PYE

Service Information

For the

PYE

KT3 Chassis

StudioCOLOUR

COLOUR
TELEVISION

'KT3'

CIRCUIT DESCRIPTION

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I POWER SUPPLY

1. Automatic degaussing (Fig. 1)

When the set is switched on, PTC resistor R6292 is cold and its resistance is low. The current in the degaussing coils is therefore large (approximately 2,75A) but as this current flows through R6292a, this resistor warms up rapidly and the current also decreases rapidly. R6292b ensures that in spite of the small current in R6292a, it remains warm by virtue of the thermal coupling so that the steady state current is only a few mA's. The degaussing circuit is rendered inoperative when connector A2 is unplugged, allowing R6292 to cool down completely. Refitting the connector A2 will give a visual check of the degaussing.

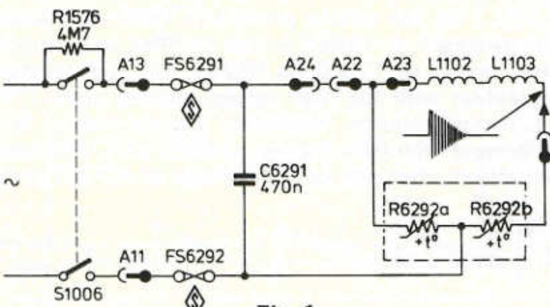


Fig. 1

2. Rectifier and smoothing

D6292, D6294, D6295 and D6296 provide full-wave rectification. R1576, by draining away any static charge, ensures that the chassis is at earth potential when the mains switch is in the off position. L6292 together with C6292, C6294, C6295 and C6296 constitute an H.F., rejection filter so that interference generated in the set is not fed back to the mains supply. The capacitors also protect the diodes against inverse voltage surges. R6291 limits current transients when the set is switched on.

3. Switched-mode power supply (Fig. 2)

a. Operation. This power supply circuit supplies a stabilised voltage of 129V to the horizontal output stage and is protected against excess currents and voltages. The operating principle is that of a loss-free d.c. converter in which T1463 is turned on and off by the drive section at line frequency, 15,625 times per second. When T1463 is turned on during the time t1, the voltage on the emitter will be 290V approx. (Fig. 3) and energy is stored in L1465. When T1463 is cut off, during t2, the current in L1465 tends to persist and D1464 is turned on via sensing resistor R1461. The emitter voltage of T1463 then becomes approximately 0V. This results in a square-wave voltage of 290V p – p on the emitter of T1463 (Fig. 3). By means of L1465 and C1460b an average value of this square-wave voltage is obtained, directly proportional to the ratio of t1 to (t1 + t2). This is referred to as the duty cycle. In order to stabilise the output voltage, regardless of the input voltage or load, the output is compared to a reference voltage. When the drive section detects that the output voltage is too high, the duty cycle is reduced. The reverse happens if the output voltage is too low. When the current through the load increases the current through D1464 also increases and the pulses across R1461 become more negative. If these pulses exceed a certain value, the drive section is switched off and the duty cycle becomes zero. This is the overcurrent protection arrangement.

b. Practical circuit. L7351 has been included to ensure that T1463 is correctly driven by the drive section. This is because the emitter voltage of T1463 is not fixed, but varies between 290V and 0V. L1461, L1462 and L1464 are chokes, L1463 ensuring a fast turn-off of T1463 by the self-induction effect. C1462 limits the turn-off dissipation by being charged directly after the turn-off of T1463. C7351 ensures that the base current of T1463 is large when the transistor is turned on, in order to reduce the dissipation, while R7351 limits the maximum base current. The two secondaries of L1465 supply a positive voltage during t2 of the duty cycle.

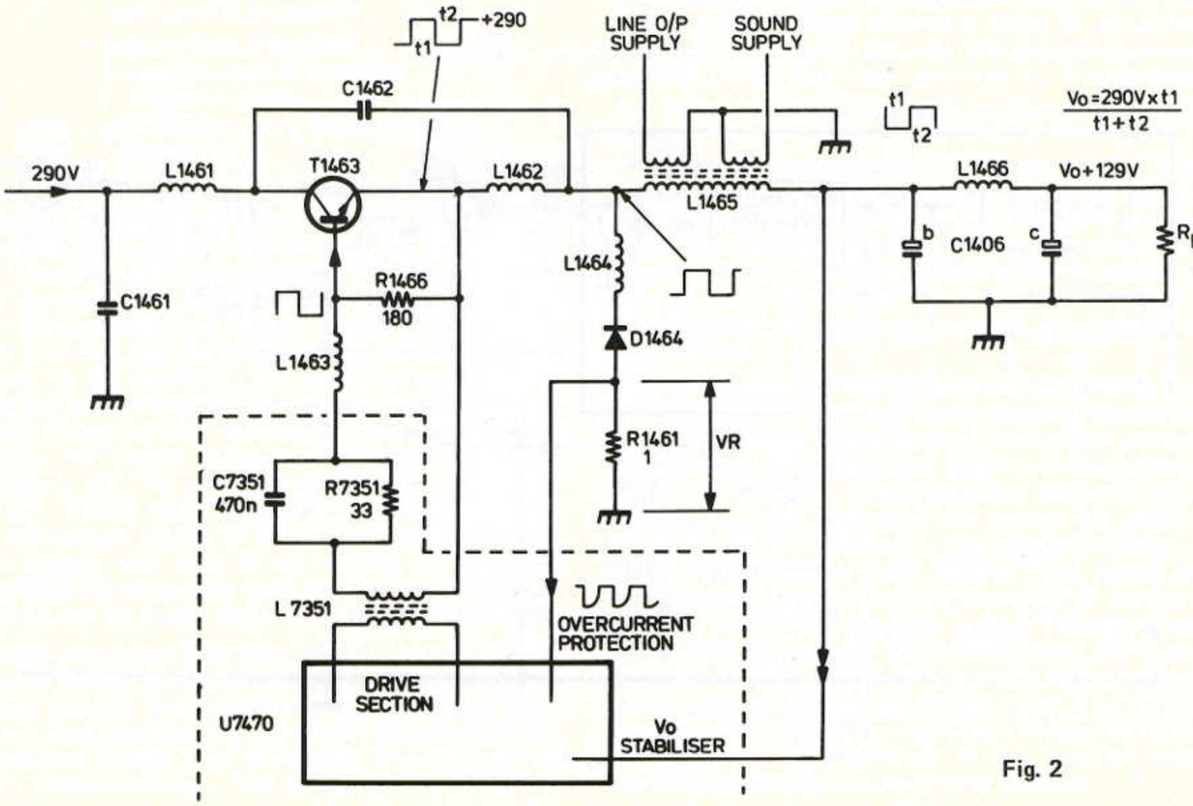


Fig. 2

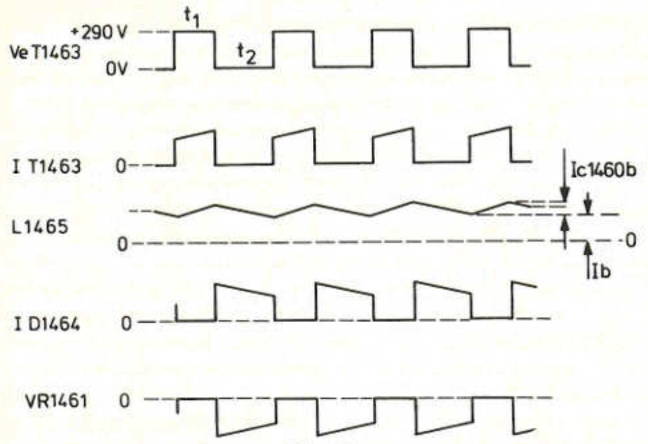


Fig. 3

c. Drive section of IC7322 (Fig. 4). The supply voltage for IC7322 is furnished by the mains rectifier module U6450. A part of the supply current for IC7322 is obtained from T7353; the current which is applied via R6299 and R6300 determines the starting voltage of the system. D7343 is a zener diode to give the 6,8V reference voltage required by the I.C. for various purposes. The first function of the drive section is to stabilize the supply voltage at 129V. This is realised in the drive section by comparing a part of the output voltage with the reference voltage and increasing or decreasing the duty cycle in accordance with the difference. Comparator 1 compares a part of the output voltage with its reference voltage. The output voltage of this comparator on point 12 of IC7322 depends on the difference between these two voltages. In the second comparator this output voltage is compared with a saw-tooth voltage from an internal oscillator. The square-wave voltage supplied by this second comparator has a variable duty cycle depending on the output voltage of comparator 1. Therefore the second comparator is called the duty-cycle modulator. If the output voltage becomes too low, the output voltage of comparator 1 increases. The pulse supplied by the duty-cycle modulator become wider, t1 increases and t2 decreases, so that ultimately the output voltage increases (Fig. 5). The opposite happens when the output voltage is too low. The voltage divider R7318, R7317, R7316 & R7324 determines the part of the output voltage which is compared to the 6,8V reference voltage, therefore the output voltage can be adjusted with R7317. Additional negative feedback is provided via R7320 to eliminate hum. T7336 controls the maximum permissible output voltage of comparator 1 and thus the maximum duty cycle of the system, in view of the fact that the horizontal output transistor is driven by the switched mode transformer L1465. The voltage on point 12 of IC7322 is limited to approximately 2,9V and at this value the maximum duty cycle is limited to 70%. The voltage on point 12 of IC7322 may also be reduced via a diode (D1) by the various protection facilities, discussed later in paragraph d. U6450 bridge rectifier panel supplies the base current of T7353 via R6293; this high resistance in conjunction with the high voltage applied turns T7353 into a current source supplying approximately 2mA. R7342 prevents the base-emitter junction of T7353 having a zener action when the output voltage of IC7322 is low.

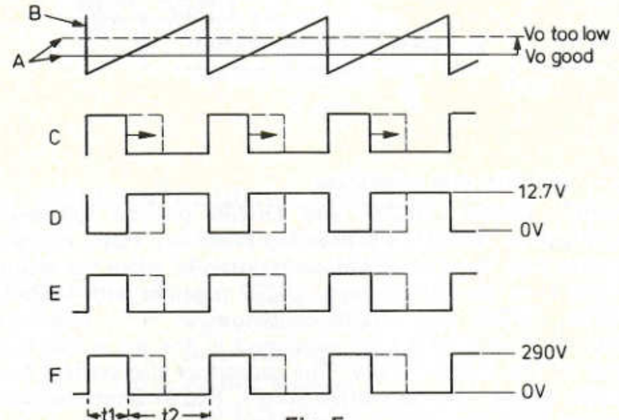


Fig. 5

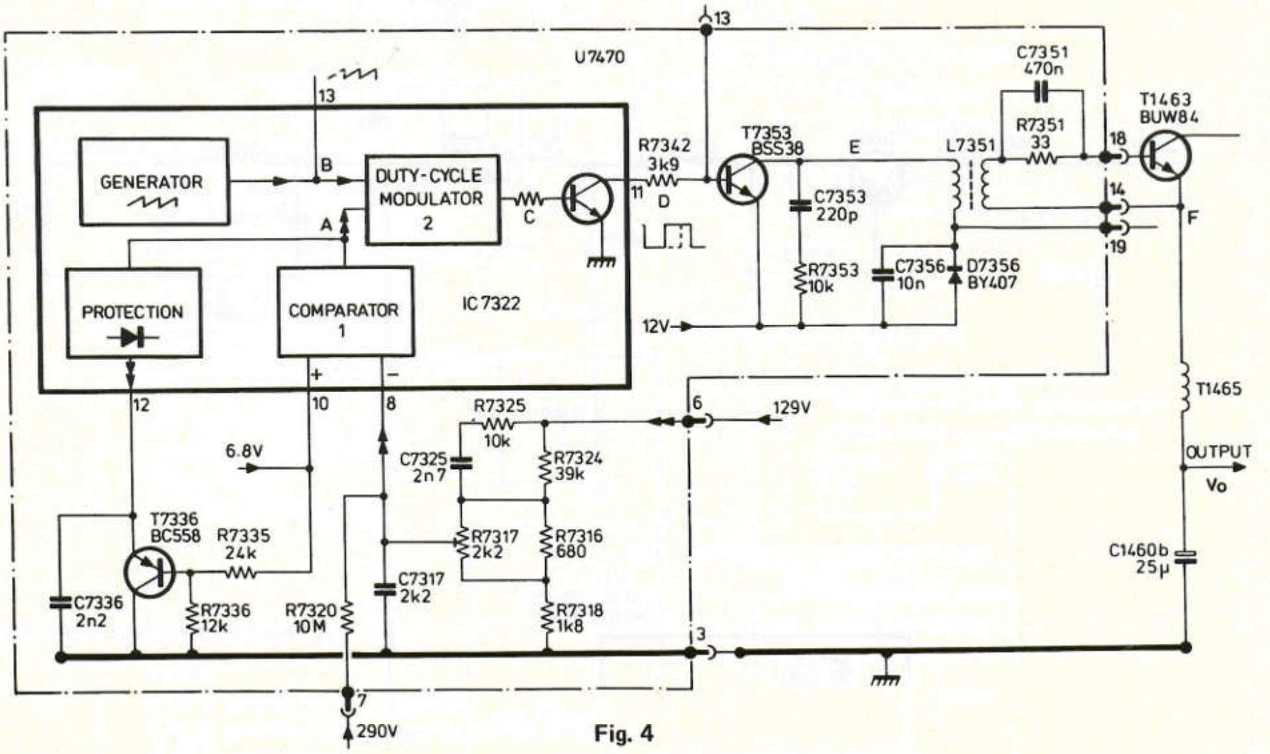


Fig. 4

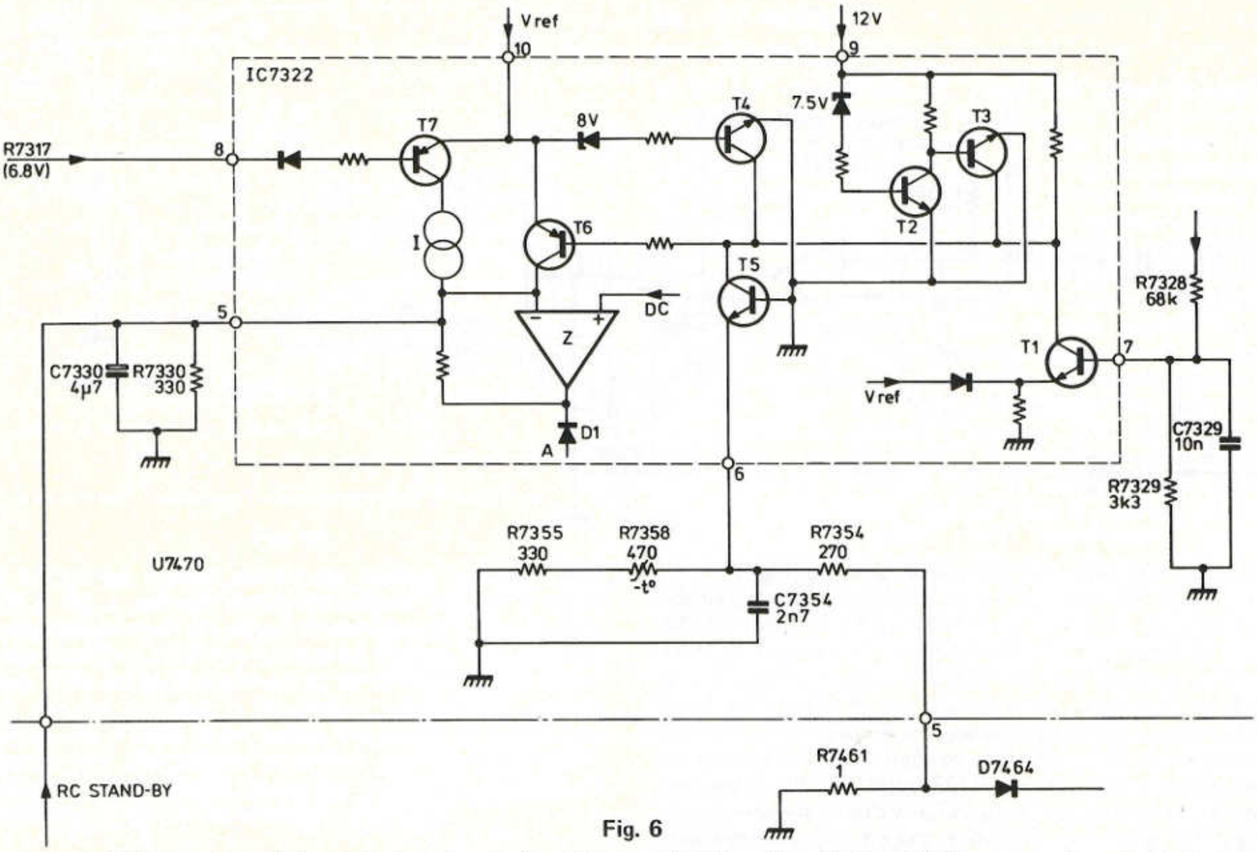


Fig. 6

Charging of C7356 during t1 (and discharging during t2) constitutes the primary voltage source for L7351. When any of the protection circuits operate (causing the duty cycle to become zero), D7356 ensures that any surges produced by L7351 are short-circuited on the primary side and not allowed to turn-on T1463.

d. Protection facilities (Fig. 6)

These include
- a slow start circuit
- over-current protection
- over-voltage protection
- protection against excessive reference voltage
- protection against voltage stabiliser circuit failure

The slow-start circuit operates as follows:—
When the set is switched on, there is a brief period of time during which the +12V is building-up. As long as this voltage is smaller than approximately 2V, T2 is cut-off and T3 conducts; T6 is also conductive and C7330 is charged. Consequently the output voltage of operational amplifier Z is low and the output of comparator 1 is also pulled low via the diode D1. This level is so low that it is less than the lowest level of the oscillator sawtooth. The duty cycle is then zero and the output voltage also remains zero. When the supply voltage has reached a value of approximately 8V, T2 is turned on and T3 and T6 are turned off. C7330 then discharges slowly via R7330, so that the output voltage of the operational amplifier Z increases slowly and with it the voltage on point A. Consequently, the duty cycle (and thus the output voltage) increases slowly at a rate determined by C7330–R7330.

Over-current protection is obtained by T5.
If an excess current appears, the negative pulses on point 6 of IC7322 become more negative than –0.6V and T5 is turned on, thus initiating the slow-start procedure. If the fault condition persists after re-starting, this will result in so-called "motor-boating". The voltage divider R7354 & R7355 with NTC R7358 serves to adapt the pulse amplitude to the base-emitter voltage of T5 at varying temperatures. C7354 constitutes a short-circuit for transients.

Over-voltage protection is obtained via T1.
The emitter of T1 receives a fixed voltage and its base receives a part of the output voltage. Normally, point 7 of IC7322 is always at a voltage lower than 6.8V. However, if the output voltage exceeds a value of approximately 145V, T1 is turned on and the slow-start process is initiated. This may also give rise to "motor-boating".

The fourth protection is against excessively high reference voltage.
This situation is dangerous because comparator 1 of the voltage stabiliser compares a part of the output voltage with this reference voltage. An excessive reference voltage would automatically result in an excessive output voltage. However, T4 is turned on as soon as the reference voltage exceeds 8.6V; via T6 and the operational amplifier Z the duty cycle is switched to zero and the output voltage becomes low.

The final protection facility becomes operative in the case of an interrupted stabiliser circuit (e.g. in the case of poor contact of point 6 of the module). The output voltage then tends to increase considerably, which is of course dangerous. When the feedback circuit operates correctly (stabiliser system functions normally) the voltage on point 8 of IC7322 is 6.8V. However, in the case of an interruption this voltage drops to 5.6V, so that T7 is turned on and switches on a constant-current source. This current flows through R7330 and produces a fixed voltage on point 5 of IC7322. Operational amplifier Z then also supplies a fixed (low) voltage. The duty cycle is then switched to a small value determined by R7322. Point 5 of IC7322 can also be made positive by applying a voltage to point 1 of U7470 and this is effected in the stand-by mode of receivers fitted with remote control facilities.

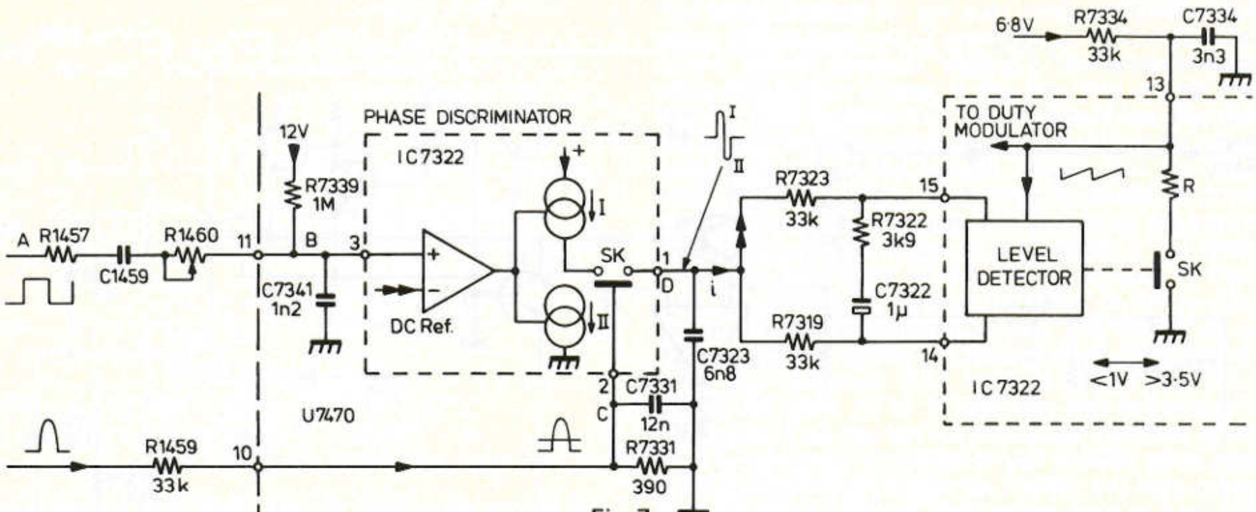


Fig. 7

e. Sawtooth oscillator and horizontal centring (Fig. 7)
Switch SK is actuated by a level detector which measures the voltage on point 13 of IC7322. If SK is open, C7334 can be charged via R7334. However, as soon as a level of 3.5V is reached, the level detector will close SK, causing C7334 to discharge very rapidly via R7334. The level detector opens SK again when the voltage on point 13 becomes lower than 1V. It is evident that the frequency of the system depends on R7334 and C7334. Since the horizontal output stage in the KT3 is driven by the power supply, the sawtooth oscillator should be synchronised. Therefore, the upper change-over level of the detector is varied by means of a voltage to be applied between points 14 and 15. When point 15 becomes positive relative to point 14, the upper change-over level is raised and the oscillator frequency is reduced because the charging time of C7334 then increases. The reverse happens when the level on point 15 becomes lower than that on point 14. The voltage between point 14 and 15 is obtained from a phase discriminator. This phase discriminator determines the phase difference between the integrated squarewave voltage B (Fig. 8) which is obtained from the sync. module (and has a fixed phase relative to the video signal) and the horizontal flyback pulses C from the horizontal output stage. If the squarewave voltage V_B exceeds a certain reference value, current source I is switched on; if V_B is smaller than the reference value, current source II is switched on. Each time that the voltage on point 2 of IC7322 exceeds a certain value (approximately 0.6V) the electronic switch in the phase discriminator closes. Then either current source I supplies (charging) current to C7323 or current source II discharges C7323. In the case of a correct phase relationship between the horizontal flyback pulses (C) and the squarewave voltage (B), both current sources supply equal currents to C7323 so that this capacitor is charged to the same extent as it is discharged. The average voltage across C7323 does not change (remains 1.4V) and the oscillator is not corrected (see Fig. 9). If the average voltage increases due to the oscillator leading, then via R7323 point 15 becomes more positive relative to point 14 so that the upper level of the level detector is raised and the oscillator frequency is reduced. The reverse happens if the oscillator lags. R7323, C7322 and R7322 form a flywheel circuit. R1460 determines the degree of integration of the squarewave voltage and thus the slope of the falling edge, (Fig. 10). As a result of this the horizontal flyback pulse is also shifted to the right and the picture is shifted to the left.

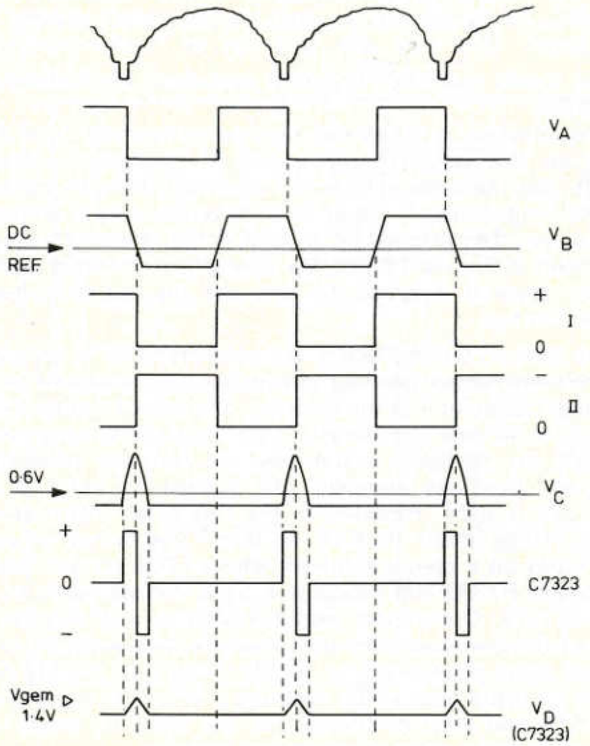


Fig. 8

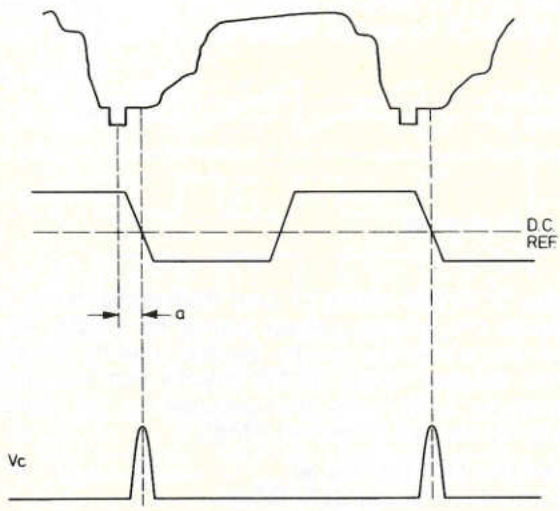


Fig. 9

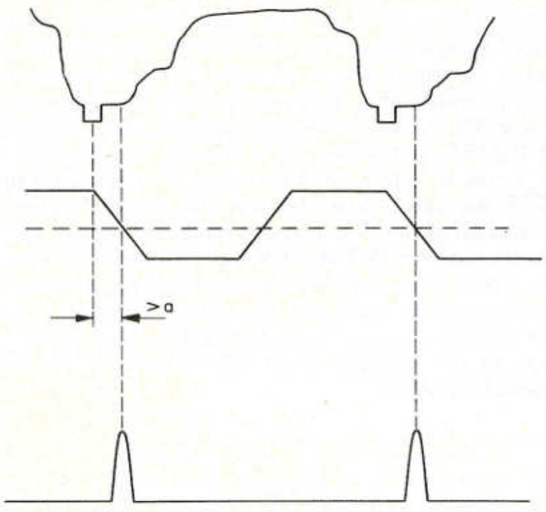


Fig. 10

The horizontal flyback pulses are applied to point 2 of IC7322 via a voltage divider/integrator and as a result are slightly delayed; the circuit responds to this by speeding up the oscillator until the horizontal flyback pulses appear earlier. This causes the picture to be shifted slightly to the right and its purpose is to obtain symmetrical picture centring. As R1460 is increased, the degree of integration increases and the picture is shifted further to the right. In other words, R1460 serves for horizontal centring of the picture. C7341 is the integrator capacitor.

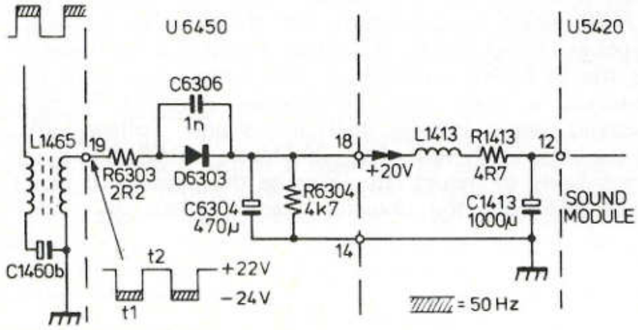


Fig. 11

4. Derived supply voltages (Fig. 11)

a. The +20V supply

The supply voltage for the sound module U5420 is obtained from switched-mode transformer L1465 by means of a diode rectifier D6303. If this supply voltage was derived from the horizontal output stage "sound on picture" would probably result. D6303 is conductive during t2 of the switched mode supply. As the primary voltage of L1465 is constant during t2 the secondary voltage will be constant also. R1413 and C1413 provide additional smoothing.

b. Tuning voltage for channel selection

This voltage is 33V and is derived from the +155V supply line via R1401.

II CHANNEL SELECTOR AND TUNING

The U321 (U1400) unit is a low-noise UHF tuner unit with improved signal-handling capabilities. Gain control is effected by internal circuitry which behaves virtually as a linear attenuator. The gain control current is limited (at maximum gain) to approximately 9mA by R2156 and filtered by C2158

III I.F. MODULE

1. Introduction

In the I.F. module the I.F. signal first passes through an input filter which provides the necessary I.F. rejection and defines the I.F. pass-band. This filter is followed by a variable-gain I.F. amplifier, the gain of which is determined by the voltage from the I.F. AFC circuit. Following the I.F. amplifier is the synchronous detector with its reference amplifier. The demodulated video is transferred to point 17 of the module via an output amplifier which incorporates a white-spot and noise inverter. The output signal from the video detector is also applied to the I.F. AGC circuit which measures the level of the peaks of the sync. pulses and controls the gain factor of the I.F. amplifier. When I.F. AGC has reduced the gain of the I.F. amplifier by some db's, the H.F. AGC will reduce the gain in the channel selector. The point at which the H.F. AGC becomes operative can be adjusted with R1414. A second synchronous detector with a separate reference circuit is the 'so-called' AFC synchronous detector which supplies an output voltage, the magnitude and polarity of which depends on the mistuning of the tuner unit. This voltage is passed through an AFC output amplifier and is available on point 12; the amplifier can be disabled, however, by making point 13 low.

2. Input filter

R2122 & C2122 are for matching to the tuner unit and the tuned circuit L2122, C2125, C2124 & C2126 determines the shape of the band-pass curve around 35MHz. Rejection of adjacent channel picture carrier frequency (31.5MHz.) is provided by L2127, C2132, C2126, C2127, C2131 & R2127. The sound carrier frequency of an adjacent UHF channel, 42.7MHz., is rejected by L2133 and C2133; the sound carrier frequency of an adjacent VHF channel, 41.5MHz., is rejected by L2139, C2139, C2140 and

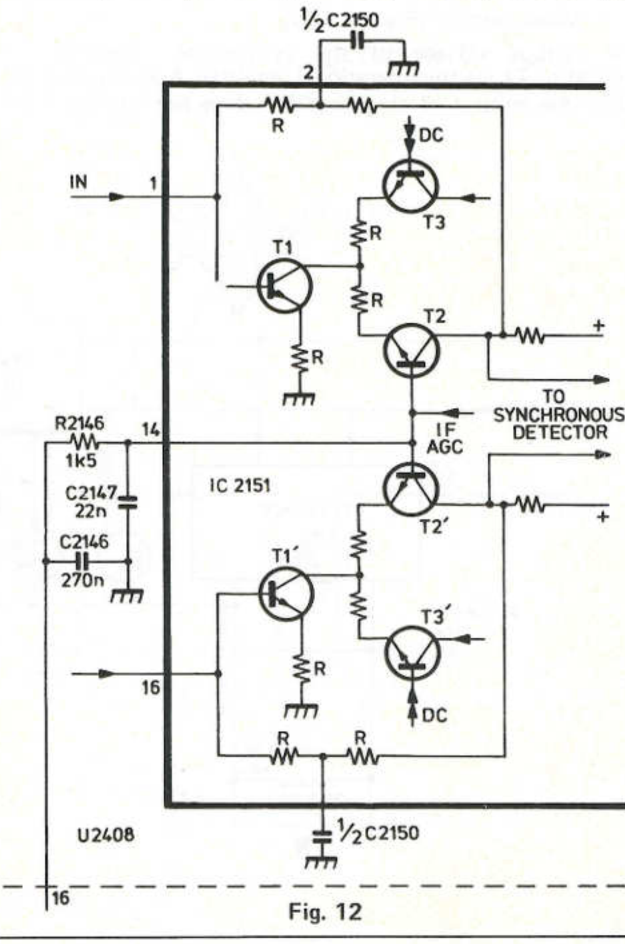


Fig. 12

R2139. C2138, C2144 and L2138 constitute a 33.5MHz. absorption circuit to provide 20db approx. attenuation of the accompanying sound carrier. L2145 defines the flatness of the overall band-pass curve.

3. I.F. amplifier (Fig. 12)

The I.F. amplifier is a symmetrical type, transistors T1 (and 1') operating as a current source. The I.F. current is distributed between transistors T2 and T3, depending on the voltage (obtained from the I.F. AGC circuit) on point 14 of IC2151. If this voltage is large, a large current will flow through T2 and 2' and the output signal will be large. The reverse will happen when the I.F. AGC output voltage is low. A resistive d.c. negative feedback network stabilises the complete circuit and C2150, between points 2 and 15 of IC2151, ensures there is no a.c. negative feedback.

4. I.F. detector and video output (Fig. 13)

The synchronous video detector B receives the amplitude amplitude-modulated I.F. signal as an input signal. Reference amplifier A is overdriven (AM interdependent) and supplies a 39.5MHz. signal, in phase with the input signal, in the tuned circuit L2157. This behaves as a resistance so that Vref. is in phase with the input, which means that the two output voltages (d.c.) are only dependent on the input signal amplitude. In other words, AM detection takes place. The input signal also contains the 35.07MHz. (chroma) and 33.5MHz. (sound) components but as the reference signal is always 39.5MHz. these two signals leave the detector as the difference frequency — superimposed on the outgoing video. In the case of incorrect tuning, the input signal has a lower amplitude and the picture carrier deviates from 39.5MHz. Tuned circuit L2157 then behaves capacitively or inductively, Vref is no longer in phase with the input and the output voltage decreases.

5. Video output (Fig. 14 &15)

The output voltage of the synchronous detector is applied to T1 via the operational amplifier A and resistor R. When the output of this amplifier does not exceed 7.2V or is not less than 2.4V the signal is passed through normally. In the case of a 'white spot' occurring in the video, the voltage from A exceeds 7.2V, the output of operational amplifier B becomes low and the base voltage of T1 cannot exceed 5.3V. The output voltage on point 12 of IC2151 is clamped at 4.7V and this part of the circuit forms a 'white spot inverter'. If a spurious pulse occurs in the sync. direction and the output voltage of operational amplifier A becomes smaller than 2.4V, output C becomes high (+12V) and the base voltage of T1 cannot become lower than 4.4V. The output voltage on point 12 is now clamped at 3.8V and the circuit becomes a 'noise inverter', transferring its signal to the I.F. AGC to prevent response to the spurious pulse. L2156 and C2160 filters out residual 39.5MHz.

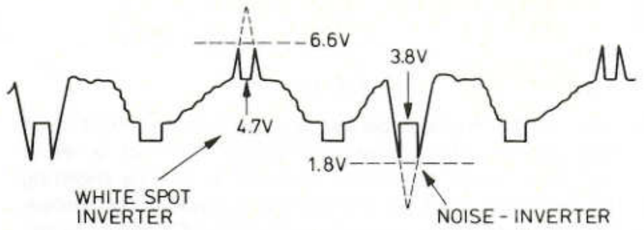


Fig. 14

6. Automatic frequency control (AFC) (Fig. 15)

The AFC synchronous detector receives the reference signal from the video detector as an input signal. Its own reference signal is derived from the tuned circuit L2158, which in conjunction with the capacitor in the IC supplies a signal exactly 90^{o} phase-shifted (leading) relative to the 39.5MHz. input signal. The output voltage of the detector is then zero. Operational amplifier D now supplies approximately half the supply voltage – 6V. If the input signal varies from 39.5MHz., L2158 will behave capacitively or inductively (because the phase shift varies from 90^{o} and the detector then supplies an output

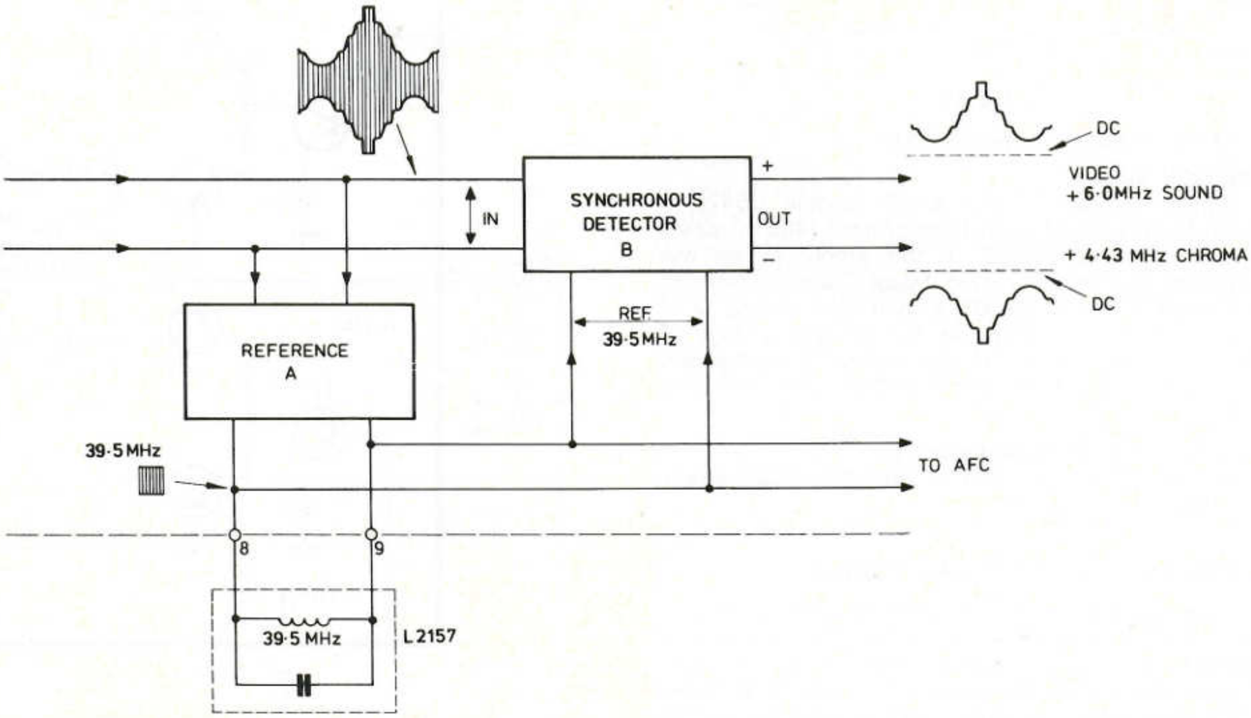


Fig. 13

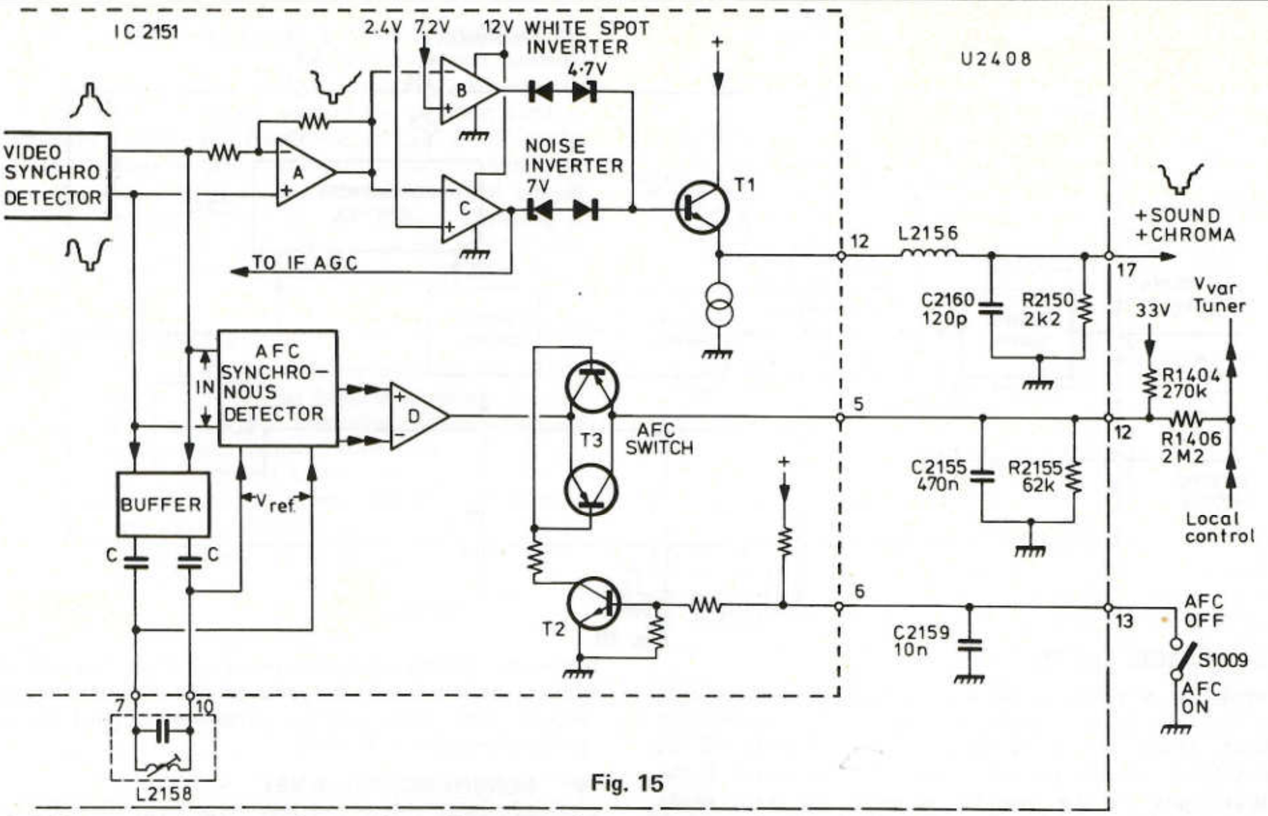


Fig. 15

signal. This means that at too low an input frequency the output of operational amplifier D becomes higher than 6 volts and at too high a tuning frequency it becomes lower than 6V. Fig. 16 shows the voltage variation as a function of the input frequency. The channel selector tuning is corrected via R1405, which together with the internal resistance of the tuning control circuitry determines the 'pull-in' and holding range of the AFC circuit. The AFC switch is operated by either the tuning cover or the tuning drawer – open when the cover is in place or the drawer is pushed in and closed when the tuning cover is removed or the tuning drawer pulled out. When the switch is open, T1 and T2 are conductive, the output voltage of operational amplifier D is transferred and the AFC is operative. When the switch is closed, T1 and T2 are turned off and the AFC is disabled because the output voltage (6V.) is determined by divider R1404 – R1401

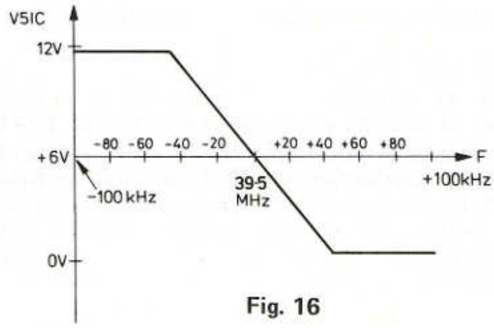


Fig. 16

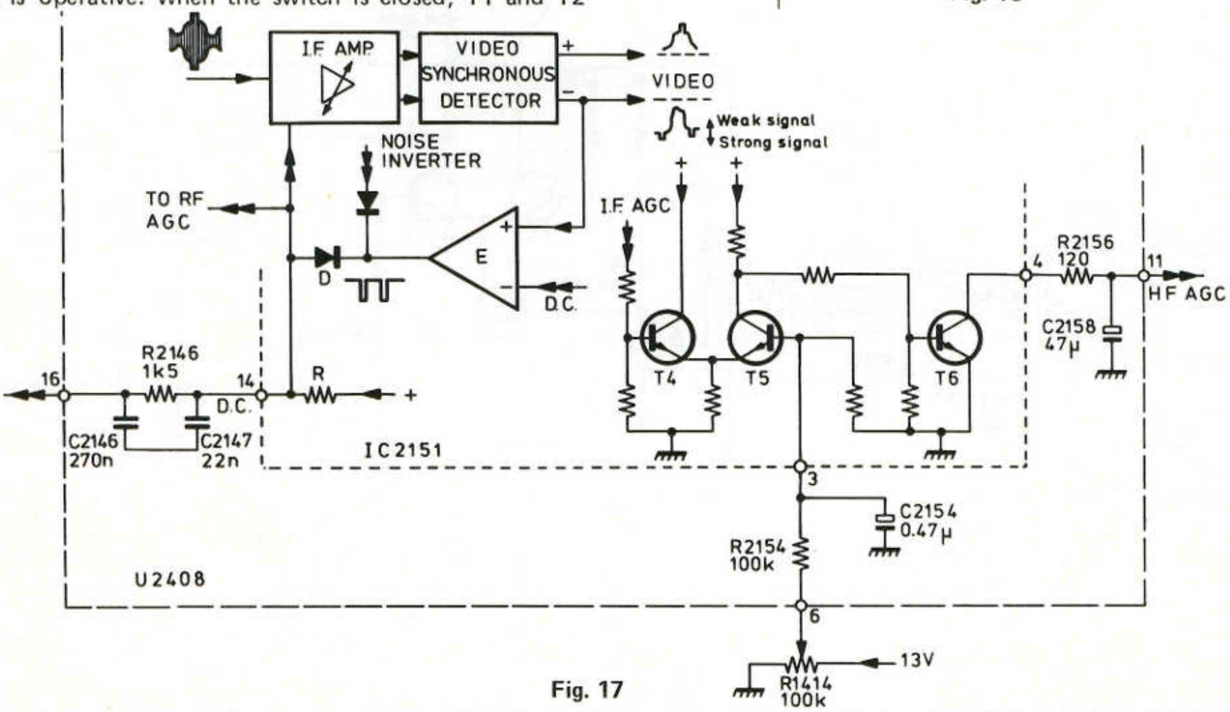


Fig. 17

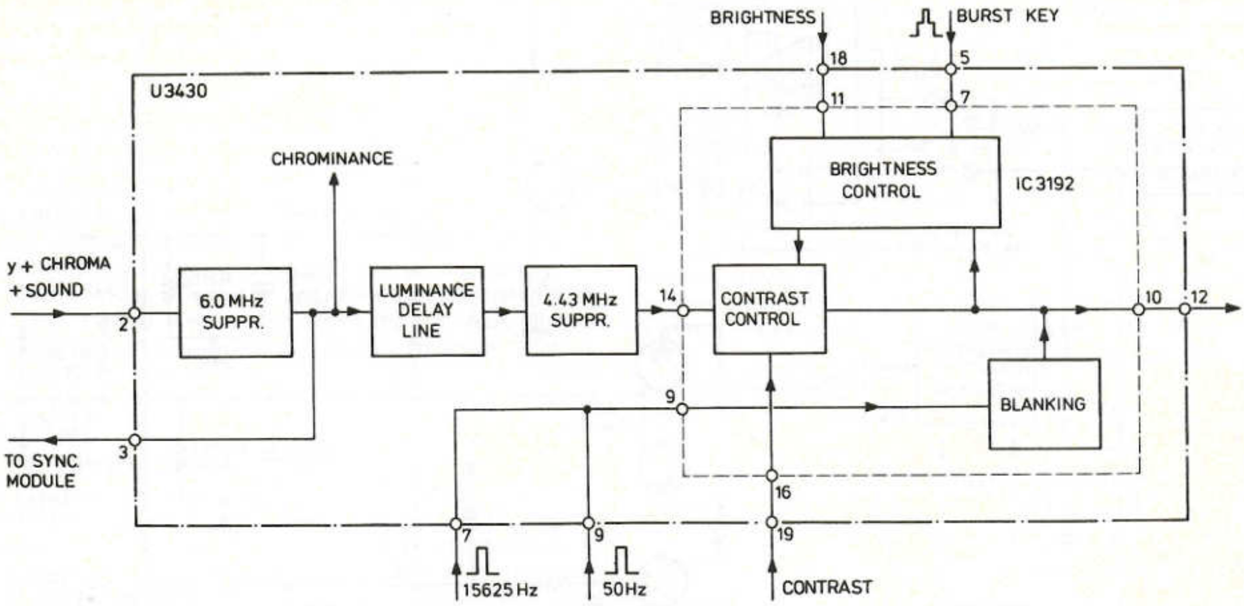


Fig. 18

7. I.F. AGC (Fig. 17)

Operational amplifier E supplies a negative pulse during the sync. peaks of the video signal on the detector output. Diode D, in conjunction with R2146, C2146 and C2147, detects the lower level of these pulses. If the output signal of the detector is large the sync. peaks are situated low and the negative peaks on the output of E are large. As a result of this, the voltage on point 14 of IC2151 is low and the gain of the I.F. is reduced. The opposite happens in the case of a weak video signal.

8. H.F. AGC (Fig. 17)

The state of conduction of T4 and T5 depend on the condition of the I.F. AGC and the setting of R1414. In the case of a small aerial signal the I.F. AGC voltage is high so that T4 is conductive and T5 is cut off; T5 collector is high and T6 conducts. The output voltage to the channel selector is then low so that maximum gain is provided. With a decreasing I.F. AGC voltage (stronger aerial signal) T4 becomes less conductive and at a given moment T5 is turned on; T6 then becomes less conductive, the H.F. AGC voltage increases and the gain of the channel selector is reduced. The 'take-over' or crossover point of the AGC can be adjusted with R1414.

IV LUMINANCE CHANNEL

1. Block-schematic description (Fig. 18)

The video, together with the 6MHz sound and 4.43MHz. chroma enters at point 2 of the U3430 luminance/chrominance module. After passing through a 6MHz rejection filter, where the sound carrier is suppressed, the signal goes in three directions; to the sync. module, the luminance channel and the chrominance channel. In the luminance channel, the signal passes through the luminance delay line to equalise the difference in transit time between the luminance and chrominance channels and then through a 4.43MHz. rejection circuit (to suppress mixing products of the luminance and chrominance signals). In IC3192 control of the contrast circuit is achieved by means of an amplifier, the gain of which depends on the contrast

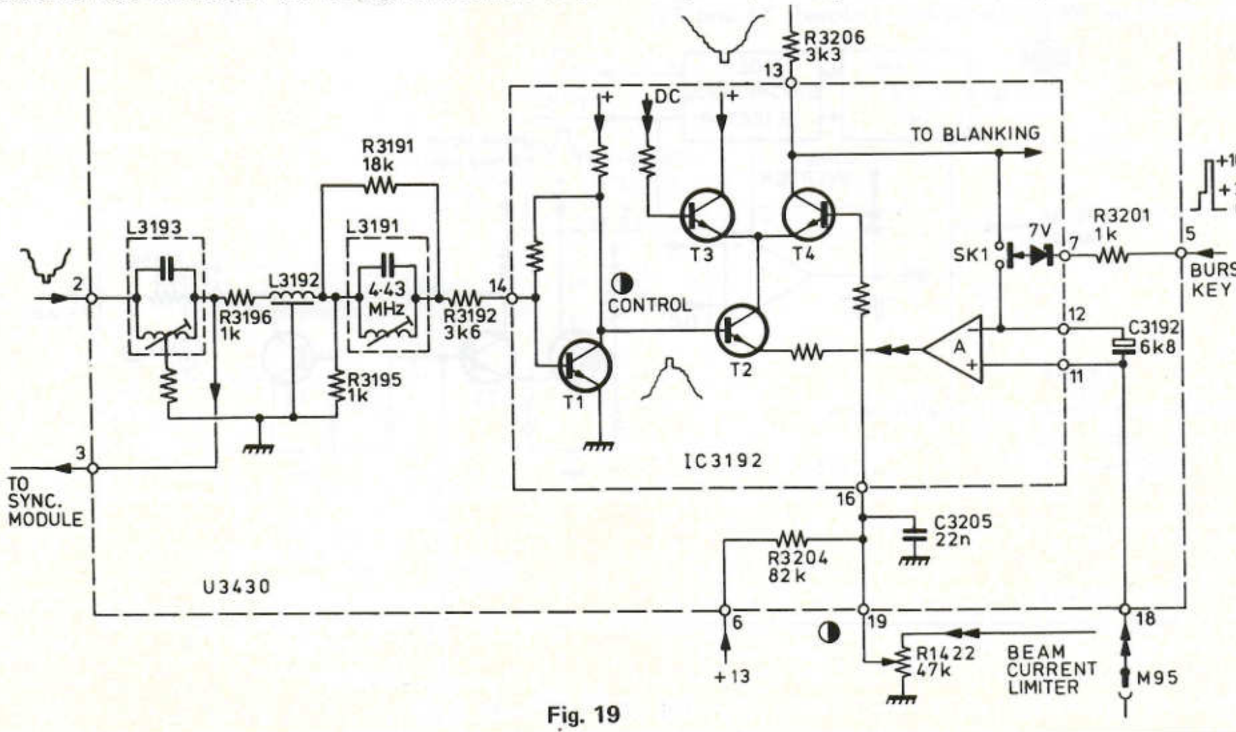


Fig. 19

voltage on point 19 of the module. The d.c. setting of this control amplifier is determined by the brightness control. During the video backporch the brightness control measures the level of the video signal leaving the contrast control and compares it with the brightness voltage on point 18 of U3430. If there is any difference between these two voltages, the d.c. setting of the contrast control circuit is corrected. Finally, horizontal and vertical blanking is effected by the horizontal flyback pulse on point 7 and the vertical flyback pulse on point 9 of the U3430 module.

2. Input circuit (Fig. 19)

After the 6MHz sound carrier rejection trap, the luminance signal is delayed by L3192, the luminance delay line, so that the transit time of the luminance signal becomes equal to the chrominance signal transit time. R3195 and R3196 terminates L3192 and L3191 attenuates the 4.43 chroma. In the IC3192, T1 is an operational amplifier with feedback. Its gain is determined by its internal feedback resistance, R3192 and the parallel connection of the input resistance, R3195 and R3196.

3. Contrast and brightness control (Fig. 19)

Following T1, the video signal is applied to T2 and distributed between T3 and T4; the signal available on point 13 will be small if the voltage on point 16 is low and vice versa. The voltage on point 16 is determined by potential divider R3204 and R1422, which is the contrast control. R1422 is also connected to the beam current limiter so that if the beam current becomes too large the contrast is reduced. During the backporch, S1 is closed so that C3192 is charged to the backporch voltage minus the voltage on point 11 of IC3192, which is obtained from the brightness control. If the backporch level is too high, the output of operational amplifier A decreases and the d.c. level of the video signal on point 13 also decreases. Thus varying the voltage on point 11 with the brightness control will ensure that the backporch level also varies to conform with the brightness control.

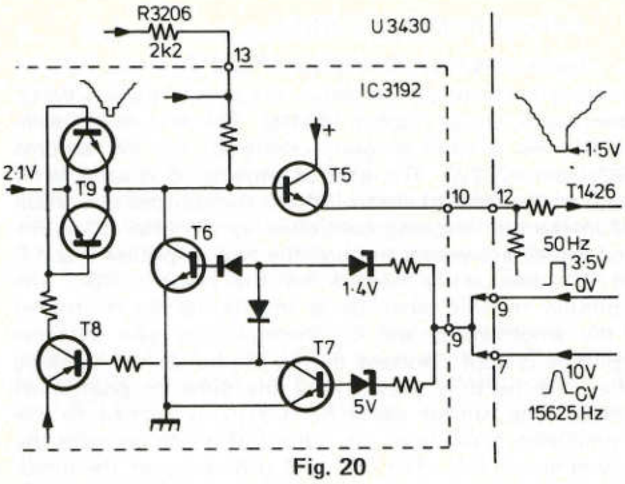


Fig. 20

4. Blanking (Fig. 20)

The blanking level measured on point 12 of U3430 may be one of two values; 0V if the pulses on point 9 (of U3430) are between +2.5V and +4V, and +1.5V if these pulses are between +5.5V and +12V. During the vertical and horizontal flyback, the voltages on points 7 and 9 of the module are approximately 0V., so that T6, T7, T8 and T9 are cut off. The video signal on point 13 of IC3192 is then applied to the output of the circuit via the emitter-follower T5. During the vertical flyback, point 9 of IC3192 will be 3.5V. and T6 turned on so that the base of T5 is connected to earth and the output voltage is zero. As the horizontal flyback pulses applied to point 7 of U3430 are larger than 5.5V., T7 is bottomed, T8 and T9 are then turned on so that the base of T5 is clamped at 2.1V. This means that the voltage on point 12 of U3430 will be +1.5V during the horizontal flyback periods. Conduction of T7 also prevents T6 from conducting so that the zero-volt clamping is eliminated. The difference in level between vertical and horizontal blanking is necessary because the horizontal flyback level is measured in the RGB amplifiers and stabilised as a cut-off level for the picture tube. By selecting a deeper level for vertical blanking, it is ensured that this blanking is satisfactory (blacker than black).

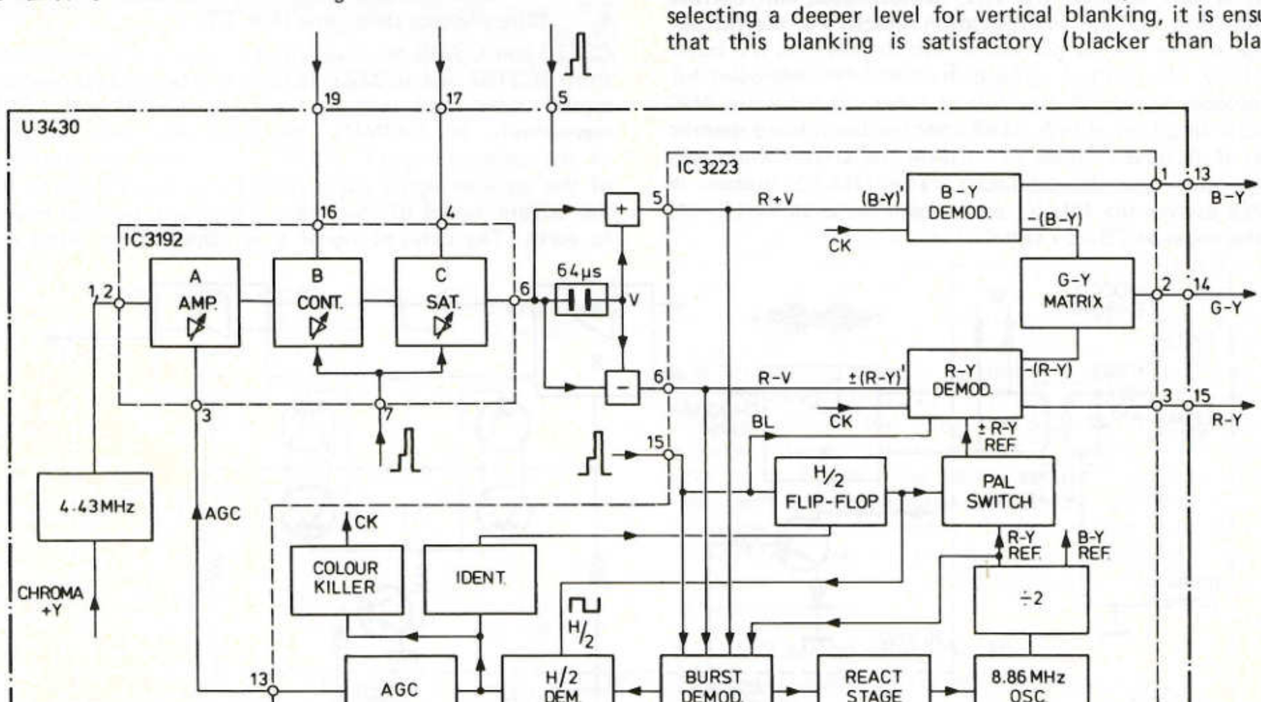


Fig. 21

V CHROMINANCE CHANNEL

1, Block schematic description (Fig. 21)

An input resonant circuit ensures that only the 4.43MHz. chrominance signal reaches IC3192. The first amplifier in IC3192 has a variable gain, controlled by the chroma AGC from IC3223. The gain of amplifier B is variable by means of the contrast control; this is the contrast saturation and interaction tracking controlled by amplifier C. As the burst signal also passes through the two amplifiers B and C and is subsequently needed for the chroma AGC, the amplitude of this burst signal should not be controlled in the amplifiers B and C. Therefore the gain of these amplifiers is kept constant during the horizontal blanking (when the burst is present) by the pulse on point 7 of IC3192. The output signal of IC3192 is applied to the chrominance delay line, the output of which contains the delayed signal (V). The sum and difference of the direct and the delayed signal are formed – R+V is applied to the (B–Y) demodulator and R–V is applied to the (R–Y) demodulator. The two demodulators receive their reference signal from a 8.86MHz. oscillator via a divide-by-two divider which supplies a (R–Y) and a (B–Y) reference signal. In order to prevent the (R–Y) demodulator supplying positive (R–Y) and negative (R–Y) alternatively, the reference signal is 180^{o} phase shifted after every other line. The (0–180^{o}) switch is controlled by the H/2 flip-flop which is changed over by the pulses on point 15 of IC3223. When the H/2 flip-flop operates in the correct phase (correct identification) the demodulator will always supply positive (R–Y). The two demodulators are disabled by the wide portion of the pulses on point 15 of IC3223 (horizontal blanking); the burst-key pulses on the same point switch on the burst demodulator. In this demodulator the phase of the local oscillator, the (R–Y) reference is compared with the phase of the burst available between points 5 and 6 of IC3223. If the oscillator leads or lags, the burst demodulator will correct the oscillator via the reactance stage. The H/2 demodulator compares the phase of the H/2 flip-flop with the phase of the demodulated burst; if not correct, the H/2 demodulator will correct the flip-flop via the identification block. As the output voltage of the H/2 demodulator also depends on the burst amplitude, this output voltage may also be employed for the colour AGC and the colour killer. The colour AGC controls amplifier A in IC3192 until the burst has a specific value; if it is too small or missing the colour killer will disable the two demodulators. The (G–Y) matrix in IC3223 derives the (G–Y) signal from the negative (R–Y) and the negative (B–Y) signal.

2. Input amplifier (Fig.22)

The input circuit of IC3192 comprises a 4.43MHz. filter formed by C3193 and L3195, together with an absorption circuit R3194 and L3194 to make the pass band symmetrical. The gain factor of amplifier A is inversely proportional to the collector voltage of T1. When the burst in the chroma signal increases, the AGC circuit in IC3223 will reduce the voltage on point 3 of IC3192, resulting in T1 becoming less conductive, its collector voltage increasing and the gain of amplifier A decreasing.

3. Contrast saturation, interaction and saturation control (Fig. 22)

The purpose of these two control circuits is to control the amplitude of the chroma signal as a function of the contrast setting and the setting of the saturation control. The burst amplitude should not be affected by these control circuits, however, because it is subsequently employed for controlling the chroma AGC. The reason why the burst is not filtered out before the contrast saturation interaction and saturation control circuit is that in this way an additional burst phase adjustment is avoided; burst and chroma pass through the same amplifiers and also through the delay line, so they are subject to exactly the same phase shifts. To achieve this the gain of amplifier B and amplifier C is set to an average value which is independent of the saturation control and contrast control, during the horizontal flyback when the burst is present. During the horizontal flyback, T2 is bottomed (as is T3 and T4) and amplifiers B and C then receive a fixed d.c. voltage so that their gain is constant. Outside the horizontal blanking period their gain factor is directly proportional to the voltage on points 16 and 4 of the IC3192. R3200, R3212, C3212, R3198 and R3199 stabilise the d.c. setting of the complete circuit with amplifiers A, B and C. The voltage on point 6 of the IC is kept constant at approx. +8V by the circuit and a symmetrical signal on points 1 and 2 of the IC is ensured by R3198 and R3199.

4. Chrominance delay line (Fig. 23)

C3210 and C3216 are included to block the direct voltages from IC3192 and IC3223. U3210 is a 64us glass line with crystal input and output, tuned by L3210 and L3219, respectively, to 4.43MHz. and these also vary the phase of the delayed signals. R3211 determines the amplitude of the delayed signal while R3217 and R3219 ensure that the output signal of the delay line is symmetrical relative to earth. The delayed signal V is obtained on point 4 of

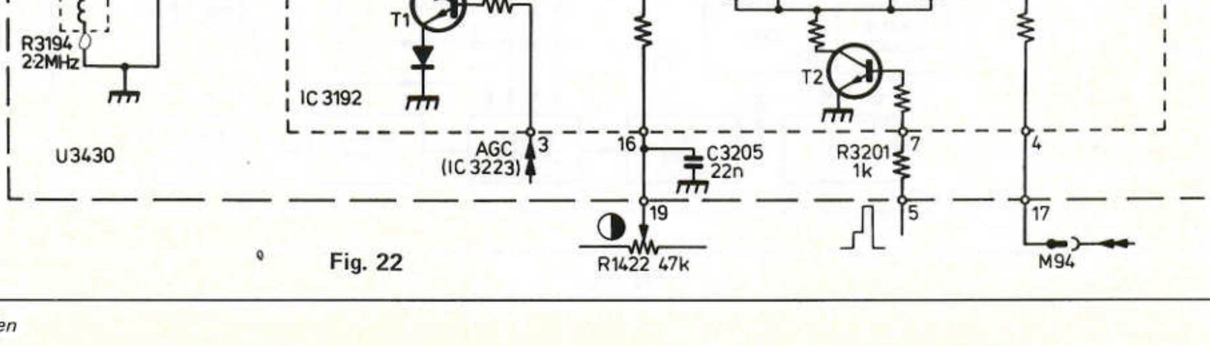


Fig. 22

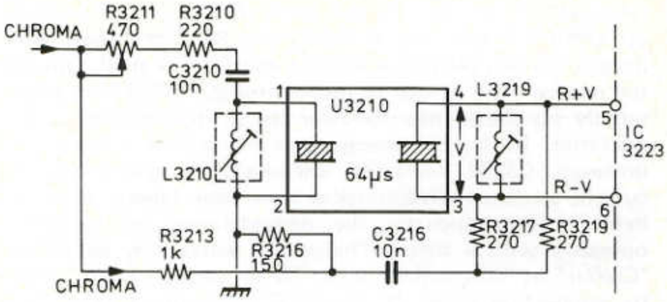


Fig. 23

U3210 and the inverse delayed signal –V on point 3, that is in the case of no signal being applied via R3213. When a direct (not delayed) signal R is applied via R3213, the R+V signal is obtained on point 4 and the R–V signal on point 3. Voltage divider R3213 and R3216 attenuates the direct signal while the delayed signal is attenuated in the delay line.

5. Reference oscillator

a. Oscillator

An amplifier oscillates at 8.86MHz. because of X3233, C3233 and positive feedback. The output amplitude is detected and compared with an internal reference voltage; if it is too high then its gain is reduced and vice versa. Apart from being slightly variable by C3233, the oscillator frequency can also be controlled by varying the direct voltage between points 7 and 8 of IC3223, thus varying the gain of another amplifier and the phase of the positive feedback. Points 7 and 8 are the outputs of the burst-phase demodulator (see Fig. 25).

b. Generating the two 4.43MHz. reference signals

An amplifier is overdriven so that it supplies squarewaves which are acted on by a digital divide-by-two divider and a gate circuit. The divider changes over on every negative-going slope of the squarewave pulses. Fig. 24 shows that the voltage on output E, which becomes the (R–Y) reference, has a phase lead of exactly 90^{o} relative to output B, which will become the (B–Y) reference.

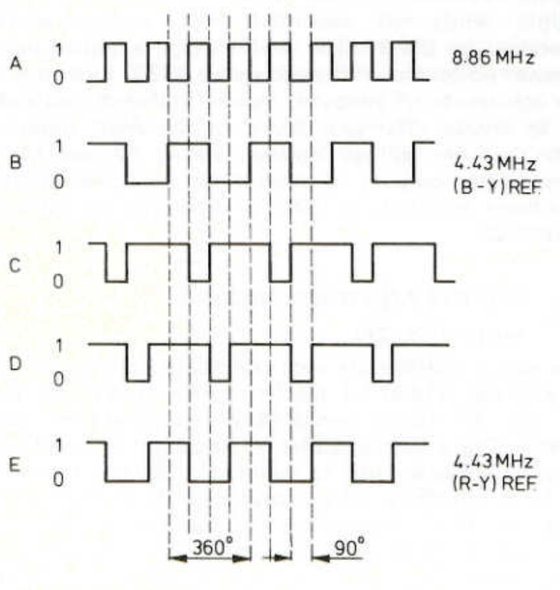


Fig. 24

6. Demodulators and (G–Y) matrix (Fig. 21)

IC3223 contains the two synchronous demodulators and the (G–Y) matrix. The reference signal for the (R–Y) demodulator is 180^{o} phase shifted by the PAL switch every other line, in order to ensure that the demodulator always supplies positive (R–Y). The two chroma signals from the delay line are applied directly to the demodulators. As these signals are already in phase with the references, the demodulators will supply the maximum signal and also an inverse signal to the (G–Y) matrix. The resistance values have been selected so that (G–Y) = –0.51(R–Y) –0.19(B–Y). The three output signals are applied to the outputs 1, 2 and 3 of IC3223 via an emitter follower, with integrating networks to filter the 4.43MHz. carrier. The 0–180^{o} PAL switch, which changes the reference phase of the (R–Y) demodulator every other line, is controlled by flip-flop that changes over each time a pulse appears on point 15 of IC3223. The state of the flip-flop is checked by the H/2 demodulator and, if necessary, corrected. In order to ensure that no chroma is demodulated during the horizontal flyback, the pulses on point 15 of the IC are also employed to disable the two demodulators; in the case of a black-white signal, the colour killer ensures the same.

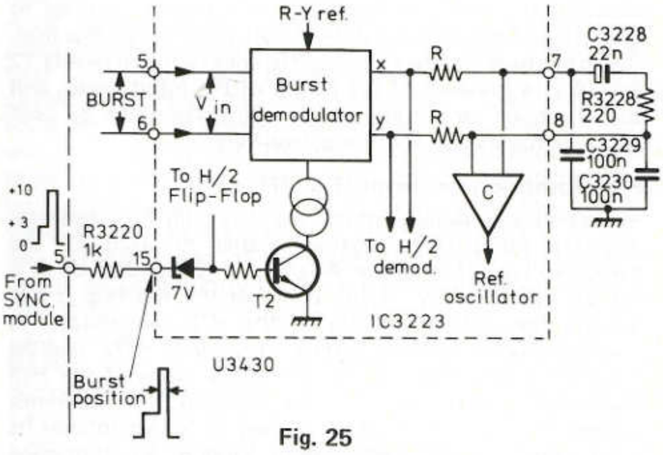


Fig. 25

7. Burst demodulator (Fig. 25)

The constant current source of the burst demodulator is turned on by the largest pulses on point 15 of IC3223, so that it only operates during the presence of the burst. A zener diode, D1, ensures that T2 can conduct only during the greatest pulse height (during the video backporch – burst position) on point 15 of IC3223. The demodulator receives the voltage difference between points 5 and 6 of IC3223 as input signal and the (R–Y) reference signal. The voltage difference between points 5 and 6 is the burst signal which during one line has a phase angle of 135^{o} relative to the (B–Y) direction and during the other line a phase angle of 225^{o}. If the phase of the reference signal is correct the burst demodulator supplies a pulse voltage between points X and Y, whose mean value is zero volts. If the local oscillator leads or lags, the mean value will become positive or negative and the phase will be corrected via amplifier C. The output voltage of the demodulator during the burst is pulse-shaped so it is integrated by a resistor and capacitor network to obtain an average voltage.

8. H/2 demodulator (Fig. 26)

This demodulator has the following functions:–

a. Rectifying the pulses from the burst demodulator for the chroma AGC.

b. Comparing the state of the H/2 flip-flop with the burst demodulator output voltage polarity (=identification).

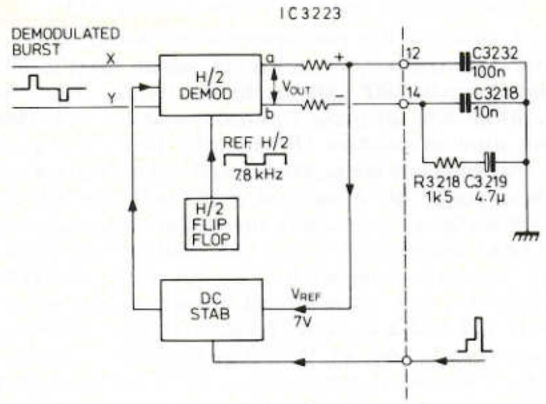


Fig. 26

The d.c. negative feedback stabilises the voltage (only during the horizontal flyback) on point 12 of IC3223 at approximately +7V. An integrating network obtains the mean value of the pulse-shaped voltage of the demodulator between points 12 and 14 of IC3223. If the H/2 flip-flop works in the correct phase, point 14 is always negative relative to point 12. When the H/2 flip–flop is not in the correct state, however, point 14 will become positive to point 12 and the identification circuit will stop the flip-flop. The magnitude of the voltage difference between points 12 and 14 is a measure of the height of the input pulses and thus the burst amplitude, which information can be used for the chroma AGC and the colour killer.

9. Identification circuit (Fig. 27)

As previously stated, when the H/2 flip-flop operates correctly, point 14 is negative relative to point 12; the output voltage of amplifier A is then +12V and diode D is cut off continuously. If the phase of the flip-flop is not correct, the output polarity of the H/2 demodulator is reversed and the cathode voltage of diode D is 0V, making it conduct and short-circuit one of the bases of the H/2 flip-flop to earth, stopping the flip-flop. The reference voltage of the H/2 demodulator then no longer follows its input signal, so this demodulator supplies an alternating voltage. After a certain time the voltage difference between points 12 and 14 is zero (mean value of the a.c. voltage) and the flip-flop can start up again. If it starts in the wrong phase the process is repeated; if it starts correctly, point 14 becomes negative with respect to point 12 and the flip-flop remains operative (correct identification).

10. Colour killer

This circuit also employs the output voltage of the H/2 demodulator (presence or absence of burst) on point 14 of the IC. As the incoming burst increases the voltage on point 14 decreases. If it became smaller than 5.8V, the Schmitt trigger will change over via the emitter-follower circuit, switch on the demodulators and there is colour.

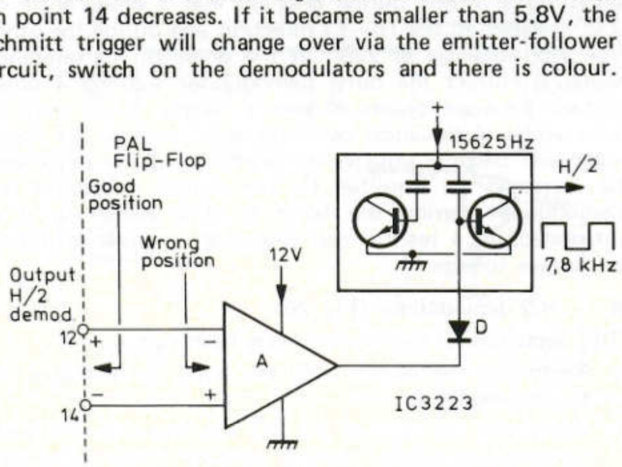


Fig. 27

However, if the burst is too weak or absent, the voltage on point 14 will exceed +6V., the Schmitt trigger will disable the demodulators and the colour is 'killed'. During the change from colour to monochrome, C3231 is charged rapidly via the emitter-follower circuit; this ensures a fast operation. During the change from monochrome to colour, however, C3231 must be discharged by the constant-current source, so that it takes some time (about 100ms.) before colour appears: the demodulators are rendered operative with a delay. The colour killer may be set to 'Colour' by connecting point 16 to earth and to 'B/W' by connecting point 16 to +12V. The colour killer also switches the set to black-and-white when the PAL switch does not operate correctly (the voltage on point 14 is then greater than 7V.).

11. Chroma AGC (Fig. 28)

The chroma AGC amplifier is controlled by the output voltage of the H/2 demodulator, which is a measure of the burst amplitude and thus the strength of the chrominance signal. When the burst amplitude increases, the H/2 demodulator output voltage increases, causing the AGC amplifier output voltage to decrease. T1 in IC3192 becomes less conductive so that the gain of amplifier A is reduced.

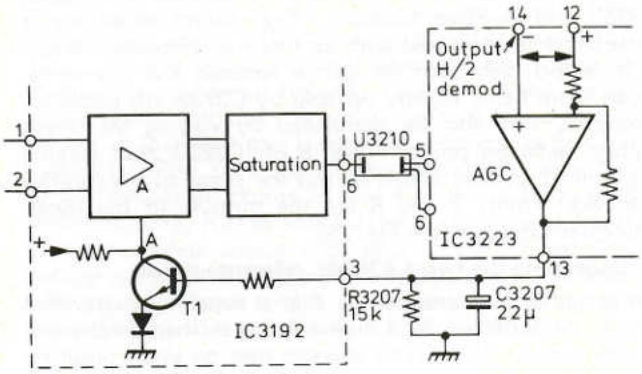


Fig. 28

During a normal colour picture the voltage on point 3 of IC3192 is approximately 1.2V.; for a normal black-and-white picture this voltage is approximately 1.7V. Amplifier A then has maximum gain because T1 is bottomed. R3207 slightly limits the maximum AGC voltage which is smoothed by C3207. The AGC voltage is limited in order to speed up control of the voltage via C3207 thus preventing the occurrence of annoying colour flashes during locking-on to colour. The gain factor of the AGC amplifier is such that the voltage between points 12 and 14 (H/2 demodulator output) is stabilised at 1.3V., corresponding to a burst amplitude of 0.3V. p–p between points 5 and 6 of IC3223.

VI MATRIX AND R/G/B MODULE

1. Matrix (Fig. 29)

The actual matrices are each constituted of two resistors – R1430 and R1435 for the 'R' matrix, R1431 and R1440 for the 'G' matrix and R1432 and R1441 for the 'B' matrix. The Y–signal is first of all subject to direct voltage drop of 5.6V. in order to maintain a low d.c. level on the R–G–B junctions. This is because a direct current flows from the R–G–B amplifiers to the matrix which means that the R–G–B junctions assume a higher d.c. level, causing the (R–Y), (B–Y) and (B–Y) emitter-followers to be turned off. As the Y–output of the luminance/chrominance module has a strong d.c. load, this signal is transferred via emitter-follower T1426.

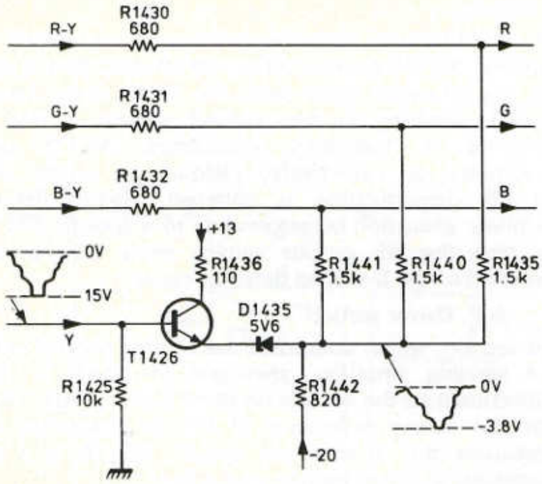


Fig. 29

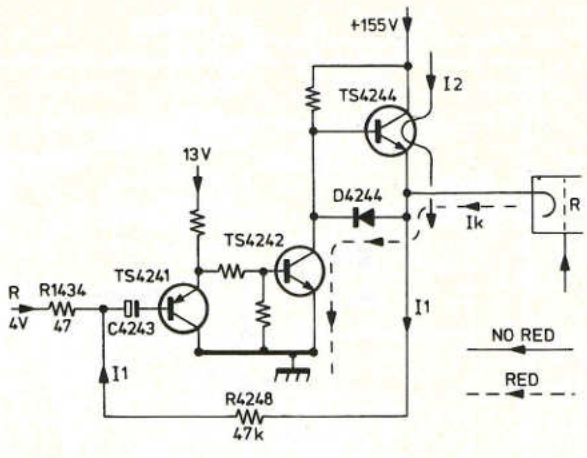


Fig. 30

2. R–G–B amplifiers, a.c. operation

The three amplifiers are identical, except for the R–amplifier, of which the input resistor R1434 is not variable. The input circuits of the B and G–amplifiers each include a potentiometer to control the gain factor; these are the white adjustments. In the R–amplifier T4241 is an emitter-follower, T4242 is the voltage amplifier and T4244 is the output emitter-follower. The cathode circuit of the red gun includes R4249 to provide additional negative feedback for the red gun in order to compensate for the higher efficiency of the red phosphors. The cathode circuits also include a switch by means of which the cathode may be connected to either the output of the relevant amplifier or to the +129V.; in the latter case the gun is cut off. D4253, D4269 and D4285 protect the amplifiers in the event of flash-over in the crt.

3. R–G–B amplifiers, d.c. operation

a. CRT drive

Fig. 30 shows that the direct current I^1, which depends on the crt cathode voltage, always flows through R4248 and R1434. I^1 is small when the cathode voltage is low and the cathode current Ik is large. If there is no red signal, Ik will be zero and I^1 will be supplied by emitter follower T4244. As the amount of red increases, I^1 will decrease and Ik will increase. As long as Ik is smaller than I^1, Ik will flow through R4248 and T4244 will furnish the rest of I^1. If there is a lot of red, Ik will exceed I^1, which will then come wholly from the direction of the cathode, whilst the rest of Ik flows via D4244 and T4242. In the absence of D4244, the current path would be via the base-emitter zener diode of T4244.

b. D.C. stabilising circuit (Fig. 31)

When T4242 is conducting, its base voltage should be 0.6V., the emitter voltage of T4241 should also be 0.6V. and T4241's base voltage 0V. The direct voltage on the base of T4241 is determined by the d.c. stabilising circuit, which measures the level of the output during the horizontal blanking. If this level does not correspond to the peak level of the horizontal blanking pulses, the d.c. stabilising circuit will change the base voltage of T4241 until this blanking level is correct. At this level the electron gun should be just cut off. Therefore, the amplitude of the line blanking pulses and thus the d.c. level is adjustable. The horizontal flyback pulses are obtained from the l.o.p.t. winding 15 – 16 via R1455, limited by D1455 at +130V. and D1456 is part of the clamping circuit. The resulting pulses are used jointly by the three d.c. stabilising circuits. The 10V. p–p line pulses obtained across R1433 are used for the horizontal blanking in the U3430 module. C4249 when not being charged via R4253 is discharged during the horizontal flyback time t^2, D4255 is then turned on and part of the charge is transferred to C4253 (this is I^2) which discharges via D4254 during t^3. In a stable situation I^3(mean)= I^2(mean)= I^1= 150uA. I^3 depends on the output level during the horizontal flyback pulse; if this is too low, I^3 will be large and C4253 will discharge to a considerable extent during t^3. This means that this capacitor should be charged more during t^2 so that I^2 is also large. I^2(mean) is now greater than I^1 and C4249 receives a voltage lower than 0V. and as a result of this the d.c. output voltage of the circuit will increase. The opposite will happen if the output voltage is too high during the horizontal flyback. The stabilising level is determined by the setting of the peak-to-peak value of the

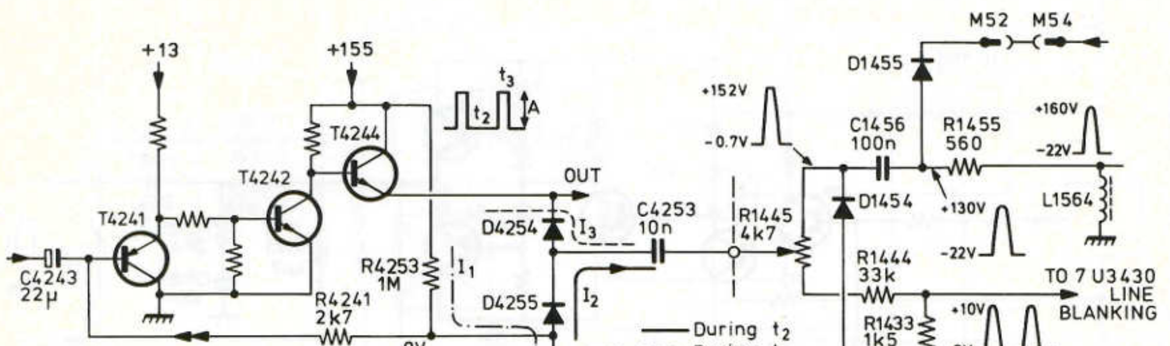


Fig. 31

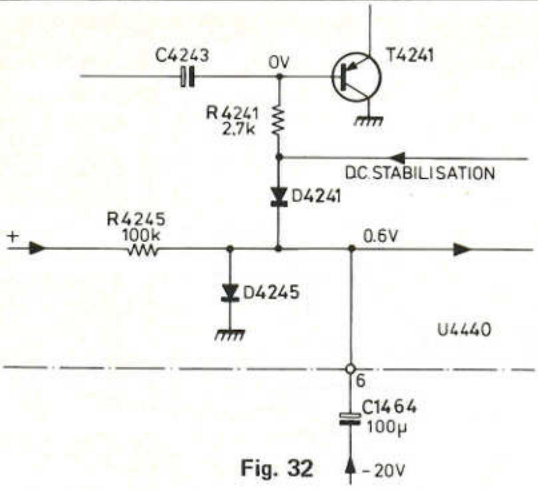


Fig. 32

horizontal flyback pulses. R4241 provides a path to earth from the base of T4241 for alternating voltages. The circuit shown in Fig. 32 switches off the R–G–B output amplifiers briefly when the set is switched on to avoid current surges. If the –20V. supply is stable, D4245 conducts via R4245 and the voltage on the junction of D4241 and D4245 is 0.6V. D4241 is then turned off and the R–amplifier operates normally. When the set is switched on, the decrease from 0V. to –20V. is transferred to the amplifier input via C1464, D4241 and R4241. The R–amplifier consequently supplies its maximum output voltage and for a short time there is no illumination until C1464 has been charged via R4245. The G– and B–amplifiers receive the same negative voltage transient on their inputs.

4. Control grid circuit

The horizontal pulses applied to the control grid of the crt are obtained from line output transformer L1564. In order to avoid shading, the forward scan voltage is clamped at 0V. by R1584 and D1586. Correct horizontal blanking is thus ensured.

VII SOUND CHANNEL

1. I.F. section

a. amplifier

X5161 is a 6MHz ceramic band-pass filter with bandwidth determined by R1561 and R5162. The I.F. amplifier in IC5164 has a symmetrical input and output, with internal negative feedback; externally, C5164 and C5163 provide a.c. feedback. The result is a fully overdriven (with respect to a.c.) amplifier with a satisfactory d.c. setting. This limiting action renders the sound section insensitive to AM interference.

b. Detector

The synchronous detector receives its reference signal from the X5175 ceramic filter, which with C5175 ensures that the reference signal leads the 6MHz input frequency by 90° resulting in zero output voltage. If the input frequency is frequency modulated, X5175 behaves capacitively or inductively, yielding an output voltage and FM demodulation is obtained. R5175 determines the phase excursion corresponding to a specific FM sweep and thus the AF output voltage while R5176 reduces distortion of the S-shaped detector curve.

2. A.F. Driver section

This section, which comprises the volume control network, is a variable amplifier, the gain of which is directly proportional to the voltage on point 5 of IC5164. Together with the output resistance of IC5164, capacitor C5177 constitutes the de-emphasis circuit. R5166 is a pre-set adjustment of the minimum sound level.

A.F. Output stage (Fig. 33)

IC5181 is an operational amplifier with feedback. The base of T1 is the positive input whilst the emitter of T2 is the negative input. A 1.3V. direct voltage from an internal voltage source in IC5181 is applied to the base of T1 and stabilises the output direct voltage at approximately 9V. (approximately half the supply voltage). A.C. negative feedback is provided internally by R1 and R2 and externally by R5178, C5178 and C5183; C5178 can be s/c by the music-speech switch in the 'speech' position. When the switch is closed, the feedback is the same for all frequencies; when it is open ('music') the feedback for the lower frequencies is reduced giving more bass.

VIII SYNC. MODULE

1. Block-schematic description (Fig. 34)

The horizontal oscillator in IC8367 operates at twice the normal line frequency. By using a divide-by-two circuit it is ensured that the outgoing pulses on point 15 of the module have the correct horizontal frequency. This oscillator frequency has been chosen because it yields 50Hz after a division by 625, thus ensuring a stable vertical synchronisation. The sync. separator separates both the vertical and the horizontal sync. pulses from the video and is also coupled to a noise inverter. The sync. pulses are applied via gate circuit A to the phase discriminator which compares them with the horizontal oscillator pulses and if necessary corrects the oscillator. The gate opens briefly before the sync. pulse appears and closes briefly afterwards as a result of pulses from the gate pulse generator B. The gate phase discriminator C ensures that the gate opens symmetrically relative to the sync. pulses.

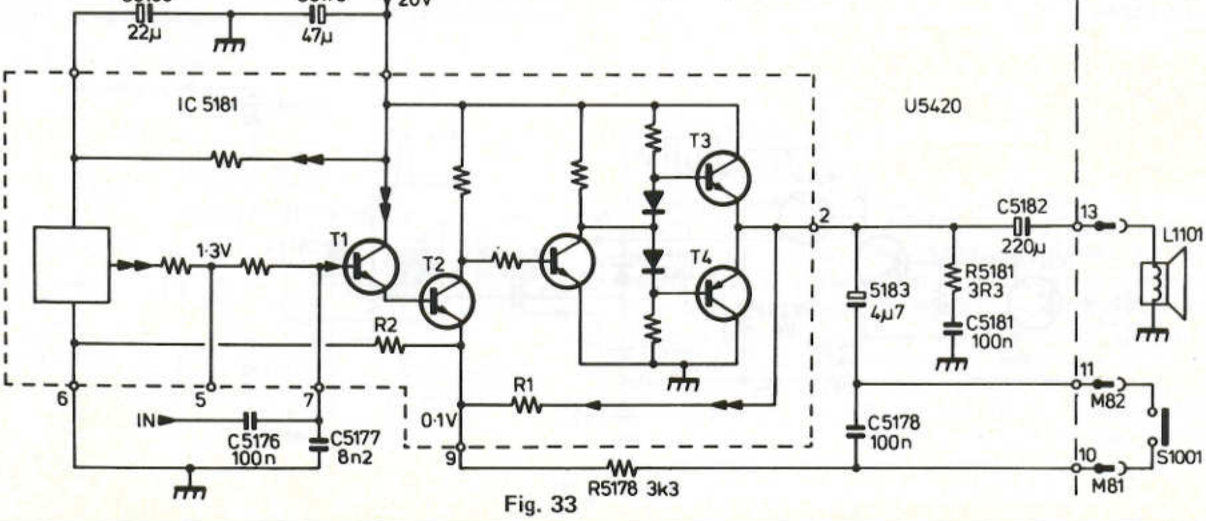
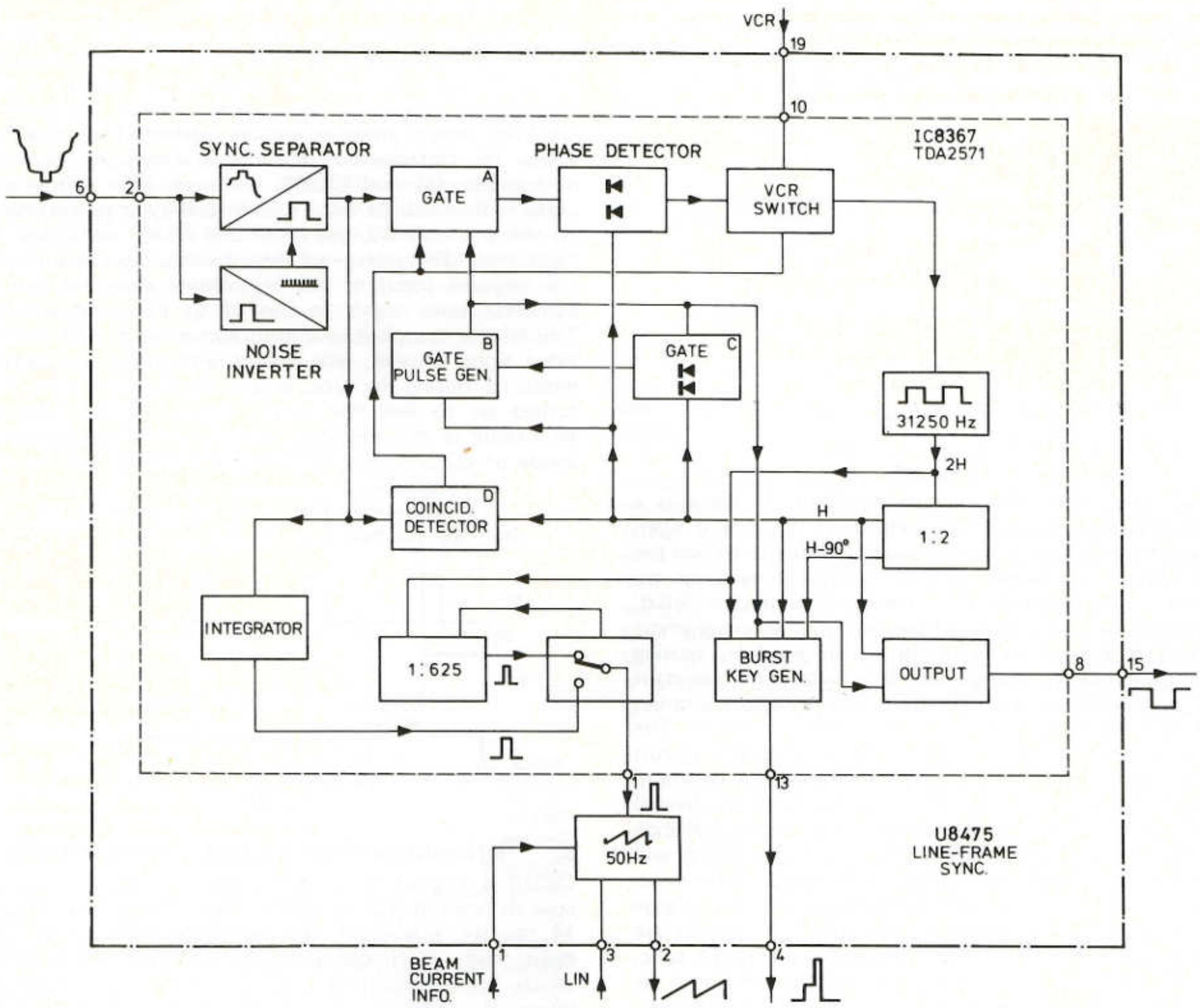


Fig. 33


VCR
19
10
IC8367
TDA2571
SYNC. SEPARATOR
PHASE DETECTOR
GATE
A
VCR
SWITCH
6
2
NOISE
INVERTER
GATE
PULSE GEN.
B
GATE
C
31250 Hz
2H
COINCID.
DETECTOR
D
H
1:2
H-90°
INTEGRATOR
1:625
BURST
KEY GEN.
OUTPUT
8
15
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13
50Hz
U8475
LINE-FRAME
SYNC.
BEAM
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3
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Fig. 34

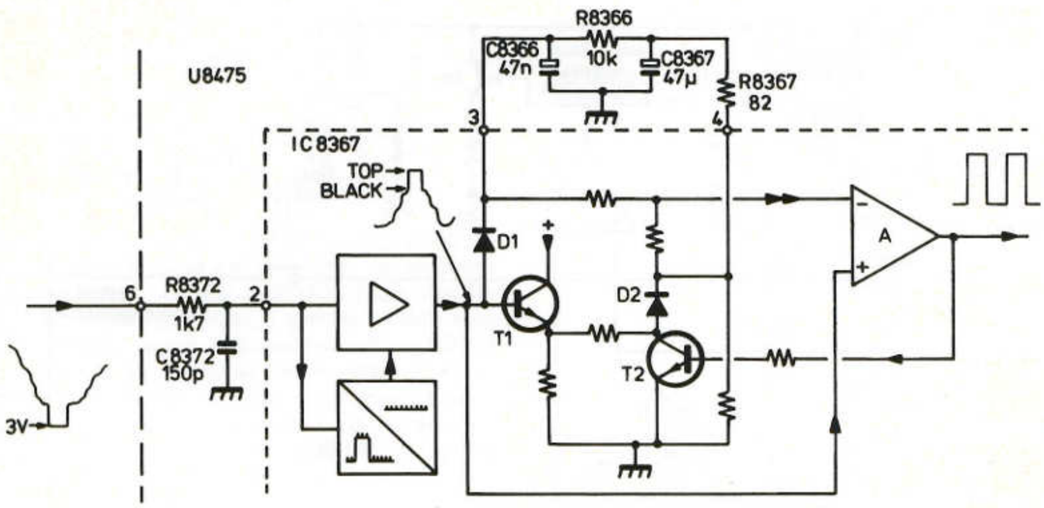

R8366
C8366
47n
10k
C8367
47μ
R8367
82
U8475
3
4
IC 8367
TOP
BLACK
D1
A
6
R8372
1k7
2
C8372
150p
D2
T1
T2
3V

Fig. 35

The coincidence detector D compares the phase of the 15,625 pulses with that of the sync. pulses. If there is no difference (in the synchronised condition), gate A opens only briefly and at the same time the VCR switch

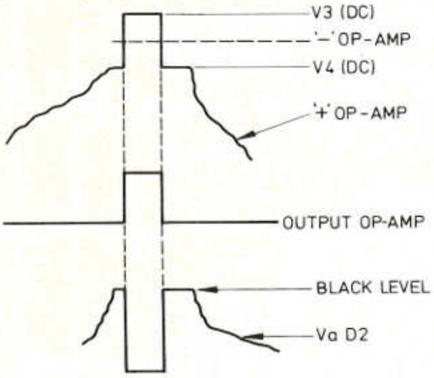


Fig. 36

changes over to the large time constant. If there is a phase difference (circuit not locked-in) the gate is open continuously so that all sync. pulses are transferred and the VCR switch is changed over to a small time constant, ensuring a very fast lock-in. Information that a 'VCR' programme has been selected (usually the last programme selector) is applied to point 19 of the module, causing the VCR switch to change over to a small time constant (gate open fully longer). The burst key generator supplies burst key pulses to point 4 of the U8475 module. The complete sync. signal is also fed to an integrator circuit which supplies the vertical (50Hz) pulses. In addition, the 31,250 pulses from the horizontal oscillator are divided by 625 giving 50Hz. If the vertical sync. pulses coincide with the divided 50Hz pulses, the automatic switch will assume the position shown in Fig. 34. However, if the sync. pulses do not coincide, the automatic switch will change over to the other position, so that the sync. pulses are supplied direct. Since the 625– divided is set by the sync. pulses it becomes synchronised, the switch returns to its normal position, resulting in very stable vertical synchronisation. The vertical oscillator is external to, but directly triggered by sync. pulses from, IC8367. Furthermore, the U8475 module receives beam current information which is used to maintain the picture height independent of the video content and also an input voltage for the linearity network.

2. Sync. separator (Fig. 35 & 36)

The signal is filtered by R8372 and C8372 to remove the chrominance signal and the highest video frequencies before passing through an amplifier to which a noise inverter is connected. This noise inverter disables the amplifier when input levels are presented with a level below 1V. (interference in the sync. direction). By means of a diode, D1 and C8366, the peak level of the video signal is detected. As video with inverse sync. pulses appears on the anode of D2, this diode and C8367 will detect the black level. The average of these two voltages is applied to the negative input of the operational amplifier and the complete sync. signal is applied to the positive input. This results in a positive output voltage each time that the video signal exceeds the average voltage on the negative input, i.e. during the sync. pulses. At the same time, T2 is turned on so that the anode voltage of D2 decreases. As a result of this the black level is the highest level on the anode of D2 and so a normal peak detector may be used.

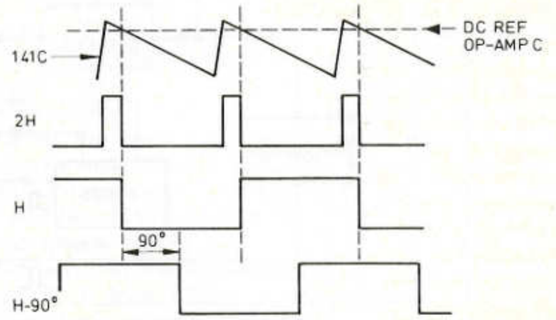


Fig. 38

3. Horizontal oscillator and divide-by-2 divider (Fig. 37)

C8370 is charged fairly rapidly via an internal resistor and level detector switch in IC8367. When the voltage on point 14 reaches a level of approximately 6.5V., this switch opens and C8370 can discharge via R8370 and R8371, which being adjustable, can vary the rate of discharge. When the voltage across C8370 decreases to 3.5V., approximately, the level detector switch will close and the cycle will be repeated. At these switching levels, the selected RC time results in a frequency of 31,250Hz. (twice the line frequency). The lower level of the level detector is variable. The value of 3.5V. is valid if no voltage difference is applied between points 7 and 15 of IC8367.

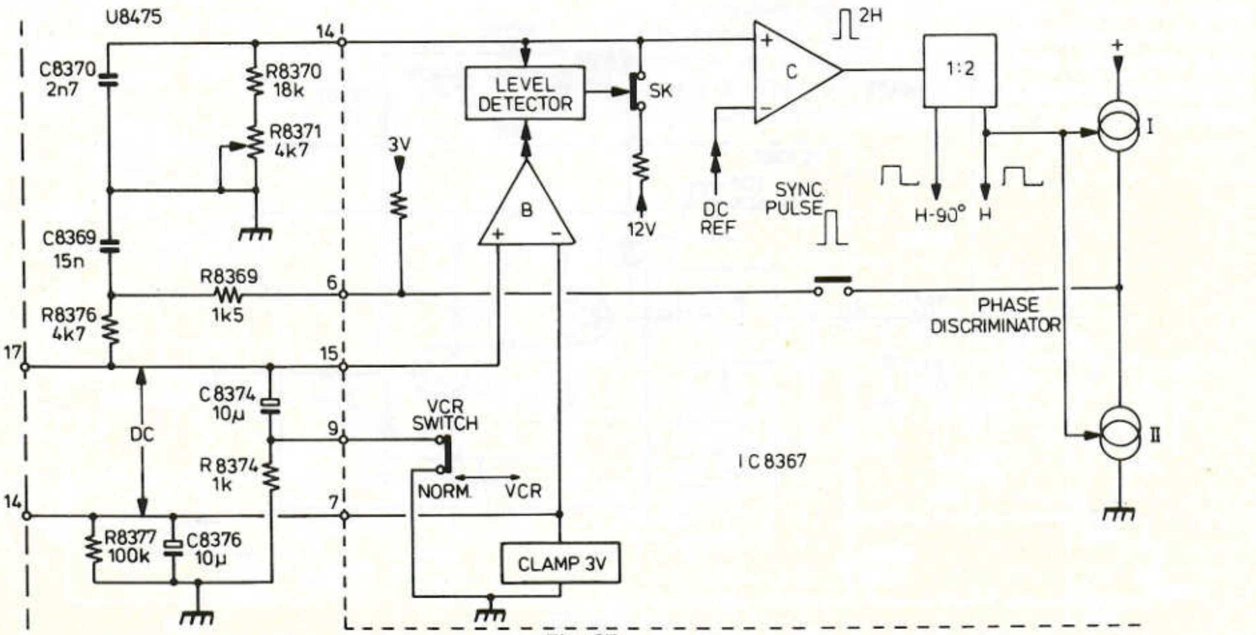
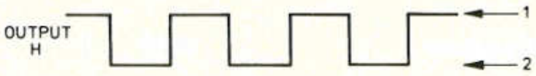


Fig. 37



When point 15 becomes positive relative to point 7, the lower switching level and thus the frequency will increase. The opposite happens when point 15 becomes negative relative to point 7 which has a fixed value of 3V. Point 15 is connected to the phase-discriminator so it corrects the horizontal oscillator. As the sawtooth voltage on point 14 is not suitable for driving a digital divide-by-two circuit, it is converted into a squarewave voltage by an operational amplifier. This amplifier supplies two pulses of 15,625Hz., one pulse lagging the other by 90^{o} (Fig. 38).

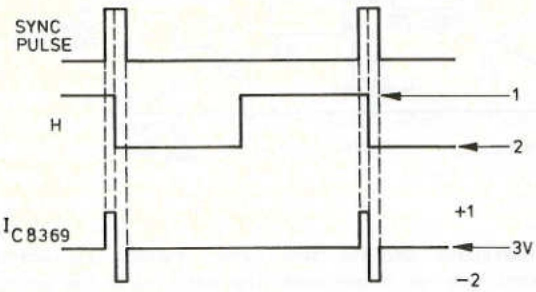


Fig. 40

4. Horizontal synchronisation (Fig. 37)

After a gate circuit the sync. pulses reach the phase discriminator, which compares their phase with that of the horizontal pulses. The phase discriminator comprises two constant-current sources which are turned on and off by the horizontal squarewaves H from the divide-by-two circuit. During the positive portions of the waveform source 1 is turned on and during the negative half cycles source 2 turns on (Fig. 39). These sources can charge (from 1) or discharge (from 2) C8369 when the switch is closed during a sync. pulse. The average voltage on C8369 is 3V., maintained when the capacitor receives equal amounts of current from the two current sources (Fig. 40). This is when the falling slope of the horizontal

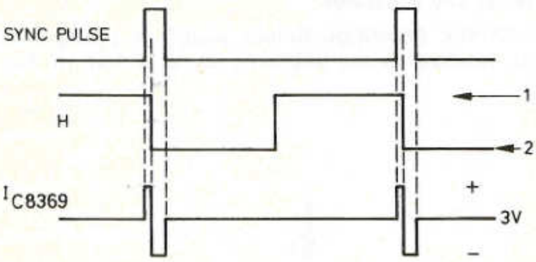


Fig. 41

appears halfway through the sync. pulse, so that point 15 of the IC is at the same level as point 7, with no necessity to correct the oscillator. If the oscillator leads relative to normal, C8369 is discharged to a greater extent than it is charged, the voltage across it decreases and via R8376 the voltage on point 15 becomes lower than that on point 7 (Fig. 41). The oscillator is then corrected towards a lower frequency until the correct situation is restored. Exactly the opposite happens when the oscillator is lagging. R8376 and C8374 function as a flywheel circuit with a fairly large time constant during NON-VCR operation because the VCR switch is then closed. In the VCR mode, point 9 is not connected to earth and R8369 with C8369 only determine the time constant, which being very small ensures a rapid lock-in. The negative side of C8374 is connected to earth via R8374, limiting the speed of control so that hunting is avoided. A D-type flip-flop slightly delays the horizontal squarewaves H before they are applied to the power supply module so that their negative-going slopes appear approximately halfway during the horizontal

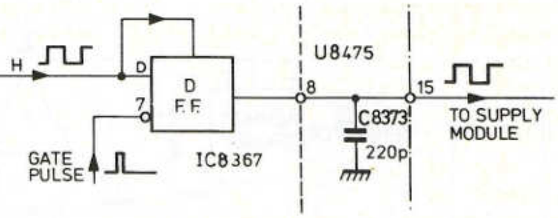


Fig. 42

blanking. The flip-flop is triggered on the negative-going slopes of the gate pulses and is set output 'high' during the "1" level of the horizontal pulse (Fig. 42 & 43). A gate circuit E, between the sync. separator and the phase discriminator, opens just before the horizontal sync. pulse and closes just after. This immunises the phase discriminator from intermediate interference pulses. The Schmitt trigger supplies a "high" level when the sawtooth exceeds a specific level (REF. A) and a "low" level when the sawtooth decreases below a certain value (REF B) (Fig. 44 & 45). Normally the pulse which is supplied is situated symmetrically around the sync. pulse and gate E is opened symmetrically relative to the sync. pulse.

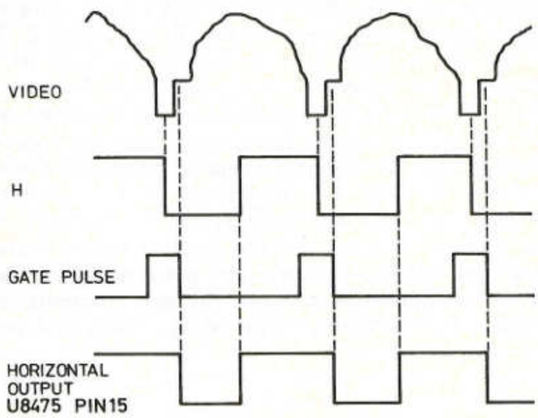


Fig. 43

REF. A and B are determined by the collector voltage of T2; if this increases, REF. A increases and REF. B decreases, so that the gate pulse appears later. The collector voltage of T2 depends on the gate phase discriminator, which compares the phase of the gate pulse and the horizontal pulse. T2 also serves to stabilise the voltage on point 7 of IC8367 at approximately 3V. The

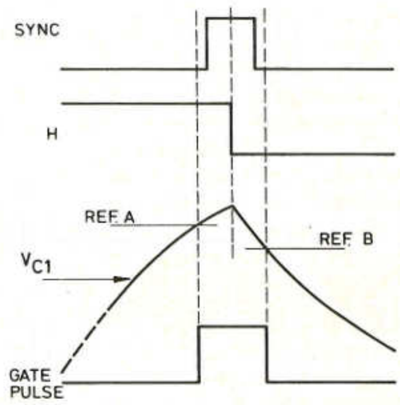


Fig. 44

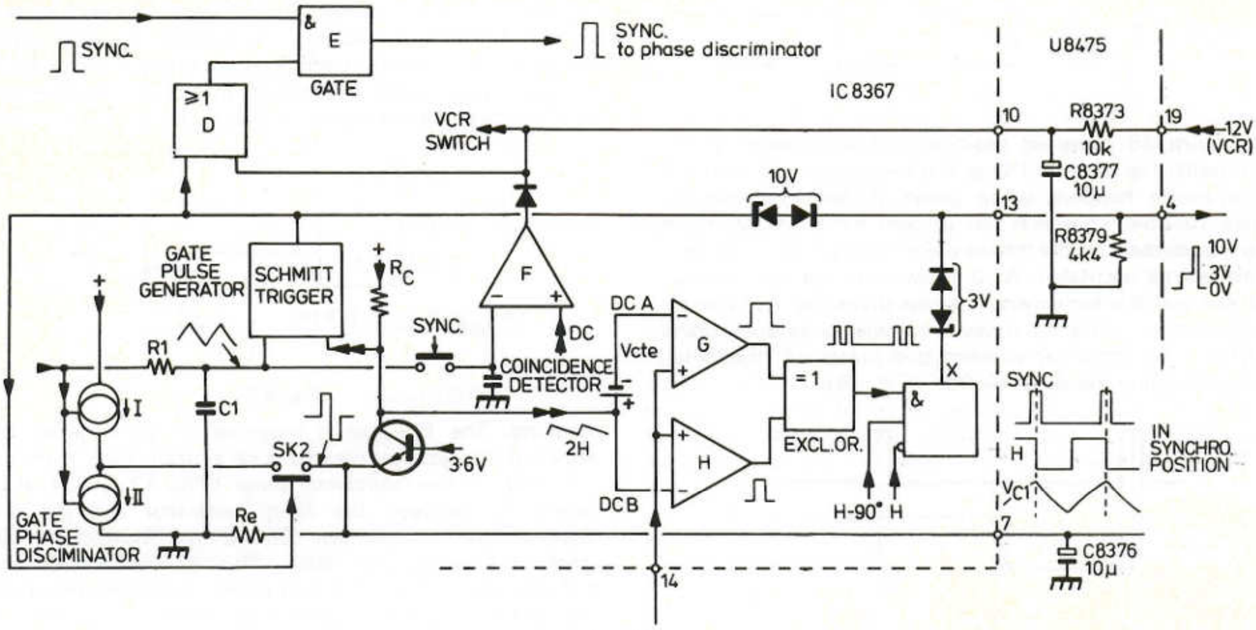


Fig. 45

operation of the gate phase discriminator is identical to that of the phase discriminator in the horizontal sync. circuit. Again two current sources are controlled by H, but S2 is now controlled by the gate pulse. If the gate pulse is symmetrical relative to the sync. pulse, source 1 will supply as much current to C8376 as source 2. The average current is zero and the collector voltage of T2 is determined by its base voltage and also Re and Rc (Fig. 46). However, if the gate pulse appears prematurely, source 1 will supply current for a longer time and source 2 for a shorter time, so that an average current flows towards the emitter of T2 (Fig. 47). As a result of this the emitter current decreases (current through Re is constant); the collector voltage increases and the Schmitt trigger changes over at a later instant. Thus the gate pulse is shifted backwards. The circuit tends to open the gate symmetrically with respect to the falling slope of the horizontal pulse (symmetrically around the sync. pulse). To maintain the burst key in phase with the gate pulse the collector voltage of T2 is also applied to the burst-key generator. If the horizontal oscillator has not locked-in gate E is kept open continuously by the coincidence detector via gate D. Moreover the VCR switch is opened in order to speed up lock-in. The gate may also be opened continuously by applying a voltage of 12V. to point 19 of the module (VCR command from the control circuitry). S3 is closed during the sync. pulse, so that C3 is charged to the instantaneous value of the voltage across C1. If H has the correct phase relative to the sync. pulses, this instantaneous value will be high and operational amplifier F will supply a "0". If there is no synchronisation, however, C3 will be charged to a much smaller value and operational amplifier F will now supply a "1". The VCR switch is then opened and via gate D gate E is kept open continuously.

5. Burst-key generator

The burst-key generator should supply a pulse which is situated, relative to the video signal, as shown in Fig. 48.

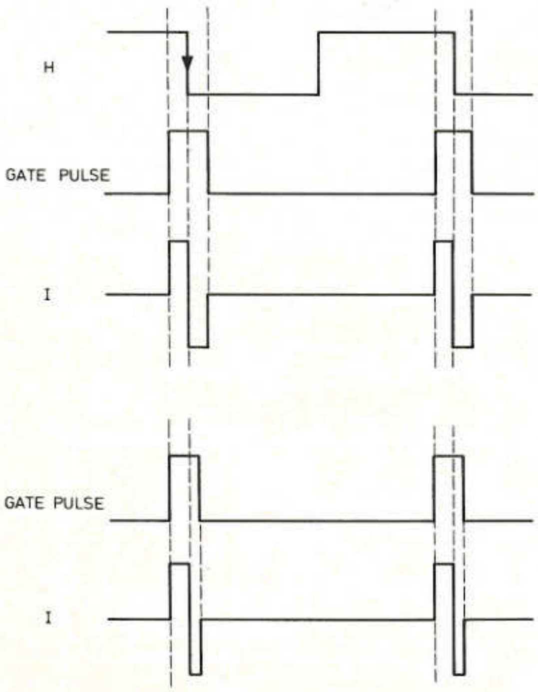


Fig. 46

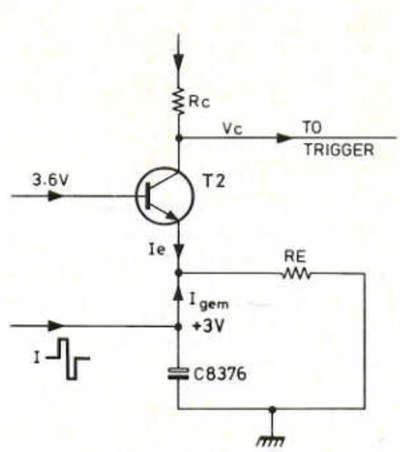


Fig. 47

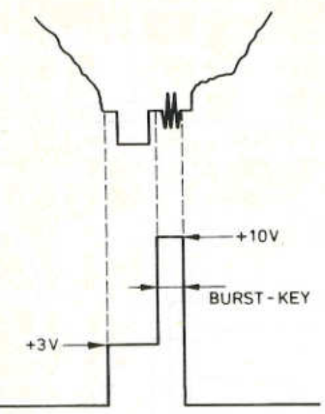


Fig. 48

The wide low portion in the burst-key pulse is derived from the gate pulse and the narrow portion from the horizontal sawtooth on point 14 of IC8367, in conjunction with two level detectors G and H, see Figs. 45 & 49. Operational amplifiers G and H compare the horizontal sawtooth voltage on point 14 of the IC with two d.c. levels. Operational amplifier G compares it with a low level and operational amplifier H with a high level. As a result, G supplies a wide pulse and H supplies a narrow pulse. The difference in width is determined by the difference in d.c. level. The two pulses are applied to an exclusive–OR gate which supplies a "1" if only one input is high; thus it supplies four pulses in one line period. The next gate, which only transfers pulses if H is low and H–90^{o} is high, transfers the correct pulse which may serve as the burst-key pulse. By means of zener diode circuits the burst-key pulse and the gate pulse are added together, giving a 3V. blanking level and a 10V. burst-key level on the output.

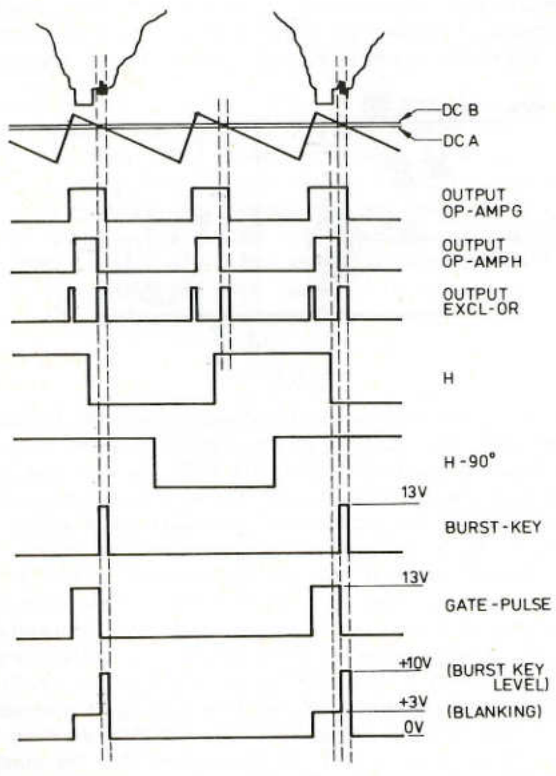


Fig. 49

6. **Vertical synchronisation (Fig. 50 & 51)**

The vertical sync. pulses are derived from the complete sync. signal by means of the internal integrator R and C. This results mainly in vertical sync. pulses on the base of T3. During these sync. pulses T3, and also T4, are turned on so that positive-going sync. pulses will appear on the collector of T4. The emitter circuit of T3 includes an RC–network, which automatically adapts the emitter voltage to the average sync. level. These direct vertical pulses are applied to an automatic switching system. This either transfers them, or the pulses derived by a division by 625 from the 31,250Hz. signal to the vertical oscillator. If the divided 50Hz. pulses coincide with the direct vertical sync. pulses, flip-flop FF maintains a switch so that three voltages enter at AND 1: a "1" from FF, the direct pulse and the divided pulse which coincide. Thus AND 1 will supply 50 Hz. pulses which function as 'set' pulses for the 16-bit counter so that this counter remains in its zero position. This means the start and stop outputs of the start-stop generator always remain zero and the state of the flip-flop does not change. In the case of a phase error (divided 50Hz. pulses not in phase with the direct pulses) gate 1 will no longer supply any pulses. The counter is then no longer set to its zero position and can start to count the divided 50Hz. pulses.

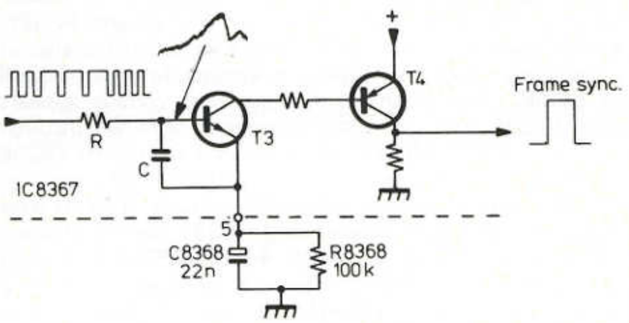


Fig. 50

After 16 frames the start-stop generator will supply a start pulse, so that the flip-flop is reset and the switch is set to its other position. The vertical oscillator is now synchronised by direct pulses. At the instant that a direct pulse appears on gate 3 (the start pulse) it is transferred to the set input of the divider. This divider is now set so that it also supplies a pulse; in other words it is again in phase with the instantaneous direct pulse. However, as the flip-flop has changed over, gate 1 is fully inhibited so the counter is still being advanced. After 14 frames a stop pulse is generated by the start-stop generator and applied to AND 2 together with the direct and the divided 50Hz. sync. pulses. As these two last-mentioned pulses are in phase, gate 2 will supply a pulse and the flip-flop will be set again. The original situation is then restored, i.e. synchronisation by the divided vertical sync. pulses. If a signal is received which does not comprise 625 lines, the process is the same until the instant that the stop pulse is generated. The direct and the divided pulse then do not coincide 14 frames after the divider has been set (because the dividend is not correct). Consequently gate 2 supplies no output pulse and the flip-flop remains reset, so that direct synchronisation is maintained. The outgoing vertical sync. pulses from IC8367 are inverted by T8386 because the oscillator used employs negative trigger pulses.

7. **Vertical oscillator**

The principle of this vertical oscillator is that a capacitor is charged by a constant current source, the capacitor is then rapidly discharged, is re-charged etc., resulting

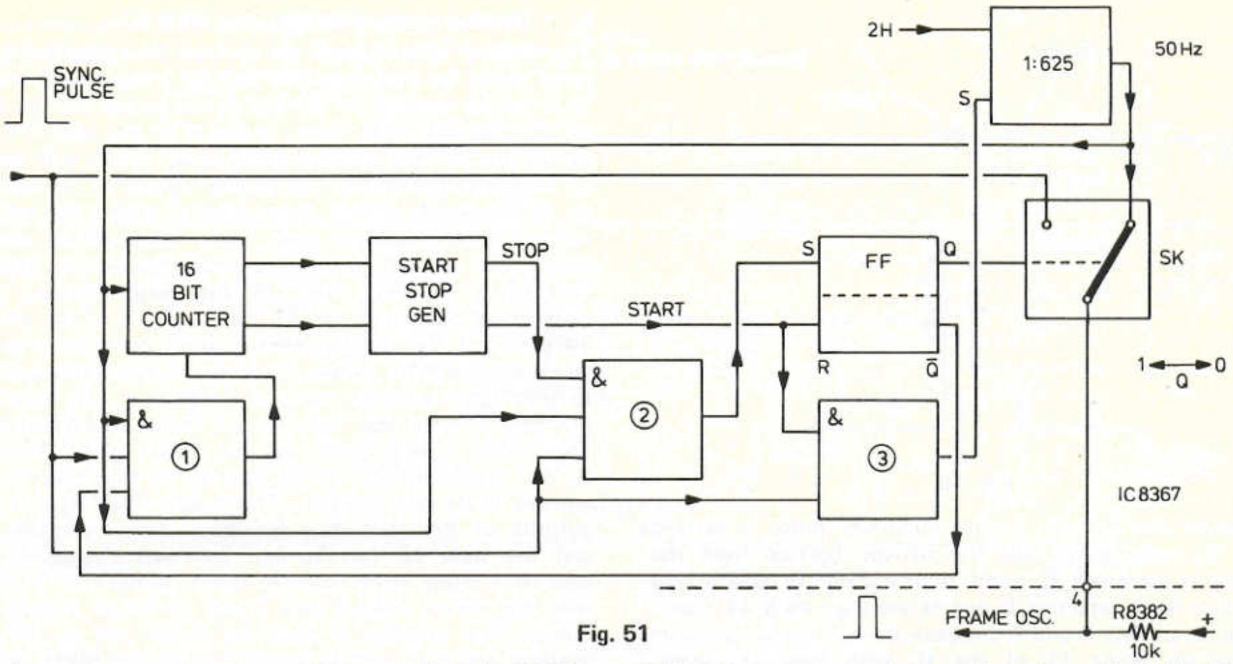


Fig. 51

in a linear sawtooth voltage. This capacitor is C8397 which is charged via R8393, R8394, R8395 and R8396. Each voltage rise on the lower end of R8395 is transferred to the upper end of R8395 via emitter-follower T8396 and C8396. This means that a constant voltage appears across R8395 and a constant current is obtained through it, charging C8397. R1501 is the emitter resistor of T8396 and being variable, consitutes the picture height control. When the emitter voltage of T8397 is lower than its base voltage, nothing will happen and C8397 can be charged further. However, at a certain instant T8397 is turned on, together with T8392 which is coupled to it in a thyristor arrangement. C8397 is now discharged very rapidly via R8397 and the two transistors. At the instant that C8397 has been discharged to the point where the thyristor hold current becomes too small, the transistors are turned off and the cycle is repeated. The moment at which the transistors are turned on can be adjusted with R8390; this is the free-running frequency adjustment (adjusted for 50Hz. without incoming sync. pulses. The frequency decreases as the voltage on the wiper increases).

The average voltage on both ends of R8388 is then equal because D8388 does not conduct in the absence of sync. pulses. When sync. pulses do appear, the average voltage on the left of R8388 increases because the sync. pulses, which are a.c. coupled via C8388 are clamped at earth level by D8388. The average base voltage of T8397 then also increases and the free-running frequency is reduced to a lower frequency, approximately 45Hz. However, the sync. pulses themselves now turn on the two transistors via R8388 so that the flyback (discharge of C8397) begins immediately; the sync. pulses "pull" the oscillator to 50Hz. Beam current information is applied via R1463 and R8393 to point 1 of the module, the voltage decreasing at increasing beam current. At high brightness levels the constant current which charges C8397 is then reduced so that the output amplitude is also reduced, guarding against the tendency towards 'blooming'.

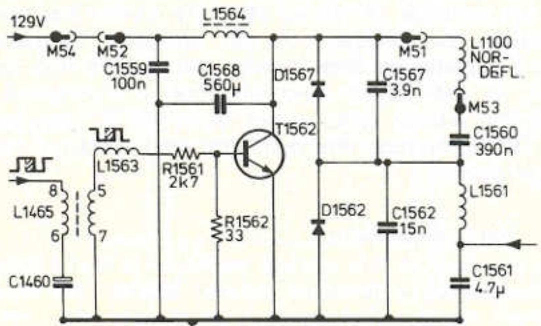


Fig. 52

IX HORIZONTAL OUTPUT STAGE

1. Horizontal deflection circuit (Fig. 52)

C1561 is charged to 129V. via the lopt and line deflection coil and the charge remains constant because of its high capacitance. The 15.625Hz. squarewave drive for T1562 is obtained from L1465 (Fig. 53). During t^1 the input voltage is positive and the transistor is bottomed, its collector voltage being zero (Fig. 54). As a result the deflection coil is connected in parallel with the capacitor so a constant voltage of 129V. appears across it, resulting in a sawtooth current through the coil and transistor.

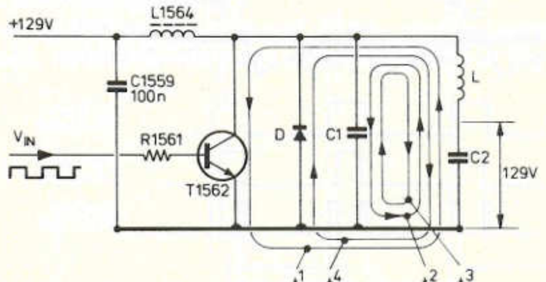


Fig. 53

At t^2 the input voltage becomes negative and the transistor turned off. The current which flowed through the coil now flows through C1567 and C1562; as the energy is transferred the current through the coil decreases and the voltage across the capacitance increases as a sinusoidal function. At a specific instant most of the energy has been transferred and the energy recovery starts at t^3. C1 now feeds current to L so that the voltage across C1 decreases and the current through L increases sinusoidally. If all the energy were transferred to L, the voltage across C1 would tend to become negative. However, diode D is now turned on during t^4, so that L is again connected to C2. The voltage across L is again 129V., yielding the same $\Delta I/\Delta t$ as during t1. At the instant that the current tends to reverse, T1 takes over the current because prior

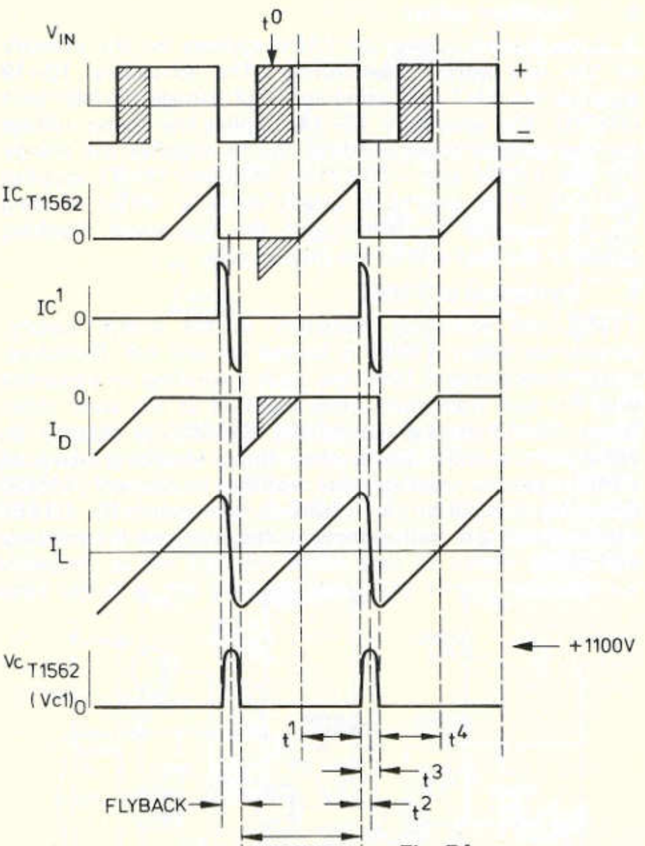


Fig. 54

to this instant it already receives a positive driven voltage during t^0. Therefore the instant t^0 should always appear before t^1 begins, and for this reason the duty cycle should be limited to a maximum of approximately 70% in the switched-mode power supply. The time $(t^2 + t^3)$ is determined by the value of C1 and the self-inductances of L and the primary of L1465. The current I_D (the current through the diode during t^4) can partly be taken over by T1 if it is turned on prematurely Fig.55. In order to obtain the so-called "S" correction, C2 cannot be selected infinitely large. Therefore, the voltage across C2 is not constant but smaller than 129V. at the beginning and end of the forward scan (on the left and right of the screen) and higher than 129V. halfway through the forward scan (screen centre). As a result of this, the current through L has a smaller $\Delta I/\Delta t$ during the left and right portion of the scan and a greater $\Delta I/\Delta t$ in the centre. Thus, S—correction (correction for the expansion of the picture on the left and right as a result of the length variation of the electron beam) is obtained. In reality L is the series connection of the horizontal deflection coil and L1561 and C2 is the series connection of C1560 and C1561. L and C2 have been split so as to enable east-west correction. If the horizontal deflection current were always constant, this would lead to a picture with horizontal pin-cushion distortion. In order to eliminate this error, the horizontal deflection current should be modulated by the east-west modulator.

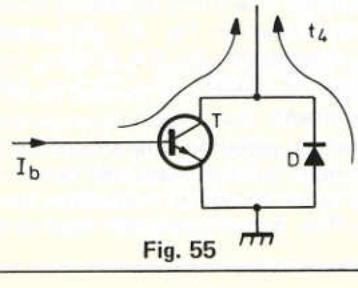


Fig. 55

2. East-west modulator

The picture width is determined by the forward scan voltage across L1100 during t^1 and t^4. When this voltage is changed, the picture width is also varied. The forward scan voltage is always Vb—Vr. If L1490 were not present, Vb would be distributed between C1560 (Vb—Vr) and C1561 (Vr) depending on the self-inductances of L1100 and L1561 and on the capacitances C1560 and C1561. Vr becomes approximately 23V. and the charge of C1560 (Vb—Vr) obviously becomes 106V. This means that during t^1 and t^4 a voltage of 106V appears across L1561; in this case the picture width is always too small. By discharging C1561 via L1490 by means of the east-west control (controlled zener diode), Vr may be caused to decrease and Vb—Vr to increase, which corresponds to a picture-width increase. Thus the picture width increases as Vr decreases. L1490 ensures that the horizontal frequency current cannot reach the east-west modulator. Figs. 56 and 57 show the currents during t^1 and t^4. The east-west modulator is in fact a controlled zener diode which discharges C1561 to an accurately defined value Vr. The east-west modulator performs the following three functions:—

- it determines the average picture width (average value of Vr)
- it adapts the value of Vr to the average beam current. When the beam current increases, Vr should also increase to prevent horizontal blooming.
- it modulates Vr with a parabolic voltage of vertical frequency in order to avoid east-west pin-cushion distortion.

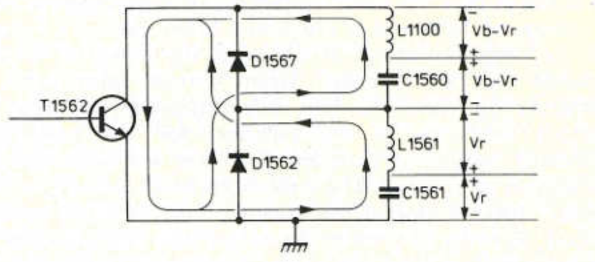


Fig.56

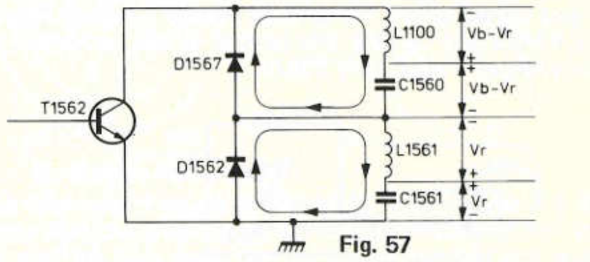


Fig. 57

T1485 and T1490 constitute an operational amplifier which can discharge C1561 but cannot charge it because the output current can flow in one direction only. The positive input of the operational amplifier is the emitter of T1485 and the negative input is the junction of C1484 and R1485, while the output is the emitter of T1490. The d.c. setting of the complete circuit determines the picture width. D.C. negative feedback is provided by R1491 and R1492 whilst C1492 ensures that there is no a.c. feedback. The picture width is adjusted with R1513 and R1473 stabilises the width for beam current variations. R1472 and C1472 provide picture-width corrections for brief beam-current variations. A.C. negative feedback is

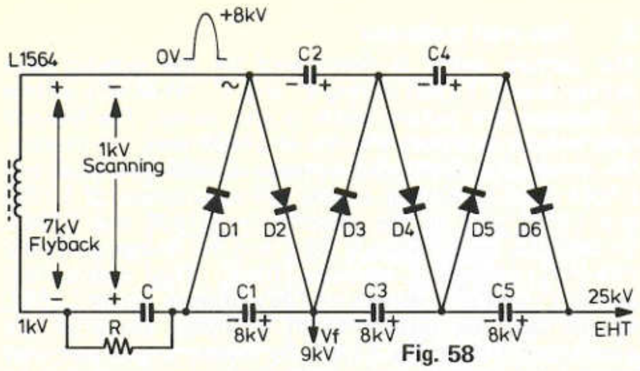


Fig. 58

provided by C1491 and R1484 is the input resistor. The circuit forms an active integrator yielding a parabolic voltage of vertical frequency at the output if the input voltage is a sawtooth of vertical frequency. This means that Vr increases at the top and bottom of the picture (reduced picture width) and that Vr decreases in the middle of the picture (increased picture width).

3. EHT, focussing voltage and Vg2 voltage (Fig. 58)

The EHT is generated by the U1570 tripler unit from its coupling with L1564 lopt. Approximately 25kV is available on the EHT point and 9kV (focussing and Vg2 voltage) on the Vf point. R1572 adjusts the focussing voltage and R1581 supplies the Vg2 volts.

4. Beam current information (Fig. 59)

Points D and A of the tripler unit are connected to +30V via R1565. Two currents flow through this resistor; The current I_f through the focussing and Vg2 resistors, constant at 0.36mA plus the beam current I_{ss}. At zero beam current a voltage of 18V, and at maximum beam current a voltage of 2V, approximately, is obtained on point A. C1565 ensures that an "average" beam current information is obtained on point A. This information is employed at various locations in the receiver, for the previously discussed blooming compensation and for beam-current limitation as follows. The maximum beam current in the picture tube is limited, by means of the contrast control circuit, in order to prevent premature wear and overloading of the power supply. At a very small beam current V_{ss} is high and D1422 is cut off; the contrast voltage is then determined by the divider R3204 and R1422. At increasing beam current V_{ss} decreases and at a certain instant D1422 is turned on; the contrast voltage now decreases via R1424, D1422 and R1422. At a very large beam current D1423 is also turned on and the contrast voltage is further reduced via R1423 and D1423; this control is fast because of the low value of R1423, only 220Ω.

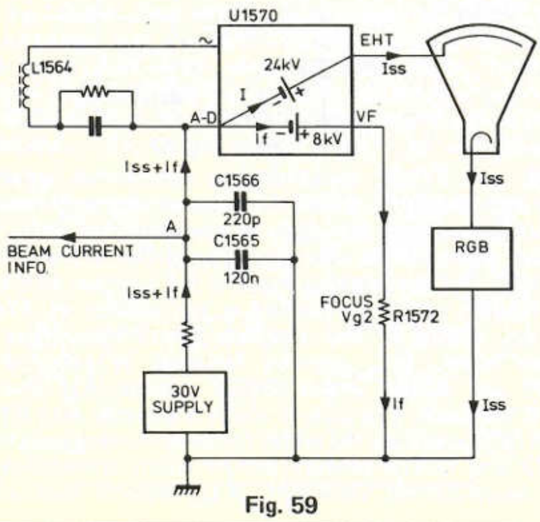


Fig. 59

5. Auxiliary pulses

A pulse-shaped voltage of 1.1kV appears on the primary of the line output transformer. The secondary 10–19 supplies the EHT, focussing and Vg2 voltages (tripler unit U1570). The secondary 13–14 supplies the heater voltage for the picture tube; winding 15–16 supplies the energy for the +155V and –20V lines. Winding 16–17 supplies the +13, +13a and +13b supply voltages, whilst winding 16–18 supplies the +30V and the horizontal blanking pulses to the first grid of the picture tube.

6. Protection of T1562

T1463, the switching transistor in the power supply, determines when T1562 is turned on and off. Switched-mode transformer L1465 has such a winding arrangement that the two transistors never conduct at the same time. When T1463 is short-circuited, C1460b is charged to 290V.; the current which then flows in the primary of L1465 creates negative base voltage to cut off T1562. Excessive dissipation in T1562 is prevented by D1461 which damps out self-induced voltages across the primary of T1463.

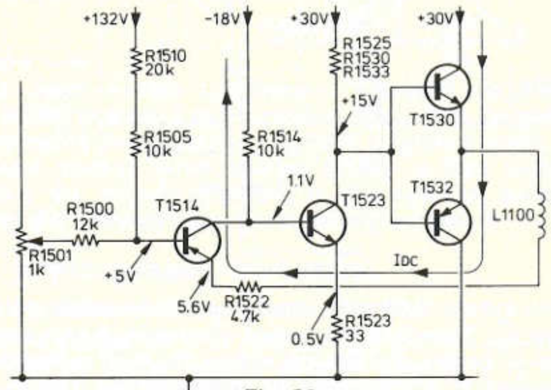


Fig. 60

X VERTICAL OUTPUT STAGE

1. D.C. operation (Fig. 60)

The purpose of the d.c. setting is to stabilise the d.c. output voltage at half the supply voltage (approximately 15V.). The base bias of T1514 is almost exclusively determined by R1510, R1505, R1500 and R1501 at 5V, which means the emitter voltage will be 5.6V. The base voltage of T1523 should be approximately 1.1V in order to obtain a collector voltage (output voltage) of 15V. The current through R1514 and R1522 is 1.91mA; in other words, these resistors and the base voltage of T1514 determine the d.c. setting. R1522 counteracts any d.c. variation at the output.

2. A.C. operation (Fig. 61)

a. Principle

The vertical output stage may be regarded as an operational amplifier with feedback. The positive input is formed by the base of T1514, the emitter of which forms the negative input. A sawtooth-shaped alternating voltage (the voltage drop across R1521) appears at both inputs because the system employs negative feedback. A linear sawtooth current passes through the circuit L1100, C1521 and R1521. The voltage waveforms appearing across the various components are shown in Fig. 61. The amplitude of the a.c. input is determined by the divider R1500, R1505 and the setting of R1501, the picture height control.

b. Linearity control

This is obtained by superimposing a fixed parabolic voltage on the incoming vertical sawtooth and introducing a variable (opposite) parabolic distortion in the vertical output stage. The actual sawtooth feedback is provided

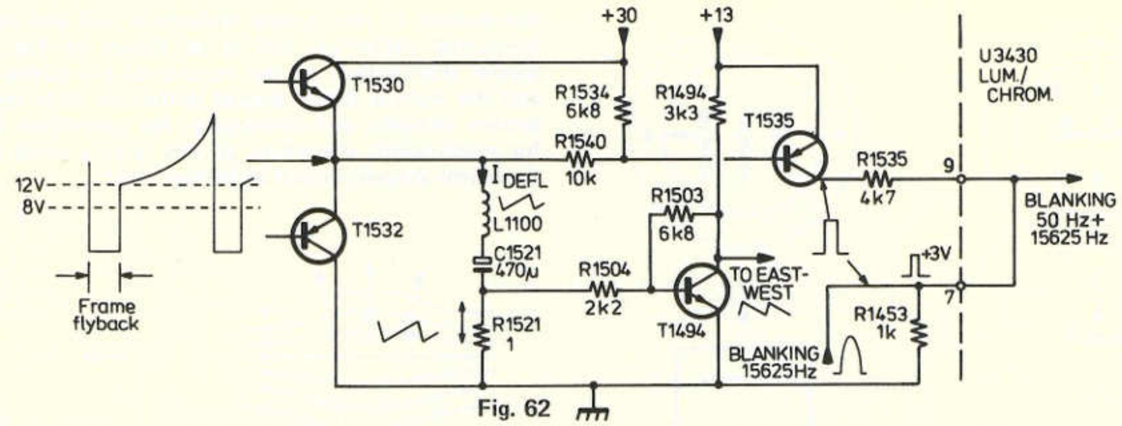


Fig. 62

via C1522, R1515 and R1520 but a certain amount of parabolic feedback is applied by R1522. The ratio between the two negative feedback voltages is adjustable with R1520. The negative feedback via R1522 makes the sawtooth voltage on the negative input slightly concave. However, as the negative input then no longer carries the same signal as the positive input, the circuit responds by

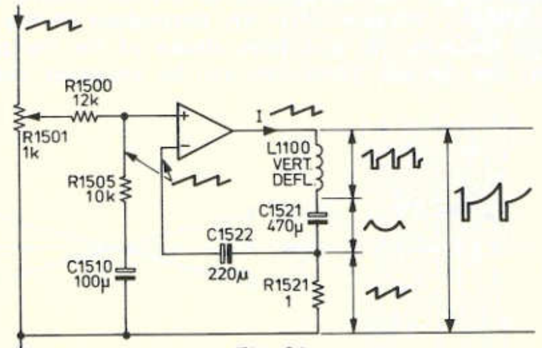


Fig. 61

making the output current convex, the degree of convexity being directly proportional to the value of R1520. This linearity control as described is not capable of making the output current linear, only "convex" in a controlled manner. By making the input sawtooth on the positive input slightly "concave", a symmetrical control can be obtained as the output current is then variable from convex to concave. This is effected as follows. A sawtooth current is fed into C8397 via C1541 and R1502, which behave capacitively and are connected to the parabolic waveform across C1521. As a result of this a parabolic voltage is produced across C8397 and the outgoing sawtooth becomes "concave". The output current can be made so convex relative to the input waveform by adjusting R1520 (vertical linearity control) that a linear sawtooth current is obtained.

c. Output transistors

T1532 supplies the current for the upper half of the picture and T1530 the current for the lower half. C1531 is a bootstrap capacitor so that the same alternating voltage is obtained on either end of R1530; a constant current flows through R1530. The voltage drop across R1533 is also constant (1.2V) permitting a distortion-free current take-over between T1532 and T1530.

3. Vertical centring

When S1002 is in the centre position the circuit is inoperative. When set to the 'chassis' position, a direct current (approximately 10mA) will flow through R1541, L1100 and T1532 to earth causing the picture to be shifted upwards. In the other position of the switch a current of approximately 10mA will flow through L1100 in the other direction and the picture will move downwards.

4. East-West drive circuit (Fig. 62)

The east-west drive requires a falling sawtooth for deriving the 50Hz parabola but only rising sawtooth voltages are available in the set so an inverter is used.

5. Blanking pulse derivation (Fig. 62)

The circuit of T1535 receives its input signal from the output of the vertical output stage. The divider R1534 and R1540 ensures that this transistor conducts only during the vertical flyback period. The collector voltage of T1535 then becomes approximately 13V and the blanking input of the luminance/chrominance module is approximately 3V as a result of divider R1535 and R1433. The sum of the vertical and horizontal pulses is obtained on points 7 and 9 of the module because there is also a pulse current of horizontal frequency through R1433.

XI STATIC CORRECTIONS

All these corrections are performed with magnetic rings in the "multipole" unit which is mounted on the back of the picture tube neck. The unit comprises two magnet rings for RED–BLUE convergence, two for MAGENTA–GREEN and two for colour purity and vertical symmetry. Each ring of a set always has an equal number of magnet poles. The two rings of each set may be rotated arbitrarily relative to each other and also arbitrarily relative to the picture tube neck, so that any desired field strength and any desired field direction can be obtained.

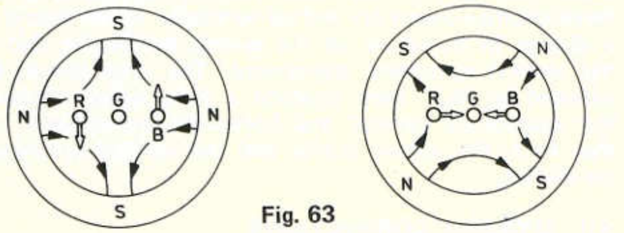


Fig. 63

1. R–B static convergence

Two four-pole rings are employed for this purpose. Fig. 63 shows that the green beam is not influenced and that the red and the blue beam can be moved towards and away from each other. In other words, these four-pole rings enable the static convergence of the red and the blue picture.

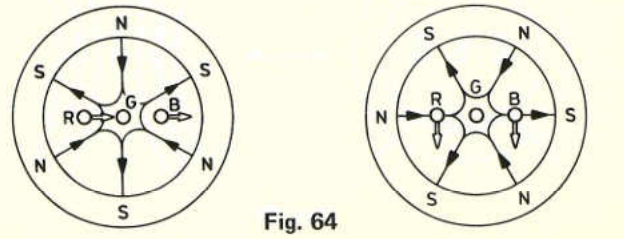


Fig. 64

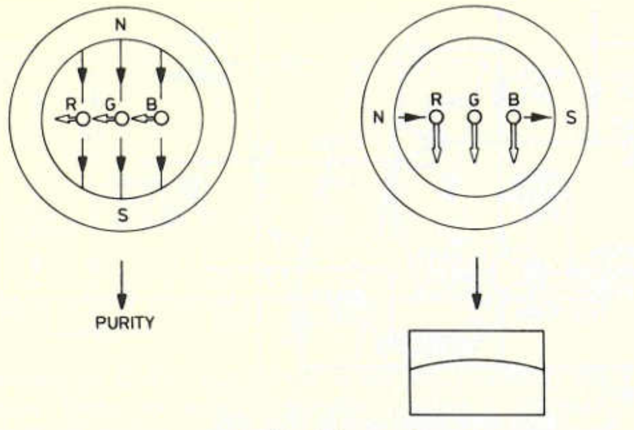


Fig. 65

2. Magenta–G static convergence

For this purpose, two six-pole rings are used, as shown in Fig. 64. Again the green beam is not influenced, but only the red and the blue beams in the same direction. This means that the magenta picture can be moved relative to the stationary green picture.

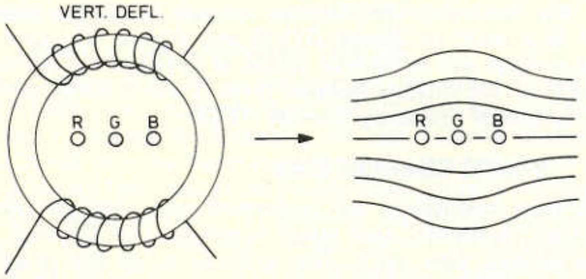


Fig. 66

3. Purity and vertical symmetry

This unit comprises one pair of two-pole rings. Fig. 65 shows that if the field extends vertically the three beams are shifted horizontally; this is the colour purity adjustment. However, if the field extends horizontally, the three electron beams are shifted vertically, which results in a change in curvature of the central horizontal; this is the vertical symmetry adjustment. The rings should be adjusted so that they produce a field which contains the appropriate vertical and horizontal components, so that both the colour purity and the vertical symmetry are correct.

XII DYNAMIC CORRECTIONS

These corrections are realised by vertically and horizontally tilting the deflection unit. The guns will then be situated in a slightly different field. Fig. 66 shows the field

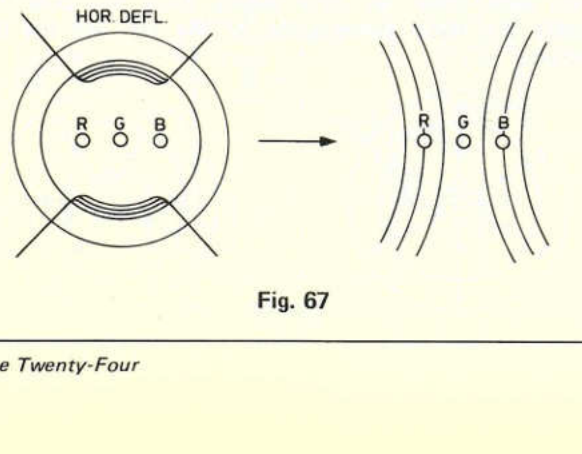


Fig. 67

distribution in the vertical deflection coil and that in the horizontal deflection coil is as shown in Fig. 67. The special distribution of the horizontal pin-cushion shaped and the vertical barrel-shaped deflection field renders the system virtually self-converging. No correction is needed for north-south distortion as this is very small owing to the barrel-shaped vertical deflection field.

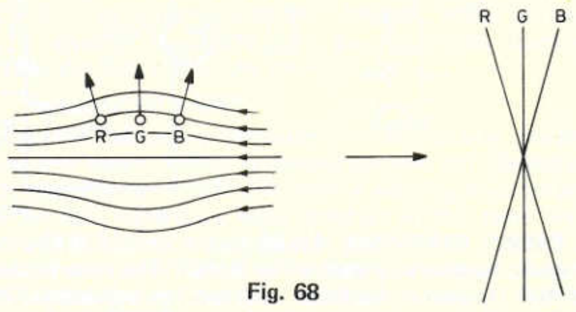


Fig. 68

1. Horizontal tilting

The guns appear to be shifted along the horizontal axis; either the red or the blue gun is then brought into a stronger field. The dimensions of the red picture then, for example, increase while the dimensions of the blue picture decrease. By a suitable choice of the horizontal tilting the picture dimensions can be equalised exactly.

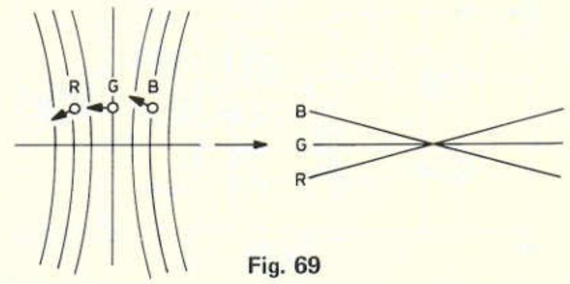


Fig. 69

2. Vertical tilting

Viewed in the vertical deflection field the R and B guns are situated in oblique field lines, so that the R and B beams are also subject to a certain amount of horizontal deflection. The blue vertical lines for example tilt clockwise whereas the red vertical lines are tilted anti-clockwise, see Fig. 68. Viewed in the horizontal field the same occurs so that the R and B beams are also subject to a certain amount of vertical deflection, see Fig. 69. Summarising, this means that if the deflection coils are tilted vertically the red picture is rotated relative to the blue picture. In this way the fault shown in Fig. 70 may be eliminated. After the appropriate horizontal and vertical tilting has been performed, the deflection unit is kept in position with rubber wedges.

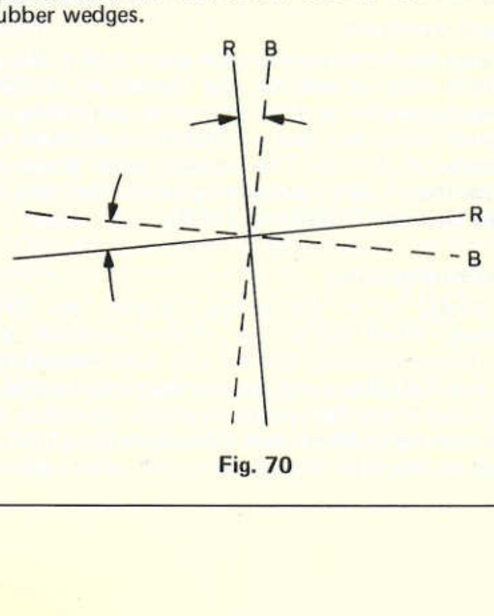
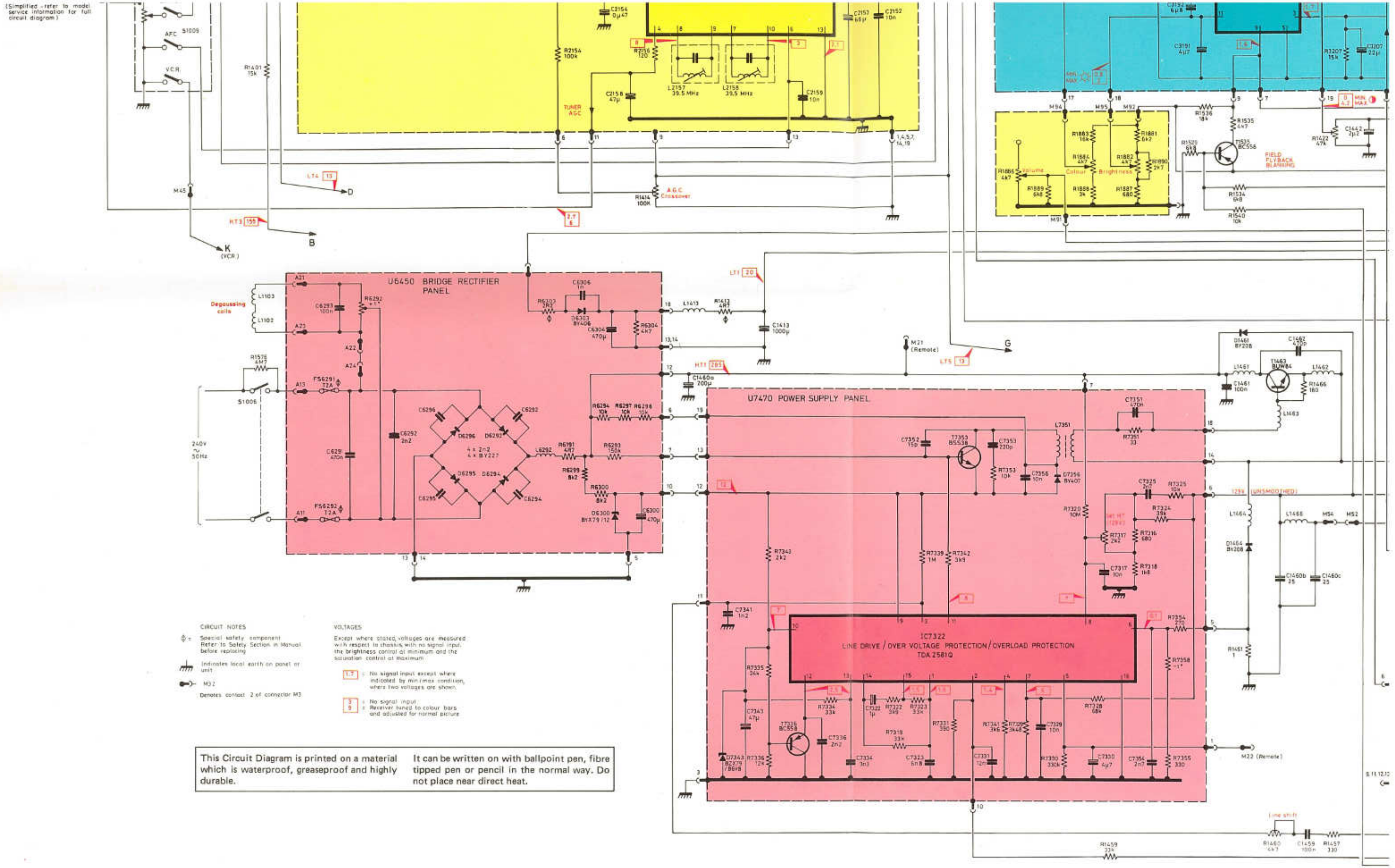


Fig. 70



CIRCUIT NOTES

⚠ = Special safety component. Refer to Safety Section in Manual before replacing

Indicates local earth on panel or unit

M32 Denotes contact 2 of connector M3

VOLTAGES

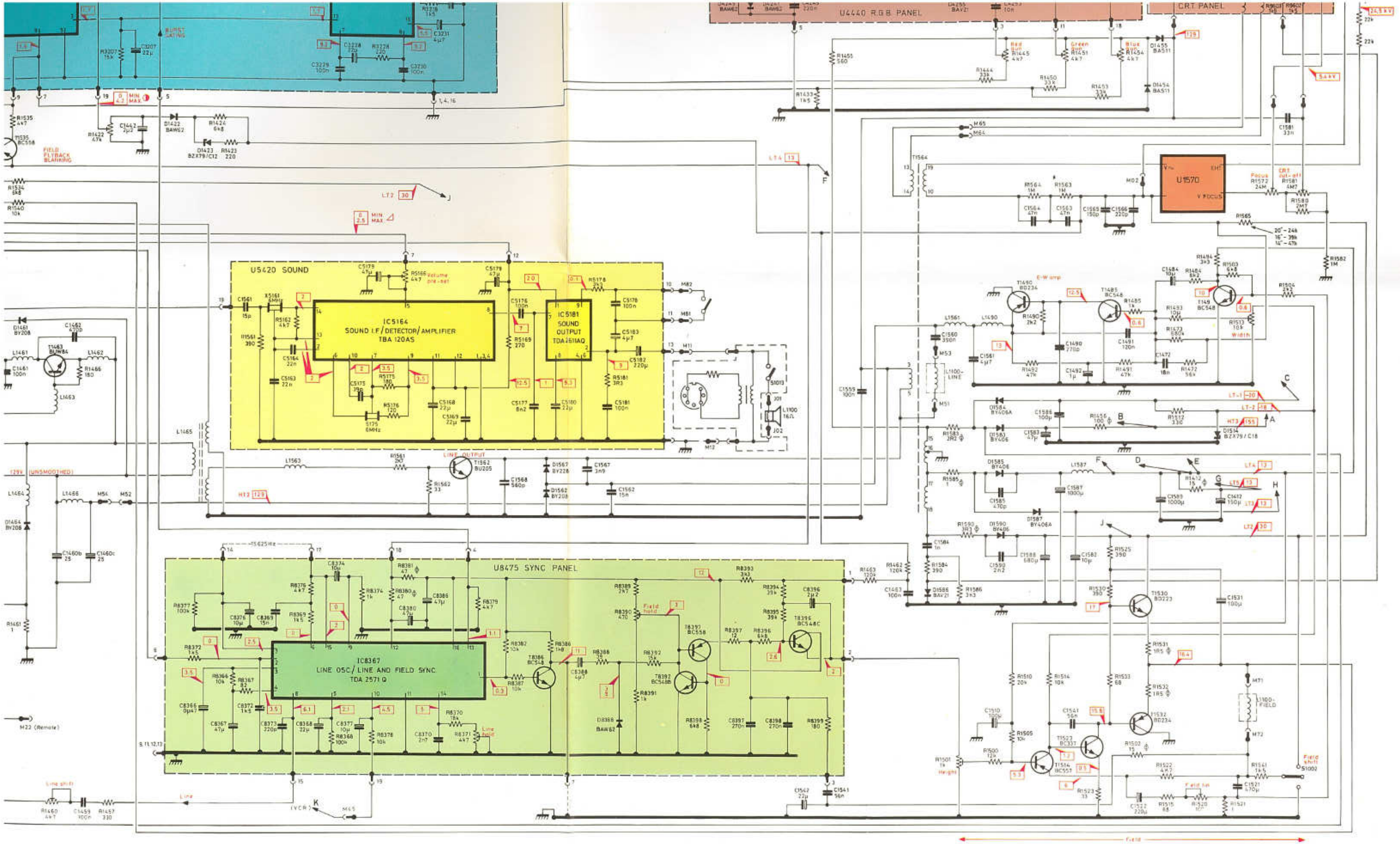
Except where stated, voltages are measured with respect to chassis, with no signal input, the brightness control at minimum and the saturation control at maximum.

1.7 : No signal input except where indicated by min / max condition, where two voltages are shown.

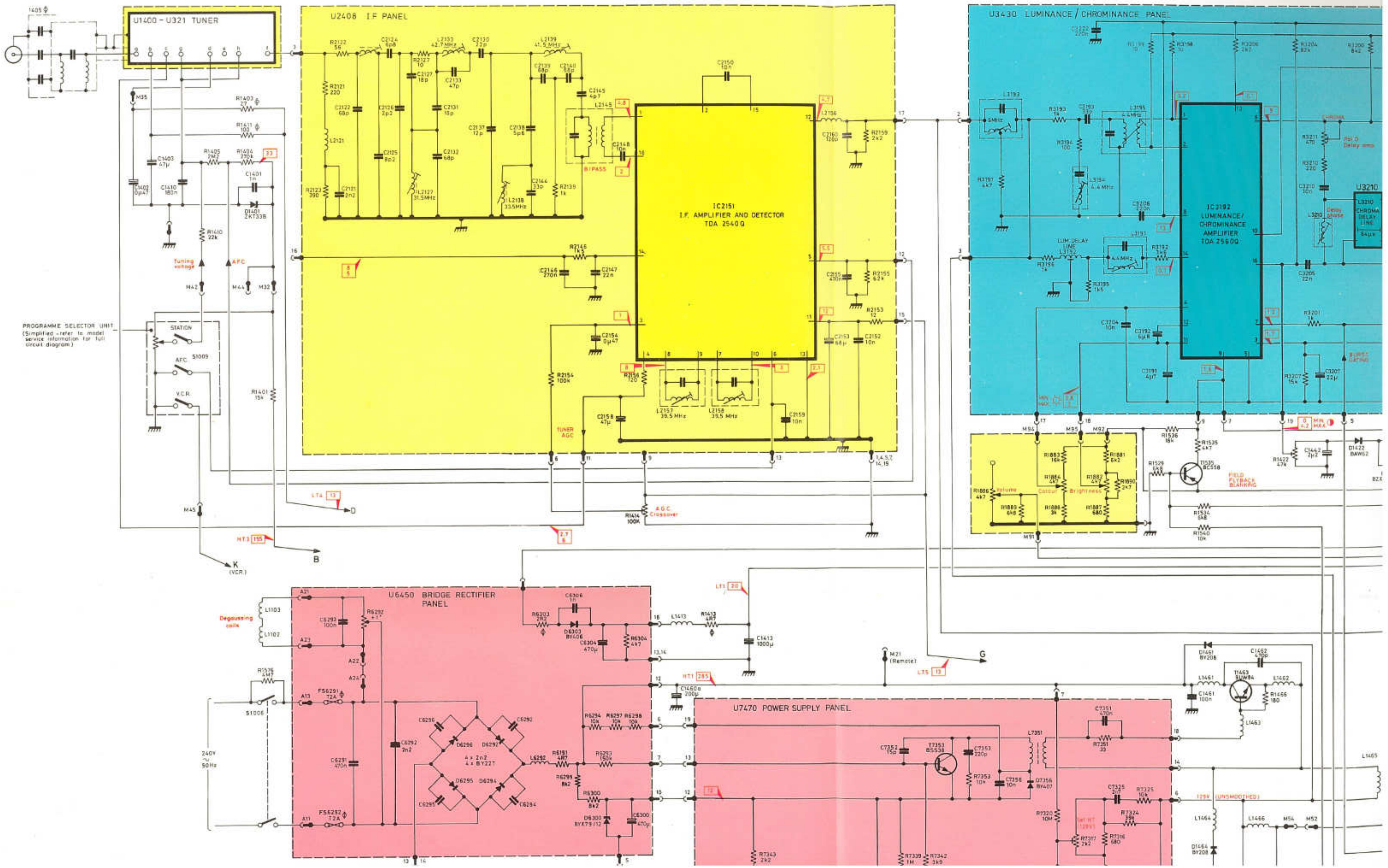
3 / 9 : No signal input / Receiver tuned to colour bars and adjusted for normal picture

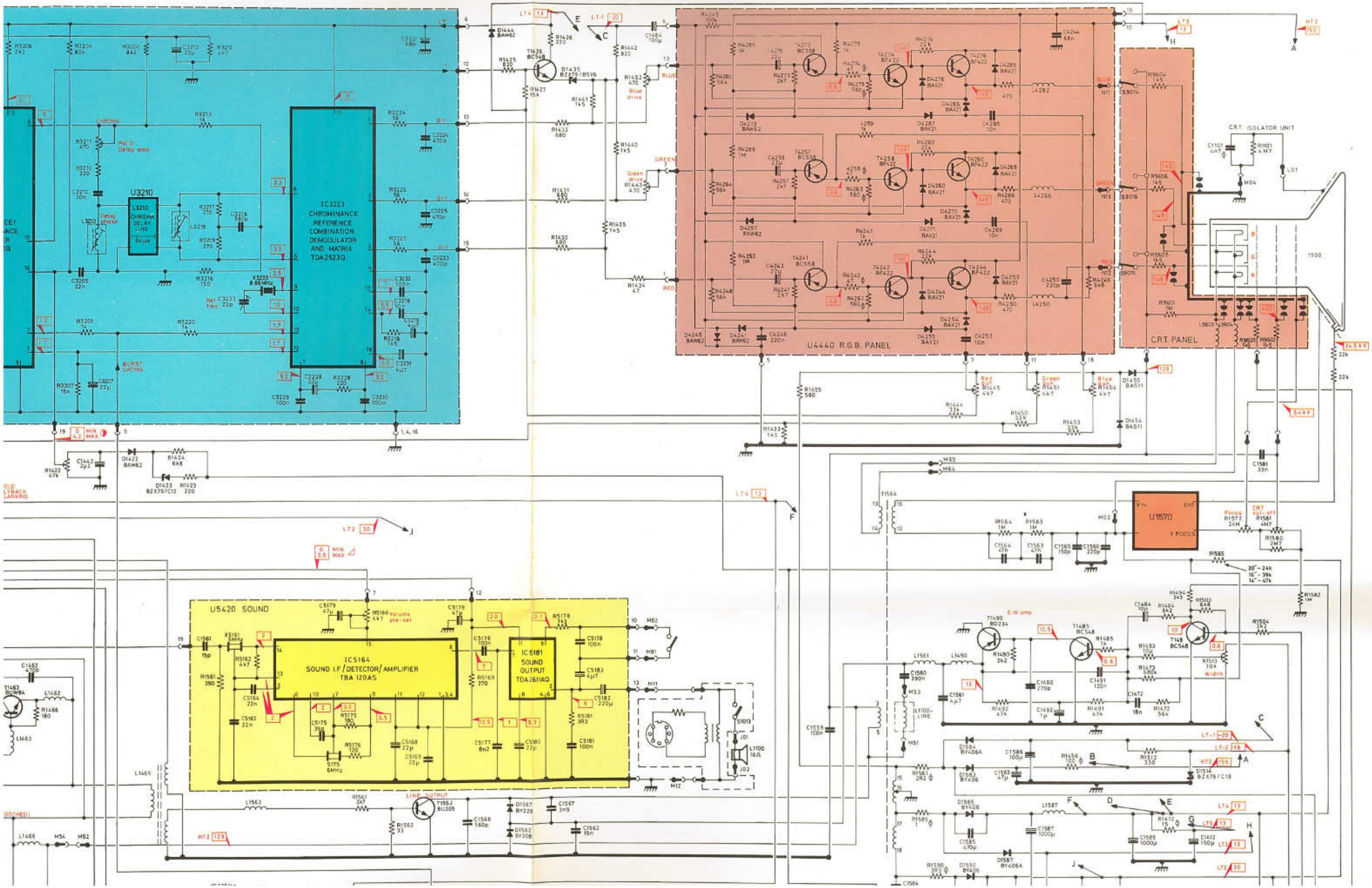
This Circuit Diagram is printed on a material which is waterproof, greaseproof and highly durable. It can be written on with ballpoint pen, fibre tipped pen or pencil in the normal way. Do not place near direct heat.

'KT3' COLOUR TELEVISION CHASSIS —

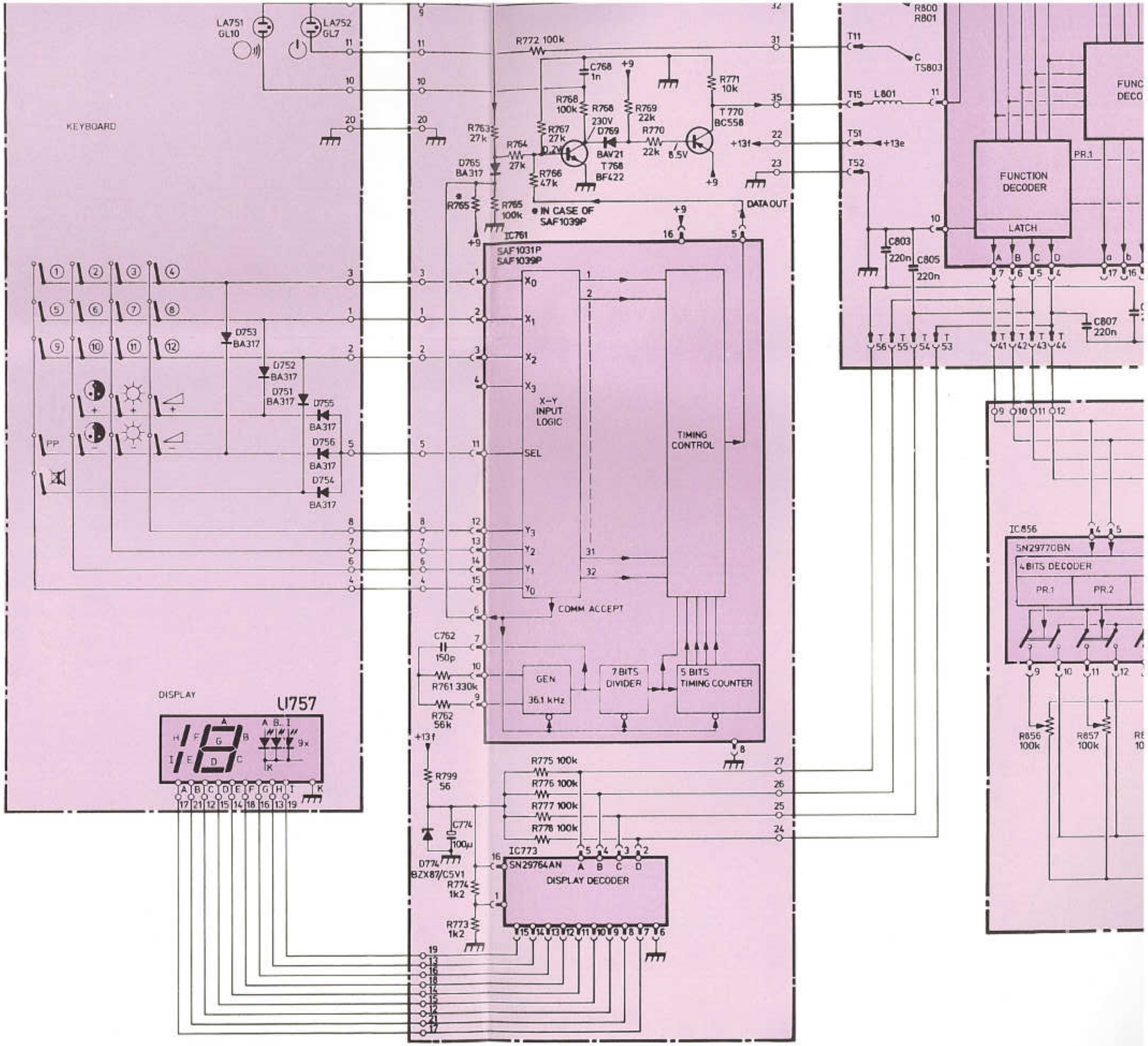


N CHASSIS — CIRCUIT DIAGRAM

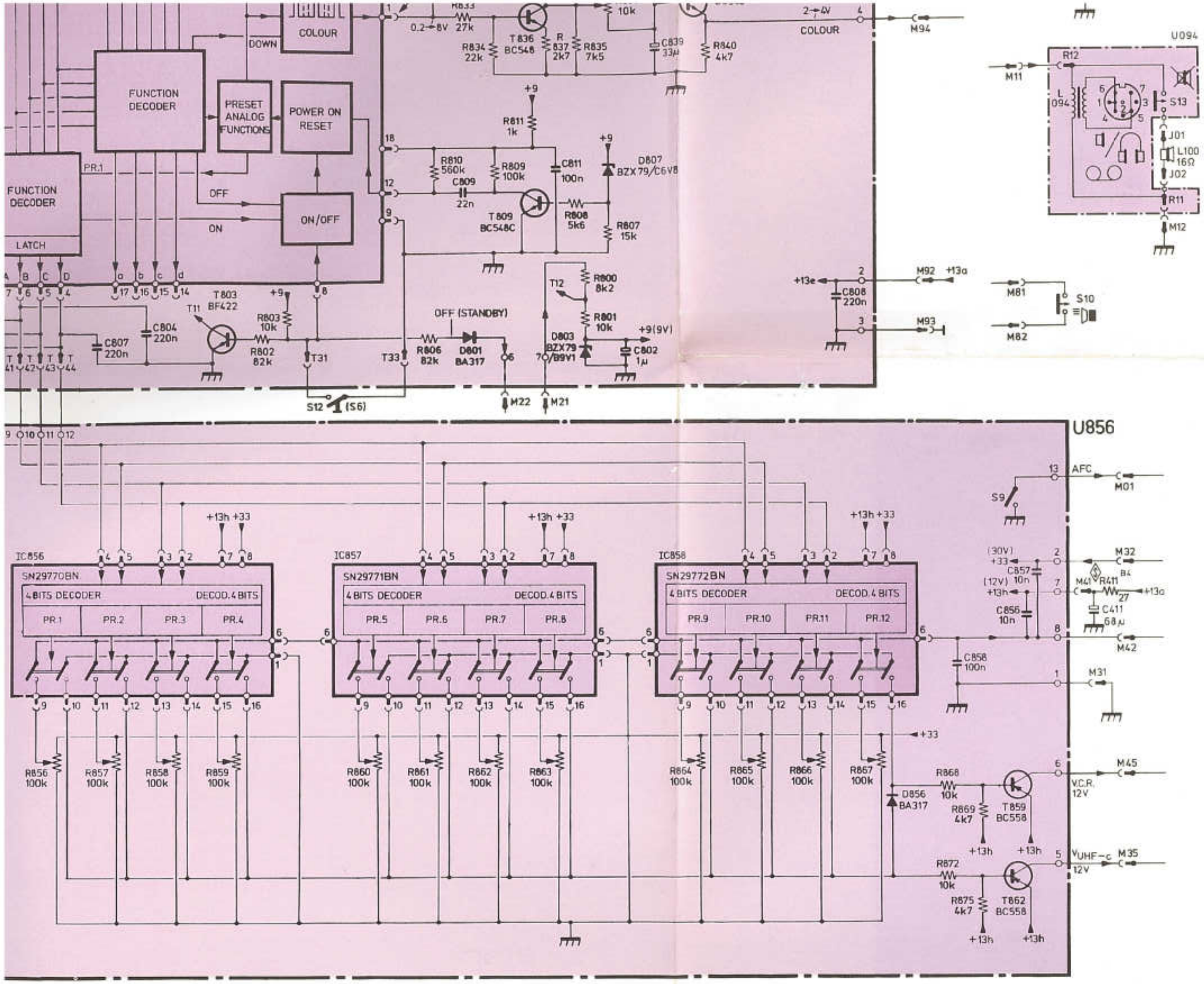

U1400 - U321 TUNER
U2408 I.F. PANEL
IC2151
I.F. AMPLIFIER AND DETECTOR
TDA 2540Q
U3430 LUMINANCE / CHROMINANCE PANEL
IC3192
LUMINANCE/
CHROMINANCE
AMPLIFIER
TDA 2560Q
U3210
CHROMA
DELAY
LINE
64μs
U6450 BRIDGE RECTIFIER
PANEL
U7470 POWER SUPPLY PANEL
PROGRAMME SELECTOR UNIT
(Simplified - refer to model service information for full circuit diagram)
STATION
AFC
S1009
V.C.R.
Tuning voltage
AFC
TUNER AGC
A.G.C. Crossover
B/PASS
LUM DELAY LINE
Volume
Colour
Brightness
FIELD FLYBACK BLANKING
BURST GATING
Pal D Delay amp
Delay phase
Degaussing coils
240V
50Hz
S1006
4 x 2n2
4 x BY227
M21 (Remote)
Set HT (128V)
128V (UNSMOOTHED)
K (VCR)



U3210
CHROMA DELAY LINE
IC3223
CHROMINANCE REFERENCE COMBINATION DEMODULATOR AND MATRIX TDA2523Q
U4440 R.G.B. PANEL
C.R.T. PANEL
C.R.T. ISOLATOR UNIT
U1570
V FOCUS
EHT
U5420 SOUND
IC5164
SOUND I.F./DETECTOR/AMPLIFIER
TBA 120AS
IC5181
SOUND OUTPUT
TDA2611AQ
LINE OUTPUT
E-W amp
Width
Volume pre-set
BURST GATING
Pal D Delay amp
Delay phase
Ref freq
Blue drive
Green drive
Red gun
Green gun
Blue gun
Focus
CRT cut-off
20" - 24k
16" - 39k
14" - 47k
24.5 kV
5.4 kV

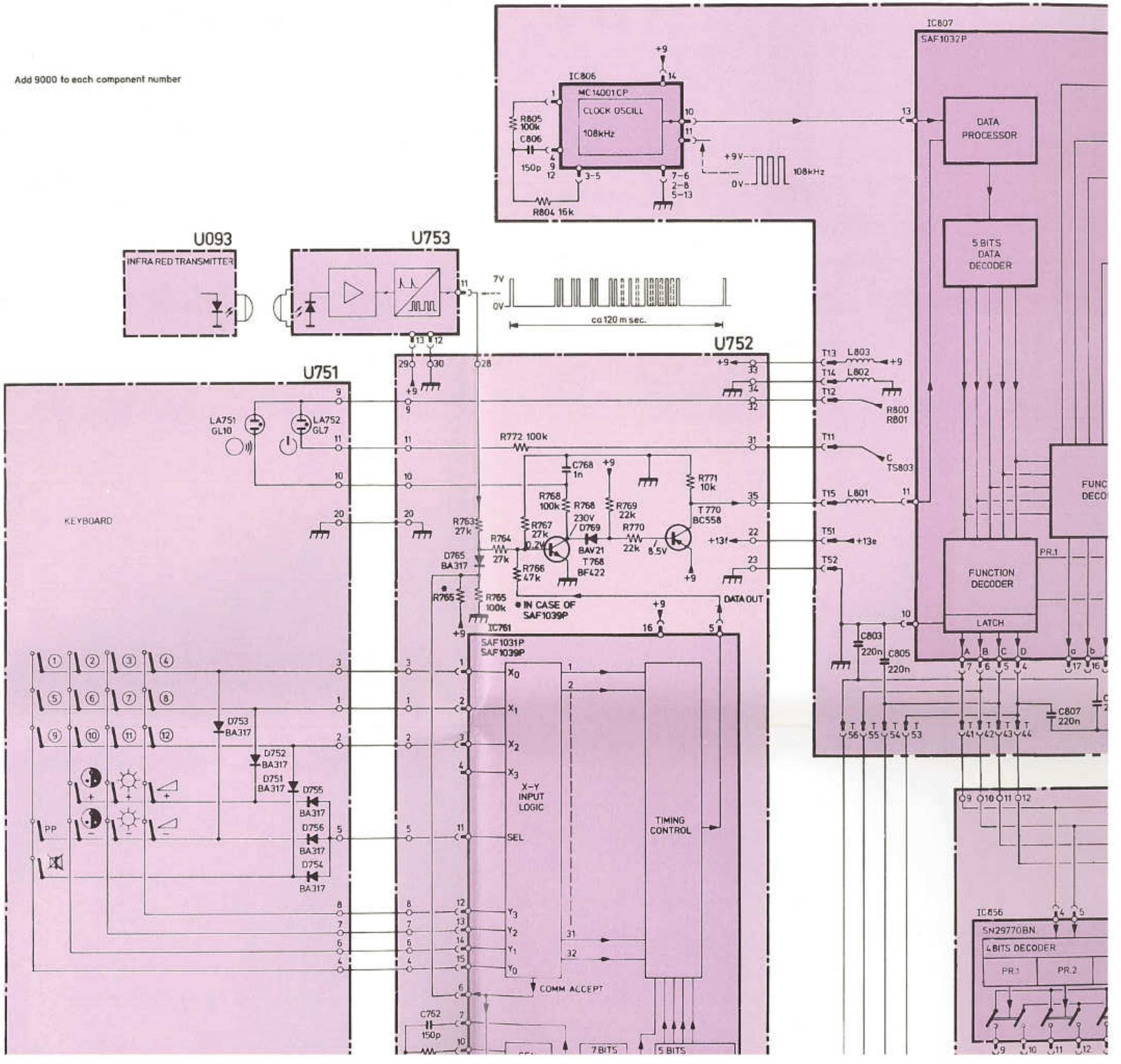


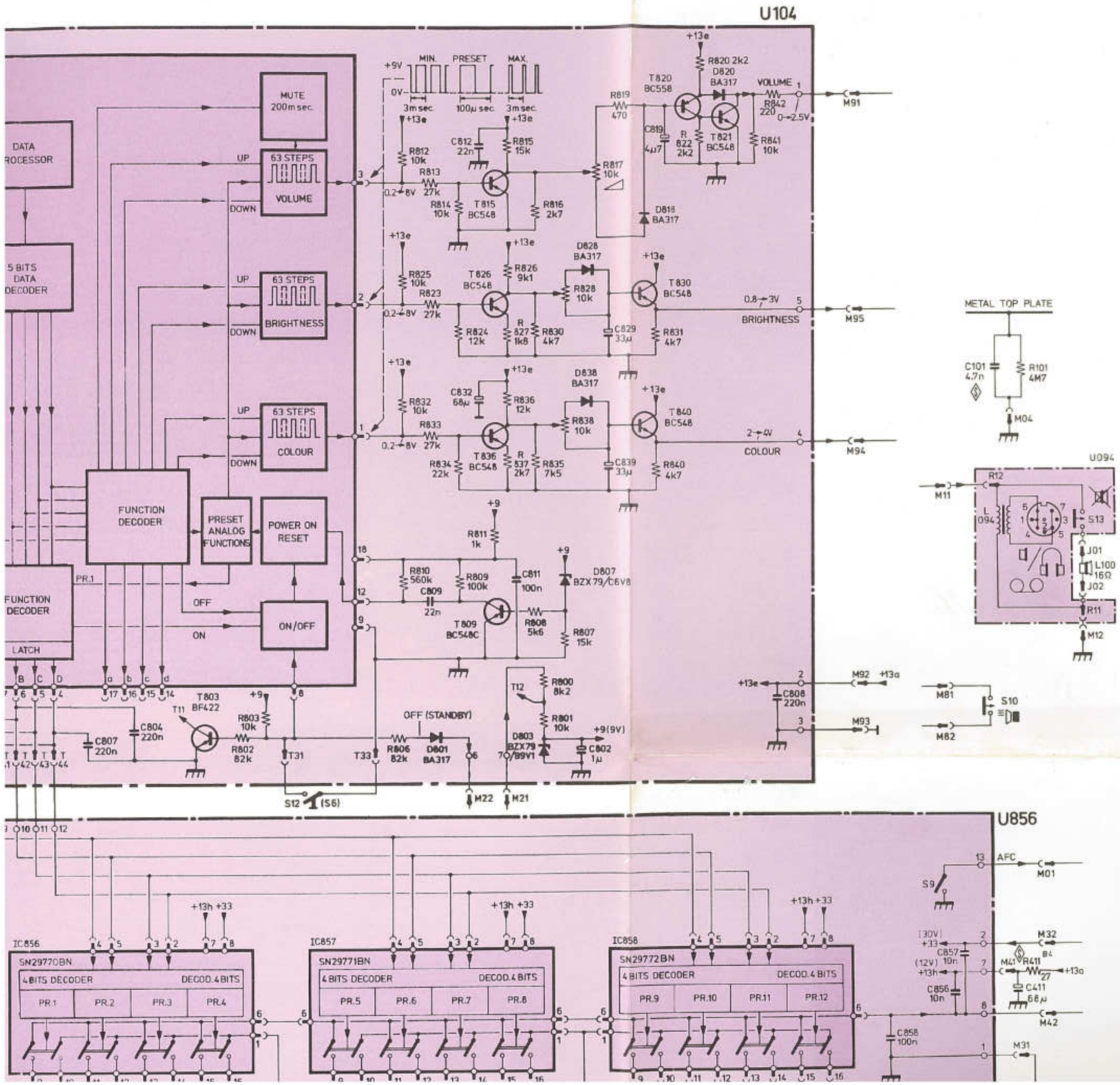
REMOTE CONTROL VERSION — ADDITIONAL



...DITIONAL PANELS & CONNECTIONS

Add 9000 to each component number





U104
DATA PROCESSOR
5 BITS DATA DECODER
FUNCTION DECODER
LATCH
FUNCTION DECODER
PRESET ANALOG FUNCTIONS
POWER ON RESET
ON/OFF
MUTE 200m sec.
63 STEPS
VOLUME
BRIGHTNESS
COLOUR
UP
DOWN
ON
OFF
PR.1
MIN.
PRESET
MAX.
3m sec.
100µ sec.
3m sec.
VOLUME
0→2.5V
BRIGHTNESS
0.8→3V
COLOUR
2→4V
OFF (STANDBY)
T803 BF422
T815 BC548
T820 BC558
T821 BC548
T826 BC548
T830 BC548
T836 BC548
T840 BC548
T809 BC548C
D820 BA317
D818 BA317
D828 BA317
D838 BA317
D801 BA317
D807 BZX79/C6V8
D803 BZX79 C9V1
S12 (S6)
M91
M95
M94
M92
M93
M22
M21
METAL TOP PLATE
C101 4.7n
R101 4M7
M04
U094
S13
J01
L100 16Ω
J02
M11
M12
S10
M81
M82
U856
AFC
M01
S9
IC856
SN29770BN
4 BITS DECODER
DECOD.4 BITS
PR.1
PR.2
PR.3
PR.4
IC857
SN29771BN
PR.5
PR.6
PR.7
PR.8
IC858
SN29772BN
PR.9
PR.10
PR.11
PR.12
+13h +33
M32
M41
R411
C411 68µ
M42
M31
C858 100n
C856 10n
C857 10n

COLOUR
TELEVISION

SERVICE INFORMATION

FOR THE

KT3 Chassis

Philips Service
604 Purley Way, Waddon, Croydon, CR9 4DR
Telephone: 01-686 0505 Telex: 262308
(Recorded messages after business hours)

CONTENTS

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B - Chassis specification	2
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A–INTRODUCTION

The KT3 series is a sold-state colour television chassis designed for both colour and monochrome reception on 625 lines U.H.F. The 90° deflection in-line cathode ray tube is inherently self-converging and has "quick-vision" guns to provide a viewable picture within about five seconds of switching on.
It consists of a single "mother-board" printed panel vertically mounted around the neck of the picture tube which carries eight plug-in "daughter" modules including the tuner. The "mother-board" is mounted on special pivots which allow it to be easily unclipped and lowered into the horizontal position for servicing.

B–CHASSIS SPECIFICATION

Mains supply	240 volts, 50Hz. a.c. only
Mains consumption	70 watts
System	625-line, U.H.F. P.A.L. colour
Tuner unit	U.H.F., capacitance diode tuning
E.H.T.	24kV
Loudspeaker impediance*	16 Ω (or 25 Ω)
Sound output*	3.5 watts (or 2.5 watts)
Intermediate frequencies	Vision : 39.5MHz.
	Sound : 33.5 MHz (6MHz intercarrier)
Picture tube	90° deflection in-line guns
Safety standard	BS 415

For the remainder of the specification (e.g. cabinet dimensions, controls, etc.) refer to the supplementary service information for the model(s) in question.

* 14" versions are fitted with a 25 Ω impedance speaker, and have a sound output of 2.5 watts.

Trade Descriptions Acts

Products offered for sale may differ from those described and/or illustrated in this Service Information due to later production changes in specifications, components or place of manufacture.
The contents of this Service Information are therefore not to be treated as representations as to the current availability of products described or as to products actually offered for sale.

C–USE OF THE CIRCUIT DIAGRAM

1. Main circuit diagram

The main circuit diagram of the KT3 chassis is provided on the large sheet accompanying this manual. Different background colours have been used to identify those parts of the circuit which are located on the individual printed circuit modules. For example, the decoder module is blue, the I.F. module is yellow and so on. Minor units and cabinet mounted items are not coloured.
In order to keep the main circuit diagram applicable to various models some sections such as the programme selector unit which may vary from model to model are shown in a simplified form. For full details of such items, reference should be made to the supplementary Service Information for the model in question.

In order to keep the main circuit diagram to a reasonable size, the internal details of circuit units and integrated circuits are omitted. To distinguish circuit units from integrated circuits, their outlines are drawn with dotted lines and solid lines respectively.
Where it has been found impracticable to show connections between various parts of the main circuit, an arrow with an identifying letter A,B,C, etc. is shown which lines up with a corresponding arrow and letter at the point of connection.

2. Individual circuit diagrams

Individual circuit diagram for each module and unit are provided in this service manual in order to supplement the main circuit diagram. The internal details of the circuit units and integrated circuits which were omitted from the main diagrams are shown in the individual circuits, with the I.C's being represented in block diagram form.
As far as possible, the layout of each individual circuit has been kept similar to the corresponding part of the main circuit diagram. Engineers can therefore turn from one to the other without the difficulty of interpreting a different layout.

3. H.T. and L.T. supply lines

The chassis has several H.T. and L.T. d.c. supply lines, and on the circuit diagrams these are labelled H.T.1, H.T.2, L.T.1 and so on. The following table lists all the supply lines giving their origins as well as nominal voltages:—

Supply line	origin	Nominal voltage
H.T.1	Bridge rectifier module	285V
H.T.2	Line output stage	129V
H.T.3	Line output stage	155V
L.T.1	Bridge rectifier module	20V
L.T.–1	Line output stage	–20V
L.T.2	Line output stage	30V
L.T.–2	Line output stage	–18V
L.T.3	Line output stage	13V
L.T.4	Line output stage	13V
L.T.5	Line output stage	13V

4. Component and plug/socket identification system

In order to identify a particular component in the circuit with its position in the receiver, a coding system for component numbers is used. For instance, any component with a 6000 is located on the main bridge rectifier module, and a component with a 2000 number will be found on the I.F. unit.

Position	Position group number
Components mounted on "mother-board", cabinet assembly, etc	1000–1999
I.F. panel	2000–2999
Luminance – Chrominance	3000–3999
R.G.B	4000–4999
Sound	5000–5999
Mains bridge rectifier	6000–6999
Mains supply control	7000–7999
Sync.	8000–8999
C.r.t. base and remote control parts	9000–9999

D–SAFETY NOTES

1. Safety standard

The KT3 series of receivers are designed and manufactured to comply with the British Standard for Safety, BS415. Engineers should always ensure that maintenance and repairs uphold the original performance and safety standards, taking particular care that safety hazards are not introduced by the inadvertent or deliberate "defeat" of any mechanical and/or electrical safety feature.

2. Safety components ◈

The receiver contains certain components which have been specially chosen to ensure safety under both normal and fault conditions. These components are identified in this Service Information by the safety symbol ◈. Should a safety component need to be replaced, it is essential to use a component of an identical type (see spare parts list), which must be mounted in exactly the same manner.

3. X-ray radiation warning

The voltage and currents on the cathode ray tube are higher in a colour receiver than in a monochrome type, and, as a result, the X-rays will have greater penetrating power and will be present in larger quantities. In practice, this means that suitable protection has to be built into a receiver in order to reduce the radiation hazard to an acceptable level. It is important that personnel involved in installation and servicing should be aware of any possible dangers.

The radiation problems are confined to X-rays generated by the cathode ray tube, and during development of the KT3 series colour television chassis, special attention has been given to these points. With the back-plate removed, no significant radiation is present, and therefore the maximum dose rate is much less than the accepted danger level. This low level of radiation can be attributed to:-

(i) The absorbing power of the glass in the cathode ray tube.

(ii) The C.R.T. internal metal shield provided for magnetic screening.

Any increase in H.T. voltage would cause the E.H.T. to rise, resulting in possible forward radiation from the C.R.T. face. An over-voltage protection circuit has therefore been incorporated on the mains power supply panel, which is described in the Circuit Description booklet.

4. Discharging and handling the C.R.T.

The C.R.T. final anode will store an E.H.T. charge for some time after the receiver is switched off. Before handling the C.R.T. (or the E.H.T. lead), it will be necessary to discharge the C.R.T. to avoid electric shock.

The only safe method of doing this is to discharge the E.H.T. terminal of the C.R.T. to the braiding which earths the tube's external aquadag coating, using the special "discharge line" supplied in the receiver.

DAMAGE TO SEMICONDUCTOR DEVICES MAY RESULT IF THE C.R.T. IS DISCHARGED TO THE METAL CHASSIS FRAME (OR ANY PART OF THE RECEIVER OTHER THAN THE TUBE AQUADAG).

THE C.R.T. CONTAINS A HIGH VACUUM AND THEREFORE IT MUST BE HANDLED WITH CARE, TAKING ALL APPROPRIATE SAFETY PRECAUTIONS, INCLUDING THE WEARING OF SUITABLE EYE PROTECTION.

E–SERVICING NOTES

1. The aerial system

The aerial system for use with the receiver should be for the correct group of U.H.F. channels applicable to the area in which the receiver is being installed. It must also be capable of supplying a good signal, free from noise and multi-path reflections.

2. Plugs and sockets

A socket can be identified as the connector which contains the female contacts and may be found either in a fixed position or on a fly-lead; similarly a plug contains the pins. Most sockets have pin numbers moulded in the plastic housing. Some of the plugs and sockets are coloured, which aids the correct reinsertion of panels, particularly when more than one panel has been removed.

Sockets should never be removed from the plugs by pulling on the leads, since this practice may result in connections being damaged.

3. Connecting test equipment

'Earth' connections for test equipment must be made as close as practicable to the part of the circuit under investigation. Failure to observe this precaution may result in misleading results and/or damage to semi-conductors.

Caution: **Most semi-conductor heat sinks are above chassis potential and therefore must not be used as 'earthing' points for test equipment.**

F–PRESET ADJUSTMENTS

1. Set H.T.2. (R7317)

Adjust the receiver for a normal picture, then connect a d.c. voltmeter between the junction of S1466/C1460c and chassis. Adjust R7317 on the supply panel (U7470) for a reading of 129volts (± 1%)

2. Line hold (R8371)

Tune the receiver to a normal transmission. Connect a shorting link between pins 14 and 17 of the sync. panel (U8475) then adjust R8371 for minimum horizontal slip. Disconnect the shorting link and check that the picture locks correctly.

3. Field hold (R8390)

Tune the receiver to a normal transmission. Connect a shorting link between pin 7 of the sync. panel (U8475) and chassis, then adjust R8390 for minimum vertical slip. Disconnect the shorting link and check that the picture locks correctly.

4. Height (R1501) and field linearity (R1520)

Tune the receiver to a test-card transmission, or a suitable display from a pattern generator. Adjust R1501 and R1520 in conjunction with one another to obtain correct height and field linearity consistent with satisfactory vertical centring of the picture.

5. Field shift (S1002)

Tune the receiver to a test-card transmission or use a pattern generator providing a suitable display for vertical centring adjustment. Adjust S1002 to centre the picture vertically within the screen.

6. Line shift (R1460)

Tune the receiver to a test-card transmission, or use a pattern generator providing a suitable display for horizontal centring adjustment. Adjust R1460 to centre the picture horizontally within the screen.

7. Width

Tune the receiver to a test-card transmission or a suitable display from a pattern generator. Adjust R1513 so that the picture just overlaps both sides of the screen.

8. Focus

Tune the receiver to a test-card transmission or a pattern generator display incorporating definition lines. Set the brightness and contrast controls to a slightly higher than normal setting. Adjust R1572 for best definition of the verticals in the outer areas of the picture.

9. Volume pre-set (R5166)

With the receiver tuned to a transmission and the user volume control at minimum, adjust R5166 on the sound panel (U5420) such that the sound in the loudspeaker is barely audible.

10. Contrast pre-set (R1422)

Adjust for optimum results with R1422 on the main panel.

11. A.G.C. cross-over (R1414)

Connect a d.c. voltmeter between pin 11 and chassis on the I.F. panel, turn the A.G.C. cross-over control R1414 fully anti-clockwise (as viewed from the print side) and with no aerial input, check for a nominal voltage between 1.2V and 1.3V. Inject a 2mV R.F. signal into the aerial socket and adjust R1414 until the meter reading has increased by 0.2 volt.

GREY SCALE ADJUSTMENTS

12. C.R.T. cut-off (R1581) and dark grey tones

a. With no aerial signal, turn the red, blue and green gun controls, R1445, R1454 and R1451 fully clockwise (viewed from the component side of the panel) and switch off SK9014, SK9015 and SK9016. Adjust R1581 to obtain a barely visible raster.

b. Switch on SK9014, SK9015 and SK9016 and adjust the brightness control to obtain a barely visible raster. The brightness control must then be left undisturbed during the following adjustments in c below.

c. Because the barely visible raster obtained in b above *may* be produced by only one gun it is necessary to check and equalize the three C.R.T. guns as follows:—

Switch off SK9015 and SK9016, check and adjust if necessary with R1454 for a barely visible blue raster.

Switch off SK9014, switch on SK9015, check and adjust if necessary with R1445 for a barely visible red raster.

Switch off SK9015, switch on SK9016, check and adjust if necessary with R1451 for a barely visible green raster.

8. White tones (R1443 and R1452)

The controls for setting the "white tone" in the grey scale tracking are accurately adjusted during the manufacture of the receiver, and should not normally require further adjustment.
The following instruction is given for guidance only since it is necessary to use special equipment to obtain precise results.
Tune the receiver to a pattern generator and display a pattern containing a large area of white. Adjust the green drive control R1443 and/or the blue drive control R1452 to obtain a neutral white.

N.B. R1445, R1451, R1454 may be slightly re-adjusted if necessary if the above adjustment has impaired the grey scale at low brightness levels.

CONVERGENCE AND PURITY ADJUSTMENTS

(see Fig. 1)

The following adjustments are carried out during the manufacture of the receiver and no subsequent adjustments are normally required unless the C.R.T., deflection coils, multi-pole unit or dynamic corrections components have been replaced. Unless the deflection unit has been replaced it is not necessary to remove the rubber wedges (G in Fig. 1), adjustment of the multi-pole unit should be sufficient. Before attempting the following adjustments ensure that the pre-set adjustments (above) have been completed. During the adjustments, let the receiver face either the East or West — this ensures optimum results in all subsequent positions of the receiver.

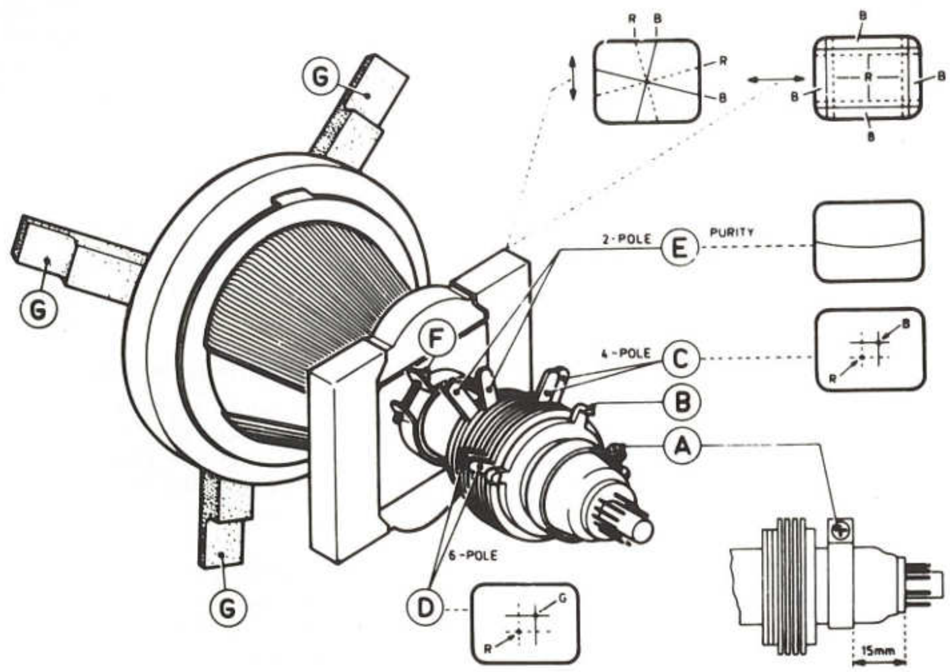
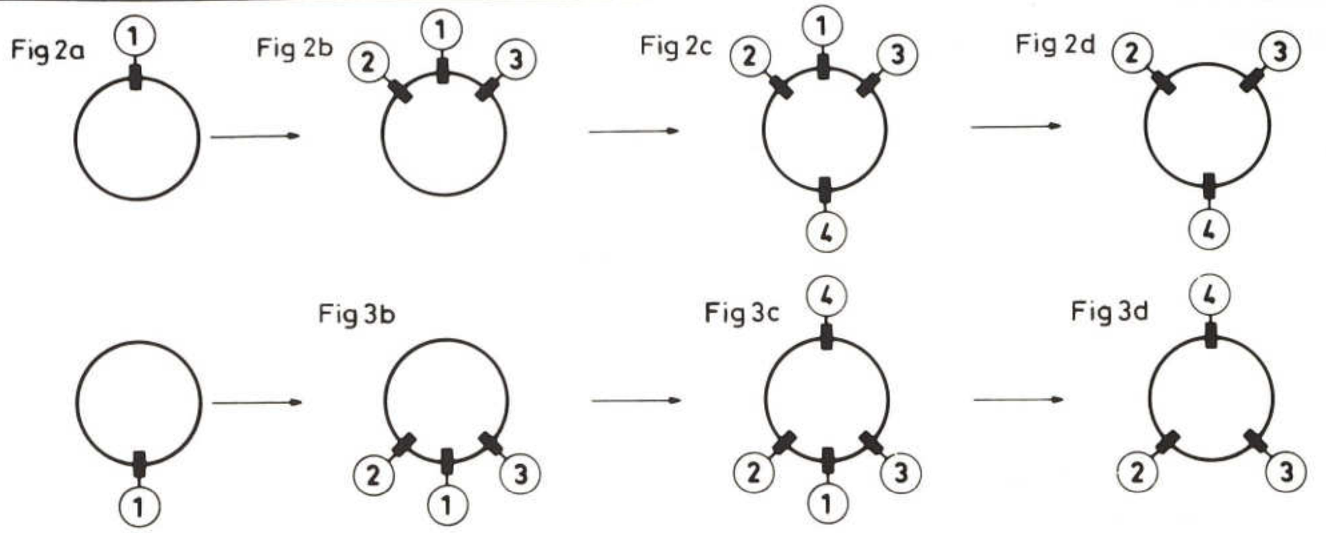


Fig.1 Deflection unit



Static convergence adjustments (see Fig. 1)

1. Tune the receiver to a cross-hatch pattern from a pattern generator and allow the receiver to warm up for ten minutes.
2. Switch off the green gun with SK9016 and turn locking ring B anti-clockwise.
3. With tags C adjust the four-pole rings so that the red and blue cross-hatch patterns are superimposed at the centre of the screen.
4. Switch on the green gun with SK9014 and switch off the blue gun with SK9014.
5. With tags D adjust the six-pole rings so that the red and green cross-hatch pattern are superimposed at the centre of the screen.
6. Switch on the blue gun with SK9014 and tighten ring B.

Purity adjustments (see Fig. 1)

1. Loosen fixing screw F on the deflection unit, move the deflection coils enough to remove the rubber wedges (G in Fig. 1).
2. Slide the deflection coils forward as far as possible against the C.R.T. and tighten screw F such that the deflection unit can still be moved but with some friction.
3. Set the multi-pole unit as shown in Fig. 1, tighten screw A and turn securing ring B anti-clockwise.
4. Set the purity tags E so that a rounded and a flat tag cover each other.
5. Tune to a cross-hatch pattern and turn the brightness control to maximum and allow the receiver to warm up for ten minutes.
6. Turn the field shift switch SK1002 to its mid-position. Switch off the blue gun (with SK9014) and the green gun (with SK9016).
7. With tags E adjust the purity rings so that the vertical red band is as close to the centre of the screen consistent with the central horizontal line of the cross-hatch remaining as straight as possible.
8. Change the pattern generator to 'white' and check that the red band is in the centre of the screen and if necessary switch the pattern generator back to cross-hatch and move the red band in the correct direction whilst ensuring that the picture does not move too much in the vertical direction.
9. Switch the pattern generator to 'white' and move the deflection unit back until the whole raster is uniformly red.
10. Switch on the green and blue guns and there should be no colour patches on the white screen. If necessary slightly adjust the colour purity rings E and/or the position of the deflection unit.
11. Tighten fixing screw F.
12. Adjust the field shift if necessary with SK1002.
13. Switch the pattern generator to cross-hatch, check and re-adjust if necessary the static convergence (described above).

N.B. The static convergence and purity adjustments are interdependant, and if initially they are too far from the correct setting, purity adjustments adversely affect the static convergence adjustments. Ideally, they should both be set approximately before carrying out all the adjustments in the above order.

Dynamic convergence (see Figs. 2 and 3)

Dynamic convergence is achieved by vertically and horizontally tilting the deflection unit. To secure the correct position, three rubber wedges (G in Fig. 1) are fitted between the C.R.T. and the deflection unit as shown in Figs. 2 and 3. Two wedge thicknesses are available, one 7mm thick, code number 462 40356, the other 11mm thick, code number 462 40357. Spare wedges are needed to carry out dynamic convergence adjustments.

1. First check the colour purity and static convergence.
2. Tune the receiver to a cross-hatch pattern from a pattern generator and switch off the green gun with SK9016.
3. Vertically tilt the deflection unit so that the central horizontal red and blue lines are superimposed together with the central vertical red and blue lines being superimposed. Having ensured that the position of the deflection unit is correct insert a rubber wedge (1) with the backing strip not removed, either at the top (Fig. 2a) *or* at the bottom (Fig. 3a).

   N.B. Fig.2a is applicable if the deflection unit is tilted upwards and Fig. 3a if the unit is tilted downwards.
4. Now horizontally tilt the deflection unit such that the horizontal red and blue lines in the upper and lower halves of the picture and the vertical red and blue lines on the left and right side of the picture are superimposed. Insert wedges with backing strips removed in positions (2) and (3) as shown in Fig. 2b *or* Fig. 3b firmly pressing the adhesive sides against the glass of the C.R.T.
5. Now place a wedge with the backing strip removed in position (4) as shown in Fig. 2c *or* Fig. 3c firmly pressing the adhesive side against the glass of the C.R.T.
6. Remove wedge (1) so that the setting up is as shown in either Fig. 2d *or* Fig. 3d.
7. Finally switch on the green gun with SK9016.

CHROMINANCE ADJUSTMENTS

1. Auxiliary oscillator

Apply a colour signal to a normally-adjusted set. Short-circuit C3231 and also s/c L3219. Adjust C3233 so that the colour signal almost stops 'running through'. Remove s/c links.

2. PAL-delay line

Apply a signal from a generator (PM5509 or PM5519) in position 'DEM', adjust receiver for normal brightness and saturation control ¾ of the way up. Adjust R3211 so that the venetian blinds effect in the third bar disappears, then adjust L3210 so that the venetian blinds effect in the first and fourth bars disappears. Readjust R3211. Set generator to 'Colour bar' position and adjust L3219 so that the venetian blinds effect in the third (cyan) and/or the fifth (magenta) bar disappears.

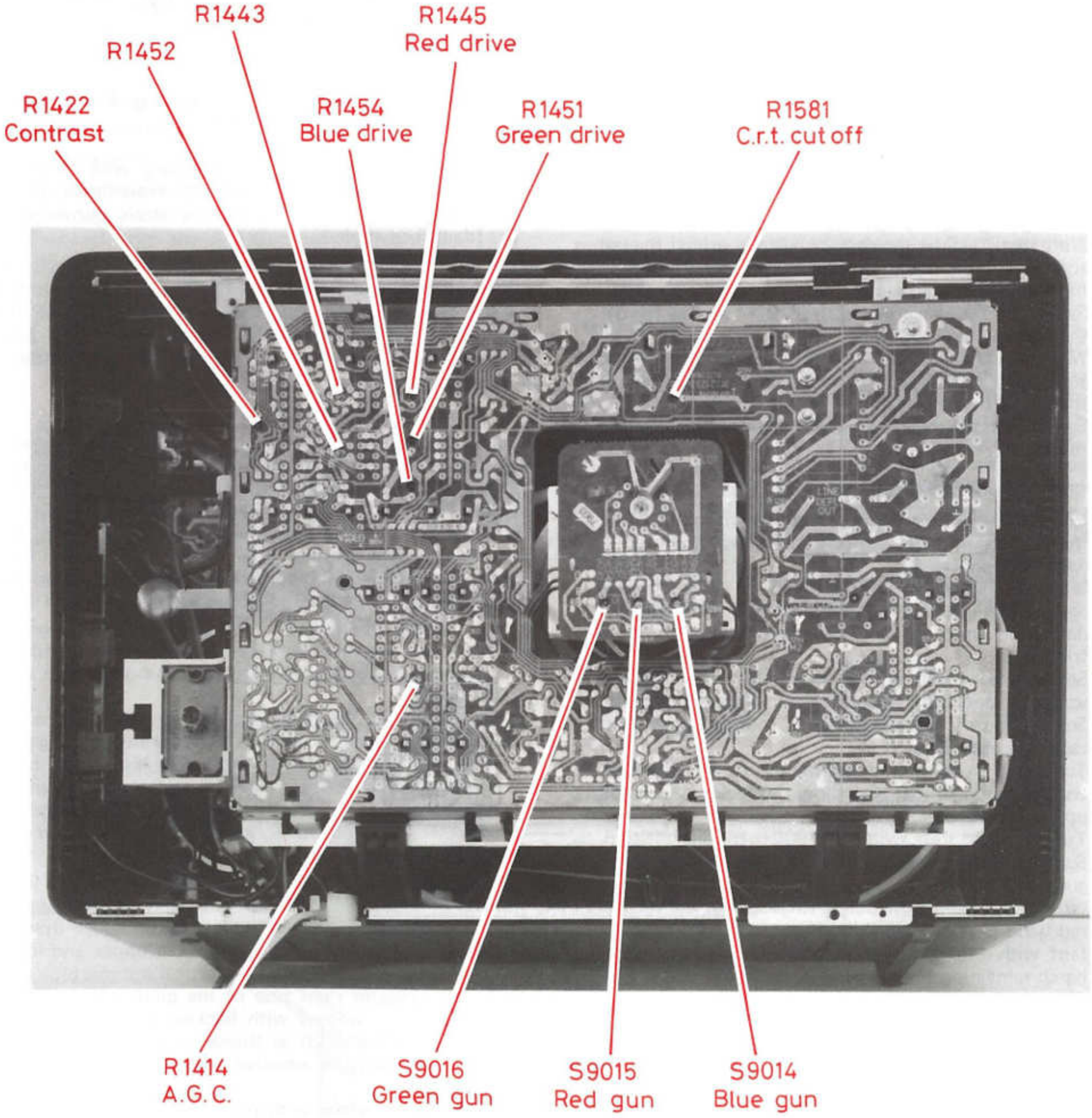


Fig. 4 Rear view of "mother board"

TRIMMING DATA

1. Sound suppression

Apply a colour signal to a normally-adjusted set. Adjust L3193 so that no interference is visible in the picture.

2. Chroma trap

Apply a colour bar pattern to a normally-adjusted set. Connect an oscilloscope to point 12 of U3430 and adjust L3191 for minimum amplitude of the chrominance signal present on the various brightness steps of the luminance signal.

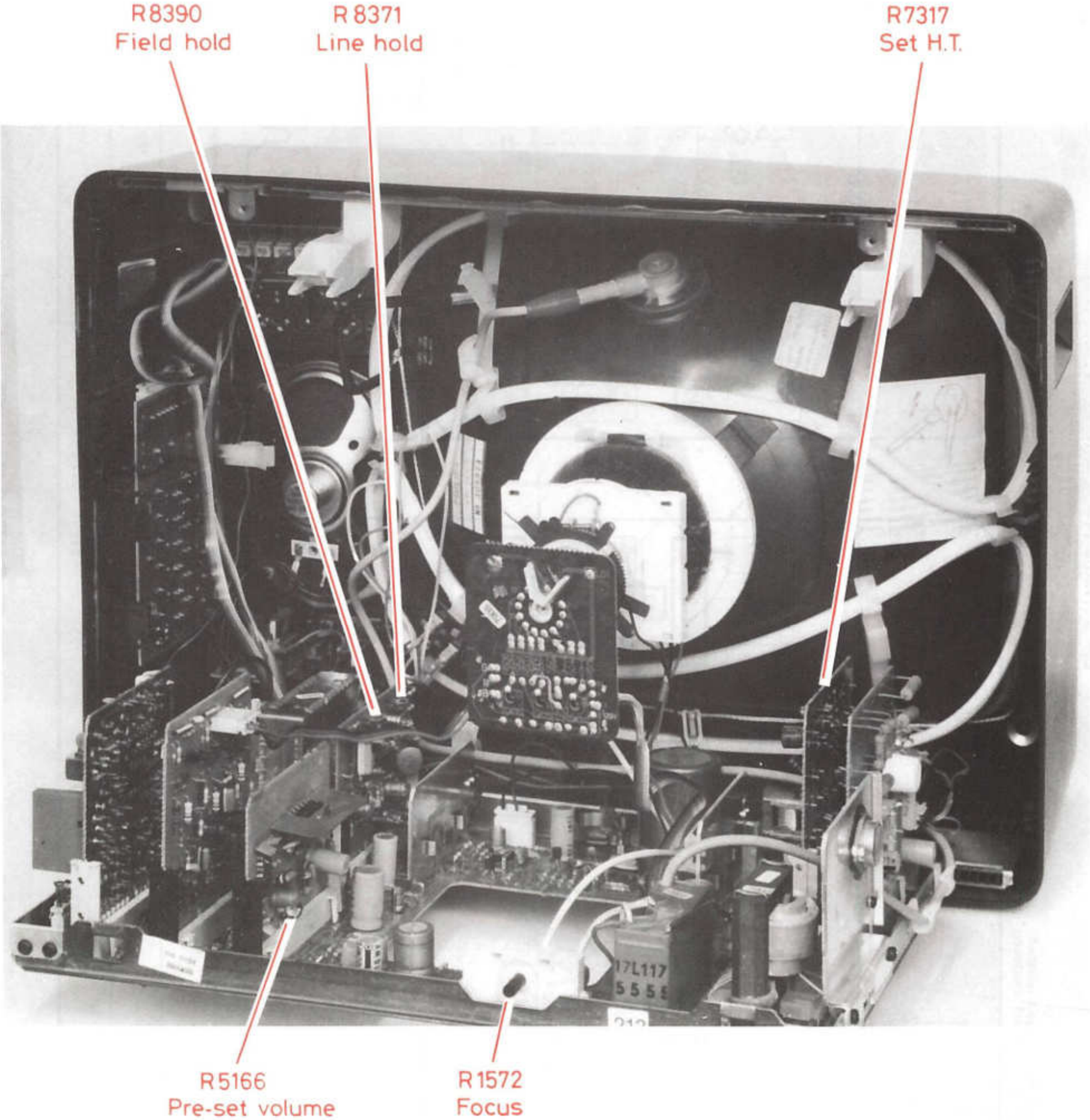
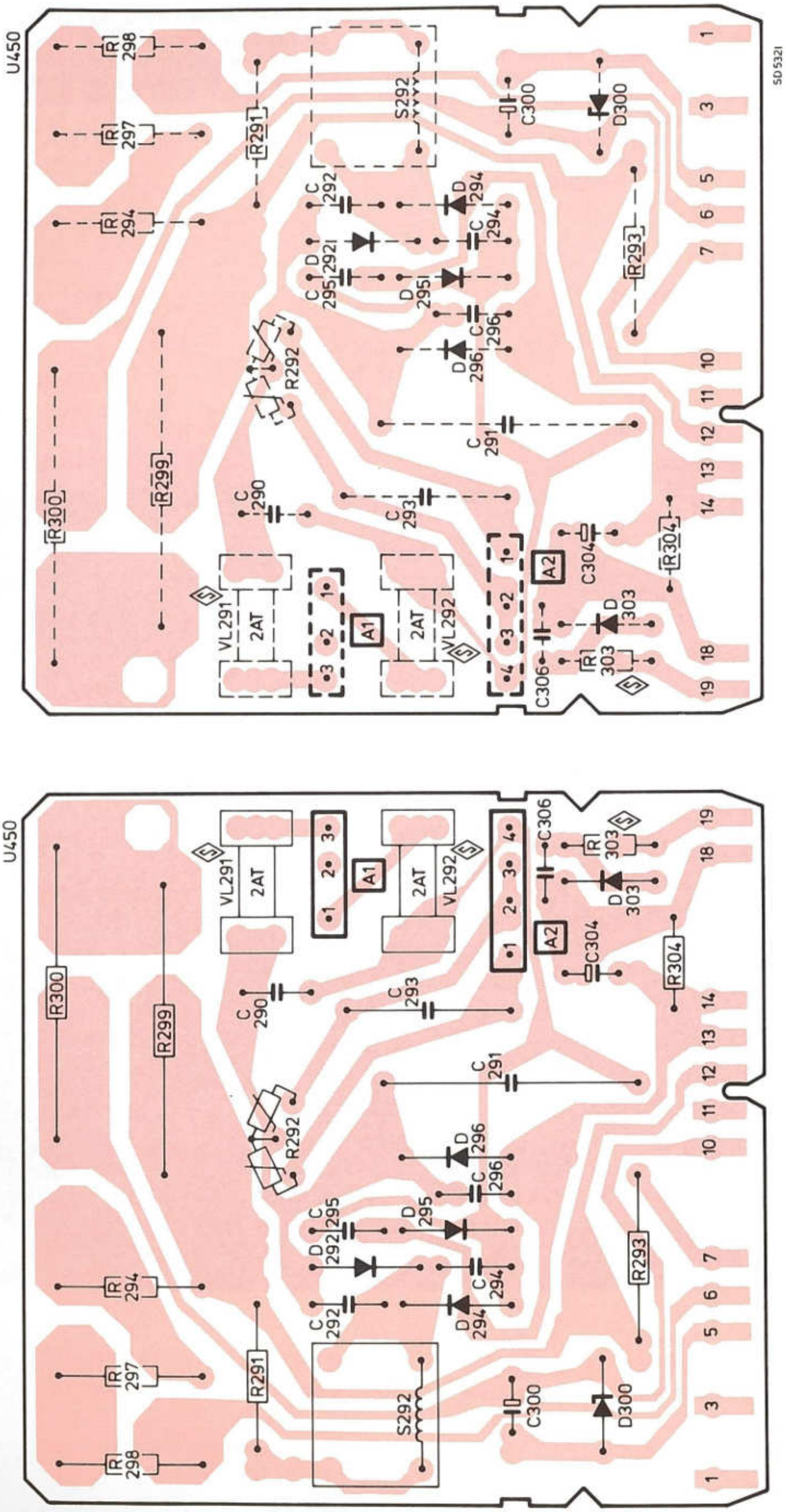


Fig. 5 Rear view of "mother board" lowered

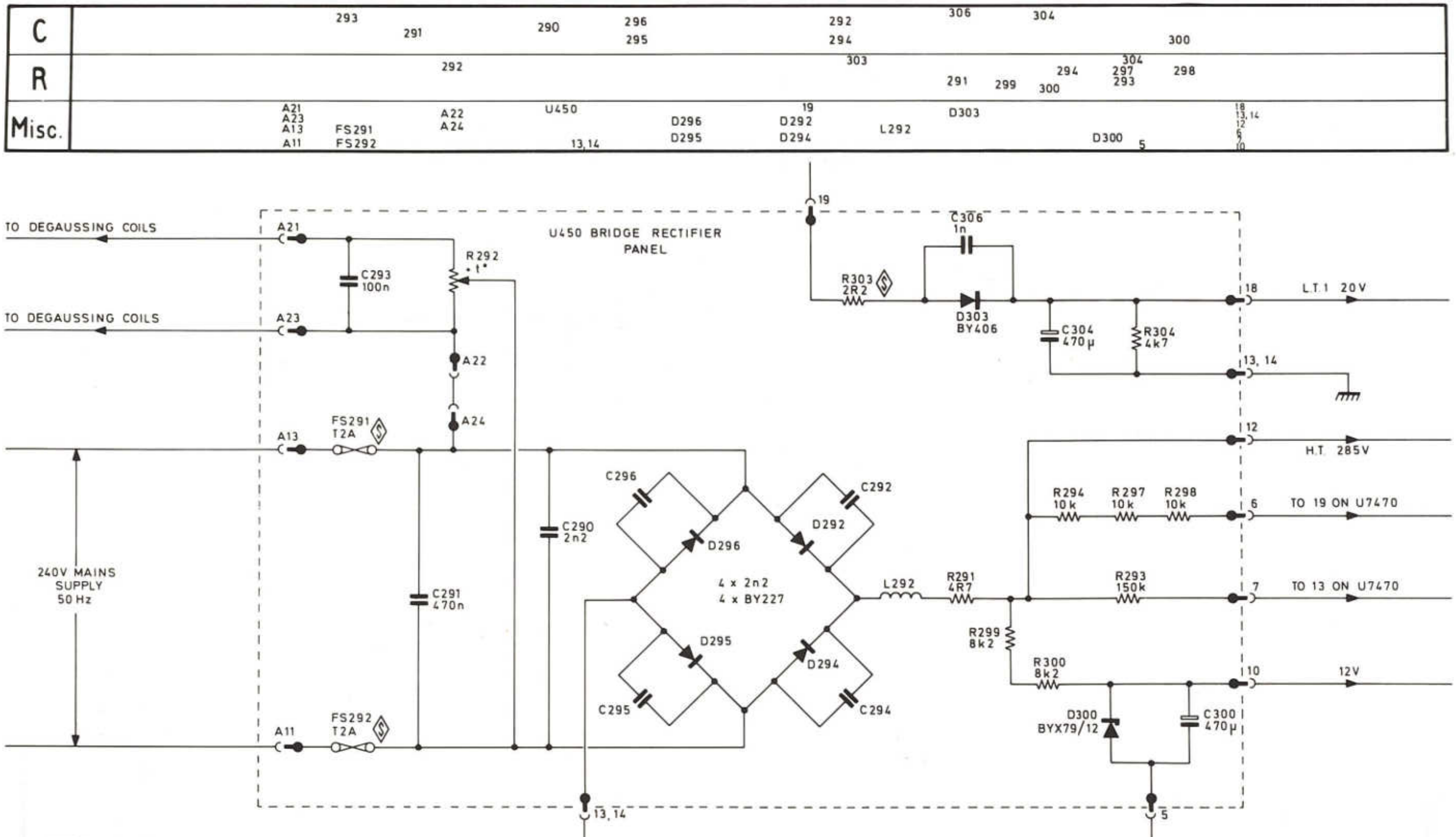


Print side

Component side

NOTES
Add 6000 to all component and unit numbers.
Ⓢ Denotes special safety component. Refer to safety section in manual before replacing.

Fig. 6 U450 Bridge rectifier panel

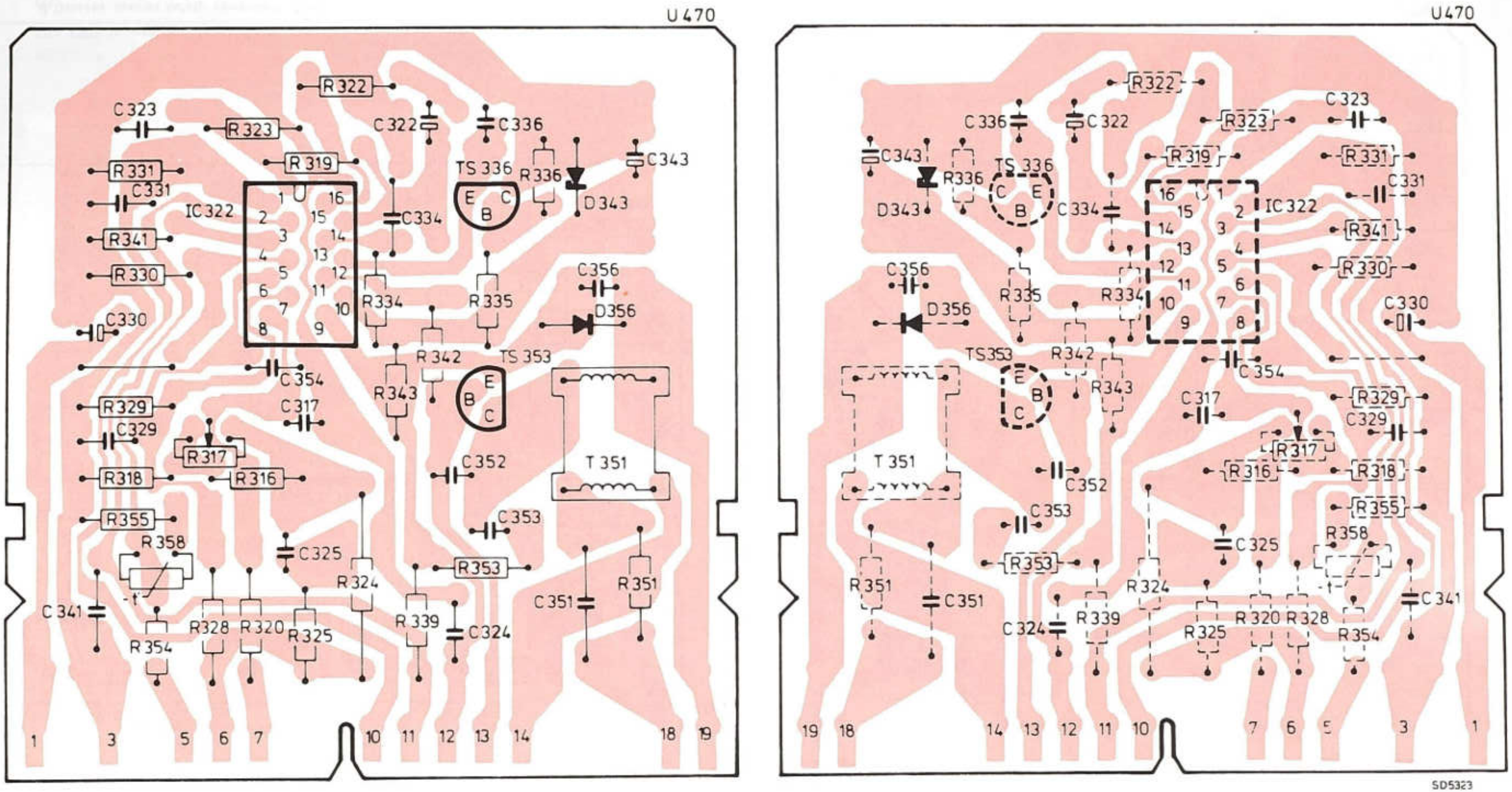


NOTES

Add 6000 to each component number

Ⓢ Denotes special safety component. Refer to safety section before replacing.

Fig. 7 U450 Bridge rectifier panel - circuit diagram



Component side

Print side

NOTES
Add 7000 to all component and unit numbers.

Fig. 8 U470 Power supply panel

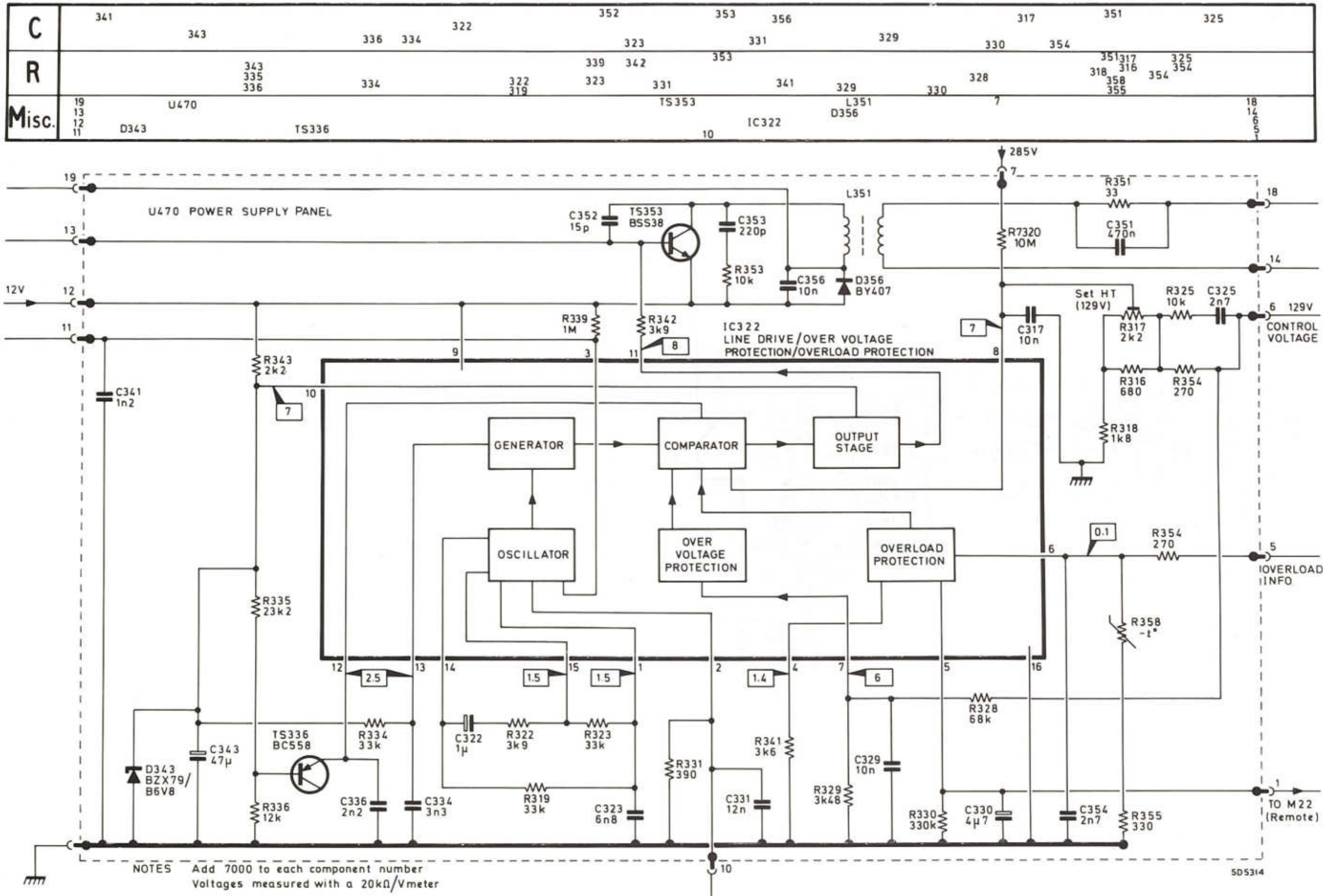
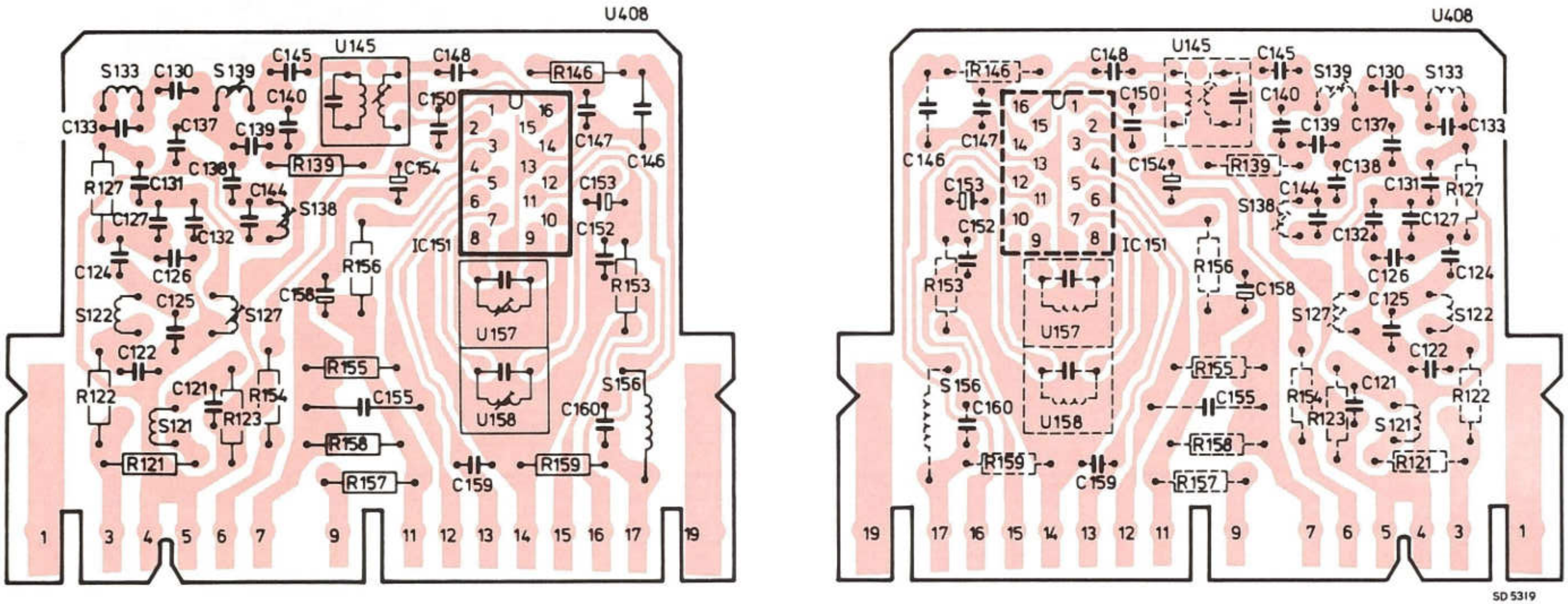


Fig. 9 U470 Power supply panel circuit diagram



Component side

Add 2000 to all component and unit numbers.

Print side

Fig. 10 U408 I.F. panel - circuit diagram

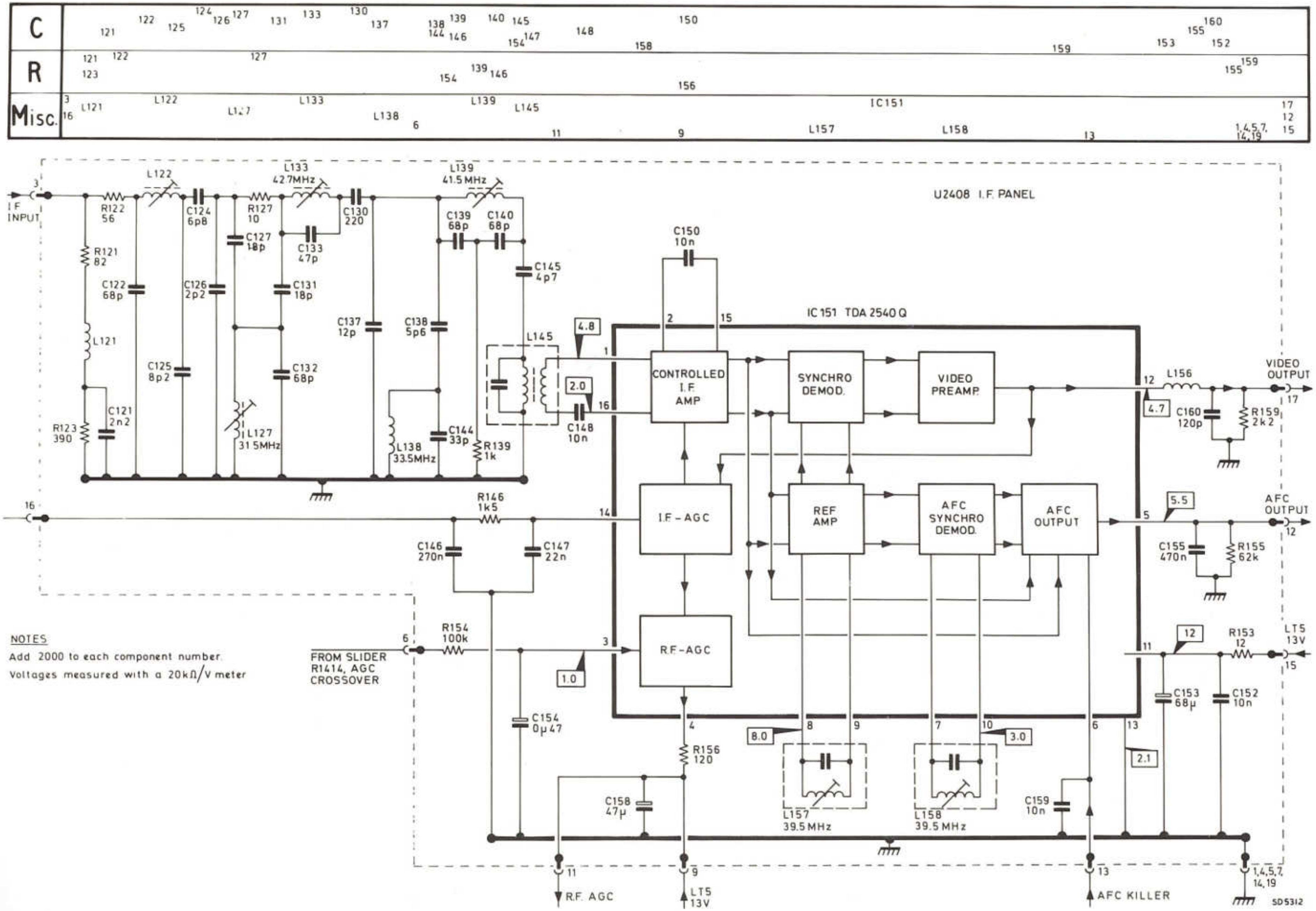
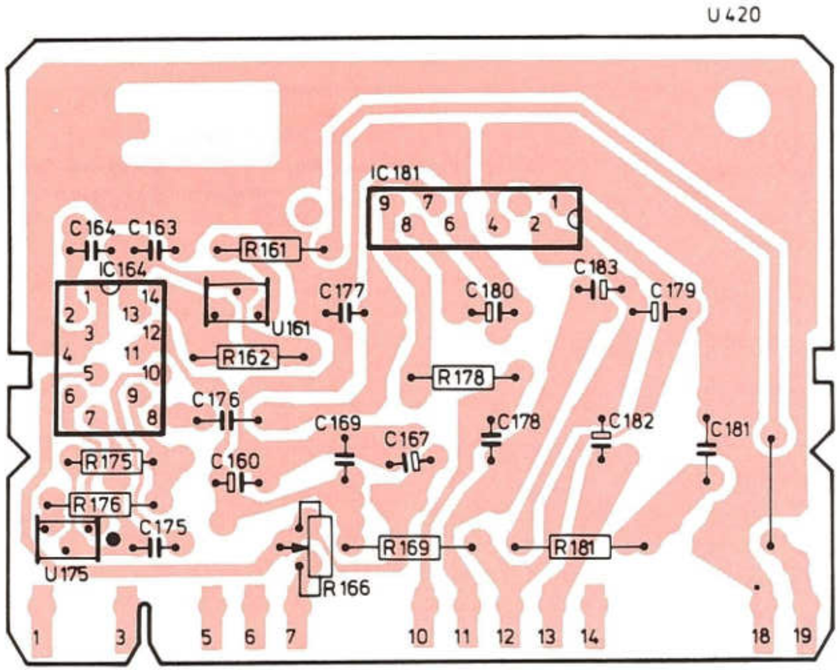


Fig. 11 U408 I.F. panel - circuit diagram

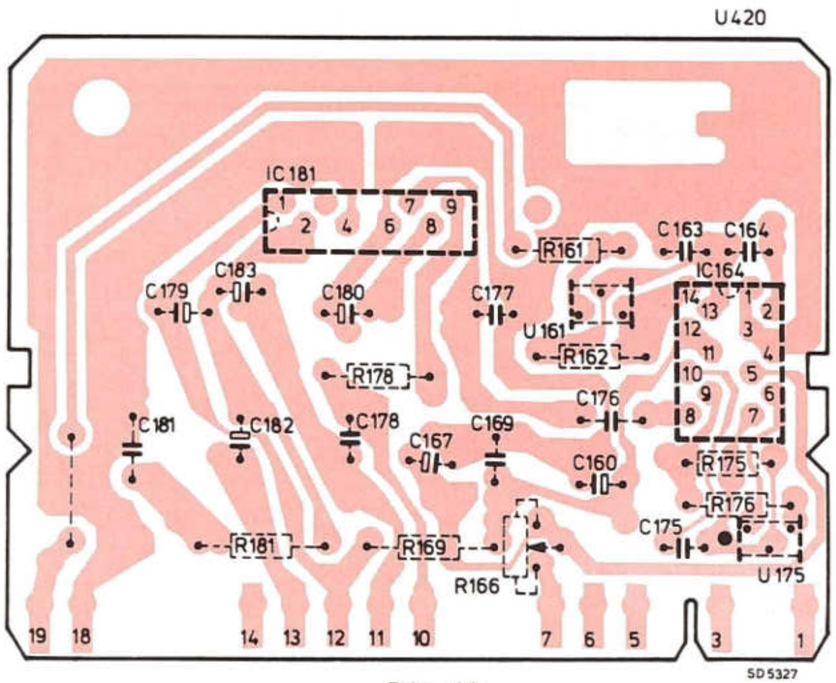
NOTES

Add 2000 to each component number.

Voltages measured with a 20kΩ/V meter



Component side



Print side

NOTES

Add 5000 to all component and unit numbers.

Fig. 12 U420 Sound output panel

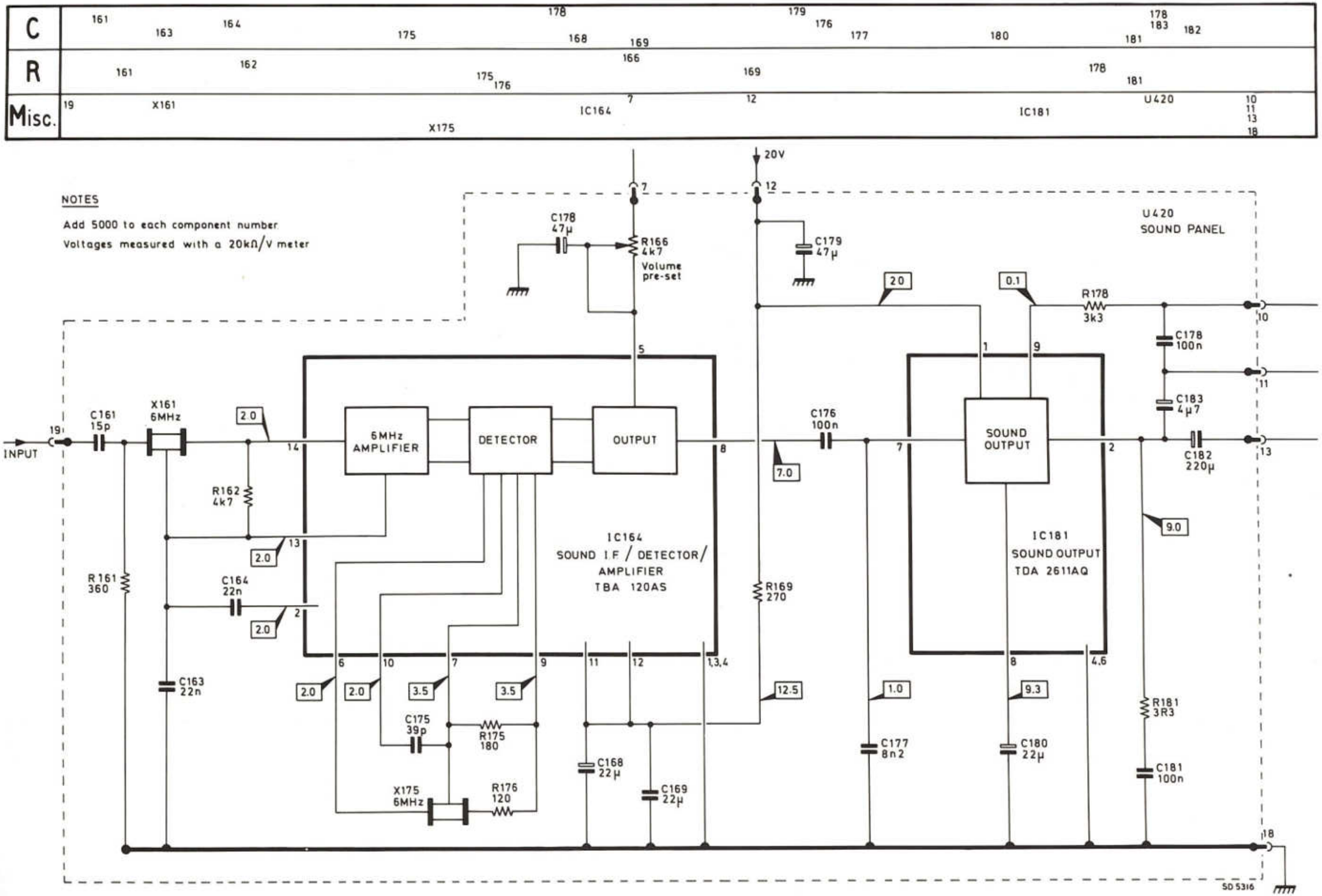
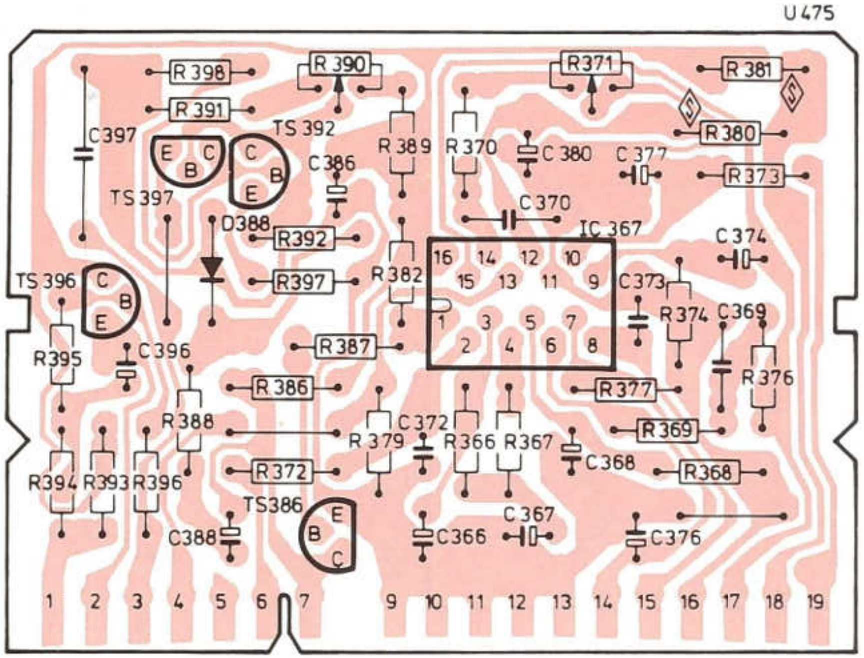
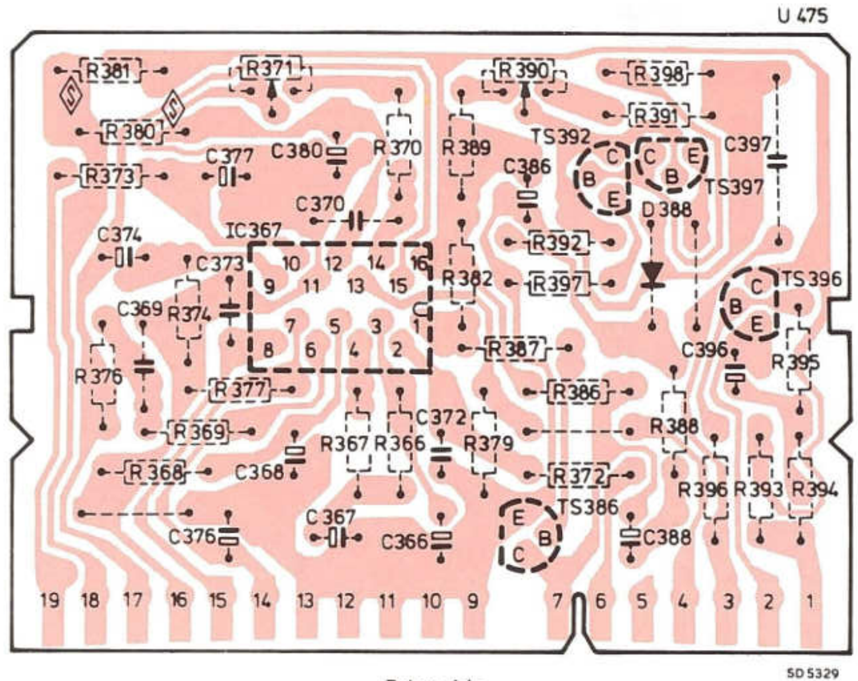


Fig. 13 U420 Sound output panel - circuit diagram



Component side



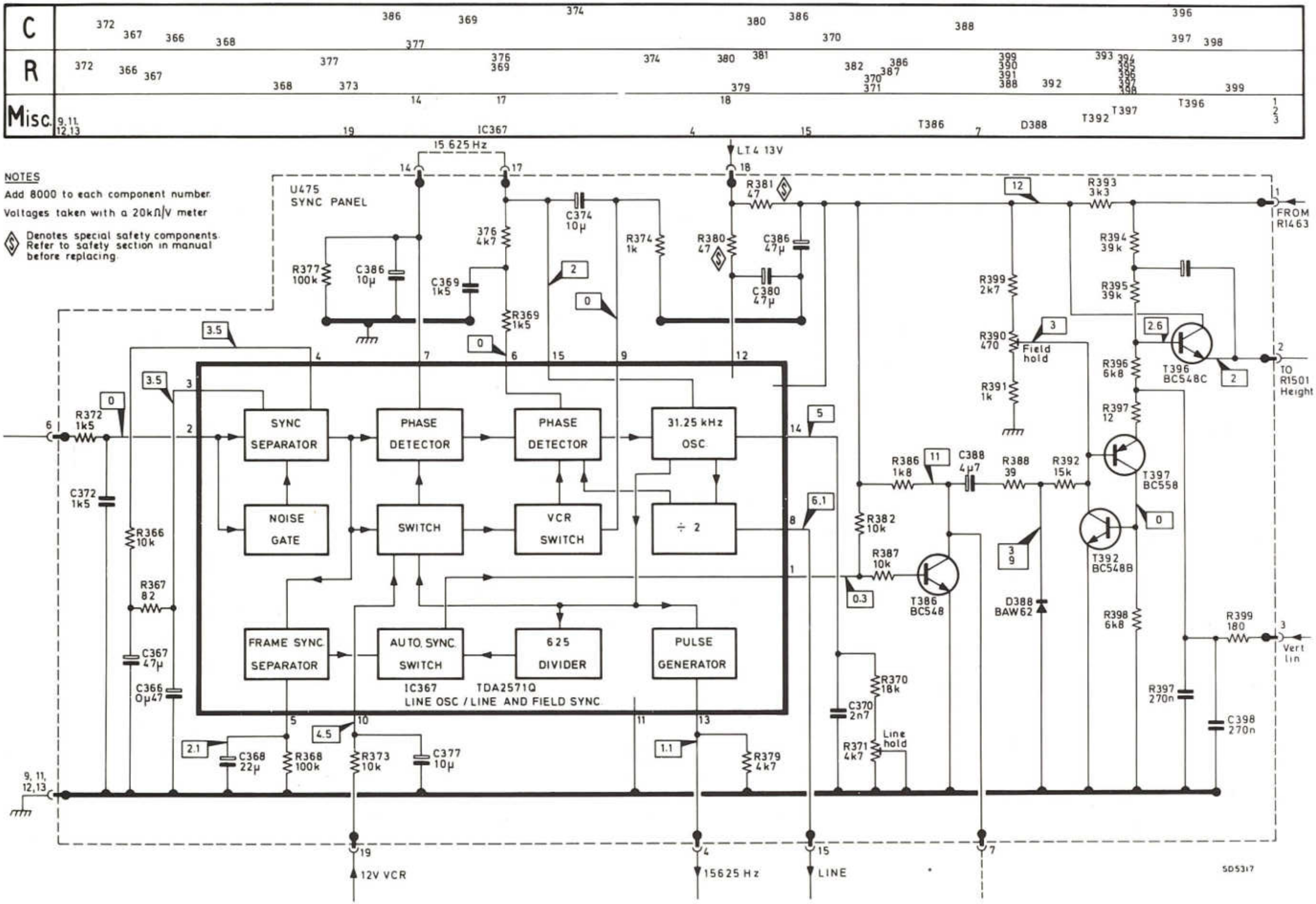
Print side

NOTES

Add 8000 to all component and unit numbers.

Ⓢ Denotes special safety component. Refer to safey section in manual before replacing.

Fig. 14 U470 Sync. panel



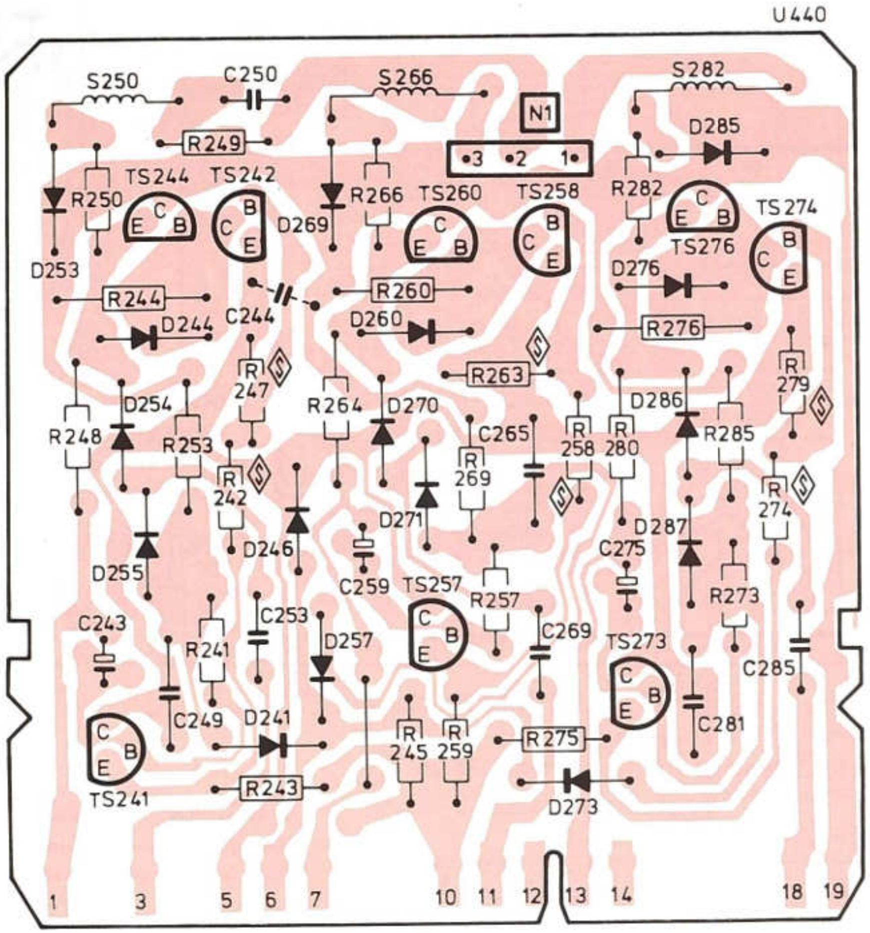
NOTES

Add 8000 to each component number.

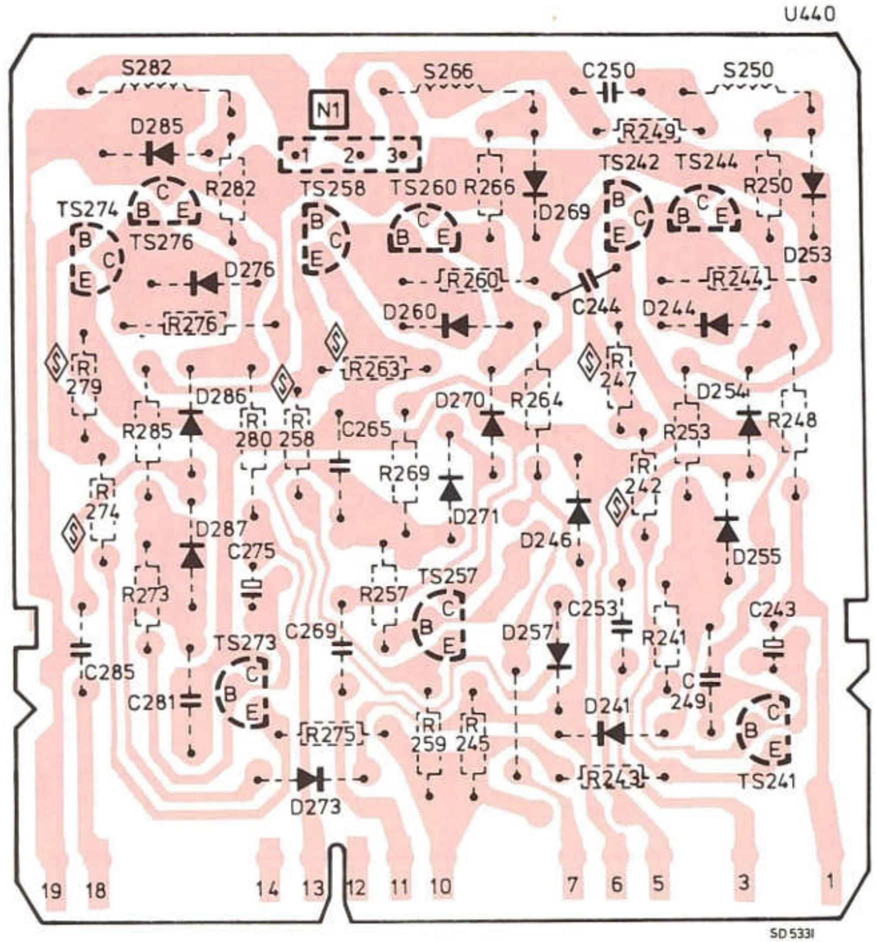
Voltages taken with a 20kΩ/V meter

(S) Denotes special safety components. Refer to safety section in manual before replacing.

Fig. 15 U475 Sync. panel - circuit diagram



Component side



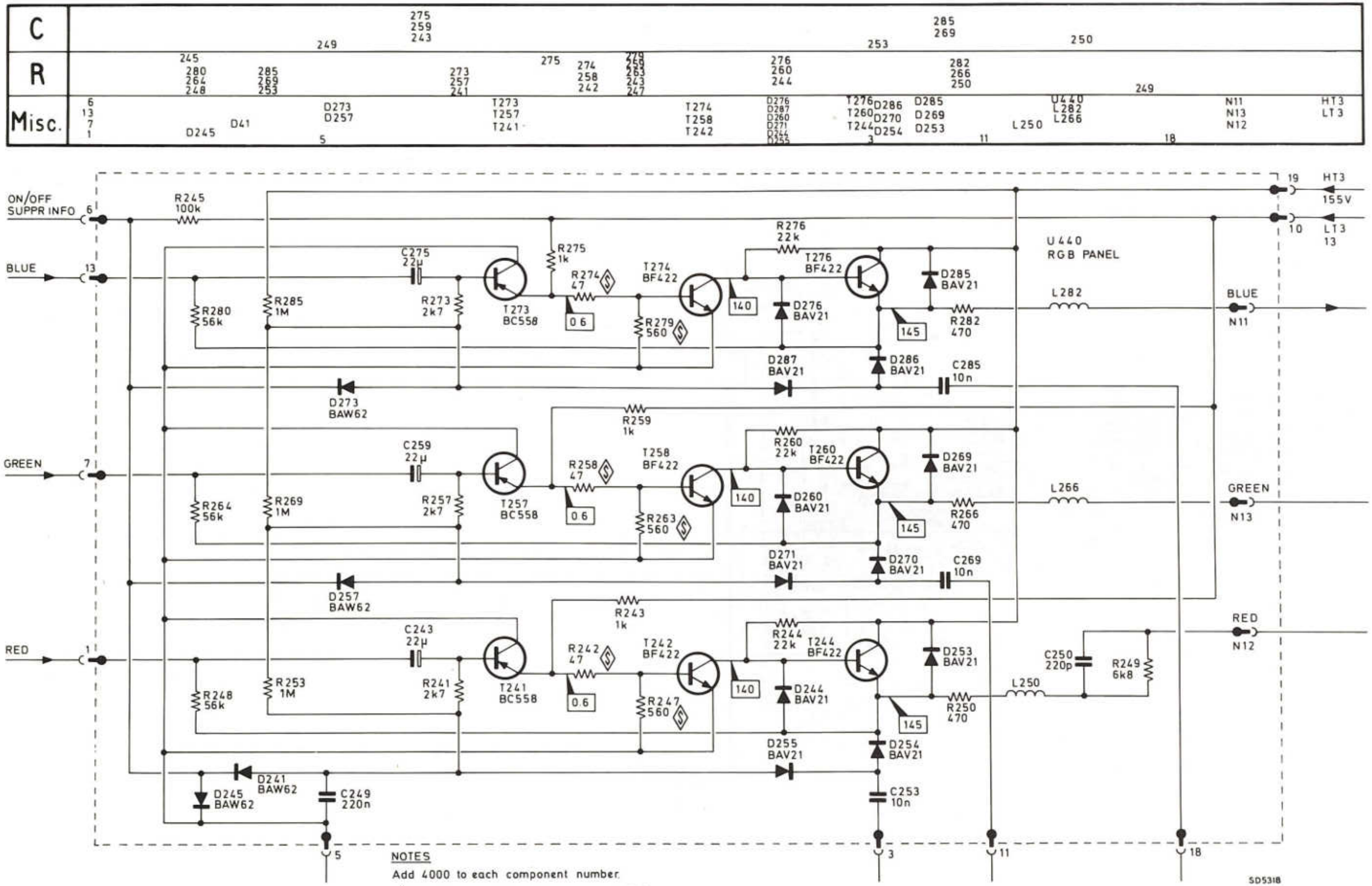
Print side

NOTES

Add 4000 to all component and unit numbers

◊ Denotes special safety component. Refer to safety section in manual before replacing.

Fig. 16 U440 R.G.B. panel



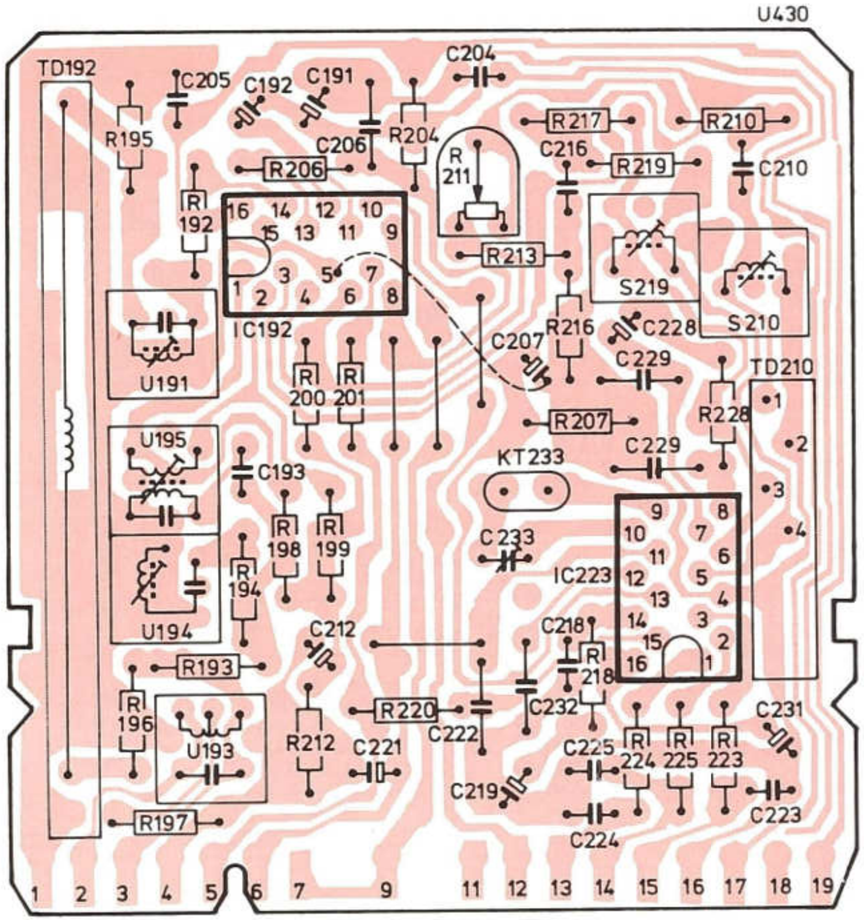
NOTES

Add 4000 to each component number.

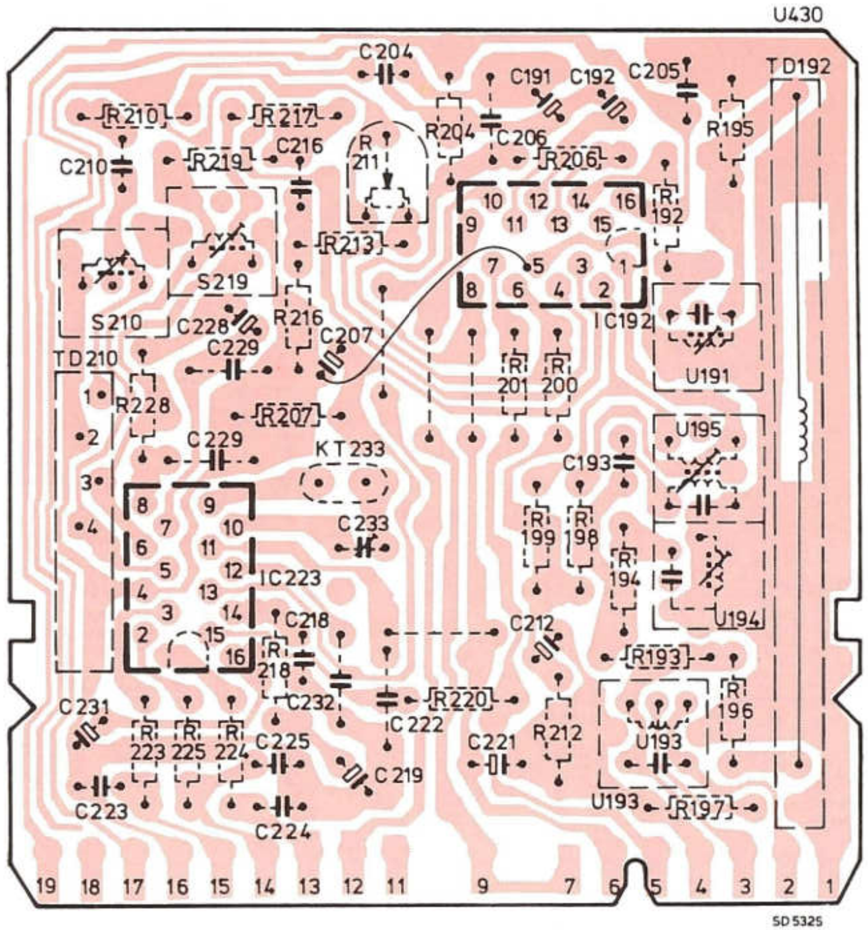
◇S Denotes special safety component. Refer to safety section before replacing.

Voltages measured with a 20kΩ/V meter

Fig. 17 U440 R.G.B. panel - circuit diagram



Component side



Print side

NOTE
Add 3000 to all component and unit numbers.

Fig. 18 U430 Luminance/Chrominance panel

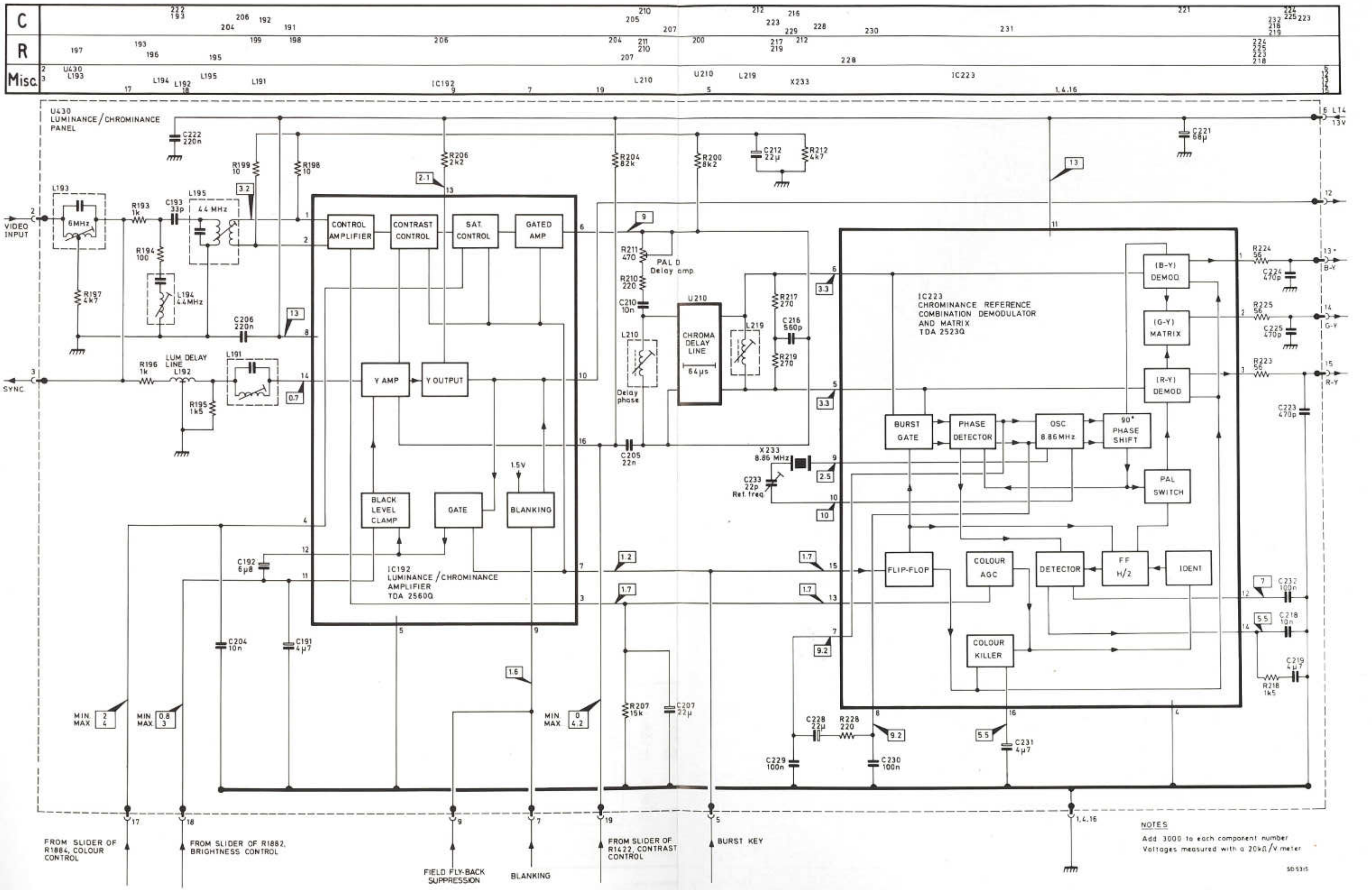
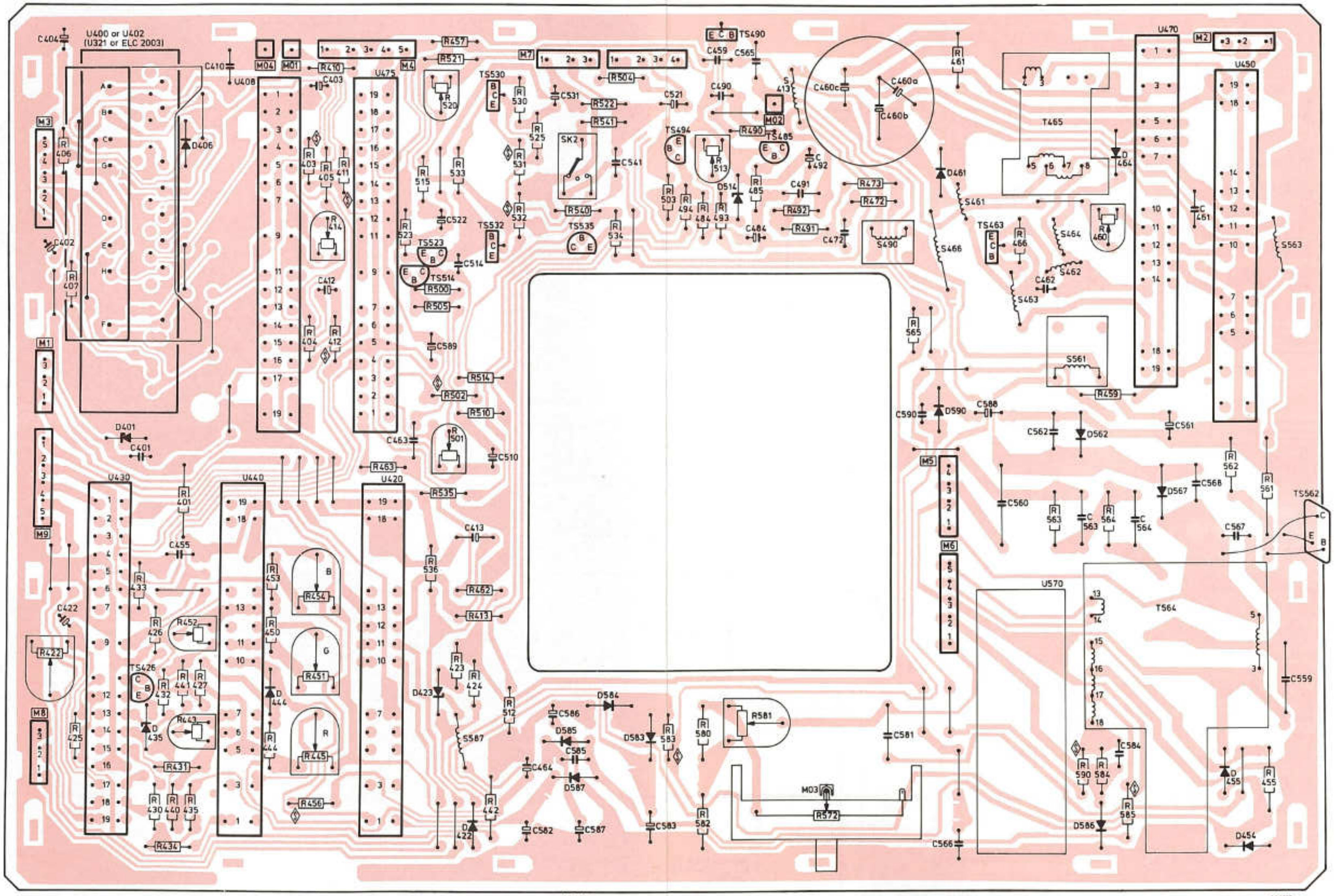


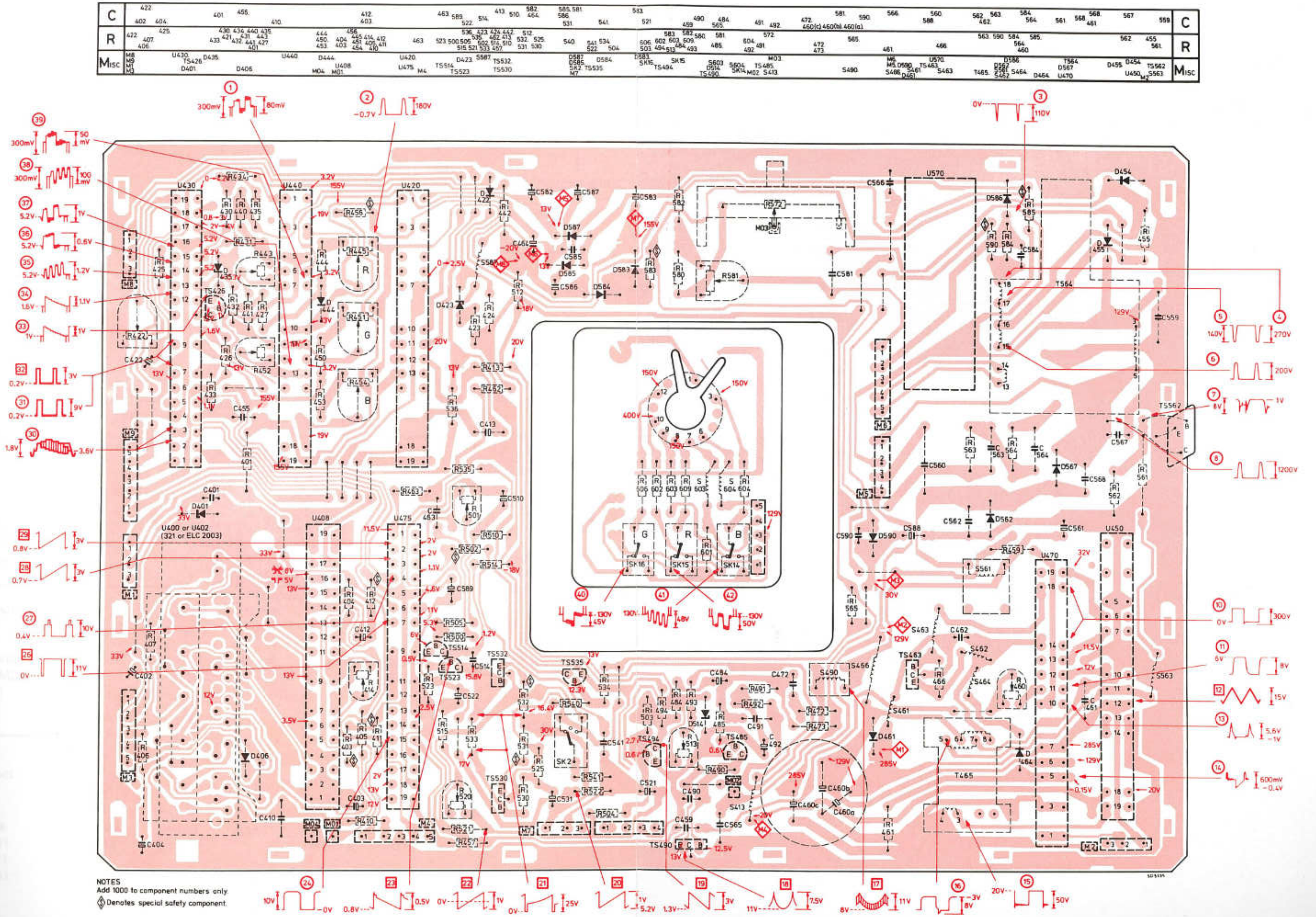
Fig. 19 U430 Luminance/Chrominance panel-circuit diagram

C	402 404 401 455 410 403 463 522 589 514 413 510 464 582 531 586 585 587 541 583 521 459 490 565 484 491 492 460c 472 460b 460a 581 590 566 588 560 462 562 563 564 584 561 461 568 567 559
R	422 406 407 425 433 430 432 426 434 431 440 401 441 452 427 435 443 453 444 450 403 410 404 405 411 414 456 454 451 412 445 463 523 515 520 500 505 536 457 423 535 521 502 501 473 424 533 514 462 442 510 512 530 531 532 525 540 522 541 504 534 503 494 583 484 580 513 493 485 581 582 490 491 492 572 473 472 565 461 466 463 590 584 460 564 459 585 562 455 561
Misc	M3 M1 M9 M8 U400 or U402 (U321 or ELC 2003) D401 U430 TS 426 D435 D406 U440 M04 U408 M01 D444 M4 U475 U420 TS514 TS523 D423 D422 TS530 TS532 M7 SK2 D585 TS535 D587 D584 D583 TS494 TS 490 D514 M02 TS 485 S490 D461 D590 M5 M6 TS 463 U570 T465 S561 D562 D464 D586 U470 D567 T564 U450 D455 D454 S563 TS562



NOTES
Add 1000 to component numbers only
◊ Denotes special safety component Refer to safety section in manual before replacing

Fig. 20 "Motherboard" panel - component side



NOTES
Add 1000 to component numbers only.
◈ Denotes special safety component.

Fig. 21 "Mother board" panel - print side with waveforms

NOTE
Add 9000 to all component numbers

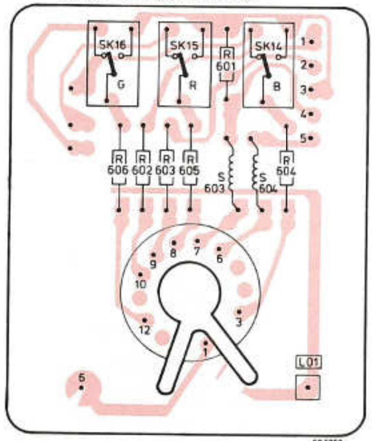


Fig. 22 C.r.t. base panel - component side

NOTE
Add 1000 to all component numbers

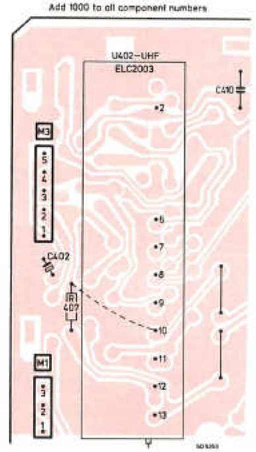


Fig. 23 Alternative tuner ELC2003
(used on 14" sets only)

H. ALGORITHMS

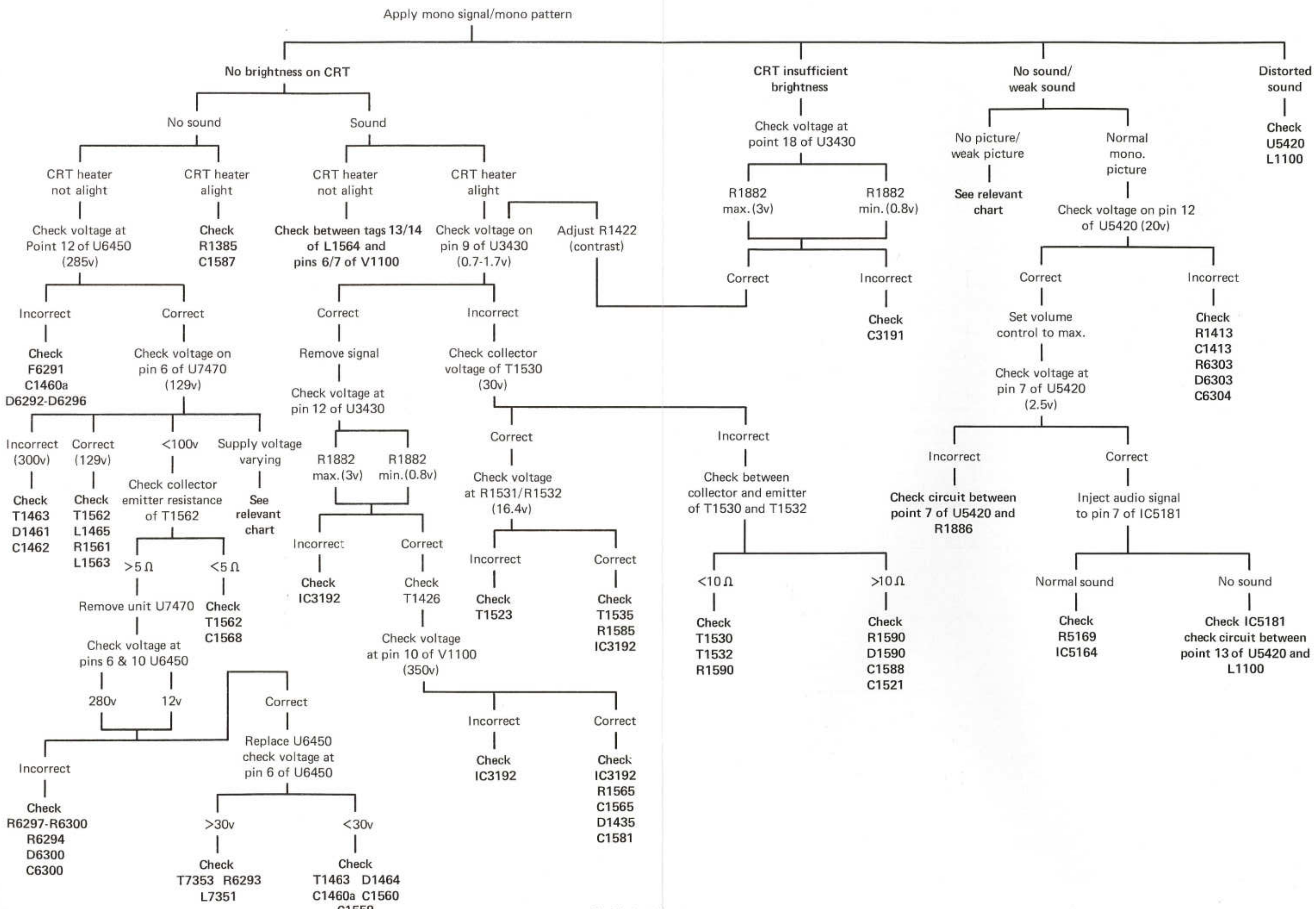


Fig. 24 Servicing algorithm

B

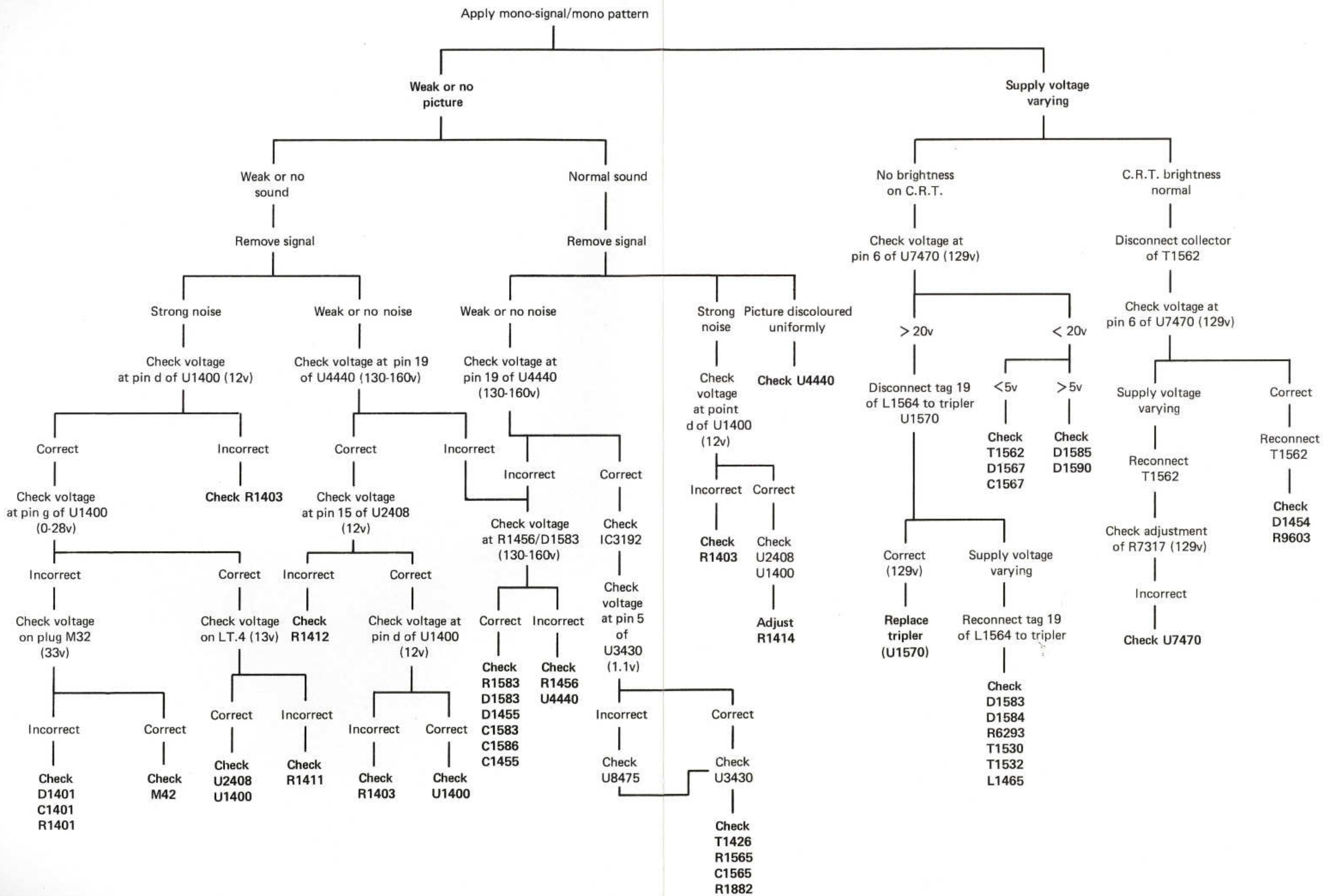


Fig. 25 Servicing algorithm

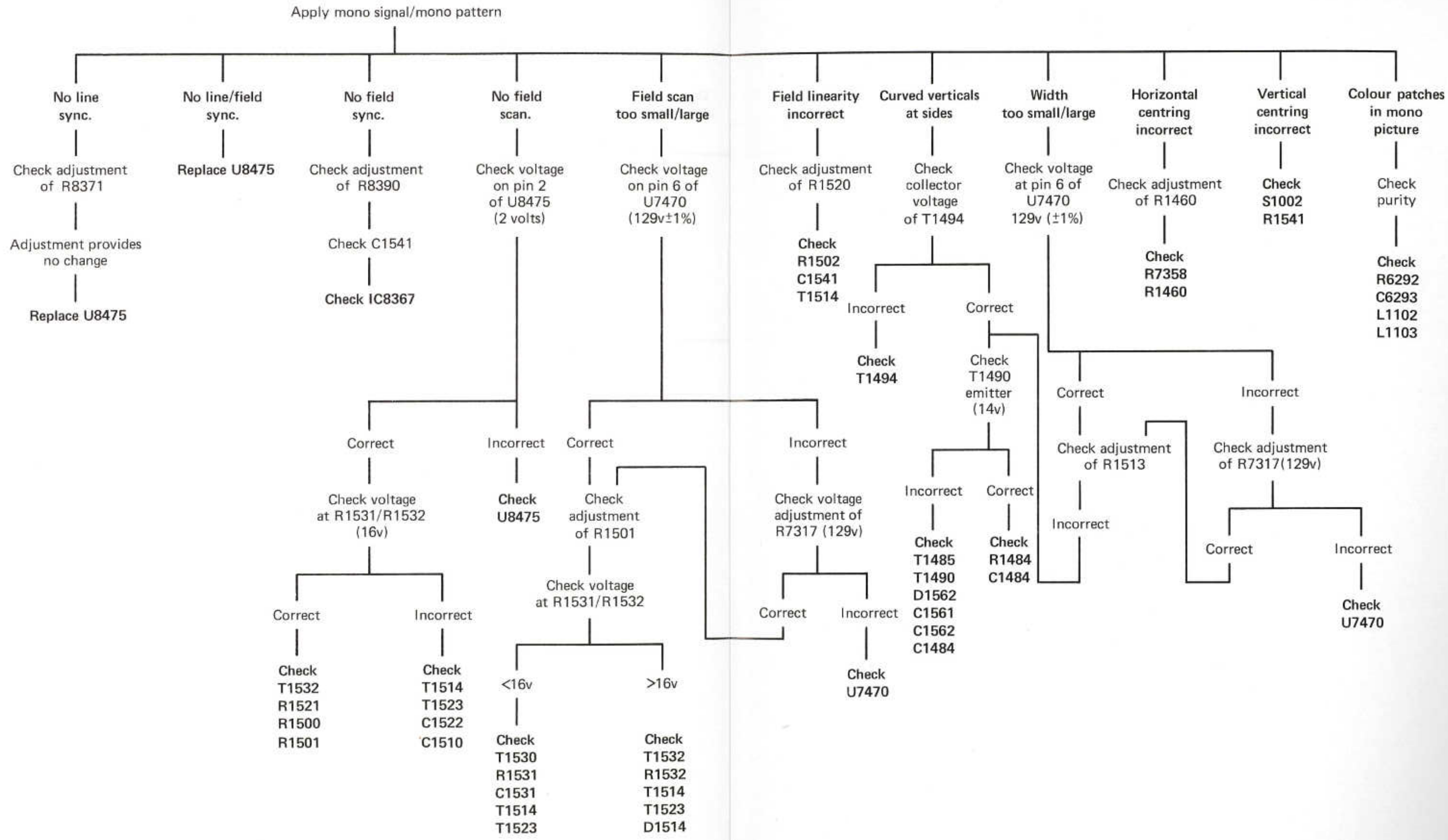


Fig. 26 Servicing algorithm

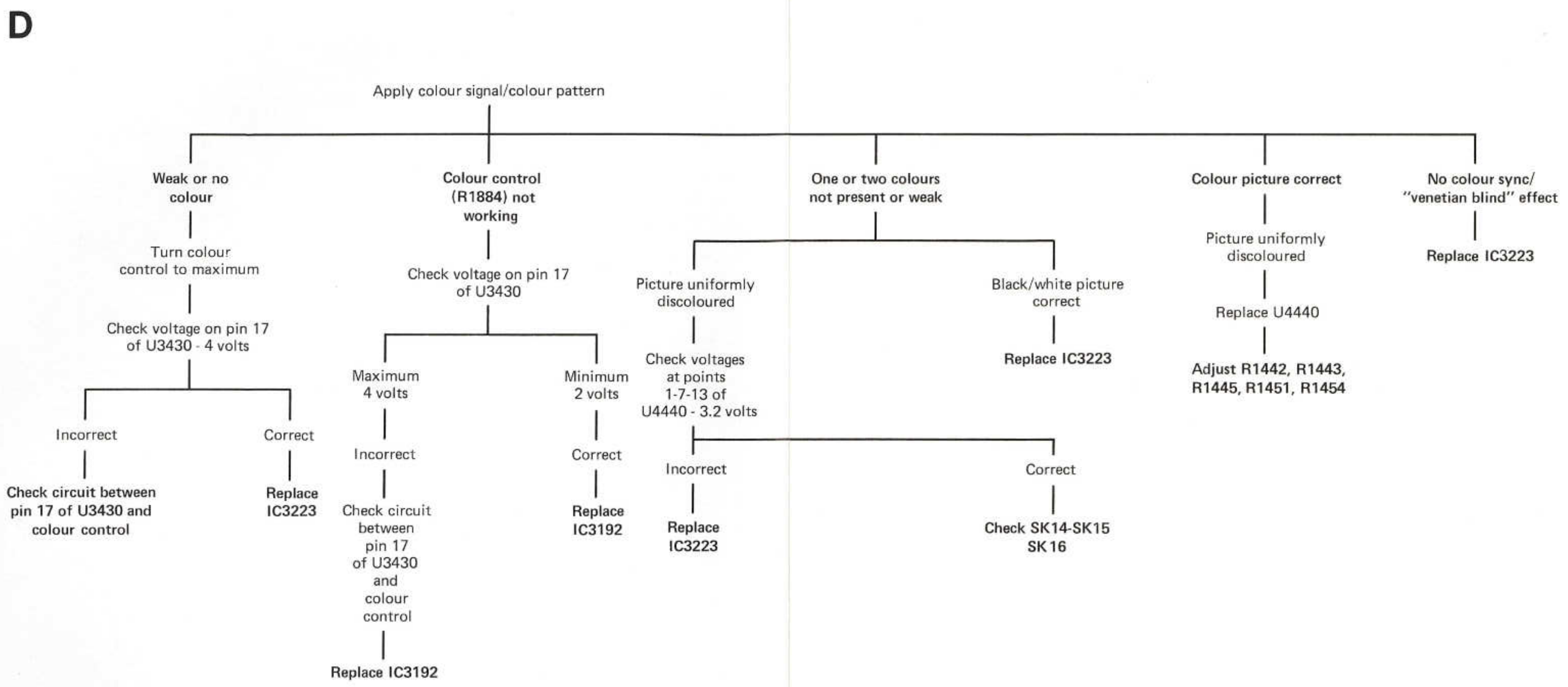


Fig. 27 Servicing algorithm

KT3 CIRCUIT DIAGRAM

ADDENDA & ERRATA

U3430 LUMINANCE/CHROMINANCE PANEL

Underneath U3210 the 'L3210' should be erased.
On some receivers, U3191 is damped by R3191, 18kΩ.
U3194 is tuned to 2.2MHz

U4440 R/G/B PANEL

C4265, 220n, connected between junction D4271/D4257 and chassis.
C4281, 220n, connected between junction D4287/D4273 and chassis.
The top end of R4253 should be connected to +155V (HT3) line.
The top end of R4269 should be connected to +155V (HT3) line.
Anode of D4285 should be connected to junction L4282/R4282 (470Ω resistor not marked).
Anode of D4269 should be connected to junction L4266/R4266.
Anode of D4253 should be connected to junction L4250/R4250.

U8475 SYNC. PANEL

C8372 should be 150p., not 1k5.
R8381 should be 27Ω Safety. Parts list should read R8381 27Ω ⅓W 111 30408.
R8389 should be 3k3, not 2k7.
R8397 may be 18Ω.
R8398 should be 10k, not 6k8.

'MOTHER BOARD'

T1564, l.o.p.t., should read L1564. T149 should read T1494.
Capacitor between base and collector of T1523 should read C1514, 100p.
R1561 should be 2R7, not 2k7.
R1493 should read 68k, not 10u.
C1565 should be 150n, not 150p.

U5420 SOUND PANEL

C5169 should be 22n, not 22u.
C5179, 47u, across volume pre-set R5166, should be C5167.
C1561 on U5420 should read C5161 (replaced by wire link on some sets).
R1561 on U5420 should read R5161 (in series with input in some sets).
6MHz. crystal 5175 should read X5175.
Loudspeaker L1100 adjacent to U5420 should be annotated L1101.
Tone switch, on 16" and 20" sets only, should be annotated S1001.

CRT BASE PANEL

R9001 should be connected to the bottom end of L9603, not the top.

U6450 BRIDGE RECTIFIER PANEL

R6191 should read R6291.
C6292, on left-hand side of bridge rectifier, should read C6290.

U7470 POWER SUPPLY PANEL

R7341 should be 5k6, not 3k6. Parts list should read R7341 carbon 5k6 ½W 110 53127.
R7329 should be 3k3, not 3k48.

COLOUR
TELEVISION

SPARE PARTS LIST

FOR THE

'KT3' Chassis

Philips Service
604 Purley Way, Waddon, Croydon, CR9 4DR
Telephone: 01-686 0505 Telex: 262308
(Recorded messages after business hours)

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MAINS RECTIFIER PANEL	7
POWER SUPPLY PANEL	8
SYNC. PANEL	8

SUPPLY OF SPARE PARTS

To ensure correct interpretation of requirements please include the following information on orders for spare parts :–

1. The full model number recorded on the type number plate, including any suffix. **Do not use the commercial abbreviation which may be misleading.**
2. Whenever possible, quote the BA, BY or HU number of the panel or unit. In some assemblies the components may be changed during production.
3. Always give an accurate description and colour where applicable.
4. Quote code number, together with the item or position number.

If it is necessary to return components, always include full identification on the accompanying advice note.

Notes

Safety components are identified by the symbol Ⓢ. Refer to the Safety Notes in the KT3 Chassis Field Service Manual before replacing. The following list covers the components and printed panels mounted on the main chassis frame. For other spare parts (e.g. cabinet parts and cabinet mounted items), refer to the supplementary service information for the model in question.

CHASSIS – MISCELLANEOUS

Item No.		
1	Heatsink for T1562	255 47125
2	Backing plate for above	255 47126
3	Nylon insulating piece for above	404 37348
4	Mica washer for above	532 57076
5	Heatsink for T1463, T1530 and T1532 (2)	255 47127
6	Heatsink clip for above and T1490 (4)	492 67347
7	Mica plate for T1463 and T1530 (2)	466 97294
8	Earthing tag for heatsinks (2)	290 47275
9	Cable clamp, chassis frame (4)	401 10654
10	Cable clamp, heatsink (2)	401 10649
11	Bracket, aerial input	404 30317
12	Key for fixing tuner (U321 only)	404 30239
13	Bracket for above	404 37515
14	Immunity shield (U321 tuner)	466 37095
15	Plug, fixed 3 way, M1	265 30121
16	Plug, fixed, 3 way, M2	265 30121
17	Plug, fixed, 5 way, M3	267 40247
18	Plug, fixed, 5 way, M4	267 40247
19	Plug, fixed, 4 way, M5	265 30119
20	Plug, fixed, 5 way, M6	267 40247
21	Plug, fixed, 3 way, M7	265 30121
22	Plug, fixed, 3 way, M8	265 30121
23	Plug, fixed, 5 way, M9	265 40247
24	Socket, 17 way for U2408 U3430 U8475 (3)	265 40141
25	Socket, 12 way for U5420 U4440 U6450 U7470 (4)	265 40139
26	Socket for U321 tuner	267 50195
26a	Blanking piece for 24 & 25 (7)	466 80672
27	Screening plate, tripler	466 37106
27a	Screw for above, 6N x ¼"	502 37082

SWITCH

Pos. No.		
S1002	Frame shift	273 37012

UNITS

Pos. No.		
U1400	UHF tuner type U321	210 57045
U1402	UHF tuner type ELC2003	210 50078
◊ U1405	Aerial input unit	267 10057
U1570	Tripler unit	218 20073
U2408	I.F. module (with U321 tuner)	212 27445
U2408	I.F. module (with ELC2003 tuner)	212 20646
U3430	Lum/Chrominance module	212 20648
U4440	R.G.B. module	212 20616
U5420	Sound module	212 20647
U6450	Main's rectifier module	212 20649
U7470	Power Supply module	212 20614
U8475	Line/frame sync. module	212 20617

TRANSISTORS

Pos. No.		
T1426	BC548	130 40938
T1463	BUW84	130 41274
T1485	BC548	130 40938
T1490	BD234	130 47246
T1494	BC548	130 40938
T1514	BC557	130 44256
T1523	BC337	130 40855
T1530	BD233	130 44281
T1532	BD234	130 47246
T1535	BC558	130 30941
T1562	2SD200 or BU205	130 47469

DIODES

Pos. No.		
D1401	ZTK33 BDPD	218 27315
D1422	BAW62	130 37123
D1423	BZX79/C12	130 34197
D1435	BZX79/B5V6	130 34173
D1444	BAW62	130 37123
D1454	BAS11	130 41273
D1455	BAS11	130 41273
D1461	BY208–800	130 30956
D1464	BY208–800	130 30956
D1514	BZX79/C18	130 44286
D1562	BY208–800	130 30956
D1567	BY228	130 41275
D1583	BY406A	130 37388
D1584	BY406A	130 37388
D1585	BY406A	130 37388
D1586	BAV21	130 30842
D1587	BY406A	130 37388
D1590	BY406A	130 37388

COILS AND TRANSFORMERS

Pos No.		
L1413	Coil 12 μH	158 10082
L1461	Coil 2 μH	158 10096
L1462	Coil 2 μH	158 10096
L1463	Coil 12 μH	158 10082
L1464	Coil 2 μH	158 10096
L1465	Line driver transformer	148 80028
L1466	Coil 27.4 μH	157 54018
L1490	Coil	157 10085
L1561	Coil	157 10086
L1563	Coil 12 μH	158 10082
L1564	Line o/p transformer	140 10161
L1587	Coil 12 μH	158 10082

CAPACITORS

Pos No	Type	Value F	Voltage	
C1401	Ceramic	1n	500	122 31175
C1402	Elco	470n	63	124 20719
C1403	Elco	47μ	25	124 20699
C1410	Polyester	180n	100	121 40206
C1412	Elco	150μ	16	124 20691
C1413	Elco	1000μ	25	124 20623
C1422	Elco	2μ2	40	124 20706
C1455	Polyester	100p	500	121 40108
C1456	Polyester	100n	250	121 41161
C1459	Polyester	100n	250	121 41161
C1460	Elco	200+25+25 μ		121 40164
C1461	Polyester	100n	400	121 40487
C1462	Ceramic	470p	500	122 47228
C1463	Polyester	100n	250	121 41161
C1464	Elco	100μ	25	124 20575
C1472	Polyester	18n	250	121 40314
C1484	Elco	10μ	40	124 20708
C1490	Ceramic	270p	100	122 31168
C1491	Polyester	120n	250	121 40183
C1492	Elco	1μ	63	124 20583
C1510	Elco	100μ	10	124 20679
C1514	Ceramic	100p		122 31081
C1521	Elco	470μ	25	124 20622
C1522	Elco	220μ	10	124 47032
C1531	Elco	100μ	25	124 20575
C1541	Polyester	56n	250	121 41154
C1542	Elco	22μ	40	124 20711
C1559	Polyester	100n	400	121 40487

C1560	Polyester	390n	400	121 47522
C1561	Elco	4µ7	50	124 20726
C1562	Polyester	15n	400	121 40475
C1563	Polyester	47n	630	121 40342
C1564	Polyester	47n	630	121 40342
C1565	Polyester	120n	100	121 44202
C1566	Ceramic	220p	500	122 47257
C1567	Polyester	3n9	2kv	121 40544
C1568	Ceramic	560p	2kv	122 54013
C1581	Polyester	33n	630	121 40412
C1582	Elco	10µ	63	124 20728
C1583	Elco	47µ	250	124 20856
C1584	Ceramic	1n	500	122 47292
C1585	Ceramic	470p	500	122 47228
C1586	Elco	100 µ	25	124 20575
C1587	Elco	1000 µ	16	124 47047
C1588	Elco	680 µ	35	124 20413
C1589	Elco	1000 µ	16	124 47047
C1590	Ceramic	2n2	500	122 31116

RESISTORS

Pos. No	*Type*	*Value Ω*	*Wattage*	
R1401	Metal film	15k	2.5	116 51109
(S) R1403 (U321)	Carbon	100	⅓	111 30343
(S) R1403 (ELC2003)	Carbon	27	⅓	111 30408
R1404	Carbon	270k	½	110 53172
R1405	Carbon	2M2	½	110 42196
R1407 (ELC2003)	Carbon	47	⅓	110 63072
R1410 (U321)	Carbon	47k	⅓	110 63152
R1410 (ELC2003)	Carbon	22k	⅓	110 63143
(S) R1411 (U321)	Carbon	100	⅓	111 30343
(S) R1412	Carbon	15	⅓	111 30422
R1413	Carbon	4R7	⅓	110 63045
R1414	Pre-set, AGC	100k		100 10052
R1422	Pre-set, contrast	47k		101 10027
R1423	Carbon	220	⅓	110 63089
R1424	Carbon	47k	⅓	110 63152
R1425	Carbon	820	⅓	110 63089
R1426	Carbon	220	⅓	110 63089
R1427	Carbon	15k	⅓	110 63138
R1430	Carbon	680	⅓	110 63103
R1431	Carbon	680	⅓	110 63103
R1432	Carbon	680	⅓	110 63103
R1433	Carbon	1k5	⅓	110 63112
R1434	Carbon	47	⅓	110 63072
R1435	Carbon	1k5	⅓	110 63112
R1440	Carbon	1k5	⅓	110 63112
R1441	Carbon	1k5	⅓	110 63112
R1442	Carbon	820	⅓	110 63105
R1443	Pre-set, green drive	470		100 10038
R1444	Carbon	33k	⅓	110 63147
R1445	Pre-set, red gun	4k7		101 17022
R1450	Carbon	33k	⅓	110 63147
R1451	Pre-set, green gun	4k7		101 17022
R1452	Pre-set, blue drive	470		100 10038
R1453	Carbon	33k	⅓	110 63147
R1454	Pre-set, blue gun	4k7		101 17022
R1455	Metal film	560	16	116 57308
(S) R1456	Carbon	100	⅓	111 30343
R1457	Carbon	330	⅓	110 63094
R1459	Carbon	33k	⅓	110 63147
R1460	Pre-set, line shift	4k7		100 10036
R1461	Carbon	1	½	110 53027
R1462	Carbon	120k	⅓	110 63163
R1463	Carbon	120k	⅓	110 63163
R1466	Carbon	180	⅓	110 63087
R1472	Carbon	56k	⅓	110 63154
R1473	Carbon	680k	½	110 53183
R1484	Carbon	8k2	⅓	110 63132
R1485	Carbon	1k	⅓	110 63107
R1490	Carbon	2k2	⅓	110 63116
R1491	Carbon	47k	⅓	110 63152
R1492	Carbon	47k	⅓	110 63152
R1493	Carbon	68k	⅓	110 63156
R1494	Carbon	3k3	⅓	110 63121
R1500	Carbon	12k	⅓	110 63136
R1501	Pre-set, height	1k		100 10037
(S) R1502	Carbon	15	⅓	111 30422
R1503	Carbon	6k8	⅓	110 63129
R1504	Carbon	2k2	⅓	110 63116
R1505	Carbon	10k	⅓	110 63134
R1510	Carbon	20k	⅓	110 60142
R1512	Carbon	330	⅓	110 63094
R1513	Pre-set, width	10k		100 10035
R1514	Carbon	10k	⅓	110 63134
R1515	Carbon	68	⅓	110 63076
R1520	Pre-set, field lin.	100		100 10075
R1521	Carbon	1	½	110 53027
R1522	Carbon	4k7	⅓	110 63125
R1523	Carbon	33	⅓	110 63067
R1525	Carbon	390	⅓	110 63096
R1529	Carbon	6k8	⅓	110 63129
R1530	Carbon	390	⅓	110 63096
(S) R1531	Carbon	1R5	⅓	111 30217
(S) R1532	Carbon	1R5	⅓	111 30217
R1533	Carbon	68	⅓	110 63076
R1534	Carbon	8k2	⅓	110 63132
R1535	Carbon	4k7	⅓	110 63125
R1536	Carbon	18k	⅓	110 63141
R1540	Carbon	10k	⅓	110 63134
R1541	Carbon	1k5	⅓	110 63112
R1561	Wirewound	2R7	4	113 80215
R1562	Carbon	33	½	110 53067
R1563	Carbon	1M	½	110 42187
R1564	Carbon	1M	½	110 42187
R1565	Carbon	36k	⅓	110 60148
R1572	Pre-set, focus	23M	3.8	101 20519
R1580	Carbon	2M7	½	110 42198
R1581	Pre-set, CRT cut-off	4M7		101 10127
R1582	Carbon	1M	½	110 42187
(S) R1583	Carbon	2R2	⅓	111 30437
R1584	Carbon	390	⅓	110 63096
(S) R1585	Carbon	1	½	111 30339
R1586	Carbon	33k	⅓	110 63147
(S) R1590	Carbon	3R3	⅓	111 30218

FIXING MATERIALS

Item No.		
27	Screw for tripler, M4x12 (2)	502 10694
28	Washer for above (12)	532 10333
29	Nut for above (2)	505 10262
30	Screw for L.O.P. TX, M3x5 (2)	502 10558
31	Screw for heatsink TS1562 (2)	502 37082
32	Screw for TS1562 (2)	502 10694
33	Screw for aerial isolator bracket (2)	502 37082
34	Screw for aerial isolator (2)	502 37208
35	Screw for heatsink earth tag (2)	502 37065
36	Screw for heatsink IC5181	502 37065
37	Washer for above	532 10582

C.R.T. PANEL

Item No.		
41	C.R.T. panel assembly	212 27447
42	Cable clamp (2)	256 97096
43	Cable clamp for focus lead	290 47276
44	Focus lead	321 20342
45	C.R.T. holder	255 70176
46	Socket, 3 way, N1	266 30071
47	Socket, 5 way M6	266 30075
48	Connector, MO3	268 20067

SWITCHES

Pos. No.		
S9014	Blue gun	273 47009
S9015	Red gun	273 47009
S9016	Green gun	273 47009

COILS

Pos. No.		
L9603	Coil 12µH	158 10082
L9604	Coil 12µH	158 10082

RESISTORS

Pos. No.	Type	Value	Wattage	
R9601	Carbon	1M	½	110 42187
R9602	Carbon	1k5	½	111 50374
R9603	Carbon	1k5	½	111 50374
R9604	Carbon	1k5	½	111 50375
R9605	Carbon	1k5	½	111 50374
R9606	Carbon	1k5	½	111 50374

I.F. PANEL (with U321 tuner)

Pos. No.		
U2408	I.F. Panel assembly (U321 tuner)	212 27445
—	Cover for above (2)	462 77401

INTEGRATED CIRCUIT

IC 2151	TDA2540Q	209 80465

COILS

Pos. No.		
L2121	Coil	156 20812
L2122	Coil	156 20793
L2127	Coil	156 20795
L2133	Coil	156 20794
L2138	Coil	156 20796
L2139	Coil	156 20797
L2145	I.F. transformer	156 20798
L2156	Coil, 12µH	158 10082
L2157	Coil	156 20799
L2158	Coil	156 20801

CAPACITORS

Pos. No.	Type	Value F	Voltage	
C2121	Ceramic	2n2	63	122 37047
C2122	Ceramic	68p		122 31076
C2124	Ceramic	6p8	100	122 37104
C2125	Ceramic	8p2	100	122 31052
C2126	Ceramic	2p2	100	122 31036
C2127	Ceramic	18p	100	122 31061
C2130	Ceramic	22p	100	122 31063
C2131	Ceramic	18p	100	122 31061
C2132	Ceramic	68p		122 31076
C2133	Ceramic	47p	100	122 31072
C2137	Ceramic	12p	100	122 31056
C2138	Ceramic	5p6	100	122 31047
C2139	Ceramic	68p		122 31076
C2140	Ceramic	68p		122 31076
C2144	Ceramic	33p		122 31067
C2145	Ceramic	4p7	100	122 31045
C2146	Polyester	270n	100	121 40431
C2147	Ceramic	22n	63	122 30103
C2148	Ceramic	10n	63	122 30043
C2150	Ceramic	10n	63	122 30043
C2152	Ceramic	10n	63	122 30043
C2153	Elco	68µ	16	124 20689
C2154	Elco	470n	63	124 20719
C2155	Polyester	470n	100	121 40438
C2158	Elco	47µ	25	124 20699
C2159	Ceramic	10n	63	122 30043
C2160	Ceramic	120p	63	122 30093

RESISTORS

Pos. No.	Type	Value	Wattage	
R2121	Carbon	120	⅓	110 63083
R2122	Carbon	56	⅓	110 63074
R2123	Carbon	390	⅓	110 63096
R2127	Carbon	10	⅓	110 63054
R2139	Carbon	1k	⅓	110 63107
R2146	Carbon	1k5	⅓	110 63112
R2153	Carbon	8R2	⅓	110 63052
R2154	Carbon	100k	⅓	110 63161
R2155	Carbon	62k	⅓	110 60155
R2156	Carbon	82	⅓	110 63078
R2159	Carbon	2k2	⅓	110 63116

I.F. PANEL (with ELC2003 tuner)

Pos. No.		
U2408	I.F. panel (ELC2003 tuner)	212 20646
—	Cover for above (2)	462 77401

INTEGRATED CIRCUIT

Pos. No.		
IC2151	TDA2540Q	209 80465

COILS

Pos. No.		
L2122	Coil	156 20793
L2127	Coil	156 20795
L2133	Coil	156 20794
L2138	Coil	156 20796
L2139	Coil	156 20797
L2145	Coil	156 20798
L2156	Coil, 12µH	158 10082
L2157	Coil	156 20799
L2158	Coil	156 20801

CAPACITORS

Pos. No.	Type	Value F	Voltage	
C2122	Ceramic	82p		122 31078
C2124	Ceramic	5p6	100	122 31047
C2125	Ceramic	5p6	100	122 31047
C2126	Ceramic	3p3	100	122 31041
C2127	Ceramic	12p	100	122 31056
C2130	Ceramic	22p	100	122 31063
C2131	Ceramic	12p	100	122 31056
C2132	Ceramic	68p		122 31076
C2133	Ceramic	47p	100	122 31072
C2137	Ceramic	12p	100	122 31056
C2138	Ceramic	6p8	100	122 37104
C2139	Ceramic	68p		122 31076
C2140	Ceramic	68p		122 31076
C2144	Ceramic	33p		122 31067
C2145	Ceramic	4p7	100	122 31045
C2146	Polyester	270n	100	121 40431
C2147	Ceramic	22n	63	122 30103
C2148	Ceramic	10n	63	122 30043
C2150	Ceramic	10n	63	122 30043
C2152	Ceramic	10n	63	122 30043

C2153	Elco	68µ	16	124 20689
C2154	Elco	470n	63	124 20719
C2155	Polyester	470n	100	121 40438
C2158	Elco	47µ	25	124 20699
C2159	Ceramic	10n	63	122 30043
C2160	Ceramic	120p	63	122 30093

RESISTORS

Pos. no.	*Type*	*Value Ω*	*Wattage*	
R2122	Carbon	56	⅓	110 63074
R2127	Carbon	47	⅓	110 63072
R2139	Carbon	1k	⅓	110 63107
R2146	Carbon	1k5	⅓	110 63112
R2153	Carbon	8R2	⅓	110 63052
R2154	Carbon	100k	⅓	110 63161
R2155	Carbon	62k	⅓	110 60155
R2156	Carbon	330	⅓	110 63094
R2157	Carbon	1k	⅓	110 63107
R2158	Carbon	2k2	⅓	110 63116
R2159	Carbon	2k2	⅓	110 63116

SOUND PANEL

Pos. No.		
U5420	Sound panel assembly	212 20647
—	Heatsink for IC5181	255 47124

INTEGRATED CIRCUITS

Pos. No.		
IC5164	TBA120AS	209 80357
IC5181	TDA2611AQ	209 80444

CERAMIC FILTERS

Pos. No.		
X5161	Ceramic filter, 6MHz	242 70279
X5175	Ceramic filter, 6MHz	242 70281

CAPACITORS

Pos. No.	*Type*	*Value F*	*Voltage*	
C5163	Ceramic	22n	63	122 30103
C5164	Ceramic	22n	63	122 30103
C5167	Elco	47µ	10	124 20461
C5168	Elco	22µ	40	123 20711
C5169	Ceramic	22n	63	122 30103
C5175	Ceramic	39p	100	122 31203
C5176	Polyester	100n	250	121 41161
C5177	Polyester	8n2	250	121 40346
C5178	Polyester	100n	250	121 41161
C5179	Elco	47µ	25	124 20699
C5180	Elco	22µ	25	124 20698
C5181	Polyester	100n	100	121 40522
C5182	Elco	220µ	35	124 20532
C5183	Elco	4µ7	63	124 20726

RESISTORS

Pos. No.	*Type*	*Value Ω*	*Wattage*	
R5161	Carbon	390	⅓	110 63096
R5162	Carbon	4k7	⅓	110 63125
R5166	Pre-set	4k7		100 10236
R5169	Carbon	390	½	111 37378
R5175	Carbon	180	⅓	110 63087
R5176	Carbon	120	⅓	110 63083
R5178	Carbon	3k3	⅓	110 63121
R5181	Carbon	3R3	½	110 53041

LUMINANCE/CHROMINANCE PANEL

Pos. No.		
U3430	Luminance/chrominance panel assembly	212 20648

INTEGRATED CIRCUITS

Pos. No.		
IC3192	TDA2560Q	209 80466
IC3223	TDA2523Q	209 80468

CRYSTAL

Pos. No.		
X3233	Crystal	242 70252

DELAY LINES

Pos. No.		
L3192	Luminance delay line	157 57196
U3210	Chrominance delay line	157 50864

COILS

Pos. No.		
L3191	Coil, 4.4MHz	156 20804
L3193	Coil, 6MHz	156 20806
L3194	Coil, 2.2MHz	156 20803
L3195	Coil, 4.4MHz	156 20802
L3210	Coil	156 20805
L3219	Coil	156 20805

CAPACITORS

Pos. No.	*Type*	*Value F*	*Voltage*	
C3191	Elco	4µ7	63	124 20726
or C3191	Elco	6µ8	63	124 20727
C3193	Ceramic	33p		122 31067
C3204	Ceramic	10n	63	122 30043
C3205	Ceramic	22n	63	122 30103
C3206	Polyester	220n	100	121 40232
C3207	Elco	22µ	25	124 20698
C3210	Ceramic	10n	63	122 30043
C3212	Elco	22µ	25	124 20698
C3216	Ceramic	560p	100	122 31166
C3218	Ceramic	10n	63	122 30043
C3219	Elco	4µ7	63	124 20726
C3221	Elco	68µ	16	124 20689
C3222	Polyester	220n	100	121 40232
C3223	Ceramic	470p	100	122 31177
C3224	Ceramic	470p	100	122 31177
C3225	Ceramic	470p	100	122 31177
C3228	Elco	22µ	25	124 20698
C3229	Polyester	100n	100	121 40522
C3230	Polyester	100n	100	121 40522
C3231	Elco	4µ7	63	124 20726
C3232	Polyester	100n	100	121 40522
C3233	Trimmer	22p	250	125 50045

RESISTORS

Pos. No.	*Type*	*Value Ω*	*Wattage*	
R3192	Carbon	3k6	⅓	110 60122
R3193	Carbon	1k	⅓	110 63107
R3194	Carbon	100	⅓	110 63081
R3195	Carbon	1k5		110 63112
R3196	Carbon	1k	⅓	110 63107
R3197	Carbon	4k7	⅓	110 63125
R3198	Carbon	10	⅓	110 63054
R3199	Carbon	10	⅓	110 63054
R3200	Metal film	8k2	0.4	116 54558
R3201	Carbon	1k	⅓	110 63107
R3204	Carbon	82k	⅓	110 63158
R3206	Carbon	2k2	⅓	110 63116
R3207	Carbon	15k	⅓	110 63138
R3210	Carbon	220	⅓	110 63089
R3211	Pre-set, delay amp.	470		100 10038
R3212	Metal film	4k7	0.4	116 54008
R3213	Carbon	1k	⅓	110 63107
R3216	Carbon	150	⅓	110 63085

R3217	Metal film	270	0.4	116 54503
R3218	Carbon	1k5	⅓	110 63112
R3219	Metal film	270	0.4	116 54503
R3220	Carbon	1k	⅓	110 63107
R3223	Carbon	56	⅓	110 63074
R3224	Carbon	56	⅓	110 63074
R3225	Carbon	56	⅓	110 63074
R3228	Carbon	220	⅓	110 63089

R.G.B. PANEL

Pos. No.		
U4440	R.G.B. panel assembly	212 20616
——	Plug, 3 way, N1	265 30121

TRANSISTORS

Pos. No.		
T4241	BC558	130 30941
T4242	BF422	130 41084
T4244	BF422	130 41084
T4257	BC558	130 30941
T4258	BF422	130 41084
T4260	BF422	130 41084
T4273	BC558	130 30941
T4274	BF422	130 41084
T4276	BF422	130 41084

DIODES

Pos. No.		
D4241	BAW62	130 37123
D4244	BAV21	130 30842
D4245	BAW62	130 37123
D4253	BAV21	130 30842
D4254	BAV21	130 30842
D4255	BAV21	130 30842
D4257	BAW62	130 37123
D4260	BAV21	130 30842
D4269	BAV21	130 30842
D4270	BAV21	130 30842
D4271	BAV21	130 30842
D4273	BAW62	130 37123
D4276	BAV21	130 30842
D4285	BAV21	130 30842
D4286	BAV21	130 30842
D4287	BAV21	130 30842

COILS

Pos. No.		
L4250	Coil, 12 μH	158 10082
L4266	Coil, 12 μH	158 10082
L4288	Coil, 12 μH	158 10082

CAPACITORS

Pos. No.	Type	Value F	Voltage	
C4243	Elco	22 μ	25	124 20698
C4249	Polyester	220n	100	121 40232
C4250	Ceramic	220p	500	122 40116
C4253	Polyester	10n	250	121 41134
C4259	Elco	22 μ	25	124 20698
C4265	Polyester	220n	250	121 40232
C4269	Polyester	10n	250	121 41134
C4275	Elco	22 μ	25	124 20698
C4281	Polyester	220n	100	121 40232
C4285	Polyester	10n	250	121 41134

RESISTORS

Pos. No.	Type	Value	Wattage	
R4241	Carbon	2k7	⅓	110 63118
◊S R4242	Carbon	47	⅓	111 30431
◊S R4243	Carbon	1k	⅓	111 30404
◊S R4244	Carbon	22k	½	110 43143
R4245	Carbon	100k	⅓	110 63161
◊S R4247	Carbon	560	⅓	111 30374
R4248	Carbon	56k	½	110 43154
R4249	Carbon	6k8	⅓	110 63129
◊S R4250	Carbon	470	⅓	111 30411
R4253	Carbon	1M	½	110 42187
R4257	Carbon	2k7	⅓	110 63118
◊S R4258	Carbon	47	⅓	111 30431
◊S R4259	Carbon	1k	⅓	111 30404
◊S R4260	Carbon	22k	½	110 43143
◊S R4263	Carbon	560	⅓	111 30374
R4264	Carbon	56k	½	110 43154
◊S R4266	Carbon	470	⅓	111 30411
R4269	Carbon	1M	½	110 42187
R4273	Carbon	2k7	⅓	110 63118
◊S R4274	Carbon	47	⅓	111 30431
◊S R4275	Carbon	1k	⅓	111 30404
◊S R4276	Carbon	22k	½	110 43143
◊S R4279	Carbon	560	⅓	111 30374
R4280	Carbon	56k	½	110 43154
◊S R4282	Carbon	470	⅓	111 30411
R4285	Carbon	1M	½	110 42187

MAINS RECTIFIER PANEL

Pos. No.		
U6450	Main's rectifier panel assembly	212 20649
———	Plug, 3 way, A1	267 47047
———	Plug, 4 way, A2	265 30119
———	Fuse clip (4)	492 60063

FUSES

Pos. No.		
◊S F6291	T2A	253 30025
◊S F6292	T2A	253 30025

DIODES

Pos. No.		
D6292	BY227	130 30259
D6294	BY227	130 30259
D6295	BY227	130 30259
D6296	BY227	130 30259
D6300	BZX79/C12, zener	130 34197
D6303	BY406A	130 37388

COIL

Pos. No.		
L6292	Coil	157 50772

CAPACITORS

Pos. No.	Type	Value F	Voltage	
C6290	Ceramic	2n2	250	122 44009
C6291	Bi-foil	470n	275	121 40517
C6292	Ceramic	2n2	250	122 44009
C6293	Polyester	100n	250	121 40518
C6294	Ceramic	2n2	250	122 44009
C6295	Ceramic	2n2	250	122 44009
C6296	Ceramic	2n2	250	122 44009
C6297	Polyester	100n	400	121 40487
C6300	Elco	470 μ	16	124 47026
C6304	Elco	470 μ	25	124 20622
C6306	Ceramic	1n	500	122 47213

RESISTORS

Pos. No.	Type	Value	Wattage	
R6291	Wirewound	4R7	4	113 80224
R6292	Duo P.T.C.	—	—	116 40025
R6293	Carbon	150k	1.15	110 23165
R6294	Metal film	10k	2.5	116 54989
R6297	Metal film	10k	2.5	116 54989
R6298	Metal film	10k	2.5	116 54989
R6299	Wirewound	8k2	7	113 80212
R6300	Wirewound	8k2	7	113 80212
◊S R6303	Carbon	2R2	⅓	111 30437
R6304	Carbon	4k7	⅓	110 63125

POWER SUPPLY PANEL

Pos. No.		
U7470	Power supply panel assembly	

INTEGRATED CIRCUIT

Pos. No.		
IC7322	TDA2581Q	209 80335

TRANSISTORS

Pos. No.		
T 7336	BC558B	130 44197
T 7353	BSS38	130 40968

DIODES

Pos. No.		
D7343	BZX79/B6V8, zener	130 34278
D7356	BY407A	130 37389

TRANSFORMER

Pos. No.		
L7351	Driver transformer	148 80029

CAPACITORS

Pos. No.	Type	Value F	Voltage	
C7317	Polyester	10n	250	121 41134
C7322	Elco	1µ	63	124 20583
C7323	Micropoco	6n8	63	121 50538
C7325	Ceramic	2n7	100	122 31174
C7329	Polyester	10n	250	121 41134
C7330	Elco	4µ7	63	124 20726
C7331	Polyester	12n	250	121 40405
C7334	Micropoco	3n3	63	121 54049
C7336	Ceramic	2n2	100	122 30114
C7341	Micropoco	1n2	63	121 50438
C7343	Elco	47µ	10	124 20461
C7344	Polyester	100n	100	121 40522
C7351	Polyester	470n	100	121 40438
C7352	Ceramic	15p		122 31197
C7353	Ceramic	220p	500	122 40116
C7354	Ceramic	2n7	500	122 31174
C7356	Polyester	10n	250	121 41134

RESISTORS

Pos. No.	Type	Value Ω	Wattage	
R7316	Carbon	680	1/3	110 63103
R7317	Pre-set, H.T.2	2k2		100 10027
R7318	Carbon	1k8	1/3	110 63114
R7319	Carbon	33k	1/3	110 63147
R7320	Carbon	10M	1/2	110 42214
R7322	Carbon	3k9	1/3	110 63123
R7323	Carbon	33k	1/3	110 63147
R7324	Carbon	39k	1/2	110 43149
R7325	Carbon	10k	1/3	110 63134
R7328	Metal film	68k	1/2	116 51131
R7329	Metal film	3k3	0.4	116 54005
R7330	Carbon	330k	1/2	110 53174
R7331	Carbon	390	1/3	110 63096
R7334	Carbon	33k	1/3	110 63147
R7335	Metal film	24k	3/4	116 54647
R7336	Metal film	12k	0.4	116 50572
R7339	Carbon	1M	1/2	110 42187
R7342	Carbon	3k9	1/3	110 63123
R7343	Carbon	2k2	1/3	110 63116
R7351	Carbon	33	1/2	110 53067
◇ R7353	Carbon	10k	1/3	111 30417
R7354	Metal film	270	0.4	116 54504
R7355	Metal film	330	0.4	116 54513
R7358	NTC	470		116 30128

SYNC PANEL

Pos. No.		
U8475	Sync. panel assembly	212 20617

INTEGRATED CIRCUIT

Pos. No.		
IC8367	TDA2571Q	209 80467

TRANSISTORS

Pos. No.		
T 8386	BC548	130 40938
T 8392	BC5488	130 40937
T 8396	BC548	130 40938
T 8397	BC558	130 30941

DIODE

Pos. No.		
D8388	BAW62	130 37123

CAPACITORS

Pos. No.	Type	Value F	Voltage	
C8366	Elco	470n	63	124 20719
C8367	Elco	47µ	25	124 20699
C8368	Elco	22µ	25	124 20698
C8369	Polyester	15n	250	121 40406
C8370	Micropoco	2n7	63	121 50474
C8372	Ceramic	150p		122 31085
C8373	Ceramic	220p	100	122 31222
C8374	Elco	10µ	63	124 20728
C8376	Elco	10µ	63	124 20728
C8377	Elco	10µ	63	124 20728
C8380	Elco	47µ	25	124 20699
C8386	Elco	47µ	25	124 20699
C8388	Elco	4µ7	63	124 20726
C8396	Elco	2µ2	63	124 20724
C8397	Polyester	270n	100	121 40431
C8398	Polyester	270n	100	121 40431

RESISTORS

Pos. No.	Type	Value Ω	Wattage	
R8366	Carbon	10k	1/3	110 63134
R8367	Carbon	82	1/3	110 63078
R8368	Carbon	100k	1/3	110 63161
R8369	Carbon	1k5	1/3	110 63112
R8370	Carbon	18k	1/3	110 63141
R8371	Pre-set, line hold	4k7		100 10236
R8372	Carbon	1k5	1/3	110 63112
R8373	Carbon	10k	1/3	110 63134
R8374	Carbon	1k5	1/3	110 63112
R8376	Carbon	4k7	1/3	110 63125
R8377	Carbon	100k	1/3	110 63161
R8379	Carbon	4k7	1/3	110 63125
◇ R8380	Carbon	47	1/3	111 30431
◇ R8381	Carbon	27	1/3	111 30408
R8382	Carbon	10k	1/3	110 63134
R8386	Carbon	1k8	1/3	110 63114
R8388	Carbon	39	1/3	110 63069
R8389	Carbon	2k7	1/3	110 63118
R8390	Pre-set, field hold	470		100 10023
R8391	Carbon	1k	1/3	110 63107
R8392	Carbon	15k	1/3	110 63138
R8393	Carbon	3k3	1/3	110 63121
R8394	Carbon	39k	1/3	110 63149
R8395	Carbon	39k	1/3	110 63149
R8396	Carbon	6k8	1/3	110 63129
R8397	Carbon	12	1/3	110 63056
R8398	Carbon	6k8	1/3	110 63129
R8399	Carbon	180	1/3	110 63087