PICTURE MONITOR

Type 2823

SERVICE MANUAL

ISSUE 1

NOTE TO READERS

The subject matter of this publication may be affected by Defence Council Instructions, Servicing schedules (Volume 4 and 5), or 'General Orders and Modifications' leaflets in this A.P., or even in some others. If possible, Amendment Lists are issued to correct this publication accordingly, but it is not always practicable to do so. When an Instruction, Servicing schedule, or leaflet contradicts any portion of this publication, the Instruction, Servicing schedule, or leaflet is to be taken as the overriding authority.

The inclusion of references to items of equipment does not constitute authority for demanding the items.

Each leaf, except the original issue of preliminaries, bears the date of issue and the number of the Amendment List with which it was issued. New or amended technical matter will be indicated by black triangles positioned in the text thus:- ◀----------▶ to show the extent of amended text, and thus:- ▶◀ to show where text has been deleted. When a Part, Section, or Chapter is issued in a completely revised form, the triangles will not appear.

◀ The reference number of this publication was altered from A.P.101S-0202-1, Cover 5 to A.P.116T-1103-1 by A.L. action in Feb. 69. ▶

ILLUSTRATIONS AND DIAGRAMS

PICTURE MONITOR

Type 2823

Parts Nos.

842823 C4Z

842823 C5Z

842823 C6Z

This service manual is for the maintenance of Pye T.V.T. equipment. The performance figures quoted are typical and are subject to normal manufacturing and service tolerances.

The right is reserved to alter the equipment described in this manual in the light of future technical development.

SERVICE MANUAL

ISSUE 1

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CONTENTS

SECTION 1 - GENERAL

1.1 INTRODUCTION

The 2823 Picture Monitor is a compact, light-weight monitor for general purpose use in television studios, closed circuit systems, etc. It is particularly suitable for application where it is frequently required to be moved or for confined spaces, provided adequate ventilation is available.

The monitor has an $8\frac{1}{2}$" rectangular picture tube providing a display with a maximum size of 7" x $5\frac{1}{4}$". Three versions are available, the 2823 C4Z for use on the standard British 405 line system, the 2823 C5Z for use on the American 525 line system, or the 2823 C6Z for use on any 625 line system. It operates on either positive going complete video, or separate video and synchronising signals. The input circuits are selectable for either high impedance bridging or low impedance terminating of the incoming lines, as required.

The contrast and brightness controls are capable of being operated remotely, e.g. from the control panel of a control console where the quality balance of several monitors is desired.

1.2 SPECIFICATION

Systems

405 lines, interlaced, 50 fields per second, 25 frames per second (2823 C4Z).

525 lines, interlaced, 60 fields per second, 30 frames per second (2823 C5Z).

625 lines, interlaced, 50 fields per second, 25 frames per second (2823 C6Z).

Video Input Signal

0.5 - 2V p-p video + blanking (white positive), and
0.2 - 2V p-p negative going complete synchronising waveform, or
0.5 - 2V p-p complete video (white positive).

Video Input Impedance — 75Ω ± 5% or high (bridged).

Sync Input Impedance — 75Ω ± 5% or high (bridged).

Input Signal Connectors — Films and Equipments Type SO239

Video Response

±1 db from 50 c/s to 7 Mc/s.
Differential gain 10%

Scanning Linearity — Less than ±2½% from the ideal.

Picture Dimensions — 7" x 5¼" (18 cm x 13.5 cm).

Picture Tube — 8½" (21.5 cm) diagonal Mullard Type AW 21-80.

A.C. Supply

Adjustable by selector plugs between the ranges 85-125V and 170-250V a.c. 47-70 c/s.

Power consumption: 145 watts approximately.

A.C. Input Connector — Films and Equipment Type EP-4-14S.

Overall Dimensions

Height	9¼ inches (23.5 cm)
Width	10 inches (25.4 cm)
Depth	16¾ inches (42.5 cm)

Weight — 24 lb (11 kg)

Part No. 842823 C4Z)
842823 C5Z) according to system
842823 C6Z)

includes:- 1 picture tube Mullard AW21-80
Complement of valves.

SECTION 2 - INITIAL INSTALLATION

2.1 GENERAL

The monitor is despatched in a non-returnable cardboard container or a returnable wooden crate, according to the nature of the journey involved. In both cases the valves and picture tube are left in their operating positions and assuming no damage has occured during transport, the unit should be ready to be put into operation immediately after being unpacked.

The complete equipment, with accessories, as normally supplied, comprises the following items:-

1 Monitor Type 2823 C4Z, 2823 C5Z or 2823 C6Z (according to scanning standard required) complete with full complement of valves and picture tube.

1 Instruction and Maintenance Manual, T.P. No. 1172

The two side covers are completely removable to give access to the interior. They are each secured by two screws to the base of the unit. After releasing the screws each cover is removed by lifting outwards and upwards to disengage its upper edge from the tie rail along the top of the unit. Remove the packing material from within the unit and ensure that all the valves are firmly seated in their respective holders and that all top cap connectors are properly attached

2.2 INTERCONNECTING CABLES

Ready made cables with the correct terminating plugs and sockets will be supplied at the length required by the customer at small additional cost; when ordering these cables quote the part numbers given below:-

Power Cable	Part No. 6060/-
Video Cable	Part No. 6057/-

Add the length of the cable in feet, as required, as a suffix to the part number, e.g. Power Cable 6060/10 is a 10 foot power cable supplied with a 4-contact socket ready to insert into the monitor.

Alternatively mating plugs and sockets may be ordered to enable the customer to manufacture his own cables; the mating plugs and sockets are:-

Plug, coaxial, cable mounting Part No. 706682
(one required for each of the four video and sync sockets SK1-4).

Socket, 4-contact, cable-mounting (for mating the a.c. plug PL1). Part No. 704772

2.3 A.C. SUPPLY

The a.c. supply must be connected via a three core, five amp. cable to the input plug PL1. The cable should be connected to the socket as follows:-

Connect the lead from the LIVE side of the supply to contact No. 1
" " " " "NEUTRAL " " " " " " No. 2
" " " " " EARTH " " " " " contacts Nos. 3 and 4.

This last lead connects the metal case of the unit to earth and is an important safety measure. This lead should not be omitted.

Before applying power to the unit ensure that the appropriate voltage taps have been selected on the selector panel under the transparent cover on the back panel. The normal operating tolerance on any setting is ±5% and the taps should be adjusted to the value nearest the input voltage, within this tolerance. Check that the fuse is rated for the appropriate voltage range, i.e. 1.5 amp. anti-surge fuse for the 170-250V a.c. range, or 3 amps. anti-surge fuse for the 85-125V a.c. range.

NOTE: The voltage of the power supply on which the unit is to be operated is normally specified at the time of ordering and a fuse of the appropriate rating will be fitted before despatch.

2.4 SIGNAL INPUTS

Four sockets are provided for connecting 75Ω coaxial cables to each of the video and sync sockets, but use of all of them will depend upon external circuit requirements.

If the video line is to be terminated at the unit link LKA should be set to the terminating position when 75Ω ±5% is connected across the incoming cable and the 'Video Out' socket SK2 is disconnected. When the unit is bridging the coaxial cable LKA is set to 'Bridge' and the video can then be taken from SK2 to feed further units; in this condition the 75Ω terminating resistor is removed, thus preventing double termination from occurring.

When separate synchronising pulses are being used, similar facilities exist at SK3, SK4 and LKC, and LKB should be set to 'Ext. Sync'. When composite video is being used, link LKB should be set to 'Int. Sync'.

2.5 VENTILATION

The monitor relies on convectional cooling to provide adequate ventilation and should not be mounted so that this convection is impeded. When mounted conventionally on a flat open surface, the ambient temperature of the surrounding atmosphere may be allowed to rise to a maximum of 40°C (104°F) but if, for example, it is required to mount the unit face upwards, the maximum limit of the ambient temperature should be reduced to 35°C (95°F).

SECTION 3 - SETTING-UP AND OPERATING PROCEDURE

3.1 INITIAL

Before the unit is put into operation, check that:-

(a) The installation is correct according to the instructions in the previous section, that the input signal amplitudes are correct, and that there is adequate ventilation.

(b) The 'Brightness' and 'Contrast' controls are at their minimum settings, i.e. fully anti-clockwise.

3.2 SETTING-UP PROCEDURE

Normally the unit is ready to switch on and the only controls necessary to adjust will be Brightness and Contrast. However, some of the preset controls may have been disturbed during despatch and ad-adjustment of these controls is necessary.

It will be necessary to remove the side covers from the unit to operate some of these controls. All precautions must be taken when operating inside the unit to avoid accidental contact with the high voltages present. Where such contact may be possible, the unit should be switched off before the adjustment is made.

(a) Switch on the a.c. supply and check the 'power-on' indicator lamp is lit. The a.c. on/off switch is of the push on and push off variety, and in the 'on' position the indicator lamp illuminates the transparent pushbutton.

(b) Allow at least three minutes for the valve heaters to warm up.

(c) Advance the 'brightness' control until a raster appears on the screen, then turn back the control until the raster just disappears.

(d) Advance the 'contrast' control until adequate modulation appears on the screen.

(e) Adjust the vertical and horizontal 'hold' controls, if necessary, to lock the picture in synchronism.

The 'Vertical Hold' control should be set in the centre of its lock-in range, i.e. midway between the positions which cause the picture to roll upwards and downwards respectively.

The 'Horizontal Hold' control should be set in the middle of lock-in range, i.e. in the centre of the two positions where the picture ceases to tear out, not in the centre of the two positions where the picture starts to tear out.

(f) Adjust the 'Height' and 'Width' controls to give the desired size of picture.

(g) Adjust the 'Focus' control to give optimum resolution over the picture; a degree of compromise is necessary between focus at the centre and at the corners of the picture.

(h) If the picture requires rotation, release the polythene deflector coil locking screw at the rear of the deflector coil assembly and rotate the whole assembly until the picture is correctly orientated with respect to the edges of the screen. Relock the locking screw.

(i) Should the picture not be in the centre of the screen adjustment is made by rotating the centring magnets at the rear of the deflector coils until the optimum position is obtained.

Access to the centring and rotation controls is obtained by swinging the printed chassis to its open position.

The above adjustments may be made irrespective of the type of signal applied to the monitor, but for correct adjustment of the vertical and horizontal 'Linearity' controls it is necessary that a test signal with a regular geometric pattern (such as a grid pattern signal) should be used.

(j) The 'Vertical Linearity' control alters the relationship of the top with respect to the remainder of the picture and in adjusting it for optimum linearity it may be necessary to readjust the 'Height' and 'Vertical Hold' controls.

(k) The 'Horizontal Linearity' control affects the left hand side of the picture and whilst adjusting for correct linearity it may be necessary to readjust the 'Width' control.

It should not be necessary to adjust the preset horizontal control or the ion trap magnet except as detailed in the maintenance section.

3.3 NORMAL OPERATION

For normal operation it will only be necessary to switch the a.c. supply on and off as required and occasionally adjust the 'Brightness' and 'Contrast'.

The side covers should be properly secured into position to prevent accidental contact with the high voltages within the unit.

SECTION 4 - TECHNICAL DESCRIPTION

4.1 VIDEO AMPLIFIER

This section comprises a double triode variable gain stage V1 followed by two pentode amplifying stages V2 and V3. The output from V3 is applied to a double triode V4, one half of which is connected as a diode and forms a d.c. restorer on the grid of the other half which is operating as a cathode follower feeding the cathode of the Cathode Ray Tube V12.

All the stages of the video amplifier have d.c. stabilization applied, resulting in the gain of the amplifier being very stable over long durations. This stability is maintained at any position of the 'Contrast' control which varies the voltage gain of the amplifier from 0 to a maximum of 36 db.

Compensation of the amplifier to keep the gain constant at the h.f. end of the video band, is adjusted by the one compensating coil L1. This has been possible by keeping the anode loads of the amplifier stages low, hence minimising phase distortion in the amplifier. The overall frequency response is within ±1db from 50 c/s to 7 Mc/s.

The anode decoupling time constants have been matched to the interstage coupling time constants to maintain a good low frequency response and after d.c. restoration the amplifier is d.c. connected to the cathode ray tube.

4.2 SYNC SEPARATION

The synchronising waveform is either obtained direct from the 'Sync In' socket SK3 or from the complete video waveform from 'Video In' SK1 depending upon the setting of link LKB 'Int/Ext. Sync'. The signal is d.c. restored on the grid of the Sync Amplifier V5 to remove any low frequency spurious signals; it is amplified in V5 and passes to the pentode section of V6.

V6 pentode is operated with a very low screen grid potential, giving the valve a very short control grid base. The sync separator operation is entirely conventional with the positive going syncs on the grid being restored by the diode action of the control grid and cathode of the pentode, this restoration drives the video part of the waveform below cut off of the valve resulting in negative going sync pulses only being obtained at the anode.

The triode section of V6 has a dual purpose of amplifying the sync pulses before passing to integration and differentiation networks and also isolating the loading of these networks from the sync separator itself.

4.3 VERTICAL DEFLECTION

The vertical synchronising pulse is taken from the output of the Sync Separator via the integrating network R64, C24 where the horizontal sync pulses are attenuated with respect to the vertical pulses. The interlace diode MR6 cleans the baseline of the residual horizontal pulses.

The triode-pentode V8 is a combined vertical sweep output and vertical oscillator of the multivibrator type. The R.C. network R92, C50, C51 forms the basic sawtooth voltage waveform for deflecting the picture spot vertically, the auxiliary R.C. network R95, R96, C52, C53 provides an additional waveform which is added to the basic sawtooth to correct the linearity of the sweep. The amount of this additional waveform is controlled by the 'Linearity' control R96 and the amount of the combined waveform that is supplied to the grid of the pentode section is controlled by the 'Height' control R94.

The output pentode V8B and the output transformer T2 translate this voltage waveform into the required current waveform for supplying the vertical deflector coils L2, L3.

The triode section V8A is normally non-conducting except during the flyback period when a large current flows discharging C50, C51 to chassis potential. During this period the triode grid takes grid current which builds up a charge on C47 and C54; during the forward sweeping cycle this charge keeps the valve cut off but the charge leaks away exponentially through R89, R90, R88 and R87, until the grid rises sufficiently positive to allow the valve to conduct and the cycle of events is repeated. The speed of the multivibrator is controlled by the 'Vert. Hold' and is adjusted to be close to the required speed to enable the vertical pulses to hold the multivibrator in synchronism with the incoming signal.

The R.C. network between the pentode anode and the triode grid provides the return circuit of the multivibrator which makes the circuit self oscillatory and provides sharp transition from one stage to the other.

4.4 HORIZONTAL DEFLECTION

Horizontal deflection is obtained from the horizontal oscillator V7 and the horizontal output stage V9 and V10.

The horizontal oscillator is a conventional free running multivibrator whose speed is initially adjusted by the 'Hor. Hold' control R72. The phase of the oscillator is automatically kept in synchronism with the horizontal sync pulses by the d.c. on the grid of V7A. The horizontal pulses from the sync separator are differentiated by the R.C. network C25, R65 and clamp pulses derived from the horizontal output

transformer T3 open the diodes MR2 for a short period during the differentiated horizontal sync period. If the oscillator is in phase with the incoming sync pulses, the voltage at the junction of C25, R65 and the voltage at the junction of R68, R69 are the same value and no change in speed occurs; if however the oscillator has drifted, the voltages at the two points are different values during the clamping period, and the voltage at the junction of R68, R69 is corrected either positively or negatively to pull the oscillator back into phase. The time constants formed by R66, R67, C26 and R68, C27 form a smoothing circuit to reduce the effect of random noise pulses that may occur during the clamping period.

The output from V7B provides a switching waveform which is of the conventional efficiency type circuit where part of the energy returned from the deflector coils L4, L5 is stored in a boost condenser. In this circuit the function of boost condenser is shared by by C36 and C37. The output transformer T3 has the leakage reactance of the E. H. T. overhang winding tuned to the 5th harmonic of the fundamental flyback frequency to minimise velocity modulation of the horizontal deflection which shows up as faint vertical bars on the picture.

The d.c. Flux normally generated in horizontal output transformers together with the required a.c. flux is normally the major source of an objectionable whistle due to magnostriction of the transformer core. The method of connecting the efficiency diode V9 to the transformer, in conjunction with L7, C35 and C36, minimises the d.c. component of flux and results in the monitor operating much more quietly.

The 'Linearity' control L8 is of the conventional saturated core type and the 'Width' control L9 is of the series/shunt type which maintains a constant load on the output circuit at all widths of horizontal deflection.

In addition to providing the horizontal deflection current, the above circuit also supplies E. H. T. for the final anode of V12 and a boosted H. T. for the accelerator and focus anodes. The focussing of the cathode ray beam is adjusted by the 'Focus' control R47 to any value from the boosted H. T. to chassis potential.

4.5 POWER SUPPLIES

The monitor is an a.c. only unit, the power being supplied via transformer T1 from the a.c. plug PL1. Taps on the primary of the transformer, selected by the voltage selector plate under the perspex cover on the back panel, will enable the monitor to be operated within the a.c. input range of 85-125 volts or 170-250 volts a.c., 47-70 cycles, single phase.

One secondary of the transformer supplies 6.3 volts a.c. to all the valve heaters with the exception of V11 which is heated from an auxiliary winding on the horizontal output transformer T3. The other transformer secondary supplies the a.c. for three bridge rectifiers MR3, 4, 5 connected in parallel, which supply the necessary H. T. (B+) for the whole unit via the smoothing circuit L6, C42, C43. The B+ after smoothing is 205 volts ±5 volts.

4.6 REMOTE CONTROLS

The 'Brightness' and 'Contrast' controls are connected to the remote control plug PL2 enabling these two functions to be operated from a remote position, i.e. the control desk of a large console where the remote Brightness and Contrast of several monitors may be grouped together for the convenience of the operator, to enable him to match all the monitors under his surveillance.

The local 'Brightness' control R43 varies the d.c. on the grid of the Cathode Ray tube via R44 and R45. When the remote controls are plugged into PL2 the resistor R44 acts to isolate effectively the local control which becomes very insensitive, thus allowing all the brightness to be controlled from the remote position. A similar condition exists in the 'Contrast' circuit where R4 acts as the isolating resistor.

4.7 PICTURE TUBE

The Mullard AW21-80 is a rectangular picture tube having an ion trap and electrostatic focusing gun assembly. The maximum angular deflection of 90^{o} is provided by the deflection circuits previously described supplying power to deflector coils L2, 3, 4, and 5; immediately behind the deflection assembly are two circular centring magnets which align the picture into the centre of the screen. The moulded screw at the rear of the deflection assembly locks the assembly to the neck of the tube to prevent rotation of the deflection assembly. If, however, the picture needs rotation, slacken off this screw, rotate the assembly as required and retighten the screw.

The ion trap magnet nearest the base of the tube is aligned in the factory to give the brightest, even illumination without signs of shading in the corners.

SECTION 5 - MAINTENANCE

5.1 GENERAL

When servicing this equipment, it is essential to take the usual precautions to avoid accidental contact with points on which high voltages are present. Before making any adjustments which may involve personal contact with these points, it is recommended that the power input connector is removed and that reservoir condensers etc. are discharged.

The location of faults will be facilitated by comparing the voltages and waveforms at appropriate points with those indicated in the voltage and waveform analysis. Any standard multi-range voltmeter and oscilloscope of sufficiently high grade may be used to make these checks, provided the test instrument does not, on application, alter the circuit operating conditions which may prove misleading. The valve base connections shown on the circuit diagram are for a valve viewed from underneath and the pins counted clockwise. The measurements on the analysis sheets were taken with an Avometer Model 8 (20kΩ/volt) and a Tektronix Oscilloscope 524AD with input leads unscreened and approximately 3 feet in length; use of other measuring instruments may result in the values being altered.

The voltage and waveforms are average values and individual units may be found to differ slightly, due to the usual manufacturing tolerances. Any wide divergence between a measured value and the nominal figure given should be immediately investigated.

5.2 POWER UNIT RESISTANCE MEASUREMENTS

The following resistance measurements are for a correctly working power unit; if any of these are found incorrect the monitor will consistantly blow its fuses in protection. The readings in Section 1 should be carried out with a 500V Megger and the readings in Sections 2 or 3 with a Model 8 Avometer on the ohms ranges, or a high quality ohm-meter.

1. Resistance of the a.c. input to chassis should be greater than 20 meg-ohms; if below this value, the insulation of the a.c. transformer T1 or the primary wiring between T1 and PL1 pins 1 or 2 is suspect.

2. Resistance of the B+ line to chassis should be greater than 7 meg-ohms. This measurement may be below 7 meg-ohms on application of the ohm-meter, but will gradually rise as the various condensers build up their charges; as long as the reading ultimately rises above 7 meg-ohms the B+ line is satisfactory. If, however the rading is lower, there is a fault condition on the line and progressive isolation of various sections should easily locate the fault.

3. Resistance of the valve heater circuit to chassis should be 23.5Ω ±10%; any variation on this limit will indicate short circuit or open circuit fault. Short circuit fault is usually attributable to heater to cathode short circuit within a valve; progressive substitution will soon clear.

5.3 PICTURE TUBE REPLACEMENT

The procedure for withdrawing and replacing the picture tube is given in Fig. 3. During the procedure great care should be taken to avoid implosion and a pair of safety goggles should be worn to protect the eyes.

After fitting the replacement tube, the unit should be put into operation by following the setting-up procedure given in Section 3.2 of this manual and adjusting the ion-tap magnet to its optimum position as follows:-

Advance the 'Brightness' control to maximum. Move the magnet slowly forward, rotating it about the neck of the tube at the same time so that one revolution is completed each time the magnet moves forward by its own thickness; as the picture brightness increases turn the 'Brightness' control back to keep the screen illumination at an acceptable level. Final position for the ion-tap magnet is when the screen illumination is at a maximum for a given 'Brightness' setting, when the illumination is even over the whole screen and when there are no dark shadows in the corners of the picture.

WARNING: The magnet must be handled carefully and not subjected to mechanical shocks. Keep it clear of other magnets.

5.4 ADJUSTMENT OF PRESET HORIZONTAL HOLD CONTROL

This control should only be adjusted when the 'lock-in' range of the normal 'Hor. Hold' control is not near its mid-setting.

The preset control should be adjusted as follows:-

(a) Set the normal 'Hor. Hold' control R72 to its mid-position.

(b) Adjust the preset trimmer C30 until the picture locks in.

(c) Operate the normal 'Hor. Hold' control over its range and check that lock-in occurs when the control is at its mid-setting.

If the position at (c) cannot be obtained, replace the horizontal oscillator valve (V7) and repeat the above procedure. Should this not prove effective, the incorrect operation will be caused by a faulty component in the oscillator or discriminator circuits or by a lack of one of the necessary signals, i.e. differentiated horizontal sync pulses or either of the clamp pulses.

5.5 REALIGNMENT OF VIDEO AMPLIFIER

The following apparatus will be required to realign the video amplifier:-

Either a sinc-wave oscillator covering the video frequencies of 50c/s to 7 Mc/s and a valve-voltmeter with a high impedance low capacity input, or a sweeping oscillator with a maximum frequency of at least 7 Mc/s, a sweep detector and high stability oscilloscope.

ALIGNMENT PROCEDURE

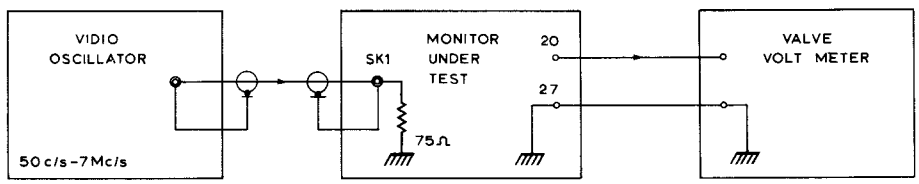


Fig. 2A

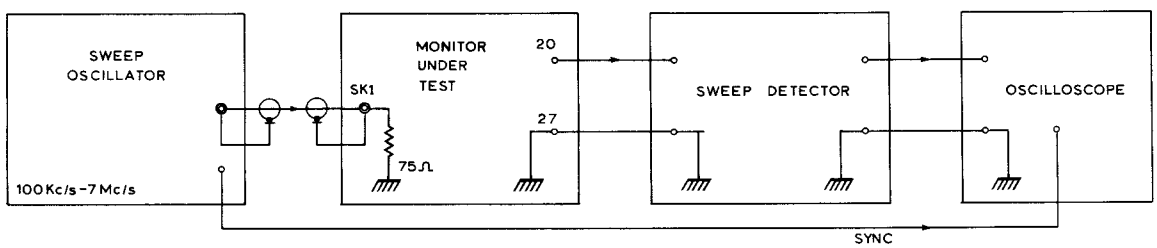


Fig. 2B

1. Connect oscillator to the monitor as shown in Fig. 2 to the 'Video In' socket SK1 and terminate in 75Ω.

2. Either connect the valve-voltmeter between tag 20 on the printed chassis and the chassis connection, tag 27, keeping the leads as short as possible.

   Or connect the sweep detector between tags 20 and 27 on the printed chassis and connect the oscilloscope to the detector as shown in Fig. 2B.

3. Remove valves V7, V9 and V10 to stop the horizontal sweep circuits from operating. Large signals would otherwise be generated which would interfere with the alignment.

4. Switch on all the apparatus and allow 10 minutes for the circuits to settle down to their steady working conditions.

5. Adjust L1 for response flat to ±1db to 7 Mc/s, then secure the durt iron core with Ragosine Core Locking Compound type 8G.

NOTE: Care should be taken to keep the signal input to the monitor to less than 0.5 volt to prevent overloading the circuit during alignment.

SECTION 6 - PARTS LIST

6.1 RESISTORS

Code				Part No.	Circuit Location
R1	75Ω	± 5%	0.5W	671919	Back Panel
R2	180kΩ	±10%	0.25W	670545	V1
R3	50kΩ	Variable		811182	V1
R4	220kΩ	±10%	0.25W	670546	V1
R5	470kΩ	±10%	0.25W	670550	V1
R6	100Ω	±10%	0.25W	670506	V1
R7	2.7kΩ	± 5%	3W	678283	V1
R8	680Ω	± 5%	0.5W	672502	V1
R9	10Ω	± 5%	0.25W	671098	V1
R10	47Ω	±10%	0.25W	670502	V1
R11	3.3kΩ	± 5%	3W	678285	V1
R12	100Ω	± 5%	0.25W	671090	V1
R13	10Ω	± 5%	0.25W	671098	V1
R14	47Ω	±10%	0.25W	670502	V1
R15	1.2kΩ	± 5%	3W	678275	V1
R16	100Ω	±10%	0.25W	670506	V1
R17	470kΩ	±10%	0.25W	670550	V1
R18	18kΩ	± 5%	3W	678303	V1
R19	150kΩ	±10%	0.25W	670544	V2
R20	10kΩ	± 5%	0.25W	671072	V2
R21	470kΩ	±10%	0.25W	670550	V2
R22	100Ω	±10%	0.25W	670506	V2
R23	1.8kΩ	± 5%	3W	678279	V2
R24	560Ω	± 5%	0.5W	673849	V2
R25	120Ω	± 5%	0.25W	672276	V2
R26	470Ω	± 5%	0.5W	671065	V2
R27	150kΩ	±10%	0.25W	670544	V3
R28	4.7kΩ	± 5%	0.5W	677364	V3
R29	220kΩ	±10%	0.25W	670546	V3
R30	100Ω	±10%	0.25W	670506	V3
R31	22kΩ	± 5%	0.25W	670777	V3
R32	1kΩ	± 5%	3W	678273	V3
R33	1.5kΩ	± 5%	3W	678277	V3
R34	47Ω	± 5%	0.25W	670796	V3
R35	180Ω	± 5%	0.5W	671918	V3
R36	82kΩ	± 5%	0.25W	670788	V4
R37	100kΩ	± 5%	0.25W	671074	V4
R38	2.7MΩ	±10%	0.25W	670559	V4
R39	100Ω	±10%	0.25W	670506	V4
R40	100Ω	±10%	0.25W	670506	V4
R41	10kΩ	± 5%	33W	678297	V4
R42	100kΩ	±10%	0.25W	670542	Front Panel
R43	100kΩ	Variable		811183	Front Panel
R44	470kΩ	±10%	0.25W	670550	Front Panel
R45	47kΩ	±10%	0.25W	670538	V12
R46	100kΩ	±10%	0.25W	670542	R.H. Rear
R47	2MΩ	Variable		810828	L.H. Front

6.1 RESISTORS (Cont.)

Code				Part No.	Circuit Location
R48	1.2MΩ	±10%	0.25W	670555	R.H. Rear
R49	2.2kΩ	±10%	0.5W	670446	Def. Coil
R50	3.9kΩ	±10%	0.5W	670449	Def. Coil
R51	3.9kΩ	±10%	0.5W	670449	Def. Coil
R52	75Ω	± 5%	0.5W	671919	Rear Panel
R53	1.2kΩ	± 5%	4W	676379	V5
R54	470kΩ	±10%	0.25W	670550	V5
R55	8.2kΩ	±10%	0.25W	670529	V5
R56	12kΩ	± 5%	4W	676317	V5
R57	220Ω	±10%	0.25W	670510	V5
R58	680kΩ	±10%	0.25W	670552	V6
R59	330kΩ	±10%	0.25W	670548	V6
R60	120kΩ	±10%	0.25W	670543	V6
R61	47kΩ	±10%	0.5W	670462	V6
R62	15kΩ	±10%	1W	672357	V6
R63	6.8kΩ	±10%	0.5W	670452	V6
R64	100kΩ	±10%	0.25W	670542	V6
R65	10kΩ	±10%	0.25W	670530	V6
R66	330kΩ	± 5%	0.25W	671930	V7
R67	330kΩ	± 5%	0.25W	671930	V7
R68	12kΩ	±10%	0.25W	670531	V7
R69	680Ω	±10%	0.25W	670516	V7
R70	22kΩ	±10%	0.5W	670458	V7
R71	100kΩ	±10%	0.25W	670542	V7
R72	250kΩ	Variable	Pt. of	811184	V7
R73	47kΩ	±10%	0.25W	670538	V7
R74	82kΩ	±10%	0.25W	670541	V7
R75	1kΩ	±10%	0.25W	670518	V7
R76	470kΩ	±10%	0.25W	670550	V7
R77	100Ω	±10%	0.25W	670506	V10
R78	2.2kΩ	± 5%	6W	671841	V10
R79	2.7kΩ	±10%	1W	672383	V10
R80	2.7kΩ	± 5%	6W	676127	V10
R81 *	15kΩ	± 5%	0.25W	670775	V7
R82 *	15kΩ	± 5%	0.25W	670775	V7
R83	10Ω	±10%	0.25W	670494	V8
R84	1MΩ	±10%	0.25W	670554	V8
R85	820kΩ	±10%	0.25W	670553	V8
R86	220kΩ	±10%	0.25W	670546	V8
R87	6.8kΩ	±10%	0.25W	670528	V8
R88	20kΩ	Variable	Pt. of	811184	V8
R89	47kΩ	±10%	0.25W	670538	V8
R90	1.2kΩ	±10%	0.25W	670555	V8
R91	22kΩ	±10%	0.25W	670534	V8
R92	2.2MΩ	±10%	0.25W	670558	V8
R93	220kΩ	±10%	0.25W	670546	V8
R94	1MΩ	Variable	Pt. of	811184	V8
R95	100kΩ	±10%	0.25W	670542	V8
R96	500kΩ	Variable	Pt. of	811184	V8
R97	270kΩ	±10%	0.25W	670547	V8

* Deleted on C5Z and C6Z

6.1 RESISTORS (Cont.)

Code				Part No.	Circuit Location
R98	270kΩ	±10%	0.25W	670547	V8
R99	2.2MΩ	±10%	0.25W	670558	V8
R100	1kΩ	±10%	0.25W	670518	V8
R101	820Ω	±10%	1W	674715	V8
R102	12Ω	± 5%	4½W	677920	Mains Unit

6.2 CAPACITORS

C1	0.5µF	±20%	150V	668908	V1
C2	100µF	+50%-20%	275V	667545	V1
C3	100µF	+50%-20%	275V	667545	V1
C4	0.25µF	±20%	250V	668904	V1
C5	0.5µF	±20%	150V	668908	V1
C6	100µF	+50%-20%	275V	667545	V2
C7	0.01µF	±20%	150V	669516	V2
C8	0.01µF	±20%	150V	669516	V2
C9	0.25µF	±20%	250V	668904	V2
C10	1000µF	+50%-20%	12V	667968	V2
C11	100µF	+50%-20%	275V	667545	V3
C12	8µF	+50%-20%	350V	667771	V3
C13	0.05µF	±20%	250V	668899	V3
C14	1000µF	+50%-20%	12V	667968	V3
C15	4µF	+50%-20%	150V	667838	V4
C16	0.01µF	±25%	200V	668962	V12
C17	0.05µF	±20%	600V	668889	V12
C18	0.1µF	±20%	750V	668892	V12
C19	100pF	±10%	5kV	660032	Def. Coil
C20	16µF	+50%-20%	350V	667939	V5
C21	0.01µF	±20%	400V	669478	V5
C22	1000pF	±20%	500V	653189	V5
C23	0.1µF	±20%	250V	668901	V5
C24	220pF	±10%	350V	661002	V6
C25	150pF	±10%	350V	661012	V6
C26	0.01µF	±20%	150V	669516	V7
C27	0.1µF	±20%	150V	668902	V7
C28	120pF	±10%	350V	661016	V7
C29	390pF	±10%	350V	661005	V7
C30	130pF	Trimmer		800411	V7
C31	0.01µF	±20%	400V	669478	V7
C32 (on 2823 C4Z)	220pF	±10%	350V	661002	V7
C32 (on 2823 C5Z, C6Z)	47pF	±10%	350V	661006	V7
C33	0.005µF	±20%	400V	669477	V10
C34 (on C4Z)	140pF	±10%	5kV	660054	V9
C34 (on C5Z and C6Z)	33pF	±10%	5kV	660067	V9

6.2 CAPACITORS (Cont.)

Code				Part No.	Circuit Location
C35	0.1μF	±20%	750V	668892	V9
C36 **	0.25μF	±20%	350V	668903	V9
C36 †	0.1μF	±20%	350V	668900	V9
C37 **	0.25μF	±20%	350V	669124	V9
C37 †	0.05μF	±20%	350V	668898	V9
C38	0.01μF	±20%	400V	669478	V10
C39	0.01μF	±20%	400V	669478	V10
C40	1000pF	± 5%	350V	665025	V7
C41	1000pF	± 5%	350V	665025	V7
C42	100μF	+50%-20%	275V	667784	on base
C43	200μF	+50%-20%	275V	667784	on base
C44	0.01μF	±20%	400V	669478	V8
C45	1000pF	±20%	500V	653189	V8
C46	1800pF	±20%	500V	666556	V8
C47	1000pF	±20%	500V	653189	V8
C48	2μF	+50%-20%	200V	667841	V8
C49	470pF	±10%	350V	661014	V8
C50	0.01μF	±10%	400V	669229	V8
C51	0.01μF	±10%	400V	669229	V8
C52	0.01μF	±10%	400V	669229	V8
C53	0.01μF	±10%	400V	669229	V8
C54	0.005μF	±10%	400V	669477	V8
C55	470pF	±10%	350V	661014	V8
C56	NOT USED				
C57	0.04μF	±10%	150V	669517	V8
C58	0.25μF	±10%	250V	668904	V8
C59	200μF	+50%-20%	25V	680000	V8
C60 **	82pF	±10%		661009	V7

** (on C4Z)
† (on C5Z and C6Z)

6.3 VALVES

V1	E88CC	860493
V2	E180F	860464
V3	EL86	860534
V4	12AU7	860302
V5	EF80	860175
V6	ECF80	860324
V7	ECF80	860324
V8	ECL82	860450
V9	EY81	860325
V10	EL81	860255
V11	EY86	860382
V12	AW21-80	860559

6.4 WINDINGS

Code	Item	Part No.
T1	Transformer A.C. Supply	771831
T2	Transformer Vert. Output	771832
T3 (on C4Z)	Transformer Hor. Output	771837
T3 (on C5Z & C6Z)	Transformer Hor. Output	771838
L1	Compensating Coil 8.2μH	782261
L2, 3, 4, 5	Deflector Coil Assembly	744603
L6	D.C. Smoothing Choke	790525
L7	Injection Choke	790449
L8	Linearity Coil	744605
L9 (on C4Z)	Amplitude Coil	744604
L9 (on C5Z & C6Z)	Amplitude Coil	744642

6.5 MISCELLANEOUS

Code		Part No.	Circuit Location
SK1-4	Sockets Coaxial	706930	Rear Panel
	Mating Plugs for above (4)	706682	Rear Panel
PL1	Plug 4 contact a.c. IN	704295	Rear Panel
	Mating Socket for above	704772	Rear Panel
PL2	Plug and Mating Socket - remote control -	704277	Rear Panel
FS1	Fuse 1.5A Antisurge (170-250V range)	700489	Rear Panel
	Fuse 3.0A Antisurge (85-125V range)	701407	Rear Panel
MR1	Crystal OA5	707846	V5
MR2	Selenium Rect. D3-2 1YZ or P3/2D	709060	V7
MR3	Silicon Rect. FST1/3	721608	Mains Unit
MR4	Silicon Rect. FST1/3	721608	Mains Unit
MR5, MR7	Silicon Rect. FST1/3	721608	Mains Unit
MR6	Crystal Rect. CG12E	704513/B	V8
SWA	Switch AC ON/OFF	744621	Front Panel
L.P.1	Pilot Lamp 6V 0.36W Les. 5mm	706398	Front Panel
	1 on Trap Magnet	714113	V12
	Centring Magnet Flat	714360	Def. Coil
	Centring Magnet Bent	714361	Def. Coil

VOLTAGE & WAVEFORM ANALYSIS

VOLTMETER AVOMETER MODEL 8 20,000Ω/VOLT. CIRCUIT CONDITIONS *NORMAL PICTURE, GRID PATTERN. 100% SCAN.*

VOLTAGE READINGS TAKEN WITH RESPECT TO CHASSIS ON LOWEST POSSIBLE RANGE. UNLESS OTHERWISE STATED.
MINIMUM AND MAXIMUM VALUES GIVEN FOR ELECTRODES WHICH ARE AFFECTED BY VARIATION OF CONTROLS.
TIMEBASE SWEEP SPEED ON OSCILLOSCOPE — H = HORIZONTAL.— V = VERTICAL FREQUENCY.
ALL WAVEFORMS SHOWN WITH POSITIVE EXCURSION TOWARDS TOP OF PAGE. e.g. + O −
HEATER VOLTS 6·3 V.A.C. UNLESS OTHERWISE STATED.

* *GRID VOLTAGES READ AT "COLD" END OF THE GRID LEAK.*
▣ *MAXIMUM, NORMAL AND MINIMUM POSITIONS OF THE CONTROL.*

VALVE		ANODE				SCREEN GRID G2.				CONTROL GRID G1				CATHODE				HTR.
No.	TYPE	PIN No.	VOLTS D. C.	WAVE – FORM.	VOLTS P – P.	PIN No.	VOLTS D. C.	WAVE – FORM.	VOLTS P – P.	PIN No.	VOLTS D. C.	WAVE – FORM.	VOLTS P – P.	PIN No.	VOLTS D. C.	WAVE – FORM.	VOLTS P – P.	PIN Nos.
1A	E88CC	1	155 ▣ 198 222							2	47 * 24 ▣ 0			3	54 ▣ 31 14	AS FOR V1. PIN 7.	0·36	4,5.
1B		6	157 ▣ 202 227	V	1·8					7	47 * 24 ▣ 0	V	1·0 ON C4Z 1·4 ON C5Z & C6Z	8	54 ▣ 31 14	AS FOR V1. PIN 7.	0·36	
2	E180F	7	164	AS FOR V1 PIN 7.	4·1	9	175			2	13 *	AS FOR V1. PIN 6.	1·8	1,3.	20·4	V	1·05	4.5.
3	EL86	7	91	AS FOR V2. PIN 1,3.	36	9	85			2	7 *	AS FOR V2. PIN 7.	4·1	3	10·2	V	1·1	4.5.
4A	ECC82 12AU7	1	48	AS FOR V2. PIN 1,3.	36					2	30	AS FOR V2. PIN 1,3.	36	3	118			4,5,9.
4B		6	220							7	30	AS FOR V2. PIN 1,3.	36	8	60 ▣ 82 115	AS FOR V2. PIN 1,3.	34	
5	EF80	7	78	V	22	8	170			2	0 *	V	1·0 ON C4Z 1·4 ON C5Z & C6Z	1,3.	2·6	AS FOR V5. PIN 2.	0·6	4,5.
6A	ECF80	1	92	V	60					9	62	V	46	8	63	V	47	4,5.
6B		6	62	AS FOR V6. PIN 9.	46	3	111			2	0 *	AS FOR V5. PIN 7.	22	7	0			

UNIT. PICTURE MONITOR TYPE 2823.

SHEET 1 OF 2

D.T.P. 1613

CONTINUED

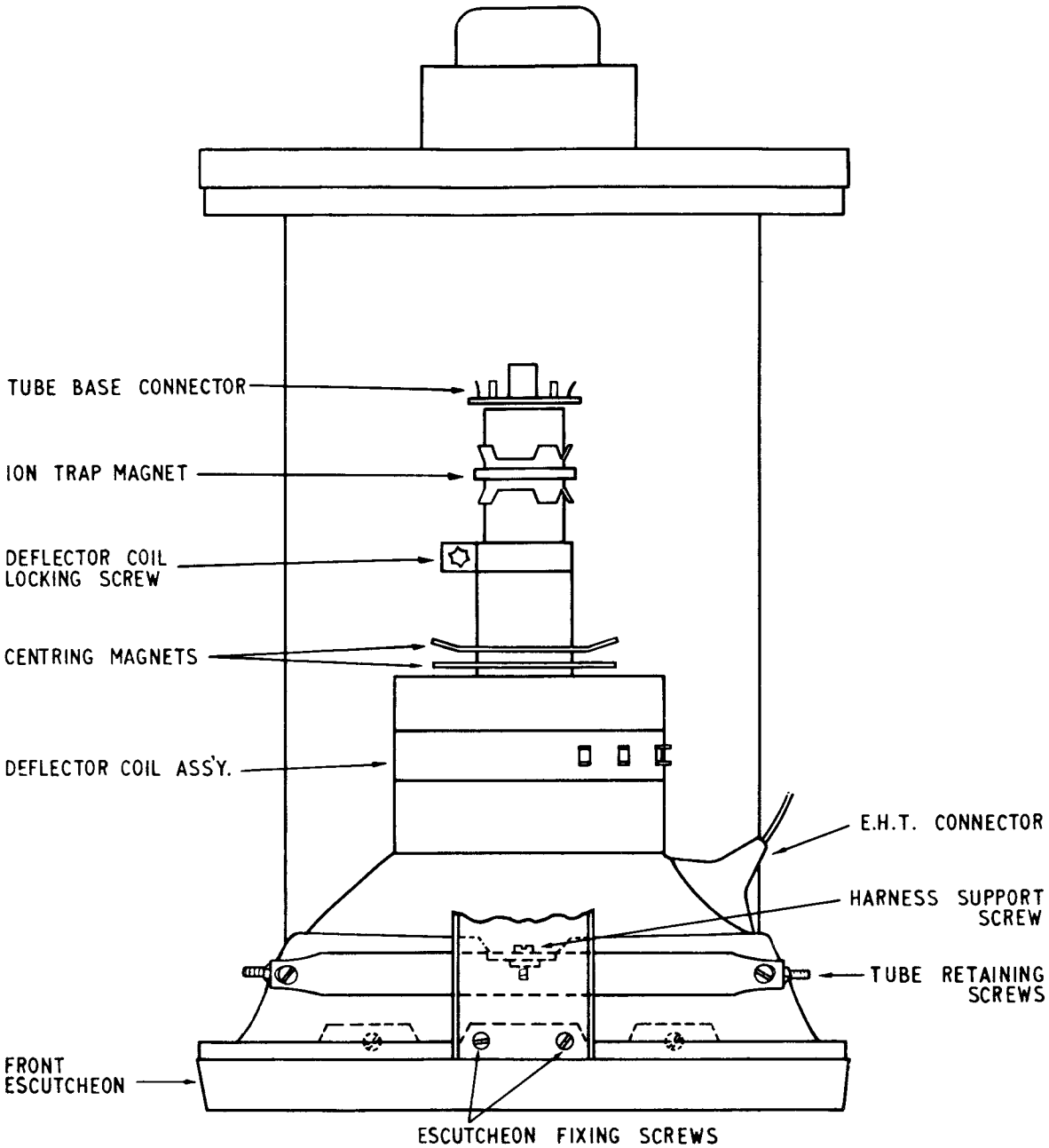
VOLTAGE & WAVEFORM ANALYSIS

VALVE		ANODE				SCREEN GRID G2				CONTROL GRID G1				CATHODE				HTR.
No.	TYPE	PIN No.	VOLTS D.C.	WAVE-FORM	VOLTS P-P	PIN No.	VOLTS D.C.	WAVE-FORM	VOLTS P-P	PIN No.	VOLTS D.C.	WAVE-FORM	VOLTS P-P	PIN No.	VOLTS D.C.	WAVE-FORM.	VOLTS P-P	PIN Nos.
7A	ECF 80	1	115	H	26					9		H	11·5	8	5·6	H	27	4,5.
7B		6	120	H	125	3	130	H	104	2	0 *	H	48	7	5·6	AS FOR V7. PIN 8.	27	
8A	ECL82	9	27 † 19 0	V	37					1	-16 *	V	78	8	0			4,5.
8B		6	210	V	1250	7	220			3	0 *	V	13 †	2	20	V	0·8	
9	EY81	9	215											T.C.		READINGS UPSET OPERATION		4,5.
10	EL81	T.C.		READINGS UPSET OPERATION		8	160 AT	MAX. BRIGHTNESS. MIN.		2	*	AS FOR V7. PIN 6.	125	3,9.	0			4,5.
11	EY86	T.C.												6	7·2 K.V. 8·4 K.V. 8·4 K.V.	MAX. † AT NORM. MIN.	BRIGHT.	1,5. △
12	AW21-80		7·2 K.V. 8·4 K.V. 8·4 K.V.	FINAL ANODE MAX. AT NORM. BRIGHTNESS MIN.	†	10	FIRST 530	ANODE		2	60 10 AT 0	MAX. NORM. BRIGHTNESS MIN.		11	60 ⊠ 82 115	AS FOR V2. PIN 1,3.	34	1, 12.
						6	FOCUS 0 TO 530	ANODE										

† READING TAKEN ON 20 K.V. ELECTROSTATIC VOLTMETER.

‡ VERT HOLD AFFECTED BY METER OR OSCILLOSCOPE.

△ HEATER SUPPLY OBTAINED FROM HORIZONTAL OUTPUT TRANSFORMER.

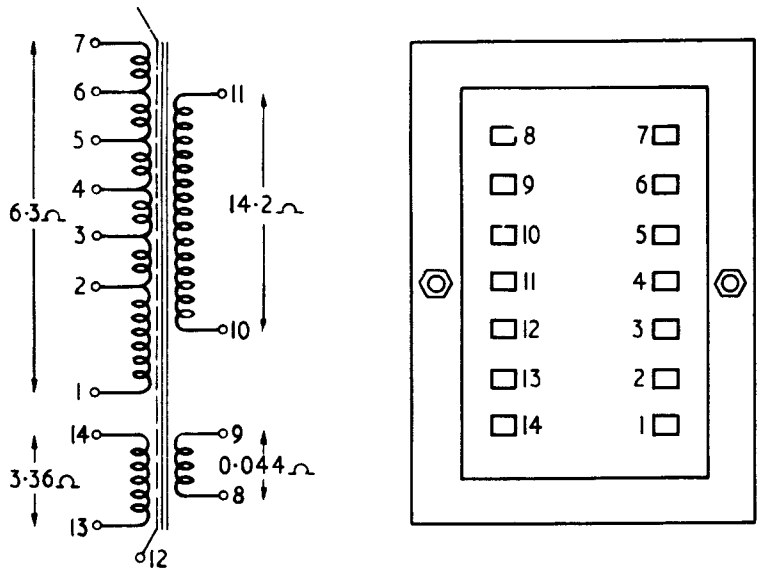


PICTURE TUBE REPLACEMENT PROCEDURE

1. UNSOLDER DEFLECTOR COIL CONNECTIONS, MAKING A NOTE OF THE CONNECTIONS FOR REFERENCE DURING REWIRING.
2. REMOVE TUBE BASE CONNECTOR.
3. REMOVE HARNESS SUPPORT SCREW.
4. REMOVE THE FOUR ESCUTCHEON FIXING SCREWS, REMOVE ESCUTCHEON.
5. REMOVE E.H.T. CONNECTOR.
6. SLACKEN TUBE RETAINING SCREWS AND WITHDRAW TUBE, TOGETHER WITH DEFLECTOR COIL ASSEMBLY AND ION TRAP MAGNET FROM THE MONITOR.
7. SLACKEN DEFLECTOR COIL LOCKING SCREW AND TRANSFER DEFLECTOR COIL ASSEMBLY AND ION TRAP MAGNET TO THE NEW PICTURE TUBE.
8. INSERT NEW PICTURE TUBE REVERSING THE PROCEDURE 1-6.

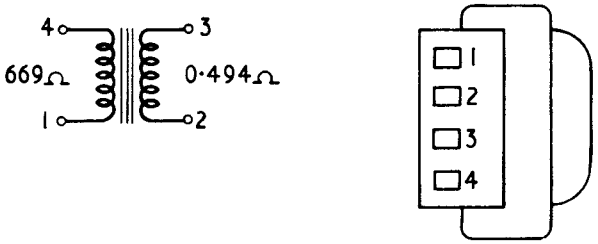
FIGURE 3

D.T.P.934



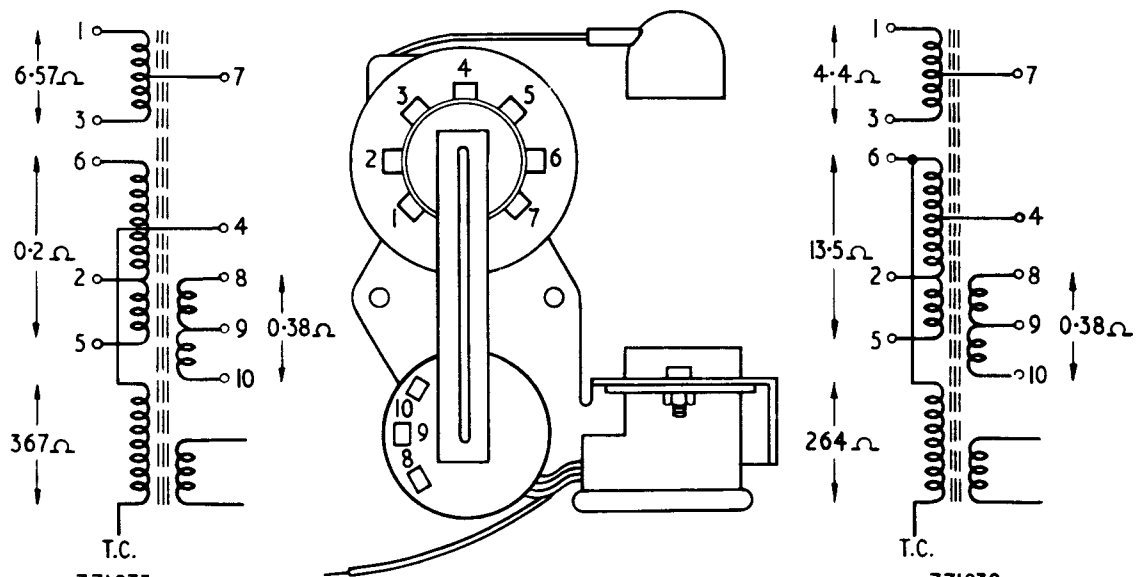
T1 A.C. INPUT TRANSFORMER
TYPE 771831

FIG. 4A



T2 VERTICAL OUTPUT TRANSFORMER
TYPE 771832

FIG. 4B



771873
405 LINE VERSION

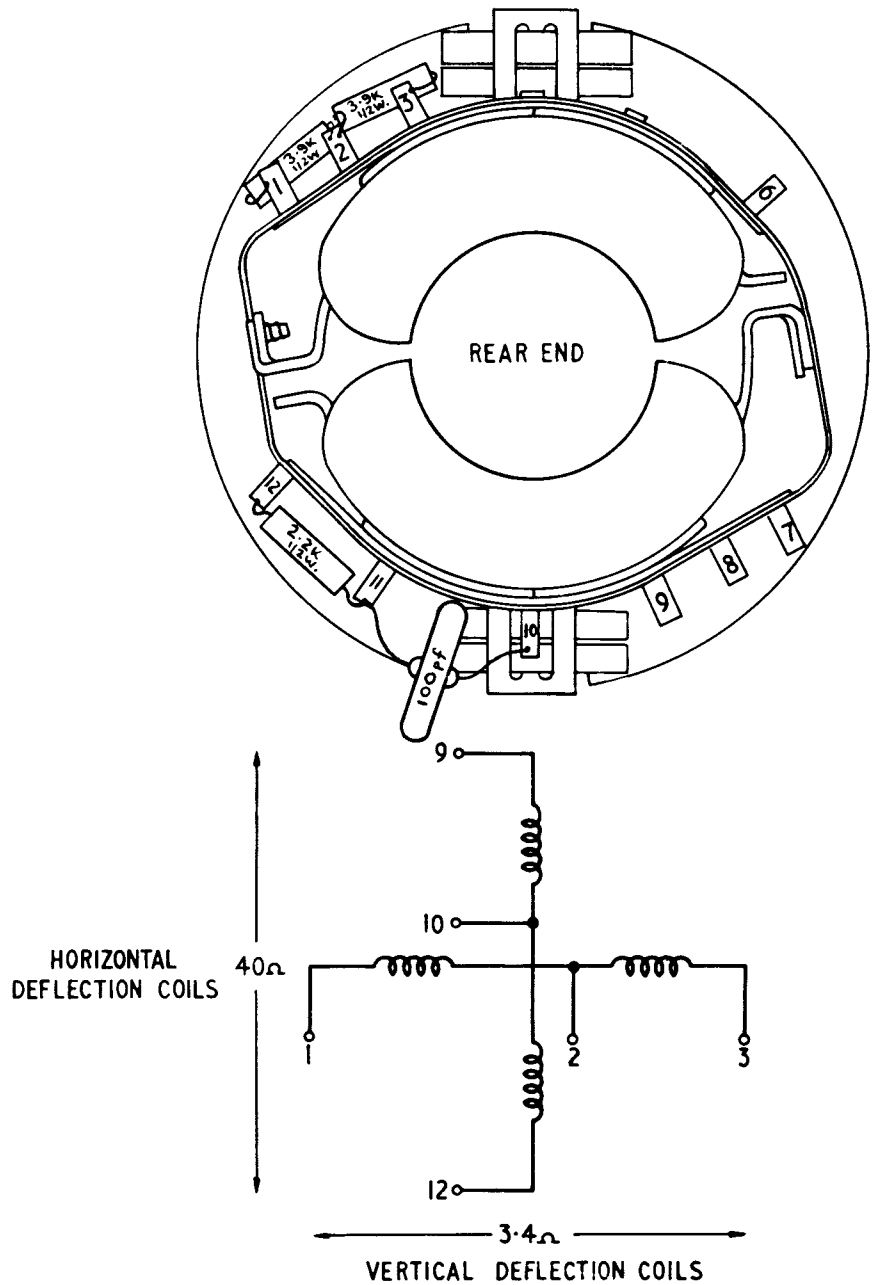
T3 HORIZONTAL OUTPUT TRANSFORMERS

FIG. 4C

771838
525 & 625 LINE VERSION

FIGS. 4A. 4B. 4C

D.T.P. 936



DEFLECTOR COIL ASSEMBLY 744603

FIGURE 4D
D.T.P.935

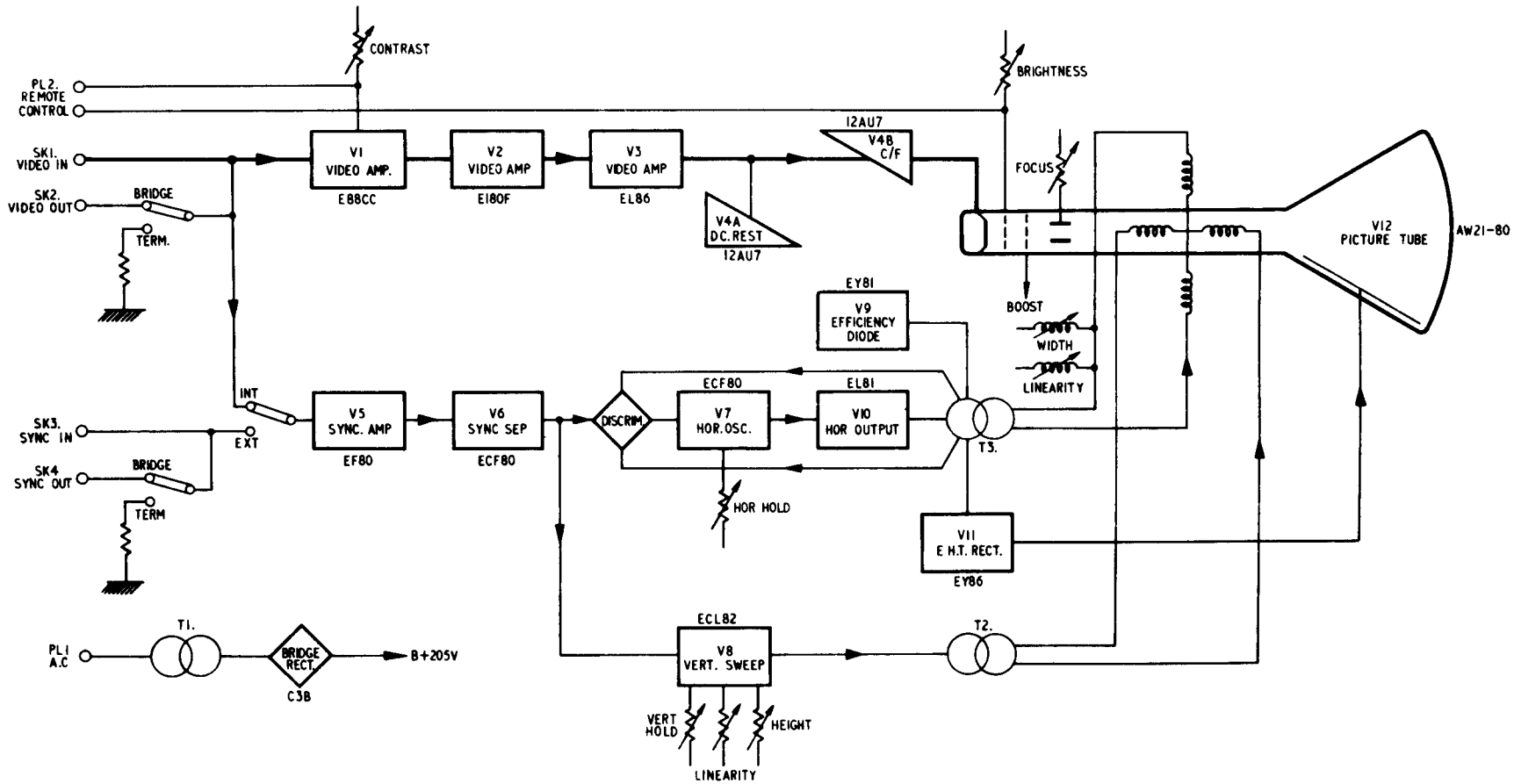
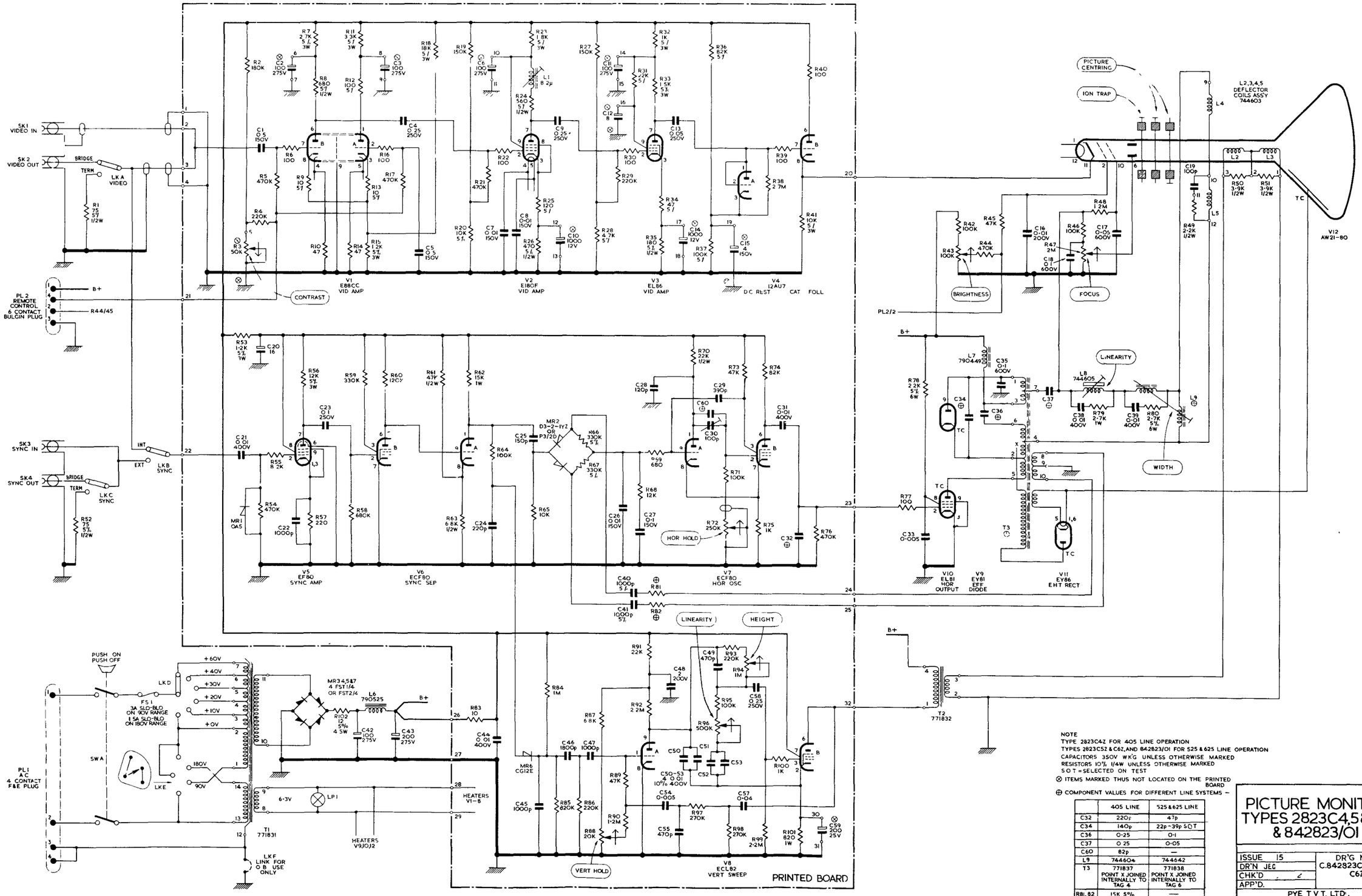


DIAGRAM 1
D.T.P. 989

PICTURE MONITOR TYPE 2823

BLOCK DIAGRAM



NOTE
TYPE 2823C4Z FOR 405 LINE OPERATION
TYPES 2823C5Z & C6Z, AND 842823/01 FOR 525 & 625 LINE OPERATION
CAPACITORS 350V W'K'G UNLESS OTHERWISE MARKED
RESISTORS 10% 1/4W UNLESS OTHERWISE MARKED
SOT = SELECTED ON TEST
⊗ ITEMS MARKED THUS NOT LOCATED ON THE PRINTED BOARD
⊕ COMPONENT VALUES FOR DIFFERENT LINE SYSTEMS –

	405 LINE	525 & 625 LINE
C32	220p	47p
C34	140p	22p-39p SOT
C36	0·25	0·1
C37	0·25	0·05
C60	82p	—
L9	744604	744642
T3	771837 POINT X JOINED INTERNALLY TO TAG 4	771838 POINT X JOINED INTERNALLY TO TAG 6
RB1, 82	15K 5%	—

PICTURE MONITOR TYPES 2823C4,5&6Z, & 842823/01

ISSUE 15	DR'G No C.842823C4Z,C5Z, C6Z & /01
DR'N JEG	
CHK'D	
APP'D.	

PYE T.V.T. LTD. CAMBRIDGE. ENGLAND