PHILIPS

PHILIPS

COLOUR/MONOCHROME
PATTERN GENERATOR

PM 5544

9499 490 05111

1/570/1/01

STS

PHILIPS

OPERATING MANUAL

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PATTERN GENERATOR

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9499 490 05111

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Correspondence

In correspondence concerning this instrument, please quote the type number and serial number as given on the indentification plate at the rear of the instrument.

GENERAL INFORMATION

I. INTRODUCTION

The PHILIPS PM 5544 is an all-solid state pattern generator for colour as well as CCIR monochrome television. The patterns are electronically generated and serve for various purposes, similar to those of the well known slide test pictures as e.g. the RTMA test card, test card "C" and the British test card "F".

The patterns are intended for visual inspection and enable supervision and quality assessment of TV transmitters, microwave links and studios. If transmitted they offer TV dealers and servicemen the highly appreciated possibility of obtaining an impression of the quality of aerial system and receiver in one overall view.
The output signals of the PM 5544 (R, G, B as well as Y, R-Y, B-Y) can e.g. be encoded by the PHILIPS PAL Encoder PM 5554. The required sync and blanking input signals can be supplied by the PHILIPS TV Pulse generator PM 5530.

II. TECHNICAL DATA

Properties expressed in numerical values with stated tolerances, are guaranteed by us. Numerical values without tolerances represent the properties of an average instrument and merely serve as a guide.

A. System

Monochrome	CCIR, 625 lines, 50 Hz-field frequency
Colour	The instrument is developed for PAL Standard, but can be used for other systems as well

B. Pattern

A number of pattern combinations can be selected with the aid of pushbuttons.
The pattern contains the following information:

1. Cross hatch raster

forms 13 x 17 squares, height: 21 lines/field, width: 2.8 μs.
Line-thickness, horizontal: one line/field; vertical: 230 ns. *)
The raster is surrounded by black/white castellations. On some of the left hand castellations alternating (R-Y) informatioı is superimposed for checking the burst gate of a receiver or decoder.

2. Background of the cross hatch raster

Video amplitude continuously adjustable between 0 and approx. 80 % of white (screwdriver control at front panel).

3. Colour difference fields

Saturation $\leqslant$ 100 %

a. *Information "COLOUR DIFFerence NORMal"*
Signals that after encoding represent:

$$\left.\begin{array}{l}\bullet\ (R\text{-}Y) = 0\\ \bullet\ (B\text{-}Y) = 0\\ \bullet\ (G\text{-}Y) = 0\end{array}\right\}\ \text{constant luminance value, equal for all six signals}$$

These signals are all present both in positive and negative phasing (after encoding).

b. *Information "COLOUR DIFFerence ALTernating"* (not visible on a correctly aligned receiver)
Signals which after encoding represent:

- (R-Y) information that is **not** line sequentially phase-inverted.
- (B-Y) information that is **indeed** line sequentially phase-inverted.

The luminance value is identical to the videoamplitude of the background.

4. Electronic circle

The circle is generated by logic circuits with a ferrite core memory. Diameter 12 units of the cross hatch raster, corresponding to approx. 83 % of the vertical scanning.
Radius error: < 1 %.
Location: centre of circle is centre of pattern.
The circle is locked to the cross hatch raster.

**) The value of 230 ns has been selected to minimize cross colour.*

5. Signal within the circle area *)

From top to bottom:

a. *Black rectangle*: width approx. 10 μs.

b. *White rectangle with black needle pulse:* width of needle pulse 230 ns (T 50 %)

c. *Square wave signal:* Repetition frequency 250 kHz, videoamplitude 75 % of white, and identical to that of the R-G-B-information in the colour bar signal.

d. *Colour bar signals:* yellow-cyan-green-magenta-red-blue, 75 % contrast 100 % saturation.

e. *White crosses:* width vertical lines 230 ns, one horizontal line per field. The scanning sequence of the horizontal line is contrary to that of the horizontal white lines of the cross hatch raster. The centre cross represents the centre of the circle as well as the pattern.

f. *Frequency gratings:* sine wave, from left to right 0.8 MHz – 1.8 MHz – 2.8 MHz – 3.8 MHz – 4.8 MHz, amplitude 75 % of white. **)

g. *Grey levels:* six levels 0 % – 20 % – 40 % – 60 % – 80 % – 100 % of full-white, amplitude of each level within 5 % of its nominal level. Number of levels may be increased to eleven or decreased to five (internal soldering) to obtain 10 %-steps or 25 % steps, resp.

h. *Black rectangle with white needle pulse:* width of needle pulse 230 ns (T 50 %). For transmitter identification the signal of a monochrome slide scanner can be gated into this rectangle via a Schmitt-trigger circuit (only 100 % contrast). The white needle pulse will then be switched off.

i. *Colour transient:* yellow-red-yellow, width of red bar approx. 2.6 μs, contrast 75 %, saturation 100 %.

C. Inputs

a. Sync. and blanking *)**

Amplitude	: 2–8 V_{pp}, negative
Permissible hum	: 100 %
Input impedance	: high, for looping-through (75 Ω-system)

b. External text

Suitable for monochrome slide scanner, via internal Schmitt-trigger circuit (100 % contrast)

Sensitivity	: 0.5–2 V_{pp}, synchronised video without sync. and set-up
Polarity	: positive or negative, can be switched internally.
Input impedance	: high

c. External picture

R-G-B-input suitable for colour camera or colour slide scanner

Matrixing error	: $\leqslant$ 2 %
Required amplitude	: 700 mV_{pp} (video without sync and set-up) for 100 % saturation
Polarity	: positive
Frequency response	: < 3 dB at 5 MHz
Input impedance	: high

*) *External video information from e.g. a colour camera or a colour slide scanner may be gated into the circle area, to replace the electronically generated information.*

**) *To minimize cross-colour*

***) *The pattern geometry is adjusted for a field blanking of 25 lines.*

D. Outputs

a. Y, R-Y, B-Y (two sets of outputs from one amplifier system)

Amplitude	: 700 mV_{pp}, without sync and set-up
Polarity Y-signal	: positive
Output impedance	: 75 Ω

b. R, G, B

Amplitude	: 700 mV_{pp}, without sync and set-up
Polarity	: positive
Matrixing error	: $\leqslant 2\,\%$
Output impedance	: 75 Ω

c. Service output

Special output via measuring amplifier for service purposes.

d. Rise and fall times

Video transitions	: < 100 ns

E. Power supply

Mains voltage	: 115 V ± 20 % or 230 V ± 20 %
Mains frequency	: 50 Hz or 60 Hz (48 – 62 Hz)
Power consumption	: 65 W at 230 V
Fuse	: for 115 V range: 1000 mA, delayed action for 230 V range: 500 mA, delayed action

F. Temperature range

Operating conditions	: 0 to +45 °C
Storage conditions	: −30 °C to +70 °C

G. Mechanical data

Width	: 6/6 module in PHILIPS universal 19" system
Height	: 132 mm (3 units)
Depth	: 435 mm
Weight	: 12 kg (without cabinet)

III. ACCESSORIES

1 Operating manual
1 Mains flex
6 BNC-75 Ω-loads
10 BNC connectors
2 Extension boards, enabling measurements in the instrument when it is in operation.

N.B. The PM 5544 is supplied without cabinet.
The required cabinet can be ordered with typenumber PM 9716

IV. DESCRIPTION OF THE SIMPLIFIED BLOCK DIAGRAM

The function of the generator can be devided into two parts (see fig. IV-1).
One performs a circle generator generating the circle gate signal. The other one is a test pattern generator which partly generates a complete field signal and partly a signal which can be gated into the circle.
This latter signal can be substituted by an externally supplied signal.
The generator has to be driven with sync and blanking signals applied from e.g. the PHILIPS TV pulse generator PM 5530.

Sync separator

This unit has high ohmic input amplifiers to obtain looped-through facilities. The line and frame pulses necessary for synchronizing the generator are obtained in the respective separator circuits.

Line register

The line register is a 21:1 divider which is counting line pulses. The pulses obtained from this divider are specially coded to facilitate the generation of the circle and are controlling in combination with the vertical divider all vertical information in the test patterns.

Vertical divider

This section generates all the gating signals on the field frequency basis. The signals are decoded to give the horizontal lines as well as the intervals in vertical directions.

630 kHz oscillator

This oscillator being controlled by the line pulses generates pulses controlling every horizontal information.

Horizontal divider

The signal from the 630 kHz oscillator is passing on to the divider to obtain the horizontal gating pulses.

Decoder system

The signals from the "vertical divider" and the "horizontal divider" are combined in a decoder system to give the gating pulses to as well the field as the circle patterns.

Field information gate

The field test patterns are controlled by the applied gating pulses. The test patterns are supplied to the video mixer as video signals.

Circle information gate

The circle test patterns are controlled by the applied gating pulses. The test patterns are supplied as video signals to the video mixer.

Video mixer

This section is adding the video signal of the circle pattern to that of the field pattern by means of the circle gate signal.
By means of the pushbutton SK4 the circle pattern can be substituted by an externally supplied signal.

R-G-B matrix

In this circuit the Y, (R-Y) and (B-Y) signals from the "video mixer" are converted into R, G, B signals.

The circle generator

The circuitry consists of the "circle register" with the "15 MHz clock oscillator", a ferrite core memory controlled by the "interval decoder" and the "read out decoder".

Circle register

The circle gate signal is obtained by a counting register being operated from the "15 MHz clock oscillator". The register is set for each line from the ferrite core memory.

The ferrite core memory

The memory is a non-destructive type operating with 10 different programmes selected by the "interval decoder".

Interval decoder

This unit is a read-in circuit securing the correct sequence of the programmes to the memory.

Read-out decoder

It controls the sequence of the setting of "circle register".

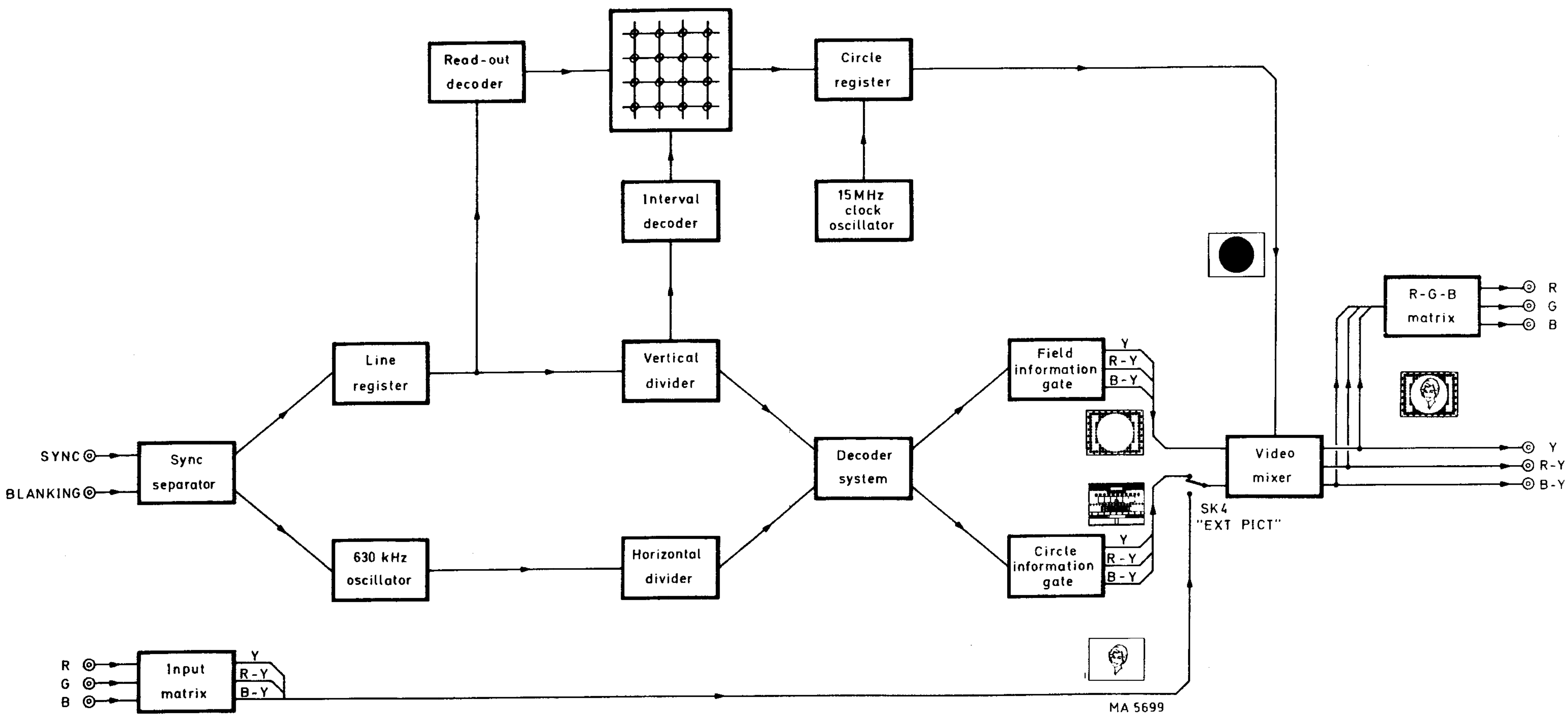


Fig. IV-1. Simplified block diagram

V. DESCRIPTION OF THE DETAILED BLOCK DIAGRAM

The block diagram is divided into two parts.
Part 1 (Fig. V-1) contains mainly the input circuits and the circuits generating the gate signals for part 2.
Part 2 (Fig. V-2) contains mainly the linear generators for the test pattern.

BLOCK DIAGRAM (fig. V-1)

A. Sync and blanking inputs

The "Input amplifiers" amplify and reshape the blanking and sync signals being applied from a TV pulse generator. The amplifiers have high input impedances and they deliver pulses which are independent of the amplitude of the applied input pulses.
Two pulse separating circuits separate the line and frame pulses out of the complete sync signal.

B. Horizontal pulse system

This part generates the basic horizontal pulses and it consists of the "630 kHz oscillator" and the "Horizontal dividers".
The start of the oscillator is for every line controlled by the line pulse (f_H).
The frequency of the oscillator is kept constant by means of a special control circuit.
Before the signal is supplied to the dividers it passes the "2:1 divider".
The "Horizontal dividers" (I and II) are Johnson counters generating the horizontal control pulses for the gate systems and for the start circuit of the circle clock oscillator.

C. Vertical pulse system

The "Line register", the "16:1 divider" and the "Vertical decoder" generate the pulses controlling the circle generator and the vertical picture content.
The "Line register" is a 21:1 divider which counts the line pulses. The start and the stop of the register are controlled by the frame pulses.
The field control circuit is controlled by the frame pulses as well as the pulses from the start/stop circuit.
The "White lines generator" is controlled by the $\bar{u}$ and $\bar{s}$ pulses from the "Line register" and it supplies the horizontal white lines (V_L) in the raster.
An adder circuit supplies this signal with blanking ($\overline{V_L'}$).
The V_L signal drives also the flip-flop supplying the horizontal bars (V_B) used for the vertical borders.
The generator for the center line is controlled by the $\bar{r}$, $\bar{s}$, $\bar{u}$, $\bar{t}$, $\bar{v}$, $\bar{h}$ and $\bar{h}$ pulses from the "Line register".
This generator supplies a raster of horizontal white lines, which are placed between the raster of V_L (the lines V4, V6, V8 etc.).
The field sequence of these lines, however, are opposite to the one of the other white horizontal lines to obtain the special interlacing center line V_I'. The center line V_I' is selected in the gate after the generator.
The "16:1 divider" generates the pulses for the "Vertical decoder" and for the "Vertical center cross gate".
The divider is counting the $\overline{V_L'}$ and $\overline{V_I}$ pulses. These pulses appear for every 25 lines (the V_I pulses are placed between the V_L' pulses).
The A, B, C and D pulses from the "16:1 divider" are combined in the "Vertical decoder" in order to obtain the vertical control pulses for the gate system and for the "Interval decoder" in the circle generator.

D. The circle generator

This generator consists of the "Memory", the "Read out decoders", the "Circle register" with the clock oscillator and the "Interval decoder" and it generates the circle gate signal "Φ".
The "Memory" is a ferrite core memory which contains 10 different programmes. The programmes are coded by the wiring of the cores.
Each program gives the information for 21 succeeding lines. The 10 programmes together give the full information for the circle properties for the two fields.
A program is read out line by line by means of the "Read out decoders". A line will be read out when both "X read out" and "Y read out decoders" supply the respective cores with current in the same direction (see "the principle of the circle generator" in the service manual).
The "Circle register" consists of two counters each one with 8 binary dividers.
The counters count the pulses from the "15 MHz clock oscillator" and they are line by line preset by the binary information from the memory.
The one counter gives information about the left side, and the other one about the right side of the circle and these two signals form the circle gate signal "Φ".
The program for the respective interval of 21 lines is read in by the "Interval amplifiers" which are controlled by the "Interval decoders".

E. The gate system

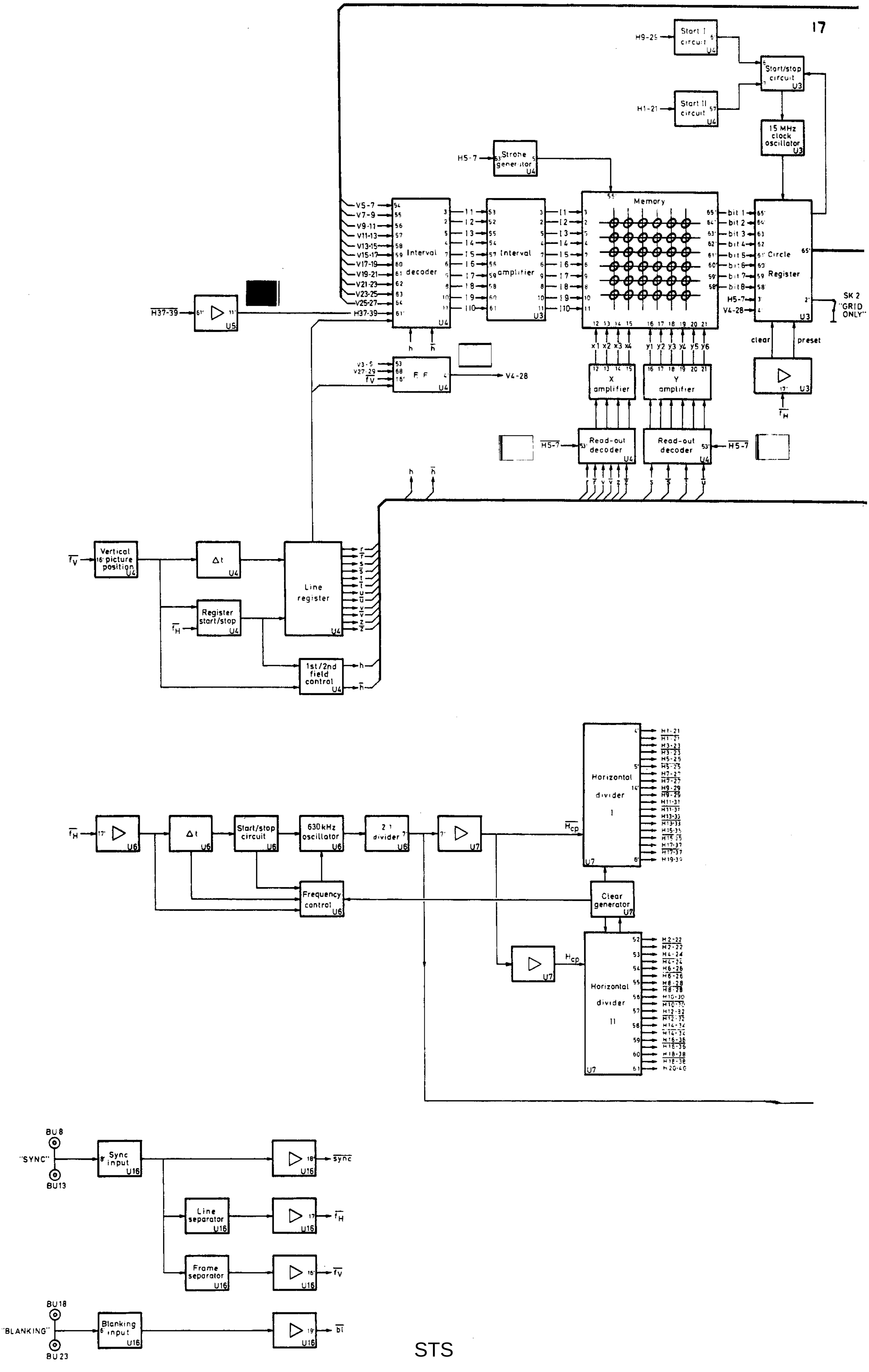
This group of gates controls the test pattern generators (see block diagram fig. V-1).
The gates combine the basic pulses from the "Horizontal dividers" and the "Vertical decoder" in order to obtain the necessary, complex signals.

The gates for the colour signals are: "± (R-Y) gate", "± (B-Y) gate", "(R-Y) gate", "(G-Y) gate" and "B-Y) gate".

The pictures in the block diagram show the areas controlled by the gates. (These pictures can be displayed by means of the test amplifier, see section VII-D).

The gates for the black and white signals are: "Colour diff. luminance gate", "Center cross gate", "Grey background gate" and "Bl/wh circle gate".
The Bl/wh circle gate" supplies the ⏀ signal, which is used as a video information in the circle.
An external supplied text signal will be passed through this gate.

The "Σ adder circuit" supplies also a signal which is used direct as a video signal. This signal is the complete black and white picture information without the circle.
The signal consists of the grid raster and the border castellations. The grid raster is produced by combining the H_L and the V_L signals.
The border castellation is produced by combining the vertical bars H_B gated with the V_C signal and with the horizontal bars V_B gated with the H_C signal.
The "Narrow line generator" supplies from the H_L') signal vertical white lines of half the width of the normal lines. The signal is used in the (R-Y), (G-Y) and (B-Y) gates to obtain a colour step exactly in the middle of the white lines.


Start I circuit U4
Start II circuit U4
Start/stop circuit U3
15 MHz clock oscillator U3
Strobe generator U4
Memory
Interval decoder U4
Interval amplifier U3
Circle Register U3
SK 2 "GRID ONLY"
clear
preset
F F U4
V4-28
X amplifier
Y amplifier
Read-out decoder U4
H37-39
U5
Vertical picture position U4
Δt U4
Register start/stop U4
Line register U4
1st/2nd field control U4
Δt U6
Start/stop circuit U6
630 kHz oscillator U6
2:1 divider U6
Frequency control U6
Clear generator U7
Horizontal divider I U7
Horizontal divider II U7
BU 8
"SYNC"
BU 13
Sync input U16
Line separator U16
Frame separator U16
BU 18
"BLANKING"
BU 23
Blanking input U16

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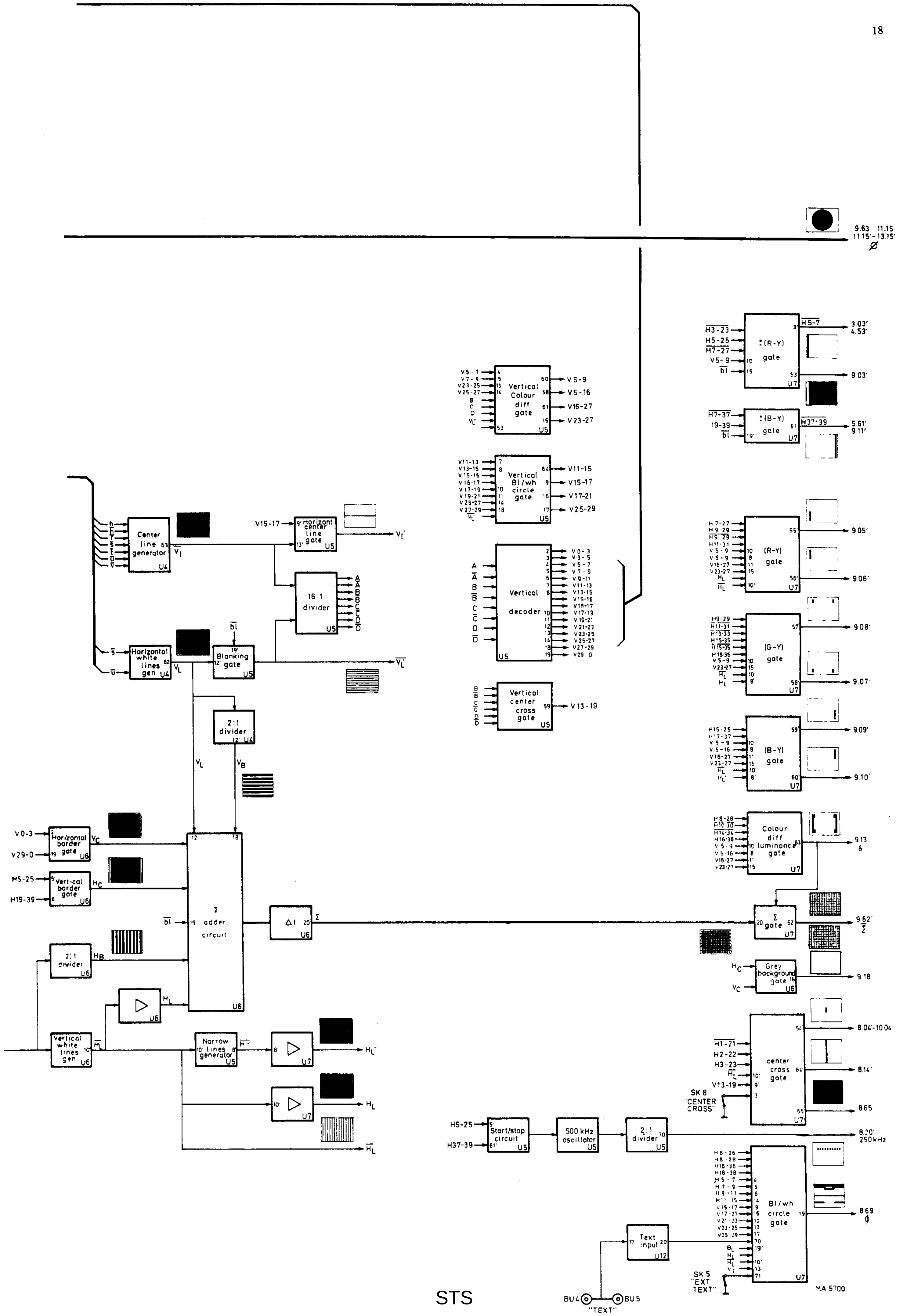
9.63 11.15
11.15'-13.15'
Vertical Colour diff gate U5
V5-9
V5-16
V16-27
V23-27
Vertical Bl/wh circle gate U5
V11-15
V15-17
V17-21
V25-29
Vertical decoder U5
V0-3
Vertical center cross gate U5
V13-19
±(R-Y) gate U7
3.03'
4.53'
9.03'
±(B-Y) gate U7
5.61'
9.11'
(R-Y) gate U7
9.05'
9.06'
(G-Y) gate U7
9.08'
9.07'
(B-Y) gate U7
9.09'
9.10'
Colour diff luminance gate U7
9.13
Center line generator U4
Horizont center line gate U5
V15-17
16:1 divider U5
Horizontal white lines gen U4
Blanking gate U5
2:1 divider U4
Horizontal border gate U6
V0-3
V29-0
Vertical border gate U6
H5-25
H19-39
Σ adder circuit U6
Δt U6
Σ gate U7
9.62'
Grey background gate U6
9.18
2:1 divider U6
Vertical white lines gen U6
Narrow lines generator U5
center cross gate U7
8.04'-10.04'
8.14'
8.65
SK 8 "CENTER CROSS"
Start/stop circuit U5
H5-25
H37-39
500 kHz oscillator U5
2:1 divider U5
8.20'
250 kHz
Bl/wh circle gate U7
8.69
Text input U12
SK 5 "EXT TEXT"
BU4
BU5
"TEXT"
MA 5700

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BLOCK DIAGRAM II (fig. V-2)

A. Grid information

This section contains the "(R-Y) and (B-Y) matrixes" and the luminance circuits for the grid information (the video signal without circle information).
The "(R-Y) and (B-Y) matrixes" are controlled by the gating signals coming from the respective gates in unit 7 (see the figures).
The ± (R-Y) and the ± (B-Y) signals (the special (R-Y) and (B-Y) signals being line sequentially phase inverted) are controlled by the "ALT control circuit" (SK7).
The resulting (R-Y) and (B-Y) signals are via an amplifier and clamping circuit applied to the respective "(R-Y) mixer" and "(B-Y) mixer" (unit 15).
The luminance information for the field is produced in the "Y adder" by the four applied signals: δ, grey field, $\overline{\Sigma}$ and Φ.
The δ signal secures correct luminance of the colour difference signals. The "Grey field" is the background for the field (adjustable between 0 and 80 % of white).
The grid raster, the colour difference area and eventually the circle are gated out of the "Grey field" in order not to influence the luminance of these signals.
The $\overline{\Sigma}$ signal is the grid raster supplied with border castellation.
When SK2 "Grid only" is released the circle is gated out of the Σ signal by means of the applied Φ signal.
The Y signal is via a clamping circuit applied to the "Y mixer" (unit 15).

B. Circle information

The circle information could be either an externally supplied or an internally generated signal.
An external signal should be supplied as R, G, B signals (BU9, 10, 14, 15,19, 20).
By means of the 3 matrixes the signals will be converted into Y, (R-Y) and (B-Y) signals.
These signals are applied to the respective mixers (unit 15) via the clamping circuits and a switching system.
The section for the internally generated signal contains: the "Colour gate" with the matrix system, the "Staircase generator", the "Definition lines generator", the "Center cross gate" and an adder circuit to obtain the complete Y signal.
By means of the supplied signal the colour gate is generating a colour bar signal with a contrast of 75 %.
For the adjustment of some receivers it is important that the contrast of the 250 kHz and the colour bar signal are exactly the same.
Therefore the 250 kHz signal is generated in the "Colour gate".
The Y signals for the colour bar and the 250 kHz signal are obtained in the "Y matrix".
The (R-Y) and (B-Y) signals are obtained in the "(R-Y), (B-Y) matrix".
Via the clamping circuits and a switching system these signals are applied to the respective mixers (unit 15).
The "Staircase generator" combines the supplied signals to a 6 levels staircase.
The staircase can be changed to 5 or 10 levels by means of internal soldering (see circuit diagram unit 8, Fig. XI-9).
The "Definition lines generator" is a dc controlled sine wave generator.
Consequently the frequency gratings from 0.8 to 4.8 MHz are controlled by a staircase signal from the "Frequency control" circuit.
The start/stop circuit is gating the area where the generator should be active.
The "Center cross generator" receives from unit 7 the necessary signals for generating the center cross.
This signal is added to the black and white signal generated in unit 7 and supplied to the Y adder.
The complete Y signal for the circle is obtained in the "Y adder".
The signal is applied to the "Y mixer" via the "Clamping" circuit and the "EXT/INT switch".

C. Video mixer

The field information are added to the circle information in the video mixers.
The Y, (R-Y) and (B-Y) signals with the circle information are applied to the switching system controlled by SK4 "EXT PICT". By the switching system either the externally applied or the internally generated signals are chosen as the circle signal. Then these signals are applied to the respective mixers ("Y mixer, (R-Y) mixer, (B-Y) mixer").
In the mixers the circle is gated out of the field signal and substituted of the circle signal.
From the mixers the video signals are applied to the respective output sockets via the output amplifiers.

D. R-G-B Matrix

In this matrix system being supplied with the Y, (R-Y) and (B-Y) signals the R, G and B signals are generated.
The R,G and B signals are via the output amplifiers applied to the respective output sockets.

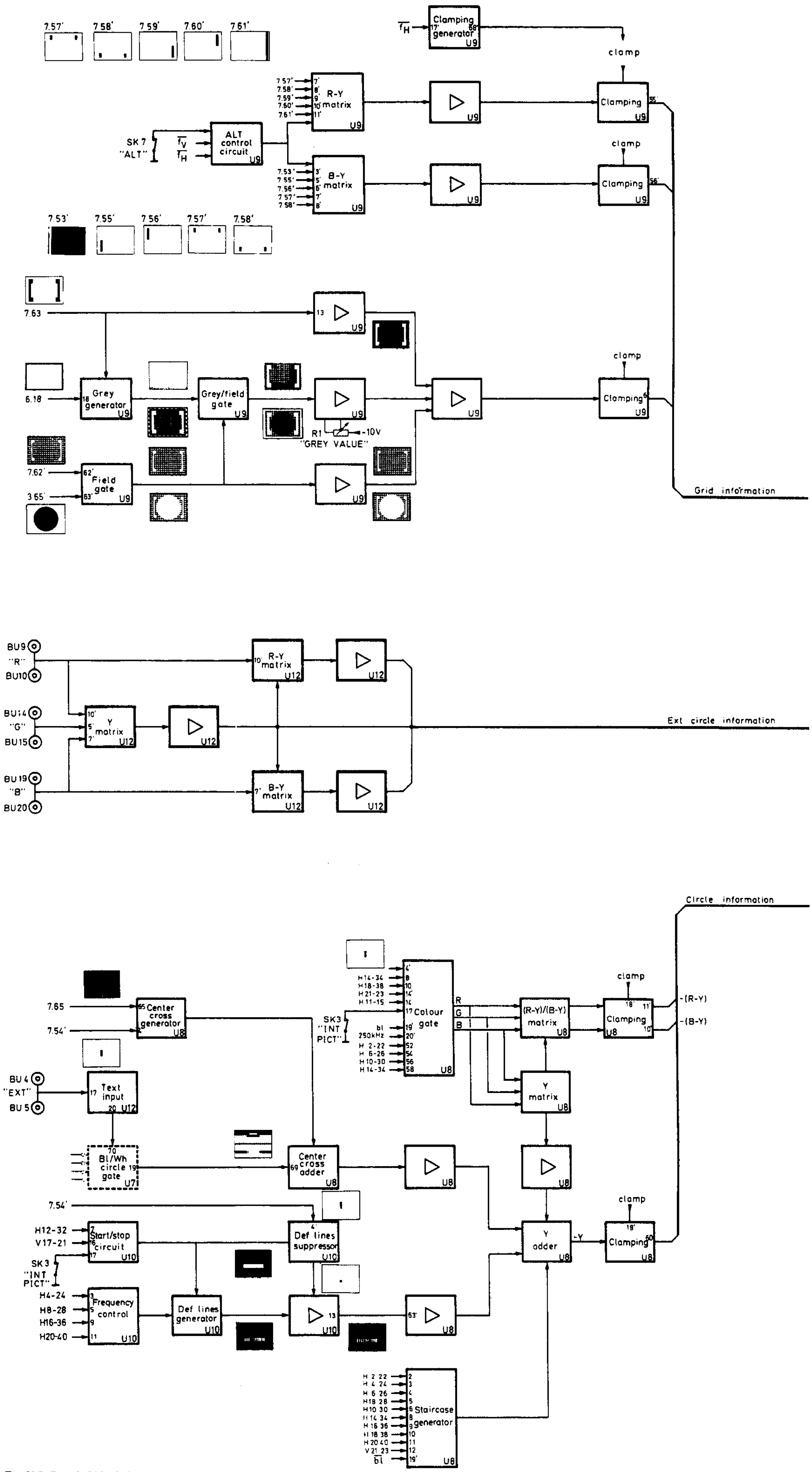
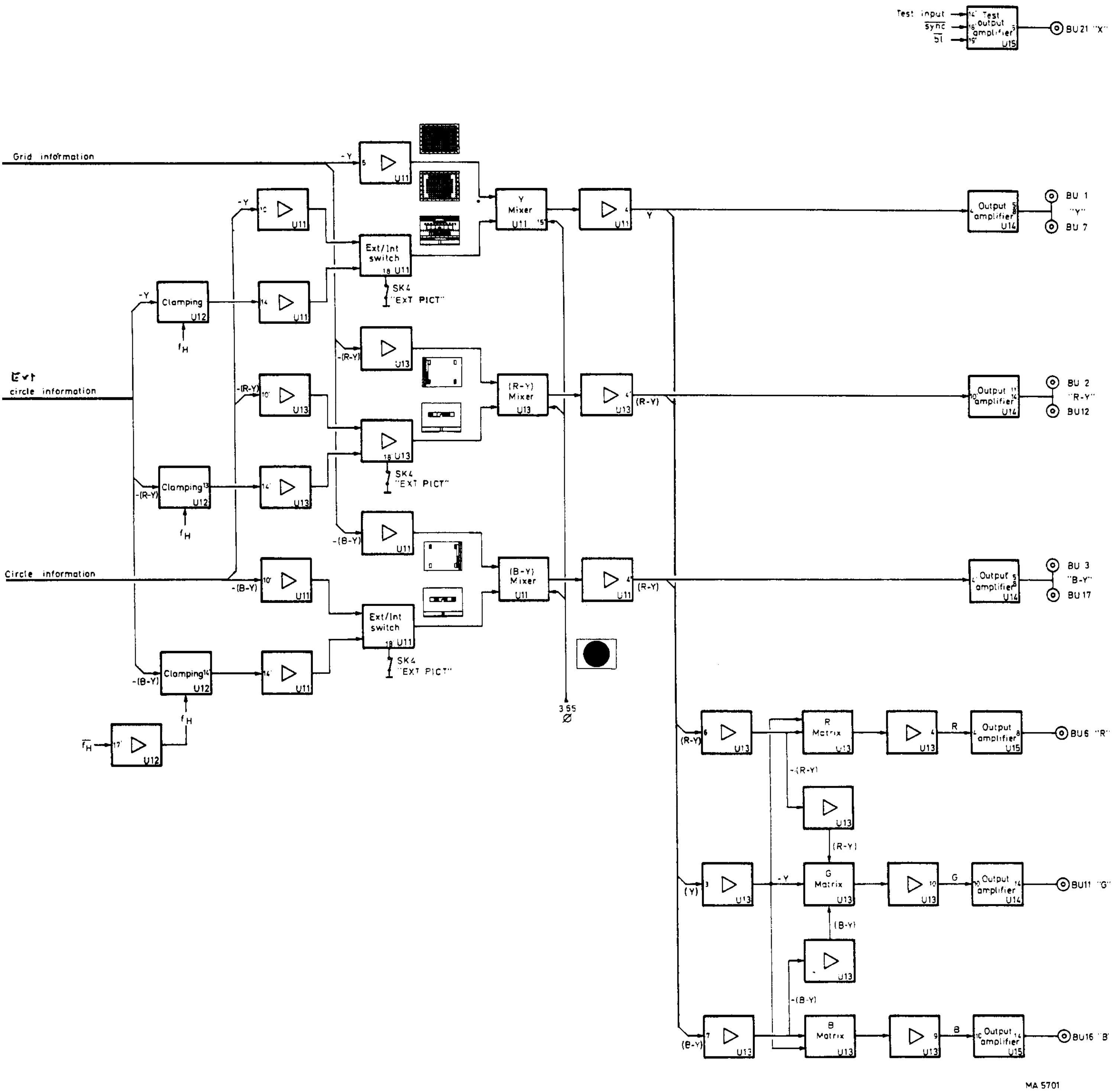


Fig. V-2. Detailed block diagram (part II)


Test input
sync
Test output amplifier U15
BU21 "X"
Grid information
circle information
Circle information
Clamping U12
Ext/Int switch U11
SK4 "EXT PICT"
Y Mixer U11
(R-Y) Mixer U13
(B-Y) Mixer U11
Output amplifier U14
BU 1 "Y" BU 7
BU 2 "R-Y" BU12
BU 3 "B-Y" BU 17
R Matrix U13
G Matrix U13
B Matrix U13
Output amplifier U15
BU6 "R"
BU11 "G"
BU16 "B"
MA 5701

VI. HOW TO READ THE PULSES IN THE DIAGRAMS

All signals in the generator are built up by pulses which can, with few exceptions, be located from a co-ordination system consisting of the grid raster (fig. VI-1a).
The pulses are indicated by the letter "H" or "V" followed by two figures.
The "H" pulses are pulses which occur with the line frequency.
The "V" pulses are pulses which occur with the frame frequency.
The figures give the exact position of the pulse in the co-ordination system (fig. VI-1a).

Examples:

1. H1-21
   This is a positive going pulse going positively at 1 and negatively at 21 (fig. VI-1b).
2. $\overline{\text{H1-21}}$
   This one is the same pulse as 1 but inverted (fig. VI-1c).
3. If the pulse 2 is applied to a NAND gate (IC 29/1 in unit 7) together with the pulse H3-23 (fig. VI-1d), the output of the NAND gate will supply a new pulse: $\overline{\text{H21-23}}$ (used in the center cross gate and the colour step generator).
   Another indication is used when an H and a V pulse are gated together (e.g. H21-23 and V13-19 to obtain a gate pulse for the center cross) or for special signals as e.g. the 250 kHz and the definition lines.
   In this case the diagrams are supplied with pictures showing the area covered by the respective gate pulses.
   Some complex signals are additionally supplied with a symbol e.g. Σ, Φ, δ.
   These pictures can be found in the generator by means of a monitor and the built-in "test output amplifier" (see chapter VII-D).

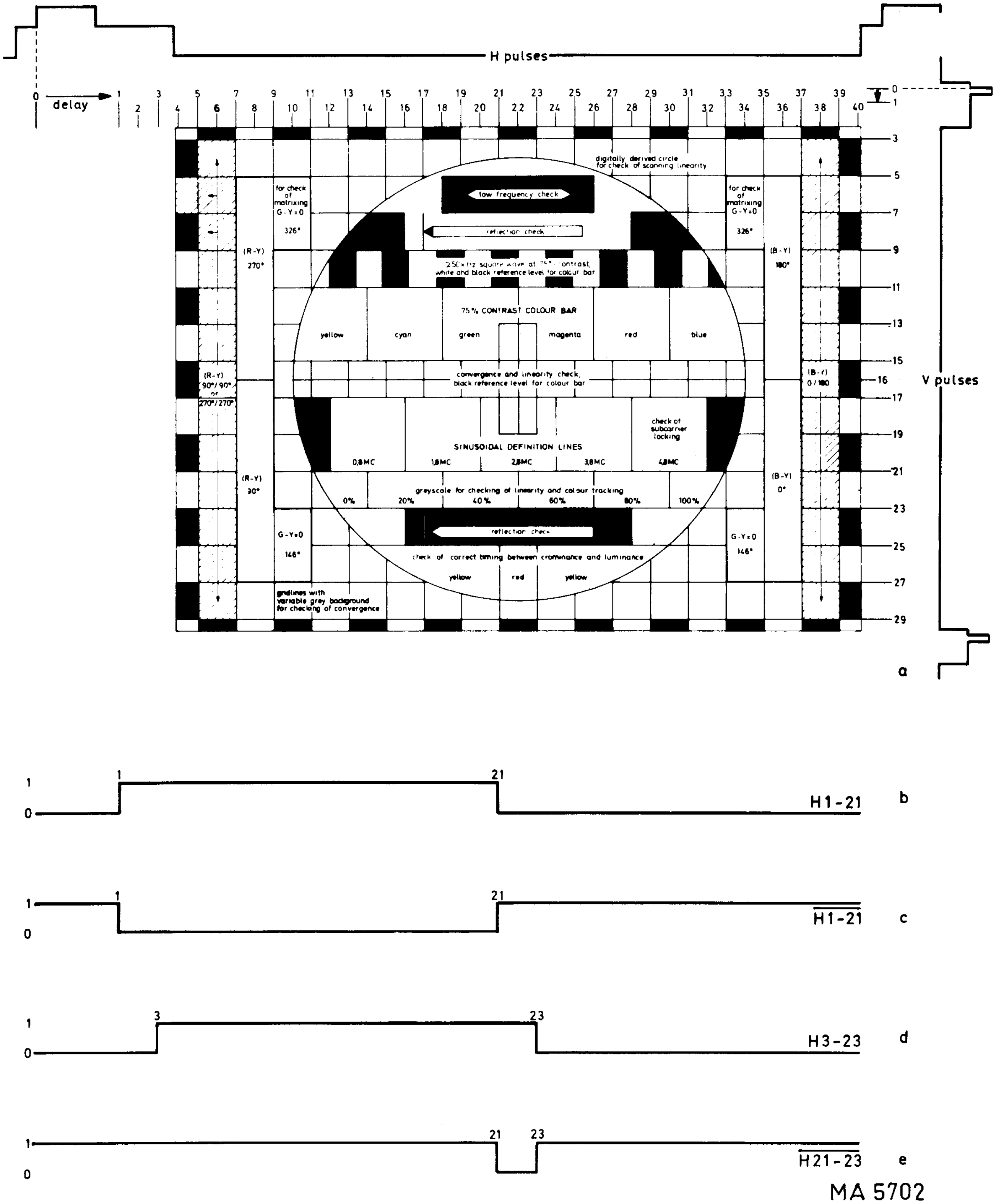


Fig. VI-1. Pulse diagram

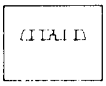
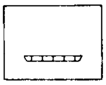
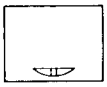
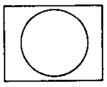
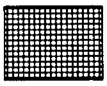
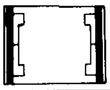
Basic signals		Signal ways
	Black rectangle Unit 7 IC 24/2 controlled by: H6-26, H18-38 and V5-7	via IC28.terminal 19→ unit 8. IC2/1. IC3/1-TS2.TS4.terminal 60→ unit 11.
	Black needle pulse in white area Unit 7 Needlepulse : IC 24/1 controlled by: H_L.H16-36 and H18-38 White area : IC 25/1 controlled by: H8-28 and H16-36	via IC26/1.IC28.terminal 19→ unit 8.IC2/1 IC3/1.TS2.TS4.terminal 60→ unit 11.
	250 kHz square waves Unit 5 TS4 and TS5 (500 kHz oscillator).	via 2:1 divider IC2/1.terminal 70'→ unit 8 IC1/2.IC9/1-2(colour gate)via R-Y and B-Y matrix to terminals 10' and 11' and via Y matrix.TS6.TS4 to terminal 60→ units 11 and 13.
	Colourbars Unit 8 IC1.IC3.IC7.IC8.IC9 and IC10(Colour gate).	via R-Y.B-Y and Y matrix to terminal 10',11' and 60→ units 11 and 13.
	Circle grid Horizontal line: Unit 5. IC18. IC19. via terminal 9 to unit 7,where vertical lines ($\overline{H}_L$) are added in IC13/3.	via IC28.terminal 19→ unit 8. IC2/1. IC3/1.TS2.TS4.terminal 60→ unit 11.
	Convergence centercross Unit 7. IC23/1 - IC26/2 and IC29.	via terminal 54' and 65→ unit 8. IC1/1. IC2/2.IC2/1.IC3/1.TS2.TS4.terminal 60→ unit 11.
	Definition lines Unit 10.-Definition lines generator controlled in MHz by: H4-24, H8-28, H16-36 and H20-40 at terminals 3,5,9 and 11. Start/stop controlled by H12-32 and V17-21 at terminals 7 and 16.	via terminal 13' → unit 8. TS1.TS4. terminal 60 → unit 11.
	Luminance staircase Unit 8 IC3.-IV4. IC5. IC6 and IC7.	via TS3.TS4. terminal 60 → unit 11.
	White needle pulse in black area Unit 7 Needlepulse : IC 24/1 controlled by: H_L. H16-36 and H18-38 Black area : IC 25/2 controlled by: H8-28 and H16-36	via IC28 terminal 19→ unit 8. IC2/1. IC3/1. TS2.TS4.terminal 60→ unit 11.
	Yellow-red-yellow areas Unit 8 red :IC7/4 controlled by V25-29 and $\overline{bl}$ green:IC1/3 controlled by V25-29.*H21-23 and $\overline{bl}$ *H21-23 is generated in unit 7. (IC29/1).	via R-Y. B-Y and Y matrix to terminal 10', 11' and 60 → units 11 and 13.
	Circlegatesignal Ø Unit 3	via terminal 65' → units 9-11 and 13.
	Bl/Wh.castellation. Unit 6 IC9 and IC10 Horizontal castellation controlled by:Vc and HB Vertical castellation controlled by:Hc and VB *VB is generated in unit 4.	via terminal 20→ unit 7. IC13/2 → unit 9. IC6/4.IC6/1.TS22.TS24.terminal 6 → unit 11.
	Grid raster. Unit 6 IC9/2-4-5 and IC10 Horizontal lines:VL (generated in unit 4). Vertical lines:HL	
	Colour DIFF and ALT signals. Unit 7	→ unit 9. R-Y and B-Y matrix to terminals 55' and 56' → units 11 and 13.

Fig. VI-2. Basic signals

OPERATING INSTRUCTIONS

VII. INSTALLATION

A. Adjusting to the local mains voltage

The instrument can be used with mains voltages of 110 V and 220 V a.c.
Before using a new instrument check the adjustment.
If the instrument has to be adjusted to another mains voltage, resolder the connections to the primary windings of the supply transformer as shown in the figures below.

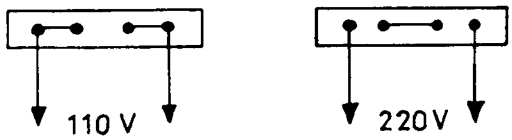


Fig. VII-1. Transformer connection 110–220 V.

B. Earthing

Earth the instrument in accordance with the local safety regulations.
The metal cabinet can be earthed via:
Socket BU21 (see Fig. VIII-2) and the earthing core of the mains lead.
The electrical circuit can be earthed via:
Socket BU22 (see Fig. VIII-2) and the screening of the coaxial connection cables.
Avoid double earthing of the electrical circuit, because this may introduce hum phenomena.

C. Connecting the PM 5544 to the encoder PM 5554

The output signals Y, R-Y and B-Y should preferably be used to prevent double matrixing when applying the video signals.
The following adjustments (see Fig. VII-2) should be carried out for correct encoding:

1. Connect an oscilloscope to the output of PM 5554.
2. Adjust R1 unit 14B (Y amplitude) to 1 V_{pp} including sync.
3. The peak levels of yellow and cyan should be equal to white. If that is not the case, adjust R1 unit 14A (B-Y amplitude) until the yellow amplitude is correct and R16 unit 14A (R-Y amplitude) until the cyan amplitude is correct.

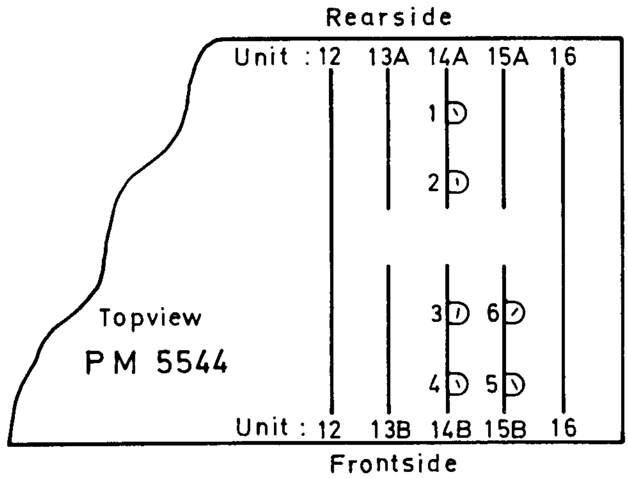


Fig. VII-2. Adjusting elements

Adjusting elements

1. (R1 – unit 14A) – B-Y amplitude
2. (R16 – unit 14A) – R-Y amplitude
3. (R1 – unit 14B) – Y-amplitude
4. (R16 – unit 14B) – G-amplitude
5. (R16 – unit 15B) – B-amplitude
6. (R1 – unit 15B) – R-amplitude

D. Test output amplifier

This amplifier is a special service amplifier added to promote the service ability of the instrument.
By means of this amplifier all signals in the pulse part of the generator can be made visible on the screen of a video monitor (see the pictures in the diagrams).
The amplifier supplies the measuring signal with (non-specified) sync and blanking signals for adapting to the monitor (sync. negative). The polarity of the signal can be inverted by means of internal soldering, (see circuit diagram unit 15A)

Connections

The monitor should be connected to output socket BU21: ”X” (≈ 75 Ω).
The signal to be measured should be applied to terminal 14’ at the test output print (unit 15A).

Warning

Do not short-circuit the terminals of the print plates, as this may damage the circuits.
Eventually an insulated wire, as shown in Fig. VII-3, can be used.

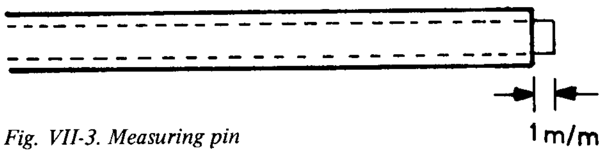


Fig. VII-3. Measuring pin

Other applications

The test output amplifier can also be used as a supplier of simple test signals with sync and blanking, e.g. the circle signal, the cross lines etc.

In some cases one of the output amplifiers (unit 14A, 14B or 15B) can be used only to make the pulse visible on the screen because the pulse amplitude is too low to be measured with the test output amplifier or the signal consists of several different levels which cannot be made visible by the test amplifier.
The pulses to be measured in this way are marked *. Then the monitor has to be connected to the output socket of that amplifier and the signal to be measured has to be applied to the input of that amplifier.
Besides complete sync. has to be supplied to the monitor (ext. sync.).

VIII. SURVEY OF CONTROLS AND SOCKETS

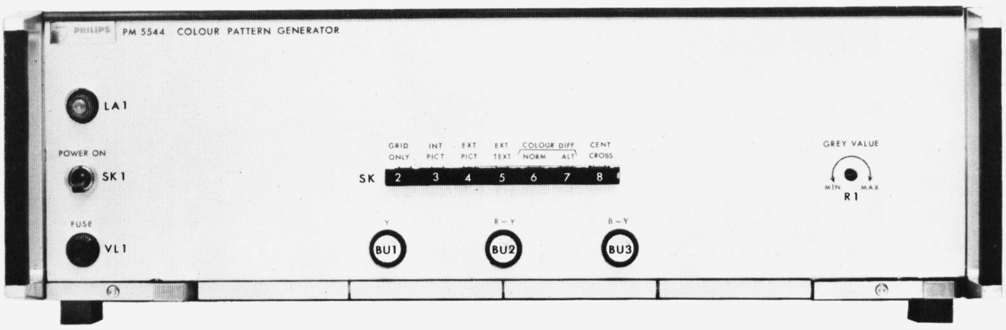


Fig. VIII-1. Front of the instrument

A. Front of the instrument (see fig. VIII-1)

LA1 Pilot lamp; lights up when the instrument is switched on

R1 "GREY VALUE"
screwdriver control for video amplitude of the grey background of the crosshatch raster.

SK1 "POWER ON"
mains switch; the instrument is switched on if the lever of the switch is placed upwards

SK2 "GRID ONLY"
by pressing the grid pattern is obtained.

SK3 "INT PICT"
by pressing the complete pattern is obtained

SK4 "EXT PICT"
by pressing the circle contents will be removed and replaced by a picture composed of an external R-G-B-source, which is connected to sockets BU9, BU14, BU19 or BU10, BU15, BU20.

SK5 "EXT TEXT"
by pressing the white needle pulse in the lower black rectangle of the complete pattern will be removed and replaced by the signal, from a monochrome flying-spot scanner, which is applied to sockets BU4 or BU5

SK6 "COLOUR DIFF – NORM"
by pressing some colour difference fields are added to the pattern

SK7 "COLOUR DIFF – ALT"
by pressing two colour difference bars are added to the pattern. These will not be visible on a well-aligned receiver.

SK8 "CENT CROSS"
by pressing a white cross in a black background will be added exactly in the centre of the complete pattern

BU1 "–Y–"
output socket for Y-signal (Ri = 75 Ω)

BU2 "R-Y"
output socket for (R-Y) signal (Ri = 75 Ω)

BU3 "B-Y"
output socket for (B-Y)-signal (Ri = 75 Ω)

VL1 safety fuse: 230 V – 500 mA, delayed action
115 V – 1000 mA, delayed action

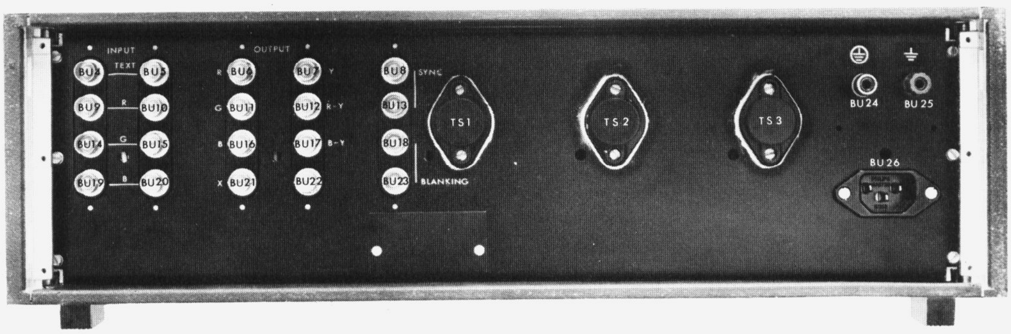


Fig. VIII-2. Rear of the instrument

B. Rear of the instrument (see fig. VIII-2)

BU4,BU5	”TEXT” interconnected input sockets for ”text”-signal from a monochrome flying spot scanner
BU6	”R” output socket for red-signal
BU7	”Y” output socket for luminance-signal
BU8,BU13	”Sync” interconnected input sockets for composite sync-signal (negative)
BU9,BU10	”R” interconnected input sockets for red-signal
BU11	”G” output socket for green-signal
BU12	”R-Y” output socket for colour difference signal (R-Y)
BU14,BU15	”G” interconnected input sockets for green-signal
BU16	”B” output socket for blue-signal
BU17	”B-Y” output socket for colour difference signal (B-Y)
BU18, BU23	”Blanking” interconnected input sockets for complete blanking signal
BU19, BU20	”B” interconnected input sockets for blue signal
BU21	”X” output socket for internal test amplifier
BU24	earthing socket connected to the metal cabinet
BU25	earthing socket connected to the electrical circuit
BU26	socket for mains connection

IX. OPERATING THE PM 5544

Fig. IX-1. Complete internal pattern

A. Internal pattern

The pattern is supplied if switch INT PICT is pressed.
The signals representing this pattern are available as [R + G + B] as well as [Y + (R-Y) + (B-Y)] information.
The following information can be simultaneously switched on/off:

1. Colour difference – fields

By pressing switch COLOUR DIFF–NORM, the following fields are added to the pattern.
After encoding the left bar represents the [(B-Y) = 0]-phases, the upper part produces a signal of 270° [– (R-Y)] the lower part 90° [+ (R-Y)].
After encoding the right bar represents the [(R-Y) = 0]-phases, the upper part produces a signal of 180° [– (B-Y)] the lower part 0° [+ (B-Y)].
After encoding the inner blocks represent the [(G-Y) = 0]-phases, the upper ones produce a signal of 326°, the lower ones of 146°.

2. Alternating colour difference bars

By pressing switch COLOUR DIFF – ALT, the following bars are added to the pattern. **After** encoding the extreme left bar produces an (R-Y) signal that is **not** line-sequentially phase inverted. The phase of the latter can be 90° or 270°, but remains the same as long as the instrument is operating. This is because the instrument is not using the 12.5 Hz PAL information.
After encoding the extreme right bar produces a (B-Y) signal that is line sequentially phase inverted.
On a well-aligned receiver these bars will not be visible.
They do become visible if e.g. the receivers demodulator phases are not correct. The left bar then shows a yellowish or bluish colour.
The right bar becoming reddish or cyanic.

3. A white cross in the centre of the pattern

By pressing switch CENT CROSS the pattern will be provided with a white cross in a black background situated exactly in the centre of the pattern. The lower part of this background can be internally adjusted, if required to 2–3 % below black level to enable black level setting of e.g. monitors.

4. Grid pattern

By pressing switch GRID ONLY, the circle with its contents is removed leaving a complete grid raster.

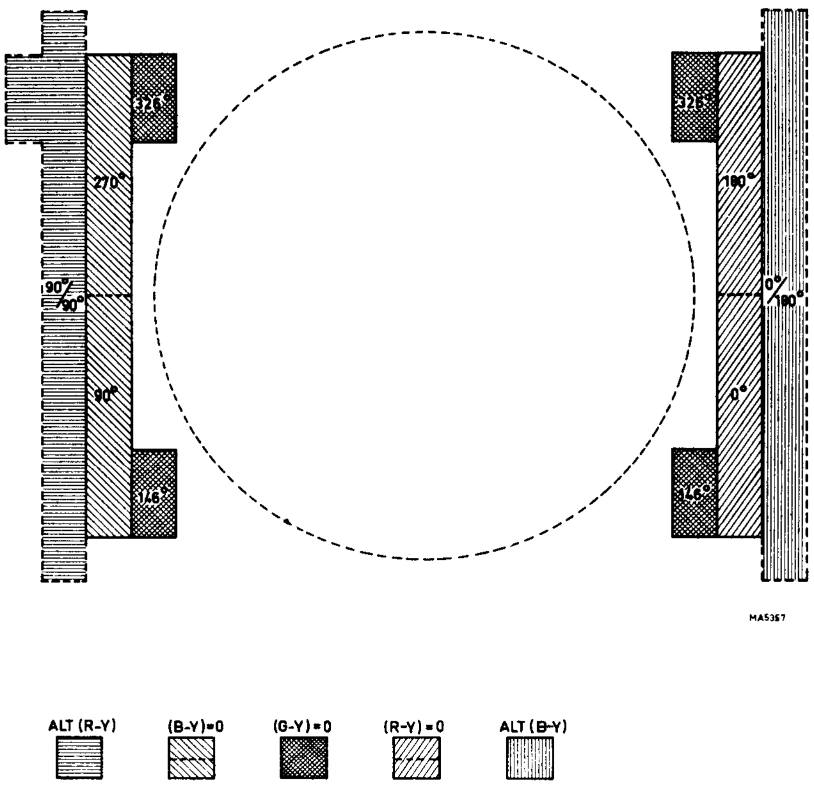


Fig. IX-2. Position and phasing of colour difference signals

B. Internal pattern with externally applied video

1. By pressing switch EXT PICT, the picture contents within the circle area will disappear and can be replaced by a picture composed of an external R-G-B-source. The output signals of a colour camera or a colour slide-scanner, connected to sockets INPUT – R-G-B (rear of the instrument) will be gated into the circle area. This means that the external videoinformation will only show up within the area of the circle.
This facility is meant for transmitting colour pictures or slides in order to facilitate overall picture quality assessment and saturation setting.

2. Transmitter identification

If switch INT PICT is pressed, the white needle pulse in the lower black rectangle in the circle can be removed by pressing switch EXT TEXT.
The output signal of a monochrome flying-spot scanner, being connected to socket INPUT TEXT (rear of the instrument), will then be gated into the black rectangle via a Schmitt-trigger circuit. This means that the external videoinformation will only show up within the area of the black rectangle, whereas it can only be white or black because of the Schmitt-trigger circuit.
This text signal can be inverted by means of a little push-button on print-board VIDEO INPUT. This input circuit accepts signals with or without sync and set-up. Releasing switch EXT TEXT removes the inserted text and replaces it by the white needle pulse again.

C. Minor changes in the patterns

In the foregoing patterns some minor changes are possible:

1. The video-amplitude of the background

By means of screwdriver control GREY VALUE (front of instrument) the video-amplitude of the background of pattern can be varied from 0 (= black) to approx. 80 % of white.

2. The greyscale steps

By means of a connection jumper on a p.w. board, the five grey steps can be increased to ten, or decreased to four.

3. Information for black level setting

If pushbuttons INT PICT, EXT PICT, and GRID ONLY are released, the frequency gratings will disappear from the pattern. The lower part of the black background of the centre cross can be adjusted to 2–3 % below black level by means of an internal control. In this way it is possible to obtain a horizontal black bar (instead of the frequency gratings) in which a small area is lightly below black level. By means of this provision the black level setting of display units can be checked and adjusted.

X. THE PATTERN OF THE PM 5544

The patterns are intended for visual inspection on the screen of a monitor or a receiver, but they also clearly show the desired information on the screen of an oscilloscope, waveform monitor and vectorscope.
If broadcasted, the patterns enable TV-servicemen to carry out an optimal adjustment and a quick function-check of a receiver just installed.
The following procedure for visual inspection is meant for orientation and does not pretend to be complete.
The sequence of the various checks is entirely determined by the composition of the patterns, and we would therefore, like to emphasize that in case of readjustments in the receiver, etc, a deviating sequence might have to be used. As a result of the complex nature of the pattern we do not recommend its use as a substitute for a service generator in a TV repair shop.

Procedure for visual inspection

1. **Cross hatch raster** (the dimensions of the raster are identical to the 14 x 19 lines raster)

It provides checking of:

- the picture geometry, such as horizontal and vertical scanning amplitude and linearity. The raster should form equal squares.
- the uniformity of focus and the pin-cushion correction. The focus of the cross hatch area and of the central area should be uniform, while at the same time the lines of the cross hatch should seem to be straight and parallel at normal viewing distance.
- the convergence of the shadow mask colour picture tube.
- the step-function response. The vertical lines should not show ringing or overshoot.

2. Grey background of the cross hatch raster

Although adjustable at any value between black and approx. 80 % of black-to-white level it is usually set to approx. 30 % video amplitude.
To a certain extent it provides an impression of the purity of the shadow mask tube.

3. Edge castellations

Black/white blocks, similar to those of test cards "C" and "F".
They provide checking of:

- the size and centring of the picture. The top and bottom castellations each cover 3.5 % of the vertical. scanning; on a screen with the usual over-scanning they will be partly visible. The cross hatch raster has a 1.30 aspect ratio and as most receivers have a display area with a 1.25 aspect ratio (5:4) it is usual for the side castellations to appear just in the display area of the receiver.
- the sync separator performance (by means of the right-hand border). A malfunction appears as a horizontal displacement of those parts of the picture where at the right side the white blocks are found.
- the burst gate performance. On a few of the left hand castellations some special (R-Y) information can be present (this information is after encoding **not** line sequentially phase inverted and is therefore normally invisible).
  A malfunction appears as colouring of the extreme left and right parts of the cross hatch background in the 2nd and 3rd square from the top.

4. Electronic circle

Diameter 12 units of the cross hatch raster, the centre of the circle also being the centre of the picture.
It provides checking of:

- the picture geometry and the scanning linearity.
- the picture aspect ratio. The circle should appear truly circular if the picture has the standard 1.33 aspect ratio (4:3).

5. Black rectangle in the top area of the circle

Similar to the one of test card "C" and "F".
It provides checking of the low-frequency response.
Poor response shows as streaking from the edges of this rectangle to the righthand side.

6. White rectangle with black needle line in the top area of the circle

It provides a check on whether reflections are present in the received television signal. Reflections from hills, large buildings, aerial systems or signal distribution are most easily seen as displaced images of the black needle line.

7. Black/white blocks in the upper area of the circle

250 kHz-square waves with a videoamplitude of 75 %.
They provide checking of the square wave response and should not show over or undershoot.
Because their video amplitude is identical to that of the R-G-B-information in the colour bar, a provision is present to check the amplitude-ratio of the R-G-B-signals applied to the colour picture tube. Switch off the red and green gun, and adjust the contrast and saturation controls so that there is no difference in brightness between the blue blocks of the colour bar and those of the 250 kHz-square wave. Switch on the red gun and switch off the blue gun.
There may not be a difference in brightness between the red blocks of the colour bar and the red parts of the 250 kHz-square-wave. The green amplitude can be checked in the same way. A phasing-fault in the green matrix can be seen as a mutual difference in brightness between the green blocks of the colour bar.

8. Colour bar

Standard colour bar, with 75 % contrast and 100 % saturation, recommended by EBU. It provides an instant orientating check on the most important functions of the colour circuits.

9. Black bar with white crosses in the central area of the circle

The horizontal white line is composed of two TV lines, one in each field. As their scanning rhythm is contrary to that of the other horizontal white lines, it provides a very effective checking of the interlacing.
Any faulty interlacing appears as a deviating thickness of this horizontal white line, compared with the other horizontal white lines.
The white crosses provide a check on the convergence in the central area of the picture.
The centre white cross shows faults in the static convergence of the picture as well as indicating the centre of the picture.

10. Blocks of frequency gratings

Five blocks of gratings each consisting of vertical stripes corresponding to the following frequencies recommended by EBU:
= 0.8 – 1.8 – 2.8 – 3.8 – 4.8 MHz =
They provide checking of:

- Resolution and bandwidth. The gratings are sine-wave signals and should (possibly with the exception of the 4.8 MHz block) appear so that they extend in value from black to 75 % of white.
- Chroma bandwidth. On a colour receiver the 3.8 and 4.8 MHz blocks will show cross-colour. Both have a different spacing from the colour subcarrier (approx. 630 and 370 kHz resp.) and the absence of cross colour will show too narrow a chroma-bandwidth. If the locking between the subcarrier-frequency and the line frequency is correct, the cross colour in the 4.8 MHz-block will show a typically non-moving pattern.

11. Greyscale steps

Six rectangles of 0 % – 20 % – 40 % – 60 % – 80 % – 100 % video amplitude. The number of rectangles can be increased to eleven (10 %-steps) or decreased to five (25 %-steps).
In all cases there is a constant difference in brightness between the adjacent rectangles.
They provide checking of:

- the linearity of the transmission path.
  The adjacent rectangles should show a constant change in contrast.
- the greyscale tracking of a colour picture tube. The various rectangles should not show any colouring.

12. Black rectangle segment in the lower area of the circle

If this rectangle contains a white needle line, it serves the same purpose as mentioned in section 6. This rectangle could however be used with inserted white text for transmitter identification.

13. Yellow-Red-Yellow segment in the bottom area of the circle

75 % contrast – 100 % saturation colour transient, with high luminance steps.
It provides a check on transient performance and group-delay differences between luminance and chrominance.

14. Colour difference fields

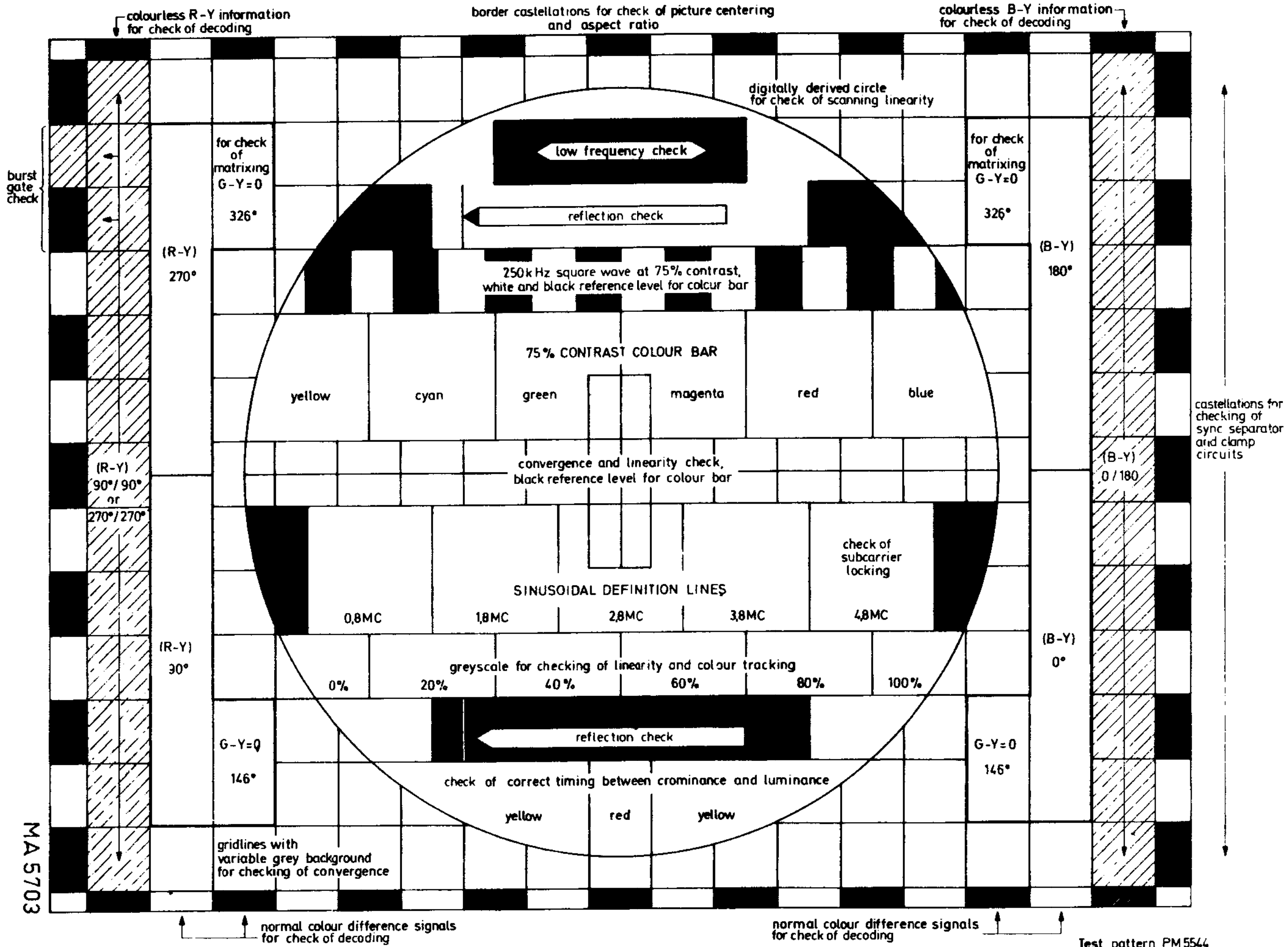
On the left and right hand side of the circle some fields with colour difference information are present. To prevent non-linear distortion in the transmission path having a different influence on the various signals, they have a constant luminance as well as a constant chrominance amplitude. Their lay-out and phasing may be derived from the figure in section "Operating the PM 5544".
They serve for indicating the proper function of the mains circuits in the chroma channel.
To the extreme left and right is a vertical bar with colour difference information which is line sequentially phase inverted (ALT-signals) before encoding. On a correctly aligned colour receiver they are **not** visible
The combination of normal and alternating colour difference areas provides a check on the performance of the colour decoding circuits of a receiver, in particular as regards the PAL properties.

In principle the following errors can be recognized in the picture:

- *Incorrect subcarrier phase to (R-Y) demodulator*
  This error causes a colouring of the extreme right-hand side bar "ALT (B-Y)".
- *Incorrect subcarrier phase to (B-Y) demodulator*
  This error causes a colouring of the extreme left hand side bar "ALT (R–Y)".
- *Incorrect subcarrier phase to both demodulators*
  This error causes a colouring of both bars at the extreme sides of the pattern (ALT-bars).
  Depending on the phasing, the colouring is bluish (left) and cyanic (right) or yellowish (left) and reddish (right).
- *Incorrect amplitude-ratio between direct and delayed signals of the PAL-delay line*
  This error causes "venetian blinds" in both bars at the sides of the pattern (ALT-bars)
  In the other bars (NORM bars), these "venetian blinds" will also be slightly noticeable.

- *Incorrect phase-relation between direct and delayed signals of the PAL-delay line*
  This error causes "venetian blinds" in all colour difference bars. In the bars at the sides (ALT bars) moreover there is a change in colouring.
- *Incorrect (G-Y) matrixing*
  - Switch off the green gun of the colour picture tube.
  - Increase the brilliance of the picture until the black parts of the pattern show a dark grey colour.
  - Vary the saturation of the picture while observing the former green block of the colour bar (3rd block from the left).

  It must be possible to obtain the same dark grey colour in this block as in the black areas.
  If the (R-Y) and (B-Y) and (G-Y) signals do not have the correct ratio the latter will not be possible.
- *Incorrect amplitude of (G-Y)*
  - Carry out the foregoing check; if the (R-Y) to (B-Y) signal – ratio is correct, switch on the green gun again and switch off the red and blue guns.
  - When varying the saturation, the four (G-Y) = 0 fields should remain constantly green. A change in brilliance of these green fields indicates that the matrixing of (G-Y) is incorrect.



Test pattern PM 5544 with 25 lines blanking

41

42

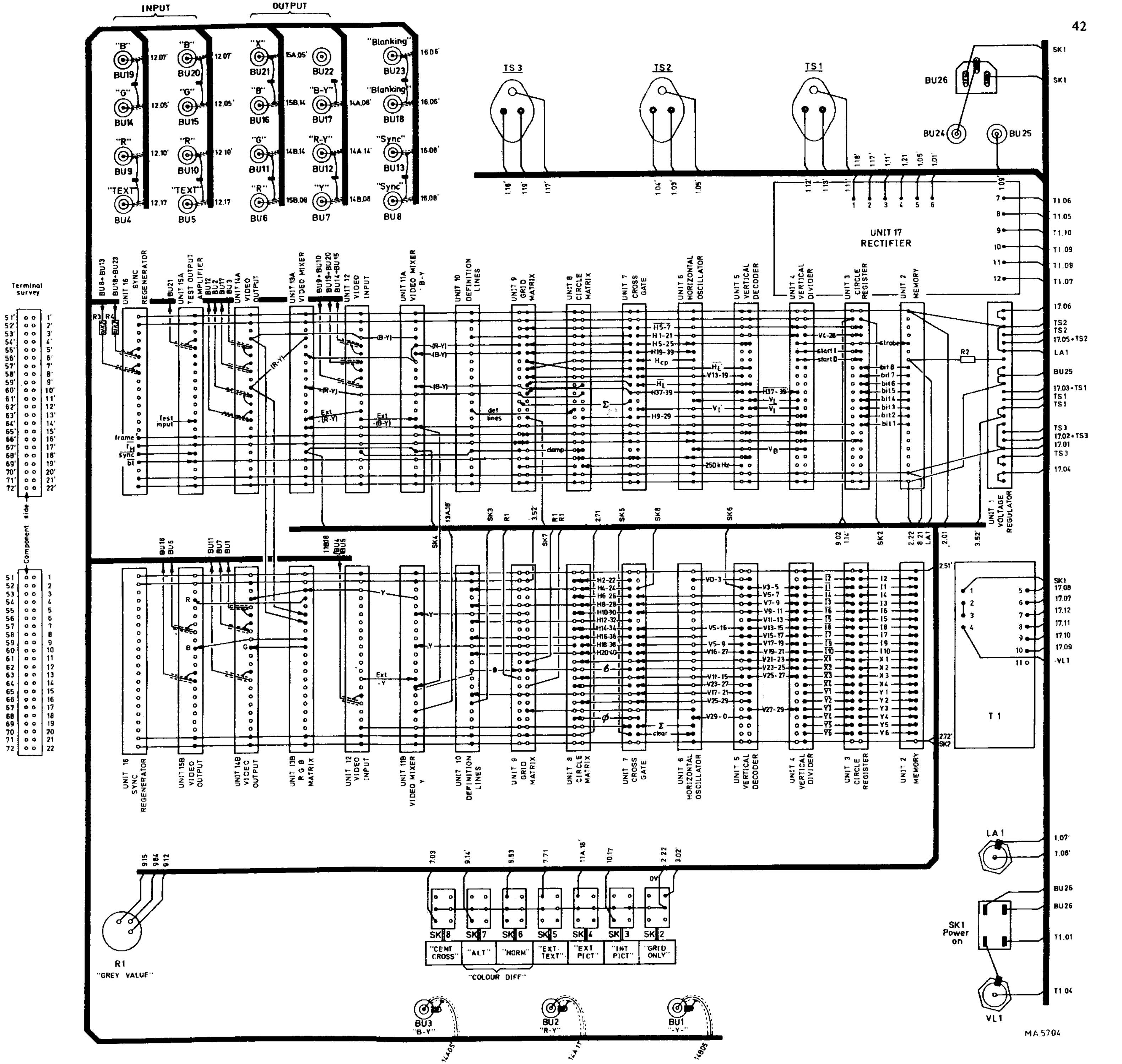


Fig. XI-1. Wiring diagram

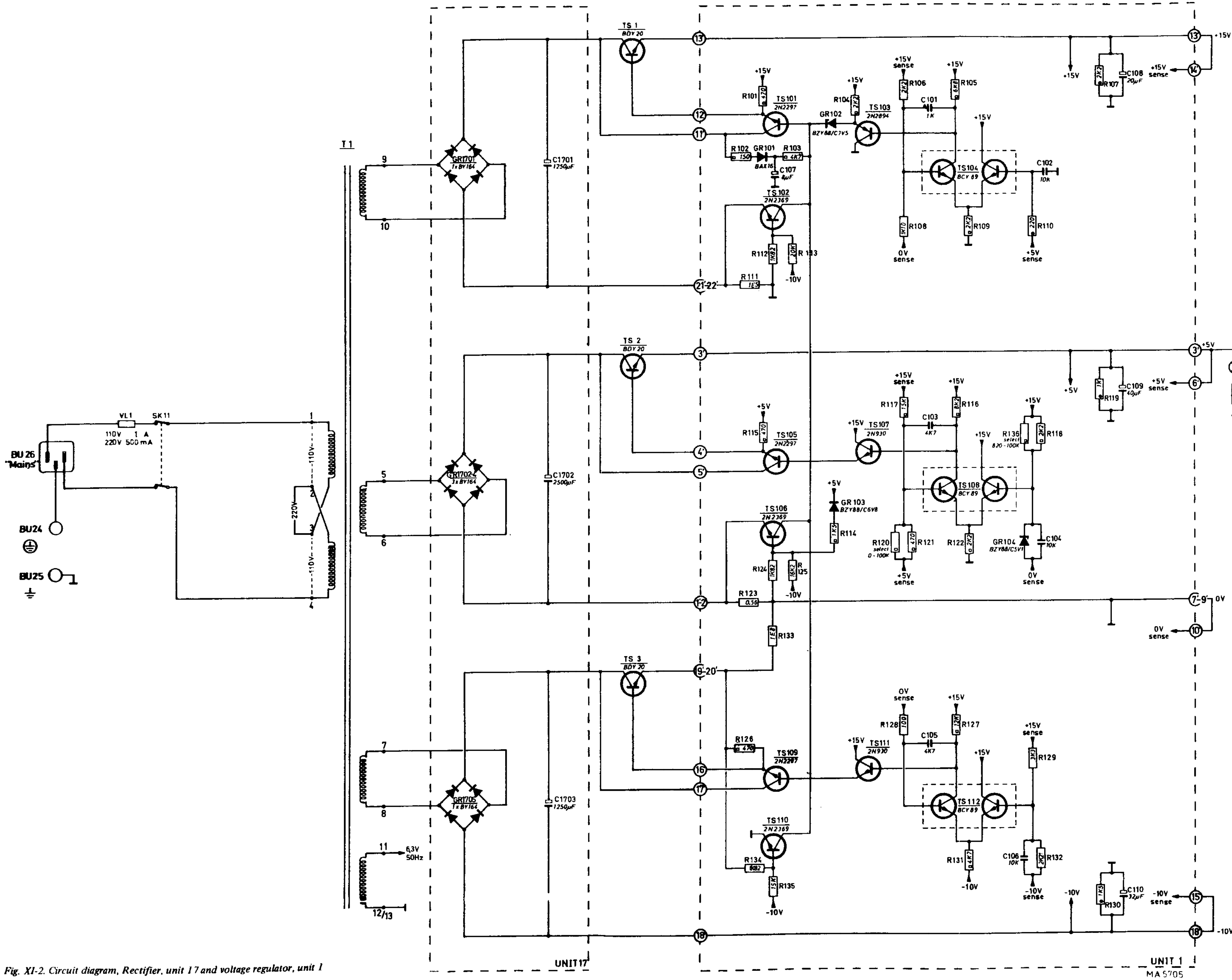


Fig. XI-2. Circuit diagram, Rectifier, unit 17 and voltage regulator, unit 1

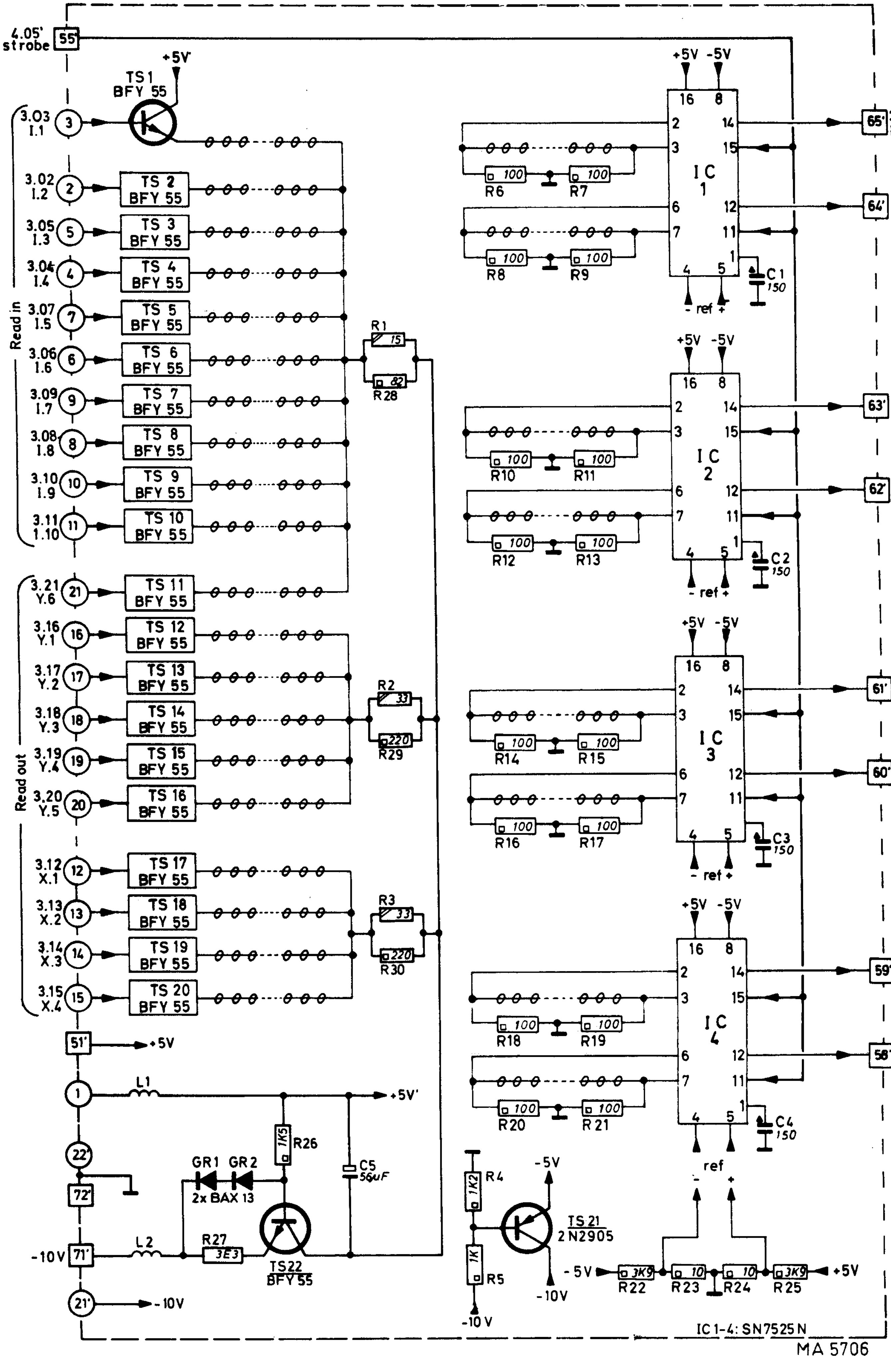


Fig. XI-3. Circuit diagram, Memory, unit 2

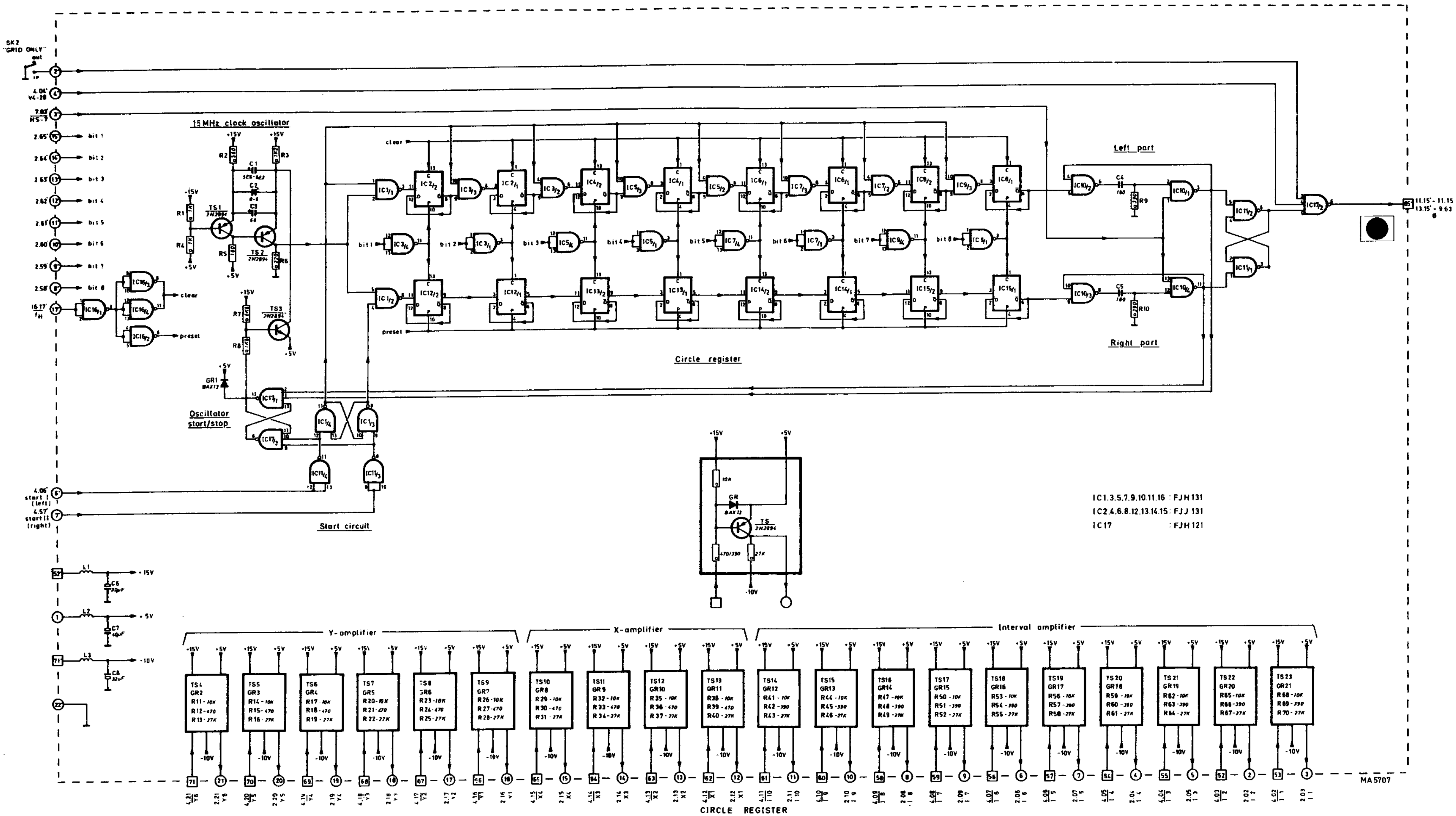


Fig. XI-4. Circuit diagram, Circle register, unit 3

STS

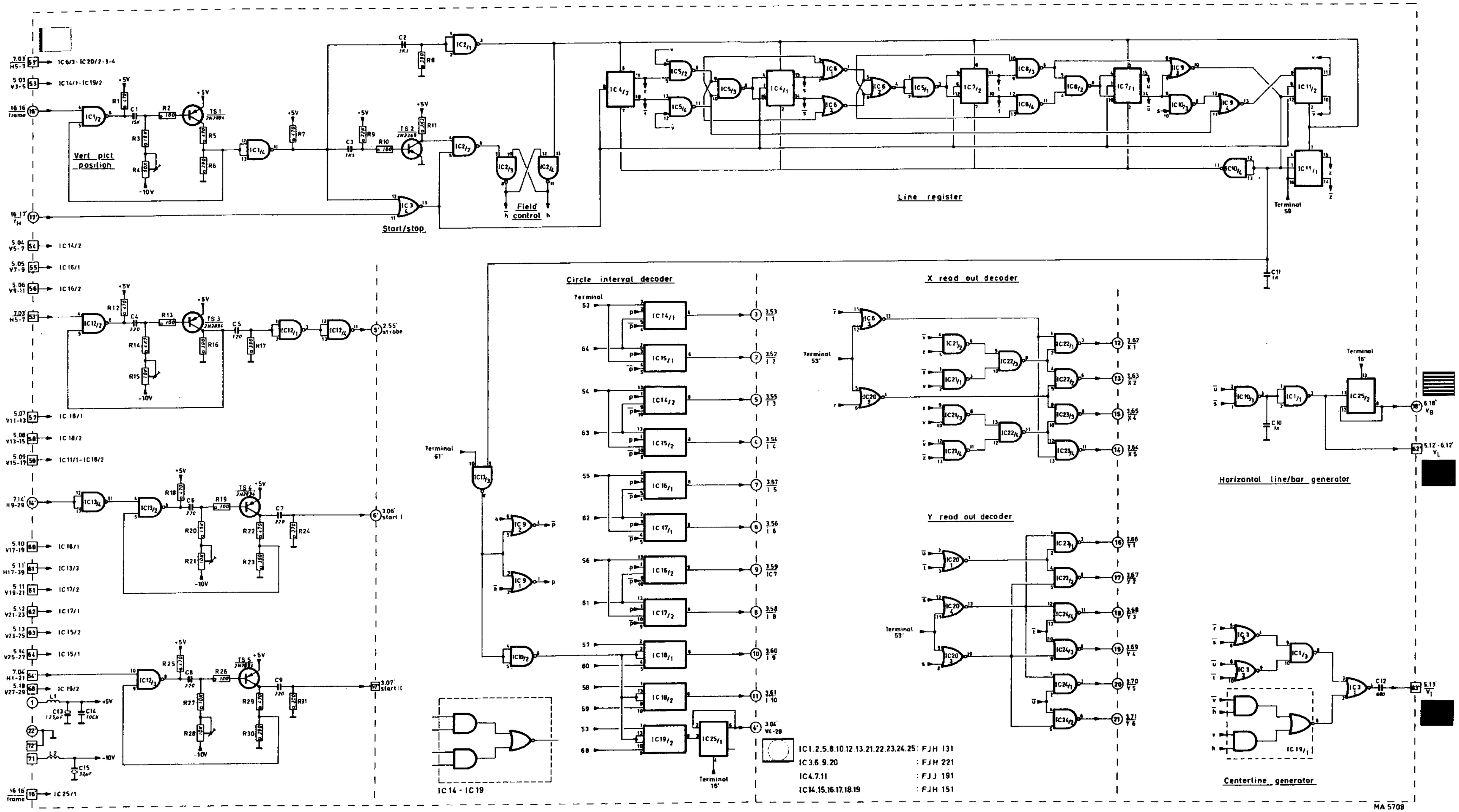


Fig. XI-5. Circuit diagram, Vertical divider, unit 4

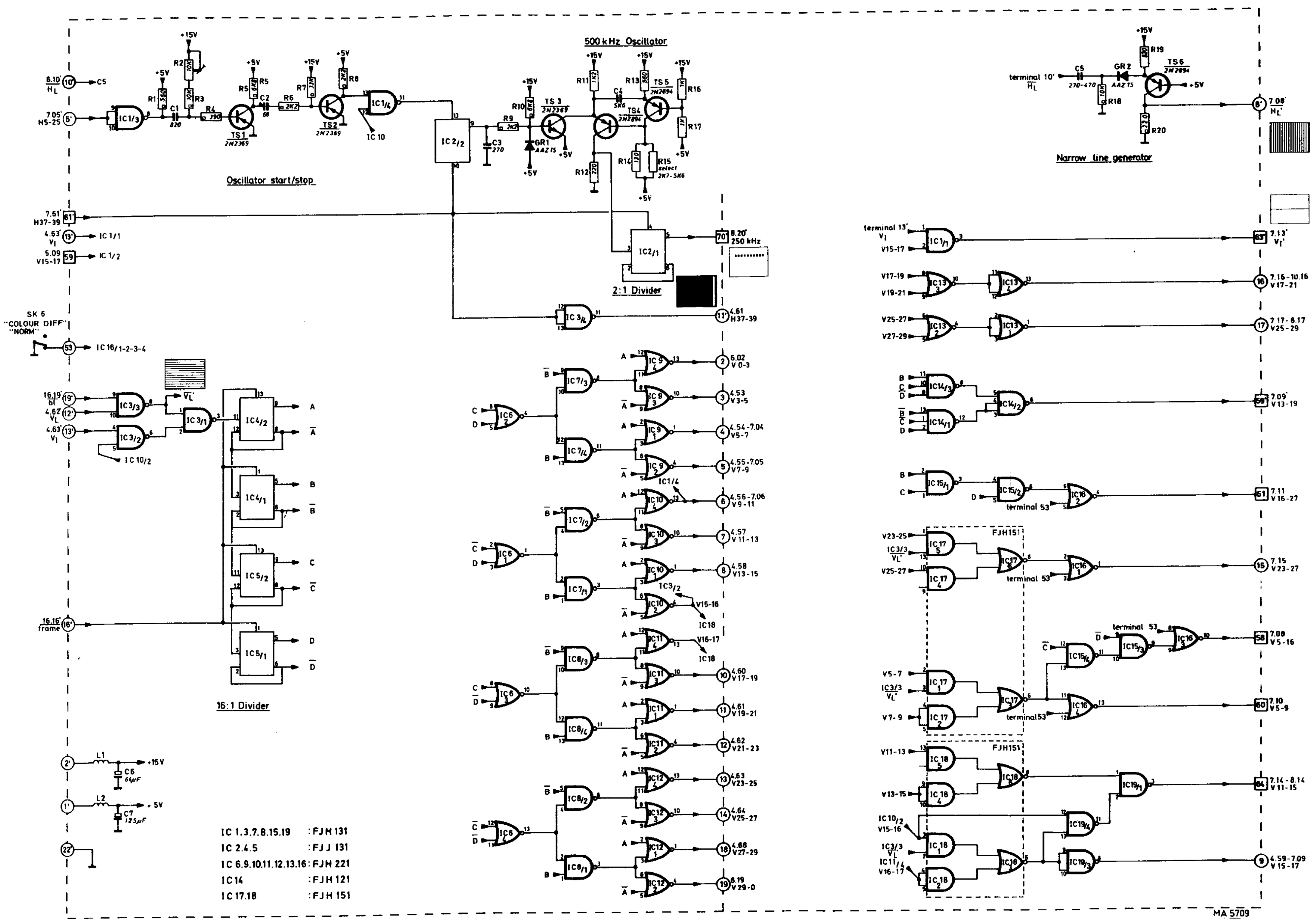


Fig. XI-6. Circuit diagram, Vertical decoder, unit 5

STS

65

STS

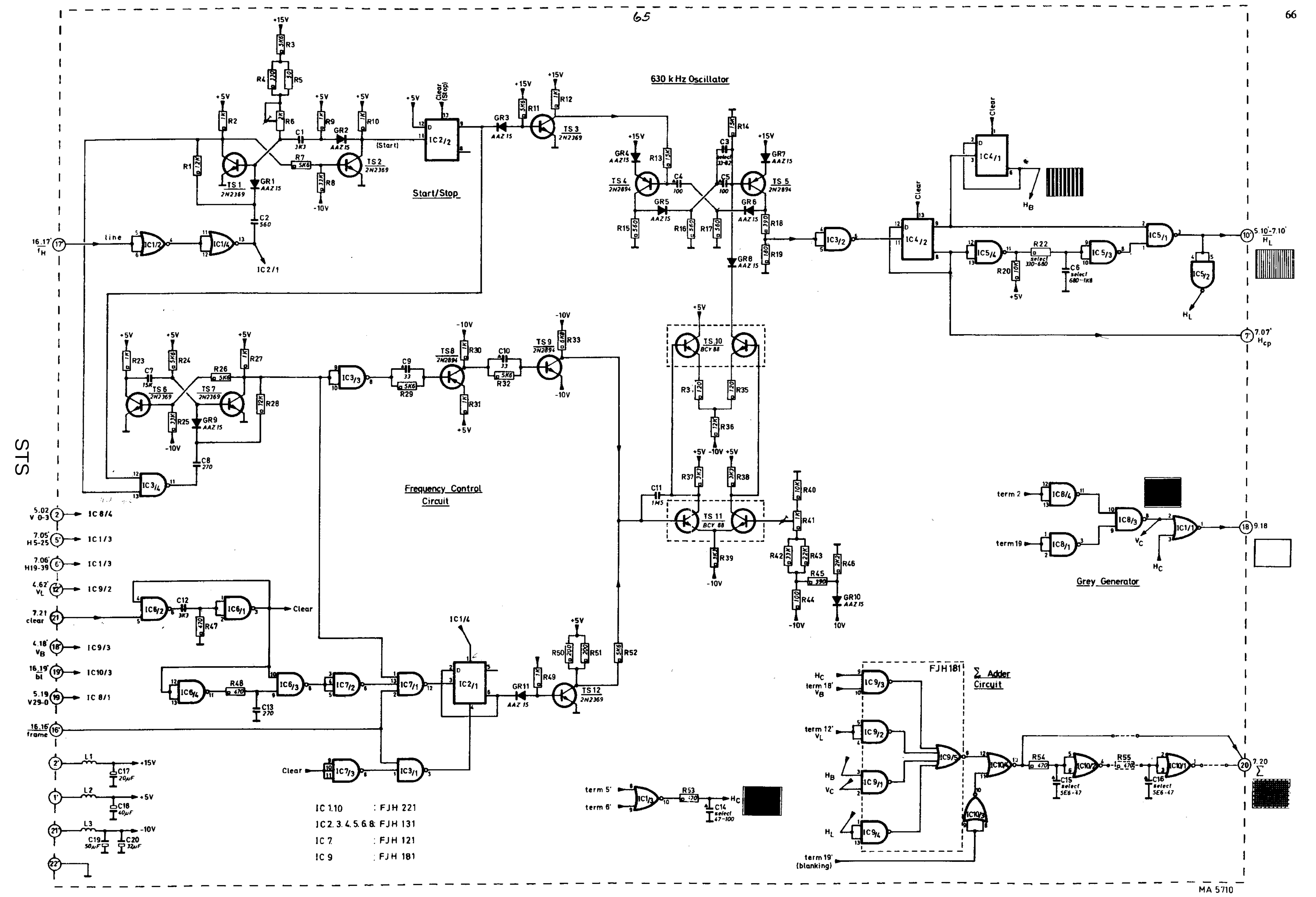


Fig. XI-7. Circuit diagram, Horizontal oscillator, unit 6

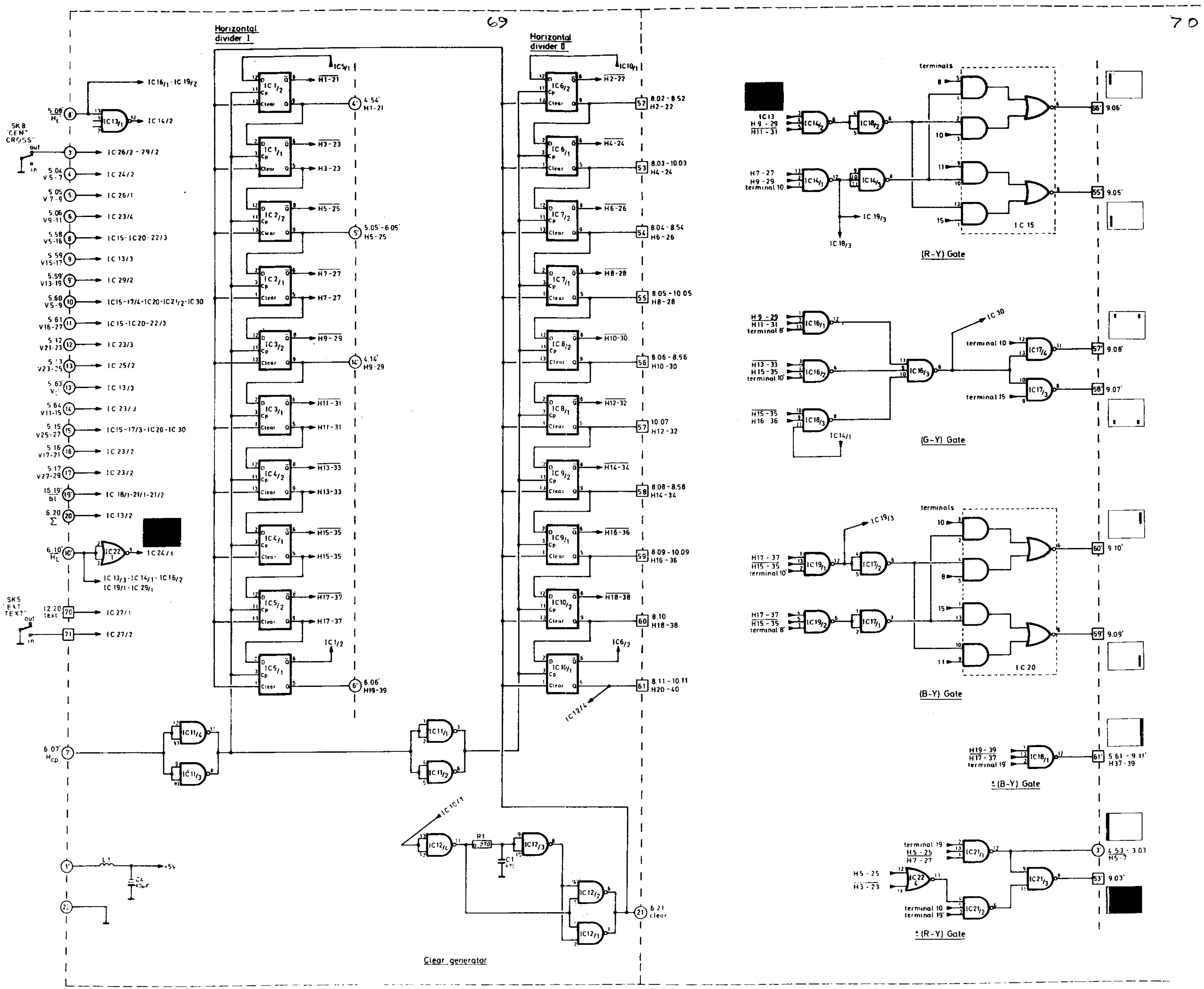
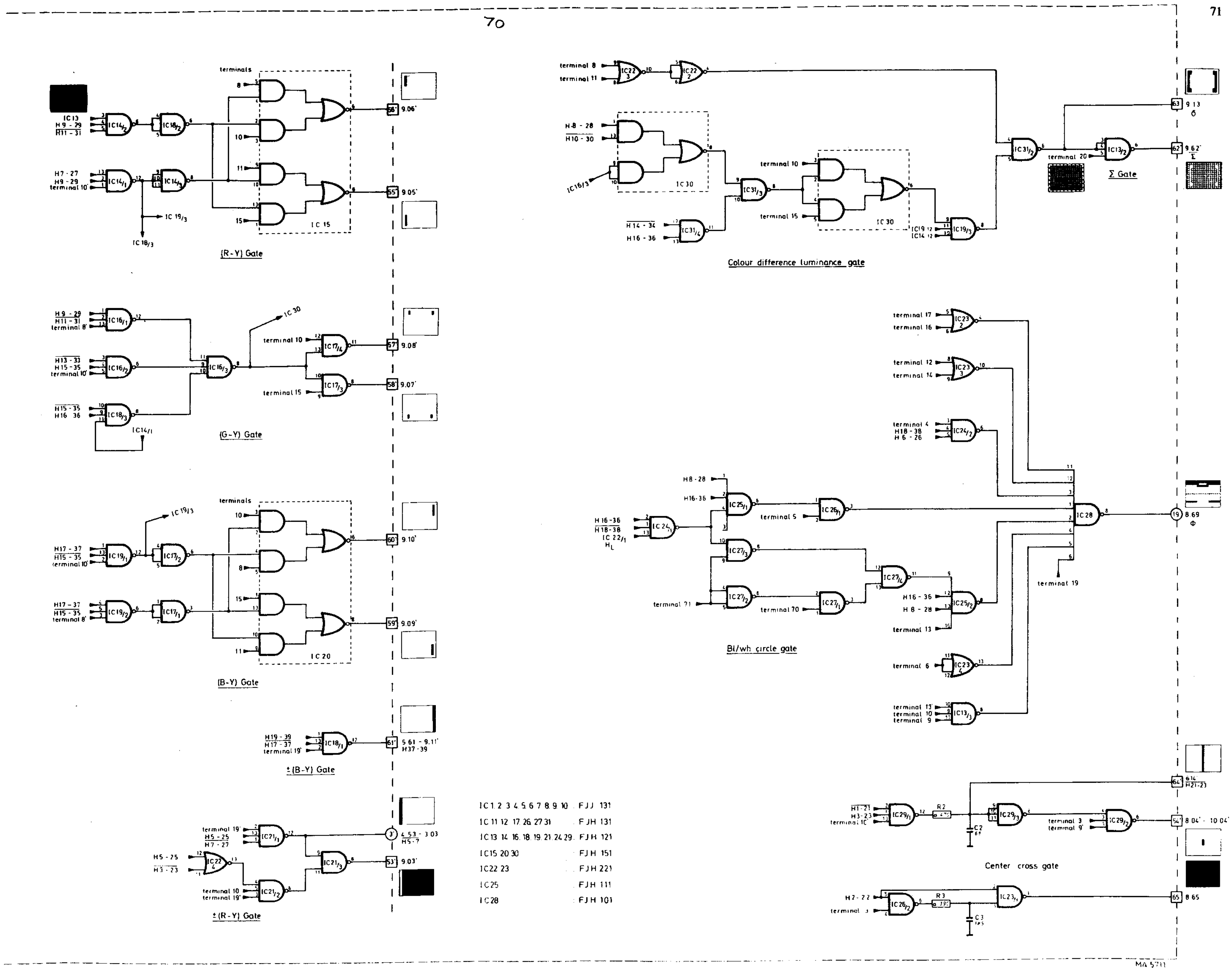


Fig. XI-8. Circuit diagram, Cross gate, unit 7



(R-Y) Gate
(G-Y) Gate
(B-Y) Gate
± (B-Y) Gate
± (R-Y) Gate
Colour difference luminance gate
Σ Gate
Bl/wh circle gate
Center cross gate
IC 15
IC 20
IC 30
9.06'
9.05'
9.08'
9.07'
9.10'
9.09'
5 61 - 9.11'
H37 - 39
4 53 - 3 03
9.03'
9 13
9.62'
8 69
8 14
H21-23
8 04' - 10 04'
8 65
IC 1 2 3 4 5 6 7 8 9 10 . FJJ 131
IC 11 12 17 26 27 31 . FJH 131
IC 13 14 16 18 19 21 24 29 . FJH 121
IC 15 20 30 . FJH 151
IC 22 23 . FJH 221
IC 25 . FJH 111
IC 28 . FJH 101
MA 5711

75

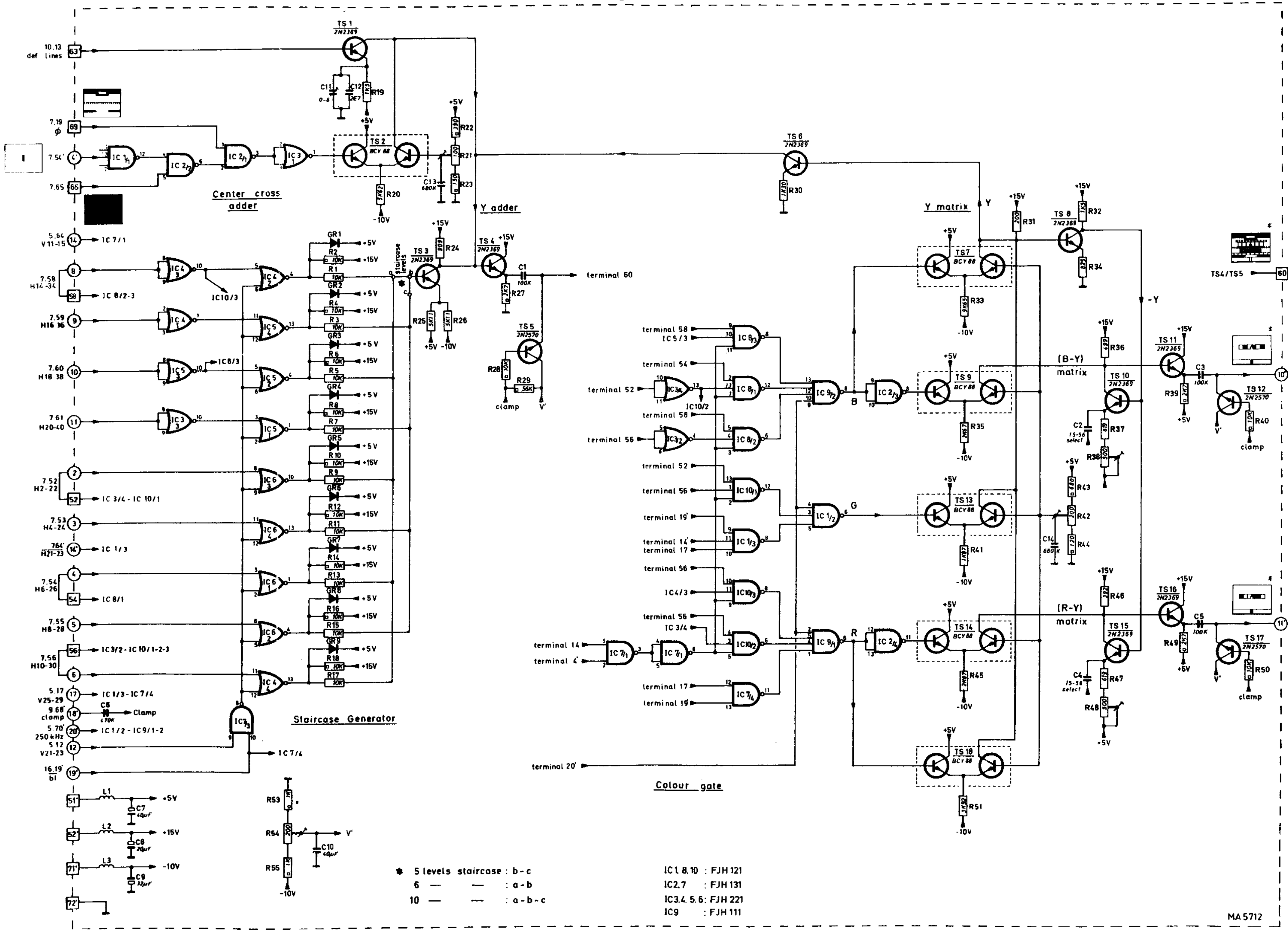


Fig. XI-9. Circuit diagram, Circle matrix, unit 8

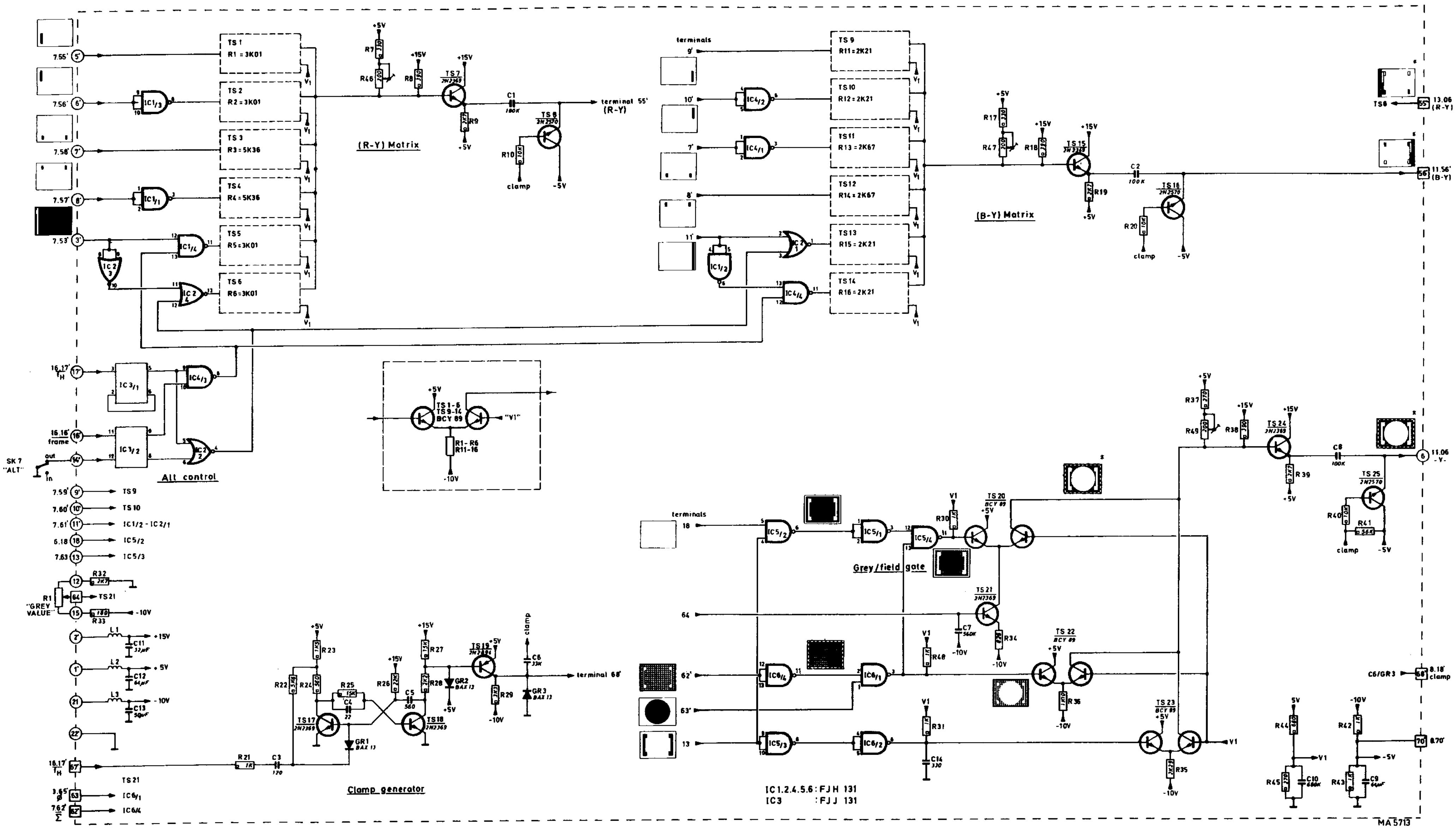


Fig. XI-10. Circuit diagram, Grid matrix, unit 9

STS

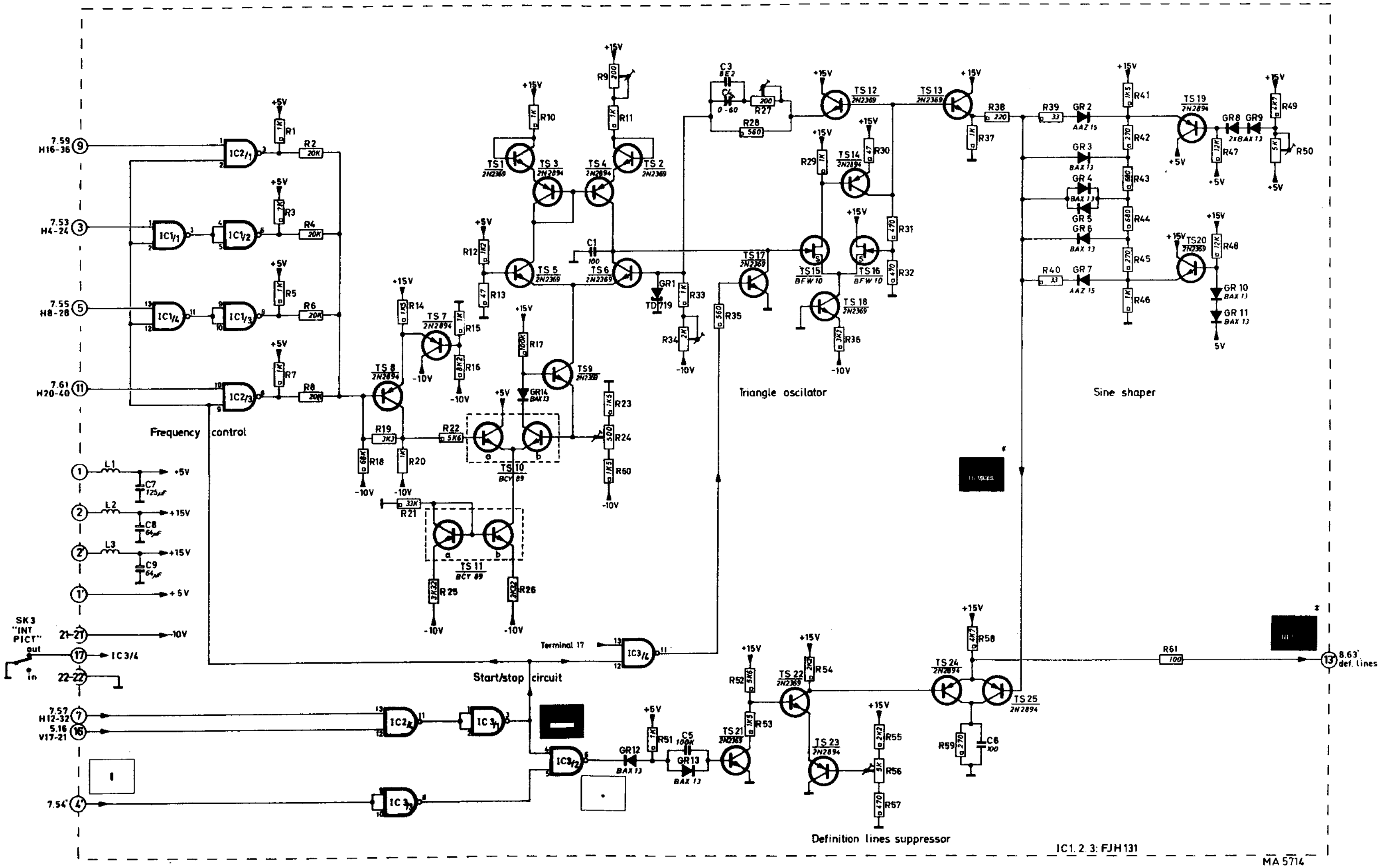


Fig. XI-11. Circuit diagram, Definition lines, unit 10

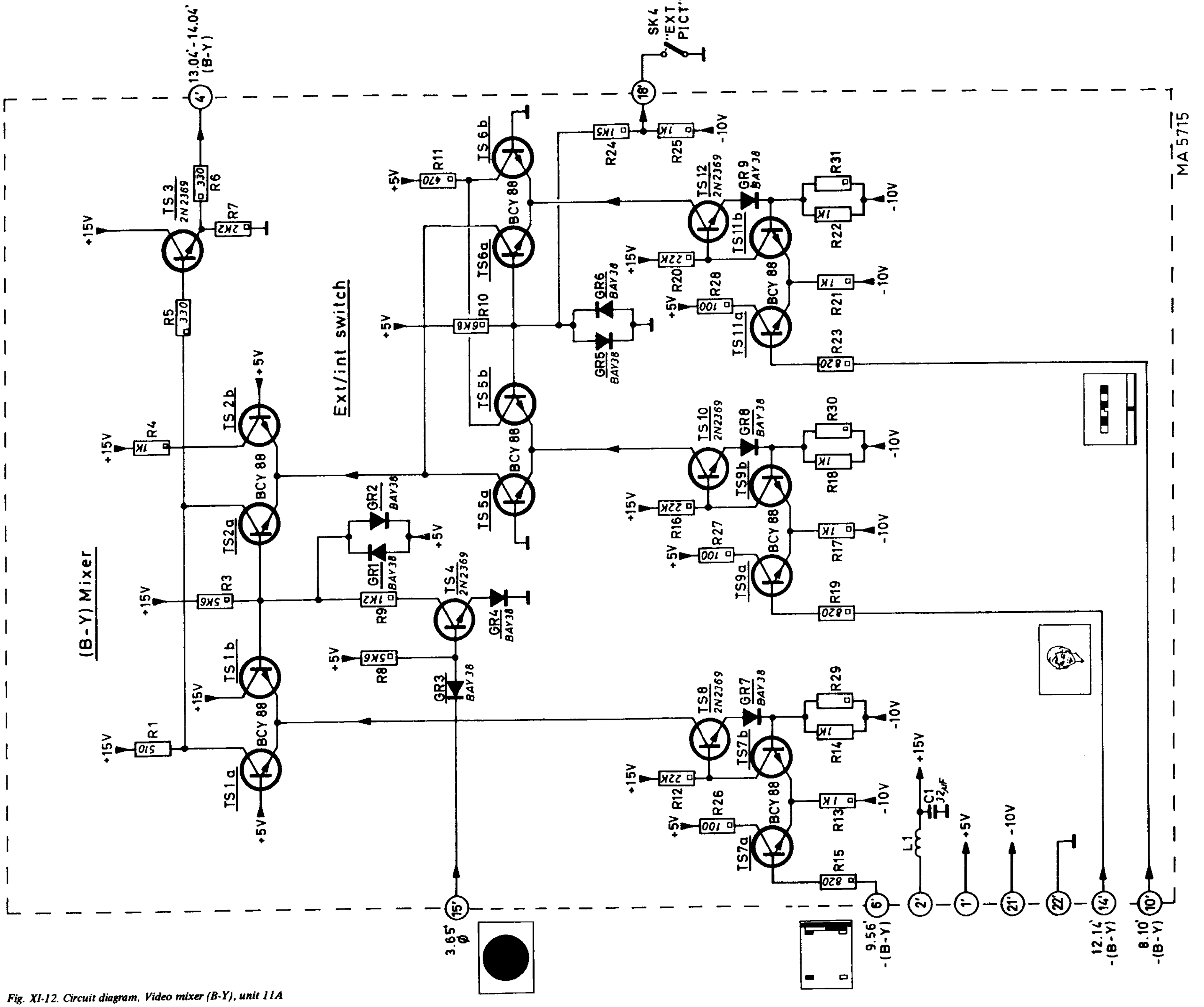


Fig. XI-12. Circuit diagram, Video mixer (B-Y), unit 11A

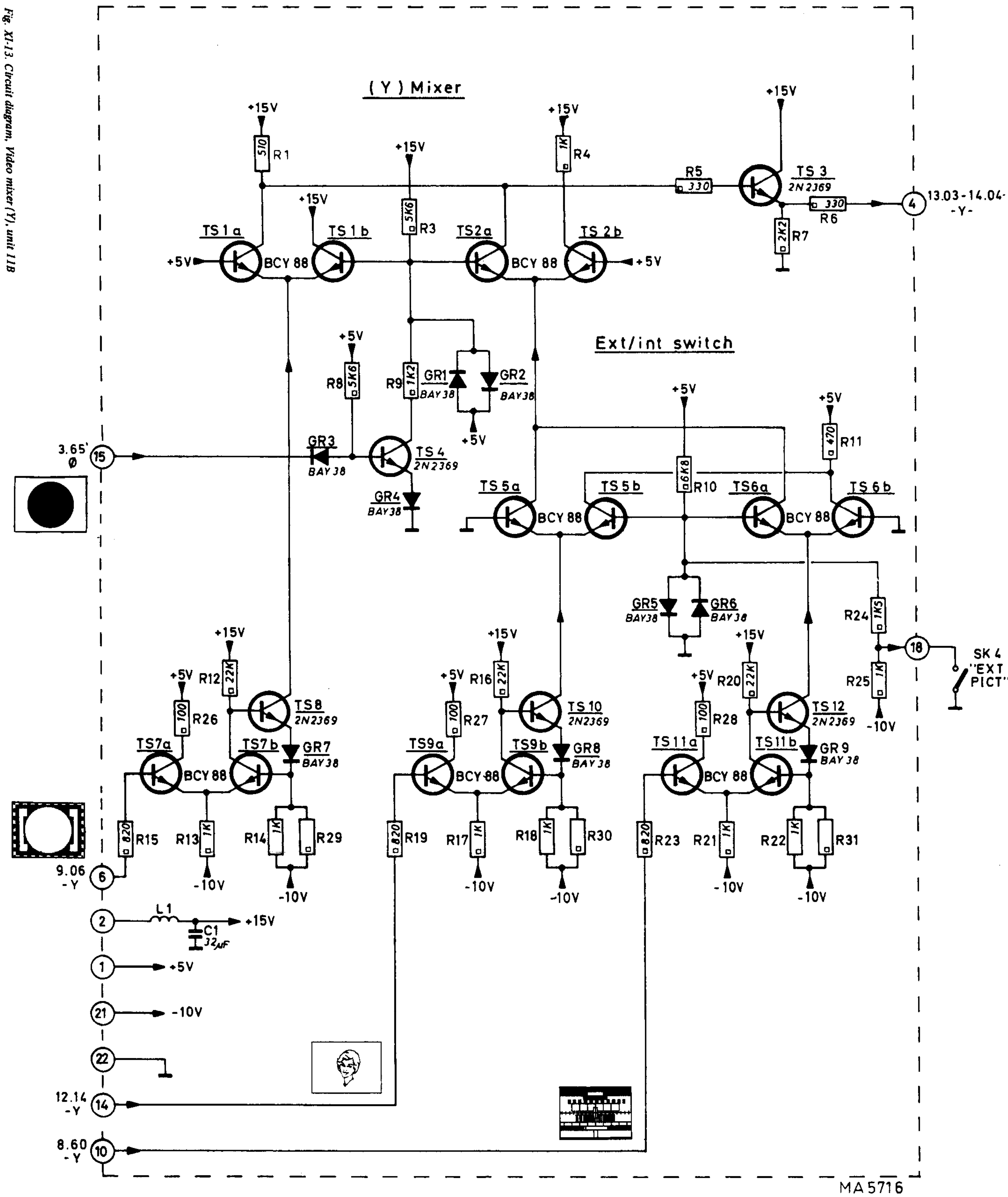


Fig. XI-13. Circuit diagram, Video mixer (Y), unit 11B

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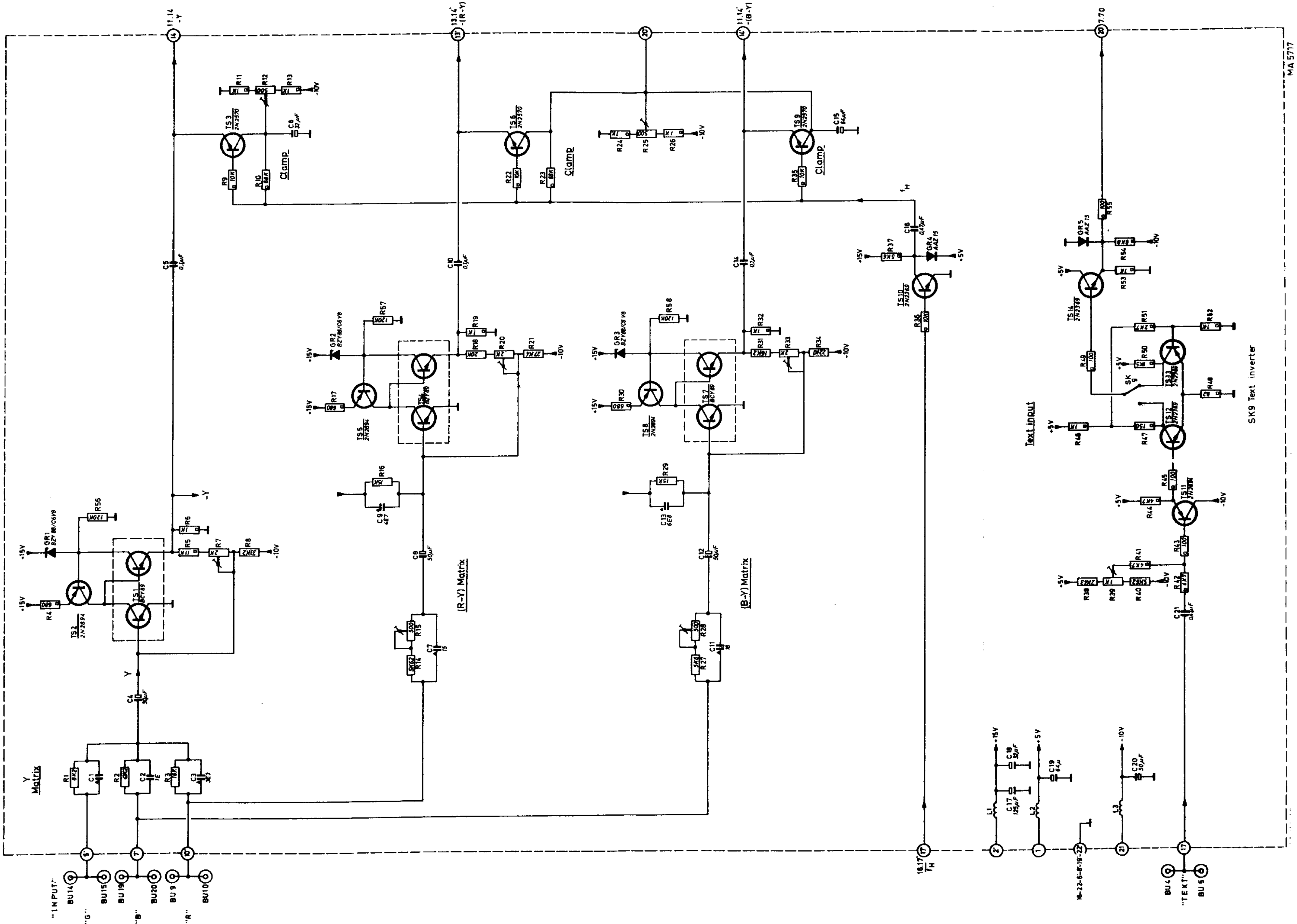


Fig. XI-14. Circuit diagram. Video input, unit 12

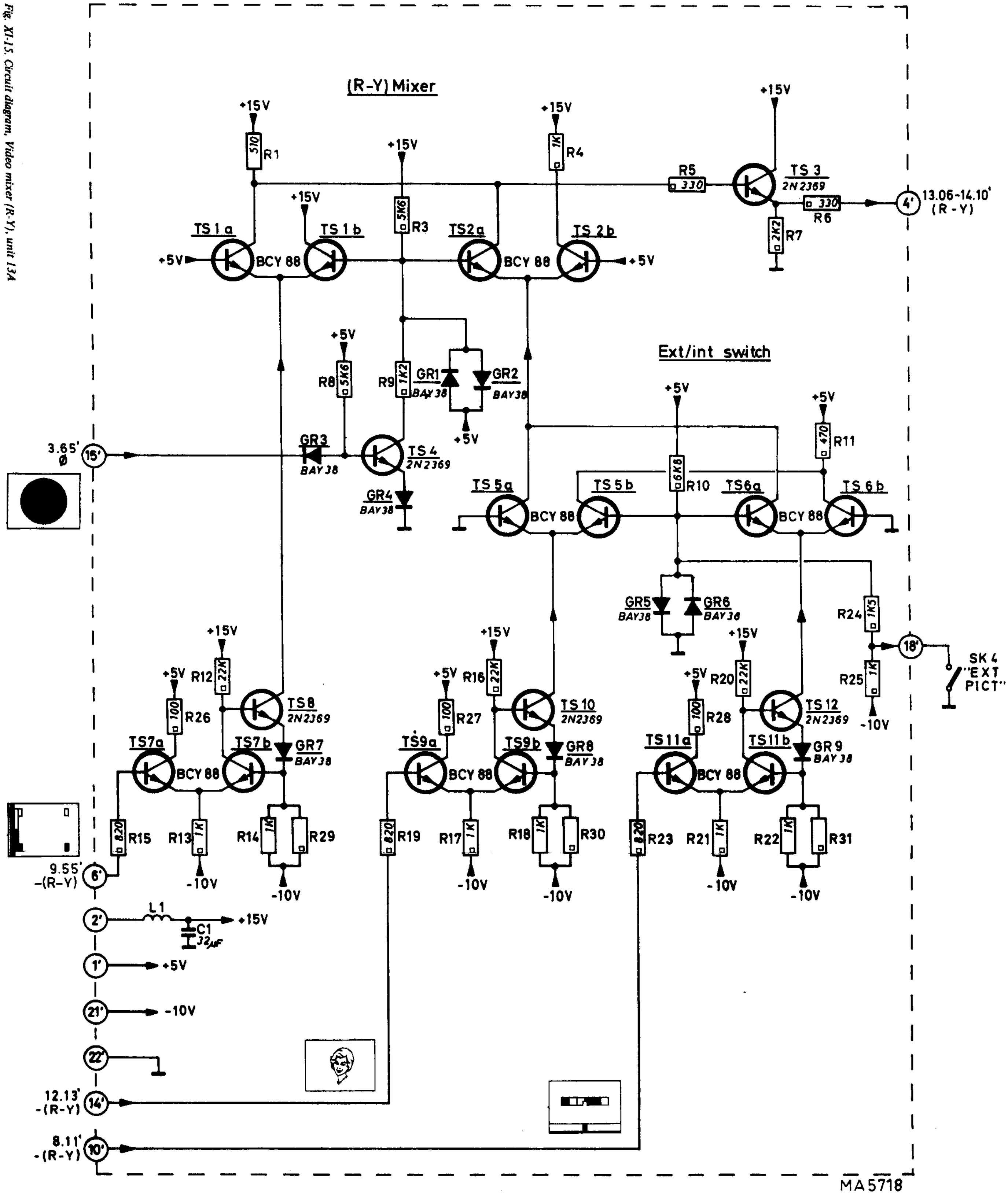
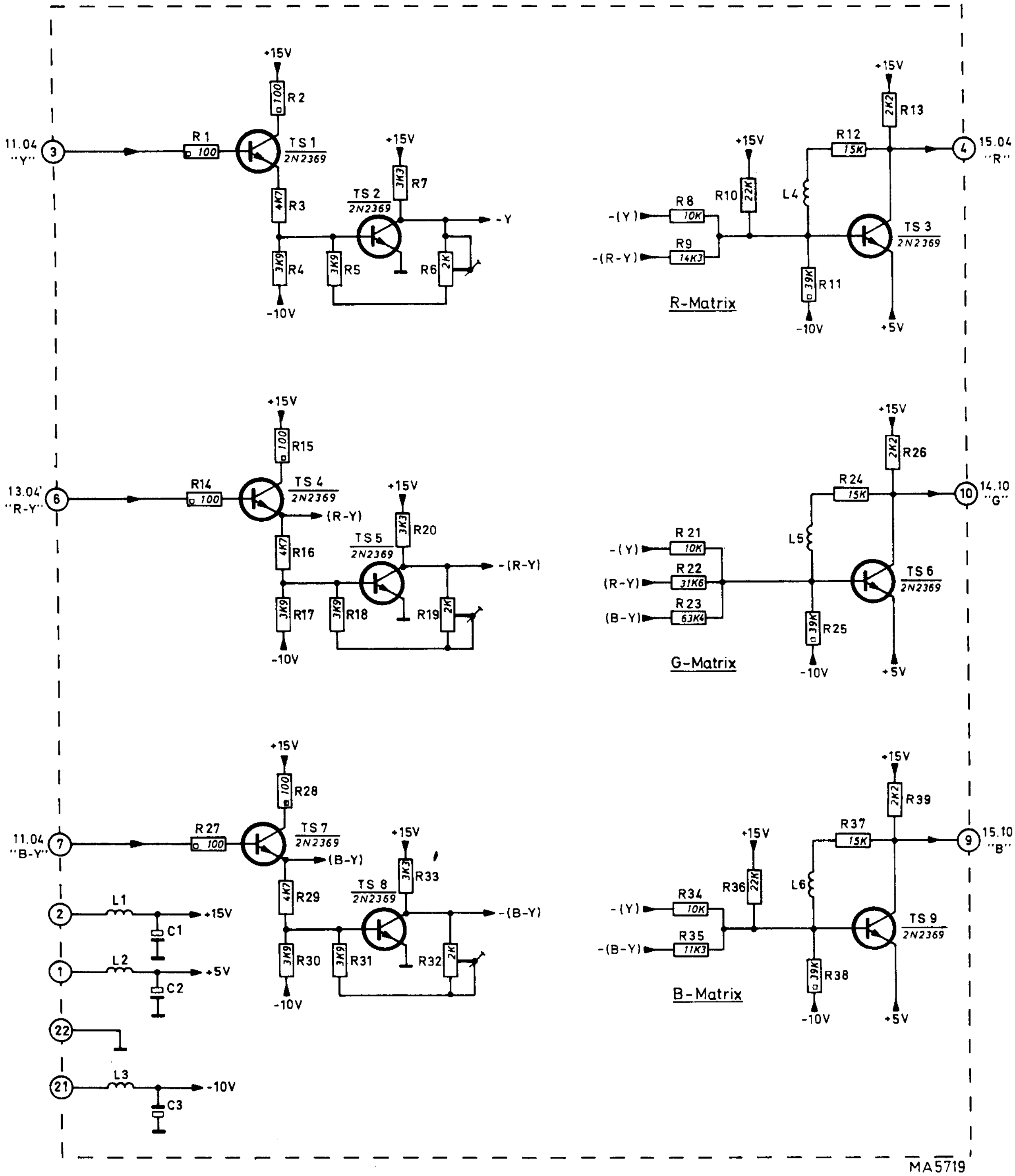


Fig. XI-15. Circuit diagram, Video mixer (R-Y), unit 13A

Fig. XI-16. Circuit diagram, R-G-B matrix, unit 13B



103

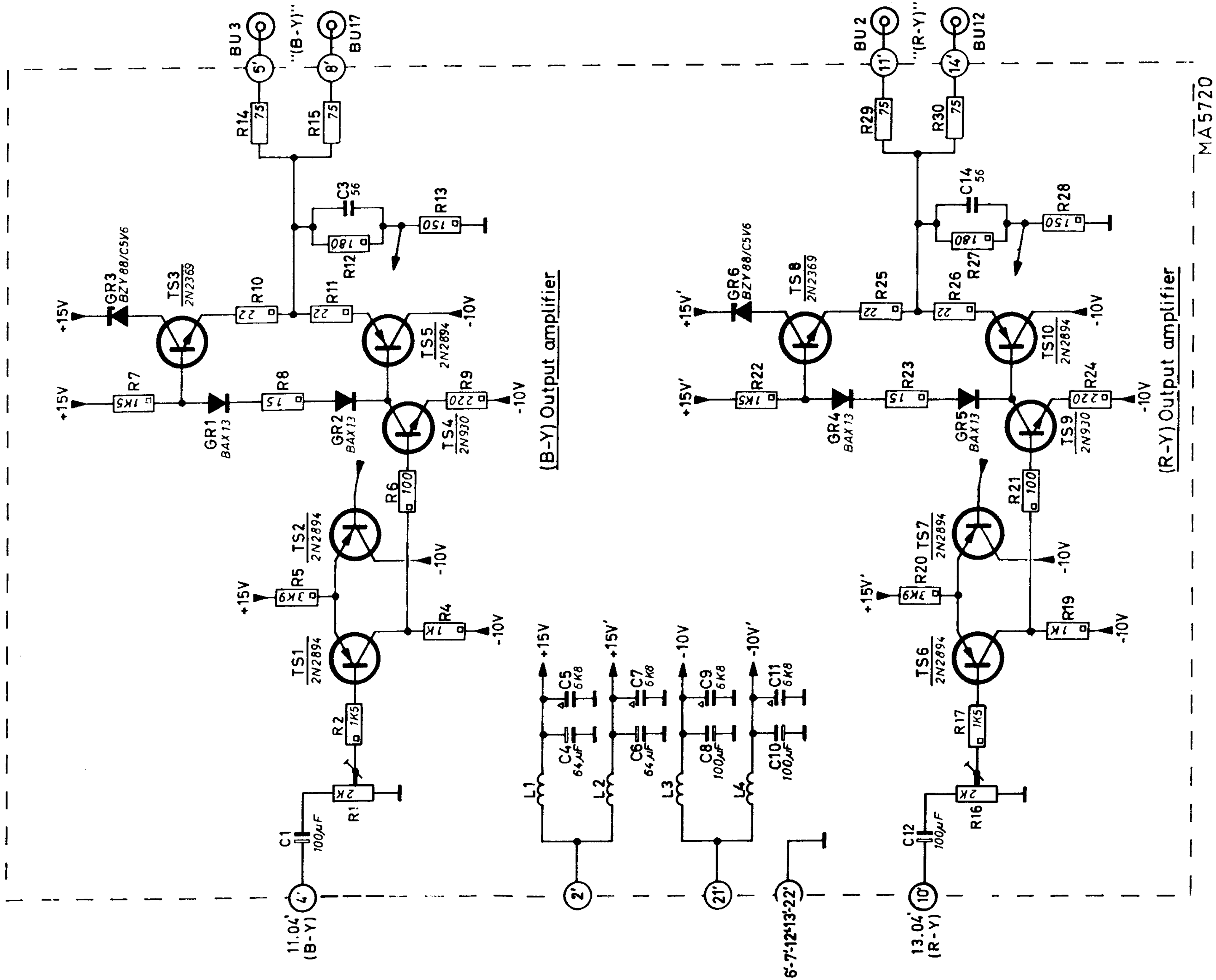


Fig. XI-17. Circuit diagram, Output amplifier, unit 14A

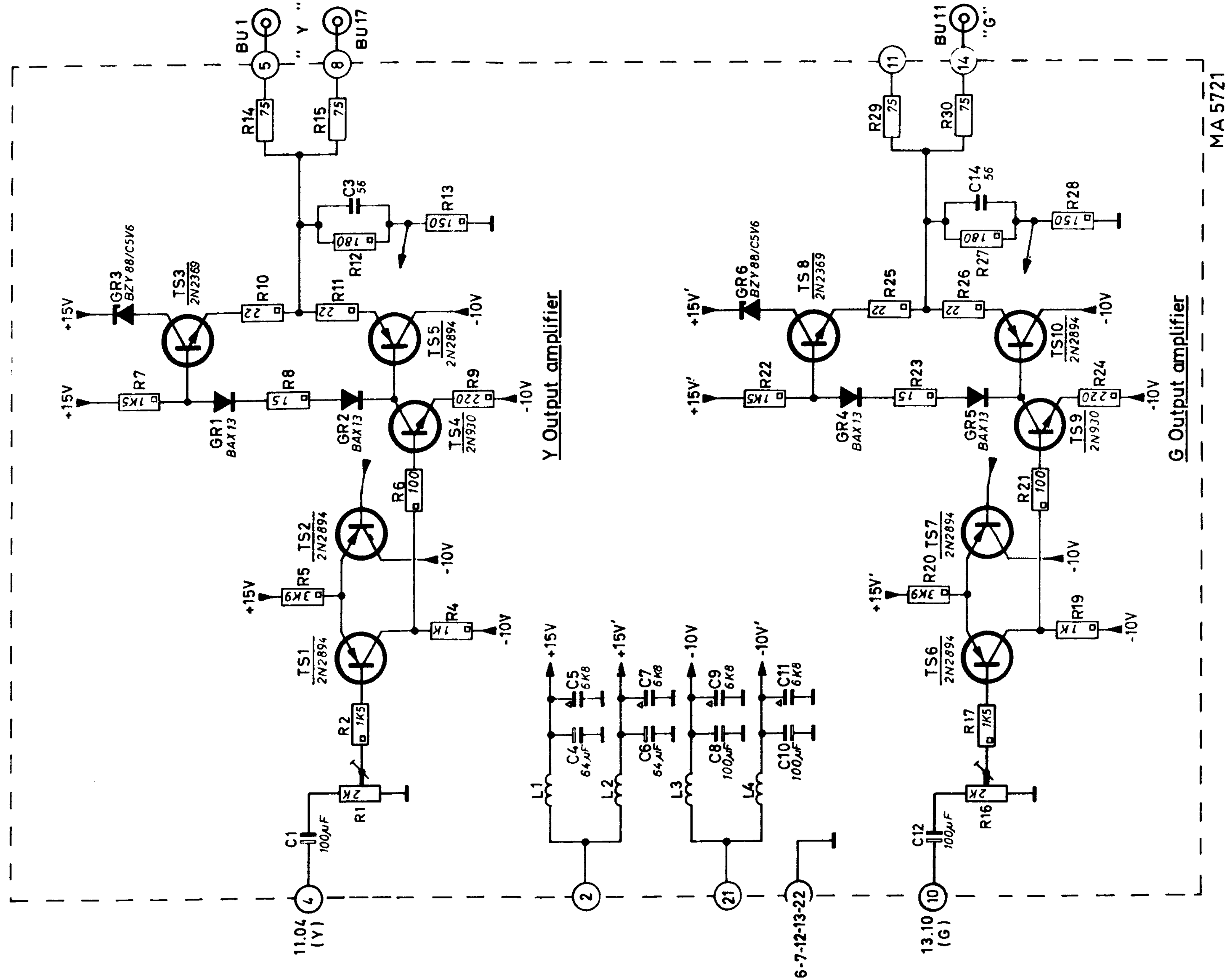


Fig. XI-18. Circuit diagram, Output amplifier, unit 14B

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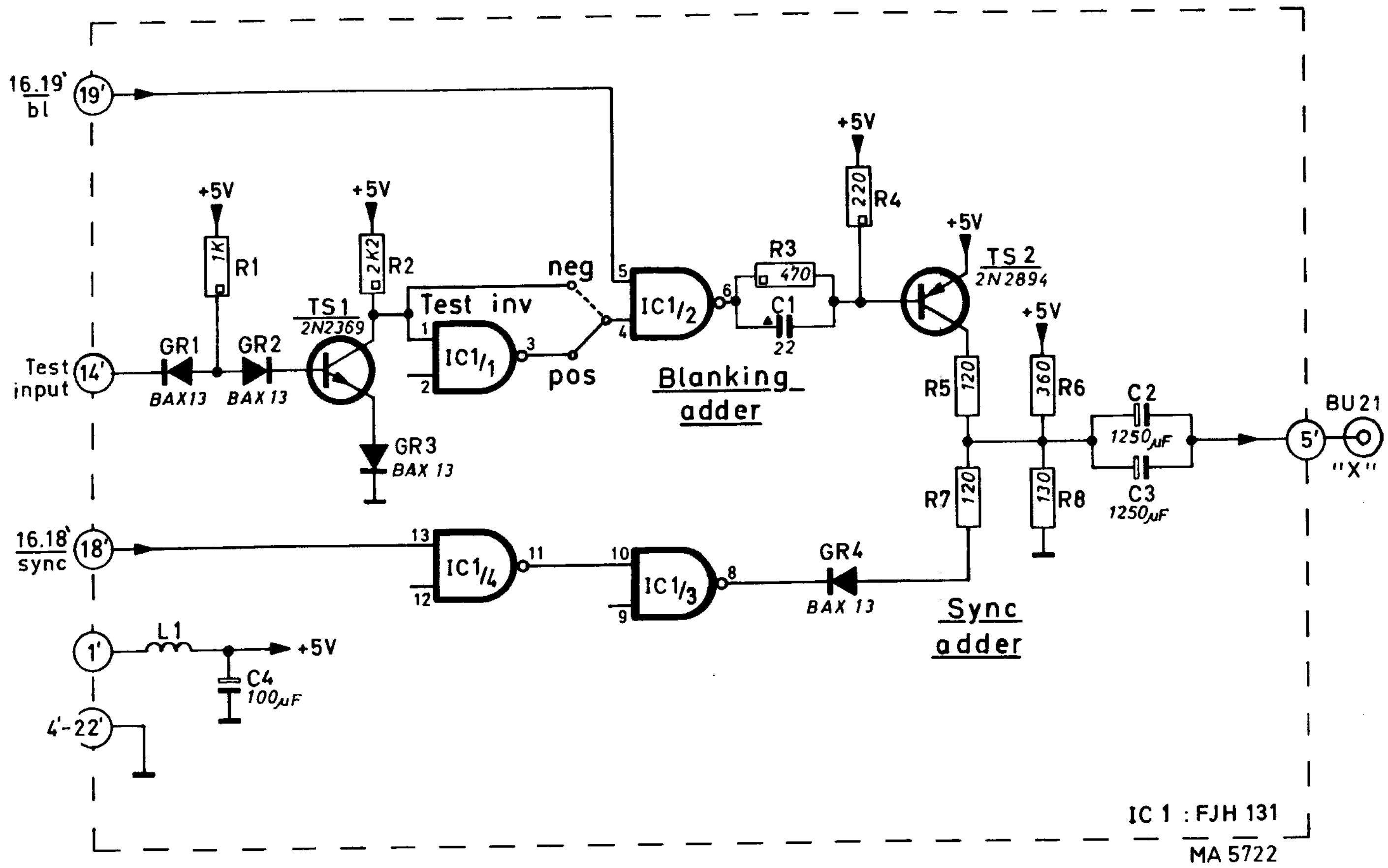

Fig. XI-19. Circuit diagram, Test output amplifier, unit 15A

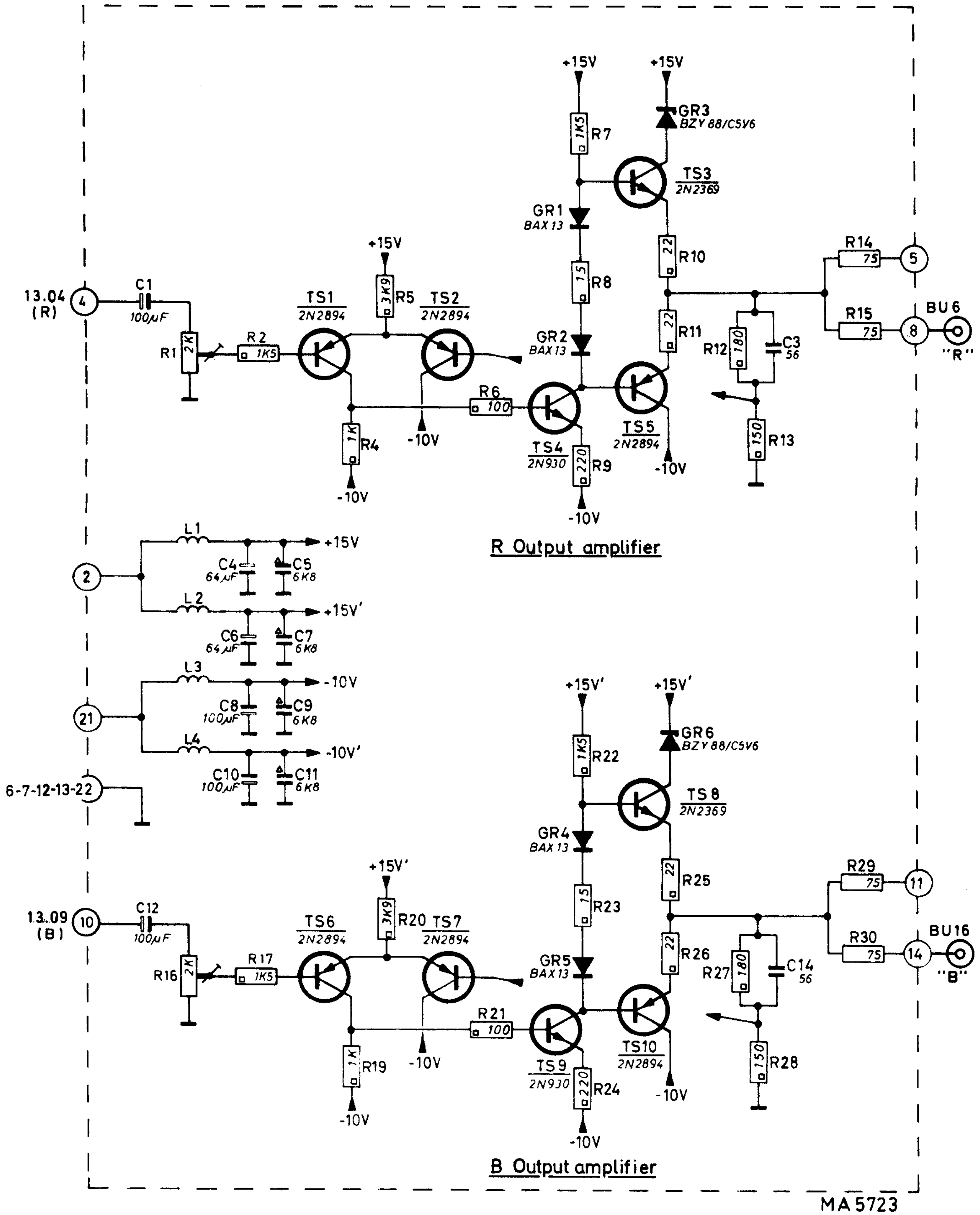

Fig. XI-20. Circuit diagram, Output amplifier, unit 15B

STS

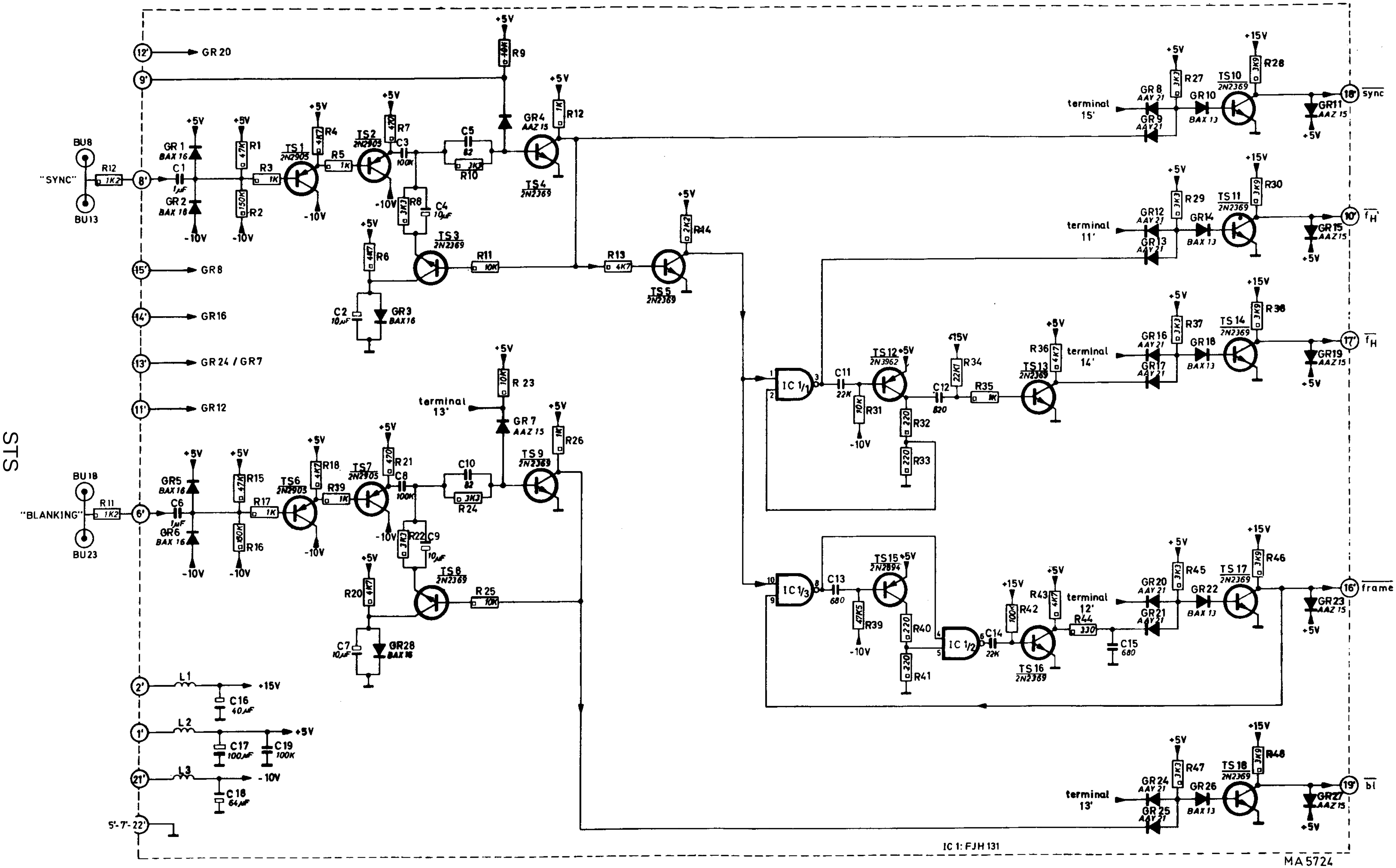

Fig. XI-21. Circuit diagram, Sync. regenerator, unit 16

XII.A. MECHANICAL PARTS

Description	Quantity	Ordering number
Textplate	1	4822 455 70102
Pushbutton switch	1	4822 276 70048
Mains switch	1	4822 277 10226
Fuseholder	1	4822 256 40039
BNC socket	23	4822 267 10004
Earth connector (chassis)	1	4822 290 40011
Earth connector (electrical)	1	4822 290 40012
Mains socket	1	4822 265 30066
Mains flex	1	4822 321 10071
Mains transformer	1	4822 146 30263
Terminating plug (75 Ω)	6	4822 263 60033
BNC connector (cable part)	10	4822 265 10003
Connector plate	5	4822 466 90687
Fuse 230 V/500 mA	1	4822 253 30017

B. ELECTRICAL — ELEKTRISCH — ELEKTRISCH — ELECTRIQUE — ELECTRICOS

This parts list does not contain multi-purpose and standard parts. These components are indicated in the circuit diagram by means of identification marks. The specification can be derived from the survey below.

Diese Ersatzteilliste enthält keine Universal- und Standard-Teile. Diese sind im jeweiligen Prinzipschaltbild mit Kennzeichnungen versehen. Die Spezifikation kann aus nachstehender Übersicht abgeleitet werden.

In deze stuklijst zijn geen universele en standaardonderdelen opgenomen. Deze componenten zijn in het principeschema met een merkteken aangegeven. De specificatie van deze merktekens is hieronder vermeld.

La présente liste ne contient pas des pièces universelles et standard. Celles-ci ont été repérées dans le schéma de principe. Leurs specifications sont indiquées ci-dessous.

Esta lista de componentes no comprende componentes universales ni standard. Estos componentes están provistos en el esquema de principio de una marca. El significado de estas marcas se indica a continuación.

Description	Specification
Carbon resistor E24 series Kohleschichtwiderstand, Reihe E24 Koolweerstand E24 reeks Résistance au carbone, série E24 Resistencia de carbón, serie E24	0,125 W 5%
Carbon resistor E12 series Kohleschichtwiderstand, Reihe E12 Koolweerstand E12 reeks Résistance au carbone, série E12 Resistencia de carbón, serie E12	1 W ≦ 2,2 MΩ, 5% > 2,2 MΩ, 10%
Carbon resistor E12 series Kohleschichtwiderstand, Reihe E12 Koolweerstand E12 reeks Résistance au carbone, série E12 Resistencia de carbón, serie E12	0,25 W ≦ 1 MΩ, 5% > 1 MΩ, 10%
Carbon resistor E12 series Kohleschichtwiderstand, Reihe E12 Koolweerstand E12 reeks Résistance au carbone, série E12 Resistencia de carbón, serie E12	2 W 5%
Carbon resistor E24 series Kohleschichtwiderstand, Reihe E24 Koolweerstand E24 reeks Résistance au carbone, série E24 Resistencia de carbón, serie E24	0,5 W ≦ 5 MΩ, 1% > 5 ≦ 10 MΩ, 2% > 10 MΩ, 5%
Wire-wound resistor Drahtwiderstand Draadgewonden weerstand Résistance bobinée Resistencia bobinada	0,4 – 1,8 W 0,5%
Carbon resistor E12 series Kohleschichtwiderstand, Reihe E12 Koolweerstand E12 reeks Résistance au carbone, série E12 Resistencia de carbón, serie E12	0,5 W ≦ 1,5MΩ, 5% > 1,5MΩ, 10%
Wire-wound resistor Drahtwiderstand Draadgewonden weerstand Résistance bobinée Resistencia bobinada	5,5 W ≦ 200 Ω, 10% > 200 Ω, 5%
Wire-wound resistor Drahtwiderstand Draadgewonden weerstand Résistance bobinée Resistencia bobinada	10 W 5%

Description	Voltage
Tubular ceramic capacitor Rohrkondensator Keramische kondensator, buistype Condensateur céramique tubulaire Condensador cerámico tubular	500 V
Polyester capacitor Polyesterkondensator Polyesterkondensator Condensateur au polyester Condensador polyester	400 V
Tubular ceramic capacitor Rohrkondensator Keramische kondensator, buistype Condensateur céramique tubulaire Condensador cerámico tubular	700 V
Flat-foil polyester capacitor Miniatur-Polyesterkondensator (flach) Platte miniatuur polyesterkondensator Condensateur au polyester, type plat Condensador polyester, tipo de placas planas	250 V
Ceramic capacitor, "pin-up" Keramikkondensator "Pin-up" (Perltyp) Keramische kondensator "Pin-up" type Condensateur céramique, type perle Condensador cerámico, versión "colgable"	500 V
Paper capacitor Papierkondensator Papierkondensator Condensateur au papier Condensador de papel	1000 V
"Microplate" ceramic capacitor Miniatur-Scheibenkondensator "Microplate" keramische kondensator Condensateur céramique "microplate" Condensador cerámico "microplaca"	30 V
Wire-wound trimmer Drahttrimmer Draadgewonden trimmer Trimmer à fil Trimmer bobinado	
Mica capacitor Glimmerkondensator Micakondensator Condensateur au mica Condensador de mica	500 V
Tubular ceramic trimmer Rohrtrimmer Buisvormige keramische trimmer Trimmer céramique tubulaire Trimmer cerámico tubular	

SERVICE

For multi-purpose and standard parts, please see PHILIPS' Service Catalogue.
Für die Universal- und Standard-Teile siehe den PHILIPS Service-Katalog.
Voor universele en standaardonderdelen raadplege men de PHILIPS Service Catalogus.
Pour les pièces universelles et standard veuillez consulter le Catalogue Service PHILIPS.
Para piezas universales y standard consulte el Catálogo de Servicio PHILIPS.

Printpanels

Unit	Quantity	Description	Print number	Ordering number
1	1	Voltage regulator	4008 108 75120	4822 216 60153
2	1	Memory	4008 108 75130	4822 216 60154
3	1	Circle register	4008 108 75140	4822 216 60155
4	1	Vertical divider	4008 108 75150	4822 216 60156
5	1	Vertical decoder	4008 108 75160	4822 216 60157
6	1	Horizontal oscillator	4008 108 75170	4822 216 60158
7	1	Cross gate	4008 108 75180	4822 216 60159
8	1	Circle matrix	4008 108 75190	4822 216 60161
9	1	Grid matrix	4008 108 75200	4822 216 60162
10	1	Definition lines	4008 108 75210	4822 216 60163
11A	1	Video mixer (B-Y)	4008 108 75220	4822 216 60164
11B	1	Video mixer (Y)	4008 108 75220	4822 216 60164
12	1	Video input	4008 108 75230	4822 216 60165
13A	1	Video mixer (R-Y)	4008 108 75220	4822 216 60164
13B	1	R-G-B matrix	4008 108 75240	4822 216 60166
14A	1	Output amplifier	4008 108 75250	4822 216 60167
14B	1	Output amplifier	4008 108 75250	4822 216 60167
15A	1	Test amplifier	4008 108 75260	4822 216 60168
15B	1	Output amplifier	4008 108 75250	4822 216 60167
16	1	Sync. regenerator	4008 108 75370	4822 216 60169
17	1	Rectifier unit	4008 108 75380	4822 216 60171
	2	Extension board	4008 108 75570	4822 466 10216

Semiconductors

Type	Ordering number
2N930	4822 130 40051
2N2297	4822 130 40131
2N2369	4822 130 40407
2N2570	4822 130 40181
2N2894	4822 130 40018
2N2905	4822 130 40444
2N3055	4822 130 40132
BCY88	4822 130 30187
BCY89	4822 130 30188
BFW10 (pair)	4822 130 40719
BFY55	4822 130 40323

Type	Ordering number
AAY21	4822 130 30087
AAZ15	4822 130 30229
AEY27	4822 130 30017
BAX13	4822 130 40182
BAX16	4822 130 30273
BY164	4822 130 30414
BZY88/C5V1	4822 130 30284
BZY88/C5V6	4822 130 30193
BZY88/C6V8	4822 130 30079
BZY88/C7V5	4822 130 30287

Integrated circuits

Type	Ordering number
FJH 101	4822 209 80106
FJH 111	4822 209 80024
FJH 121	4822 209 80062
FJH 131	4822 209 80023
FJH 151	4822 209 80125
FJH 181	4822 209 80131
FJH 221	4822 209 80128
FJJ 131	4822 209 80065
FJJ 191	4822 209 80127
SN 7525 N	4822 209 80129

Diagram number	Description	Value	Watt/Volt	Ordering number
R1	Potentiometer			4822 103 20094
Unit 1				
C1	Capacitor	1 kpF		4822 120 21107
C7	Electrolytic capacitor	8 μF	40 V	4822 124 10083
C8	Electrolytic capacitor	20 μF	16 V	4822 124 10008
C9	Electrolytic capacitor	40 μF	6.4 V	4822 124 10011
C10	Electrolytic capacitor	32 μF	10 V	4822 124 10062
R6, R32	Resistor	2.21 kΩ	1 %	4822 116 50532
R8	Resistor	1.10 kΩ	1 %	4822 116 50518
R12, R24, R34	Resistor	1.82 kΩ	1 %	4822 116 50781
R13	Resistor	20 kΩ	1 %	4822 116 50332
R17, R35	Resistor	15.0 kΩ	1 %	4822 116 50663
R25	Resistor	16.2 kΩ	1 %	4822 116 50593
R28	Resistor	100 kΩ	1 %	4822 116 50746
R29	Resistor	3.3 kΩ	1 %	4822 116 50404
Unit 2				
	Sub memory assy			4822 216 60181
L1, L2	Coil			4822 158 10052
C1 ... C4	Capacitor	150 pF		4822 122 30002
C5	Electrolytic capacitor	56 μF	16 V	4822 124 10068
R27	Resistor	3.3 Ω	10 %	4822 113 60072
Unit 3				
L1 ... L3	Coil			4822 158 10052
C4, C5	Capacitor	180 pF		4822 121 50416
C6	Electrolytic capacitor	20 μF	16 V	4822 124 10008
C7	Electrolytic capacitor	40 μF	6.4 V	4822 124 10011
C8	Electrolytic capacitor	32 μF	10 V	4822 124 10062
R5	Resistor	182 Ω	1 %	4822 116 50754
Unit 4				
L1, L2	Coil			4822 158 10052
C1	Capacitor	15 kpF		4822 121 40301
C2	Capacitor	3.3 kpF	1 %	4822 121 50085
C3	Capacitor	1.5 kpF	1 %	4822 121 50432
C4, C6 ... C9	Capacitor	220 pF	1 %	4822 121 50371
C5	Capacitor	120 pF	1 %	4822 121 50439
C10, C11	Capacitor	1 kpF	2 %	4822 122 30027
C12	Capacitor	680 pF	1 %	4822 121 50367
C13	Electrolytic capacitor	125 μF	6.4 V	4822 124 10074
C14	Electrolytic capacitor	0.1 μF	100 V	4822 124 40146
C15	Electrolytic capacitor	33 μF	10 V	4822 124 10062
R4	Potentiometer	50 kΩ		4822 100 10079
R15, R21, R28	Potentiometer	10 kΩ		4822 100 10035
Unit 5				
L1, L2	Coil			4822 158 10052
C1	Capacitor	820 pF		4822 121 50368
C2	Capacitor	68 pF		4822 120 11076
C3	Capacitor	270 pF		4822 121 50409
C4	Capacitor	5.6 kpF		4822 121 50373
C6	Electrolytic capacitor	68 μF	16 V	4822 124 10016
C7	Electrolytic capacitor	125 μF	6.4 V	4822 124 10074

Diagram number	Description	Value	Watt/Volt	Ordering number
R2	Potentiometer	10 kΩ		4822 100 10035
R11	Resistor	1.21 kΩ	1 %	4822 116 50099
R12	Resistor	227 Ω	1 %	4822 116 50435
R13	Resistor	562 Ω	1 %	4822 116 50662
R14	Resistor	130 Ω	1 %	4822 116 50085
R16, R17	Resistor	1.00 kΩ	1 %	4822 116 50573
R19	Resistor	825 Ω	1 %	4822 116 50764
Unit 6				
L1, L2, L3	Coil			4822 158 10052
C1, C12	Capacitor	3.3 kpF		4822 121 50085
C2	Capacitor	560 pF		4822 121 50061
C7	Capacitor	15 kpF		4822 121 40301
C8, C13	Capacitor	270 pF		4822 121 30409
C11	Capacitor	1.5 μF		4822 121 40227
C17	Electrolytic capacitor	20 μF	16 V	4822 124 10153
C18	Electrolytic capacitor	40 μF	6.4 V	4822 124 10011
C19	Electrolytic capacitor	50 μF	10 V	4822 124 10068
C20	Electrolytic capacitor	32 μF	10 V	4822 124 10062
R5	Resistor	50 μ	PTC	4822 116 40007
R6	Potentiometer	2 kΩ		4822 103 10135
R41	Potentiometer	1 kΩ		4822 103 10023
Unit 7				
L1	Coil			4822 158 10052
C1	Capacitor	470 pF		4822 121 50413
C3	Capacitor	1.5 kpF		4822 121 50432
C4	Electrolytic capacitor	40 μF	6.4 V	4822 124 10011
Unit 8				
L1, L2, L3	Coil			4822 158 10052
C1, C3, C5	Capacitor	100 kpF		4822 121 40059
C6	Capacitor	470 kpF		4822 121 40175
C7, C10	Electrolytic capacitor	40 μF	6.4 V	4822 124 10011
C8	Electrolytic capacitor	20 μF	20 V	4822 124 10153
C9	Electrolytic capacitor	32 μF	10 V	4822 124 10062
C11	Capacitor	0.6 pF		4822 125 60067
C12	Capacitor	2.7 pF		4822 120 10038
C13, C14	Capacitor	680 kpF		4822 121 40233
R1, R3, R5, R7, R9, R11, R13, R15, R17	Resistor	10 kΩ	1 %	4822 116 50748
R18	Resistor	1.50 kΩ	1 %	4822 116 50293
R20	Resistor	5.62 kΩ	1/4 %	4822 116 50885
R21	Potentiometer	100 Ω		4822 100 10073
R24	Resistor	909 Ω	1/4 %	4822 116 50765
R25, 26	Resistor	5.11 kΩ	1/4 %	4822 116 50762
R30	Resistor	1.30 kΩ	1/4 %	4822 116 50878
R31	Resistor	200 Ω	1/4 %	4822 116 50267
R32	Resistor	1.50 kΩ	1 %	4822 116 50293
R33	Resistor	9650 Ω	1/4 %	4822 116 50618
R34	Resistor	825 Ω	1 %	4822 116 50764
R35	Resistor	2.67 kΩ	1/4 %	4822 116 50867
R36	Resistor	499 Ω	1/4 %	4822 116 50847

Diagram number	Description	Value	Watt/Volt	Ordering number
R37	Resistor	619 Ω	1/4 %	4822 116 50584
R38	Potentiometer	500 Ω		4822 100 10038
R41	Resistor	1870 Ω	1/4 %	4822 116 50472
R42	Potentiometer	200 Ω		4822 100 10019
R45	Resistor	2.67 kΩ	1/4 %	4822 116 50867
R46	Resistor	392 Ω	1/4 %	4822 116 50287
R47	Resistor	619 Ω	1/4 %	4822 116 50584
R48	Potentiometer	500 Ω		4822 100 10038
R51	Resistor	3920 Ω	1/4 %	4822 116 50882
R52	Resistor	59.0 kΩ	1/4 %	4822 116 50886
R54	Potentiometer	200 Ω		4822 100 10019
Unit 9				
L1, L2, L3	Coil			4822 158 10052
C1, C2, C8	Capacitor	100 kpF		4822 121 40059
C3	Capacitor	120 pF		4822 121 50404
C4	Capacitor	22 pF		4822 122 30022
C5	Capacitor	560 pF		4822 121 50491
C6	Capacitor	330 kpF		4822 121 40257
C7, C10	Capacitor	680 kpF		4822 121 40233
C9, C12	Electrolytic capacitor	64 μF	6.4 V	4822 124 10016
C11	Electrolytic capacitor	32 μF	16 V	4822 124 10062
C13	Electrolytic capacitor	50 μF	10 V	4822 124 10068
C14	Capacitor	330 pF		4822 121 50369
R1, R2, R5, R6	Resistor	3.01 kΩ	1/4 %	4822 116 50806
R3, R4	Resistor	5.36 kΩ	1/4 %	4822 116 50884
R11, R12, R15, R16	Resistor	2.21 kΩ	1/4 %	4822 116 50532
R13, R14	Resistor	2.67 kΩ	1/4 %	4822 116 50867
R34	Resistor	825 Ω	1 %	4822 116 50764
R35	Resistor	2.29 kΩ	1 %	4822 116 50227
R36	Resistor	1.10 kΩ	1/4 %	4822 116 50844
R46, R47, R49	Potentiometer	200 Ω		4822 100 10019
Unit 10				
L1, L2, L3	Coil			4822 158 10052
C1	Capacitor	100 pF		4822 121 50411
C4	Trimmer	0-12 pF		4822 125 60033
C5	Capacitor	100 kpF		4822 121 40059
C7	Electrolytic capacitor	125 μF	6.4 V	4822 124 10074
C8, C9	Electrolytic capacitor	64 μF	16 V	4822 124 10016
R2, R4, R6, R8	Resistor	20.0 kΩ	1 %	4822 116 50332
R9, R27	Potentiometer	200 Ω		4822 103 10118
R19, R25, R26	Resistor	3.32 kΩ	1 %	4822 116 50404
R20	Resistor	1.00 kΩ	1 %	4822 116 50573
R24	Potentiometer	500 Ω		4822 103 10052
R34	Potentiometer	2 kΩ		4822 103 10135
R50, R56	Potentiometer	5 kΩ		4822 103 10049
Unit 11A and Unit 11B				
L2	Coil			4822 158 10052
C1	Electrolytic capacitor	32 μF	16 V	4822 124 10148
R1	Resistor	511 Ω	1 %	4822 116 50659
R14, R18, R22	Resistor	1.00 kΩ	1 %	4822 116 50573

Diagram number	Description	Value	Watt/Volt	Ordering number
Unit 12				
L1, L2, L3	Coil			4822 158 10052
C2	Capacitor	1 pF		4822 122 30104
C4, C8, C12, C20	Electrolytic capacitor	50 μF	10 V	4822 124 10068
C5, C10, C14	Capacitor	0.1 μF		4822 121 40059
C6, 18	Electrolytic capacitor	32 μF	16 V	4822 124 10148
C15, C19	Electrolytic capacitor	64 μF	16 V	4822 124 10016
C16, C21	Capacitor	0.47 μF		4822 121 40175
C17	Electrolytic capacitor	125 μF		4822 124 10076
R1	Resistor	8.16 kΩ	1/4 %	4822 116 50888
R2	Resistor	42.2 kΩ	1/4 %	4822 116 50883
R3	Resistor	16 kΩ	1/4 %	4822 116 50881
R5	Resistor	11.0 kΩ	1 %	4822 116 50445
R7, R20, R33	Potentiometer	2 kΩ		4822 100 10029
R8	Resistor	33.2 kΩ	1 %	4822 116 50482
R12, R15, R25, R28	Potentiometer	500 Ω		4822 100 10038
R14, R27, R40	Resistor	5.62 kΩ	1 %	4822 116 50853
R16, R29	Resistor	15.0 kΩ	1 %	4822 116 50663
R18	Resistor	20 kΩ	1 %	4822 116 50332
R21	Resistor	27.4 kΩ	1 %	4822 116 50559
R31	Resistor	16.2 kΩ	1 %	4822 116 50593
R34	Resistor	22.1 kΩ	1 %	4822 116 50648
R38	Resistor	2.43 kΩ	1 %	4822 116 50248
R39	Potentiometer	1 kΩ		4822 100 10038
Unit 13A				
L2	Coil			4822 158 10052
C1	Electrolytic capacitor	32 μF	16 V	4822 124 10148
R1	Resistor	511 Ω	1 %	4822 116 50659
R14, R18, R22	Resistor	1.0 kΩ	1 %	4822 116 50573
Unit 13B				
L1, L2, L3	Coil			4822 158 10052
L4, L5, L6	Coil			4822 158 10307
C1	Electrolytic capacitor	64 μF	6.4 V	4822 124 10016
C2	Electrolytic capacitor	64 μF	16 V	4822 124 10016
C3	Electrolytic capacitor	100 μF	10 V	4822 124 10012
R3, R16, R29	Resistor	4.75 kΩ	1 %	4822 116 50385
R4, R5, R17, R18, R30, R31	Resistor	3.92 kΩ	1 %	4822 116 50103
R6, R19, R32	Potentiometer	2 kΩ		4822 103 10135
R7, R20, R33	Resistor	3.32 kΩ	1 %	4822 116 50404
R8, R21, R34	Resistor	10.0 kΩ	1 %	4822 116 50463
R9	Resistor	14.3 kΩ	1/4 %	4822 116 50879
R10, R36	Resistor	22.1 kΩ	1 %	4822 116 50648
R12, R24, R37	Resistor	15 kΩ	1 %	4822 116 50539
R13, R26, R39	Resistor	2.21 kΩ	1 %	4822 116 50532
R22	Resistor	31.6 kΩ	1/4 %	4822 116 50421
R23	Resistor	63.4 kΩ	1/4 %	4822 116 50887
R35	Resistor	11.3 kΩ	1/4 %	4822 116 50877

Diagram number	Description	Value	Watt/Volt	Ordering number
Unit 14A, Unit 14B and Unit 15B				
L1 ... L4	Coil			4822 158 10052
C1, C8, C10, C12	Electrolytic capacitor	100 μF	10 V	4822 124 10012
C3, C14	Capacitor	56 pF		4822 122 30116
C4, C6	Electrolytic capacitor	64 μF	16 V	4822 124 10016
C5, C7, C9, C11	Capacitor	6.8 kpF		4822 120 21129
R1, R16	Potentiometer	2 kΩ		4822 100 10029
R14, R15, R29, R30	Resistor	75.0 Ω	1 %	4822 116 50001
Unit 15A				
L1	Coil			4822 158 10052
C2, C3	Electrolytic capacitor	1250 μF	4 V	4822 124 20509
C4	Electrolytic capacitor	100 μF	10 V	4822 124 10012
R5, R7	Resistor	121 Ω	1 %	4822 116 50003
R6	Resistor	365 Ω	1 %	4822 116 50529
R8	Resistor	130 Ω	1 %	4822 116 50085
Unit 16				
L1, L2, L3	Coil			4822 158 10052
C1, C6	Capacitor	1 μF		4822 121 40176
C3, C8, C19	Capacitor	100 kpF		4822 121 40036
C5, C10	Capacitor	82 pF		4822 120 10078
C11, C14	Capacitor	22 kpF		4822 121 50287
C12	Capacitor	820 pF		4822 121 50368
C13, C15	Capacitor	680 pF		4822 121 50367
C2, C4, C7, C9	Electrolytic capacitor	10 μF	16 V	4822 124 10004
C16	Electrolytic capacitor	40 μF	25 V	4822 124 10108
C17	Electrolytic capacitor	100 μF	10 V	4822 124 10012
C18	Electrolytic capacitor	64 μF	16 V	4822 124 10016
R31	Resistor	10.0 kΩ	1 %	4822 116 50748
R34	Resistor	22.1 kΩ	1 %	4822 116 50648
R36	Resistor	47.5 kΩ	1 %	4822 116 50391
R42	Resistor	100 kΩ	1 %	4822 116 50244
Unit 17				
C1, C3	Electrolytic capacitor	1250 μF	40 V	4822 124 30069
C2	Electrolytic capacitor	2500 μF	25 V	4822 124 30009

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