PTV **Professional Television measuring equipment**

Instruction manual

PHILIPS

Industrial &
Electro-acoustic Systems

PHILIPS

VITS generator and inserter
PM 5654

Instruction manual

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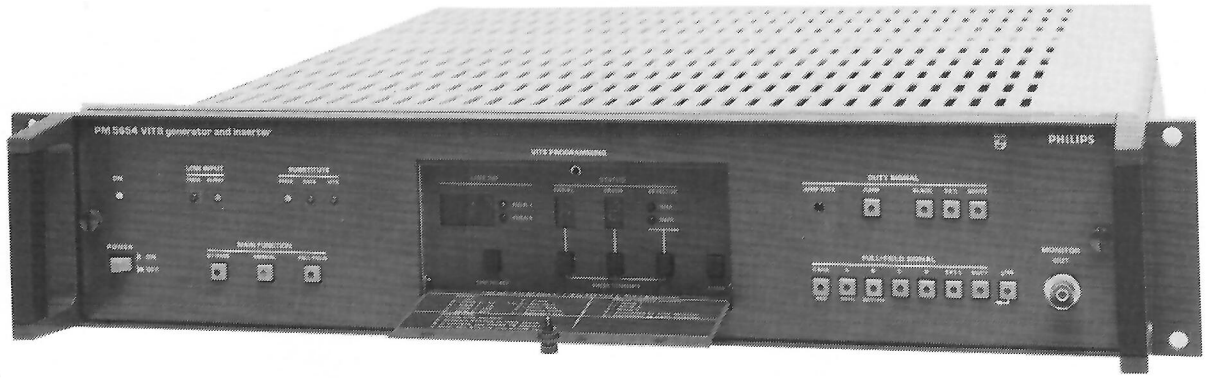

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Important

In correspondence concerning this instrument, please quote the full type and 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 service organisation in your country.

Fault analysis

In the event of instrument failure, please complete the "Fault Analysis report" situated in Chapter 23 of this manual. After completion, please send it to the Philips service organisation in your country.

REQUEST FOR TRAINING

AFTER COMPLETION, CUT ALONG DOTTED LINE AND RETURN TO THE PHILIPS SERVICE ORGANISATION IN YOUR COUNTRY.

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 service organisation in your country who will contact you and provide more detailed information for your consideration.

COMPANY NAME: _____

ADDRESS: _____

_____

_____

We require information only: ☐

WE WOULD LIKE TRAINING ON THE FOLLOWING INSTRUMENTS:

PM _____ PM _____ PM _____ PM _____

PM _____ PM _____ PM _____ PM _____

Number of participants: ☐ (MAX. 12).

Location:

☐ ON MY OWN PREMISES.

☐ AT PHILIPS SERVICE ORGANISATION.

☐ IN COPENHAGEN.

Time available: ☐ WEEKS/DAYS.

Start date: ☐ DAY ☐ MONTH ☐ YEAR

Finish date: ☐ DAY ☐ MONTH ☐ YEAR

Type of course required:

☐ SYSTEMS/APPLICATIONS.

☐ SERVICING-FAULTFINDING.

☐ OTHER (PLEASE SPECIFY BELOW)

PLEASE SEND THIS REQUEST TO THE PHILIPS SERVICING ORGANISATION IN YOUR COUNTRY. THANK YOU.

Positive feedback

Now you are the user of a Philips test and measuring instrument. We trust that it will give you many years of faithful service. But we would like you to realize one thing: we can only supply the best in T & M equipment with **your** help, user.

We need to know what you have found to be the strong and weak points of this instrument; and we would be very interested to hear about any unusual or elegant applications you have devised for it. Some of this information can be passed on to our design and development departments; and some may be fed back to other users via our bimonthly publication **T & M News.**

May we therefore suggest that you fill in the reply card alongside and send it back to us right now. That way, you'll be helping to provide the positive feedback we need to help you!

All contributions that are published will be paid for at current rates; while as an inducement for you to fill in the reply card, we are offering a free subscription to T & M News or a free copy of Part I of our Digital Instrument Course to all who reply.

Erfahrungsaustausch

Meßgeräte müssen sich in der Praxis bewähren und die in sie gesteckten Erwartungen erfüllen; auch bei Ihnen, dem Besitzer eines Geräts aus der Serie der Philips Test- und Meßgeräte. Wir aber können T & M-Geräte nur zu Ihrer vollen Zufriedenheit herstellen, wenn wir alle Ihre Wünsche kennen.

Deshalb interessiert uns Ihre Meinung über die guten und weniger guten Eigenschaften dieses Gerätes. Außerdem suchen wir Erfahrungen über ungewöhnliche oder neue Anwendungsmöglichkeiten. Vielleicht können Sie unseren Entwicklungs- und Konstruktionsabteilungen einen guten Wink geben; vielleicht können wir Ihre Erfahrungen aber auch in unserer Publikation **Info-dienst** (nur in Deutschland) veröffentlichen, damit auch andere Anwender davon profitieren können.

Deshalb möchten wir Sie bitten, die anhängende Antwortkarte auszufüllen und an uns zurückzusenden. Damit helfen Sie uns, und wir können Ihnen helfen!

Alle veröffentlichten Beiträge werden dem üblichen Tariff entsprechend honoriert. Als Dank für das Ausfüllen der Antwortkarte bieten wir Ihnen ein Freiabonnenment auf Info-dienst (nur in Deutschland) oder ein kostenloses Exemplar von Teil I von unserem Kursus Digital Instrument.

L'intérêt du ''feedback''

Vous voilà possesseur d'un instrument d'essai et de mesure Philips. Nous espérons qu'il vous donnera de nombreuses années de bons et loyaux services, mais nous voudrions attirer votre atten- tion sur un point: ce n'est qu'avec **votre** aide que nous pouvons fournir des matériels d'essai et de mesure de toute première qualité.

Nous avons besoin de savoir quels en sont les points forts et les points faibles que vous avez découverts et nous serions très intéressés d'apprendre quelles applications inhabituelles ou élégantes vous lui avez trouvé. Certains de ces renseignements peuvent être transmis utilement à nos bureaux d'études; certains autres peuvent être communiqués à d'autres utilisateurs par l'intermédiaire de notre publication **T & M Informations** (édition française seulement en France).

C'est pourquoi nous vous serions reconnaissants de remplir la carte-réponse à côté et de nous la renvoyer. De cette façon, vous contribuerez à nous fournir le ''feedback'' dont nous avons besoin pour mieux vous servir!

Toutes les réponses publiées seront payées conformément aux tarifs en vigueur; pour vous inciter à remplir la carte-réponse, nous offrons un abonnement gratuit à T & M Informations ou un exemplaire gratuit de la première partie de notre cours sur les instruments numériques à tous ceux qui répondront.

Details of user: **Persönliche Angaben:** **Expéditeur:**

Company/
Firma/Société .....
Department/
Abteilung/Service .....
Street/Straße/Rue .....
Box/Postfach/Boîte Postale .....
City/Stadt/Ville .....
Country/Land/Pays .....
Name/Name/Nom .....
Phone/Telefon/Numéro de téléphone .....

Details of instruments: **Gerätedaten:** **Instrument:**

Name/Name/
Désignation .....
Type number/Typennummer/
Numéro de type .....
Serial number/Serienummer/
Numéro de série .....
Date purchased/Kaufdatum/
Date d'achat .....

What are the main applications for which you use this instrument?
Wofür verwenden Sie dieses Gerät hauptsächlich?
Quelles sont les principales utilisations auxquelles vous affectez cet instrument?

.....
.....

Please, list what you consider to be the **strong points** and the **weak points** of the instrument.
Zählen Sie bitte auf, was Ihrer Meinung nach die **guten Seiten** und was die **schwachen Stellen** dieses Geräts sind.
Veuillez énumérer ce que vous considérez être les **points forts** et les **points faibles** de l'instrument.

.....
.....
.....

Do you have any queries about the use of this instrument? If so, what?
Haben Sie irgendwelche Fragen über die Anwendung dieses Geräts? Wenn ja, welche?
Avez-vous des questions à poser sur l'emploi de l'instrument? Si oui, lesquelles?

.....
.....
.....

I have devised an interesting application for this instrument.
- ☐ I enclose a brief description (up to about 500 words) of this application
- ☐ Please send a representative to collect information about the application

Ich habe einen interessanten Verwendungszweck für dieses Gerät gefunden.
- ☐ Eine kurze Beschreibung hiervon (max. ca. 500 Wörter) erhalten Sie anliegend.
- ☐ Senden Sie bitte jemanden, der sich an Ort und Stelle über den Verwendungszweck informieren kann.

J'ai trouvé une application intéressante pour cet instrument
- ☐ Je joins une brève description (500 mots environ au maximum) de cette application.
- ☐ Veuillez envoyer un représentant à qui nous donnerons des renseignements sur l'application.

- ☐ I would like to receive **T & M News** regularly.
- ☐ Please send me Digital Instrument Course Part I.
- ☐ Ich möchte **Info-dienst** regelmäßig beziehen.
- ☐ Senden Sie mir Digital Instrument Course, Teil I.
- ☐ J'aimerai recevoir **T & M Informations** régulièrement.
- ☐ Envoyez moi la première partie du cours sur les instruments numériques.

PHILIPS

T & M News

Philips Scientific and Industrial Equipment Division
Test and Measuring Instruments Department
Att. Mr. T. Sudar
TQ III - 4
EINDHOVEN
The Netherlands

please fold

T & M News is your feedback unit

T & M News is a bimonthly publication issued by the T & M Measuring Department of Philips' Science & Industry Division, for distribution to actual and potential users of Philips' T & M equipment. It provides an effective means of exchanging information in the T & M field - both from the manufacturer to the customer and **vice versa.**

Apart from **T & M News** itself, we also issue **T & M Reports,** which provide a vehicle for (generally longer) articles of a more specialized and/or theoretical nature to supplement the information given in **T & M News.** These Reports, being of a more specialized interest, are generally sent to a more restricted group of users; though anyone who is interested can obtain them on request.

One special series that was brought out in supplements to T & M News is our Digital Instrument Course (Part I: Basic binary theory and logic circuits; Part II: Digital counters and timers; Part III: Digital voltmeters and multimeters; Part IV: IEC Bus Interface; Part V: Logic Analyzers), which proved so popular with readers that each part of the course has been issued in booklet form.

Info-dienst für Ihren Erfahrungsaustausch

Info-dienst (nur in Deutschland) ist eine Publikation der Philips GmbH Unternehmensbereich für Elektronik für Wissenschaft und Industrie für die jetzigen Besitzer und potentiellen Kunden von Philips T & M-Geräten. Dieses Blatt strebt einen effektieven Informationsaustausch auf dem T & M-Gebiet zwischen Hersteller und Anwender sowie **umgekehrt an.**

Neben diesen **Info-dienst** geben wir auch die **T & M Reports** heraus (nur in englischer Sprache), in denen (im allgemeinen längere) Artikel mehr spezieller bzw. theoretischer Art als Ergänzung zu den Informationen in **Info-dienst** stehen. Diese Reports, an denen in allgemeinen nur Spezialisten interessiert sind, werden an eine begrenzte Anwendergruppe verteilt. Jeder, der daran interessiert ist, kann sie auf Anfrage erhalten.

Eine spezielle Serie, die gerade in den T & M News Supplements erschienen ist, war unser Digital Instrument Course (Teil I: Basic binary theory and logic circuits; Teil II: Digital counters and timers; Teil III: Digital voltmeters and multimeters; Teil IV: IEC Bus Interface; Teil V: Logic Analyzers). Diese Serie war bei den Lesern so populär, daß jeder Teil von diesem Kursus auch in Buchform herausgegeben wurde (nur in englischer Sprache).

T & M Informations est notre moyen de communiquer mutuellement

T & M Informations est une publication de département de Mesure de Philips, destinée aux utilisateurs effectifs et un puissance d'appareils d'essai et de mesure Philips. Elle constitue un moyen efficace de transmettre de l'information dans ce domaine, aussi bien du fabricant vers le client que **vice versa.**

A part la publication **T & M Informations proprement dite,** nous diffusons les **T & M Reports** (seulement en anglais) qui contiennent des articles (généralement plus longs) de nature plus spécialisée ou plus théorique, destinés à compléter l'information donnée dans **T & M Informations.** Etant donné leur nature, ces Reports ne sont généralement envoyés qu'à un cercle plus restreint d'utilisateurs; toutefois, quiconque s'y intéresse peut les obtenir sur demande.

Nous venons de publier dans les T & M News Supplements une série spéciale d'articles qui constituent un cours sur les instruments numériques (1ère partie: Théorie binaire de base et circuits logiques; 2ème partie: Compteurs numériques et minuteries; 3ème partie: voltmètres et multimètres numériques; 4ème partie: IEC Bus Interface; 5ème partie: Logic Analyzers) qui a rencontré un tel succés auprès des lecteurs que chaque partie du cours a été réimprimée sous forme de livret (seulement en anglais).

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INSTALLATION AND OPERATING INSTRUCTIONS

SERVICE INSTRUCTIONS

Subject index

GENERAL INFORMATION

1. Safety

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

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 the hazards involved.

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.

Caution and warning statements

CAUTION: Used to indicate correct operating or maintenance procedures in order to prevent damage to, or destruction of, equipment or other property.

WARNING: Used to indicate a potential hazard that requires correct procedures or practices in order to prevent personal injury.

Symbols

Symbol	Colour	Explanation
	Red	: High voltage terminal: a terminal at which a voltage, with respect to another terminal or part 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.
	White/Black	: Protective Earth (grounding) terminal.

Impaired safety protection

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

2. Introduction and applications

General

The PM 5654 VITS generator and inserter is a selfcontained instrument designed to generate VITS (Vertical Interval Test Signals) and is capable to insert these digitally generated EBU and NTC-7/FCC specified VITS into progam video signals at TV transmitters, satellite links, terrestrial microwave links and PTT switching centres. Simultaneously the PM 5654 may insert signals applied to external inputs and from the optional internal source code generator.
The instrument is designed to operate in either the 625line/4.43MHz PAL system (G-version) or the 525 line/3.58MHz NTSC system (M-version) and the generated VITS are in accordance with the specification set up in CCIR Rec. 473-3/FCC rules and regulations.
A control panel covered by a hinged lid on the front of the instrument makes it possible to either erase or insert any of the generated test signals, the EXT inputs or the source code on any of the lines 6 to 22 of field 1, 319 to 335 of field 2 (G-version) and lines 10 to 21 of field 1, 10 to 21 of field 2 (M-version). Furthermore can the control panel be used for status monitoring of the mentioned line positions.

With built-in security measures to prevent unathorized access to programming, the PM 5654 permits line selection directly from its front panel for storage in a non-volatile memory.

Automatic substitution of a missing program video signal with one of the VITS or signals from any EXT inputs can be selected via the control panel.

For test purposes, may the program signal be exchanged with a Full-field test signal based on the various test signals and DUTY/APL modes. Moreover, a separate Full-field test signal output (incl. VITS), is also provided.

Applications

The PM 5654 generates VITS and insert signals for TV transmitters, satellite links and terrestrial microwave links. Via the EXT inputs a number of special signal such as teletext/data, antiope, source identification and closed captioning can be inserted. At the same time it can serve as a test signal generator for signal substitution, maintenance and repair. This application is facilitated by the complete build-in sync generator.

3. Technical data

Safety characteristics

This instrument has been designed and tested in accordance with Safety Class I requirement of IEC Publication 348 (G-version), VDE 0871/DIN 57871 class B (M-versions), 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 instrument in a safe condition.

Performance characteristics

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

A. Initial characteristics

- Cabinet type : 2U high, 19 inch rackmount/table top cabinet
- Maximum dimensions
  - Height : 88mm (3.45") excl. feet
  - Width : 440mm (17.30") } excl. handles
  - Depth : 430mm (17.00") }
- Maximum weight (Mass) : 8kg (17.5 lbs)

Environmental conditions

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

B. Climatic conditions

- Ambient temperature
  - Rated range of use : 5°C to +45°C (+40°F to +113°F)
  - Limited range for storage and transportion : -30°C to +70°C (-22°F to +158°F)

C. Mechanical requirements

- Vibration		
Limit range for storage and transportion	: 30 min. 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.
- Bump		
Limit range for storage and transportion	: 1000 bumps of 100m/s^2 1/2 sine, 6ms duration in each of 3 directions.	: According to IEC-Publ. 68, test Eb.
- Packing	: Acc. to UN-D-1400.	: The test methods mentioned in the N.V. Philips Standard UN-D-1400 are in accordance with those of the relevant ISO-Standards.

D. Mains supply conditions

Mains supply voltage	: 100,120,220, or 240V AC, +10%, -15%.	
Mains supply frequency	: 48-65Hz	
Power consumption	: 40W	: at nominal mains voltage.

E. General operating conditions

625 lines, 50Hz field frequency (G-version)
525 lines, 60Hz field frequency (M-version)

F. Operating modes

The instrument can operate in the following modes:

1. By-pass mode

To protect a program from any interruption caused by a malfuction, e.g. as the result of poor or non-standard program signal, the PM 5654 has a By-pass protection circuit (By-pass relay). This By-pass relay loops the program signal directly to the program output connector in the case of one or more of the following conditions:

a. The "BY-PASS" button is pressed (locally or remotely).
b. Power line failure or instrument switched off.

c. The program signal falls below -6dB (measured on sync amplitude) and automatic substitution is not selected.
d. Malfunctioning or removal of sync generator or system control unit.

2. Normal mode

The instrument operates in the Normal mode when the program signal is >-6dB (measured on sync amplitude). The programme signal then passes through the instrument's inserter/deleter circuit, which functions as a 3-pole switch to select one of the following signals:
a. The program signal (after back porch clamping).
b. The internally generated VITS (insertion).
c. Neutral (deletion).

This approach guaranties that any signal content in a VITS line is removed before new VITS insertion.
Internally generated VITS and signals to EXT inputs are inserted into the program signal according to the program stored in the non-volatile memory.

If the program signal is <-6dB (measured on sync amplitude) and automatic substitution is selected, the program signal is disabled and replaced by a Full-field test signal with sync and burst according to the program stored in the non-volatile memory. See also the operating instructions, Chapter 8.

3. Full-field mode

In the event of the program signal is disabled, the PM 5654 generates a Full-field test signal with sync and burst according to selections entered via the front panel. Available signals listed under item K and Chapter 8.
The instrument genlocks to the program signal if present.
VITS insertion as specified under Normal mode.

4. Full-field test signal

The signal is continously available, i.e. independent of VITS mode it supplies a Full-field test signal with internally generated sync and burst. Available signals listed under item K and Chapter 8.

G. Insertion and erasure of VITS

The insertion of VITS signals is controlled by.
1. Readout from the non-volatile memory containing status information for each of 34 (G-version)/24 (M-version) possible test line positions. The status information indicates the signal to be inserted and for the remote control to which group of lines the particular line is assigned.
2. Remote control inputs with the possibility of disabling insertion or erasure for each group of lines.

3. A control panel covered by a hinged lid on the front panel of the instrument. The control panel makes it possible to check and/or change the status in the non-volatile memory for each test line position.

   NOTE: All information in lines to be inserted upon is automatically erased before insertion takes place.

The erasure of VITS lines is controlled by:

1. Readout from the non-volatile memory containing status information for each of the 34 (G-version)/24 (M-version) possible test line positions.
   The status information indicates if erasure shall occur and for the remote control to which group of lines the particular line is assigned.
2. Remote control. See item G.2.
3. Programming. See item G.3.

H. Electrical data

Inputs

Program signal

Impedance	: 75ohm looped through (By-pass mode). Internally terminated with 75ohm in Normal and Full-field mode.
Amplitude	: 1.0Vpp/140IRE nominal composite video signal.
Acceptable input level	: Nominal +3 to -6dB (measured on sync amplitude).
Return loss	: >34dB up to 7MHz (Normal and By-pass mode).
Delay difference	
Normal/By-pass	: <1.5ns.
Tolerable S/N ratio	
Without Sound in sync	: >26dB RMS (unweighted)
With Sound in sync	: >30dB RMS (unweighted)

EXT.1 to EXT.4

Impedance	: 75ohm looped through
Amplitude	: 1.0Vpp/140IRE nominal composite or 0.7Vpp /100IRE nominal non-composite.
Return loss	: >34dB up to 7MHz

Ext.5-6 : optional external inputs. If provided only inputs Ext.1 and Ext.2 are looped through.

Outputs

Program signal, Test and Monitor

Impedance	: 75ohm ±0.5% (resistive components)
Return loss	: >34dB up to 7MHz
Gain	: 1.00 ±1%
Isolation between transmission and auxiliary outputs	: Up to 1MHz >46dB. At 4.43MHz/3.58MHz >36dB.
Frequency response	: ±1% up to 6MHz, +1 to -5% from 6-10MHz.
Chrominance/luminance inequalities	: Gain <0.5%, Delay <±5ns
2T pulse-to-bar	: 100% ±0.25%
2T pulse overshoot	: Must not differ from input signal by more than 0.5% of the luminance bar amplitude.
50Hz/60Hz square wave tilt	: <0.5%
15kHz line tilt	: <0.25%
Differential phase	: At standard level <0.15°, at +3dB <0.3°.
Differential gain	: At standard level <0.2%, at +3dB <0.4%.
Line time non linearity	: <0.25%
Random HF noise (weighted)	: <-75dB RMS
Residual subcarrier on program lines	: <-60dBpp
Hum and lower order harmonics	: <-60dBpp
Spurious transients during active lines	: <-60dBpp up to 10MHz (G-version), 5MHz (M-version).
Spurious transients outside active lines	: <-40dBpp up to 10MHz (G-version), 5MHz (M-version).
Signal attenuation in erase mode	: 2T pulse >70dBpp, subcarrier >60dBpp
Cross talk into main signal	: 2T pulse <-70dBpp, subcarrier <-60dBpp
Test lines and Full-field signals	: Amplitude: 0.7Vpp /100IRE as specified under item I, J and K.

Sync output

Amplitude	: 4Vpp ±10% into 75ohm
Return loss	: >34dB up to 5 MHz
Rise and fall time	: 230ns ±20ns (G-version), 140ns ±15ns (M-version)

Subcarrier output

Amplitude	: 1Vpp ±10% into 75ohm
Return loss	: >34dB at 4.43MHz (G-version), 3.58MHz (M-version)

Black burst output

Sync	: As specified under item K, Full-field signals
Burst	: As specified under item K, Full-field signals
Return loss	: >34dB up to 7MHz

Full-field output

Sync	: As specified under item K, Full-field signals
Burst	: As specified under item K, Full-field signals
Test signals	: As specified under item I and J, VIT signal specifications
Return loss	: >34dB up to 7MHz

I. Test signals G-version

The four VITS (A,B,C,D) are all stored in the non-volatile memory on their respective lines when the instrument is delivered.

VITS (EBU specified signals)

The timing of the test signals is determinated by a clock locked to the line frequency.

Timing of luminance waveforms	: <250ns
Timing of chrominance waveforms	: <500ns
Time periode difference	: <±40ns

1. (A) Line 17 signal (See also fig. 3-1)

a. Signal elements.

White reference bar	: (timing 6-11)
2T sine^2 pulse	: (timing 13)
20T carrierborn sine^2 pulse	: (timing 16)
6 level staircase	: (timing 20-31)

b. Electrical data

White reference bar	:	Amplitude	: 0.70Vpp ±0.5%
		Rise and fall time	: 200ns ±20ns
		Tilt	: <0.5%
2T pulse	:	Amplitude	: 0.70Vpp ±1%
		Width	: 200ns ±6ns
		K factor	: <0.25%
20T composite pulse	:	Amplitude	: 0.70Vpp ±1%
		Width	: 2000ns ±60ns
		Bottom curvature	: <0.5%
		Modulation unbalance	: <3mVpp
		Chroma phase	: 60^o Nominal
		Subcarrier distortion	: <1%
Staircase signal	:	Number of levels	: 6 (black and white incl.)
		Amplitudes	: 0-140-280-320-460-700mVpp ±1%
		Rise time	: 235ns ±15ns
		Step inequality	: <0.5%

2. (B) Line 18 signal (See also fig. 3-2)

a. Signal elements.

White reference bar	: (Timing 6-8)
Black reference bar	: (Timing 8-10)
0.5MHz sine burst	: (Timing 12-15)
1.0MHz sine burst	: (Timing 15-18)
2.0MHz sine burst	: (Timing 18-21)
4.0MHz sine burst	: (Timing 21-24)
4.8MHz sine burst	: (Timing 24-27)
5.8MHz sine burst	: (Timing 27-30)

b. Electrical data.

White reference bar	: Amplitude	: 80% of 0.70Vpp ±1%
	Rise and fall time	: 200ns
Black reference bar	: Amplitude	: 20% of 0.70Vpp ±1%
	Rise and fall time	: 200ns

NOTE: Ref. bar = white ref. bar - black ref. bar.

Sine burst 0.5MHz	: Amplitude	: Within 1% of ref. bar
	Frequency	: 0.5MHz ±1%
	Start/stop	: Zero phase
	DC content	: <0.5%
Sine burst 1.0MHz	: Amplitude	: Within 1% of ref. bar
	Frequency	: 1.0MHz ±1%
	Start/stop	: Zero phase
	DC content	: <0.5%
Sine burst 2.0MHz	: Amplitude	: Within 1% of ref. bar
	Frequency	: 2.0MHz ±1%
	Start/stop	: Zero phase
	DC content	: <0.5%
	Burst envelope rise time	: 200ns
Sine burst 4.0MHz	: Amplitude	: Within 1% of ref. bar
	Frequency	: 4.0MHz ±1%
	Start/stop	: Zero phase
	DC content	: <0.5%
	Burst envelope rise time	: 200ns
Sine burst 4.8MHz	: Amplitude	: Within 1% of ref. bar
	Frequency	: 4.8MHz ±1%
	Start/stop	: Zero phase
	DC content	: <0.5%
	Burst envelope rise time	: 200ns
Sine burst 5.8MHz	: Amplitude	: Within 1% of ref. bar
	Frequency	: 5.8MHz ±1%
	Start/stop	: Zero phase
	DC content	: <0.5%
	Burst envelope rise time	: 200ns
Grey level	: Amplitude	: 50% of 0.70Vpp ±1%

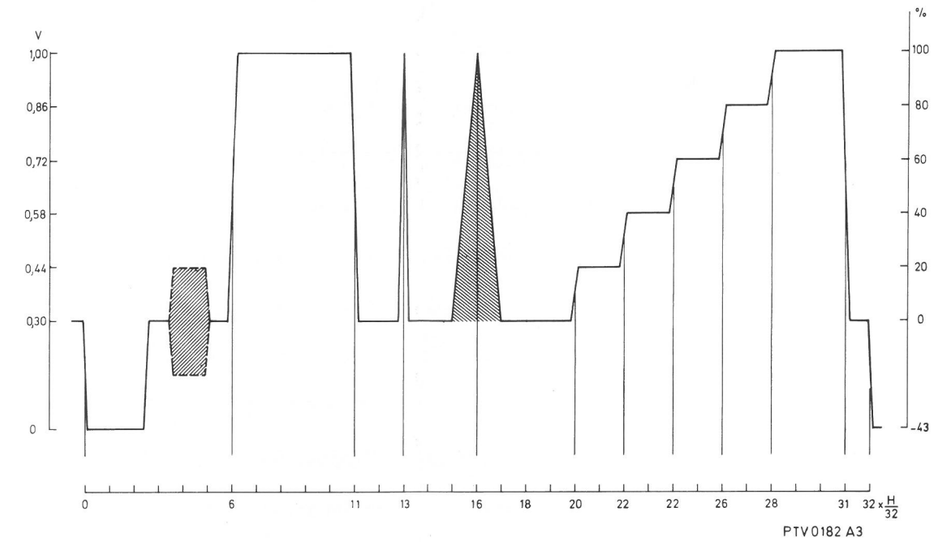

Fig. 3-1 Line 17 signal

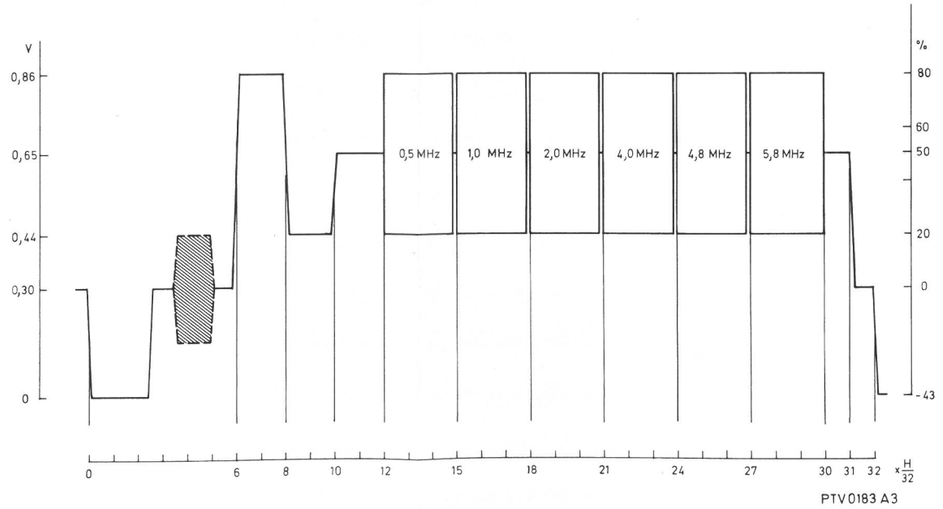

Fig. 3-2 Line 18 signal

3. (C) Test line 330 signal (See also fig. 3-3)

a. Signal elements.

White reference bar	: (Timing 6-11)
2T $sine^2$ pulse	: (Timing 13)
Composite staircase	: (Timing 15-30)

b. Electrical data.

White reference bar	: Identical to line 17 bar		
2T $sine^2$ pulse	: Identical to line 17 pulse		
Staircase	: Identical to line 17 staircase		
Superimposed subcarrier	: Amplitude	:	0.28Vpp ±2%
	Rise and fall time	:	1us ±5%
	Phase	:	60^o ±5^o for burst $135^o/225^o$
Composite staircase	: Differential gain	:	<0.5%
	Differential phase	:	<0.2^o

4. (D) Test line 331 signal (See also fig. 3-4)

a. Signal elements.

Three level chr.bar	: (Timing 7-14)
Chrominance reference	: (Timing 17-30)

b. Electrical data.

Three level chr. bar	: Amplitude	:	20%, 60% and 100% of 0.70Vpp ±1%
	Grey level	:	50% of 0.70Vpp ±1%
	Rise and fall time	:	1us ±5%
	DC content	:	<0.5%
Chrominance reference	: Amplitude	:	60% of 0.70Vpp ±1%
	Grey level	:	50% of 0.70Vpp ±1%
	Rise and fall time	:	1us ±5%
	Chroma phase	:	60^o Nominal

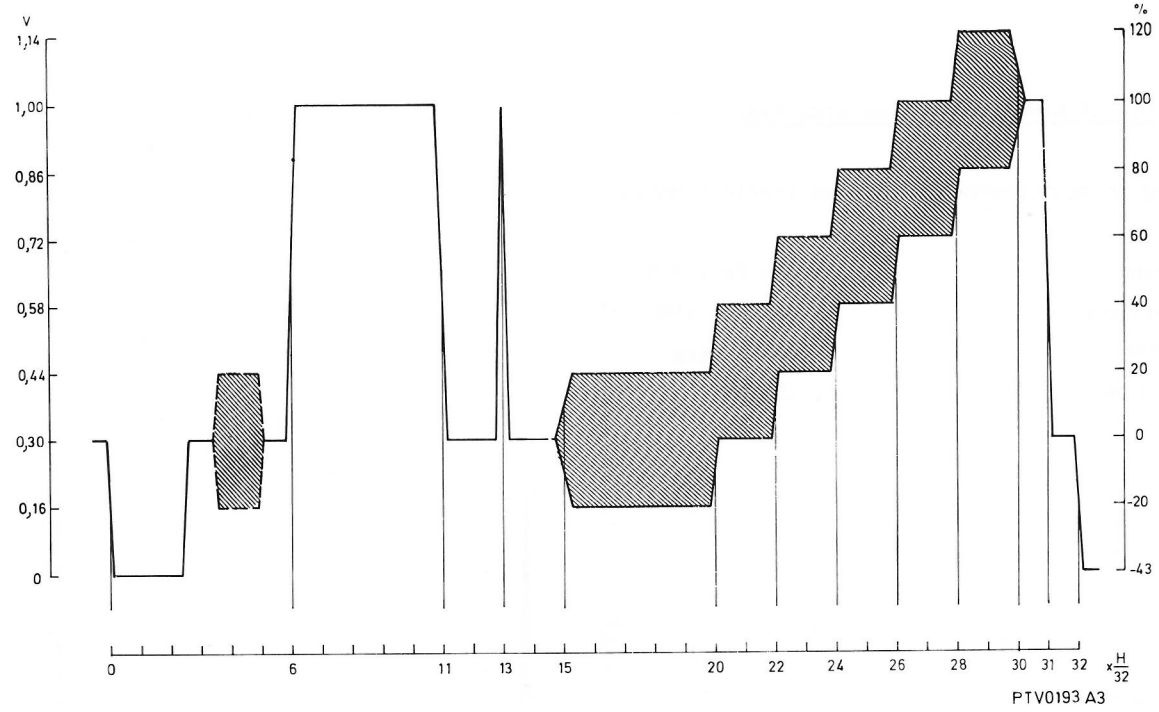

Fig. 3-3 Test line 330 signal

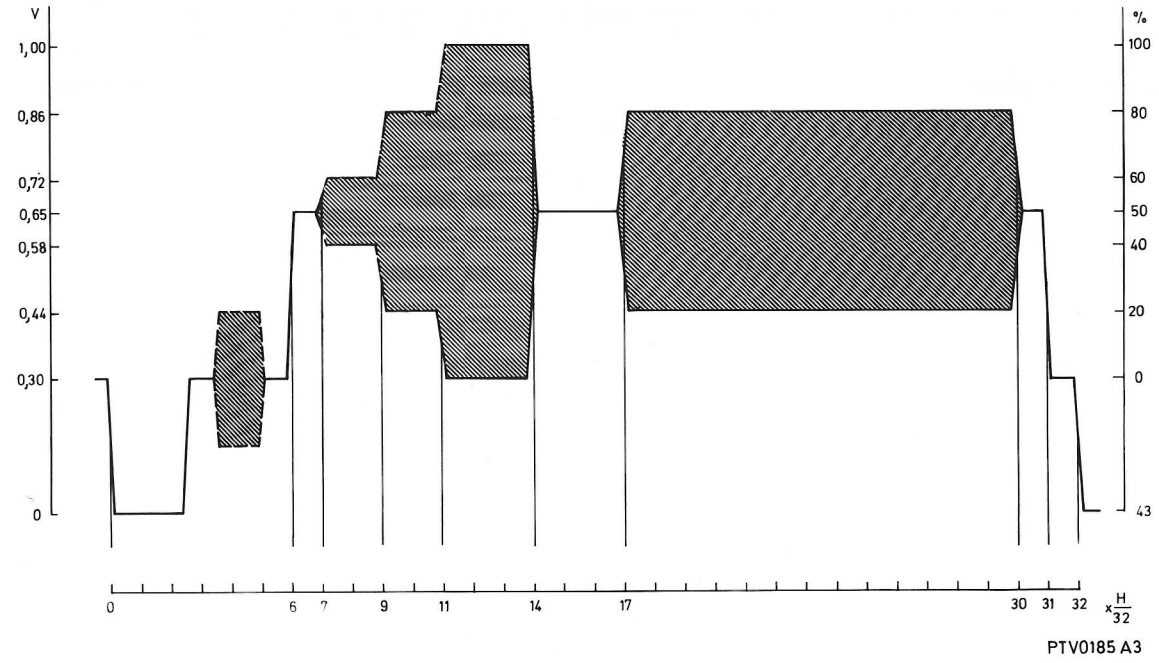

Fig. 3-4 Test line 331 signal

5. (H) EBU color bar

The color bar is a standard EBU color bar: 100/0/75/0

6. (L) 2T sine^2 pulse (See also fig. 3-5)

Used in measurements of echoes (reflections).

Timing	: see fig. 3-5
Amplitude	: 0.70Vpp ±1%
Width	: 200ns ±6ns
K factor	: <0.25%

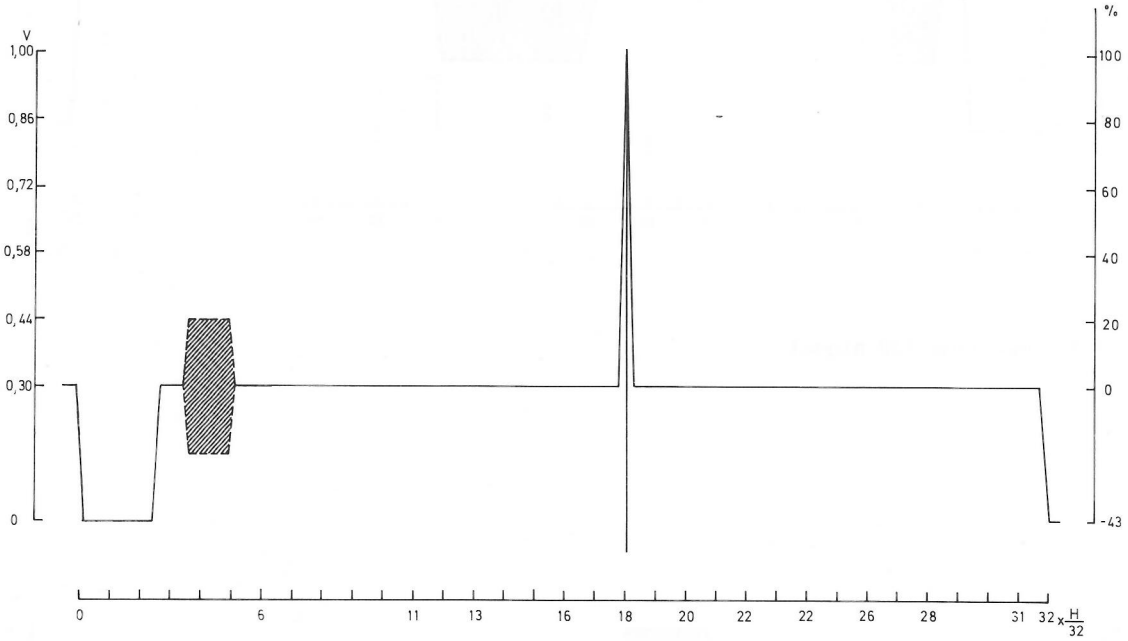

Fig. 3-5 2T pulse

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J. Test signals M-version

NOTE: When the instrument is delivered, the NTC-7 composite is stored in line 17 field 1, the NTC-7 combination is stored in line 17 field 2, the VIR signal is stored in line 19 both fields 1 and 2.

Vertical Interval Test Signals

The timing of the test signals is determined by a clock locked to the line frequency.

Timing offset of luminance waveforms	: <150ns
Timing offset of chrominance waveforms	: <300ns
Timing jitter	: <5ns
Insertion delay range	: >±500ns
Unwanted pedestal at time of insertion	: <0.5IRE

1. (A) NTC-7 composite test signal (See also fig. 3-6)

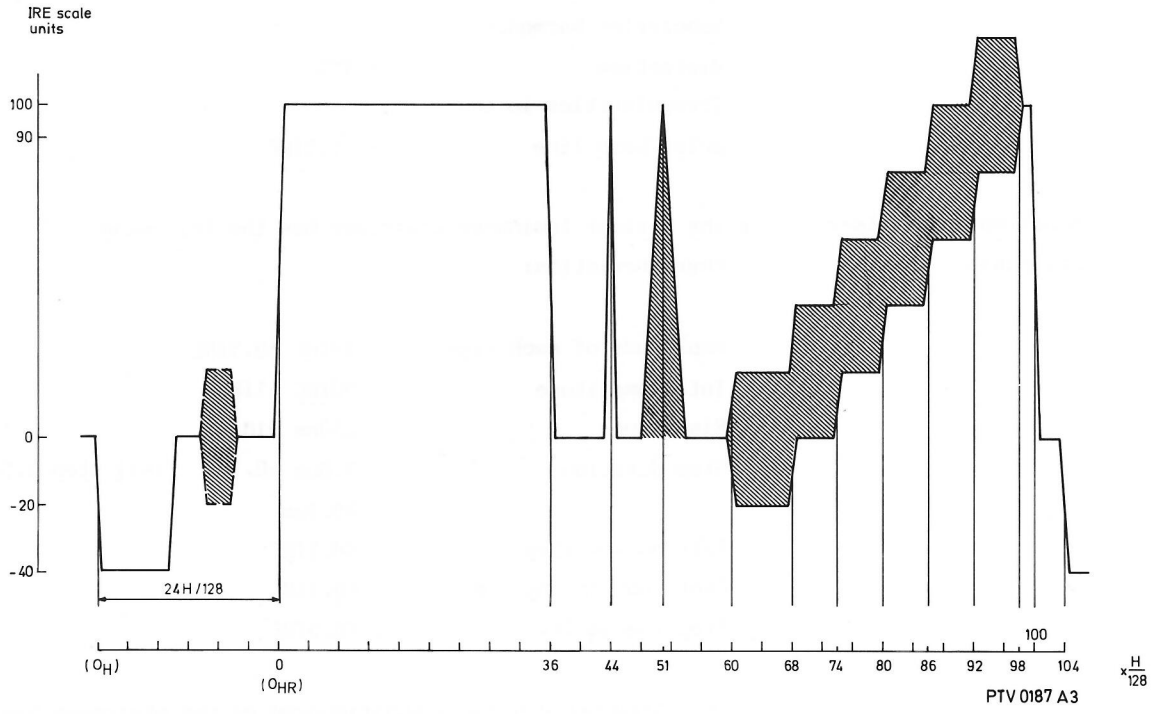

Fig. 3-6 NTC-7 composite

a. Signal elements.

Line bar	: (Timing 0-36)
2T pulse	: (Timing 44)
Modulated 12.5T pulse	: (Timing 51)
Superimposed 5-riser staircase	: (Timing 60-98)

b. Electrical data.

Line bar	: Amplitude	: 100IRE ±0.5IRE
	: Rise and fall time	: 125ns ±5ns with integrated sinesquared shape
	: Inherent line-time distortion	: <0.3%
	: Overshoot and undershoot	: <1IRE
2T pulse	: Peak amplitude	: 100IRE, within 0.5IRE of line bar
	Half amplitude duration	: 250ns ±10ns
	Undershoot	: <0.5IRE
Modulated 12.5T pulse	: Peak amplitude	: 100IRE, within 0.5IRE of line bar
	Half amplitude duration	: 1570ns ±50ns
	Inherent chrominance-luminance:	
	1. Gain inequality	: <0.5IRE
	2. Delay inequality	: <5ns
	Modulator unbalance	: <0.5IRE
	Subcarrier harmonic distortion	: <1%
	Irregularities in the pulse base line	: <0.5IRE
Superimposed 5-riser staircase	: The 5-riser luminance staircase has the following characteristics:	
	Amplitude of each riser	: 18IRE ±0.5IRE
	Total amplitude	: 90IRE ±1IRE
	Rise time	: 250ns ±10ns
	Step duration	: 3.0us ±0.1us, final step 4.0us ±0.1us
	Tilt on any step	: <0.3IRE
	Overshoot on any step	: <0.3IRE
	Step inequality	: <0.5IRE
	The chrominance signals superimposed on the staircase has the following characteristics:	
	Chrominance amplitude	: 40IRE ±0.4IRE
	Rise and fall times of the modulation envelope	: 400ns ±25ns
	Chrominance Phase	: Within 1% of color burst
	Inherent differential gain	: <0.25%
	Inherent differential phase	: <0.2^{o}

2. (B) NTC-7 combination test signal (See also fig. 3-7)

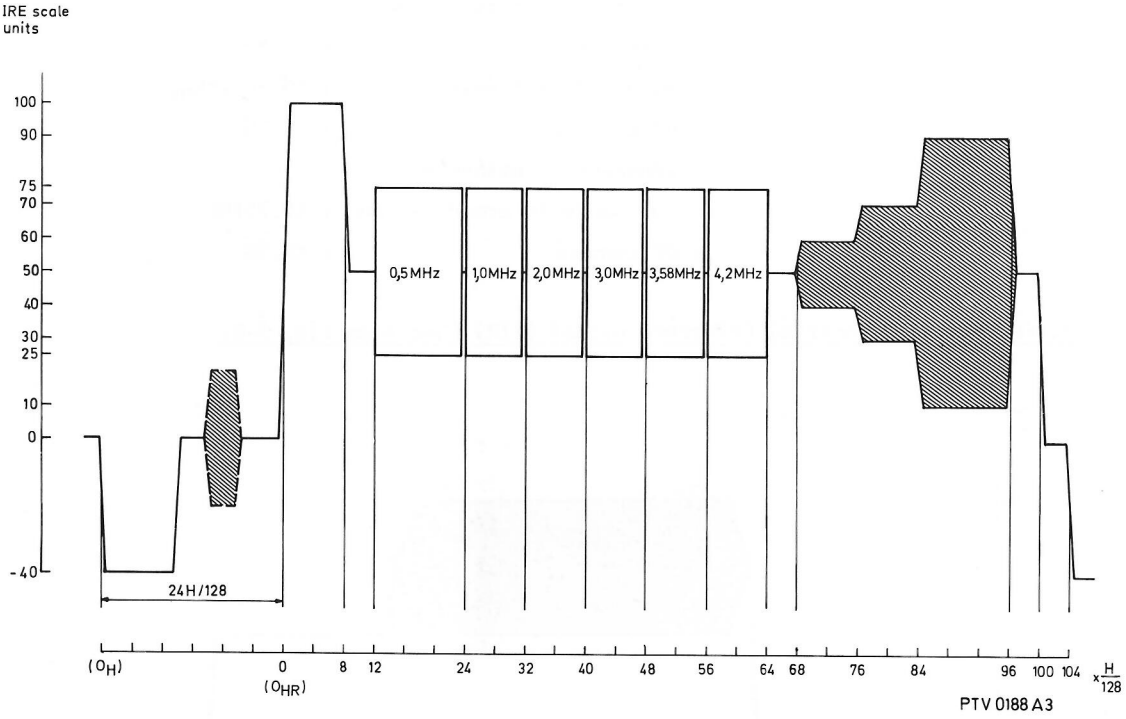

Fig. 3-7 NTC-7 combination

a. Signal elements.

White flag	: (Timing 0-8)
0.5MHz sine burst	: (Timing 12-24)
1.0MHz sine burst	: (Timing 24-32)
2.0MHz sine burst	: (Timing 32-40)
3.0MHz sine burst	: (Timing 40-48)
3.58MHz sine burst	: (Timing 48-56)
4.2MHz sine burst	: (Timing 56-64)
3-level chrominance signal	: (Timing 68-96)

b. Electrical data.

White flag	:	Amplitude	: 100IRE ±0.5IRE
		Rise and fall time	: 125ns ±25ns
		Overshoot	: <1IRE
		Tilt	: <1IRE
Multiburst	:	Peak to peak amplitude	: 50IRE ±2IRE
		Accuracy on frequencies	: ±1%
		Pedestal amplitude	: 50IRE ±0.5IRE
		DC component of each burst	: <0.25IRE
		Start/stop	: Zero phase
		Harmonic distortion	: <1%

3-level chrominance signal	: Peak to peak amplitudes	:	20,40,80IRE, all ±1IRE
	Subcarrier frequency phase	:	90° ±1°
	: Phase inequality of the three steps	:	<0.2°
	Rise and fall time	:	400ns ±25ns
	DC content	:	<0.5%
	Inherent chrominance/ luminance intermodulation	:	<0.25IRE
	: DC content	:	<0.5%

3. (E) Vertical Interval Reference signal (VIR) (See also fig. 3-8)

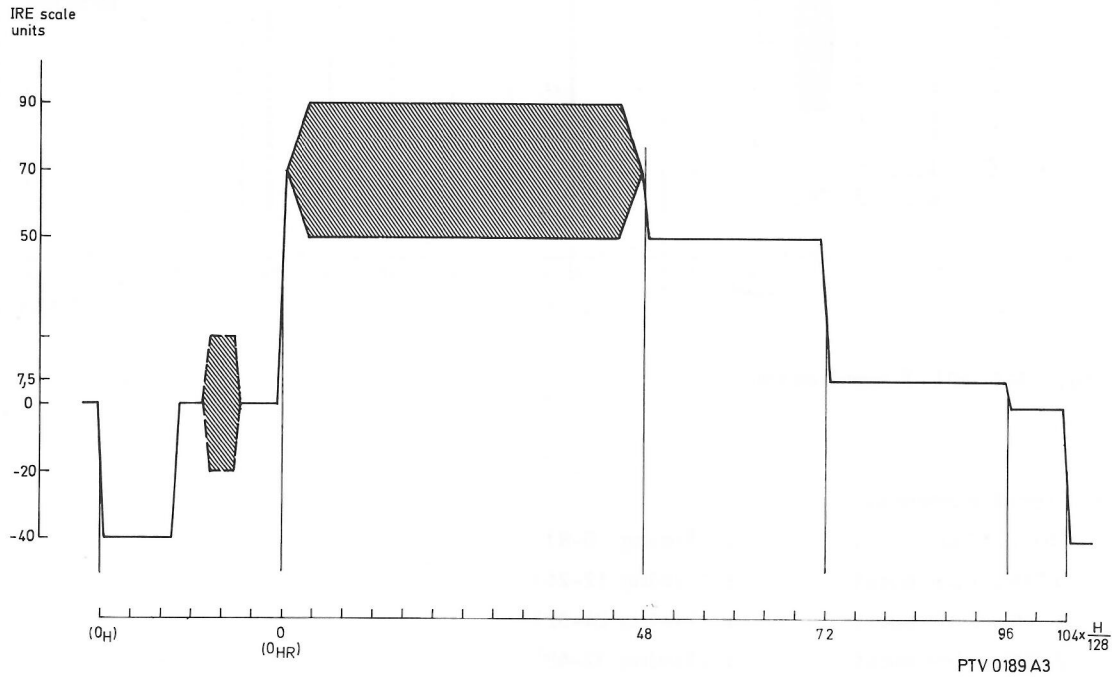

Fig. 3-8 VIR

a. Signal elements.

Chrominance reference	:	(Timing 0-48)
Luminance reference	:	(Timing 48-72)
Black reference	:	(Timing 72-96)

b. Electrical data.

Chrominance reference	: Amplitude	:	40IRE ±0.5IRE
	Rise and fall time	:	1us ±0.05us
	Subcarrier frequency phase	:	0° ±1° relative to program burst
	Subcarrier harmonic distortion	:	<1%
	Pedestal level	:	70IRE ±0.5IRE
	Rise and fall time	:	250ns ±10ns

Luminance reference	:	Amplitude	: 50IRE ±0.5IRE
		Rise and fall time	: 250ns ±10ns
Black reference	:	Amplitude	: 7.5IRE ±0.5IRE
		Rise and fall time	: 250ns ±10ns

4. (C) FCC multiburst test signal (See also fig. 3-9)

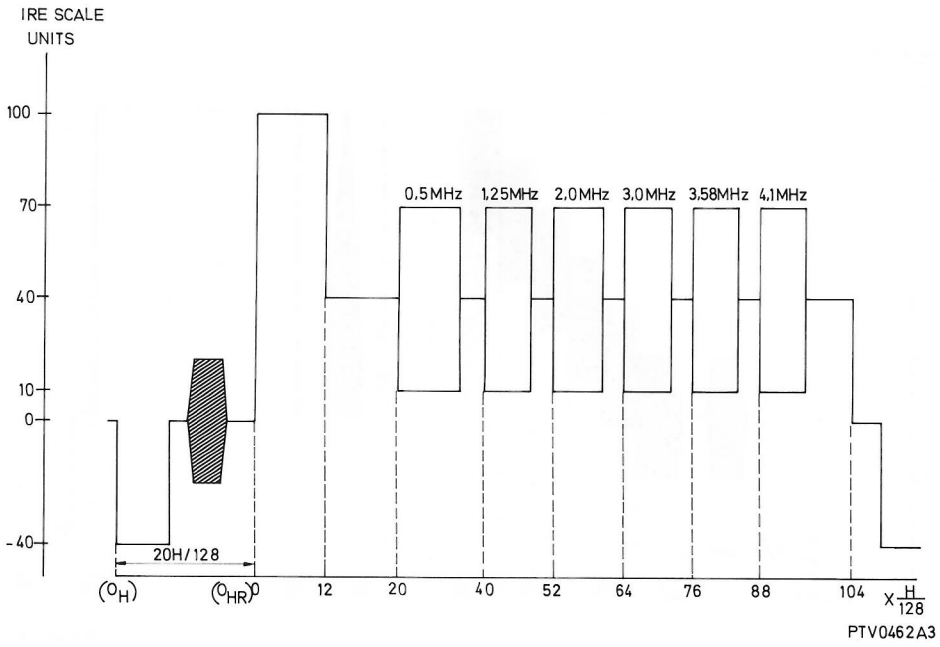

Fig. 3-9 FCC multiburst

a. Signal elements.

White flag	:	(Timing 0-12)
0.5MHz sine burst	:	(Timing start 20)
1.25MHz sine burst	:	(Timing start 40)
2.0MHz sine burst	:	(Timing start 52)
3.0MHz sine burst	:	(Timing start 64)
3.58MHz sine burst	:	(Timing start 76)
4.1MHz sine burst	:	(Timing start 88)

b. Electrical data.

White fag	:	Amplitude	: 100IRE ±0.5IRE
		Rise and fall time	: 250ns ±25ns
		Overshoot	: <1IRE
		Tilt	: <1IRE

Multiburst	: Peak to peak amplitude	: 60IRE ±1IRE
	Accuracy on the frequencies	: ±1%
	Pedestal amplitude	: 40IRE ±0.5IRE
	DC component of each burst	: <0.25IRE
	Start/stop	: Zero phase
	Harmonic distortion	: <1%

5. (D) FCC composite radiated test signal (See also fig. 3-10)

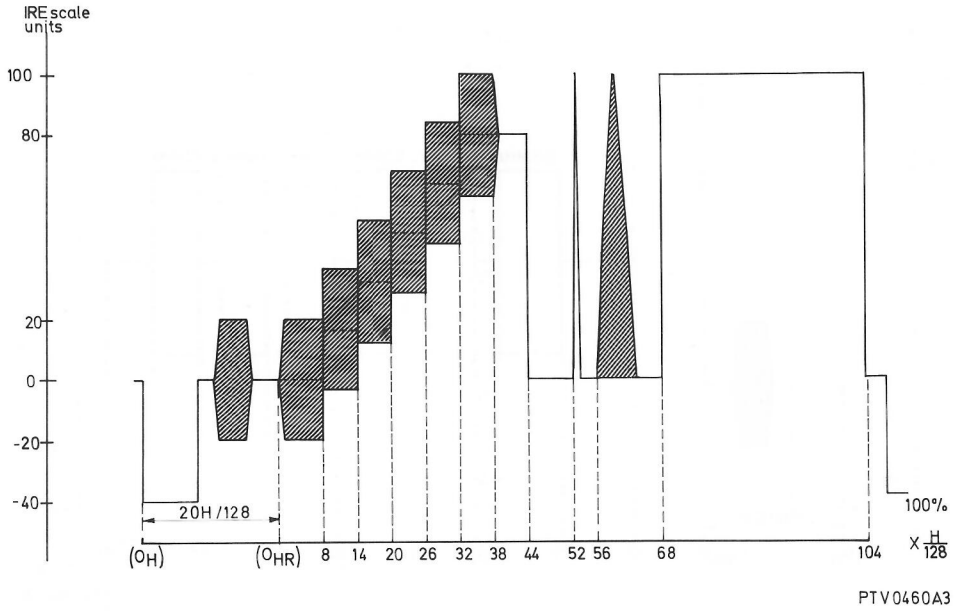

Fig. 3-10 FCC composite

a. Signal elements.

Superimposed 5-riser staircase	: (Timing 0-38)
2T pulse	: (Timing 52)
12.5T pulse	: (Timing 56)
Line bar	: (Timing 68-104)

b. Electrical data.

Superimposed 5-riser staircase.

Luminance staircase	: Amplitude of each riser	: 16IRE ±0.5IRE
	Total amplitude	: 80IRE ±0.5IRE
	Rise time	: 250ns ±10ns
	Step duration	: 3.0us ±0.1us, final step 6.0us ±0.1us
	Tilt on any step	: <0.3IRE
	Overshoot on any step	: <0.3IRE
	Step inequality	: <0.5IRE

Chrominance superimposed	:	Amplitude	: 40IRE ±0.4IRE
		Rise and fall time of the modulation envelope	: 400ns ±25ns
		Chrominance phase	: Within 1% of color burst
		Inherent differential gain	: <0.25%
		Inherent differential phase	: <0.2°
2T pulse	:	Peak amplitude	: 100IRE within 0.5IRE of line bar
		Half amplitude duration	: 250 ±10ns
		Undershoot	: <0.5IRE
Modulated 12.5T pulse	:	Peak amplitude	: 100IRE within 0.5IRE of line bar
		Half amplitude duration	: 1570ns ±50ns
		Inherent chrominance-luminance	
		1. Gain inequality	: 0.5IRE
		2. Delay inequality	: 5ns
		Modulator unbalance	: <0.5IRE
		Subcarrier harmonic distortion	: <1%
		Irregularities in the pulse base line	: <0.5IRE
Line bar	:	Amplitude	: 100IRE ±0.5IRE
		Rise and fall time	: 250ns ±15ns within inteergrated sine-squared shape
		Inherent line time distortion	: <0.3%
		Overshoot and undershoot	: <1IRE

6. (H) FCC color bar (See also fig. 3-11)

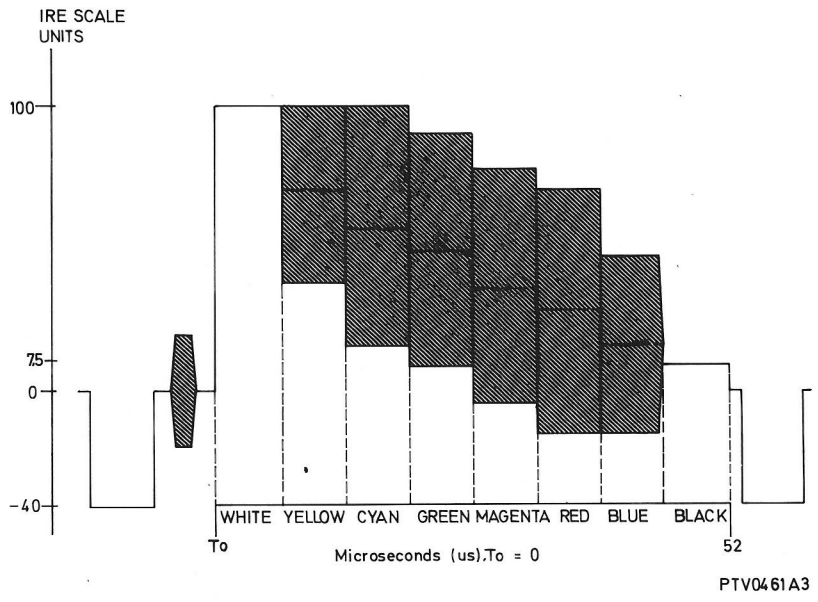

Fig. 3-11 FCC color bar

7. (L) 2T sine^2 pulse (See also fig. 3-12)

Used in measurements of echoes (reflections).

Timing	: see fig. 3-12
Peak amplitude	: 100IRE within 0.5IRE
Half amplitude duration	: 250ns ±10ns
Undershoot	: <0.5IRE

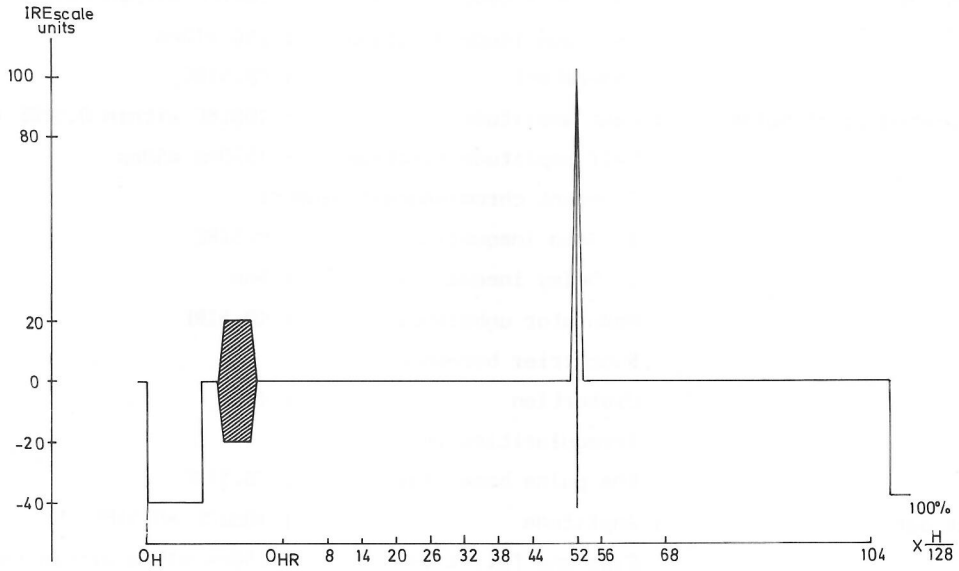

Fig. 3-12 2T pulse

K. Full-field signals

1. Test signals

G-version	M-version
a. Duty signal Levels: 0%, 50% or 100% of white	a. APL signal Levels: 10%, 50% or 90% of white
b. Jumping signal 0/100% (adjustable jump rate between 1 and 10s)	b. Bounce signal 10/90% (adjustable bounce rate between 1 and 10s)
c. Any one of the four VITS line repeated	c. Any one of the four VITS line repeated
d. Any two of the four VITS repeated line alternately	d. Any two of the four VITS repeated line alternately
e. Any two of the four VITS repeated every 8 lines, the intervening lines being one of signals a or b	e. Any two of the four VITS lines repeated every 10 lines, the intervening lines being one of signals a or b
f. Any of four VITS lines repeated every 4 lines, the intervening lines being one of the signals a or b	f. Any of the four VITS lines repeated every 5 lines, the intervening lines being one of the signals a or b
g. EBU color bar 100/0/75/0	g. SMPTE color bar
h. EXT 1 input signal	h. EXT 1 input signal
i. RED signal 75% saturation	i. RED signal 75% saturation
j. 50Hz square wave, rise and fall time 200ns	j. 60Hz square wave, rise and fall time 250ns
k. 250kHz square wave, rise and fall time 200ns	k. 250kHz square wave, rise and fall time 125ns
l. Calibration test signals for fast checking of signal performance *	l. Calibration test signal for fast checking of signal performance *
m. 2T pulse (reflection test)	m. 2T pulse (reflection test)

* NOTE: Specifications of calibration test signal see Chapter 23.

See also Full-field test signals on page 8-2

2. Sync

	G-version	M-version
Hor. line frequency	: 15625Hz ±1Hz	15734.264Hz ±1Hz
Stability (internal locked to subc)	: <1x10^{-5} (ambient 5°-45°C) (40°-113°F)	<1x10^{-5} (ambient 5°-45°C) (40°-113°F)
Pulse width	: 4.7us ±0.2us	4.7us ±0.2us
Egualizing pulse width	: 2.35us ±0.1us	2.35us ±0.1us
Vertical blanking	: 25 lines	21 lines
Amplitude	: 0.30Vpp ±2%	40IRE ±1IRE
Rise and fall time	: 230ns ±20ns	140ns ±15ns

3. Burst

	G-version	M-version
Subcarrier frequency	: 4433618.75Hz ±5Hz	3579545Hz ±5Hz
Stability (TCXO)	: <1x10^{-6} (ambient 5°-45°C) (40°-113°F)	<1x10^{-6} (ambient 5°-45°C) (40°-113°F)
Ageing	: <1x10^{-7}/month	<1x10^{-7}/month
Burst start	: 5.6us ±0.1us	5.6us ±0.15us
Burst width	: 2.4us ±0.2us	2.5us ±0.15us
Amplitude	: 0.30Vpp ±3%	40IRE ±1.5IRE

L. Substitution

	G-version	M-version
Substitution	: Black burst	Black burst
	Any one of the 4 VITS	Any one of the 4 VITS
	2T pulse	2T pulse
	EBU color bar	SMPTE color bar *
	Any of the EXT inputs	Any of the EXT inputs

NOTE: When PM 5654 is in substitution mode, all intergral LED's on the right hand side of the hinged lid are switched off.

* Even though signal H (FCC color bar) on the programming panel has been selected for substitution, the SMPTE color bar will appear if the program signal is missing. It should be noticed that when the instrument is delivered, the color bar (G) and SMPTE color bar (M) are stored in the non volatile momery as substitution Full-field signals.

4. Accessories

Item	Quantity	Ordering number
Mains cable, EU	1	5322 321 20697
Mains cable, US		5322 321 10123
Extension cable	1	5322 321 21729
Extension board	1	5322 216 91782
Instruction manual	1	9499 493 05311
OPTIONS		
PM 8538 Source code generator/detector and VITS detector	1	9449 085 38001

5. Block diagram description

The block diagram shown in fig. 5-1 is the instrument block diagram for the PM 5654. It shows inputs and outputs and the main signal path.
It is important at this stage to understand what the various parts of the instrument DO and not HOW they do it. That information is found in Chapter 12 to 22.
The unit number for a circuit block is indicated in the block concerned; e.g. unit 8 "U8".

The PM 5654 VITS generator and inserter (625 lines - PAL G-version) consists of 9 units.
These are:
Unit 1 - power supply
Unit 2 - main board
Unit 3 - sync generator
Unit 4 - system control
Unit 5 - black burst and color bar generator
Unit 6 - test signal generator
Unit 7 - keyboard and display
Unit 8 - signal processing
Unit 9 - remote interface TTL

The PM 5654 NTSC generator and inserter (525 lines - NTSC M-version) consists of 10 units.
These are:
Units 1-9 identical to G-version
Unit 11 - subcarrier phase shift network

Options
Unit 10 - PM 8538 Source code generator - detector and VITS detector

Unit 1 - main functions
The power supply provides the regulated +5V (DC-DC converter IC) and the unregulated +12V and -12V, which are regulated to +8V and -8V on the units where required. Furthermore a master reset pulse is provided for the microprocessors.

Unit 2 - main fuctions
The main board acts only as interconnection between all the units.

Unit 3 - main functions
Unit 3 consists of two main blocks:
a) A sync regenerator (locked to the incoming video signal if present) provides a 5MHz clockpulse and all sync and timing signals needed by the other units of the instruments.

b) A subcarrier regenerator (locked to the incoming burst if present).
In case the program signal is missing and autosubstitution or Full-field mode is selected, the subcarrier regenerator genlocks to the TCXO reference located on unit 8. The sync regenerator is then locked to the subcarrier.

Unit 4 - main functions

The main part of the system control is the microprocessor (clock frequency is 12MHz) and the non-volatile memory.

Unit 5 - main functions

Unit 5 provides the color bar and the black burst signals digitally derived from a PROM. Furthermore is the composite sync processed through the unit and fed to the rear plate. In the M-version is set-up introduced in this unit.

Unit 6 - main fuctions

Unit 6 is the test signal generator. It consists of a line frequency locked oscillator which clocks the PROM's (separate PROM's for luminance-circuit and chrominance-circuit) in which the digital values for the test signals are stored. These are fed through a bit-reduction system, precision D/A converters and LP-filters to generate a complete analoque test signal which is then fed to the signal processing unit.

Unit 7 - main functions

Unit 7 contains also a microprosser which transmit or receive information to/from unit 4 whenever the instrument changes status as a result of operation of the pushbuttons.
It communicates also with the remote interface via an I^2C bus.

Unit 8 - main functions

Unit 8 consists of 4 mainblocks:

a) An input preselector, selecting whether it is signals from the external inputs, the test signals, color bar or the source code signal which are to be processed through the unit.
b) A feed forward and feed back clamp circuit, providing secure clamp before the test signals are fed to the inserter circuit.
c) A VITS insertion switch circuit in addition to the substitution switch circuit.
d) Various amplifiers processing the signals before being sent to the output connectors on the rear panel.

In addition it also provides the By-pass relay controlled by the system control unit.

Unit 9 - main functions

The remote interface TTL acts as I^2C bus interface between the remote connector and unit 7.
See also the description in Chapter 6.

Unit 11 - main functions (only M-version)

The subcarrier is here phaseshifted 90^o before being sent to unit 6.

Unit 10 (Optional) - PM 8538

The source code generator - detector and VITS detector consists of 3 main blocks:

a) Generates source codes consisting of a sequence of biphase signals. 4 different sets are selectable by the remote control.

b) Provides automatic insertion of data from either the source code generator or signals applied to the external inputs in case of missing program data.

c) Provides automatic insertion of VITS in case of missing program VITS on a specific input line selectable from the programming panel.

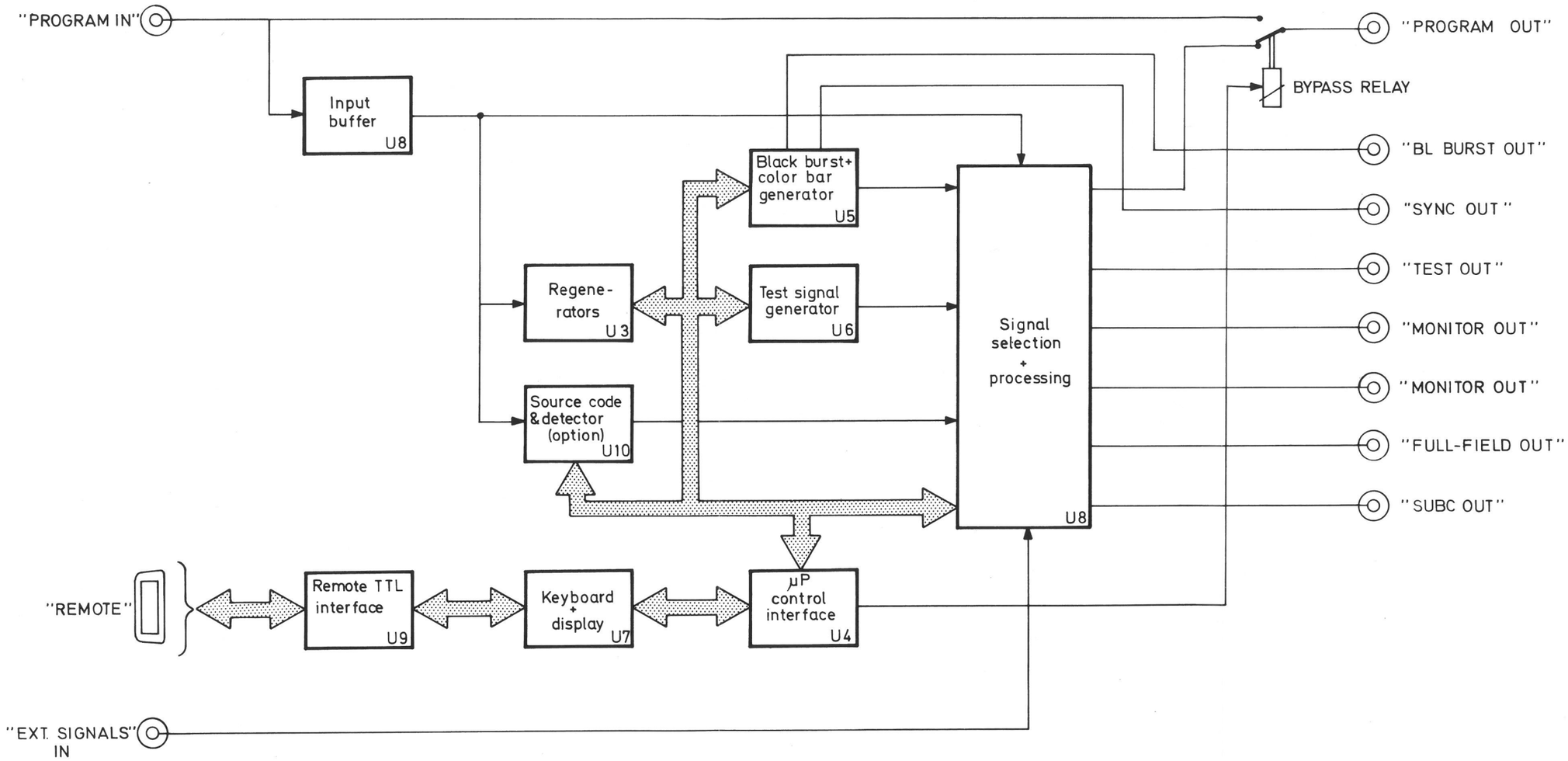

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Fig. 5-1 Instrument block diagram

INSTALLATION AND OPERATING INSTRUCTIONS

6. Installation

A. 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 organisation should be notified in order to facilitate the repair or replacement of the instrument.

B. Safety instructions

Earthing.

Before any other connection is made, the instrument must be connected to a protective earth conductor in one of the following ways:

- via the protective earth terminal marked  .
- 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 interuption 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.

C. 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.Likewise, it is impossible to insert the mains cable when the fuse is being replaced or the operating voltage is being altered.
The instrument can be used with a mains voltage supply of 100V, 120V, 220V, or 240V +10% -15%.

To set the instrument to the local mains supply:

- Remove the mains cable.
- Slide the protective plastic cover to the left to expose the fuse and coded mains plug. (See fig. 6-1).
- 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 proper rating.
- Slide the protective cover to the right.
- Reinsert the mains cable.

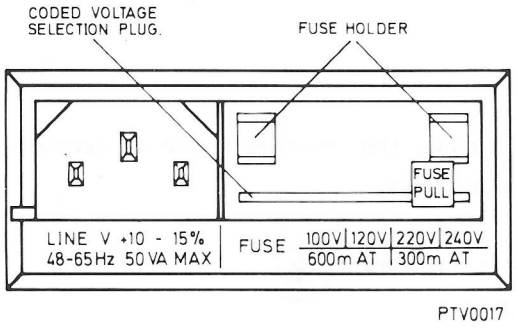


Fig. 6-1 Mains connector

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 fuse holders is prohibited. Fuses must only be replaced by a qualified person who is aware of the hazards involved.

D. Rack mounting

All PHILIPS PTV instruments are delivered (or 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:

1. FREE AIR CONVECTION I

Mount an air-flow unit (e.g. type PM9799) between or underneath the cabinets. The dimensions of this unit is 1U high (=4.5cm) and 19" wide.

2. FORCED CIRCULATION

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

E. Video connections

The program video signal is applied to the "PROGRAM IN" connector and is either terminated internally in the Normal mode of operation or in the case of By-pass mode, by the load connected to the "PROGRAM OUT" connector.

The four external inputs "EXT IN", 1 through 4, are loop-through connections and thus require 75ohm external terminations. Note that if the instrument is equipped with six external inputs only inputs EXT 1 and EXT 2 are looped through. The remaining four are internally terminated.

"SYNC OUT", "BL BURST" and "SUBC OUT" may be employed to synchronize external video and data generators to the incoming program video signal.

The operation of the VITS and Data insertion function may be monitored using the "MONITOR OUT" connection (available on both front and rear of the instrument).

F. Remote control

All major operational functions may be controlled by means of the 24 pin "REMOTE" connector located on the rear panel of the instrument. The remote control operates in parallel to the controls on the front panel and may at any time be overridden by these.

Inputs active "low" (GND) are provided for:

a) Mode (momentary control):
- By-pass
- Normal
- Full-field

b) Group Insertion Disable (sustained control):
- Group 1
- Group 2
- Group 3
- Group 4 (Controlled by VITS detector)
- Group 5 (Controlled by Data detector)

c) Source Code Select (binary encoded sustained control):
- Up to 4 different codes may be selected, e.g. Mono/Stereo/Dual command codes.

d) Selection of Full-field test signals (binary encoded sustained control):
- All available single test signals and some combinations of signals may be selected.

Tally outputs (low "on") are provided for:

a) Mode: By-pass
Normal
Full-field

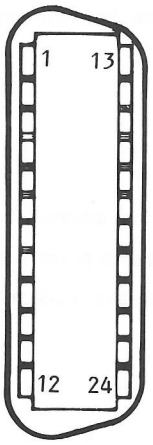
b) Status Flags: Program autosubstitution
VITS Substitution
Data Substitution

Control Levels: +5V TTL logic levels, protected against voltages up to ±25V.
Internal pull-ups and series resistors on all in and outputs.

Male connector (Amphenol DKK 57-30240)

Female connector (Amphenol type 57L-20240-2700D35):

pin mode numbers



By-pass mode select
Normal mode select
Full-field mode select
Group 3 lines disable
Data detector disable
Group 2 lines disable
VITS detector disable
Group 1 lines disable
Full-field select, bit 3
Source ID select, bit 0
Source ID select, bit 1
(Special purpose)

By-pass tally out
Normal tally out
Full-field tally out
Autosubstitution tally out
Data substitution tally out
VITS substitution tally out
Full-field select, bit 0
Full-field select, bit 1
Full-field select, bit 2
do not connect (+5V)
Full-field select, bit 4
Signal ground

The selection of the Full-field test signal is binary encoded into a 5 bit word, Full-field select bit 0 through bit 4. Sustained control signals should be employed and the codes for the available selections are given below. The 5 bit code is here represented in hex format from 00 to 1F using positive logic. Note that even though these inputs must be sustained to maintain a selection, manual control from the front panel is still possible.

Full-field remote control codes

Hex code	G-version	M-version
00	75% Color bar	SMPTE Color bar
01	(A) CCIR Line 17	(A) NTC-7 Composite
02	(B) CCIR Line 18	(B) NTC-7 Combination
03	(C) CCIR Line 330	(C) FCC Multiburst
04	(D) CCIR Line 331	(D) FCC Composite
05	EXT 1	EXT 1
06	75% RED	75% RED
07	50Hz	60Hz
08	250kHz	250kHz
09	Duty w/Jump	APL w/Bounce
0A	Duty at black (0%)	APL at black (10%)
0B	Duty at grey (50%)	APL at grey (50%)
0C	Duty at white (100%)	APL at white (90%)
0D	A + Duty w/Jump	A + APL w/Bounce
0E	A + Duty at black	A + APL at black (10%)
0F	A + Duty at white	A + APL at white (90%)
10	C + Duty w/Jump	D + APL w/Bounce
11	C + Duty at black	D + APL at black (10%)
12	C + Duty at white	D + APL at white (90%)
13	EXT 1 + Duty w/Jump	EXT 1 + APL w/Bounce
14	EXT 1 + Duty at black	EXT 1 + APL at black (10%)
15	EXT 1 + Duty at white	EXT 1 + APL at white (90%)
16	A & B line alternated	2T pulse (reflection)
17	A & C line alternated	-
18	A & D line alternated	-
19	C & D line alternated	-
1A	A & C + Duty w/Jump	-
1B	A & C + Duty at black	-
1C	A & C + Duty at white	-
1D	2T pulse (reflection)	-
1E	-	-
1F	-	-

G. Source ID codes

The Source ID selection employs 2 lines, Source ID select bit 0 and bit 1 to select a total of four different ID's using negative code i.e. using GND to select. These signals are custom programmed at the factory.

H. Configuration

1. Full-field output

The Full-field output is on delivery connected to the Full-field signal generator. This may be changed to provide a PGM monitor output by changing the positions of the programming plugs SW2 and SW3 on unit 8, signal processor. Refer to circuit diagram and component location drawing in Chapter 19. This change requires removal of top cover.

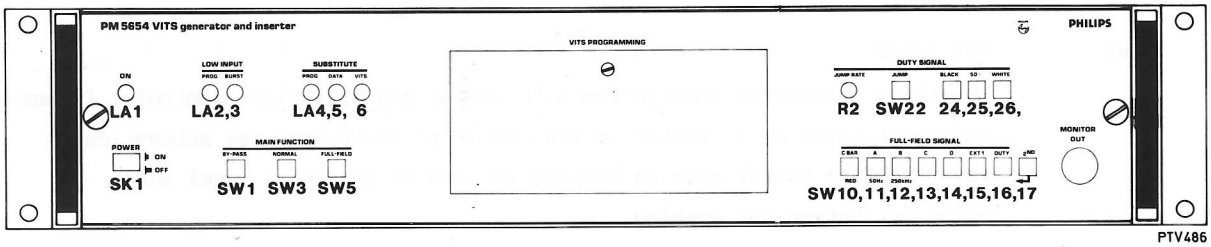
2. RAM check

An automatic RAM test may be enabled by repositioning the programming plug SW9 on unit 4, system control. Refer to circuit diagram and component location drawing in Chapter 15. Note that when the RAM test is enabled, the turn-on time for the instrument is extended.

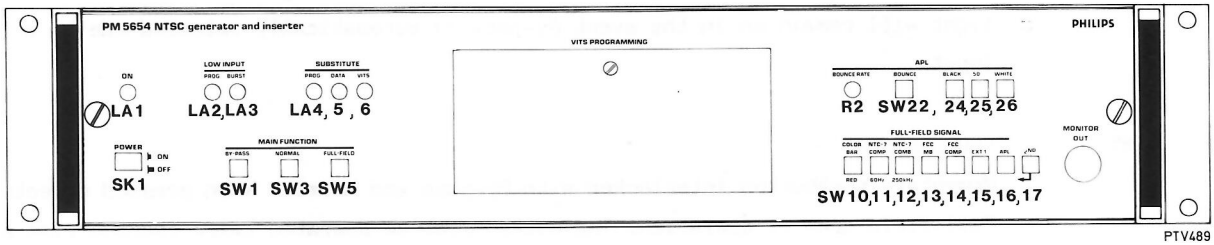
7. Controls and connections

Front panel controls

For a full description of the operation of the controls, refer to Chapter 8, Operating Instructions.



PTV486



PTV489

Fig. 7-1 PM 5654 Front panel controls

SK1 "POWER"

The mains power is switched on when button is pressed.

Note: All control settings and VITS programming are retained in a non-volatile memory. The instrument will therefore power up in the same state it was in, prior to power being removed.

LA1 "ON"

Indicates when power to the instrument is turned on by means of SK1.

LA2 "PROG"

Indicates when the program input signal is below -6dB (measured on sync amplitude).

LA3 "BURST"

Shows when color burst on the incoming signal is below -6dB. Internal subcarrier generator will then be referenced to the internal TCXO.

LA4 "PROG"

Indicates when program signal is autosubstituted.

LA5 "DATA"

Indicates when data is autosubstituted; only if PM 8538, unit 10 (Source code generator/detector and VITS detector) is installed.

LA6 "VITS"

Indicates when VITS is autosubstituted; only if PM 8538, unit 10 (Source code generator/detector and VITS detector) is installed.

SW1 "BY PASS"

Momentary pushbutton interlocked with Normal and Full-field controls. Integral indicator turns on if button is pressed or if instrument has automatically reverted from Normal mode to By-pass in case of low input level and autosubstitution not enabled.

SW3 "NORMAL"

Momentary pushbutton interlocked with By-pass and Full-field. Intergral indicator shows that the incoming signal is being processed through the instrument. The light will remain on in the event By-pass is automatically selected due to a low input.

SW5 "FULL FIELD"

Momentary pushbutton interlocked with By-pass and Normal. When pressed selects the Full-field mode of operation. The button must be operated twice (second time after 0.5 seconds and within 10 seconds) to select this mode in order to prevent accidental replacement of the program output signal.

SW10 through SW16

Momentary interlocked illuminated pushbuttons select the Full-field signal. The buttons are labelled as follows:

	G-version (PAL)		M-version (NTSC)	
SW10	"C-BAR"	75% Color bar	"COLOR BAR"	SMPTE Color bar
SW11	"A"	CCIR Line 17	"NTC-7 COMP"	NTC-7 Composite
SW12	"B"	CCIR Line 18	"NTC-7 COMB"	NTC-7 Combination
SW13	"C"	CCIR Line 330	"FCC MB"	FCC Multiburst
SW14	"D"	CCIR Line 331	"FCC COMP"	FCC Composite
SW15	"EXT 1"	External 1	"EXT 1"	External 1
SW16	"DUTY"	Duty signal	"APL"	Variable APL

NOTE: The illumination of these buttons is extinguished when autosubstitution is active.

SW17 "2nd"

Pressing this button simultaneously with any of SW10 to SW13 and SW16 provides a selection from a second set of Full-field test signals. The integral indicator light shows when this set of signals is active. The selection may be made from:

	G-version (PAL)		M-version (NTSC)	
SW10	"RED"	75% Red signal	"RED"	75% Red signal
SW11	"50Hz"	50Hz Squarewave	"60Hz"	60Hz Squarewave
SW12	"250kHz"	250kHz Squarewave	"250kHz"	250kHz Squarewave
SW13		2T pulse		2T pulse
SW16		Calibration signal		Calibration signal

SW24 through SW26 "BLACK", "50%", "WHITE"

Momentary illuminated pushbuttons which modify the Duty signal (G) or APL signal (M) to 0% black, 50% grey or 100% white signals; 10/50/90% M-version.

SW22 "JUMP" (G), "BOUNCE" (M)

Alternate action illuminated switch enables the Jump (G) or Bounce (M) function.

R2 "RATE"

Screwdriver adjustable potentiometer sets Jump (Bounce) rate for the Duty (APL) signal over a range of from 1 second to 10 seconds.

"MONITOR"

BNC connector providing a monitor output of the incoming video signal with the test signals inserted.

Programming panel controls

The programming panel is located behind a hinged lid on the front of the instrument.
See fig. 7-2

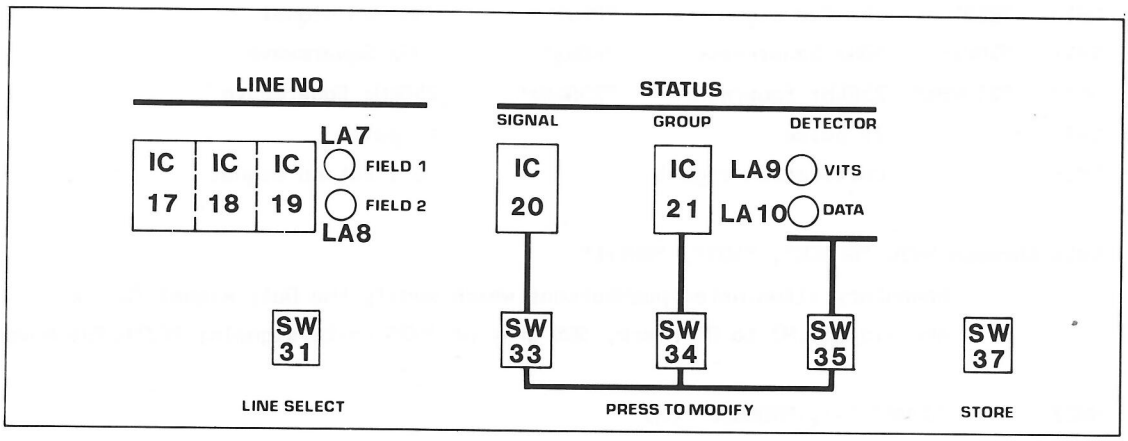


Fig. 7-2 Programmig panel

SW31 "LINE SELECT"
Enables programming panel in that displays are turned on at the first push of this button. Any programable line in the vertical interval in any field may be selected by repeatedly pressing this button.

IC17-19 "LINE NO."
3 digit display showing the selected line number.

LA7 "Field 1", LA8 "Field 2"
LED's indicating the selected field number.

SW33 "SIGNAL"
Operated repeatedly will select the signal to be inserted or deleted, according to description on label on the hinged lid.

IC20 "SIGNAL STATUS"
1 digit display indicating the signal selected by means of SW33 or current selection for the line selected.

SW34 "GROUP"
Assigns the line selected to one of five groups of inserted test signals.

IC21 "GROUP STATUS"
1 digit display showing preselected or current group assignment for the selected line.

SW35 "DETECTOR"

Repeated operations of this button will preselect the detector function for the selected line between Off, VITS detector and Data detector; only if PM 8538, unit 10 is installed.

LA9 "VITS", LA10 "DATA"

2 LED display showing the current or the preselected status for the VITS and Data detectors for the selected line; only if PM 8538, unit 10 is installed. When both LEDs are off, none of the detectors are enabled for that line.

SW37 "STORE"

Enters currently displayed information into the non-volatile memory.

Rear panel connections

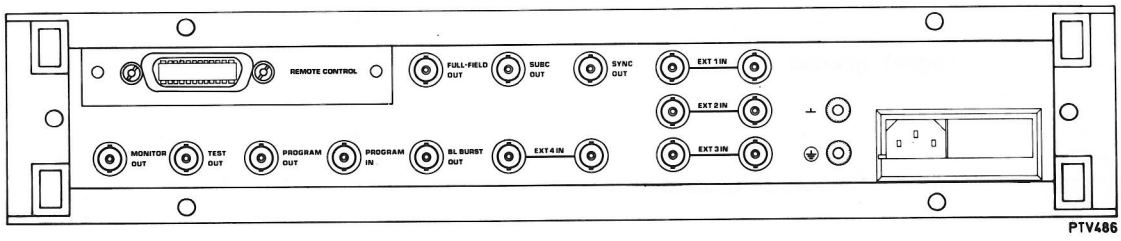


Fig. 7-3 PM 5654 rear panel connections

"PROGRAM IN"

BNC connector for the video input signal to be provided with VITS and data signals in the vertical interval.

"EXTERNAL 1-4 IN"

Four loop-through BNC inputs for external video or data signals to be inserted into the program signal.

"PROGRAM OUT"

The incoming video signal, By-passed or processed with VITS or data inserted, is available at this BNC connector.

"TEST OUT"

Identical output to "PROGRAM OUT" when the incoming video signal is processed with VITS or data inserted.

"MONITOR OUT"

A BNC connector providing a monitor output of the incoming program video signal with inserted VITS or data (output is identical to the one on the front of the instrument).

"BL BURST OUT"

A continuous source of Black burst (Color Black), locked to the incoming signal (if present) is available on this BNC connector.

"FULL-FIELD OUT"

Provides a continuous BNC output of the selected Full-field test signal (locked to the incoming program video signal if present).

"SUBC OUT"

Continuous color subcarrier is available on this BNC connector.

"SYNC OUT"

BNC connector providing a composite sync-pulse output.

"REMOTE"

24 pin Amphenol connector (type 57L-20240-2700D35) providing remote control of all major operational functions. Please refer to Chapter 6, Installation, for detailed connections and to Chapter 8, Operating Instructions, for applications.

Signal ground

Safety (Chassis) ground

"MAINS"

Mains power connector for 100-120-220-240V AC. A fuse with the correctly specified rating is contained in the connector together with a mains voltage adjustment key.

8. PM 5654 operating instructions

Operating modes

The PM 5654 may operate in one of three main operating modes. These are controlled by three electrically interlocked pushbuttons located on the front panel and labelled:

a) By-pass
b) Normal
c) Full-field

In order to prevent accidental change of mode and thereby the program output signal, the Full-field button must be pressed twice within 0.5 to 10 seconds to enter this mode. The integral indicator light will turn on at the first press and the actual mode change on the second. A time-out function is provided to reset the selection, if the button is only pressed once within 10 seconds.

The modes provided are as follows:

1) By-pass

A relay built into the cabinet loops the incoming program signal directly to the output connector under the following circumstances:

a) The By-pass button is pressed (local or remote)
b) Powerline fails or is switched off
c) The sync unit or the system control unit is removed
d) The incoming program signal is below -6dB level (measured on sync amplitude) and autosubstitution is not selected, in the event Normal mode was orginally selected, will both By-pass and Normal indicators be lit indicating that Normal mode will be resumed, when the input level is restored.

2) Normal

a) If the program signal > -6dB, the signal is processed through the instrument. Internally generated VITS and signals applied to the EXT inputs may be inserted into the program signal in accordance with the program stored in a non-volatile memory (See Programming section p. 8-4).
b) If the program signal < -6dB and autosubstitution is selected, the program signal is disabled and substituted by a Full-field test signal complete with sync and burst in accordance with the program stored in a non-volatile memory. VITS insertion will take place as specified above (2a).

3) Full-field

a) The program signal is disabled. The instrument generates a Full-field test signal with sync and burst in accordance with the front panel selection. The available test signals are listed overleaf.
b) The instrument genlocks to the program signal if present.
c) VITS insertion as specified under Normal Mode (2a).

Full-field test signal

The signal is continuously available; i.e. independent of the current VITS mode is a Full-field test signal with sync and burst supplied. The test signals provided are as follows:

G-version		M-version	
Normal	2nd function	Normal	2nd function
75% Colorbar	75%Red	SMPTE Colorbar	75%Red
CCIR line 17 (A)	50Hz	NTC-7 COMPOSITE	60Hz
CCIR line 18 (B)	250kHz	NTC-7 COMBINATION	250kHz
CCIR line 330 (C)	2T	FCC Multiburst	2T
CCIR line 331 (D)	-	FCC COMPOSITE	-
EXT 1	-	EXT 1	-
DUTY	-	APL	-

See Chapter 3, Technical Data, for a precise definition of each signal.

Full-field test signal selection

Selection of the Full-field test signal is performed by means of a row of 7 electrically interlocked pushbuttons with integral indicator lights. Operating any one of these buttons will instantaneously change the signal to the one indicated on the button.

A second set of test signals is available by simultaneously pressing the 2nd function button.

NOTE: The manual selection is overridden by the programmed selection for autosubstitution, if this mode is selected and in fact activated by a low input signal (sync amplitude <-6dB)

Multiple selection

Pressing two or more buttons simultaneously produces an output signal composed of alternate lines of VITS or Duty (APL) signal. Selecting two VITS signals together produces a line alternating output of the two signals.

Selecting Duty (APL) together with one VITS signal generates an output consisting of repeating groups of:

G-version	M-version
1 line VITS signal	1 line VITS signal
3 lines Duty signal	4 lines APL signal

Selecting Duty (APL) with two VITS produces groups of:

G-version	M-version
2 lines VITS signals	2 lines VITS signals
6 lines Duty signals	8 lines APL signal

Duty/APL signal

The Duty (APL) signal may be modified by operating the buttons marked BLACK, 50% and WHITE. Automatic Jump (Bounce) may be enabled by operating the DUTY (BOUNCE) button. The rate is adjustable by means of the screwdriver adjustable trimming potentiometer (Jump Rate/Bounce Rate) on the front panel.

Group assignment

VITS and Data may be inserted (erased) into lines 6-22 of field 1 and lines 319-335 of field 2 in the G-version (PAL) or lines 10-21 of field 1 and lines 10-21 of field 2 in the M-version (NTSC). For ease of operation and in order to conform with standard operating practices can any of these lines be assigned to one of a total of five groups of lines. Note that a given line can only be assigned to one group; i.e. when a line is assigned to a group, that same line will then be automatically deleted from any previous group it may have been assigned to.

The line groups are labelled as follows:

G-version	M-version
Group 1	Group 1
Group 2	Group 2
Group 3	Group 3
Group 4 (Controlled by VITS Detector)	Group 4 (Controlled by VITS Detector)
Group 5 (Controlled by Data Detector)	Group 5 (Controlled by Data Detector)

Group 4 and 5 are only active when the instrument is equipped with the optional Source Identification Generator/Detector and VITS Detector PM 8538.

For normal operation should line numbers employed for transmission of local VITS be assigned to Group 1. Lines employed for network use would be assigned to Group 2; e.g. would standard EBU practice require lines 17 & 18 of field 1 and lines 330 & 331 of field 2 be assigned to this group.

Data signals such as teletext, closed captioning or Source ID signals could then be contained in lines assigned to Group 3.

By use of the remote control facility may any or all of these groups be enabled and thereby control the insertion of the above groups of VITS.

If the optional Source Identification Generator/Detector and VITS Detector is installed, can the insertion of lines programmed into Groups 4 or 5 be controlled automatically by detecting the absence of either Data (Data Detector) or VITS signals (VITS Detector) from the incoming video signal.

The detectors may be programmed to operate on any line. If enabled by the remote control and no incoming VITS or data are present on that particular line, the whole range of lines assigned to Groups 4 or 5 will be inserted. Note that this will be in addition to any other group of lines that may already be inserted from any other group. Overlap does not occur, as a

Programming panel

Assignment of VITS and Data signals to individual lines and of these lines to groups is performed by means of the programming panel located behind a hinged lid on the front of the instrument. The panel contains a Line Selector push-button in conjunction with a 3 digit line and a 2 LED field indicator, a Signal type selector with a 1 digit display, a Group selector also with a 1 digit display, a VITS and Data detector selector with a 2 LED display and finally a Store button. See fig. 8-1

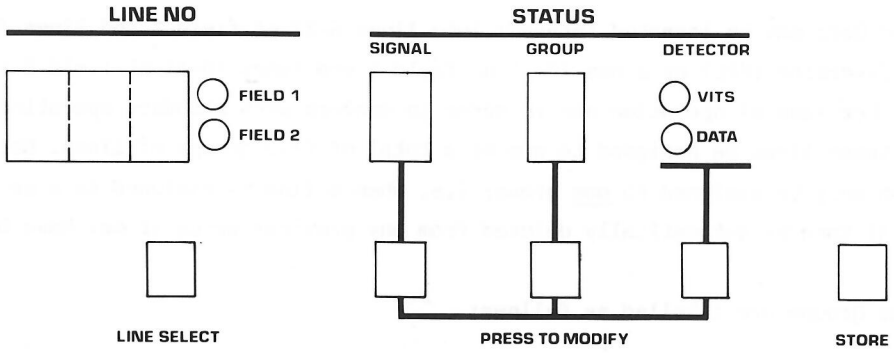


Fig. 8-1 PM 5654 Programming panel

The panel, which may be employed both for programming and for status display of any line, is activated by pressing the Line Select button. This causes the display to illuminate and status may then be read. The display will extinguish automatically approx. 3 minutes after the last button is operated.

VITS programming

To program a given line, press the Line Selector button repeatedly until the line and field display shows the desired line and field number (the line numbers will automatically increment, if the button is held down).

Now repeatedly press the Signal Selector button until the signal display indicates the wanted type of signal. Note that the display will flash to indicate preselection of a new VITS or data signal for the line in question. The code employed for the display is as follows:

Display	G-version	M-version
-	Off	Off
A	CCIR line 17	NTC-7 Composite
b	CCIR line 18	NTC-7 Combination
c	CCIR line 330	FCC Multiburst
d	CCIR line 331	FCC Composite
0	Erase	Erase
1-4 (6)	External inputs	External inputs
E	Not valid	VIR
F	Source code	Source code
H	Color bar	FCC color bar
L	2T pulse (Reflection test)	2T pulse (Reflection test)

Refer to Chapter 3, Technical Data, for specifications of these signals.

Next press the Group Select button repeatedly until the Group Display shows the desired group assignment for the selected line. Also this display will flash, if a new group is selected.

Pressing now the Store button will enter the programmed information for the selected line into the non-volatile memory and the displays will show a steady illumination. The result may also be observed on the monitor output signal, provided the remote control for the group selected is enabled. If the instrument is operating in the normal mode can the result of course also be observed on the program output signal. Note also that the same signal is inserted into the Full-field output.

This selection process must be repeated for every line in the vertical interval one wishes to process.

VITS and Data detectors

If the optional Source Identification Generator/Detector and VITS Detector PM 8538 is installed, the VITS and Data detectors may be enabled, so that signals programmed into Groups 4 or 5 respectively are automatically inserted into the program signal in the event VITS or data are missing from the incoming lines for which the detectors are enabled.

The VITS detector may be programmed to operate on only <u>one</u> line in each field. If enabled by the remote control and no incoming VITS is present on the selected lines, the whole range of lines in both fields assigned to Group 4 will be inserted into the program output.
NOTE: Detector is factory adjusted to detect Line 17 (See unit 10, adjustments).

The Data detector operates in similar manner but with the lines from Group 5 being inserted, when data is detected as missing.

The detectors are enabled or disabled by first repeatedly pressing the Line Selector button until the Line Number display shows the line for which the status of a detector should be changed. Then repeatedly press the detector button. The 2 LED detector display will cycle through three states indicating which detector should be enabled or disabled (if no LED is lit). Note that the display together with the relevant field indicator will flash in this preselected state.

If the detector off-state is selected i.e. both VITS and Data LED´s are off, only the field indicator will flash.

To complete the selection, press the Store button. This transfers the displayed information to the non-volatile RAM and the displays show a steady illumination.

The automatic insertion function, if otherwise enabled via the remote control input, is thereby set or reset. A prior selection within the same field will be automatically cancelled to ensure the operation on only one line per field for each type of detector.

The operation of the detectors may be monitored on the front panel indicators as well as on the remote control connector in form of tally outputs.

Programming of lines in Groups 4 and 5 follows the procedure given above. Care should be exercised, so that already selected for other purposes are not used for Groups 4 or 5 as the original programming information will be erased.

Note that if no VITS or Data are programmed for Groups 4 or 5 respectively, no actual insertion will occur, even though the VITS and Data substitution indicators on the front panel will light up, when incoming VITS or data are detected as missing.

Status indication

To read the status of a line in a particular field, press repeatedly the Line Selector button (or hold it down) until the display indicates the chosen line and field number. The signal type programmed is then read on the Signal Display using the code given above for programming. The group to which the line is assigned may be read from the Group Display and status for the VITS and Data detectors from the 2 LED display.

Program substitution

The PM 5654 may be programmed to automatically provide a preselected ouput signal in the event the incoming program signal fails. This substitution signal may be any of the VITS signals, colorbar or any of the signals from the external inputs.

To enable this mode, press the Line selector button repeatedly (or hold it down) until the word "SUB" appears on the line number display. Then press the Signal Selector button repeatedly until the signal display indicates the required substitution signal.

Finally press store.

Active autosubstitution is indicated on the front panel and a tally signal is available on the remote control connector.
NOTE: All integral LED's on the right hand side of the hinged lid are then switched off.

A typical set-up for automatic substitution by the signal from an external pattern generator is shown in fig. 8-2

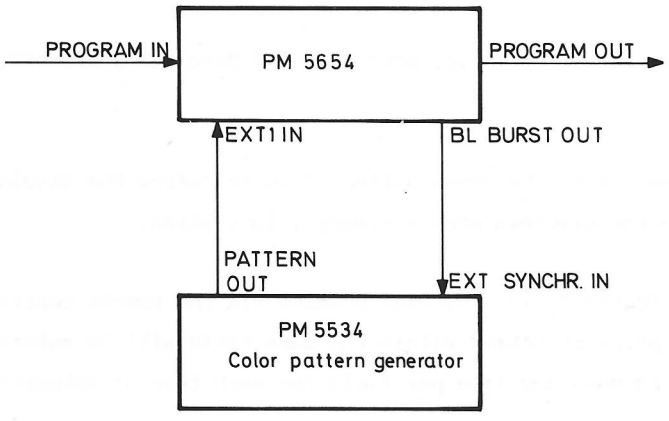


Fig. 8-2 Example of program substitution set-up

Remote control

All major operational functions may be controlled from a remote location. The control is in parallel to the controls on the front panel and may at any time be overridden by these.

Inputs active "low" (GND) are provided for:

a) Mode (momentary control):
- By-pass
- Normal
- Full-field

b) Group Insertion Disable (sustained control):
- Group 1
- Group 2
- Group 3
- Group 4 (Controlled by VITS detector)
- Gruop 5 (Controlled by Data detector)

c) Source Code Select (binary encoded sustained control):
- Up to 4 different codes may be selected, e.g. Mono/Stereo/Dual command codes.

d) Selection of Full-field test signals (binary encoded sustained control):
- All available single test signals and some combinations of signals may be selected. See Chapter 6, Installation, for all control possibilities.

Tally outputs (low "on") are provided for:

a) Mode:
- By-pass
- Normal
- Full-field

b) Status Flags:
- Program autosubstitution
- VITS Substitution
- Data Substitution

For pin connections of the remote control connector refer to Chapter 6, Installation.

SERVICE INSTRUCTIONS

Use of the service instructions

Troubleshooting is best carried out on a funcional level using block diagrams. Reference is made to Chapter 5 for an overall description of the instrument. The block diagrams of each individual unit are descriped in Chapter 12 to 22. 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 the appropriate circuit diagrams.

9. Access to, and replacement of parts

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.

A. Access to unit 1,2,8,9 and 11(only M-version)

1. If the instrument is rack-mounted, it is necessary to remove it before repairing or adjusting these units.

2. Remove top-cover of the instrument by loosening the two screws A (See fig. 9-1). If subsequent access to the solder side of unit 8 is necessary, the bottom cover may be removed by loosening the screws B (See fig. 9-1). See also fig. 11-1 (wiring diagram)

B. Unit removal

NOTE: For routine test and adjustment, the instrument does not need to be removed from its rack mount. The units 3-6 and 10 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 when access to all units is required simultaneously.

1. Remove the instrument from the rack.

2. Remove the top-cover. All units are now accessible for test and adjustment.

3. Referring to fig. 9-2 loosen the screws C and remove the front plate. The front plate is pulled forward and down.

4. Loosen the screws D, lift the bracket and slide it either to the right or left (depending which unit is to be removed) and pull out the unit(s). Refer to fig. 9-3.

5. By removing the screws E (refer to fig. 9-4) and removing the plugs P and XP, unit 1 (power supply) can be pulled out.

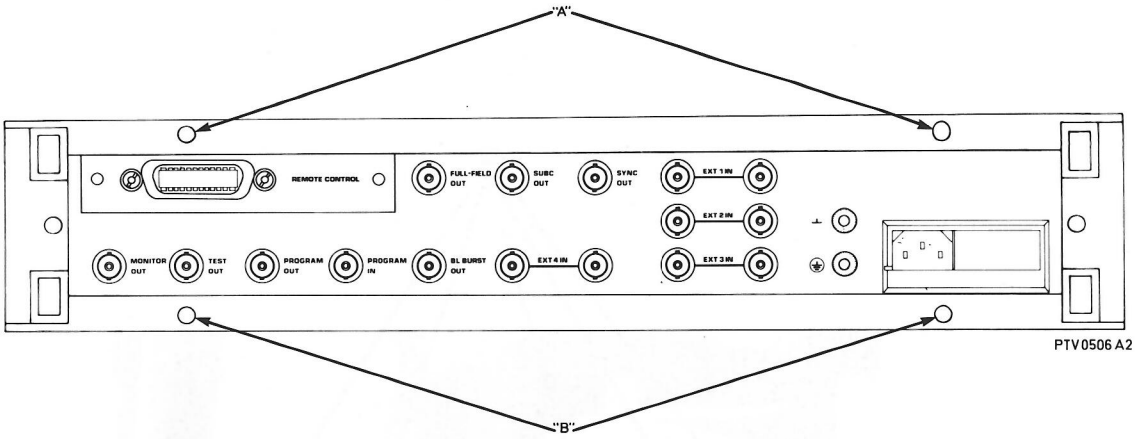


Fig. 9-1 Instrument rear panel

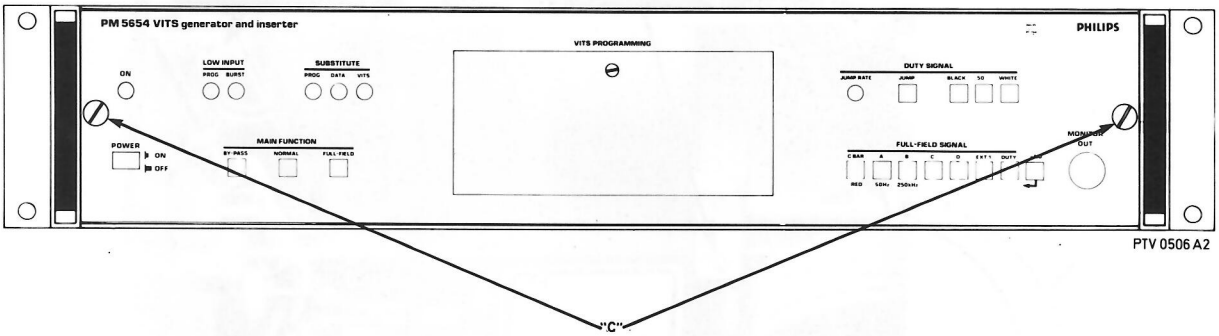


Fig. 9-2 Instrument front panel

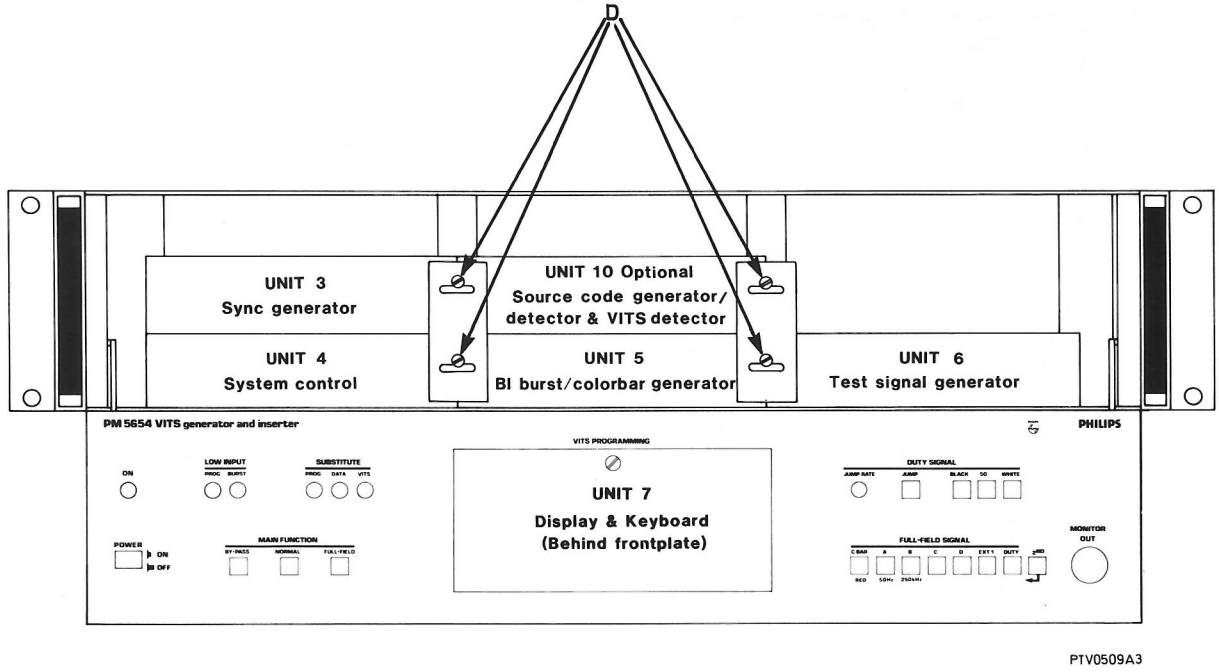


Fig. 9-3 Unit location - front panel removed

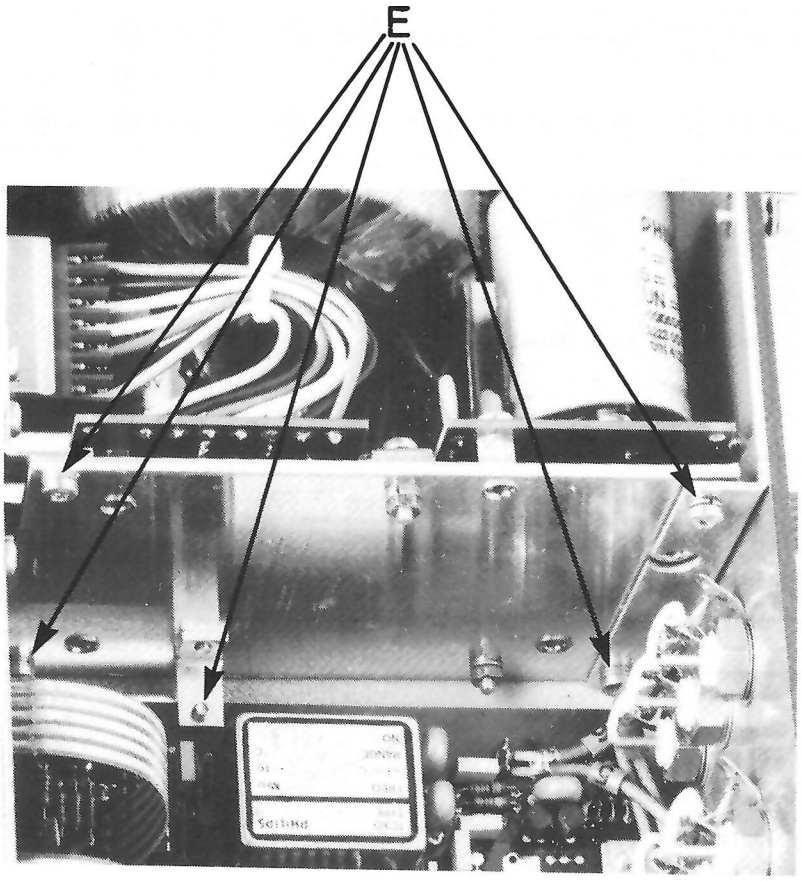
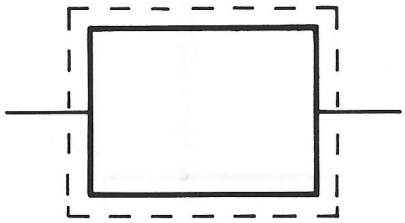


Fig. 9-4 Access to power supply

10. Block diagram symbols information

Various symbols and conventions have been used in the block diagrams and a short description of these is given below.

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 square

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

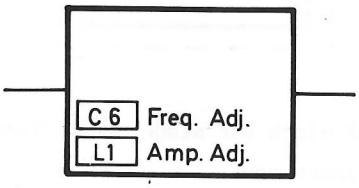
The numbered diamond

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 check point sheet.

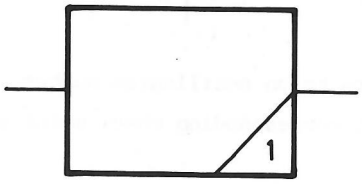
The numbered circle

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

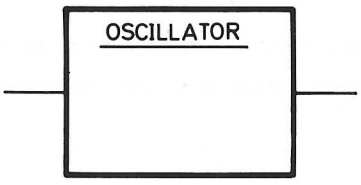
Functional block information



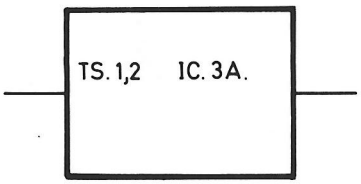
Inside some of the functional blocks, there are other smaller blocks. These show the adjustable components within the stage and what they adjust. These components are high lighted in the check point diagram, and an explanation of their use is given in the appropriate adjustment procedure.



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

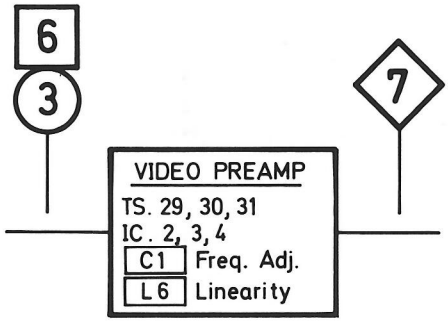


The underlined text within the block gives the function provided by the block.



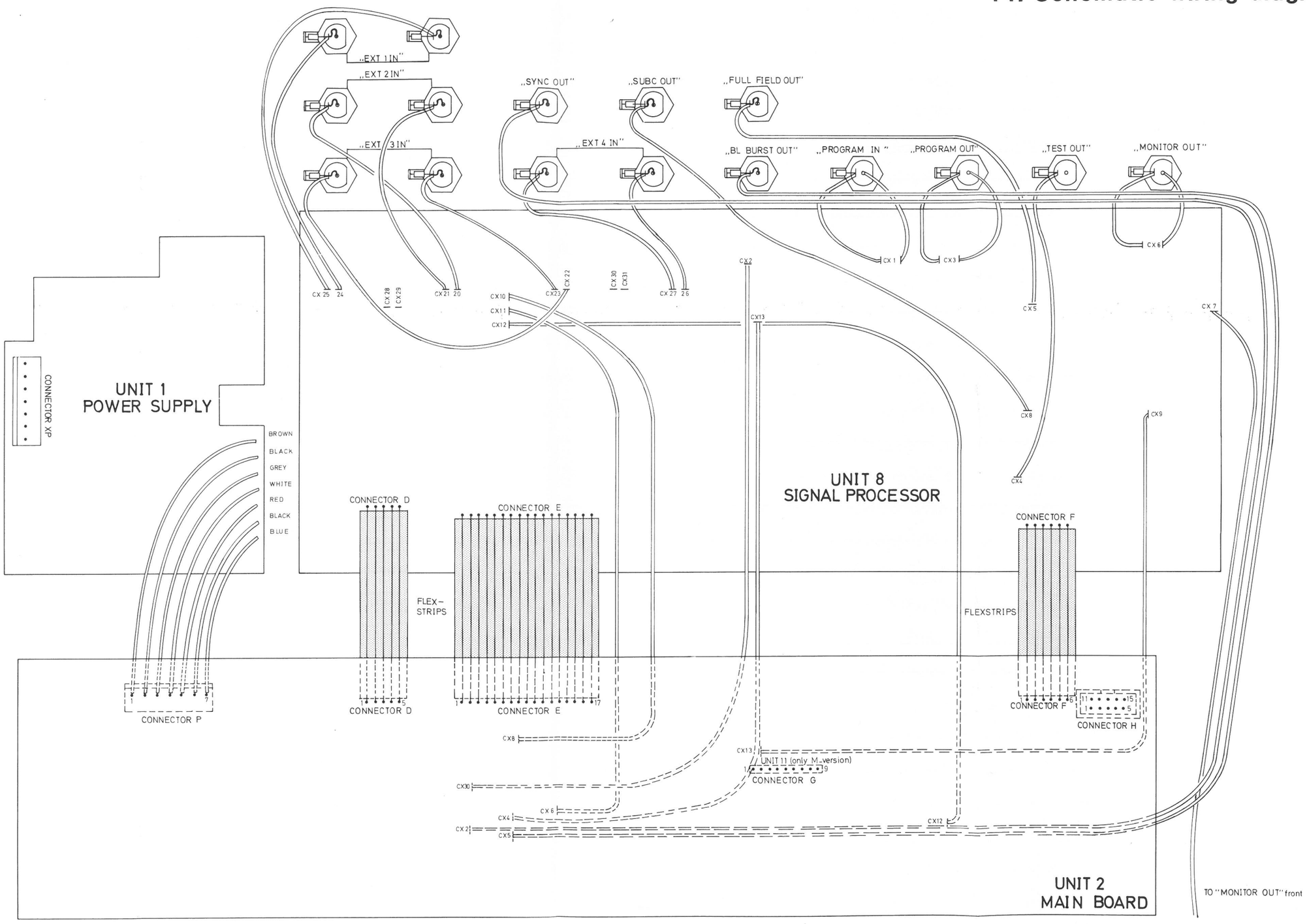
Other text shows the major components in the block or stage.

EXAMPLE:



NOTE: All circuit diagrams shows values for the G-version. Where values differ in other versions 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 Chapter 27, List of electrical parts.

11. Schematic wiring diagram



PTV 0505A1

Fig. 11-1 Wiring diagram

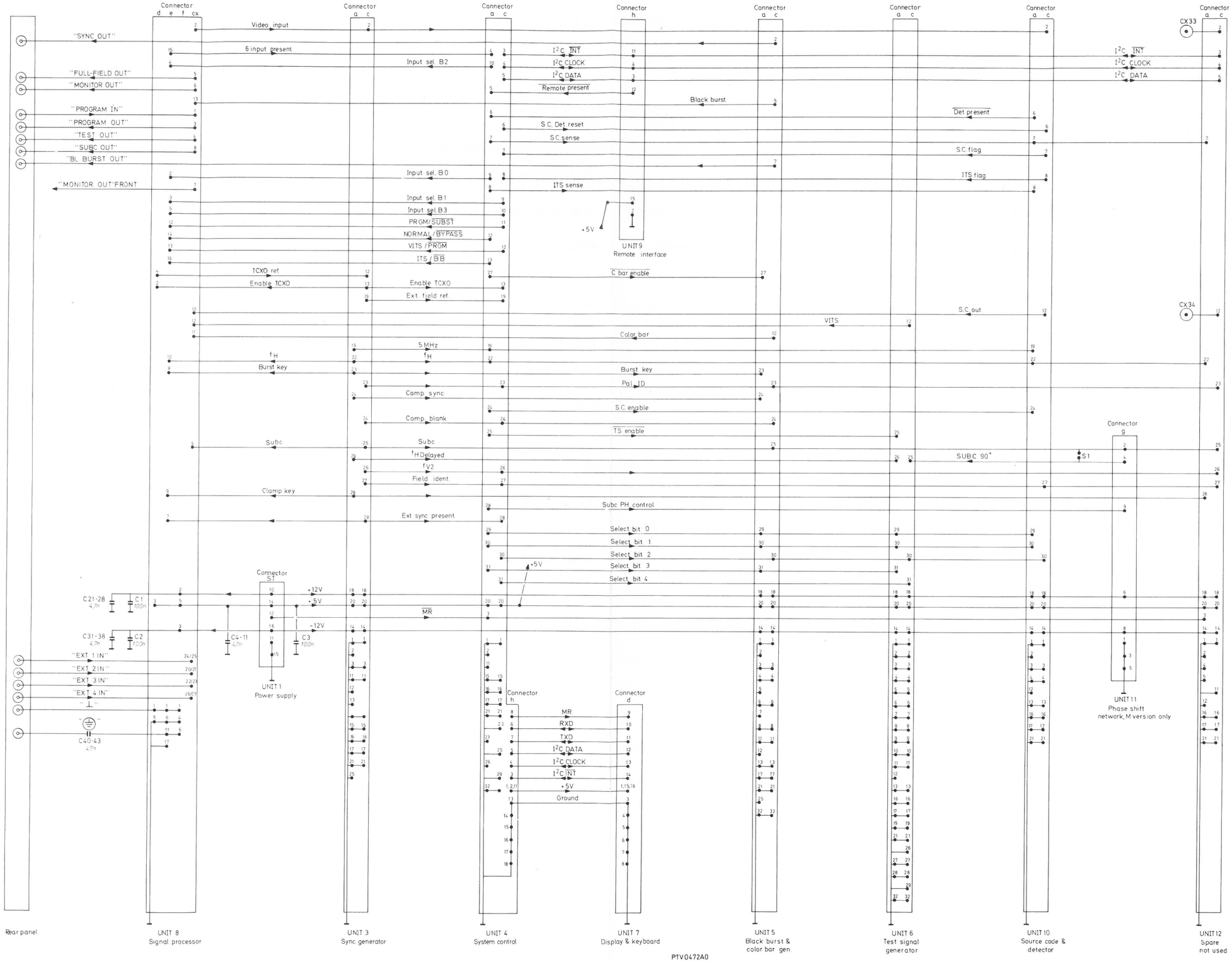


Fig. 11-2 Schematic wiring diagram

12. Unit 1 - power supply

The mains voltage enters the instrument on the rear panel and passes through the integral mains filter (incorporated in the mains connector). It is applied to the primary winding of the toroidal mains transformer. The two secondary windings, coupled in series with the centre tap connected to ground, are full-wave rectified by GR1, 2 and 3, providing unregulated +12V and -12V (See circuit diagram overleaf). The +12V feeds the DC/DC converter (IC1, SCS L296) that provides the +5V, max. 4A output current (in PM 5654 approx. 1A). The DC/DC converter consists of a sawtooth oscillator (f osc is approx. 50kHz), an error amplifier, a comparator and an output stage. There is also an overvoltage protection circuit, which triggers the thyristor TS1 if the output voltage exceeds the 5.1V by 20%. Furthermore the DC/DC converter delivers an active low reset pulse ($\overline{MR}$) to the micro processors. Output overcurrents at power turn-on, are prevented by a soft start function. The error amplifier output is initially clamped by the external capacitor C13 and allowed to rise, linearly, as this capacitor is charged by a constant current source. The thermal overload circuit disables circuit operation when the junction temperature reaches about 150°C and has hysteresis to prevent unstable conditions.

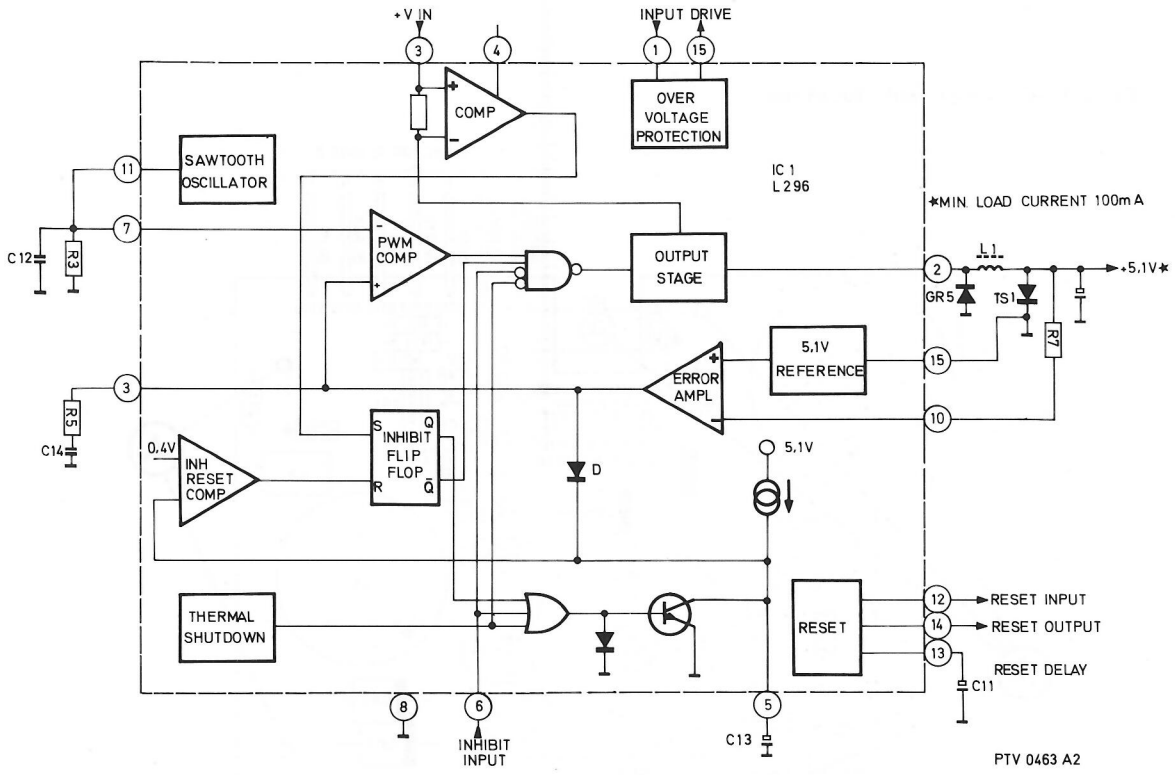


Fig. 12-1 Block diagram IC1 (L296)

NOTE: For removal of the power supply from the instrument; refer to Chapter 9. Removal of the PCB from the mounting bracket is done by removing the screws A (See fig. 12-3 overleaf).

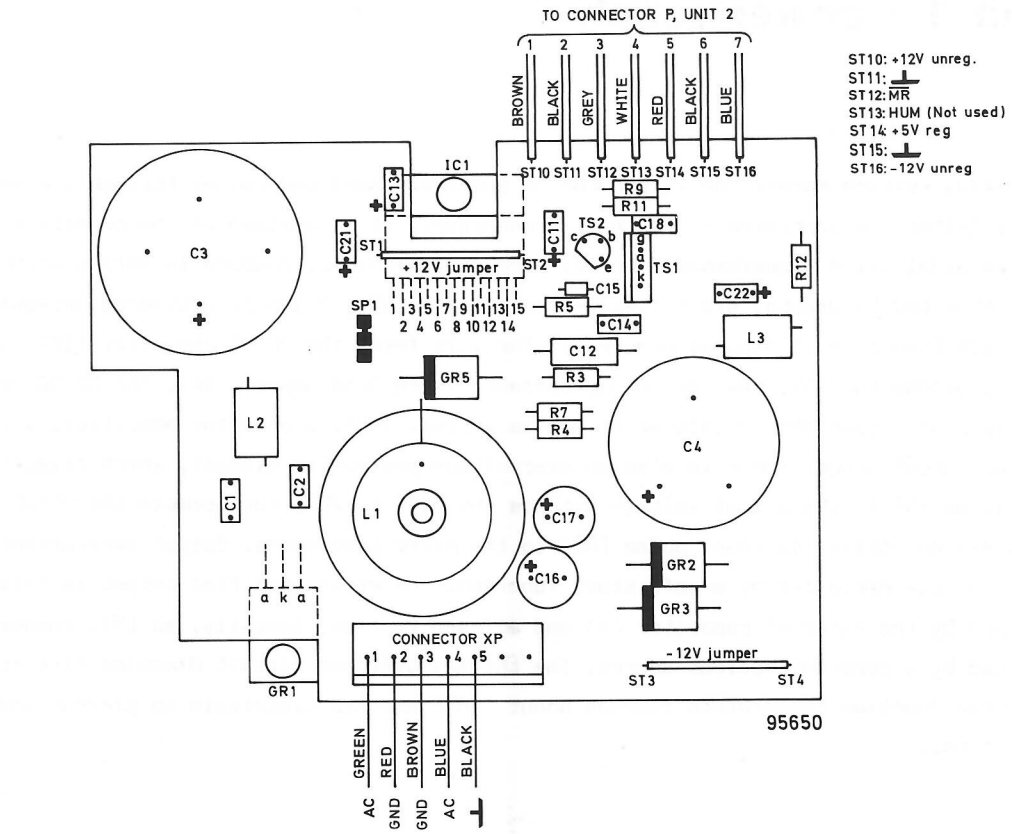


Fig. 12-2 Component location

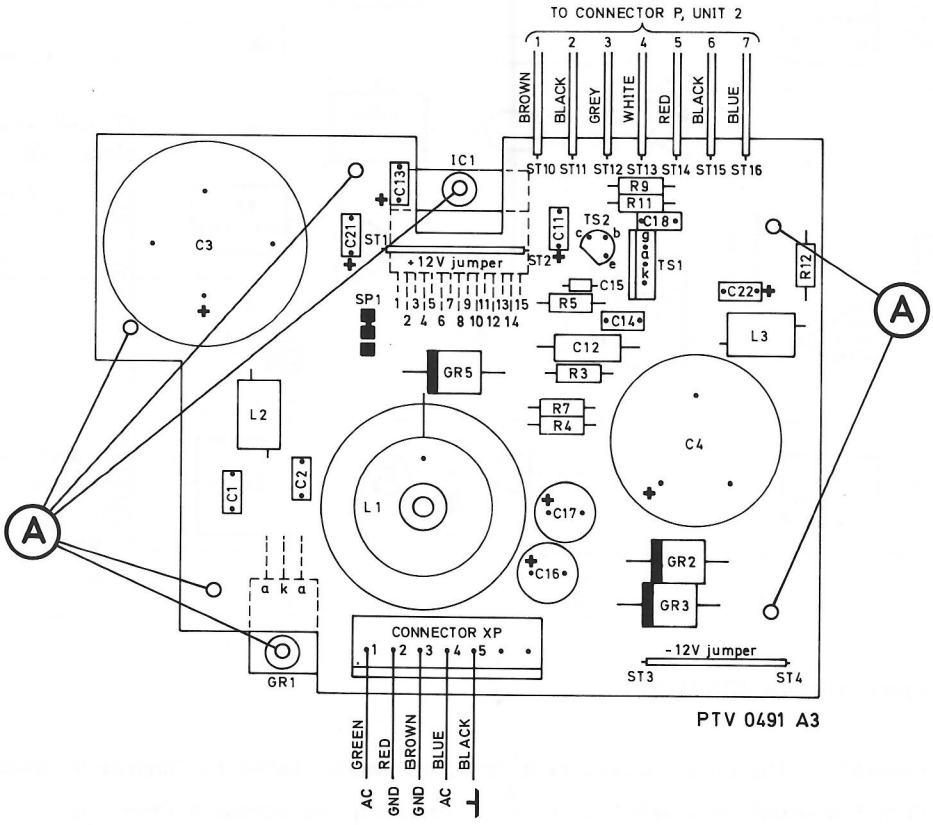
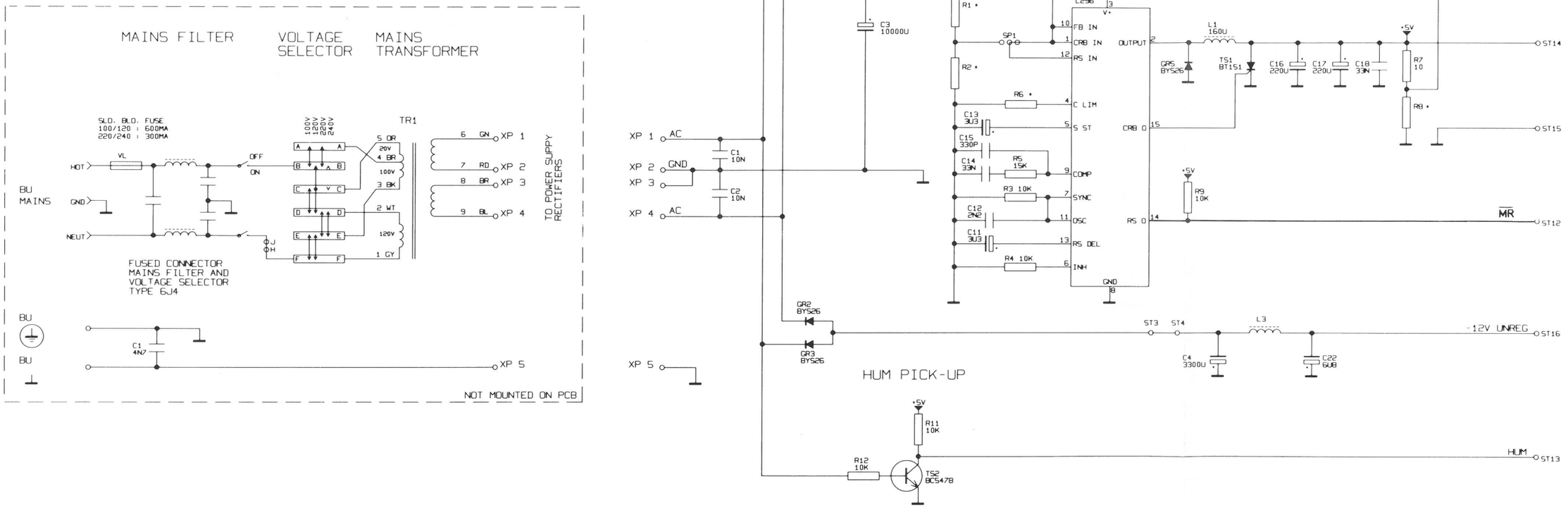


Fig. 12-3 Removal of PBC



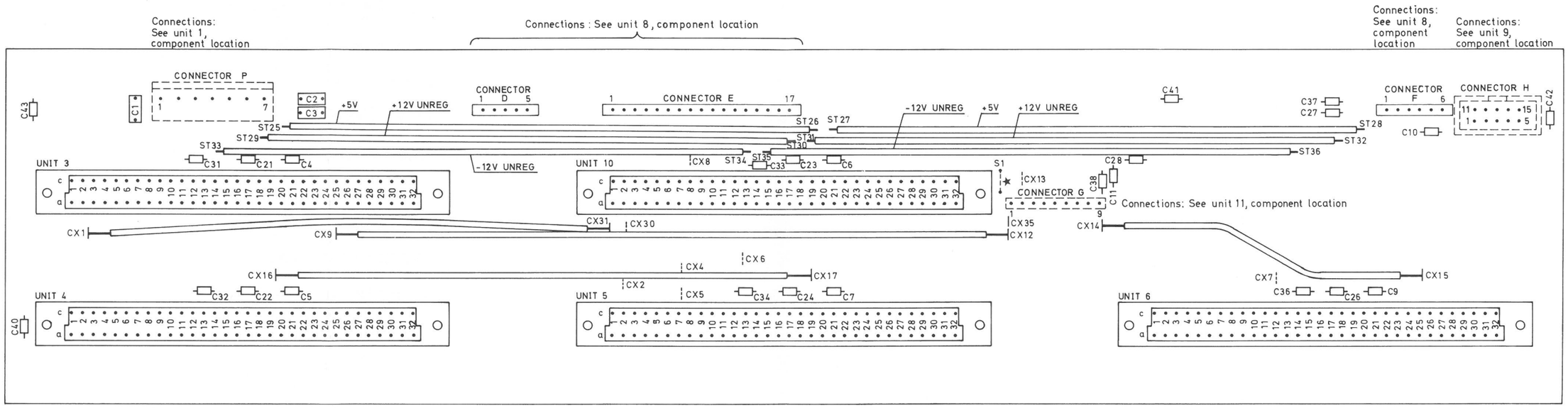
* = NOT MOUNTED

95650

Fig. 12-4 Circuit diagram, power supply, unit 1

13. Unit 2 - main board description

The main board acts as interconnection between all the units. The schematic wiring diagram fig. 11-2 can be seen as a circuit diagram for the main board. The component location is shown overleaf (fig. 13-1).
The capacitors shown on the schematic wiring diagram are all mounted on the main board.



95520

*Only PAL-version

Fig. 13-1 Component location, main board, unit 2

14. Unit 3 - sync generator

Block diagram description

Unit 3 generates a number of signals without which the instrument cannot function. These are either derived from the incoming program signal or produced entirely by the unit itself.
When program signal is present the sync regenerator is locked to the incoming sync and the subcarrier regenerator is locked to the incoming burst. When the TCXO (unit 8) is enabled (no program signal at all, sync and/or burst level below -6dB of nominal amplitude) the subcarrier regenerator is locked to the TCXO. The sync regenerator is then locked to the subcarrier regenerator. For how the system control reacts; refer to Chapter 8, operating instructions.
The prime sync generator functions are implemented by the sync generator IC12 (SAA1043) and the subcarrier coupler IC26 (SAA1044), see overleaf for a description of these IC's. The sync generator (IC12) has a built-in 5MHz (G)/5.03MHz (M) oscillator controlled by the crystal XT1. When incoming sync is present (exceeds -6dB of nominal video sync amplitude) the sync generator is locked to the ECS (ext. composite sync). From the clamp pulse generator a CLP (clamp pulse) is derived from EV (ext. vert.), V1 (vert. drive) and the EBK (external burst key). The pulse is not present in field sync period. A burst gate pulse is also derived to control the burst gate circuit (IC5A). The clamp key pulse output on connector 28a secures clamping in the program amplifier on unit 8, also in the field sync period.
If the burst amplitude is OK (exceeds -6dB of nominal burst amplitude), the ext. subcarrier information is fed to the demodulator via the switch (IC5B) and the limiter (TS10, 11). The S/H (sample and hold) pulse makes sure that the oscillator around XT2 (IC26) is phaselocked to the positive phase of the incoming burst. The subcarrier SO from the same oscillator is the subcarrier reference for the demodulator (IC20). The VCXO is the second oscillator in the genlock circuit controlled by the phaseshift circuit (IC24B and R113) and is phaselocked to the first oscillator.
If the program signal is missing or sync amplitude is below -6dB of nominal sync amplitude, the sync level detector blocks the sync slicer, meaning that there is no ECS to the sync generator (IC12). It generates a no sync (NS) pulse (active HIGH). This means that the ext. sync present signal (now active LOW) is fed to the clamp pulse generator and stops the burst gate pulses. The burst level detector receives no external subcarrier. The enable TCXO (HIGH) signal activates the TCXO on unit 8 and the TCXO reference enters on connector 12c. It is then the TCXO reference which is fed to the demodulator. At the same time the NS (HIGH) is fed to the switch IC25C. PH1 from IC26 is then fed to the sync generator (IC12) via the integrator (IC11A). The NS is also fed to the crash lock (IC13) disabling crash lock by stopping the internal line counter in IC12 until an external vertical sync pulse is applied on the EV line from the field separator.

In case of break down; refer to Chapter 24, troubleshooting hints.

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).

FUNCTIONAL DESCRIPTION

The SAA1043 is provided with a built-in oscillator.

The following frequencies are applied to the clock input (OSCI):

PAL (G)	: 5.0MHz
NTSC (M)	: 5.034964MHz

Another circuit makes it possible to lock the internally generated sync signal to an external sync signal. This functions are 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 internal 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 V_{dd} or V_{ss} dependent on the direction of the error. The phase analogue voltage on PH is used to correct the frequency at OSCI via a VCO and null the phase error between internal and external signals. Equalization and seration 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 manipulating the DL ($2xf_h$) input to the vertical counter via the addition/suppression logic.

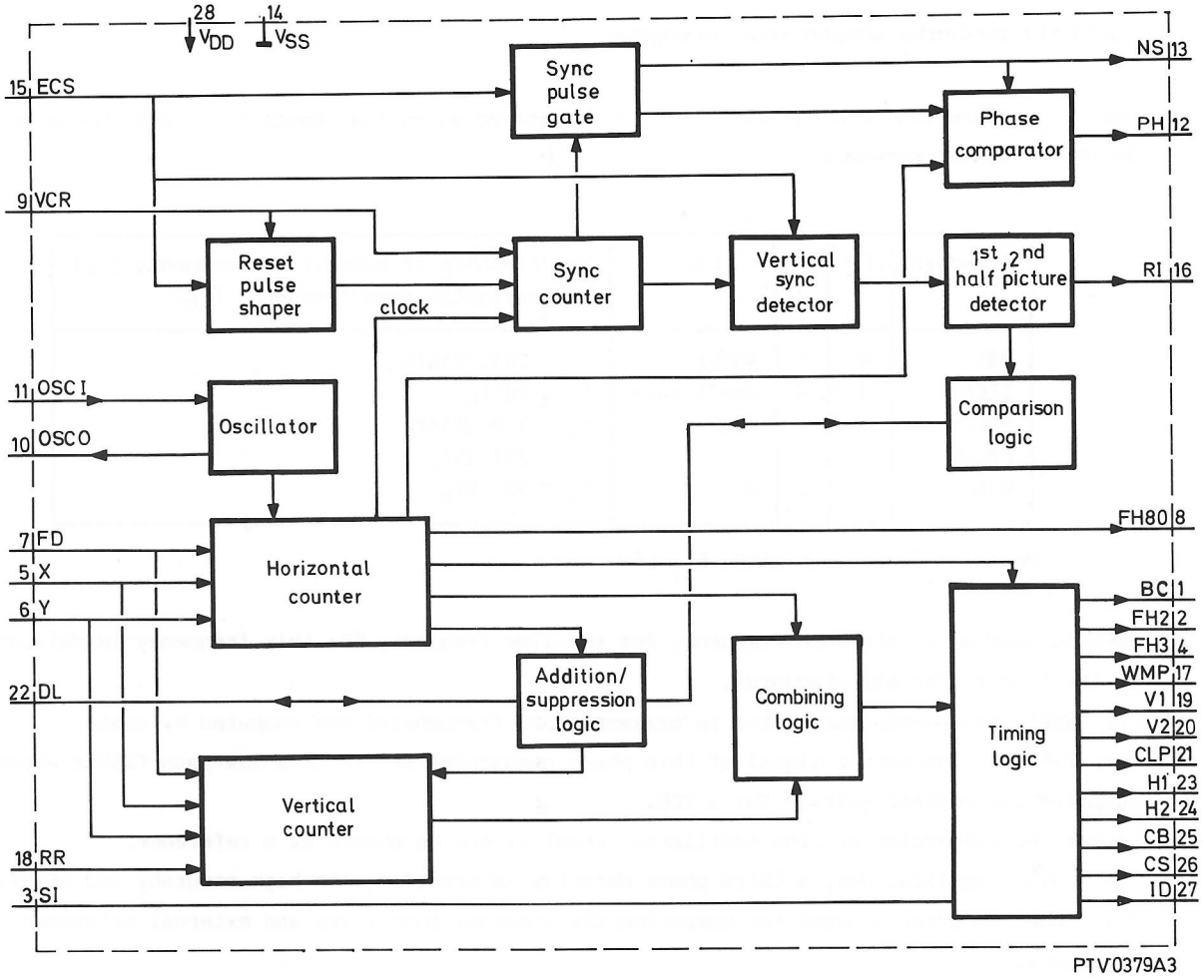


Fig. 14-1 SAA1043 Internal block diagram

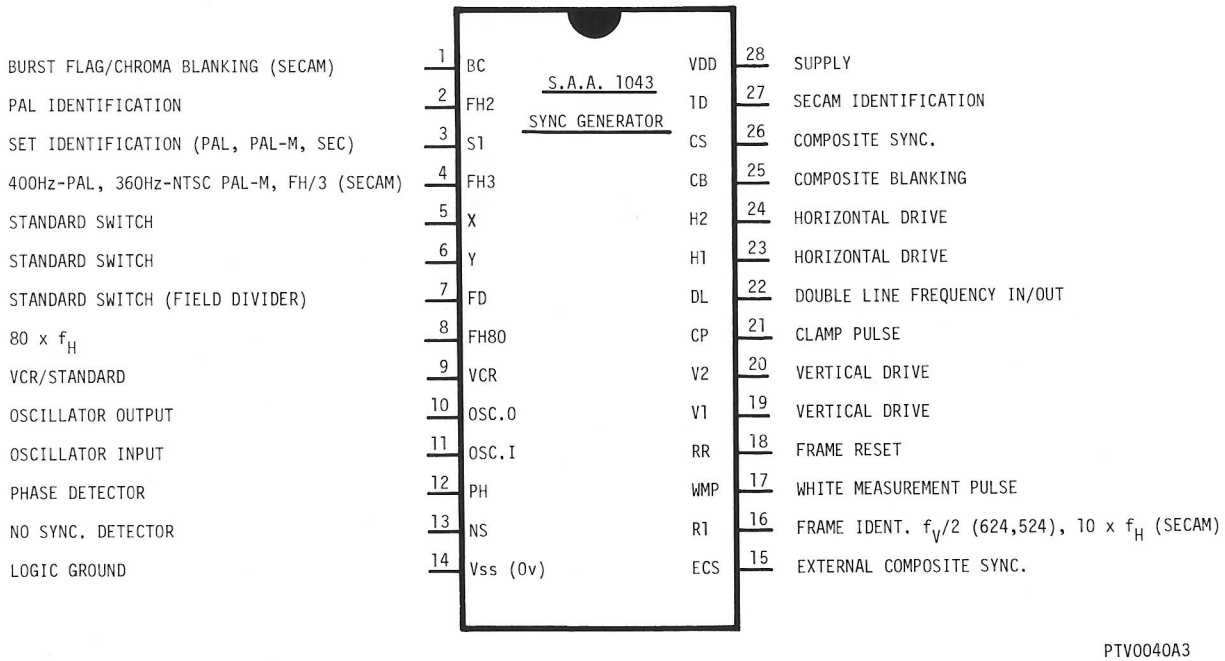


Fig. 14-2 SAA1043 pin connections/signal names

SAA1044 subcarrier coupler chip description

The TV standard required for operation is programmed using the inputs FD, 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)
PAL	0	1	400Hz	$f_s = 283.7516 f_h$
SECAM	0	0	don't care	$f_s = 282 f_h$
PAL-N	1	1	400Hz	$f_s = 229.2516 f_h$
PAL-M	1	0	1	$f_s = 227.25 f_h$
NTSC	1	0	0	$f_s = 227.5 f_h$

Positive logic: 1 = HIGH; 0 = LOW

80FH is used as a reference frequency for the line frequency FH; this frequency is delivered by the Sync IC for all standards.

For FSUBC, an on-chip oscillator is present. Both frequencies are compared by phase comparator 1. The output signal of this phase comparator is 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.

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.

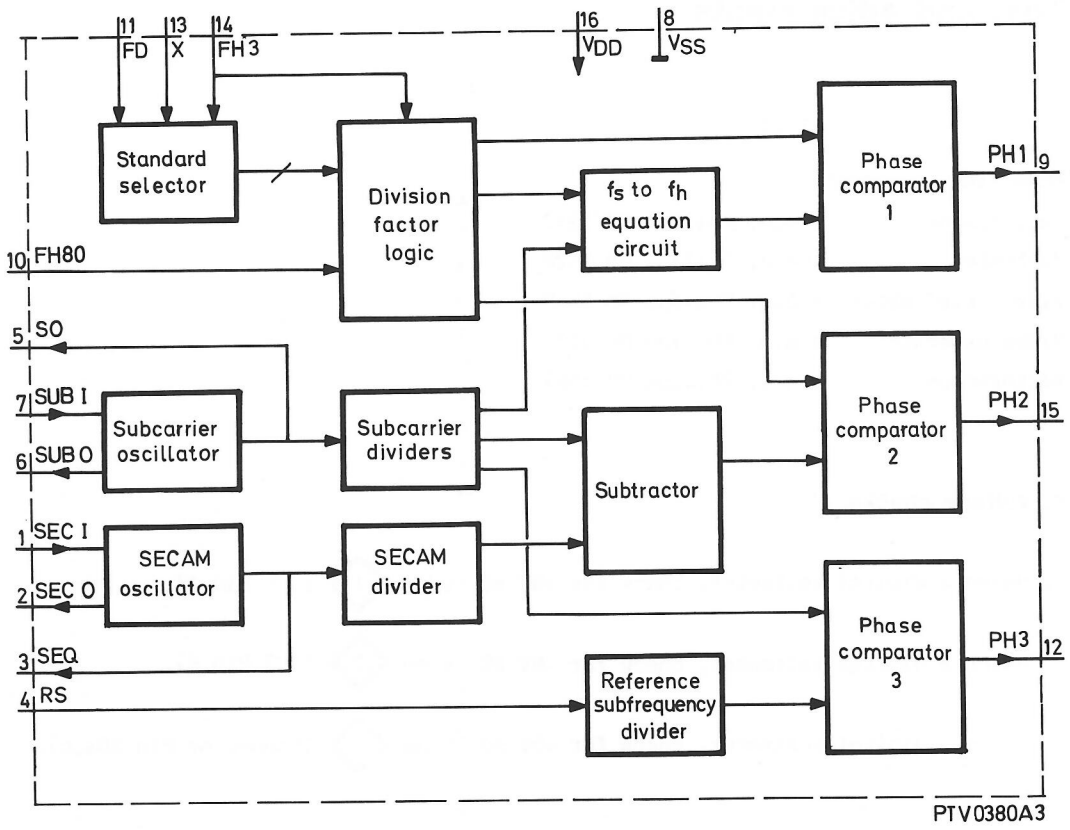


Fig. 14-3 SAA1044 block diagram

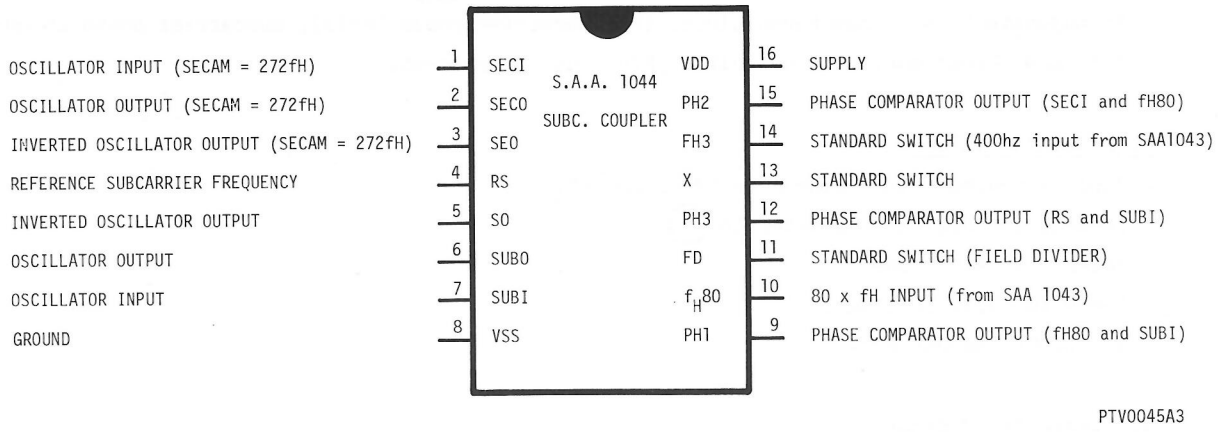


Fig. 14-4 SAA1044 pin connections/signal names

Test and adjustments

Measuring equipment:

Oscilloscope	: e.g. Philips PM 3217
Voltmeter	: e.g. Philips PM 2528
Video level meter	: e.g. Philips PM 5548
Video generator	: e.g. Philips PM 5570
Vectorscope	: e.g. Philips PM 5567

A. Voltage checks

1. Using a digital voltmeter, check for +8V ±0.4V on ◇1 (IC8 Pin 1).

2. Using a digital voltmeter, check for -8V ±0.4V on ◇2 (IC8 Pin 6).

3. Using a digital voltmeter, check for +5V ±0.2V on ◇3 (Connector Pin 20a,c).

B. Adjustments

1. Burst notch.

- Apply a nominal video signal to "PROGRAM IN".
- Connect the oscilloscope (10us/div.) to (2).
- Adjust L1 to minimum burst. See [1].

2. Subcarrier output

- Apply a nominal video signal to "PROGRAM IN".
- Connect the oscilloscope (0.1us/div.) terminated with 75ohm to "SUBC OUT".
- Adjust L5 for maximum subcarrier (1.0Vpp ±10%). See [15].
- If adjustment on L5 has taken place, the subcarrier phase (R113), subcarrier phase on unit 5 (L1) and chroma amplitude on unit 6 (R29) must be checked.

3. Modulator balance

- Apply a nominal video signal to "PROGRAM IN".
- Connect the digital voltmeter to (8).
- Select "NORMAL" mode.
- Check for 0.1V DC ±10mV.
- If not OK, adjust R91.

4. Extern field delay

- Apply a nominal video signal to "PROGRAM IN".
- Connect the oscilloscope to ◇5 (IC18 pin 5).
- Select "NORMAL" mode.
- Adjust R76 for max. pulse length (See [2]).

5. Line phase

- Apply a nominal video signal to "PROGRAM IN".
- Connect the oscilloscope (input A, 10us/delayed 0.5us/div.) to "BL BURST OUT".
- Connect input B (X10 probe) to "PROGRAM IN".
- Select "NORMAL" mode.
- Check that the leading edges of the sync pulses coincide.
- If not OK, adjust R133 ; refer to [8] .

6. Subcarrier frequency-freerun

- Apply a nominal video signal to "PROGRAM IN".
- Connect the oscilloscope to (9) .
- Check for 0V ±0.1V. Noise < 0.4Vpp.
- If not OK, adjust C37.

7a. Subcarrier phase G-version

- Check subc output level (item 2).
- Apply a black burst signal to "PROGRAM IN".
- Connect the vectorscope to "PROGRAM OUT".
- Select "NORMAL" mode, line 17(A) signal inserted.
- Adjust R113 for 60^{o} $\pm 1^{o}$ relative to U axis; refer to fig. 14-6.
- Check subcarrier phaseshift (unit 5, adjustments, item 9).

7b. Subcarrier phase M-version

- Check subc output level (item 2).
- Apply a black burst signal to "PROGRAM IN".
- Connect the vectorscope to "PROGRAM OUT".
- Select "NORMAL" mode, NTC-7 COMP inserted.
- Adjust R113 for 0^{o} $\pm 1^{o}$ relative to burst.
- Check subcarrier phaseshift (unit 5, adjustments, item 9).

8. Hor. drive delay

- Apply a nominal video signal to "PROGRAM IN".
- Connect the oscilloscope (2us/div.) terminated with 75ohm to "PROGRAM OUT".
- Select "FULL-FIELD" mode, G-version: Line 17(A) signal, M-version: NTC-7 COMB.
- Check for reference bar start at 12us ±0.2us (measured from the leading edge of the sync pulse). See fig. 14-5.
- If not OK, adjust R78.

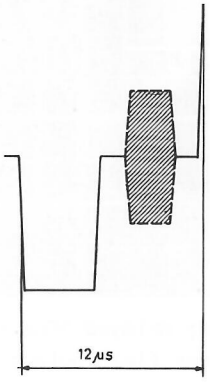


Fig. 14-5 Hor. drive delay

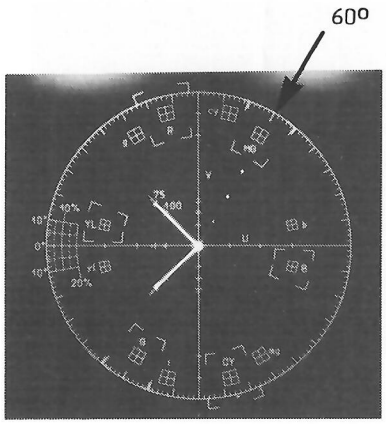
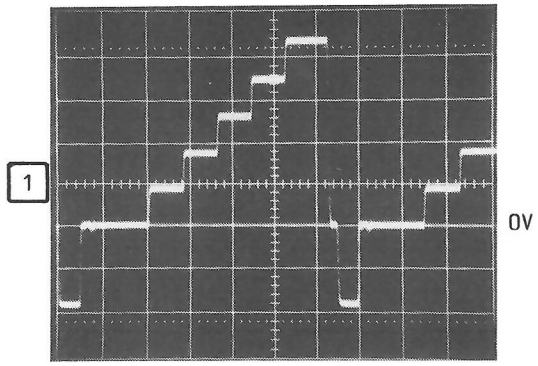
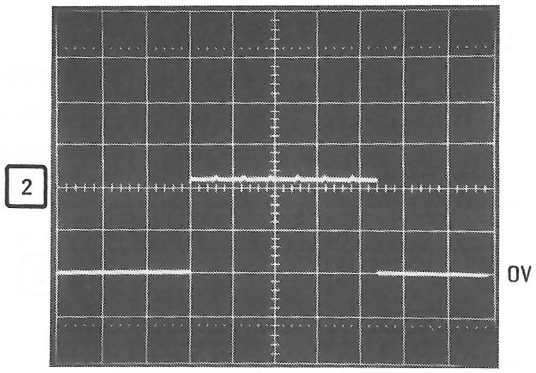


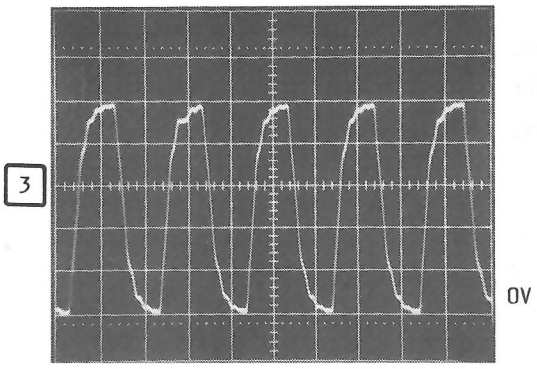
Fig. 14-6 Subcarrier phase



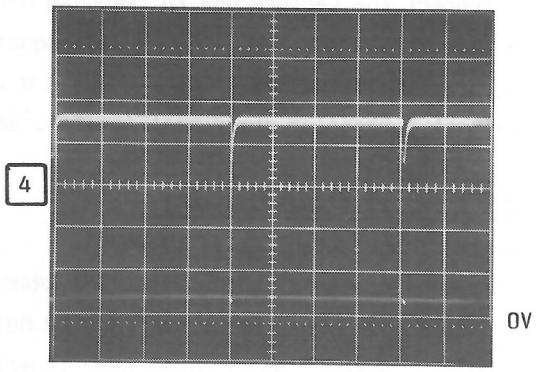
(2) 0.5V/div. 10us/div.
Burstgate adjustment



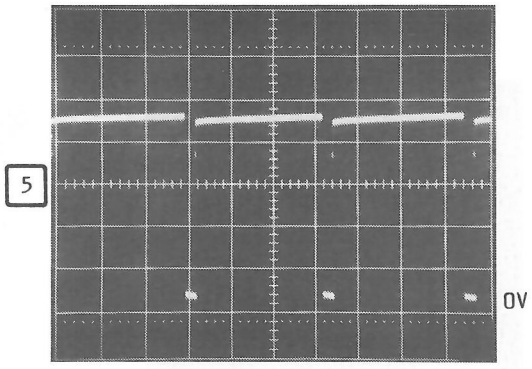
◇5 2V/div. 5ms; delayed 0.1ms/div.
Delay adjustment



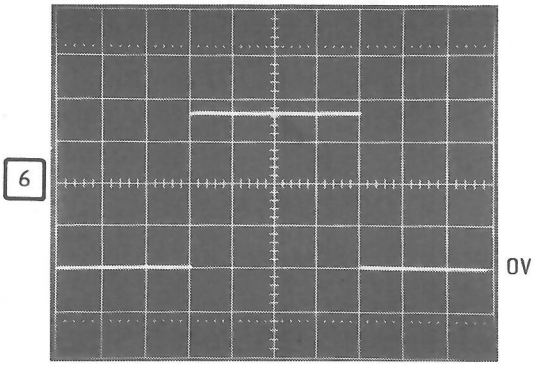
1V/div. 0.1us/div.
5MHz clockpulse



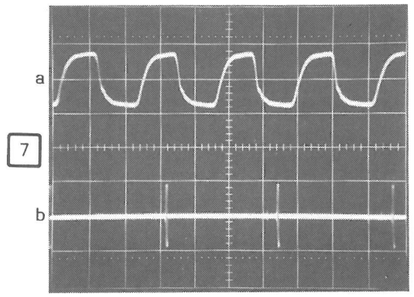
1V/div. 5ms/div.
Sync slicer output.



1V/div. 20us/div.
Sync slicer output.



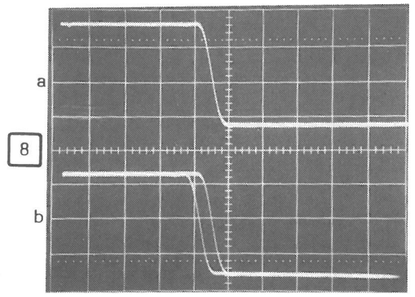
(3) 2V/div. 5ms; delayed 50us/div.
Sync separator field output.



7

a: 0.5V/div. 0.1us/div.
TCXO ref. present

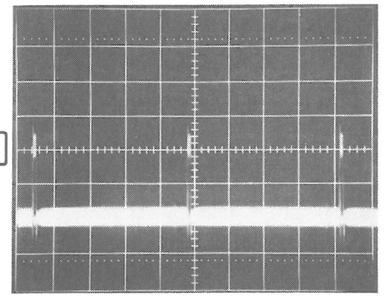
4 b: 1V/div. 20us/div.
Program signal present



8

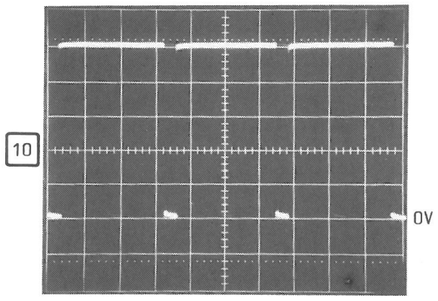
0.1V/div. 10us; delayed 0.5us/div.
a: R133 correctly adjusted

b: R133 misadjusted



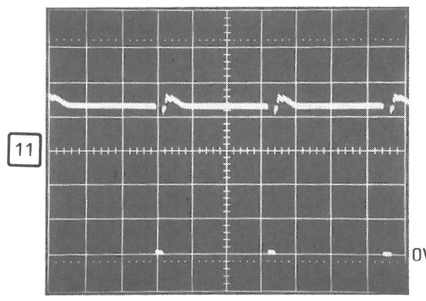
9

8 1V/div. 10us/div. var.
Burst-lock.



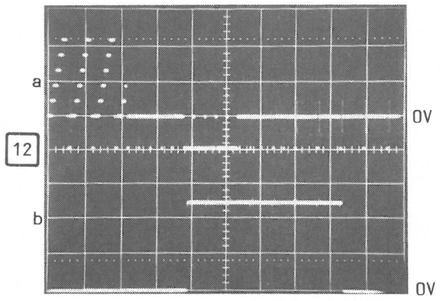
10

1V/div. 20us/div.
FH pulses.



11

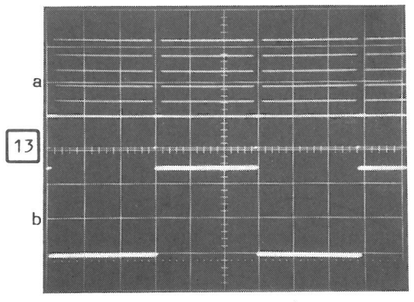
1V/div. 20us/div.
FH delayed pulses.



12

a: Program out 0.2V/div. var.

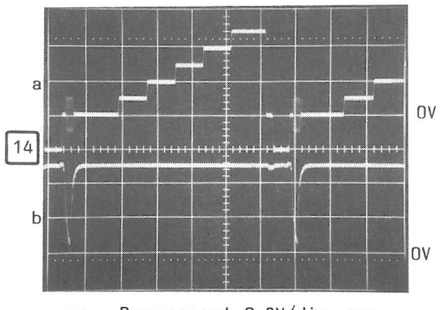
b: 19c Ext. field ref. output
2V/div. 5ms; delayed 0.1ms/div.



13

a: Program out 0.2V/div. var.

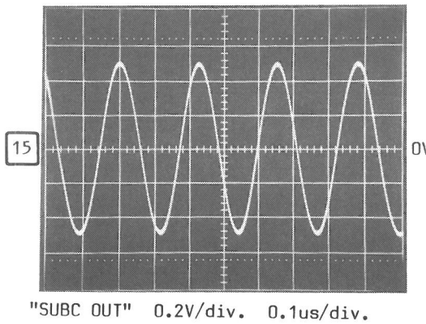
b: 27c Field identity pulses
2V/div. 5ms/div. var.



14

a: Program out 0.2V/div. var.

b: 28a Clamp key out
2V/div. 10us/div



15

"SUBC OUT" 0.2V/div. 0.1us/div.

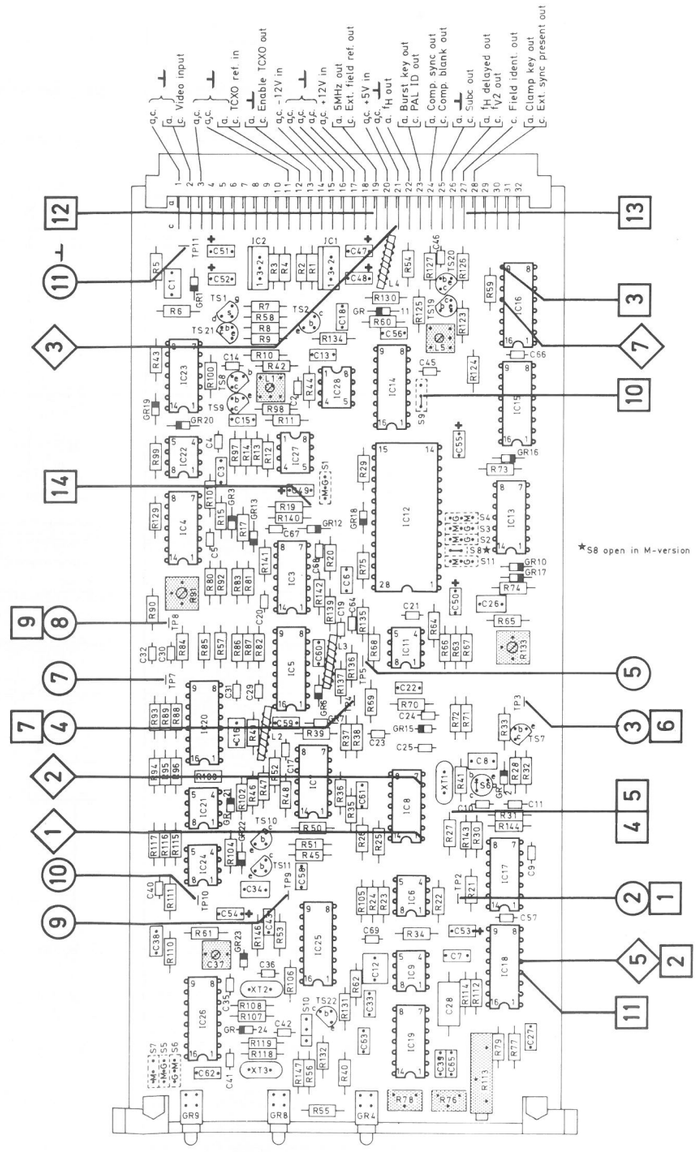


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Fig. 14-7 Adj. elements, sync generator, unit 3

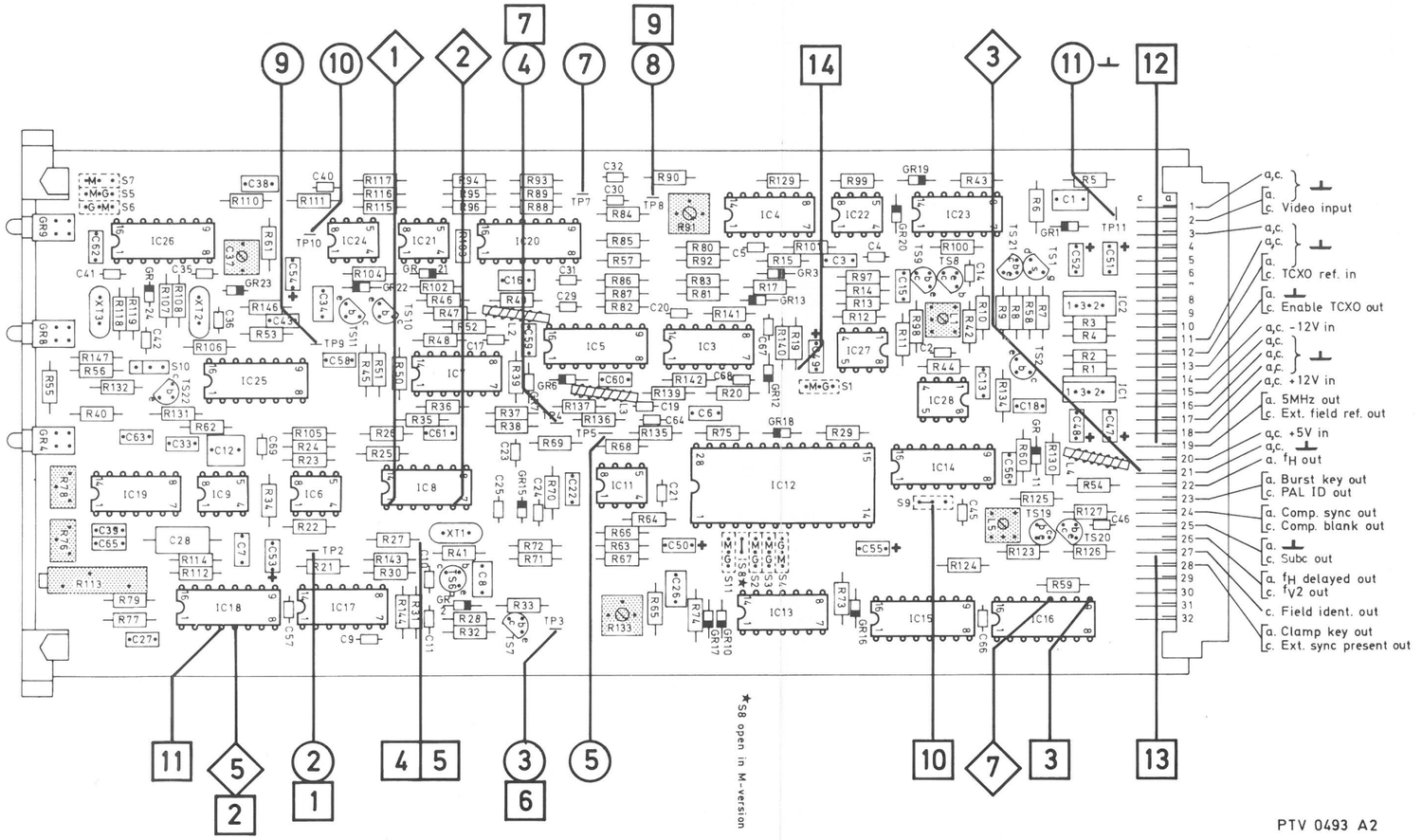


Fig. 14-8 Check points, sync generator, unit 3

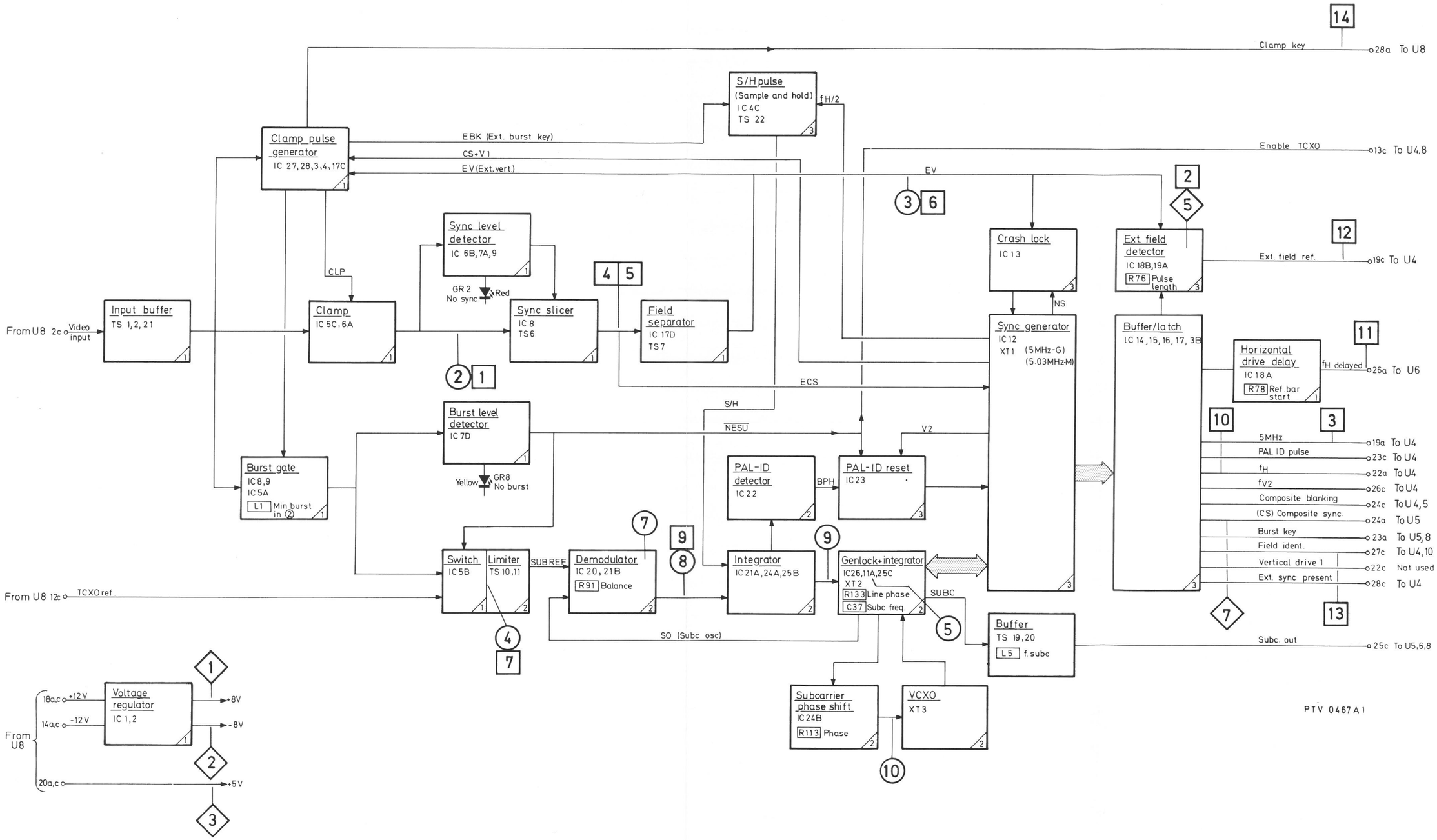
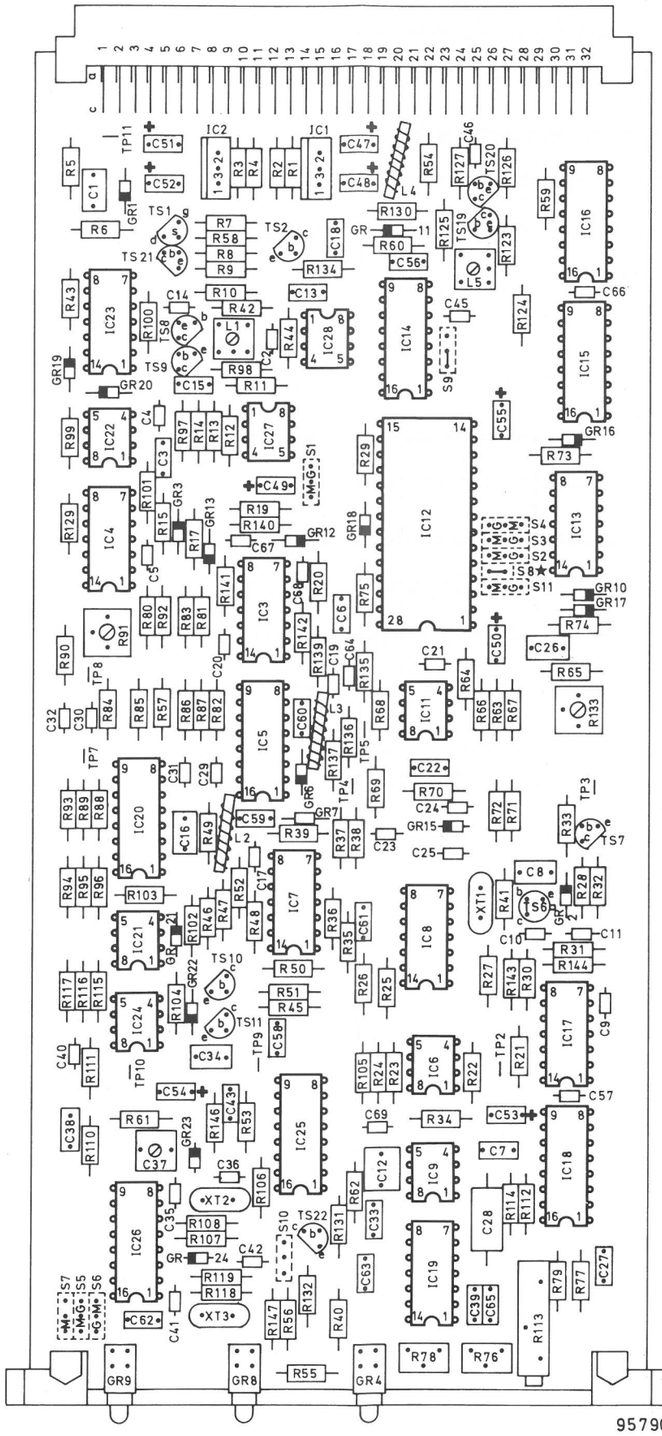
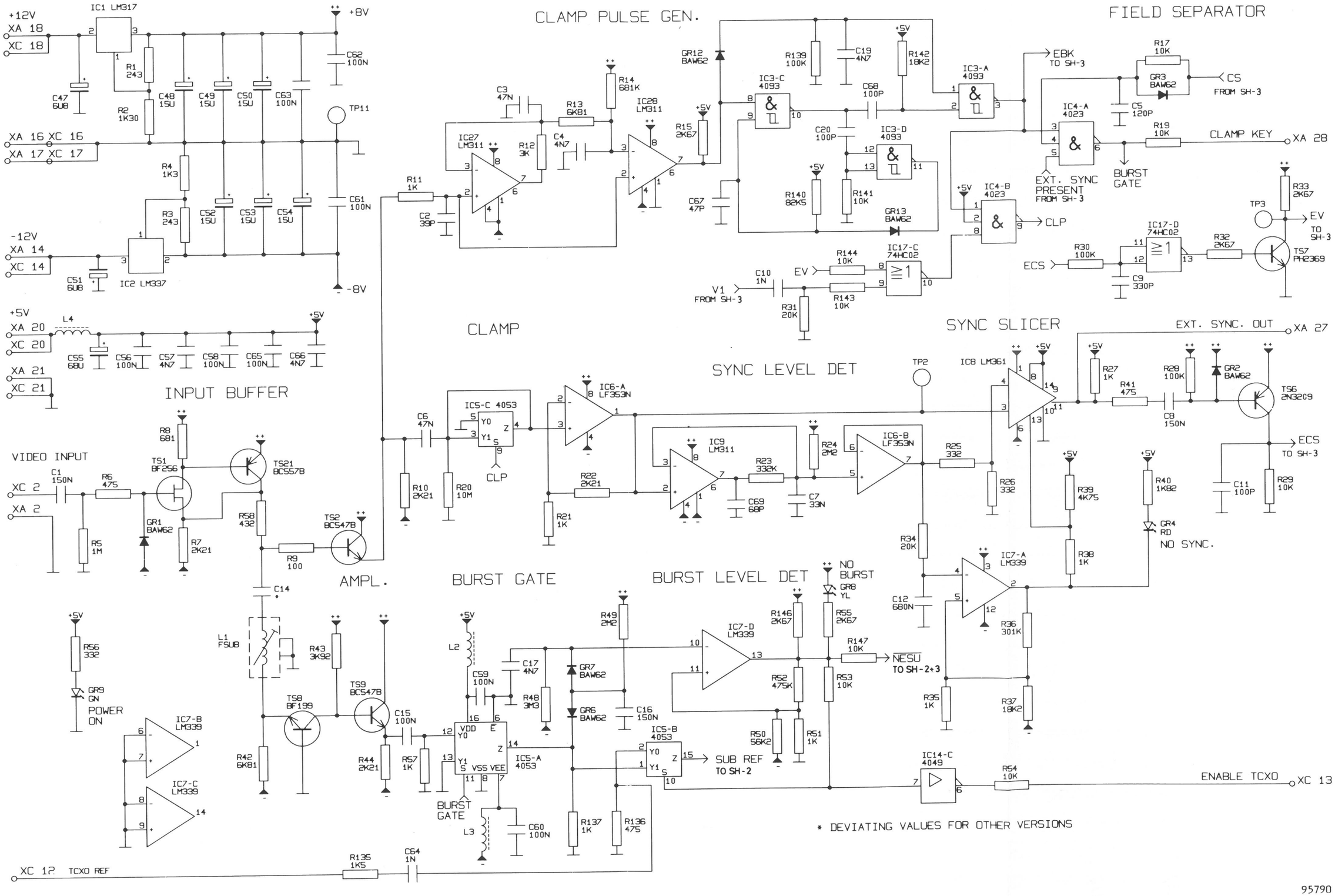


Fig. 14-9 Block diagram, sync generator, unit 3



★S8 open in M-version

Fig. 14-10 Component location, sync generator, unit 3



95790

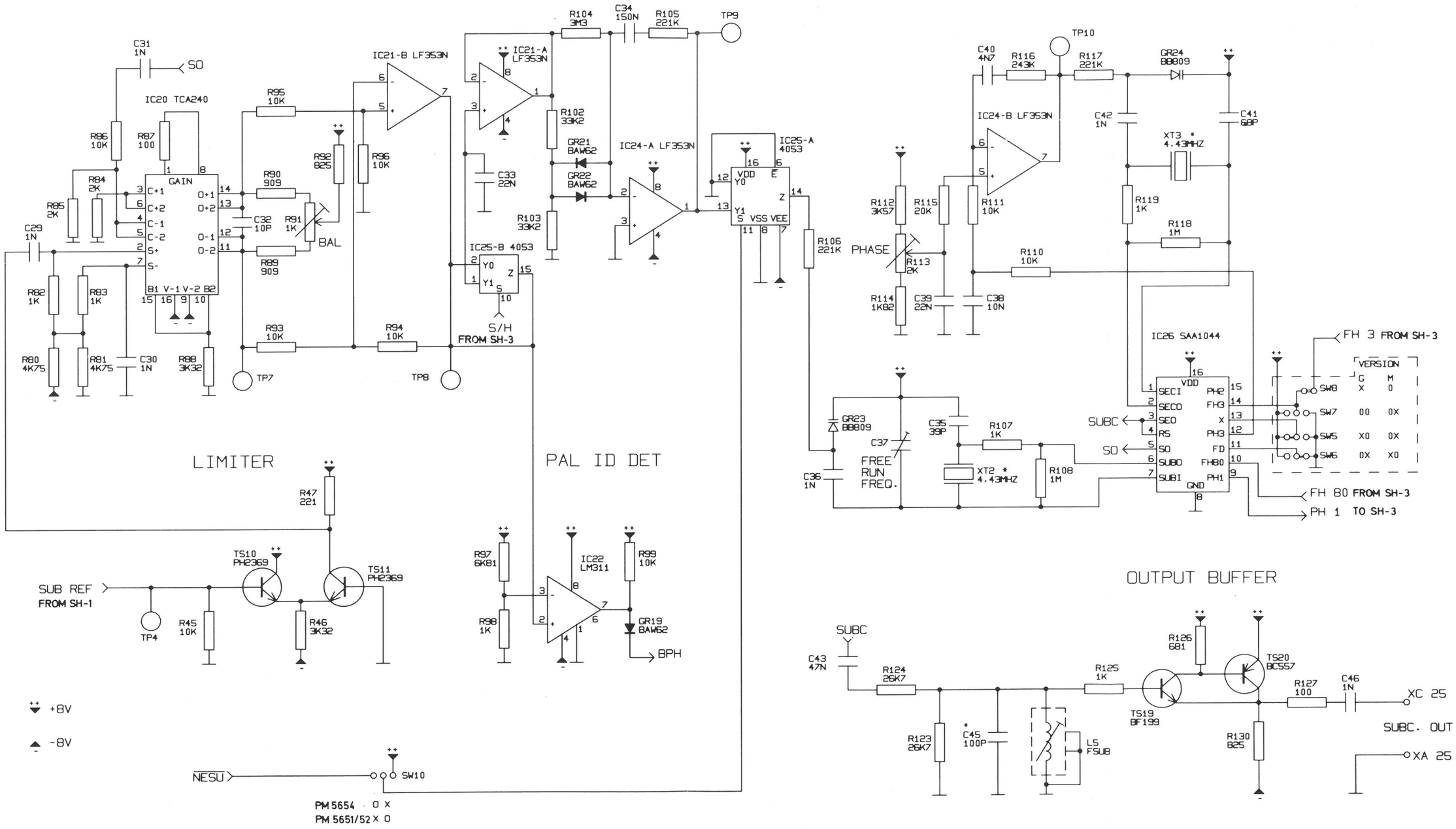
Fig. 14-11 Circuit diagram, sync generator, unit 3, sh. 1

DEMODULATOR

INTEGRATOR

SUBC PHASE SHIFT

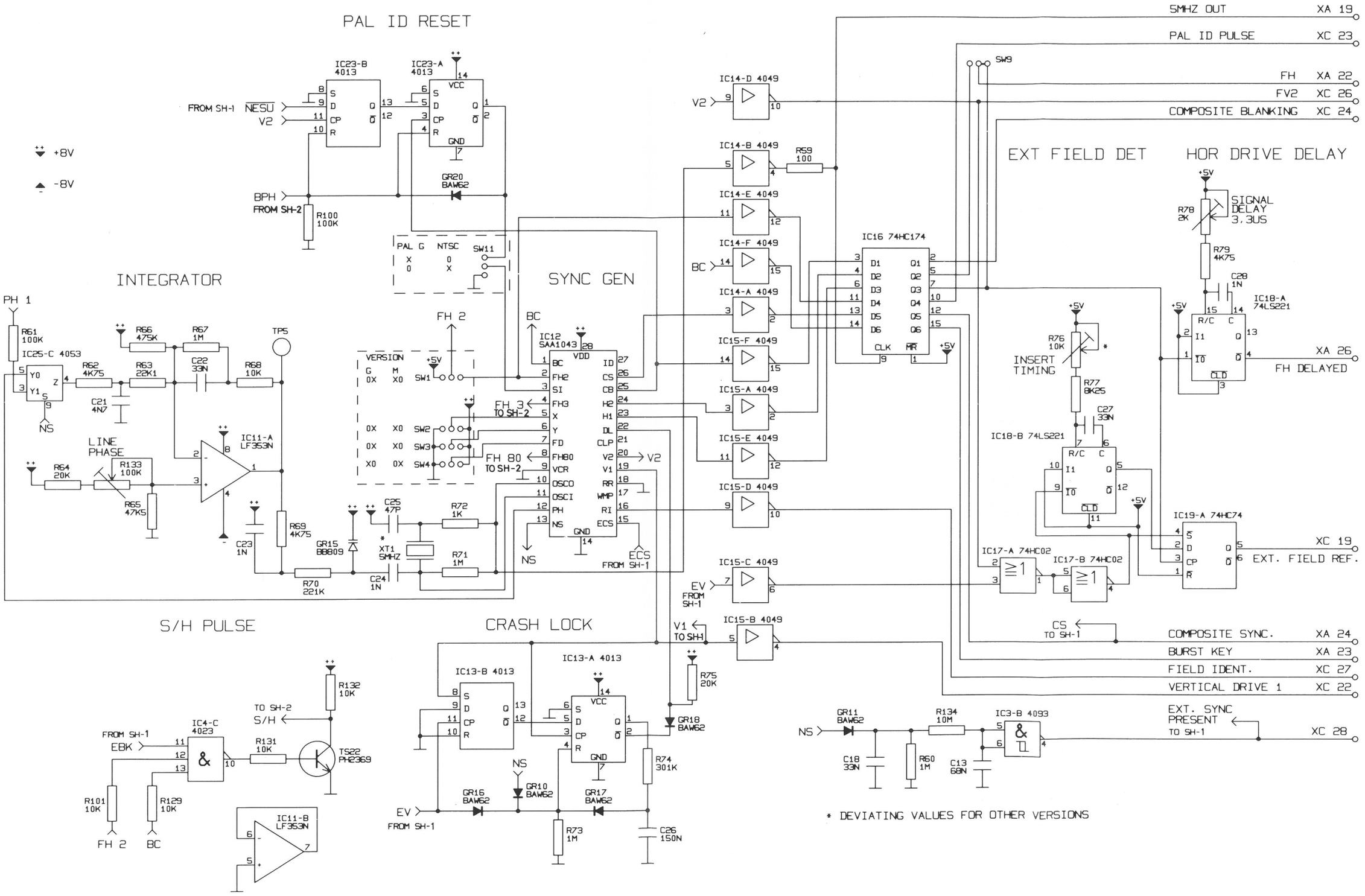
GEN LOCK



* DEVIATING VALUES FOR OTHER VERSIONS

95790

Fig. 14-12 Circuit diagram, sync generator, unit 3, sh. 2



95790

Fig. 14-13 Circuit diagram, sync generator, unit 3, sh. 3

15. Unit 4 - system control

The system control is the keystone unit in PM 5654. The main part is the microprocessor (CPU) which constantly transmits and receives status information (on the lines TXD/RXD) to/from the keyboard & display, unit 7 and from that controls the generation and insertion of VITS. On how to select/store (non-volatile memory, IC26 EEPROM) signals, please refer to Chapter 8, operating instructions.

Software functions are:

1. To read the functional conditions of the instrument by looking at the logic outputs from the sync generator.

1a. In addition to this, to read the incoming flags from the source code and VITS detectors if PM 8538 - unit 10 is installed.

2. To control the By-pass relay and substitution switch (unit 8) after reading 1 as the well the function selected (unit 7).

3. To control the programmed VITS to be inserted in the correct lines/fields; refer to [4] .

3a. To activate the source code and VITS detectors in the programmed lines, if PM 8538 - unit 10 is installed.

4. To control the Full-field patterns with the possibility for jump/duty.

5. To selecting the control signal for the inserter switch (unit 8); refer to [6] .

6. To scan all switches (pushbuttons) to select the functions:
   Full-field signal and VITS programming.

7. To scan all 7-segment displays and all LEDs for indication of selected function, wanted function, missing signals etc.

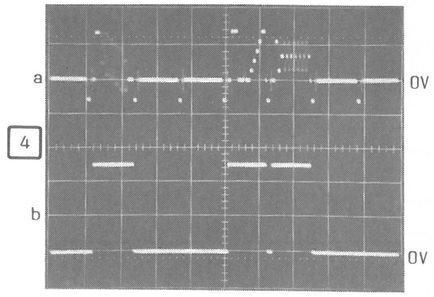
8. To control (via an I^2C bus from the remote interface) the main functions, Full-field signal selection, source code selection and in groups disable VITS insertion.

In case of service and if extension board is used, it is necessary to use the extension cable provided as interconnection to the keyboard & display, unit 7.

See also Chapter 23, service hints.

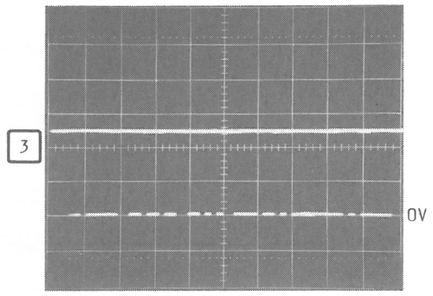
Adjustments

There are no adjustments on this unit.

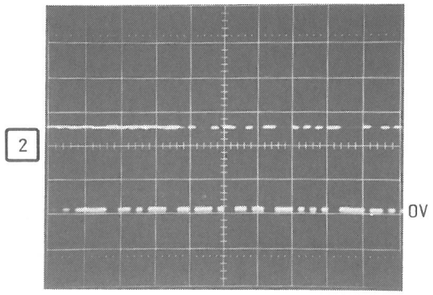


a: 0.5V/div. 5ms; delayed 50us/div.
Program out

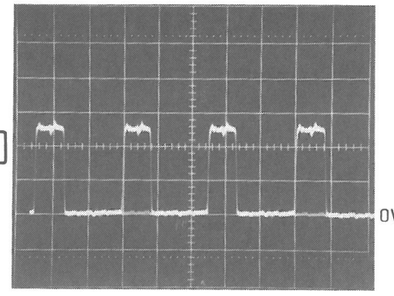
(7) (8) b: 2V/div.



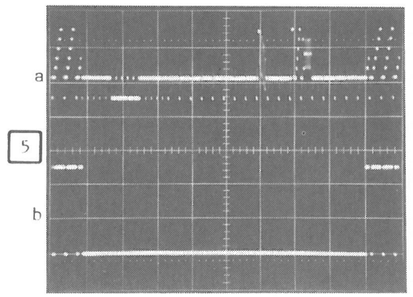
(4) 2V/div. 5ms/div.



(3) 2V/div. 5ms/div.

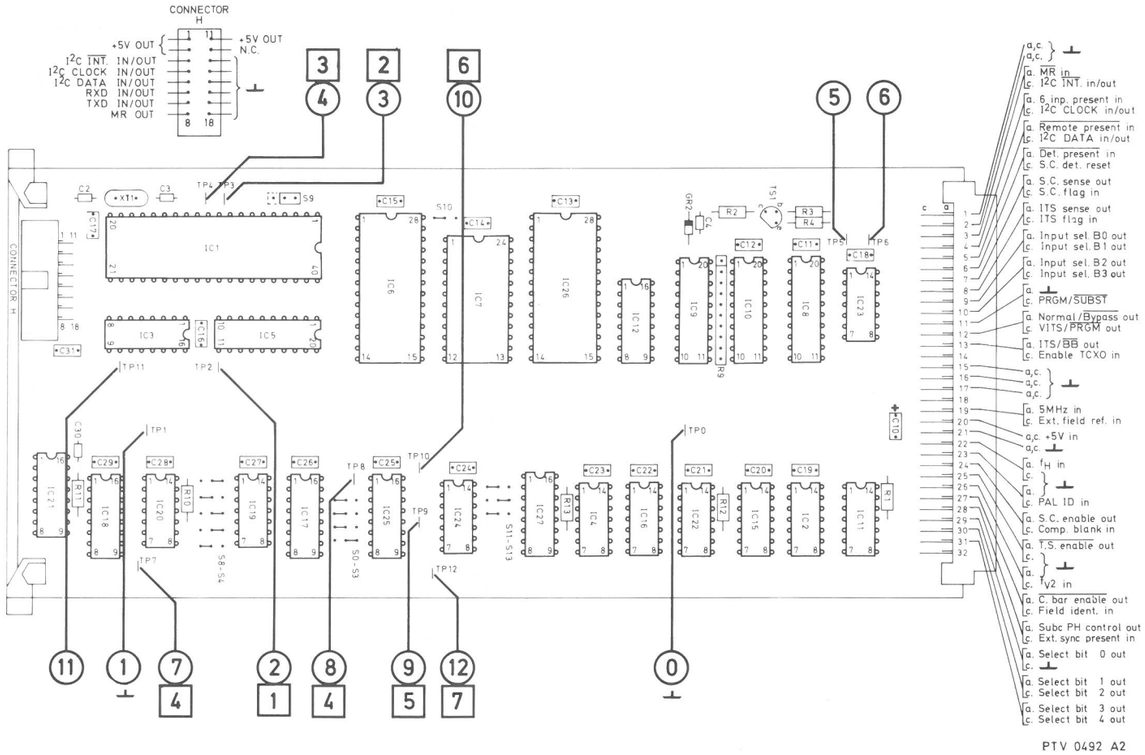


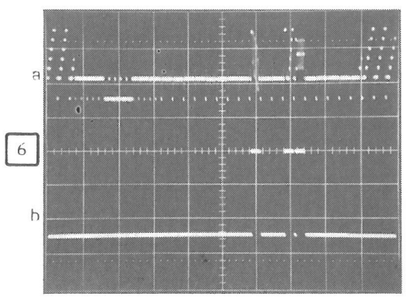
(2) 2V/div. 0.2us/div.



a: 0.5V/div. 5ms; delayed 0.2ms/div.
Program out

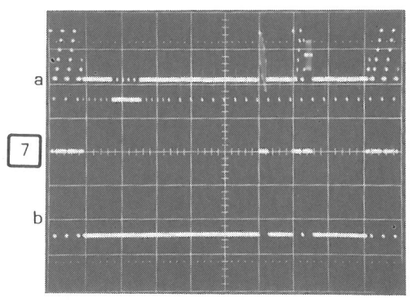
(9) b: 2V/div.





a: 0.5V/div. 5ms; delayed 0.2ms/div.
Program out

(10) b: 2V/div.



a: 0.5/div. 5ms; delayed 0.2ms/div.

(12) b: 2V/div.

Fig. 15-1 Check points, system control, unit 4

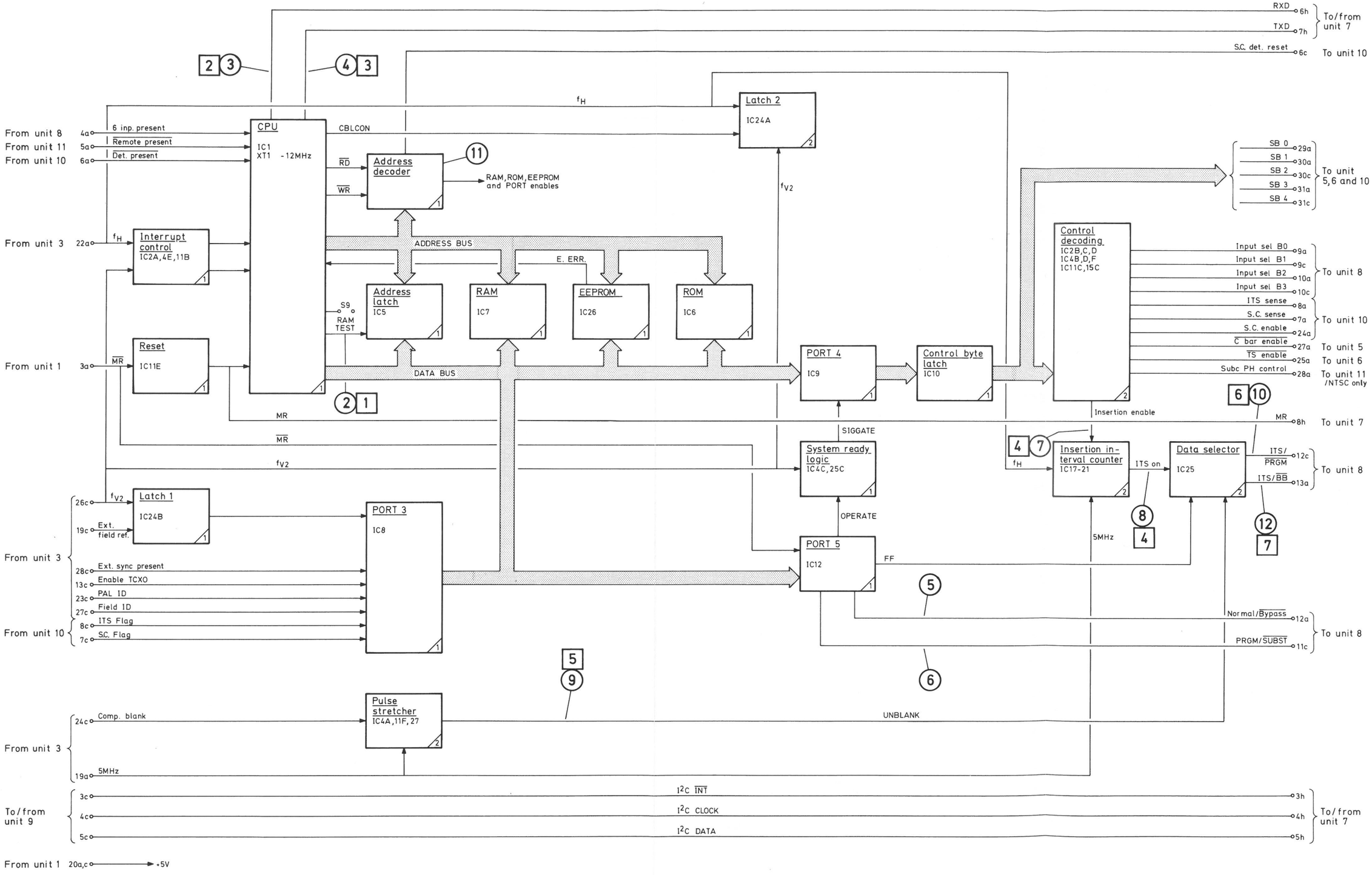


Fig. 15-2 Block diagram, system control, unit 4

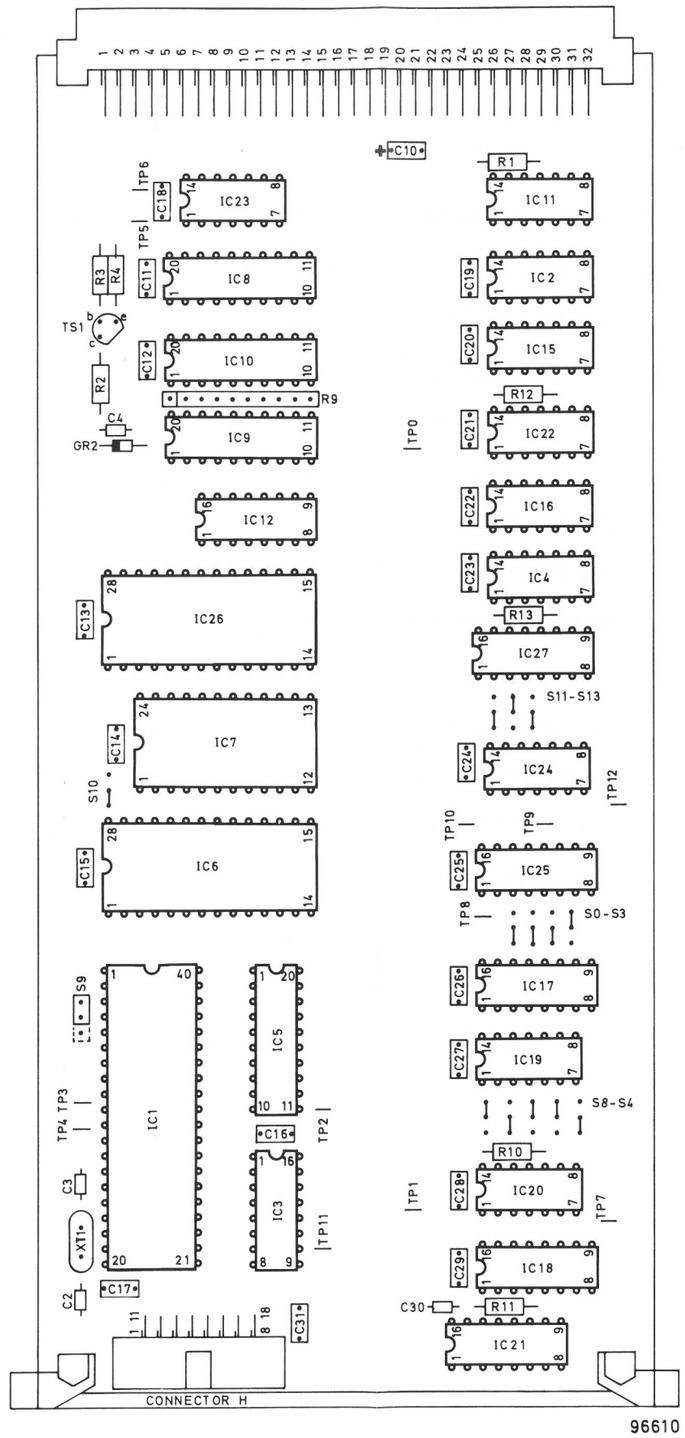
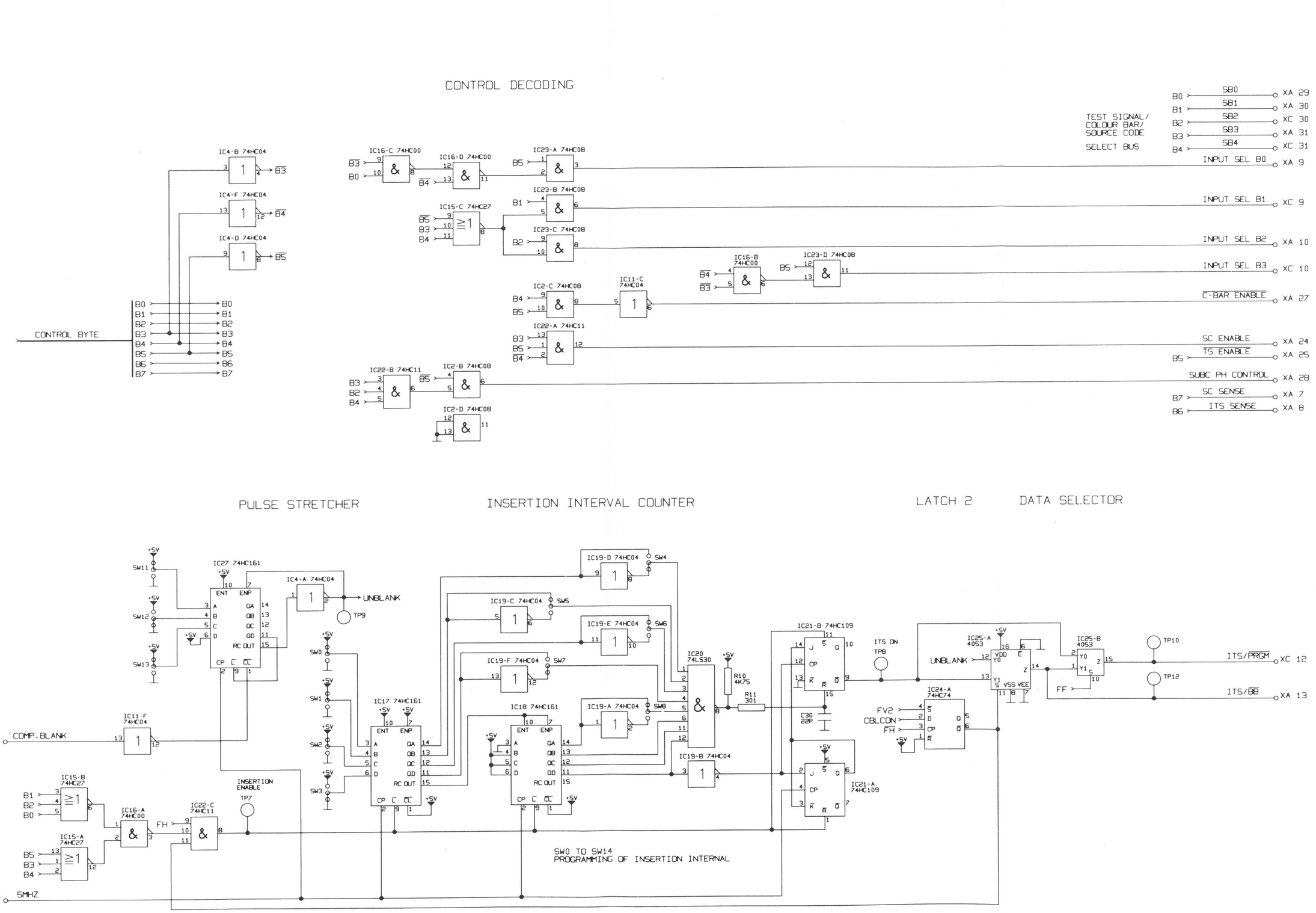
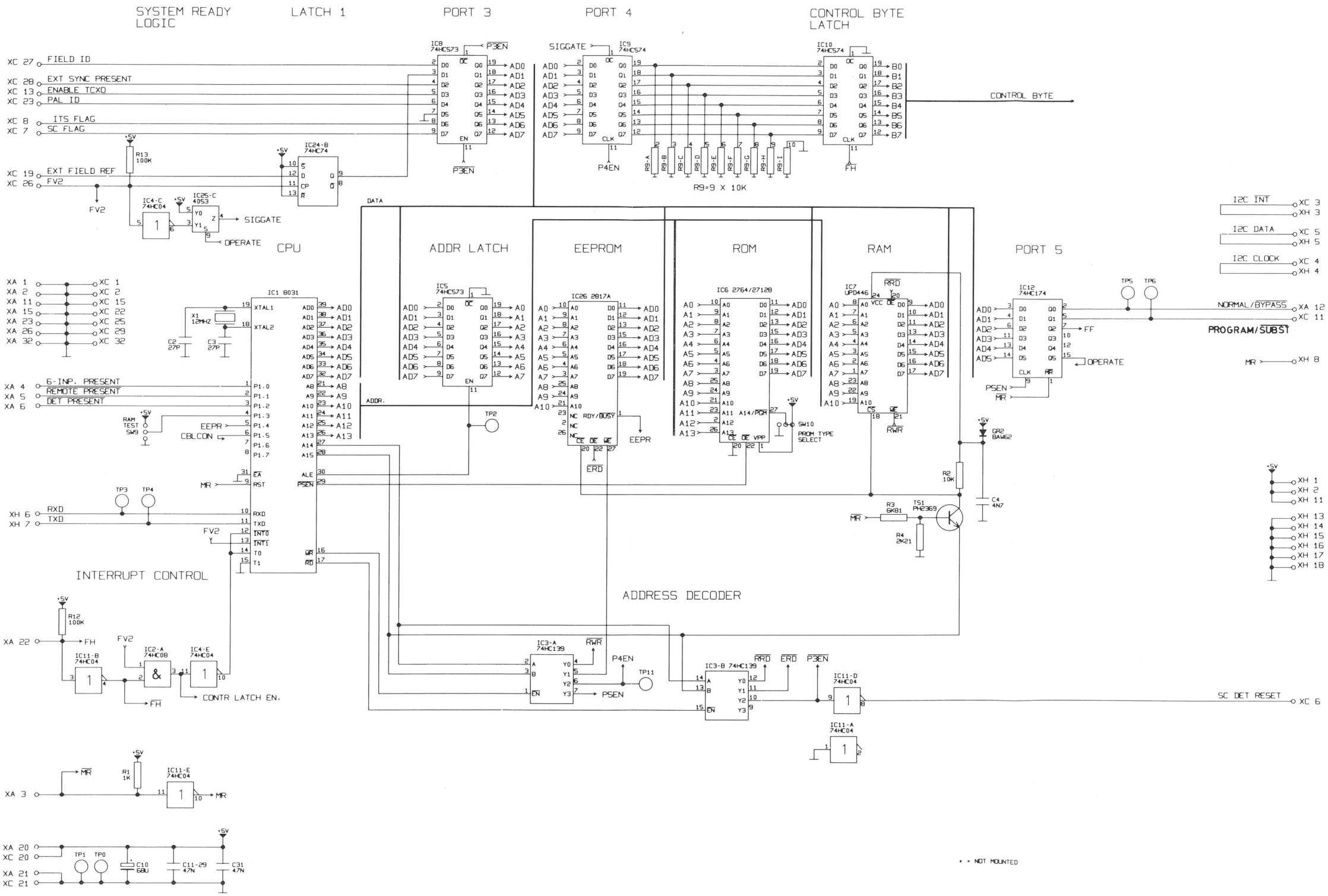


Fig. 15-3 Component location, system control, unit 4



96610

Fig. 15-4 Circuit diagram, system control, unit 4, sh. 1



96610

Fig. 15-5 Circuit diagram, system control, unit 4, sh. 2

16. Unit 5 - black burst/color bar generator

On how to select the color bar as Full-field or insertion/substitution signal, please refer to Chapter 8, operating instructions.

Block diagram description

The unit contains a single digital generator in which the digital values for Y, B-Y and R-Y are stored. The generator is controlled by the CPU on unit 4 (SB0-SB3). The trailing edge of the sync starts the PROM counter. Clock frequency is 5MHz. The series DATA in the PROM are clocked into the latches (IC10, 12, 14) in the order R-Y, B-Y and Y. On the fourth byte (Y3, from IC8A) the output latches (IC11, 13, 15) bring the data to the D/A converters simultaneously (Y-delayed by IC5B, adjustable by R8). The timing of the signals is thus correct on the output; refer to [2] . It should be noted that the burst is always present regardless whether color bar inselected or not.
In the burst switch, color bar is suppressed (grounded in TS17), controlled by the burst key pulse; refer to [7] and [9] . In the summing amplifier, composite sync is added to the burst signal. In M-version, set-up (derived from composite blanking) is added in the summing amplifier; refer to [10] . The composite sync is derived from the 1 bit D/A converter and the flip-flop IC23A controlled by the comp. sync from unit 3 and the 5MHz clock pulse. The darlington coupling (TS7,8) in the inverting amplifier is supplied with -12V to achieve the 4Vpp (75ohm) output signal; refer to [8] . The darlington coupling provides also hum suppression of the unregulated -12V.

A color test bar for check of the quadrature modulators can be selected by pressing 2ND, DUTY and CBAR simultaneously; refer to fig. 16-1 and fig. 16-2 in the adjustment procedure.

Test and adjustments

Measuring equipment :

Oscilloscope	: e.g. Philips PM 3217
Digital voltmeter	: e.g. Philips PM 2528
Video generator	: e.g. Philips PM 5570
Video level meter	: e.g. Philips PM 5548
Vectorscope	: e.g. Philips PM 5567
Function generator	: e.g. Philips PM 5134

A. Voltage checks

1. Using a digital voltmeter, check for +8V ±0.4V on ◇1◇.
2. Using a digital voltmeter, check for -8V ±0.4V on ◇2◇.
3. Using a digital voltmeter, check for +5V ±0.2V on ◇3◇.

B. Adjustments

1. 3xfsubc filter

- Remove sync generator (unit 3).
- Connect the oscilloscope (term. 75ohm) to "FULL-FIELD OUT".
- Apply a sinewave of 13.30MHz (G)/10.74MHz (M) to centre pin of S3 (See check point sheet).
- Adjust L7 to minimum amplitude of 3xfsubc.
- Insert sync generator (unit 3).

2. R-Y filter response.

- No video signal needs to be applied.
- Connect the oscilloscope (5us/div. var.) to (4).
- Select CBAR Full-field signal.
- Check that there is no overshoot; refer to [4].
- If not OK, adjust L2.

3. B-Y filter response.

- No video signal needs to be applied.
- Connect the oscilloscope (5us/div. var.) to (5).
- Select CBAR Full-field signal.
- Check that there is no overshoot; refer to [5].
- If not OK, adjust L3.

4. Luminance filter response

- No video signal needs to be applied.
- Connect the oscilloscope (5us/div. var.) to "FULL-FIELD OUT".
- Select CBAR Full-field signal.
- Check that there is no ripple/overshoot on white reference bar.
- If not OK, adjust L5 and L6.

5. Sync amplitude

- No video signal needs to be applied.
- Connect the video level meter to "BL BURST OUT".
- Select any of the main functions/any of the Full-field signals.
- Check that the amplitude is -300mV/-40IRE ±2%.
- If not OK, adjust R85.

6. Sync filter response

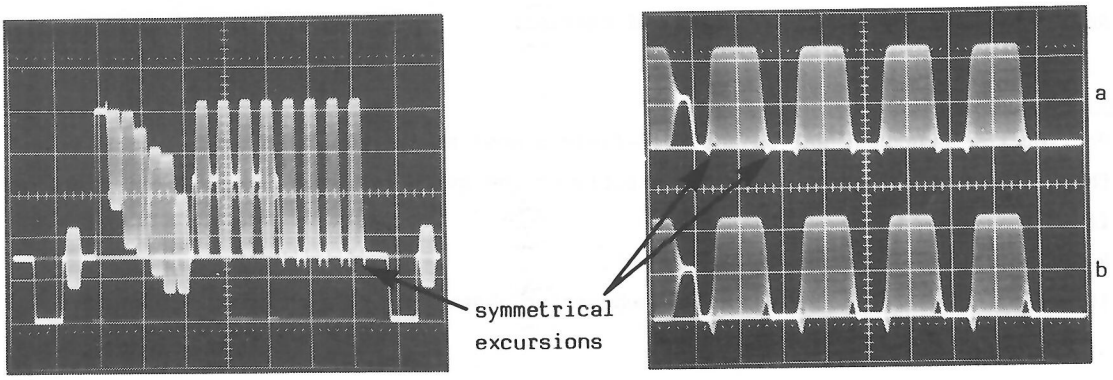
- No video signal needs to be applied.
- Connect the oscilloscope (term. 75ohm, 10us/div.) to "BL BURST OUT".
- Check for minimum ripple/overshoot on sync pulse.
- If not OK, adjust L12 and L13.

7. Video amplitude

- Check first the program output amplifier on unit 8 (adjustments, item 2).
- No video signal applied.
- Connect the video level meter to "PROGRAM OUT".
- Select "FULL-FIELD" mode, CBAR.
- Check that the amplitude of the white reference bar is 700mV/100IRE ±0.5%.
- If not OK, adjust R16.

8. Chrominance/luminance delay

- No video signal needs to be applied.
- Connect the oscilloscope (term. 75ohm, 5us/div. var.) to "PROGRAM OUT".
- Select "FULL-FIELD" mode, color test bar (press 2ND, DUTY and CBAR simultaneously).
- Check for symmetrical excursions on the H-bars; refer to fig. 16-1.
- If not OK, adjust R8.



H-bars delayed 2us/div.
a: R8 correctly adjusted
b: R8 misadjusted

Fig. 16-1 Color test bar

9. Subcarrier phaseshift

- Check first subcarrier phase on unit 3 (adjustments, item 7).
- Apply a nominal video signal to "PROGRAM IN".
- Connect the vectorscope (externally synchronized from the same video source) to "PROGRAM OUT".
- Select "NORMAL" mode and place the burst vectors correctly on the vectorscope.
- Then select "FULL-FIELD" mode, color test bar (press 2ND, DUTY and CBAR simultaneously).
- Check that the vector on the V axis is exactly on the axis; refer to fig. 16-2.
- If not OK, adjust L1.

10. Pulse response

- Provide the same test set-up and Full-field signal as in item 9.
- Check that the green-magenta jump goes through 0.0 on the vectorscope, or observe the jump on the oscilloscope.
- If not OK, adjust L8.

11. Chroma amplitude

- Check first video amplitude, item 7.
- No video signal needs to be applied.
- Connect the oscilloscope (term. 75ohm, 5us/div. var.) to "PROGRAM OUT".
- Select "FULL-FIELD" mode, CBAR or color test bar (See item 9).
- Check that the yellow and cyan bars are at white reference bar level.
- If not OK, adjust R39 and R48.

12. Burst amplitude

- No video signal needs to be applied.
- Connect the oscilloscope (term. 75ohm, 10us/div.) to "BL BURST OUT".
- Select any of the main functions.
- Check that the burst amplitude is 300mVpp/40IRE ±3%
- If not OK, adjust R81.

13. Modulator balance

- No video signal needs to be applied.
- Connect the oscilloscope (term. 75ohm, 5us/div. var.) to "PROGRAM OUT".
- Select "FULL-FIELD" mode, CBAR or color test bar (See item 9).
- Adjust R38 and R47 to minimum residual carrier.

14. 90^{o} phase

- Provide the same test set-up and Full-field signal as in item 9.
- Check that the vector on U axis is exactly on the axis; refer to fig. 16-2.
- If not OK, adjust L4.
- Repeat the modulator balance adjustment.
- It may be necessary to readjust the subcarrier phaseshift (L1), item 9.

15. Delay equalizer

- Provide the same test set-up and Full-field signal as in item 9.
- Check that the burst phase difference "NORMAL/FULL-FIELD" is less than ±1°.
- If not OK, adjust L14 ("FULL-FIELD" mode).

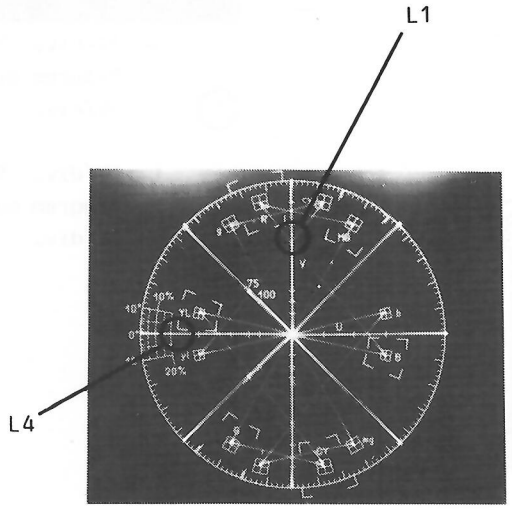
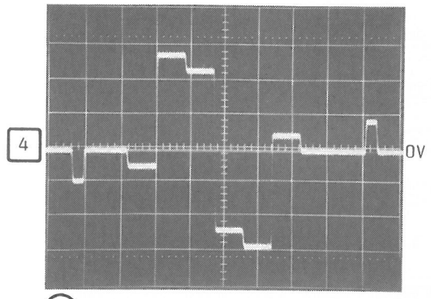
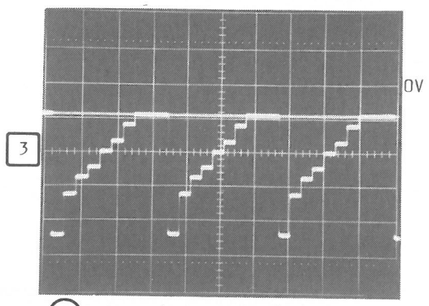


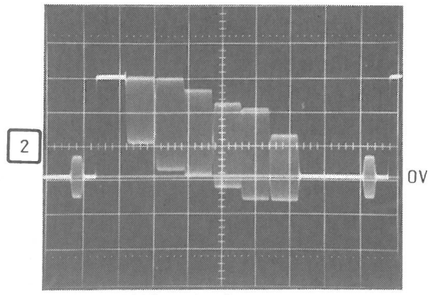
Fig. 16-2 Vector display, color test bar (G-version).



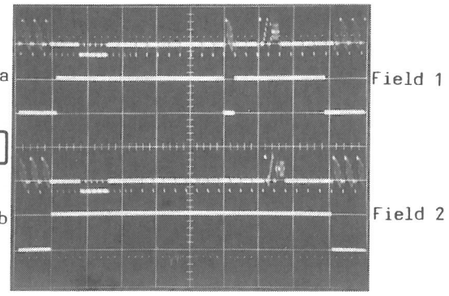
(4) 0.2V/div. 5us/div. var.
Color bar selected



(3) 0.2V/div. 20us/div.

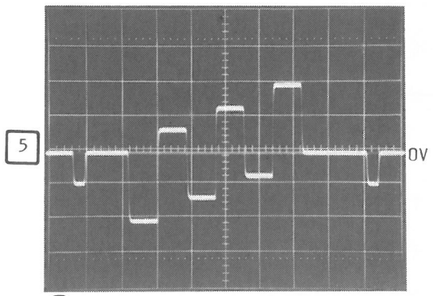


IC22, pin 8
0.5V/div. 5us/div. var.

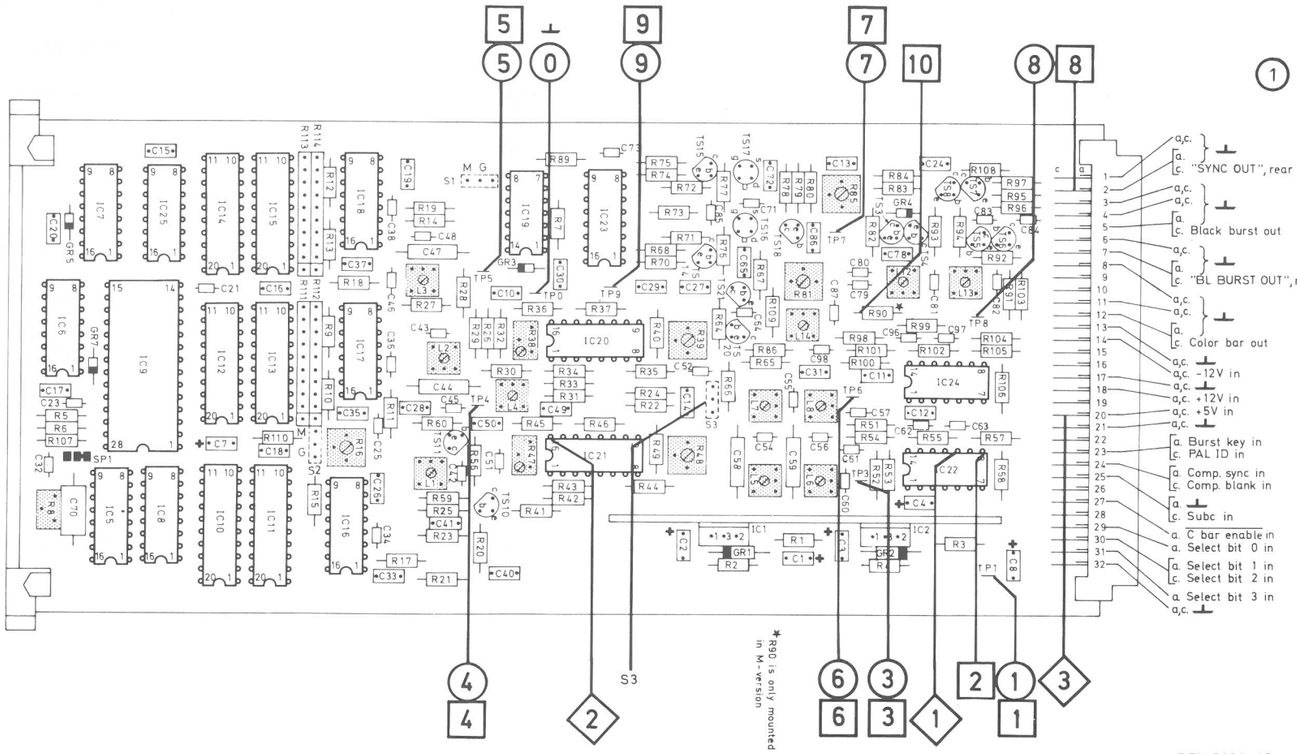


(1) a: 1V/div. 5ms; delayed 0.2us/div.
Program out "FULL-FIELD", CBAR.
5V/div.

b: 1V/div. 5ms; delayed 0.2us/div.
Program out "FULL-FIELD", CBAR.
5V/div.



(5) 0.2V/div. 5us/div. var.
Color bar selected



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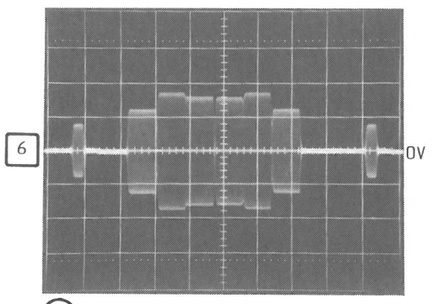
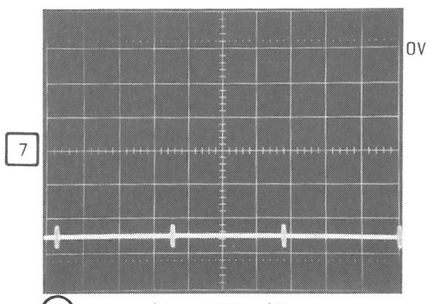
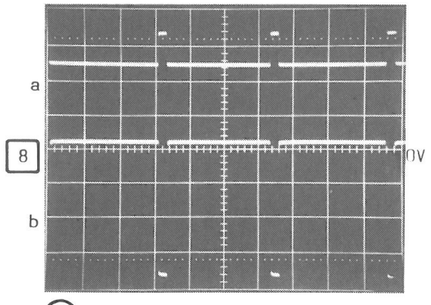


(6) 0.1V/div. 5us/div. var.

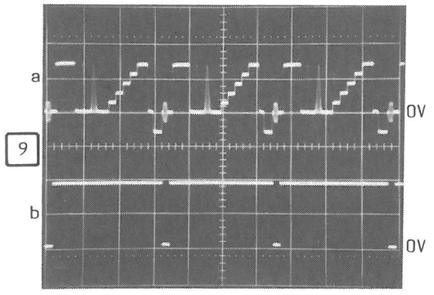


(7) 0.2V/div. 20us/div.



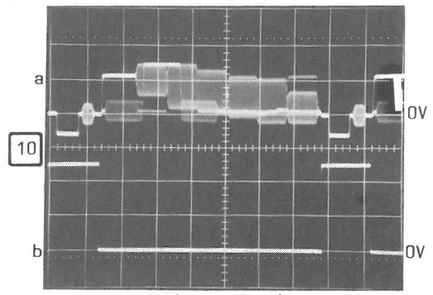
(8) a: 1V/div. 20us/div.
Composite sync

b: "SYNC OUT"
1V/div. 20us/div.
Composite sync out



(9) a: 0.5V/div. 20us/div.
Program out

b: 2V/div. 20us/div.
Burst key



a: 0.5V/div. 5us/div.var.
Program out
(M-version, Set-up)

b: R89/R90
2V/div. 5us/div. var.

Fig. 16-3 Check points, black burst/color bar, unit 5

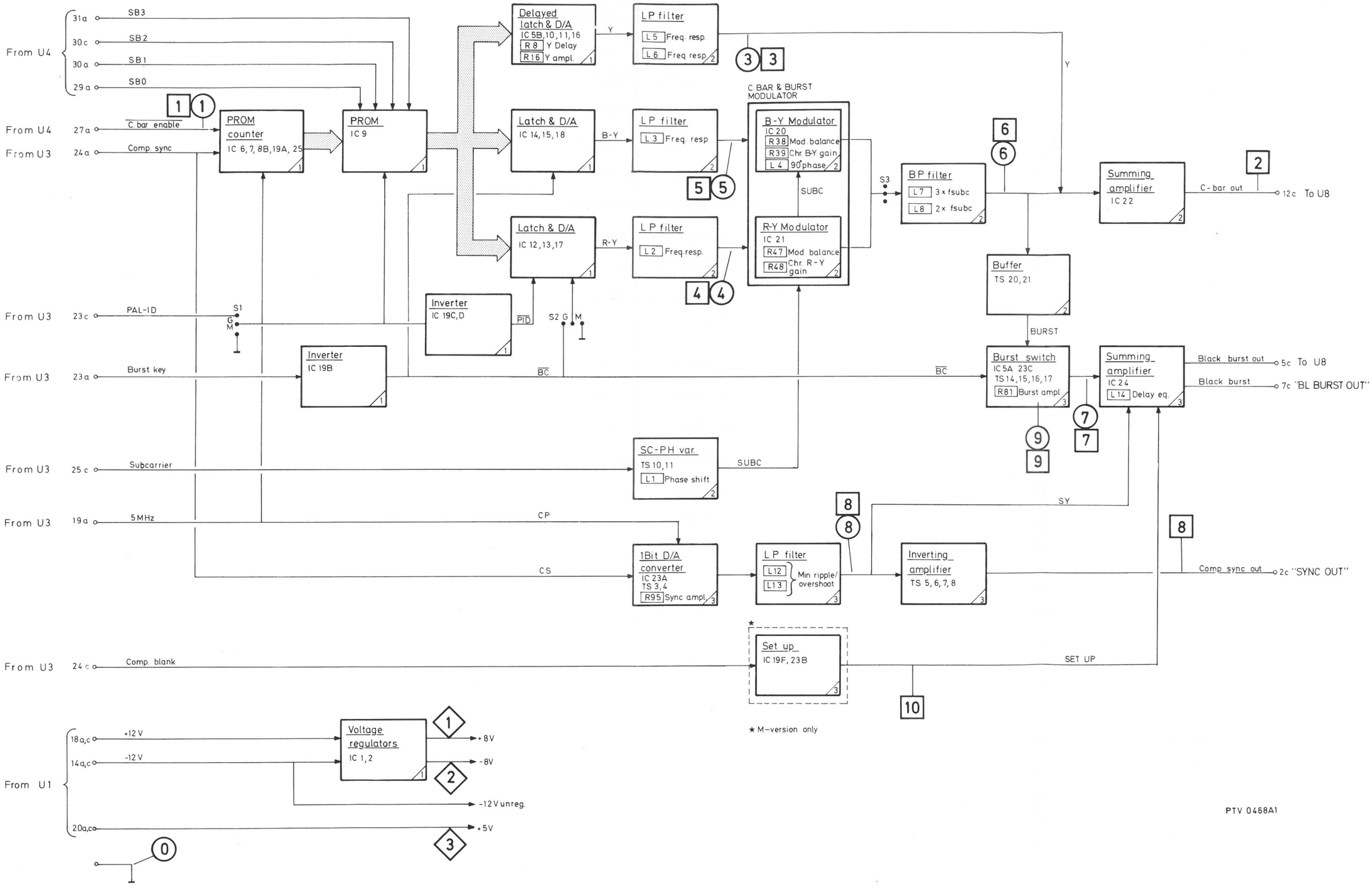
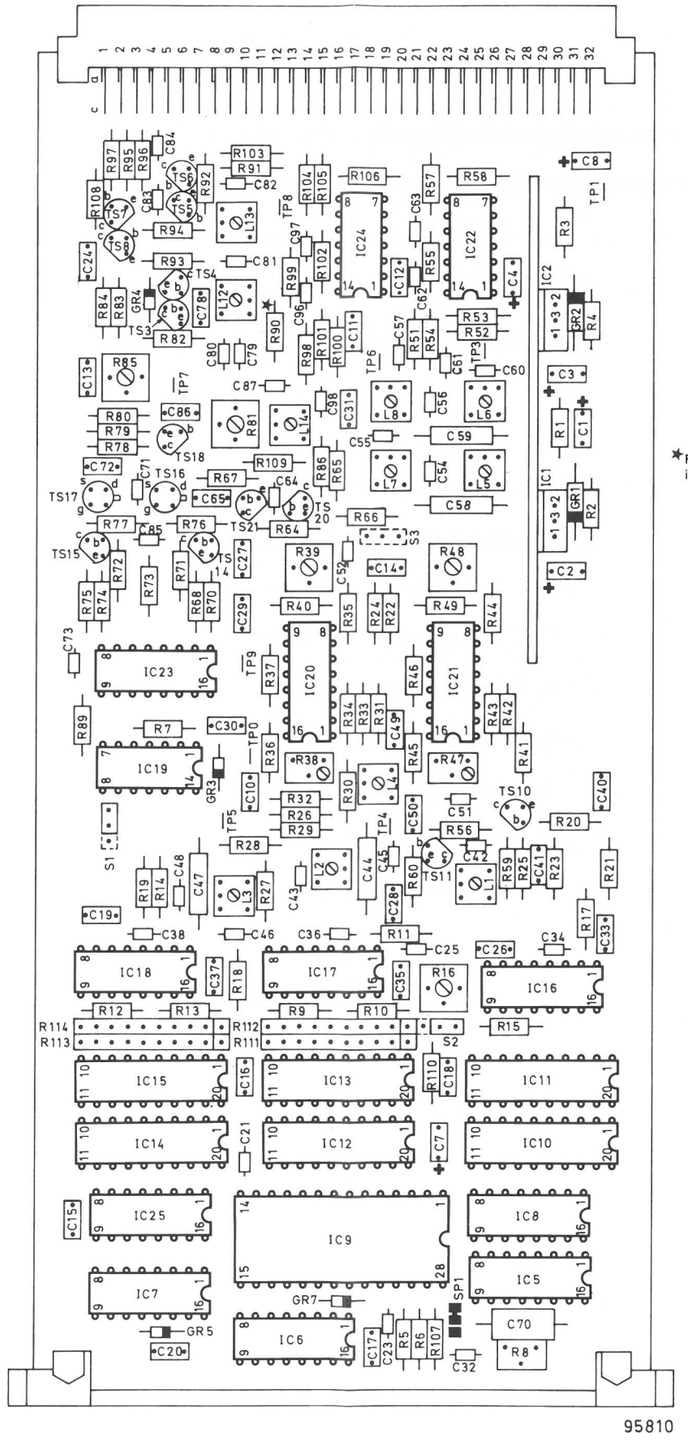


Fig. 16-4 Block diagram, black burst/color bar, unit 5



*R90 is only mounted in M-version

Fig. 16-5 Component location, black burst/color bar, unit 5

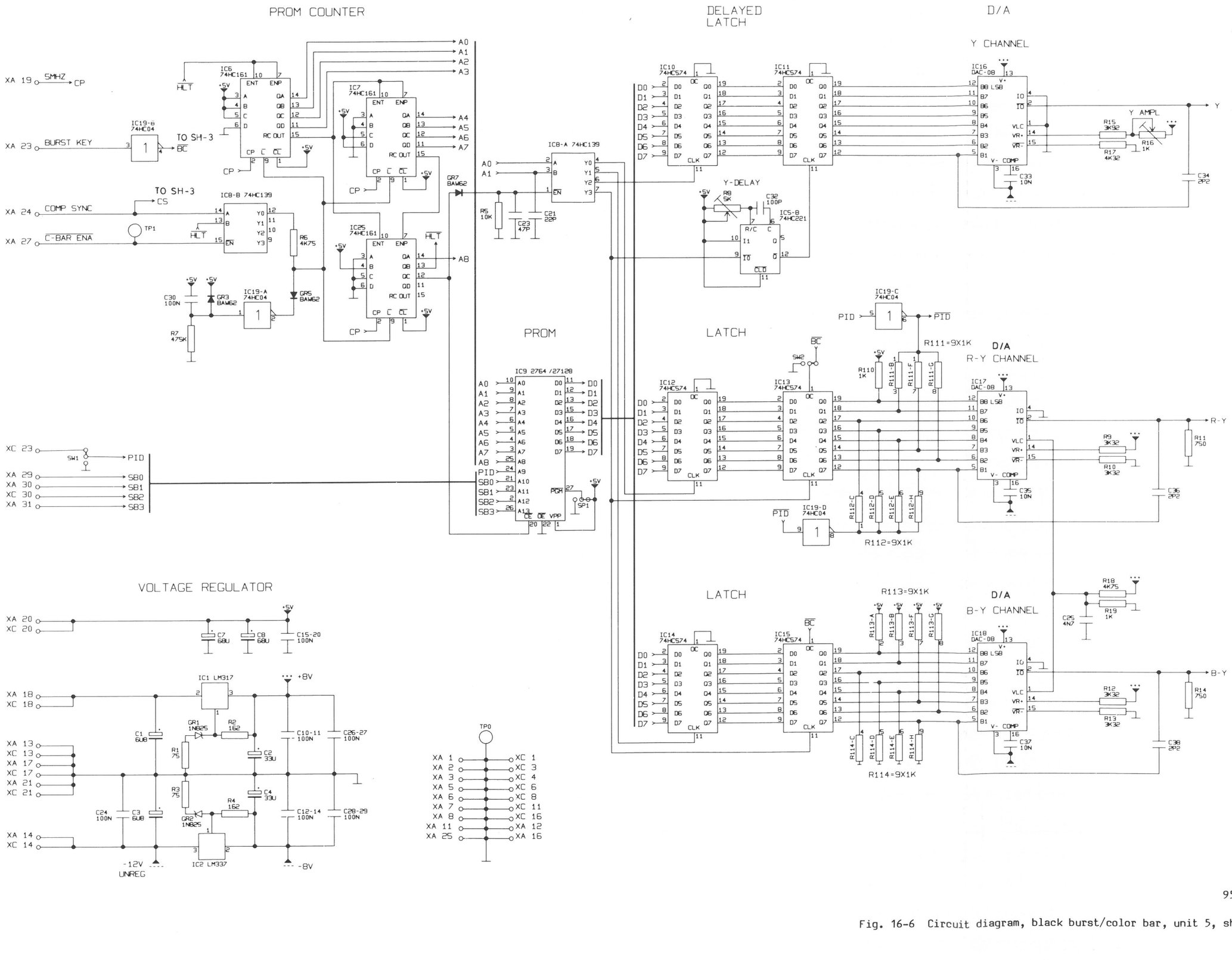


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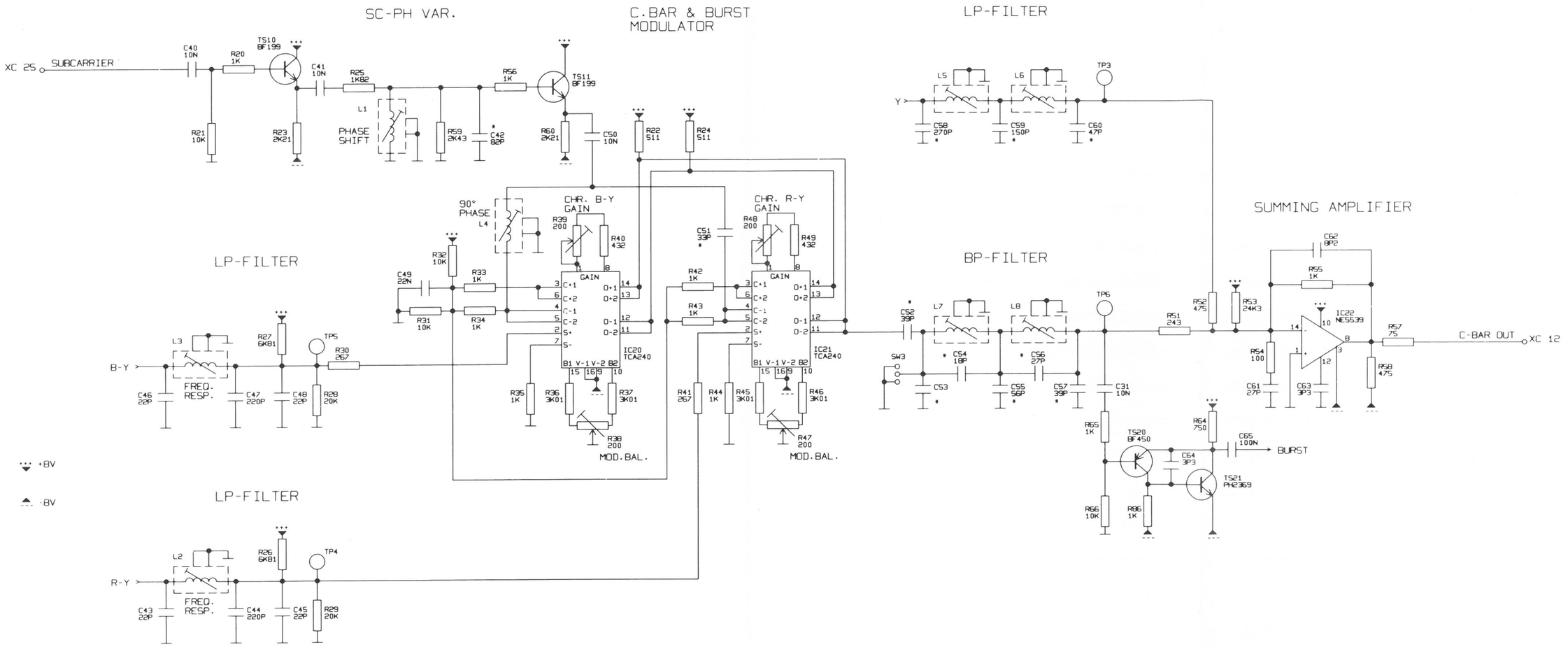
Fig. 16-6 Circuit diagram, black burst/color bar, unit 5, sh. 1



* DEVIATING VALUES FOR OTHER VERSIONS

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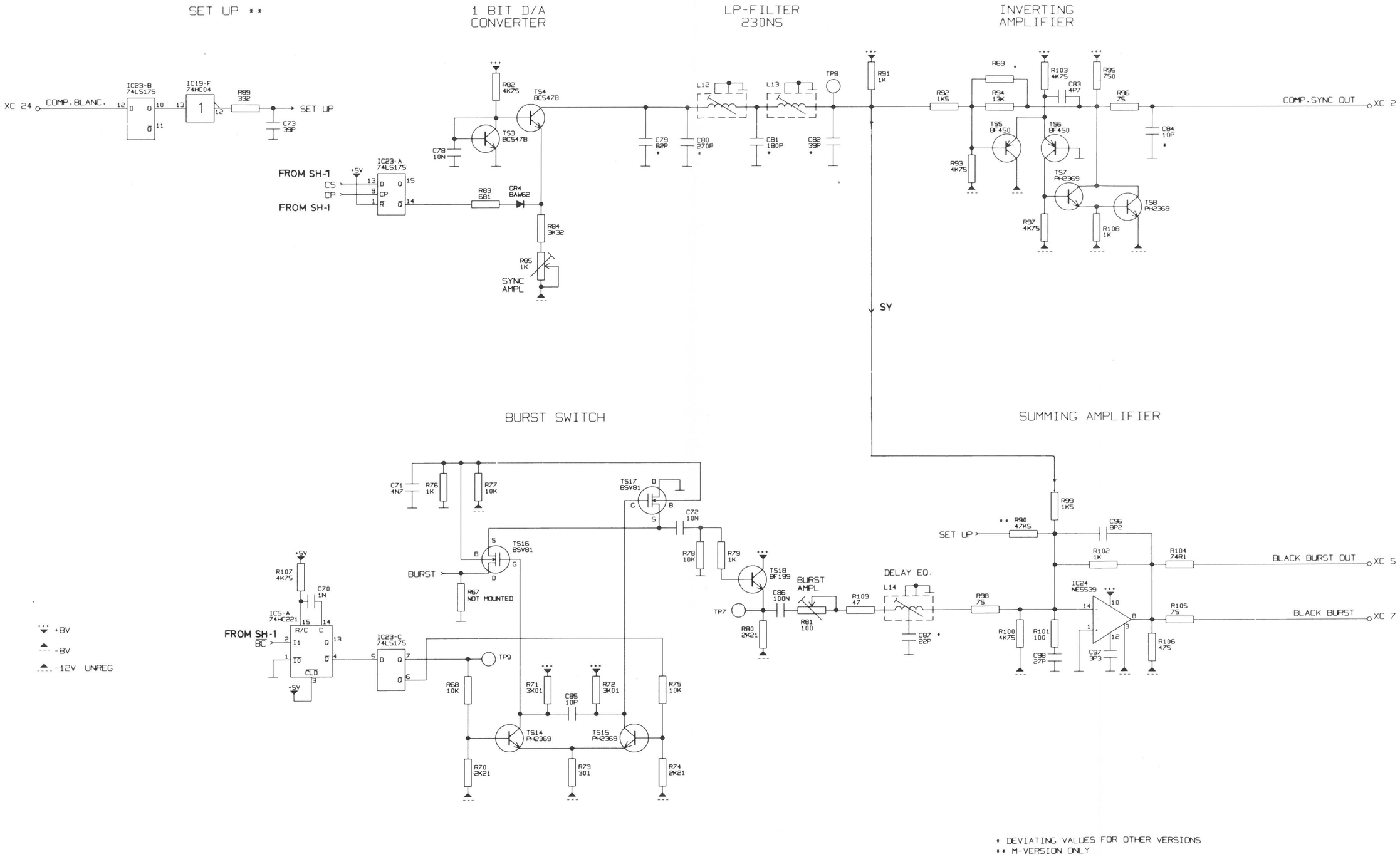
Fig. 16-7 Circuit diagram, black burst/color bar, unit 5, sh. 2



* DEVIATING VALUES FOR OTHER VERSIONS
** M-VERSION ONLY

95810

Fig. 16-8 Circuit diagram, black burst/color bar, unit 5, sh. 3

17. Unit 6 - test signal generator

On how to select the various test signals as Full-field or insertion/substitution signals, please refer to Chapter 8, operating instructions.

Block diagram description

The test signal generator produces all the test signals, except for the color bar, which are to be inserted into the applied video signal. The unit contains two digital generators, one for the luminance and one for the chrominance. The luminance information which is stored in a PROM is converted to an analogue signal and fed to a summing amplifier. In the same way is the chrominance information also converted to an analogue signal and modulates the color subcarrier. The resulting chrominance signal is fed to the summing amplifier where it is added to the luminance signal (refer to [3], [6], [7], [8]).

The test signal generator is controlled by the CPU on unit 4 via the start address PROM.
The digital values for the test signals are fed to bit reduction circuits IC12 and 18 (0Q500), in order to save memory space in the PROMs. Each line is divided into segments.
When a segment has to be retained, the PROM sets a flag and the output latch holds the information. The flag (FE) is followed by an information about the delay "length", which controls the delay counter.
An extra flag detector is mounted in the luminance circuit to detect an FF-pulse which comes at the end of every line, for the purpose of loading the PROM counters.

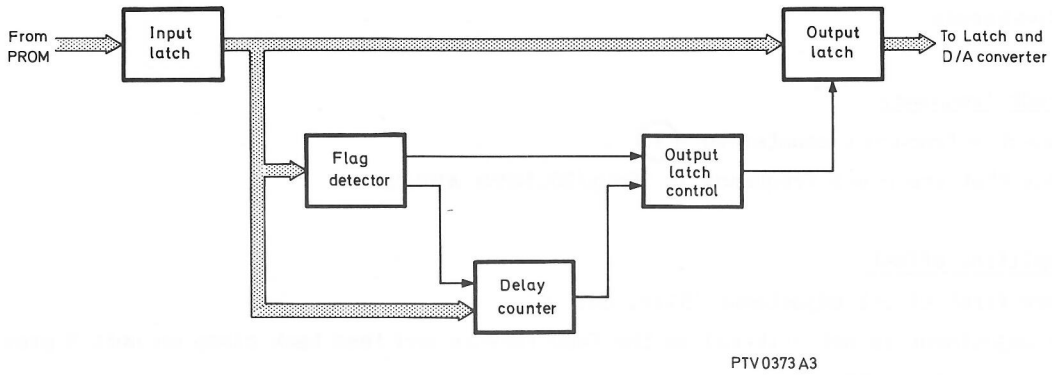


Fig. 17-1 Principle block diagram 0Q500.

From this circuit the digital values are via a latch fed to a D/A-converter where it is changed into an analogue signal. (The D/A-converter in the luminance circuit has a built-in latch). After the analogue signals have been combined in the summing amplifier, the test signal is fed to the input preselector on unit 8 (refer to [8]).

The clock pulse oscillator (VCO) provides 20MHz clock pulses for the luminance circuit and 5MHz clock pulses for the chrominance circuit. The VCO is phase-locked to the sync regenerator on unit 3 via the FH delayed pulse. This delayed pulse is used so that the phase comparison takes place in the middle of the sync pulse. A pulse stretcher (IC1B) is inserted in front of the phase comparator because of the short pulses (50ns) it gets from the bit reduction circuit.

Test and adjustments

Measuring equipment:

Oscilloscope	: e.g. Philips PM 3217
Digital voltmeter	: e.g. Philips PM 2528
Video level meter	: e.g. Philips PM 5548
Frequency counter	: e.g. Philips PM 6670
Spectrum analyser	: e.g. HP8557
Video generator	: e.g. Philips PM 5570
Vectorscope	: e.g. Philips PM 5567

A. Voltage checks

1. Using a digital voltmeter, check for +8V ±0.4V on ◇1◇ (IC20 Pin 13).
2. Using a digital voltmeter, check for -8V ±0.4V on ◇2◇ (R44).
3. Using a digital voltmeter, check for +5V ±0.2V on ◇3◇ (IC4 Pin 11).
4. Using a digital voltmeter, check for -5V ±0.2V on ◇4◇ (IC13 Pin 23).
5. Using a digital voltmeter, check for +5V ±0.2V on ◇5◇ (connector Pin 20a,c).

B. Adjustments

1. Clock frequency

- Connect a frequency counter to (1) .
- Check that the clock frequency is 20MHz/20.14MHz ±10kHz.

2. Amplifier offset

- Check first offset adjustment (R124, unit 8).
- The adjustment is not critical as the feed forward and feed back clamp on unit 8 provide the necessary clamp (DC-offset).
- Apply a nominal video signal to "PROGRAM IN".
- Connect the oscilloscope (10us/div.) to connector 12c.
- Select "FULL-FIELD" mode, EXT 1.
- Check for a black level of 0V.
- If not OK, adjust R39.

3. Amplifier gain

- Check first the program output amplifier and fast clamp amplifier gain adjustment on unit 8.
- Apply a nominal video signal to "PROGRAM IN".
- Connect a video level meter to "PROGRAM OUT".
- Select "FULL-FIELD" mode, line 17 (A)/NTC-7 COMP; refer to Chapter 3, item I and J.

- Check that the amplitude of the reference bar is 700mV/100IRE ±0.5%.
- If not OK, adjust R46.

4. 8.86MHz/7.16MHz filter (2 x fsubc).

- Apply a nominal video signal to "PROGRAM IN".
- Connect a spectrum analyser to "PROGRAM OUT".
- Select "FULL-FIELD" mode, DUTY 50%.
- Adjust L5 for minimum 8.86MHz/7.16MHz signal content.

5. 13.3MHz/10.8MHz filter (3 x fsubc).

- Apply a nominal video signal to "PROGRAM IN".
- Connect the vectorscope to "PROGRAM OUT".
- Select "FULL-FIELD mode, line 17 (A)/NTC-7 COMP.
- Adjust L6 for minimum loop in the 2T/12.5T vector.
- It may be necessary to readjust subcarrier phase (R113, unit 3).

6. 14.2MHz filter and frequency response

- Apply a nominal video signal to "PROGRAM IN".
- Connect the oscilloscope (term. 75ohm, 10ms/div.) to "PROGRAM OUT".
- Select "FULL-FIELD" mode, line 18 (B)/NTC-7 COMB.
- Adjust C33 to maximum amplitude in multiburst.
- Adjust L1 and L2 in such a way that the multiburst frequencies form a straight line (from lowest freq. to highest freq.) and minimum spikes; refer to fig 17-2.
- Then readjust C33 for flat response according to specifications; refer to fig 17-3.
- Select the line 17 (A)/NTC-7 COMP signal and check that the amplitude of the 2T pulse is equal to the amplitude of the white reference bar. Check the shape as well; refer to fig. 17-4.

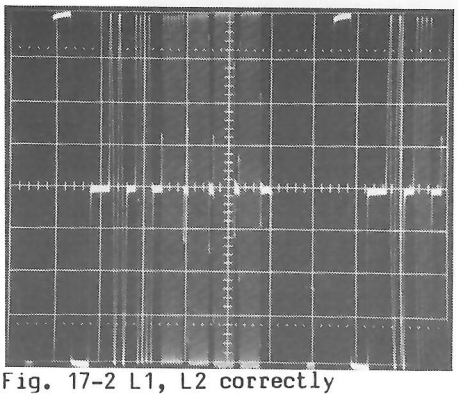


Fig. 17-2 L1, L2 correctly adjusted. C33 to max.

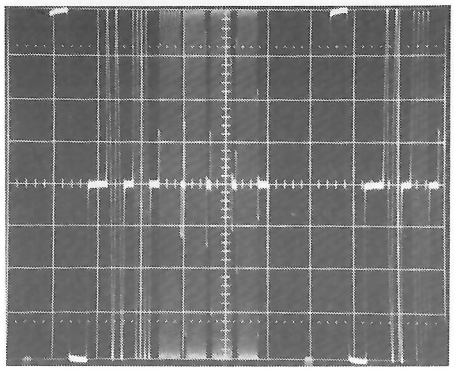


Fig. 17-3 L1, L2, C33 correctly adjusted

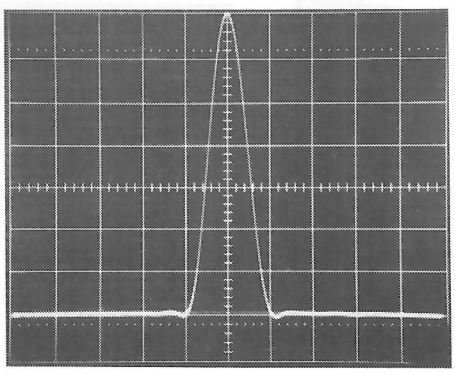


Fig. 17-4 Correct 2T pulse

7. Chroma gain/chroma delay

- Check first "SUBC OUT" for max. (unit 3, adjustments, item 2).
- Apply a nominal video signal to "PROGRAM IN".
- Connect the oscilloscope (term. 75ohm, 10us delayed 0.5us/div.) to "PROGRAM OUT".
- Select "FULL-FIELD" mode, line 17 (A)/NTC-7 COMP.
- Check for flat bottom of the 20T/12.5T pulse.
- If not OK, adjust R29 (chroma gain) and/or C14 (chroma delay).

8. Modulator balance

- Apply a nominal video to "PROGRAM IN".
- Connect the oscilloscope (term. 75ohm, 10us/div.) to "PROGRAM OUT".
- Select "FULL-FIELD" mode, DUTY 50%.
- Adjust R26 for minimum residual subcarrier.

9. Frequency response (L3)

- Apply a nominal video signal to "PROGRAM IN".
- Connect an oscilloscope (term. 75ohm, 10us delayed 0.5us/div.) to "PROGRAM OUT".
- Select "FULL-FIELD" mode, line 331 (D)/NTC-7 COMB.
- Adjust L3 for best pulse response as shown on fig. 17-5 (G-version) and 17-7 (M-version).

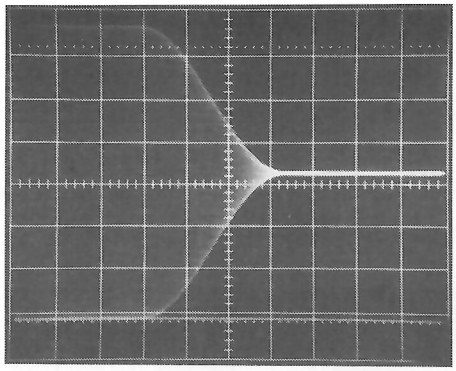


Fig. 17-5 L3 correctly adjusted

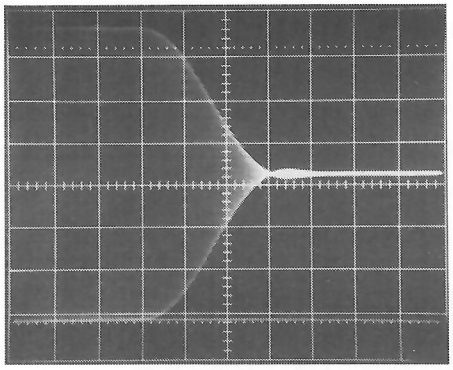
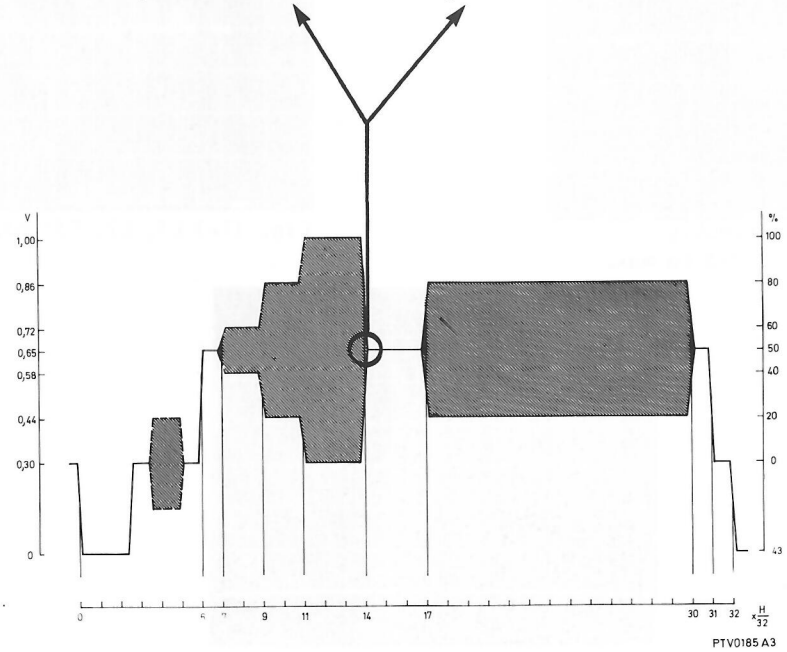


Fig. 17-6 L3 detuned



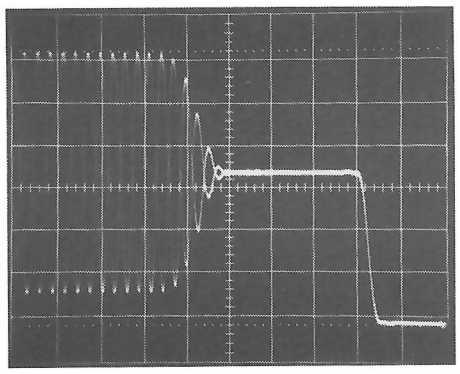


Fig. 17-7 L3 correctly adjusted

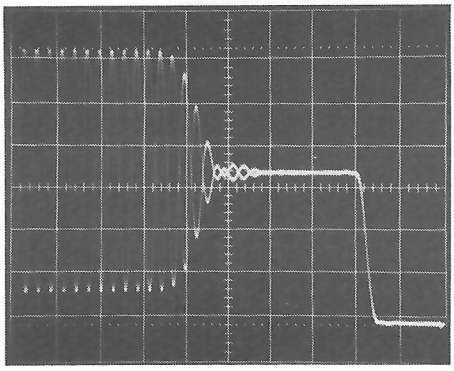
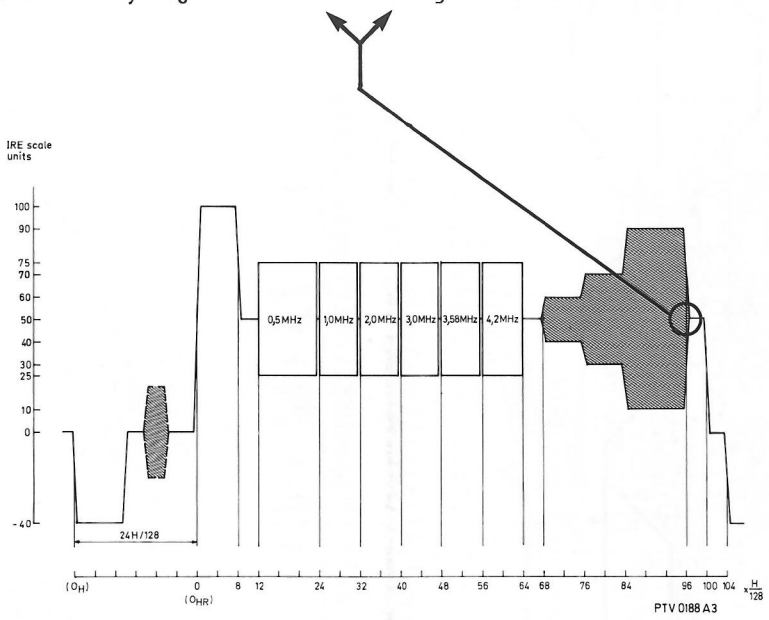
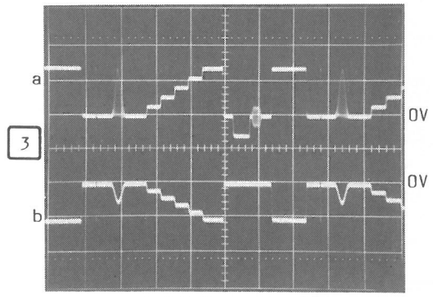


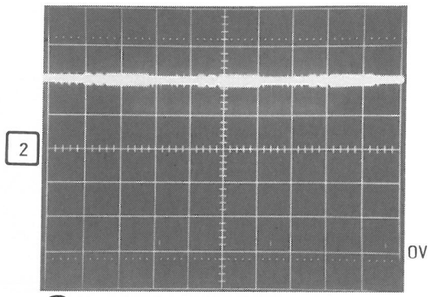
Fig. 17-8 L3 detuned



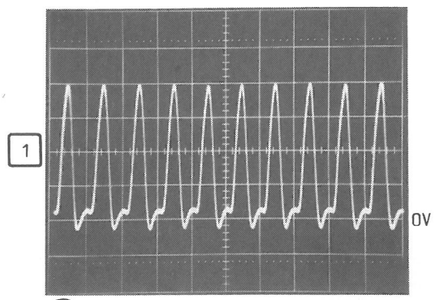


a: 0.5V/div. 10us/div.
Program out
Line 17 (A) selected

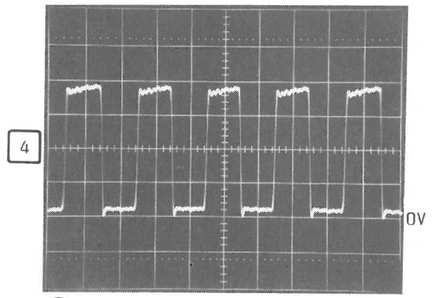
(4) b: 0.5V/div. 10us/div.



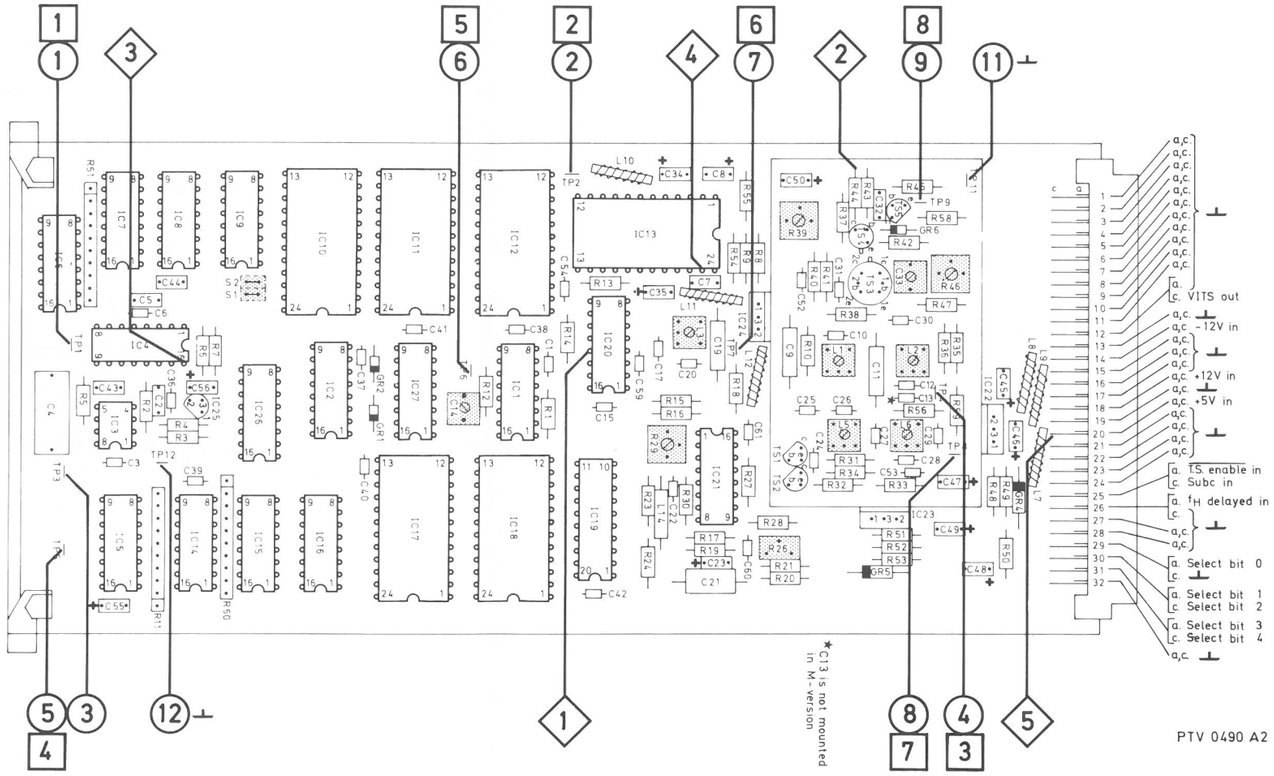
(2) 1V/div. 20us/div.
Line 18 (B) selected

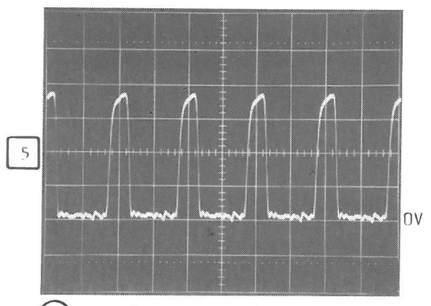


(1) 1V/div. 0.05us/div.

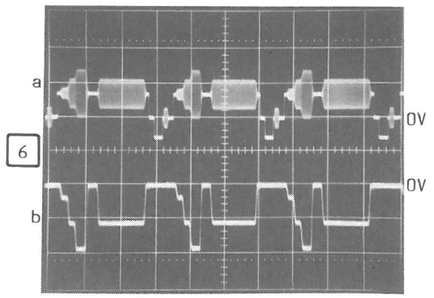


(5) 1V/div. 0.1us/div.



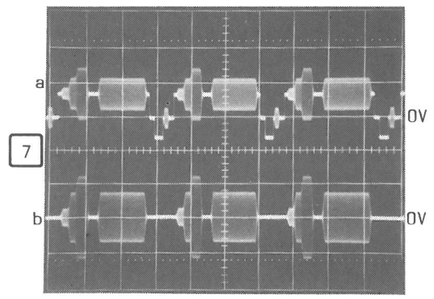


(6) 1V/div. 0.1us/div.



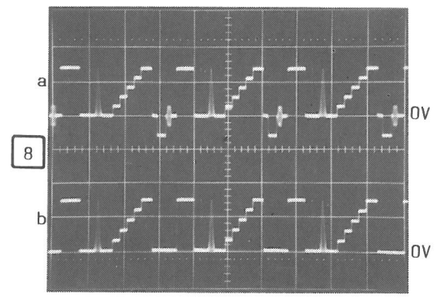
a: 0.5V/div. 20us/div.
Program out

(7) b: 0.5V/div. 20us/div.
Line 331 (D) selected



a: 0.5V/div. 20us/div.
Program out
Line 331 (D) selected

(8) b: 1V/div.



a: 0.5V/div. 20us/div.
Program out
Line 17 (A) selected

(9) b: 0.5V/div.

Fig. 17-9 Check points, test signal gen., unit 6

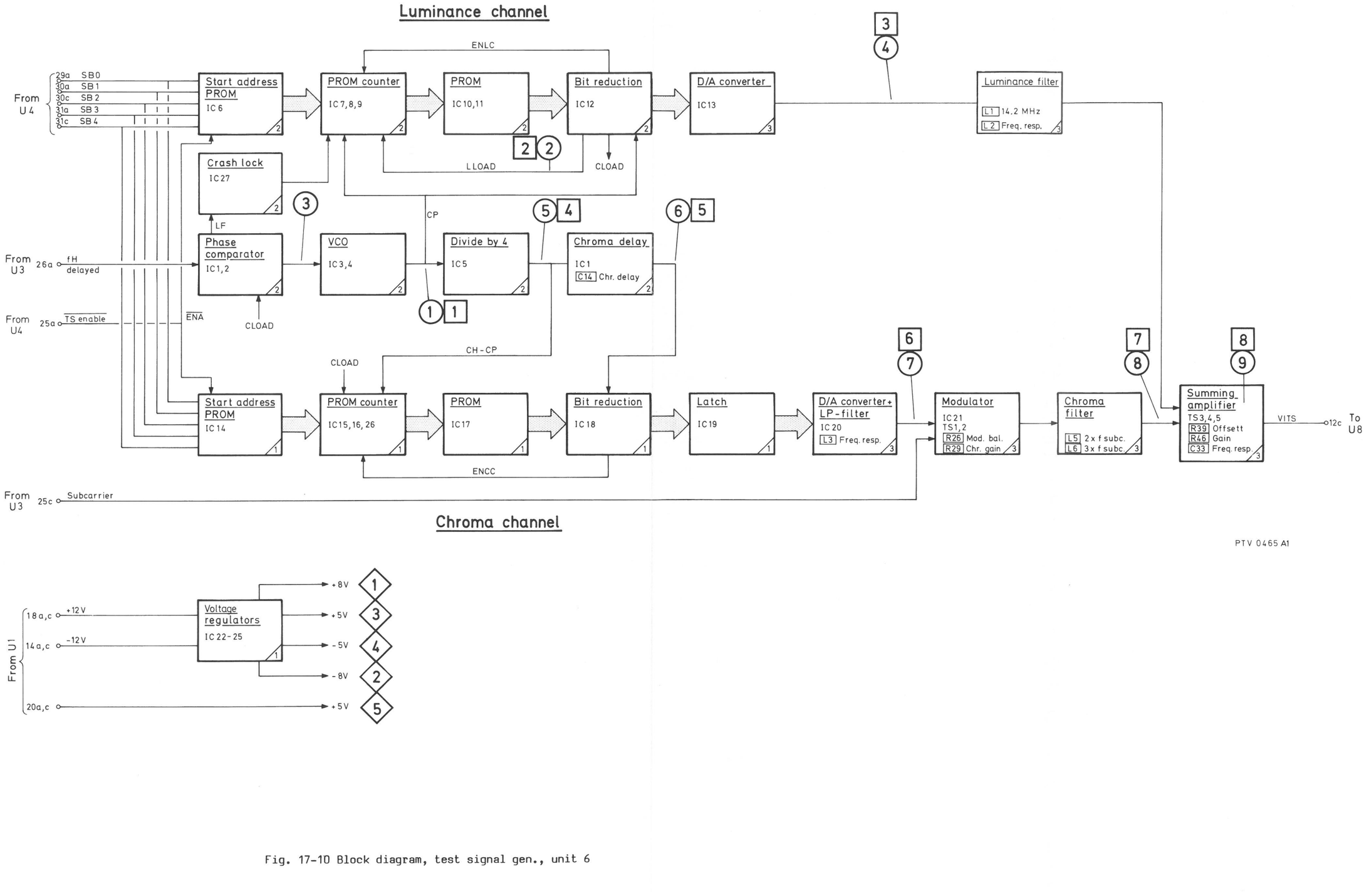
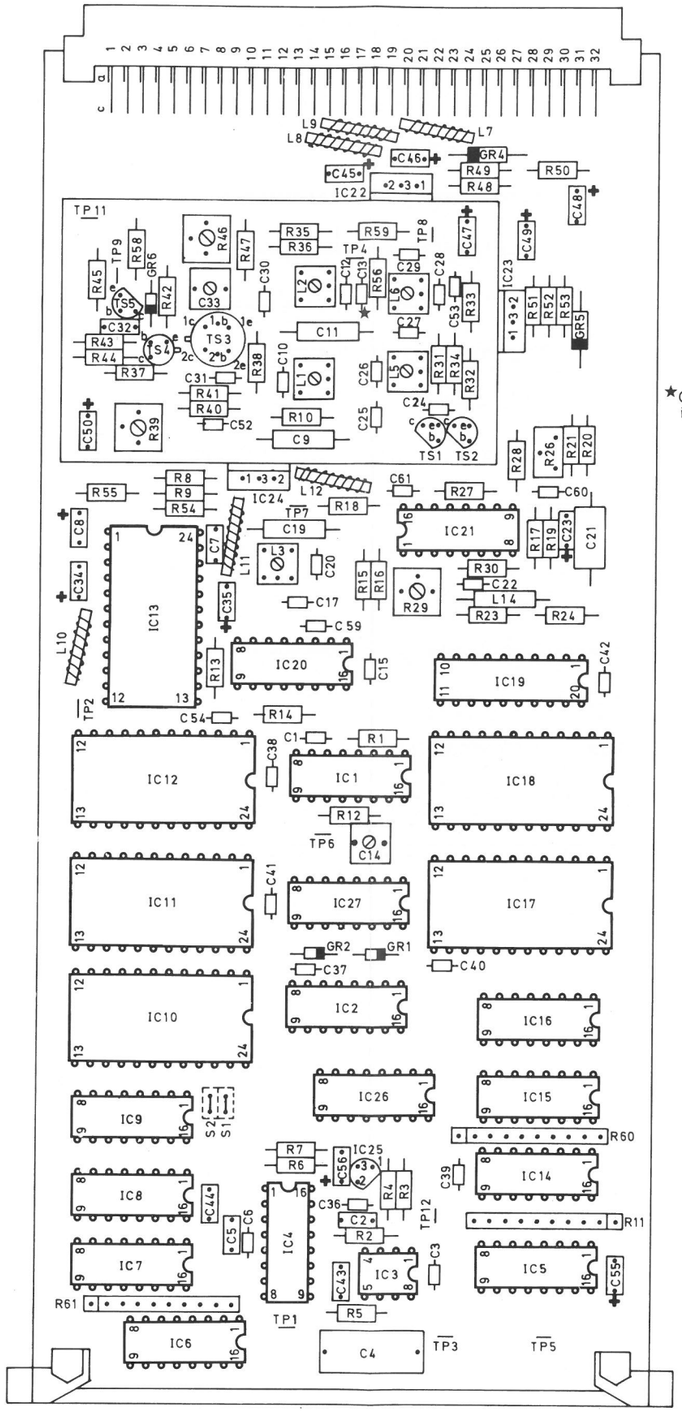


Fig. 17-10 Block diagram, test signal gen., unit 6



★C13 is not mounted in M-version

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Fig. 17-11 Component location, test signal gen., unit 6

CHROMINANCE CHANNEL

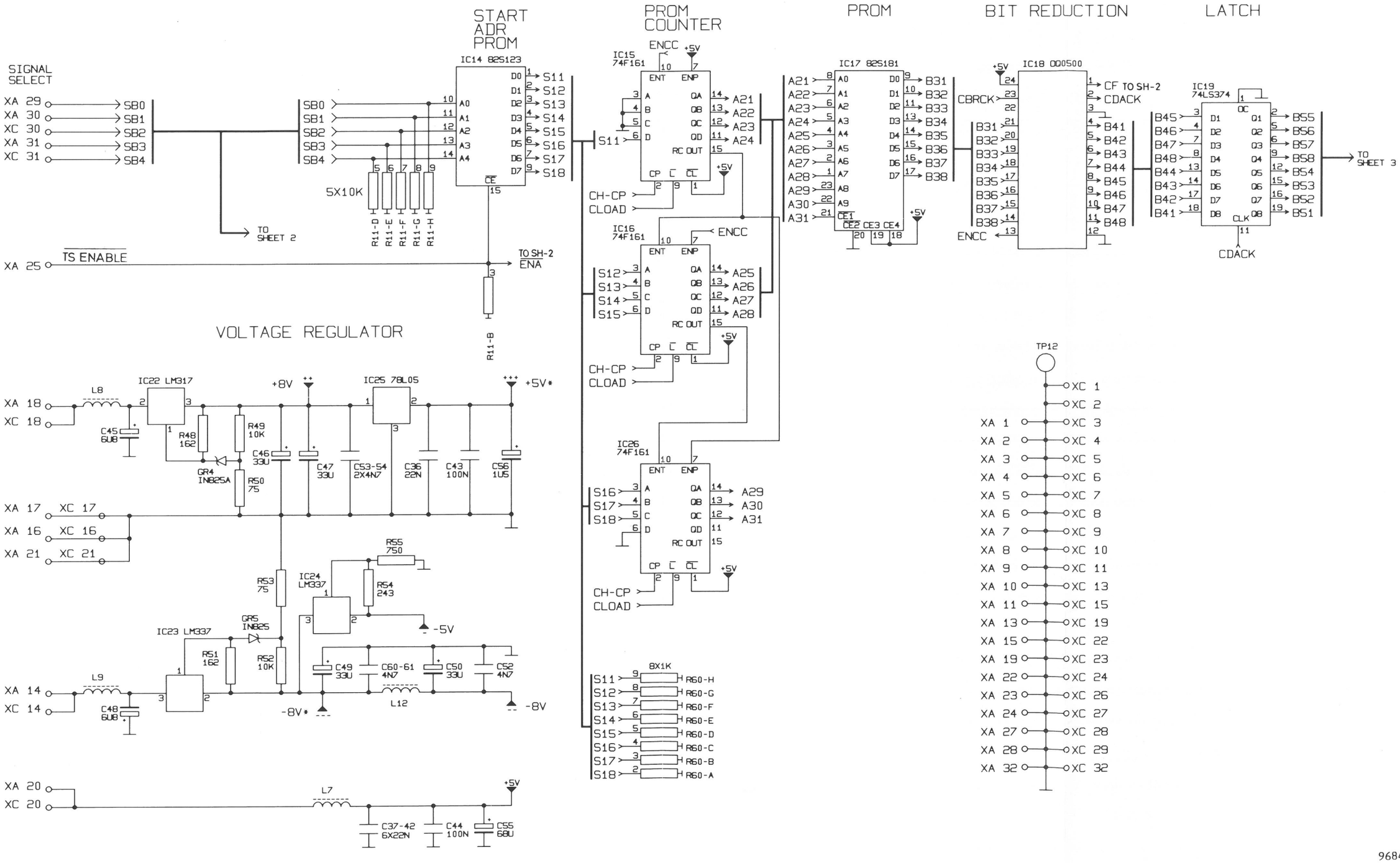

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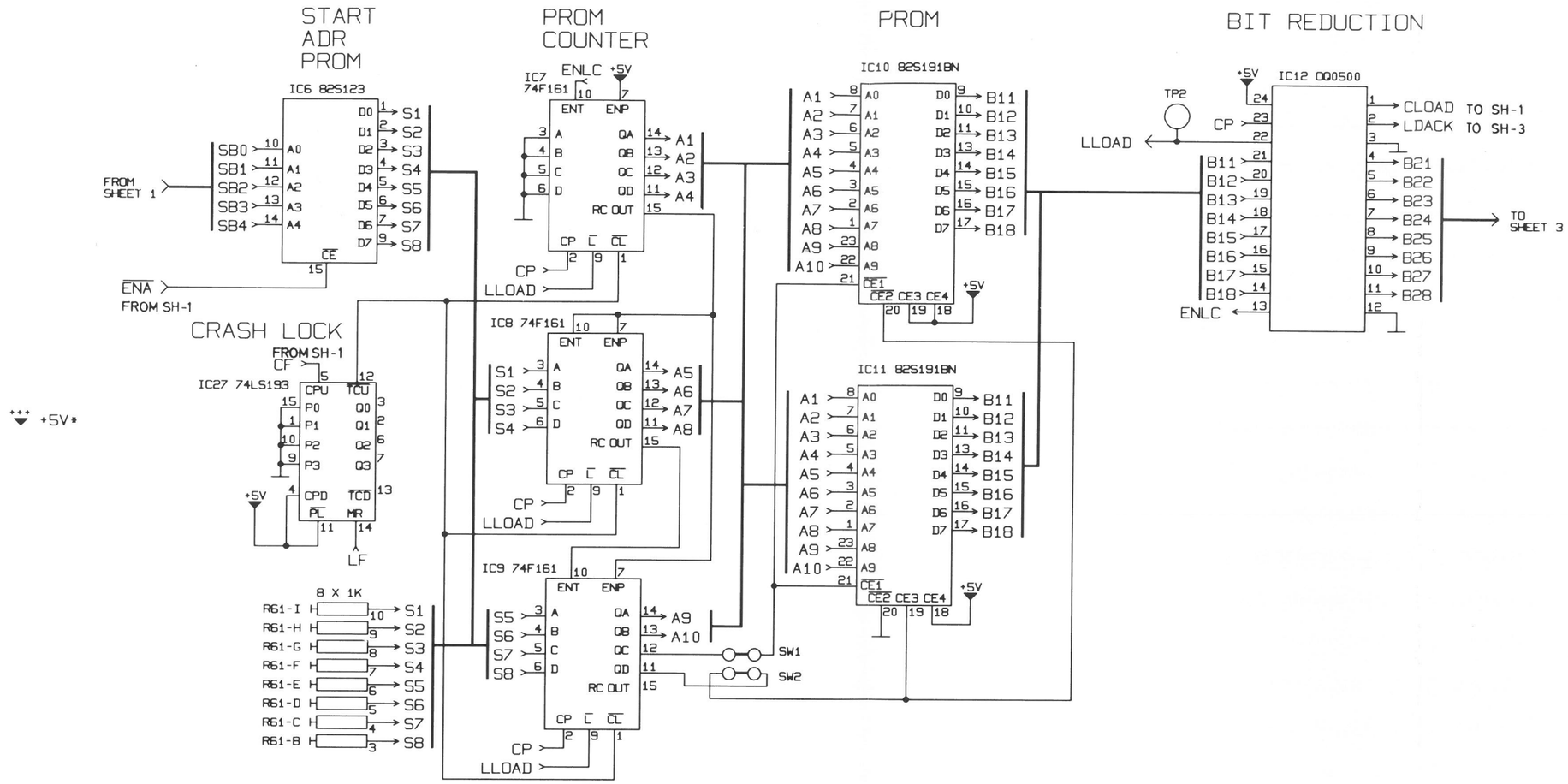
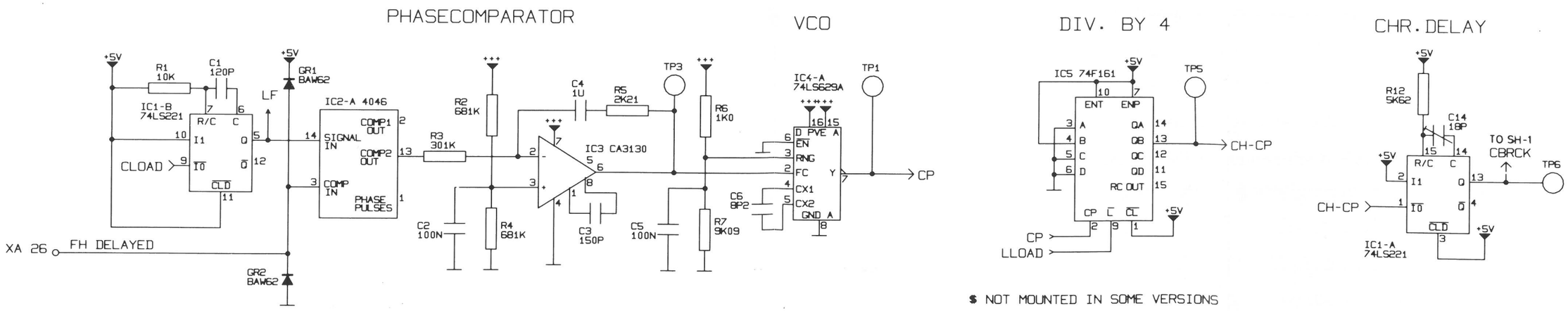
Fig. 17-12 Circuit diagram, test signal gen., unit 6, sh. 1

LUMINANCE CHANNEL





$ NOT MOUNTED IN SOME VERSIONS

96840

Fig. 17-13 Circuit diagram, test signal gen., unit 6, sh. 2

ANALOG SECTION

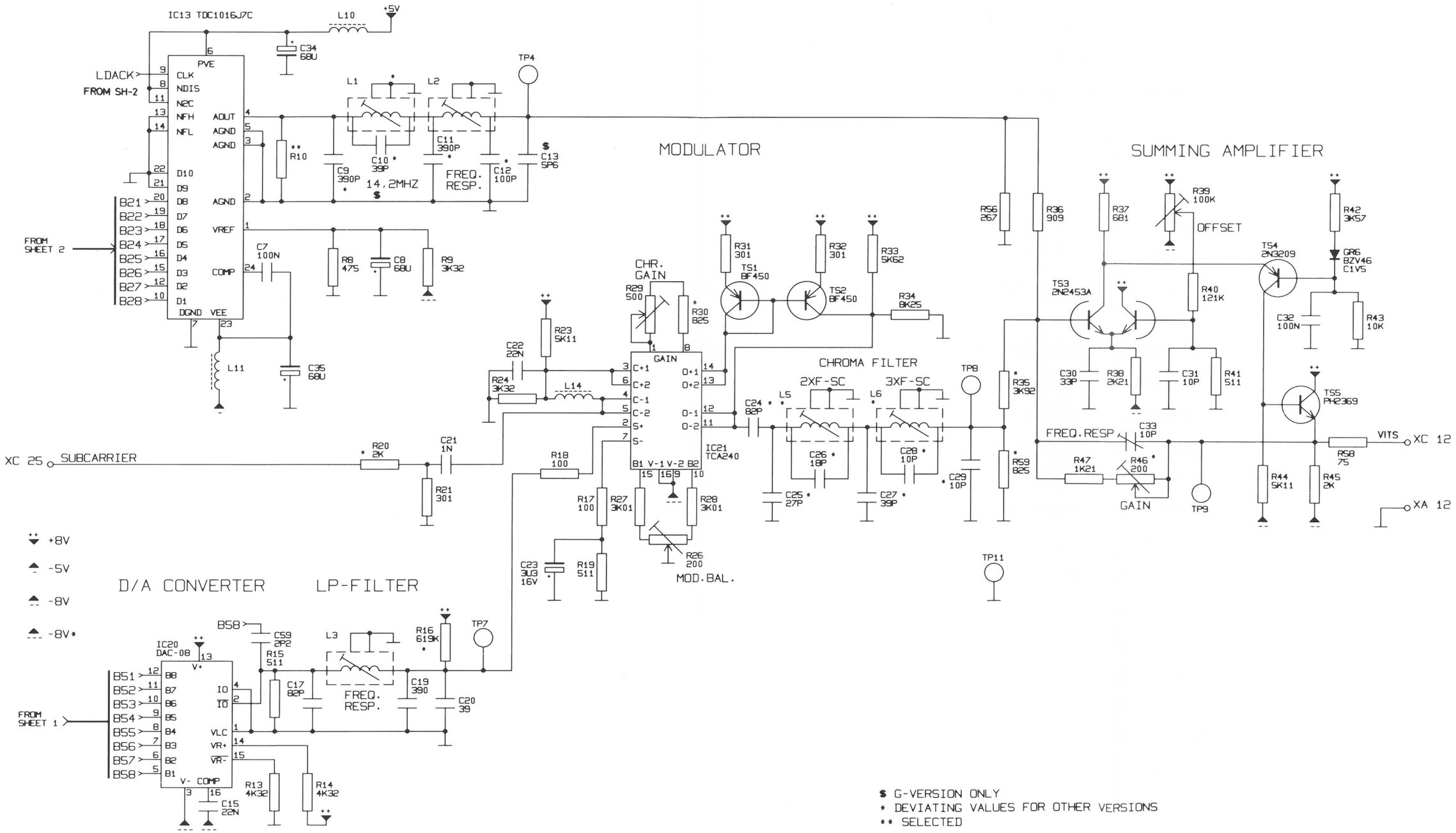


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Fig. 17-14 Circuit diagram, test signal gen., unit 6, sh. 3

18. Unit 7 - keyboard and display

Access to unit 7 is achieved by removing the front panel (refer to Chapter 9, fig. 9-2). Access to component side of PCB: remove the 8 screws on the printed side of the PCB. Access to unit 7A (LED panel) is then possible.

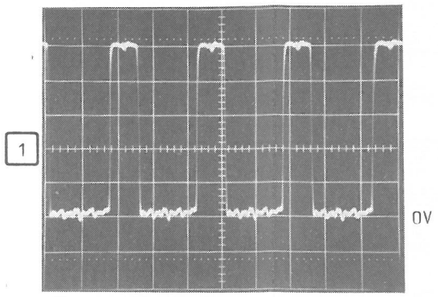
Block diagram description

Unit 7 contains also a microprocessor (CPU, IC1), which operates at a clock frequency of 12MHz (XT1). The CPU transmits or receives information to/from the system control (unit 4) whenever the instrument changes status as a result of operation of the pushbuttons or when the stored information in the non-volatile memory on unit 4 gives a message (e.g. autosubstitution). The I^2C bus from the remote interface enters here the CPU via unit 4 (connector H).

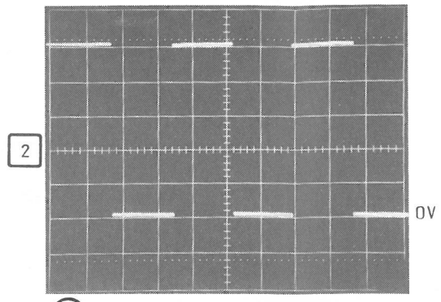
Check of jump/bounce frequency:

- Connect the oscilloscope to (2) .
- Check for a frequency range of 15Hz to 180Hz (fast to slow) controlled by R2.

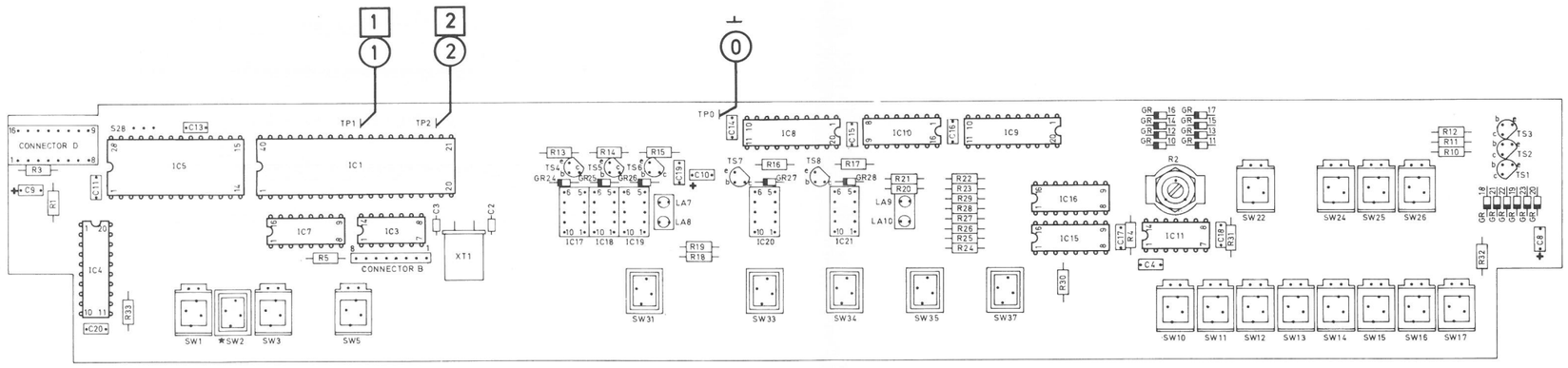
See also Chapter 23, service hints.



(1) 1V/div. 0.2us/div.



(2) 1V/div, 10ms/div.
Jump rate



*Service switch

96630

Fig. 18-1 Check points, keyboard & display, unit 7

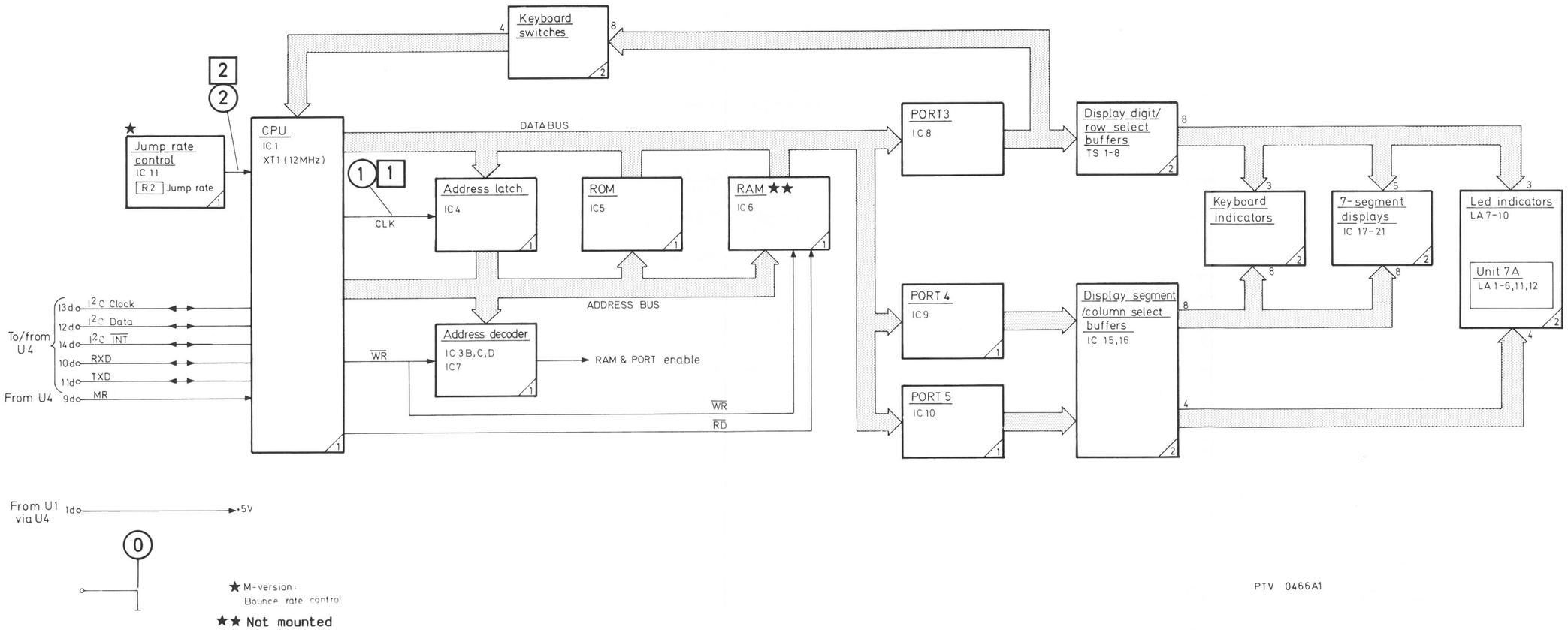
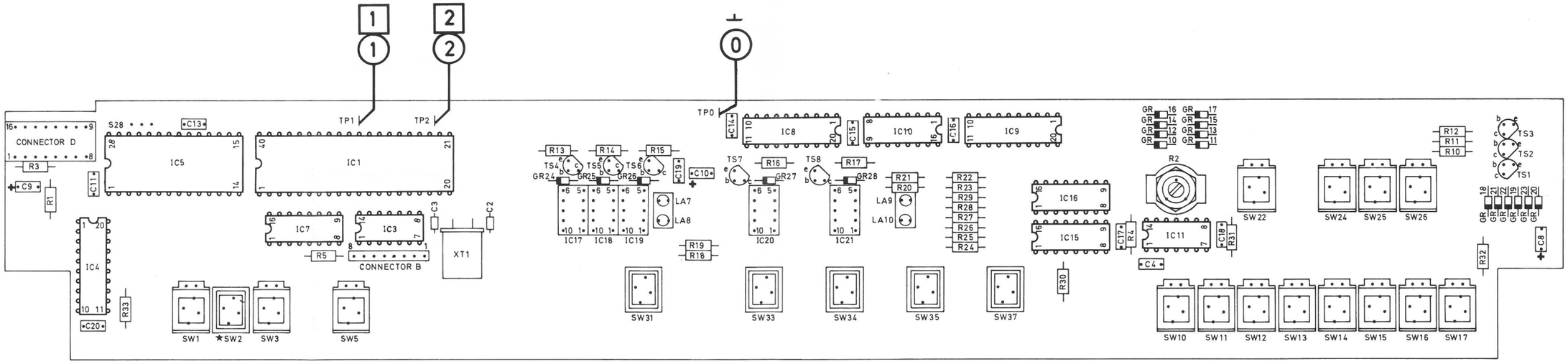
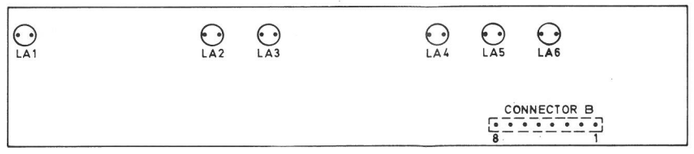


Fig. 18-2 Block diagram, keyboard & display, unit 7



★Service switch



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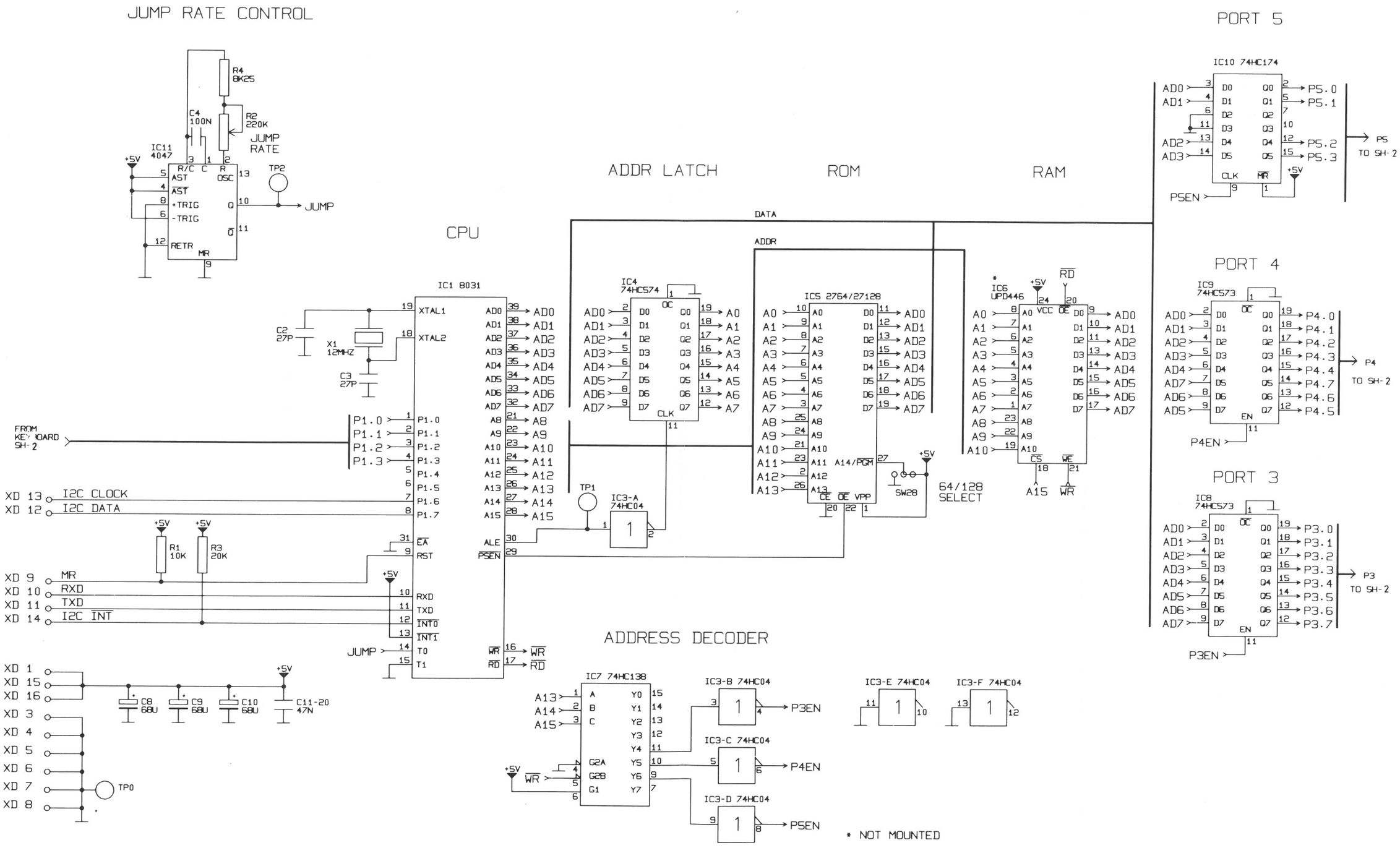
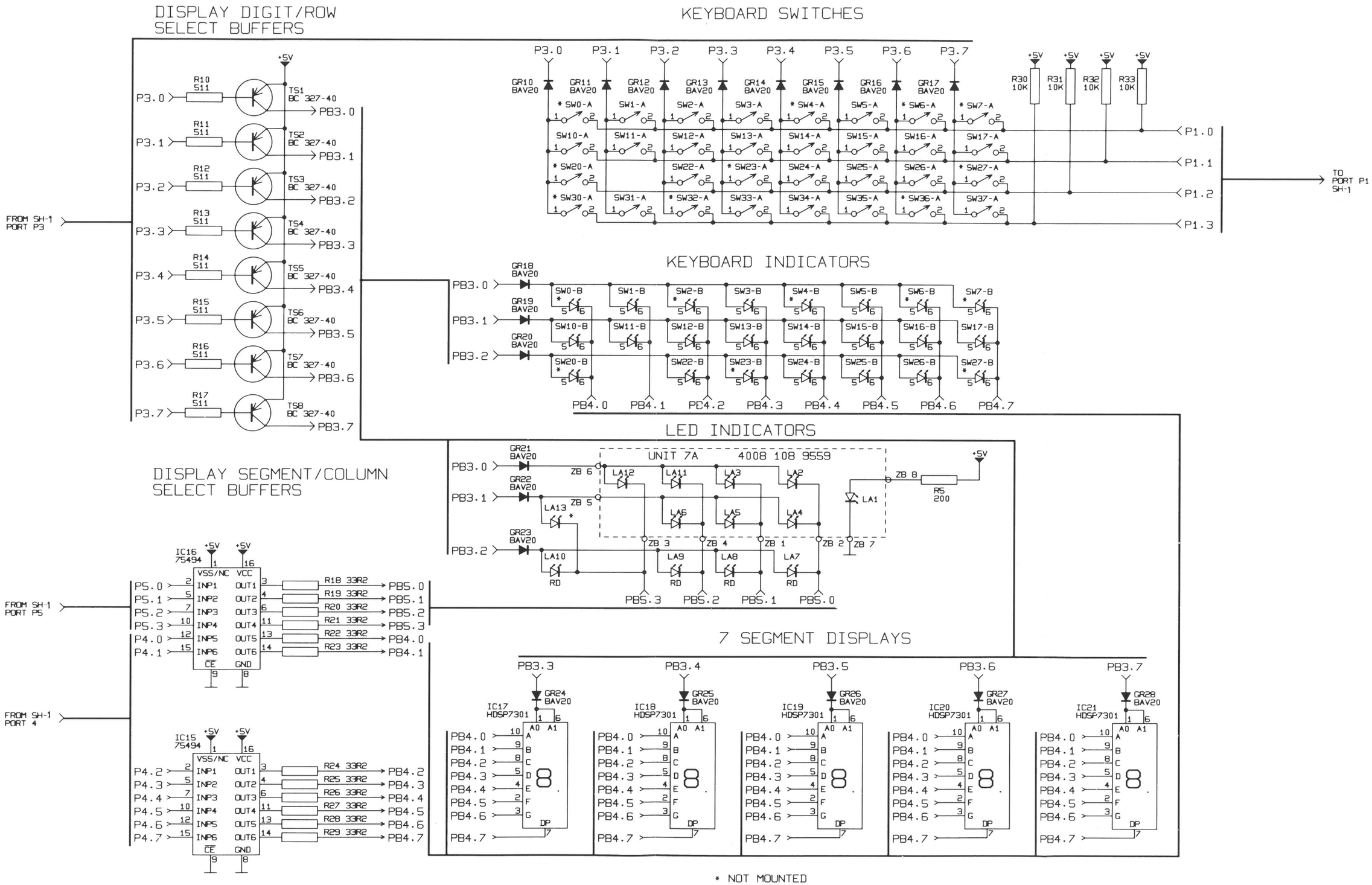
96630

Fig. 18-3 Component location, keyboard & display, unit 7



96630

Fig. 18-4 Circuit diagram, keyboard & display, unit 7, sh. 1



96630

Fig. 18-5 Circuit diagram, keyboard & display, unit 7, sh. 2

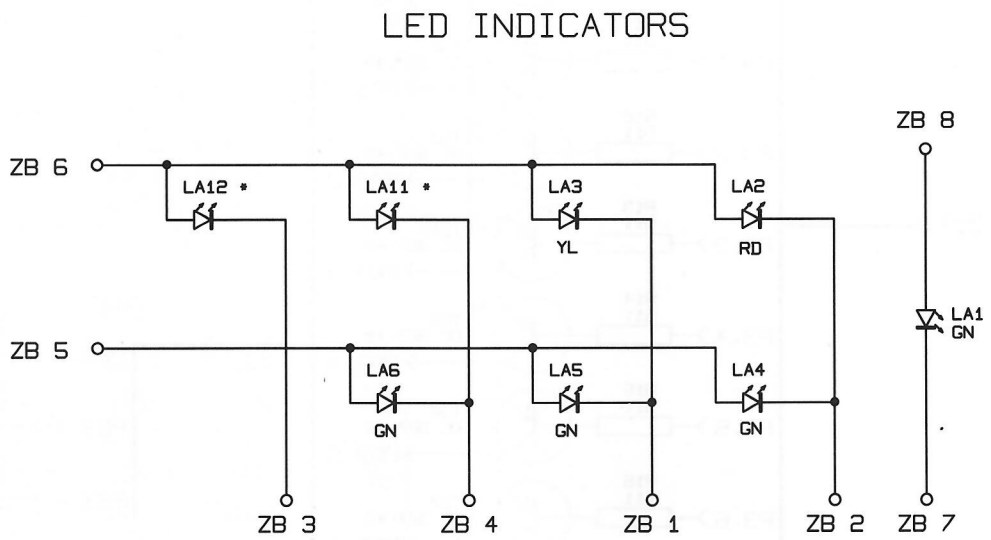


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Fig. 18-6 Circuit diagram, LED panel, unit 7.A

19. Unit 8 - signal processor

Block diagram description

The signal processor is the unit where all major output signals are processed before being fed to the rear panel, except "sync" and "bl burst" outputs; they are derived from the black burst/color bar generator, unit 5.
In "NORMAL" mode the incoming video signal is buffered (assisted emitter follower), amplified and clamped (feed back clamp) before the VITS and/or DATA is applied to the inserter switch.
In the substisution mode, the internally generated black burst signal from unit 5 is fed to the substitution switch and added (in the inserter switch) to the internally generated or externally applied signal. Thus a complete Full-field signal is generated and fed to the program output amplifier (refer to [7]). The VITS are, as can be seen, also present.
All internally generated as well as the externally applied signals pass through the input selector whether it is as FULL-FIELD signals or as VITS/DATA to be inserted.
In IC4 the 5V control levels SB0-SB3 are converted to 8V levels before being fed to the multiplexers IC1 and IC2. All input signals to the preselector are grounded, when not selected to reduce x-talk, by means of TS13 to TS20 (controlled by IC3). In the feed forward clamp circuit a fast, but not very exact clamp takes place. Therefore the feed back clamp is needed to secure an accurate clamp. The black level offset is adjusted by means of R124. Any kind of signal applied, is in this manner secured correct clamp and hum suppression.
Any signal from the input selector is added to a clamped black burst signal in the FULL-FIELD switch before being fed to the FULL-FIELD output amplifier (FULL-FIELD as well as VITS/DATA, refer to [10]).
The reference oscillator (TCXO) is enabled when the program signal is missing or sync/burst amplitude is below - 6dB level. The 8.86MHz/7.16MHz is divided by 2 before being fed to the sync generator, unit 3. The TCXO is then the reference for the subcarrier regenerator and sync regenerator.

Test and adjustments

Measuring equipment:

Oscilloscope	: e.g. Philips PM 3217
Digital voltmeter	: e.g. Philips PM 2528
Video level meter	: e.g. Philips PM 5548
Video generator	: e.g. Philips PM 5570
Frequency counter	: e.g. Philips PM 6670
Spectrum analyser	: e.g. HP 8557

75ohm VSWR bridge

A. Voltage checks

1. Using a digital voltmeter, check for +8V ±0.4V on ◇1◇.
2. Using a digital voltmeter, check for -8V ±0.4V on ◇2◇.
3. Using a digital voltmeter, check for +5V ±0.2V on ◇3◇.

B. Adjustments

1. Burst notch (clamp amplifier)

- Apply a nominal video signal to "PROGRAM IN".
- Select any of the main functions.
- Connect an oscilloscope (10us/div.) to (2).
- Adjust L1 to minimum burst; refer to [2].

2. Gain (program out)

- Connect first the video generator to the video level meter.
- Select an H-signal and note the white level (700mV/100IRE).
- Then apply the H-signal to "PROGRAM IN".
- Connect the video level meter to "PROGRAM OUT".
- Select "NORMAL" mode.
- Check for the same white level as measured before (700mV/100IRE ±0.5%).
- If not OK, adjust R207.

3. Frequency response (program out).

- Select a sweep signal with marker on the video generator.
- Connect the oscilloscope (term. 75ohm, 2ms/div.) to "PROGRAM OUT".
- Check for flat response ±1%, f<6MHz and +1-5%, 6-10MHz.
- If not OK, adjust C56.

4. Gain (monitor out)

- Apply an H-signal to "PROGRAM IN".
- Connect the video level meter to "MONITOR OUT".
- Select "NORMAL" mode.
- Check for the same white level as measured in item 2.
- If not OK, adjust R221.

5. Frequency response (monitor out)

- Select a sweep signal with marker on the video generator.
- Connect the oscilloscope (term. 75ohm, 2ms/div.) to "MONITOR OUT".
- Check for flat response ±1%, f<6MHz and +1-5%, 6-10MHz.
- If not OK, adjust C60.

6. Burst notch (feed forward clamp)

- Apply a nominal video signal to "PROGRAM IN".
- Select "FULL-FIELD" mode, color test bar (press 2ND, DUTY and CBAR simultaneously).
- Connect the oscilloscope to (5) .
- Adjust L21 to minimum residual carrier; refer to [5] .

7. Burst notch (feed back clamp)

- Apply a nominal video signal to "PROGRAM IN".
- Select "FULL-FIELD" mode, color test bar (press 2ND, DUTY and CBAR simultaneously).
- Connect the oscilloscope (10us/div.) to (4) .
- Adjust L22 to minimum residual carrier; refer to [4] .

8. Burst notch (buffer & clamp).

- Apply a nominal video signal to "PROGRAM IN".
- Select any of the main functions.
- Connect the oscilloscope (10us/div) to (10) .
- Adjust L5 to minimum burst; refer to [9] .

9. Forward gain (feed forward clamp)

- Apply a nominal video signal (superimposed with 1Vpp hum) to "EXT 1"; provide a connection from the unused connector to "PROGRAM IN".
- Connect the oscilloscope (term. 75ohm, 10us/div.) to "PROGRAM OUT".
- Select "FULL-FIELD" mode, EXT 1.
- Close S1 on the PCB; see check point sheet.
- Adjust R114 to minimum hum.
- Open S1.

10. DC offset (feed back clamp)

- Apply a black burst signal to "EXT 1"; provide a connection from the unused connector to "PROGRAM IN".
- Connect the video level meter to "PROGRAM OUT".
- Select "FULL-FIELD" mode, EXT 1.
- Check for a black level of 0V/0IRE.
- If not OK, adjust R124.

11. Gain (fast clamp amplifier)

- Apply an H-signal to "EXT 1"; provide a connection from the unused connector to "PROGRAM IN".
- Connect the video level meter to "PROGRAM OUT".
- Select "FULL-FIELD" mode, EXT 1.
- Check for a white level as measured in item 2.
- If not OK, adjust R140.

12. Frequency response (switch buffer)

- Apply a sweep signal with marker to "EXT 1"; provide a connection from the unused connector to "PROGRAM IN".
- Connect the oscilloscope (2ms/div.) to (8) .
- Select "FULL-FIELD" mode, EXT 1.
- Check for flat response ±1%, f<6MHz and +1-5%, 6-10MHz; refer to [8] .
- If not OK, adjust C15.

13. Frequency response (fast clamp amplifier)

- Apply a sweep signal with marker to "EXT 1"; provide a connection from the unused connector to "PROGRAM IN".
- Connect the oscilloscope (term. 75ohm, 2ms/div.) to "PROGRAM OUT".
- Select "FULL-FIELD" mode, EXT 1.
- Check for flat response ±1%, f<6MHz and +1-5%, 6-10MHz.
- If not OK, adjust C23.

14. DC offset (buffer & clamp)

- Apply a black burst signal to "EXT 1"; provide a connection from the unused connector to "PROGRAM IN".
- Connect the video level meter to "FULL-FIELD OUT".
- Select "FULL-FIELD" mode, EXT 1.
- Check for a black level of 0V.
- If not OK, adjust R237.

Remove the REMOTE INTERFACE (access to R267, C84, C66 and L31).

15. Gain (Full-field output amplifier)

- Apply an H-signal to "EXT 1"; provide a connection from the unused connector to "PROGRAM IN".
- Connect the video level meter to "FULL-FIELD OUT".
- Select "FULL-FIELD" mode, EXT 1.
- Check for a white level as measured in item 2.
- If not OK, adjust R267.

16. Frequency response (Full-field output amplifier)

- Apply a sweep signal with marker to "EXT 1"; provide a connection from the unused connector to "PROGRAM IN".
- Connect the oscilloscope (term. 75ohm, 2ms/div.) to "FULL-FIELD OUT".
- Select "FULL-FIELD" mode, EXT 1.
- Check for flat response ±1%, f<6MHz and +1-5%, 6-10MHz.
- If not OK, adjust C84.

17. Delay difference (program out)

- Apply a nominal video signal to "PROGRAM IN".
- Connect the vectorscope to "PROGRAM OUT". It must be externally synchronized from the video source.
- Check that the delay difference "NORMAL/BY-PASS" is less than ±2°.
- If not OK, adjust C66 in "BY-PASS" mode.

18. Return loss (program output)

- Connect a sweep signal to the spectrum analyser via the 75ohm VSWR bridge.
- Connect the DUT output (third terminal of VSWR bridge) to "PROGRAM OUT".
- Terminate "PROGRAM IN" with 75ohm.
- Select "BY-PASS" mode.
- Check for a return loss better than 34dB.
- If not OK, adjust L31.

NOTE: It may be necessary to readjust C66 and L31 a couple of times.

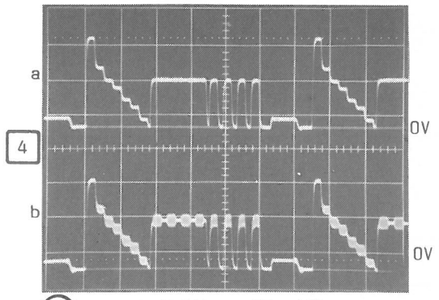
- Insert the REMOTE INTERFACE.

19. TCXO reference

- No video signal applied.
- Connect the frequency counter to (6).
- Select any of main functions.
- Check for a frequency of 4433618.75Hz ±5Hz (G-version)/3579545Hz ±5Hz (M-version).
- If not OK, adjust C41.

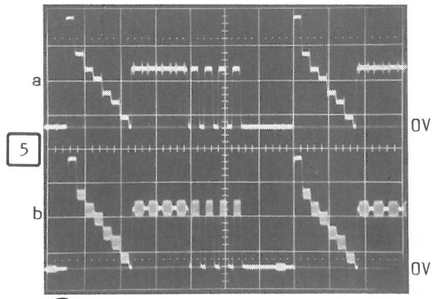
20. Sync amplitude

- Check first sync amplitude on "BL BURST OUT" adjustable by R85, unit 5.
- No video signal applied.
- Select color bar (H) as substitution signal on programming panel.
- Connect the video level meter to "PROGRAM OUT".
- Check that the sync amplitude is -300mV/40IRE ±2%.
- If not OK, adjust R151.
- Now connect the video level meter to "FULL-FIELD OUT".
- Check that the sync amplitude is -300mV/40IRE ±2%.
- If not OK, adjust R230.



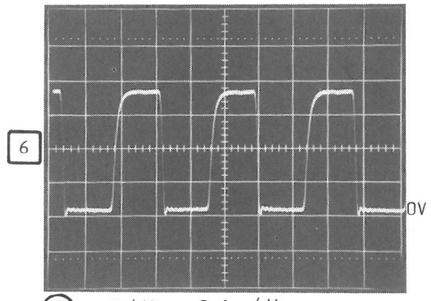
4 0.2V/div. 10us/div.
a: L22 correctly adjusted

b: L22 detuned

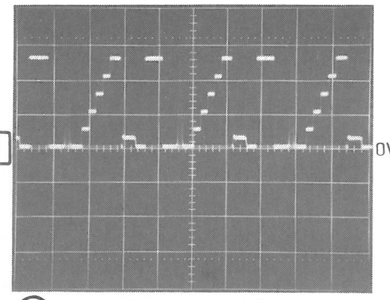


5 0.1V/div. 10us/div.
a: L21 correctly adjusted

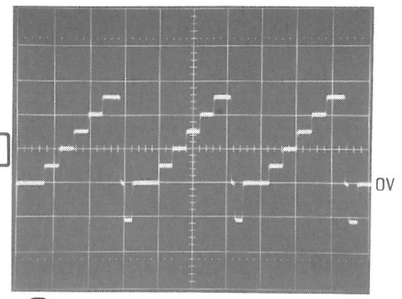
b: L21 detuned



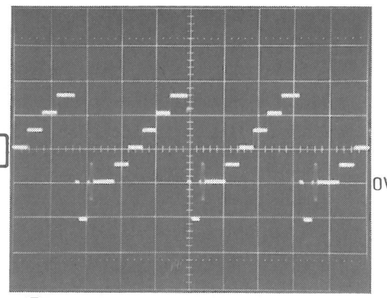
6 1V/div. 0.1us/div.
TCXO Ref. activated



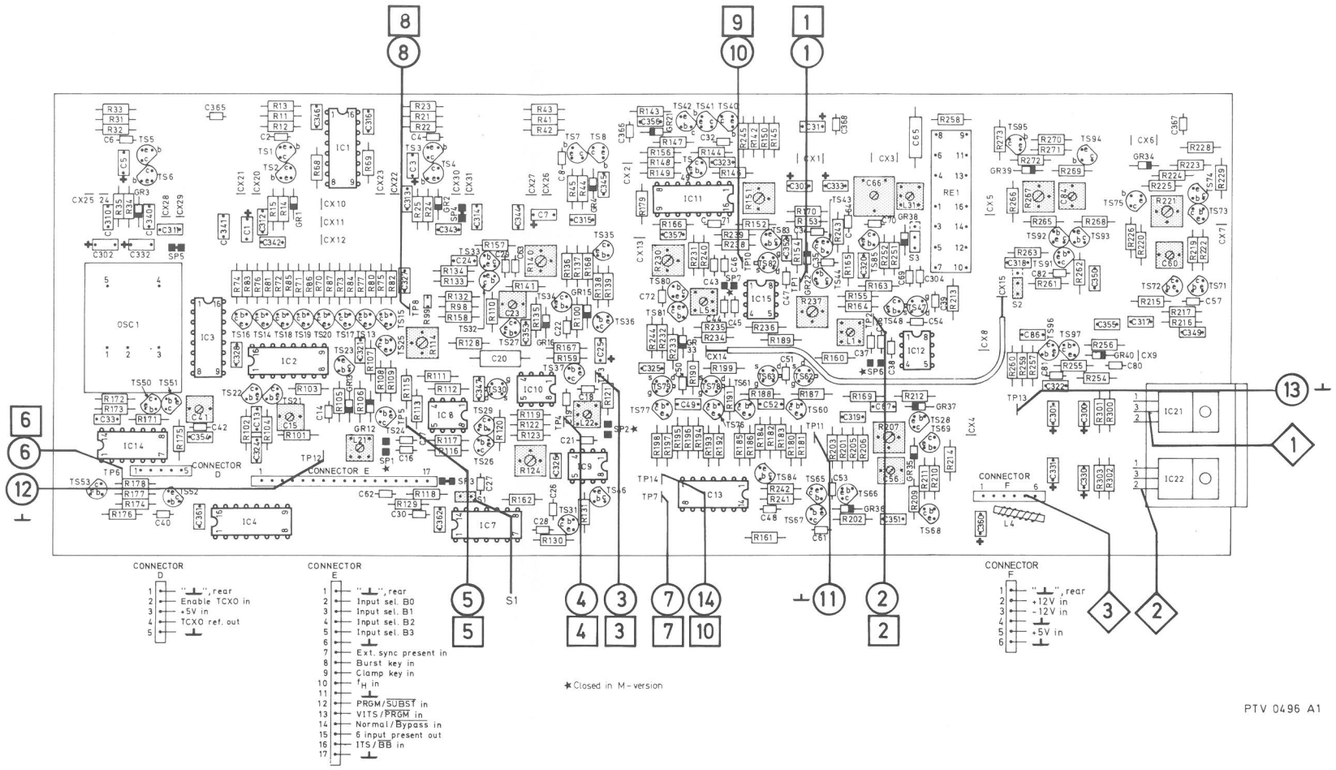
3 0.2V/div. 20us/div.
Line 17 (A) Full-field

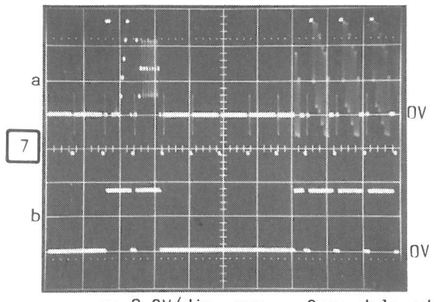


2 0.2V/div. 20us/div.
Min. burst adj. L1



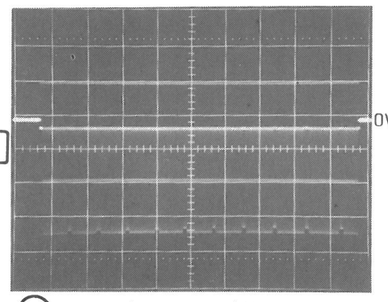
1 0.2V/div. 20us/div.



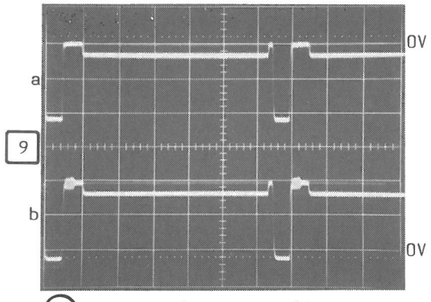


a: 0.2V/div. var. 2ms; delayed 50us/div. var.
Program out

7 b: 2V/div.
Autosubstitution, CBAR selected

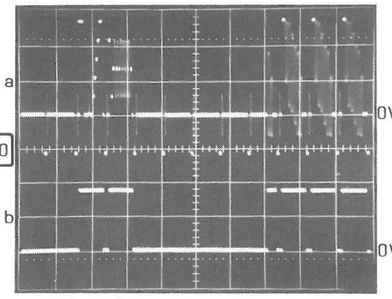


8 0.2V/div. 2ms/div. var.
Freq. response



10 0.1V/div. 10us/div.
a: L5 correctly adjusted

b: L5 detuned



a: 0.2V/div. var. 2ms; delayed 50us/div.
Full-field out, CBAR selected

14 b: 2V/div.

Fig. 19-1 Check points, signal processor, unit 8

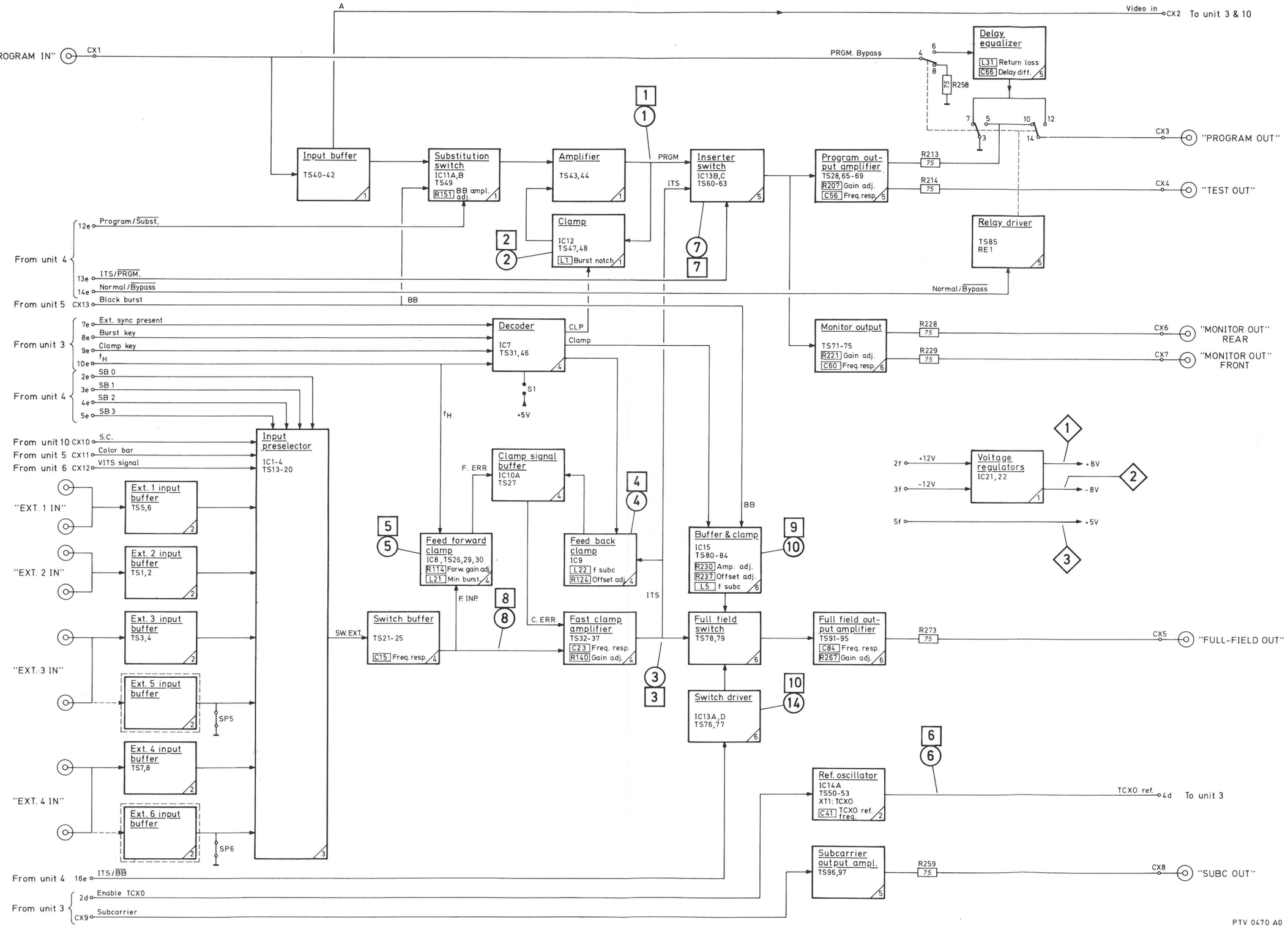


Fig. 19-2 Block diagram, signal processor, unit 8

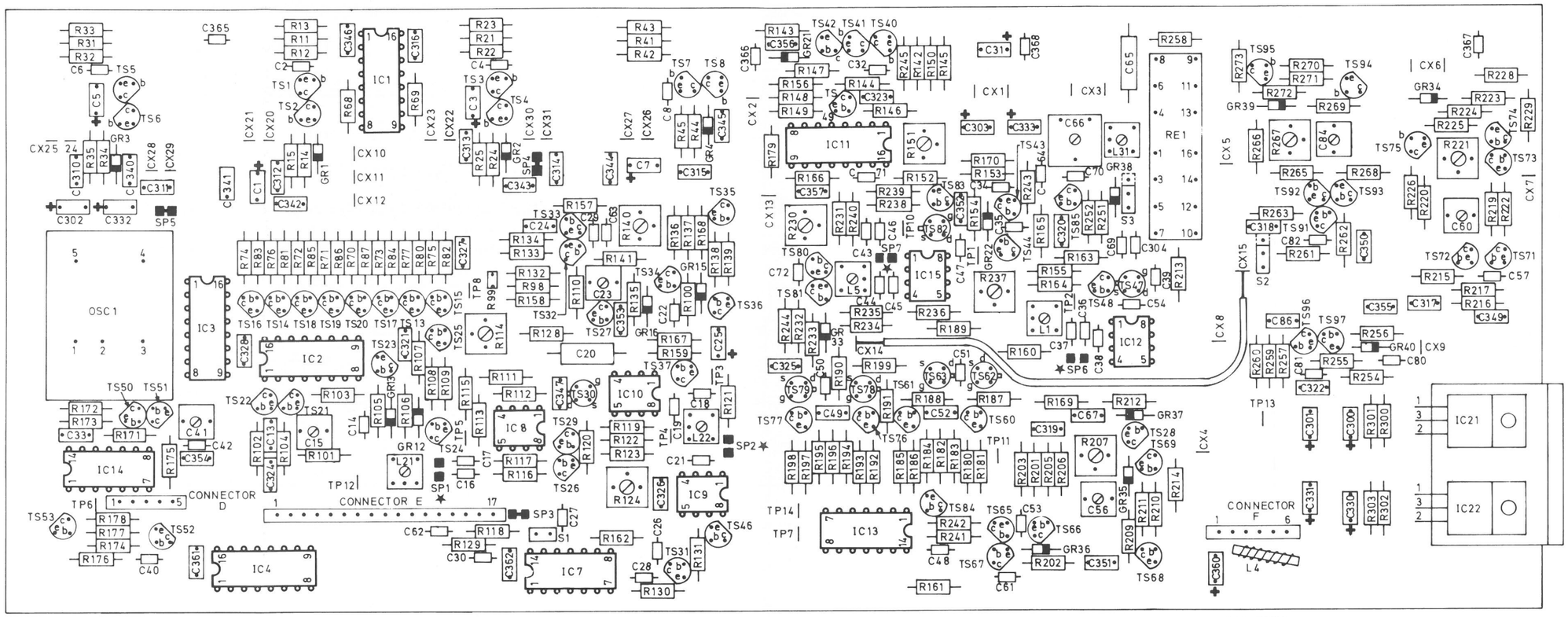


Fig. 19-3 Component location, signal processor, unit 8

INPUT BUFFER

SUBSTITUTION SWITCH

CLAMP AMPLIFIER

PRGM IN
CX1
C31 68U
R145 110K
R150 56K2
R142 825
C32 2P2
TS40 BF450
R144 1K5
R143 1K82
TS41 BF199
GR21 BAW62
R147 1K
R245 1K
TS42 BC547B
R148 100
R156 3K92
A
PRGM BYPASS TO SH-5

U5 XC 6
CX13
BLACK BURST
R152 150
R179 150
R151 200
BLACK BURST AMPL. ADJ.
IC11-C 4053
BB TO SH-6
IC11-A 4053
R166 6K81
C71 27P
IC11-B 4053
R153 1K5
R170 75
C64 18P

XD 2 ENABLE TCXO
XE 12 PROGRAM/$\overline{\text{SUBST}}$
R146 2K
R149 10K
TS49 BC547B

TS47 BFW13
TS48 BC547B
C39 2N2
R163 10K
R165 4K32
R164 3K01
IC12 CA3080
CLP FROM SH-4
C54 1P5
L1
BURST NOTCH
TP2
C37 22P
C38 220P
C36 5P6
SP6
R160 825
TP1
PRGM TO SH-5
R155 750
TS43 BF450
C34 4P7
TS44 BF199
GR22 BAW62
R154 1K
R243 475
C35 2P2

VIDEO IN 10
A
CX2
U10 XC 2

POWER SUPPLY

XD 3
+5V
C33 100N
+12V
C304 1N
+8V
IC21 LM317
XF 2 +12V
R300 243
C300 6U8
C301 33U
C302 33U
C303 33U
C310-328 100N
TP11
TP12
TP13
XD 1
XF 1
XF 4
XF 6
R301 1K3
R302 1K3
C365-368 4N7
CHASSIS
C330 6U8
C331 33U
C332 33U
C333 33U
C340-357 100N
R303 243
XF 3 -12V
IC22 LM337
-8V

XF 5 +5V
L4
C360 68U
C361-362 100N

REF. OSCILLATOR

ENABLE TCXO
R171 10K
TS50 BC547B
R172 10K
TS51 BC557B
OSC1 TCXO
IC
F.ADJ.
OUTP
R173 475
C41 18P TCXO REF. FREQ.
C42 18P
TS52 PH2369
C40 4N7
R176 100
TS53 PH2369
R174 10K
R175 2K67
R177 22K1
R178 2K21
IC14-A 74HC74
TP6
TCXO REF. U3
XD 4
XD 5
PAL-G 4.433.618.8 MHZ
NTSC 3.579.545 MHZ

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Fig. 19-4 Circuit diagram, signal processor, unit 8, sh. 1

EXTERNAL INPUT BUFFERS

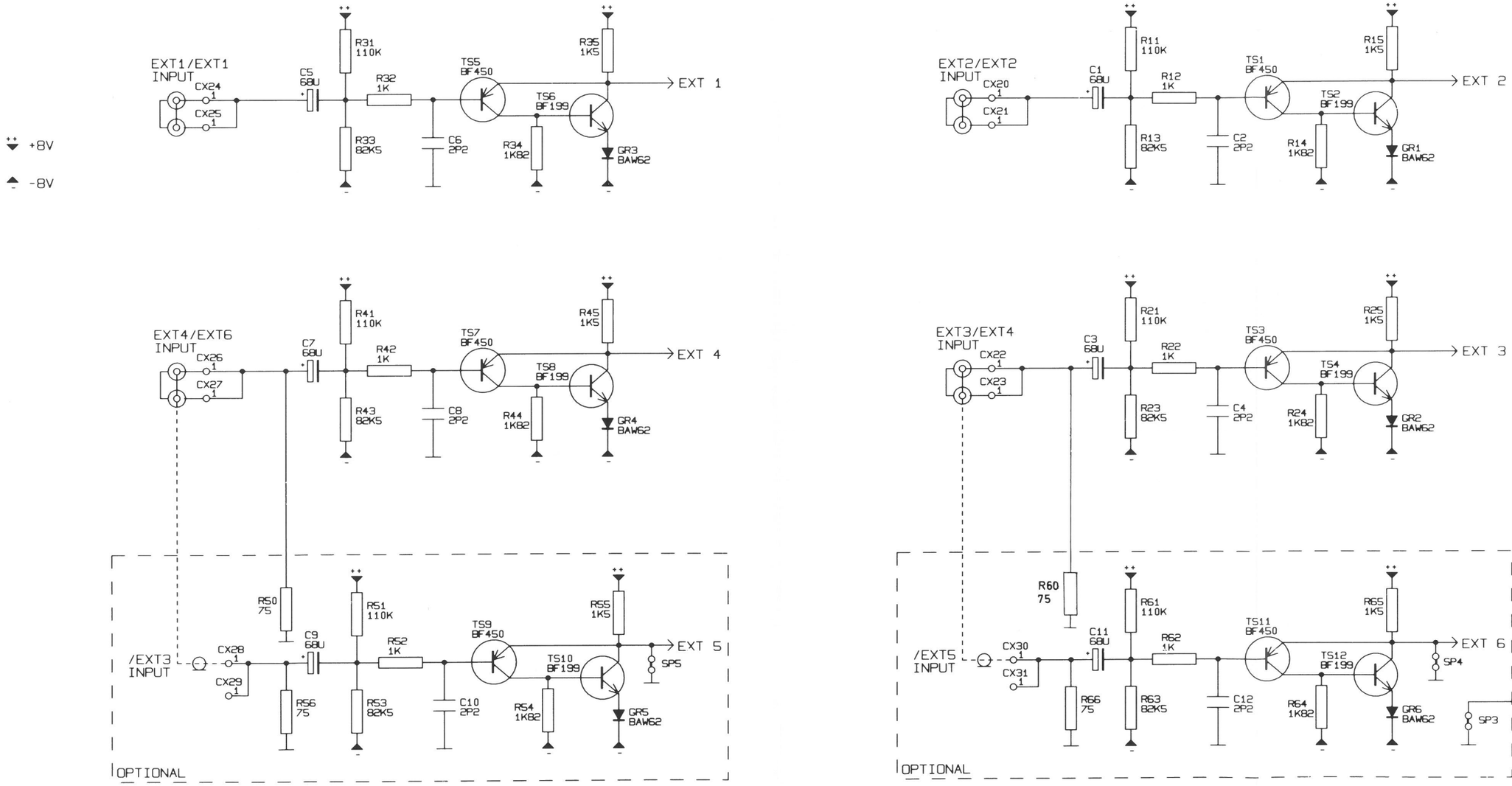

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Fig. 19-5 Circuit diagram, signal processor, unit 8, sh. 2

INPUT PRESELECTOR

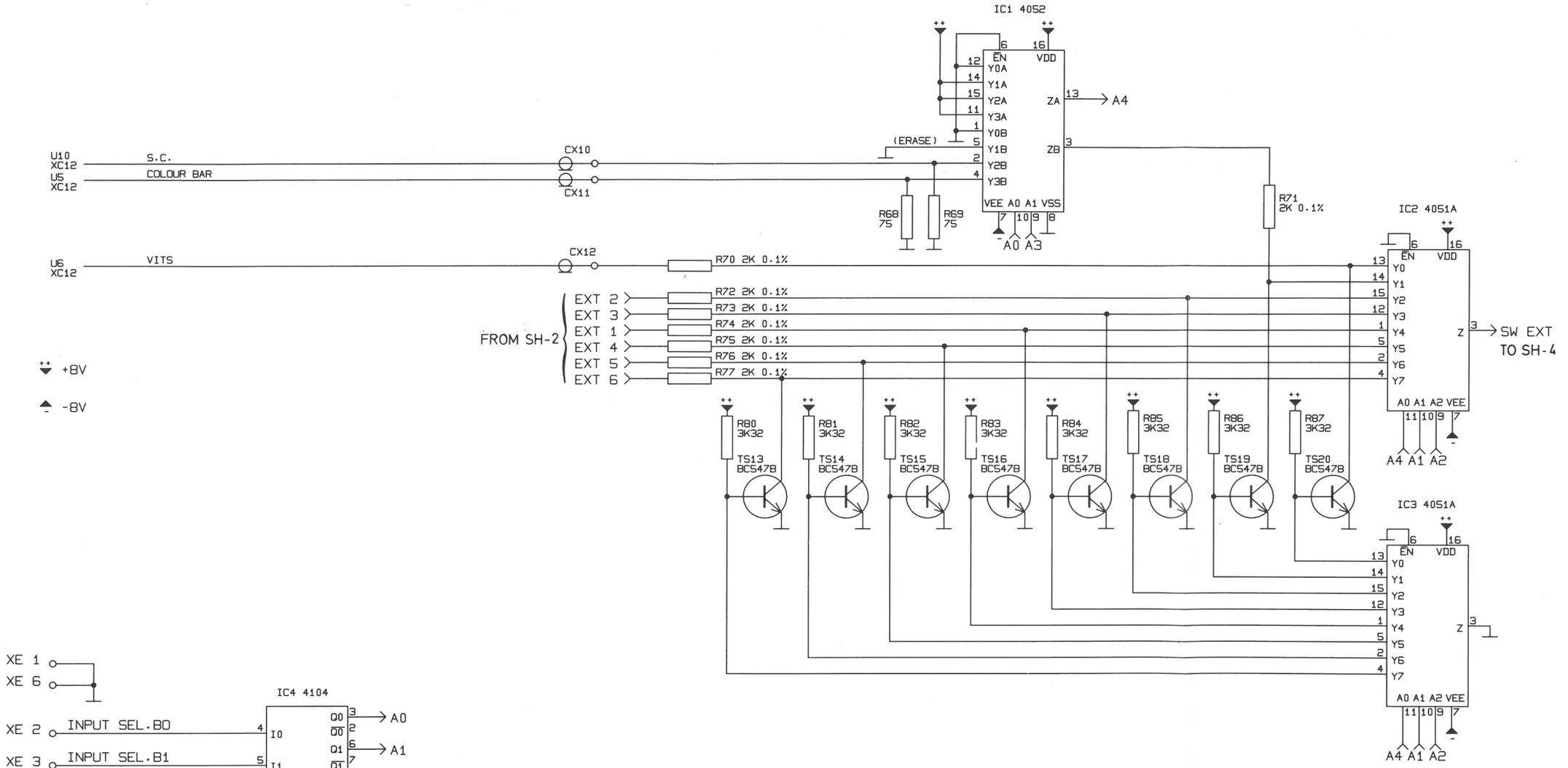

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Fig. 19-6 Circuit diagram, signal processor, unit 8, sh. 3

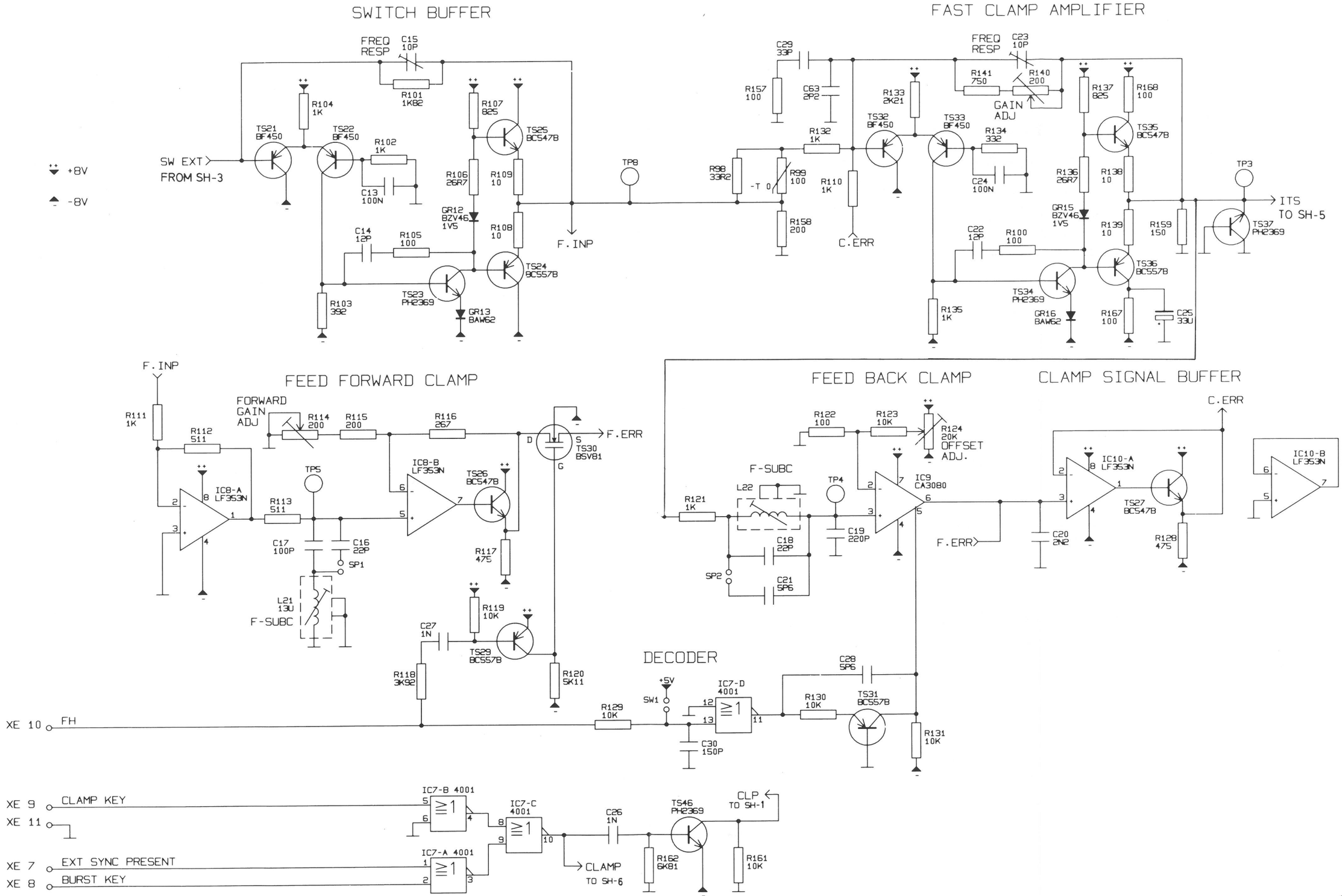

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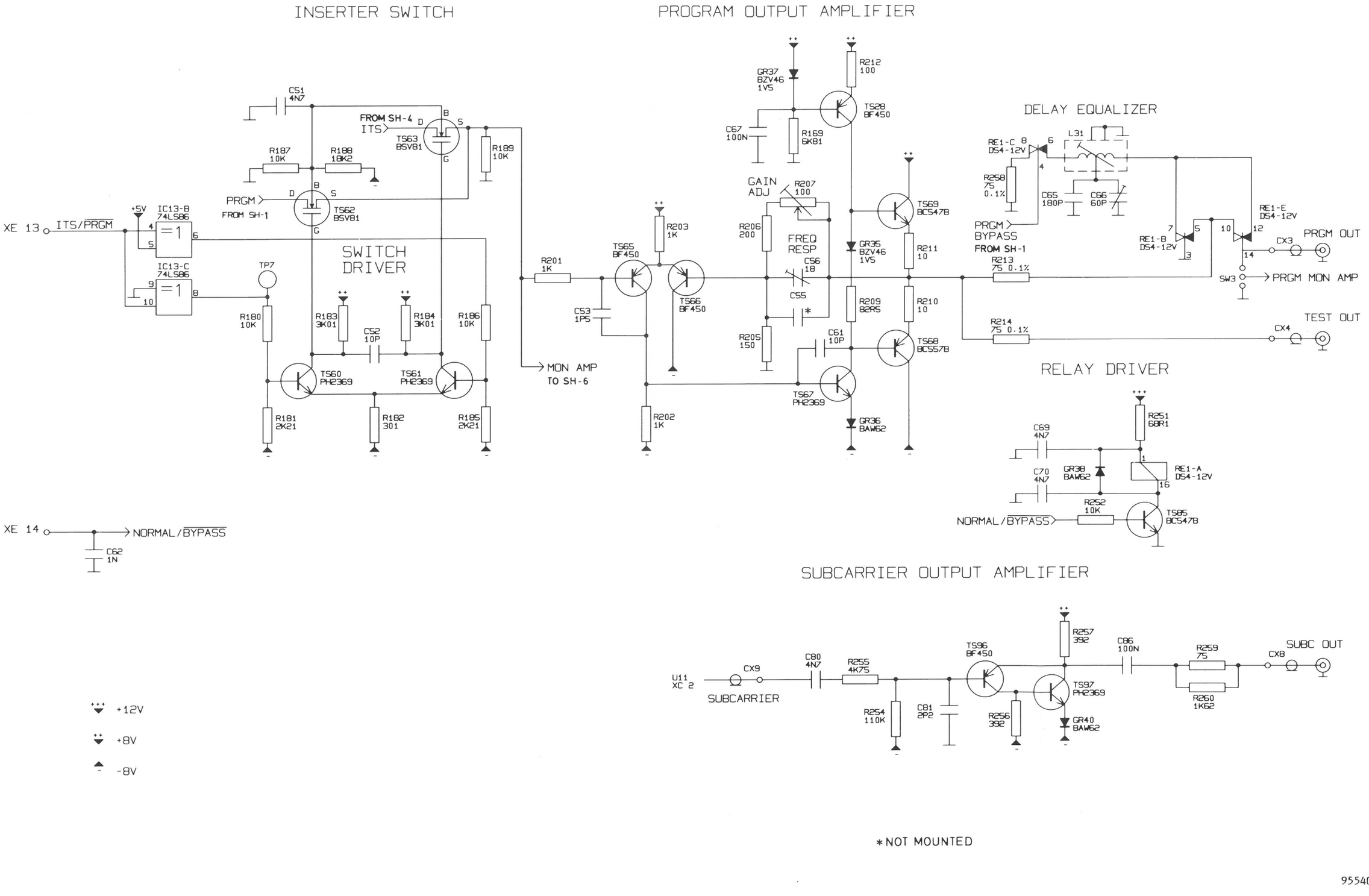
Fig. 19-7 Circuit diagram, signal processor, unit 8, sh. 4



*NOT MOUNTED

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Fig. 19-8 Circuit diagram, signal processor, unit 8, sh. 5

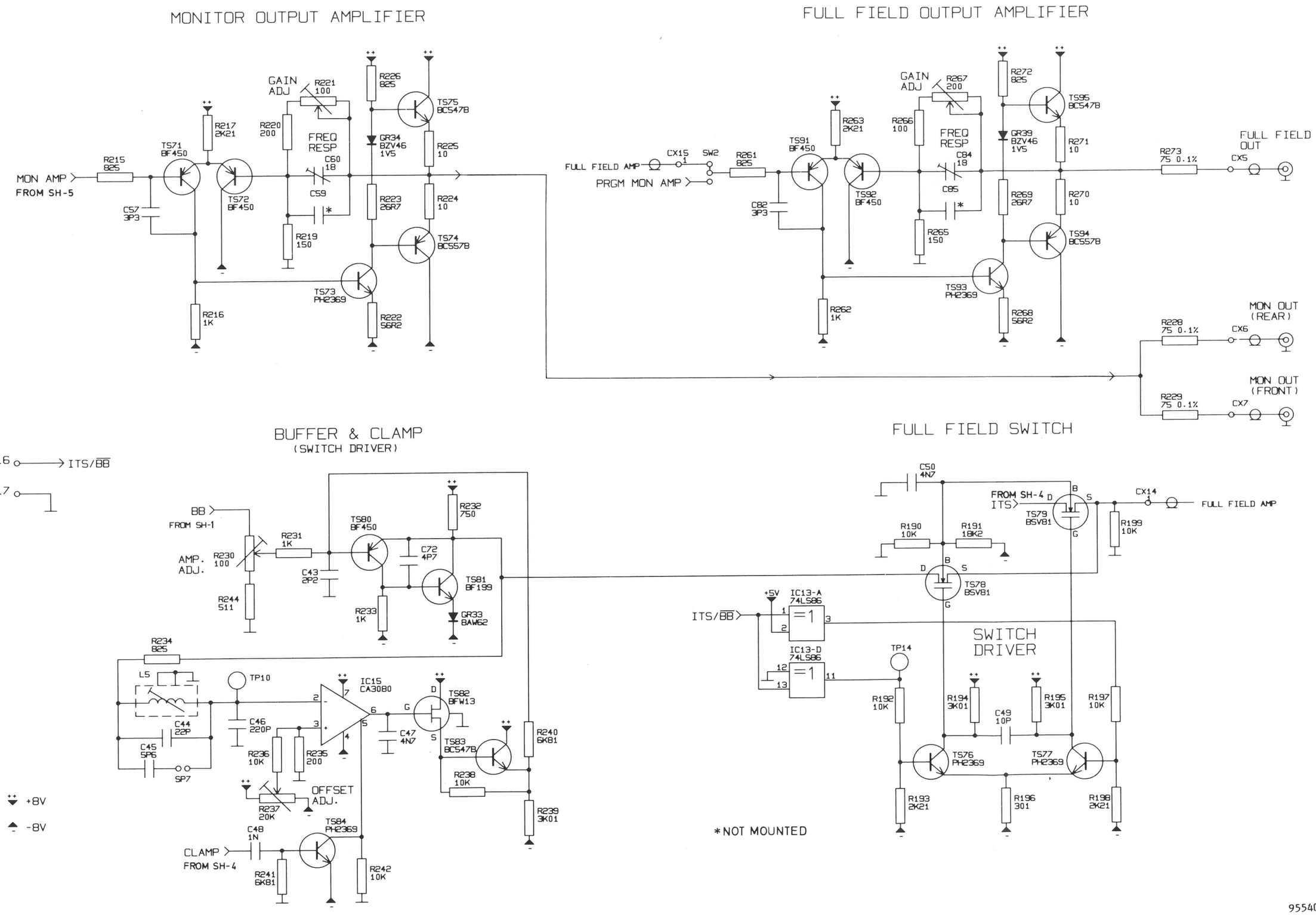

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Fig. 19-9 Circuit diagram, signal processor, unit 8, sh. 6

20. Unit 9 - remote interface

The remote interface consists of three I^2C I/O Ports, based on +5V TTL logic levels, protected against voltages up to ±25V. Internal pull-ups and series resistors on all in and outputs.
For further information; refer to Chapter 6, installation instructions and Chapter 8, operating instructions.
Circuit diagram and component location are shown overleaf.

In addition refer to Chapter 23, service hints.

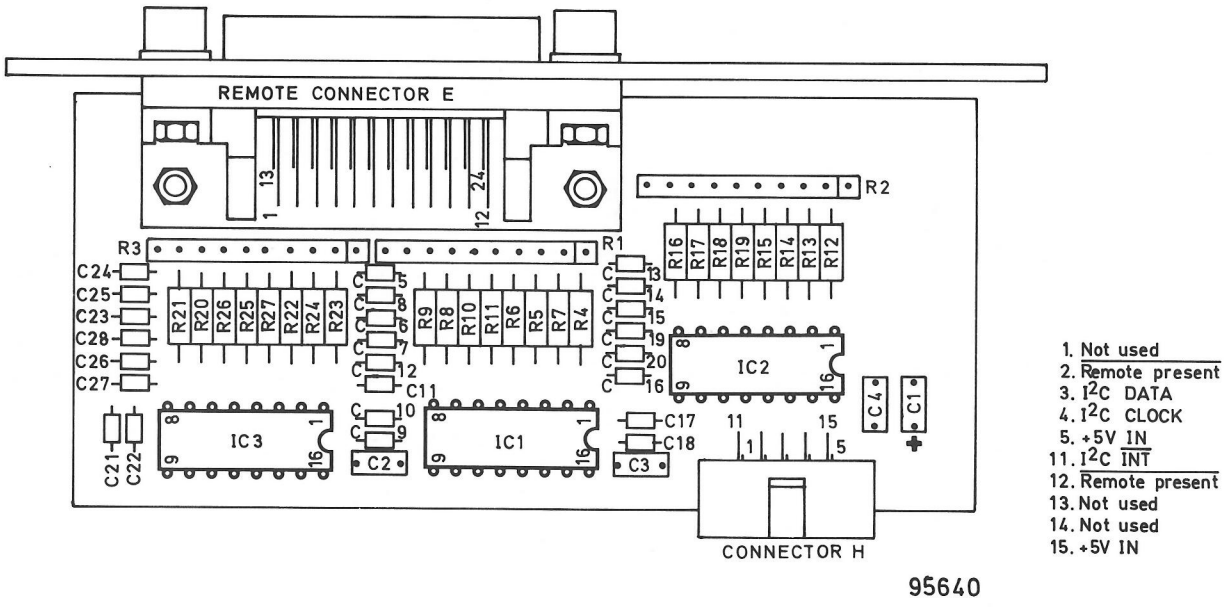

Fig. 20-1 Component location, remote interface, unit 9

I2C I/O PORTS

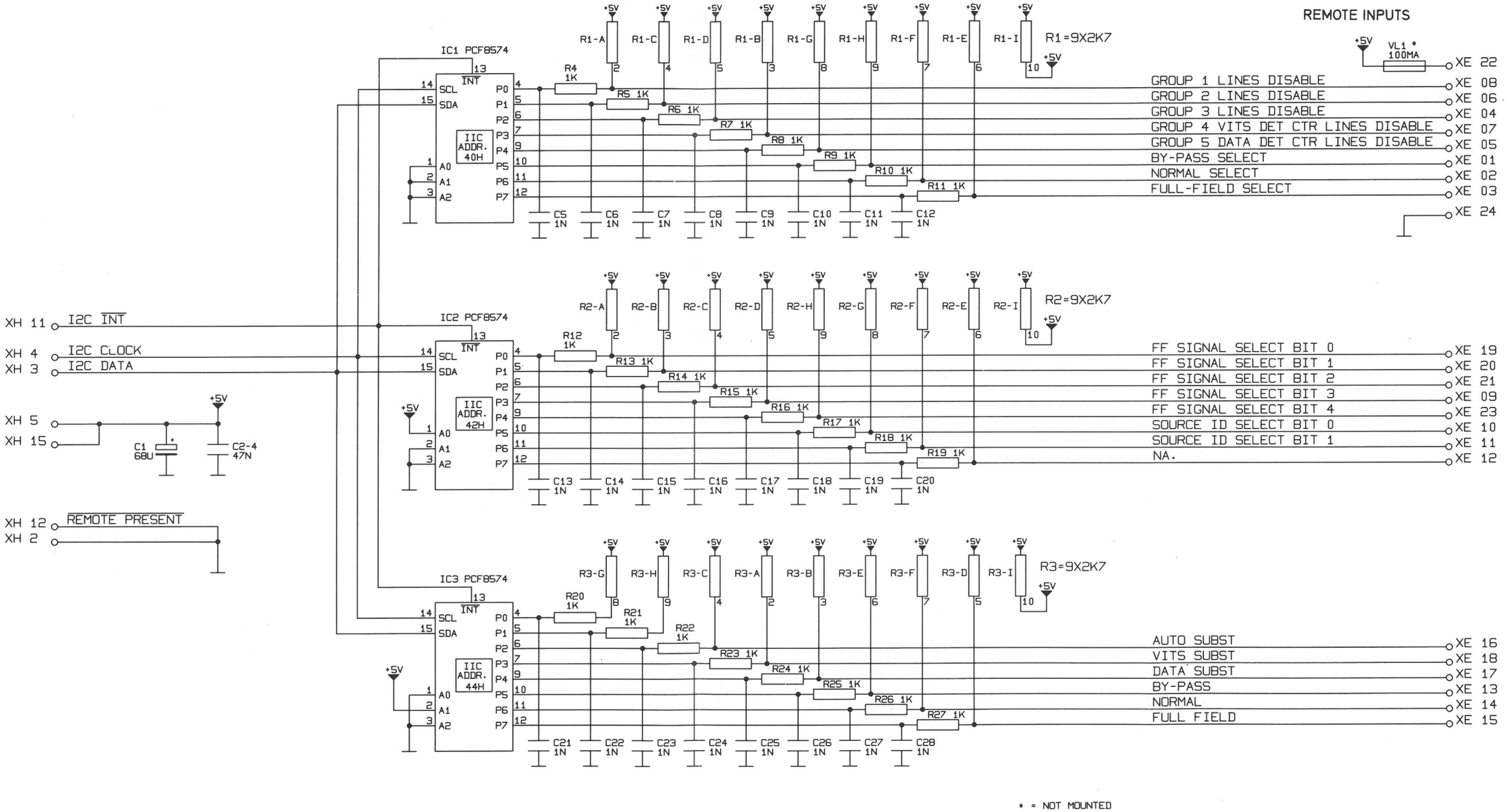

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Fig. 20-2 Circuit diagram, remote interface, unit 9

21. PM 8538 - unit 10 (Optional)
Source code generator/detector & VITS detector

Block diagram description

General

The data to be inserted consists of a stream of bi-phase (complemented elements) signals, in which a "1" bit is transmitted as two complemented elements in the order 1, 0 and a "0" bit is transmitted as two complemented elements in the order 0, 1. The sequence in each data line begins with a "run-in" series of alternating 1 and 0 elements, the purpose of which is to synchronize the data-extraction clock at the receiver end. This is followed by a "start code" which marks the commencement of the information to be transmitted. The identification of the source is coded in the subsequent data.

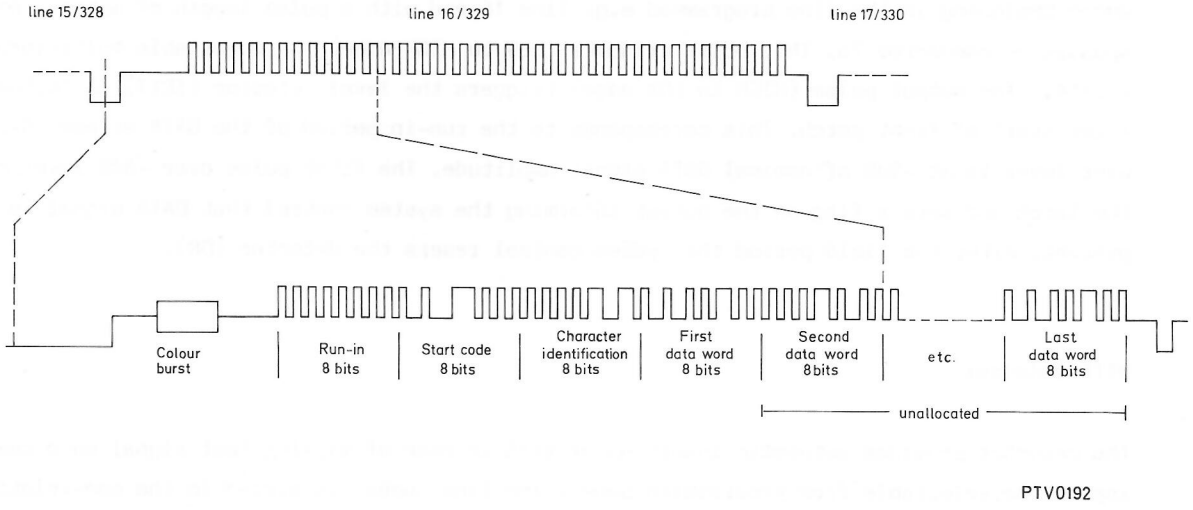


Fig. 21-1 Schematic representation of the data stream

Source generator

The lines in which the souce identification code should be inserted are selected by use of the VITS programming panel (See operating instructions, Chapter 8).
4 sets of source identification codes in an 8 field sequence can be selected by use of the remote facilities (See installation instructions, Chapter 6).

The source identification code is digitally stored in the PROM (factory programmed to customer requirements). The horizontal counter is divided into two sections. The first section (IC1) provides the right place on the line and the second section acts as an address counter for the PROM with a clock frequency of 5MHz. The code sequence circuit provides "the correct code in the correct field".

Source code detector

The detector provides automatic insertion of DATA from either the source identification generator or a signal from one of the EXT inputs in case of missing incoming DATA. In addition see operating instructions.
The BP-filter (2.5MHz) in the detector allows only source code information to pass to the comparator (IC13). When DATA detector is selected ON, a S.C. sense pulse (starts at front porch beginning in the line programmed e.g. line 16 and with a pulse length of approx. 65us) appears on connector 7a. This pulse triggers (LOW to HIGH edge) the monostable multivibrator (IC11A). The output pulse (HIGH to LOW edge) triggers the level detector (IC13) at 16.5us after start of front porch. This corresponds to the run-in period of the DATA stream. Switch over level is at -8dB of nominal DATA signal amplitude. The first pulse over -8dB level clocks the latch and sets a flag on the output informing the system control that DATA signal is present. After the field period the system control resets the detector (DR).

VITS detector

The detector provides automatic insertion of VITS in case of missing test signal on a specific input line selectable from programming panel. The line number is stored in the non-volatile memory. In addition see operating instructions.
The principle for the VITS detector operation is quite identical to that of the DATA detector, except for the fact that it is factory adjusted to detect line 17 (A) composite signal (last step in the staircase signal; refer to [2]).

Test and adjustments

Measuring equipment:
Digital voltmeter : e.g. Philips PM 2528
Oscilloscope : e.g. Philips PM 3217
Video generator : e.g. Philips PM 5570
Video generator
incl. source code : e.g. Another PM 5654

A. Voltage checks

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

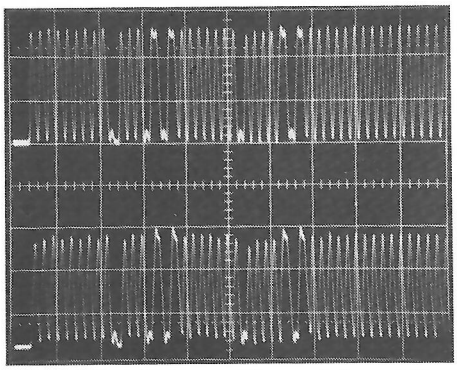
2. Using a digital voltmeter, check for -8V ±0.4V on ◇2◇.

3. Using a digital voltmeter, check for +5V ±0.2V on ◇3◇.

B. Adjustments

1. Filter shape and source code level.

- Remove unit 5 (B1 burst/color bar generator) and insert unit 10 instead.
- Select "FULL-FIELD" mode, CBAR.
- Apply a nominal video signal to "PROGRAM IN".
- Connect the oscilloscope (term. 75ohm) to "PROGRAM OUT".
- Check that the shape is identical to the curve in fig. 21-1.
- If not OK, adjust L1, L2 and L3.
- Then check the source code signal amplitude, it should be 0.5Vpp ±15mVpp.
- If not OK, adjust R4 (See fig. 21-2).
- Place units in correct positions (See Chapter 9, fig. 9-3).



L1, L2 and L3 correctly adjusted

L1, L2 and L3 detuned

0.2V/div. 10us; delayed 2us

Fig. 21-2 Source code shape.

2. Burst notch

- Apply a nominal video signal to "PROGRAM IN".
- Select any of the main functions.
- Connect the oscilloscope (10us/div.) to (1) .
- Adjust L21 to minimum burst; refer to [1] .
  NOTE: SP1 is connected in M-version.

3. ITS detector time

- Apply a nominal video signal to "PROGRAM IN".
- Select any of the main functions.
- Program any line and any group for VITS detector ON.
- Connect the oscilloscope (5ms; delayed 10us/div.) to (2) .
- Check that the pulse length is 58us ±2us; refer to [2] or as required (the detector is adjusted to detect a line 17 signal, when delivered).
- If not OK, adjust R30.

4. 2.5MHz filter

- Apply a nominal video signal containing a source code signal (e.g. on line 16, field 1).
- Select any main functions.
- Connect the oscilloscope (5ms; delayed 20us/div.) to (3) .
- Adjust L41 to maximum 2.5MHz; refer to [3] .

5. Source code detector time

- Apply a nominal video signal containing a source code signal (e.g. on line 16, field 1).
- Select "NORMAL" and source code detector ON.
- Connect the oscilloscope (5ms; delayed 10us/div.) to (4) .
- Check that the pulse length is 16.5us ±1us; refer to [4] .
- If not OK, adjust R48.

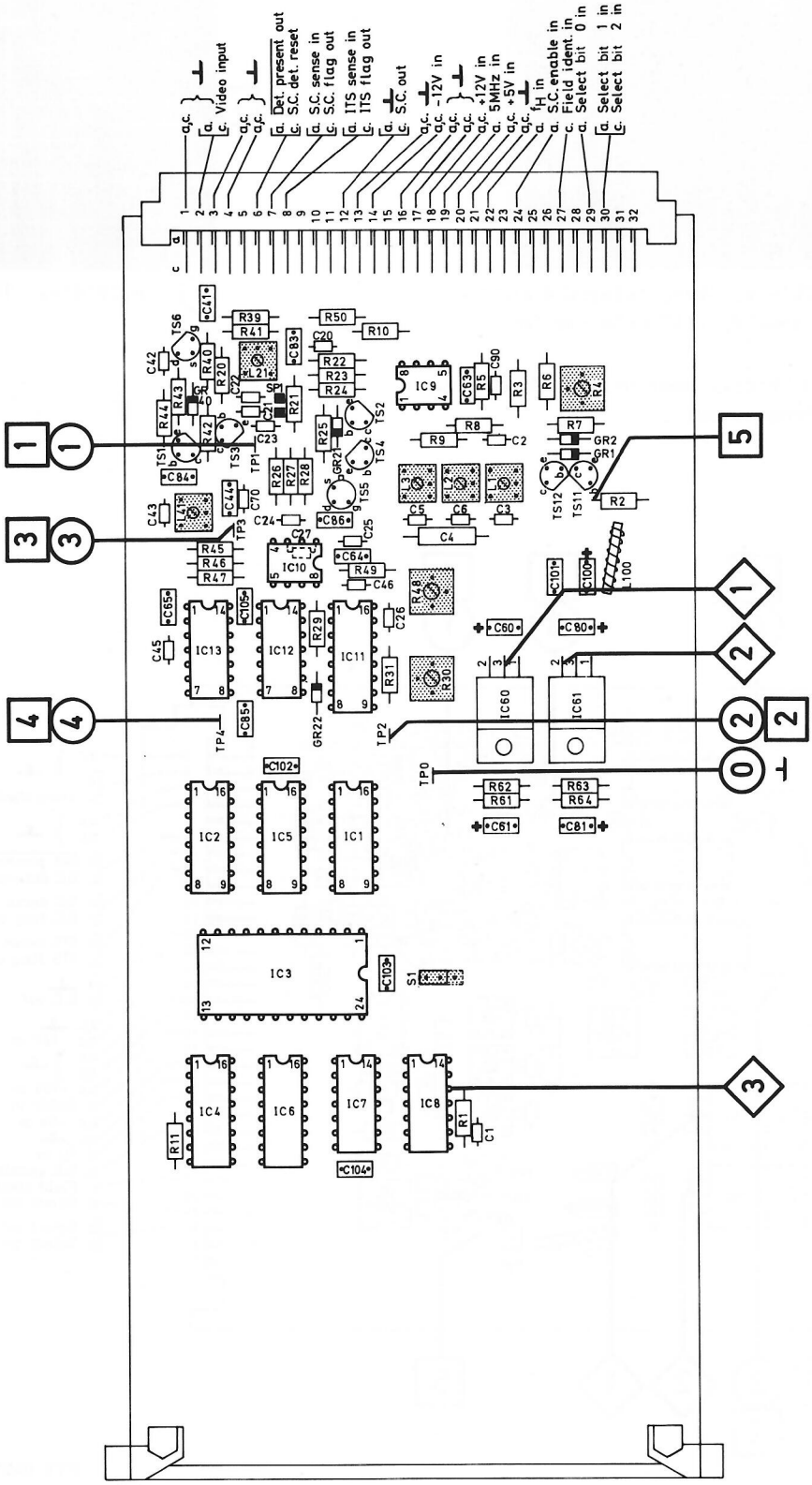


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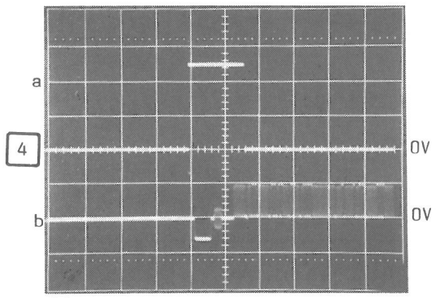
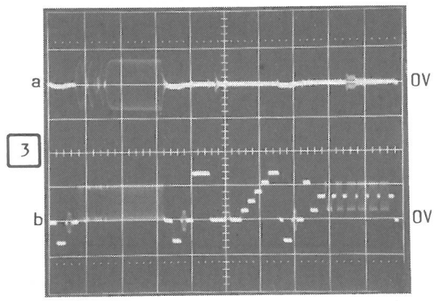
Fig. 21-3 Adj. elements, PM 8538, unit 10



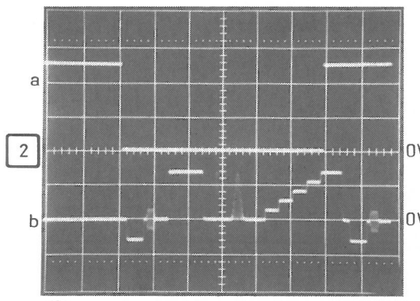
(4) a: 5V/div. 5ms; delayed 10us/div.
S.C. det. ON

b: 0.5V/div. 5ms; delayed 10us/div.
Program out



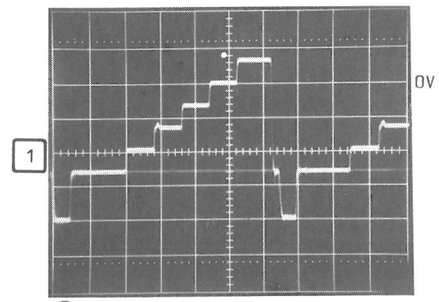
(3) a: 0.5V/div. 5mV; delayed 20us/div.
Line 16, with incoming S.C.
C41 max. adjust

b: 0.5V/div. 5mV; delayed 20us/div.
Program out

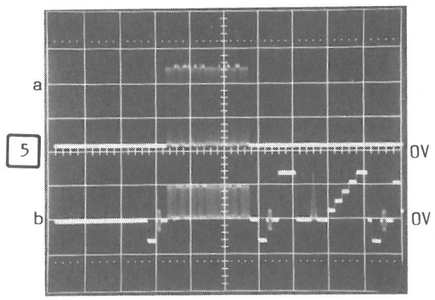


(2) a: 2V/div. 5ms; delayed 10us/div.
Line 17, VITS Detector ON

b: 0.5V/div. 5ms; delayed 10us/div.
Program out



(1) 0.2V/div. 10us/div.



a: 2V/div. 5ms; delayed 20us/div.

b: 0.5V/div. 5ms; delayed 20us/div.
Program out

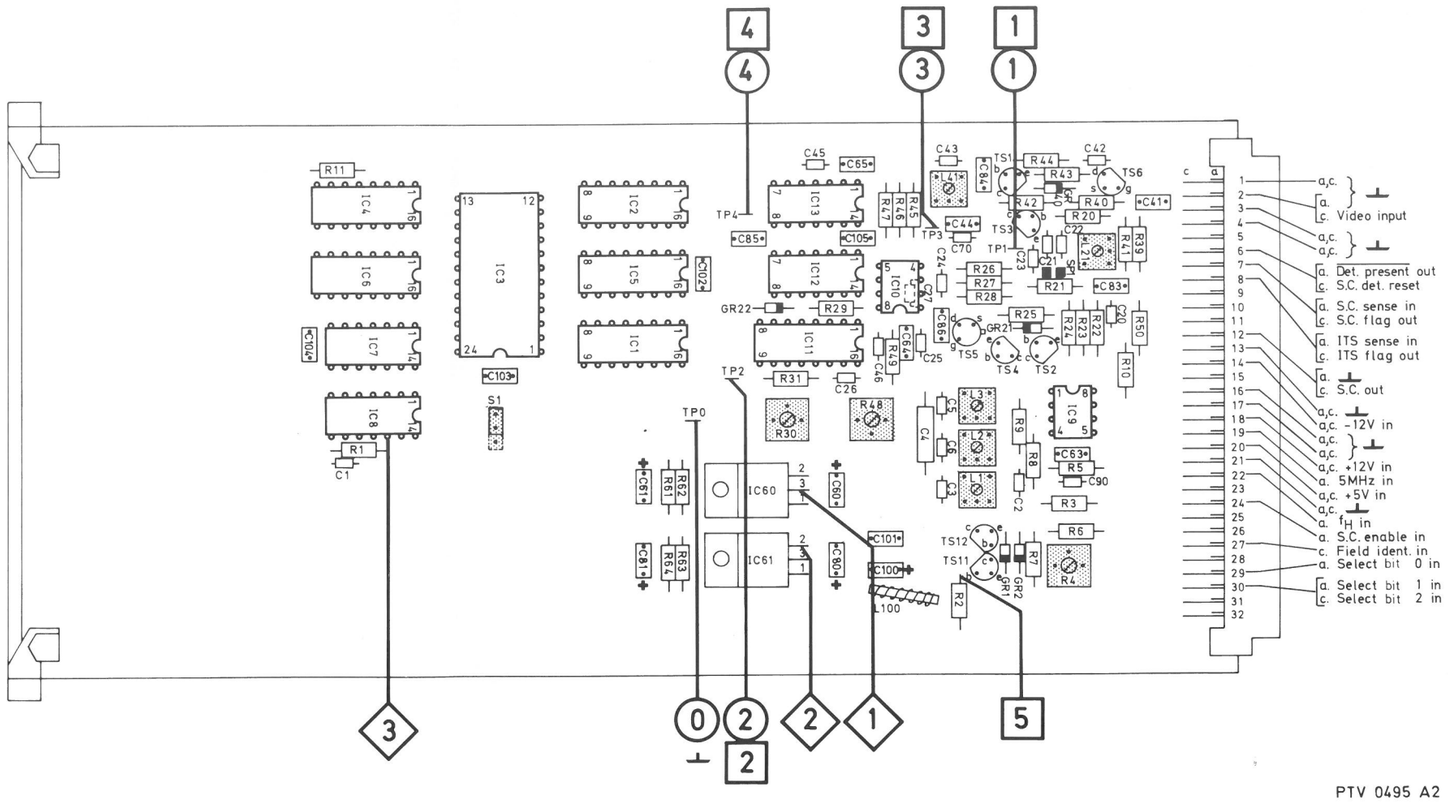


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Fig. 21-4 Check points, PM 8538, unit 10

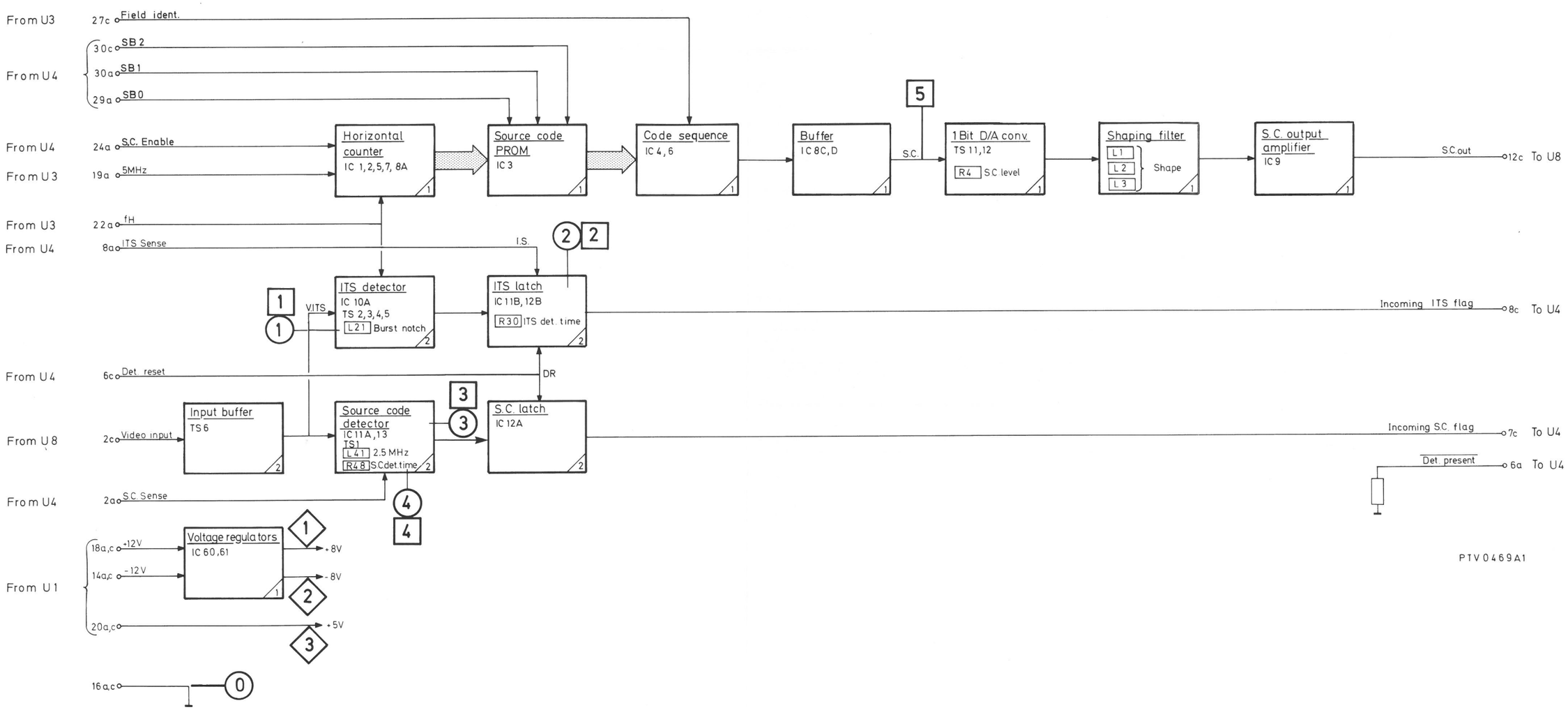


Fig. 21-5 Block diagram, PM 8538, unit 10

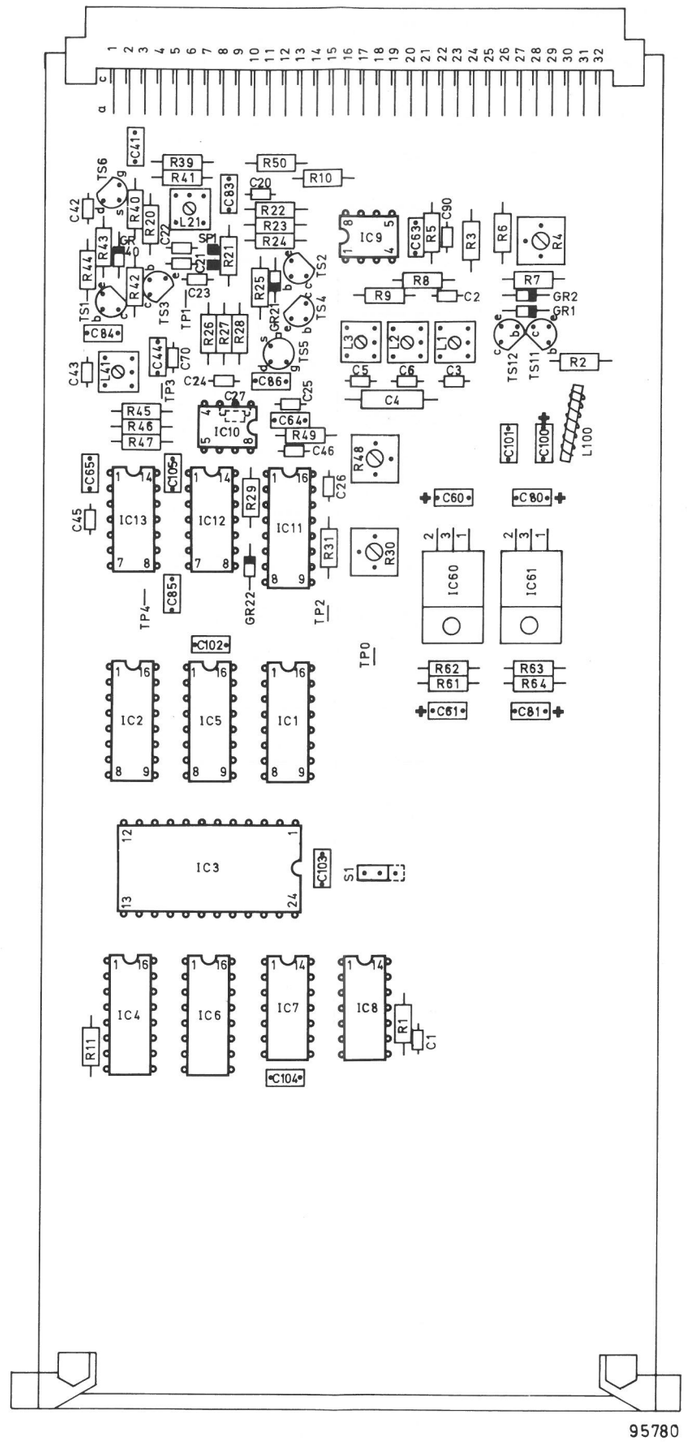


Fig. 21-6 Component location, PM 8538, unit 10

SOURCE CODE GENERATOR

HORIZONTAL COUNTER

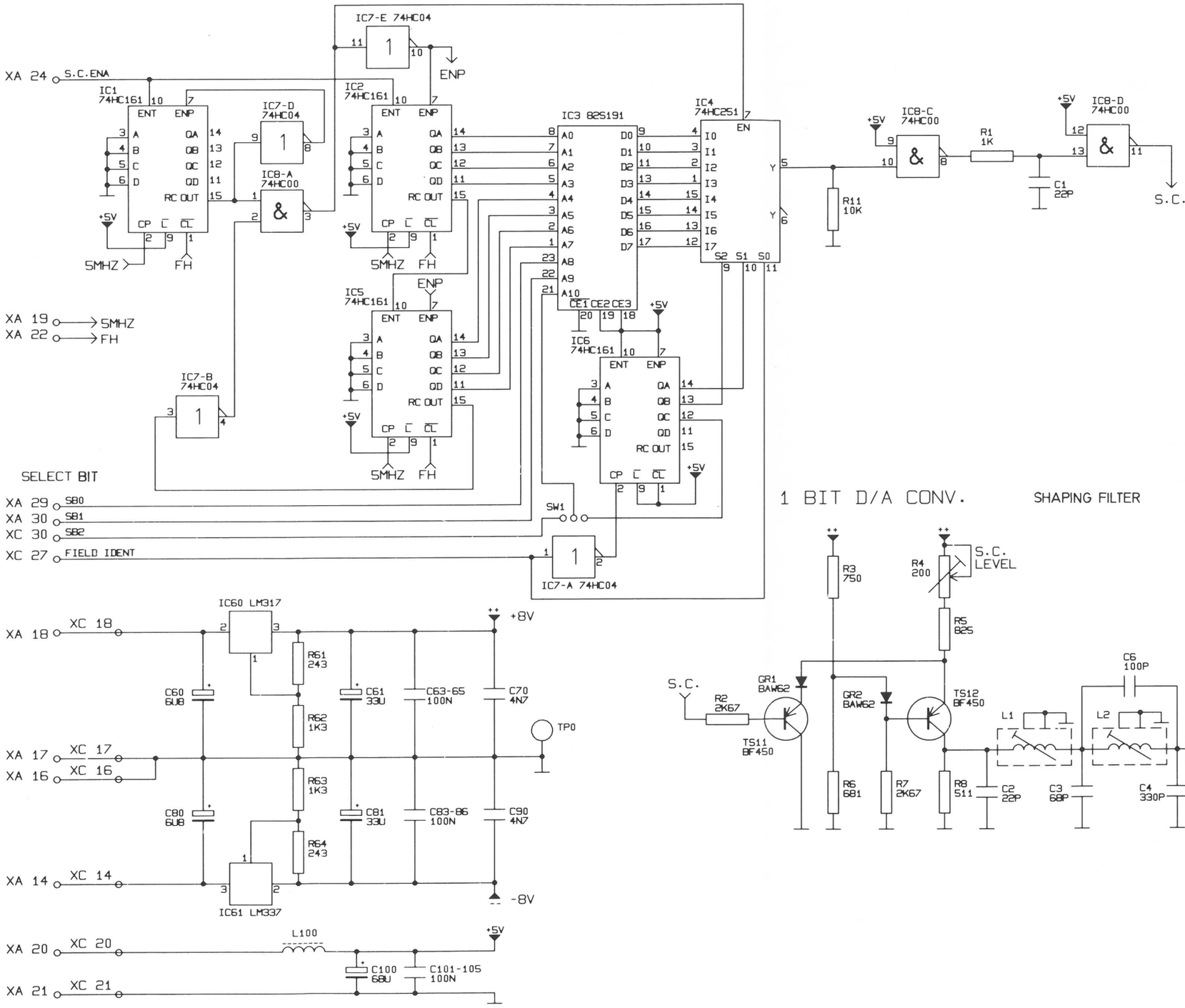
SOURCE CODE PROM

CODE SEQUENCE

1 BIT D/A CONV.

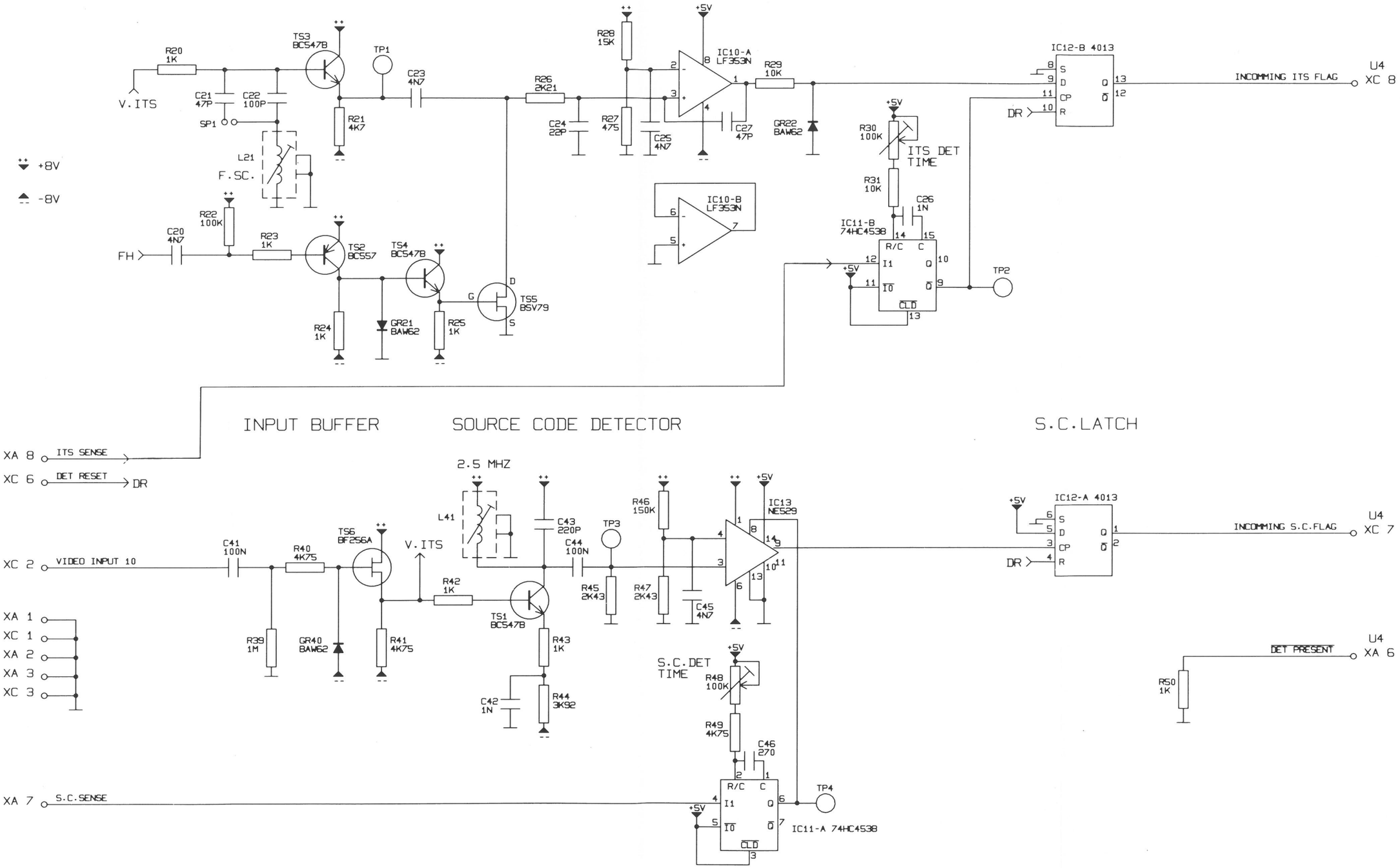
SHAPING FILTER

S.C.OUTPUT AMPL.



95780

Fig. 21-7 Circuit diagram, PM 8538, unit 10, sh. 1



95780

Fig. 21-8 Circuit diagram, PM 8538, unit 10, sh. 2

22. Unit 11 - Phase shift network (M-version only)

The phase shift network provides a 90° phaseshift of the subcarrier before being applied to the test signal generator (unit 6) modulator circuit.

Test and adjustments

Measuring epuipment :
Digital voltmeter : e.g. Philips PM 2528
Vectorscope : e.g. Philips PM 5567

A. Voltage checks

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

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

B. Adjustments

Subcarrier amplitude/phase

- No video signal needs to be applied.
- Connect the vectorscope to "FULL-FIELD OUT".
- Select "FULL-FIELD" mode, NTC-7 COMB.
- Select uncal. on the vectorscope and adjust the amplitude of burst vector to the circle edge and in the +V direction (+90°) by means of the phase adjustment on the vectorscope.
- Connect pin 10 of IC1 (or GR1 anode) to (1) (ground).
- Adjust R6 in such a way that the burst vector is exactly on the -U axis (180°) and R7 in such a way that the amplitude is the same as before (at circle edge).
- It may be necessary to readjust R6 and R7 a couple of times.
- Remove ground connection.

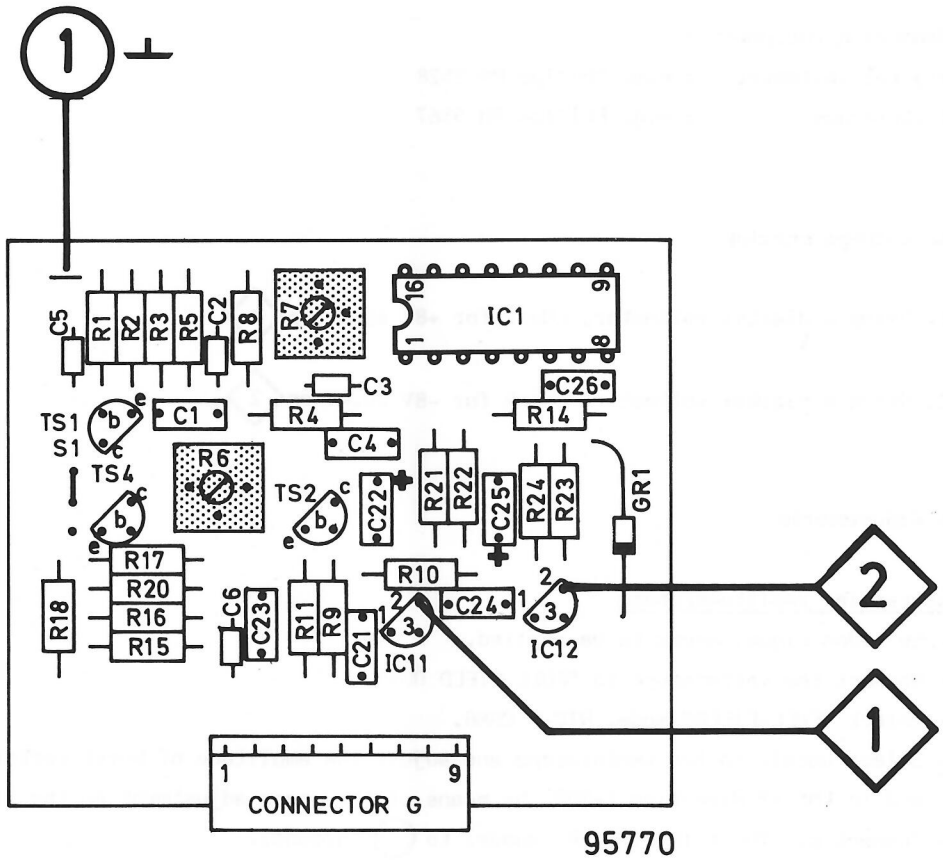
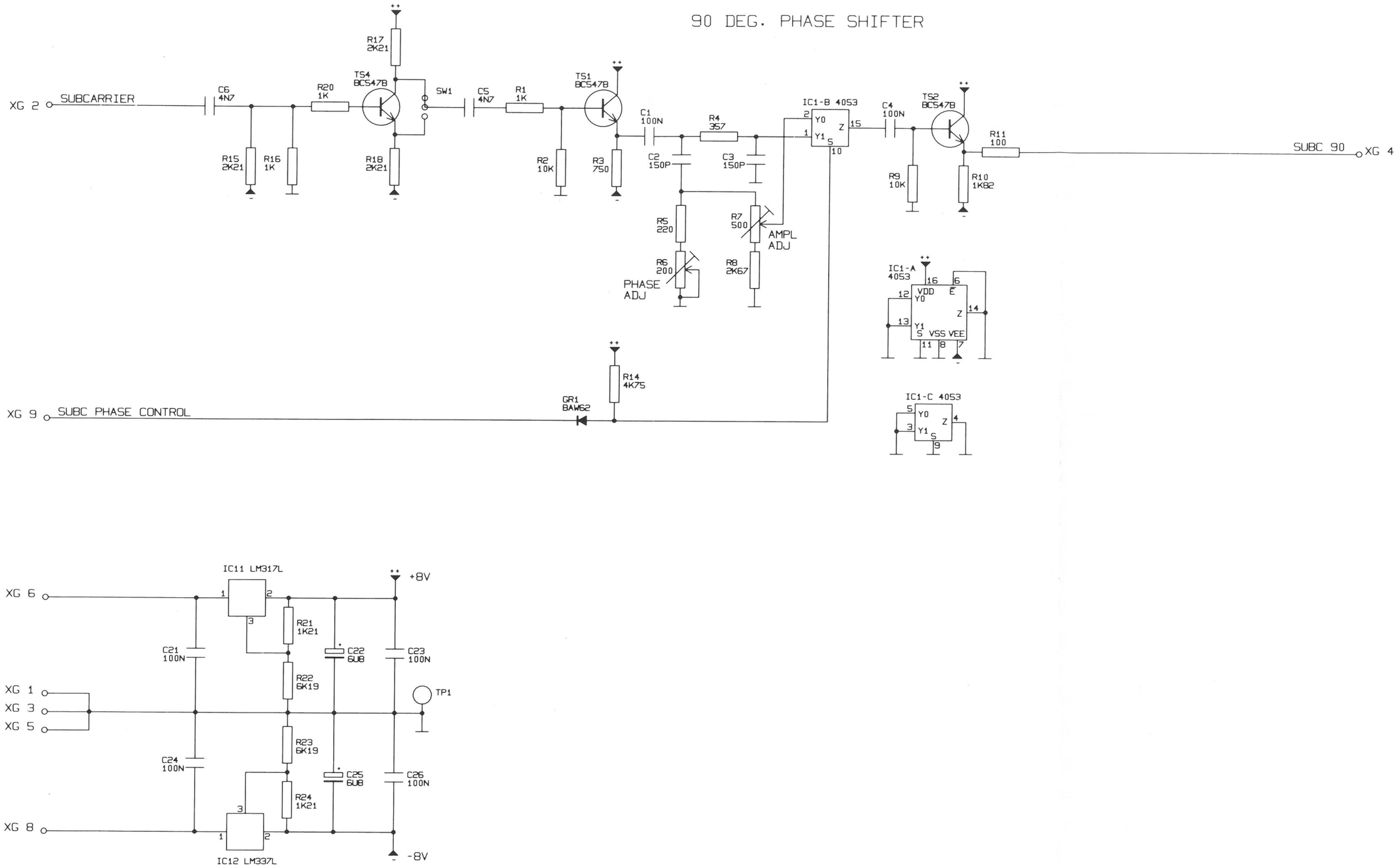


Fig. 22-1 Check points, phase shift network, unit 11



95770

Fig. 22-2 Circuit diagram, phase shift network, unit 11

23. Service hints

A service switch (SW2) is provided on the keyboard & display, unit 7. By pressing the switch the non-volatile memory is reset, meaning that the instrument is in the state as delivered, refer to Chapter 3, technical data, item I & J (VITS specification).

The instrument runs a built-in diagnostic program when switched on. If OK: ALL LED's and segments (88888) are lit for 0.5 seconds. Then the instrument will shift to the state as before power off (according to information stored in the non-volatile memory).
To include a RAM test; refer to Configuration page 6-6.

Different error codes indicate malfunctions:
Substitute PRGM LED flashes: Control PROM error (IC6, system control, unit 4).
Substitute DATA LED flashes: RAM error (IC5, system control, unit 4).
Substitute VITS LED flashes: PROM error (IC5, keyboard & display, unit 7).

Errors codes in LINE NO segments:
"E40": PORT 40 = IC1 , remote interface, unit 9.

"E42": PORT 42 = IC2 , remote interface, unit 9.

"E44": PORT 44 = IC3 , remote interface, unit 9.

In the case where all LED's and segments lit constantly, check first the ALE on (2) , unit 4 (refer to [1]). If OK, the control PROM (IC6, unit 4) is defective.

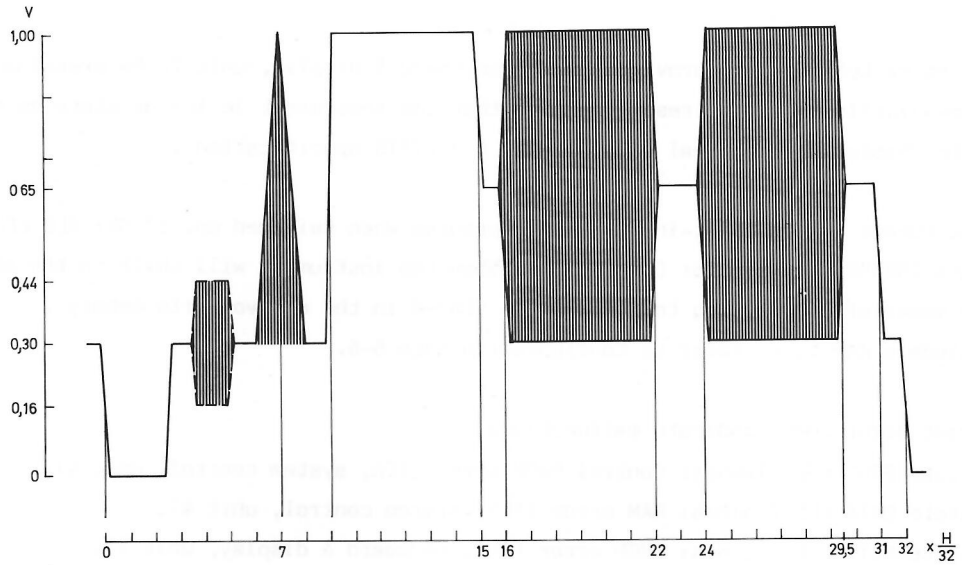
In the case where all LED's and segment or some of them are random flashing, the PROM (IC5, unit 7) is defective.

After the power ON sequence has run it is possible to disconnect the keyboard & display unit by removing connector H from the system control, unit 4. The instrument will remain in the selected operating conditions; but will not be able to start again after power off.

If VITS insertion is missing in one field, then possible shortcircuit/interruption in the fv2 or field ident. Signals derived from the sync generator (unit 3).

NOTE: The calibration signal overleaf is used for an overall check of chrominance/luminance generated signals in the test signal generator (unit 6).

G-version, calibration signal



PTV0371A3

A. Signal elements

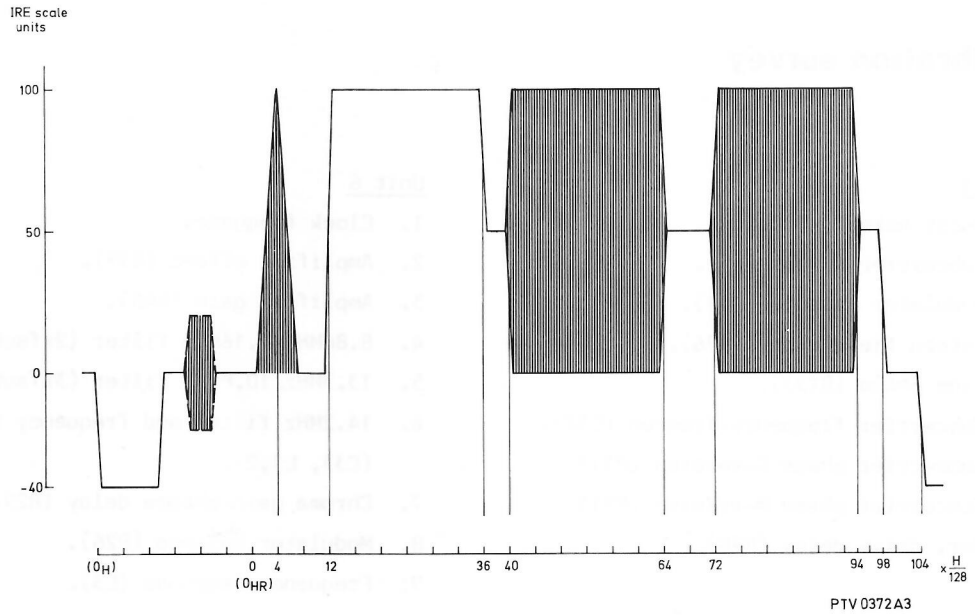
Carrier born sine^2 pulse	: (Timing 7)
White reference bar	: (Timing 9-15)
Chroma bar generated in luminance channel	: (Timing 16-22)
Chroma bar generated in chrominance channel	: (Timing 24-29,5)

B. Electrical data

Carrier born sine^2 pulse	: Amplitude	: 0.7Vpp ±1%
	Half amplitude duration	: 2000ns ±60ns
	Bottom curvature	: 0.5%
	Modulation unbalance	: <3mV
	Subcarrier distortion	: <1%
White Reference bar	: Amplitude	: 0.7Vpp ±0.5%
	Rise and fall time	: 500ns ±50ns
	Tilt	: <0.5%

Chroma bar generated in luminance channel	:	Amplitude	: 0.7Vpp ±1%
		Frequency	: 4.43MHz ±0.01MHz
		Rise and fall time	: 1us ±0.05us
Chroma bar generated in chrominance channel	:	Amplitude	: 0.7Vpp ±1%
		Frequency	: Phase locked to program burst, if present.
		Rise and fall time	: 1us ±0.05us

M-version, calibration signal



A. Signal elements

Carrier born sine^2 pulse	:	(Timing 4)
White reference bar	:	(Timing 12-36)
Chroma bar generated in luminance channel	:	(Timing 40-64)
Chroma bar generated in chrominance channel	:	(Timing 72-94)

B. Electrical data

Carrier born sine^2 pulse	:	Amplitude	: 100IRE ±0.5IRE
		Half amplitude duration	: 1570ns ±50ns
		Bottom curvature	: 0.5%
		Modulation unbalance	: <3mV
		Subcarrier distortion	: <1%

White reference bar	:	Amplitude	: 100IRE ±0.5IRE
		Rise and fall time	: 500ns ±50ns
		Tilt	: <0.5%
Chroma bar generated in luminance channel	:	Amplitude	: 100IRE ±1IRE
		Frequency	: 3.58MHz ±0.01MHz
		Rise and fall time	: 1us ±0.05us
Chroma bar generated in chrominance channel	:	Amplitude	: 100IRE ±1IRE
		Frequency	: Phase locked to program burst, if present
		Rise and fall time	: 1us ±0.05us

Calibration survey

Unit 3

1. Burst notch (L1).
2. Subcarrier output (L5).
3. Modulator balance (R91).
4. Extern field delay (R76).
5. Line phase (R133).
6. Subcarrier frequency-freerun (C37).

7a. Subcarrier phase G-version (R113).

7b. Subcarrier phase M-version (R113).

8. Hor. drive delay (R78).

Unit 5

1. 3xfsubc filter (L7).
2. R-Y filter response (L2).
3. B-Y filter response (L3).
4. Luminance filter response (L5,6).
5. Sync amplitude (R85).
6. Sync filter response (L12,13).
7. Video amplitude (R16).
8. Chrominance/luminance delay (R8).
9. Subcarrier phaseshift (L1).
10. Pulse response (L8).
11. Chroma amplitude (R39,48).
12. Burst amplitude (R81).
13. Modulator balance (R38,47).
14. 90° phase (L4).
15. Delay equalizer (L14).

Unit 6

1. Clock frequency
2. Amplifier offset (R39).
3. Amplifier gain (R46).
4. 8.86MHz/7.16MHz filter (2xfsubc) (L5).
5. 13.3MHz/10.8MHz filter (3xfsubc) (R113).
6. 14.2MHz filter and frequency response (C33, L1,2).
7. Chroma gain/chroma delay (R29, C14).
8. Modulator balance (R26).
9. Frequency response (L3).

Unit 8.

1. Burst notch (clamp amplifier) (L1).
2. Gain (program out) (R207).
3. Frequency response (program out) (C56).
4. Gain (monitor out) (R221).
5. Frequency response (monitor out) (C60).
6. Burst notch (feed forward clamp) (L21).
7. Burst notch (feed back clamp) (L22).
8. Burst notch (buffer & clamp) (L5).
9. Forward gain (feed forward clamp) (R114).
10. DC offset (feed back clamp) (R124).
11. Gain (fast clamp amplifier) (R140).
12. Frequency response (switch buffer (C15).
13. Frequency response (fast clamp amplifier) (C23).
14. DC offset (buffer & clamp) (R237).

15. Gain (Full-field output amplifier) (R267).
16. Frequency response (Full-field output amplifier) (C84).
17. Delay difference (program out) (C66).
18. Return loss (program output) (L31).
19. TCXO reference (C41).
20. Sync amplitude (R151, 230).

Unit 10.

1. Filter shape and source code level (L1,2,3 and R4).
2. Burst notch (L21).
3. ITS detector time (R30).
4. 2.5MHz filter (L41).
5. Source code detector time (R48).

Unit 11.

1. Subcarrier amplitude/phase (R6,7).

Maintenance

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.

CABINET

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

NOTE:

If you meet service problems with this equipment, please contact the local PHILIPS sales/service organization. Our service centres 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 centre 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 and the remark "Return-shipment for repair".

AFTER COMPLETION, CUT ALONG DOTTED LINE AND RETURN TO THE PHILIPS SERVICE ORGANISATION IN YOUR COUNTRY.

FAULT ANALYSIS REPORT

To aid us in maintaining our 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 instrument requires repair and/or adjustment.

INSTRUMENT TYPE NO.: PM_____ SERIAL NO.: _____

ESTIMATED USAGE: _____ HRS/YR

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.

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

- ☐ EXCELLENT ?
- ☐ VERY GOOD ?
- ☐ GOOD ?
- ☐ ADEQUATE ?
- ☐ POOR ?
- ☐ VERY POOR ?

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

_____

_____

Does your company/organisation normally:

- ☐ REPAIR SELF.
- ☐ SEND INSTRUMENT TO PHILIPS SERVICE.

Have you any other suggestions/complaints.

_____

_____

PLEASE SEND THIS REPORT TO THE PHILIPS SERVICING ORGANISATION IN YOUR COUNTRY. THANK YOU.

24. Troubleshooting hints

Remove unit 4, 5, 6, 9, 10 (if installed) and unit 11 (M-version only).
Switch on the power.
Check the supply voltages on unit 1 (+12V, -12V and +5V regulated); refer to page 12-2.

Unit 3

Apply a nominal video signal to "PROGRAM IN".
Check the supply voltages; refer to pages 14-10 and 14-11.

+8V ±0.4V on ◇1◇ (IC8, pin 1).

-8V ±0.4V on ◇2◇ (IC8, pin 6).

+5V ±0.2V on ◇3◇ (connector 20a,c)

Check the sync slicer output; refer to [4] and [5] (page 14-8).
Check the field separator output on (3) ; refer to [6] (page 14-8).
Check the subc ref. on (4) ; refer to [7] (page 14-9).
Check the 5MHz (G)/5.03MHz (M) clockpulse; refer to [3] (page 14-8).
Check the sync lock according to the adjustment procedure, item 5; refer to [8] (page 14-9).
Check the burst lock by checking for stable pulses on (8) ; refer to [9] (page 14-9).
Check the fH pulses on S9; refer to [10] (page 14-9).
Check the ext. field reference pulses on connector 19c; refer to [12] (page 14-9).
Check the field identity pulses on connector 27c; refer to [13] (page 14-9).
Check the clamp key pulses on connector 28a; refer to [14] (page 14-9).
Check the subcarrier on "SUBC OUT"; refer to [15] (page 14-9).

Unit 4 and 7

Switch off the power and insert unit 4 and 7.
Switch on the power and observe the diagnostic according to Chapter 23, service hints.
Check the insertion pulses on (10) and (12) ; refer to [6] and [7] , unit 4, page 15-2.
Check the switch pulses on (5) and (6) , refer to pages 15-2 and 15-3.

Unit 5

Switch off the power and insert unit 5. Switch on the power.
Check the supply voltages, refer to pages 16-6 and 16-7.

+8V ±0.4V on ◇1◇ (IC22 pin 10).

-8V ±0.4V on ◇2◇ (IC21 pin 16).

+5V ±0.2V on ◇3◇ (connector 20a,c).

Check the "BL BURST OUT" signal (-300mVpp sync, 300mVpp burst and black level at 0V. Refer to page 16-7.
Check color bar out on connector 12c, select CBAR Full-field signal; refer to [2] (page 16-6).
Check "SYNC OUT"; refer to [8] (page 16-6).

Unit 8

Check the supply voltages; refer to pages 19-6 and 19-7.

+8V ±0.4V on ◇1◇ (IC21 pin 3).

-8V ±0.4V on ◇2◇ (IC22 pin 2).

+5V ±0.2V on ◇3◇ (connector F pin 5).

Apply a nominal video signal to "PROGRAM IN".
Check the program channel; refer to [1] and [2] (pages 19-6 and 19-7).
Apply a nominal video signal (superimposed with approx. 1Vpp hum) to "EXT 1". Connect the unused connector to "PROGRAM IN".
Select "FULL-FIELD" mode, EXT 1.
Check the signal on "PROGRAM OUT" (no hum must be observed).
Select "FULL-FIELD" mode, CBAR.
Check the color bar on "FULL-FIELD OUT".
No signal applied to "PROGRAM IN".
Check the TCXO reference on (6) ; refer to [6] (page 19-6).

Unit 6

Switch off the power, insert unit 6. In M-version insert furthermore unit 11; refer to page 22-1. Switch on the power.
Check the supply voltages; refer to pages 17-6 and 17-7.

+8V ±0.4V on ◇1◇ (IC20 pin 13).

-8V ±0.4V on ◇2◇ (R44).

+5V ±0.2V on ◇3◇ (IC4 pin 16).

-5V ±0.2V on ◇4◇ (IC13 pin 23).

+5V ±0.2V on ◇5◇ (connector 20a,c).

Check the clock frequencies on (1) and (5), refer to [1] and [4] (page 17-6).
If the clock frequencies (20MHz/20.14MHz) are not correct, check the loadpulses on (2); refer to [2] (1 pulse per line).
Select "FULL-FIELD" mode, line 17 (A)/NTC-7 COMP and check the Full-field signal on "PROGRAM OUT"; refer to [8].
Press the service switch (SW2) on unit 7; refer to page 23-1, service hints and check that the VITS are on their respective lines according to Chapter 3, item I and J.

Unit 9

Switch off the power, insert unit 9 and switch on the power; refer to page 23-1, service hints.

Unit 10

Switch off the power, insert unit 10 if provided and switch on the power; refer to Chapter 21.

25. Recommended test equipment

PTV TYPE NO

PM5533 PM5534 PM5535 PM5537 PM5538 PM5539 PM5545 PM5546 PM5548 PM5549 PM5560 PM5565 PM5567 PM5570 PM5575 PM5576 PM5578 PM5580 PM5581 PM5582 PM5583 PM5588 PM5597 PM5598 PM5625 PM5630 PM5631 PM5632 PM5633 PM5634 PM5645 PM5646 PM5651 PM5652 PM5654 PM5669 PM5670 PM5671 PM5672 PM5673 PM5691 PM5693 PM5694 PM8501/02 PM8503 PM8504 PM8515 PM8519 PM8521 PM8522

BASIC EQUIPMENT

- Oscilloscope PM3217
- Voltmeter PM2528
- Counter/Timer PM6670
- Current Tracer HP547A
- Video level meter PM5548
- Test signal gen. PM5570
- Colour generator PM5631
- Vectorscope PM5567
- Function generator PM5134
- Monitor PM5625
- Power supply PE1542
- TV test signal gen. PM5646

VIDEO
Overall performance

- CTV W/Teletext decoder
- ITS Generator PM5576
- Spectrum anal. HP8557+1121A
- Modulator PM5597/98
- Vectorscope Tektronix 521A
- CTV
- Vecamscope TTV 8300
- Vector voltmeter HP8405A
- PAL encoder PM5545
- Const.ampl.gen. SG503
- S/N equipm.R&S UPSF 110.2894
- White-D comparator PM8519
- Calibration gen. PM5546
- Waveform mon. PM5565
- Gain delay test set R&S SPAF
- RMS Voltmeter HP3400A
- Test print PM8507

PTV TYPE NO

PM5533 PM5534 PM5535 PM5537 PM5538 PM5539 PM5545 PM554€ PM5548 PM5549 PM5560 PM5565 PM5567 PM5570 PM5575 PM5576 PM5578 PM5580 PM5581 PM5582 PM5583 PM5588 PM5597 PM5598 PM5625 PM5630 PM5631 PM5632 PM5633 PM5634 PM5645 PM5646 PM5651 PM5652 PM5654 PM5669 PM5670 PM5671 PM5672 PM5673 PM5691 PM5693 PM5694 PM8501/02 PM8503 PM8504 PM8515 PM8519 PM8521 PM8522

FM Demodulator HP8501A
RF voltmeter HP3406A
Spectrum anal. HP8554L
Counter/Timer PM6672
IF modulator PM 5580
Tracking gen. HP8444A
Audio anal. HP8903A
Videoscope R&S SWOF 3

VHF converter PM5581
Group del. meter R&S LFM 2
Sweep generator HP3335A
UHF converter PM5582
Spectrum anal. HP8558B+182C
Test demodulator PM8515
Intercarrier mixer PM8513
38.9MHz osc. PM8514

Signal gen. HP8640B
VSWR bridge 50ohms Wiltron
Network anal. HP8505A
X-Y recoder PM8134
Weighting filter CCIR
Sideband anal.R&S SWOF 3-Z
VSWR bridge 75ohms
Dummy load >1W 75ohms

RF
Overall performance

26. List of mechanical parts

ITEM	DESCRIPTION	QUANTITY	ORDERING NUMBER
1.	Textplate, G	1	5322 455 71025
	Textplate, M		5322 455 71024
2.	Door (incl. labels)	1	5322 447 90698
3.	Ornamental strip	1	5322 460 60412
4.	Mains switch	1	5322 276 11123
5.	Shaft for mains switch	1	5322 555 91613
6.	Button for mains switch	1	5322 414 20036
7.	LED Green ("ON")	1	4822 130 30923
8.	LED Red ("NO PROGRAM")	1	5322 130 34387
9.	LED Yellow ("NO BURST")	1	5322 130 32234
10.	LED Green ("SUBSTITUTE")	3	4822 130 30923
11.	Switch ("BY-PASS")	1	5322 276 14418
12.	Switch ("NORMAL")	1	5322 276 11245
13.	Switch ("FULL-FIELD")	1	5322 276 11916
14.	Switch ("DUTY-SIGNAL")	4	5322 276 11245
15.	Switch ("F-F SIGNAL")	7	5322 276 11245
16.	Switch ("2ND")	1	5322 276 11916
11-16	Knob for switches	15	5322 414 60038
17.	Jump rate ("R2")	1	5322 103 60037
18.	Window red	1	5322 381 10793
	LED display 7-segment	5	5322 130 90237
19.	LED Red	4	5322 130 34387
20.	Switch for programming	5	5322 276 11915
21.	BNC connector	1	5322 267 14027
22.	Remote connector	1	5322 265 51034
23.	BNC connector	16	5322 267 14027
24.	Safety earth connector	1	5322 414 30042
25.	Signal ground connector	1	5322 290 40012
26.	Mains connector	1	5322 290 60432
	Fuse 300mA slow EU	1	4822 253 50048
	Fuse 600mA slow US		5322 253 40101
	Mains transformer	1	5322 146 21173
	Handle assy 2U	2	5322 263 70186
	Foot	4	5322 462 40756
	Spring for foot	4	5322 492 64745
	Mains cable EU	1	5322 321 10388
	Mains cable US		5322 321 10123
	Extension board	1	5322 216 91782
	Extension cable	1	5322 321 21729

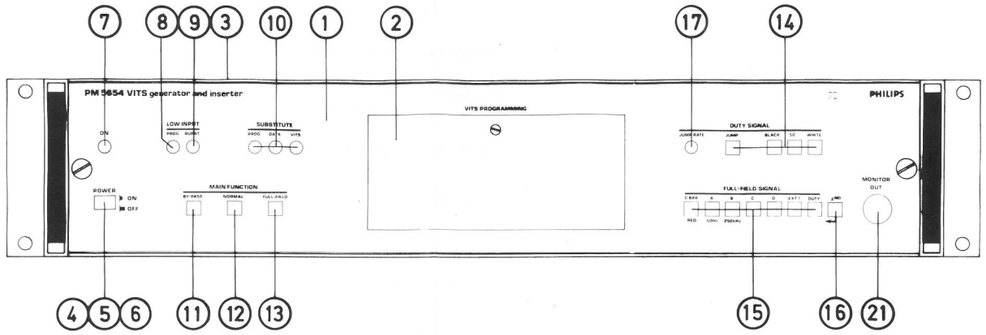


Fig. 26-1 Front of the instrument

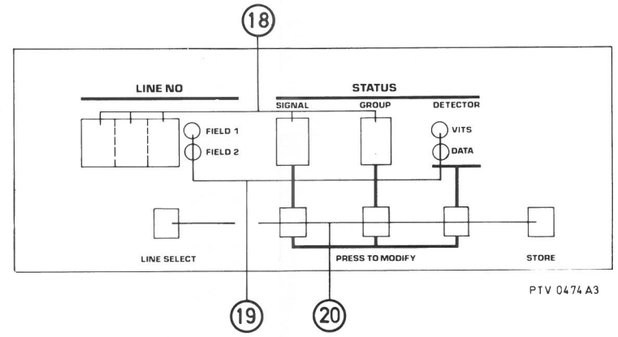


Fig. 26-2 Programming panel

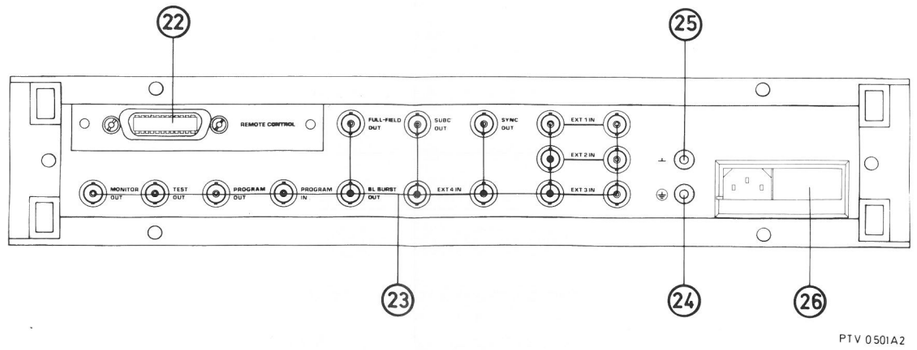


Fig. 26-3 Rear of the instrument

27. List of electrical parts

Standard resistors of MR25, 0.4W, 1% are found in the "LIST OF STANDARD RESISTORS" at the rear of the manual.

Unit 1

Number	Ordering number	Type
INTEGRATED CIRCUITS		
IC1	5322 209 86289	L296
TRANSISTORS		
TS1	5322 130 24081	BT151
TS2	4822 130 40959	BC547B
DIODES		
GR1	5322 130 32246	BYV 33-45
GR2,3,5	4822 130 31425	BYV 26-45

Number	Ordering number	Value	Tol (%)	Volt/Watt	Description
CAPACITORS					
C1,2	4822 121 41857	10N	±10%	100V	FOIL
C3	5322 124 70411	100000U	±20%	25V	ELECTROLYTIC
C4	4822 124 70392	3300U	±20%	40V	ELECTROLYTIC
C11,13	4822 124 20947	3U3	±20%	16V	ELECTROLYTIC
C12	5322 121 54071	2N2	±1%	250V	FOIL
C14,18	5322 121 42489	33N	±10%	100V	FOIL
C15	4822 122 31353	330P	±2%	100V	CERAMIC
C16,17	4822 124 40196	220U	±20%	16V	ELECTROLYTIC
C21,22	5322 124 14081	6U8	±20%	25V	ELECTROLYTIC

Unit 2

Number	Ordering number	Value	Tol (%)	Volt/Watt	Description
CAPACITORS					
C1,2,3	5322 121 42386	100N	±10%	63V	FOIL
C4-43	4822 122 30128	4N7	±10%	100V	CERAMIC

Unit 3

Number	Ordering number	Type
INTEGRATED CIRCUITS		
IC1	4822 209 80591	LM317T
IC2	5322 209 81236	LM337T
IC3	5322 209 14927	HEF4093BP
IC4	4822 209 10252	HEF4023BP
IC5,25	5322 209 10576	HEF4053BP
IC6,11,21, 24	5322 209 81395	LF353N
IC7	4822 209 80631	LM339AN
IC8	5322 209 85528	LM361N
IC9,22,27, 28	5322 209 85503	LM311N
IC12	5322 209 81468	SAA1043P
IC13,23	4822 209 10248	HEF4013BP
IC14,15	5322 209 11341	74HC4049P
IC16	5322 209 11338	74HC174P
IC17	5322 209 11331	74HC02P
IC18	5322 209 86059	74LS221
IC19	5322 209 82575	74HC74P
IC20	4822 209 80629	TCA240
IC26	5322 209 81724	SAA1044P
TRANSISTORS		
TS1	5322 130 44418	BF256A
TS2,9	4822 130 40959	BC547B
TS6	5322 130 44609	2N3209
TS7,10,11, 22	4822 130 41594	PH2369
TS8,19	4822 130 44154	BF199
TS20,21	4822 130 44568	BC557B
DIODES		
GR1-3,6-7, 10-13, 16-22	4822 130 30613	BAW62
GR4	5322 255 40339	LED RED
GR8	5322 130 32292	LED YELLOW
GR9	5322 255 40338	LED GREEN
GR15,23-24	5322 130 31684	BBB09

Number	Ordering number	Type
CRYSTALS		
XT1G	4822 242 70362	5.000000MHz
XT1M	5322 242 70704	5.034964MHz
XT2,3 G	4822 242 70323	4.433619MHz
XT2,3 M	4822 242 70105	3.579545MHz
COILS		
L1,5	5322 157 51698	

Number	Ordering number	Value	Tol (%)	Volt/Watt	Description
CAPACITORS					
C1,8,16, 26,34	4822 121 41854	150N	±10%	63V	FOIL
C2,35	4822 122 31069	39P	±2%	100V	CERAMIC
C3,6,43	5322 121 42604	47N	±10%	63V	FOIL
C4,17,19, 21,40,57, 66	4822 122 30128	4N7	±10%	100V	CERAMIC
C5	4822 122 31348	120P	±2%	100V	CERAMIC
C7,18,22, 27	5322 121 42489	33N	±10%	100V	FOIL
C9	4822 122 31353	330P	±2%	100V	CERAMIC
C10,23,24, 29-31,36, 42,46,64	4822 122 30027	1N0	±10%	100V	CERAMIC
C11,20,68	4822 122 31316	100P	±2%	100V	CERAMIC
C12	5322 121 42498	680N	±10%	63V	FOIL
C13	5322 121 42465	68N	±10%	63V	FOIL
C14 G	4822 122 31316	100P	±2%	100V	CERAMIC
C14 M	4822 122 31348	120P	±2%	100V	CERAMIC
C15	5322 121 42386	100N	±10%	63V	FOIL
C25,67	4822 122 31072	47P	±2%	100V	CERAMIC
C28	4822 121 50591	1N0	±1%	630V	FOIL
C32	4822 122 32185	10P	±2%	100V	CERAMIC
C33,39	4822 121 41856	22N	±10%	100V	FOIL
C37	5322 125 50051	2-18P			TRIM
C38	4822 121 41857	10N	±10%	100V	FOIL
C41,69	4822 122 31349	68P	±2%	100V	CERAMIC
C45 G	5322 122 32493	100P	±2%	100V	CERAMIC
C45 M	4822 122 32189	120P	±2%	100V	CERAMIC
C47,51	5322 124 14081	6U8	±20%	25V	ELECTROLYTIC
C48,49,50, 52,53,54	4822 124 20977	15U	±20%	16V	ELECTROLYTIC
C55	4822 124 20941	68U	±20%	6.3V	ELECTROLYTIC
C56,58-63,65	5322 122 31799	100N	-20+50%	63V	CERAMIC
RESISTORS					
R20,134	4822 110 72214	10M	5%	0.25W	RES.HI-TENSION
R24,49	4822 110 72196	2M2	5%	0.25W	RES.HI-TENSION
R48,104	4822 110 72201	3M3	5%	0.25W	RES.HI-TENSION
R76	5322 101 14143	10K	20%	0.5W	TRIM
R78	5322 101 10337	2K0	20%	0.5W	TRIM
R91	5322 100 10143	1K0	20%	0.5W	TRIM
R113	5322 103 10135	2K0	10%	0.75W	TRIM
R133	5322 100 10142	100K	20%	0.5W	TRIM

Unit 4

Number	Ordering number	Type
INTEGRATED CIRCUITS		
IC1	4822 209 10948	MAB8031AH-12P
IC2,23	5322 209 11322	74HC08P
IC3	5322 209 11336	74HC139P
IC4,11,19	4822 209 70194	74HC04P
IC5,8	5322 209 83271	74HC573P
IC6G	5322 209 50723	PROM-system Ctrl.G
IC6M	5322 209 50713	PROM-system Ctrl.M
IC7	5322 209 50722	8416-20L RAM
IC9,10	5322 209 11342	74HC574P
IC12	5322 209 11338	74HC174P
IC15	5322 209 11333	74HC27P
IC16	5322 209 83218	74HC00P
IC17,18,27	5322 209 11337	74HC161P
IC20	5322 209 84985	74LS30
IC21	5322 209 11334	74HC109P
IC22	5322 209 11332	74HC11P
IC24	5322 209 82575	74HC74P
IC25	5322 209 10576	HEF4053BP
IC26	5322 209 50721	2817 EEPROM
TRANSISTORS		
TS1	4822 130 41594	PH2369

Number	Ordering number	Type
DIODES		
GR2	4822 130 30613	BAW62
CRYSTALS		
XT1	5322 242 71523	12.000000MHz

Number	Ordering number	Value	Tol (%)	Volt/Watt	Description
CAPACITORS					
C2,3	4822 122 30045	27P	±2%	100V	CERAMIC
C4	4822 122 30128	4N7	±10%	100V	CERAMIC
C10	4822 124 20941	68U	±20%	6.3V	ELECTROLYTIC
C11-29,31	5322 122 31684	47N	-20+50%	63V	CERAMIC
C30	5322 122 32143	22P	±2%	100V	CERAMIC
RESISTORS					
R9	5322 111 94201	9x10K	2%	0V	NETWORK

Unit 5

Number	Ordering number	Type
INTEGREATED CIRCUITS		
IC1	4822 209 80591	LM317T
IC2	5322 209 81236	LM337T
IC5	5322 209 11339	74HC221P
IC6,7,25	5322 209 11337	74HC161P
IC8	5322 209 11336	74HC139P
IC9 G	5322 209 50718	PROM C.Bar
IC9 M	5322 209 50764	PROM C.Bar
IC10-15	5322 209 11342	74HC574P
IC16-18	5322 209 11254	DAC-08EN
IC19	4822 209 70194	74HC04P
IC20,21	4822 209 80629	TCA240
IC22,24	5322 209 81723	NE5539N
IC23	5322 209 84999	74LS175
TRANSISTORS		
TS3,4	4822 130 40959	BC547B
TS5,6,20	4822 130 44237	BF450
TS7,8,14,15,21	4822 130 41594	PH2369
TS10,11,18	4822 130 44154	BF199
TS16,17	4822 130 44041	BSV81
DIODES		
GR1,2	5322 130 30742	1N825
GR3-5,7	4822 130 30613	BAW62
COILS		
L1,7,8,13	5322 157 51698	
L2,3	5322 158 10646	
L4,6	5322 157 51701	
L5,12	5322 157 51825	
L14	5322 157 52736	

Number	Ordering number	Value	Tol (%)	Volt/Watt	Description
CAPACITORS					
C1,3	5322 124 14081	6UB	±20%	25V	ELECTROLYTIC
C2,4	4822 124 40963	33U	±20%	10V	ELECTROLYTIC
C7,8	4822 124 20941	68U	±20%	6.3V	ELECTROLYTIC
C10-20,24, 26-30,65 86	5322 121 42386	100N	±10%	63V	FOIL
C21,43,45, 46,48	5322 122 32143	22P	±2%	100V	CERAMIC
C23	4822 122 31072	47P	±2%	100V	CERAMIC
C25,71	4822 122 30128	4N7	±10%	100V	CERAMIC
C31,33,35, 37,40,41, 50,72,78	4822 121 41857	10N	±10%	100V	CERAMIC
C32	4822 122 31316	100P	±2%	100V	CERAMIC
C34,36,38	4822 122 31036	2P2	±P25	100V	CERAMIC
C42 G	4822 122 31237	82P	±2%	100V	CERAMIC
C42 M	4822 122 31316	100P	±2%	100V	CERAMIC
C44,47	5322 121 54059	220P	±1%	630V	FOIL
C49	4822 121 41856	22N	±10%	100V	FOIL
C51 G	5322 122 32072	33P	±2%	100V	CERAMIC
C51 M	4822 122 31069	39P	±2%	100V	CERAMIC
C52 G	5322 122 32072	33P	±2%	100V	CERAMIC
C52 M	4822 122 31072	47P	±2%	100V	CERAMIC
C54 G	4822 122 31061	18P	±2%	100V	CERAMIC
C54 M	5322 122 32143	22P	±2%	100V	CERAMIC

Number	Ordering number	Value	Tol (%)	Volt/Watt	Description
C55 G	4822 122 32027	56P	±2%	100V	CERAMIC
C55 M	4822 122 31349	68P	±2%	100V	CERAMIC
C56 G	4822 122 31069	39P	±2%	100V	CERAMIC
C56 M	4822 122 30045	27P	±2%	100V	CERAMIC
C57 G	5322 122 32072	33P	±2%	100V	CERAMIC
C57 M	4822 122 31072	47P	±2%	100V	CERAMIC
C58 G	5322 121 54047	270P	±1%	630V	FOIL
C58 M	5322 121 54077	330P	±1%	630V	FOIL
C59 G	4822 121 50416	150P	±1%	630V	FOIL
C59 M	5322 121 54057	180P	±1%	630V	FOIL
C60 G	4822 122 31072	47P	±2%	100V	CERAMIC
C60 M	4822 122 32027	56P	±2%	100V	CERAMIC
C61	4822 122 30045	27P	±2%	100V	CERAMIC
C62	4822 122 31052	8P2	±P25	100V	CERAMIC
C63,64	4822 122 31821	3P3	±P25	100V	CHIP
C70	4822 121 50591	1N0	±1%	630V	FOIL
C73	5322 122 32072	33P	±2%	100V	CERAMIC
C79 G	4822 122 31237	82P	±2%	100V	CERAMIC
C79 M	4822 122 31316	100P	±2%	100V	CERAMIC
C80 G	4822 122 30107	270P	±2%	100V	CERAMIC
C80 M	4822 122 31316	100P	±2%	100V	CERAMIC
C81 M	4822 122 31316	100P	±2%	100V	CERAMIC
C82 G	5322 122 32072	33P	±2%	100V	CERAMIC
C82 M	4822 122 30045	27P	±2%	100V	CERAMIC
C83	5322 122 32053	4P7	±P25	100V	CERAMIC
C84,85	4822 122 32185	10P	±2%	100V	CERAMIC
C87 G	5322 122 32143	22P	±2%	100V	CERAMIC
C87 M	5322 122 32167	22P	±2%	100V	CHIP
RESISTORS					
R8	5322 156 14118	5K0	20%	0.5W	TRIM
R16,85	5322 100 10143	1K0	20%	0.5W	TRIM
R38,47	5322 100 10671	200R	10%	0.5W	TRIM
R39,48	5322 100 10133	200R	20%	0.5W	TRIM
R81	5322 100 10138	100R	20%	0.5W	TRIM
R111-114	5322 111 94199	9x1K	2%		NETWORK

Unit 6

Number	Ordering number	Type
INTEGRATED CIRCUITS		
IC1	5322 209 86059	7LS221
IC2	5322 209 84717	MC14046CP
IC3	5322 209 70291	CA3130E
IC4	5322 209 81589	74LS629N
IC5,7-9,15,16	5322 209 82001	74F161PC
IC6 G	5322 209 50727	PROM LUM ADDR
IC6 M	5322 209 50717	PROM LUM ADDR
IC10 G	5322 209 50725	PROM LUM 01
IC10 M	5322 209 50715	PROM LUM 01
IC11 G	5322 209 50726	PROM LUM 02
IC11 M	5322 209 50716	PROM LUM 02
IC12,18	5322 209 83279	0Q0501N
IC13	5322 209 83298	TDC1016B7C9
IC14 G	5322 209 50402	PROM CHROMA ADDR
IC14 M	5322 209 50407	PROM CHROMA ADDR
IC17 G	5322 209 50405	PROM CHROMA
IC17 M	5322 209 50409	PROM CHROMA
IC19	5322 209 81646	74LS374
IC20	5322 209 11254	DAC-08EN
IC21	4822 209 80629	TCA240
IC22	4822 209 80591	LM317T
IC23,24	5322 209 81236	LM337T
IC25	5322 209 80903	LM78L05ACZ
IC26	5322 209 82001	74F161PC
IC27	5322 209 85405	74LS193
TRANSISTORS		
TS1,2	4822 130 44237	BF450
TS3	5322 130 44894	2N2453A
TS4	5322 130 44609	2N3209
TS5	4822 130 41594	PH2369
DIODES		
GR1,2	4822 130 30613	BAW62
GR4,5	5322 130 30742	1N825
GR6	5322 130 34865	BZV46-C1V5
COILS		
L1 G	5322 158 10654	
L1 M	5322 158 10645	
L2	5322 158 10645	
L3	5322 158 10646	
L5 G	5322 158 10647	
L5 M	5322 157 51858	
L6 G	5322 158 10647	
L6 M	5322 157 51858	

Number	Ordering number	Value	Tol (%)	Volt/Watt	Description
CAPACITORS					
C1	4822 122 31348	120P	±2%	100V	CERAMIC
C2,5,7,32, 43,44	5322 122 31799	100N	+20-50%	63V	CERAMIC
C3	4822 122 31085	150P	±2%	100V	CERAMIC
C4	5322 121 40197	1U0	±10%	63V	FOIL
C6	4822 122 31052	8P2	±P25	100V	CERAMIC
C8,34,35, 55	4822 124 20941	68U	±20%	6.3V	ELECTROLYTIC
C9 G	5322 121 54128	390P	±1%	630V	FOIL
C9 M	5322 121 54077	330P	±1%	630V	FOIL
C10 G	4822 122 31069	39P	±2%	100V	CERAMIC
C10 M	5322 122 32054	12P	±2%	100V	CERAMIC
C11 G	5322 121 54128	390P	±1%	630V	FOIL
C11 M	5322 122 54057	180P	±1%	630V	FOIL
C12 G	4822 122 31316	100P	±2%	100V	CERAMIC
C12 M	4822 122 31069	39P	±2%	100V	CERAMIC
C27 G	4822 122 31069	39P	±2%	100V	CERAMIC
C13	4822 122 31047	5P6	±P25	100V	CERAMIC
C14,33	5322 125 50051	2-18P			TRIM
C15,22	5322 122 44058	22N	-20+50%	63V	CERAMIC
C17	4822 122 31237	82P	±2%	100V	CERAMIC
C19	5322 121 54128	390P	±1%	630V	FOIL
C20	4822 122 31069	39P	±2%	100V	CERAMIC
C21	4822 121 50591	1N0	±1%	630V	FOIL
C23	4822 124 20947	3U3	±20%	16V	ELECTROLYTIC
C24 G	4822 122 31237	82P	±2%	100V	CERAMIC
C24 M	4822 122 31316	100P	±2%	100V	CERAMIC
C25 G	4822 122 30045	27P	±2%	100V	CERAMIC
C25 M	5322 122 32072	33P	±2%	100V	CERAMIC
C26 G	4822 122 31061	18P	±2%	100V	CERAMIC
C26 M	4822 122 30045	27P	±2%	100V	CERAMIC
C27 G	4822 122 31069	39P	±2%	100V	CERAMIC
C27 M	4822 122 31072	47P	±2%	100V	CERAMIC
C28,29,31	4822 122 31054	10P	±2%	100V	CERAMIC
C30	5322 122 32072	33P	±2%	100V	CERAMIC
C36-42	5322 122 44058	22N	-20+50%	63V	CERAMIC
C45,48	5322 124 14081	6U8	±20%	25V	ELECTROLYTIC
C46,47,49, 50	4822 124 40963	33U	±20%	10V	ELECTROLYTIC
C52,53,54, 60,61	4822 122 30128	4N7	±10%	100V	CERAMIC
C56	4822 124 20942	1U5	±20%	25V	ELECTROLYTIC
C59	4822 122 31036	2P2	±P25	100V	CERAMIC
RESISTORS					
R11	5322 111 94201	9x10K	2%		NETWORK
R60,61	5322 111 94199	9x1K	2%		NETWORK
R26	5322 100 10671	200R	10%	0.5W	TRIM
R29	5322 100 10135	500K	20%	0.5W	TRIM
R39	5322 100 10142	100K	20%	0.5W	TRIM
R46 G	5322 100 10133	200R	20%	0.5W	TRIM
R46 M	5322 100 10135	500K	20%	0.5W	TRIM

Unit 7

Number	Ordering number	Type
INTEGRATED CIRCUITS		
IC1	4822 209 10948	MAB8031AH-12P
IC3	4822 209 70194	74HC04P
IC4	5322 209 11342	74HC574P
IC5 G	5322 209 50724	PROM DISPL. PROG.
IC5 M	5322 209 50714	PROM DISPL. PROG.
IC7	5322 209 11335	74HC138P
IC8,9	5322 209 83271	74HC573P
IC10	5322 209 11338	74HC174P
IC11	4822 209 10259	HEF4047BP
IC15,16	5322 209 50719	75494
TRANSISTORS		
TS1-8	4822 130 41246	BC327-25
DIODES		
GR10-28	4822 130 34189	BAV20
CRYSTALS		
XT1	5322 242 71523	12.000000MHz

Number	Ordering number	Value	Tol (%)	Volt/Watt	Description
CAPACITORS					
C2,3	4822 122 30045	27P	±2%	100V	CERAMIC
C4	5322 121 42386	100N	±10%	100V	FOIL
C8,9,10	4822 124 20941	68U	±20%	6.3V	ELECTROLYTIC
C11,13-20	5322 122 31684	47N	+20-50%	63V	CERAMIC

Unit 8

Number	Ordering number	Type
INTEGRATED CIRCUITS		
IC1	4822 209 10263	HEF4052BP
IC2,3	4822 209 10626	HEF4051BP
IC4	4822 209 10273	HEF4104BP
IC7	4822 209 10246	HEF4001BP
IC8,10	5322 209 81395	LF353N
IC9,12,15	4822 209 82525	CA3080E
IC11	5322 209 10576	HEF4053BP
IC13	5322 209 84997	74LS86N
IC14	4822 209 80782	74LS74
IC21	4822 209 80591	LM317T
IC22	5322 209 81236	LM337T
TRANSISTORS		
TS1,3,5,7,21, 22,28,32,33, 43,65,66,71, 72,80,91,92,96	4822 130 44237	BF450
TS2,4,6,8,41, 44,81	4822 130 44154	BF199
TS13-20,25,26, 27,35,42,48,49, 50,69,75,83, 85,95	4822 130 40959	BC547B
TS23,34,37,46, 52,53,60,61,67, 73,76,77,84, 93,97	4822 130 41594	PH2369
TS24,29,31,36, 51,68,74,94	4822 130 44568	BC557B
TS30,62,63, 78,79	5322 130 44041	BSV81
DIODES		
GR1-4,13,16, 21,22,33,36, 38,40	4822 130 30613	BAW62
GR12,15,34, 35,37,39	5322 130 34865	BZV46-C1V5
COILS		
L1,5,22	5322 157 51825	
L21	5322 157 51698	
L31	5322 157 10126	
CRYSTALS		
XT1 G	5322 242 74144	8.867237MHz
XT1 M	5322 242 74143	7.159090MHz
RELAIS		
RE1	5322 280 60469	SDS DS4-DC 12C

Number	Ordering number	Value	Tol (%)	Volt/Watt	Description
CAPACITORS					
C1,3,5,7, 31,360	4822 124 20941	68U	±20%	6.3V	ELECTROLYTIC
C2,4,6,8, 32,35,43, 63,81	4822 122 31036	2P2	±P25	100V	CERAMIC
C13,24,33, 67,68,86, 310-328, 340-357, 361,362	5322 121 42386	100N	±10%	63V	FOIL
C14,22	5322 122 32191	22P	2%	100V	CERAMIC
C15,23	5322 125 50049	1P8-10P			TRIM
C16,18,37, 44	5322 122 32143	22P	±2%	100V	CERAMIC
C17	5322 122 32493	100P	±2%	100V	CERAMIC
C19,38,46	5322 122 32056	220P	±2%	100V	CERAMIC
C20	5322 121 54071	2N2	±1%	250V	FOIL
C21,28,36, 45	4822 122 31047	5P6	±P25	100V	CERAMIC
C25,301, 302,303, 331,332, 333	4822 124 40963	33U	±20%	10V	ELECTROLYTIC
C26,27,48, 62,304	4822 122 30027	1N0	±10%	100V	CERAMIC
C29	5322 122 32072	33P	±2%	100V	CERAMIC
C30	4822 122 31085	150P	±2%	100V	CERAMIC
C34,53,72	5322 122 32053	4P7	±P25	100V	CERAMIC
C39	4822 122 30114	2N2	±2%	100V	CERAMIC
C40,47,50, 51,69,70, 80,365-368	4822 122 30128	4N7	±10%	100V	CERAMIC
C41,60,56 84	5322 125 50051	2-18P			TRIM
C42,64	4822 122 31061	18P	±2%	100V	CERAMIC
C49,52,61	4822 122 32185	10P	±2%	100V	CERAMIC
C54	5322 122 32101	1P5	±P25	100V	CERAMIC
C57,82	4822 122 31821	3P3	±P25	100V	CHIP
C65	5322 121 54057	180P	±1%	630V	FOIL
C66	5322 125 54003	5-60P			TRIM
C71	4822 122 30045	27P	±2%	100V	CERAMIC
C300,330	5322 124 14081	6U8	±20%	25V	ELECTROLYTIC

Number	Ordering number	Value	Tol (%)	Volt/Watt	Description
RESISTORS					
R70-77	5322 116 51812	2K00	0.1%	0.25W	METAL FILM
R99	4822 116 30243	100R	5%		NTC
R114,140, 151,267	5322 100 10133	200R	20%	0.5W	TRIM
R124,237, R207,221	4822 100 10136	20K	20%	0.5W	TRIM
R230	5322 100 10138	100R	20%	0.5W	TRIM
R213,214, 228,229, 258,273	5322 116 53599	75R0	0.1%	0.25W	METAL FILM

Unit 9

Number	Ordering number	Type
INTEGRATED CIRCUITS		
IC1-3	5322 209 101883	PCF8574P

Number	Ordering number	Value	Tol (%)	Volt/Watt	Description
CAPACITORS					
C1	4822 124 20941	68U	±20%	6.3V	ELECTROLYTIC
C2-4	5322 122 32908	47N	-20+50%	63V	CERAMIC
C5-28	4822 122 30027	1N0	±10%	100V	CERAMIC
RESISTORS					
R1-3	5322 111 90326	9x2K7	2%		

Unit 10 PM 8538 (Optional)

Number	Ordering number	Type
INTEGRATED CIRCUITS		
IC1,2,5,6	5322 209 11337	74HC161P
IC7	4822 209 70194	74HC04P
IC8	5322 209 83218	74HC00P
IC10	5322 209 81395	LF353N
IC12	4822 209 10248	HEF4013BP
IC13	5322 209 85528	LM361N
IC60	4822 209 80591	LM317T
IC61	5322 209 81236	LM337T
TRANSISTORS		
TS1,3,4	4822 130 40959	BC547B
TS2	4822 130 44568	BC557B
TS5	5322 130 44017	BSV79
TS6	5322 130 44418	BF256A
TS11,12	4822 130 44237	BF450
DIODES		
GR1,2,21,22,40	4822 130 30613	BAW62
COILS		
L1,2,3,21,41	5322 157 51698	

Number	Ordering number	Value	Tol (%)	Volt/Watt	Description
CAPACITORS					
C1,2,24	5322 122 32143	22P	±2%	100V	CERAMIC
C3	4822 122 31349	68P	±2%	100V	CERAMIC
C4	4322 121 54077	330P	±1%	630V	FOIL
C5,6,22	4822 122 31316	100P	±2%	100V	CERAMIC
C20,23,25, 45,70,90	4822 122 30128	4N7	±10%	100V	CERAMIC
C21,27	4822 122 31072	47P	±2%	100V	CERAMIC
C26,42	4822 122 30027	1N0	±10%	100V	CERAMIC
C41,44,63, 64,65,83, 84,85,86, 101-105	5322 121 42386	100N	±10%	63V	FOIL
C43	5322 122 32056	220P	±2%	100V	CERAMIC
C46	4822 122 30107	270P	±2%	100V	CERAMIC
C60,80	5322 124 14081	6U8	±20%	25V	ELECTROLYTIC
C61,81	4822 124 40963	63U	±20%	10V	ELECTROLYTIC
C100	4822 124 20941	68U	±20%	6.3V	ELECTROLYTIC
RESISTORS					
R4	5322 100 10133	200R	20%	0.5W	TRIM
R30,48	5322 100 10142	100K	20%	0.5W	TRIM

Unit 11

Number	Ordering number	Type
INTEGRATED CIRCUITS		
IC1	5322 209 10576	HEF4053BP
IC11	5322 209 82943	LM317LZ
IC12	5322 209 83228	LM337LZ
TRANSISTORS		
TS1,2,4	4822 130 40959	BC547B
DIODES		
GR1	4822 130 30613	BAW62

Number	Ordering number	Value	Tol (%)	Volt/Watt	Description
CAPACITORS					
C1,4,21, 23,24,26	5322 121 42386	100N	±10%	63V	FOIL
C2,3	4822 122 31085	150P	±2%	100V	CERAMIC
C5,6	4822 122 30128	4N7	±10%	100V	CERAMIC
C22,25	5322 124 14081	6U0	±20%	25V	ELECTROLYTIC
RESISTORS					
R6	5322 100 10133	200R	20%	0.5W	TRIM
R7	5322 100 10135	500R	20%	0.5W	TRIM

28. List of recommended spare parts

Ordering number : 4008 118 85680 G-version } To be ordered at your National Philips Sales
4008 118 85690 M-version } organisation

Description	Quantity	Ordering number
Mains switch	1	5322 276 11123
Mains connector	1	5322 290 60432
Mains transformer	1	5322 146 21173
Fuse (300mA slow)	5	4822 253 50048
Fuse (600mA slow)	5	5322 253 40101
Switch ("BY-PASS")	1	5322 276 14418
Switch ("NORMAL/DUTY/F-F")	3	5322 276 11245
Switch ("FULL-FIELD/2ND")	2	5322 276 11916
Switch for programming	2	5322 276 11915
Knob for switches	6	5322 414 60038
Relay (By-pass)	1	5322 280 60469
Capacitor 10000U	1	5322 124 70411
Capacitor 3300U	1	4822 124 70392
Crystal 12.000000MHz	1	5322 242 71523
Crystal 5.000000MHz G-version	1	4822 242 70362
4.433619MHz G-version	1	4822 242 70323
TCXO 8.867237MHz G-version	1	5322 242 74144
Crystal 5.034964MHz M-version	1	5322 242 70704
3.579545MHz M-version	1	4822 242 70105
TCXO 7.159090MHz M-version	1	5322 242 74143
LED display 7-segment	2	5322 130 90237
INTEGRATED CIRCUITS		
2817A EEPROM	1	5322 209 50721
74F161PC	2	5322 209 82001
74HC00P	2	5322 209 83218
74HC02P	2	5322 209 11331
74HC04P	2	4822 209 70194
74HC08P	2	5322 209 11322
74HC109P	2	5322 209 11334
74HC11P	2	5322 209 11332
74HC138P	2	5322 209 11335
74HC139P	2	5322 209 11336
74HC161P	2	5322 209 11337
74HC174P	2	5322 209 11338
74HC221P	2	5322 209 11339
74HC27P	2	5322 209 11333
74HC4049P	2	5322 209 11341
74HC573P	2	5322 209 83271
74HC574P	2	5322 209 11342
74HC74P	2	5322 209 82575
74LS175	2	5322 209 84999
74LS193	2	5322 209 85405
74LS221	2	5322 209 86059
74LS30	2	5322 209 84985
74LS374	2	5322 209 81646
74LS629	2	5322 209 81589
74LS74	2	4822 209 80782
74LS86N	2	5322 209 84997
75494 LED Driver	2	5322 209 50719
8416-20L RAM	1	5322 209 50722
CA3080E	2	4822 209 80525
CA3130E	2	5322 209 70291
DAC-08EN	2	5322 209 11254
HEF4001BP	2	4822 209 10246
HEF4013BP	2	4822 209 10248
HEF4023BP	2	4822 209 10252
HEF4047BP	2	4822 209 10259
HEF4051BP	2	4822 209 10262
HEF4052BP	2	4822 209 10263
HEF4053BP	2	5322 209 10576
HEF4093BP	2	5322 209 14927
HEF4104BP	2	4822 209 10273
L296	1	5322 209 70292
LF353N	2	5322 209 81395
LM311N	2	5322 209 85503
LM317LZ M-version only	2	5322 209 82943
LM317T	2	4822 209 80591
LM337LZ M-version only	2	5322 209 83228
LM337T	2	5322 209 81236
LM339AN	2	4822 209 80631
LM361N	2	5322 209 85528
LM78L05ACZ	2	5322 209 80903
MAB8031AH-12P CPU	2	4822 209 10948
MC14046CP	2	5322 209 84717
NE5539N	2	5322 209 81723
OQ0500N	2	5322 209 83279
PCF8574P	3	5322 209 10883
SAA1043P	2	5322 209 81468
SAA1044P	2	5322 209 81724
TCA240	2	4822 209 80629
TDC1016B7C9 D/A Converter	1	5322 209 83298

Description	Quantity	Ordering number
TRANSISTORS		
2N2453A	1	5322 130 44894
2N3209	2	5322 130 44609
BC327-25	4	4822 130 41246
BC547B	10	4822 130 40959
BC557B	10	4822 130 44568
BF199	10	4822 130 44154
BF256A	3	5322 130 44418
BF450	10	4822 130 44237
BFW13	2	5322 130 40516
BSV79	2	5322 130 44017
BSV81	4	5322 130 44041
BT151	2	5322 130 24081
PH2369	10	4822 130 41594
DIODES		
1N825	2	5322 130 30743
BAV20	10	4822 130 34181
BAW62	15	4822 130 30613
BB809	5	5322 130 31684
BYS26-45	3	4822 130 31425
BYV33-45	1	5322 130 32246
BZV46-C1V5	10	5322 130 34865
LED Green	2	4822 130 30923
LED Red	2	5322 130 34387
LED Yellow	1	5322 130 32234
POTENTIOMETERS		
JUMP RATE ("R2")	1	5322 103 60037

LIST OF STANDARD COMPONENTS

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	4822 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 54067
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	121	5322 116 54426
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
NR25	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

Type	Value	Ordering number
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
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
MR26	182K	5322 116 54722
MR25	200K	4822 116 51286
MR25	221K	4822 116 51272
MR25	243K	5322 116 54733
MR25	267K	5322 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

CODING SYSTEM OF FAILURE REPORTING FOR QUALITY ASSESSMENT OF T & M INSTRUMENTS
(excl. potentiometric recorders)

The information contents of the coded failure description is necessary for our computerized processing of quality data.

Since the reporting of repair and maintenance routines must be complete and exact, we give you an example of a correctly filled-out PHILIPS SERVICE Job sheet.

① Country	② Day Month Year	③ Typenumber /Version	④ Factory/Serial no.
3 2	1 5 0 4 7 5	0 P M 3 2 6 0 0 2	D O 0 0 7 8 3

CODED FAILURE DESCRIPTION ⑥

⑤ Nature of call	Location	Component/sequence no.	Category
☐ Installation		T S 0 6 0 7	5
☐ Pre sale repair		R 0 0 6 3 1	2
☐ Preventive maintenance	0 0 2 1	9 9 0 0 0 1	4
☒ Corrective maintenance			
☐ Other			

⑦ *Job completed* ☒

Working time ⑧ ☐☐12 Hrs

Detailed description of the information to be entered in the various boxes:

①Country: 3 2 = Switzerland

②Day Month Year 1 5 0 4 7 5 = 15 April 1975

③Type number/Version O P M 3 2 6 0 0 2 = Oscilloscope PM 3260; version 02 (in later oscilloscopes this number is placed in front of the serial no)

④Factory/Serial number D O 0 0 7 8 3 = DO 783 These data are mentioned on the type plate of the instrument

⑤Nature of call: Enter a cross in the relevant box

⑥Coded failure description

Location

☐☐☐☐

These four boxes are used to isolate the problem area. Write the code of the part in which the fault occurs, e.g. unit no or mechanical item no of this part (refer to 'PARTS LISTS' in the manual).

Example: 0001 for Unit 1
000A for Unit A
0075 for item 75

If units are not numbered, do not fill in the four boxes; see Example Job sheet.

Component/sequence no.

☐☐☐☐☐☐

These six boxes are intended to pinpoint the faulty component.

A. Enter the component designation as used in the circuit diagram. If the designation is alfa-numeric, the letters must be written (starting from the left) in the two left-hand boxes and the figures must be written (in such a way that the last digit occupies the right-most box) in the four right-hand boxes.

B. Parts not identified in the circuit diagram:

990000 Unknown/Not applicable
990001 Cabinet or rack (text plate, emblem, grip, rail, graticule, etc.)
990002 Knob (incl. dial knob, cap, etc.)
990003 Probe (only if attached to instrument)
990004 Leads and associated plugs
990005 Holder (valve, transistor, fuse, board, etc.)
990006 Complete unit (p.w. board, h.t. unit, etc.)
990007 Accessory (only those without type number)
990008 Documentation (manual, supplement, etc.)
990009 Foreign object
990099 Miscellaneous

Category

☐

0 Unknown, not applicable (fault not present, intermittent or disappeared)
1 Software error
2 Readjustment
3 Electrical repair (wiring, solder joint, etc.)
4 Mechanical repair (polishing, filing, remachining, etc.)
5 Replacement (of transistor, resistor, etc.)
6 Cleaning and/or lubrication
7 Operator error
8 Missing items (on pre-sale test)
9 Environmental requirements are not met

⑦Job completed: Enter a cross when the job has been completed.

⑧Working time: Enter the total number of working hours spent in connection with the job (excluding travelling, waiting time, etc.), using the last box for tenths of hours.

☐☐12 = 1,2 working hours (1 h 12 min.)

Sales and service all over the world

Alger: Bureau de Liaison Philips,
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Eire: Philips Electrical (Ireland) Ltd.,
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