered wire to a convenient solder tag direct on the chassis and take through the same hole as the H.T. lead. This is the H.T. return wire and must be soldered direct to the main receiver chassis. Insert a grommet, or bind these two wires with insulation tape where they pass through the hole in the chassis end.

Testing

The unit is now ready for testing. Insert the two valves in their holders and connect the heater cable to the output tags of a small 6·3V 1A heater transformer. Take a mains lead, complete with plug, and solder to the mains input of the heater transformer. Now cover all the tags on this component with insulating tape to obviate any possibility of shock whilst testing. Connect an ohm-meter or continuity tester between the H.T. lead and the chassis and make quite sure that no short exists between the two. The meter should not read less than 200k.

Solder the red p.v.c.-covered H.T. supply wire to the output tag of the

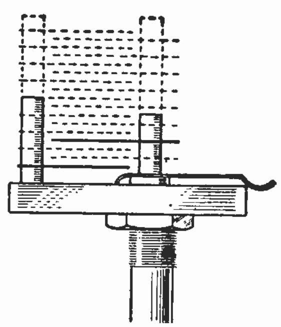
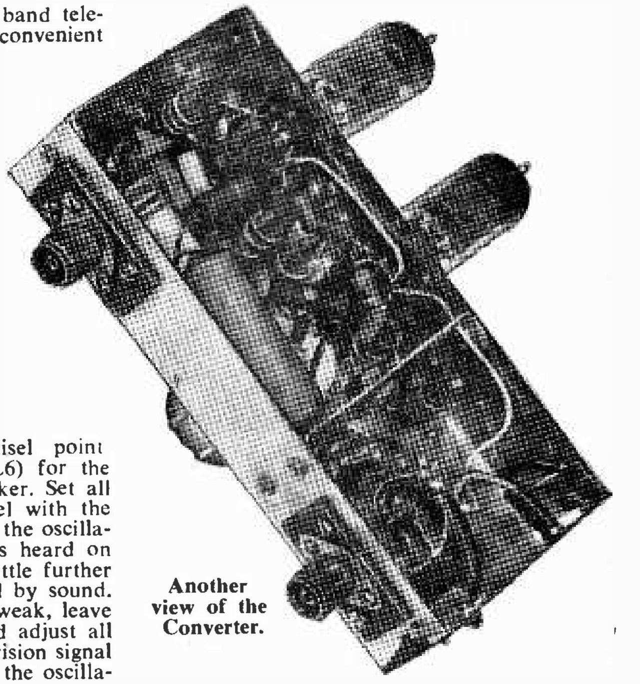


Fig. 5.—Modifications to the tuning condenser to leave one moving and one fixed vane.

main smoothing condenser of a single band television receiver and the black wire to a convenient earth tag. Set the fine tuner so that the vanes are half engaged. Plug in the aerials to the correct sockets of the converter, and the output lead of the converter to the input socket of the television receiver. Switch the band-switch on the converter to position 1, and switch on the main receiver and allow to warm up on the BBC signal.



Another view of the Converter.

Tuning

Now plug in the lead to the filament transformer, switch to position 2 and observe that the converter valves light up correctly. Allow about 30sec and switch to position 3. With a non-metallic tuning rod, such as a broken plastic knitting needle with its end filed to a chisel point adjust the core of the output coil (L6) for the loudest "rushing" noise from the speaker. Set all other cores with their tops about level with the rims of the holders and slowly screw in the oscillator core (L5) until the vision signal is heard on the speaker. Screwing in the core a little further should produce a picture, accompanied by sound. If, however, the vision signal sounds weak, leave the oscillator core in that position and adjust all the other cores to produce the loudest vision signal noise in the speaker. Now go back to the oscillator core and screw in until the picture and sound appear. It is only necessary, then, to readjust all the cores for the best picture and sound, adjusting L4 for maximum sound, and noting also that the fine tuner functions correctly.

If the sound and picture are only obtainable separately, then the oscillator frequency is too high, and the core of that coil should be screwed further into the former.

If the heater transformer can be accommodated on the main receiver chassis, then a worthwhile refinement could be added to the converter by incorporating a four-way non-reversible plug and socket in the bottom end of the chassis to convey the supplies to the converter from the main set. This would make subsequent servicing far easier.

Installing the Converter

Before installing the converter in the receiver for which it is intended, switch on that receiver and test the chassis with a neon screwdriver. This is a precaution one should always take before touching any receiver. If it is alive—and it is surprising how many are—reverse the connections to the mains plug. If the plug is of the reversible type, mark suitably with white paint and give firm instructions to the owners always to ensure that the plug is correctly inserted.

Resistor R2 can now be experimented with to obtain reasonable matching between the signals—the higher the value, the lower the gain.

On some older receivers employing auto-wound or double-wound mains transformers it will be found that the receiver H.T. line will be in the neighbourhood of 350V. Under such conditions R10 should be increased to about 5k to 6k, so as to reduce the supply to the converter to about 200-250V.

A.M. RADIO FROM SPARE TURRET COILS

(Continued from page 126)

which might become a combined feedback oscillator. To keep an oscillator running about 5 per cent from the main I.F. is difficult. There need be no great concern of the TV enthusiast on this count, as dirty contacts, valve bases and drift are speedily noticed and corrected.

Filters

Other points to watch for are the possibility of filters fitted in the aerial lead to the turret removing M.W. radio frequencies. These should only be removed if they do not spoil the results on the TV. The disturbed raster that may irritate when using radio can in some cases be cleared by making a vision valve inoperative with any spare switch contacts existing on the wafer where fitted on to the turret spindle. It is not advisable to attempt to switch off the vision sections of the set owing to the complex interdependence of sound and turret sections on the normal running of picture and timebase sections. Heater current, H.T. level and parts of some AGC systems affecting sound rely on line gating pulses.

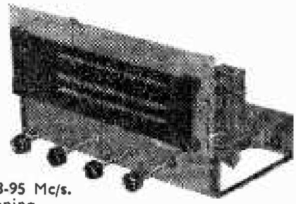
Results

Good radio results were obtained in the London area with a normal outside aerial on the Light and Home programmes, 247m and 330m, with no noticeable drift or oscillator pulling. Radiation to other receivers was also negligible. Using the inner only of the coaxial increases the volume.

7-VALVE AM/FM RADIOGRAM CHASSIS

TRS

Valve Line up:
ECC85, ECH81
EF89, EABC80,
EL84 EM81 EZ80.



3 wave band and switched gram positions. Med. 200 m.-500 m., Long 1,000 m.-2,000 m., VHF/FM 88-95 Mc/s. **4 Controls.** Vol., On-Off, Tone Tuning. Wavechange. P.U., Ae. and E., and speaker sockets. Magic eye tuning. Philips continental tuning insert with permeability tuning on FM, and combined AM/FM IF transformers, 460 Kc/s and 10.7 Mc/s. Dust core tuning all coils. Latest circuitry, including AVC and Neg. Feedback. 3 watt output. Sensitivity and reproduction of a very high standard. Chassis size 13½in x 6½in. Height 7½in. Edge illuminated glass dial 11½in. x 3½in. Vertical pointer. Horizontal station names, gold on brown background. A.C. 200/250 v. Indoor dipole aerial 3/6 extra. *Complete with 4 knobs walnut or ivory to choice.*

£13.10.0 *Carr. and Ins. 5/-.* Recommended Speakers 8in. 21/6, 10in. 30/-.

As previously announced fresh supplies are now being received, but we regret some slight delay may be experienced in fulfilling orders for this popular item.

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7in. 1200ft. ..	21/-	1800ft. ..	32/6

Plastic Tape Spools
3in., 2/9; 5in., 3/-; 5¾in., 3/3; 7in., 3/6

BAND 3 TV CONVERTER

All channels 7-13 (180-250 Mc/s).
Mk. 2 Model. Using ECC84 and EF80 valves. 18db gain, 200-250 v. A.C. Size 6½in. x 3in. x 4in. Simple to fit, ready to use. **Only 79/6.** P. & P. 2/6.
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Band 3 Aerials. Single Dipole with 4 yds. cable, 13/9. 3 Element Beam, 25/-, 5 Element, 32/6, etc. B1-B3 Crossover Units. 7/6.

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IR5, IS5	7/6	DK92	9/6	EZ80	7/6
IT4	6/-	ECC85	11/6	MU14	9/-
3S4, 3V4	7/6	ECF80	9/6	PCC84	9/6
5Z4	9/-	ECL80	10/6	PCF80	9/6
6K7	5/-	ECL82	10/6	PLL83	12/6
6K8	7/6	EF80	8/-	PL81	12/6
6Q7	7/6	EF86	12/6	PL82	9/6
6V6	6/6	EF91	5/-	PL83	10/3
DAF96	9/-	EL84	8/6	PY80	7/6
DF96	9/-	EM81	9/6	PY82	7/6
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SPECIAL PRICE PER SET
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Cabinet Price **£3.3.0** Carr. and Ins. 3/6

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6in. speaker and matching transformer, 22/-. P. & P. 1/6.

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5k ohms—2 Megohms. All long spindles. Morganite Midget type, 1½in. diameter. Guar. 1 year. Log or Lin. Ratios. Less Sw. 3/- D.P. Sw. 4/9. Twin Stereo Controls—Log or Lin. Less Sw. 6/6. D.P. Sw. 8/-.

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RESISTORS.—FULL RANGE 10 ohms—10 megohms 20% ¼ w. and ½ w. 3d., ¾ w., 5d. (Midget type modern rating), 1 w., 6d., 2 w., 9d., 10% Hi-Stab, ¼ w., 5d. ½ w., 7d., 5% ½ w. 9d., 1% HI-STAB, ½ w., 1/6 (10-100 ohms 2/-).

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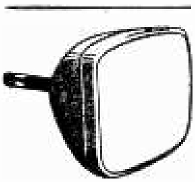

PHONES FOR TV RECEIVERS

FOR PERSONAL LISTENING AND THE DEAF

By F. G. Rayer

IT is not always realised that headphones can be worked from a TV receiver, and that this can be of great convenience for individual listening, or for a deaf person. If the receiver speaker is switched off (as it can be) a viewer can use the phones without any danger of disturbing others, and this arrangement is occasionally handy.

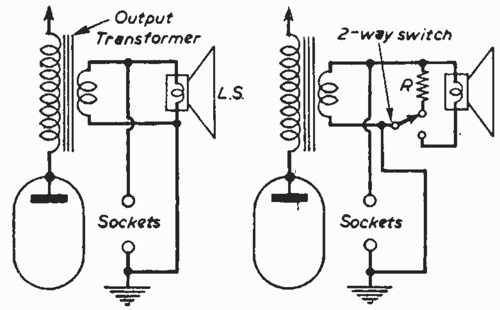

Fig. 1.—Connections for a receiver with an earthed chassis.

Advantages

In the case of a deaf person, when phones are connected, there is no longer any need to adjust the receiver volume control to a level which is unpleasant for other people in the room nor need for the deaf individual to sit near the receiver. This is sometimes done in an attempt to follow the programme, but is not a good viewing position. A deaf aid can, of course, be helpful, but it is not always easy to situate this so that it picks up a good signal from the receiver loudspeaker and yet allows the deaf person to be at the best viewing distance.

To overcome these difficulties, phones may be connected to the output circuit, with their own volume control. The exact manner in which hearing has deteriorated varies with different people, and this can have a bearing upon the circuit which is found best. Frequently, however, the maximum reduction in hearing is in the top register, and a simple condenser coupling circuit will allow considerable top boost to be made available.

Output Sockets

Sockets are provided so that the phone circuit can be plugged in. If the receiver speaker is always to be left working when the phones are in use, no changes will have to be made except for this socket circuit. But if a speaker silencing switch is required, this will have to be fitted at a convenient point at the back of the cabinet.

It is essential that the headphone circuit is isolated from receiver high tension and mains voltages. If the receiver is of A.C. type, with all circuits isolated from the mains by means of a transformer, and an earthed chassis, then it is only necessary to connect the sockets to the output transformer secondary, as in Fig. 1. One side of the phone circuit is then earthed.

If the receiver speaker is to be silenced, it is often enough to include an on/off switch in one lead from output transformer secondary to speaker speech coil. But if the circuit has a powerful output stage, or takes negative feedback from the secondary, a 2-way switch can be used instead, as also shown in Fig. 1. The resistor R is somewhat higher in value than the speech coil impedance of the speaker—say 5Ω, for a 2/3Ω unit. For normal purposes with the speaker silenced it is unlikely that very much power will be dissipated in this resistor, so a 1W to 5W component may be fitted.

Isolation

With A.C./D.C. or series-heater circuits, it is not safe to assume that the output transformer secondary is isolated, because it may be wired to chassis, or to a negative feedback circuit. Because of this, an isolating transformer can best be added, as in Fig. 2. The primary of this is returned to the chassis, and is therefore alive to the mains. The secondary is isolated, however, and one secondary lead can be connected to earth (*not* the receiver chassis, with this type of set).

The transformer is a small output coupling type, with a fairly high primary impedance. The condenser C is a high voltage paper component, and 0·1μF will usually be suitable. This can be modified if desired, as explained later.

Phone Control Unit

A length of twin flex is run from the receiver sockets to a small box or case, which contains a volume control for the person using the phones. Some surplus phones of very low impedance are encountered, and these may be operated directly from the low impedance output sockets, fitted as in Figs. 1 and 2. The matching will not usually be correct, but can be near enough for satisfactory quality.

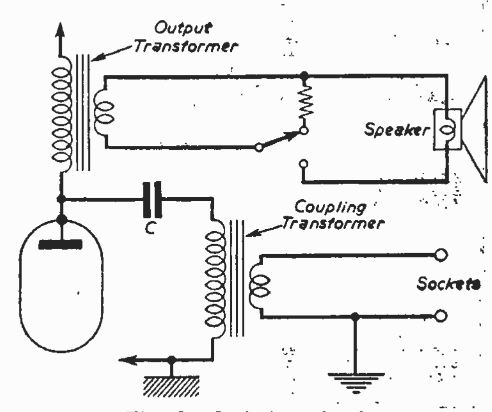

Fig. 2.—Isolating circuit.

When this method of operation is to be adopted, the circuit in Fig. 3 will be satisfactory. R1 is a volume limiting resistor, because the power required by the phones will usually be relatively small. R2 is for volume control purposes. For a low impedance circuit, R2 can usually be some 10 to 50Ω or so, without very much influencing results. R1 can, of course, be omitted. But it is

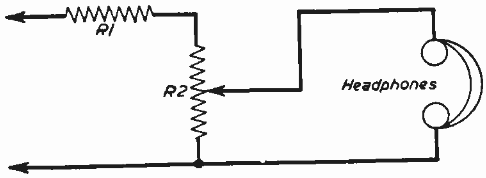

Fig. 3.—Low impedance circuit with volume control.

wise to adjust speaker volume to a normal level, then employ for R1 a resistor which will avoid distress to the person using the phones, even with the volume control near maximum.

If medium or high impedance phones are to be used, the volume obtained from them will be small with a low impedance output circuit. It is possible to feed such phones from isolating condensers connected to the primary of the receiver output transformer, but a fault can then result in a high voltage reaching the phones. For this reason, a small output transformer is best used, wired as shown in Fig. 4. A moderate ratio, such as would be fitted to couple a triode output valve to a speaker, will be satisfactory.

Resistor R1 is again so chosen that careless adjustment of the phone unit volume control will not distress the listener. R2 should be of fairly high value, and 10,000Ω will generally serve. A small 0·1μF condenser can be used for C.

Treble Boost

When it is necessary to accentuate the treble, the condenser in Figs. 2 or 4 can be reduced in value. Quite small condensers can be fitted, if necessary. Readjustment of the volume control will be needed, and this will give a relative increase in the power of the higher frequencies. If the phones are only to be used for personal listening by people having normal hearing, the coupling condenser should be of reasonably large value. When a deaf person is using the phones, while other viewers listen with the speaker, the receiver volume control should be adjusted first. The deaf person should then set the phone volume at the required level.

Many ex-service headsets can handle quite a powerful signal. This is not so, however, with some types of diaphragm phones which are produced for crystal sets, 1-valvers and similar purposes. Attempts to work the phones at high volume will then cause a rattle, owing to the diaphragm striking the magnet poles. If this arises, the cap should be unscrewed, and the diaphragm lifted off. By drawing a pencil line round the diaphragm, a narrow washer of the same

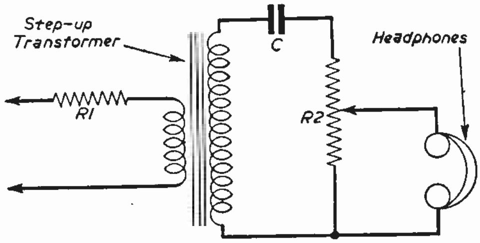

Fig. 4.—Impedance matching and top-boost circuit.

diameter can be cut from stout paper or very thin card. One such washer is then placed under each diaphragm, to increase the clearance between diaphragm and magnet poles.

A spare multi-ratio output transformer will be handy for coupling purposes, as it is then possible to select tappings to match phones of various impedances.

NEW BBC TRANSMITTING STATION AT DRYDEN HILL

THE BBC has chosen a site at Dryden Hill, near Galashiels, for its new station in South-East Scotland. The site has been approved by the Postmaster General and legal negotiations for its acquisition are in progress. The station will transmit BBC Television, and also the Scottish Home Service, the Light Programme, and the Third Programme, with Network Three, on VHF. The station will be provided with a 750ft. mast, and will serve an area with a population of nearly 100,000 people, some 70,000 of whom have not hitherto been within range of BBC Television or of the VHF sound services. This area will extend to Lauder, Duns, Selkirk, Hawick, Jedburgh, and Coldstream.

The station will work in Channel 1 with vertical polarization.

Work on the site will be started as soon as possible, but the construction of the building, the installation of plant, and the design and completion of the mast and aerials will necessarily take some time so that it is not yet possible to give a completion date.

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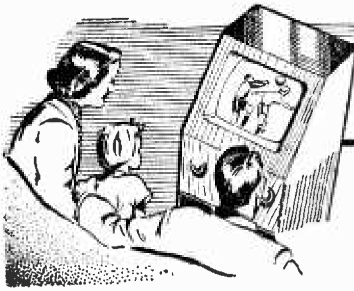


UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

SOUNDING brass and tinkling cymbals! How realistically they are reproduced on modern V.H.F. hi-fi sound radio—and especially on the latest stereophonic radiograms. Memories of the Radio Show are fading now, but recent examinations I have made of some of the very latest commercial television sets have reminded me of the enormous difference in the sound quality when compared with the best of the hi-fi receivers.

Lo-fi Sound

THE shape of the modern TV set allows little space for a good loudspeaker and baffle, and in any case the loudspeaker is usually relegated to the side or back of the set, thus effectively losing the high harmonics and "top" that give sound presence and character.

What is to be done about it? Nothing, I regret to say. For in the majority of cases, it is the woman of the family who chooses the make of television set at the shop and the choice is dependent upon her existing furniture styles in the house, the wallpaper or other local colour. Some modern receivers have spikes on their legs as injurious to the carpets as stiletto heels. With a resigned expression on his face, a television set designer said to me, "I don't like the trends, but what can I do? I'm restricted by the credit squeeze and slimline fashions; outer styling is now more important than inner engineering—and I have to sell my sets to eat, so I pander to the ladies."

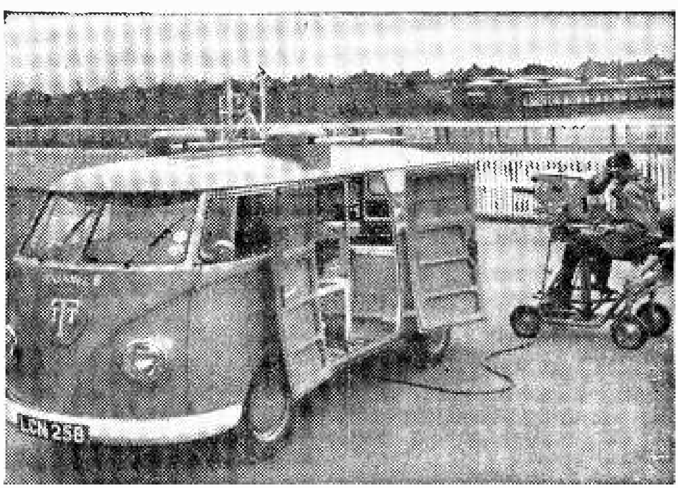
I am, of course, exaggerating to make my point, but not grossly exaggerating. However, two or three makers have lately achieved an admirable compromise by producing rather wide-fronted slimline models with forward directed loudspeakers on each side of the TV picture combined with cabinet styling that harmonises with almost any kind of furnishings. This is a remarkable achievement!

Piped Television

POOR sound on television is not only heard from some modern TV sets. It is very often heard on the sets provided by wired television companies in some provincial towns. These services are a boon for those viewers who live in towns which are badly screened from their local BBC and ITA transmitters. In some cases, even the highest aerials will not give an interference-free picture from either transmitter, whereas the piped services originate from a first-class receiver with a high aerial on high ground outside the town. Picture and sound are relayed to various parts of the town with amplifiers and repeaters at various points. Picture quality is usually of a high order, free from car and other similar interferences, but sometimes subject to very slight ghost or reflection effects which are possibly due to local distribution line conditions. Surprisingly, the sound sometimes lacks brightness and top. The pictures of BBC and, say, two alternative ITA transmitters are often surprisingly different in strength and quality. I recently looked at a provincial wired television set in a hotel which gave the following picture results:—

1. BBC—excellent.
2. London ITA—excellent.
3. Local ITA—weak and poor.

Considering that the people in the town who use their own sets with normal aerials can receive the local regional ITA station perfectly but **not** the London ITA, the above results are sur-



Tyne Tees Television's new Remote Unit equipped with two Marconi Mark IV cameras in action at Redcar Racecourse.

prising. I would imagine that advertisers who have purchased expensive space for their commercials from the local regional ITA company must be furious.

TV Humour

It really is not very surprising that the public seem to prefer television in its lightest vein. The most popular films in the cinemas are light comedies which include a quota of slapstick such as the "Doctor" series ("Doctor At Sea", "Doctor In Love", etc.) and the "Carry-ons" ("Carry on, Constable", "Carry on, Nurse", etc.). Virtually the same formulæ are used for "The Army Game", "Bootsie and Snudge", Granada's two comedy series.

It all goes to show that there is no joke like an old joke, as long as you dress it up in a new way. Granada do this very well, and a good storyline and slick direction keep the laughter going, however old the chestnuts.

My personal preference is for "goonish" humour of the type "distilled" by Peter Sellars, Harry Secombe, Valentine Dyall and the "Fred" gang. There is a touch of this type of humour in BBC's "Parade", in which Alan Melville distinguished himself recently. The pace of this show is a merry one. It is always a wonder to me how the writers and producers, not to mention the artists, can keep it up week after week in any of these comedy series.

I hear that Gracie Allen, of the Burns and Allen team, rejoices in the end of the series which has caused so much laughter week by week both here and in the U.S.A. "What a lovely rest from having to learn pages and pages of dialogue each week!" she said. It is forgotten by many that Burns and Allen toured their music hall act in Britain before the war. I remember seeing them at the Victoria Palace. They were not at the top of the bill then, but their act had the audience rolling in their seats with laughter. Their television act each week is based upon the same routines. Early episodes of "I Love Lucy", another domestic comedy series, are still being enjoyed by some of the regional stations more recently opened.

Many a humorous film series is started for TV but not many succeed in getting further than a pilot of the first episode. It is a big gamble to assess the possible audience reactions to humour, but there are big financial rewards for those who succeed in making the grade.

Special Effects

IT only seems a few months since the special effects panel, capable of providing a variety of electronic wipes, was evolved, and yet years have passed since a BBC engineer, Dr. Spooner, first investigated the prospects of applying photographic trick effects, as used in films, to television. He spent several weeks visiting Ealing Studios and watching the travelling mattee process in use on a famous film called "The Lavender Hill Mob." Alec Guiness (now Sir Alec) and the other actors, including Stanley Holloway, were unable to leave London and so other means had to be found to enable them to act in front of the authentic backgrounds. Foreground actors and pieces of scenery were therefore shot in the Ealing Studio and superimposed on backgrounds of the Eiffel Tower and streets of Paris. The result was most convincing and it was hard to believe that the chase down the iron stairway of the great tower was not completely shot *in situ*. Dr. Spooner then started his first experiments on inlay and overlay which resulted in the development of the electronic switch. In turn this was simplified to provide straight electronic wipes in which one scene wipes across and replaces an existing scene.

A further recent development and simplification of the special effects wipe panel was evolved by Dave Whittle, Chief Engineer of Alpha Television Studios, Birmingham, and now, various versions of special effects panels are being supplied to the BBC and ITV Companies by Pye, Marconi, RCA, and E.M.I. The Marconi panel is the most elaborate and can deal with overlay as well as eighteen different types of wipe. These electronic tricks will become commonplace, largely replacing the cumbersome back-projection system. The only danger is that they will become over-used at the least pretext. Remember the dazzling wipes and zooms which became such boring technical clichés in film trailers announcing next week's attractions at the cinema? Let us hope the television people do not overplay this new electronic card in their hands.

Granville Theatre

AS I mentioned last month, the Granville Theatre, Fulham Broadway, has once more been opened for television but in a more elaborate way than it was four years ago and is available for hiring to any of the TV Companies. It is fitted with Pye cameras and telecine, and excellent lighting grid by Mole Richardson and all the very latest paraphernalia of the TV studios. I'm glad that the Granville is in circulation again. It has been a theatre of some kind since 1898, housing music hall, melodrama, revue and non-stop variety in turn. It was rather on the small side, seating only 777 people, but this is no disadvantage for television. The maximum audience that can now watch television shows here is about 200. Almost the entire stalls and pit have been turned into an extension of the stage and large control rooms have been fixed up in the gallery.

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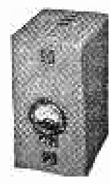

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Letters to the Editor

The Editor does not necessarily agree with the opinions expressed by his correspondents.

***SPECIAL NOTE:** Will readers please note that we are unable to supply Service Sheets or Circuits of ex-Government apparatus, or of proprietary makes of commercial receivers. We regret that we are also unable to publish letters from readers seeking a source of supply of such apparatus.*

SURGES

SIR,—I am an experimenter and find most enjoyment in trying out timebases. Recently I had a most unfortunate accident with a unit which virtually "blew up". I assumed at the time that one of the condensers had developed a fault which is not uncommon, and proceeded to dismantle it and wired in a new one. I have now found that the output transformer has gone o.c. The primary is burnt out and so I looked through a large number of circuits and books I have, and discovered a very interesting point. Some years ago it was the custom, apparently, to fit a 1W resistor across the primary as a "surge limiter". Today this does not seem to be included in any of the commercial circuits which I have looked at, and I wonder whether there is anything in the frame circuits which now does away with this surge, or are transformers now made to withstand the surge? I have not been able to see any data on this in any books or publications.—G.E. (Enfield).

A STRANGE FAULT

SIR,—I have seen some peculiar faults in television sets, but am now faced by a most awkward one, which two local dealers have been unable to solve. When switched on the set warms up in the usual way, and suddenly the line whistle may be heard. The screen then starts to light up, and for about ten seconds there is a good picture with a full raster. Almost immediately, however, the frame jumps to about two-thirds full size with no alteration in width. Everything is accordingly elongated but if the set is not touched, after a period varying from ten minutes to half an hour, the frame jumps back to full size. It may do the same thing once or twice more during the evening, although some evenings it remains constant for the entire viewing period. Every component has been changed in the frame timebase, and the valves replaced with no effect. Can anyone offer a suggestion as to the cause?—D.K.L. (Aylesbury).

ALTERNATIVE TRANSMISSIONS

SIR,—It is now many months since I read that the Government had authorised the use of Bands IV and V, yet nothing seems to transpire. I expected to see something at the Radio Show on the lines of a really simple multi-band tuner, but was disappointed. Why cannot the BBC or ITV give us the opportunity of having these additional bands, especially as I understand that this may be done with no heavy cost, simply by using the present programmes, radiating them on two or three bands as required. It would give us experimenters something to mess about with on those nights when there is nothing to hold our interest, as well as permitting developments to be made in multi-band tuning. I agree that colour would be more difficult as changes in the transmitter would be required, but the addition of a simple aerial array on all masts and radiation on three or four bands does not appear to me to be a difficult proposition, and would also help the transmitting people when an alternative transmission is commenced.—F.T.R. (Hull).

COLOUR TV

SIR,—The BBC has just announced the possibility of introducing colour television to Britain. Unless I am very much mistaken, this will be a costly changeover for both the viewer and the BBC.

For the BBC it will mean employing many more technical advisers who have had experience with scenery and costume arrangement suitable for colour television, as well as the cost of new cameras and equipment. This means that some of the finer points of acting and arrangement of the "sets", which in recent years have come near to perfection, will inevitably be lost under the restrictions caused by the necessity that colours will neither clash nor become lost against a background of similar colour. The result can only be a deterioration in the high standard of production we have at the moment on British television. Which excels, I wonder—a cheap colour production or a first-class play in monotone?

For the viewer it will almost certainly mean an increase in the price of a television licence—the BBC have said so. The receiver will cost many times the amount usually paid for one now. Also, every TV set will have to be increased in size to accommodate the extra components, and much of the elegant styling that has been accomplished over a number of years and which can be seen in nearly all of today's models will have to be forfeited for the addition of colour programmes.—D. HILLIAM (Bexley).

SIR,—I, for one, was pleased to hear of the BBC's plan for colour television in this country, but am somewhat sceptical about the quality of the picture that will be received. Although I have no experience in this field of television, I would imagine that faults that were either common or inevitable on normal TV sets would become serious defects on colour receivers.

For instance, would the strength of the colours become lessened when a receiver is used in a "fringe" area? Would the overlapping images formed by "ghosting" result in a change of colour over certain parts of the screen?

No doubt manufacturers will overcome these and other difficulties, but additional controls will almost certainly be necessary, making the operation of receivers more complex than ever.—J. EVANS (Redhill).

Your PROBLEMS Solved

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. The coupon from p. 168 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

ULTRA V707

This set has developed a 1in. black line down the right-hand side of the picture. When the sound is loud, the picture breaks up.—D Cole (London, W.3).

We are not familiar with the model V707, but assuming this belongs to the W700 series we would suggest you check the UU8, the electrolytic capacitors and the "beehive" capacitor adjustment on the right side chassis (oscillator tuning).

H.M.V. 1826

This set uses an Emiscope 4/15 tube which is now going dim. As regunned tubes are hard to obtain for this model I was wondering if there is any way to convert it to take a Mullard or Mazda tube.—E. Williams.

A rebuilt 4/15 tube may be obtained from firms advertising in our pages.

FERGUSON 989T

The trouble started with what appears to be EHT "brushing" spots in two separate horizontal bands. These have now spread all over the screen, but not always present. I have inspected the circuit in the dark for sparking but with no success. This has become worse after interference accompanied by a forked lightning effect from the top centre to the middle of the screen. This appears to have caused a slight vertical burn, leaving a permanent mark. There is also an erratic frame hold. At intervals of up to 15 minutes or more the picture commences to move up or down and, while a lock can be obtained, there is sometimes a tendency for the bottom of the picture to fold up.—P. Hunt (Hackney, E.8).

There is a possibility that the disturbance is in fact the result of a form of external electrical interference. You should first prove this by disconnecting the aerial from the set when the effect occurs. If the interference spots are still present with the brightness suitably advanced to show a raster, then it is being caused by a fault in the set. If the raster is clear, however, the interference is external. In the former case check the line output transformer insulation and soldered connections, especially those on the EHT rectifier. Also check the EHT smoothing capacitors. These often tend to break down and cause the troubles mentioned. External interference may require Post Office investigation.

ALBA

This set is six years old and has developed a wedge-shaped raster or picture. I purchased a new set of scan coils but there was no life on the tube face at all, so I put the old ones back without results. I increased the heater voltage on the tube slightly, and I was able to see the wedge shape but it was misty. The sound is also lacking in strength, and the ion trap magnet failed to increase the brilliance. There is plenty of EHT and the line timebase whistle is loud and clear.—A. James (New Tredegar).

Whilst the tube is almost certainly responsible for the lack of brilliance, we do not doubt that the scan coils were responsible for the wedge-shaped raster. Check H.T. and electrolytic capacitors.

BUSH M56

I have noticed the fault on this set for some time and have carried out a check over the sound output stage but can find no fault with it. The effect I am obtaining is a low-pitched hum on sound, but while checking I noticed that the hum was not present during the warm-up period, and does not become apparent until the line timebase starts, which also makes the frame circuit operate. I believe that I am obtaining a feedback from the frame circuit. If I open the height control to maximum, the hum becomes louder, and likewise if I reduce the height the hum decreases. I have been wondering if it could be a fault in the frame output transformer.—C. E. Herridge (Paignton).

The main smoothing is carried out by a 100+100μF and separate 200μF electrolytic capacitors. It is quite likely that one of the 100μF sections of the former is open circuited. A wire-ended 32μF 350VW capacitor can be used for checking, touching the negative wire to chassis and the positive to each capacitor tag in turn to see which gives a result.

VIDOR CN4217

The picture is excellent but tapered from top to bottom leaving a 3in. blank each side of the screen. The coils on the CRT neck become fairly hot. There is a white band about 1in. wide at the bottom of the screen. The following have been checked and found to be in order:—sound, interlace, contrast, horizontal and vertical holds, picture height and brightness.—J. Davies (Barry).

The scanning coils should be changed as it would appear that a fault in these is causing the tapered picture. The 1in. white band at the bottom should direct your attention to the ECL80, beneath and to the left of the focus magnet, i.e. to the right of the PY82 valves as viewed from the rear.

PHILIPS 1746U

Recently the picture on this set has been gradually contracting in width to about 3in. border on

the right-hand side and 1in. on the left. Although the knob for adjusting the horizontal width is working it has no effect on the picture. The image appears to be curved on the right-hand side at the extreme edge.—E. Robinson (Staines).

We would advise you to replace the PL81 line output valve. This is the right-hand valve of the two situated in the screened compartment on the left side as viewed from the rear.

G.E.C. BT1748

After being switched on for about an hour, the width and height become smaller. I fitted a new metal rectifier RM5 a few months ago to remedy this fault, which it did, but now it has appeared again.—J. Goodger (Leicester).

Check the H.T. voltage which should not be much under 200. If it is, change the RM5 and see that the ventilation of the receiver is not restricted in any way. If the H.T. voltage is normal, check the N339 line output valve and the timebase voltages generally.

ALBA T432

A fault has developed in the H.T. circuit. In the past six months we have changed four GZ32 valves, three condensers C37a and C37b. On the last occasion, a U52 rectifier was used to increase current. This too has burned out. After changing condenser 37a and 37b a new rectifier was fitted but this immediately flashed. Condensers 36a, b and c, 37a and b do not appear to be shorting. — H. Mercer (Hove 4).

You should not use a directly heated rectifier such as a U52 since this causes a rapid voltage rise (to about 500V) almost as soon as the receiver is switched on. Revert to the GZ32. Check the line oscillator EF50 and circuit since a short often occurs here of an intermediate nature causing the rectifier to flash over and fail.

BANNER 124B

Can you tell me where to obtain a service sheet for this receiver? I have flyback lines seriously interfering with the top half of the picture. I think I have the wrong value components.—G. Gibson (Wadhurst).

You will find that a service sheet on the Sobell T143-T144 series will apply to your receiver. You may have fitted a wrong value coupling capacitor in the frame timebase; that to pin 9 of the ECL80 via a 10k resistor is 0·1μF.

INVICTA 126

My trouble is two or three lines down the left-hand side of the screen like waterfalls. This only occurs on BBC, ITA is perfect. — R. Shorrock (New Ferry).

Check the PL81 line output valve by replacement, then the top centre PCF80. If these are in order, check the 3·9k resistor and 47pF capacitor wired in series behind the line output transformer.

PILOT TV94

This set has completely broken down to give a horizontal white line of intense brightness. When this line appeared a rasping, grating sound was heard from the speaker. The brilliance control was turned down and the set switched off. Previous to this fault, the line hold control was at the end of its travel but failed to lock. The only method of locking the line hold was switching from one channel to the next then back again but this operation had to be carried out every 20 minutes or so. The line output valve was glowing rather blue before horizontal lines appeared. It was later noted that the large resistor underneath the line output valve was rather black and burnt. The set is three years old and has the original valves except for the EY51. — A. Taylor (B.F.P.O.39).

The 12BH7 may be at fault but from the "rasping sounds" heard we are suspicious of the frame output transformer or the H.T. feed from the boosted line. Check for H.T. at pin 1 of the 12BH7 and at the junction of the 6·8k resistor and 8μF capacitor. If no H.T. is present at pin 1, but it can be recorded at the resistor/capacitor, the transformer is at fault. Inability to lock should direct your attention to the 12AU7 line oscillator valve and the adjustment of the lower core of the coil next to the PY83.

DEFIANT T.R.1756T

When first switched on there is a loss of height top and bottom. After one hour or so it reaches the correct height and later it loses height or perhaps becomes "too tall". The ECL80 has been changed without effect. — D. Tindel (North Shields).

The ECL80 concerned is that on the front left side as viewed from the rear. Then replace the 4·7M (yellow-violet-green) and 1·8M (brown-grey-green) resistors associated with this valve and circuit. The H.T. metal rectifier is possibly low but this would also cause loss of width and focus.

ENGLISH ELECTRIC C45

An unusual fault has developed on the above set. Everything is normal except when the contrast control is turned down or when the aerial plug is removed. Then the EY51 heater goes out and this means that there is no EHT and the PL81 becomes red-hot. Also the line output transformer becomes overheated. All the valves in the line output section and EF80 line oscillator have been checked and also the components but they are in order. As this circuit has a separate line oscillator valve this does not make sense to me. There are about five bands about ¼in. wide on the left-hand side of the screen which do not alter with the controls.—W. Worral (Holywell).

There is no completely separate oscillator, the EF80 is operated in conjunction with the line output transformer in a feed-back circuit. We would direct your attention to the 220pF capacitor to pin 2 of the EF80 and the 33pF wired across terminals 1 and 3 of the line output transformer.

VIEWMASTER

This set is built to take wide angle 17in. tube and adapted to take a 12-channel turret tuner. I am unable to obtain a full-width picture; it is about 1in. too small on either side. The width control is at its best position. I have replaced C82 on the side of the line transformer 140pF and this

improved the width slightly, but not enough.—A. Kemp (Leeds).

Loss of width, evenly on both sides, normally denotes a low-emission H.T. rectifier. If this is in order, however, check the anode resistor of the line oscillator and the timebase valves and components generally.

BUSH TV56

I believe the fault is in the tuner. The fault is only on ITA. It is a noise rather like an electric shaver and at the same time two white bands appear on the screen from left to right, one about ¾in. from the top and the other ¼in. from the bottom. These white bands pull the picture contents to the right. I have changed PCF80 in the tuner and also PCC84 and EF80, first I.F. valve but the noise still remains. The only way to eliminate it momentarily is to adjust the fine tuner very slightly, but the slightest movement to either left or right brings it back.—H. Wronski (Leeds).

If the original position of the components and wiring in the tuner have not been disturbed, you will probably find that the cause of the disturbance is an open-circuited decoupling capacitor of 560pF associated with the H.T. feed to pin 1 of the PCF80. Check the other decouplers of this value if necessary. It is necessary to maintain the original positions of the components.

FERRANTI 17T5

I am shortly moving to Sittingbourne, Kent and I am anxious to know whether my set will work in that area without many adjustments. — T. Scoates (Orpington).

Set channel selection switch to Band I, and adjust tuning control until Channel 1 is opposite pointer (this gives London BBC); set switch to Band III and adjust tuning control until channel 9 is opposite pointer (this gives London ITV).

COSSOR 948

On switching off the set a residual spot of some intensity persists for about a minute, which, according to my agent, is of no importance. However, I should like to remove it.—A. Lacy (Aspley).

An EHT Metrosil, fitted between the EHT lead and chassis should reduce the time taken for your spot to decay, and should improve EHT regulation. Metrosils are ordered by their working voltage and we suggest you measure the EHT and purchase the nearest available Metrosil.

THE "OLYMPIC"

(Continued from page 146)

can be obtained from most good garages. They are carefully straightened by rolling them on a hard flat surface with a domestic iron, after thoroughly cleaning with metal polish and hot detergent solution. They are preferably silver plated—the method has been described in this journal—not only to improve the "Q" of the circuit but to avoid oxidation which will cover the copper in time with a layer of copper oxide, which is less conductive.

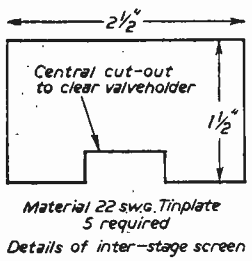

Fig. 9.—Details of the valveholder screens — these screens are used across various valveholders as indicated on the blueprint.

A hole of suitable size is cut in the back plate of the tuner chassis, and a large enough piece of paxolin to cover it is obtained. This is drilled with two holes exactly ¾in. apart each ⅛in. in diameter. A piece of Perspex is also drilled with holes ¾in. apart in the same way. The two pieces of tube are pushed and tapped carefully through the paxolin to the required depth, and then the piece of Perspex is also pushed over the tubes so that it will in the end be inside the tuner. The slight inaccuracies which will inevitably occur in drilling will enable the Perspex to jam the tubes solidly in position when it is tapped gently towards the paxolin mount. Last of all, the paxolin, with tubes in place, is mounted on the back plate of the tuner, and the tubes rendered parallel by slight bending as necessary.

Attachment of the tubes to the oscillator wafer is made by means of flexible braid which may be obtained from odd lengths of coaxial cable. A hot soldering iron is required because of the high thermal capacity of the copper tubes. Extra heat may be needed, from a small blowlamp or gas jet, to increase the temperature of the soldering iron.

Building up the tuner should be carried out wafer by wafer. The first, for the aerial switching (if used), is slipped into position and the wiring done on it. Then the valve wiring for the R.F. stage should be started, and when the grid circuit is reached the second wafer is put in position, using the correct spacers between the two wafers. No inter-stage switching is needed—the coupling circuit has been designed so as to avoid this complication—and so the remainder of the wiring can be completed as far as the oscillator stage.

(To be continued)

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REGENTONE:	17C, 17T, 17 Comb.	59/6
BAIRD:	2014, 2017, 2114, 2117	49/6
COSSOR:	930 & T, 931, 933-4-5-, 937, 938 & A & F, 939 & A & F, 943T, 946	59/6
H.M.V.:	1824 & A, 1825 & A, 1826 & A, 1827 & A, 1829 & A	65/-
MARCONI:	VT68DA, VT69DA	65/-
SOBELL:	T817, T346	63/-
FERGUSON:	306T, 308T	63/-
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DEFIANT:	TR1454-5-6, 1552, 1754-5-6	8/6
MARCONI:	VT63DA	8/6
REGENTONE:	14-5-7T, 143T, 173T	8/6
R.G.D.:	6012-4-5-7T series	8/6
H.M.V.:	1824 & A, 1825 & A, 1826 & A, 1827 & A, 1829 & A, 1840-1-2-3-4-5-6-7-8	14/6
MARCONI:	VT68DA, VT69DA, VT150, VC & VT151, VC152-3	14/6
FERGUSON:	992T-997T, 998T	16/9
PYE:	V4, VT4, V7, VT7, CTM4	16/9

FRAME BLOCKING OSC. TRANSFORMERS

Makes	Models	Prices
ALBA:	T301, 304, 312 372 & B, 394, 483 & B series	12/9
ARGOSY:	T8-3, CTV517	12/9
DECCA:	D14, D17, D17C	12/9
DEFIANT:	TR1454-5-6, 1552, 1754-5-6	12/9
MARCONI:	VT63DA	12/9
R.G.D.	6012-4-5-7T series	12/9
REGENTONE:	14-5-7T, 143T, 173T	12/9
VIDOR:	CN4216, CN4225 series	12/9
PHILIPS:	385U, 485U, 492U, 683U, 704A, 1502U	15/-
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PHILIPS:	1400A, 1700A, 1800A, 2347A	15/-
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PHILIPS:	1114UM, 1115U, TG1437U, 1446U & /45, 1726U, 1746U & /45, 1747U	16/-
STELLA:	8314U, 8317U	16/-
PYE:	FV1 & C, FV2C, V2, FV4C & CDL	11/6
PAM:	904, 906, 952-3-4-, 958	11/6
INVICTA:	T105, 107-8, 110-1-2-4-5-7-8-9, T120	11/6
FERRANTI:	14T3-4-5-6, 17T3-4-5-6, 20T4-5-6, 21K5-6, 24K4, T1325, 1625, 1825	14/6
SOBELL:	T817, T144, T145 & C, T174 & C, TRG174, T175 & LC, TRG 175, T274, T277, T346	15/-
BANNER:	BT114, BT117 & C	15/-
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MARCONI:	VC59DA, VT59DA, VC60DA, VC62DA, VT68DA, VT69DA, VT150, VC & VT151, VC152-3	14/6
PYE:	V4, VT4, V7, VT7, CTM4	11/9

All Makes Available.

FRAME OUTPUT TRANSFORMERS

Makes	Models	Prices
BANNER:	BT114, 117 & C	25/-
COLUMBIA:	C503, C505, C506	25/-
SOBELL:	T817, T121, T122, T143, T144, T145 & C, T174C, TRG174, T175 & LC, TRG175, T176, T224, T274, T277, T346	25/-
PYE:	V4, VT4, V7, VT7, CTM4	23/6
FERGUSON:	992T-998T	21/-

All Makes Available

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Makes	Models	Prices
PYE:	V4, VT4, V7, VT7, CTM4	59/6
FERGUSON:	992T-998T series	59/6
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