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# 1. Safety

***Read this Chapter carefully before installation and use of the instrument.***

## 1.1 Introduction

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

## 1.2 Safety Precautions

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

## 1.3 Caution and Warning Statements

### Caution

Used to indicate correct operation or maintenance in order to prevent damage to, or destruction of equipment or other property.

### Warning

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

## 1.4 Impaired Safety Protection

### 1.4.1 Technical Specifications

This manual provides technical information important for safe operation of the equipment.

Please refer to the Chapter **Product Data** for information regarding technical specifications and the Chapters **Installation** and **Operating Instructions** regarding instructions for use.

Technical assistance may be obtained from your local DK-Technologies customer support organization or from

DK-Technologies A/S  
Marielundvej 37D  
DK-2730 Herlev  
Denmark

Phone: +45 4485 0255  
Fax: +45 4485 0250  
E-mail: [info@dk-technologies.com](mailto:info@dk-technologies.com)  
Website: [www.dk-technologies.com](http://www.dk-technologies.com)

### 1.4.2 Equipment Ratings

**The instrument can be used with a power voltage supply of:**

#### Voltage:

100VAC - 240VAC  
(-15%, max. 250VAC)

#### Frequency:

48 - 65Hz

#### Power consumption:

< 15 VA.

**The instrument is designed for the following environmental conditions:**

- ✦ Indoor use
- ✦ Altitudes up to 2000m
- ✦ Temperatures between 5°C and 40°C
- ✦ Maximum relative humidity of 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C
- ✦ Transient overvoltages according to installation category II
- ✦ Pollution degree 1

The instrument is equipped with a number of input and output terminals as described in the Chapter **Product Data**.

The terminals are protected from becoming hazardous live by means of basic insulation and protective screening.

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 be informed.

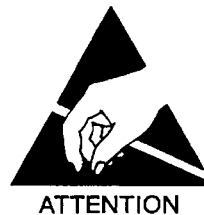
For example, safety is likely to be impaired if the instrument fails to perform the intended measurements or shows visible damage.

**WARNING:** Protection provided by the equipment may be impaired, if the equipment is used in a manner not specified by this manual.


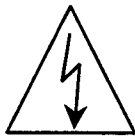

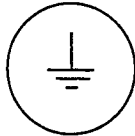


## 1.5 Electrostatic Sensitive Devices

All ICs and many other semi-conductors are susceptible to electrostatic discharges (ESD). Careless handling during repair can reduce life-time drastically.

When repairing, make sure that you are connected to the same potential as the mass of the set via a wrist wrap with resistance. Keep components and tools also at this potential.



## 1.6 Symbols

Symbol:	Color:	Explanation:
	Red	High voltage terminal: a terminal at which a voltage, with respect to another terminal or parts exists or may be adjusted to 1000V or more. (High voltage $\geq 1000V$ ).
	Black/Yellow	Live part shock risk of electric shock.
	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
	Black	Alternating current ( <i>placed on the identification plate</i> )
	White/Black	Off (supply - <i>power switch</i> )
	White/Black	On (supply - <i>power switch</i> )





## 2. Introduction and Applications

### 2.1 Introduction

The PT 5211 VariTime™ Changeover is designed for use together with two PT 5210 VariTime™ Digital Sync Generators.

The PT 5210 is designed as a modular system which can be configured for use in all environments, from the smallest edit bay to the largest studio.

The PT 5211 is designed as a similar modular system in order to form the perfect solution, operating together with variously configured PT 5210 VariTime™ Digital Sync Generators.

The basic version of the PT 5211 includes four channels equipped with 75Ω BNC connectors. The channels can be used to switch both analog and digital video signals as well as unbalanced digital audio.

Two options can provide further channels.

- ✦ The PT 8617 BNC channel option adds two additional BNC channels. Up to four PT 8617 options may be used at the same time.
- ✦ The PT 8618 XLR channel option adds two additional XLR channels for balanced signal switching. Only one PT 8618 may be installed at any one time. One installed PT 8618 takes up the same amount of space as two of PT 8617 options.

### 2.2 Applications

The PT 5211 VariTime™ Changeover is designed for use in both serial digital and analog television environments, also environments with AES/EBU digital audio signals. The use of the changeover unit greatly improves the reliability of a single *Sync Pulse Generator* (SPG) by having a backup unit ready to take over in the event of an SPG break-

down. To improve the reliability of the complete system, it is essential to have a simple changeover unit. So that system reliability will not be affected by the complexity of the changeover unit.

The PT 5210 VariTime™ Digital Sync Generator employs internal surveillance of the operation by means of hardware separate from the rest of the SPG. The monitored signals are selectable in the SPG. This reduces the complexity of the changeover unit and results in two independent sets of surveillance circuits, one for each SPG.

Information on each of the SPGs operating conditions is communicated in a simple and reliable way to the changeover unit, which in turn uses this information to determine the status of both SPGs.

The PT 5211 VariTime™ Changeover automatically switches serial digital video, composite video, composite black burst, AES/EBU digital audio, and LTC signals from the primary to the backup SPG.

The switching is done by means of relays which switch all channels simultaneously. Latching relays ensure that the SPG selection remains unchanged even in the case of power failure in the changeover unit.

Front panel control is provided to select which generator is to be the primary SPG (operating mode manual or automatic). The front panel is secured against accidental operation by a **"HOLD TO MODIFY"** button which must be pressed simultaneously with any other button.

Remote control is facilitated by a parallel remote interface. In emergency situations, the remote control can always be overruled by the front panel controls.

A simple relay contact in the remote connector may be used to connect an external warning circuit. The contact is open during normal operation and closes during failure. This relay may be used

to activate an external alarm in the event of a failure - even in the case of power failure in the changeover system.

## 2.3 Configuration

The basic PT 5211 VariTime™ Changeover includes four identical 75Ω channels with BNC connectors.

The two options, the PT 8617 and PT 8618, are used to add more channels to the changeover unit.

The PT 8617 BNC option adds two additional channels. The function and quality of these extra BNC channels are equal to that of the basic channels.

The PT 8618 XLR option adds two balanced channels with XLR connectors. The PT 8618 is used for switching balanced AES/EBU digital audio and balanced LTC signals.

Up to four PT 8617 options or two PT 8617 options plus one PT 8618 can be used at the same time. This gives a maximum of either 12 BNC channels or of eight BNC channels plus two XLR channels.

## 3. Product Data

### 3.1 Safety Characteristics

This apparatus has been designed and tested in accordance with the Safety Class 1 requirements of IEC Publication 1010-1 ("Safety Requirements for Electrical Measuring Apparatus"), and is safe as supplied. This manual contains information and warnings which must be followed during operation and maintenance in order to ensure operator and service personnel safety.

### 3.2 Performance Characteristics

Characteristics expressed in numerical values with stated tolerances are guaranteed to be within these limits. Characteristics expressed in numerical values indicate typical values at a nominal ambient temperature (25 °C) and reflect an average performance.

### 3.3 Versions

The PT 5211 VariTime™ Changeover is multi-standard, operating with all the formats available from the PT 5210 VariTime™ Digital Sync Generator.

For operation with balanced signals the PT 8618 2 XLR Changeover Channels option is required.

### 3.4 Options

#### 3.4.1 PT 8617 - BNC Changeover Channels

This option adds two unbalanced channels to the PT 5211. Up to four options may be used at the same time, except when a PT 8618 is being used, in which case installation of two 2 additional PT 8617s is possible.

#### 3.4.2 PT 8618 - XLR Changeover Channels

This option adds two balanced channels to the PT 5211. Only one option can be used at a time. The PT 8618 comes with an interface cable to provide the connections between the changeover and the two PT 5210s in the setup.

### 3.5 Electrical Data

#### 3.5.1 BNC Channels (Basic and PT 8617)

**Connector:**

BNC 75  $\Omega$

**Return loss:**

> 36 dB, 0.1 to 10 MHz

> 15 dB, 10 to 360 MHz

**Insertion loss:**

< 0.2 dB, 0.1 to 180 MHz

< 1 dB, 180 to 360 MHz

**On resistance:**

< 0.2  $\Omega$

**Cross-talk:**

< -70 dB, 0.1 to 10 MHz

< -80 dB at fsc

< -50 dB, 10 to 180 MHz

< -30 dB, 180 to 360 MHz

### 3.5.2 XLR Channels (PT 8618 Option)

**Connectors:**

Signal input : Sub-D 9 pin, female

Signal output : XLR 3 pin, male

**Insertion loss:**

< 0.4 dB, 0.1 to 20 MHz

**On resistance:**

< 0.2  $\Omega$

**Cross-talk:**

< -50 dB, 0.1 to 8 MHz

### 3.5.3 Remote Interface

Specification for relay contacts for external alarm function.

**Connector:**

9 pin male sub-D

**Voltage between contacts:**

< 50 V

**Relay current:**

< 0.5 A

**Switching power:**

< 60 W

**Common mode voltage:**

< 50 V

**Other contacts in remote connector:**

Internal pull up resistors, max. external voltage  
-0.5 V to + 6 V.

## 3.6 Environmental Conditions

### 3.6.1 Regulations and Standards, EMI

EN 50081-1/1994 (emissions)

EN 50082-1/1992 (immunity)

FCC Rules & Regulations, Part 15, Subpart J,  
Level B (emissions)

### 3.6.2 Climatic Conditions

**Temperature Range:**
Storage:

20 to +70°C

Operating ambient:

+5 to +45°C

Humidity:

Non-condensing (IEC 721)

### 3.6.3 Mechanical Requirements

**Vibration, according to IEC 68-2-64 test Fh**

10 - 20 Hz, 0.05 g<sup>2</sup>/Hz, decreasing 20 - 150 Hz  
-3 dB/oct, 1h in each of three directions, 1.6gRMS.

**Bump, according to IEC 68-2-29 test Eb**

1000 bumps/direction, 3 directions, 6 ms/bump,  
25g.

### 3.6.4 Safety

IEC1010-1

### 3.6.5 Power Supply

**Voltage:**

85 - 132 V AC, 180 - 250 V AC

**Frequency:**

48 - 62 Hz

**Power consumption:**

< 15 VA with all options

### 3.6.6 Mechanical Data

19" rack mount cabinet.

Height : 44 mm (1.73")

Width : 483 mm (19")

Depth : 490 mm (19.3")

Weight : 4 kg (8.8 lbs)

## 4. Accessories and Options

### 4.1 Accessories

Item:	Quantity:	Order Number:
Mains cable, EURO	1	5322 321 11284
Mains cable, US		5322 321 11285
Mains cable, UK		5322 321 11286
Instruction Manual	1	9499 493 10111
Rubber foot selfadh.	4	5322 462 44434
Cable Assy (3 x Sub-D)	1	4008 105 04210

### 4.2 Options

Description:	Order Number:
PT 8617 : BNC Option	9449 086 01701
PT 8618 : XLR Option	9449 086 01801
PM 8552 : Rack Mounting Kit	9449 085 52001



## 5. Installation

### 5.1 Initial Inspection


Check the contents of the shipment for completeness and possible transport damage. If the contents are incomplete or damaged, a claim should be filed with the carrier immediately, and the

The PTV Sales or Service organization should be notified in order to facilitate the repair or replacement of the instrument.

### 5.2 Safety Instructions

#### 5.2.1 Grounding

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

- ♦ via the three-core power cable
- ♦ via the protective ground terminal marked 

Before connecting the equipment to the main power supply make sure that the building is properly grounded.

**WARNING:** Any break in or disruption of the protective conductor inside or outside the instrument or disconnection of the protective ground terminal, is likely to make the instrument dangerous. Intentional interruption is prohibited.

### 5.3 Power Supply Cord and Fuses

Different power supply cords are available for various voltage outlets.

**Note:** If the outlet plug has to be adapted to the local situation it should only be done by a qualified person.

No voltage setting of the equipment is necessary. The instrument is equipped with a tapless switch mode power supply that covers most nominal voltage ranges in use: 90-250V AC RMS. This eliminates the need to change anything to adapt to the local power supply voltage.

The frequency required is 48-65 Hz.

**WARNING:** Please disconnect the instrument from all voltage sources before replacing a fuse.

**Power fuse rating:** 1.6A delayed action, 250V. The mains fuseholder is located on the rear panel of the instrument.

**If the power fuse has to be replaced, proceed as follows:**

1. Remove the mains cable.
2. Lift the plastic cover (fuseholder) using two small screwdrivers (simultaneously).
3. Remove old fuse.
4. Insert the new fuse into the top of the fuseholder.
5. Replace the cover (fuseholder).

**WARNING:** Make sure that only fuses of the required rating, correct voltage, and the specified type are used for replacement. The use of repaired (jumped) fuses and/or short circuiting of the fuse holder is prohibited. Fuses may only be replaced by a qualified person who is aware of the hazards involved.

## 5.4 Rack Mounting

This PTV instrument is delivered in a 19" cabinet. Four selfadhesive rubber feet are supplied together with this instrument.

If several cabinets are mounted in a 19" rack, special attention must be paid to the temperature inside the rack.

The PT 5211 can be used in between two PT 5210s without problem, but if the PT 5211 is mounted between other instruments with high surface temperatures, we recommend using one PM 9799 air-flow unit for every two pieces of equipment in the rack and fans in the top of the racks to provide forced air circulation.

### 5.4.1 Installation of Rack Mounting Kit PM 8552

The rack slides can be used in any rack with a front-to-rear spacing of between 18 and 27 inches. Make sure to provide clearance between the rear panel of the instrument and the cabinet panel for connectors and to provide necessary air circulation.

#### Mounting slide tracks

1. Mount the chassis section of the rack slide kit onto the instrument with the snap latch at the rear. Make sure that the screws are secured.
2. Mount the rails using the hardware shown in the figure below. Align the stationary sections both horizontally and with respect to level.

#### Installing the instrument

1. Pull the slide-out section out until it is fully extended.
2. Insert the instrument chassis section into the slide-out sections.

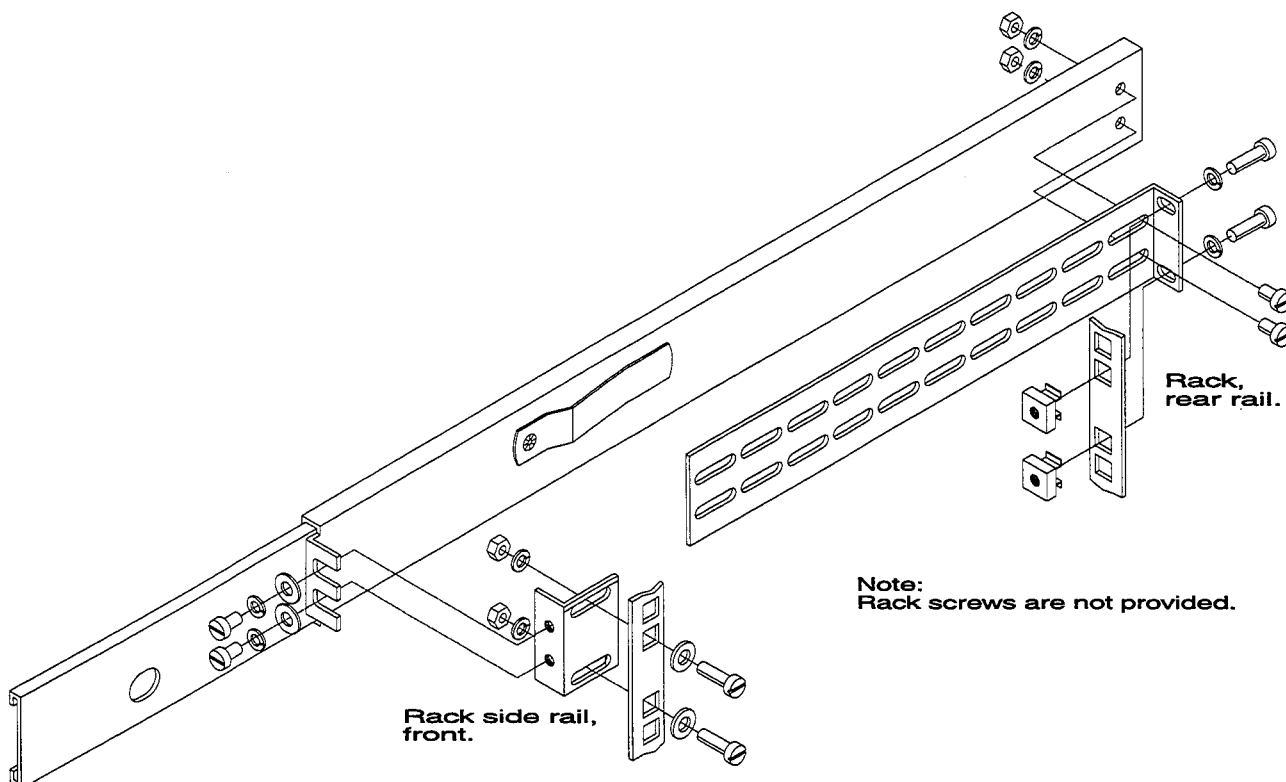


Fig. 5-1 Installation of PM 8552



3. Press the snap latches and push the instrument towards the rack frame until the latches snap into their holes.
4. Press the stop latches again and push the instrument all the way into the rack.
5. Fix the instrument by means of the front panel screws.

After installation, the slide tracks may need to be adjusted slightly to ensure smooth operation. To do so, pull the instrument halfway out, slightly loosen the screws holding the tracks onto the front rail and allow the tracks to settle to position which allows smooth operation. Tighten the screws and pull the instrument in and out several to make sure it moves smoothly.

### **Removing the instrument**

Be sure that all cabling is disconnected before removing the instrument.

1. Loosen the screws in the rack frame and pull the instrument forward until the stop latches snap into their holes.
2. Press the stop latches and remove the instrument.

## **5.5 Cleaning**

- Disconnect the instrument from the power voltage supply before cleaning.
- Use a damp cloth only.
- Be careful not to spill liquid into the instrument.

## **5.6 Access to and Replacement of Parts**

### **5.6.1 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.

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 repair of the opened instrument is unavoidable, it must only be carried out by a skilled person who is aware of the hazards involved.

To guarantee safety only original spare parts must be used.

### **5.6.2 Access to the Units**

To gain access to the units, remove the screws that secure the top cover of the instrument and lift the cover up.

### **5.6.3 Installation of Options**

Installation instructions are included with the option to be installed.



## 6. Configuration

### 6.1 General Information

The function of the PT 5211 VariTime™ Changeover is internally programmed by use of jumper plugs.

The jumpers are located on the left side of the Main Board (Unit 1). The jumpers are visible just below the printed circuit board, which is placed with the component side down.

#### ALARM:

Is defined as an action where the changeover indicates that there is or was, an error, either by closing the relay contacts in the remote connector and, if selected, sounding the audible beeper.

A previously detected fault is always indicated on the PT 5210 which performed the actual fault detection: the "WARNING" LED on the PT 5210 front plate lights up (*Please refer to the PT 5210 operating manual*).

### 6.2 Jumpers

#### 6.2.1 PP1 - Audio Beeper

The audible alarm can be programmed to three different functional modes.

**CENTER position:** (*factory default setting*).

OFF

No connection in the jumper field

**FRONT position:**

FOLLOWS ALARM

The beeper follows the alarm function and is reset together with this function from the front of the instrument.

**BACK position:**

FOLLOWS FAULT

The beeper follows the fault indicators on the front of the PT 5211. The fault indicators are directly controlled by the error signals from the PT 5210s. Whenever an error is detected in any of the PT 5210s, the beeper will sound.

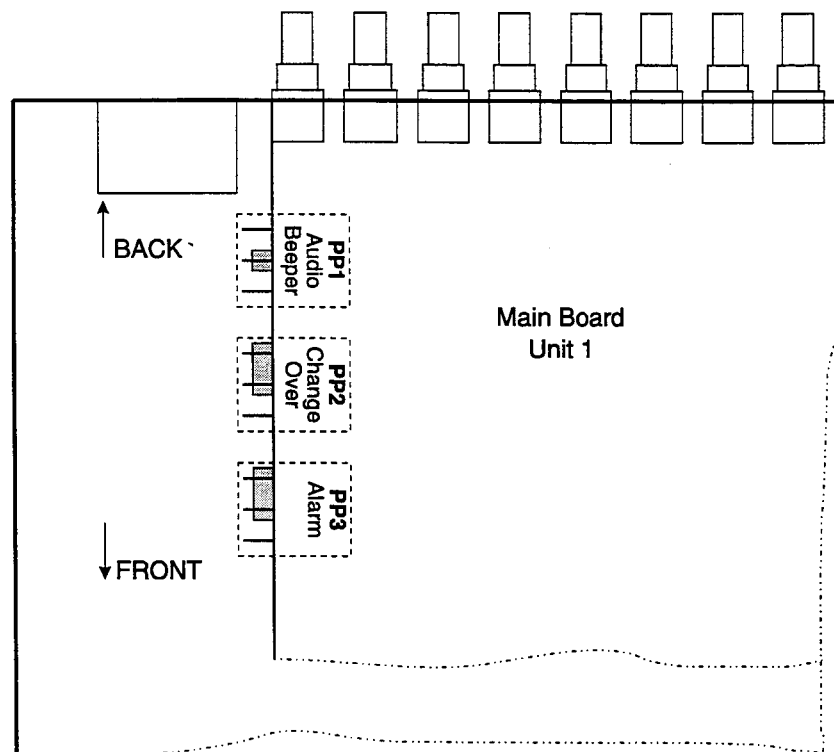


Fig. 6-1 Jumpers Location

### 6.2.2 PP2 - Change Over

PP2 enables the "one time switching only function" in AUTO mode.

When multiple switching is selected and a short circuit appears downstream from the changeover, the error can not be corrected and the changeover will start switching back and forth between the two sync generators. This can be overcome by use of the "one-time switching only" function.

When an error is detected in the primary sync generator, the changeover switches to the backup unit. The changeover will then switch back to the primary if the error flag from the primary disappears as long as "multiple switching" is selected. The changeover will not switch back when this happens if "one-time switching only" is selected.

**FRONT position:** (*factory default setting*)

Selects single time switching.

**BACK position:**

Selects multi time switching only.

By choosing the mode already active the alarm relay can be reset without changing to changeover signal routing.

**Note:** The alarm can not be reset if the error signal from the PT 5210 is still active. It is not possible to disable the alarm relay function completely.

**FRONT position:** (*factory default setting*)

Alarm relay enabled in both auto and manual mode.

**BACK position:**

Alarm relay enabled in auto mode only.

### 6.2.3 PP3 - Alarm

The alarm relay with contacts connected to the remote connector can be programmed to operate in two different ways. The alarm relay can only be activated when the changeover is used in the AUTO mode or when the alarm relay is enabled in both MANUAL and AUTO mode. The alarm indicates that a fault has occurred. The function is latched and has to be reset at the front of the instrument.

**Resetting the alarm relay**

The alarm relay is reset by selecting MANUAL, or by designating one of the generators as primary.

**To reset press:**

plus   
 or  
 plus   
 or  
 plus

## 7. Operating Instructions

### 7.1 Front Panel Indicators

#### POWER

A green LED that indicates when DC power is available from the internal DC supply.

#### REMOTE

A yellow LED that indicates that the unit is being controlled from the remote interface, not from the front panel.

#### ON AIR

Two green LEDs that indicate which sync generator is "on air". One of the ON AIR indicators will be active at any one time.

#### FAULT

Two red LEDs, each indicating that an error has been detected in the corresponding sync generator. When an LED is illuminated, it indicates that the error in the sync generator is momentarily active.

#### MANUAL

A button that takes the unit into the manual operation mode. The unit does not respond to any detected errors in the connected PT 5210s (except for the fault indicators which are still enabled). If the yellow LED in the button is lit, this indicates that manual mode is activated.

#### AUTO

A button that takes the unit into automatic operation mode. The unit switches automatically according to the status of error detection circuit in the sync generators and additional setup parameters in the changeover unit. A lit yellow LED in the button indicates that auto mode is activated.

#### SYNC GEN. 1 / PRIMARY

A button used to select Sync Generator 1, PT 5210, as the primary - i.e. Sync Generator 2, PT 5210, as backup. If the green LED is lit, this indicates that Sync Generator 1 is selected as primary.

#### SYNC GEN. 2 / PRIMARY

A button used to select Sync Generator 2, PT 5210, as the primary - i.e. Sync Generator 1 as backup. If the green LED is lit, this indicates that Sync Generator 2 is selected as primary.

### 7.2 Front Panel Controls

#### HOLD TO MODIFY

A safety button which has to be held down whenever another button is operated. This function reduces the risk of accidentally changing to the function of the changeover.

#### REMOTE ENABLE

A button that enables use of the remote interface. Depending upon the selection on the remote connector the instrument may go into remote-controlled mode. In emergencies it is always possible to disable the remote and take the instrument into the local mode controlled from the front panel.

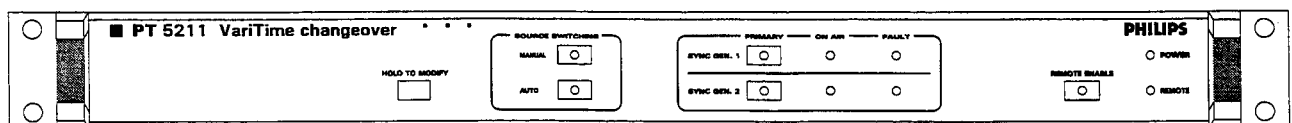


Fig. 7-1 Front of the Instrument

## 7.3 Rear Panel Connections

**Note:** Depending upon which options are installed, some or all of the outputs may be present in your changeover unit.



Safety Grounding (chassis)

### On/Off button

Power switch

ON: When "I" is pressed.

OFF: When "O" is pressed.

### Power Connector

Inlet power connector.

### REMOTE

Connector for remote control of the changeover unit. The remote connector is of the ground closure type.

### PT 5210 1/2

Control connector used with a special cable to connect the two PT 5210 VariTime™ Digital Sync Generators in the setup to the changeover unit. Which generator is SPG1 and which is SPG2 is defined by how this cable is connected. The identification is printed on the cable connectors.

### BNC connectors

BNC connectors are used on all the unbalanced channels. The connectors are arranged in groups of three, each identified by an number corresponding to a the changeover channel. The standard unit includes the Channels 1 to 4. Up to 12 channels can be installed in the form of optional units.

### IN1:

Connector to be used for the signal from the SPG1 generator.

### IN2:

Connector to be used for the signal from the SPG2 generator.

### OUT:

Connector with the selected output from either SPG1 or SPG2.

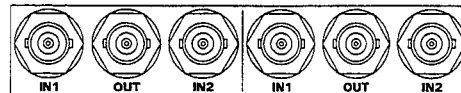


Fig. 7-3 PT 8617 Option

## 7.3.1 PT 8618 - Option

### XLR connectors

XLR connectors are used for output at the balanced signal channels of the changeover. These channels are only available when the PT 8618 option has been installed.

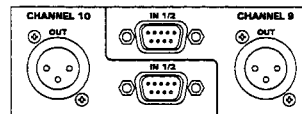


Fig. 7-4 PT 8618 Option

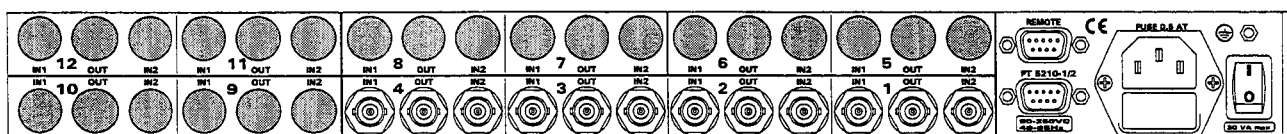


Fig. 7-2 Rear of the Instrument (Basic Instrument)

### 7.3.2 Remote Interface

The remote interface is of the TTL pull-down type with a 9-pin male sub-D connector on the back panel.

The remote interface provides access to additional functions other than those on the front of the instrument.

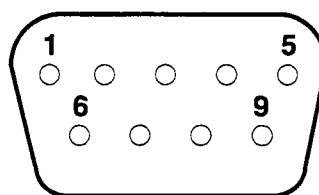


Fig. 7-4 Remote Interface, seen from rear panel

Pin:	Function and Value:	Comments:
1	Input:  0: Remote enable 1: Remote disable.	Control function to enable remote controlled operation if remote control is enabled on the front of the instrument. The output signals from the remote connector are active and indicate the status even when the remote control is disabled.  <u>Note:</u> If the remote is enabled on the front of the instrument and nothing is connected to the remote connector, the operation of the instrument is unchanged.
2	Input:  0: Selection of sync generator 1 as primary 1: Selection of sync generator 2 as primary	Selects which sync source has been selected as the primary.  The primary generator is always selected "ON AIR" in manual mode.  The primary generator is the preferred "ON AIR" generator in auto mode.
3	Input:  0: Selection of manual mode 1: Selection of auto mode	Selects if the switching is manual or automatic.
4	Output: "ON AIR"  0: Sync generator 1 1: Sync generator 2	Indicates which sync generator is being used, i.e. ON AIR on the front panel.
5	Ground connection	
6	Output  0: Fault on sync generator 1 1: No fault on sync generator 1	Error status flag for sync generator 1.  <u>Note:</u> During power failure in the changeover, pins 6 and 7 indicate fault on sync generators both 1 and 2.
7	Output  0: Fault on sync generator 2 1: No fault on sync generator 2	Error status flag for sync generator 2  <u>Note:</u> During power failure in the changeover, pins 6 and 7 indicate fault on sync generators both 1 and 2.
8/9	Relay contacts  Connected during fault conditions.	Relay contacts to be used for an externally powered alarm circuit. The relay contacts are floating. The contact closes whenever an error is detected, also in case of internal or external power failure.





## 8. General Service Information

### 8.1 Use of the Service Instructions

Troubleshooting is best carried out on a functional level using block diagrams. Reference is made to Chapters - "Instrument Block Diagram" and "Circuitry Description" for an overall description of the instrument.

Fault finding to component level will however, require the use of appropriate circuit diagrams.

### 8.2 Safety

The opening of covers or removal of parts, except those to which access can be gained by hand, is liable to expose live parts. Accessible terminals may also be live.

The instrument must be disconnected from all voltage sources before performing any adjustment, replacement, maintenance, or repair which requires the instrument to be opened.

If adjustment, maintenance, or repair of the opened instrument is unavoidable, it must only be carried out by a skilled person who is aware of the hazards involved.

#### 8.2.1 Electrostatics Sensitive Devices

All ICs and many other semi-conductors are susceptible to electrostatic discharges (ESD).

Careless handling during repair can reduce life drastically.

When repairing, make sure that you are connected with the same potential as the mass of the set via a wrist wrap with resistance. Keep components and tools also at this potential.

### 8.3 Block Diagram Symbols Description

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

#### 8.3.1 Functional Block Information

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

Text shows the major components in the block or stage.

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

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.





## 9. Instrument Block Diagram

### 9.1 General Information

The PT 5211 VariTime™ Changeover is designed to serve two PT 5210 VariTime™ Digital Sync Generators. The reliability of the total system is considerably better than that of a system with only one sync generator. The simple design of the PT 5211 is essential for the high reliability of the complete system.

The PT 5211 simplified instrument block diagram is shown in figure 9-1. The instrument consists of a basic design that can easily be extended by adding optional PCB modules. In the instrument block diagrams the optional blocks are surrounded by a dotted outer line.

### 9.2 Basic Instrument

The basic instrument is the simplest version of the instrument which includes no added optional units. The circuitry of the PT 5211 can be divided into a number of functional blocks.

#### 9.2.1 Signal Switches

All the signal switches in the PT 5211 switch simultaneously and are either controlled from the front panel or by the fault signals from the PT 5210 VariTime™ Digital Sync Generators. This functional block contains the relay switches and the switch drivers. The latched signal switches "remember" the mode of the instrument under and after a power-down.

#### 9.2.2 Relay Memories

The instrument mode is controlled either from remote source or from the front panel. This mode is preserved after a power-down. This functional block contains latched relays that serve to store

the manual/auto selection, the primary/secondary selection, the signal switch mode, and the remote enable mode.

#### 9.2.3 Source Error and Shift Logic

The PT 5211 receives fault signals from the PT 5210 sync generators if they fail. These two fault signals are buffered and used in AUTO mode to decide which of the two inputs are to be distributed via the signal switches. If a fault signal is received, an alarm signal is generated and present at the alarm output of the TTL Remote.

#### 9.2.4 Clock Generator and Watchdog

A clock signal of approximately 200Hz is generated for use in the relay memories and in the TTL input buffer. Power watchdog circuitry ensures a proper power-up or -down of the instrument.

#### 9.2.5 Front Panel

The front panel features the pushbuttons necessary for local operation of the instrument. Also included are LED indicators that provide information on various modes. An audio beeper that is activated by an alarm is also placed on the front panel.

#### 9.2.6 Power Supply

The power supply is of a modular switch mode type that generates a single +5 Volt supply to all the circuitry.

## 9.3 Options

Two different kind of options can be installed into the basic instrument. They are shown in the instrument block diagrams (Figures 9-1 and 10-1) as optional blocks surrounded by a dotted outer line.

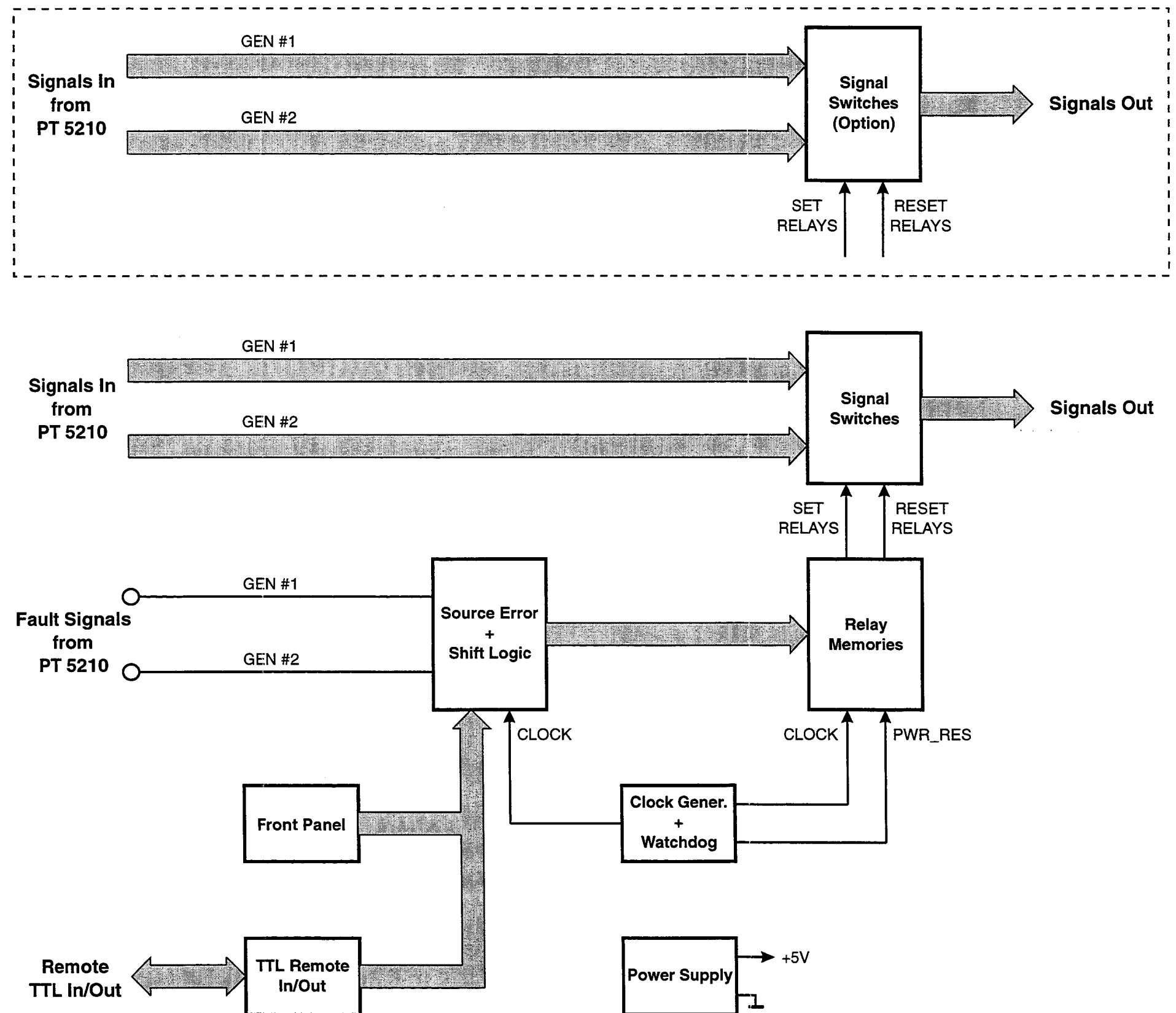
### 9.3.1 PT 8617 - BNC Changeover Channels

The PT 8617 BNC option contains two sets of extra relay switches and switch drivers. The switches and drivers are the same type as found in the basic instrument, which improves changeover capacity.

### 9.3.2 PT 8618 - XLR Changeover Channels

The PT 8618 XLR option is capable of switching AES/EBU standardized digital audio signals.

Standard XLR connectors are used in the output in order to conform with the AES/EBU standard for digital audio signal distribution.





## 10. Circuitry Description

The circuitry of the basic instrument consists of the following units:

- ✦ Main Board - Unit 1
- ✦ Front Panel - Unit 2
- ✦ Remote Interfaces
- ✦ Power Supply

The functionality of the circuitry contained in the detailed block diagram is described below.

### 10.1 Main Board - Unit 1

#### 10.1.1 Signal Switches

The Signal Switches (RE101 - 104) are of the two coil latching type. This means that the relays are bistable and that the contact position will not change after a power-down. Each coil has its own Switch Driver (Q101 - 108). Surge suppression is handled by diodes (D101 - 108). All the signal relays in both the basic instrument and in the optional units will switch simultaneously, controlled by RESET\_REL or SET\_REL control signals. These control signals are buffered in the V101 buffer.

#### 10.1.2 Relay Memories

The following parameters of the instrument mode are preserved even after a power-down:

- ✦ the Manual/Auto control selection
- ✦ the Primary/Secondary generator selection
- ✦ which sync source generator is actually "On air"
- ✦ the Remote Enable/Disable

These parameters are thus stored in two-coil Latching Relays (RE201 - 203 and RE205). These relays are driven by Relay Drivers (Q201 - 210) and surge suppression is handled by diodes (D201 - 210). Monostables (V203, V204, V206, and V209) ensure a drive pulse long enough to energize the relay coils for a safe switch action. To prevent both coils in a relay from being energized simultaneously, only one monostable per relay can

be active at a time. This is controlled by Flip-flops (V210 and V212) clocked by the CLOCK2 signal.

#### 10.1.3 Clock Generator and Power Watchdog

The Master Clock signal of the instrument is approximately 200Hz and generated in V14. Two Clock Signals (CLOCK1 and CLOCK2) are used by the Source Error Logic, the Relay Memories and in the TTL input.

Special precautions are taken in order to prevent false relay switching during power-up and -down. A Watchdog circuit (V17) supervise the +5V supply and generates a 50ms power reset pulse (POW\_RES) if the +5V deviates from the nominal voltage. This pulse disables the Master Clock signal and clears the monostables.

#### 10.1.4 Source Error Logic

The Sync Signal Detectors are all located in the PT 5210 VariTime™ Digital Sync Generators. The PT 5211 receives a fault signal from a sync generator if its sync signals fall outside certain limits. The fault signals are buffered in V6 and clocked by the Master Clock signal (CLOCK1) in V8. The fault signals are used in the Source Shift logic.

If a fault signal is received, an alarm signal is generated in V7 and V13 and the Audio Beeper on the Front Panel may be activated by transistor Q1. The alarm signal is also stored in V12. When an alarm goes on the coil of the Alarm Relay (RE204) will de-energize and the relay contacts close.

Access to the Alarm Relay is via the Alarm Output of the TTL socket. During power-down the Alarm Relay contacts are also closed indicating an "Alarm" situation.

### 10.1.5 Source Shift Logic

The fault signals from the sync generators, the selection of primary/secondary generator, and information specifying which generator is actually "On air" - all this information is taken into consideration when the Logic Circuitry (V6-7, V10-11, and V15) decides whether or not a changeover should take place.

Only in AUTO mode can an automatic changeover take place on the command of incoming fault signals. In MANUAL mode, which can be selected either from the Front Panel or via TTL Input, changeover can only take place after a "manual" command. V16 is the Man/Auto Selector.

## 10.2 Front Panel - Unit 2

The six pushbuttons (S501 to 506) necessary for local operation of the instrument are located on the Front Panel.

The mode of the instrument can only be modified by pushing the S501 ("HOLD TO MODIFY") together with one of the other buttons (S502 - 506).

The mode of the PT 5211 is indicated by the 11 LEDs on the Front Panel plate. 5 of the LEDs are integrated in the pushbuttons. The V501 and V502 are the LED Drivers, although not for the "POWER ON" LED, which is connected directly to the +5V power supply.

## 10.3 Interfaces

The PT 5211 can respond to a signal fault condition. The instrument is connected to fault detectors in two PT 5210 sync generators.

From the PT 5211 can the Front Panel be set into a "Remote Enable" mode. Then the instrument may be remote controlled and information of the mode can be present at remote.

The instrument has two interfaces:

- ✦ a PT 5210 interface ("PT 5210 1/2")
- ✦ a TTL remote interface ("REMOTE")

The circuit boards are located just behind the In- and Output connectors on the Rear Panel and serve as EMI protection of the instrument.

Every control signal In- and Output passes an LC Low-pass Filter.

## 10.4 Options

### 10.4.1 PT 8617 - BNC Channels

The PT 8617 BNC option is designed very much the same way as the BNC signal switches in the basic instrument.

Signal Switches (RE301 - 302) are of the two-coil latching type. This means that the relays are bistable and that the contact position will not change after a power-down. Each coil has its own Switch Driver (Q301 - 304). Surge suppression is handled by diodes D301 - 304. All the Signal Relays in both the basic instrument and in the optional units will switch simultaneously, controlled by RESET\_REL or SET\_REL control signals. These control signals are buffered in the V301 buffer.

### 10.4.2 PT 8618 - XLR Channels

The PT 8618 XLR option is capable of switching AES/EBU digital audio signals. Since these signals are normally balanced, two sets of relay switches are needed per signal to be switched.

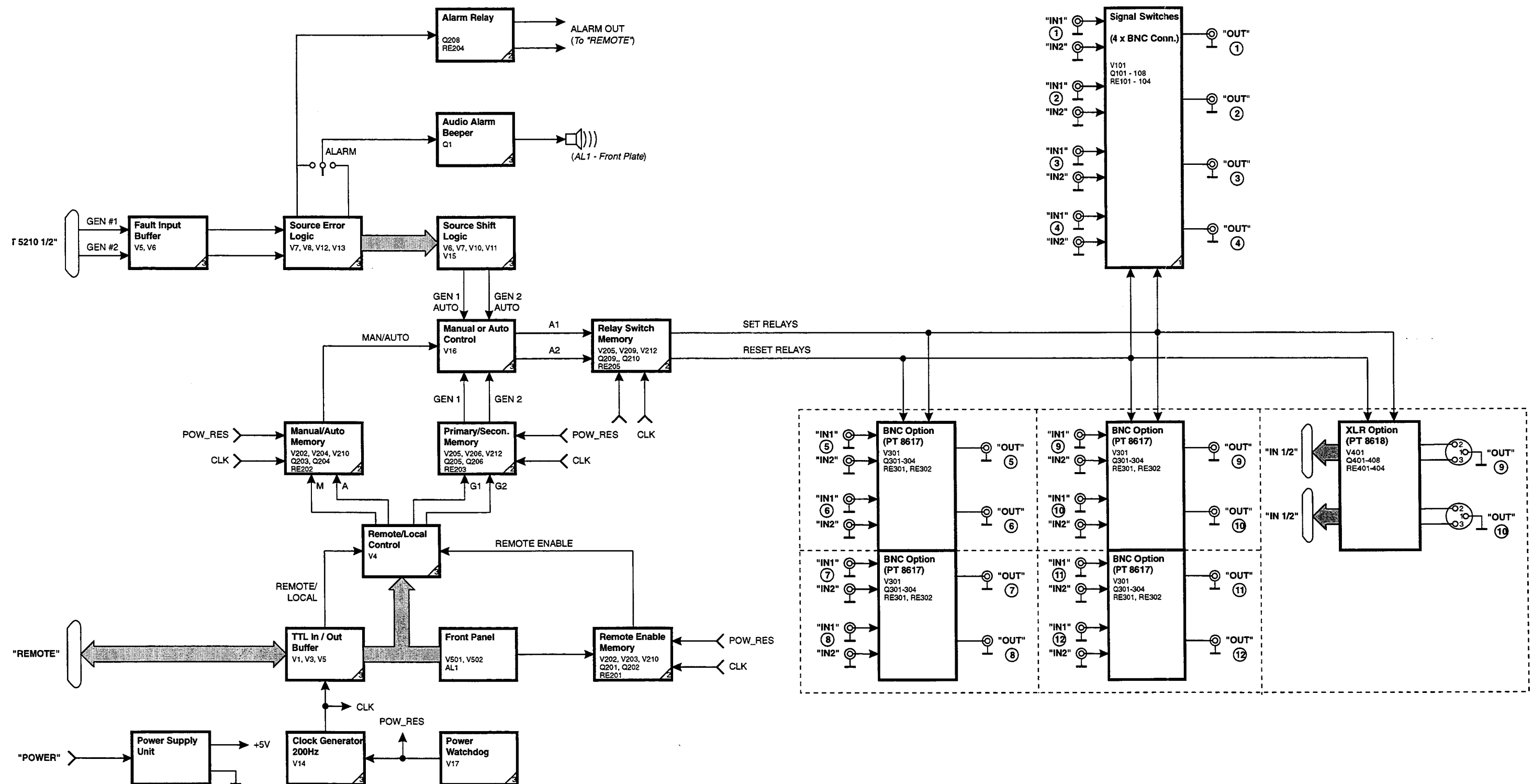
Signal Switches (RE401 and RE404) are of the two-coil latching type. This means that the relays are bistable and that the contact position will not change after a power-down. Each coil has its own Switch Driver (Q401 to 408). Surge suppression is handled by the diodes D401 to 408.



All the Signal Relays in the basic instrument, in the PT 8617 option, and in this optional unit will switch simultaneously, controlled by RESET\_REL or the SET\_REL control signals. These control signals are buffered in the V401 buffer.

The PT 8618 is equipped with standard XLR connectors in the signal outputs and with 9-pole sub-D connectors to interface with PT 5210 VariTime™ Digital Sync Generator's digital audio output ("AES/EBU AUDIO") or time code output ("TIME CODE"). The digital audio output conforms with the AES/EBU standard for digital audio signal distribution.





CDR  
Fig. 10-1 Instrument Block Diagram



# 11. Performance Check

## 11.1 General Information

The PT 5211 (incl. options) is an instrument that requires no adjustments. However, signal switching should be checked at **ALL** signal In- and Outputs of the instrument.

### Test Equipment:

Oscilloscope	: e.g. PM 3094
SDI Generator	: e.g. PT 5210 plus PT 8609
Video Generator	: e.g. PM 5640A
Color Monitor	: e.g. BARCO CVM-22B
Digital Sync Generator	: e.g. PT 5210
CAV Converter	: e.g. Miranda SDM-110

- Check the video performance.

The amplitude loss in the 0-20MHz frequency range should be less than 0.5dB.

### 2. SDI performance

- Use an SDI Generator and Monitor Receiver instead of a Video Generator and an Oscilloscope.
- Check that the SDI signal is transmitted and received with no errors.

## 11.2.2 Front Panel

- Press the **HOLD TO MODIFY** pushbutton together with each of the other five pushbuttons, one at a time, to check for correct performance and for correct LED indication.

## 11.2 Basic Instrument

### 11.2.1 Signal In - and Outputs

#### 1. Video performance

- Connect video sweep signal from a Video Generator to "IN1".
- Then connect the corresponding output ("OUT") to an Oscilloscope terminated with 75 Ω.
- Check that the corresponding "ON AIR" LED on the Front Panel is lit.
- Check the video performance.  
The amplitude loss in the 0-20MHz frequency range should be less than 0.5dB.
- Connect video sweep signal from a Video Generator to "IN2" of the same signal switch.
- Select other input, first press **HOLD TO MODIFY** plus **MANUAL** (SOURCE SWITCHING) pushbutton on the Front Panel, LED in "MANUAL" is lit, then press **HOLD TO MODIFY** plus **SYNC GEN. 2** (PRIMARY) pushbutton on the Front Panel to select other input.
- Check that the corresponding "ON AIR" LED on the Front Panel is lit.

### 11.2.3 Automatic Changeover Function

- Connect two PT 5210 Sync Generators to the "PT5210-1/2" control input of the PT 5211 using the correct interconnection cable.
- Set the PT 5211 to AUTO mode.  
Press **HOLD TO MODIFY** plus **AUTO**, LED in "AUTO" pushbutton is lit.
- Connect video or SDI signals to the BNC inputs ("IN1" or "IN2").
- Check that the PT 5211 will changeover to the second Sync Generator if the first one is switched OFF and vice versa.

## 11.3 PT 8617 - BNC Option

For performance check instructions for this option see performance check of the basic PT 5211.

## 11.4 PT 8618 - XLR Option

### Test Equipment:

AES/EBU Audio Gener. : e.g. PT 5210  
plus PT 8605  
AES/EBU Audio Monitor : e.g. Tek 764

### 1. Digital Audio Performance

- Connect a digital signal from an AES/EBU Audio Generator to the "IN 1/2" input using the correct interconnection cable.
- Then connect the corresponding output connector ("OUT") to an AES/EBU Audio Monitor.
- Check that the corresponding "ON AIR" LED on the Front Panel is lit.
- Use the monitor to check that the audio is transmitted with no errors.
  
- Connect a digital audio signal from an AES/EBU Audio Generator to the other "IN 1/2" input using the correct interconnection cable.
- Then connect the corresponding output connector ("OUT") to an AES/EBU Audio Monitor.
- Select other input, first press **HOLD TO MODIFY** plus **MANUAL** (SOURCE SWITCHING) pushbutton on the Front Panel, LED in "MANUAL" pushbutton is lit, then press **HOLD TO MODIFY** plus **SYNC GEN. 2** (PRIMARY) pushbutton on the Front Panel.
- Check that the corresponding "ON AIR" LED on the Front Panel is lit.
- Use the monitor to check that the audio is transmitted with no errors.

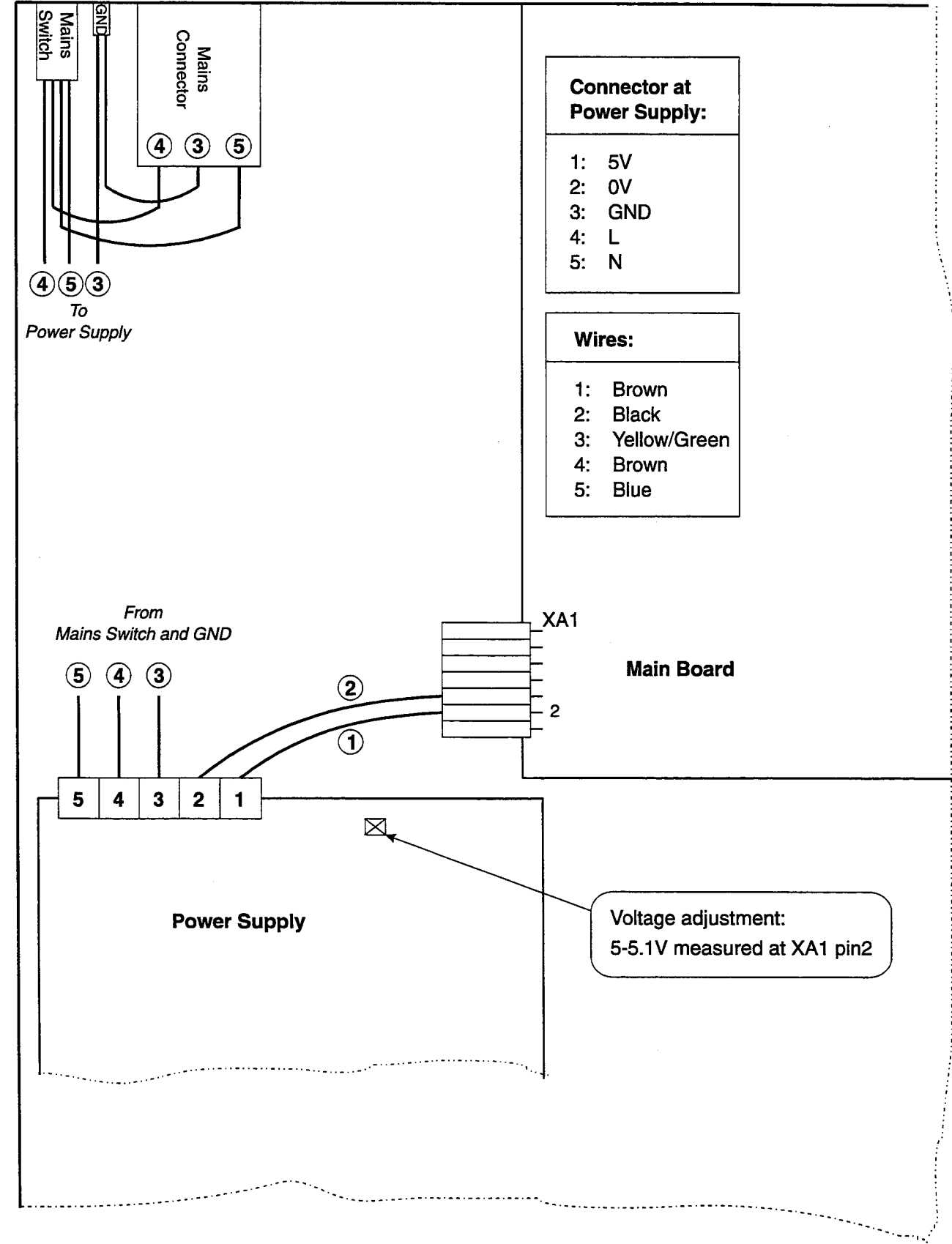


Fig. 11-1 Power supply, wiring + adjustment

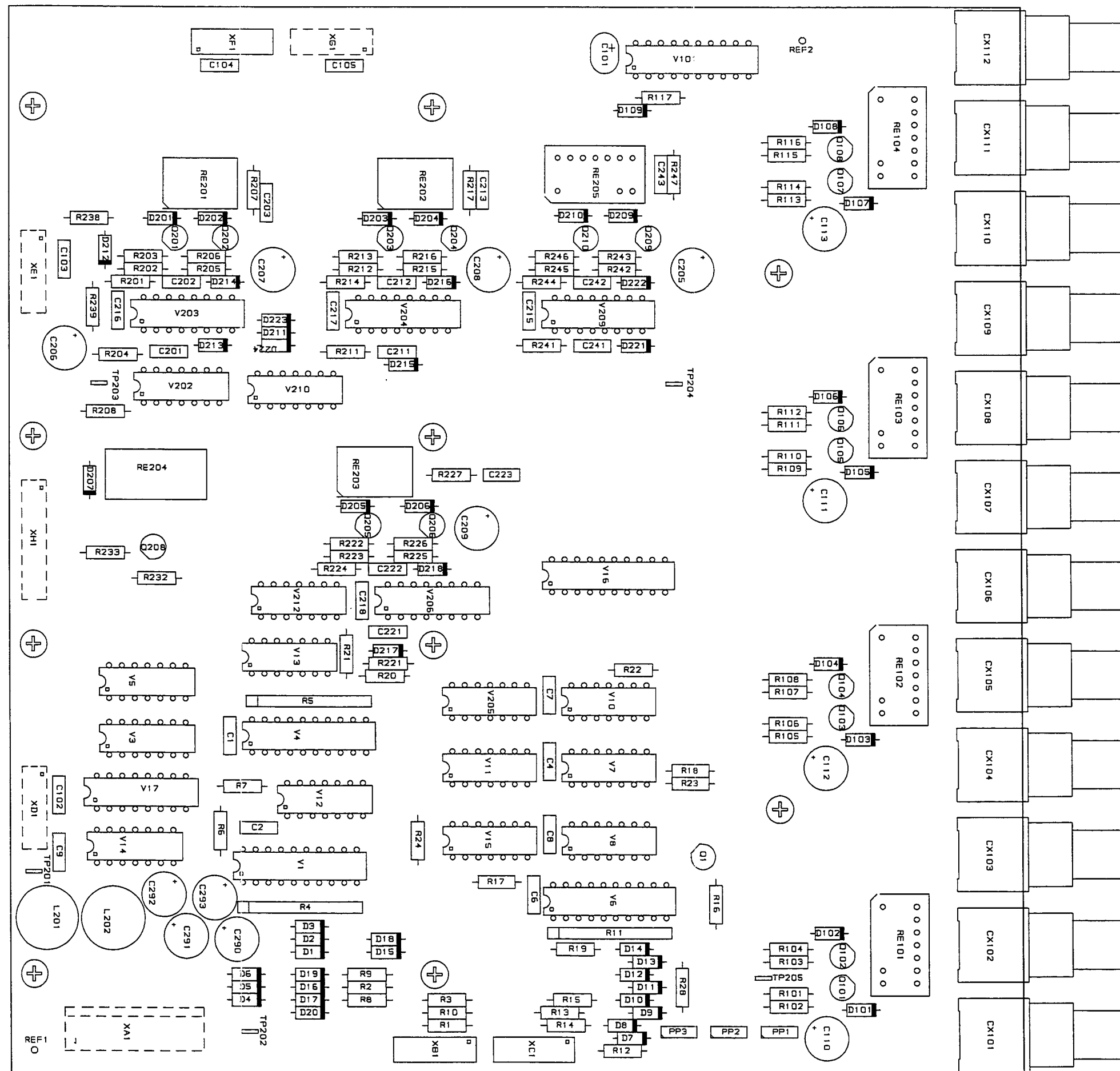
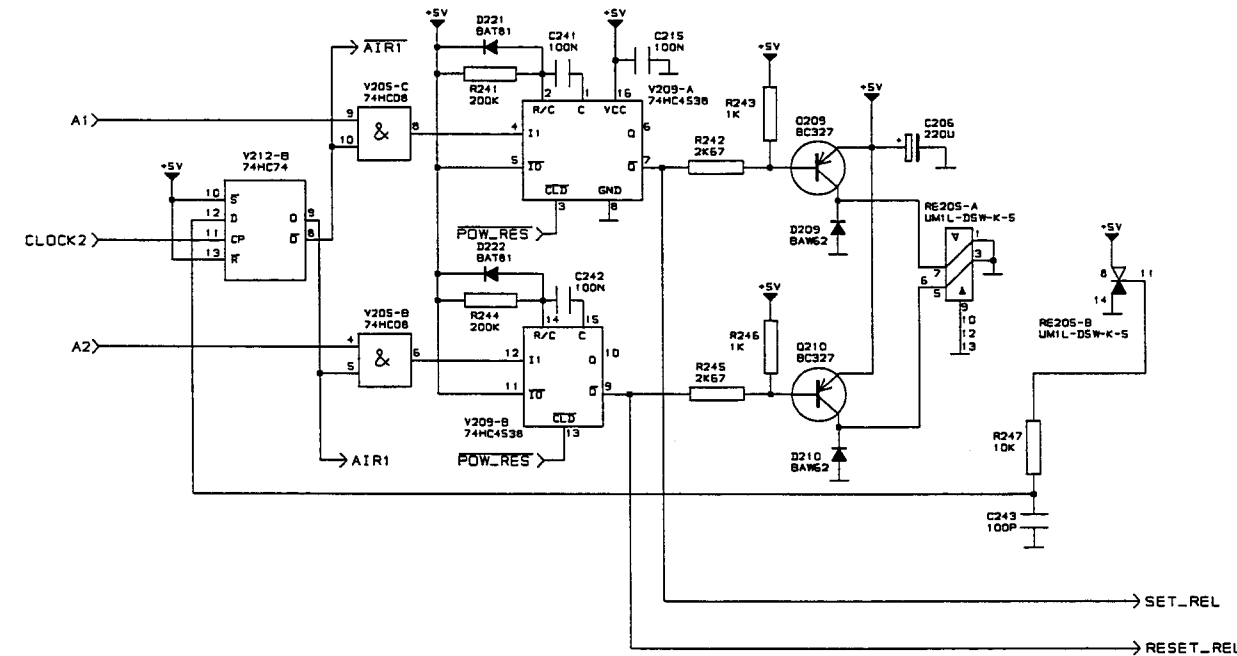
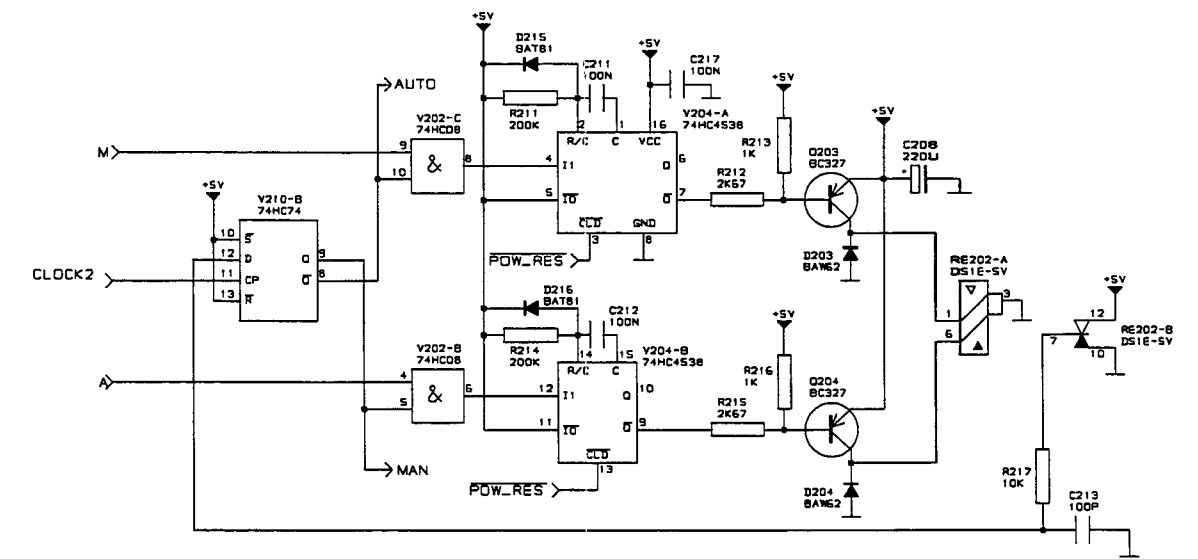
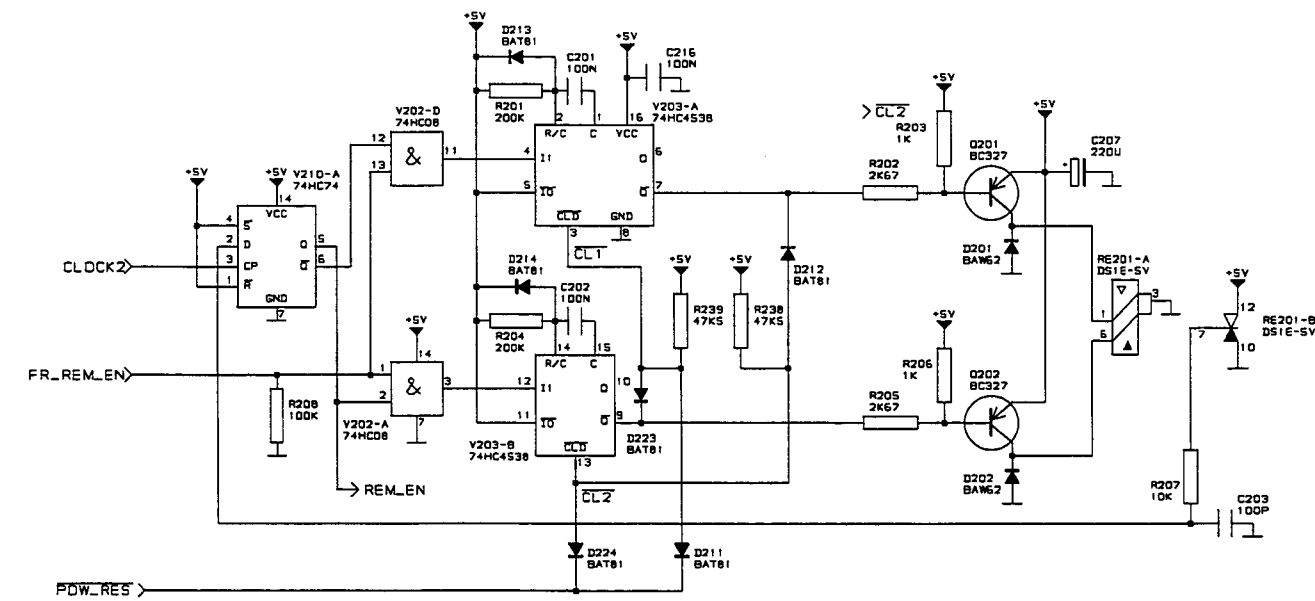


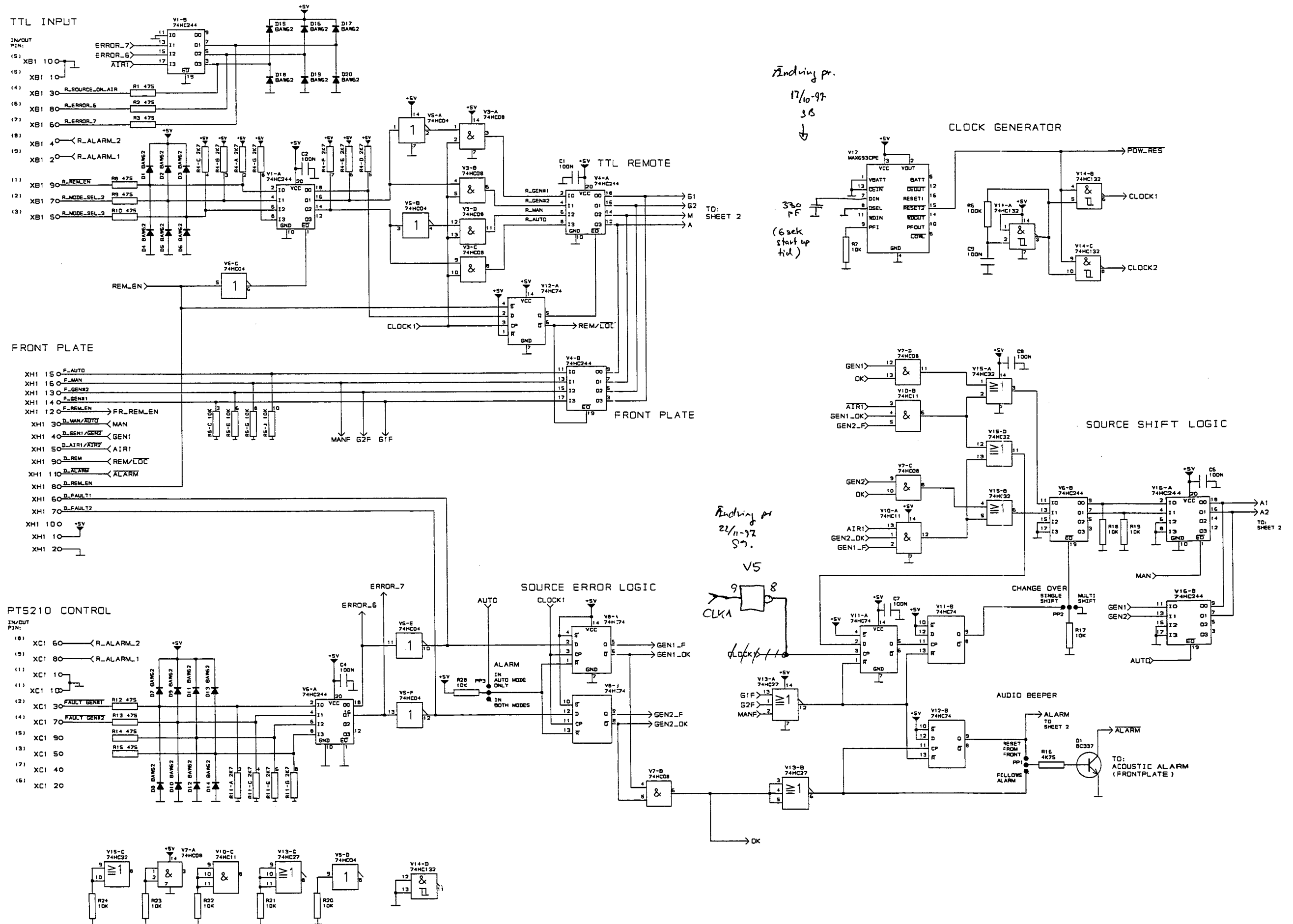
Fig. 11-2 Component Location, Unit 1

Main Board











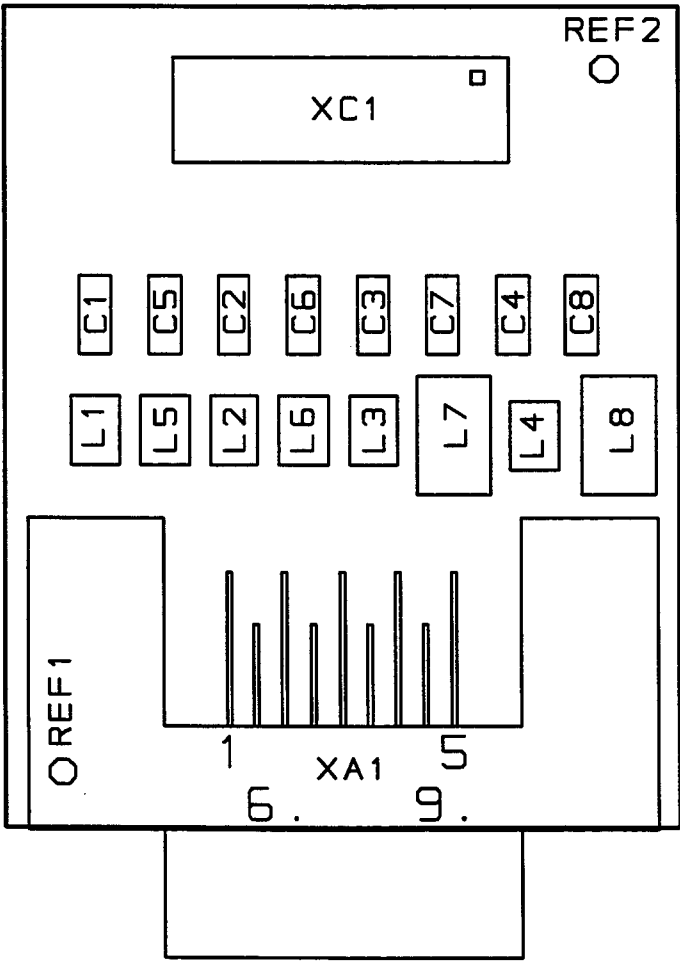


Fig. 11-8 Component Location - Remote Interfaces

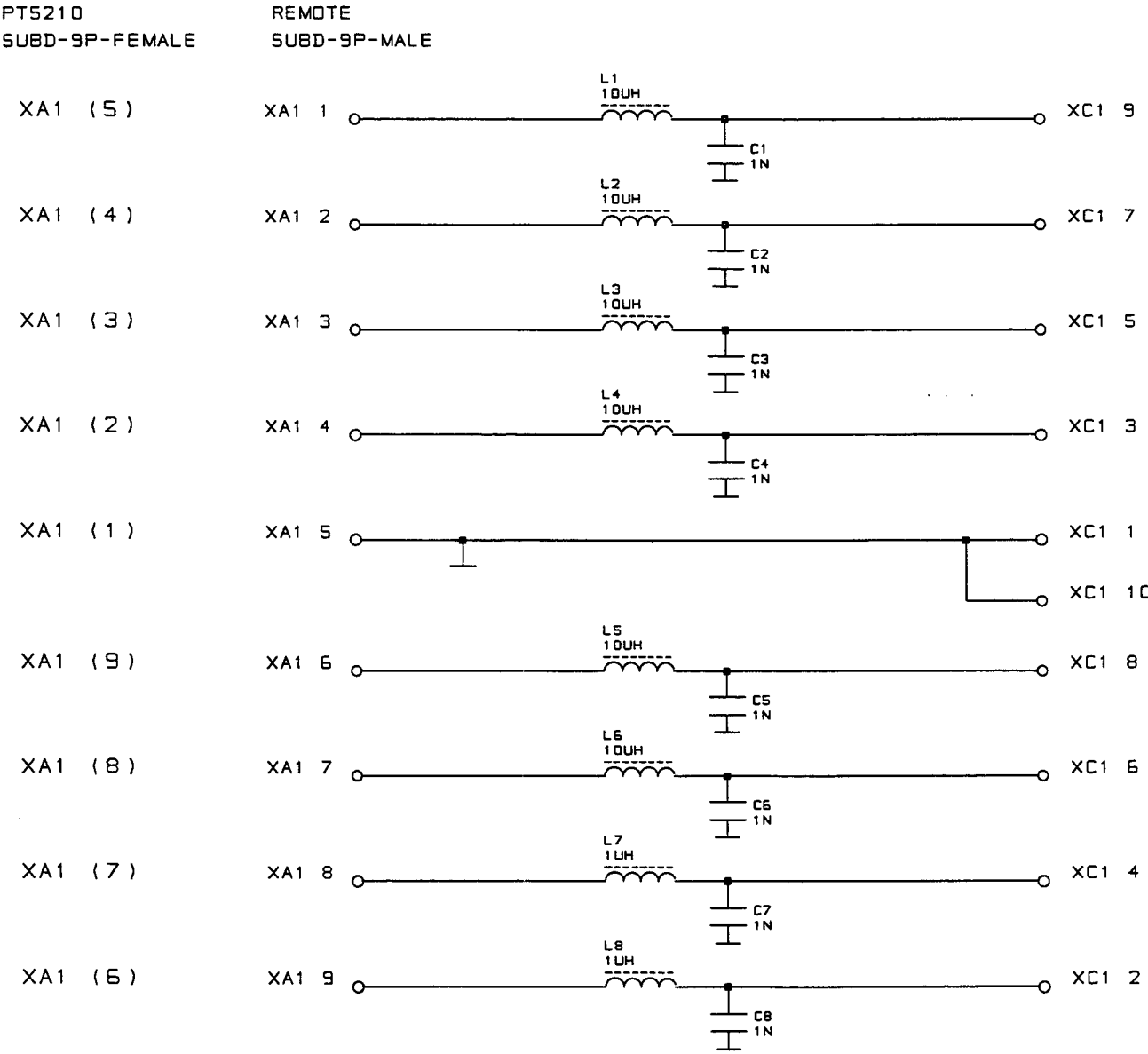


Fig. 11-9 Circuit Diagram - Remote Interfaces

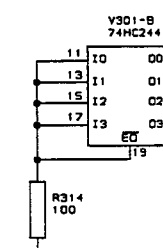
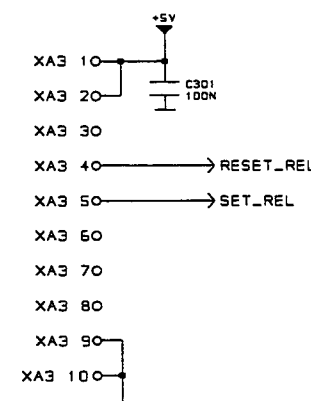
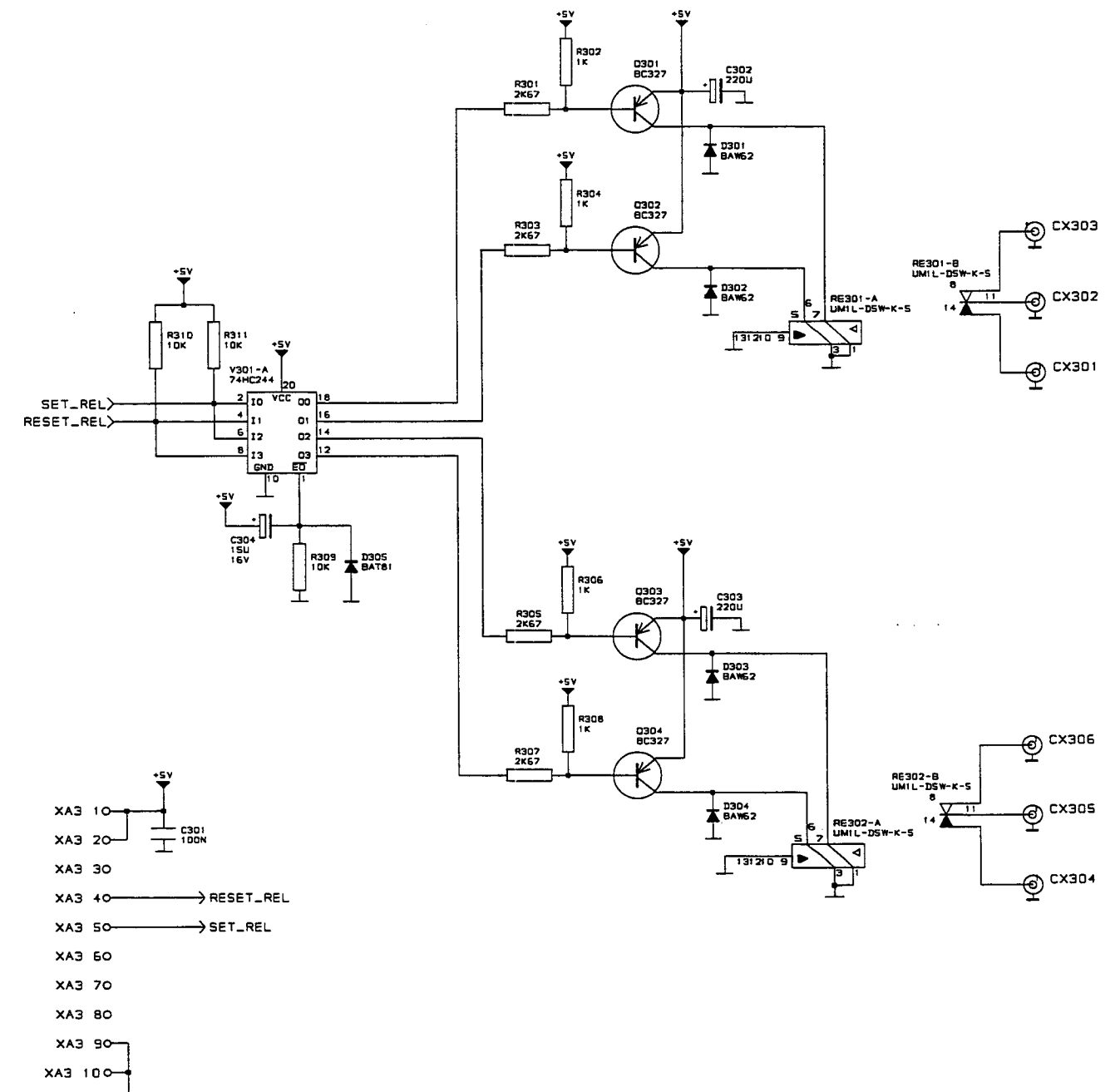
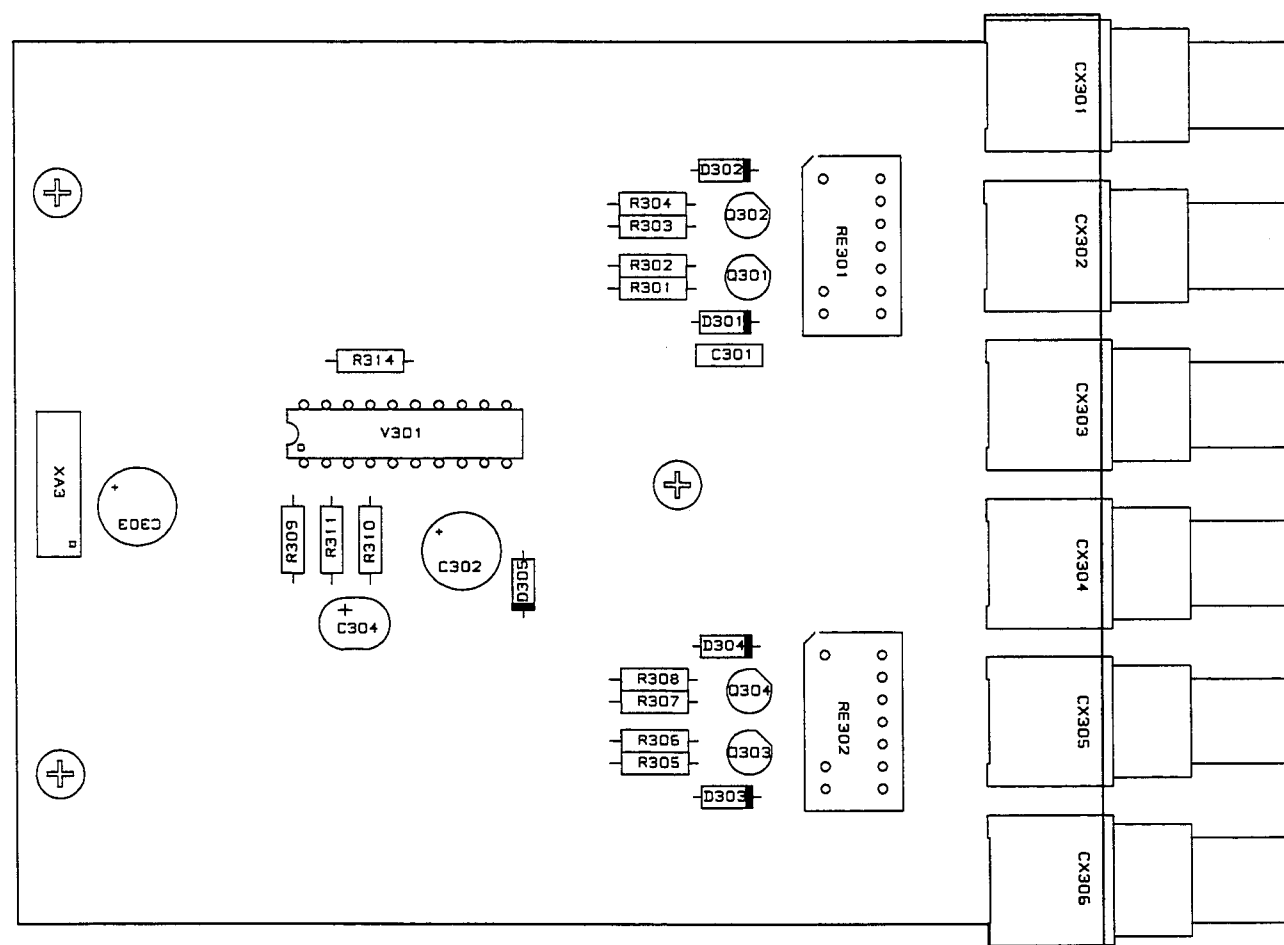


Fig. 11-10 Component Location - PT 8617

BNC Option - 109 83530

Fig. 11-11 Circuit Diagram - PT 8617

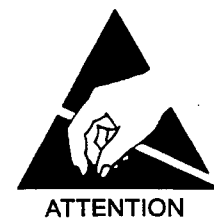
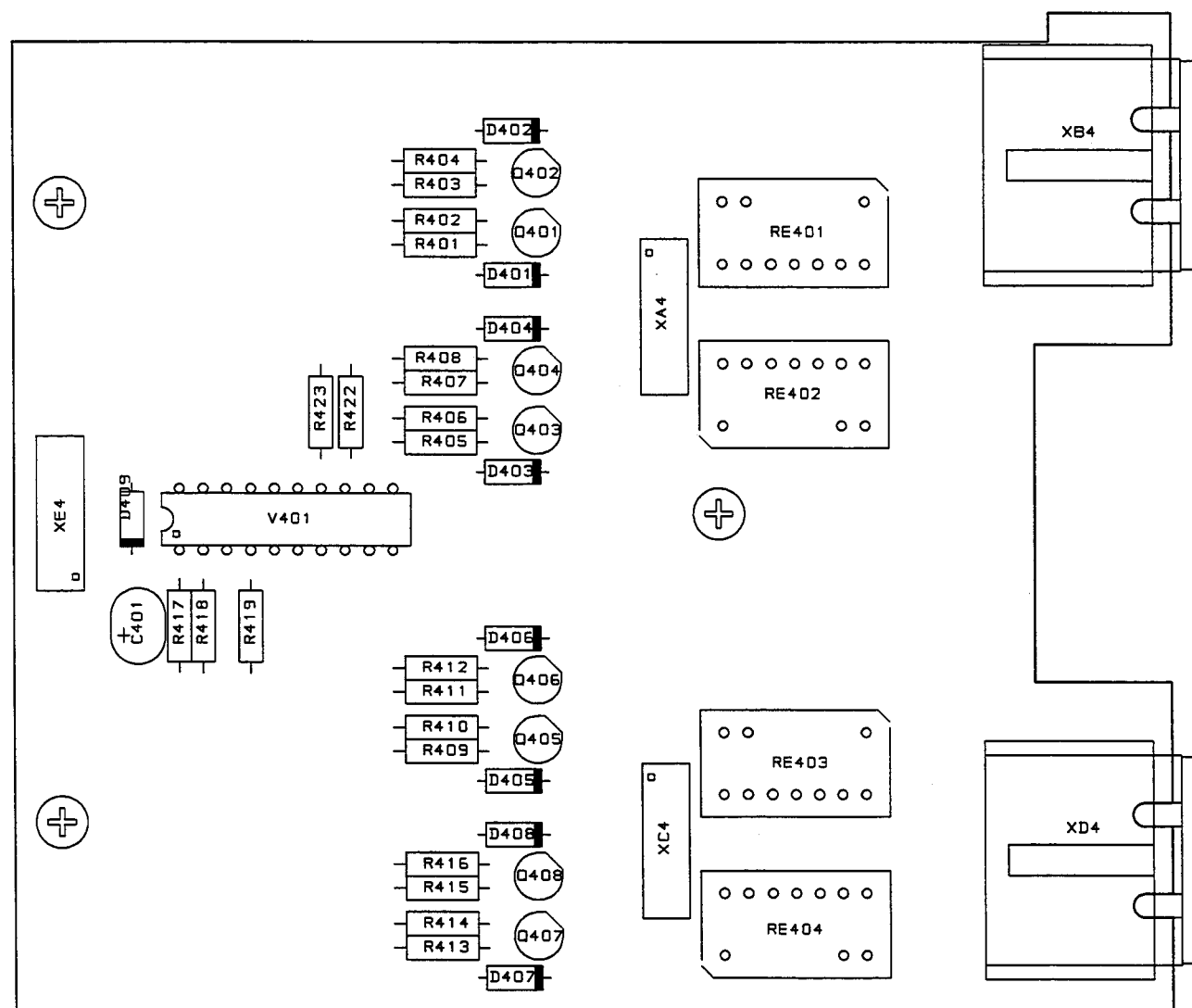
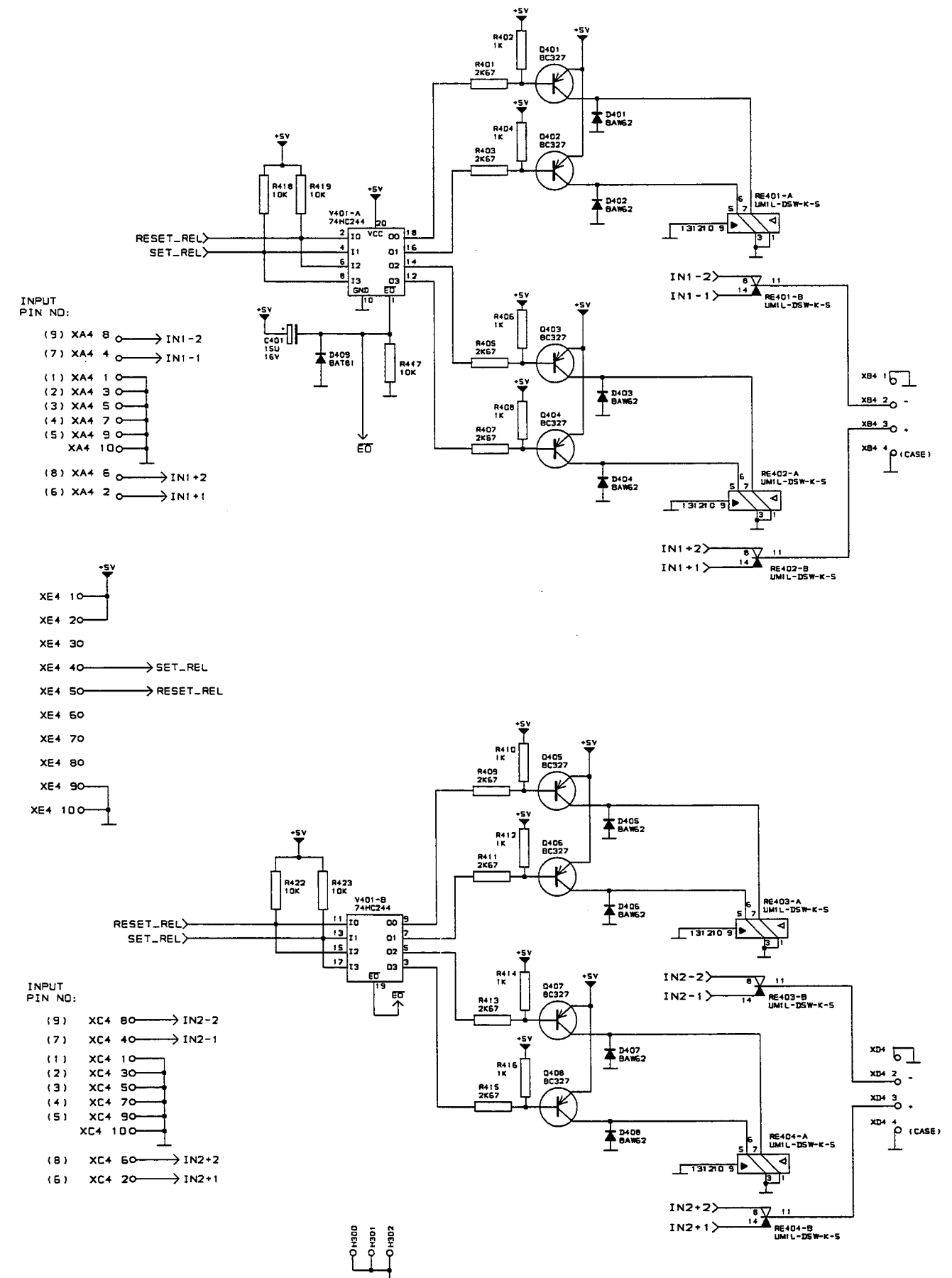


Fig. 11-12 Component Location - PT 8618



XLR Option - 109 83520

Fig. 11-13 Circuit Diagram - PT 8618





## 12. Service Hints

### 12.1 Maintenance

#### 12.1.1 Switches

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

#### 12.1.2 Cabinet

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

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 with filling materials in order to avoid transport damage.
3. The box should be marked with the complete type- and serial number (KU. number) and the remark "Return-shipment for repair".

### 12.2 Repairs

Repair can be done on component level by replacement of faulty component by new one of similar type.

Be aware that some components in signal path are critical in order to obtain the excellent transmission performance.

Never replace the relays with different types.

The power supply has no internal service parts and must be replaced by a whole new unit. Be aware of the safety aspects.

If the instrument has to be sent to the Philips service center for repair and/or alignment, the following points should be noted:

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



13. List of Mechanical Parts

Item:	Ordering Number:	Description:
1	4008 108 56010	FRONT PLATE ASSY
2	2408 135 00032	KNOB FOR BUTTON (GREY)
3	2408 135 00036	KNOB FOR BUTTON W/LED
4	4008 108 55690	HANDLE ASSY
5	4008 107 58590	TOP COVER
6	4008 127 03930	BOTTOM/REAR PLATE
7	4008 118 86280	GND CONNECTOR ASSY
8	4008 104 60130	MAINS SWITCH
9	4008 105 91260	MAINS INLET CONNECTOR
10	4008 105 91270	FUSE HOLDER
11	2422 025 09571	CONNECTOR "REMOTE"
12	4008 103 66750	CONNECTOR "PT 5210 1/2"
13	4008 103 56030	BNC CONNECTOR
	4008 108 04650	COVER FOR BNC CONNECTOR
14	4008 127 03910	OPTION PLATE
	4008 105 25000	FUSE 1.6A
	4008 105 91300	POWER SUPPLY
15	4008 103 66580	XLR CONNECTOR
16	2422 025 10013	CONN. "IN 1/2"

**Warning:** For reasons of safety, please use only original parts for the power supply and all parts connected to or adjacent to primary circuits.

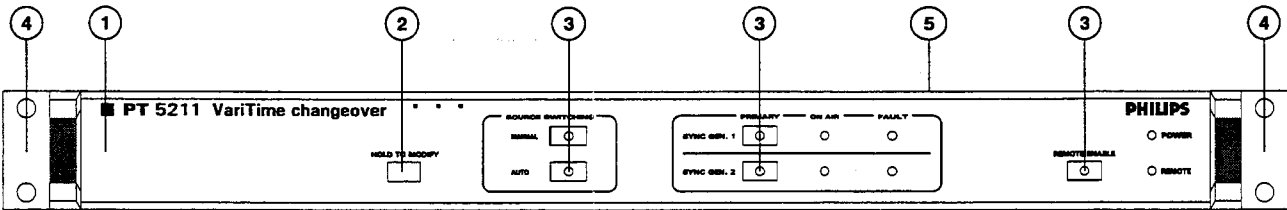


Fig. 13-1 Front of the Instrument

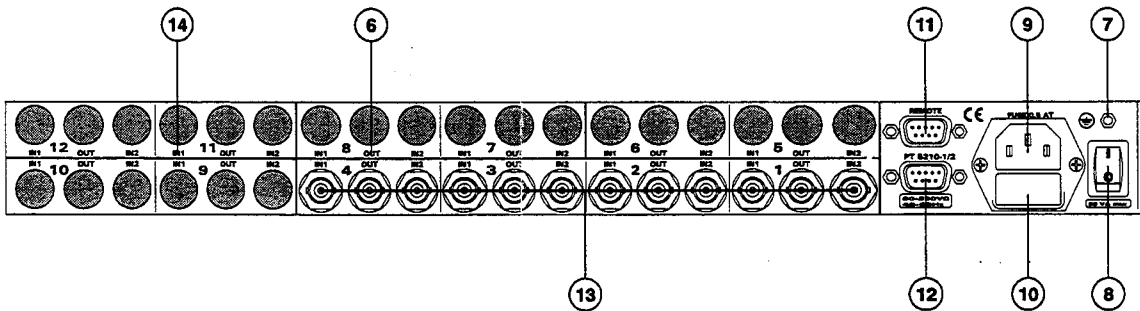


Fig. 13-2 Rear of the Instrument

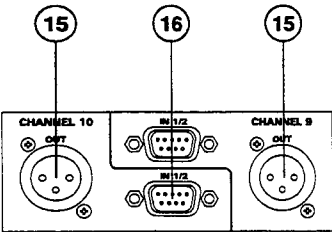


Fig. 13-3 PT 8618 Option



## 14. List of Electrical Parts

Item:	Order Number:	Description:
<b>Main Board - Unit 1</b>		
<i>Capacitors</i>		
C-001	2012 572 10024	CAP PLATE 100N -20+50% 63V
C-002	2012 572 10024	CAP PLATE 100N -20+50% 63V
C-004	2012 572 10024	CAP PLATE 100N -20+50% 63V
C-004	2222 370 11104	CAP MKT 100N +-10% 63V
C-006	2012 572 10024	CAP PLATE 100N -20+50% 63V
C-007	2012 572 10024	CAP PLATE 100N -20+50% 63V
C-008	2012 572 10024	CAP PLATE 100N -20+50% 63V
C-009	2222 370 11104	CAP MKT 100N +-10% 63V
C-101	2222 122 55159	ELCO SOL 15U +-20% 16V
C-102	2012 572 10024	CAP PLATE 100N -20+50% 63V
C-103	2012 572 10024	CAP PLATE 100N -20+50% 63V
C-104	2012 572 10024	CAP PLATE 100N -20+50% 63V
C-105	2012 572 10024	CAP PLATE 100N -20+50% 63V
C-110	2222 116 55221	ELCO 220U +-20% 16V
C-111	2222 116 55221	ELCO 220U +-20% 16V
C-112	2222 116 55221	ELCO 220U +-20% 16V
C-113	2222 116 55221	ELCO 220U +-20% 16V
C-201	2222 370 11104	CAP MKT 100N +-10% 63V
C-202	2222 370 11104	CAP MKT 100N +-10% 63V
C-203	2222 683 34101	CAP N150 N10 +-2% 100V
C-205	2222 116 55221	ELCO 220U +-20% 16V
C-206	2222 116 55221	ELCO 220U +-20% 16V
C-207	2222 116 55221	ELCO 220U +-20% 16V
C-208	2222 116 55221	ELCO 220U +-20% 16V
C-209	2222 116 55221	ELCO 220U +-20% 16V
C-211	2222 370 11104	CAP MKT 100N +-10% 63V
C-212	2222 370 11104	CAP MKT 100N +-10% 63V
C-213	2222 683 34101	CAP N150 N10 +-2% 100V
C-215	2012 572 10024	CAP PLATE 100N -20+50% 63V
C-216	2012 572 10024	CAP PLATE 100N -20+50% 63V
C-217	2012 572 10024	CAP PLATE 100N -20+50% 63V
C-218	2012 572 10024	CAP PLATE 100N -20+50% 63V
C-221	2222 370 11104	CAP MKT 100N +-10% 63V
C-222	2222 370 11104	CAP MKT 100N +-10% 63V
C-223	2222 683 34101	CAP N150 N10 +-2% 100V
C-241	2222 370 11104	CAP MKT 100N +-10% 63V
C-242	2222 370 11104	CAP MKT 100N +-10% 63V
C-243	2222 683 34101	CAP N150 N10 +-2% 100V
C-290	2222 116 55221	ELCO 220U +-20% 16V
C-291	2222 116 55221	ELCO 220U +-20% 16V
C-292	2222 116 55221	ELCO 220U +-20% 16V
C-293	2222 116 55221	ELCO 220U +-20% 16V
<i>Diodes</i>		
D-001	9331 012 20113	DIODE BAW62
D-002	9331 012 20113	DIODE BAW62
D-003	9331 012 20113	DIODE BAW62
D-004	9331 012 20113	DIODE BAW62
D-005	9331 012 20113	DIODE BAW62
D-009	9331 012 20113	DIODE BAW62
D-007	9331 012 20113	DIODE BAW62
D-008	9331 012 20113	DIODE BAW62

Item:	Order Number:	Description:
D-009	9331 012 20113	DIODE BAW62
D-010	9331 012 20113	DIODE BAW62
D-015	9331 012 20113	DIODE BAW62
D-016	9331 012 20113	DIODE BAW62
D-017	9331 012 20113	DIODE BAW62
D-018	9331 012 20113	DIODE BAW62
D-019	9331 012 20113	DIODE BAW62
D-020	9331 012 20113	DIODE BAW62
D-101	9331 012 20113	DIODE BAW62
D-102	9331 012 20113	DIODE BAW62
D-103	9331 012 20113	DIODE BAW62
D-104	9331 012 20113	DIODE BAW62
D-105	9331 012 20113	DIODE BAW62
D-106	9331 012 20113	DIODE BAW62
D-107	9331 012 20113	DIODE BAW62
D-108	9331 012 20113	DIODE BAW62
D-109	9336 247 30113	DIODE BAT81
D-201	9331 012 20113	DIODE BAW62
D-202	9331 012 20113	DIODE BAW62
D-203	9331 012 20113	DIODE BAW62
D-204	9331 012 20113	DIODE BAW62
D-205	9331 012 20113	DIODE BAW62
D-206	9331 012 20113	DIODE BAW62
D-207	9331 012 20113	DIODE BAW62
D-209	9331 012 20113	DIODE BAW62
D-210	9331 012 20113	DIODE BAW62
D-211	9336 247 30113	DIODE BAT81
D-212	9336 247 30113	DIODE BAT81
D-213	9336 247 30113	DIODE BAT81
D-214	9336 247 30113	DIODE BAT81
D-215	9336 247 30113	DIODE BAT81
D-216	9336 247 30113	DIODE BAT81
D-217	9336 247 30113	DIODE BAT81
D-218	9336 247 30113	DIODE BAT81
D-221	9336 247 30113	DIODE BAT81
D-222	9336 247 30113	DIODE BAT81
D-223	9336 247 30113	DIODE BAT81
D-224	9336 247 30113	DIODE BAT81
<i>Transistors</i>		
Q-001	9331 492 00112	TRANSIST. BC337
Q-101	9331 795 30112	TRANSIST. BC327
Q-102	9331 795 30112	TRANSIST. BC327
Q-103	9331 795 30112	TRANSIST. BC327
Q-104	9331 795 30112	TRANSIST. BC327
Q-105	9331 795 30112	TRANSIST. BC327
Q-106	9331 795 30112	TRANSIST. BC327
Q-107	9331 795 30112	TRANSIST. BC327
Q-108	9331 795 30112	TRANSIST. BC327
Q-201	9331 795 30112	TRANSIST. BC327
Q-202	9331 795 30112	TRANSIST. BC327
Q-203	9331 795 30112	TRANSIST. BC327
Q-204	9331 795 30112	TRANSIST. BC327
Q-205	9331 795 30112	TRANSIST. BC327
Q-206	9331 795 30112	TRANSIST. BC327

Item:	Order Number:	Description:
Q-208	9331 795 30112	TRANSIST. BC327
Q-209	9331 795 30112	TRANSIST. BC327
Q-210	9331 795 30112	TRANSIST. BC327
<b>Resistors</b>		
R-001	2322 156 14751	RES MRS25 475R 1% 0,6W
R-002	2322 156 14751	RES MRS25 475R 1% 0,6W
R-003	2322 156 14751	RES MRS25 475R 1% 0,6W
R-004	2122 118 01058	RES NETW. 9X2K7 2%
R-005	2122 118 01066	RES NETW. 9X10K 2%
R-006	2322 156 11004	RES MRS25 100K 1% 0,6W
R-007	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-008	2322 156 14751	RES MRS25 475R 1% 0,6W
R-009	2322 156 14751	RES MRS25 475R 1% 0,6W
R-010	2322 156 14751	RES MRS25 475R 1% 0,6W
R-011	2122 118 01058	RES NETW. 9X2K7 2%
R-012	2322 156 14751	RES MRS25 475R 1% 0,6W
R-013	2322 156 14751	RES MRS25 475R 1% 0,6W
R-016	2322 156 14752	RES MRS25 4K75 1% 0,6W
R-017	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-018	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-019	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-020	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-021	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-022	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-023	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-024	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-025	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-028	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-101	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-102	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-103	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-104	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-105	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-106	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-107	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-108	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-109	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-110	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-111	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-112	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-113	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-114	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-115	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-116	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-117	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-201	2322 156 12004	RES MRS25 200K 1% 0,6W
R-202	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-203	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-204	2322 156 12004	RES MRS25 200K 1% 0,6W
R-205	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-206	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-207	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-208	2322 156 11004	RES MRS25 100K 1% 0,6W
R-211	2322 156 12004	RES MRS25 200K 1% 0,6W
R-212	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-213	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-214	2322 156 12004	RES MRS25 200K 1% 0,6W
R-215	2322 156 12672	RES MRS25 2K67 1% 0,6W

Item:	Order Number:	Description:
R-216	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-217	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-221	2322 156 12004	RES MRS25 200K 1% 0,6W
R-222	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-223	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-224	2322 156 12004	RES MRS25 200K 1% 0,6W
R-225	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-226	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-227	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-232	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-233	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-238	2322 156 14753	RES MRS25 47K5 1% 0,6W
R-239	2322 156 14753	RES MRS25 47K5 1% 0,6W
R-241	2322 156 12004	RES MRS25 200K 1% 0,6W
R-242	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-243	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-244	2322 156 12004	RES MRS25 200K 1% 0,6W
R-245	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-246	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-247	2322 156 11003	RES MRS25 10K0 1% 0,6W

**Relays**

RE101	4008 105 05020	HF RELAY RK1-L2-SV
RE102	4008 105 05020	HF RELAY RK1-L2-SV
RE103	4008 105 05020	HF RELAY RK1-L2-SV
RE104	4008 105 05020	HF RELAY RK1-L2-SV
RE201	4008 105 05030	RELAY DS1E-SL2-5V
RE202	4008 105 05030	RELAY DS1E-SL2-5V
RE203	4008 105 05030	RELAY DS1E-SL2-5V
RE204	4008 104 95050	RELAY DS 2 E-SV
RE205	4008 105 05020	HF RELAY RK1-L2-SV

**Integrated Circuits**

V-001	9336 705 40112	IC 74HC244N
V-003	9336 687 80112	IC 74HC08N
V-004	9336 705 40112	IC 74HC244N
V-005	9336 687 70112	IC 74HC04N
V-006	9336 705 40112	IC 74HC244N
V-007	9336 687 80112	IC 74HC08N
V-008	9336 691 30112	IC 74HC74N
V-009	9336 688 70112	IC 74HC86N
V-010	9336 688 00112	IC 74HC11N
V-011	9336 691 30112	IC 74HC74N
V-012	9336 691 30112	IC 74HC74N
V-013	9336 688 20112	IC 74HC27N
V-014	9336 690 30112	IC 74HC132N
V-015	9336 688 30112	IC 74HC32N
V-016	9336 705 40112	IC 74HC244N
V-017	9339 744 80682	IC MAX693ACPE
V-101	9336 705 40112	IC 74HC244N
V-202	9336 687 80112	IC 74HC08N
V-203	9336 698 40112	IC 74HC4538N
V-204	9336 698 40112	IC 74HC4538N
V-205	9336 687 80112	IC 74HC08N
V-206	9336 698 40112	IC 74HC4538N
V-209	9336 698 40112	IC 74HC4538N
V-210	9336 691 30112	IC 74HC74N
V-212	9336 691 30112	IC 74HC74N

Item:	Order Number:	Description:
<b>Front Panel - Unit 2</b>		
<b>Beeper</b>		
AL001	4008 105 91310	AUDIO INDICATOR
<b>Capacitors</b>		
C-501	2012 572 10024	CAP PLATE 100N -20+50% 63V
C-502	2012 572 10024	CAP PLATE 100N -20+50% 63V
<b>Diodes</b>		
D-501	9335 593 40682	LED 3MM RED TLR124
D-502	9335 593 40682	LED 3MM RED TLR124
D-503	9335 593 70682	LED 3MM GREEN TLG124A
D-504	9335 593 70682	LED 3MM GREEN TLG124A
D-505	9335 593 70682	LED 3MM GREEN TLG124A
D-506	9335 594 00682	LED 3MM YELLOW TLY124
<b>Resistors</b>		
R-501	2122 118 01066	RES NETW. 9X10K 2%
R-506	2322 156 13321	RES MRS25 332R 1% 0,6W
R-507	2322 156 13321	RES MRS25 332R 1% 0,6W
R-508	2322 156 13321	RES MRS25 332R 1% 0,6W
R-509	2322 156 13321	RES MRS25 332R 1% 0,6W
R-510	2322 156 13321	RES MRS25 332R 1% 0,6W
R-511	2322 156 13321	RES MRS25 332R 1% 0,6W
R-512	2322 156 13321	RES MRS25 332R 1% 0,6W
R-513	2322 156 13321	RES MRS25 332R 1% 0,6W
R-514	2122 118 01066	RES NETW. 9X10K 2%
<b>Buttons</b>		
S-501	2408 128 00033	PUSHBUTTON SWITCH 3FTH9
S-502	2408 128 00035	PUSHBUTTON SWITCH 3FTH640
S-503	2408 128 00035	PUSHBUTTON SWITCH 3FTH640
S-504	2408 128 00036	PUSHBUTTON SWITCH 3FTH620
S-505	2408 128 00036	PUSHBUTTON SWITCH 3FTH620
S-506	2408 128 00035	PUSHBUTTON SWITCH 3FTH640
<b>Integrated Circuits</b>		
V-501	9336 687 70112	IC 74HC04N
V-502	9336 687 70112	IC 74HC04N
<b>Interfaces</b>		
<b>Capacitors</b>		
C-001	2222 863 15102	CAP CER SMD 1N0 NP0 5%
C-002	2222 863 15102	CAP CER SMD 1N0 NP0 5%
C-003	2222 863 15102	CAP CER SMD 1N0 NP0 5%
C-004	2222 863 15102	CAP CER SMD 1N0 NP0 5%
C-005	2222 863 15102	CAP CER SMD 1N0 NP0 5%
C-006	2222 863 15102	CAP CER SMD 1N0 NP0 5%
C-007	2222 863 15102	CAP CER SMD 1N0 NP0 5%
C-008	2222 863 15102	CAP CER SMD 1N0 NP0 5%

Item:	Order Number:	Description:
<b>BNC Option - PT 8617</b>		
<b>Capacitors</b>		
C-301	2222 370 11104	CAP MKT 100N +-10% 63V
C-302	2222 116 55221	ELCO 220U +-20% 16V
C-303	2222 116 55221	ELCO 220U +-20% 16V
C-304	2222 122 55159	ELCO SOL 15U +-20% 16V
<b>Diodes</b>		
D-301	9331 012 20113	DIODE BAW62
D-302	9331 012 20113	DIODE BAW62
D-303	9331 012 20113	DIODE BAW62
D-304	9331 012 20113	DIODE BAW62
D-305	9336 247 30113	DIODE BAT81
<b>Transistors</b>		
Q-301	9331 491 80112	TRANSIST. BC327
Q-302	9331 491 80112	TRANSIST. BC327
Q-303	9331 491 80112	TRANSIST. BC327
Q-304	9331 491 80112	TRANSIST. BC327
<b>Resistors</b>		
R-301	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-302	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-303	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-304	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-305	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-306	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-307	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-308	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-309	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-310	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-311	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-314	2322 156 11001	RES MRS25 100R 1% 0,6W
<b>Relay</b>		
RE301	4008 105 05020	HF RELAY RK1-L2-SV
RE302	4008 105 05020	HF RELAY RK1-L2-SV
<b>Integrated Circuits</b>		
V-301	9336 705 40112	IC 74HC244N

**XLR Option - PT 8618**

<b>Capacitors</b>		
C-401	2222 122 55159	ELCO SOL 15U +-20% 16V
<b>Diodes</b>		
D-401	9331 012 20113	DIODE BAW62
D-402	9331 012 20113	DIODE BAW62
D-403	9331 012 20113	DIODE BAW62
D-404	9331 012 20113	DIODE BAW62
D-405	9331 012 20113	DIODE BAW62
D-406	9331 012 20113	DIODE BAW62
D-407	9331 012 20113	DIODE BAW62
D-408	9331 012 20113	DIODE BAW62
D-409	9336 247 30113	DIODE BAT81

Item:	Order Number:	Description:
<b>Transistors</b>		
Q-401	9331 491 80112	TRANSIST. BC327
Q-402	9331 491 80112	TRANSIST. BC327
Q-403	9331 491 80112	TRANSIST. BC327
Q-404	9331 491 80112	TRANSIST. BC327
Q-405	9331 491 80112	TRANSIST. BC327
Q-406	9331 491 80112	TRANSIST. BC327
Q-407	9331 491 80112	TRANSIST. BC327
Q-408	9331 491 80112	TRANSIST. BC327
<b>Resistors</b>		
R-401	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-402	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-403	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-404	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-405	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-406	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-407	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-408	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-409	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-410	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-411	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-412	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-413	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-414	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-415	2322 156 12672	RES MRS25 2K67 1% 0,6W
R-416	2322 156 11002	RES MRS25 1K00 1% 0,6W
R-417	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-418	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-419	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-422	2322 156 11003	RES MRS25 10K0 1% 0,6W
R-423	2322 156 11003	RES MRS25 10K0 1% 0,6W
<b>Relays</b>		
RE401	4008 105 05020	HF RELAY RK1-L2-SV
RE402	4008 105 05020	HF RELAY RK1-L2-SV
RE403	4008 105 05020	HF RELAY RK1-L2-SV
RE404	4008 105 05020	HF RELAY RK1-L2-SV
<b>Integrated Circuits</b>		
V-401	9336 705 40112	IC 74HC244N



## 15. List of Recommended Spare Parts

We recommended that you purchase 1 kit per 10 instruments in service.

Type of Kit:	Order Number:
Recommended Spare Parts Kit - PT 5211	9449 818 52111

Qty.:	Order Number:	Description:
1	4008 105 91300	POWER SUPPLY
1	4008 118 86280	GND CONNECTOR ASSY
1	4008 104 60130	MAINS SWITCH
1	4008 105 91260	MAINS INLET CONNECTOR
3	4008 105 25000	FUSE 1.6A
2	4008 103 56030	BNC CONNECTOR
2	4008 108 04650	COVER FOR BNC CONNECTOR
2	2408 128 00036	PUSHBUTTON SWITCH 3FTH620
1	2408 128 00033	PUSHBUTTON SWITCH 3FTH9
1	2408 135 00032	KNOB FOR BUTTON (GREY)
2	2408 135 00036	KNOB FOR BUTTON W/LED
3	4008 105 05020	HF RELAY RK1-L2-SV
1	4008 104 95050	RELAY DS 2 E-SV
1	4008 105 05030	RELAY DS1E-SL2-5V
1	4008 105 91310	AUDIO INDICATOR
2	2222 370 11104	CAP MKT 100N +-10% 63V
3	2222 116 55221	ELCO 220U +-20% 16V
1	2222 122 55159	ELCO SOL 15U +-20% 16V
1	9335 593 70682	LED 3MM GREEN TLG124A
1	9335 593 40682	LED 3MM RED TLR124
1	9335 594 00682	LED 3MM YELLOW TLY124
3	9336 247 30113	DIODE BAT81
4	9331 012 20113	DIODE BAW62
3	9331 795 30112	TRANSIST. BC327
1	9331 492 00112	TRANSIST. BC337
1	9336 687 70112	IC 74HC04N
1	9336 687 80112	IC 74HC08N
1	9336 688 00112	IC 74HC11N
1	9336 690 30112	IC 74HC132N
1	9336 705 40112	IC 74HC244N
1	9336 688 20112	IC 74HC27N
1	9336 688 30112	IC 74HC32N
1	9336 698 40112	IC 74HC4538N
1	9336 691 30112	IC 74HC74N
1	9339 744 80682	IC MAX693ACPE