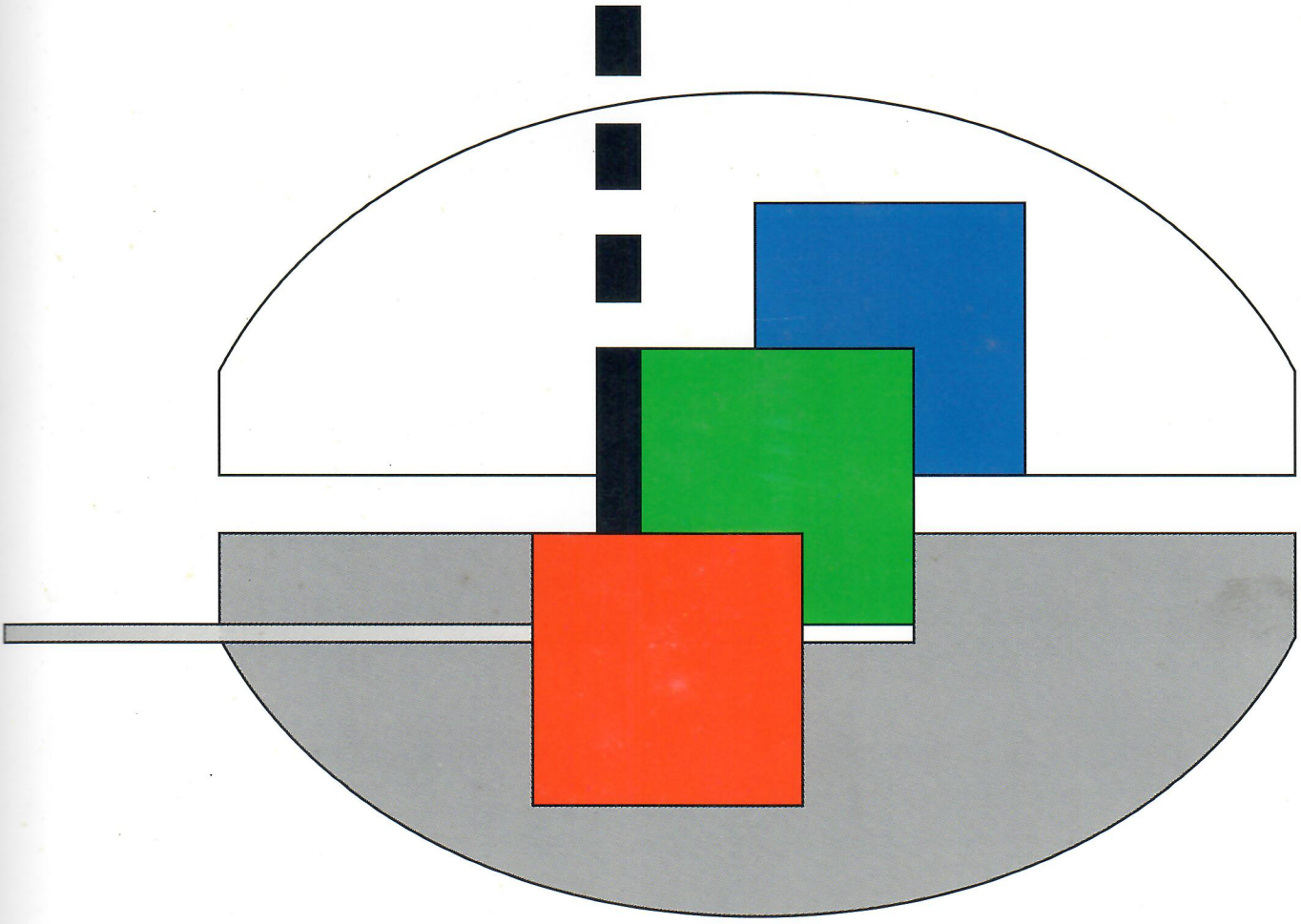
Instruction Manual



Philips TV Test Equipment

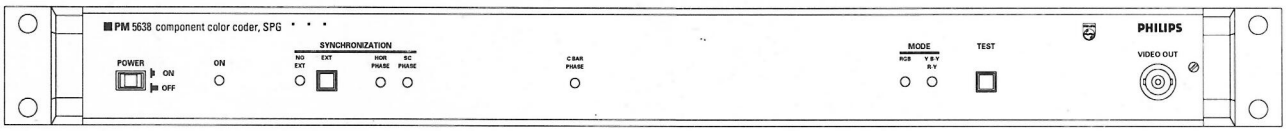
PHILIPS

PHILIPS

PHILIPS

Component Color Coder, SPG
PM 5638

Instruction manual



9499 493 07611
920815/03

Important

In correspondence concerning this instrument, please quote the full type and KU. number (serial number) as shown on the identification plate on the rear of the instrument.

Training

Courses of technical training on this, and other current PTV equipment are available either on a pre-planned basis, or to suit individual requirements.
These courses are held in English.
For details of location, time and duration of pre-planned courses, or the possibilities that exist for individually planned courses, please complete the form on the next page and return it to the Philips Customer Support Organization in your country.

Fault analysis

In the event of instrument failure, please complete the "Fault Analysis report" situated in Chapter - Service hints of this manual. After completion, please send it to the Philips Customer Support Organization in your country.

Printed in Denmark

Request for training

Recent advances in equipment design and our commitment to the use of leading edge technology has placed increasing demands on servicing personnel world-wide. While we make every effort to ensure that our manuals reflect these advances (at the same time remaining service oriented), the need for effective and regular training has become more and more necessary.
Tailor-made courses of instruction on current PTV instruments are therefore being made available to complement the information contained in our manuals. Participation will inevitably lead to reduced down-time and repair costs.
If you are interested in our training program or just require information, please complete the information sheet below, and send it to the Philips Customer Support Organization in your country who will contact you and provide more detailed information for your consideration.

We require information only : ☐

Company name : _____

Address : _____

_____

_____

We like training on the following instruments :

PM _____ PM _____ PM _____ PM _____

PM _____ PM _____ PM _____ PM _____

Type of course required :

Systems/Applications ☐

Servicing/Faultfinding ☐

Other (please specify below) ☐

_____

Number of participants (max. 12): ☐

Time available (days): ☐

Location :

On my own premises ☐

At Philips Customer Support ☐

In Copenhagen ☐

Please send this request to the Philips Customer Support Organization in your country. Thank you.

GUARANTEE STATEMENT

The Philips guarantee is in addition to all rights which buyer may have against his supplier under the sales agreement the buyer and the supplier and according to local legislation.

Philips guarantees this product to be free from defects in material and workmanship under normal use and service for a period of one (1) year from the date of shipment. This guarantee does not cover possible required re-calibration and/or standard maintenance actions. This guarantee extends only to the original purchaser and does not apply to fuses, batteries or to any product or part thereof that has been misused, altered or has been subjected to abnormal conditions of operation and handling.

Philips - supplied software is guaranteed to be properly recorded on non-defective media. We will replace improperly recorded media without charge for 90 days after shipment upon receipt of the software. Our soft-ware is not guaranteed to be error free.

Philips' obligation under this guarantee is limited to have repaired or replace a product that is returned to an authorized Philips Service Centre within the guarantee period, provided that Philips determines that the product is defective and that the failure has not been caused by misuse, alteration or abnormal operation.

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If a failure occurs, send the product, freight prepaid to the Service Centre designated by Philips with a description of the difficulty. At Philips' option, repairs will be made or the product will be replaced. Philips shall return the product, F.O.B. Repair Centre, transportation prepaid, unless the product is to be returned to another country, in which case the Buyer shall pay all shipping charges, duties and taxes.
Philips assumes NO risk for damage in transit.

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Some countries or states do not allow the foregoing limitations. Other rights may also vary.

Contents

GENERAL INFORMATION

INSTALLATION AND OPERATION INSTRUCTIONS

SERVICE INSTRUCTIONS

Subject index

1. Safety

Read this chapter carefully before installation and use of the instrument.

1.1 Introduction

The instrument described in this manual is designed to be used by properly-trained personnel only. Adjustment, maintenance and repair of the exposed equipment shall be carried out only by qualified personnel who are aware of hazards involved.

1.2 Safety precautions

For the correct and safe use of the instrument, it is essential that both operating and servicing personnel follow generally accepted safety procedures in addition to the safety precautions specified in this manual. Specific warning and caution statements, where applicable, are found throughout this manual. Warning and caution statements and/or symbols are marked on the instrument where necessary.

1.3 Caution and warning statements

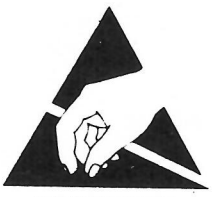
Caution
Used to indicate correct operation or maintenance in order to prevent damage to, or destruction of equipment or other property.
Warning
Used to indicate a potentional hazard that requires correct procedures or practices in order to prevent personal injury.

1.4 Impaired safety protection

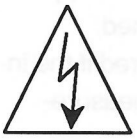
Whenever it is likely that safe operation is impaired, the instrument must be made in-operative and secured against unintended operation. The appropriate servicing authority must be informed.
For example, safety is likely to be impaired if the instrument fails to perform the intended measurements or shows visible damage.

1.5 Electrostatic sensitive devices

All ICs and many other semi-conductors are susceptible to electrostatic discharges (ESD).
Careless handling during repair can reduce lifetime drastically.
When repairing, make sure that you are connected to the same potential as the mass of the set via a wrist wrap with resistance. Keep components and tools also at this potential.


ATTENTION

1.6 Symbols

Symbol:	Color:	Explanation:
	Red	High voltage terminal: a terminal at which a voltage, with respect to another terminal or parts exists or may be adjusted to 1000V or more. (High voltage≥1000V).
	Black/Yellow	Live part
	Black/Yellow	To preserve the instrument from damage the operator must refer to an explanation in the instruction manual.

2. Introduction and application

The PM 5638 is a compact high performance Component Color Coder with a built-in Sync Pulse Generator. It encodes analog component signals (R, G, B or Y, R-Y, B-Y - signals) into a composite video signal with correct Sc-H phase.

It is intended for use in, for example:
– television studios,
– program production centers and
– TV laboratories.

The built-in Sync Pulse Generator may function as a stand alone SPG. It is provided with a genlock facility.
The following sync signals are separately available at the rear of the instrument:
– Black burst
– Sync
– Blanking
– Subcarrier

The PM 5638 is furthermore provided with a remote control facility which makes it possible to control for example:
– Int/Ext. Sync
– Burst on/off,
– Sync on, Output signals etc.

The PM 5638 is available in:
– G-PAL,
– N-PAL,
– M-PAL and
– M-NTSC.

PM 8544 - Optional colorbar generator
The PM 5638 can be equipped with an optional colorbar generator, which applies component colorbar signal output configured in either GBR or Y, P_B, P_R.

3. Technical data

3.1 Safety characteristics

This apparatus has been designed and tested in accordance with Safety Class I requirements of IEC Publication 348 (Safety Requirements for Electronics Measuring Apparatus), and has been supplied in a safe condition. This manual contains information and warnings which must be followed to ensure safe operation and to retain the apparatus in a safe condition.

3.2 Performance characteristics

Properties expressed in numerical values with stated tolerances are guaranteed by the Philips organization in your country. Specified non-tolerance numerical values indicate those that could be nominally expected as a mean of a range of identical instruments.

3.3 Versions

PM 5638:

The following versions are available:
G-PAL:
625 lines, 50Hz, 4.43361875MHz subc. freq.
N-PAL:
625 lines, 50Hz, 3.582056MHz subc. freq.
M-PAL:
525 lines, 60Hz, 3.575611MHz subc. freq.
M-NTSC:
525 lines, 60Hz, 3.579545MHz subc. freq.

PM 8544:

625 lines, 50Hz.
525 lines, 60Hz.
Both versions supplying EBU/SMPTE Y, P_B, P_R or GBR format according to configuration

3.4 Inputs

3.4.1 Video inputs

Signal types:
R, G, B or Y, R-Y, B-Y.
Sync on Y-signal in Y, R-Y, B-Y mode is acceptable.
Amplitude:
700mV excl. sync and set-up.
Input impedance:
High ohmic looped-through.
Maximum DC on inputs:
±2V
Return loss:
40dB up to 7MHz
Maximum hum accepted:
$1V_{PP}$
Hum suppression:
34dB

3.4.2 Synchronization input

Amplitude:
nom. ±6dB
Signal types:
1. Composite video
2. Black burst
3. Composite sync

Maximum hum on signal:
100% or $1V_{PP}$
Input impedance:
High ohmic looped-through
Return loss:
40dB up to 7MHz

3.5 Outputs

3.5.1 Video outputs

Signal types:
1. Composite video (3 outputs)
2. Black burst

In internal mode and in sync lock with correct Sc-H phase, the signal may include an 8-field reference pulse (4-field for NTSC). This signal can be switched on/off by internal programming plug.

G-PAL : Line 7, field 1
N-PAL : Line 7, field 1
M-PAL : Line 8, field 1
M-NTSC : Line 11, field 1

Sync amplitude:
PAL : 300mV ±3%
NTSC : 286mV ±3%

Sync rise/fall time:
PAL : 230nsec. ±20nsec.
NTSC : 140nsec. ±15nsec.

Burst amplitude:
PAL : 300mV ±4%
NTSC : 286mV ±4%

Burst phase accuracy:
±2°

Output impedance:
75Ω ±1%

Return loss:
Video outputs : > 34dB up to 7MHz
Black burst : > 36dB up to 7MHz

Isolation between outputs:
36dB up to 5MHz

Residual subcarrier:
< 2.0mV (3.5mV$_{PP}$ for black burst)

Stability Line/Subc. (internal mode):
Jitter : Typ. ±2°
Drift : Typ. ±2°

3.5.2 Component outputs (Optional)

Signal types:
The PM 8544 may be configured to apply the following signals
(internal selectable by use of programming plugs):

625-LINE VERSIONS:
Split-field signals:
– EBU-colorbar and red (2:1)

Full-field signals:
– EBU-colorbar (Factory set)
– 100% colorbar
– BBC-colorbar
– 100% red signal
– 75% red signal
– 100% white signal
– 75% white signal
– black

525-LINE VERSIONS:
Split-field signals:
– SMPTE colorbar (66% - 7% - 27%) (Factory set)
Full-field signals:
– 7-element colorbar (SMPTE)
– Reverse blue bars
– -I/White/Q/black/PLUGE

Signal amplitude:
Amplitudes according to standards:
700mV$_{PP}$ ±1% for 100% luminance white.

Sync
Sync may be added to the Y/G signal and/or the R/B (P_R/P_B) signals (selectable by use of programming plugs).

Sync amplitude:
300mV$_{PP}$ ±2%

Signal rise and fall time:
625-line: 230nsec.
525-line: 140nsec.

Sync rise and fall time:
As for signal.

Output impedance:
75Ω ±0.25%

Return loss:
>34dB up to 7MHz

3.5.3 Sync outputs

COMPOSITE SYNC

Amplitude:
4V ±0.4V$_{PP}$

Rise/fall time:
200nsec.

Output impedance:
75Ω

Return loss:
26dB up to 4MHz

Line sync pulse width:
4.7 ±0.2µsec.
Front porch width:
1.5 ±0.2µsec.
Equalizing pulses width:
G,N-PAL : 2.35 ±0.15µsec.
M-PAL/NTSC : 2.28 ±0.15µsec.
Serration pulses width:
4.7 ±0.2µsec.
Number of serration pulses:
G,N-PAL : 5
M-PAL/NTSC : 6
Number of equalizing pulses:
G,N-PAL : 5+5
M-PAL/NTSC : 6+6

COMPOSITE BLANKING
Amplitude:
4V ±0.4V_{PP}
Rise/fall time:
200nsec.
Output impedance:
75Ω
Return loss:
26dB up to 4MHz
Line blanking duration:
G,N-PAL : 12.0 ±0.3µsec.
M-PAL/NTSC : 11.0 +/-0.2µsec.
Field blanking duration:
G,N-PAL : 25H +12µsec.
M-PAL/NTSC : 21H +11µsec.

SUBCARRIER
Amplitude:
2V ±0.2V_{PP}
Output impedance:
75Ω
Return loss:
26dB at f_{SUBC}

3.6 Remote control

Type:
Parallel TTL-control by grounding
Functions which may be remote controlled:
– Int./Ext. sync selection
– Burst on/off
– Sc-H lock on/off
– Notch on/off
– Sync on/off
– Test

3.7 Electrical specification

3.7.1 Video performance

LUMINANCE CHANNEL
Matrix coefficients:
Ey = 0.299 Er + 0.587 Eg + 0.114 Eb
Matrix inaccuracy:
<1%
Frequency response:
±0.1dB, 15kHz to 6MHz
+0.1dB/-0.5dB to 8MHz
Above 8MHz smooth roll-off
Low frequency response:
<1% tilt on 50Hz squarewave
Pulse response:
2T pulse shape <0.5%K
2T pulse to bar ratio <1%
Bar response <0.5%K
Random HF noise:
<-75dB_{RMS} weighted
(in 5MHz BW and with subc notch)
Hum and lower order harmonics:
<-60dB_{PP}
Spurious transients during active lines:
<-60dB_{PP} up to 10MHz
Spurious transients outside active lines:
<-40dB up to 10MHz
Non-linear distortions:
Differential gain : <0.2%
Differential phase : <0.15°
Line time non-lin. : <0.25%
Notch filter:
Attenuate min. 6dB at subc. frequency

CHROMINANCE CHANNEL
PAL versions all coded along U and V axes.
NTSC version coded along I and Q axes.
Matrix coefficients:
PAL:
Eu = - 0.147 Er - 0.289 Eg + 0.437 Eb
Ev = 0.615 Er - 0.515 Eg - 0.100 Eb
NTSC:
Eq = 0.211 Er - 0.522 Eg + 0.311 Eb
Ei = 0.596 Er - 0.274 Eg - 0.322 Eb
Chrominance bandwidth:
PAL versions:
not more than 3dB down at 1.3MHz
not less than 20dB at subc freq.
NTSC version:
Ei : <3 dB at 1.3MHz
20dB at 3.6MHz
Eq :<2dB at 0.4MHz
>6dB at 0.5MHz
>6dB at 0.6MHz
V-axis switching:
180° ±0.5° (PAL-only)
Quadrature phase:
90° ±1°
Coding accuracy:
Amplitude : within 0.25dB
Angle : within 1°
Residual subcarrier:
less than 2mV
Chroma noise:
<-60dB$_{RMS}$ S/N amplitude
<-60dB$_{RMS}$ S/N phase

TIMING
Time difference
Between the two chrominance components:
PAL : < 5nsec
NTSC : <15nsec
Between luminance and chrominance:
PAL : <10nsec
NTSC : <20nsec
Insertion delay:
PAL : approx. 350nsec
NTSC : approx. 750nsec
Time difference between components:
Less than 5nsec. referring to Y/G signal.

The colorbar generator signals can be independently timed with respect to the sync generator and encoder signals.

Range:
Advancing more than 10µsec.
Delaying more than 3µsec.

3.7.2 Sync Pulse Generator

MODES OF OPERATION
Internal mode:
The Sync Pulse Generator is controlled by an internal oscillator which is locked to a reference oscillator.
External mode
1. The Sync Pulse Generator genlocks to an external composite video signal or black burst signal. Adjustable Line- and Subc- phase.
2. The Sync Pulse Generator locks to an external sync signal (no burst).

The subcarrier may be either:
a. Free-running or
b. Locked to the sync signal giving correct Line/ Subc phase (internal selectable).

This mode is especially useful when a component signal is converted to normal composite signal.
Mode of genlock:
Crash lock

SYNC LOCK
Horizontal freq. lock range:
±10ppm
Lock-in time:
<1sec

Jitter with respect to input sync:
<6nsec with noise-free signal of nom. ampl. and frequency
Jitter for 100% hum (max 1V$_{PP}$):
<25nsec
Jitter with 28dB$_{RMS}$ S/N:
<10nsec
Line phase change:
<15nsec for sync level nom. ±6dB
Line phase adjustm.
±3usec via front panel potentiometer

SUBC LOCK
Lock range:
±25Hz of nominal
Lock-in time:
<1sec

Jitter with respect to incoming burst phase:
<1°
Subc. phase adjustment:
360° via front panel potentiometer
If burst is absent two modes are programmable (jumper):
– Subcarrier will either be free-running
– Locked to line freq. with correct Sc-H phase
Subc jitter : <2°
Lock range : ±5ppm

3.8 Mechanical dimensions

1U high, 19" rackmount/table-cabinet
Maximum dimensions:
Height : 44mm
Width : 483mm
Depth : 416mm
Weight : 5.0kg

3.9 Environmental conditions

The environmental data mentioned in this instruction manual is based on the results of the manufacturer's procedures.
Details of these procedures and failure criteria are supplied on request by the PHILIPS organization in your country, or by PHILIPS, INDUSTRIAL ELECTRONIK DIVISION, EINDHOVEN, THE NETHERLANDS.

3.10 Climatic conditions

Ambient temperature:
+5°C to +45°C
Limit range for storage and transport:
-30°C to +70°C

3.11 Mechanical requirements

Vibration
Limit range for storage and transport:
30min. in each of three directions, 10 to 150Hz;
0.7mm $_{P-P}$ and 50m/s^2 max acceleration.
According to IEC-Publ. 68, test Fc.
NOTE: Unit mounted on vibration table without shock absorbing material.

Bump
Limit range for storage and transport:
1000 bumps of 100m/s^2 sine, 6ms duration in each of 3 directions.
According to IEC-Publ. 68, test Eb.

Packaging
According to UN-D-1400
The test methods mentioned in the N.V. Philips Standard UN-D-1400 are in accordance with those of relevant ISO-Standards.

3.12 Mains supply conditions

Mains supply voltage:
100, 120, 220 or 240V AC, +10%, -15%
(max. 250V AC)
Mains supply frequency:
48 - 65Hz
Power consumption at nominal mains voltage:
21W or
25W with PM 8544 mounted.

4. Accessories & options

4.1 Acessories

Item	Quantity	Ordering number
Mains cable	1	5322 321 20697
Mains cable, US		5322 321 10123
Extender board	1	5322 216 91782
75Ω termination	1	5322 264 40191
Instruction manual	1	9499 493 07611

4.2 Options

PM 8544G/00 Color bar generator, Y, P_B, P_R, 625 lines
PM 8544G/10 Color bar generator, GBR, 625 lines
PM 8544M/00 Color bar generator, Y, P_B, P_R, 525 lines
PM 8544M/10 Color bar generator, GBR, 525 lines

5. Installation

5.1 Initial inspection

Check the contents of the shipment for completeness and possible transport damage. If the contents are incomplete or damaged, a claim should be filed with the carrier immediately, and the Philips Sales or Service organization should be notified in order to facilitate the repair or replacement of the instrument.

5.2 Safety instruction

5.2.1 Earthing

Before any other connection is made, the instrument must be connected to a protective earth conductor via the three-core mains cable.

Before connecting the equipment to the mains of the building installation, the proper functioning of the protective earth lead of the building installation needs to be verified.

WARNING: Any interruption of the protective conductor inside or outside the instrument, or disconnection of the protective earth terminal, is likely to make the instrument dangerous. Intentional interruption is prohibited.

5.3 Mains voltage setting and fuses

Before inserting the mains plug into the mains socket make sure that the instrument is set to the local mains voltage.

NOTE: If the mains plug has to be adapted to the local situation it should only be done by a qualified person.

The mains connector of this instrument is specially constructed for safety. It is impossible to change the mains fuse or alter the operating voltage without removing the mains cable first.
The instrument can be used with a mains voltage supply of 100V, 120V, 220V or 240V +10%-15%.

- Remove the mains cable.
- Slide the protective plastic cover to the left to expose the fuse and coded mains plug. See fig. 5-1.

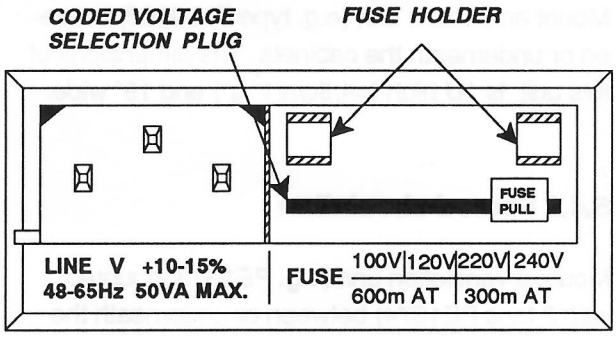


Fig. 5-1 Mains connector.

- Remove the fuse by pulling the black lever.
- The text printed on the coded mains plug is now visible.
- If the text does not agree with the local mains supply, insert a pointed instrument into the hole and remove the coded plug.
- Re-insert the plug so that the visible text agrees with the local mains voltage. (This is the number on the top-left portion of the card).
- Insert the mains fuse with one of the proper rating.
- Slide the protective cover to right.
- Re-insert the mains cable.

WARNING: If mains voltage has to be adapted to the local supply, it must only be done by a qualified person who is aware of the hazards involved. Make sure that only fuses of the required current rating and specified type are used for renewal. The use of repaired (jumpered) fuses and/or the short circuiting of the fuse holders is prohibited. Fuses must only be replaced by a qualified person who is aware of the hazards involved.

5.4 Rack mounting

This PHILIPS PTV instrument is delivered (can be mounted) in a 19" cabinet. In systems where several cabinets are mounted in a 19" rack, special attention must be paid to the temperature. To avoid overheating, we recommend the following solutions:

5.4.1 Free air convection I.

Mount an air-flow unit (e.g. type PM 9799) between or underneath the cabinets. The dimensions of this unit is 1U high (=4.5cm/$1^3/_4$") and 19" wide.

5.4.2 Forced circulation

Mount a ventilation unit (e.g. PE1373 mounted with 2 fans PE1374) between or underneath the cabinets. The dimensions of this unit are 1U high (=4.5cm/$1^3/_4$") and 19" wide.

5.5 Access to and replacement of parts

5.5.1 Safety

The opening of covers or removal of parts, expect those to which access can be gained by hand, is liable to expose live parts. Accessible terminals may also be live.
The instrument must be disconnected from all voltage sources before performing any adjustment, replacement, maintenance, or repair of the opened instrument is unavoidable, it must only be carried out by a skilled person who is aware of the hazards involved.

5.5.2 Access to main board and black burst generator.

If the instrument is rack mounted, it is necessary to remove it before repairing or adjusting the power supply.
Remove the top cover of the instrument by unscrewing the two rear mounting brackets and sliding the cover towards the rear. If subsequent access to the solder side of the PCB is necessary, the bottom cover may be removed in the same manner.

5.5.3. Unit removal

NOTE: For routine test and adjustment, the instrument does not need to be removed from its rack mount. The units 2-4 can be individually removed and placed on an extender board (provided) for maintenance and adjustment. The following steps describe the complete procedure for unit removal where access to all units is required simultaneously.

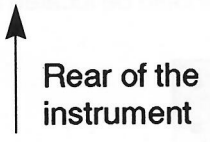
- Remove the instrument from the rack.
- Remove the top-cover. All units are now accessible for test and adjustment.
- Referring to fig. 7-2 loosen the screws A and remove the front panel.
- Remove the unit securing screws and pull the required unit(s) forward. Refer to fig. 7-4.

6. Configuration

6.1 General

The PM 5638 is delivered in four different versions which are:
– G-PAL,
– N-PAL,
– M-PAL, and
– M-NTSC.

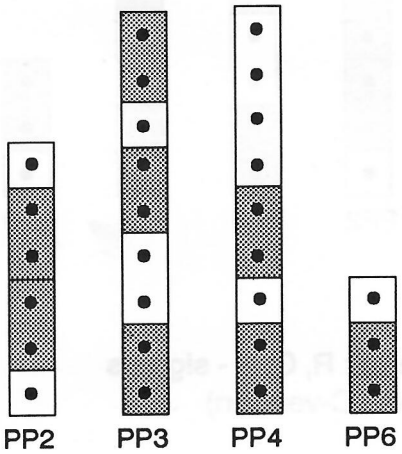
When the instrument is delivered it is set-up for the version ordered. Changing the instrument from one version to another requires component changes, altering of X-tal frequencies and other circuit modifications which are outside the scope of this manual.
This chapter deals with the programming plugs which makes it possible to select e.g. different types of incoming signals, and options on the output signal. In addition the switches that determine the particular version are also shown, so that the correct location can be controlled if for some reason they have been disturbed.
Refer in all cases to fig. 6-1 which shows the location of all programming plugs.



6.2 Incoming signal selection

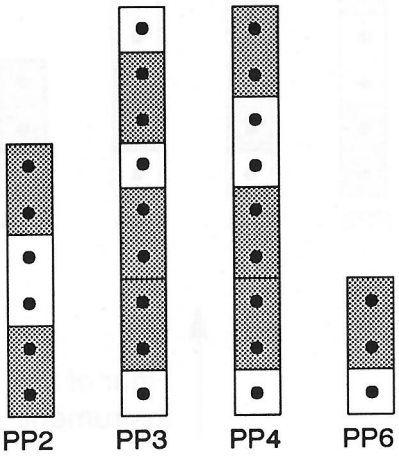
6.2.1 Input: Y, R-Y, B-Y - signals (PAL-versions)

To make the encoder convert Y, R-Y, B-Y - signals into a composite video signals the programming plugs PP2, PP3, PP4, and PP6 (all located on unit 4 - Encoder) must be located as follows:



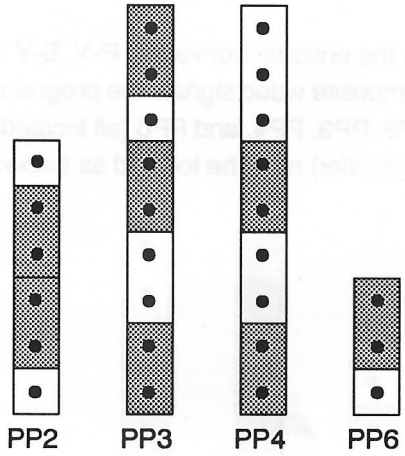
6.2.2 Input: R, G, B signals (PAL-versions)

To make the encoder convert R, G, B signals into a composite video signals the programming plugs PP2, PP3, PP4, and PP6 (all located on unit 4 - Encoder) must be located as follows:



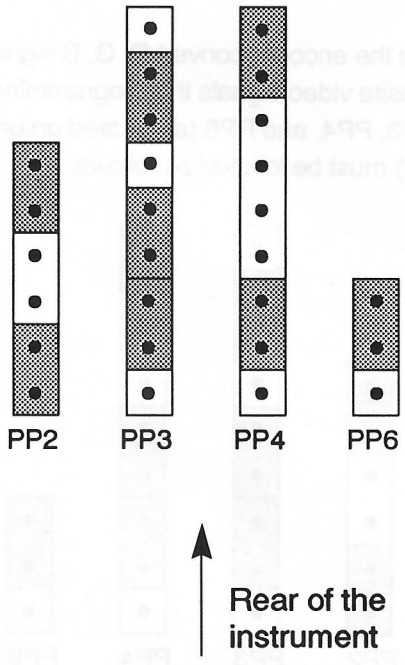
6.2.3 Input: Y, P_R, P_B - signals (NTSC-version)

To make the encoder convert Y, P_R, P_B signals into a composite video signals the programming plugs PP2, PP3, PP4, and PP6 (all located on unit 4 - Encoder) must be located as follows:



6.2.4 Input: R, G, B - signals (NTSC-version)

To make the encoder convert R, G, B signals into a composite video signals the programming plugs PP2, PP3, PP4, and PP6 (all located on unit 4 - Encoder) must be located as follows:



6.3 Sync clipper (input signals)

The sync clipper removes the sync pulses from the input signals. In configurations in which it is preferred to use the sync pulses from the incoming signals instead of the internally generated signals the sync clipper (PP4 on the Main board - unit 1) must be switched off (and "Sync on output signals" must be switched on - *see paragraph 6.4.2*).

Sync clipper ON Sync clipper OFF

Default value from the factory is Sync clipper on.

6.4 Output signals options

6.4.1 Output mode selection, PM 8544

The output of the optional colorbar generator can be in either RGB format or YUV format. To select this PP1 on the Colorbar generator - unit 3 must be located as follows:

RGB-mode YUV-mode

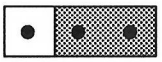
6.4.2 Sync on output signal

To provide the composite video output signal with sync the programming plug PP1 on unit 4 - Encoder should be located as follows:

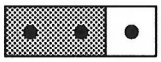
Sync ON Sync OFF

6.4.3 Sync on output signals, PM 8544

To provide the G/Y output signal from the PM 8544 with sync the programming plug PP3 on unit 3 - Color bar generator should be located as follows:

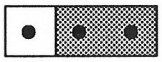


ON

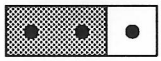


OFF

To provide the R&B/U&V output signals from the PM 8544 with sync the programming plug PP4 on unit 3 - Color bar generator should be located as follows:



ON

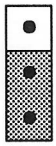


OFF

6.4.4 Notch filter ON/OFF

The notch filter on the encoder card can be switched ON or OFF depending on the setting of the programming plug PP7 on unit 4 - Encoder:

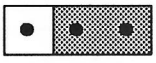
Notch ON



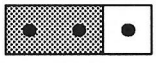
Notch OFF

6.4.5 Burst on output signal.

To provide the composite video output signal with burst the programming plug PP3 on unit 1 - Main board should be located as follows:



Burst ON



Burst OFF

6.4.6 White bar line 7 field 1 option, composite video signal.

To insert the white bar in line 7 of field 1, the programming plug PP1 on unit 1 - Main board should be located as follows:

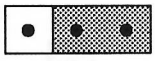
White bar ON

White bar OFF

6.4.7 White bar line 7 field 1 option, black burst signal.

To insert the white bar in line 7 of field 1, the programming plug PP1 on unit 5 - Black burst generator should be located as follows:

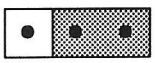
White bar ON



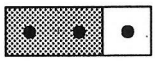
White bar OFF

6.4.8 Sc-H lock on/off

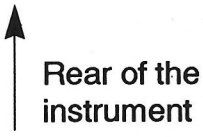
To lock the subcarrier to the line frequency, when external sync with no subcarrier is supplied, the programming plug PP2 on unit 1 - Main board should be located as follows:



Sc-H lock ON



Sc-H lock OFF



6.4.9 Sync signal amplitude

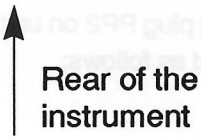
The amplitude of sync signal available at the SYNC OUT connector can be either 2V_{PP} or 4V_{PP}. This is selected by locating the programming plug PP12 on unit 1 - Main board as follows:

Default value from the factory is 4V_{PP}.

6.4.10 Blanking signal amplitude

The amplitude of sync signal available at the BLANK OUT connector can be either 2V_{PP} or 4V_{PP}. This is selected by locating the programming plug PP13 on unit 1 - Main board as follows:

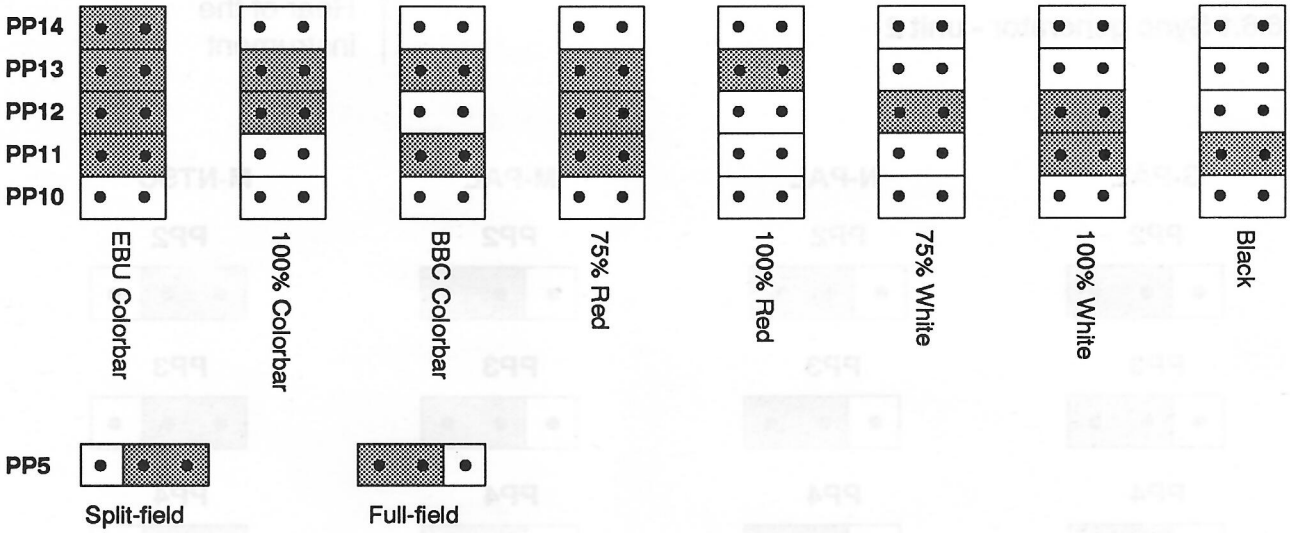
Default value from the factory is 4V_{PP}.



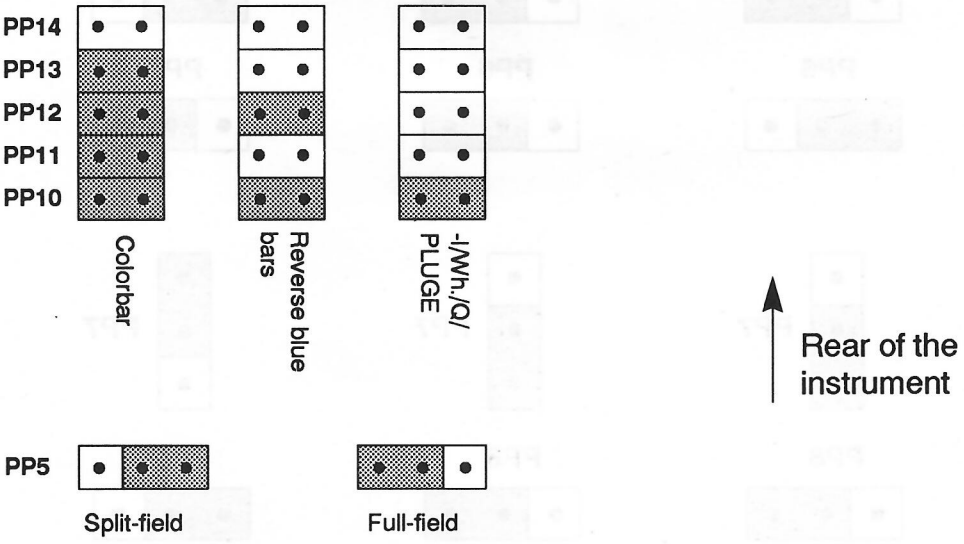
6.5 Signal selection, PM 8544

Several different color signals can be selected as outputs from the Colorbar generator.

6.5.1 625-line version



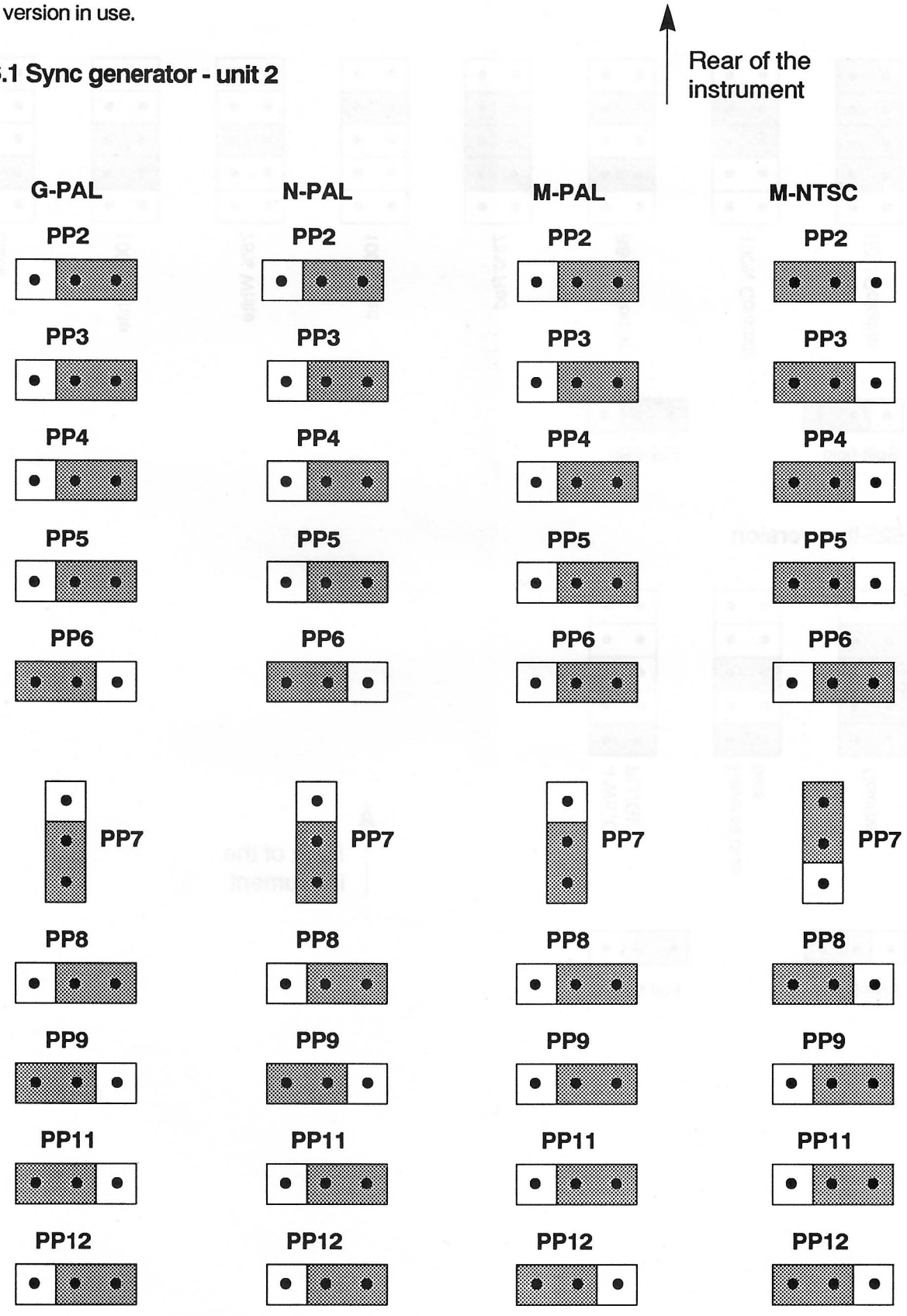
6.5.2 525-line version



6.6 Version dependent configuration

This section shows the location of the programming plugs on unit 2 - Sync generator and unit 3 - Colorbar generator (optional) which MUST be located in the indicated position for correct operation of the version in use.

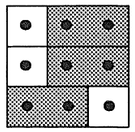
6.6.1 Sync generator - unit 2



6.6.2 Colorbar generator, PM 8544 - unit 3

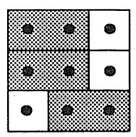
625-line version

PP110
PP111
PP112



525-line version

PP110
PP111
PP112



Rear of the instrument

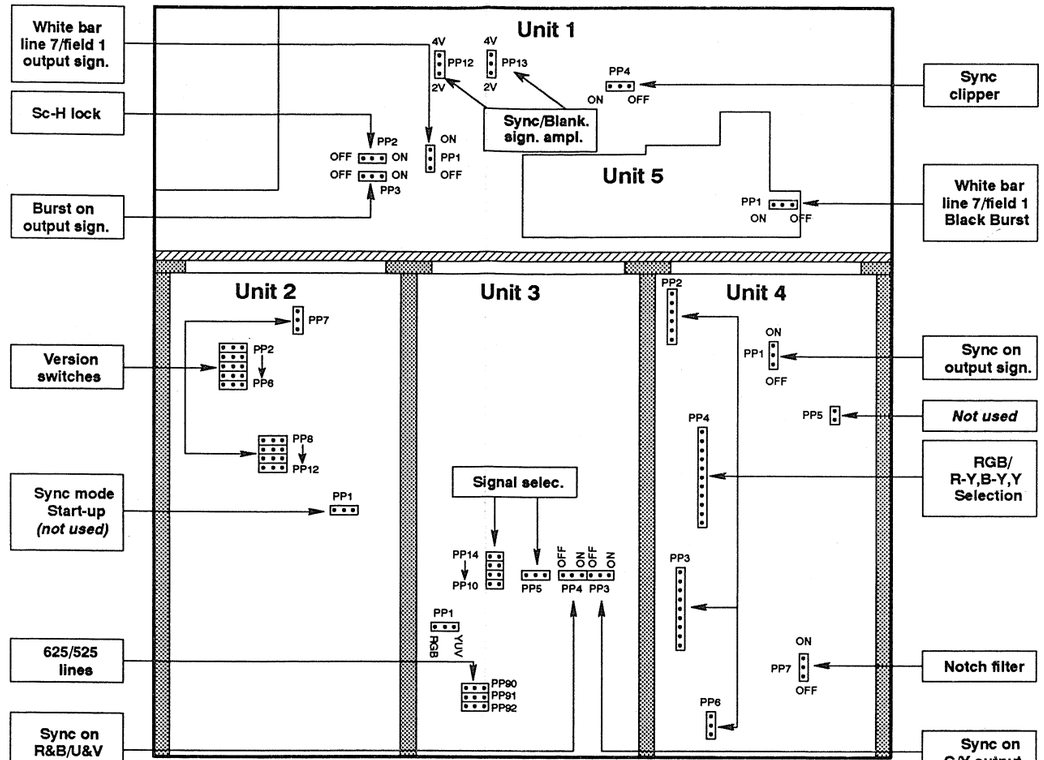


Fig. 6-1 Location of Programming Plugs

7. Controls and connections

7.1 Front panel controls and connections

SK1 "POWER"
The mains power is switched on when the button is pressed, connecting power to the internal DC power supply.

LA1 "POWER ON"
This green LED indicates that DC power is available from the power supply.

SK2 "EXT SYNCHRONIZATION"
When this switch is pressed the integral green LED lights, and the PM 5638 genlocks to an external video or composite sync signal. The line and field frequency phase-locks to the external source, and if a burst is present the internal subcarrier oscillator locks to it.

LA2 "NO EXT"
A red LED which lights, if EXT SYNC is selected on SK2, and the ext. sync signal disappears.
The PM 5638 automatically switches to internal sync if the external sync signal fails. If the external sync signal re-appears, the PM 5638 automatically switches back to the external mode.

P1 "HOR PHASE"
This screwdriver control is active only when EXT is selected on SK2. It allows adjustment of the phase between the ext. line pulses in the composite sync/ video signal and the internal generated line pulses.

P2 "SC PHASE"
The same as for P1 except that it allows for adjustment of the phase between external and internal burst signal.

P3 "CBAR PHASE" (PM 8544)
This screwdriver control allows adjustment of the horizontal timing of the output component signals from the optional colorbar generator. The horizontal timing may be adjusted in the range +10µsec to -3µsec referred to the output signals from the sync generator and encoder. This adjustment is inactive while TEST mode is selected.

LA3 "RGB"
This LED indicates that the encoder is set-up for coding RGB component signals into a composite video signal.

LA4 "Y, R-Y, B-Y"
This LED indicates that the encoder is set-up for coding Y-, R-Y, B-Y signals into a composite video signal.

SK3 "TEST"
When this switch is pressed the integral green LED lights, and the PM 5638 will supply either a Black Burst signal on the composite video outputs or, if the optional PM 8544 is mounted, the signal from the colorbar generator. This also results that the component output signals from the colorbar generator are disconnected from their respective output connectors while TEST has been selected.

BU1 "VIDEO OUT"
The composite video output signal is available on this BNC connector.

7.2 Rear panel connections.

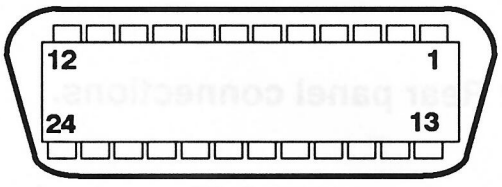
BU2,3 "VIDEO OUT"
The composite video output signal is available on these connectors.

BU4 "REMOTE"

24-pole right angle Champ-bus connector (type Amphenol 552791-1) for remote control facility.

Functions:

Pin number	Name	Description
16	Remote	Grounding this pin enables remote control of internal/external synchronization and TEST mode.
2	Int/Ext	Grounding this pin selects external synchronization (Pin 16 must be grounded too).
1	Burst off	Grounding this pin removes burst (function in parallel with internal jumper).
6	SC lock	Grounding this pin enables Sc-H lock with composite sync as genlock source (functions in parallel with internal jumper).
7	Notch on	Grounding enables the notch filter (functions in parallel with internal jumper).
3	Sync on	Grounding this pin adds composite sync onto coded signal.
4	CBAR	Grounding this pin switches the PM 5638 into TEST mode (Pin 16 must be grounded too).
5/11	On-air	Not used in this version



Pin 8, 9, 13, 14, 15 and 17 should not be connected.

Pin 12, 18, 19, 20, 21, 22, 23 and 24 are connected to ground.

Fig. 7-1 Remote connector seen from rear panel.

BU5,6 "RED/R-Y IN"

Looped-through input for component signal type RED or R-Y.

BU7,8 "GREEN/Y IN"

Looped-through input for component signal type GREEN or Y.

BU9,10 "BLUE/B-Y IN"

Looped-through input for component signal type BLUE or B-Y.

BU11 "BLACK B OUT"

A BNC connector providing a black burst signal output.

BU12 "BLANK OUT"

A BNC connector providing a blanking output.

BU13 "SYNC OUT"

A BNC connector providing a composite sync signal output.

BU14 "SUBC OUT"

A BNC connector providing a subcarrier frequency output.

BU15,16 "EXT SYNCHR"

Two BNC connectors for application of external sync signal and looped-through operation.

BU19 Mains connector.

BU20 "RED/R-Y OUT"

The Red- or R-Y component of the selected signal from the optional colorbar generator, PM 8544 is available on this connector.

BU21 "GREEN/Y OUT"

The Green- or Y component of the selected signal from the optional colorbar generator, PM 8544 is available on this connector.

BU22 "BLUE/B-Y OUT"

The Blue- or B-Y component of the selected signal from the optional colorbar generator, PM 8544 is available on this connector.

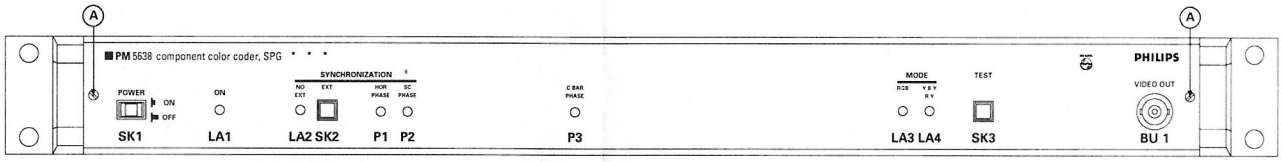


Fig. 7-2 Front panel controls and connections

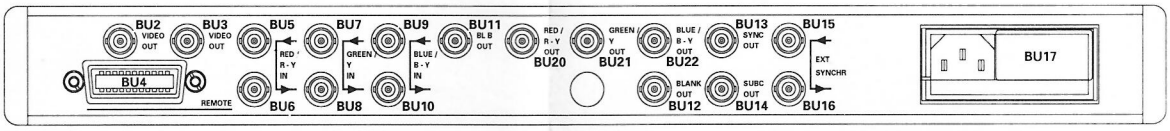


Fig. 7-3 Rear panel connections

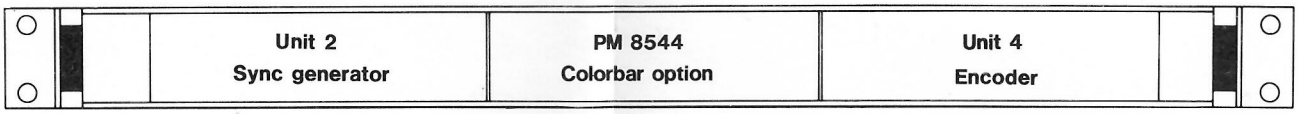


Fig. 7-4 Unit location (front panel removed)

8. General

8.1 Use of the service instructions

Troubleshooting is best carried out on a functional level using block diagrams. Reference is made to Chapter 9 - "Block diagram description" for an overall description of the instrument. The block diagrams of each individual unit are described in the chapters to follow. These diagrams contain sufficient information for a skilled technician to carry out performance checks, adjustments, maintenance, and fault finding down to stage level. Fault finding to component level will however, require the use of appropriate circuit diagrams.

8.2 Safety

The opening of covers or removal of parts, except those to which access can be gained by hand, is liable to expose live parts. Accessible terminals may also be live.
The instrument must be disconnected from all voltage sources before performing any adjustment, replacement, maintenance, or repair which requires the instrument to be opened. If adjustment, maintenance, or repair of the opened instrument is unavoidable, it must only be carried out by a skilled person who is aware of the hazards involved.

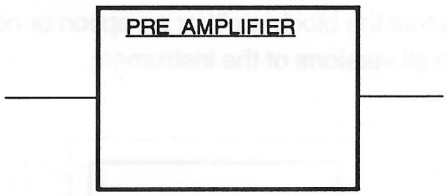
8.2.1 Electrostatics sensitive devices

All ICs and many other semi-conductors are susceptible to electrostatic discharges (ESD).
Careless handling during repair can reduce life time of the components drastically.
When repairing, make sure that you are connected with the same potential as the mass of the set via a wrist wrap with resistance. Keep components and tools also at this potential.

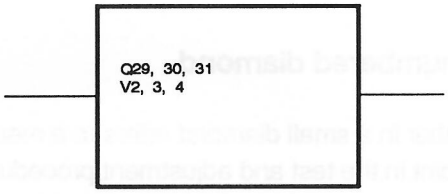
8.3 Block diagram symbols-description

Various symbols and conventions are used in the block diagram and a short description of these is given below.

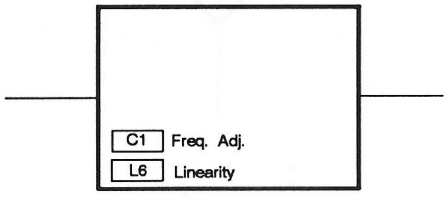
Functional block information



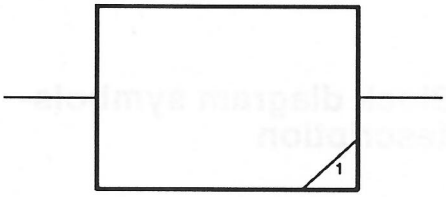
The underlined text within the block gives the function provided by the block.



Text shows the major components in the block or stage.



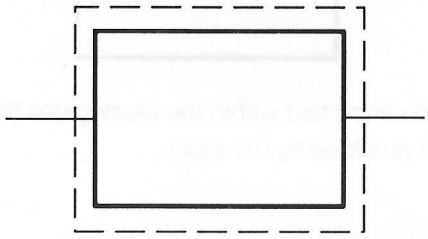
Inside some of the functional blocks, there are other smaller blocks. These show the adjustable components within the stage and what they adjust.



The number in the lower right hand corner of the block shows on which sheet of the appropriate circuit diagram the block may be found.

The dotted line

A dotted line around a functional block (or stage) means that the block is either an option or not used in all versions of the instrument.



The numbered diamond

A number in a small diamond refers to a measuring point in the test and adjustment procedures. These symbols are cross-referenced both on the block diagram and its corresponding checkpoint sheet.

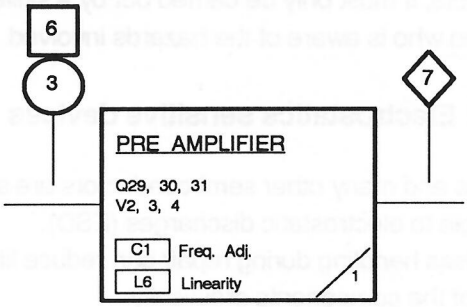
The numbered square

A number in a small square refers to an oscillogram number. These symbols are cross-referenced both on the block diagram and its corresponding checkpoint sheet.

The numbered circle

A number in a small circle refers to a test point physically provided on the PCB. These symbols are cross-referenced on the checkpoint sheet, its corresponding block diagram, and the circuit diagram.

Example:



NOTE: All circuit diagrams shows values for the G-version. Where values differ in other version an * indicates this. Make sure when replacing a component that one of same value is re-installed as is removed. Values for other versions are found in "List of electrical parts".

9. Block diagram description

The PM 5638 Component Color Coder consists of four units and one optional unit.
These are:
1. Main board . . . . . unit 1
2. Sync generator . . . . . unit 2
3. PM 8544 Colorbar generator unit 3 (*Optional*)
4. Encoder . . . . . unit 4
5. Black burst generator . . . . . unit 5

9.1 Main functions of the units

9.1.1 Main board - unit 1

The main board provides the following functions:
1. Contains the mains transformer and the power supply which provides various regulated and unregulated voltages used by all the units.
2. Contains a *Temperature Compensated X-tal Oscillator* (TCXO) which is the internal reference source.
3. Amplifies the sync and blanking signals before they are send to their respective output connectors.
4. Buffers the RED/R-Y, GREEN/Y, BLUE/B-Y and external sync. input signals.
5. Switches the input of the encoder between the incoming component signals and the component signals from the optional colorbar generator.
6. Acts as motherboard and interconnection between the other units of the instrument.

9.1.2 Sync generator - unit 2

The sync generator provides a 5MHz clock pulse and all the sync signals needed by the other units of the instrument. In addition, it provides the means to generate the required signals either by using the internal TCXO reference or by genlocking to an external sync source. If the external sync source should fail, automatic switching to the internal reference takes place. The subcarrier signals are also derived, amplified and buffered by this unit before being fed directly to the BNC connector on the rear panel.

9.1.3 PM 8544 Colorbar generator - unit 3 (*Optional*).

The colorbar generator applies a component colorbar signal output configured in either GBR or Y, P_B, P_R. Several types of colorbars are available (internal selectable). The output is either fed to the respective output connectors or to the input of the encoder (TEST mode).

9.1.4 Encoder - unit 4

The coder combines the three component color signals (R, G, B) to one composite video output signal. RED, GREEN and BLUE component signals are first converted to R-Y, B-Y and Y - signals. The R-Y and B-Y signals are modulated onto a subcarrier. The chroma signal is thereafter added together with the Y - signal and a sync signal.

9.1.5 Black burst generator - unit 5

The black burst generator combines the different sync signals to produce a black burst output signal mostly used for synchronization of other instruments.

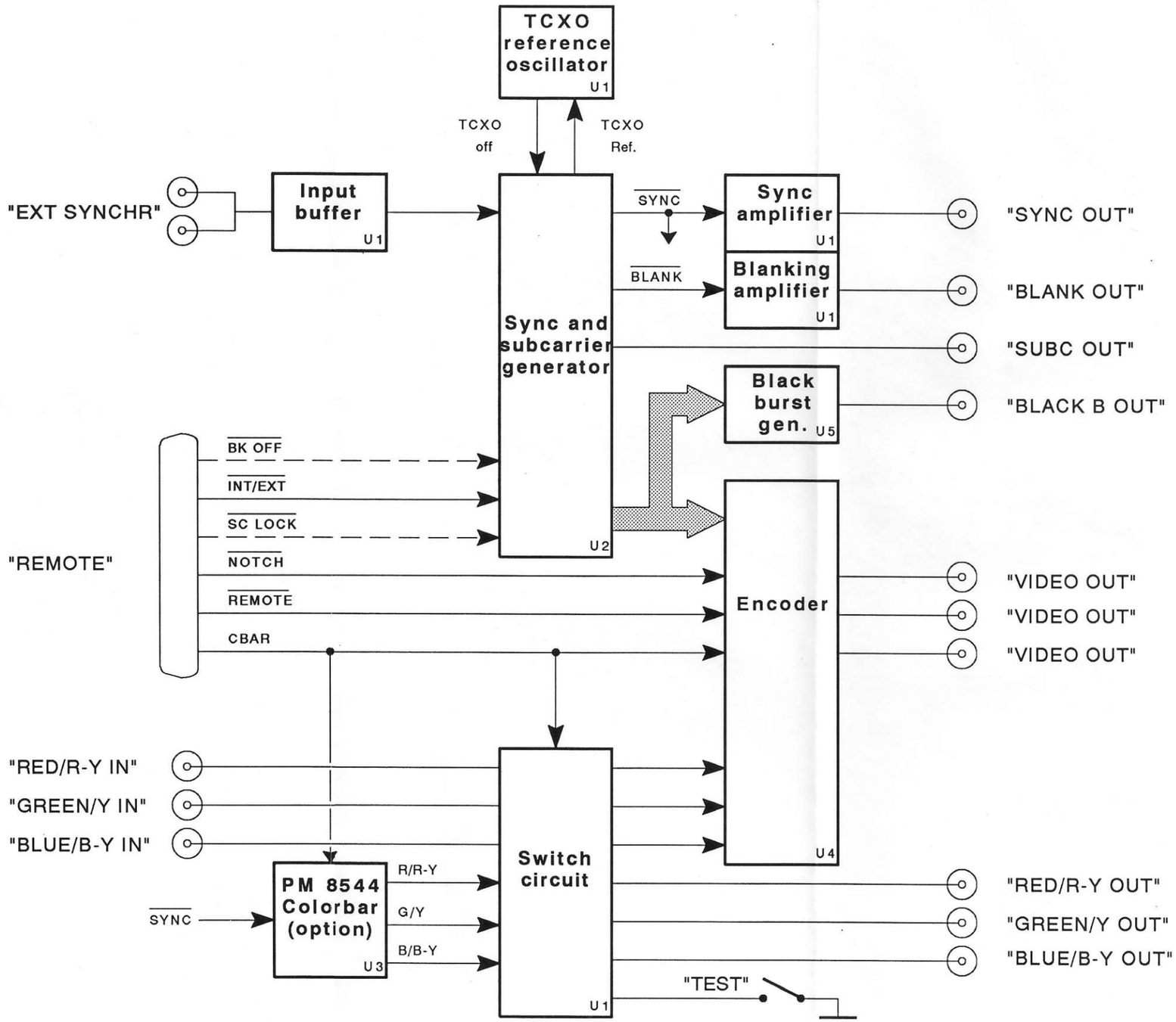


Fig. 9-1 Instrument block diagram

10. Wiring diagram

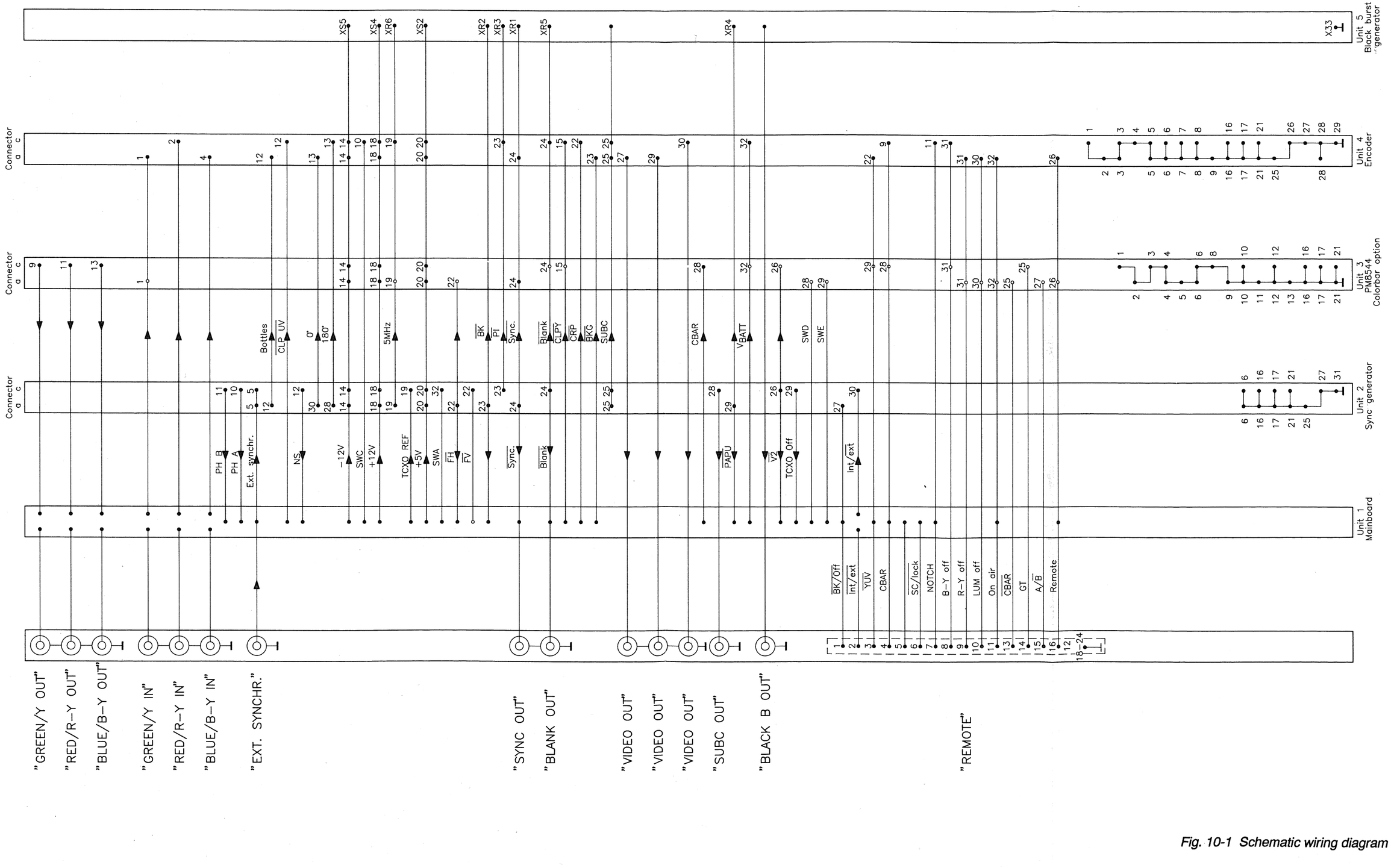


Fig. 10-1 Schematic wiring diagram

11. Main board

11.1 General

The main board serves the following purposes:

1. It provides all necessary internal voltages for the instrument.
2. It contains the internal reference oscillator circuit (TCXO).
3. It acts as a "mother board" for the other units and provides interconnection between them.
4. It amplifies the output synchronization signals.
5. It switches the input of the encoder between the incoming component signals and the component signals from the optional colorbar generator.

11.2 Description

11.2.1 Power supply.

The mains voltage enters the instrument on the rear panel and is fed through the integral mains filter (on the mains socket) to the primary winding of the mains transformer. The secondary windings are connected to the two rectifiers D1 and D2. Three solid-state regulators provide supplies of +8V, -8V, and +5V. In additional, unregulated supplies of +12V and -12V are distributed to all units of the instrument.

11.2.2 Reference oscillator

The reference oscillator is based on a *Temperature Compensated X-tal Oscillator* (TCXO) at twice the subcarrier frequency (version dependent). This TCXO can assume three different states:
– Disabled (switched off)
– Free-running (at nominal subcarrier frequency)
– Phase locked (Sc-H)
The TCXO is disabled via the TCXO OFF signal when the instrument is operated in genlock mode and an external subcarrier reference (burst) is available. The TCXO is switched on when the instrument is in internal sync mode and when external subcarrier information is absent in gen-lock mode. In the latter case the TCXO can be locked to the external line sync information (f_H) via the subcarrier coupler facility in unit 2 provided that the programming plug PP2 is in position "Sc-H lock ON" (*see also paragraph 6.4.8*). The phase control information (PHA and PHB) is then passed to the TCXO via the loop filter build around V5. If the external sync information is lost in this mode the NS signal (No Sync) will interrupt the connection between the loop filter and the TCXO leaving the TCXO in a free running mode.
The output of the TCXO is buffered, divided by two and fed to the sync generator.

11.2.3 Sync signal amplifiers

The output sync signals (except SUBC OUT) from the sync generator are amplified on the main board before being fed to their respective output connectors.
The external sync signal is fed through a buffer amplifier before being fed to the sync generator.

11.2.4 Control latch

The circuit block acts like 4 independently latched push-button switches. The function is to store push-button activated selections:
a. Internal/external synchronization selection
b. "TEST" status when PM 8544 is mounted
Additional two functions are not used in the standard version.
Each latch works based on a feed-back basis: The outputs of the clocked latch V9 (74HC173) are fed back to the respective data inputs via EX-OR gates V8. As long as the other inputs of the EX-OR are "low" the data inputs will remain the same as the flip-flop outputs. Any clocking will have no effect.
When the other inputs of the EX-OR are high the data inputs will have opposite state of the flip-flops, resulting in a logic state change when clocking occurs.

Clocking:
The four inputs (SWC, SWA, SWE and SWD) are inverted (V7) and OR'ed together to a common clock line, which clocks all flip-flops. De-bouncing of the switches is done by means D34, R138, R139, C141 and delay circuit R145 and C142. Clocking can be inhibited by either "REMOTE" or the remote control function "ON-AIR".

Output control:
The latch is battery-backed, so information will remain when power is removed, while the latch is set into inactive tri-state. Also the latch is "disconnected" when the "REMOTE" function is activated.

Misc.:
Adding D36 and C143 will ensure that all flip-flops are cleared under power-up and thus overriding and previous conditions.

11.3 Test and adjustments

Measuring equipment:

Digital voltmeter	: e.g. Phillips PM 2528
Frequency counter	: e.g. Phillips PM 6670

11.3.1 Voltage checks

1. Using a digital voltmeter, check for +8V ±0.4V on V1, pin2
2. Using a digital voltmeter, check for -8V ±0.4V on 2 V2, pin2
3. Using a digital voltmeter, check for +5V ±0.2V on 3 V3, pin2
4. Using a digital voltmeter, check that the voltage on the battery B1 is > 3V.

11.3.2 Adjustment

1. TCXO frequency adjustment
- Connect a frequency counter to (1) .
- Set SK2 ("EXT") to internal synchronization.
- Check that the subcarrier frequency is correct for the version in use:

G-PAL	: 4.43361875MHz
N-PAL	: 3.582056MHz
M-PAL	: 3.575611MHz
M-NTSC	: 3.579545MHz

- If not, adjust C69.

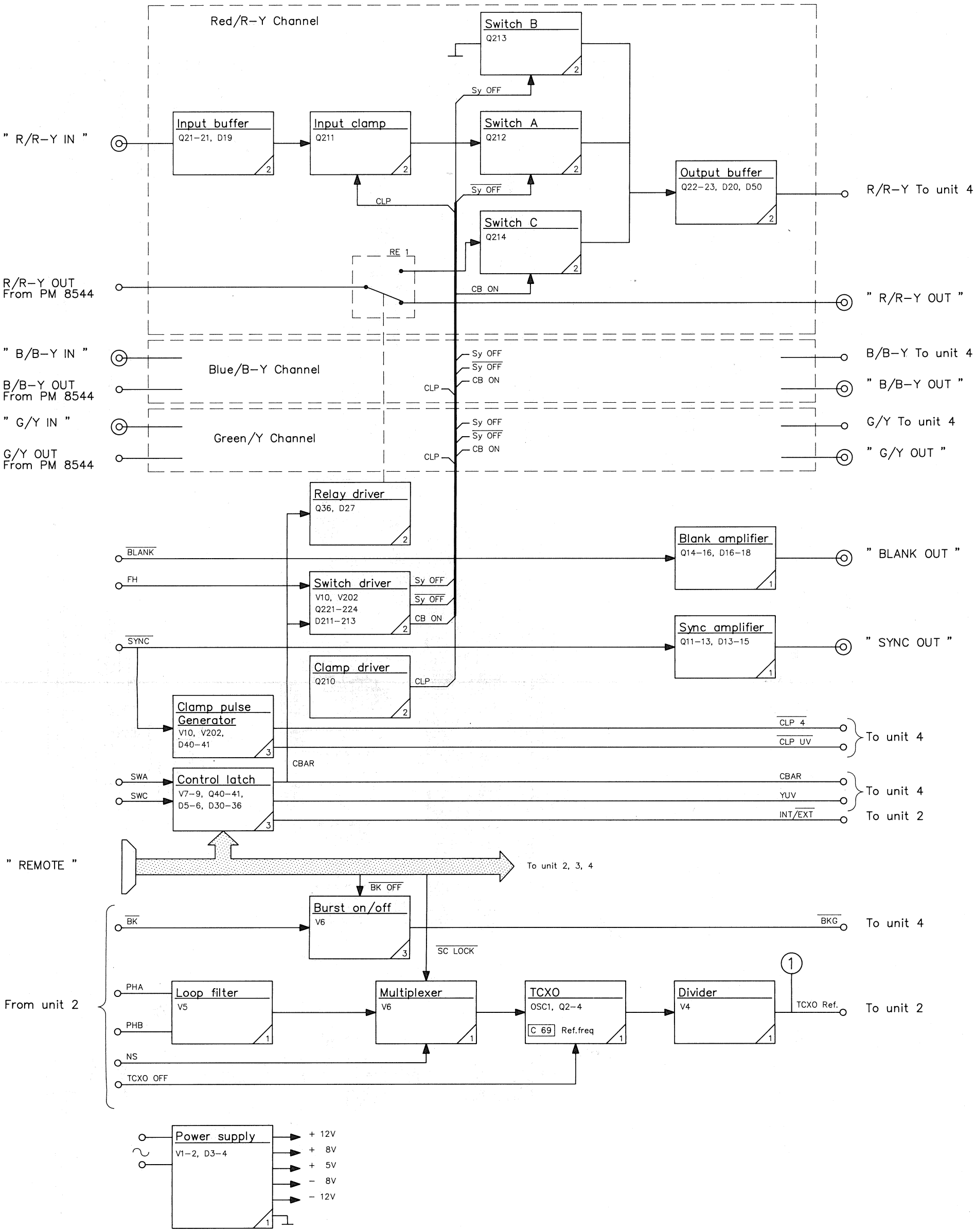


Fig. 11-1 Block diagram, main board - unit 1

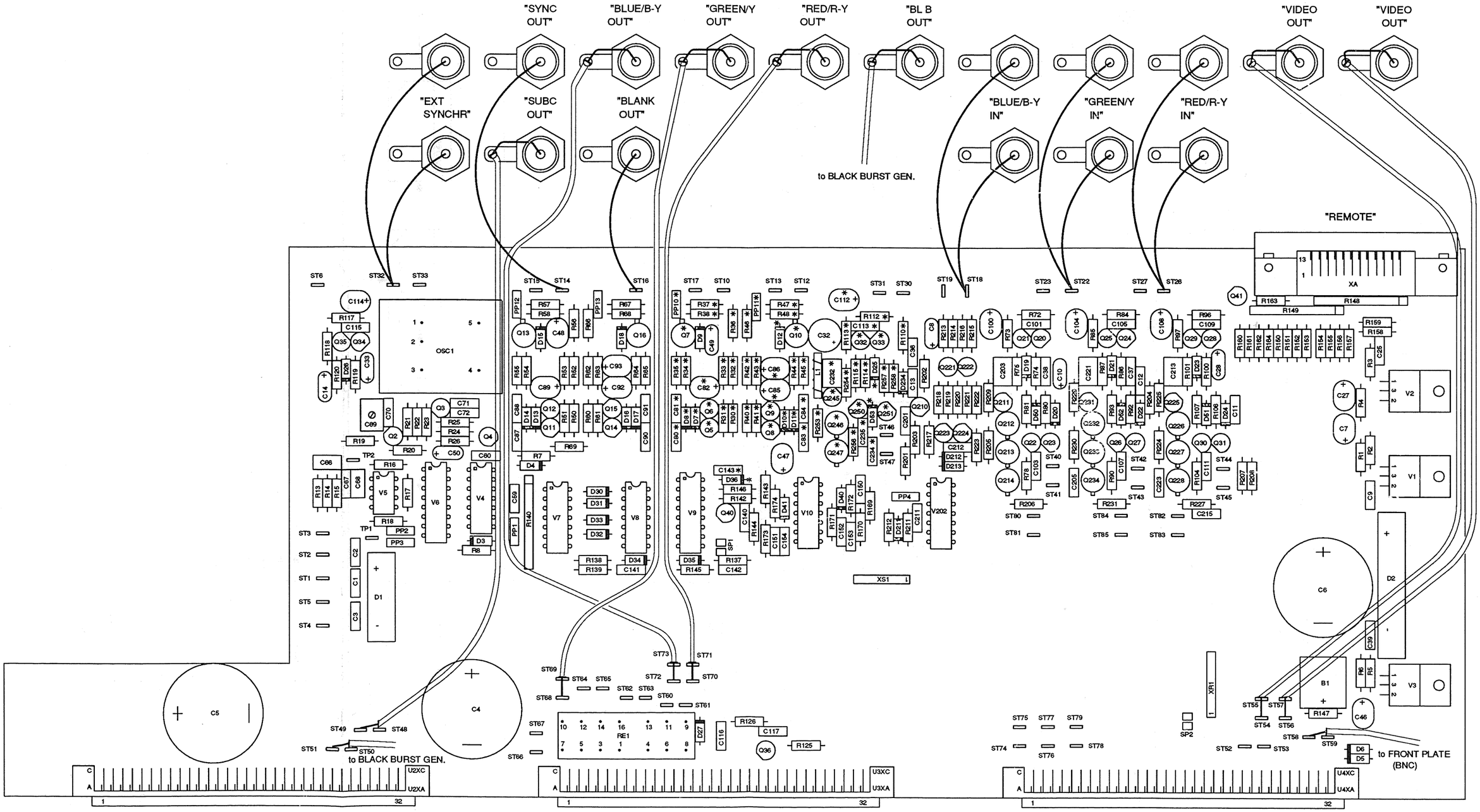
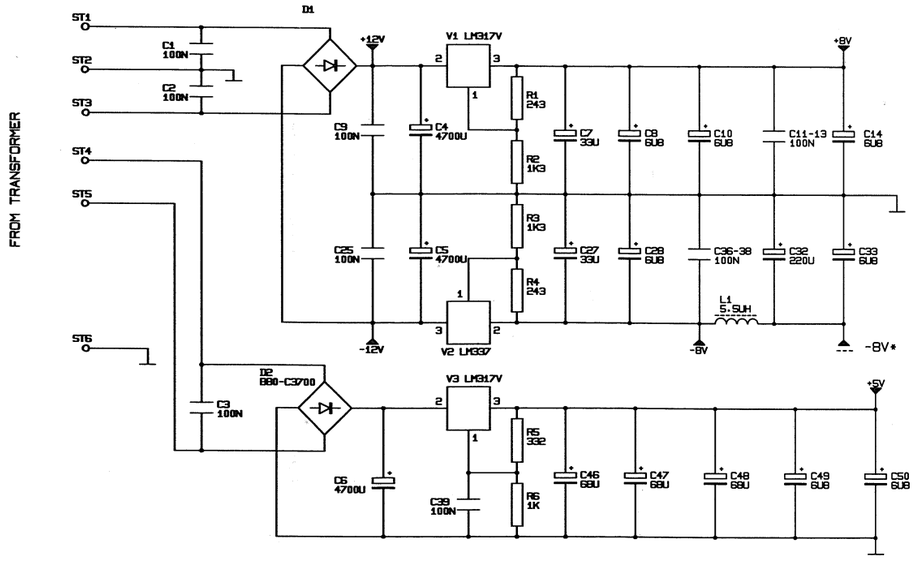
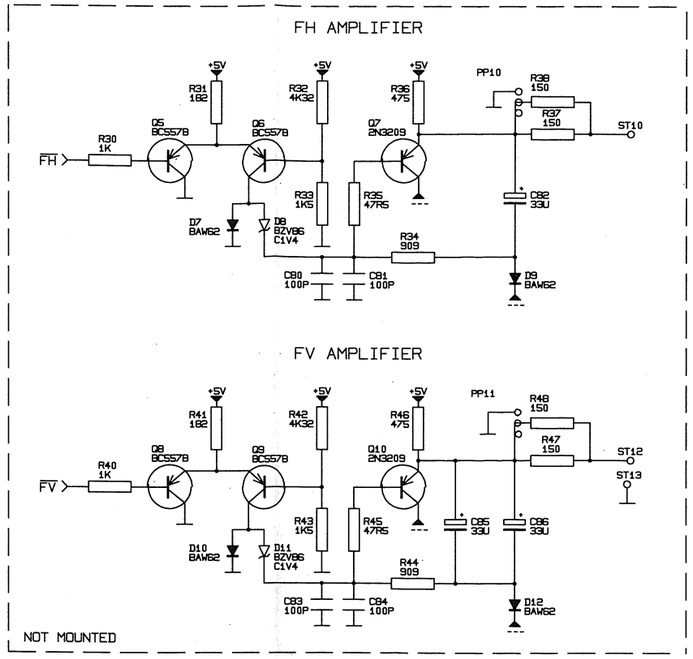


Fig. 11-2 Component location, main board - unit 1

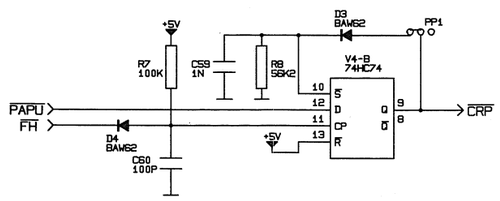
POWER SUPPLY



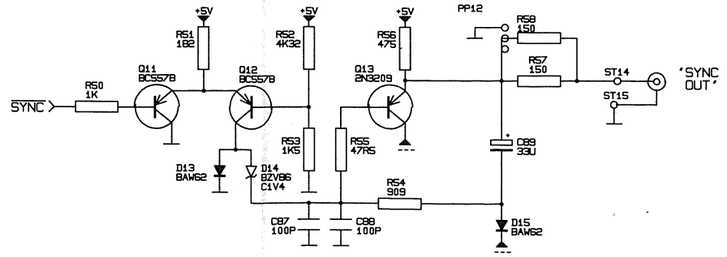
PULSE AMPLIFIERS



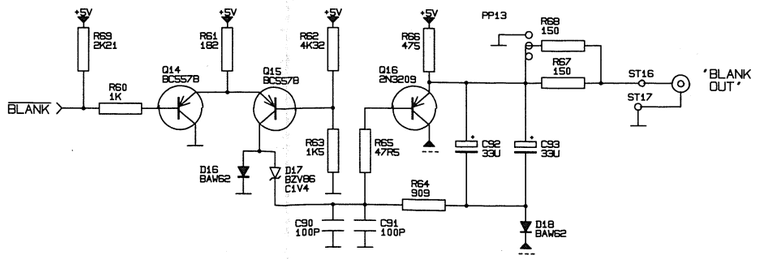
COLOR REF.GEN.



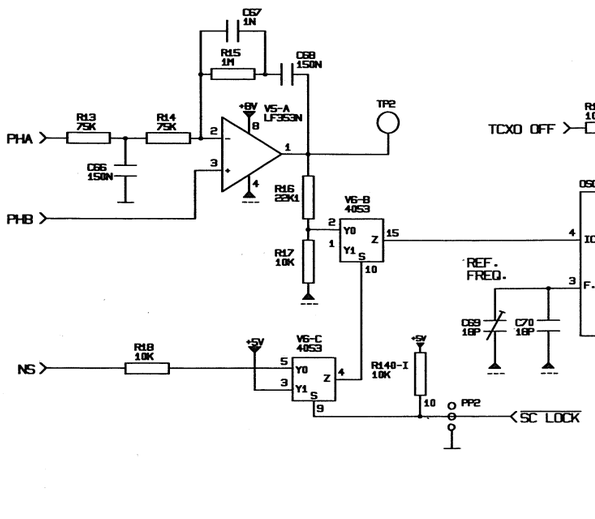
SYNC AMPLIFIER



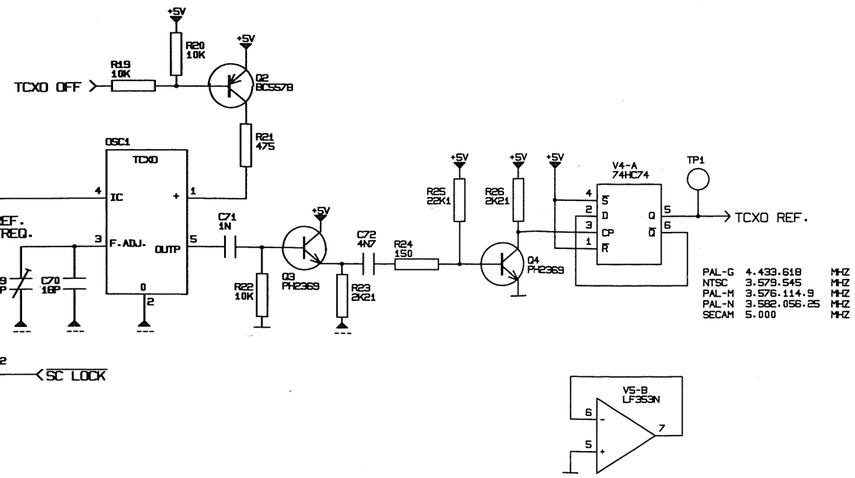
BLANK AMPLIFIER



LOOP FILTER



REF.OSCILLATOR



109 74430

Fig. 11-3 Circuit diagram, main board - unit 1, sh.1

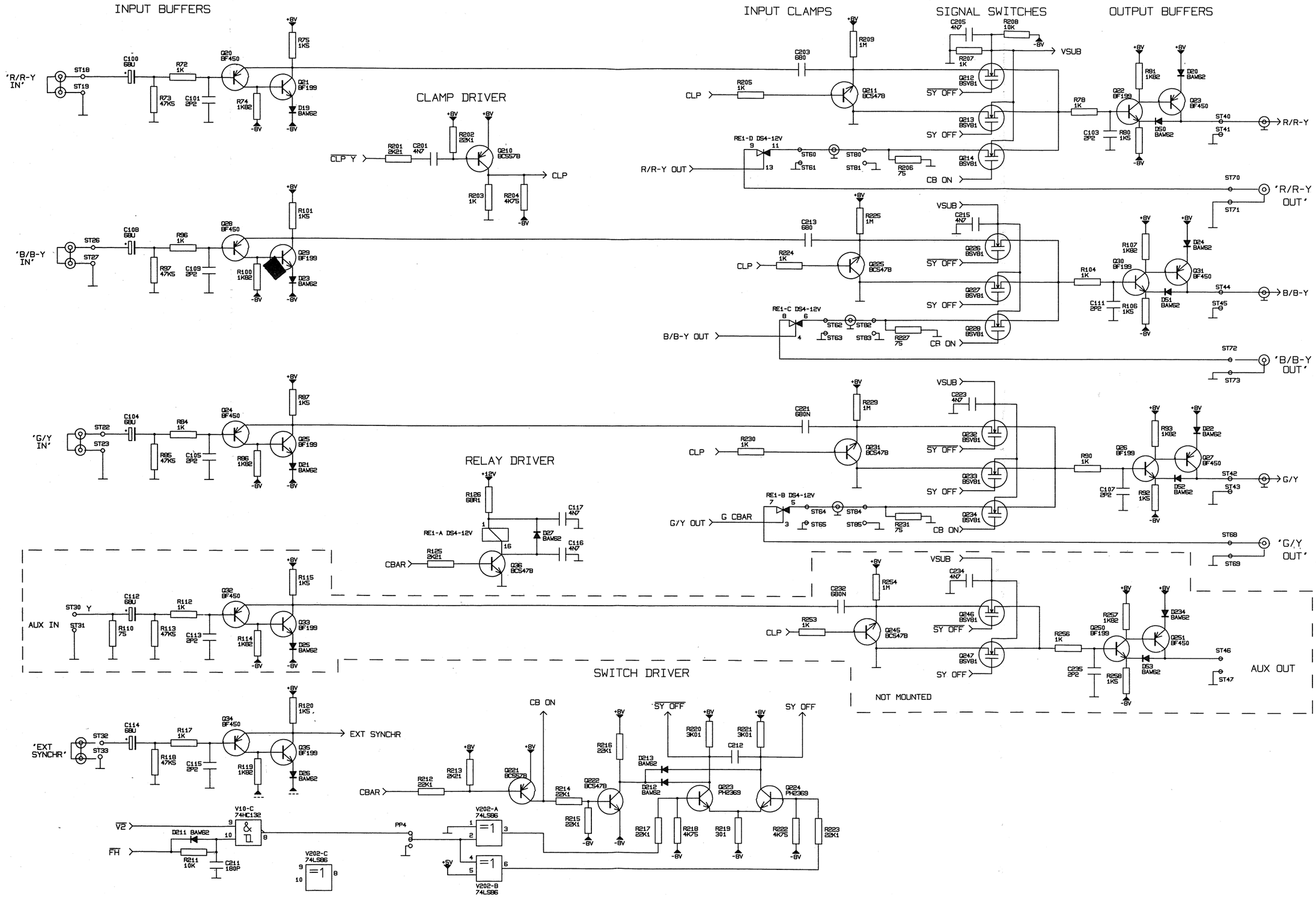
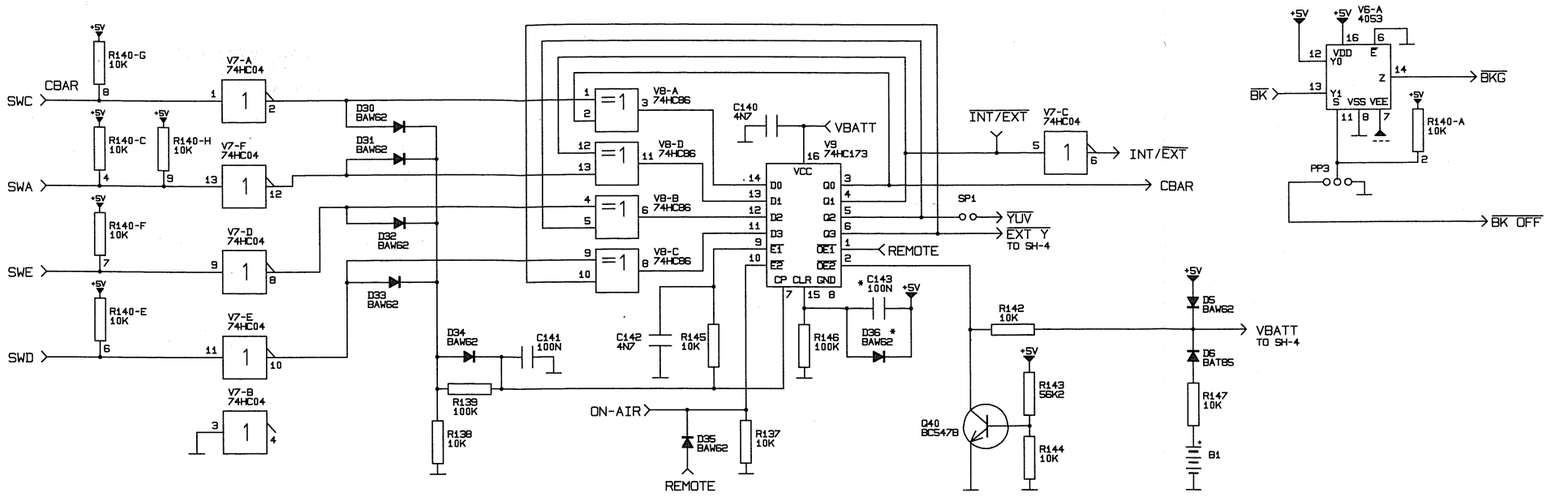
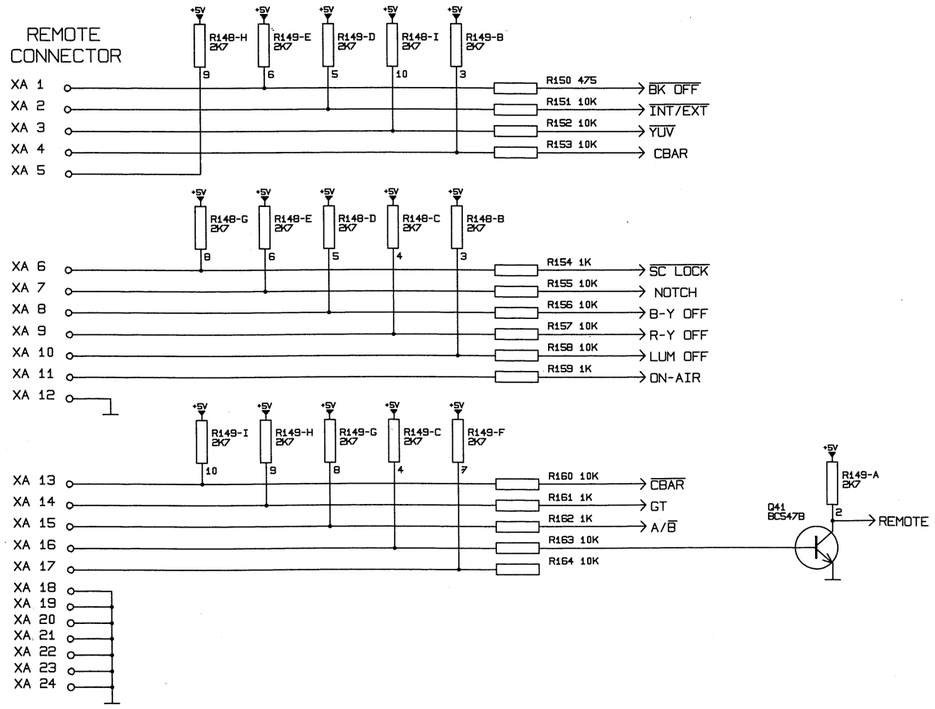


Fig. 11-4 Circuit diagram, main board - unit 1, sh.2

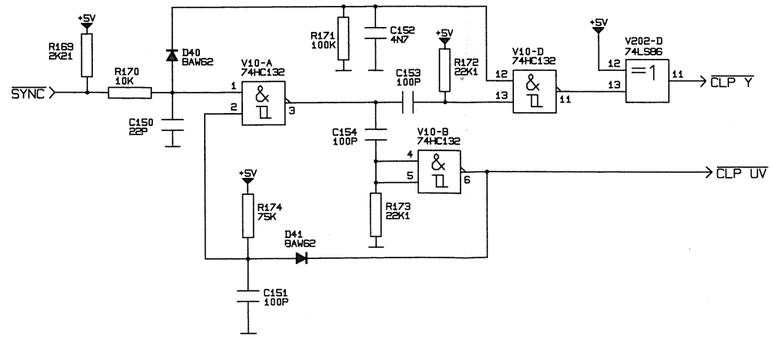
CONTROL LATCH



REMOTE INTERFACE

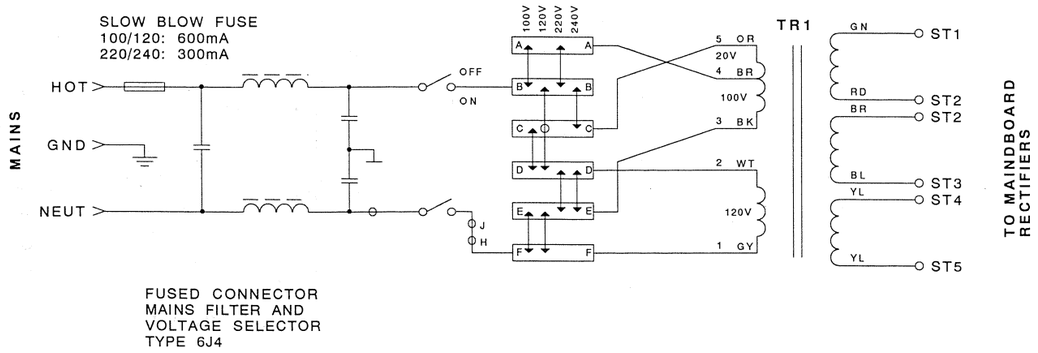


CLAMP PULSE GENERATOR



* NOT MOUNTED

Fig. 11-5 Circuit diagram, main board - unit 1, sh.3



FUSED CONNECTOR
MAINS FILTER AND
VOLTAGE SELECTOR
TYPE 6J4

Fig. 11-6 Mains inlet circuit

12. Sync generator - unit 2

12.1 General

Unit 2 generates a number of signals without which the instrument cannot function. These can either be locked to an external video signal or to the TCXO reference oscillator on unit 1. In addition, information (pin connections, description, etc.) is provided about the two integrated circuits, the SAA1043 and SAA1044, which play an important part in the operation of this unit.

12.2 Description

The sync generator is built up around the SAA1043 (V19). This IC has a built-in 5MHz oscillator (5.03MHz M-PAL and NTSC-versions) from which a number of sync signals are derived. This oscillator is locked to either the line sync pulses of an external video signal, or to the internal TCXO reference oscillator via SAA1044 genlock IC in order to obtain correct subc/line relationship.
If an external sync signal is present it is fed via the chroma take out circuit and the clamp circuit to the sync peak detector. This circuit detects if the incoming sync is missing or decides whether it level is too low. If the level is below 6dB from nominal value, the detector gives information to the sync IC (SAA1043) via the Int/Ext signal selector circuit. The sync generator shifts to internal mode, and locks to the TCXO on unit 1.

SAA1044 (V27) is the heart of the subcarrier genlock circuit. It is provided with two built-in oscillators at f_{SUBC}. The oscillator A is locked to the TCXO reference oscillator on unit 1 in internal mode. In external mode it is locked to either the burst of an external video signal, or to the line sync. The subcarrier may also free run, internally selectable by jumper. The oscillator B is locked to oscillator A.
If an external video signal is present, the burst of this signal is fed to the burst level detector. This circuit detects if the burst is missing or decides whether its level is too low. If the level is below 6dB of nominal value the subcarrier reference select circuit is either free-running or locked to the line sync.

If the subcarrier is genlocked to an external source, the TCXO on unit 1 is switched off to prevent noise due to interaction of the two frequencies. This function is controlled via the SUGE signal.

Proper subc/line relationship is maintained by using the two signals FH3 and FH80 from the SAA1043. These are fed to the line/subc phase detector circuit in the SAA1044 where they are compared with the internal subcarrier signal from oscillator A. The output of this circuit (PH.A) is fed to the sync lock filter where it controls the 5MHz (or 5.03MHz) oscillator in the sync IC.

If an external sync signal is applied, the subc/line relationship is referenced to the external signal if a burst is present.

The small crash-lock unit underneath the sync IC (V19) consists of two flip-flops. The first flip-flop detects if there is an external sync present. If no sync is applied the second flip-flop stops the internal line counter in the sync generator IC (V19) until an external vertical sync pulse is applied on the V1 line.

12.3 SAA1043 sync generator chip description

The SAA1043 generates the synchronizing waveforms required in all types of video source equipment. The device is programmable to suit different TV standards with the aid of three program inputs (FD, X, Y).

12.3.1 Functional description

The SAA1043 is provided with a built-in oscillator. The oscillator can work with an external LC-circuit or a crystal.
The following frequencies are applied to the clock input (OSCI):
G,N-PAL : 5.0MHz
M-PAL/NTSC : 5.034964MHz
An other circuit makes it possible to lock the internally generated sync signal to an external sync signal.

This functions as follows:
Reset pulses are derived from each falling edge of the external sync signal (ECS). This resets the sync counter which is clocked by a pulse from the horizontal counter. The ECS is compared with the internally generated horizontal sync pulse in the phase comparator.

If a phase difference between the two signals is detected, the output (PH) is pulled towards the Vdd or Vss dependent on the direction of the error. The phase error voltage (PH) is used to correct the frequency of OSCI via VCO and nullifies the phase error between internal and external signals. Equalization and serration pulses do not effect the phase comparator.
A no sync signal is generated by the sync pulse gate if the sync counter is not reset from the ECS. The no sync signal (NS) occurs 6.4us after the time of the missing reset pulse.
Vertical lock is performed by comparing the internal vertical sync with a pulse derived from the ECS and using the result to modify the period of the vertical counter. This is achieved by manipulation the DL ($2xf_H$) input to the vertical counter via the addition/subtraction logic. Note that the crash-lock circuit override this function.

12.4 SAA1044 subcarrier coupler description

The subcarrier coupling IC SAA1044 is designed in combination with the universal sync IC SAA1043 for applications involving cameras, film scanners, signal generators, and associated equipment. The use of this IC is necessary when an exact relationship between the subcarrier and line frequency is desired.

The TV standard required for operation is programmed by use the inputs FX, X, and FH3 as shown in the following schedule.

Standard	FD	X	FH3	Relationship of subcarrier frequency (f_S) to horizontal scan frequency (f_H)
G-PAL	0	1	400Hz	$f_S = 283.7516f_H$
N-PAL	1	1	400Hz	$f_S = 229.2516f_H$
M-PAL	1	0	1	$f_S = 227.25f_H$
M-NTSC	1	0	0	$f_S = 227.5f_H$

Positive logic: 1 = HIGH; 0 = LOW

$80f_H$ is used as a reference frequency for the line frequency f_H; this frequency is delivered by the sync IC for all standards.

The f_{SUBC} is derived from an on-chip oscillator, which can work with a crystal or with LC elements. Both frequencies are compared by phase comparator 1. The output signal of this phase comparator can be fed to a low-pass filter, which supplies the control voltage for a VCO.

Either the subcarrier or line oscillator frequency can be chosen as a reference. The filter can be active or passive depending on the application.

For genlock applications a third phase detector is provided with high accuracy and stability. This phase detector is used for comparing the internal subcarrier and external reference frequency.
To adjust the phase, a phase detector with a linear characteristics is provided.
Control of the phase is achieved by comparing the average value with a reference voltage.

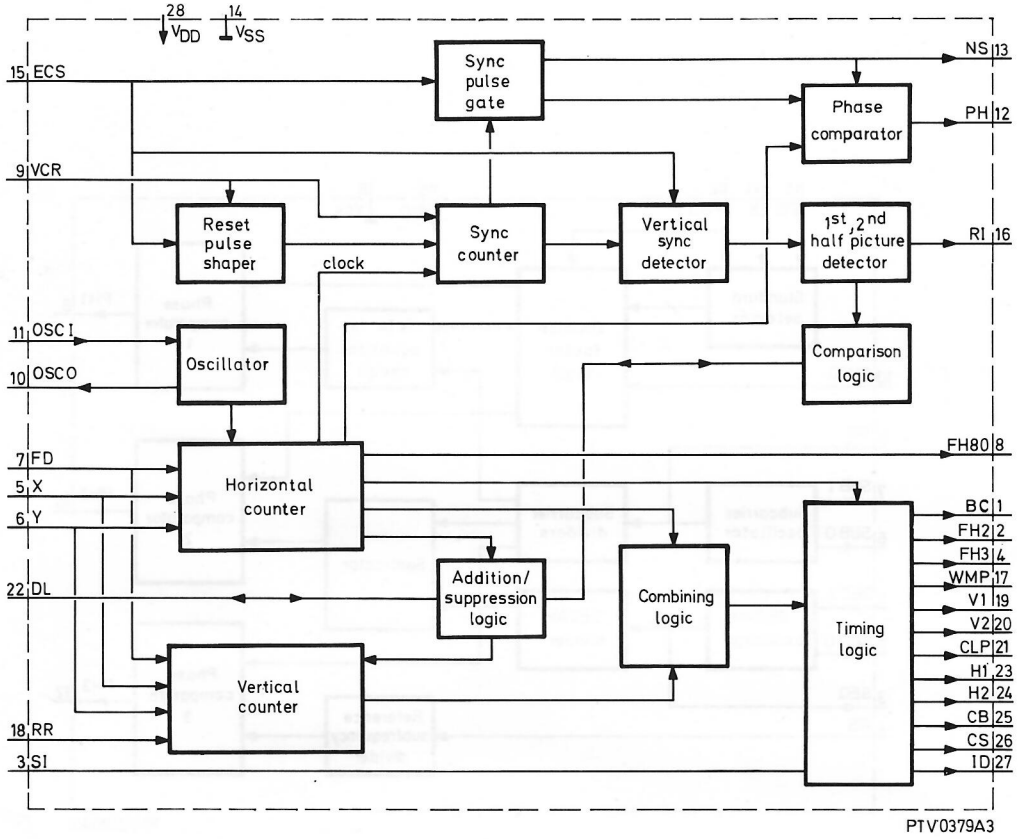


Fig. 12-1 SAA1043 internal block diagram

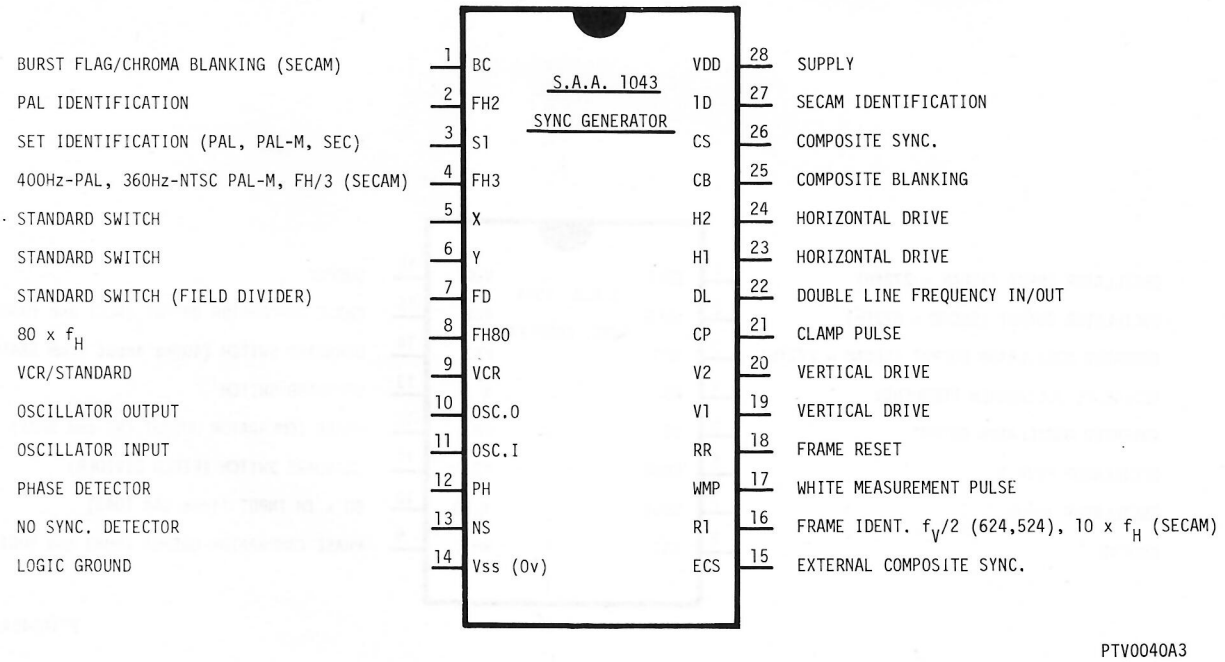


Fig. 12-2 SAA1043 pin connections/signal names

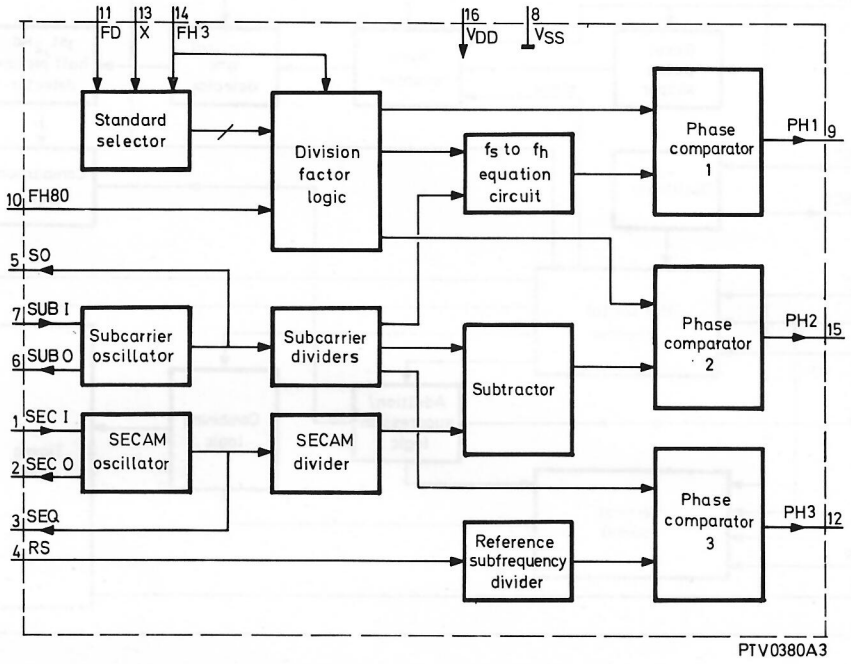


Fig. 12-3 SAA1044 internal block diagram

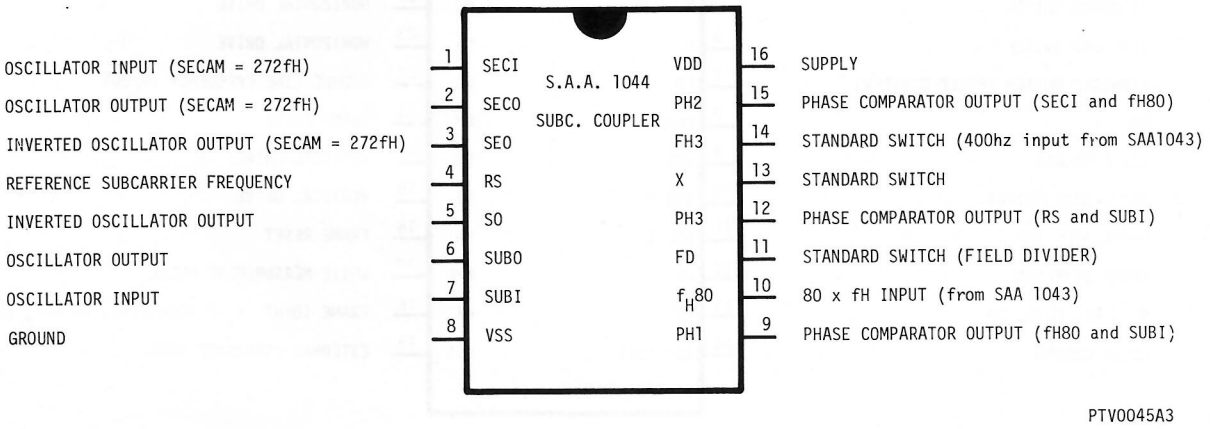


Fig. 12-4 SAA1044 pin connections/signals names

12.5 Test and adjustment

Measuring equipment :

Oscilloscope	: e.g. Philips PM 3055
Digital voltmeter	: e.g. Philips PM 2528
Test signal generator	: e.g. Philips PM 5640
Sc-H meter	: e.g. Philips PM 5668

Check that all configuration switches are correctly placed for the version in use.
(*This information is found in Chapter 6 - Configuration*).

12.5.1 Voltage checks

1. Using a digital voltmeter, check for +8V ±0.4V on ◇1◇ (V6, pin8).
2. Using a digital voltmeter, check for -8V ±0.4V on ◇2◇ (V6, pin4).
3. Using a digital voltmeter, check for -5V ±0.2V on ◇3◇ (V25, pin16).
4. Using a digital voltmeter, check for +5V ±0.2V on ◇4◇ (connector pin20 a,c).

12.5.2 Adjustments

1. Subcarrier output amplitude.
- Connect an oscilloscope terminated with 75Ω to the SUBC OUT connector.
- Set synchronization to the INT mode.
- Adjust L2 for 2V_{PP} ±0.2V_{PP}

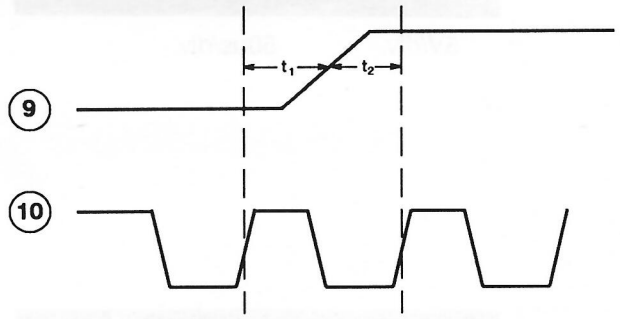
2. Internal subcarrier amplitude.
- Connect an oscilloscope to (6).
- Set synchronization to the INT mode.
- Adjust L3 for maximum amplitude (approx. 2V_{PP}).

3. Chroma amplitude.
- Connect an oscilloscope to (1).
- Connect a nominal video signal to the EXT SYNCHR connector.
- Set synchronization to the EXT mode.
- Adjust L1 for maximum amplitude (minimum 2V_{PP}).

4. Subcarrier phase detector balance.
- Connect an oscilloscope to (4)
- Connect a nominal video signal to the EXT SYNCHR connector.
- Set synchronization to EXT mode.
- Trigger the oscilloscope with a f_V-pulse from the Test signal generator.
- Adjust R68 for minimum peak during the field pulse.

5. Line/Subc phase
- Connect a Sc-H meter terminated with 75Ω to either VIDEO OUT connector.
- Check that the Line/Subc phase is 0°.
- If not, adjust R140.

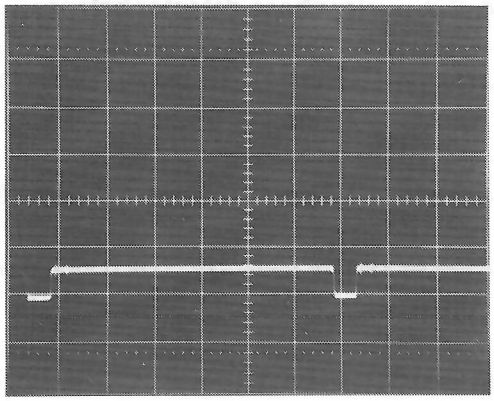
6. Clock timing
Only in case the SAA1043 has been replaced.
- Connect the oscilloscopes CH-A to (9) and CH-B to (10) (ground lead to (8)).
- Check that the leading edge of signal (9) is located more than 25ns after and more than 55ns before the leading edge of (10) measured at the signals 2V crossing (*see below*).
- If not OK, move the jumper S13 to its opposite position and repeat the test.



t_1>25ns t_2>55ns

Clock timing

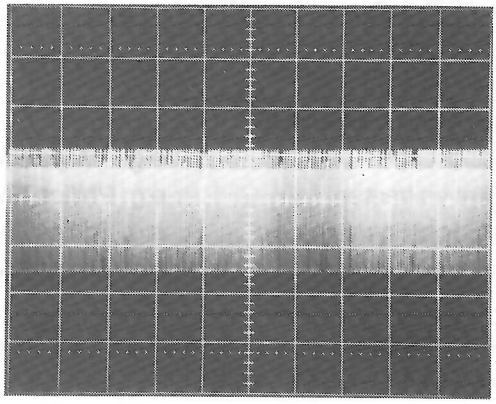
1



0V

0.5V/div. 10us/div.

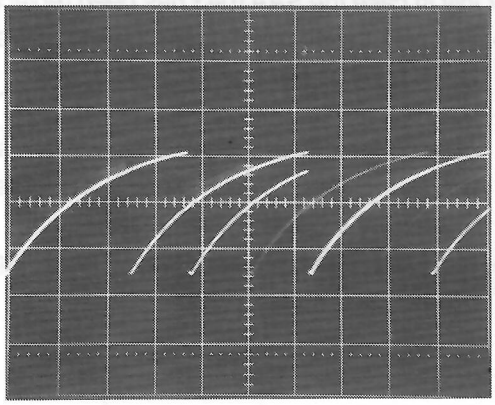
2



0V

5V/div. 5ms/div.

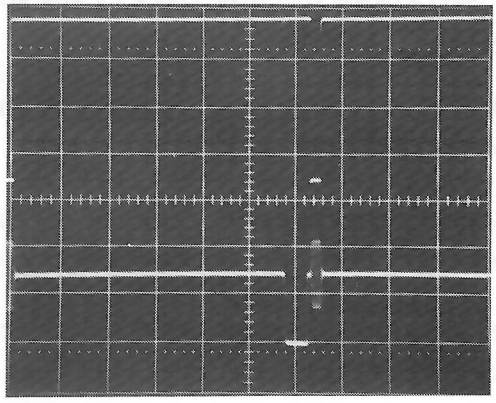
2



0V

5V/div. 50us/div.

3



0V

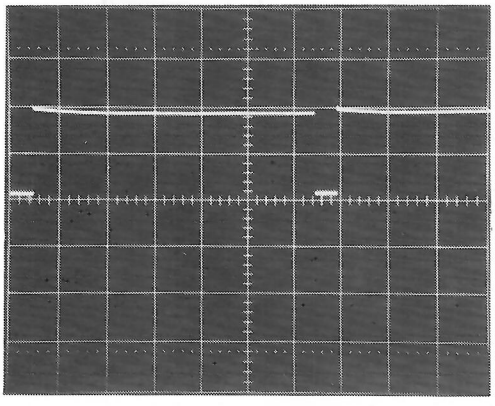
0V

10us/div.

a: 2V/div.

b: 0.2V/div. VIDEO OUT connector

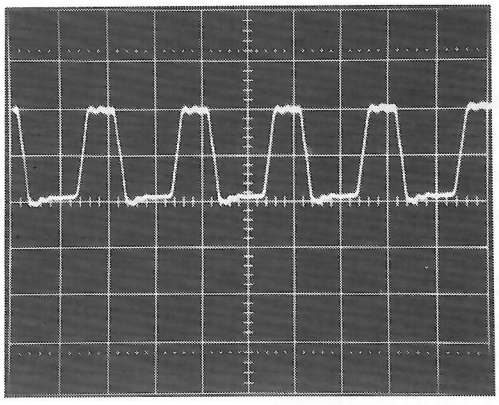
4



0V

2V/div. 10us/div.

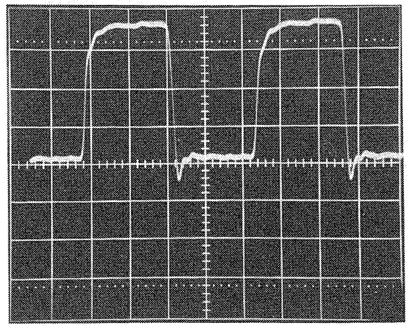
5



0V

2V/div. 0.1us/div.

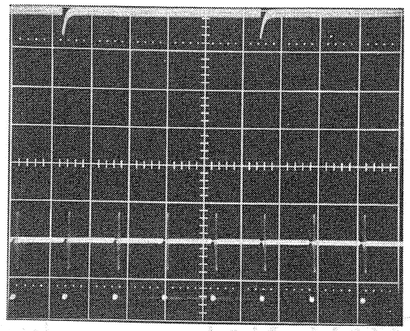
6



0V

2V/div. 0.2us/div.

7

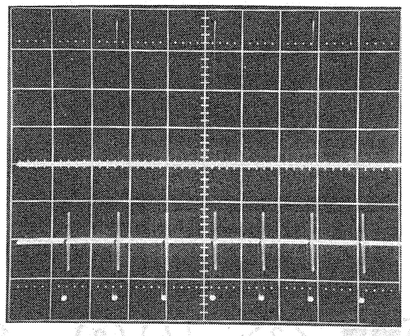


0V

0V

50us/div.
a: 1V/div.
b: 0.2V/div. VIDEO OUT connector

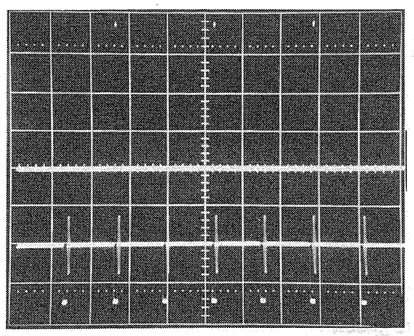
8



0V

50us/div.
a: 2V/div.
b: 0.2V/div. VIDEO OUT connector
EXT. SYNC provided

9

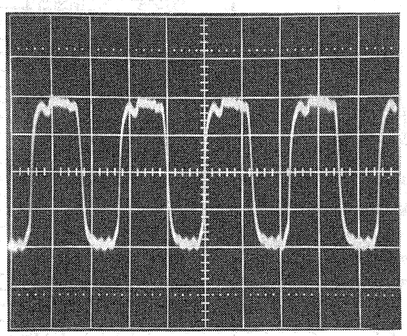


0V

0V

50us/div.
a: 2V/div.
b: 0.2V/div. VIDEO OUT connector
EXT. SYNC provided

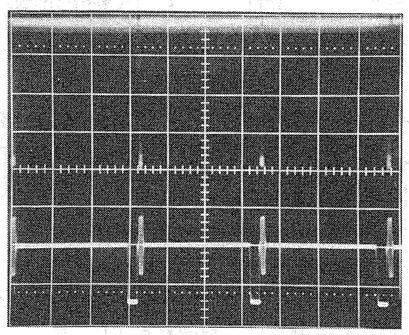
10A



0V

100mV/div. 0.1us/div.
INT. SYNC

10B

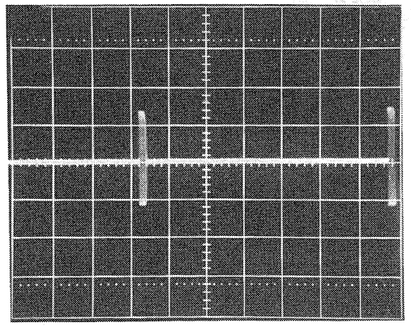


0V

0V

20us/div.
a: 100mV/div.
b: 0.2V/div. VIDEO OUT connector
EXT. SYNC provided

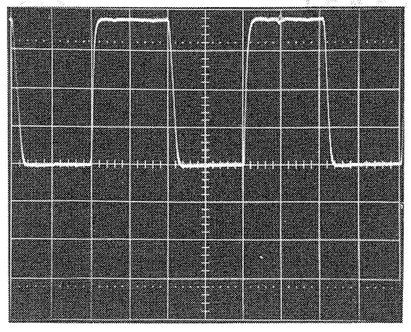
11



0V

1V/div. 10us/div.

12



0V

1V/div. 0.5us/div.

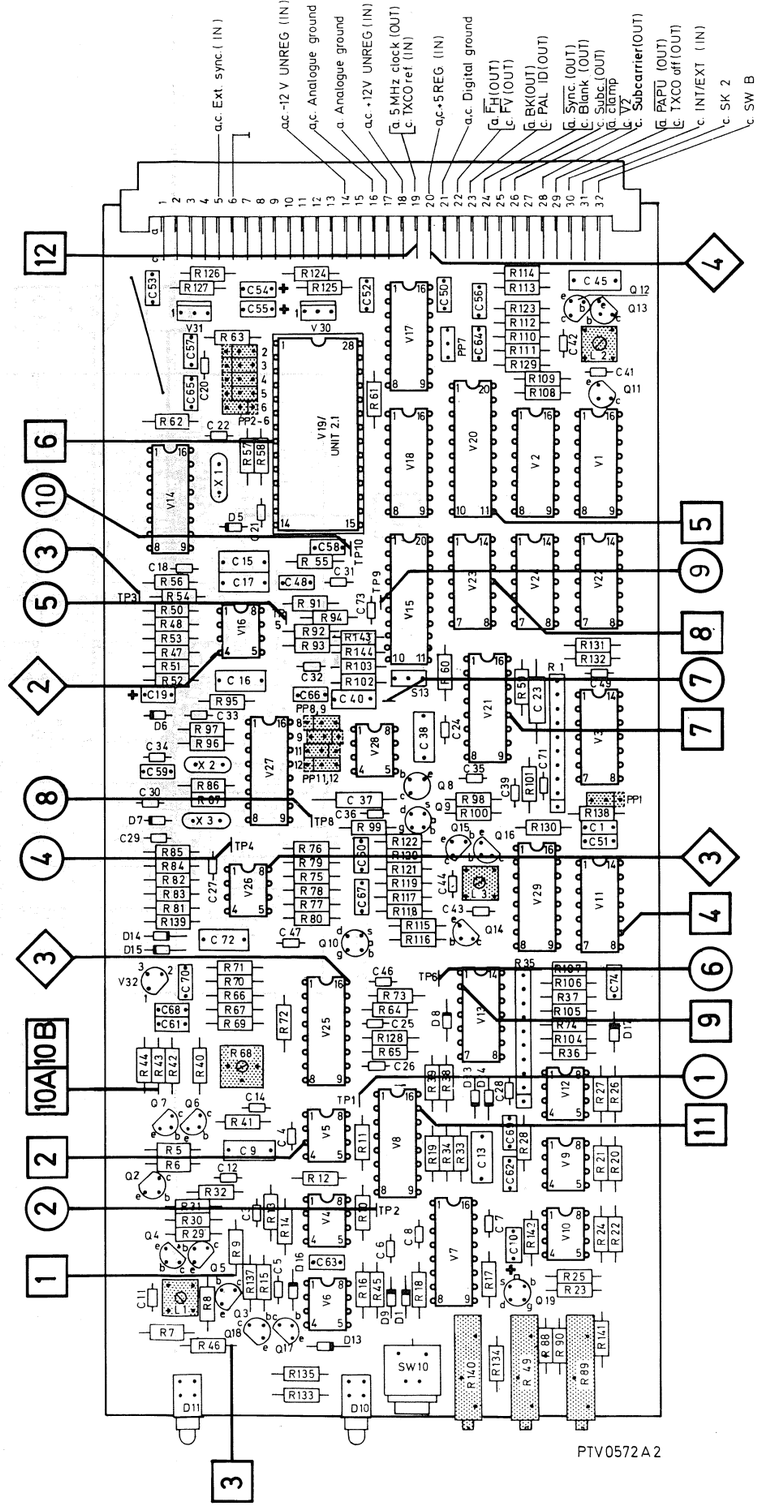


Fig. 12-5 Adj. elements, sync generator - unit 2

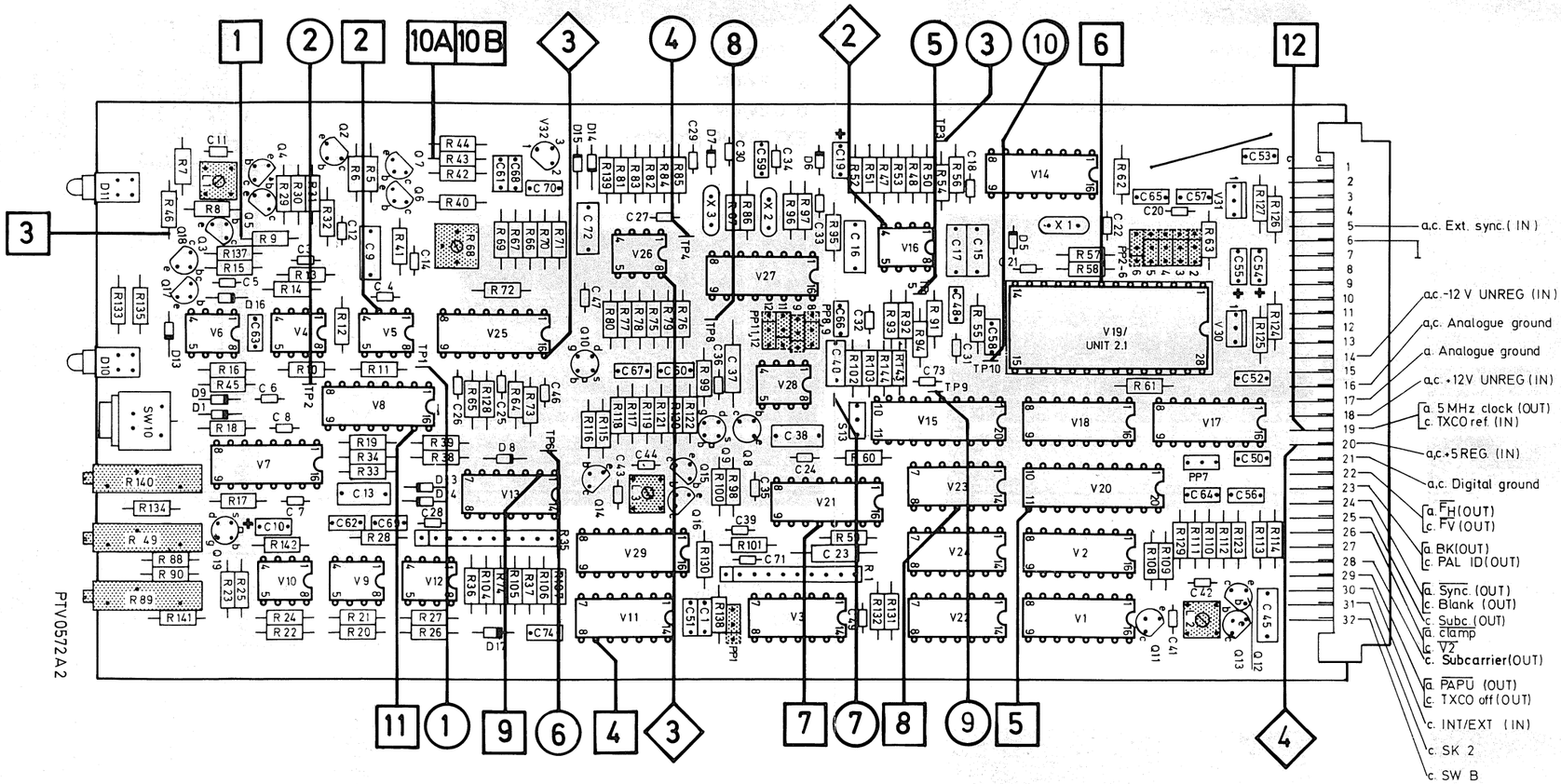


Fig. 12-6 Checkpoints, sync generator - unit 2

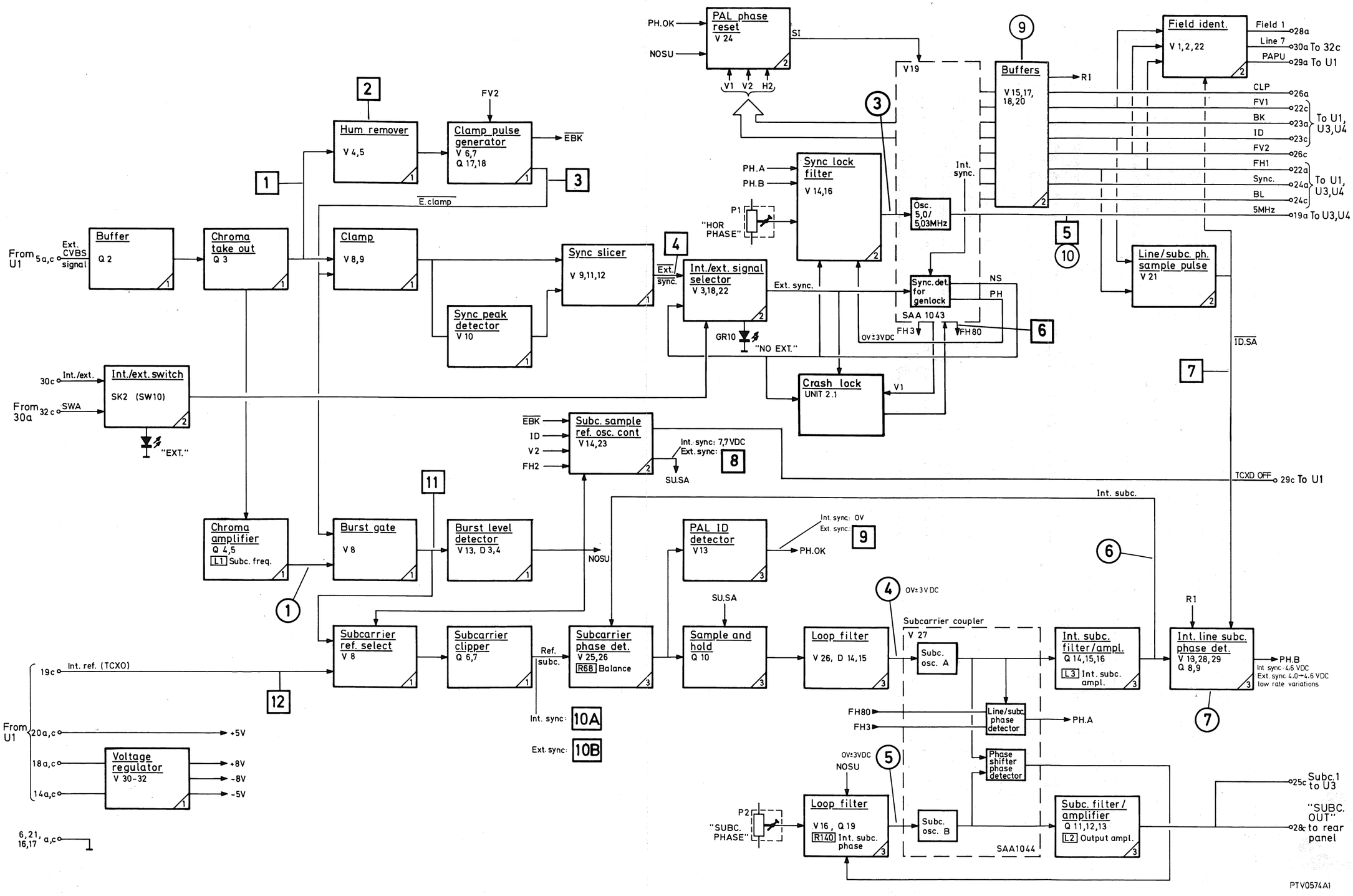


Fig. 12-7 Block diagram, sync generator - unit 2

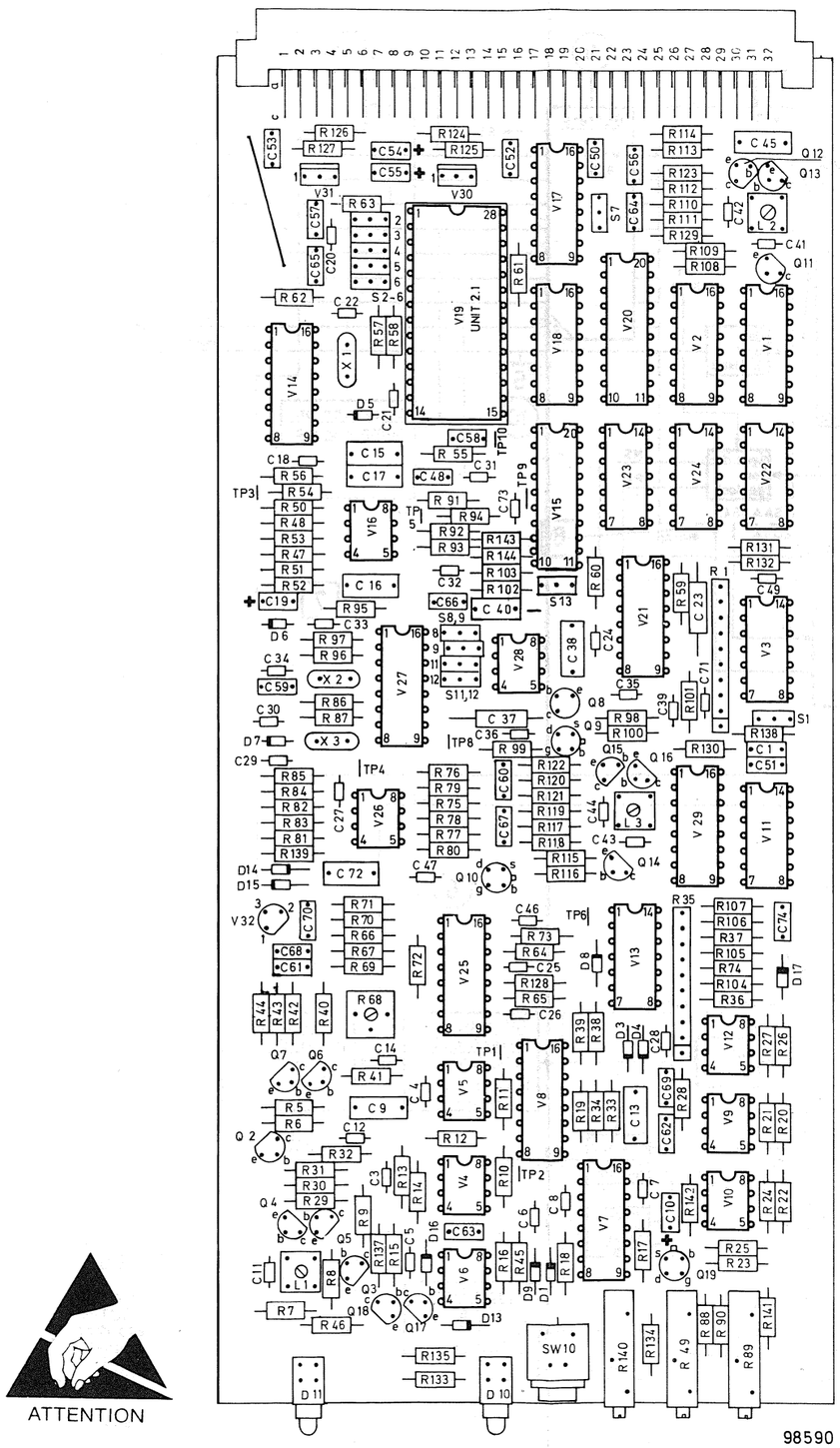
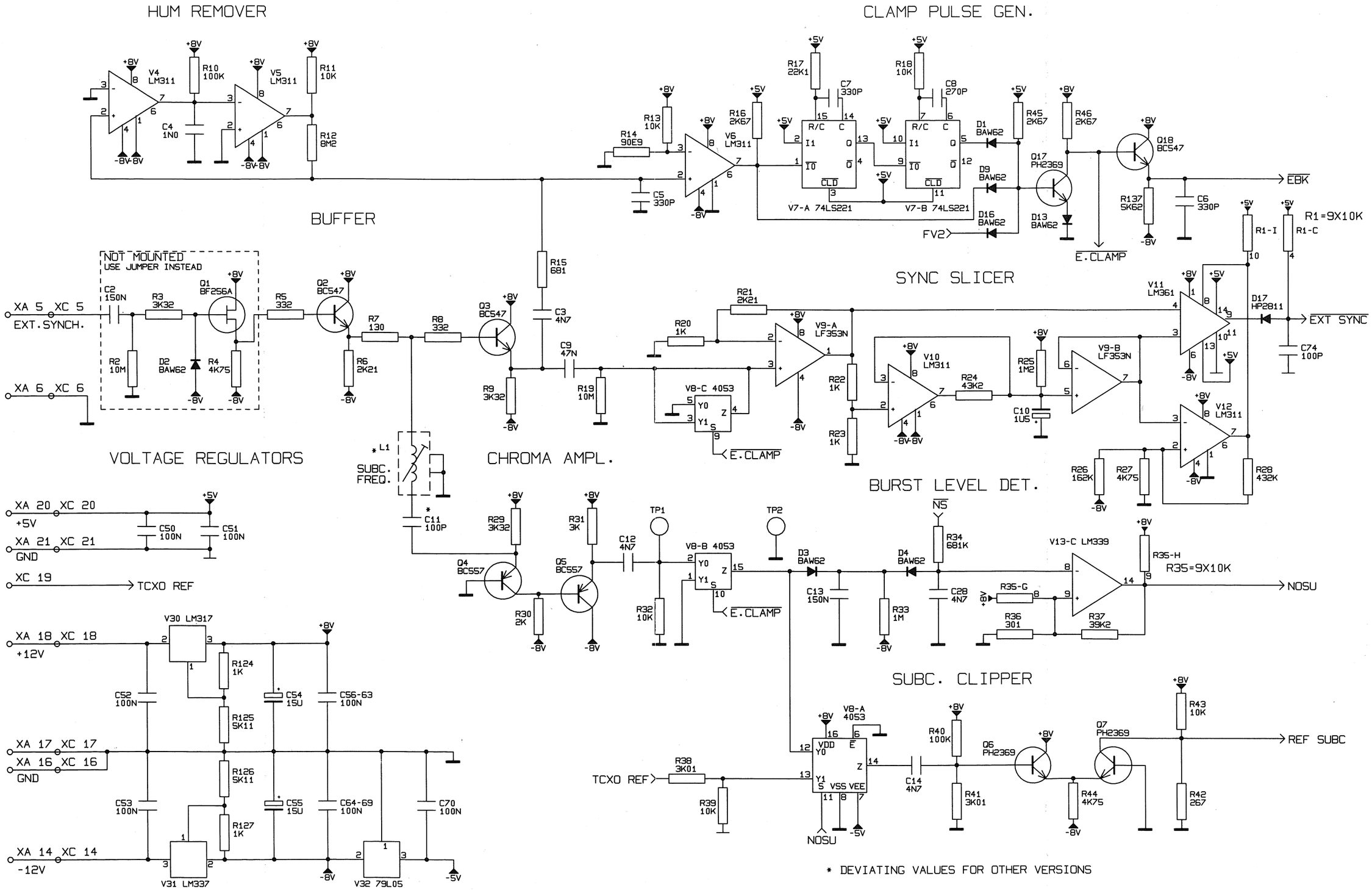
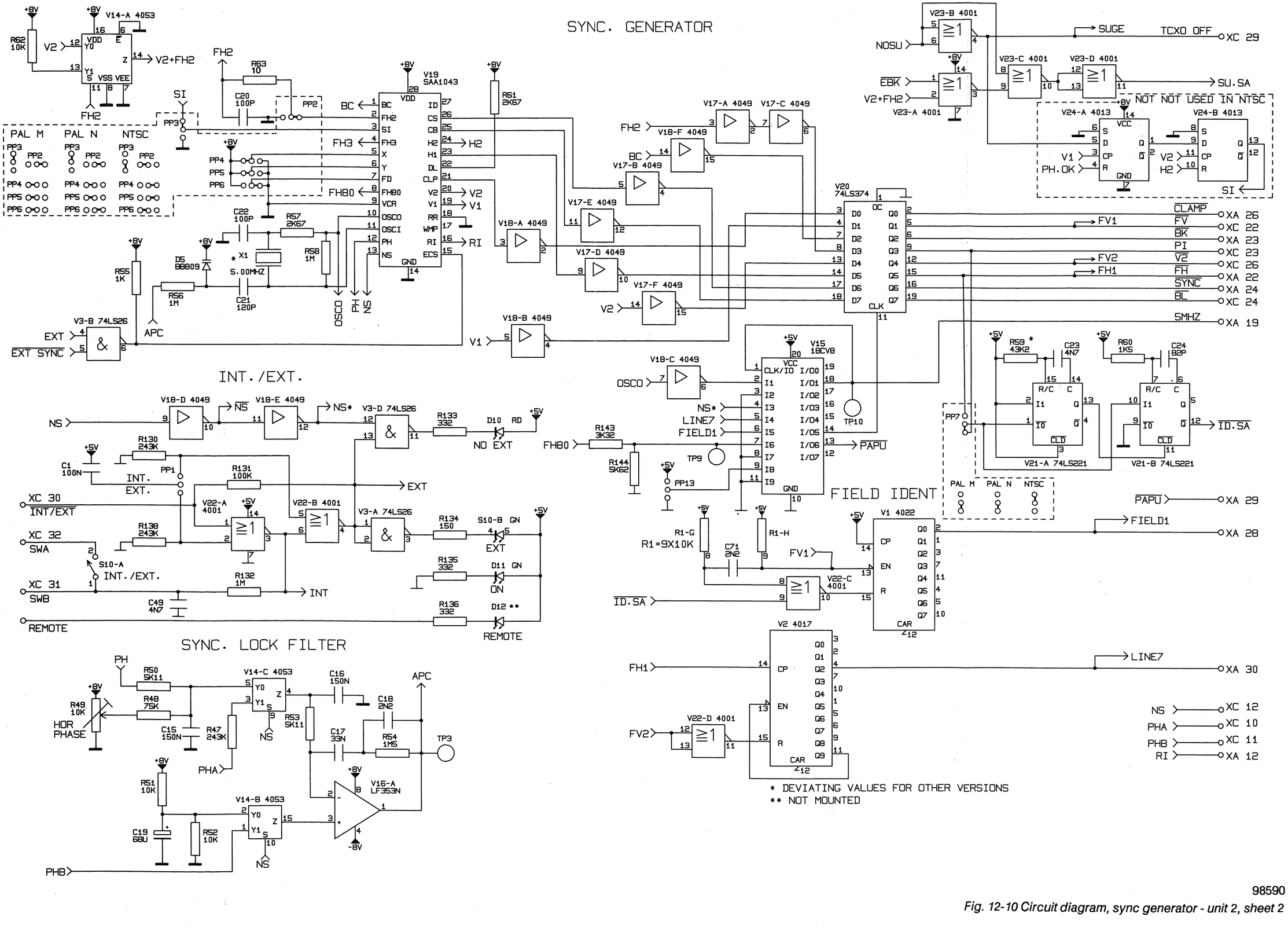


Fig. 12-9 Component location, sync generator - unit 2



108 98590

Fig. 12-10 Circuit diagram, sync generator - unit 2, sh.1



98590

Fig. 12-10 Circuit diagram, sync generator - unit 2, sheet 2

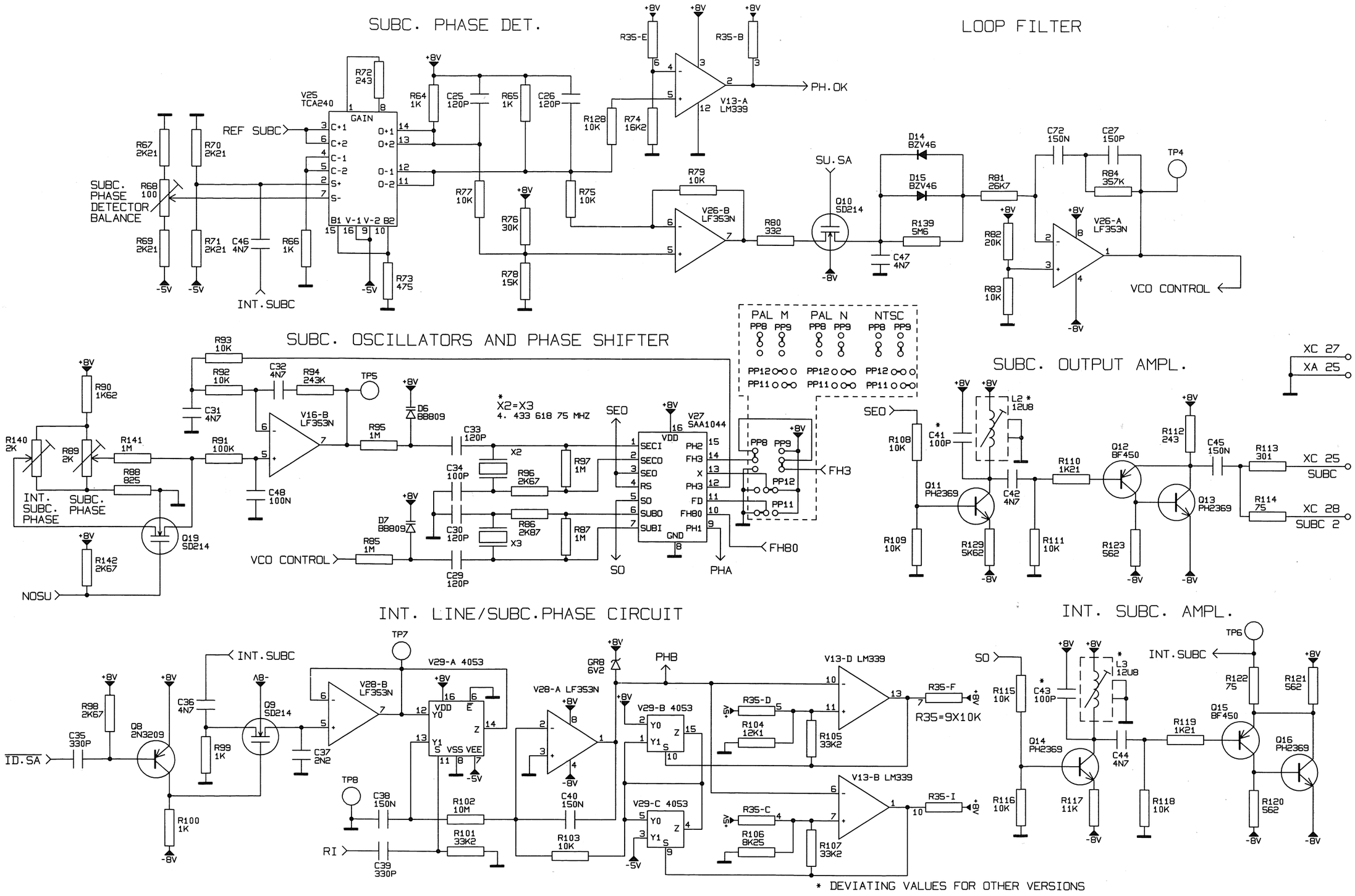


Fig. 12-12 Circuit diagram, sync generator - unit 2, sh.3

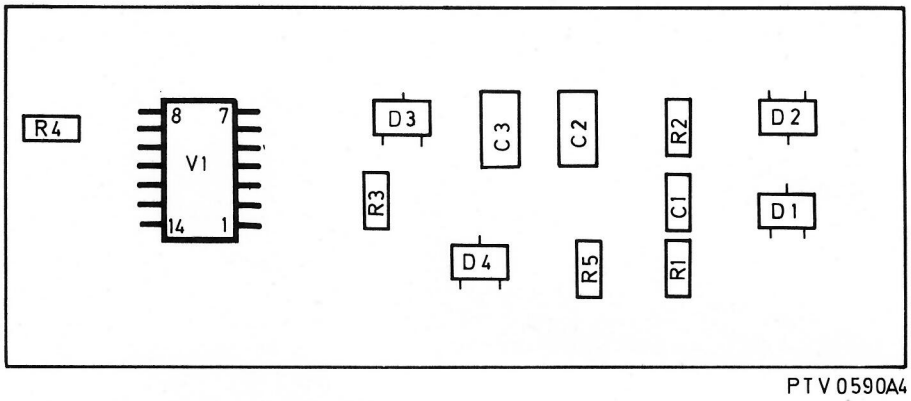


Fig. 12-13 Component location, crash-lock unit - unit 2.1

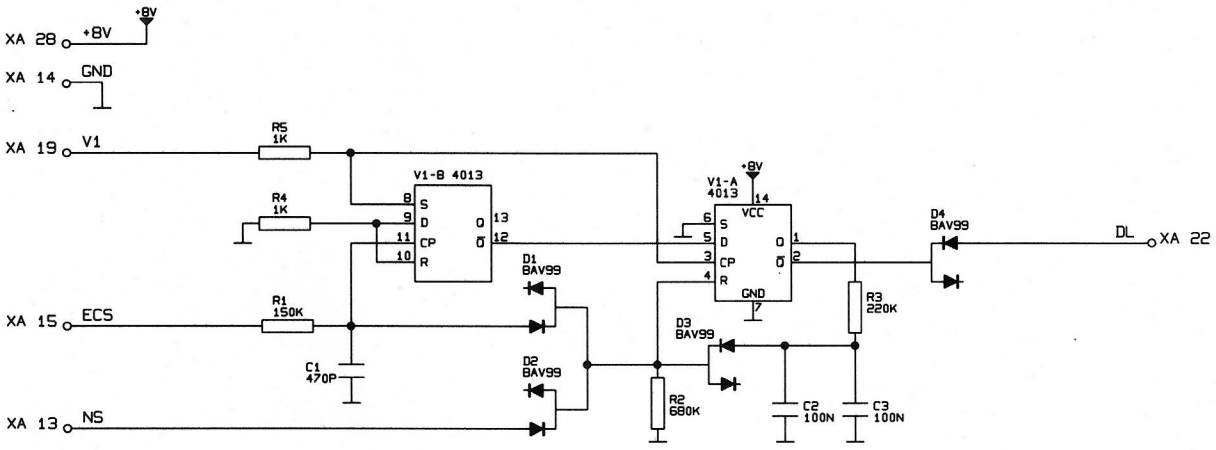


Fig. 12-14 Circuit diagram, crash-lock unit - unit 2.1

13. Colorbar generator - unit 3 (Option PM 8544)

13.1 Block diagram description

13.1.1 Sync circuit

The sync circuit is based on the integrated circuit SAA1043. This IC is provided with a 5MHz (625-lines)/ 5.03MHz (525-lines) oscillator.
Input for the sync IC is a composite sync signal used for external synchronization. Furthermore this signal is fed via a field-detector to the crash-lock circuit. The crash-lock circuit compares the external field sync with a field-pulse from the sync IC, and in case of timing difference resets the internal line counter in the sync IC.
Via the potentiometer R200 (P3) it is possible to adjust the horizontal phase between an advance of 10µsec. and a delay of 3µsec. In case the "TEST" - mode is selected this potentiometer is disabled via Q201.

13.1.2 Pattern generator

All the different signals is stored as digital values in a PROM. This PROM receives an address from the horizontal and vertical counters. The address from the vertical counter is fed through a programming plug matrix and therefore depending on the selected signal type.
The output of the PROM are the digital values of the three signal components. The three signal-components are clocked out one after the other and therefore fed each to a latch. All three signal-components are now available at the same time and fed each to a D/A-converter. The D/A-converters are followed by low-pass filter which controls the shape of the signal. Finally the signals are amplified before they are fed to the output connector.

13.2 Test and adjustments

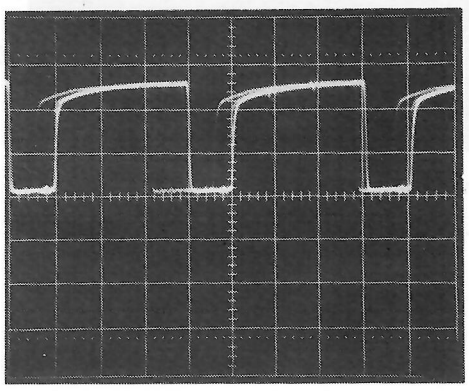
Measuring equipment	:
Oscilloscope	: e.g. Philips PM 3055
Video level meter	: e.g. Philips PM 5664
Digital voltmeter	: e.g. Philips PM 2528

13.2.1 Voltage checks

1. Using a digital voltmeter, check for +8V at V1, pin 3.
2. Using a digital voltmeter, check for -8V at V2, pin 2.
3. Using a digital voltmeter, check for +5V at V106, pin 1.
4. Using a digital voltmeter, check for +5V at V30, pin 16.

13.2.2 Adjustments

1. Timing of the DAC-clockpulse.
– Connect an oscilloscope to V22, pin 5.
– Check that the duty-cycle is 75% (see also 1).
– If not, adjust R110.

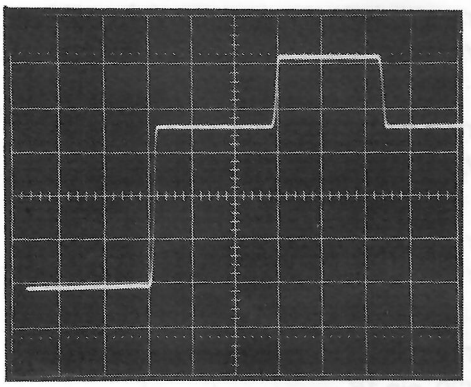


75% Duty cycle
V22, pin 22
1V/div. Delay time: 0.2µs/div.

2. Low-pass filters.

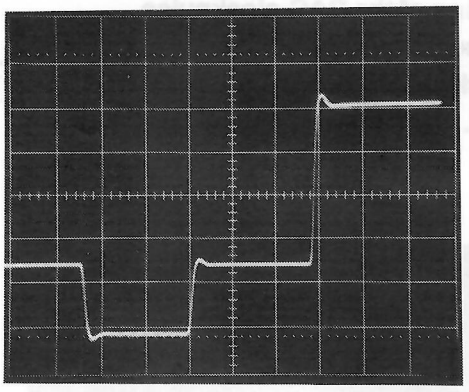
- Select RGB mode and Sync on R+B and G outputs.
- Select a full-field colorbar (625-lines: EBU-colorbar / 525-lines: 7-element colorbar).
- Connect an oscilloscope to the Y/G OUT.
- Adjust L1 and L2 for best pulse response (see also [2] and [3]).
- Connect an oscilloscope to the B-Y/B OUT.
- Adjust L3 and L4 for best pulse response.
- Connect an oscilloscope to the R-Y/R OUT.
- Adjust L5 and L6 for best pulse response.

[2]



L1/L2 correctly adjusted
0.2V/div. Delay time: 0.2µs/div.

[3]



L1/L2 misadjusted
0.2V/div. Delay time: 2µs/div.

3. Gain

- Select RGB mode and Sync on R+B and G outputs.
- Select a full-field colorbar (625-lines: EBU-colorbar / 525-lines: 7-element colorbar).
- Connect a video level meter to the Y/G OUT.
- Check that the white amplitude is 700mV ±1%.
- If not, adjust R53.
- Connect the video level meter to the B-Y/B OUT.
- Check that the white amplitude is 700mV ±1%.
- If not, adjust R69.
- Connect the video level meter to the R-Y/R OUT.
- Check that the white amplitude is 700mV ±1%.
- If not, adjust R89.

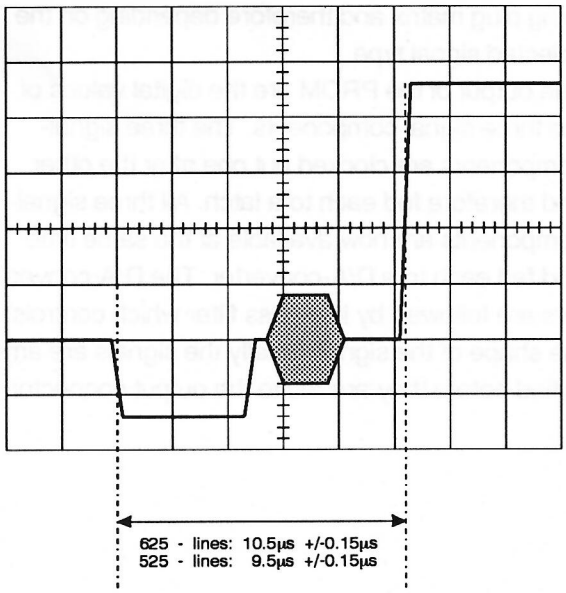
4. Internal horizontal timing

- Connect the oscilloscope terminated with 75Ω to one of the VIDEO OUT connectors.

- <u>625-lines version:</u>
- Check that the leading edge of the white bar starts 10.5µs ±0.15µs after the leading adge of the sync pulse (SYNC OUT).
- If not, adjust R221.

<u>525-lines version:</u>

- Check that the leading edge of the white bar starts 9.5µs ±0.15µs after leading edge of the sync pulse (SYNC OUT).
- If not, adjust R221.



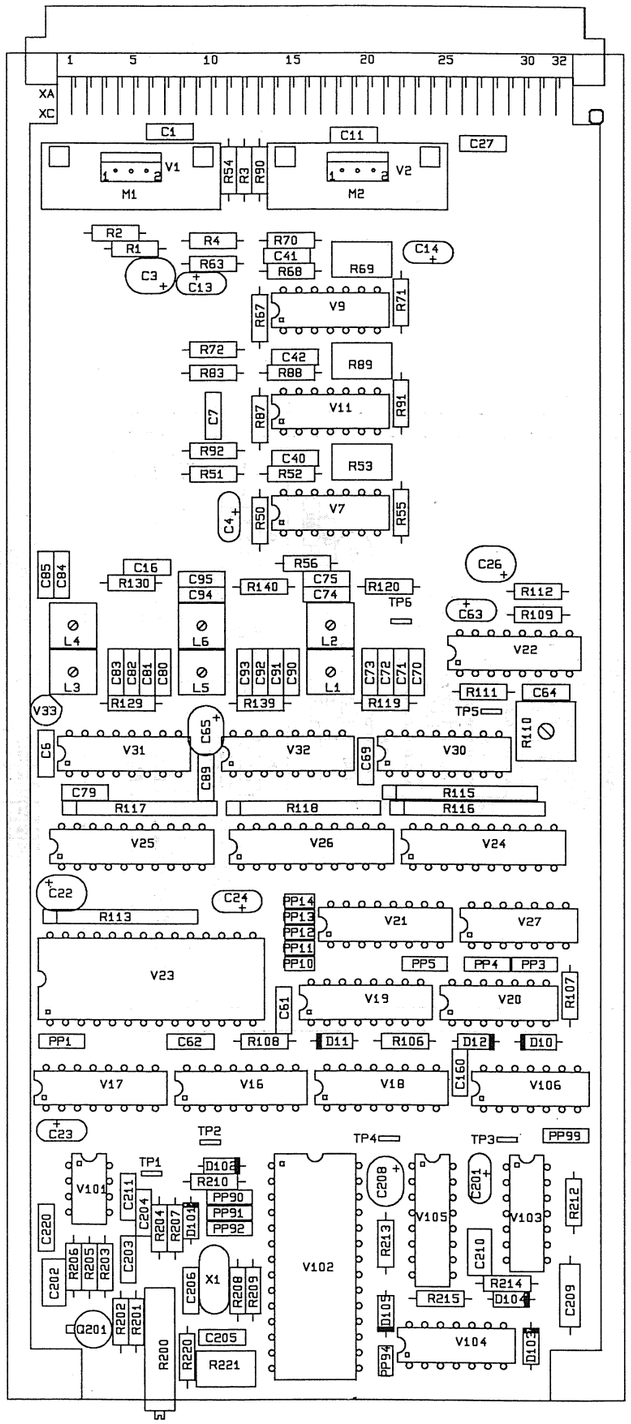
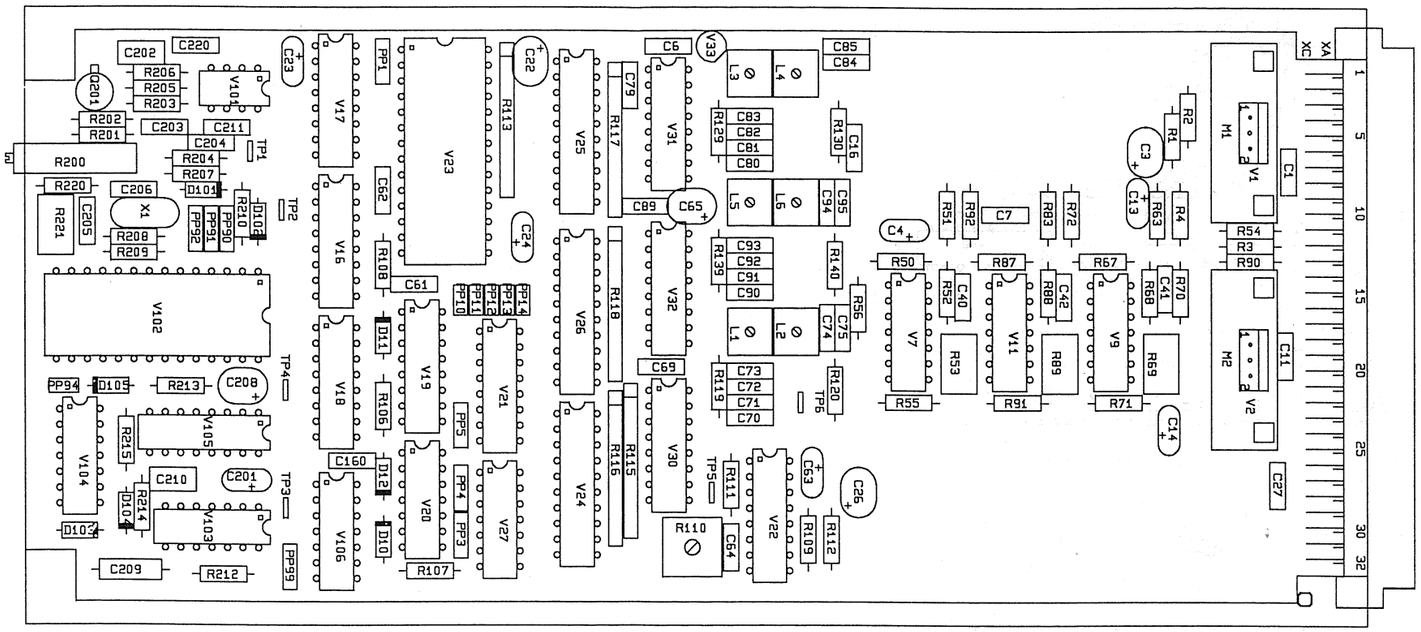


Fig. 13-1 Adj. elements, colorbar generator - unit 3 (PM 8544)



Pin no.		Signals
9	a	Ground
	b	Y/G OUT
10	a, c	Ground
11	a	Ground
	c	R-Y/R OUT
12	a, c	Ground
13	a	Ground
	c	B-Y/B OUT
14	a, c	-12V UNREG (IN)
16	a, c	Ground
17	a, c	Ground
18	a, c	+12V UNREG (IN)
20	a, c	+5V REG. (IN)
21	a, c	Ground
24	a	SYNC SIGNAL (IN)
28	c	CBAR INT/EXT

Fig. 13-2 Checkpoints, colorbar generator - unit 3 (PM 8544)

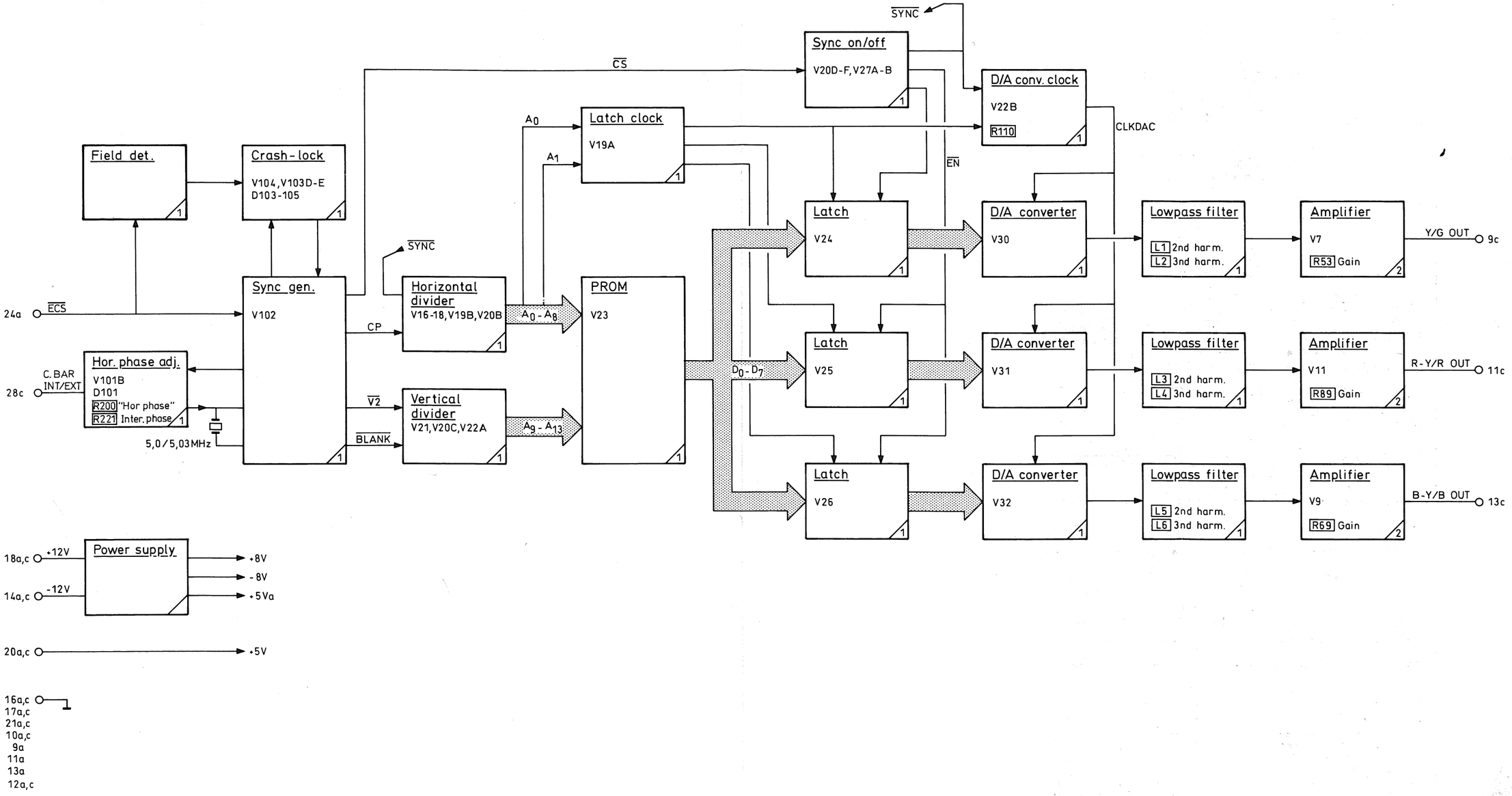
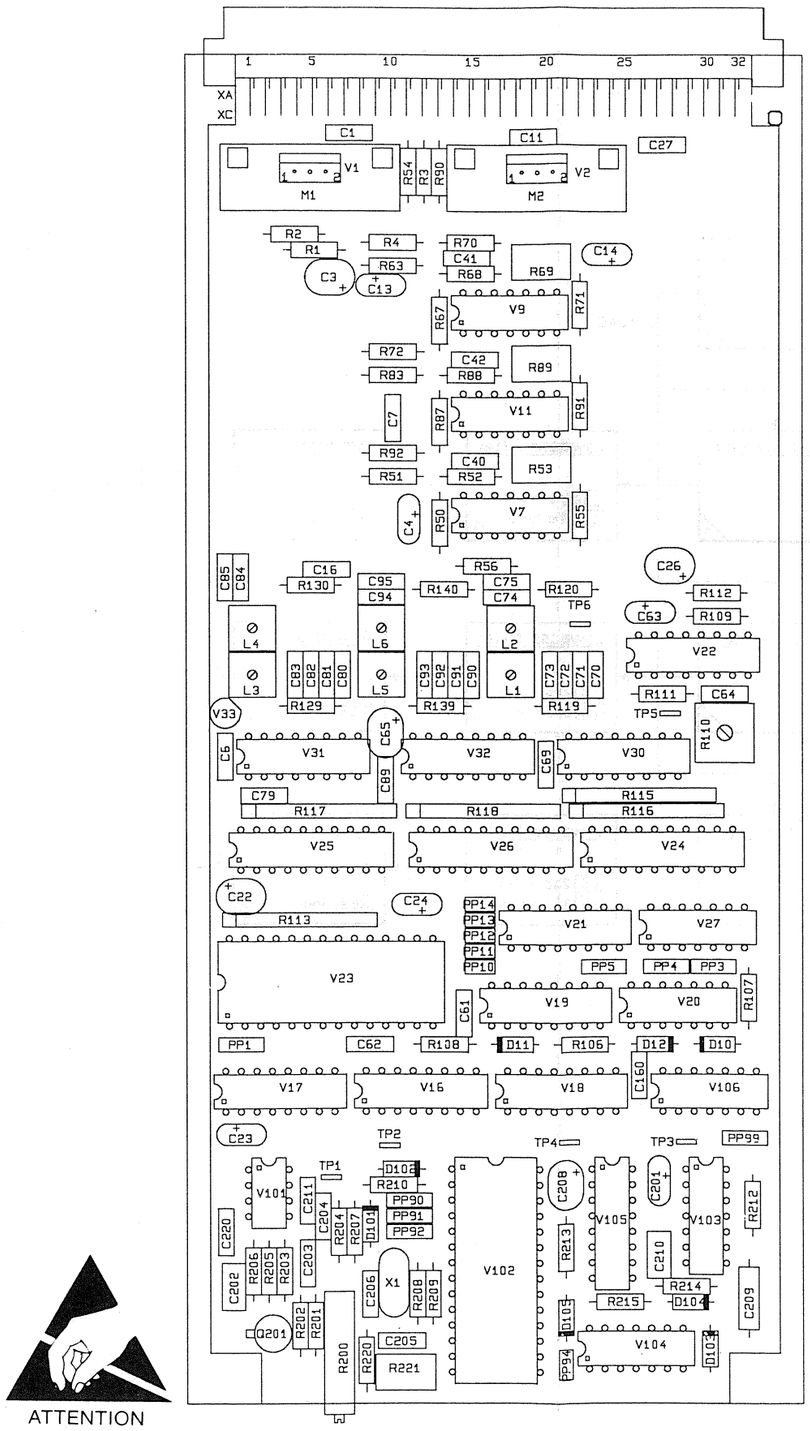
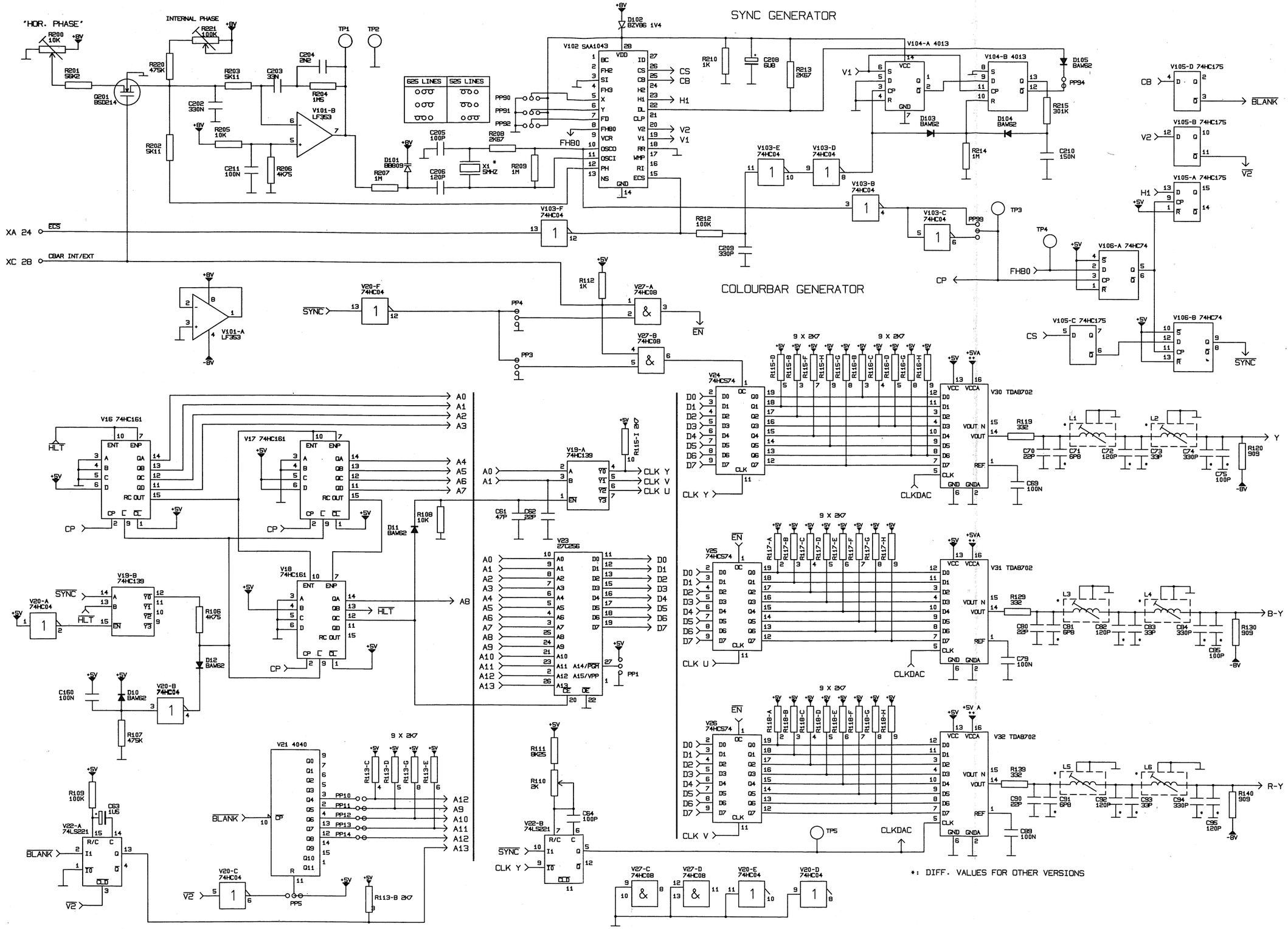


Fig. 13-3 Block diagram, colorbar generator - unit 3 (PM 8544)



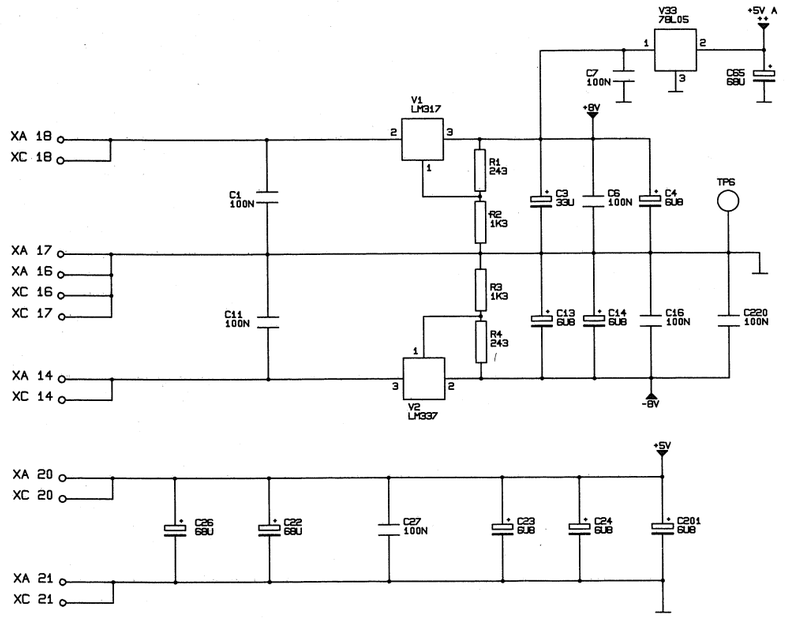
ATTENTION

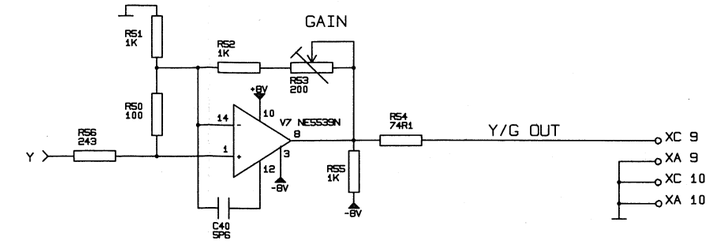
Fig. 13-4 Component location, colorbar generator - unit 3 (PM 8544)

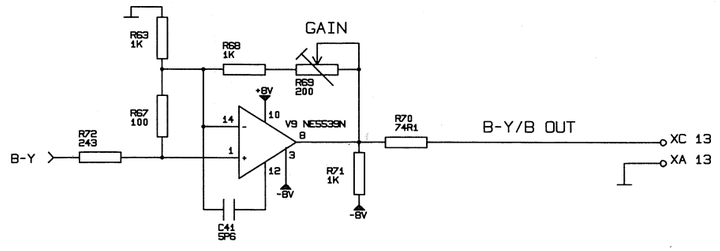


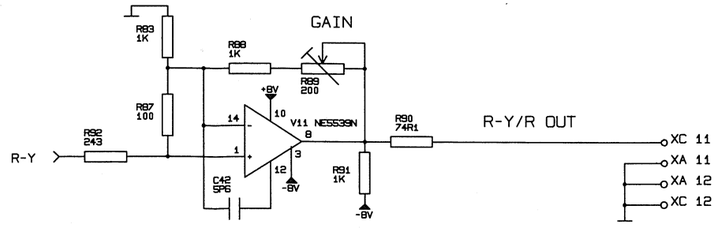
109 74420

Fig. 13-5 Circuit diagram, colorbar generator - unit 3, sh.1 (PM 8544)


V33
78L05
+5V
C7
100N
C85
68U
V1
LM317
+8V
XA 18
XC 18
R1
243
C1
100N
C3
33U
C6
100N
C4
6U8
TPG
R2
1K3
XA 17
XA 16
XC 16
XC 17
R3
1K3
C11
100N
C13
6U8
C14
6U8
C16
100N
C220
100N
R4
243
XA 14
XC 14
V2
LM337
-8V
XA 20
XC 20
C26
68U
C22
68U
C27
100N
C23
6U8
C24
6U8
C201
6U8
XA 21
XC 21


GAIN
R51
1K
R52
1K
R53
200
+8V
R50
100
V7 NE5539N
R54
74R1
Y/G OUT
Y
R56
243
R55
1K
-8V
C40
SP6
XC 9
XA 9
XC 10
XA 10


GAIN
R63
1K
R68
1K
R69
200
+8V
R67
100
V9 NE5539N
R70
74R1
B-Y/B OUT
B-Y
R72
243
R71
1K
-8V
C41
SP6
XC 13
XA 13


GAIN
R83
1K
R88
1K
R89
200
+8V
R87
100
V11 NE5539N
R90
74R1
R-Y/R OUT
R-Y
R92
243
R91
1K
-8V
C42
SP6
XC 11
XA 11
XA 12
XC 12

14. Encoder - unit 4

14.1 Block diagram description

The three signals "R", "G", and "B" are fed to the three matrix circuits where the signals are converted to Y, R-Y, and B-Y -signals. If the external signals supplied are Y, R-Y, and B-Y -signals they are fed directly through the corresponding matrix circuit to the clamp amplifier. The R-Y and B-Y signals are fed to a low-pass filter where also a burst gate pulse is added to the signal. The signals from the low-pass filters are fed to two balanced modulators.
The chroma signal from the modulators is fed through two filters which removes 2nd and 3rd harmonics of the subcarrier.
The Y-signal is fed through a notch filter (can be switched on/off) and a delay before it is added together with the chroma and the sync signal in the output amplifier.

14.2 Test and adjustment

Measuring equipment :

Oscilloscope	: e.g. Philips PM 3055
Vectorscope	: e.g. Philips PM 5668
Digital voltmeter	: e.g. Philips PM 2528
Component generator, SPG	: e.g. Philips PM 5643
Function generator	: e.g. Philips PM 5390
Video level meter	: e.g. Philips PM 5664
Test signal generator	: e.g. Philips PM 5640

Check that all configuration switches are correctly placed for the version in use. *This information is found in Chapter 6 - Configuration.*

14.2.1 Voltage checks

1. Using a digital voltmeter, check for +8V ±0.4V on ◇1◇ (V10, pin7)
2. Using a digital voltmeter, check for -8V ±0.4V on ◇2◇ (V10, pin4)
3. Using a digital voltmeter, check for +5V ±0.2V on ◇3◇ (Conn. 20a,c)

14.2.2 Adjustments

Before adjusting unit 4, unit 2 must be correctly adjusted.
The programming plugs should be set in the Y, R-Y, B-Y position (YUV).

1. Chroma filter

- Connect an oscilloscope terminated with 75Ω to either VIDEO OUT connector.
- Trigger the oscilloscope from the SYNC OUT connector.
- Inject a signal 2 x f_{SUBC} at ◇4◇ (PP5).
- Adjust L12 for minimum signal on the oscilloscope.
- Inject a signal 3 x f_{SUBC} at ◇4◇ (PP5).
- Adjust L11 for minimum signal on the oscilloscope.

2. Chroma modulator balance

- Connect an oscilloscope terminated with 75Ω to either VIDEO OUT connector.
- Trigger the oscilloscope from the SYNC OUT connector.
- Select SYNC OFF and BURST OFF (programming plugs on unit 1).
- Adjust R148 and R139 for minimum subcarrier (< 2mV_{PP}).

3. 180° PAL shift.

- Connect a vectorscope terminated with 75Ω to either VIDEO OUT connector.
- Connect a color component generator to the Y, R-Y, B-Y inputs and apply a signal with B-Y=0 (e.g. chroma staircase).
- Adjust C81 so that the vertical vectors are placed upon each others.

4a. Subcarrier 90° phase (*PAL-versions*)

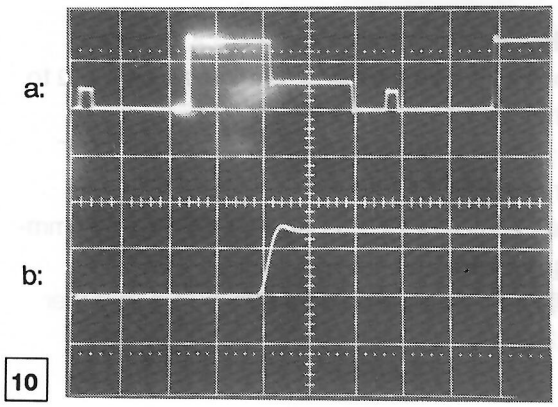
- Connect an oscilloscope terminated with 75Ω to either VIDEO OUT connector.
- Connect a color component generator to the Y, R-Y, B-Y inputs and apply a colorbar signal.
- Adjust L13 for minimum jump on the signal.

4b. Subcarrier phase (*NTSC-version*)

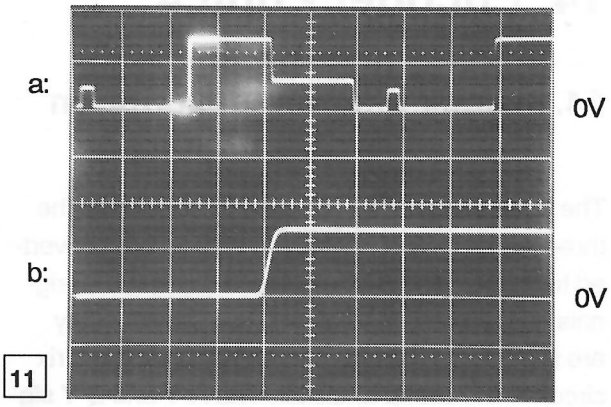
- Connect a vectorscope terminated with 75Ω to either VIDEO OUT connector.
- Connect a color component generator to the Y, U, V inputs and apply a SMPTE-bar with I and Q.
- Adjust L13 so that there are 90° between the I vector and the Q vector.

5. R-Y response

- Connect an oscilloscope to (4).
- Connect a color component generator to the Y, R-Y, B-Y inputs and apply an (R-Y=0/B-Y=0/G-Y=0) signal.
- Switch off the B-Y and Y information.
- Adjust L8 for minimum ripple and overshoot.



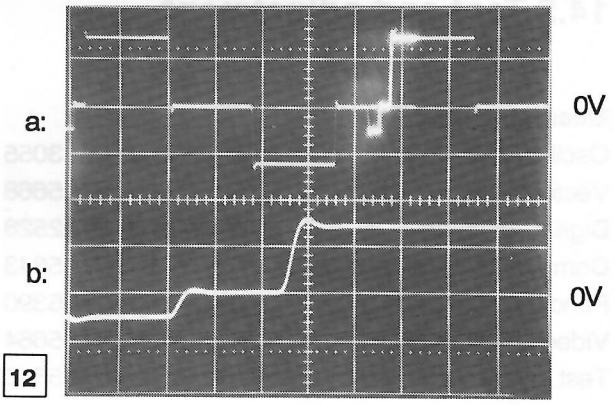
L8 Misadjusted.
0.5V/div.
a: Main timebase 10µs/div.
b: Delay timebase 1µs/div.



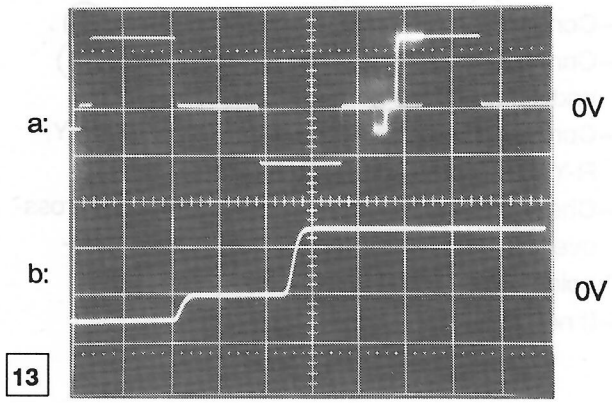
L8 Correctly adjusted.
0.5V/div.
a: Main timebase 10µs/div.
b: Delay timebase 1µs/div.

6. B-Y response.

- Connect an oscilloscope to (5).
- Connect a color component generator to the Y, R-Y, B-Y inputs and apply an (R-Y=0/B-Y=0/G-Y=0) signal.
- Switch off the R-Y and Y information.
- Adjust L10 for minimum ripple and overshoot.



L10 Misadjusted
0.5V/div.
a: Main timebase 10µs/div.
b: Delay timebase 1µs/div.



L10 Correctly adjusted
0.5V/div.
a: Main timebase 10µs/div.
b: Delay timebase 1µs/div.

7. Sync amplitude
- Connect a video level meter to either VIDEO OUT connector.
- Check that the sync pulse is 300mV (PAL-versions)/40IRE(286mV) (NTSC-version).
- If not, adjust R13.

8a. Y amplitude (*PAL-versions*).
- Connect a video level meter to either VIDEO OUT connector.
- Connect a color component generator to the Y, R-Y, B-Y inputs and apply a EBU colorbar signal.
- Check that the amplitude of the white bar is 700mV.
- If not, adjust R39.

8b. Y amplitude (*NTSC-version*).
- Connect a video level meter to either VIDEO OUT connector.
- Connect a color component generator to the Y, U, V inputs and apply a FCC colorbar signal.
- Check that the amplitude of the white bar is 100IRE (714mV).
- If not, adjust R39.

9. Frequency response, Y channel.
- Connect an oscilloscope terminated with 75Ω to either VIDEO OUT connector.
- Connect a test signal generator to the GREEN/Y input connector and apply a sweep signal.
- Check that the frequency response is within ±0.1dB up to 6MHz.
- If not, adjust C38.

10. Luminance notch.
- Connect an oscilloscope terminated with 75Ω to either VIDEO OUT connector.
- Connect a test signal generator to the GREEN/Y input connector and apply a chroma bar signal.
- Switch Notch ON.
- Adjust L1 for minimum (attenuation > 6dB).

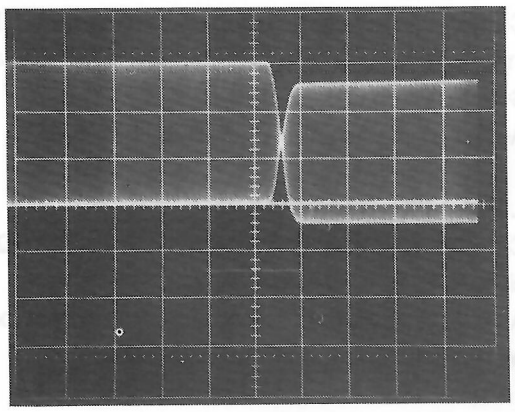
11. Sync filter response
- Connect an oscilloscope terminated with 75Ω to either VIDEO OUT connector.
- Adjust L4 and L5 for minimum ripple/overshoot on the trailing edge of the sync pulse.

12. Chroma amplitude
- Connect an oscilloscope terminated with 75Ω to either VIDEO OUT connector.
- Connect a color component generator to the Y, R-Y, B-Y inputs and apply a EBU colorbar signal (PAL-versions) or FCC colorbar (NTSC-version).
- Check that the chroma level of the yellow bar and the cyan bar is at the same level as the level of the white bar.
- If not, adjust R150 and R141.

13a. Chroma/luminance delay (*PAL-versions*).
- Connect an oscilloscope terminated with 75Ω to either VIDEO OUT connector.
- Connect a color component generator to the Y, R-Y, B-Y inputs and apply a EBU colorbar signal.
- Check that the cross-over point between the green bar and the magenta bar is in the middle between the top of the green bar and the bottom of the magenta bar (See 14).
- If not, adjust L3.

13b. Chroma/luminance delay (*NTSC-version*).
- Connect an oscilloscope terminated with 75Ω to either VIDEO OUT connector.
- Connect a sync signal (without burst) to the EXT SYNCHR connector.
- Select Sc-H lock OFF (PP2 on the main board).
- Connect a color component generator to the Y, R-Y, B-Y inputs and apply a FCC colorbar signal.

– Check that the cross-over point between the green bar and the magenta bar is in the middle between the top of the green bar and the bottom of the magenta bar (See 14).
– If not, adjust L3.



14

L3 correctly adjusted.
0.2V/div.
Delay timebase 1µs/div.

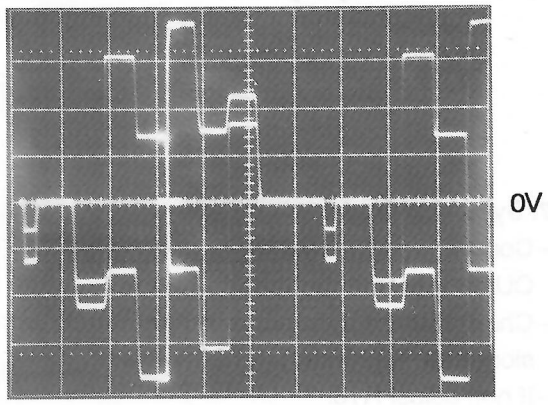
14a. Burst balance (*PAL-versions*).
– Connect a vectorscope terminated with 75Ω to either VIDEO OUT connector.
– Check that there is 90° between burst vectors.
– If not, adjust R168.

14b. Burst balance (*NTSC-version*)
– Connect a vectorscope terminated with 75Ω to either VIDEO OUT connector.
– Check that the burst is placed at -180°.
– If not, adjust R168.

15. Burst amplitude
– Connect an oscilloscope terminated with 75Ω to either VIDEO OUT connector.
– Check that the burst amplitude is 300mV (PAL-versions)/40IRE (286mV) (NTSC-version).
– If not, adjust R164.

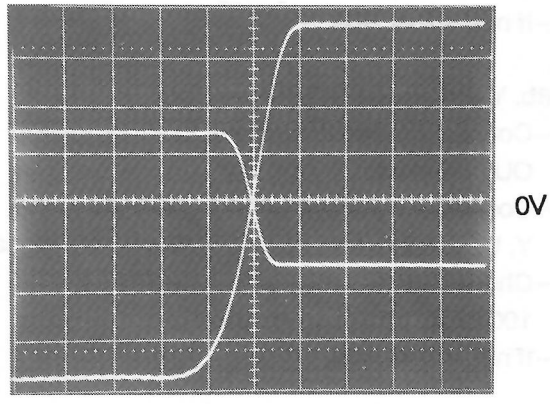
16. Q-filter (*NTSC-only*).
– Connect an oscilloscope to (5) .
– Connect a color component generator to the Y, R-Y, B-Y inputs and apply a FCC color bar signal.
– Adjust L9 for the best pulse response (minimum ripple, no overshoot).

17. I-delay (*NTSC-only*).
– Connect the A-input of an oscilloscope to (5) .
– Connect the B-input of the oscilloscope to (4) and select inversion of the B-channel.
– Connect a color component generator to the Y, R-Y, B-Y inputs and apply a colorbar signal.
– Check that the two signal's green/magenta cross-over point crosses each other at 0 Volts (mid-point). See 15 and 16 .
– If not, adjust L7.



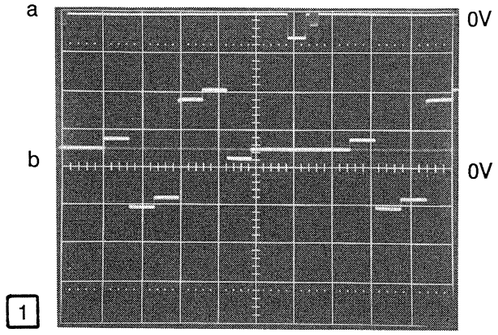
15

L7 correctly adjusted.
Input colorbar, RGB
Main timebase 10µs/div.
a: TP5 0.2V/div.
b: TP4 0.2V/div. (inverted).

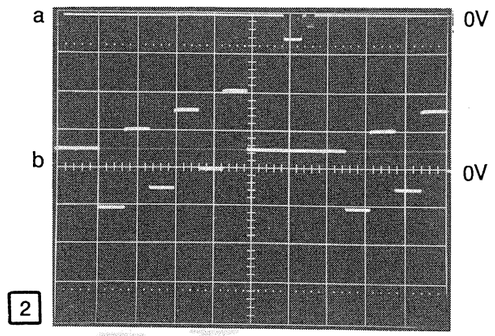


16

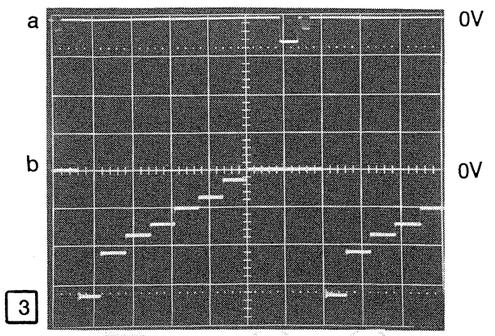
L7 correctly adjusted.
Input colorbar, RGB
Delay timebase 0.5µs/div.
a: TP5 0.2V/div.
b: TP4 0.2V/div. (inverted).



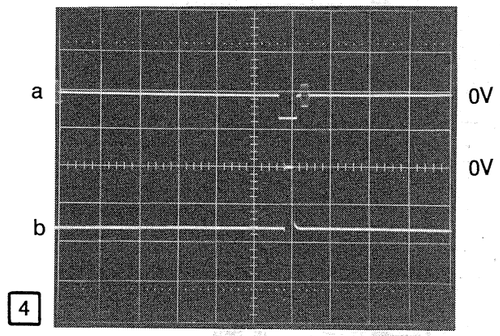
Input EBU colorbar, RGB
10us/div.
a: Black burst out 0.5V/div.
b: Pin 8, V9 0.5V/div.



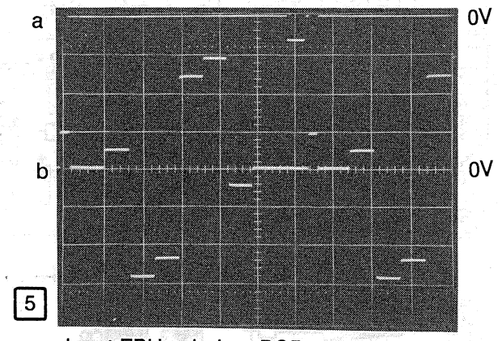
Input EBU colorbar, RGB
10us/div.
a: Black burst out 0.5V/div.
b: Pin 8, V11 0.5V/div.



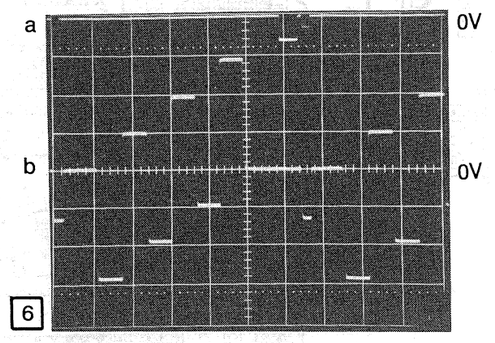
Input EBU colorbar, RGB
10us/div.
a: Black burst out 0.5V/div.
b: TP2 0.5V/div.



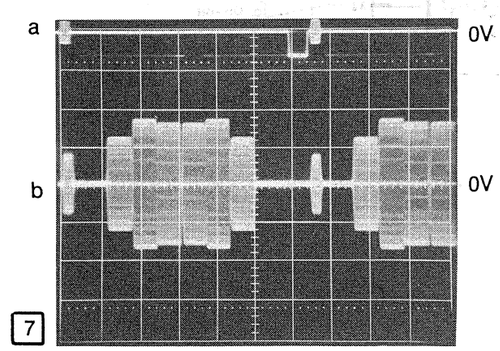
Input EBU colorbar, RGB
10us/div.
a: Black burst out 0.5V/div.
b: Collector of Q20 5V/div.



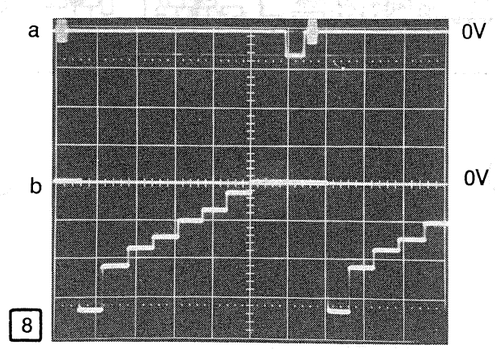
Input EBU colorbar, RGB
10us/div.
a: Black burst out 0.5V/div.
b: TP4 0.2V/div.



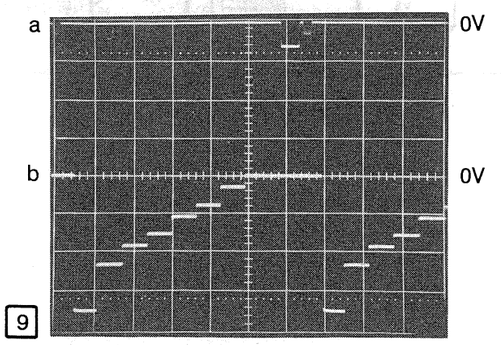
Input EBU colorbar, RGB
10us/div.
a: Black burst out 0.5V/div.
b: TP5 0.2V/div.



Input EBU colorbar, RGB
10us/div.
a: Black burst out 0.5V/div.
b: Output L12 0.1V/div.



Input EBU colorbar, RGB
10us/div.
Notch OFF
a: Black burst out 0.5V/div.
b: Output L3 0.2V/div.



Input EBU colorbar, RGB
10us/div.
Notch ON
a: Black burst out 0.5V/div.
b: Output L3 0.2V/div.

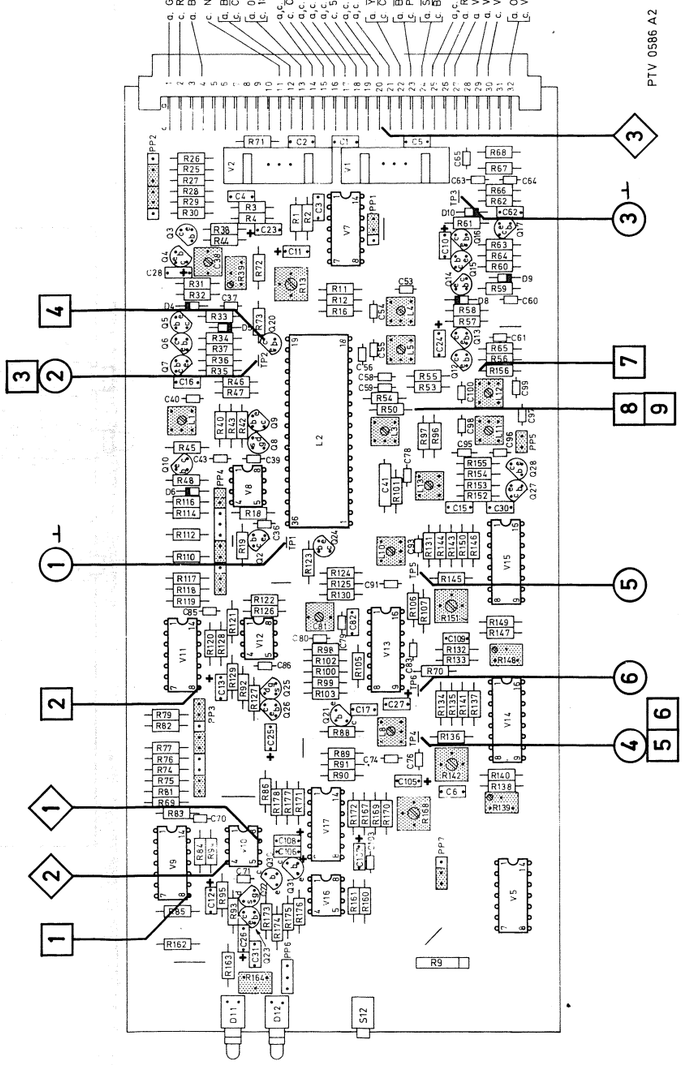


Fig. 14-1 Adj. elements, encoder - unit 4

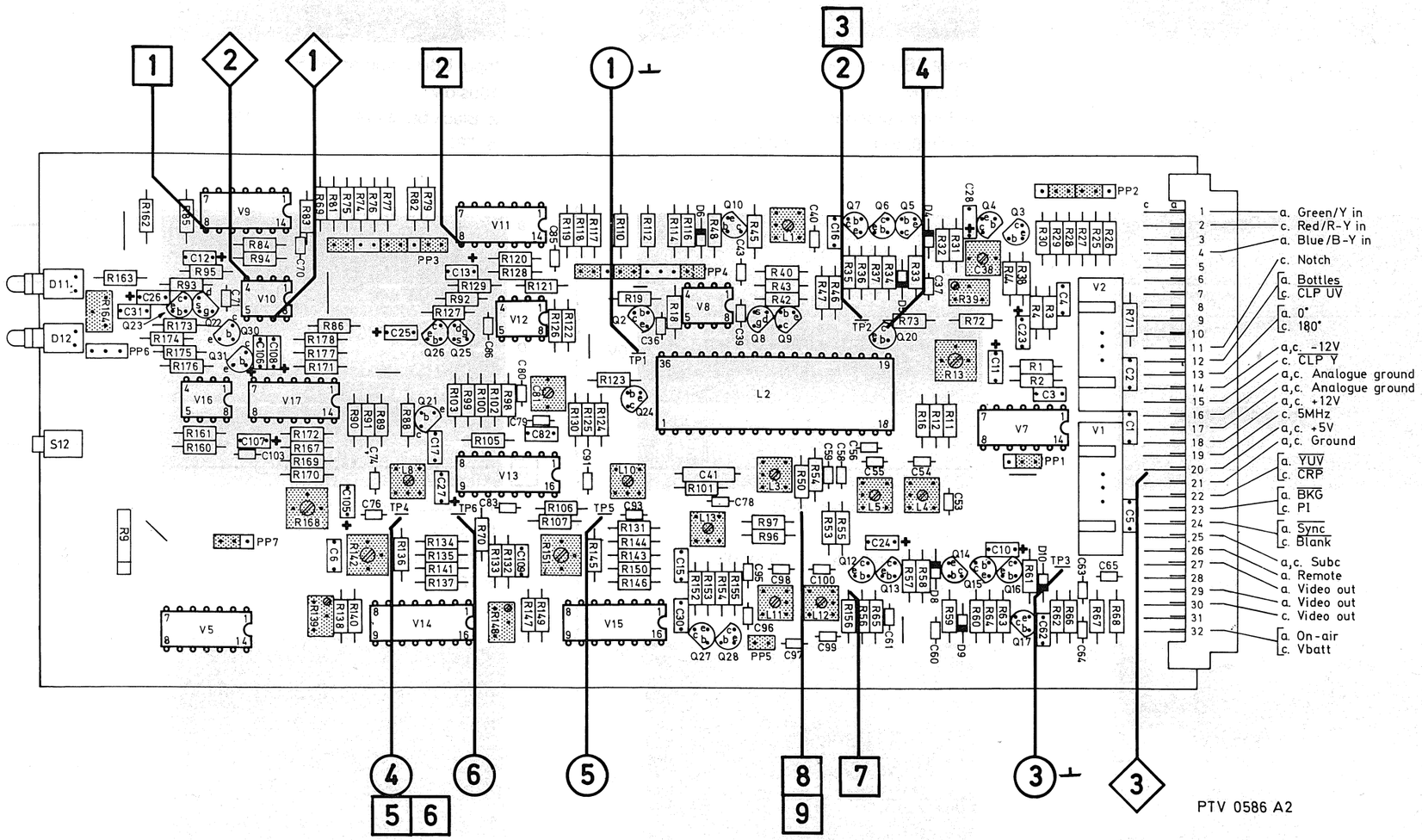


Fig. 14-2 Checkpoints, encoder - unit 4

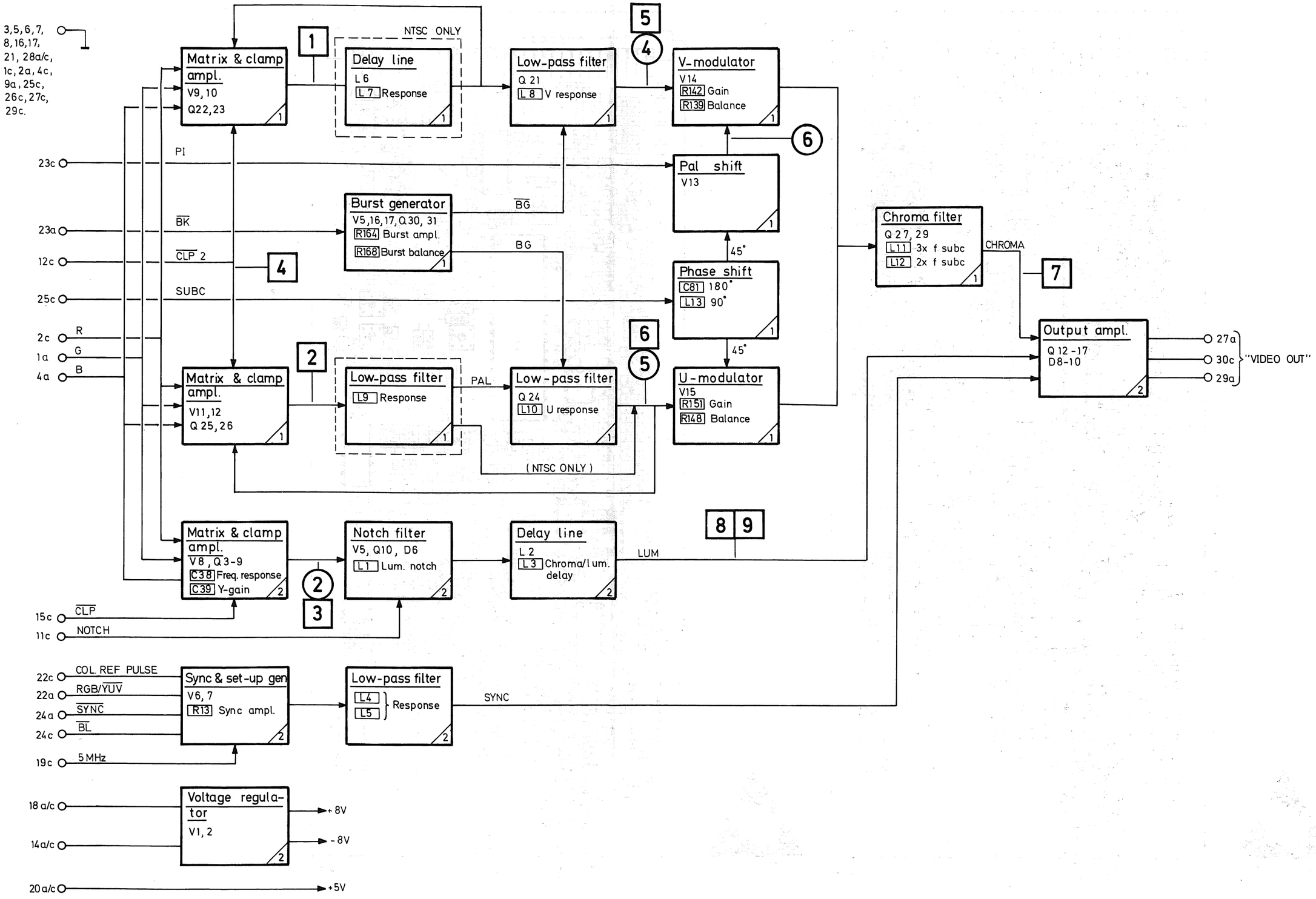
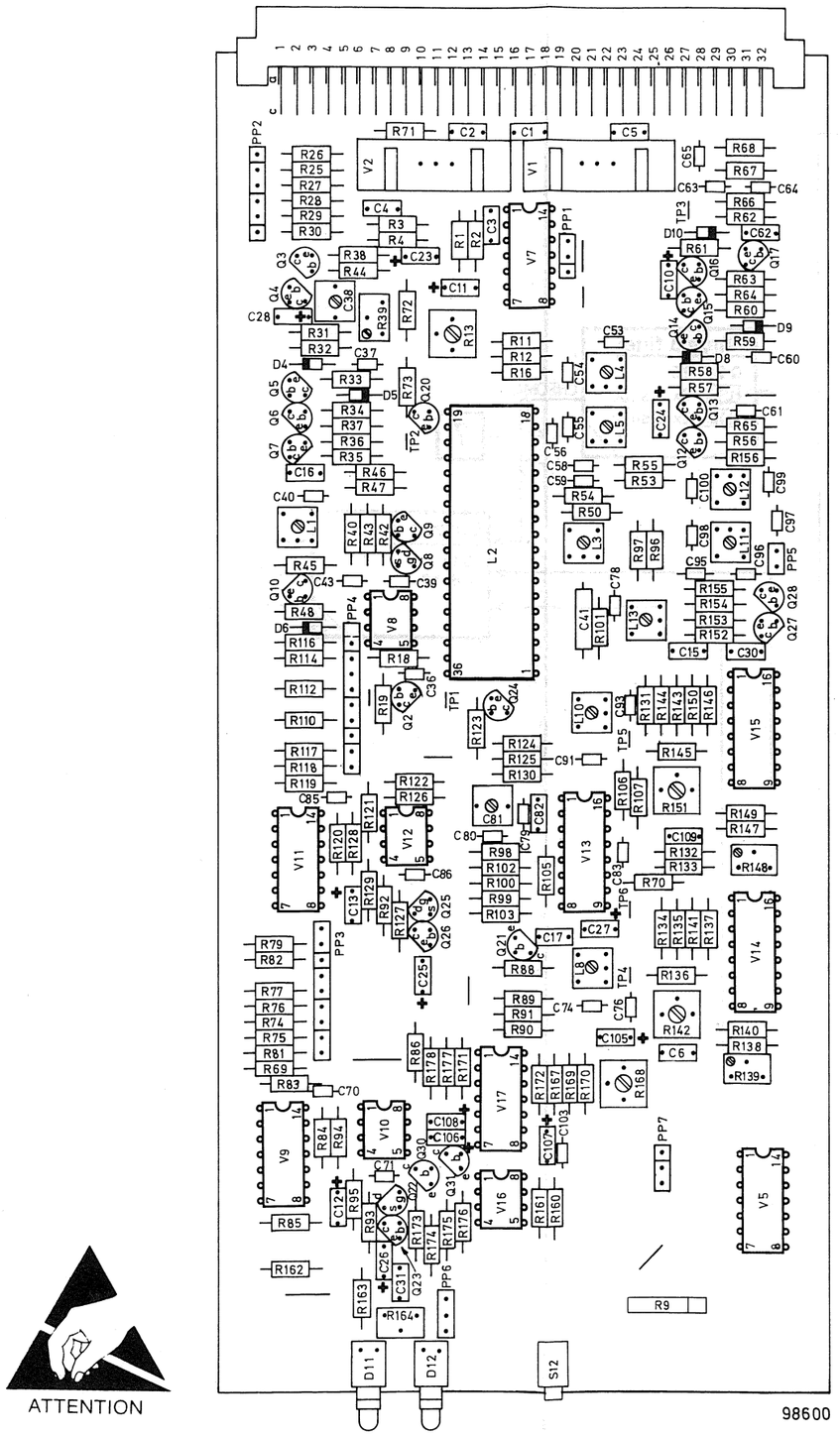
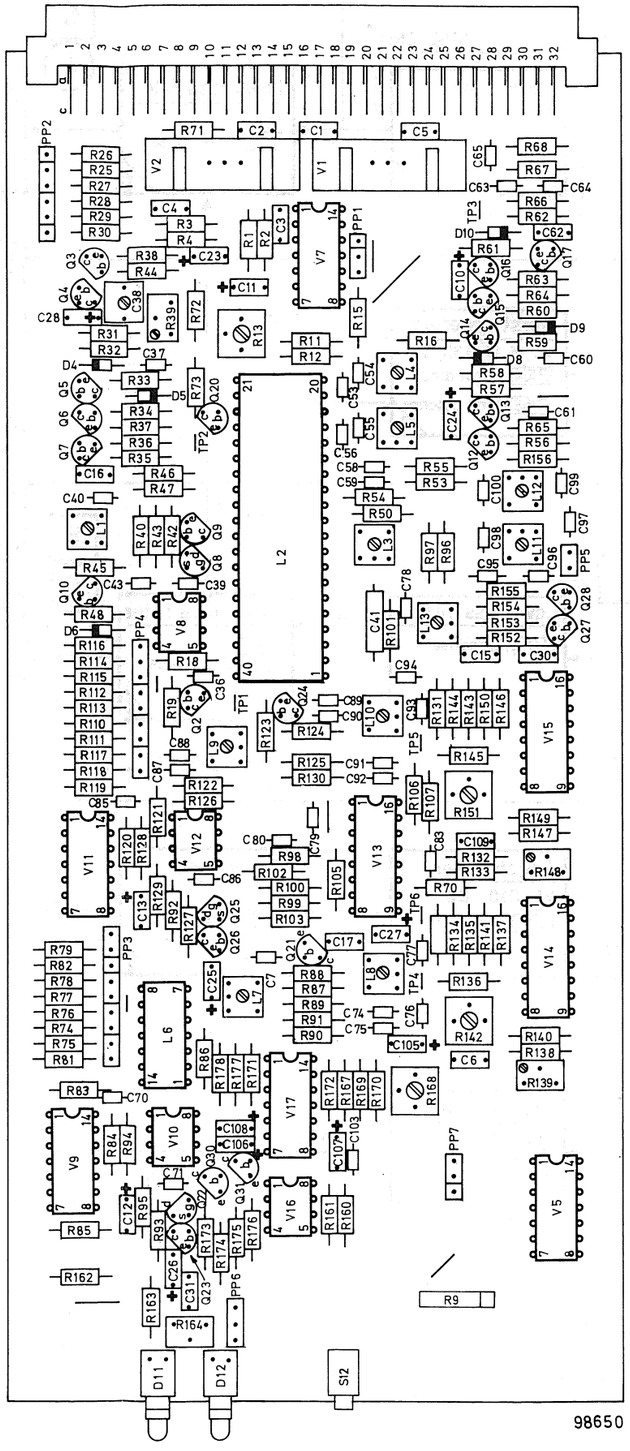


Fig. 14-3 Block diagram, encoder - unit 4



ATTENTION

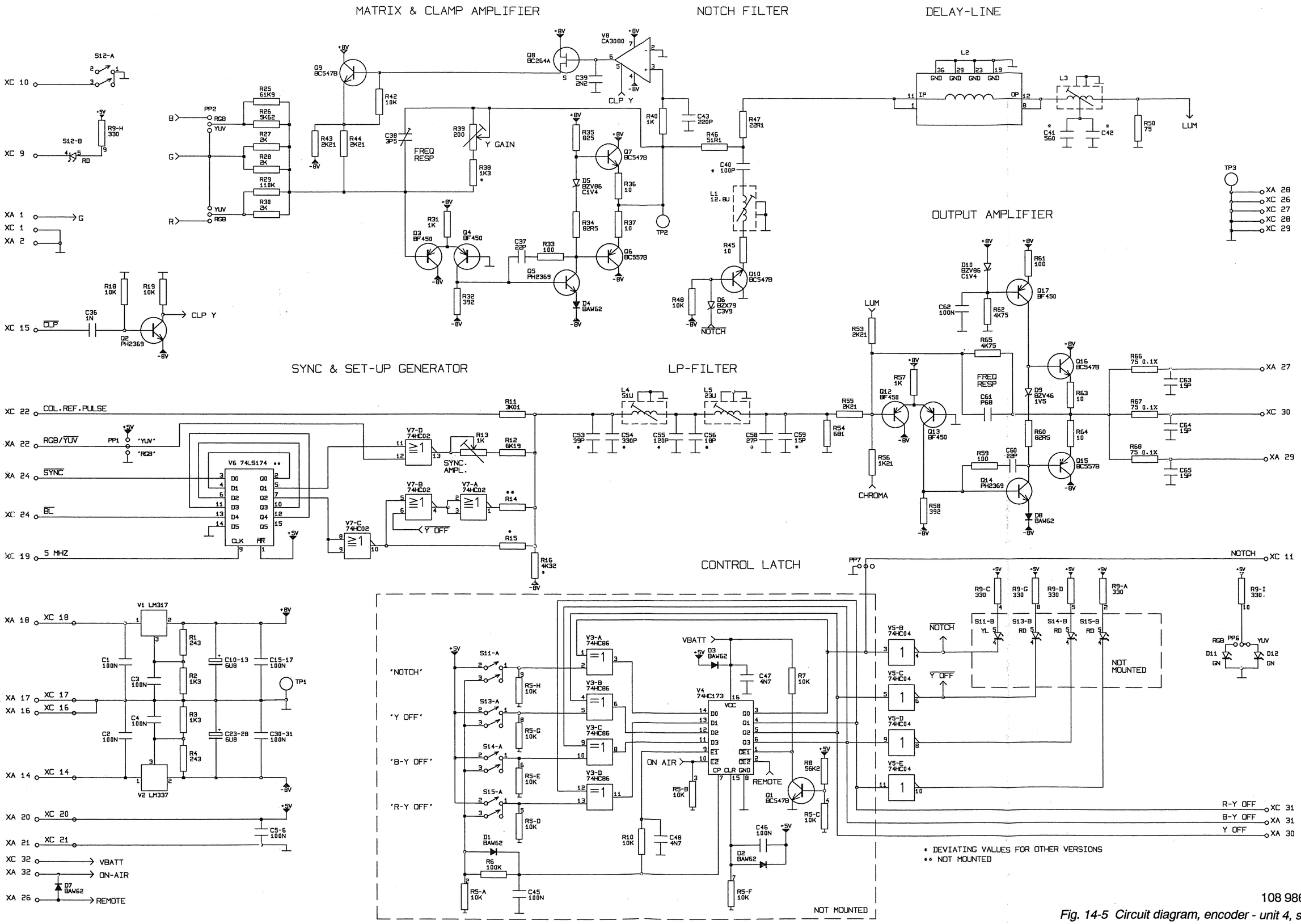
PAL - versions



ATTENTION

NTSC - version

Fig. 14-4 Component location, encoder - unit 4



108 98600

Fig. 14-5 Circuit diagram, encoder - unit 4, sh.1

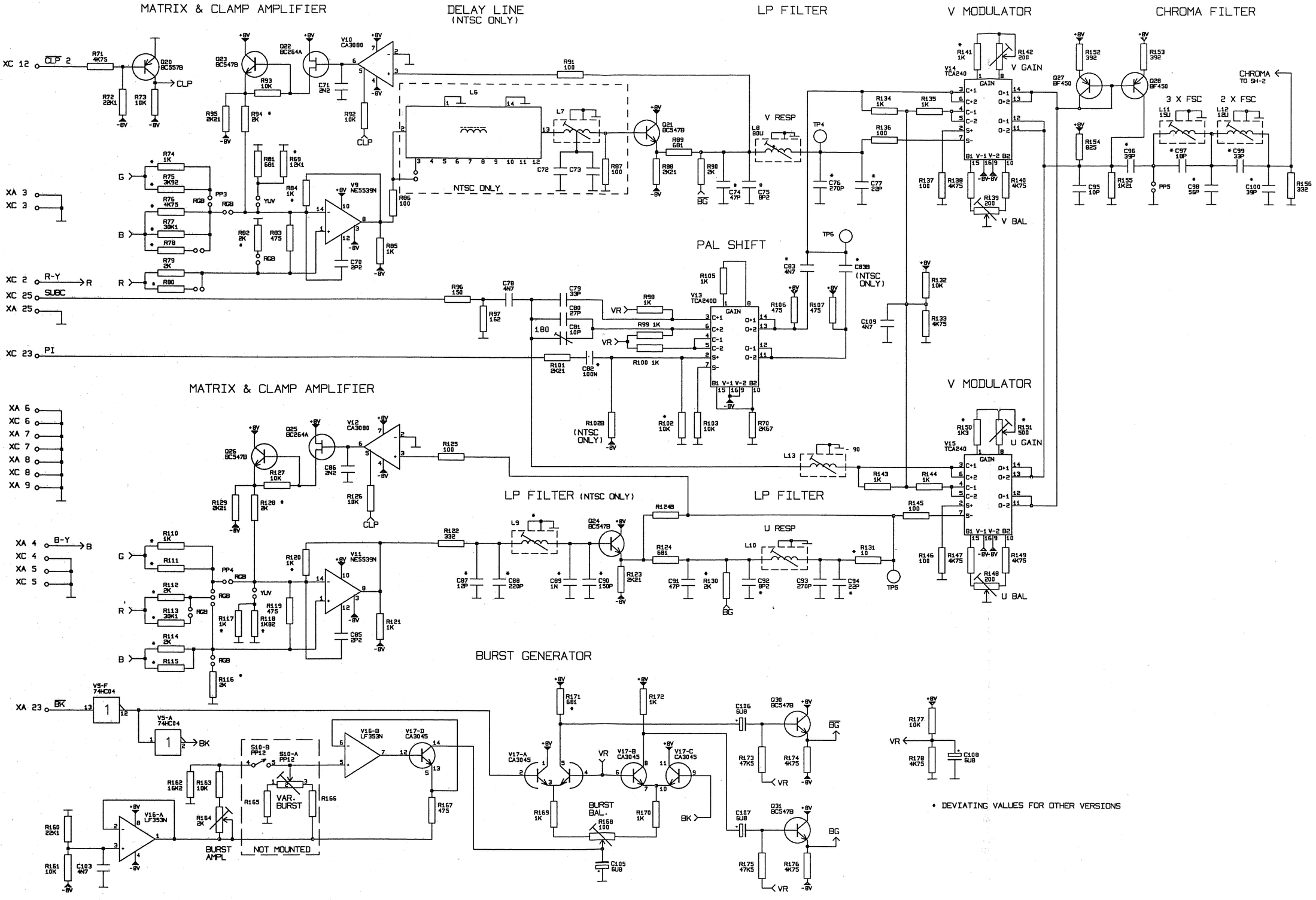


Fig. 14-6 Circuit diagram, encoder - unit 4, sh.2

15. Black burst generator - unit 5

15.1 Test and adjustments

Measuring equipment :

Oscilloscope	: e.g. Philips PM 3055
Voltmeter	: e.g. Philips PM 2528
Video level meter	: e.g. Philips PM 5664
Vectorscope	: e.g. Philips PM 5668

15.1.1 Voltage checks

1. Using a digital voltmeter, check for +8V ±0.4V on ◇1◇ (IC5, pin10).

2. Using a digital voltmeter, check for -8V ±0.4V on ◇2◇ (IC5, pin3).

3. Using a digital voltmeter, check for +5V ±0.4V on ◇3◇ (IC2, pin2).

15.1.2 Adjustments

1. Modulator balance
- Connect an oscilloscope terminated with 75Ω to the BLACK B. OUT connector.
- Adjust R58 for minimum restcarrier.

2. Frequency response
- Connect an oscilloscope terminated with 75Ω to the BLACK B. OUT connector.
- Adjust L1 and L6 for best sync pulse response.

3. Sync amplitude
- Connect a video level meter to the BLACK B. OUT connector.
- Check that the amplitude of the sync pulse is 300mV (PAL-version) or 40IRE(286mV) (NTSC-version).
- If not, adjust R6.

4. Chroma filter
- Connect a vectorscope terminated with 75Ω to the BLACK B. out connector.
- Adjust L2 for best frequency response (maximum burst amplitude and best linearity).

5. Burst shape
- Connect an oscilloscope terminated with 75Ω to the BLACK B. OUT connector.
- Adjust L3 for best possible burst pulse response.

6. Burst symmetry
- Connect an oscilloscope terminated with 75Ω to the BLACK B. OUT connector.
- Adjust R67 for equal burst amplitudes in all fields (minimum flutter on the burst signal). NTSC-versions: place the potentiometer in mid-position.

7. Burst amplitude
- Connect an oscilloscope terminated with 75Ω to the BLACK B. OUT connector
- Check that the amplitude of the burst is 300mV (PAL-version) or 40IRE(286mV) (NTSC-version)
- If not, adjust R24

8. Phase shift
- Connect a vectorscope terminated with 75Ω to the BLACK B. OUT connector
- Connect the EXT. INPUT of the vectorscope to either VIDEO OUT connector.
- Check that the -V burst vector has the same phase as it has on the VIDEO OUT signal. (NTSC use single burst).
- If not, adjust L5

9. 90° phase shift. (*PAL-version only*)
- Connect a vectorscope terminated with 75Ω to the BLACK B. OUT connector.
- Connect the EXT. INPUT of the vectorscope to either VIDEO OUT connector.
- Check that the burst of the black burst signal is in phase with the burst of the VIDEO OUT signal (+V burst vector is correct).
- If not, adjust L4.

10. Selection of C12 (sync timing).
- To make timing coincidence between the sync signals on the VIDEO OUT-puts and BLACK BURST output, C12 sometimes has to be installed from the emitter of TS1 to ground. The value of C12 is normally between 1.5pF and 4.7pF.

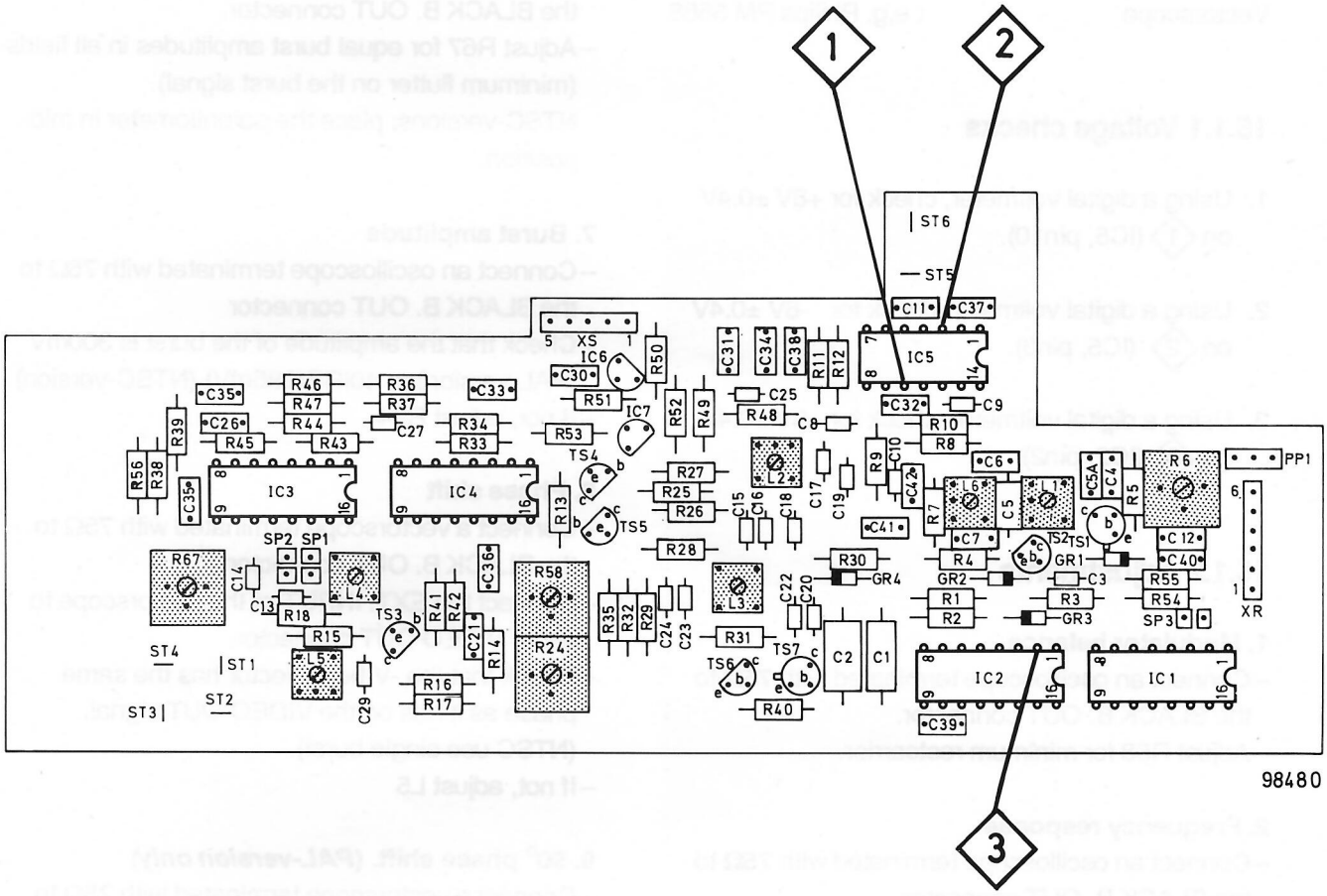


Fig. 15-1 Checkpoints, black burst generator - unit 5

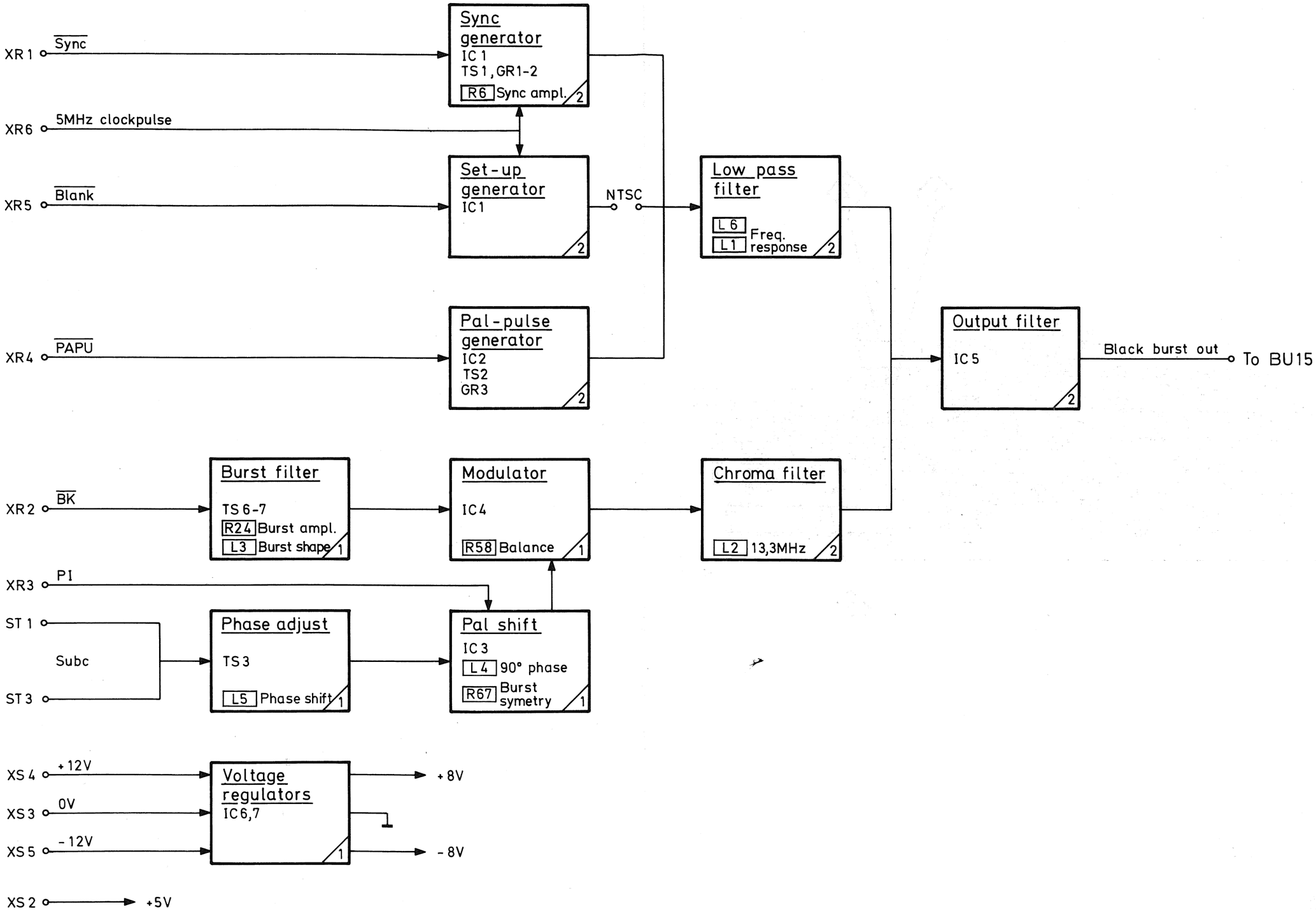
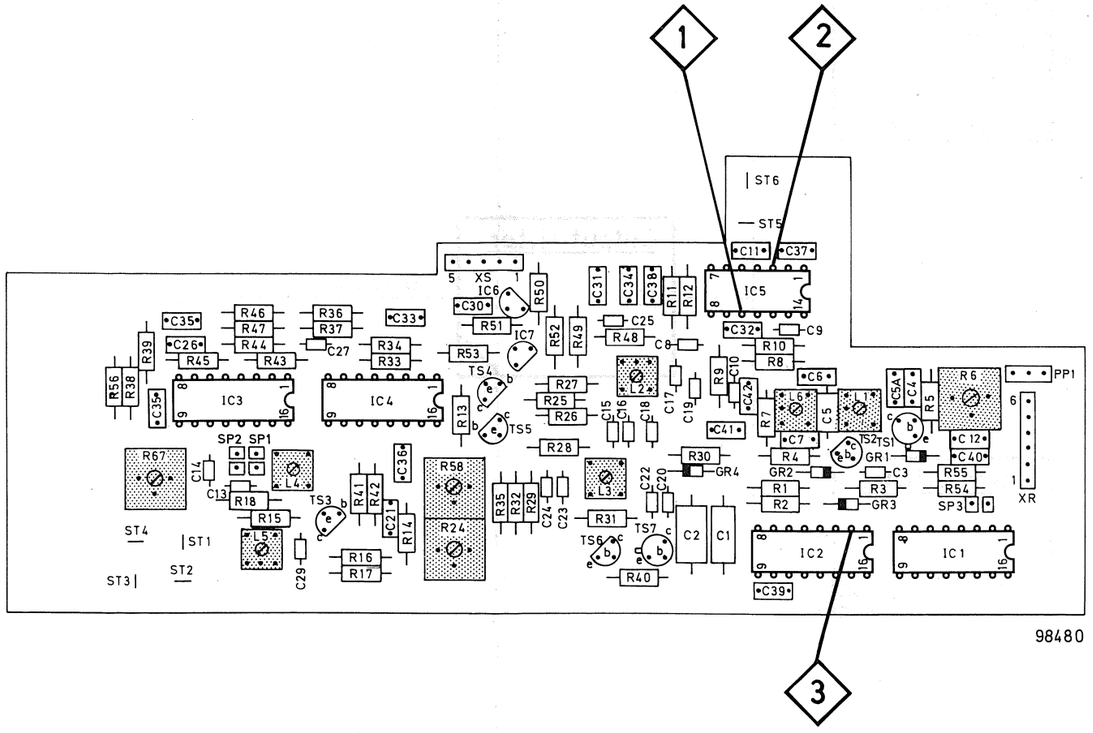
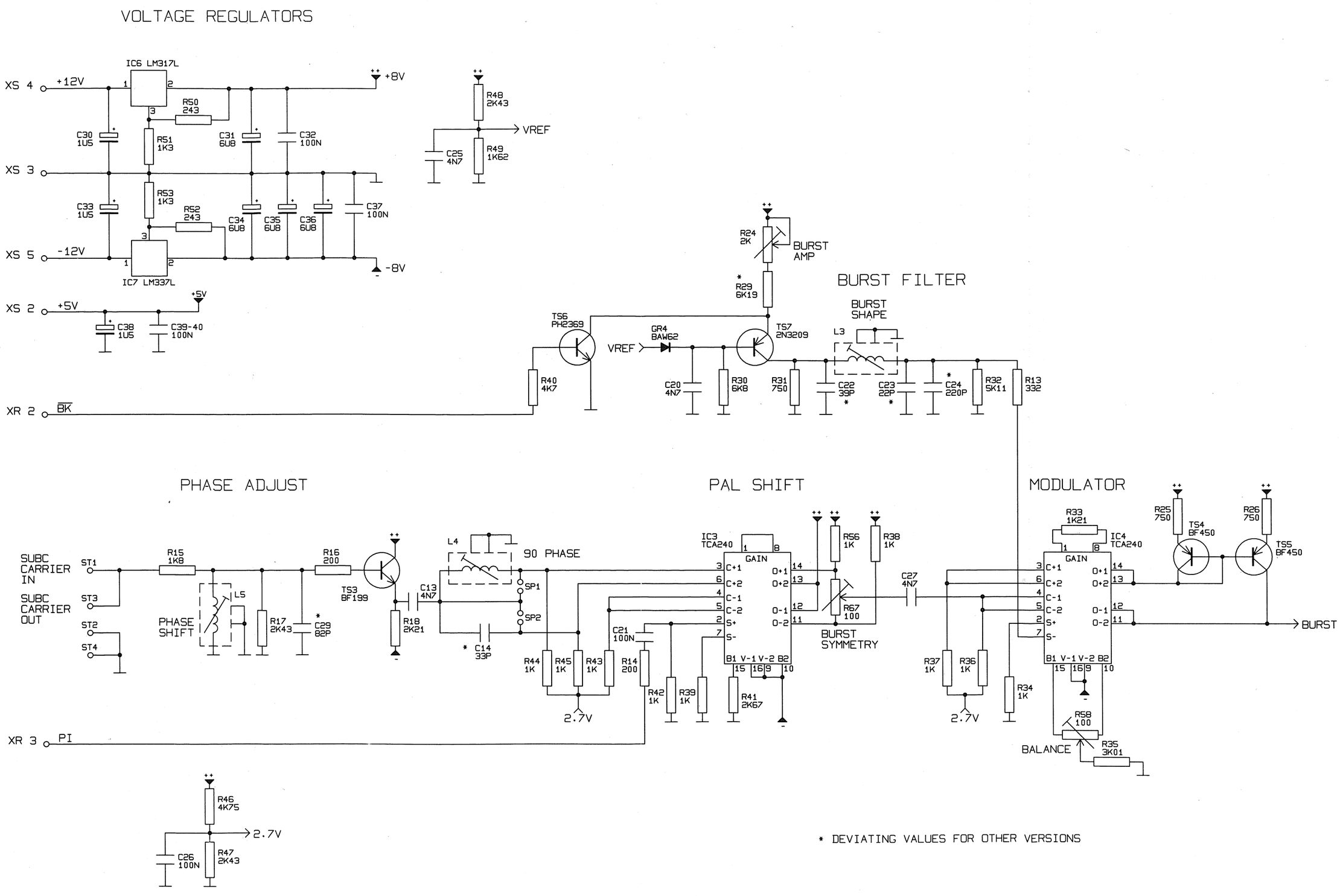


Fig. 15-2 Block diagram, black burst generator - unit 5



ATTENTION

Fig. 15-3 Component location, black burst generator - unit 5



* DEVIATING VALUES FOR OTHER VERSIONS

Fig. 15-4 Circuit diagram, black burst generator - unit 5, sh. 1

SYNC GEN

*** IN PM5633 IC1-74LS175 IS SUBSTITUTED WITH A 74LS04

SET UP GEN.

230 NS LOWPASS FILTER

OUTPUT AMPLIFIER

PAL PULSE GEN.

CHROMA FILTER

13.3 MHZ

BLACK BURST OUT (VIDEO)

(NTSC SET UP)

* DEVIATING VALUES FOR OTHER VERSIONS
** NOT MOUNTED

16. Service hints

16.1 Maintenance

16.1.1 Switches

Should the switches cease to function properly due to dirty contacts, they should be treated with a switch cleaner which both cleans and lubricates. After being cleaned, the switch should be operated a number of times to distribute the cleaner evenly.

16.1.2 Cabinet

The cabinet can be cleaned with soap and water. If necessary, a fine scouring detergent can be used.

16.2 Repairs

If you meet service problems with this equipment, please contact the local PHILIPS sales/service organization. Our service centers have a trained staff who will provide all possible support in solving your problems.
If the instrument has to be sent to the PHILIPS service center for repair and/or alignment, the following points should be noted:

1. Attach a label to the instrument stating the address of the sender and describing the fault(s) and complaint(s) as clearly as possible.

2. Use the original shipping carton and padding materials (if still available) or pack the instrument, wrapped in a plastic bag, in a rigid box in order to avoid transport damage.

3. The box should be marked with the complete type- and serial number (KU. number) and the remark "Return-shipment for repair".

16.3 Calibration survey

Main board - unit 1

1. TCXO frequency

Sync generator - unit 2

1. Subcarrier output amplitude
2. Internal subcarrier amplitude
3. Chroma amplitude
4. Subcarrier phase detector balance
5. Line/subc phase

Colorbar generator - PM 8544

1. Timing of the DAC clockpulse
2. Low-pass filters
3. Gain
4. Internal horizontal timing

Encoder - unit 4

1. Chroma filter
2. Chroma modulator balance
3. 180° PAL-shift
4. Subcarrier phase
5. R-Y response
6. B-Y response
7. Sync amplitude
8. Y amplitude
9. Frequency response, Y channel
10. Luminance notch
11. Sync filter response
12. Chroma amplitude
13. Chroma/luminance delay
14. Burst balance
15. Burst amplitude
16. Q-filter (NTSC only)
17. I-delay (NTSC only)

Black burst generator - unit 5

1. Modulator balance
2. Frequency response
3. Sync amplitude
4. Chroma filter
5. Burst shape
6. Burst symmetry
7. Burst amplitude
8. Phase shift
9. 90° phase shift
10. Selection of C12 (sync timing)

Fault analysis report

To aid us in maintaining records and in our continuing efforts to improve instrument reliability and the quality of the servicing manuals, we kindly request that you complete this fault analysis report if the instruments requires repair and/or adjustment.

Instrument type no.: PM _____ KU no. (serial no.) : _____

Estimated usage: _____ HRS/Year

Company name: _____

How many instruments of this type does your company use? _____

Please give a short description of the fault/symptoms:

_____

_____

_____

What was the cause? (Failed component, mis-adjustment etc).:

_____

_____

Time taken to repair/adjust __ HRS.

Does your company/organization normally?:

☐ Repair self ☐ Send the instrument to Philips Customer Support

When fault-finding/making adjustments, did you find the manual:

☐ Excellent? ☐ Adequate?

☐ Very good? ☐ Poor?

☐ Good? ☐ Very poor?

Do you have any suggestions that you think would improve future servicing manuals:

_____

_____

Have you any other suggestions/complains:

_____

_____

Please cut along the line and send this report to the Philips Customer Support Organization in your country.

17. List of mechanical parts

Item	Description	Quantity	Ordering number
1.	Textplate, grey	1	5322 459 11073
	Textplate, brown	1	5322 455 40166
2.	Ornamental strip, grey	1	5322 466 62139
	Ornamental strip, black	1	5322 460 60358
3.	Switch (SK1)	1	5322 276 11123
3.	Shaft for SK1	1	5322 535 91613
3.	Button for SK1, grey	1	5322 414 40059
	Button for SK1, brown	1	5322 414 20036
4.	LED (LA1,3,4)	3	4822 130 32472
5.	LED (LA2)	1	4822 130 31274
6.	Switch (SK2)	1	5322 276 11166
6.	Cover for SK2, grey	1	5322 414 30172
	Cover for SK2, brown	1	5322 414 60038
7.	Potmeter (P1)	1	5322 101 20721
8.	Potmeter (P2)	1	5322 103 10135
9.	BNC-connector	15	5322 267 14027
10.	Switch (SK3), grey	1	5322 276 11207
10.	Cover for SK3, grey	1	5322 414 30172
11.	Handle, grey	2	5322 498 10439
	Handle, brown	2	5322 498 50174
12.	Rear foot, grey	2	5322 462 30538
	Rear foot, brown	2	5322 462 50432
13.	Mains socket	1	5322 290 60432
14.	Remote socket (24 pole right angle Champ-bus)	1	5322 267 60321
	Foot	4	5322 462 40756
	Spring for foot	4	5322 492 64745
	Fuse 300mA slow	1	4822 253 50048
	Fuse 600mA slow	1	5322 253 40101
	Mains transformer	1	5322 146 20848

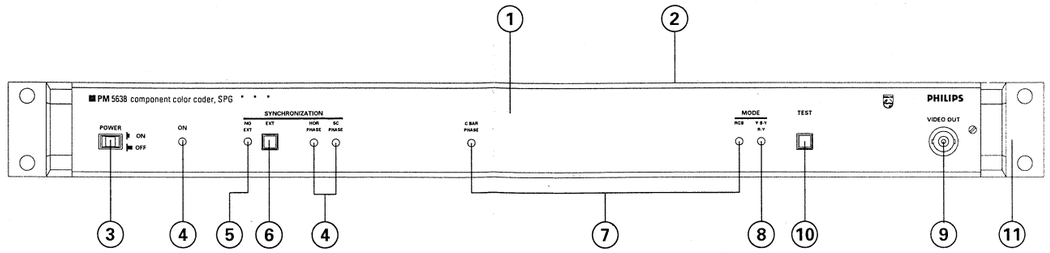


Fig. 17-1 Front panel

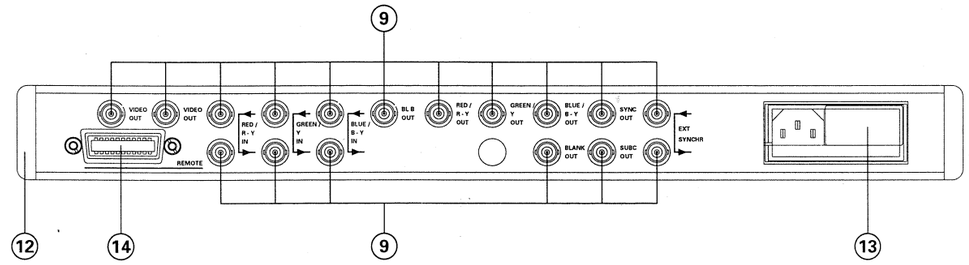


Fig. 17-2 Rear panel

18. List of electrical parts

Standard resistors (MR25, 0.4W, 1% and CHIP0805, 1W, 0.5%) are found on the "List of standard resistors" at the rear of the manual.

Unit 1 - Main board

Number	Ordering number	Type
Integrated circuits		
V1.	4822 209 80591	LM317T
V2.	5322 209 81236	LM337T
V3.	4822 209 80591	LM317T
V4.	5322 209 82575	74HC74P
V5.	5322 209 81395	LF353N
V6.	5322 209 10576	HEF4053BP
V7.	4822 209 70194	74HC04P
V8.	4822 209 11426	74HC86P
V9.	5322 209 72302	74HC173P
V10.	5322 209 11194	74HC132P
V202.	5322 209 81636	74LS86N
Transistors		
Q2.	4822 130 44568	BC557B
Q3.	4822 130 41594	PH2369
Q4.	4822 130 41594	PH2369
Q11.	4822 130 44568	BC557B
Q12.	4822 130 44568	BC557B
Q13.	5322 130 44609	2N3209
Q14.	4822 130 44568	BC557B
Q15.	4822 130 44568	BC557B
Q16.	5322 130 44609	2N3209
Q20.	4822 130 44237	BF450
Q21.	4822 130 44154	BF199
Q22.	4822 130 44154	BF199
Q23.	4822 130 44237	BF450
Q24.	4822 130 44237	BF450
Q25.	4822 130 44154	BF199
Q26.	4822 130 44154	BF199
Q27.	4822 130 44237	BF450
Q28.	4822 130 44237	BF450
Q29.	4822 130 44154	BF199
Q30.	4822 130 44154	BF199
Q31.	4822 130 44237	BF450
Q34.	4822 130 44237	BF450
Q35.	4822 130 44154	BF199

Number	Ordering number	Type
Q36.	4822 130 40959	BC547B
Q40.	4822 130 40959	BC547B
Q41.	4822 130 40959	BC547B
Q210.	4822 130 44568	BC557B
Q211.	4822 130 40959	BC547B
Q212.	5322 130 44041	BSV81
Q213.	5322 130 44041	BSV81
Q214.	5322 130 44041	BSV81
Q221.	4822 130 44568	BC557B
Q222.	4822 130 40959	BC547B
Q223.	4822 130 41594	PH2369
Q224.	4822 130 41594	PH2369
Q225.	4822 130 40959	BC547B
Q226.	5322 130 44041	BSV81
Q227.	5322 130 44041	BSV81
Q228.	5322 130 44041	BSV81
Q231.	4822 130 40959	BC547B
Q232.	5322 130 44041	BSV81
Q233.	5322 130 44041	BSV81
Q234.	5322 130 44041	BSV81
Diodes		
D1.	5322 130 81291	RECT. BRIDGE TYPE2
D2.	5322 130 50399	B40C3700/2200
D3.	4822 130 30613	BAW62
D4.	4822 130 30613	BAW62
D5.	4822 130 30613	BAW62
D6.	4822 130 31983	BAT85
D13.	4822 130 30613	BAW62
D14.	4822 130 81423	BZV86-C1V4
D15.	4822 130 30613	BAW62
D16.	4822 130 30613	BAW62
D17.	4822 130 81423	BZV86-C1V4
D18.	4822 130 30613	BAW62
D19.	4822 130 30613	BAW62
D20.	4822 130 30613	BAW62
D21.	4822 130 30613	BAW62
D22.	4822 130 30613	BAW62
D23.	4822 130 30613	BAW62
D24.	4822 130 30613	BAW62
D26.	4822 130 30613	BAW62
D27.	4822 130 30613	BAW62
D30.	4822 130 30613	BAW62
D31.	4822 130 30613	BAW62
D32.	4822 130 30613	BAW62
D33.	4822 130 30613	BAW62
D34.	4822 130 30613	BAW62

Number	Ordering number	Type
D35.	4822 130 30613	BAW62
D40.	4822 130 30613	BAW62
D41.	4822 130 30613	BAW62
D50.	4822 130 30613	BAW62
D51.	4822 130 30613	BAW62
D52.	4822 130 30613	BAW62
D211.	4822 130 30613	BAW62
D212.	4822 130 30613	BAW62
D213.	4822 130 30613	BAW62
Crystal		
OSC1 G.	5322 242 74144	TCXO - 8.867237MHz
OSC1 N.	5322 242 74383	TCXO - 7.1641125MHz
OSC1 P.	5322 242 74384	TCXO - 7.151223MHz
OSC1 NTSC.	5322 242 74143	TCXO - 7.159090MHz
Relay		
RE1.	5322 280 60489	12V
Miscellaneous		
B1.	5322 138 10262	Lithium-batt.
	5322 115 80116	"Programming Plug"

Number	Ordering number	Value	Tol(%)	Volt/Watt	Description
Capacitors					
C1.	5322 121 42386	100N	+/-10%	63V	FOIL
C2.	5322 121 42386	100N	+/-10%	63V	FOIL
C3.	5322 121 42386	100N	+/-10%	63V	FOIL
C4.	5322 124 80089	4700U	+/-20%	25V	ELECTROLYTIC
C5.	5322 124 80089	4700U	+/-20%	25V	ELECTROLYTIC
C6.	5322 124 80089	4700U	+/-20%	25V	ELECTROLYTIC
C7.	4822 124 40963	33U	+/-20%	10V	TANTAL
C8.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C9.	5322 121 42386	100N	+/-10%	63V	FOIL
C10.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C11.	5322 121 42386	100N	+/-10%	63V	FOIL
C12.	5322 121 42386	100N	+/-10%	63V	FOIL
C13.	5322 121 42386	100N	+/-10%	63V	FOIL
C14.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C25.	5322 121 42386	100N	+/-10%	63V	FOIL
C27.	4822 124 40963	33U	+/-20%	10V	TANTAL
C28.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C32.	4822 124 40196	220U	+/-20%	16V	ELECTROLYTIC
C33.	5322 124 24115	6U8	+/-20%	10V	TANTAL

Number	Ordering number	Value	Tol(%)	Volt/Watt	Description
C36.	5322 121 42386	100N	+/-10%	63V	FOIL
C37.	5322 121 42386	100N	+/-10%	63V	FOIL
C38.	5322 121 42386	100N	+/-10%	63V	FOIL
C39.	5322 121 42386	100N	+/-10%	63V	FOIL
C46.	5322 124 10455	68U	+/-20%	6.3V	TANTAL
C47.	5322 124 10455	68U	+/-20%	6.3V	TANTAL
C48.	5322 124 10455	68U	+/-20%	6.3V	TANTAL
C49.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C50.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C59.	5322 122 32331	1N0	+/-10%	100V	CERAMIC
C60.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C66.	4822 121 41854	150N	+/-10%	63V	FOIL
C67.	5322 122 32331	1N0	+/-10%	100V	CERAMIC
C68.	4822 121 41854	150N	+/-10%	63V	FOIL
C69.	5322 125 50051	2P0-18P			TRIMMER
C70.	4822 122 31061	18P	+/-2%	100V	CERAMIC
C71.	5322 122 32331	1N0	+/-10%	100V	CERAMIC
C72.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C87.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C88.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C89.	4822 124 40963	33U	+/-20%	10V	TANTAL
C90.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C91.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C92.	4822 124 40963	33U	+/-20%	10V	TANTAL
C93.	4822 124 40963	33U	+/-20%	10V	TANTAL
C100.	5322 124 10455	68U	+/-20%	6.3V	TANTAL
C101.	4822 122 31036	2P2	+/-P25	100V	CERAMIC
C103.	4822 122 31036	2P2	+/-P25	100V	CERAMIC
C104.	5322 124 10455	68U	+/-20%	6.3V	TANTAL
C105.	4822 122 31036	2P2	+/-P25	100V	CERAMIC
C107.	4822 122 31036	2P2	+/-P25	100V	CERAMIC
C108.	5322 124 10455	68U	+/-20%	6.3V	TANTAL
C109.	4822 122 31036	2P2	+/-P25	100V	CERAMIC
C111.	4822 122 31036	2P2	+/-P25	100V	CERAMIC
C114.	5322 124 10455	68U	+/-20%	6.3V	TANTAL
C115.	4822 122 31036	2P2	+/-P25	100V	CERAMIC
C116.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C117.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C140.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C141.	5322 121 42386	100N	+/-10%	63V	FOIL
C142.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C150.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C151.	4822 122 32027	56P	+/-2%	100V	CERAMIC
C152.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C153.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C154.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C201.	4822 122 30128	4N7	+/-10%	100V	CERAMIC

Number	Ordering number	Value	Tol(%)	Volt/Watt	Description
C203.	5322 121 42498	680N	+/-10%	63V	FOIL
C205.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C211.	5322 122 31907	180P	+/-2%	100V	CERAMIC
C213.	5322 121 42498	680N	+/-10%	63V	FOIL
C215.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C221.	5322 121 42498	680N	+/-10%	63V	FOIL
C223.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
Resistors					
R140.	5322 111 90431	9x10K	2%		NETWORK
R148.	5322 111 91609	9x10K	2%		NETWORK
R149.	5322 111 91609	9x10K	2%		NETWORK

Unit 2 - Sync generator

Number	Ordering number	Type
Integrated circuits		
IC1.	5322 209 84508	HEF4022BP
IC2.	4822 209 10297	HEF4017BP
IC3.	5322 209 85832	74LS26
IC4.	5322 209 85503	LM311N
IC5.	5322 209 85503	LM311N
IC6.	5322 209 85503	LM311N
IC7.	5322 209 86059	74LS221
IC8.	5322 209 10576	HEF4053BP
IC9.	5322 209 81395	LF353N
IC10.	5322 209 85503	LM311N
IC11.	5322 209 85528	LM361N
IC12.	5322 209 85503	LM311N
IC13.	5322 209 60188	LM339AN
IC14.	5322 209 10576	HEF4053BP
IC15.	5322 209 51887	PLD (SYNC TIMING)
IC16.	5322 209 81395	LF353N
IC17.	5322 209 11341	74HC4049P
IC18.	5322 209 11341	74HC4049P
IC19.	5322 209 63001	SAA1043P SELECTED II
IC20.	5322 209 81646	74LS374
IC21.	5322 209 86059	74LS221
IC22.	4822 209 10246	HEF4001BP
IC23.	4822 209 10246	HEF4001BP
IC24 G, P, N.	4822 209 10248	HEF4013BP

Number	Ordering number	Type
IC25.	5322 209 63029	OQ0702
IC26.	5322 209 81395	LF353N
IC27.	5322 209 81724	SAA1044P
IC28.	5322 209 81395	LF353N
IC29.	5322 209 10576	HEF4053BP
IC32.	5322 209 86434	LM79L05ACZ
Transistors		
TS2.	4822 130 40959	BC547B
TS3.	4822 130 40959	BC547B
TS4.	4822 130 44568	BC557B
TS5.	4822 130 44568	BC557B
TS6.	4822 130 41594	PH2369
TS7.	4822 130 41594	PH2369
TS8.	5322 130 44609	2N3209
TS9.	5322 130 42405	BSD214
TS10.	5322 130 42405	BSD214
TS11.	4822 130 41594	PH2369
TS12.	4822 130 44237	BF450
TS13.	4822 130 41594	PH2369
TS14.	4822 130 41594	PH2369
TS15.	4822 130 44237	BF450
TS16.	4822 130 41594	PH2369
TS17.	4822 130 41594	PH2369
TS18.	4822 130 40959	BC547B
TS19.	5322 130 42405	BSD214
Diodes		
GR1.	4822 130 30613	BAW62
GR3.	4822 130 30613	BAW62
GR4.	4822 130 30613	BAW62
GR5.	5322 130 31684	BB809
GR6.	5322 130 31684	BB809
GR7.	5322 130 31684	BB809
GR8.	4822 130 34167	BZX79-C6V2
GR9.	4822 130 30613	BAW62
GR10.	4822 130 31274	LED, 3mm RED - TLR124
GR11.	4822 130 32472	LED, GREEN-TLG 124A
GR12.	4822 130 31274	LED, 3mm RED - TLR124
GR13.	4822 130 30613	BAW62
GR14.	4822 130 81423	BZV86-C1V4
GR15.	4822 130 81423	BZV86-C1V4
GR16.	4822 130 30613	BAW62
GR17.	4822 130 31983	BAT85

Number	Ordering number	Type
Coils		
L1.	5322 157 51698	10UH-26UH
L2.	5322 157 51698	10UH-26UH
L3.	5322 157 51698	10UH-26UH
Crystals		
X1 G, N.	4822 242 70362	5.000000MHz
X1 P, NTSC.	5322 242 70704	5.034964MHz
X2 G.	4822 242 70323	4.433619MHz
X2 N.	4822 242 71686	3.582056MHz
X2 P.	5322 242 70705	3.575611MHz
X2 NTSC.	4822 242 71687	3.579545MHz
X3 G.	4822 242 70323	4.433619MHz
X3 N.	4822 242 71686	3.582056MHz
X3 P.	5322 242 70705	3.575611MHz
X3 NTSC.	4822 242 71687	3.579545MHz
Miscellaneous		
	5322 115 80116	"Programming Plug"

Number	Ordering number	Value	Tol(%)	Volt/Watt	Description
Capacitors					
C1.	5322 122 31799	100N	-20+50%	63V	CERAMIC
C3.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C4.	5322 122 32331	1N0	+/-10%	100V	CERAMIC
C5.	4822 122 31353	330P	+/-2%	100V	CERAMIC
C6.	4822 122 31353	330P	+/-2%	100V	CERAMIC
C7.	4822 122 31353	330P	+/-2%	100V	CERAMIC
C8.	4822 122 30107	270P	+/-2%	100V	CERAMIC
C9.	4822 121 43526	47N	+/-10%	63V	FOIL
C10.	4822 124 20942	1U5	+/-20%	25V	TANTAL
C11 G.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C11 N, P, NTSC	4822 122 31348	120P	+/-2%	100V	CERAMIC
C12.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C13.	4822 121 41854	150N	+/-10%	63V	FOIL
C14.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C15.	4822 121 41854	150N	+/-10%	63V	FOIL
C16.	4822 121 41854	150N	+/-10%	63V	FOIL
C17.	5322 121 42489	33N	+/-10%	100V	FOIL
C18.	4822 122 30114	2N2	+/-10%	100V	CERAMIC
C19.	5322 124 10455	68U	+/-20%	6.3V	TANTAL
C20.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C21.	4822 122 31348	120P	+/-2%	100V	CERAMIC

Number	Ordering number	Value	Tol(%)	Volt/Watt	Description
C22.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C23.	4822 121 50539	4N7	+/-1%	63V	POLYESTER
C24.	4822 122 31237	82P	+/-2%	100V	CERAMIC
C25.	4822 122 31348	120P	+/-2%	100V	CERAMIC
C26.	4822 122 31348	120P	+/-2%	100V	CERAMIC
C27.	4822 122 31413	150P	+/-2%	100V	CERAMIC
C28.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C29.	4822 122 31348	120P	+/-2%	100V	CERAMIC
C30.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C31.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C32.	5322 122 32331	1N0	+/-10%	100V	CERAMIC
C33.	4822 122 31348	120P	+/-2%	100V	CERAMIC
C34.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C35.	4822 122 31353	330P	+/-2%	100V	CERAMIC
C36.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C37.	5322 121 54071	2N2	+/-1%	250V	POLYESTER
C38.	4822 121 41854	150N	+/-10%	63V	FOIL
C39.	4822 122 31353	330P	+/-2%	100V	CERAMIC
C40.	4822 121 41854	150N	+/-10%	63V	FOIL
C41 G.	5322 122 32493	100P	+/-2%	100V	CERAMIC
C41 N, P, NTSC	5322 126 10457	120P	+/-2%	100V	CERAMIC
C42.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C43 G.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C43 N, P, NTSC	4822 122 31348	120P	+/-2%	100V	CERAMIC
C44.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C45.	4822 121 41854	150N	+/-10%	63V	FOIL
C46.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C47.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C48.	5322 121 42386	100N	+/-10%	63V	FOIL
C49.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C50.	5322 121 42386	100N	+/-10%	63V	FOIL
C51.	5322 121 42386	100N	+/-10%	63V	FOIL
C52.	5322 121 42386	100N	+/-10%	63V	FOIL
C53.	5322 121 42386	100N	+/-10%	63V	FOIL
C54.	4822 124 20977	15U	+/-20%	16V	TANTAL
C55.	4822 124 20977	15U	+/-20%	16V	TANTAL
C56.	5322 121 42386	100N	+/-10%	63V	FOIL
C57.	5322 121 42386	100N	+/-10%	63V	FOIL
C58.	5322 121 42386	100N	+/-10%	63V	FOIL
C59.	5322 121 42386	100N	+/-10%	63V	FOIL
C60.	5322 121 42386	100N	+/-10%	63V	FOIL
C61.	5322 121 42386	100N	+/-10%	63V	FOIL
C62.	5322 121 42386	100N	+/-10%	63V	FOIL
C63.	5322 121 42386	100N	+/-10%	63V	FOIL
C64.	5322 121 42386	100N	+/-10%	63V	FOIL
C65.	5322 121 42386	100N	+/-10%	63V	FOIL
C66.	5322 121 42386	100N	+/-10%	63V	FOIL

Number	Ordering number	Value	Tol(%)	Volt/Watt	Description
C67.	5322 121 42386	100N	+/-10%	63V	FOIL
C68.	5322 121 42386	100N	+/-10%	63V	FOIL
C69.	5322 121 42386	100N	+/-10%	63V	FOIL
C70.	5322 121 42386	100N	+/-10%	63V	FOIL
C71.	4822 122 30114	2N2	+/-10%	100V	CERAMIC
C72.	4822 121 41854	150N	+/-10%	63V	FOIL
C74.	4822 122 31316	100P	+/-2%	100V	CERAMIC
Resistors					
R4.	5322 103 10317	500R	20%	0.5W	TRIMPOTM.
R12.	4822 053 20825	8M2	5%	0.25W	VR25
R19.	4822 053 20106	10M	5%	0.25W	VR25
R25.	4822 053 20125	1M2	5%	0.25W	VR25
R35.	5322 103 10317	500R	20%	0.5W	TRIMPOTM.
R49.	5322 101 20721	10K	10%	0.75W	TRIMPOTM.
R54.	4822 053 20155	1M5	5%	0.25W	VR25
R68.	5322 103 10323	100R	20%	0.5W	TRIMPOTM.
R89.	5322 103 10135	2K0	10%	0.75W	TRIMPOTM.
R102.	4822 053 20106	10M	5%	0.25W	VR25
R139.	4822 053 20565	5M6	5%	0.25W	VR25
R140.	5322 103 10135	2K0	10%	0.75W	TRIMPOTM.

Unit 2.1 - Crash lock unit

Number	Ordering number	Type
	5322 212 70183	Crash lock unit

Unit 3 - Colorbar gen. (PM 8544)

Number	Ordering number	Type
Integrated circuits		
V1.	4822 209 80591	LM317T
V2.	5322 209 81236	LM337T
V7.	5322 209 81723	NE5539N
V9.	5322 209 81723	NE5539N
V11.	5322 209 81723	NE5539N
V16.	5322 209 11337	74HC161P
V17.	5322 209 11337	74HC161P

Number	Ordering number	Type
V18.	5322 209 11337	74HC161P
V19.	5322 209 11336	74HC139P
V20.	4822 209 70194	74HC04P
V21.	5322 209 11365	74HC4040P
V22.	5322 209 86059	74LS221
V23 G, N, P.	5322 209 51671	PROG PROM
V23 NTSC.	5322 209 51672	PROG PROM
V24.	5322 209 11342	74HC574P
V25.	5322 209 11342	74HC574P
V26.	5322 209 11342	74HC574P
V27.	5322 209 11322	74HC08P
V30.	5322 209 60776	TDA8702C1
V31.	5322 209 60776	TDA8702C1
V32.	5322 209 60776	TDA8702C1
V33.	5322 209 80903	LM78LO5ACZ
V101.	5322 209 81395	LF353N
V102.	5322 209 63001	SAA1043P SELECTED II
V103.	4822 209 70194	74HC04P
V104.	4822 209 10248	HEF4013BP
V105.	4822 209 70985	74HC175P
V106.	5322 209 82575	74HC74P
Transistors		
Q201.	5322 130 42405	BSD214
Diodes		
D10.	4822 130 30613	BAW62
D11.	4822 130 30613	BAW62
D12.	4822 130 30613	BAW62
D101.	5322 130 31684	BB809
D102.	4822 130 81423	BZV86-C1V4
D103.	4822 130 30613	BAW62
D104.	4822 130 30613	BAW62
D105.	4822 130 30613	BAW62
Coils		
L1.	5322 157 51698	10UH-26UH
L2 G, N, P.	5322 157 51825	31UH-66UH
L2 NTSC.	5322 157 51701	18UH-44UH
L3.	5322 157 51698	10UH-26UH
L4 G, N, P.	5322 157 51825	31UH-66UH
L4 NTSC.	5322 157 51701	18UH-44UH
L5.	5322 157 51698	10UH-26UH
L6 G, N, P.	5322 157 51825	31UH-66UH
L6 NTSC.	5322 157 51701	18UH-44UH

Number	Ordering number	Type
Crystal		
X1 G, N, P.	4822 242 70362	5,000000MHz
X1 NTSC.	5322 242 70704	5.034964MHz
Miscellonous		
	5322 115 80116	"Programming plug"

Number	Ordering number	Value	Tol(%)	Volt/Watt	Description
Capacitors					
C1.	5322 121 42386	100N	+/-10%	63V	FOIL
C3.	4822 124 40963	33U	+/-20%	10V	TANTAL
C4.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C6.	5322 121 42386	100N	+/-10%	63V	FOIL
C7.	5322 121 42386	100N	+/-10%	63V	FOIL
C11.	5322 121 42386	100N	+/-10%	63V	FOIL
C13.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C14.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C16 G, N, P.	5322 121 42386	100N	+/-10%	63V	FOIL
C22.	5322 124 10455	68U	+/-20%	6.3V	TANTAL
C23.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C24.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C26.	5322 124 10455	68U	+/-20%	6.3V	TANTAL
C27.	5322 121 42386	100N	+/-10%	63V	FOIL
C40.	5322 122 32163	5P6	+/-P25	100V	CERAMIC
C41.	5322 122 32163	5P6	+/-P25	100V	CERAMIC
C42.	5322 122 32163	5P6	+/-P25	100V	CERAMIC
C61.	4822 122 31072	47P	+/-2%	100V	CERAMIC
C62.	5322 122 32143	22P	+/-2%	100V	CERAMIC
C63.	5322 124 14078	1U5	+/-20%	40V	TANTAL
C64.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C65.	5322 124 10455	68U	+/-20%	6.3V	TANTAL
C69.	5322 121 42386	100N	+/-10%	63V	FOIL
C70.	5322 122 32143	22P	+/-2%	100V	CERAMIC
C71.	4822 122 31049	6P8	+/-P25	100V	CERAMIC
C72.	4822 122 31348	120P	+/-2%	100V	CERAMIC
C73 G, N, P.	5322 122 32072	33P	+/-2%	100V	CERAMIC
C73 NTSC.	4822 122 31336	100P	+/-2%	100V	CERAMIC
C74 G, N, P.	4822 122 31353	330P	+/-2%	100V	CERAMIC
C74 NTSC.	5322 122 32056	220P	+/-2%	100V	CERAMIC
C75 G, N, P.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C75 NTSC.	4822 122 31069	39P	+/-2%	100V	CERAMIC
C79.	5322 121 42386	100N	+/-10%	63V	FOIL
C80.	5322 122 32143	22P	+/-2%	100V	CERAMIC
C81.	4822 122 31049	6P8	+/-P25	100V	CERAMIC

Number	Ordering number	Value	Tol(%)	Volt/Watt	Description
C82.	4822 122 31348	120P	+/-2%	100V	CERAMIC
C83 G, N, P.	5322 122 32072	33P	+/-2%	100V	CERAMIC
C83 NTSC.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C84 G, N, P.	4822 122 31353	330P	+/-2%	100V	CERAMIC
C84 NTSC.	5322 122 32056	220P	+/-2%	100V	CERAMIC
C85 G, N, P.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C85 NTSC.	4822 122 31069	39P	+/-2%	100V	CERAMIC
C89.	5322 121 42386	100N	+/-10%	63V	FOIL
C90.	5322 122 32143	22P	+/-2%	100V	CERAMIC
C91 G, N, P.	4822 122 31049	6P8	+/-P25	100V	CERAMIC
C92 G, N, P.	4822 122 31685	120P	+/-2%	100V	CERAMIC
C93 G, N, P.	5322 122 32072	33P	+/-2%	100V	CERAMIC
C93 NTSC.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C94 G, N, P.	4822 122 31353	330P	+/-2%	100V	CERAMIC
C94 NTSC.	5322 122 32056	220P	+/-2%	100V	CERAMIC
C95 G, N, P.	4822 122 31348	120P	+/-2%	100V	CERAMIC
C95 NTSC.	4822 122 31069	39P	+/-2%	100V	CERAMIC
C160.	5322 121 42386	100N	+/-10%	63V	FOIL
C201.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C202.	5322 121 42661	330N	+/-10%	63V	FOIL
C203.	5322 121 42489	33N	+/-10%	100V	FOIL
C204.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C205.	4822 122 31316	100P	+/-2%	100V	CERAMIC
C206.	4822 122 31348	120P	+/-2%	100V	CERAMIC
C208.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C209.	5322 121 54077	330P	+/-1%	630V	POLYESTER
C210.	4822 121 41854	150N	+/-10%	63V	FOIL
C211.	5322 121 42386	100N	+/-10%	63V	FOIL
C220.	5322 121 42386	100N	+/-10%	63V	FOIL
Resistors					
R53.	5322 100 11864	200R	10%	0.5W	TRIMPOTM.
R69.	5322 100 11864	200R	10%	0.5W	TRIMPOTM.
R89.	5322 100 11864	200R	10%	0.5W	TRIMPOTM.
R90.	5322 116 82607	74R1	0.5%	0.25W	MPR24
R110.	5322 100 11082	2K	20%	0.5W	TRIMPOTM.
R113.	5322 111 91609	9x2K7	2%		NETWORK
R115.	5322 111 91609	9x2K7	2%		NETWORK
R116.	5322 111 91609	9x2K7	2%		NETWORK
R117.	5322 111 91609	9x2K7	2%		NETWORK
R118.	5322 111 91609	9x2K7	2%		NETWORK
R200.	5322 101 20721	10K	2%	0.75W	TRIMPOTM.
R204.	4822 053 20155	1M5	5%	0.25W	VR25
R221.	5322 103 10321	100K	20%	0.5W	TRIMPOTM.

Unit 4 - Encoder (PAL-versions)

Number	Ordering number	Type
Integrated circuits		
V1.	4822 209 80591	LM317T
V2.	5322 209 81236	LM337T
V5.	4822 209 70194	74HC04P
V7.	5322 209 11331	74HC02P
V8.	4822 209 80525	CA3080E
V9.	5322 209 81723	NE5539N
V10.	4822 209 80525	CA3080E
V11.	5322 209 81723	NE5539N
V12.	4822 209 80525	CA3080E
V13.	5322 209 63029	OQ0702
V14.	5322 209 63029	OQ0702
V15.	5322 209 63029	OQ0702
V16.	5322 209 81395	LF353N
V17.	5322 209 73005	LM3146N
Transistors		
Q2.	4822 130 41594	PH2369
Q3.	4822 130 44237	BF450
Q4.	4822 130 44237	BF450
Q5.	4822 130 41594	PH2369
Q6.	4822 130 44568	BC557B
Q7.	4822 130 40959	BC547B
Q8.	5322 130 44476	BC264A
Q9.	4822 130 40959	BC547B
Q10.	4822 130 40959	BC547B
Q12.	4822 130 44237	BF450
Q13.	4822 130 44237	BF450
Q14.	4822 130 41594	PH2369
Q15.	4822 130 44568	BC557B
Q16.	4822 130 40959	BC547B
Q17.	4822 130 44237	BF450
Q20.	4822 130 44568	BC557B
Q21.	4822 130 40959	BC547B
Q22.	5322 130 44476	BC264A
Q23.	4822 130 40959	BC547B
Q24.	4822 130 40959	BC547B
Q25.	5322 130 44476	BC264A
Q26.	4822 130 40959	BC547B
Q27.	4822 130 44237	BF450
Q28.	4822 130 44237	BF450
Q30.	4822 130 40959	BC547B
Q31.	4822 130 40959	BC547B

Number	Ordering number	Type
Diodes		
D4.	4822 130 30613	BAW62
D5.	4822 130 81423	BZV86-C1V4
D6.	4822 130 31981	BZX79-C3V9
D8.	4822 130 30613	BAW62
D9.	4822 130 81423	BZV86-C1V4
D10.	4822 130 81423	BZV86-C1V4
D11.	4822 130 32472	LED, GREEN-TLG 124A
D12.	4822 130 32472	LED, GREEN-TLG 124A
Coils		
L1.	5322 157 51698	10UH-26UH
L4.	5322 157 51825	31UH-66UH
L5.	5322 157 51701	18UH-44UH
L8.	5322 157 51825	31UH-66UH
L10.	5322 157 51825	31UH-66UH
L11.	5322 157 51698	10UH-26UH
L12.	5322 157 51698	10UH-26UH
L13.	5322 157 51825	31UH-66UH

Number	Ordering number	Value	Tol(%)	Volt/Watt	Description
Capacitors					
C1.	5322 122 31799	100N	-20+50%	63V	CERAMIC
C2.	5322 122 31799	100N	-20+50%	63V	CERAMIC
C3.	5322 122 31799	100N	-20+50%	63V	CERAMIC
C4.	5322 122 31799	100N	-20+50%	63V	CERAMIC
C5.	5322 122 31799	100N	-20+50%	63V	CERAMIC
C6.	5322 122 31799	100N	-20+50%	63V	CERAMIC
C10.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C11.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C12.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C13.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C15.	5322 121 42386	100N	+/-10%	63V	FOIL
C16.	5322 121 42386	100N	+/-10%	63V	FOIL
C17.	5322 121 42386	100N	+/-10%	63V	FOIL
C23.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C24.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C25.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C26.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C27.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C28.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C30.	5322 121 42386	100N	+/-10%	63V	FOIL
C31.	5322 121 42386	100N	+/-10%	63V	FOIL

Number	Ordering number	Value	Tol(%)	Volt/Watt	Description
C36.	5322 122 32331	1N0	+/-10%	100V	CERAMIC
C37.	5322 122 34067	22P	+/-2%	100V	CERAMIC
C38.	5322 125 50048	1P0-3P5			TRIMMER
C39.	4822 122 30114	2N2	+/-10%	100V	CERAMIC
C40 G.	5322 122 32493	100P	+/-2%	100V	CERAMIC
C40 N, P.	5322 126 10457	120P	+/-2%	100V	CERAMIC
C41 G.	5322 151 54128	390P	+/-1%	630V	POLYESTER
C41 N, P.	5322 121 54131	560P	+/-1%	630V	POLYESTER
C43.	5322 122 32056	220P	+/-2%	100V	CERAMIC
C53.	5322 122 34067	22P	+/-2%	100V	CERAMIC
C54.	4822 122 31353	330P	+/-2%	100V	CERAMIC
C55.	5322 126 10457	120P	+/-2%	100V	CERAMIC
C56.	5322 122 34064	18P	+/-2%	100V	CERAMIC
C58.	5322 122 34063	27P	+/-2%	100V	CERAMIC
C59.	4822 122 31404	15P	+/-2%	100V	CERAMIC
C60.	5322 122 34067	22P	+/-2%	100V	CERAMIC
C61.	4822 122 31215	P68	+/-P25	100V	CERAMIC
C62.	5322 122 31799	100N	-20+50%	63V	CERAMIC
C63.	4822 122 31404	15P	+/-2%	100V	CERAMIC
C64.	4822 122 31404	15P	+/-2%	100V	CERAMIC
C65.	4822 122 31404	15P	+/-2%	100V	CERAMIC
C70.	4822 122 31036	2P2	+/-P25	100V	CERAMIC
C71.	4822 122 30114	2N2	+/-10%	100V	CERAMIC
C74.	4822 122 31244	47P	+/-2%	100V	CERAMIC
C76.	4822 122 30107	270P	+/-2%	100V	CERAMIC
C78.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C79.	5322 122 32072	33P	+/-2%	100V	CERAMIC
C80.	4822 122 30045	27P	+/-2%	100V	CERAMIC
C81.	5322 125 50049	1P8-10P			TRIMMER
C82.	5322 122 31799	100N	-20+50%	63V	CERAMIC
C83.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C85.	4822 122 31036	2P2	+/-P25	100V	CERAMIC
C86.	4822 122 30114	2N2	+/-10%	100V	CERAMIC
C91.	4822 122 31244	47P	+/-2%	100V	CERAMIC
C93.	4822 122 30107	270P	+/-2%	100V	CERAMIC
C95.	5322 122 34059	10P	+/-2%	100V	CERAMIC
C96 G.	5322 122 31906	39P	+/-2%	100V	CERAMIC
C96 N, P.	4822 122 32193	33P	+/-2%	100V	CERAMIC
C97 G.	5322 122 34064	18P	+/-2%	100V	CERAMIC
C97 N, P.	5322 122 34067	22P	+/-2%	100V	CERAMIC
C98 G.	5322 122 34206	56P	+/-2%	100V	CERAMIC
C98 N, P.	5322 122 34057	68P	+/-2%	100V	CERAMIC
C99 G.	5322 122 32193	33P	+/-2%	100V	CERAMIC
C99 N, P.	5322 122 31906	39P	+/-2%	100V	CERAMIC
C100 G.	5322 122 31906	39P	+/-2%	100V	CERAMIC
C100 N, P.	5322 122 34067	22P	+/-2%	100V	CERAMIC
C103.	4822 122 30128	4N7	+/-10%	100V	CERAMIC

Number	Ordering number	Value	Tol(%)	Volt/Watt	Description
C105.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C106.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C107.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C108.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C109.	5322 121 42386	100N	+/-10%	63V	FOIL
Resistors					
R9.	5322 111 90449	9x330R	2%		NETWORK
R13.	5322 103 10316	1K	20%	0.5W	TRIMPOTM.
R15 P.	4822 050 23323	33K2	1%		MPR24
R27.	5322 116 51812	2K00	0.1%	0.25W	MPR24
R28.	5322 116 51812	2K00	0.1%	0.25W	MPR24
R30.	5322 116 51812	2K00	0.1%	0.25W	MPR24
R38 P.	4822 050 21212	1K21	1%		MPR24
R39.	5322 100 11864	200R	10%	0.5W	TRIMPOTM.
R66.	5322 116 53599	75R0	0.1%	0.25W	MPR24
R67.	5322 116 53599	75R0	0.1%	0.25W	MPR24
R68.	5322 116 53599	75R0	0.1%	0.25W	MPR24
R74.	5322 116 83627	1K00	0.1%	0.25W	MPR24
R79.	5322 116 51812	2K00	0.1%	0.25W	MPR24
R82.	5322 116 51812	2K00	0.1%	0.25W	MPR24
R84.	5322 116 83627	1K00	0.1%	0.25W	MPR24
R94.	5322 116 51812	2K00	0.1%	0.25W	MPR24
R105 N, P.	4822 050 24751	475R	1%		MPR24
R110.	5322 116 83627	1K00	0.1%	0.25W	MPR24
R112.	5322 116 51812	2K00	0.1%	0.25W	MPR24
R114.	5322 116 51812	2K00	0.1%	0.25W	MPR24
R116.	5322 116 51812	2K00	0.1%	0.25W	MPR24
R117.	5322 116 83627	1K00	0.1%	0.25W	MPR24
R120.	5322 116 83627	1K00	0.1%	0.25W	MPR24
R128.	5322 116 51812	2K00	0.1%	0.25W	MPR24
R139.	5322 100 11864	200R	10%	0.5W	TRIMPOTM.
R142.	5322 103 10306	200R	20%	0.5W	TRIMPOTM.
R145 N, P.	4822 050 29091	909R	1%		MPR24
R148.	5322 100 11864	200R	10%	0.5W	TRIMPOTM.
R151.	5322 103 10317	500R	20%	0.5W	TRIMPOTM.
R164.	5322 101 10337	2K	20%	0.5W	TRIMPOTM.
R168.	5322 103 10323	100R	20%	0.5W	TRIMPOTM.

Unit 4 - Encoder (NTSC - version)

Number	Ordering number	Type
Integrated circuits		
V1.	4822 209 80591	LM317T
V2.	5322 209 81236	LM337T
V5.	4822 209 70194	74HC04P
V7.	5322 209 11331	74HC02P
V8.	4822 209 80525	CA3080E
V9.	5322 209 81723	NE5539N
V10.	4822 209 80525	CA3080E
V11.	5322 209 81723	NE5539N
V12.	4822 209 80525	CA3080E
V13.	5322 209 63029	OQ0702
V14.	5322 209 63029	OQ0702
V15.	5322 209 63029	OQ0702
V16.	5322 209 81395	LF353N
V17.	5322 209 73005	LM3146N
Transistors		
Q2.	4822 130 41594	PH2369
Q3.	4822 130 44237	BF450
Q4.	4822 130 44237	BF450
Q5.	4822 130 41594	PH2369
Q6.	4822 130 44568	BC557B
Q7.	4822 130 40959	BC547B
Q8.	5322 130 44476	BC264A
Q9.	4822 130 40959	BC547B
Q10.	4822 130 40959	BC547B
Q12.	4822 130 44237	BF450
Q13.	4822 130 44237	BF450
Q14.	4822 130 41594	PH2369
Q15.	4822 130 44568	BC557B
Q16.	4822 130 40959	BC547B
Q17.	4822 130 44237	BF450
Q20.	4822 130 44568	BC557B
Q21.	4822 130 40959	BC547B
Q22.	5322 130 44476	BC264A
Q23.	4822 130 40959	BC547B
Q24.	4822 130 40959	BC547B
Q25.	5322 130 44476	BC264A
Q26.	4822 130 40959	BC547B
Q27.	4822 130 44237	BF450
Q28.	4822 130 44237	BF450
Q30.	4822 130 40959	BC547B
Q31.	4822 130 40959	BC547B

Number	Ordering number	Type
Diodes		
D4.	4822 130 30613	BAW62
D5.	4822 130 81423	BZV86-C1V4
D6.	4822 130 31981	BZX79-C3V9
D8.	4822 130 30613	BAW62
D9.	4822 130 81423	BZV86-C1V4
D10.	4822 130 81423	BZV86-C1V4
D11.	4822 130 32472	LED, GREEN-TLG 124A
D12.	4822 130 32472	LED, GREEN-TLG 124A
Coils		
L1.	5322 157 51698	10UH-26UH
L4.	5322 157 51701	18UH-44UH
L5.	5322 157 51698	10UH-26UH
L8.	5322 157 51825	31UH-66UH
L9.	5322 158 10646	50UH-110UH
L10.	5322 157 51825	31UH-66UH
L11.	5322 157 51698	10UH-26UH
L12.	5322 157 51698	10UH-26UH
L13.	5322 157 51825	31UH-66UH

Number	Ordering number	Value	Tol(%)	Volt/Watt	Description
Capacitors					
C1.	5322 122 31799	100N	-20+50%	63V	CERAMIC
C2.	5322 122 31799	100N	-20+50%	63V	CERAMIC
C3.	5322 122 31799	100N	-20+50%	63V	CERAMIC
C4.	5322 122 31799	100N	-20+50%	63V	CERAMIC
C5.	5322 122 31799	100N	-20+50%	63V	CERAMIC
C6.	5322 122 31799	100N	-20+50%	63V	CERAMIC
C10.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C11.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C12.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C13.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C15.	5322 121 42386	100N	+/-10%	63V	FOIL
C16.	5322 121 42386	100N	+/-10%	63V	FOIL
C17.	5322 121 42386	100N	+/-10%	63V	FOIL
C23.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C24.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C25.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C26.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C27.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C28.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C30.	5322 121 42386	100N	+/-10%	63V	FOIL

Number	Ordering number	Value	Tol(%)	Volt/Watt	Description
C31.	5322 121 42386	100N	+/-10%	63V	FOIL
C36.	5322 122 32331	1N0	+/-10%	100V	CERAMIC
C37.	5322 122 34067	22P	+/-2%	100V	CERAMIC
C38.	5322 125 50048	1P0-3P5			TRIMMER
C39.	4822 122 30114	2N2	+/-10%	100V	CERAMIC
C40.	5322 126 10457	120P	+/-2%	100V	CERAMIC
C41.	5322 121 54131	560P	+/-1%	630V	POLYESTER
C43.	5322 122 32056	220P	+/-2%	100V	CERAMIC
C53.	5322 122 32103	8P2	+/-P25	100V	CERAMIC
C54.	5322 122 32056	220P	+/-2%	100V	CERAMIC
C55.	4822 122 31505	82P	+/-2%	100V	CERAMIC
C56.	4822 122 32186	5P6	+/-P25	100V	CERAMIC
C58.	5322 122 34067	22P	+/-2%	100V	CERAMIC
C59.	4822 122 31821	3P3	+/-P25	100V	CERAMIC
C60.	5322 122 34067	22P	+/-2%	100V	CERAMIC
C61.	4822 122 31215	P68	+/-P25	100V	CERAMIC
C62.	5322 122 31799	100N	-20+50%	63V	CERAMIC
C63.	4822 122 31404	15P	+/-2%	100V	CERAMIC
C64.	4822 122 31404	15P	+/-2%	100V	CERAMIC
C65.	4822 122 31404	15P	+/-2%	100V	CERAMIC
C70.	5322 122 34067	22P	+/-2%	100V	CERAMIC
C71.	4822 122 30114	2N2	+/-10%	100V	CERAMIC
C72.	5322 122 32056	220P	+/-2%	100V	CERAMIC
C74.	5322 122 34057	68P	+/-2%	100V	CERAMIC
C75.	4822 122 32187	6P8	+/-P25	100V	CERAMIC
C76.	4822 122 31353	330P	+/-2%	100V	CERAMIC
C77.	5322 122 34063	27P	+/-2%	100V	CERAMIC
C78.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C79.	5322 122 32072	33P	+/-2%	100V	CERAMIC
C80.	5322 122 32072	33P	+/-2%	100V	CERAMIC
C83.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C85.	4822 122 31036	2P2	+/-P25	100V	CERAMIC
C86.	4822 122 30114	2N2	+/-10%	100V	CERAMIC
C87.	5322 122 32056	220P	+/-2%	100V	CERAMIC
C88.	4822 122 31404	15P	+/-2%	100V	CERAMIC
C89.	4822 121 50591	1N0	+/-1%	630V	POLYESTER
C90.	4822 122 30107	270P	+/-2%	100V	CERAMIC
C91.	5322 122 34057	68P	+/-2%	100V	CERAMIC
C92.	5322 126 10458	12P	+/-2%	100V	CERAMIC
C93.	4822 122 31353	330P	+/-2%	100V	CERAMIC
C94.	5322 122 32493	100P	+/-2%	100V	CERAMIC
C95.	5322 122 34059	10P	+/-2%	100V	CERAMIC
C96.	5322 122 31906	39P	+/-2%	100V	CERAMIC
C97.	5322 122 34067	22P	+/-2%	100V	CERAMIC
C98.	5322 122 34057	68P	+/-2%	100V	CERAMIC
C99.	5322 122 31906	39P	+/-2%	100V	CERAMIC
C100.	5322 122 34067	22P	+/-2%	100V	CERAMIC

Number	Ordering number	Value	Tol(%)	Volt/Watt	Description
C103.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C105.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C106.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C107.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C108.	5322 124 24115	6U8	+/-20%	10V	TANTAL
C109.	5322 121 42386	100N	+/-10%	63V	FOIL
Resistors					
R9.	5322 111 90449	9x330R	2%		NETWORK
R11.	4822 050 22672	2K67	1%	0.6W	MRS25
R12.	4822 050 25622	5K62	1%	0.6W	MRS25
R13.	5322 103 10316	1K	20%	0.5W	TRIMPOTM.
R15.	4822 050 23323	33K2	1%	0.6W	MRS25
R16.	4822 050 23572	3K57	1%	0.6W	MRS25
R27.	5322 116 51812	2K00	0.1%	0.25W	MPR24
R28.	5322 116 51812	2K00	0.1%	0.25W	MPR24
R30.	5322 116 51812	2K00	0.1%	0.25W	MPR24
R38.	4822 050 21622	1K62	1%	0.6W	MRS25
R39.	5322 100 11864	200R	10%	0.5W	TRIMPOTM.
R56.	4822 050 21502	1K50	1%	0.6W	MRS25
R66.	5322 116 53599	75R0	0.1%	0.25W	MPR24
R67.	5322 116 53599	75R0	0.1%	0.25W	MPR24
R68.	5322 116 53599	75R0	0.1%	0.25W	MPR24
R74.	5322 116 51812	2K00	0.1%	0.25W	MPR24
R75.	4822 050 21303	13K0	1%	0.6W	MRS25
R76.	5322 116 51812	2K00	0.1%	0.25W	MPR24
R77.	4822 050 25622	5K52	1%	0.6W	MRS25
R78.	4822 050 23012	3K01	1%	0.6W	MRS25
R79.	5322 116 51812	2K00	0.1%	0.25W	MPR24
R81.	5322 116 80623	2K67	0.1%	0.25W	MPR24
R82.	4822 050 23322	3K32	1%	0.6W	MRS25
R84.	5322 116 51812	2K00	0.1%	0.25W	MPR24
R87.	4822 050 21001	100R	1%	0.6W	MRS25
R94.	4822 050 23922	3K92	1%	0.6W	MRS25
R105.	4822 050 24751	475R	1%	0.6W	MRS25
R110.	5322 116 80623	2K67	0.1%	0.25W	MPR24
R111.	5322 116 80623	2K67	0.1%	0.25W	MPR24
R112.	4822 050 24752	4K75	1%	0.6W	MRS25
R113.	4822 050 21303	13K0	1%	0.6W	MRS25
R114.	4822 050 23322	3K32	1%	0.6W	MRS25
R115.	4822 050 27503	75K0	1%	0.6W	MRS25
R116.	5322 116 51812	2K00	0.1%	0.25W	MPR24
R117.	5322 116 83627	1K00	0.1%	0.25W	MPR24
R118.	4822 050 23012	3K01	1%	0.6W	MRS25
R120.	5322 116 51812	2K00	0.1%	0.25W	MPR24
R122.	4822 050 23571	357R	1%	0.6W	MRS25
R128.	4822 050 24752	4K75	1%	0.6W	MRS25

Number	Ordering number	Value	Tol(%)	Volt/Watt	Description
R130.	4822 050 24751	475R	1%	0.6W	MRS25
R131.	4822 050 21502	1K50	1%	0.6W	MRS25
R139.	5322 100 11864	200R	10%	0.5W	TRIMPOTM.
R141.	4822 050 27501	750R	1%	0.6W	MRS25
R142.	5322 103 10306	200R	20%	0.5W	TRIMPOTM.
R148.	5322 100 11864	200R	10%	0.5W	TRIMPOTM.
R150.	4822 050 21002	1K00	1%	0.6W	MRS25
R151.	5322 103 10317	500R	20%	0.5W	TRIMPOTM.
R164.	5322 101 10337	2K	20%	0.5W	TRIMPOTM.
R167.	4822 050 24321	432R	1%	0.6W	MRS25
R168.	5322 103 10306	200R	20%	0.5W	TRIMPOTM.
R171.	4822 050 24751	475R	1%	0.6W	MRS25

Unit 5 - Black burst generator

Number	Ordering number	Type
Integrated circuits		
IC1.	5322 209 81625	74LS04
IC2.	5322 209 86059	74LS221
IC3.	5322 209 63029	OQ0702
IC4.	5322 209 63029	OQ0702
IC5.	5322 209 81723	NE5539N
IC6.	5322 209 82943	LM317LZ
IC7.	5322 209 83228	LM337LZ
Transistors		
TS1.	5322 130 44609	2N3209
TS2.	4822 130 41594	PH2369
TS3.	4822 130 44154	BF199
TS4.	4822 130 44237	BF450
TS5.	4822 130 44237	BF450
TS6.	4822 130 41594	PH2369
TS7.	5322 130 44609	2N3209
Diodes		
GR1.	4822 130 30613	BAW62
GR2.	4822 130 30613	BAW62
GR3.	4822 130 81423	BZV86-C1V4
GR4.	4822 130 30613	BAW62

Number	Ordering number	Type
Coils		
L1 G, N, P.	5322 157 51701	18UH-44UH
L1 NTSC.	5322 157 51698	10UH-26UH
L2.	5322 157 51698	10UH-26UH
L3.	5322 158 10646	50UH-110UH
L4.	5322 157 51701	18UH-44UH
L5.	5322 157 51698	10UH-26UH
L6 G, N, P.	5322 157 51698	10UH-26UH
L6 NTSC.	5322 158 10645	5UH-10UH

Number	Ordering number	Value	Tol(%)	Volt/Watt	Description
Capacitors					
C1.	5322 121 54131	560P	+/-1%	630V	POLYESTER
C2.	5322 121 54071	2N2	+/-1%	250V	POLYESTER
C3.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C4.	4822 122 30107	270P	+/-2%	100V	CERAMIC
C5 G, N, P.	4822 122 31353	330P	+/-2%	100V	CERAMIC
C5 NTSC.	5322 126 10457	120P	+/-2%	100V	CERAMIC
C6.	5322 126 10457	120P	+/-2%	100V	CERAMIC
C7 G, N, P.	5322 122 31907	180P	+/-2%	100V	CERAMIC
C7 NTSC.	5322 122 34057	68P	+/-2%	100V	CERAMIC
C8.	5322 122 32493	100P	+/-2%	100V	CERAMIC
C10.	5322 122 33587	4P7	+/-P25	100V	CERAMIC
C13.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C14 G.	4822 122 32193	33P	+/-2%	100V	CERAMIC
C14 N, P, NTSC	5322 122 31906	39P	+/-2%	100V	CERAMIC
C15.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C16 G.	4822 122 31244	47P	+/-2%	100V	CERAMIC
C16 N, P, NTSC	5322 122 34206	56P	+/-2%	100V	CERAMIC
C17 G.	5322 122 32103	8P2	+/-P25	100V	CERAMIC
C17 N, P, NTSC	5322 122 34059	10P	+/-2%	100V	CERAMIC
C18 G.	4822 122 31505	82P	+/-2%	100V	CERAMIC
C18 N, P, NTSC	5322 122 32493	100P	+/-2%	100V	CERAMIC
C19 G.	5322 122 32103	8P2	+/-P25	100V	CERAMIC
C19 N, P, NTSC	5322 122 34059	10P	+/-2%	100V	CERAMIC
C20.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C21.	5322 122 31799	100N	-20+50%	63V	CERAMIC
C22.	4822 122 31823	15P	+/-2%	100V	CERAMIC
C23.	5322 122 34067	22P	+/-2%	100V	CERAMIC
C24.	5322 122 32056	220P	+/-2%	100V	CERAMIC
C25.	4822 122 30128	4N7	+/-10%	100V	CERAMIC
C26.	5322 122 31799	100N	-20+50%	63V	CERAMIC
C27.	4822 122 30128	4N7	+/-10%	100V	CERAMIC

19. List of recommended spare parts

Please observe that the recommended spare parts are split into "basic" and "supplement" packages. The "basic" package contains the components common to all versions of PM 5638.
A "supplement" package contains the additional components needed to support a specific version of PM 5638, e.g. the M-PAL version.

The packages are to be ordered at your National Philips Sales Organization (we recommend that you purchase 1 package per 10 instruments in service).

Type	Ordering number
Basic kit	9389 818 56381
G-PAL suppl.	9389 818 56383
M-PAL suppl.	9389 818 56384
M-NTSC suppl.	9389 818 56388
N-PAL suppl.	9389 818 56389

Basic kit

Quantity	Ordering number	Description
1	5322 276 11123	Mains switch
1	5322 290 60432	Mains connector assembly
1	5322 146 20848	Mains transformer
1	5322 276 11166	Switch (SK2)
1	5322 276 11207	Switch (SK3)
3	4822 253 50048	Fuse, 300mA
3	5322 253 40101	Fuse, 600mA
5	5322 115 80116	Programming plug, female
2	5322 124 80089	4700uF ELCO
2	4822 124 40196	220uF ELCO
2	5322 124 10455	68uF ELCO
2	5322 124 11084	33uF Tantal
2	4822 124 20977	15uF ELCO
2	5322 124 24115	6.8uF ELCO
2	4822 124 20942	1.5uF ELCO
INTEGRATED CIRCUITS		
2	5322 209 11331	74HC02P
2	4822 209 70194	74HC04P
2	5322 209 82575	74HC74P
2	4822 209 11426	74HC86P
2	5322 209 11194	74HC132P

Quantity	Ordering number	Description
2	5322 209 72302	74HC173P
2	5322 209 11341	74HC4049P
2	5322 209 81625	74LS04
2	5322 209 85832	74LS26
2	5322 209 81636	74LS86N
2	5322 209 86059	74LS221
2	5322 209 81646	74LS374
2	4822 209 80525	CA3080E
2	4822 209 10246	HEF4001BP
2	4822 209 10248	HEF4013BP
2	4822 209 10297	HEF4017BP
2	5322 209 84508	HEF4022BP
2	5322 209 10576	HEF4053BP
2	5322 209 81395	LF353N
2	5322 209 85503	LM311N
2	5322 209 82943	LM317LZ
2	4822 209 80591	LM317T
2	5322 209 83228	LM337LZ
2	5322 209 81236	LM337T
2	5322 209 60188	LM339AN
2	5322 209 85528	LM361N
2	5322 209 73005	LM3146N
2	5322 209 86434	LM79L05ACZ
2	5322 209 81723	NE5539N
2	5322 209 63029	OQ0702
2	5322 209 51887	PLD (sync timing)
2	5322 209 63001	SAA1043P
2	5322 209 81724	SAA1044
TRANSISTORS		
2	5322 130 44609	2N3209
2	5322 130 44476	BC264A
3	4822 130 40959	BC547B
3	4822 130 44568	BC557B
2	4822 130 44154	BF199
3	4822 130 44237	BF450
2	5322 130 42405	BSD214
2	5322 130 44041	BSV81
3	4822 130 41594	PH2369
DIODES		
2	5322 130 50399	B40C3700/2200
5	4822 130 30613	BAW62
2	4822 130 31983	BAT85
2	5322 130 31684	BB809
2	4822 130 81423	BZV86-C1V4
2	4822 130 31981	BZX79-C3V9

Quantity	Ordering number	Description
2	4822 130 34167	BZX79-C6V2
2	4822 130 32472	TLG 124A, Green LED
2	4822 130 31274	TLR 124, Red LED
2	5322 130 81291	Rect. Bridge TYP 2

G-PAL Supplement kit

Quantity	Ordering number	Description
1	5322 242 74144	TCXO 8.867237MHz
1	4822 242 70323	X-TAL 4.433619MHz
1	4822 242 70362	X-TAL 5.000000MHz

M-PAL Supplement kit

Quantity	Ordering number	Description
1	5322 242 74384	TCXO 7.151223MHz
1	5322 242 70705	X-TAL 3.575611MHz
1	5322 242 70704	X-TAL 5.034964MHz

M-NTSC Supplement kit

Quantity	Ordering number	Description
1	5322 242 74143	TCXO 7.159090MHz
1	4822 242 71687	X-TAL 3.579545MHz
1	5322 242 70704	X-TAL 5.034964MHz

N-PAL Supplement kit

Quantity	Ordering number	Description
1	5322 242 74383	TCXO 7.1641125MHz
1	4822 242 71686	X-TAL 3.582056MHz
1	4822 242 70362	X-TAL 5.000000MHz

List of standard resistors

MR25 = 0.4W, 1%,
METAL FILM RESISTOR

Type	Value	Ordering number
MR25	10	5322 116 50452
MR25	11	5322 116 54059
MR25	12.1	5322 116 54069
MR25	13	5322 116 54082
MR25	15	5322 116 51221
MR25	16.2	5322 116 54431
MR25	18.2	5322 116 54083
MR25	20	5322 116 51048
MR25	22.1	5322 116 50983
MR25	24.3	5322 116 54435
MR25	26.7	5322 116 54087
MR25	30.1	5322 116 50904
MR25	33.2	5322 116 50527
MR25	35.7	5322 116 54439
MR25	39.2	5322 116 54087
MR25	43.2	5322 116 50519
MR25	47.5	5322 116 50952
MR25	51.1	5322 116 54442
MR25	56.2	5322 116 54446
MR25	61.9	5322 116 54451
MR25	68.1	5322 116 54455
MR25	75	5322 116 54459
MR25	82.5	5322 116 54462
MR25	90.9	5322 116 54466
MR25	100	5322 116 55549
MR25	110	5322 116 54474
MR25	130	5322 116 54481
MR25	150	5322 116 54486
MR25	162	5322 116 50417
MR25	182	5322 116 54493
MR25	200	5322 116 54496
MR25	221	4822 116 51223
MR25	267	5322 116 54503
MR25	301	5322 116 55366
MR25	332	4822 116 51226
MR25	357	5322 116 50603
MR25	392	5322 116 54006
MR25	432	5322 116 54522
MR25	475	5322 116 54007
MR25	511	4822 116 51282
MR25	562	4822 116 51231
MR25	619	4822 116 51232
MR25	681	4822 116 51233
MR25	750	4822 116 51234
MR25	825	5322 116 54541
MR25	909	5322 116 55278
MR25	1K	4822 116 51235
MR25	1.10K	4822 116 51236
MR25	1.21K	5322 116 54557
MR25	1.30K	5322 116 50526
MR25	1.50K	4822 116 51239
MR25	1.62K	5322 116 55359
MR25	1.82K	5322 116 54568
MR25	2K	5322 116 54572
MR25	2.21K	4822 116 51245
MR25	2.43K	5322 116 54004
MR25	2.67K	5322 116 54578
MR25	3.01K	4822 116 51246
MR25	3.32K	5322 116 54005
MR25	3.57K	5322 116 54586
MR25	3.92K	5322 116 54591
MR25	4.32K	5322 116 54594
MR25	4.75K	5322 116 54008
MR25	5.11K	5322 116 54595
MR25	5.62K	4822 116 51281
MR25	6.19K	5322 116 55426
MR25	6.81K	4822 116 51252
MR25	7.50K	5322 116 54608
MR25	8.25K	5322 116 54558
MR25	9.09K	4822 116 51284

Type	Value	Ordering number
MR25	10K	4822 116 51253
MR25	11K	5322 116 54623
MR25	12.1K	5322 116 50572
MR25	13K	5322 116 50522
MR25	15K	4822 116 51255
MR25	16.2K	5322 116 55361
MR25	18.2K	5322 116 54638
MR25	20K	5322 116 54642
MR25	22.1K	4822 116 51257
MR25	24.3K	5322 116 54647
MR25	26.7K	5322 116 54652
MR25	30.1K	5322 116 54655
MR25	33.2K	4822 116 51259
MR25	35.7K	5322 116 54662
MR25	39.2K	4822 116 51262
MR25	43.2K	5322 116 54667
MR25	47.5K	5322 116 54671
MR25	51.1K	5322 116 50672
MR25	56.2K	4822 116 51264
MR25	61.9K	5322 116 50872
MR25	68.1K	4822 116 51266
MR25	75K	4822 116 51267
MR25	82.5K	5322 116 55374
MR25	90.9K	5322 116 54694
MR25	100K	4822 116 51268
MR25	110K	5322 116 54701
MR25	121K	5322 116 54704
MR25	130K	5322 116 54707
MR25	150K	4822 116 51269
MR25	162K	5322 116 54716
MR25	182K	5322 116 54722
MR25	200K	4822 116 51286
MR25	221K	4822 116 51272
MR25	243K	5322 116 54733
MR25	267K	4822 116 54737
MR25	301K	5322 116 54743
MR25	332K	4822 116 51184
MR25	357K	5322 116 51767
MR25	392K	5322 116 51768
MR25	432K	5322 116 51769
MR25	475K	4822 116 51275
MR25	511K	5322 116 55258
MR25	562K	4822 116 51169
MR25	619K	5322 116 55315
MR25	681K	5322 116 55284
MR25	750K	5322 116 55532
MR25	825K	5322 116 51398
MR25	909K	5322 116 55533
MR25	1M	5322 116 55535

SMD resistors

Type 0805 = 1W, 0.5%,
CHIP

Type	Value	Ordering number
0805	2R2	4822 116 90466
0805	2R7	5322 116 82067
0805	3R3	4822 116 90469
0805	3R9	4822 116 82062
0805	4R7	4822 116 90462
0805	5R6	5322 116 82068
0805	6R8	5322 116 82069
0805	8R2	5322 116 82071
0805	10R	4822 116 90457
0805	12R	5322 116 82066
0805	15R	4822 116 81118
0805	18R	5322 116 81929
0805	22R	4822 116 90467
0805	27R	4822 116 90468
0805	33R	4822 116 90471
0805	39R	4822 111 91653
0805	47R	4822 111 91652
0805	56R	4822 116 90451
0805	68R	4822 116 80887
0805	82R	4822 111 91507
0805	100R	4822 116 90441
0805	120R	4822 116 81026
0805	150R	4822 116 80879
0805	180R	4822 116 90438
0805	220R	4822 116 90339
0805	270R	4822 116 80882
0805	330R	4822 111 91501
0805	390R	4822 116 81029
0805	470R	4822 116 90446
0805	560R	4822 111 91533
0805	680R	4822 116 90463
0805	820R	4822 116 81034
0805	1K0	4822 111 91516
0805	1K2	4822 116 80877
0805	1K5	4822 116 90458
0805	1K8	4822 116 81383
0805	2K2	4822 111 91522
0805	2K7	4822 111 91449
0805	3K3	4822 111 91526
0805	3K9	4822 111 91527
0805	4K7	4822 111 91532
0805	5K6	4822 111 91534
0805	6K8	4822 116 90464
0805	8K2	4822 111 91655
0805	10K	4822 111 91517
0805	12K	4822 116 81382
0805	15K	4822 111 91498
0805	18K	4822 111 91521
0805	22K	4822 111 91523
0805	27K	4822 116 90342
0805	33K	4822 116 81017
0805	39K	4822 116 90445
0805	47K	4822 111 91661
0805	56K	4822 111 91535
0805	68K	4822 116 90347
0805	82K	4822 116 81389
0805	100K	4822 111 91518
0805	120K	4822 116 90442
0805	150K	4822 116 90459
0805	180K	4822 116 90443
0805	220K	4822 116 80881
0805	270K	4822 116 81028
0805	330K	4822 116 90345
0805	390K	4822 111 91529
0805	470K	4822 116 90447
0805	560K	4822 116 80925
0805	680K	4822 116 81032
0805	820K	4822 116 90348