

Super-VGA Colour Monitor

Series Y

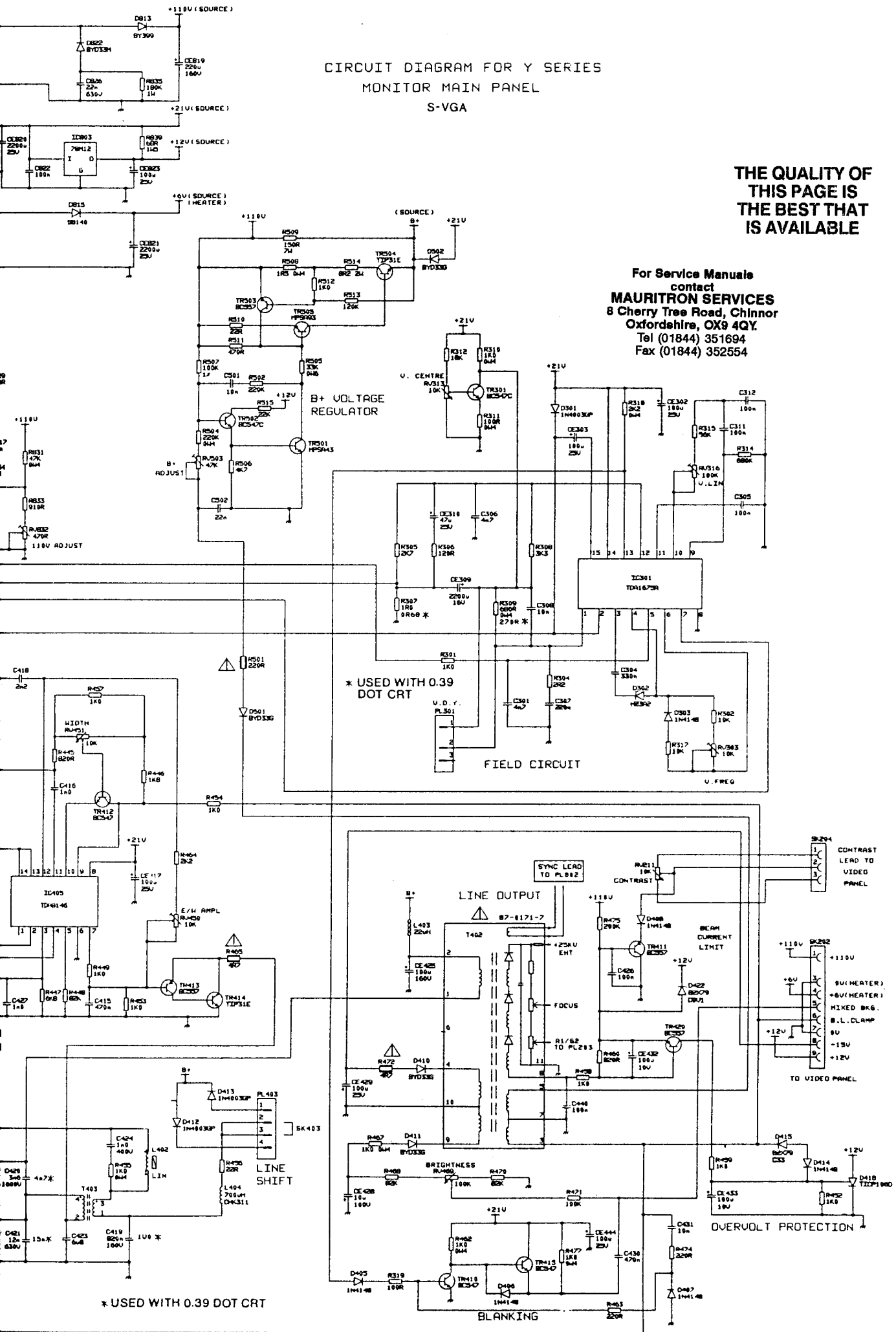
Tm 3401

SERVICE INFORMATION

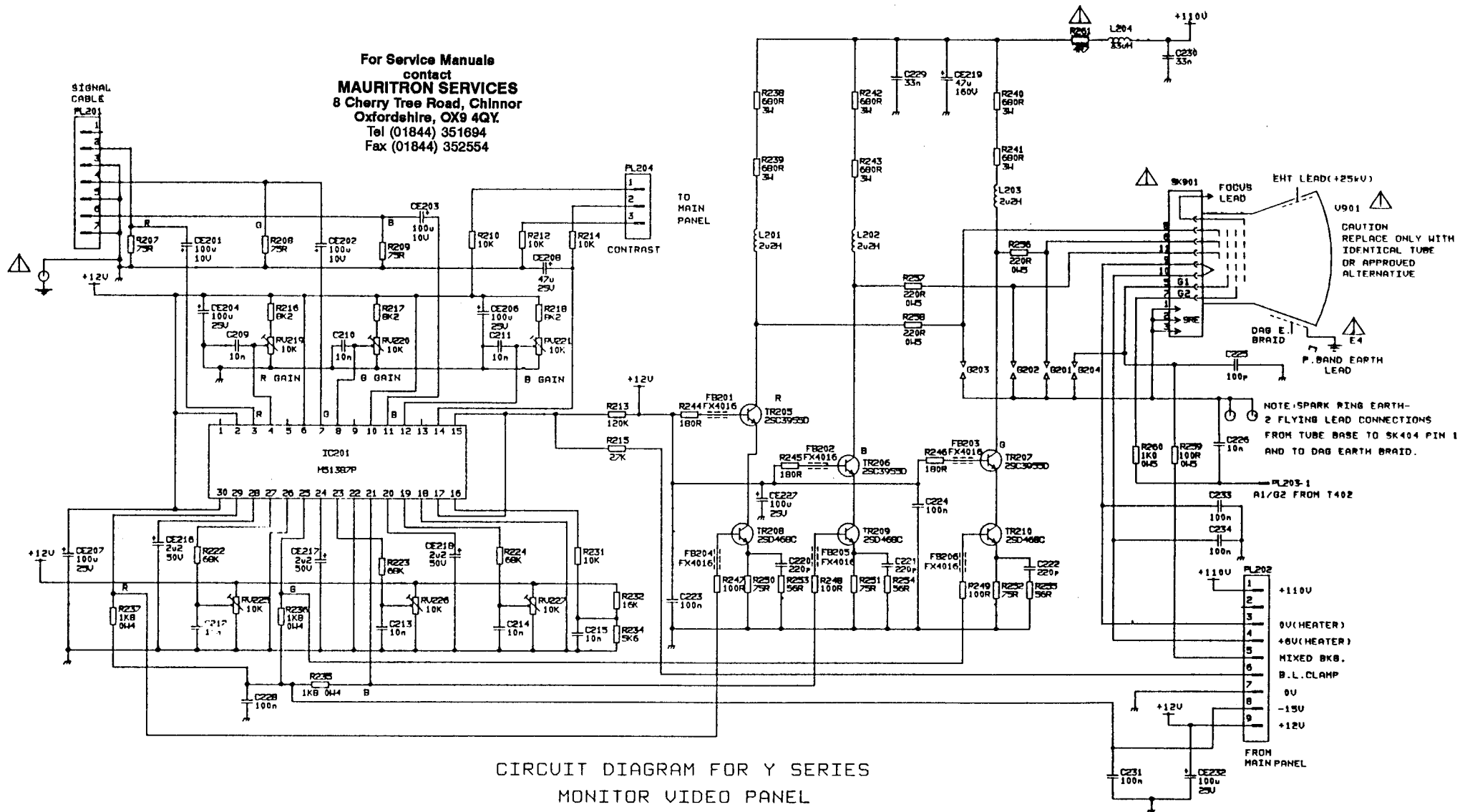
CIRCUIT DIAGRAM FOR Y SERIES
MONITOR MAIN PANEL
S-VGA

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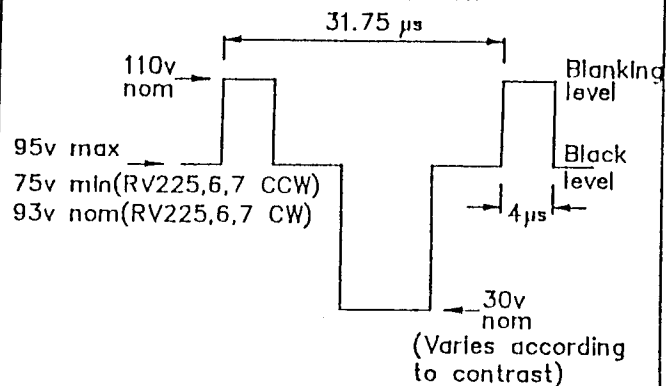


CIRCUIT DIAGRAM FOR Y SERIES
MONITOR VIDEO PANEL
S-VGA

CODE No. 79-1479-2-001
MAY 92

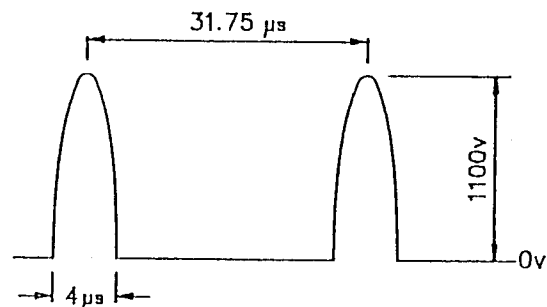
VIDEO WAVEFORM (WHITE BOX)

Measured on R.G.B. cathodes of CRT.



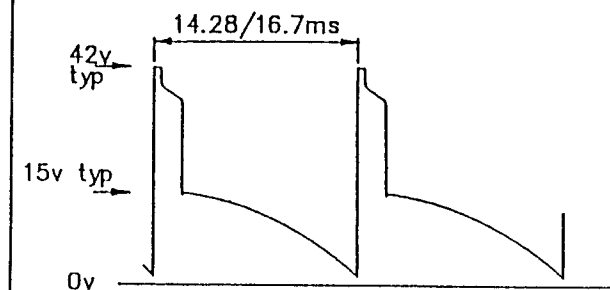
LINE OUTPUT WAVEFORM

Measured at TR407 collector



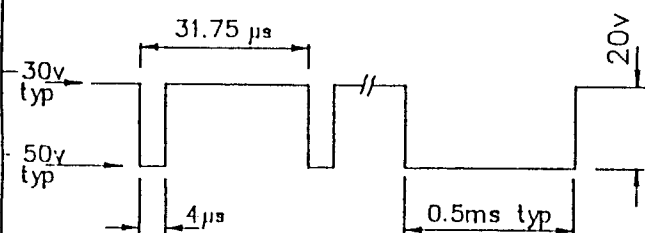
FIELD OUTPUT WAVEFORM

Measured at IC301 pin 1



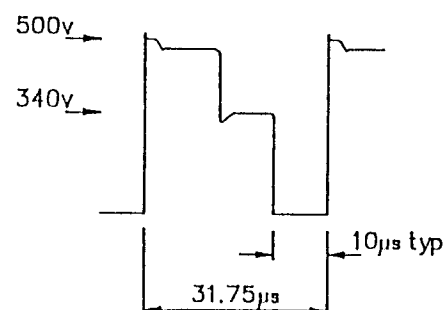
GRID 1 WAVEFORM, BRIGHTNESS & BLANKING

Measured at SK202 pin 5

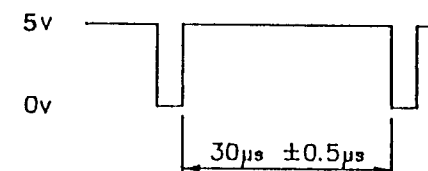


SMPS WAVEFORM

Measured at Q801 drain (with isolated mains supply)

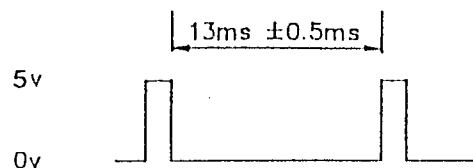
30 μ s MONOSTABLE

Measured at IC402 pin 13/D421



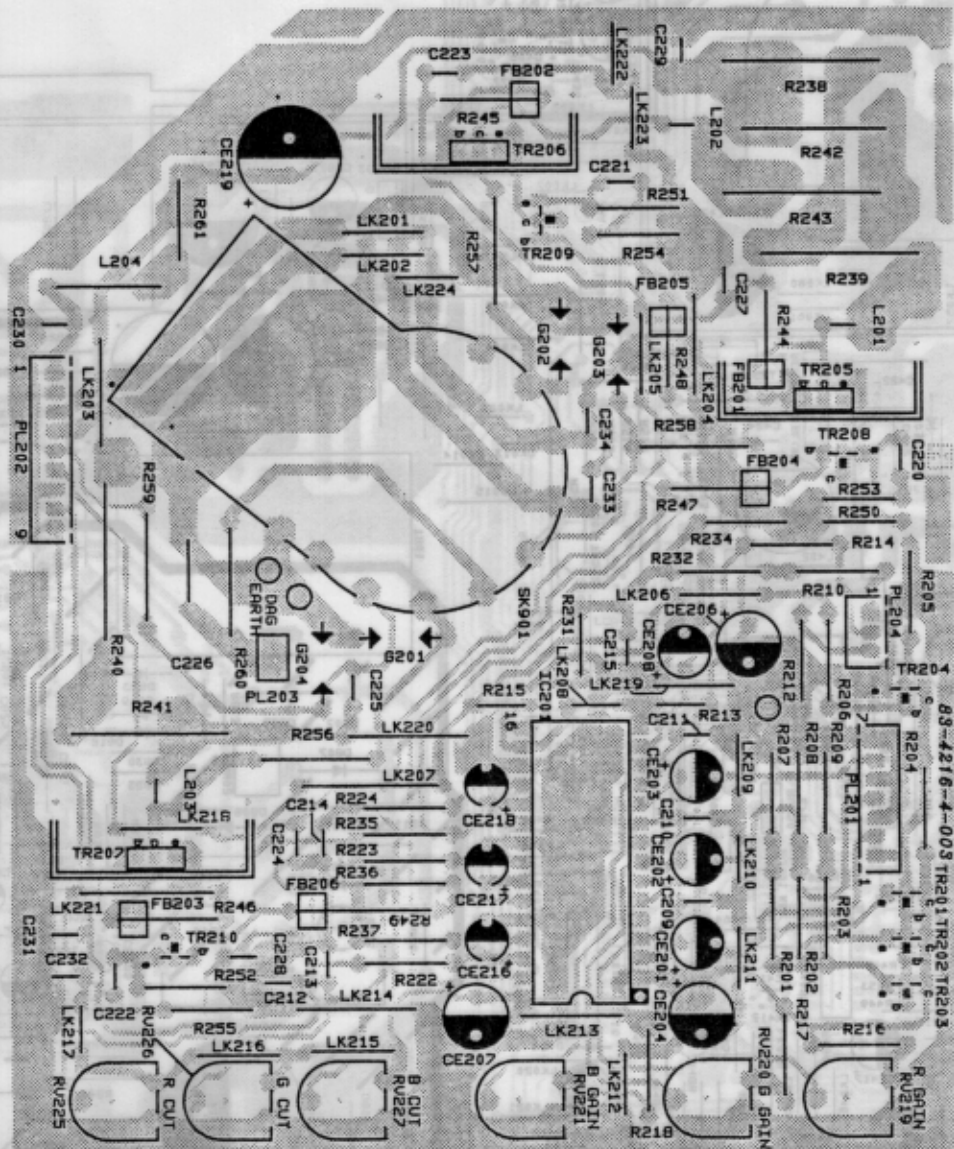
13ms MONOSTABLE

Measured at IC402 pin 12/R496

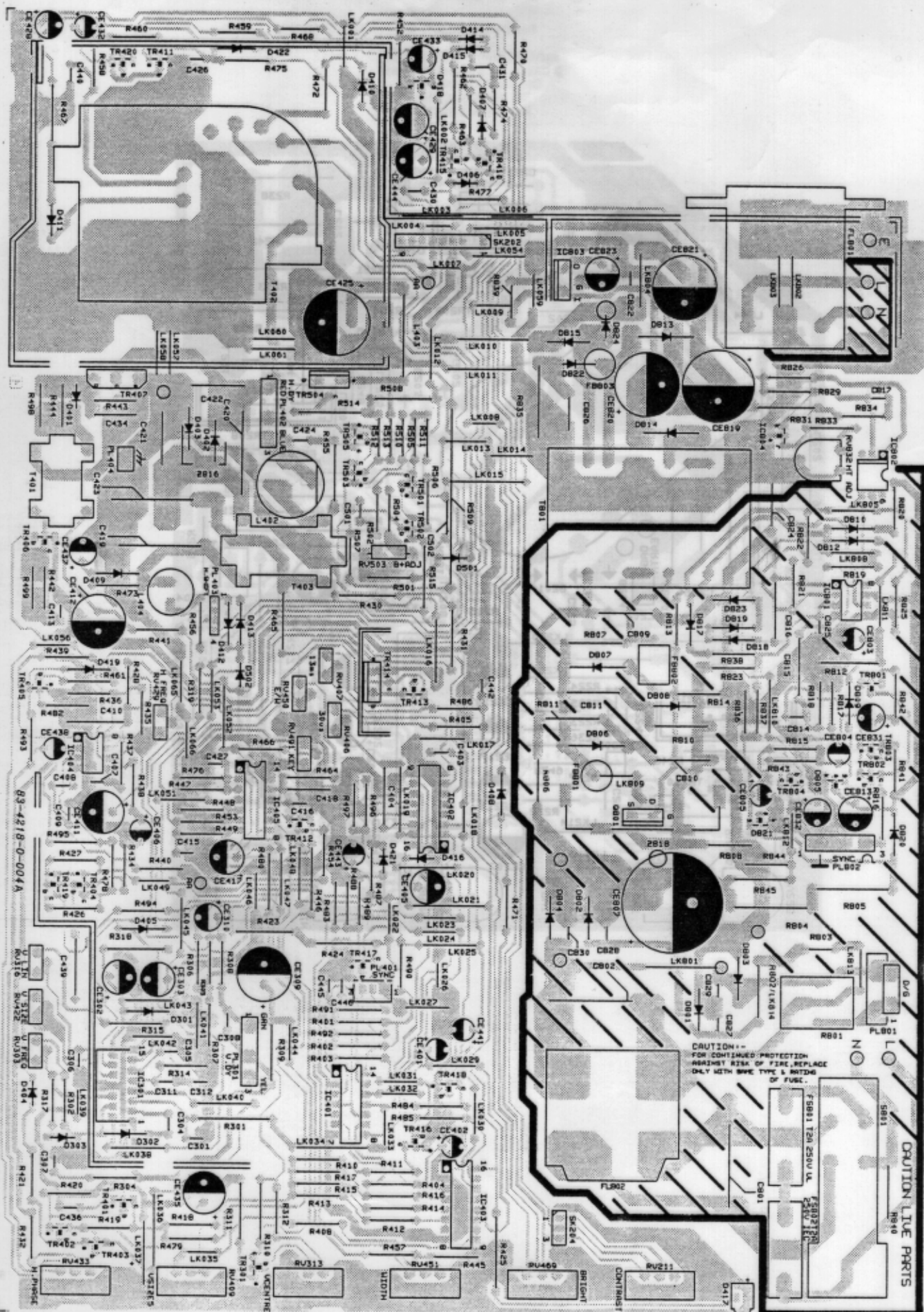


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SECTION 6 Y Series Main Chassis p.c.b. Component Side



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SECTION 1. SPECIFICATION

1.1 Power Input

220-240V AC, 48-63Hz.

1.7 Video Input

RGB Analogue video signal
0.71V Positive

1.2 Sync Input

TTL Levels :

Mode	H-Sync	V-Sync	H-Freq/kHz	V-Freq/Hz
1	+	-	31.5	70
2	-	+	31.5	70
3	-	-	31.5	60
4	+	+	35.52	87(I)
5	+/-	+/-	35-38	55-60

1.8 User Controls

Power On/Off
Contrast
Brightness
Width
V-Centre
Height (mode 5)
H-Phase(mode 4,5)

1.3 Signal Cable

15-Way Sub-Miniature 'D' type

1.9 Display Colours

Infinite array

1.4 Cathode Ray Tube

34cm (14") Diagonal, landscape mode.

Dot pitch 0.28mm, anti-glare

Dot pitch 0.39mm, polished

VA models only:

Anti-static and anti-glare coating. VLMF
(Very Low Magnetic Field emissions).

N.B. This version is fitted with a YN128V
or YN128VC chassis.

1.10 Display Area

245mm wide x 183mm high

1.5 Operating Ranges

Temperature: 10-40°C

Humidity : 5-85% (non-condensing)

1.11 Dimensions

Width 351mm

Height 327mm

Depth 384mm

1.6 Weight

~1.5Kg

SECTION 2. PRECAUTIONS AND SAFETY


2.1 Observe all cautionary and safety related notes located on the chassis, cabinet, and display tube.

2.2 Operation of the display with the back cover removed presents a potential shock hazard. Only personnel familiar with the precautions necessary for safe working on high voltage equipment should attempt to carry out servicing.

2.3 Always wear safety approved shatter-proof goggles when removing, installing or generally handling the picture tube. People not so equipped should be kept at a safe distance when any such handling is being undertaken. Do not handle the picture tube by the neck or deflection coil. Do not carry the picture tube resting against the body.

2.4 The picture tube is designed and constructed to limit X-Radiation to a safe level during normal operation. To maintain the required level of protection and safe operation, replacement tubes must be correctly adjusted and any protective circuits **must not be defeated**.

2.5 A.C. Current Leakage Test

After servicing and before returning the display to the customer, perform a thorough safety test to ensure there is no potential shock hazard to the operator. The safety check should be in the form of a high voltage test between live and neutral joined together to earth, at 1.5 kilovolts, 50Hz for one minute, an earth continuity test at 25 amps between the primary safety earth point (marked with a  symbol, located near the mains inlet) and the earth terminal of the mains plug and, if possible, an AC current leakage test on the exposed metallic parts of the cabinet, e.g. signal cable shell and screw heads. Using the test circuit shown in Fig.1, connect the monitor power lead, via an isolating transformer, to the mains supply and switch on.

Measure the AC leakage current between any exposed metallic parts of the cabinet and each pole of the isolated supply line in turn. The earth leakage current must not exceed 0.5mA rms.

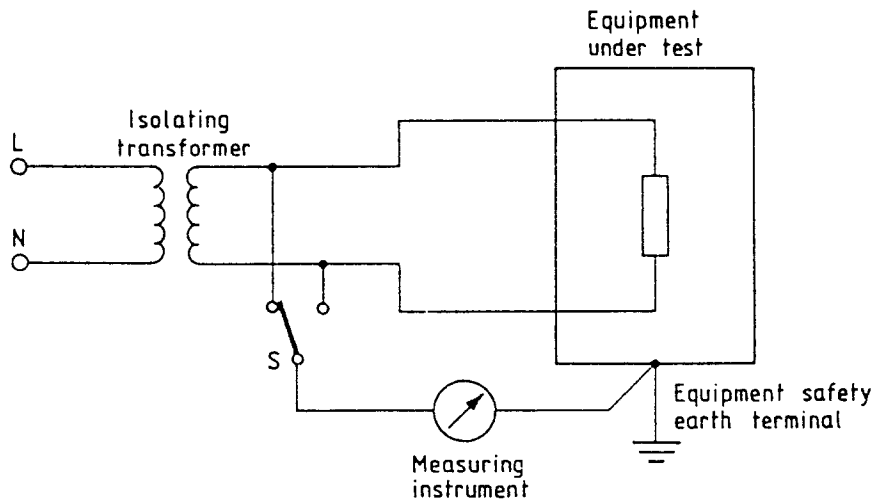



Fig.1. Measurement of AC Leakage Current.

2.6 Critical Safety Components

A number of electrical components in this monitor contribute to operating safety, and the protection afforded by them cannot necessarily be maintained by using replacement components rated for higher voltage, wattage, etc. They are identified by the  symbol which indicates that only manufacturers approved replacements are to be used.

2.7 Cabinet Back Removal

- a) Place the monitor on its frony, protecting the screen and cabinet with some suitable material, and remove the tilt/swivel base by pressing down its retaining clip at the rear of the swivel ball, and at the same time sliding the swivel base towards the back of the cabinet to release the bayonet catches.
- b) Remove the retaining screw just above and to the left of the power inlet socket.
- c) Remove the two retaining screws at the top left-hand and top right-hand corners of the cabinet back.
- d) Insert a screwdriver blade into the slot above each screw (item c) pressing downward and forward to release the retaining tabs whilst easing the cabinet away from the front bezel.
- e) The back can now be removed, threading the signal cable through its access opening.

2.8 Servicing notes

2.8.1 Soldered Connections

Always wrap the lead wires around terminals before soldering.

2.8.2 Wire Replacement

Run connecting wires along their original routes in order to :
Avoid introducing unwanted interference.
Avoid them being too close to high voltage or temperature.
Maintain safety approval standards.

SECTION 3. OPERATING INSTRUCTIONS

3.1 Connections

The Colour Monitor should be connected to a computer incorporating a VDE approved SVGA graphics display card which supplies analogue video signals.

Connect the captive signal cable to the 15 pin output on the card, and secure it in place with the locking screws. Connect the monitor and computer to the mains supply.

3.2 Controls

3.2.1 Power On/Off

The On/Off switch is located on the right by the Power On LED which should illuminate after approximately 3 seconds. The display should become visible within approximately 30 seconds of switching on.

IMPORTANT. Repeatedly switching On and Off should be avoided. This action may activate the Safety Protection shut-down circuits. Should this occur or the supply be accidentally interrupted, allow 30 seconds for the circuits to reset before switching on again.

3.2.2 Contrast

This control varies the difference in intensity between black and coloured areas of the screen. After setting the brightness control as described below, set the contrast for the most comfortable display.

3.2.3 Brightness

This sets the average intensity of the whole display. Normally this control will be set at the centre detent position.

3.2.4 Width

Allows the user to vary the display width by approximately $\pm 8\text{mm}$.

3.2.5 V-Centre

Allows the picture to be centred vertically, to compensate for the users viewing angle.

3.2.6 Height (Mode 5)

The display area in Mode 5 may vary between different graphics cards so a separate height adjustment has been included. Set for a similar height to the automatic setting achieved in Mode 3 (VGA).

3.2.7 H-Phase (Mode 4,5)

This control will have to be adjusted to suit the particular graphics card in use. Once adjusted for a correctly centred display in mode 4 (or 5), further adjustment should not be required.

3.2.8 Plinth

The plinth can be rotated or tilted to improve the viewing angle.

SECTION 4. CIRCUIT DESCRIPTION

4.1 Power Supply

The power supply is of the flyback switch mode type and will operate over the input range 220 to 240V rms $\pm 10\%$. The circuit is based around IC801 (UC3842N) which directly drives the switching FET Q801 at a fixed frequency, synchronized to the line output stage. The output power is regulated by duty cycle control depending on input voltage and load.

Immediately after switch-on, current derived from the rectified mains input flows through R804/805 and D820, charging C813 to approximately 17V. At this point, IC801 makes a start attempt; relying on stored charge in C813 to supply current until the power supply starts, when operating current is then derived from a winding on the transformer via D810/R820 at 12.5V. The circuit operates as follows:

Q801 is switched on, causing a linear rise in current in the primary winding 1-5 of T801. After a period determined by the voltage drop across the current limit resistor R808, Q801 is then switched off and the energy stored in the flux of T801 is now transferred to the secondary circuits. Diodes D813, D814 and D815 conduct until the transformer is demagnetised at which point, after a short delay, Q801 is switched on again as before.

The three secondary transformer windings produce 110V (112V on YN128V chassis), 21V and 6V d.c. when rectified by D813, D814 and D815 respectively. A protective clamp is incorporated in the 110V (112V on YN128V chassis) rectifier circuit formed by D822, C826 and R835 to prevent damage to D813 under certain conditions.

The energy stored in the leakage flux of T801 must be safely dissipated to avoid destruction of Q801. The dv/dt is limited on Q801 drain by D808 which charges C811. In addition, D806 clamps the peak voltage to about 500V to prevent damage to Q801.

The main regulation circuit centres around IC804 which conducts heavily when the voltage on the reference pin exceeds 2.50V. The regulation circuit senses the 110V (112V on YN128V chassis) rail and the control signal is fed back to the error amplifier in IC801 via the opto-isolator IC802. This forms the voltage feedback loop. A current feedback loop is also employed on the primary side to sense the drain current in Q801. The linear ramp voltage across R808 (1V max) is fed into pin 3 of IC801. This is low pass filtered to remove transient spikes. The current feedback circuit actively limits the peak transformer flux during each cycle, and is used to provide feed-forward compensation to improve regulation.

The operating frequency is synchronized to the line output stage using a double-insulated single turn of wire around the flyback transformer core. This sync pulse is fed into IC801 via TR801, but is momentarily shorted by TR802 at switch on.

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4.2 B+ Regulator

The horizontal scan coil has to be driven with a constant amplitude sawtooth current at all of the possible scan frequencies and this is done by controlling the B+ voltage, applied to the scan coil, over the range 84 to 105V (86 to 108V on YN127V chassis), corresponding to the line frequencies of 31.5 to 38kHz respectively. At the lowest B+ voltage of 84V (86V on YN128V chassis) (for 31.5kHz), the B+ current is mainly provided by R509. A parallel shunt, formed by TR504, is controlled to provide higher voltages up to 105V (108V on YN128V chassis) (for 38kHz). A negative pulse from the flyback transformer of about -280V is used as a feedback signal to sense the flyback amplitude; the loop is then able to maintain a reasonably constant width, flyback voltage and hence, EHT.

The B+ Regulator is protected against a short circuit on the B+ rail by D502 which would conduct heavily and force the power supply to shut down, by effectively shorting the 21V rail to ground, and also by a re-entrant current limit circuit comprising TR503, R508, R512 and R513.

4.3 Synchronization

The incoming horizontal and vertical sync. pulses are fed to IC401 (74LS86) which has the function of providing positive sync pulses to the line and field oscillators, as well as providing retriggering pulses to the dual monostable IC402 for SVGA mode detection. IC403 uses the mode identification signals from IC401 and IC402 to provide automatic height adjustment.

IC402 contains two monostables to detect a change in line and field frequencies. The line monostable is set for 30us so that during SVGA operation it is constantly being reset and pin 13 is held high, turning TR417 on. This enables the H-Phase control to make the line oscillator of IC404 run between 35.5 and 38kHz. During VGA operation, in modes 1,2 or 3, or when there is no sync. input, TR405 is on, forcing 31.5kHz oscillation.

4.4 Automatic Height Adjustment

The same data area is required in all five modes and some height correction is needed. The logic levels produced by IC401/2 are decoded by IC403 (3 to 8 line decoder) which modifies the field scan amplitude by subtracting a reference current from the field chip, IC301 pin 7. The 1% tolerance resistors, R410-417 are used to set the height in modes 1 to 4. Mode 5 is user adjustable from RV409. TR416 is on during mode 4 (8514A) only.

4.5 Vertical Deflection

The incoming sync. signal locks the vertical oscillator to provide a steady, synchronized display. The series combination C311/312 charge from a current out of IC301 pin 9, mirrored at pin 7 into TR403, to establish the correct height, producing a field rate ramp voltage on pin 9. The output current from pin 1 flows through the deflection coil, CE309, and R307. Feedback from R307 into pin 12 is compared with this internally generated ramp to produce a linear scan.

Vertical shift is achieved by providing positive or negative offset current into the DY using R310 and TR301, with RV313 providing user adjustment to centre the display.

4.6 Horizontal Deflection

The incoming negative sync signal at pin 3 of IC404 causes the phase locked loop to bring the horizontal oscillator into lock. The circuit formed by TR404/419 acts as a monostable to give a constant sync pulse width of 4 μ s at IC404 pin 3. The oscillator frequency for the VGA modes is adjusted by RV429, R428 and C410. In the SVGA modes, a parallel combination of RV433, R493 is added and TR405 is off. This allows a higher oscillation frequency of 35-38kHz.

The IC output from pin 1 drives TR406 which is connected to the line drive transformer T401. This provides the high base current and controlled turn-off characteristics required by the line output transistor TR407.

The line drive circuit is based on a diode modulator configuration. D402/C420 and D403/C421 form separate tuned flyback circuits with the horizontal deflection coil and T403. C422 provides fine tuning. The voltage across C423 controls the scan width and is used for East/West and Width control. In normal operation the voltage across C423 is a parabola with a positive d.c. offset voltage, controlled by TR414. PL403 allows a link selectable offset current to be added to the DY to provide horizontal shift.

The line output section also includes a beam current limit circuit connected to the contrast control wiper of RV211 so that the screen light output is automatically limited in the event of excessive brightness. The voltage on the wiper is pulled low by TR411 if the beam current exceeds 0.5mA.

The T402 is used to provide pulses from pin 3 for horizontal blanking, and a video clamp pulse supplied to IC201. Pin 9 provides pulses to give a -64V supply to the brightness control.

4.7 East/West, Width and Keystone

All of these functions are performed by IC405 (TDA8146) which controls the diode modulator via TR414. The IC generates a parabola from the 1.3Vp-p field voltage ramp fed into pin 2. This is internally compared with a line rate sawtooth voltage, fed into pins 9 and 10. The comparator output appears as a 20V pulse width modulated output at pin 7. The output is integrated by R449 and C415 to produce a d.c. voltage which enables TR414 to control the voltage on C423. The voltage across C423 controls the scanning width. Feedback is applied via RV450 and R464 to IC405 pin 12.

4.8 Blanking

IC301 produces a 1.5V field blanking pulse from pin 13. This is mixed with line flyback pulses from T402 pin 3, at the base of TR410. C431 and D407 d.c. restore the line flyback pulses, to improve the blanking performance. Output buffering is provided by TR415 to give 20V negative going composite blanking pulses. The blanking pulses are superimposed on the brightness control voltage through C430. T402 pin 9 produces -54V negative line pulses. These are rectified by D411/CE428, and the potential divider formed by R468, RV469 and R470 gives the -30V dc nominal grid voltage onto which the blanking pulses are superimposed.

4.9 Video Circuits

The monitor can only accept RGB signals of 0.71V amplitude into 75 ohms. The incoming signals are capacitor coupled into the inputs of IC501. The function of IC501 is to provide gain control, cut-off control and clamping (d.c. restoration). The latter ensures that the outputs at pins 21, 25, and 29 of IC501 are directly able to drive their respective cascode amplifiers (e.g. TR205 and TR208 for the red channel), and the tube. The cascode amplifiers provide the CRT cathodes with a maximum of 40V drive from a 93V nominal black level (adjustable to 75V for cut-off adjustment).

A built in Self-Test feature (if fitted) operates when the signal cable is not connected to a graphics card. This gives a white screen to show the monitor is operating correctly. A line pulse is fed into TR204 to chop the d.c. level produced by TR201-3, and R201-3 during line flyback. The result is a fake video signal of 0.6V amplitude which appears at the input of IC501.

The Self-Test function is disabled when PL201 pin 1 is grounded by the action of plugging the signal cable into a graphics card.

4.10 Protection Circuits

4.10.1 Power Supply

The mains input fuse F802 is of the IEC time-delay T2A type. Replacements must be of the same type and rating. (Some versions have two fuses to meet UL/CSA and IEC safety standards).

Immediately after the power supply has started, D821 is triggered into an 'on' state which disables the start-up circuit, so that in the event of a fault, the power supply is prevented from attempting to re-start. The power supply will shut down if any output is shorted after a single start attempt.

De-magnetization sensing is provided by D817 which feeds a voltage produced by the transformer secondary winding 7-8 into pin 3 of IC801. Diodes D818,9 and D823 limit the input to a 1.8V maximum. This signal is a representation of the transformer flux during the secondary discharge cycle and only when it has fallen to zero can the IC begin another cycle. This circuit is constantly active but normally only limits the flux during the start-up sequence, or in the event of overload or input undervoltage.

R808 and R806 (Flame Proof) will fail, going open circuit should Q801 become short circuited.

Over-voltage protection has been included for fail-safe operation. The zener diode D809 conducts if the IC supply voltage derived from T801 exceeds a safe limit of 16V. This causes D805 to latch on, and this disables IC801. CE804 prevents D805 from being falsely triggered by spurious spikes at the gate.

4.10.2 B+ Regulator

D502 conducts heavily in the event of the B+ rail being short circuited. This effectively shorts the 21V rail to ground and the power supply shuts down. R501 (Flame Proof) protects against failure of D501 or C502.

4.10.3 Line Drive

R441 (Flame Proof) protects against the possible failure of TR406, CE412 or T401.

4.10.4 Line Scan

The EHT is protected from exceeding a safe limit by monitoring the flyback pulse amplitude at T402 pin 3. If it exceeds 34V the D418 triggers and 'crowbars' the +12V to ground which shuts down the power supply. The trigger typically operates at an EHT of about 27kV.

The maximum beam current is automatically limited by TR411 during normal monitor operation. In the event of a fault causing excessive current in the EHT winding, thyristor D418 is triggered by current from TR420, which shuts down the SMPS.

The -15V rail fed to the video IC via SK202 pin 8 is protected against short circuit or failure of D410, by R472.

4.10.5 East/West

R465 (Flame Proof) is required to give protection to the E/W IC and the diode modulator in the event of a fault.

SECTION 5. ADJUSTMENTS

5.1 Introduction

The monitor incorporates a number of adjustments which are listed below. The monitor will have been correctly aligned before leaving the factory, and adjustments should be made only if necessary.

5.1.1 Main pcb:

HT Adjust	RV832
B+ Adjust	RV503
VGA Frequency	RV429
30µs Monostable	RV406
13ms Monostable	RV407
Keystone	RV491
East/West Amplitude	RV450
H-Shift	SK403
V-Size (Master)	RV422
V-Frequency	RV303
V-Linearity	RV316
A1/Screen Voltage	FBT
Focus	FBT

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5.1.2 Video pcb

Red Gain	RV219
Green Gain	RV220
Blue Gain	RV221
Red Cut-off	RV225
Green Cut-off	RV226
Blue Cut-off	RV227

5.2 Adjustments

All test patterns refer to TUK SVGA Test Programme, Issue 001, used in conjunction with a Trident MVGA-T8900A Video Card running on an IBM AT computer or equivalent, e.g. TATUNG TCS4000.

5.2.1 HT and B+ Setting

N.B. Numbers in square brackets refer to the calculator numeric keypad. Numbers without brackets refer to the typewriter numeric keys.

Select WHITE SCREEN. "3,F1" from keyboard.
Set CONTRAST to MID-RANGE and BRIGHTNESS to DETENT.
Check the voltage at C819 is 110V \pm 1V (112V \pm 1V on YN127V chassis).
Adjust RV832, if necessary.
Check the voltage at C425 is 84V \pm 0.5V (86V \pm 0.5V on YN128V chassis)
Adjust RV503, if necessary.

5.2.2 Vertical Hold

Select MODE 7 50Hz SYNC "7" from Keyboard.
Set CONTRAST to MID-RANGE and BRIGHTNESS to DETENT.
Turn RV303 (Vertical Hold) fully anti-clockwise. Then slowly turn RV303 clockwise until the display becomes stable. Stop turning RV303 immediately.

5.2.3 Focus Setting

Set the CONTRAST to MID-RANGE and BRIGHTNESS to DETENT.
Select FOCUS PATTERN GREEN "3,F6,[5]" from keyboard.
Adjust FOCUS control so that the resolution is optimised.

5.2.4 Horizontal Centre

Select MODE 3 BLANK RASTER "3,F9,[1]" from keyboard.
Set BRIGHTNESS to MAXIMUM.
Check for a centred raster within \pm 2.0mm.
Adjust the position of jumper SK403 if necessary.

5.2.5 Horizontal Phase (VGA)

Select FOUR BY FOUR GRID "3,F3,[8]" from keyboard.
Set CONTRAST to MID-RANGE and BRIGHTNESS to MAXIMUM.
Adjust RV429 (H.FREQ) to centre display image within the display consistent with a voltage of 4.0 \pm 0.5V on IC404, pin 5.

5.2.6 Vertical Linearity

Set BRIGHTNESS to DETENT.
Select SQUARE GRID "3,F8" from keyboard.
Adjust RV316 (Vertical Linearity) for best linearity, if necessary.
Check that Vertical Linearity is better than 10%.

5.2.7 Horizontal Width

Select MODE 3, WHITE SCREEN NO BORDER "3,F9" from keyboard.
Set BRIGHTNESS to DETENT and CONTRAST to give 100 \pm 20 Cd/m²
Adjust RV451 USER WIDTH and check that a width of 240mm is available.
Set RV451 to DETENT.

5.2.8 Vertical Size

Select MODE 3 WHITE SCREEN NO BORDER "3,F9" from keyboard.
Set BRIGHTNESS to DETENT and CONTRAST to give $100 \pm 20 \text{ Cd/m}^2$
Adjust RV422 (480 SIZE) for $183\text{mm} \pm 1\text{mm}$ display size.
Select MODE 2 WHITE SCREEN NO BORDER "2,F9" from keyboard.
Check for display size $183\text{mm} \pm 3\text{mm}$.
Select MODE 1 WHITE SCREEN NO BORDER "1,F9" from keyboard.
Check for display size $183\text{mm} \pm 3\text{mm}$.
Select MODE 4 WHITE SCREEN NO BORDER "4,F9" from keyboard.
Adjust RV433 USER HORIZONTAL PHASE for a locked, centred display.
Check for display size $183\text{mm} \pm 3\text{mm}$.
Select MODE 5 WHITE SCREEN NO BORDER "5,F9" from keyboard.
Adjust RV433 USER HORIZONTAL PHASE for a locked display and check that 183mm display size can be obtained using RV409 SVGA SIZE USER CONTROL.
Set RV409 for $183\text{mm} \pm 5\text{mm}$ display size.

5.2.9 Vertical Centre

Set CONTRAST to MID-RANGE and BRIGHTNESS to DETENT.
Select FOUR BY FOUR GRID "3,F3" from keyboard.
Adjust RV313 (Vertical Centre) for a centred display within $\pm 2.0\text{mm}$.

5.2.10 Geometric Distortion

Select FOUR BY FOUR GRID "3,F3" from keyboard.
Check the total distortion.
Adjust RV450 E/W AMP for straight VERTICAL edges, if necessary.
Adjust RV491 for a rectangular display.

5.2.11 Video Cut-Off

Select MODE 3 BLANK SCREEN "3,F10" from keyboard.
Set BRIGHTNESS to maximum.
Check the screen emission is $6 \pm 2 \text{ Cd/m}^2$. Adjust A1, if necessary.
Select MODE 3 WHITE BLOCK "3,F1,[*]" from the keyboard.
Set BRIGHTNESS to DETENT and CONTRAST to give a screen emission of $14 \pm 1 \text{ Cd/m}^2$.
Using the CUT-OFF presets adjust as required to obtain
 $X = 0.281 \pm 0.005$
 $Y = 0.311 \pm 0.005$

(Adjusting a minimum number of the presets to meet the required limit).
Do not make COARSE adjustments.

5.2.12 Video Gain

Select MODE 3 GREEN BLOCK "3,F1,[8],[5]" from keyboard.

Set BRIGHTNESS to DETENT and CONTRAST to MAXIMUM.

Set GREEN GAIN RV220 for a screen emission of $76 \pm 1 \text{ Cd/m}^2$.

Select MODE 3 WHITE BLOCK "3,F1,[8]" from keyboard.

Without further adjustment to RV220, set RED and BLUE GAIN, RV219, RV221 to obtain a white balance of $x = 0.281 \pm 0.005$ $y = 0.311 \pm 0.005$ (Note the measurement).

Check the screen emission is $100 \pm 10 \text{ Cd/m}^2$. If not, re-adjust RV220.

Reduce CONTRAST to give a screen emission of $17 \pm 1 \text{ Cd/m}^2$.

Check the X and Y co-ordinates are within ± 0.015 of the measurement taken in 5.2.5 (at CONTRAST maximum).

If not, using the MINIMUM of adjustment, carefully re-adjust the appropriate CUT-OFF presets (RV225, RV226, RV227) to bring the colour co-ordinates **just** within the limits stated below.

Verify the following conditions.

Screen brightness:	$100 \pm 15-10 \text{ Cd/m}^2$.	BRIGHTNESS DETENT.
"3,F1"		CONTRAST MAXIMUM.
Colour Point	$x = 0.281 \pm 0.015$ $y = 0.311 \pm 0.015$	BRIGHTNESS DETENT. 90 Cd/m^2 WHITE SCREEN.
Colour Tracking	$x = \pm 0.015$ $y = \pm 0.015$	CONTRAST VARIES. $20 \text{ to } 90 \text{ Cd/m}^2$.
Background BRIGHTNESS:	$6 \pm 3 \text{ Cd/m}^2$.	BRIGHTNESS MAXIMUM.
"3,F10"		CONTRAST MINIMUM.

5.2.13 Self-Test (if fitted)

Check that SELF TEST SCREEN meets the following:

Self test Brightness: Greater than 35 Cd/m^2 . BRIGHTNESS DETENT,
CONTRAST MAXIMUM.

Self test Colour Point: $x = 0.281 \pm 0.030$. SIGNAL LEAD
 $y = 0.311 \pm 0.030$. DISCONNECTED.

N.B. In all measurements co-ordinate x must be less than y.

5.2.14 Static Convergence

Select MODE 3 SQUARE GRID MULTICOLOUR "3,F8,[9]" from keyboard.

Adjust CRT CONVERGENCE RINGS for best alignment of colour segments, if necessary.