SERVICE NOTES

Model 815

Issued
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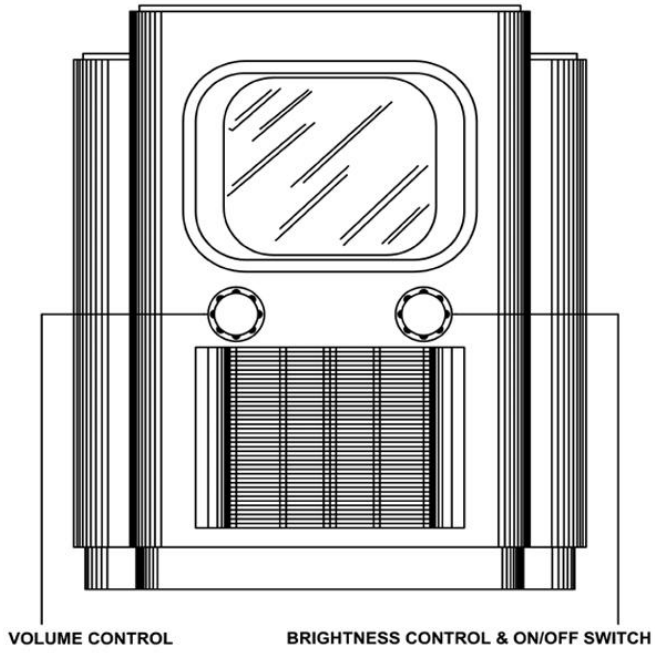
THE PYE 815 TELEVISION RECEIVER



Power Consumption :	**150 watts.**
Picture Size :	**7 x**
Sound Output :	**2 watts at 10% distortion**

TO FACILITATE THE USE OF THESE NOTES

Arrange so that the pages in use are uppermost

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SUMMARY OF OPERATION

The following summary is intended mainly as a brief reminder of the essential functions of the various controls and circuits.

It follows the path of the signals step by step from the aerial to the cathode ray tube screen and the loudspeaker.

The Technical Specification given elsewhere in these notes gives a full and detailed description of the operation of each unit.

1. Vision and sound signals picked up by dipole aerial and fed into the control grid circuit of the first R.F. pentode (V1 in the vision channel).
2. Sound signal tapped off the anode of V1 and fed into the control grid circuit of the first valve in the sound channel (V7).
3. The vision signal is amplified throughout four T.R.F. stages with band pass coupling. The gain of the first three T.R.F. stages is controlled by the potentiometer R37 (**Vision Sensitivity Control**), which varies the voltages applied to the suppressor grids of the valves V1, V2 and V3.
4. The output from V4 is fed to a full wave rectification or detector circuit, consisting of two diodes, and from this rectification circuit the output is fed to both the control grid of the C.R. tube, for varying the intensity of the electron beam, and the line and frame synch. separator valves V16 and V17, for line and frame time base synchronisation.

5a. The line synch. separator valve V16 filters the line synchronising pulses from the vision channel output applied to its control grid circuit. These line synch. pulses are fed by capacity coupling to the oscillatory circuit of the 1st valve in the line time base, V14, thus synchronising the line time base to the transmitter. The potentiometer R61 (**line synch. bias control**) regulates the operation of this circuit.

5b. The frame synch. separator valve, V17, functions in a similar manner to the line synch. separator valve. Its purpose is to filter out the frame synch. pulses from the vision channel output applied to its control grid, and to feed these pulses via the coupling on T5 to the oscillatory circuit of the frame time base, thus synchronising the frame time base to the transmitter. The circuit is regulated by the potentiometer R62 (**frame synch. bias control**).

6. The line time base oscillator valve, V14, produces saw tooth oscillations of line frequency. These in turn are fed to V15, amplified, and then applied via T4 to the line scan deflector coils. The line frequency is controlled by means of the variable resistor R47 (**line hold control**). The amplitude of the saw tooth oscillations is controlled by the semi-variable resistor R52 (**line amplitude control**). Line linearity is controlled by the compensating circuit R78 and C74.
7. The frame time base operates in a somewhat similar manner to the line time base. A triode-hexode valve (V18) is employed, the operation of the triode section being similar to the operation of the R.F. pentode in the line time base, and the oscillatory circuit consisting of T5 primary and secondary, R71, R72 and C70. The frame frequency is controlled by the variable resistor R71 (**frame hold control**), whilst the amplitude of the saw tooth voltages is controlled by a semi-variable resistor R74 (**frame amplitude control**). The output from the frame time base is applied via the transformer coupling T6 to the frame scan deflector coils. Frame line correction is obtained from the compensating circuit R70 and C68.
8. The electron beam in the cathode ray tube, which is liberated by the action of the tube heater and accelerated by the high voltages imposed on the anodes of the tube, produces television pictures, the light and shade of which is controlled by the vision channel output to the cathode ray tube grid, and the building up of which is controlled by the magnetic field induced in the deflector coil circuits by the outputs from the line and frame time bases. The general level of picture brilliancy can be adjusted by means of the potentiometer R41 (**brightness control**), which varies the cathode volts on the tube. Focussing control is obtained by varying the potentiometer R36 (**focus control**), which varies the current through the coils L28 (a and b) and so varies the magnetic field produced by the coils.
9. The sound signal is tapped off from the anode of the 1st valve in the vision channel and then fed through three T.R.F. stages, employing R.F. pentodes with band pass coupling. The gain of these three stages is controlled by the potentiometer R38 (**sound sensitivity controls**). The output from the last R.F. pentode is fed via a diode detector circuit and an A.F. stage employing a pentode to the last stage of the sound channel employing a high slope A.F. pentode. The anode of this high slope A.F. pentode is transformer coupled to a moving coil speaker and provides for an output of 2 watts at 10% distortion.
10. Power. All power necessary for the operation of the television receiver is supplied from one mains transformer. The H.T. supply for the time base, and vision, and sound channels is obtained from one indirectly heated rectifier, V13, whilst the E.H.T. for the tube is obtained from another indirectly heated rectifier, V12.

INDUCTANCES AND TRANSFORMERS

	Circuit indication	Specification	Location Fig.	Component number
Vision Channel.	L1	T.R.F. Aerial coil (No. 1)	10	78202
	L2	Heater choke	9	
	L3	T.R.F. Primary coil } No. 13	9	78211
	L4	T.R.F. Secondary coil }		
	L5	Heater choke	10	
	L6	T.R.F. Primary coil (No. 4)	10	78205
	L7	T.R.F. Secondary coil (No. 3)	10	78204
	L8	Heater choke	9	
	L9	T.R.F. Primary coil (No. 4)	9	78205
	L10	T.R.F. Secondary coil (No. 4)	9	78205
	L11	Heater choke	10	
	L12	Heater choke	10	
	L13	T.R.F. Primary coil (No. 5)	10	78206
	L14	T.R.F. Link Coupling coil (No. 5)	10	78206
	L15	T.R.F. Secondary coil (No. 6)	10	78207
	L16	T.R.F. Secondary coil (No. 6)	10	78207
	L17	R.F. choke	9	79406
Sound Channel.	L18	T.R.F. Coupling coil (No.7)	10	78208
	L19	Heater choke	9	
	L20	T.R.F. Primary coil (No. 8)	9	78209
	L21	T.R.F. Secondary coil (No. 9)	9	78210
	L22	Heater choke	10	
	L23	T.R.F. Primary coil (No 8)	10	78209
	L24	T.R.F. Secondary coil (No. 9)	10	78210
	L25	Diode Choke	10	71914
Power Unit.	L26	Speaker Speech coil } (2 ohms)	14 on	85044
	L27	Speaker Hum Balancing coil }		
	L28 a & b	Focussing coil (a 98 ohms and b 27 ohms)	13	78201
	L29	Speaker Field coil (150 ohms)	14 on	85044
	L30	Smoothing Choke (92 ohms)	14	79050
	T1	A.F. Output Transformer (Prim 727 ohms)	14	77078
	T2	Mains Transformer (Prim 8 ohms. H.T. 176 ohms E.H.T. 9872 ohms)	14	77421
Tube Unit.	L31	Frame Scan Deflecting coil (3.5 ohms)	15 on	SA74118
	L32	Line Scan Deflecting coil (4.5 ohms)	15 on	SA74118
	L33	Frame Scan Deflecting coil (3.5 ohms)	15 on	SA74118
	L34	Line Scan Deflecting coil (4.5 ohms)	15 on	SA74118
Time Base.	T3	Line Oscillator Transformer (Prim. 316 ohms. Sec. 38 ohms)	12	77425
	T4	Line Output Transformer (Prim. 270 ohms. Sec. 7 ohms)	11	77423
	T5	Frame Oscillator Transformer (Prim. 240 ohms. Sec. 3220 ohms. Syn. 3500 ohms)	11	77424
	T6	Frame Output Transformer (Prim. 1086 ohms. Sec. 1 ohm)	11	77422

RESISTANCES

	Circuit indication	Specification ohms	watts	Colour code Body	Tip	Dot	± Tolerance	Location	Component No.
Vision Channel	R1	18,000	1½	Brown	Grey	Orange	10%	9	72418N
	R2	400	1/10	Yellow	Black	Brown	10%	9	70042
	R3	2,500	1/2	Red	Green	Red	10%	9	72417N
	R4	18,000	1½	Brown	Grey	Orange	10%	10	72418N
	R5	400	1/10	Yellow	Black	Brown	10%	10	70042
	R6	2,500	1/2	Red	Green	Red	10%	10	72417N
	R7	18,000	1½	Brown	Grey	Orange	10%	9	72418N
	R8	15,000	1/10	Brown	Green	Orange	10%	9	70044
	R9	400	1/10	Yellow	Black	Brown	10%	9	70042
	R10	2,500	1/2	Red	Green	Red	10%	9	72417N
	R11	250	1/2	Red	Green	Brown	10%	10	72415N
	R12	5,000	0.8	Green	Black	Red	10%	10	72424N
	R13	300	1/10	Orange	Black	Brown	10%	10	70041
	R14	500,000	1/10	Green	Black	Yellow	10%	10	70046
	R15	5,000	1/4	Green	Black	Red	10%	9	71922
	R80	50	1/10	Green	Black	Black	10%	9	70067
Sound Channel	R16	18,000	1½	Brown	Grey	Orange	10%	9	72418N
	R17	400	1/10	Yellow	Black	Brown	10%	9	70042
	R18	2,500	1/2	Red	Green	Red	10%	9	72417N
	R19	18,000	1½	Brown	Grey	Orange	10%	10	72418N
	R20	400	1/10	Yellow	Black	Brown	10%	10	70042
	R21	2,500	1/2	Red	Green	Red	10%	10	72417N
	R22	1,000	1/4	Brown	Black	Red	10%	10	71914Q
	R23	50,000	1/10	Green	Black	Orange	10%	10	70045
	R24	50,000	1/10	Green	Black	Orange	10%	9	70045
	R25	100,000	1/2	Brown	Black	Yellow	10%	10	72659
	R26	10,000	1/10	Brown	Black	Orange	10%	9	70040
	R27	1,000	1/10	Brown	Black	Red	10%	9	70045
	R28	500,000	1/10	Green	Black	Yellow	10%	10	70046
Power Unit	R29	0.25 ohms	Poten	tiometer	(volume control)			13	81089
	R30	1,000	1/10	Brown	Black	Red	10%	14	70043
	R31	10,000	1/10	Brown	Black	Orange	10%	14	70040
	R32	1,000	2	Brown	Black	Red	10%	14	72006
	R33	150	1/4	Brown	Green	Brown	10%	14	71969
	R34	5,000	1/4	Green	Black	Red	10%	14	71922
	R35	10	1	Brown	Black	Black	10%	14	72324
	R36	2,000	Poten	tiometer	(Focus Control)			14	81069P 81104C
	R37	50,000	Poten	tiometer	(Vis: Sens: Control)			14	81086
	R38	50,000	Poten	tiometer	(Snd: Sens: Control)			14	81087
	R39	5,000	1/10	Green	Black	Red	10%	13	70047
	R40	50,000	2	Green	Black	Orange	10%	14	72323
	R41	20,000	Poten	tiometer	(Brightness Control)			13	81177
	R42	5,000	1/2	Green	Black	Red	10%	13	71935
	R43	500	1	Green	Black	Brown	10%	13	71941
	R44	10,000	1/10	Brown	Black	Orange	10%	13	70040
	R45	50 Megohms	1	Green	Black	Blue	10%	14	72322
Time Base	R46	50,000	1/10	Green	Black	Orange	5%	12	70056
	R47	100,000	Poten	tiometer	(Line Hold)			12	81088
	R48	250,000	1/2	Red	Green	Yellow	5%	12	72325
	R49	200	1/10	Red	Black	Brown	5%	12	70061
	R50	10,000	2	Brown	Black	Orange	10%	12	72011
	R51	100	1/2	Brown	Black	Brown	10%	12	72320
	R52	500	Semi-	var. Pot	(Line Amplitude)			12	81143
	R53	500,000	1/10	Green	Black	Yellow	10%	12	70046
	R54	100,000	1/10	Brown	Black	Yellow	10%	11	70050
	R55	100,000	1/10	Brown	Black	Yellow	5%	11	70058
	R56	50,000	1/10	Red	Green	Yellow	10%	12	70051
	R57	50,000	1/10	Green	Black	Orange	10%	12	70045
	R58	30,000	1	Orange	Black	Orange	5%	12	72327
	R59	25,000	1	Red	Green	Orange	5%	12	72328
	R60	4,500	1/10	Yellow	Green	Red	5%	12	70052
	R61	5,000	Poten	tiometer	(Line Synch. Bias)			11	81130
	R62	5,000	Poten	tiometer	(Frame Synch Bias)			11	81130
	R63	500	1/10	Green	Black	Brown	5%	12	70059
	R64	50,000	1/10	Green	Black	Orange	10%	12	70045
	R65	250,000	1/10	Red	Green	Yellow	10%	12	70051
	R66	100,000	1/10	Brown	Black	Yellow	10%	12	70050
	R67	50,000	1/10	Green	Black	Orange	5%	12	70056
	R68	400,000	1/4	Yellow	Black	Yellow	5%	12	72326
	R69	500	1/10	Green	Black	Brown	10%	12	70054
	R70	1,000	Semi-	Var. Pot	(Frame Linearity)			12	81142
	R71	100,000	Poten	tiometer	(Frame Hold)			12	81088
	R72	150,000	1/10	Brown	Green	Yellow	5%	12	70053
	R73	500	1/10	Green	Black	Brown	5%	12	70059
	R74	1,000	Semi-	Var. Pot	(FrameAmplitude)			12	81142
	R75	1,000	1/4	Brown	Black	Red	10%	12	71914
	R76	2 megohms	1/10	Red	Black	Green	10%	11	70055
	R77	100,000	1/10	Brown	Black	Yellow	10%	12	70050
Tube Unit	R81	400	1/10	Yellow	Black	Brown	5%	12	70068
	R78	3,000	Semi-	var. Pot	(Line Linearity)			15	81144
	R79	25,000	1/10	Red	Green	Orange	10%	13	70048

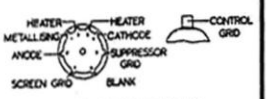
CONDENSERS

	Circuit indication	Specification	Location Fig.	Component No.
Vision Channel	C1	Aerial coil Trimmer	10	80106
	C2	T.R.F. Secondary coil Trimmer	10	80106
	C3	500pF Mica condenser	9	66095D
	C4	500pF Mica Condenser	9	66095D
	C5	500pF Mica Condenser	9	66095D
	C6	500pF Mica Condenser	9	66095D
	C7	500pF Mica Condenser	9	66095D
	C8	500pF Mica Condenser	10	66095D
	C9	500pF Mica Condenser	10	66095D
	C10	500pF Mica Condenser	10	66095D
	C11	500pF Mica Condenser	10	66095D
	C12	500pF Mica Condenser	9	66095D
	C13	500pF Mica Condenser	9	66095D
	C14	500pF Mica Condenser	9	66095D
	C15	500pF Mica Condenser	9	66095D
	C16	500pF Mica Condenser	10	66095D
	C17	500pF Mica Condenser	10	66095D
	C18	500pF Mica Condenser	10	66095D
	C19	.002 mfd. Mica Condenser	10	66045T
	C20	.002 mfd. Mica Condenser	10	66045T
	C21	500pF Mica Condenser	10	66095D
	C22	.1 mfd. Tub. Paper condenser 350 v. D.C. wkg.	10	68020N
	C23	.002 mfd. Mica Condenser	10	66045T
Sound Channel	C24	Coupling Coil Trimmer	10	80106
	C25	T.R.F. Secondary Coil Trimmer	9	80106
	C26	T.R.F. Primary Coil Trimmer	9	80106
	C27	T.R.F. Secondary Coil Trimmer	10	80106
	C28	T.R.F. Primary Coil Trimmer	10	80106
	C29	500pF Mica Condenser	9	66095D
	C30	500pF Mica Condenser	9	66095D
	C31	500pF Mica Condenser	9	66095D
	C32	500pF Mica Condenser	9	66095D
	C33	500pF Mica Condenser	10	66095D
	C34	500pF Mica Condenser	10	66095D
	C35	500pF Mica Condenser	10	66095D
	C36	500pF Mica Condenser	10	66095D
	C37	.1 mfd. Tub. Paper Condenser 350 v. D.C. wkg.	10	68020N
	C38	500pF Mica Condenser	9	66095D
	C39	500pF Mica Condenser	9	66095D
Power Unit	C40	2 mfd. Tub. Electrolytic Cond. 300 v. D.C. wkg.	10	67009
	C41	.1 mfd. Tub. Paper Cond. 350 v. D.C. wkg.	9	68020N
	C42	500pF Mica Condenser	9	66095D
	C43	.1 mfd. Tub. Paper Condenser 350 v. D.C. wkg.	10	68020N
	C44	500pF Mica Condenser	10	66095D
	C45	.01 mfd. Tub. Paper Condenser 450 v. D.C. wkg.	14	68005
	C46	50 mfd. Tub. Electrolytic Cond. 12 v. D.C. wkg.	14	67005
	C47	8 mfd. } Block Electrolytic Condenser 350 v.	13	67069
	C48	16 mfd. } D.C. working	13	
	C49	8 mfd. Tub. Electrolytic Cond. 150 v. D.C. wkg.	14	67011
	C50	30 mfd. Tub. Electrolytic cond. 350 v. D.C. wkg.	13	67056T
	C51	30 mfd. Tub. Electrolytic Cond. 350 v. D.C. wkg.	13	67056T
	C52	16 mfd. Electrolytic Cond. 440 v. D.C. wkg.	13	67053T
	C53	.25 mfd. Condenser 6000 v. D.C. working	14	68108T
	C54	.01 mfd. Tub. Paper Condenser 450 v. D.C. wkg.	12	68005
Time Base	C55	500pF Mica Condenser ±5%	12	66094D
	C56	.001 mfd. Mica Condenser ±5%	12	66980
	C57	.01 mfd. Tub. Paper Cond. 450 v. D.C. working	12	68005
	C58	.002 mfd. Mica Condenser ±5%	12	66984
	C59	.25 mfd. Tub. Paper Cond. 350 v. D.C. working	12	68012
	C60	20 mfd. Tub. Electrolytic Cond. 30 v. D.C. wkg.	12	67008
	C61	8 mfd. Tub. Electrolytic Cond. 150 v. D.C. wkg.	12	67011
	C62	.0012 mfd. Mica Condenser ±5%	11	66986
	C63	20 mfd. Tub. Electrolytic Cond. 30 v. D.C. wkg.	12	67008
	C64	8 mfd. Tub. Electrolytic Cond. 150 v. D.C. wkg.	12	67011
	C65	20 mfd. Tub. Electrolytic Cond. 30 v. D.C. wkg.	12	67008
	C66	500pF Mica Condenser	12	66095 D
	C67	.025 mfd. Tub. Paper Cond. ±5% 350 v. D.C.W.	12	68112
	C68	.25 mfd. Tub. Paper Cond. ±5% 350 v. D.C.wkg.	12	68111
	C69	.25 mfd. Tub. Paper Cond. 350 v. D.C. wkg.	12	68012
	C70	.05 mfd. Tub. Paper Cond. 350 v. D.C. working	12	68027
	C71	50 mfd. Tub. Electrolytic Cond. 25 v. D.C. wkg.	12	67078
	C72	8 mfd. Tub. Electrolytic Cond. 450 v. D.C. wkg.	11	67088T
	C73	.01 mfd. Tub. Paper Cond. 450 v. D.C. working	12	68005
	C75	.01 mfd. Tub. Paper Cond. 450 v. D.C. working	12	68005
Tube Unit	C74	.012 mfd. Mica Condenser ±5%	15	66047T

CIRCUIT ANALYSIS.

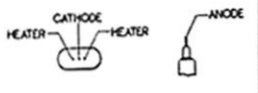
The following conditions must be observed before any voltages or currents are measured.
(1) " No Signal " condition on receiver.
(2) Vision and Sound Sensitivity controls in fully clockwise position..
(3) Line and Frame Synch : Sep : bias controls in fully clockwise position.
(4) Line and Frame Hold controls adjusted for correct Line and Frame Scan speeds.
(5) Line and Frame Linearity controls adjusted for correct Line and Frame Scan linearity.
(6) Line and Frame Amplitude controls adjusted for correct Line and Frame Scan amplitudes.
(7) Voltages measured from chassis with a 1,000 ohms per voltmeter with the exception of the C.R. tube 2nd anode voltage which is measured with an electrostatic voltmeter.

	Component No.	Valve	Circuit	Voltage	Current	Associated Components.
Vision Channel.	86116	(V1) R.F. Pentode Mullard EF6 (Clear)	Anode	162 volts.	5.2 m.a.	C3, C6, R1, R80, L3 and screened lead.
			Screen	162 volts	1.7 m.a.	R1, C6 and main H.T. line.
			Suppressor Grid	—	—	R3, C14, C37, R44, L29, L30.
			Control Grid	—	—	C1, L1 and screened lead.
			Cathode	2.8 volts	6.9 m.a.	R2, C5.
			Heater	6.3 volts	200 m.a.	L2, C4.
	86116	(V2) R.F. Pentode Mullard EF6 (Clear)	Anode	162 volts	5.2 m.a.	R4, C10, L6.
			Screen	162 volts	1.7 m.a.	R4 and main H.T. line.
			Suppressor Grid	—	—	R6, C11 and Vision Sens. Control circuit.
			Control Grid	—	—	C6 and L4.
			Cathode	2.8 volts	6.9 m.a.	R5 and C9.
			Heater	6.3 volts	200 m.a.	L5 and C8.
	86116	(V3) R.F. Pentode Mullard EF6 (Clear)	Anode	162 volts	5.2 m.a.	R7, L9, C13.
			Screen	162 volts	1.7 m.a.	R7 and main H.T. line.
			Suppressor Grid	—	—	R10, C15 and Vision Sens. Control circuit.
			Control Grid	—	—	L7, C10 and C11.
			Cathode	2.8 volts	6.9 m.a.	R9 and C14.
			Heater	6.3 volts	200 m.a.	L8 and C12.
	86116	(V4) R.F. Pentode Mullard EF6 (Clear)	Anode	235 volts	10.5 m.a.	R11, R12, L13, C19 and C20.
			Screen	235 volts	3.4 m.a.	R11, R12, C19 and C20.
			Control Grid	—	—	R8, L10, C13 and C15.
			Cathode	4.3 volts	13.9 m.a.	R13 and C21.
			Heater	6.3 volts	200 m.a.	L11, C17 and C18.
	86118	(V5 & V6) diode detector Mullard T6D (Clear)	Diode	—	—	L14, L16 and C2.
			Cathode	—	—	R15, L17.
			Heater	6.3 volts	200 m.a.	L12, C16.
Sound Channel.	86116	(V7) R.F. Pentode Mullard EF6 (Clear)	Anode	162 volts	5.2 m.a.	R16, L20, C26 and C30.
			Screen	162 volts	1.7 m.a.	R16, C30 and main H.T. line.
			Suppressor Grid	—	—	R18, C31 and Sound Sens. Control Circuit.
			Control Grid	—	—	L18, C24 and screened lead.
			Cathode	2.8 volts	6.9 m.a.	R17 and C32.
			Heater	6.3 volts	200 m.a.	L19 and C29.
	86116	(V8) R.F. Pentode Mullard EF6 (Clear)	Anode	162 volts	5.2 m.a.	R19, L23, C28 and C34.
			Screen	162 volts	1.7 m.a.	R19 and C34.
			Suppressor Grid	—	—	R21, C35 and Sound Sens. Control Circuit.
			Control Grid	—	—	L21 and C25.
			Cathode	2.8 volts	6.9 m.a.	R20 and C36.
			Heater	6.3 volts	200 m.a.	L22 and C33.
	86118	(V9) diode detector Mullard T6D (Clear)	Diode	—	—	R22, R33 and L25.
			Cathode	—	—	L24 and C27.
			Heater	6.3 volts	200 m.a.	L22 and C33.
	86116	(V10) R.F. Pentode Mullard EF6 (Clear)	Anode	45 volts	1.5 m.a.	R25, R26, R27, C40, C41 and C42.
			Screen	38 volts	0.6 m.a.	R24, R25, C37 and C38.
			Control	—	—	R22, R23 and L25.
			Cathode	—	2.1 m.a.	
			Heater	6.3 volts	200 m.a.	C39.
	86123	(V11) A.F. Pentode Mullard EL3 (Clear)	Anode	230 volts	30 m.a.	R31, R32, R34, Primary T1, C45, C47 and C48.
			Aux. grid	225 volts	6.0 m.a.	R31, R32 and C45.
			Control Grid	—	—	R29, R30, C41 and screened lead.
			Cathode	5.7 volts	36 m.a.	R33, C46.
			Heater	6.3 volts	200 m.a.	
Power Pack.	86055	(V12) High voltage Rectifier Mullard HVR2 (Clear)	Anode	—	—	E.H.T. winding on Mains transformer.
			Cathode	The cathode voltage is given as the 2nd anode voltage in the tube section.	—	R45, C53 and C.R. tube, 2nd anode.
	86114	(V13) H.T. Rectifier Mazda UU4 (Clear)	Each anode	353 V.A.C.	—	Mains Transformer L29, L30, C51, C52.
			Cathode	380 volts	165 m.a.	Mains H.T. line.
Line Time Base.	86116	(V14) R.F. Pentode Mullard EF6 (Clear)	Anode	25 volts	1.2 m.a.	R48, R49, C56, C57, C58.
			Screen	310 volts	0.5 m.a.	Secondary T3 and main H.T. line.
			Control Grid	—	—	R46, R47, Secondary T3, C54, C55.
			Cathode	—	1.7 m.a.	
	86115	(V15) Beam power Output valve Mazda AC6Pen (Clear)	Anode	300 volts	47 m.a.	Primary T4 and main H.T. Line.
			Aux. Grid	190 volts	11.0 m.a.	R50, C59 and main H.T. Line.
			Control Grid	—	—	R53, C57, C60.
			Cathode	18 volts	58 m.a.	R51, R52, C60.
Line Synch. Separ.	86116	(V16) R.F. Pentode Mullard EF6 (Clear)	Anode	90 volts	—	R56, R57, C54.
			Screen	30 volts	—	R58, R59 and main H.T. line.
			Control Grid	—	—	R54, R55, C62, R79 and Vision Channel output.
			Cathode	13 volts	—	R60, R61, R63, C63.
Frame Synch. Separ.	86116	(V17) R.F. Pentode Mullard EF6 (Clear)	Anode	90 volts	—	R58, R64, R65, C66.
			Screen	30 volts	—	R58, R59, C64.
			Control Grid	—	—	R54, R55, C62, C79 and Vision Channel output.
			Cathode	13 volts	—	R60, R61, R63, C65.
Frame Time Base.	86117	(V18) dual purpose valve triode hexode Mullard 6153/T (Clear)	Anode	280 volts	15 m.a.	R75, C72, C73, Primary T6.
			Screen	290 volts	4.6 m.a.	R75 and main H.T. line.
			Control Grid	—	—	R76, C69 and screened lead.
			Osc. anode	80 volts	0.5 m.a.	R68, C68, C69, Primary T5.
			Osc. Grid	—	—	R71, R72, C70, Secondary T5.
			Cathode	18 volts	21.1 m.a.	R73, R74, R81, C71.
Tube Unit.	72805	C.R. Tube Mullard MW/22/1	1st Anode	150 volts	—	R58, C61.
			2nd Anode	5000 volts	—	Mains Transformer E.H.T. winding.
			Control Grid	—	—	R54, R55, R79, C62.
			Cathode (Brightness control set to minimum and maximum respectively	100—28	—	R77, C73.



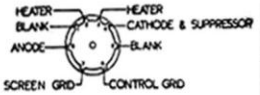
TOP VIEW OF VALVEHOLDER TYPE R.F. PENTODE EF6

Fig. 1



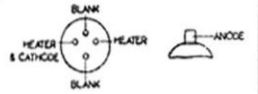
TOP VIEW OF VALVEHOLDER TYPE DIODE T6D

Fig. 2



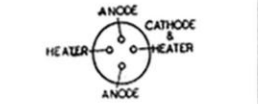
TOP VIEW OF VALVEHOLDER TYPE OUTPUT PENTODE EL3

Fig. 3



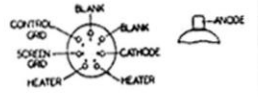
TOP VIEW OF VALVEHOLDER TYPE HIGH VOLTAGE RECTIFIER HVR2

Fig. 4



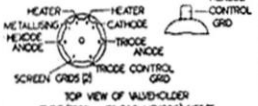
TOP SIDE OF VALVE HOLDER IH RECTIFIER UU4

Fig. 5



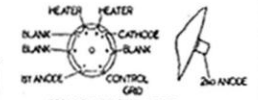
TOP VIEW OF VALVEHOLDER TYPE BEAM POWER AC6PEN

Fig. 6



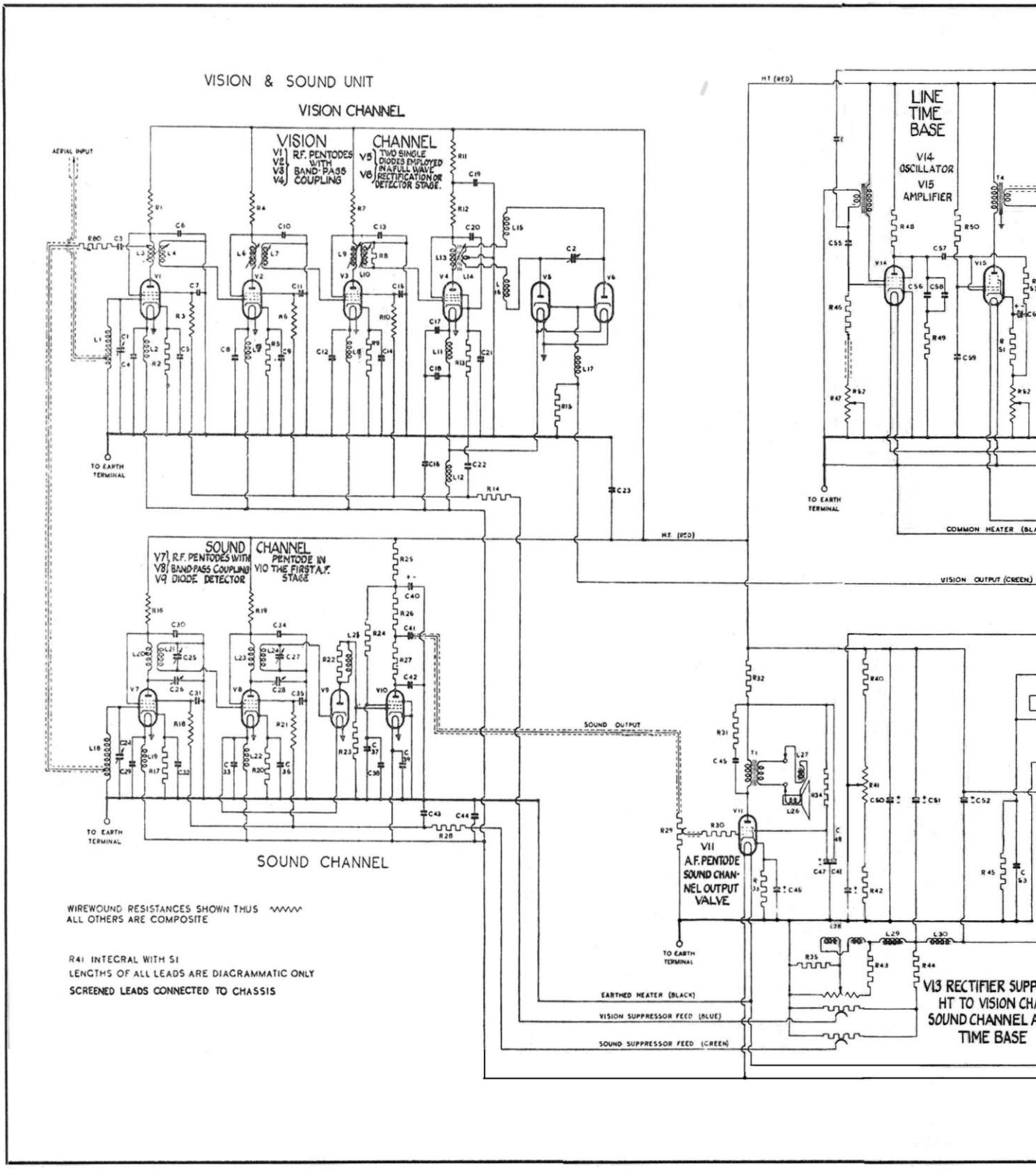
TOP VIEW OF VALVEHOLDER TYPE (SPECIAL TRIODE HEXODE) 6B5/T

Fig. 7



TOP VIEW OF CRT HOLDER TYPE MW22-14

Fig. 8


VISION & SOUND UNIT
VISION CHANNEL
VISION CHANNEL
V1 V2 V3 V4 R.F. PENTODES WITH BAND-PASS COUPLING
V5 V6 TWO SINGLE DIODES EMPLOYED IN A FULL WAVE RECTIFICATION OR DETECTOR STAGE.
AERIAL INPUT
TO EARTH TERMINAL
SOUND CHANNEL
V7 V8 V9 R.F. PENTODES WITH BAND-PASS COUPLING DIODE DETECTOR
V10 PENTODE IN THE FIRST A.F. STAGE
SOUND CHANNEL
V11 A.F. PENTODE SOUND CHANNEL OUTPUT VALVE
LINE TIME BASE
V14 OSCILLATOR
V15 AMPLIFIER
H.T. (RED)
VISION OUTPUT (GREEN)
SOUND OUTPUT
EARTHED HEATER (BLACK)
VISION SUPPRESSOR FEED (BLUE)
SOUND SUPPRESSOR FEED (GREEN)
V13 RECTIFIER SUPP
HT TO VISION CHA
SOUND CHANNEL A
TIME BASE
WIREWOUND RESISTANCES SHOWN THUS
ALL OTHERS ARE COMPOSITE
R41 INTEGRAL WITH S1
LENGTHS OF ALL LEADS ARE DIAGRAMMATIC ONLY
SCREENED LEADS CONNECTED TO CHASSIS

VISION AND SOUND CHANNELS

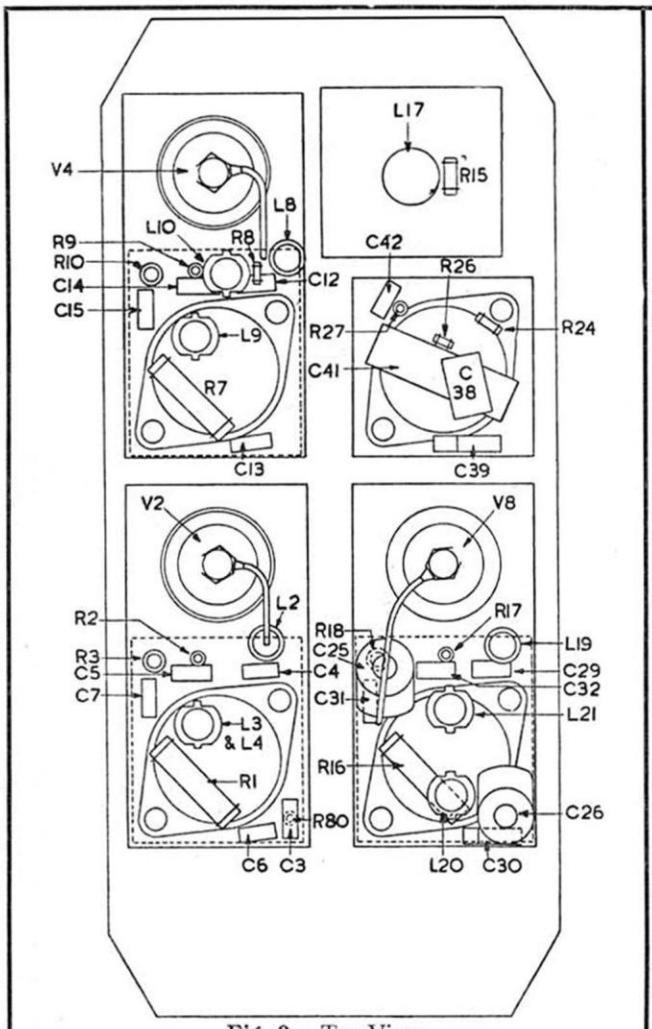


Fig. 9. Top View.

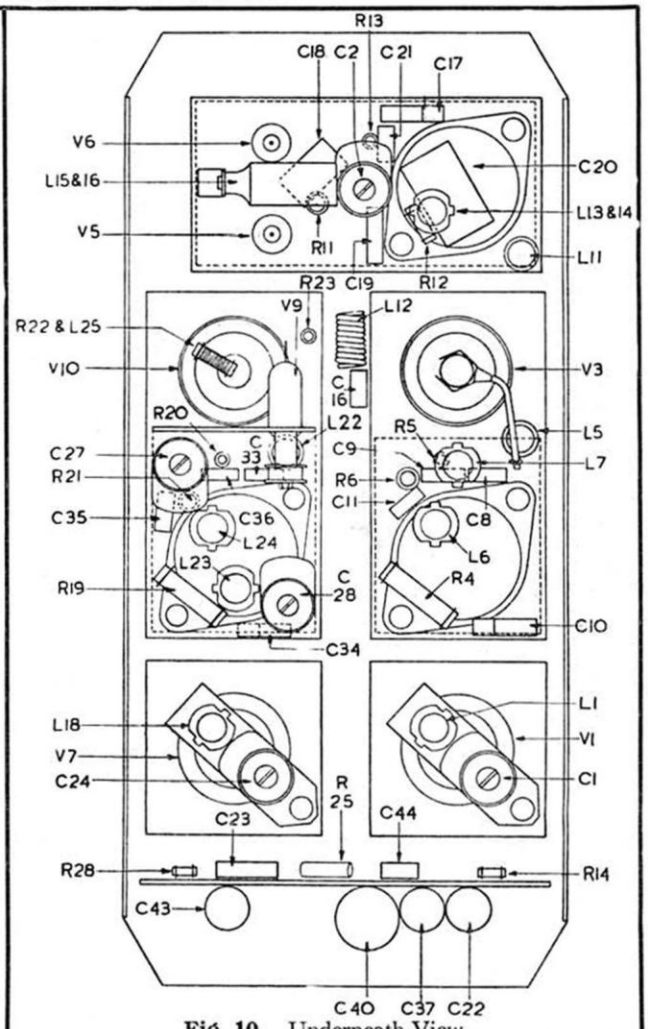


Fig. 10. Underneath View.

POSSIBLE FAULTS AND THEIR CAUSES.

The data given below covers the type of fault which may develop in the 815 Vision and Sound Channels and which cannot be detected by the ordinary voltage and current analysis.

Faults	Causes
No vision Output	L17 disconnected or o/c.
No vision or Sound	Faulty connection in aerial circuit.
No sound	Screened lead letween 1st A.F. stage and volume control disconnected. Sound sensitivity control advanced too far (1st A.F. valve will then be backed right off in presence of strong signal).
Distorted Sound	Sound sensitivity control advanced too far overloading 1st A.F. stage.
Poor noise reducing characteristic	Sound sensitivity control set too low (or signal strength very low).
High lights flat (very " contrasty " picture)	Vision sensitivity control advanced too far.
Instability on Vision at max. setting of sensitivity control	T6D faulty, causing half-wave detection (re-radiated R.F. is then considerably increased).
Instability on Sound at max. setting of sensitivity control.	Apart from faulty decoupling condensers or dry joints, which may cause instability, it may be present owing to a particularly high slope EF6 in V7 and/or V8 positions. (This is not considered a disadvantage as it will only be necessary to slightly reduce the sensitivity control to cure the trouble).
General.	
Weak results, no results, noisy results and microphony.	These faults may be caused by faulty EF6 valves and should be easily located by the usual methods. However, when V7, V8 or V9 in the Sound Channel are changed it will usually be necessary to retrim. The vision channel, having a much flatter response, is little affected by valve changing. If misalignment is suspected retrimming of this channel should only be done where the correct apparatus is available.

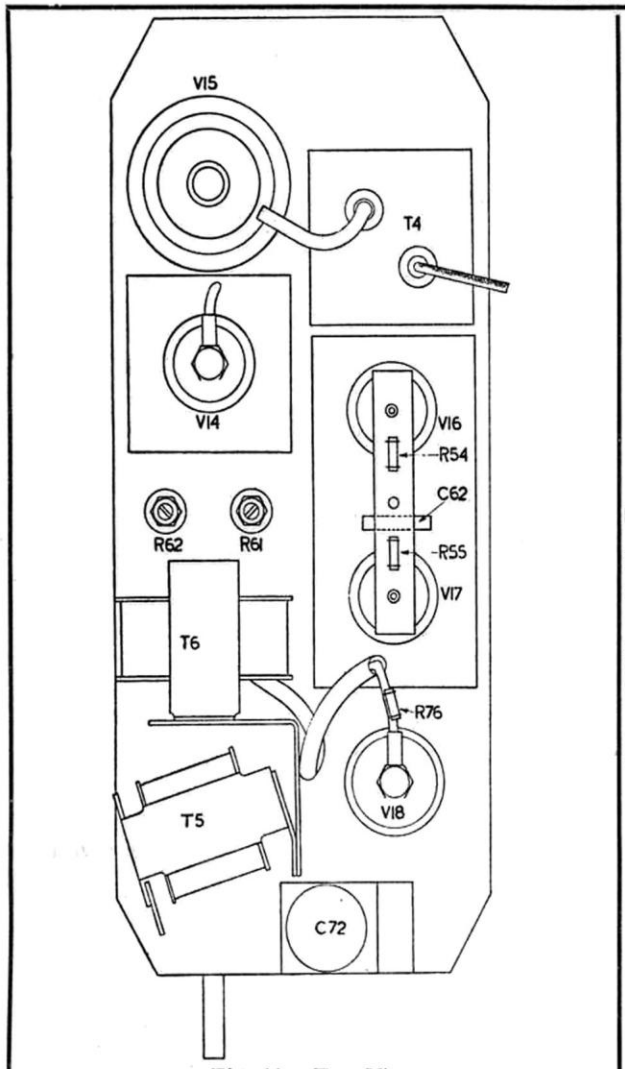


Fig. 11. Top. View.

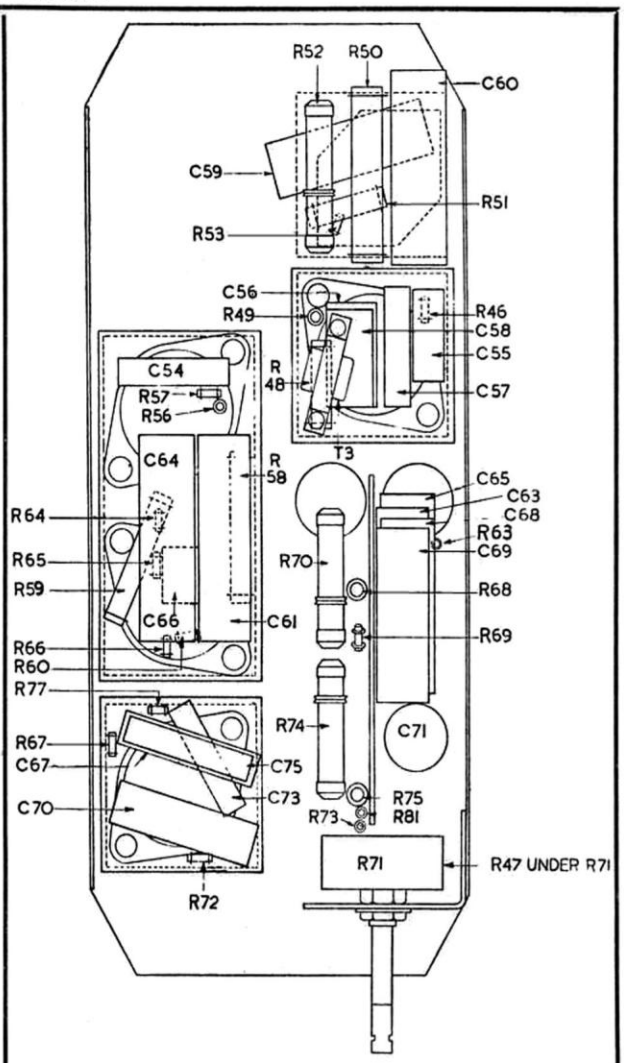


Fig. 12. Underneath View.

POSSIBLE FAULTS AND THEIR CAUSES.

The data given below covers the type of fault which may develop in the 815 Time Base and which cannot be detected by the ordinary voltage and current analysis.

Faults	Causes
(*a*) **Line Scan Generator.**	
(i) No output	(*a*) Faulty deflector coil or coils (L32 and/or L34). (*b*) Output transformer (T4) o/c or s/c. (*c*) Oscillator transformer (T3) o/c or s/c.
(ii) Non linear scan	(*a*) Faulty output or oscillator transformer. (*b*) Compensation circuit C74 or R78 faulty or set incorrectly.
(*b*) **Frame Scan Generator.**	
(i) No output	(*a*) Faulty deflector coil or coils (L31 and/or L33). (*b*) Output transformer (T6) o/c or s/c. (*c*) Oscillator transformer (T5) o/c or s/c.
(ii) Non linear scan	(*a*) Faulty Output or oscillator transformer. (*b*) Compensation circuit (R69 and R70) faulty or set incorrectly.
(iii) Diagonal " fly-back " lines in bottom half of raster.	(*a*) " Fly-back " suppression circuit (C73, R77 and R39) faulty or lead to tag on speaker mounting board disconnected.
(*c*) **Synchronising Stages.**	
(i) No output from either valve	(*a*) Grid circuits faulty. (*b*) No H.T. to potentiometer strip (R58, R59, R60, R61, R62 and R63).
(ii) No output from line synch. separator.	(*a*) Faulty cathode circuit e.g. bias condenser C62 s/c. (*b*) Feed condenser C54 o/c.
(iii) No output from frame synch. separator.	(*a*) Faulty cathode circuit, e.g. bias condenser C65 s/c. (*b*) Feed condenser C66 o/c.

POWER UNIT

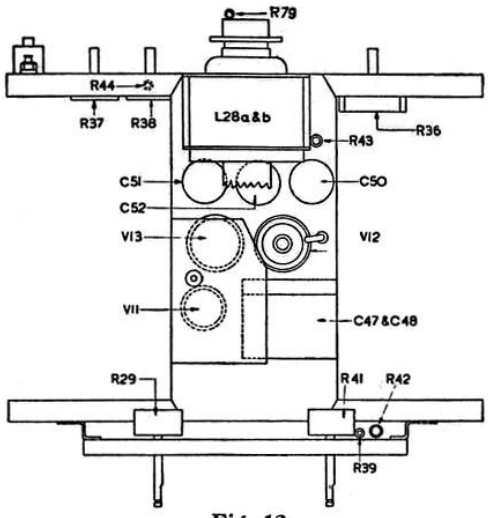


Fig. 13
Top View

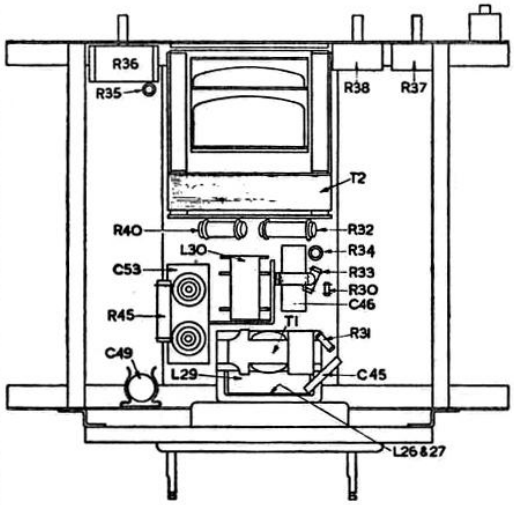


Fig. 14
Underneath View

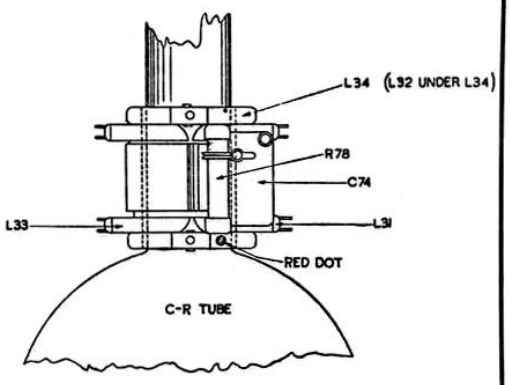


Fig. 15
Deflection Coils Assembly

POSSIBLE FAULTS AND THEIR CAUSES.

The data given below covers the type of fault which may develop in the 815 Power Unit and which cannot be detected by the ordinary voltage and current analysis.

Faults	Causes
1. No, or low, E.H.T.	(*a*) Broken down smoothing condenser C53 indicated by blue glow in rectifying valve V12. Liable to lead to burnt out E.H.T. winding on mains transformer. (*b*) Defective rectifying valve. Indicated by A.C. volts on plate but no D.C. across condenser, and no glow in valve. (*c*) Disconnected or o/c E.H.T. winding. Indicated by no A.C. to plate of rectifier.
2. No, or low H.T.	(*a*) Faulty rectifier V13 indicated by A.C. volts on plates, but no D.C. across condenser C52 and no glow in rectifier. (*b*) Faulty smoothing condenser, indicated by low H.T. volts, blue glow in rectifier and hum on sound. (*c*) Disconnected or o/c H.T. winding, indicated by no volts between earth and one or both anodes of rectifier.
3. Continuous breakdown of rectifiers.	As for 1 (*a*) or 2 (*b*)
4. Hum on sound.	As for 2 (*b*)
5. Hum on raster.	As for 2 (*b*) or E.H.T. smoothing condenser disconnected or faulty.
6. Erratic Brightness Control.	(*a*) Defective brightness control potentiometer R41. (*b*) Earth connection to R42 or brightness control disconnected. (*c*) Defective C.R. Tube.
7. No light on C.R. tube screen.	(*a*) No E.H.T. (*b*) No. H.T. (*c*) Defective C.R. Tube.

TRIMMING DATA

The trimmers and coils in the 815 Television Receiver are accurately adjusted on special apparatus when the receiver is manufactured and no re-adjustments should be made unless :—

1. All voltages, currents, components and valves have been checked and found to be up to standard.
2. The efficiency of the receiver has been found to be below standard when compared with other standard models.
3. Accurate equipment is available for their re-adjustment.

All adjustments should be made with :—

1. Vision and sound sensitivity controls in the fully clockwise position.
2. Line and frame synch., seperator bias controls in the fully clockwise position.
3. Line and frame hold controls adjusted for correct line and frame scan speeds. (These controls should be adjusted when the Television Receiver is receiving the television transmission or alternatively they can be adjusted with the aid of a Signal Generator such as the Pye De Luxe Trimeasy.
4. Line and frame linearity controls adjusted for correct line and frame scan linearity.
5. Line and frame amplitude controls adjusted for correct line and frame scan amplitude.
6. Volume control turned to the fully clock-wise position.
7. A D.C. Volt Meter connected across the output of the vision channel (between the green lead to the Cathode Ray Tube and earth). This D.C. Volt Meter should have a D.C. resistance of not less than 50,000 ohms. If a Volt Meter of lower resistance is used the vision channel loading will be upset. The Volt Meter should also have a full scale deflection such that 10 volt readings can be easily obtained. An Analyser having a 1 milliamp. range can be used for this purpose. Simply connect a 50,000 ohm resistance in series with the meter ; this gives a meter with a D.C. resistance of 50,000 ohms and a full scale deflection of 50 volts.
8. An Output Meter connected in parallel with the speech coil of the loudspeaker.
9. A special trimming tool such as the Pye Ivory Trimming Tool should be used for adjusting the iron cores inside the coils and the condensers of the vision channel. It is important to note that an ordinary screwdriver cannot be used for this purpose.

The Signal Generator which is to be used for trimming should be checked for frequency accuracy The easiest method of doing this is to beat it with the signal from Alexandra Palace, but before proceeding as outlined below it is important that the genrator be switched on and allowed to warm up for approximately half-an-hour. This is necessary in order to ensure frequency stability when the generator is operating at frequencies of the order of 45 megacycles.

Switch on a television receiver and ensure that the vision and sound transmissions are being received. Connect a length of wire (about a foot) to the " live " side of the generator output cable, turn the attenuator to maximum and place the wire close to the vision channel. Remove the anode connector from the top pin of the T6D diode valve in the **sound channel** and connect a condenser (approximately 0.1 mfd.) between the control grid (top cap) of the L.F. valve (EF6) and the green vision channel output lead which is connected to the C.R. tube. (Do not remove the green lead from the C.R. tube connector or the connecting clip from the L.F. valve top cap.)

The generator can now be checked for frequency accuracy. Set the frequency control to the supposed **45 megacycle** position and carefully adjust it : as the correct frequency is approached a high frequency whistle will be heard in the loudspeaker and this whistle will decrease in pitch as the **45 megacycle** frequency is approached ; **when the generator is adjusted exactly to 45 megacycles no note should be audible, i.e., " zero beat " is obtained,** but if this point is passed a note will again be heard which will increase in pitch as the generator frequency differs from the 45 megacycle Alexandra Palace transmitter frequency.

A method which differs slightly from that outlined above is to connect a pair of headphones between the pin on the C.R. tube connector to which is connected the green vision channel output lead and the chassis. The beat note will then be heard in the headphones.

The reading obtained on the generator when " zero-beat " is obtained should, if different to that already given by the manufacturers of the generator, be noted and allowed for at any frequencies used when aligning the vision channel.

N.B. Before proceeding with the alignment of the Vision Channel the condenser must be removed, the connector replaced on the T6D valve anode pin and the screening can be replaced. If the headphone method has been employed the headphones must, of course, be removed. Also remove the length of wire from the generator output cable.

The unmodulated output from the signal generator should be fed to the television screened aerial connector, the live wire being connected to the centre protion of the connector, whilst the screening should be connected to the outer portion. The output should be attenuated so that the D.C. volt meter reading is always approximately 10 volts.

IT IS IMPORTANT THAT THE IMPEDANCE AT THE RECEIVER END OF THE LINE FROM THE GENERATOR TO THE RECEIVER IS APPROXIMATELY 100 OHMS. WHEN USING SIGNAL GENERATORS WHICH WHEN MEASURED AT THE ATTENUATOR HAVE AN OUTPUT IMPEDANCE OF 25–150 OHMS, IT IS SUFFICIENT TO FEED THE OUTPUT FROM THE GENERATOR TO THE VISION CHANNEL INPUT VIA 2 FT. OF CONCENTRIC R.F. CABLE (THE TYPE OF CABLE USED AS A TRANSMISSION LINE FROM A TELEVISION AERIAL IS ADMIRABLE FOR THIS PURPOSE). THE PYE 1939 MODEL DE-LUXE TRIMEASY FALLS WITHIN THIS CATEGORY.

WHEN USING SIGNAL GENERATORS HAVING AN IMPEDANCE GREATER THAN 150 OHMS, SPECIAL CONSIDERATIONS ARE NECESSARY AND THE MANUFACTURERS OF THE GENERATOR SHOULD BE CONSULTED.

To facilitate the reading of the frequency—dial reading graphs supplied with the Pye 1939 model Trimeasy and other similar types of Signal Generators, at the high frequencies required for Television Trimming the slope of the curve should be calculated.

To do this :—

(*a*) Beat the Generator output with Vision transmission from Alexandra Palace as explained previously in these notes, observe the dial reading, note the correct 45 megacycle position on the Graph curve.

(*b*) Note on the Graph curve the correct 30 megacycle position.

(*c*) By means of the formulae given below the slope of the curve can be calculated :—

$$\text{Slope of curve} = \frac{\text{Dial reading for 30 megacycles} - \text{Dial reading for 45 megacycles.}}{\text{45 megacycles} - \text{30 megacycles.}}$$

This gives the slope of the 6–17 metre curve as being approximately 1.6.

That is to say for 1 megacycle variation at frequencies between 50–30 megacycles the large pointer on the Trimeasy dial should be moved through 1.6 large divisions or 16 small divisions.

The adjustment of the various dust iron cores and trimming condensers in the vision channel should then be carried out in the following order.

(*a*) Inject a signal of **45 megacycles** and adjust C1 and the dust iron core of L3 and L4 for maximum output.

(*b*) Inject a signal of **43.75 megacycles** and adjust the dust iron cores of L6 and L7 for maximum output. Then inject a signal of **46.25 megacycles** and adjust the cores of L6 and L7 for maximum output. Finally inject a signal of **43.75 megacycles** and adjust these cores once again for maximum output.

(*c*) Inject a signal of **46.25 megacycles** and adjust the dust iron core of L9 for maximum output.

(*d*) Inject a signal of **43.75 megacycles** and adjust the dust iron core of L10 and the core of L13 and L14 for maximum output.

(*e*) Inject a signal of **46.25 megacycles** and adjust C2 for maximum output.

It is important that the cores and trimming condensers are adjusted in the order given above in order that the correct over all response curve is obtained.

SOUND CHANNEL.

The Signal Generator should be checked for correct frequency calibration at the Television Sound transmission frequency (**41.5 megacycles**). To check the generator beat it with the sound transmission reception obtained with a television receiver and adjust the frequency until "zero-beat" is obtained.

The above can be carried out in the manner outlined for checking the vision frequency. The connection to the T6D valve anode pin must not be removed and the condenser is not employed.

The output from the generator should be connected to the aerial connector as described in the instructions concerning the vision channel. The R.F. output from the generator should be modulated at 400 cycles, to a depth of approximately 30%, and it should also be attenuated so that the reading shown on the output meter connected across the speaker speech coil is always approximately **250 milliwatts.**

The trimming condensers in the sound channel should be adjusted in the following order. Inject a signal of frequency **41.5 megacycles** and adjust C24, C26, C25, and C28 and C27 for maximum output. The condenser C1 and the core of L3 and L4 must not be adjusted.

TIME BASE UNIT.

(Please note that in some 815 Television receivers the Line and Frame Synch. Separator Bias controls are of the semi-variable potentiometer type and they are mounted together with the amplitude controls on the top of the Time Bars).

All adjustments to the Time Base Unit are carried out by means of potentiometers and semi-variable potentiometers.

The correct method of adjusting the semi-variable potentiometers is given in the paragraphs dealing with Mechanical Data.

The effects of incorrect adjustment of these controls are given below :—

1. **Line Amplitude Control** (R.52). Picture breadth too great or too small—control should be adjusted until breadth of picture is correct for size of mask.
2. **Frame Amplitude** (R74). Picture height too great or too small—adjust control until height of picture is correct for size of mask.
3. **Frame Linearity** (R70). Elongation or cramping of part of the picture in the vertical direction. This effect will always be noticed in the top half of the picture—adjust control to eliminate effect.

The Line and Frame Synch. Separator bias controls are mounted in the centre of the Time Base and are each fitted with slotted control spindles. They can be adjusted by means of an ordinary screwdriver.

If these controls require adjusting the following effects will be noted.

Before deciding that these controls require adjusting it is important that the Vision Sensitivity Control and the Brightness Control are adjusted for correct picture contrast. (See 815 Instruction Book).

Interference affecting picture in the horizontal direction, picture unsteady and distorted in the horizontal direction, or a whitish " ghost " picture appearing on the left hand side of the picture—this latter effect is known as " turnover."—Line Synch. Separator Bias Control (R61) requires adjustment.

Interference affecting the picture in the vertical direction or picture unsteady in the vertical direction—Frame Synch. Separator Bias Control (R62) requires adjustment.

This control will also require adjusting if the picture is not interlacing correctly. If the picture is not interlacing the number of horizontal lines composing it is only half the correct number, and hence the distance between the lines is greater than it should be. Therefore when this effect is noted and the Frame Synch. Separator Bias Control is adjusted to rectify the defect the number of lines will be doubled and the space between the lines will be decreased.

IMPORTANT. THE LINE AND FRAME SPEED CONTROLS SHOULD BE ADJUSTED IN CONJUNCTION WITH THE SYNCH. SEPARATOR BIAS CONTROLS. For details concerning the correct adjustment of the speed controls please refer to the 815 Instruction Book.

TUBE UNIT

The Line Linearity control (R78) mounted on the deflector coil assembly will require adjusting when the following effects are noted :—

Elongation or cramping of part of the picture in the horizontal direction. This effect will always be noticed in the left hand half of the picture.

When checking the picture for correct line and frame amplitude and linearity, as instructed above, it should be noted that the amplitude will effect the linearity and vice versa, and hence the amplitude and linearity controls should be adjusted in conjunction with each other, so that when the amplitude is correct the linearity is also correct.

N.B. The operation of the 815 major controls is not covered in these Service Notes. The uses and effects of these controls are fully dealt with in the 815 Television Receiver Instruction Book.

MECHANICAL DATA

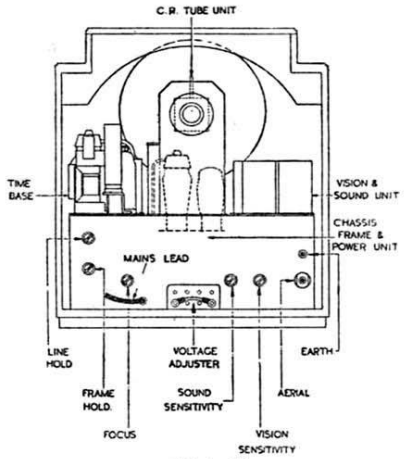


Fig. 16

WARNING. AFTER THE RECEIVER HAS BEEN SWITCHED OFF, THE TERMINALS OF THE E.H.T. SMOOTHING CONDENSER (C53) SHOULD BE SHORT CIRCUITED BY MEANS OF A SCREWDRIVER OR SIMILAR TOOL BEFORE ANY WORK IS CARRIED OUT ON THE RECEIVER. THIS IS NECESSARY BECAUSE THE CONDENSER HOLDS ITS CHARGE FOR A CONSIDERABLE TIME AFTER THE RECEIVER IS SWITCHED OFF.

REMOVING THE COMPLETE CHASSIS ASSEMBLY FROM THE CABINET.

Note. It is not necessary to remove the chassis from the cabinet in order to inspect the chassis wiring. When the card under cover fitted in the base of the cabinet is removed, the wiring is easily accessible.

To remove the chassis from the cabinet :—

1. Remove the control knobs fitted to the Volume and Brightness control spindles. These can be easily removed by means of a direct forward pull.
2. Take out the two wood screws holding the cathode ray tube frame to the front of the cabinet.
3. Remove the lower screw from the left hand back cover fixing bracket and rotate the bracket through 180°.
4. Remove the four fixing bolts fitted to the chassis from the underside of the cabinet. The chassis should then be partially removed from the cabinet until the control spindles are clear of the front. In this position the chassis should be tilted slightly towards the cabinet front and then it can easily be completely removed from the cabinet.

REMOVING THE SPEAKER.

1. Disconnect the two brown leads from the chassis to the speaker field coil by removing the screws holding these leads to the speaker terminal strip.
2. Disconnect the two pink pull-back leads from the chassis to the output transformer (mounted on the speaker chassis). The screws holding these leads to the transformer terminal plate should be removed.
3. Remove the four wood screws holding the speaker to the mounting board. The speaker can then be removed from the chassis via the hole in the mounting board.

VARIABLE POTENTIOMETERS R52 AND R78. (LINE AMPLITUDE AND LINE COMPENSATION CONTROLS) R74 AND R70 (FRAME AMPLITUDE AND FRAME COMPENSATION CONTROLS).

These resistances resemble an ordinary 4 watt resistance with the exception that they have a phosphor-bronze wire loop slipped over them. By varying the position of the phosphor-bronze wire on these resistances control of Frame Compensation, Line Compensation, Frame Amplitude and Line

Amplitude is obtained. To move the slider on these controls press the two prongs at the end of the loop and then the wire can easily be moved. Care must be taken to see that the sharp bend in the loop is always in contact with the bare portion of the resistance. When the slider is in the correct position release the two prongs and the wire loop will slip tightly into position. Please note that none of the sliders on these controls are live, but care should be taken when adjusting the Line Compensation control, as under certain conditions this resistance may become slightly warm.

TO FIT NEW VALVES.

All the EF6 valves in the Vision and Sound Unit are screened by clip cans which can be easily pulled off their bases ; in addition, the valves are screened by tinned copper cylinders which form part of the chassis and cannot be removed and therefore the valves must be carefully tapped out of their holders by inserting a screwdriver or similar tool in the hole provided in the base of the valve holders.

The valves in the Time Base Unit can all be removed in the normal manner : in the case of the three EF6 valves, however, the screening cans must, of course, first be removed.

The E.H.T. rectifier valve (HVR2) mounted near the C.R. tube, the H.T. rectifier valve (UU4) and the sound output valve (EL3) can all be removed in the normal manner, but in the case of the UU4 and EL3 valves the black screen fitted under the C.R. tube must first be removed. To remove this screen simply take off the knurled nut and shake-proof washer securing it to the anchoring post and withdraw the screen from the post.

REMOVING THE C.R. TUBE.

1. The tube connector is clipped on the base of the tube. This should be pulled clear.
2. Loosen the four 6BA bolts securing the deflector coil assembly to the neck of the tube.
3. Remove the safety glass fitted in front of the tube screen. To remove this glass simply slide it sideways clear of the supporting brackets. When replacing glass and tube make sure that both are clean and free of finger prints.
4. Pull rubber mask clear.
5. Disconnect 2nd anode lead from connector on side of tube.
6. Slide tube through tube frame and work the deflector coil assembly along the neck of the tube until the tube is finally clear. **N.B.** Care must be taken not to disturb the adjustor clip on the semi-variable line compensation resistance.

When fitting a new tube reverse the operating procedure for removing the tube. For correct positioning of the deflector coil assembly rotate the coil assembly around the neck of the tube until the picture is correct way up and square with the mask.

N.B. It is important that the deflector coil assembly is kept well up against the flare of the tube. Also, when adjusting, please remember that the Line Compensation resistance mounted on this assembly may be rather warm.

Cases may be experienced when the picture is not in the centre of the mask. To rectify this, loosen the two wing nuts under the focus coil can (at the end of the tube) and alter the position of the coil assembly by adjusting the three screws holding the back of the focus coil can. After this adjustment has been made, the two wing nuts should be tightly screwed up again and then the focus of the raster should be checked to ensure that it is correct over the entire raster. If it is not correct, the focus coil may have to be repositioned and also the focus control at the rear of the chassis may have to be readjusted.

Before checking the focus remove the aerial so that no picture is received and adjust the brightness control while checking the focus, so as to ensure that the focus is correct for all degrees of brightness.

REMOVING THE TIME BASE UNIT FROM THE CHASSIS FRAME.

1. Disconnect the four leads from the mains transformer to the unit. (Make a careful note how these leads are connected so that when reconnecting these wires no mistake is made).
2. Disconnect the screened lead, black and mauve leads from the Time Base to the deflector coil assembly.
3. Disconnect the pink pull-back covered lead from the time base to the tube connector.
4. Disconnect the black pull-back covered lead from the junction tag on the speaker mounting board.
5. Disconnect earthing braid from the unit.
6. Remove the four 6 B.A. holding screws. The unit can then be withdrawn.

REMOVING THE VISION AND SOUND UNIT FROM THE CHASSIS FRAME.

1. Disconnect the green lead from the unit to the C.R. tube connector.
2. Disconnect the screened lead from the unit to the volume control. This lead is connected in two places:— (*a*) The live lead, and (*b*) the braiding.
3. Disconnect the three leads from the mains transformer to the unit. (Make a careful note how these leads are connected so that when reconnecting these wires no mistake is made.)
4. Disconnect the blue lead from the unit to the Vision Sensitivity Control.
5. Disconnect the green lead from the unit to the Sound Sensitivity control.

N.B. Make a careful note of the respective connections of the above two leads, as they must not be reversed when the Vision and Sound Unit is refitted to the chassis.

6. Take out the two 6 B.A. screws holding the screened aerial connector to the chassis.
7. Remove the four 6 B.A. holding screws. The unit can then be withdrawn.

Special Note. If at any time the television receiver wiring on the underside of the chassis is disturbed care must be taken to regroup it so that there is no possibility of this wiring coming into contact with the high voltage terminal of the E.H.T. condenser, or any part of the E.H.T. circuit.

TECHNICAL SPECIFICATION

VISION

(In this technical specification the path of the television signal from the aerial input terminal to the cathode ray tube is followed and a detailed explanation is given concerning the functions of the various units necessary for the reproduction of television pictures).

VISION CHANNEL (V1, V2, V3, V4, V5 and V6).

In this unit four R.F. pentodes are employed in tuned R.F. stages and two diodes in a full wave rectification or detector circuit. Coupling between the tuned R.F. stages is of the band pass type giving an over-all band width of approximately three megacycles. The gain of the first three tuned R.F. stages is controlled by applying a varying negative voltage from the potentiometer R37 (**vision sensitivity control**) to the suppressor grids of the first three valves. The vision signal from the aerial input terminal is fed via the aerial coupling coil L1 to the grid of the first T.R.F. stage. It is then amplified throughout the four tuned R.F. stages and finally it is fed into the full wave rectification or detector circuit. The D.C. output from the detector stage is then fed to the control grid of the cathode ray tube and also to the control grid circuits of the line and frame synch. separator valves in the time base.

TIME BASE (V14, V15, V16, V17, and V18).

The time base can for this purpose be considered as three separate units.

(*a*) **The synchronising stages** which are employed to deliver synch. pulses free from any picture or noise content to the line and frame time bases.

(*b*) **The Line time base** from which is derived an ample linear saw tooth voltage, sufficient to scan the cathode ray tube, at 10,125 pulses per second, in the horizontal direction.

(*c*) **The frame time base** from which is derived an ample linear saw tooth voltage sufficient to scan the cathode ray tube, at 50 pulses per second, in a vertical direction.

(*a*) **SYNCHRONISING STAGES—V16 and V17** (line and frame).

The valve fitted in the line synch. separator stage is an R.F. pentode and its purpose is to separate the synch. pulses from the vision content and any noise content which may be present in the signal obtained from the vision channel. In effect it eliminates all the vision content and any noise content from the signal fed into its control grid from the vision channel, and the remaining synch. pulses are fed via a condenser, C54, to the grid end of the oscillatory transformer T3 in the control grid circuit of the R.F. Pentode fitted in the line time base.

The potentiometer R61 (**line synch. bias control**) is used to vary the potential on the cathode of the line synch. separator valve, the control being set so that this potential ensures that when the output from the vision channel is applied to the control grid of the valve only that part of the voltage generated by the synch. pulses is allowed to take effect over the effective part of the anode current—grid voltage characteristic curve of the valve. In this way the voltage generated by the picture content of the signal and the voltage generated by any noise which may be present do not increase the voltages developed across the load resistors R56 and R57 in the anode circuit of the valve.

The frame synch. separator valve V17 is an R.F. pentode and it functions in a similar manner to the line synch. separator valve. The frame synchronising pulses, free from any vision or noise content, are filtered from the input signal obtained from the vision channel and are then fed via the coupling on T5 to the control grid of the triode section of the valve in the frame time base (V18), thus synchronising the frequency of the time base with the transmitter. R55 and C62 provide a filter circuit for the line synch. pulses and ensure that interlacing is correct. The potentiometer R62 (**frame synch. bias control**) varies the potential on the cathode of the valve so that this potential ensures that when the output from the vision channel is applied to the control grid of the valve only that part of the voltage generated by the synch. pulses is allowed to take effect over the effective part of the anode current—grid voltage characteristic curve of the valve. This is similar to the arrangement provided for the line synch. separator valve.

(*b*) **LINE TIME BASE (V14 and V15).**

In this unit there are two valves employed, an R.F. pentode and a beam power output valve. The R.F. pentode (V14) is employed in a Blocking Oscillator type circuit and its function is to produce a saw tooth voltage of 10,125 pulses per second. The operation of this Blocking Oscillator circuit is as follows :—

The transformer T3 is part of an oscillatory circuit between the screen and the control grid of the valve. The oscillations take place at a much higher frequency than the fundamental saw tooth frequency generated by the whole Blocking Oscillator circuit. The current passing through the primary of the transformer T3 induces a voltage in its secondary. This voltage charges the condenser C55 and builds up a negative voltage on the control grid. As this negative voltage increases there will come a time when the voltage on the control grid is of such a value that it completely blocks the valve and allows the charge condensers C56 and C58 to build up a voltage. Whilst this is taking place, the negative charge on the control grid is draining through resistances R46 and R47 and as this draining occurs, there will come a time when the negative voltage built up on the control grid is reduced to a value where the R.F. pentode becomes conductive, and allows the condensers C56 and C58 to discharge through the valve.

The frequency control or speed of the saw tooth voltages is varied by means of the variable resistor R47 (**line hold control**) in the control grid circuit of the R.F. pentode V14. By varying the resistor in this circuit one can control the drain of the negative charge built up on the control grid by means of the Blocking Oscillator circuit and consequently one can control the speed of the saw tooth output obtained. The Blocking Oscillator circuit is synchronised by feeding the output of the Line

Synch. separator valve via a condenser (C54) on to the grid end of the oscillator transformer T3.

The control grid of the beam power output valve (V15) is capacity coupled to the anode of the R.F. pentode preceding it, and this valve is controlled by the saw tooth voltages generated in the preceding stage. The amplified output from V15 is fed by transformer coupling to the deflector coils and produces the electro-magnetic field for the horizontal scan. The amplitude of the horizontal scan is controlled by varying the amount of negative feed-back applied to the output valve. This control is effected by the semi-variable resistor R52 (**line amplitude control**) and by this method an amplitude control is obtained free from frequency distortion and entirely independent of the speed circuit. The compensating circuit comprised of a condenser and a variable resistor is connected across the deflector coils and has a correct setting to obtain a linear scan. This circuit consists of C74 and R78 (**line linearity control**).

(*c*) FRAME TIME BASE (V18).

The operation of this unit is somewhat similar to the operation of the Line Time Base, but a dual purpose valve (V18) is employed. This valve is of the triode-hexode type, the operation of the triode section being similar to the operation of the R.F. pentode in the Line Time Base. The oscillatory circuit consists of T5 primary and secondary, R71, R72 and C70.

The speed of the saw tooth voltages generated is controlled by the variable resistor R71 (**frame hold control**). The charge circuit consists of C68, R68, R67 and R70. The semi-variable resistor R70 (**frame linearity control**) is connected in series with the charge condenser C68 to compensate for valve variation and to give a linear scan.

The saw tooth voltage is fed from the charge condenser via C69 to the control grid of the hexode section of the valve. The amplified output from this section is then transformer fed to the deflector coils to produce the electro-magnetic field for the vertical scan. The amplitude of the vertical scan is controlled by means of the semi-variable resistor R74 (**frame amplitude control**) which varies the cathode bias voltage applied to the valve.

TUBE UNIT.

The pulsating D.C. output from the vision channel is fed to the control grid of the cathode ray tube. This tube is a Mullard Type MW22/1 and is of the short type specially designed for Pye Limited. The tube is magnetically focussed, the magnetic focussing device L28 (a and b) being arranged round the end of the tube neck and shrouded by a metal can. By varying the potentiometer R36 (**focus control**), the current through L28 (a and b) is varied, thus altering the field. There is a gap in the magnetic circuit which surrounds the coil, and this gap confines the focussing field to the correct position in the tube. The heater of the tube is energised from a 4 volt winding on the mains transformer. This heater raises the temperature of the cathode in the tube, and as the temperature rises a stream of electrons is liberated. This stream of electrons is accelerated by the voltages on the 1st and 2nd anodes of the tube. It also varies in intensity as the positive voltage on the control grid is varied by the output from the vision channel. The basic control of the intensity of the stream is obtained from the resistor network R40, R41, R42. R41 is a variable potentiometer (**brightness control**).

The line scanning and frame scanning of the tube, that is the deflection of the electron beam in the horizontal and vertical directions, is obtained as explained previously in the notes on Line and Frame Time Bases.

Thus we have the output from the vision channel controlling the horizontal and vertical scanning of the tube and the intensity of the electron beam, the whole combining to produce television pictures on the screen.

SOUND

SOUND CHANNEL (V1, V7, V8, V9, V10 and V11.)

The sound channel, with the exception of the pentode output stage (V11) is built on the same chassis as the vision channel. The T.R.F. method of reception is employed, high efficiency coils and trimming condensers providing a band width of approximately 100 kilocycles, with a sharp " cut off " on either side. The valves employed in the first four stages are R.F. pentodes. The sound input signal is fed via the aerial coupling coil L1 to the control grid of the 1st R.F. pentode in the vision channel, and is amplified throughout four stages. The gain of these four stages is controlled by applying a negative voltage to the suppressor grids of the valves. This negative voltage is obtained from the potentiometers R37 and R38 (**vision and sound sensitivity controls**).

The anode of the last T.R.F. stage is transformer coupled to the cathode of a diode detector valve which in turn is directly coupled to an R.F. pentode in the 1st A.F. stage. This circuit is so arranged to ensure that the valve has a sharp " cut off," thus ensuring a marked reduction in car ignition or other interference when the valve is biased to the correct point by the rectified output from the diode detector preceding it. The anode of the pentode valve in the 1st A.F. stage is resistance coupled to the control grid of the A.F. pentode (V11) in the output stage, whilst the anode of this valve is transformer coupled to the energised moving coil speaker. Volume control is obtained by means of the variable resistor R29 (**volume control**) in the grid circuit of the output valve. The complete sound output stage is located on the power unit chassis.

POWER UNIT.

The power unit lies directly beneath the cathode ray tube and supplies from one mains transformer all the power necessary for the complete operation of the television receiver. The H.T. supply for the Time Base and Vision and Sound Channels is obtained from one indirectly heated rectifier (V13), whilst the E.H.T. for the tube is obtained from another indirectly heated rectifier (V12). The smoothing of the H.T. supply is in the negative lead. This is arranged primarily in order to obtain negative voltages for controlling the R.F. gain of the Vision and Sound channels.