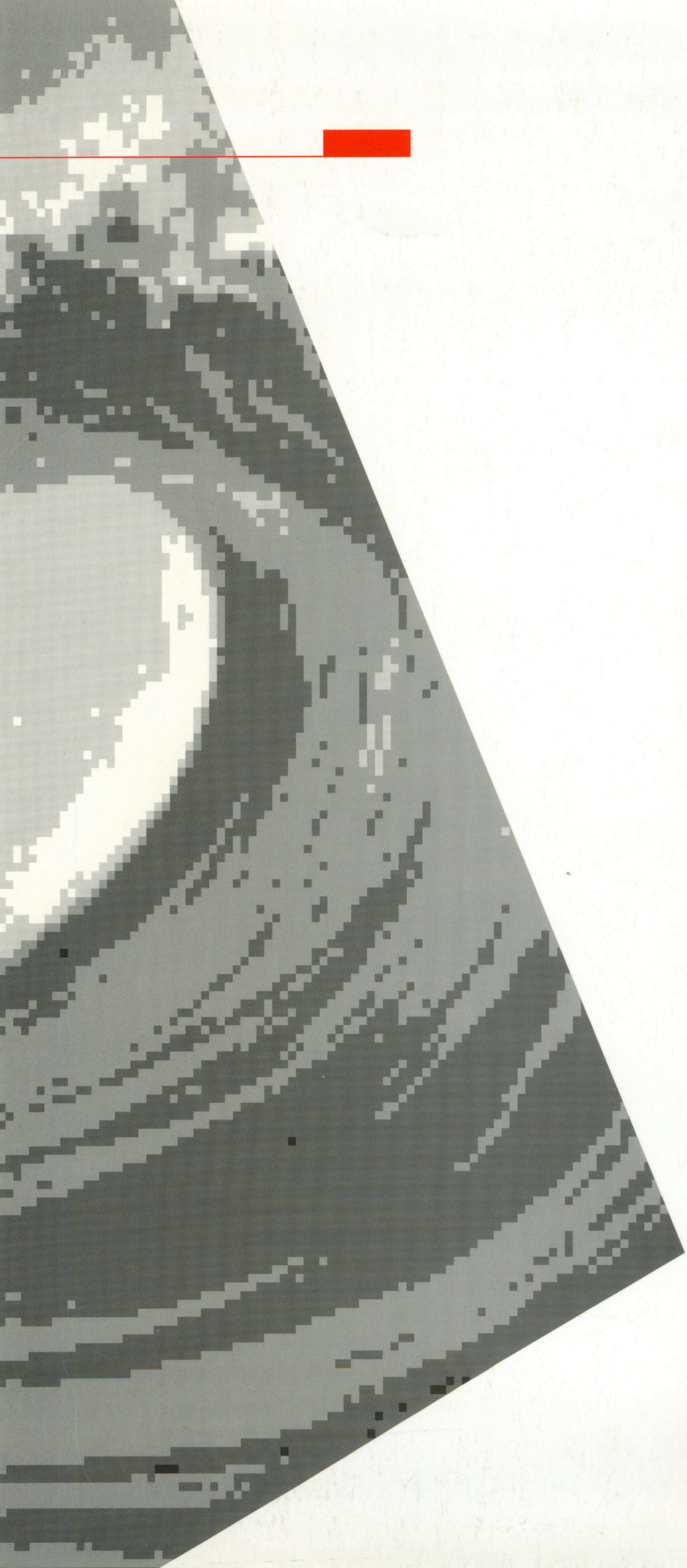

RE 521
FM Stereo Coder
Operator and Service Manual

RE 521
FM Stereo Coder
Operator and Service Manual

SAFETY PRECAUTIONS FOR LINE-POWERED EQUIPMENT

All line-powered equipment can be dangerous. Therefore, certain basic rules and precautions must be observed to ensure the best possible safety for users, service personnel, as well as third parties. At RE TECHNOLOGY AS we have taken great care during the design and production of our equipment. However, safety may be impaired by incorrect installation, handling, or intervention.

WARNING

Ensure that the line cable, connectors, and power outlet all have the correct configuration, to establish a protective earth. Disconnecting the protective earth conductor, inside or outside the equipment, may potentially be hazardous to the operator. Removing the covers may expose parts carrying potentially dangerous voltages.

INSTALLATION

This is a Safety Class I unit which requires protective earthing via the IEC power inlet. Before switching on, the unit must be connected via the third wire in the power cable to a protective earth contact in the line socket. The protective action must not be negated by using an extension cord (power cable) without a protective conductor (protective earth). Grounding one conductor of a two-conductor outlet is not sufficient protection. Ensure that the line fuse has the correct value according to the voltage and power consumption. If the unit requires separate signal grounding, through external connections to the unit chassis, do not disconnect the protective earth.

SERVICE

Only trained service personnel should attempt to dismantle and repair the unit. Take great care during the installation and service of the unit, especially when adjusting or measuring an open unit under voltage. Before removing any covers, switch off the unit and remove the line cable from the power outlet.
Capacitors inside the unit may hold dangerous charges for a considerable time after the unit has been switched off. If it is necessary to replace components in the line connected partition or area, use only new parts of the correct and approved type. Take special care to maintain or re-establish the protective earthing. The conductivity must be measured after the service or repair is finished. Do not remove any warning labels. Replace any damaged or illegible labels with new labels.

BACK-UP BATTERIES

For units with lithium back-up batteries, ensure, when replacing them, that they are of the same type and are correctly installed before you switch the power on to the unit. Do not recharge the batteries or expose them to temperatures above 100 °C (212 °F). Dispose of used batteries responsibly, according to your national/local guidelines. The batteries contain chemicals which are harmful to the environment. When you dispose of the unit itself, first remove the batteries and dispose of them separately.

SAFETY SYMBOLS

Warning. The unit will be marked with this symbol when it is necessary for the user to refer to the manual.

Ground terminal (sometimes used in the manual to indicate circuit common connected to the chassis).

Attention. Observe precautions for handling Electrostatic Sensitive Devices.

Danger. Live voltage exceeding 1000 V.

Warning label for laser radiation. The product is marked with this symbol if it is necessary to protect against laser radiation which is invisible and can cause permanent damage to the eye.

Use of Product Names. The product names mentioned herein are used for identification purposes only, and may be trademarks and/or registered trademarks of their respective companies.

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1. INTRODUCTION

1.1 Introduction

The purpose of this operating & servicing manual for the RE 521 FM Stereo Coder is to provide the information necessary to:

* understand the principles of operation for the RE 521,
* be able to install and operate the RE 521,
* carry out preventive maintenance and regular adjustments,
* perform troubleshooting to board level.

In order to fulfil these objectives, the manual presents detailed descriptions of electrical and mechanical features of the RE 521 together with detailed instructions on how to install and operate the RE 521.

This manual comprises the following sections:

Section 1 Introduction.

A general introduction to the manual and the RE 521.

Section 2 Installation.

Detailed instructions on how to install the RE 521 in the customers system.

Section 3 Front and Rear Panels.

Description of the various plugs, switches and meters located on the front and rear panels.

Section 4 Manual Operation.

A description of the principles of operation, emphasizing information which is relevant for setting up and operating the RE 521.

Section 5 Programming.

Detailed command descriptions for the control of RE 521 via an RS232 interface.

Section 6 Dismantling.

General instruction on how to get access to the individual printed circuit boards of the RE 521.

Section 7 Adjustment and Maintenance.

Description on how to perform adjustments and maintenance of the RE 521.

Section 8+9 Technical Description of Print/Modules.

Each printed circuit board is described in details regarding principle of operation. This is followed by schematic diagrams, component locations and parts lists for the board in question.

Section 10 Equipment and Accessories.

A list of the accessories supplied with the instrument, available options (if any) and optional equipment and accessories.

Section 11 Specifications.

A list of specifications that all RE 521s are able to meet or exceed.

Section 12 Index.

Section 13 Miscellaneous.

This section contains response sheets, blank problem reports and eventual release information together with a data sheet of the RE 521.

1.2 RE 521

The RE 521 is a compact FM stereo coder, providing a time multiplexed, composite signal conforming to the EBU and FCC standards for stereo broadcasting.

Due to RE 521's 1 U high cabinet and low power consumption it is ideally suited to be mounted in tight spaces.

The RE 521 is provided with two sets of L and R audio inputs. Furthermore, this RE 521 has got three AUX inputs for RDS/VRF or SCA signals that must be added to the normal stereo signal. For synchronization and monitoring purposes a Pilot and Composite output is supplied.

SECTION 1 INTRODUCTION

The RE 521 has been designed to conform 100% with the German Pflichtenheft 5/1.0 and 5/3.2, however, a number of features have been added to increase the usefulness of the coder.

Controlling the settings of the RE 521 may take place from three sources:

The front panel
the Remote Control Interface or
an RS232C Interface.

All settings are stored in EEPROM in order for the coder to be able to start up correctly following a power fail.

The RE 521 has excellent specifications, which makes it well suited for broadcasting of high quality stereo:

L/R separation	> 65 dB (80 Hz to 5 kHz)
Distortion	< -70 dB (-80 dB MONO)
Residuals	< -64 dB (Rel. to +6 dBm)

During installation the following parameters may be modified:

Use of input filters or bypass of the filters.
Input impedances (600 Ω or 47 kΩ)
Preemphasis (25, 50 or 75 μsec)
Mono mode (L only, R only or (L+R)/2)
Status Lock in Local Mode (Enable/Disable)

The RE 521 is equipped with a cable equalization network for balancing out the drop in stereo separation at high frequencies introduced if the coder is connected to the exciter via long cables.

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2. INSTALLATION

This section contains general instructions on the installation of the RE 521 FM Stereo Coder. This section must be read in order to ensure correct installation and function of the RE 521.

2.1 Unpacking

When unpacking the RE 521, the instrument, the accessories and the packing material should be inspected for any damage. Please refer to section 9, Equipment and Accessories, for a complete list of items. Should any item be damaged, please notify the carrier and your local RE TECHNOLOGY AS representative or the factory directly.

In case of complaint, the packaging material should be retained for inspection by the carrier.

When you have certified that no damage has occurred, you can start installing the instrument. However, before you apply line power to the instrument you should study in detail the following section, Power Requirements, and section 3, Front and Rear Panels.

2.2 Power Requirements

The RE 521 is supplied ready to operate on either 220 V or 110 V AC supplies. The actual power supply installed can be read on the back of the chassis near the main plug. It will read either "220 V, 0,5 A" or "110 V, 1 A".

The following procedure should be used when applying power for the first time:

1. Check that the power outlet is turned off as the RE 521 has no power switch.

2. Remove the plug in the mains adapter and check that a fuse of correct value has been installed. The fuse must always be of the type "slow blow". Then install the plug again.

3. Connect the power cord supplied with the instrument between the power connector and the AC power receptacle.

4. Turn on the AC power.

CAUTION

According to international safety regulations, the RE 521 is grounded via the third wire in the power cord. In case the RE 521 must be operated from AC outlets without a ground connector, the instrument must be grounded by means of the ground plug situated close to the mains adapter.

2.3 Selecting Input Filter

Broadcasters that already have band limited the audio input signal to 15 kHz can decide to bypass the input filters in the RE 521. This is done by means of the solder links SP3/SP25 and SP6/SP26, the test points TP1/TP3 and the jumpers JP1/JP2. The number after the "slash" being the links for the right channel. The testpoints and the jumpers are connected by means of jumpers while the solder links require a soldering iron. The locations are shown on fig. 2.1.

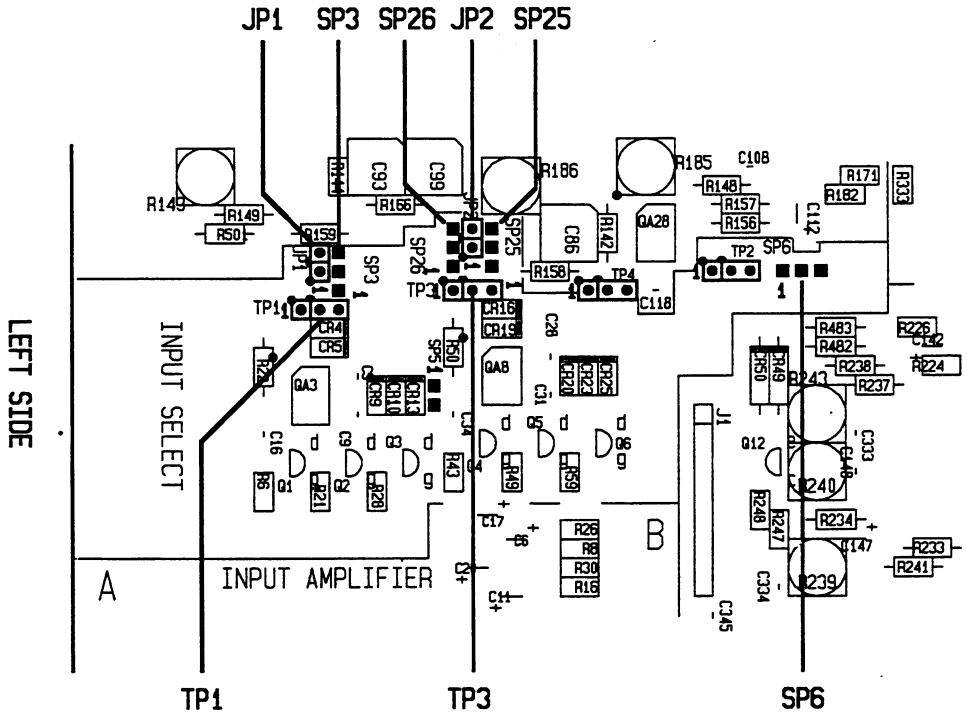

Fig. 2.1 - Selection of Input Filter

The actual solder links and the setting of jumpers for either bypassing or selecting the input filters can be found from table 2.1.

The default setting from the factory is "Input filter selected".

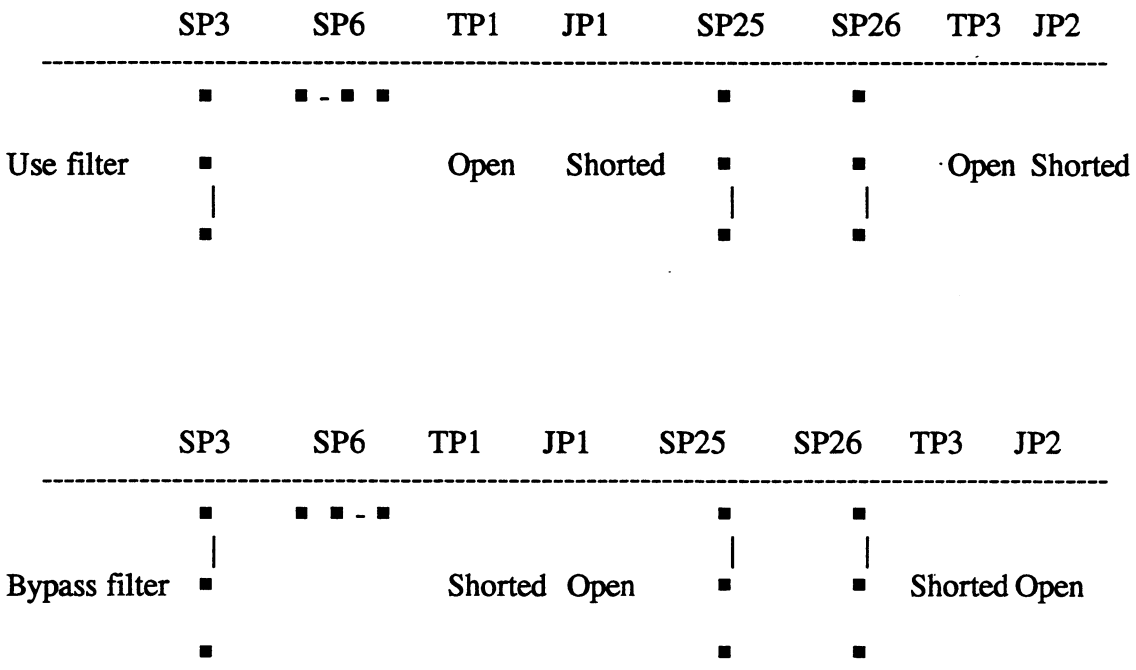

Table 2.1 - Selection of Input Filter

2.4 Selecting the Preemphasis

The RE 521 is able to work with the following preemphasis standards: 25 μs, 50 μs and 75 μs, any of which may be selected by means of solder links SP8 to SP12 internal to RE 521 (see fig. 2.2)

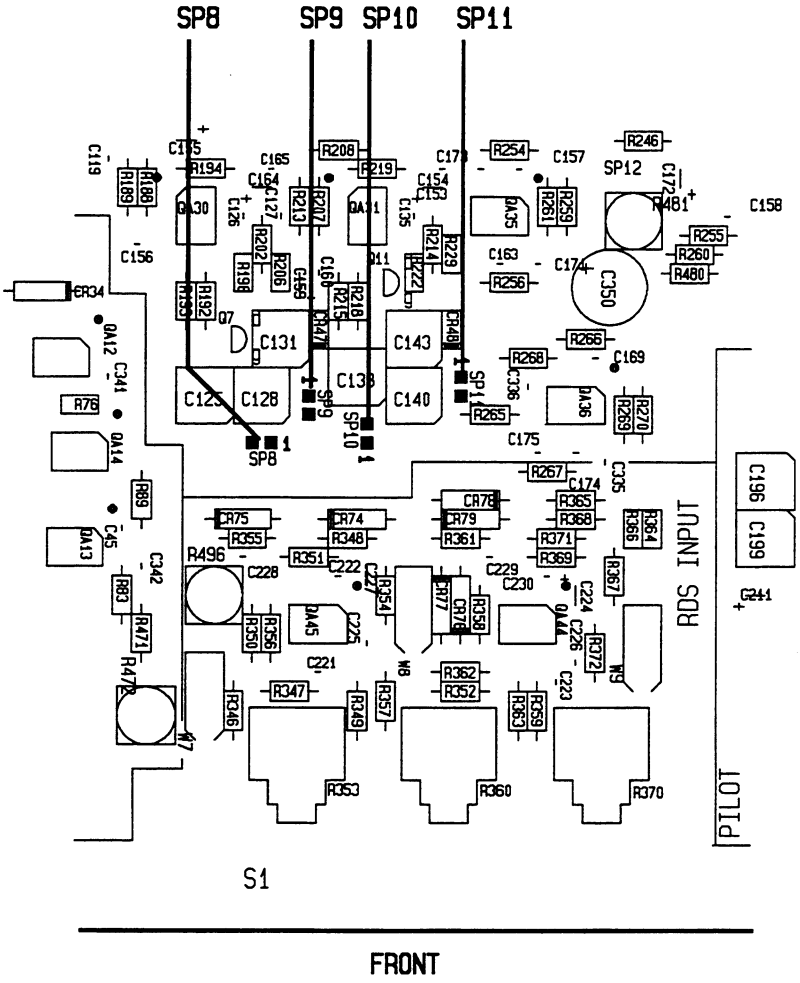

Fig. 2.2 - Selection of Preemphasis

The table on the following page details which solder links to connect in order to select the different preemphasis standards:

Preemphasis Standard	Left	Right
25 μs	SP8, Open SP9, Open	SP10, Open SP11, Open
50 μs	SP8, Short SP9, Open	SP10, Short SP11, Open
75 μs	SP8, Short SP9, Short	SP10, Short SP11, Short

Table 2.2 - Selection of Preemphasis

The default setting from the factory is "50 μs preemphasis selected".

2.5 Selecting the Input Impedance

The RE 521 has been constructed using floating inputs. The inputs may be set to either a low impedance, 600 Ω or a high input impedance, 47 kΩ. The input impedance is set by means of internal solder links, SP1, SP2, SP4 and SP7.

NOTE

In order to get access to solder links SP1, SP2, SP4 and SP7 the attenuator board has to be removed by carefully unscrewing the 3 screws and unplugging the board.

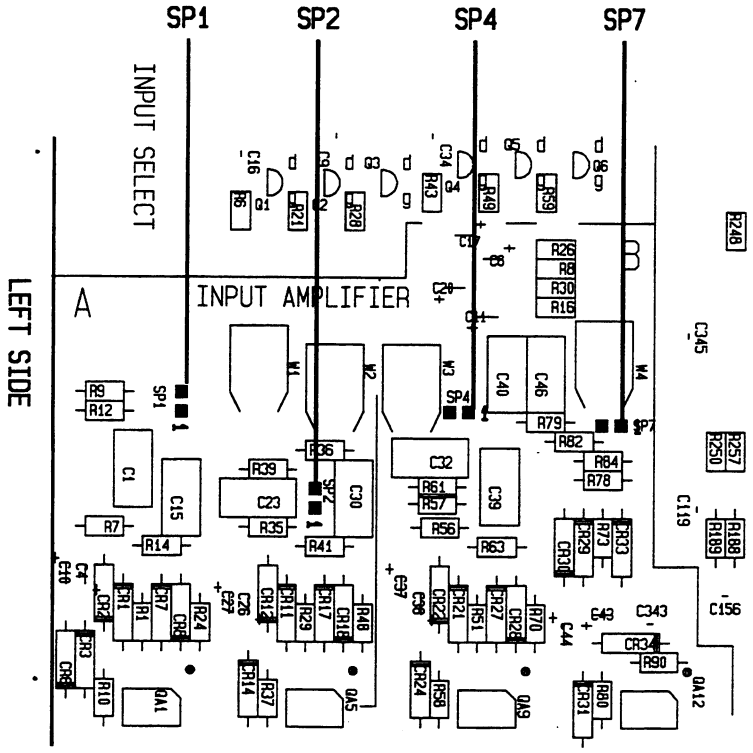

Fig. 2.3 - Selection of Input Impedance

A shorted solder link results in 600 Ω impedance while an open solder link results in 47 kΩ input impedance.

The following table shows the relationship between the solder links and the inputs:

Input channel	Left	Right
Channel A	SP2	SP1
Channel B	SP7	SP4

Table 2.3 - Selection of Input Impedance

The default setting from the factory is "47 kΩ impedance selected".

2.6 Selecting the Mono Source

The RE 521 can output a mono signal instead of the stereo signal when it is switched to mono mode. The mono signal can be generated from three different sources (the mono output plug always outputs (L+R)/2):

Left only
Right only
(L+R)/2

The selection is done by means of solder links SP12 that consists of 4 solder points (see fig. 2.4).

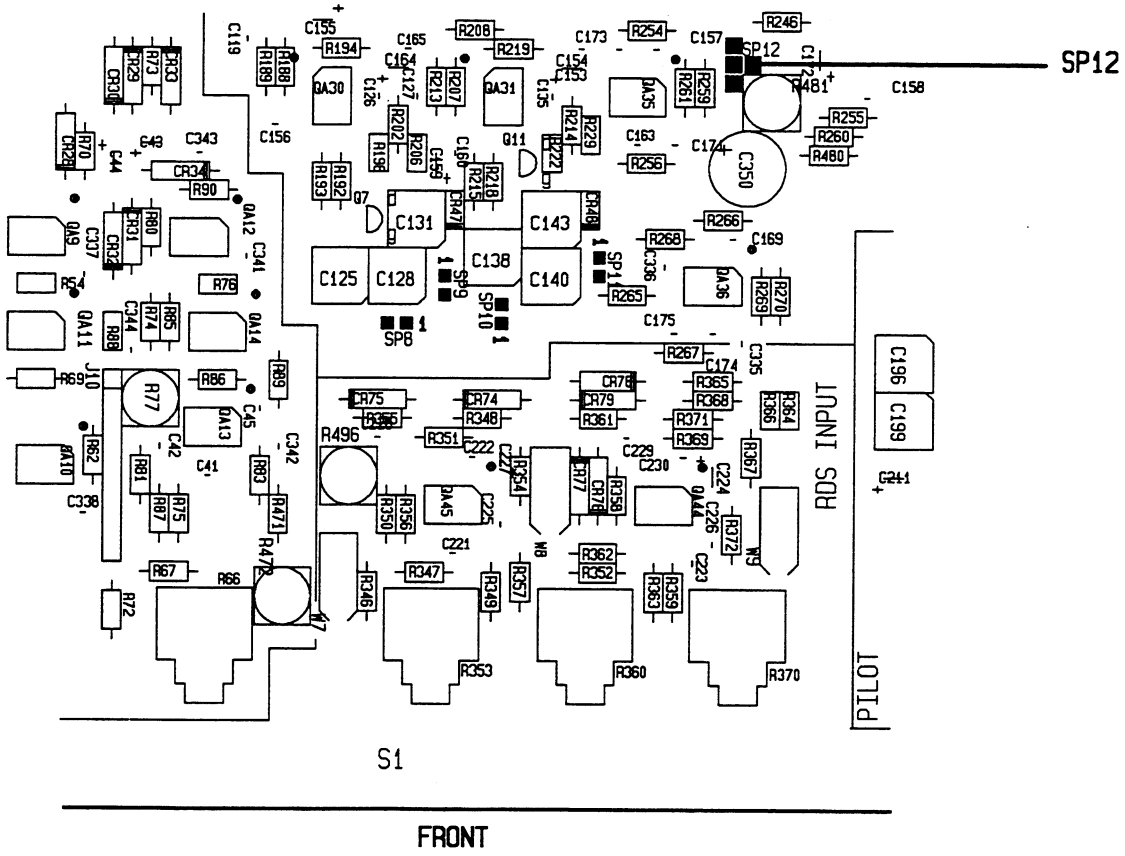

Fig. 2.4 - Selection of Mono Source

The actual relationship between the solder links and the selection is seen from table 2.4:

Left only	Right only	(L+R)/2

Table 2.4 - Selection of Mono Source

The default setting from the factory is "L only selected".

2.7 Controlling Status Outputs when in Local Mode

According to Pflichtenheft 5/1.0, the RE 521 allows the status outputs to be enabled or disabled while the coder is in Local Mode. Whether or not these status outputs are active is selected by means of solder link SP13 (see fig. 2.5)

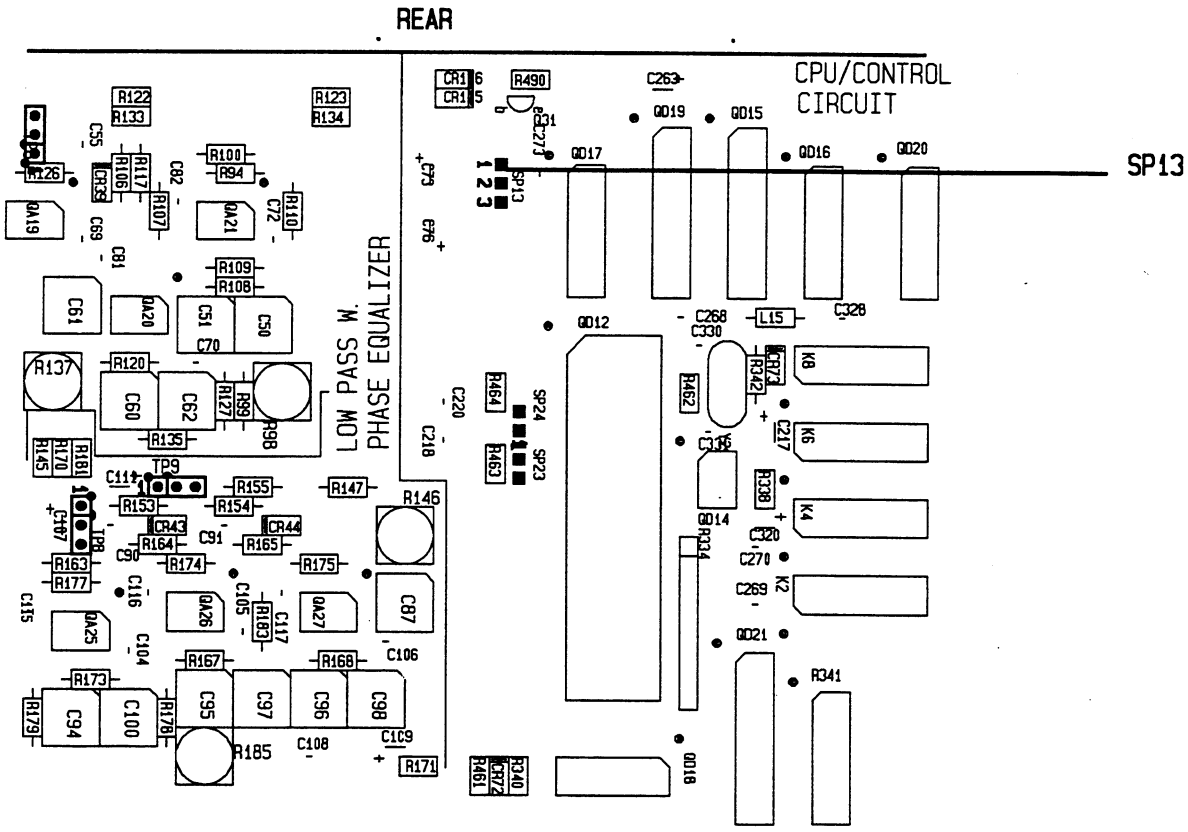

Fig. 2.5 - Controlling Status Outputs when in Local Mode

The actual relationship between the solder links and the control of Status Outputs is seen from table 2.5:

Status Output active	Status Output inactive
■ ■ ■	■ ■ ■

Table 2.5 - Controlling Status Outputs when in Local Mode

The default setting from the factory is "Status Output active selected".

2.8 Adjusting the Cable Equalizer

The RE 521 is equipped with an equalization circuit that is able to compensate for the loss of stereo separation introduced by connecting the stereo coder to the transmitter via long cables.

The equalization is especially designed for the use of RG-59 cable ranging from 0 to app. 50 m. For convenience, the scale is calibrated in %, as different types of cable require different amounts of compensation. 0% compensation is equal to flat frequency response, while setting the compensation to 100% gives app. 0.25 dB amplification of the MPX signal at high frequencies.

The adjustment of the equalizer is carried out by connecting the cable which is going to be used in the final setup, to the RE 521 and measure the channel separation at the other end of the cable. Please note that the two MPX outputs in RE 521 are equalized seperately. Adjust the compensation through the two holes in the top plate until satisfactory separation is reached throughout the audio range.

2.9 General Environmental Precautions

The RE 521 should be installed in a suitable environment for professional equipment. Due to its 1 U high cabinet it can fit into very tight spaces, only requiring a surrounding temperature of less than 45 °C.

3. FRONT AND REAR PANELS

3.1 Front Panel

This section describes from left to right the controls found on the front of the RE 521 (fig. 3.1 shows the RE 521 Front Panel).

All toggle switches are locked in order to prevent accidental activation. To activate a switch pull the toggle during activation - when released, the toggle locks in place again. All switching takes place under computer control; in order to ensure that the settings are retained following a power fail, the computer stores the switch settings in EEPROM; these settings are then read on power up in order to initialize the coder correctly.

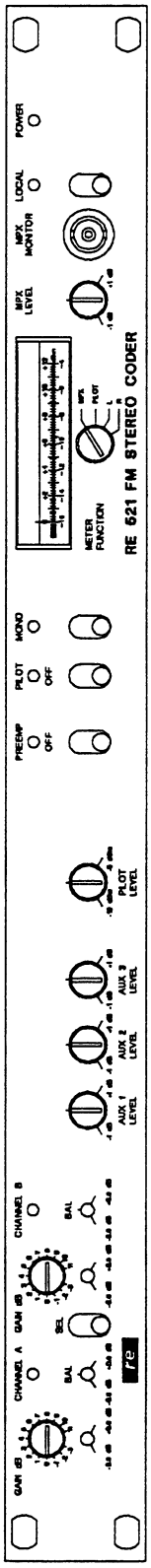

Fig. 3.1 - RE 521 Front Panel

Channel A Gain/Channel B Gain

By means of these rotary switches the input level on the A/B inputs may be adjusted in 1 dB steps from -3 dB to +11 dB. Below the switches you will find holes to be used for fine adjustment of the levels by means of a small screwdriver (±0.5 dB).

Channel A Balance/Channel B Balance

Through these holes up to ±0.5 dB of unbalance between the L and R input can be corrected by means of a small screwdriver.

Channel Select

This toggle switch is used to select between the A and B inputs at the rear panel - the green LED below the text CHANNEL A (CHANNEL B) indicate the current setting.

AUX n LEVEL

By means of these potentiometers the level on the AUX inputs may be adjusted in the range ±1 dB.

PILOT LEVEL

By means of this potentiometer the pilot level may be adjusted between -13 dBm and -6 dBm. The top position gives the standard -9.5 dBm level.

PREEMP OFF

This switch toggles preemphasis on and off. A red LED is used to indicate that preemphasis has been switched off.

PILOT OFF

This switch toggles the Pilot signal on and off. A red LED is used to indicate that the Pilot signal has been switched off.

MONO

This switch is used to switch the RE 521 between Mono and Stereo - a red LED is used to indicate that the RE 521 transmits a mono signal. Switching back to Stereo, the RE 521 will remember the setting of the Pilot on/off switch i.e. reestablishing the correct stereo signal.

METER FUNCTION

The built-in meter may be used to check four signals:

MPX signal following level adjustment (black scale)
Pilot (red scale)
L input following level adjustment (black scale)
R input following level adjustment (black scale)

MPX LEVEL

By means of this potentiometer the level on the MPX outputs may be adjusted ± 1 dB.

MPX MONITOR

The MPX signal may be checked using this BNC output connector.

LOCAL

Switching the RE 521 into LOCAL (red LED on) the coder blocks the control inputs at the rear panel and signals "Coder forced to local". In case solder link SP13 is connected the Status outputs will also be disabled (see section 2.7).

POWER

A green LED indicating that the RE 521 is powered up.

3.2 Rear Panel

The following connectors are found on the back of RE 521. (the RE 521 Rear Panel is shown in fig. 3.2).

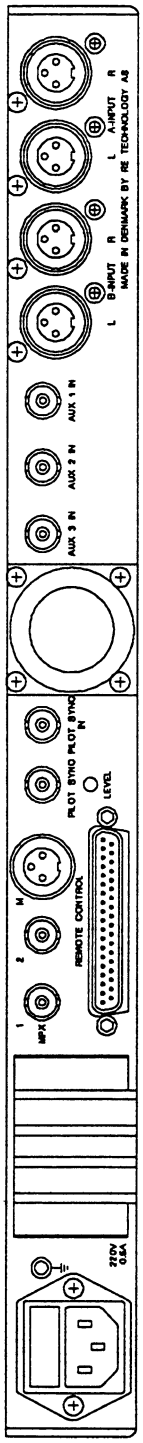

Fig. 3.2 - RE 521 Rear Panel

3.2.1 Inputs

Two L/R audio inputs (A and B)
Three AUX inputs for RDS/SCA/ARI signals
One Pilot Sync input.

L/R Inputs

Connections to the L/R input connectors are shown in fig. 3.3 (seen from rear of instrument)

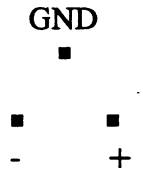

Fig. 3.3 - Connection to L/R Audio Inputs

Nominal input level:	+6 dBm
Input impedance(balanced):	47 kΩ/600 Ω
Connector type:	DIN 41524 female

AUX Inputs

Nominal gain to MPX output:	0 dBm
Input impedance:	10 kΩ
Connector type:	BNC female

Pilot Sync Input

Nominal input level:	1 Vpeak
Input impedance:	10 kΩ
Connector type:	BNC female

3.2.2 Outputs

Two MPX outputs
One Mono output
One Pilot Sync output

MPX Outputs

Output limiting level:	> 15 dBm
Output impedance:	< 1 Ω, unbalanced
Connector type:	BNC female

MONO Output

Output limiting level:	> 15 dBm
Output impedance:	< 25 Ω, balanced, floating
Connector type:	DIN 41524, female

Connections to the Mono output connector are shown in fig. 3.4 (seen from rear of instrument)

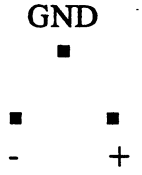

Fig. 3.4 - Connection to Mono Output

PILOT SYNC Output

Output voltage:	0.9 Vpp to 1.8 Vpp, square
Connector type:	BNC female

3.2.3 Input/Outputs

One remote control port

REMOTE CONTROL

The connector marked REMOTE CONTROL is used to control several settings of the RE 521 as required in Pflichtenheft 5/1.0 - also these settings may be controlled via a serial link (RS232); finally this connector carries the Alarm and Status outputs (Relays).

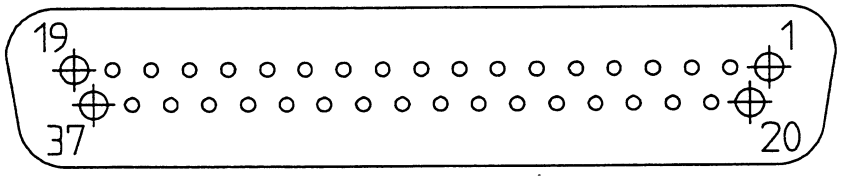

Fig. 3.5 - Remote Control Connector Pin-out (seen from Rear Panel Side)

Table 3.1 on the following page shows the connections to the Remote Control connector:

Remote Controls:	Pin number:
Remote Control Inputs:	
Stereo mode	1
Mono mode	21
Preemp on	3
Preemp off	22
A input selected	4
B input selected	23
Pilot on	5
Pilot off	24
Local Lockout	20
Status Outputs:	
Mono selected	9 + 27
Stereo selected	11 + 29
Preemp on	12 + 30
Preemp off	13 + 31
A input selected	14 + 32
B input selected	15 + 33
Pilot on	16 + 34
Pilot off	17 + 35
Coder forced to local	19 + 37
Alarm Outputs:	
Power fail	18 + 36
RS232 Port:	
RS232 input (RX)	25
Miscellaneous pins:	
Not connected	8 + 26
Future use	2 + 10 + 28
Gnd	6 + 7

Table 3.1 - Remote Control Connections

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4. MANUAL OPERATION

This section contains a description of the different parts of the RE 521 and how they operate and interact. The description is focused on information which is relevant for setting up and operating the RE 521 and to get a good knowledge of how a stereo coder operates.

4.1 General Description

The RE 521 is constructed on three different printed circuit boards, the main board, the input attenuator board and the cable equalizer board. The main board by far contains the majority of the electronic circuits. The boards will be discussed in details in section 8, here we do a general description of the principles of operation considering the complete RE 521.

The RE 521 building blocks are shown in the block diagram in fig. 4.1.

The RE 521 is a high performance stereo coder employing several innovative circuits in order to achieve the high specifications. It is controlled by a built-in microcomputer which handles all internal switching based on the inputs from the front panel switches, the remote controls or the serial input. In order to recover gracefully from power glitches all settings are stored in non volatile memory at the time of power fail.

The analogue inputs are configured as two identical dual channel inputs. A separate input circuit has been dedicated to each of the four inputs, providing a balanced input protected against over voltages.

The input levels are set by switching in various highly accurate resistors mounted on a separate board. This ensures that the channel balance does not change at different gain settings.

After the levels and the balance have been fixed, the signals are passed through a 15 kHz low-pass filter, realized as a 9th order elliptical filter and then through a third order allpass filter with phase equalization ensuring linear phase response to the end of the audio band. If the source signals are band limited already, this filter can be bypassed.

The L and R signals are tapped here and added to generate the mono signal to the mono output. This connector will always carry a (L+R)/2-signal.

From the LP filter the signals go through the preemphasis circuit, where the time constants can be selected by means of solder links. Preemphasis can be deselected from the front panel.

Before the signals enter the stereo modulator a small amount of crosstalk is added, just enough to cancel the inevitable crosstalk introduced in the board.

The modulator is a standard 38 kHz modulator controlled from a 38 kHz square wave signal from the VCXO. This will introduce uneven harmonics of the MPX signal at decreasing levels and the third harmonic is balanced out by means of a 114 kHz modulator whose signal is inverted and added to the MPX-signal.

The MPX signal is fed to a summing point where pilot, SCA/RDS signals and Mono signals can be added or selected, and the combined signal is then passed through a 130 kHz composite filter that removes higher harmonics. Finally the MPX output levels are set and the signal goes through the cable equalizer before it reaches the output connectors MPX1 and MPX2. These two outputs are equipped with high drive capability buffers where the MPX Monitor output has a standard drive capability.

The cable equalizer network is able to compensate limitations in the separation introduced by feeding the exciter through long cables.

The 19 kHz pilot signal is generated by the 4.56 MHz VCXO, and by adding the inverse 3th and 5th harmonic of the pilot we ensure a relatively clean signal. The 7th harmonic is removed by a 133 kHz notch filter and the higher harmonics are removed by the composite filter in the output.

The three AUX signals are passed through individual buffers with level control, then added and passed through an optional 100 kHz low-pass filter to the summing point.

All timing signals are generated in the 4.56 MHz VCXO. It generates a 38 kHz normal and inverted signal to the modulator and a 114 kHz normal and inverted signal to the other modulator. Also the pilot frequency and its higher harmonic frequencies are generated in the oscillator. The oscillator can be synchronized to an external source through input marked PILOT SYNC IN. Likewise a sync signal is output from the RE 521.

Finally a built-in meter can be used to monitor the MPX-signal, the pilot signal, or the L and R signal.

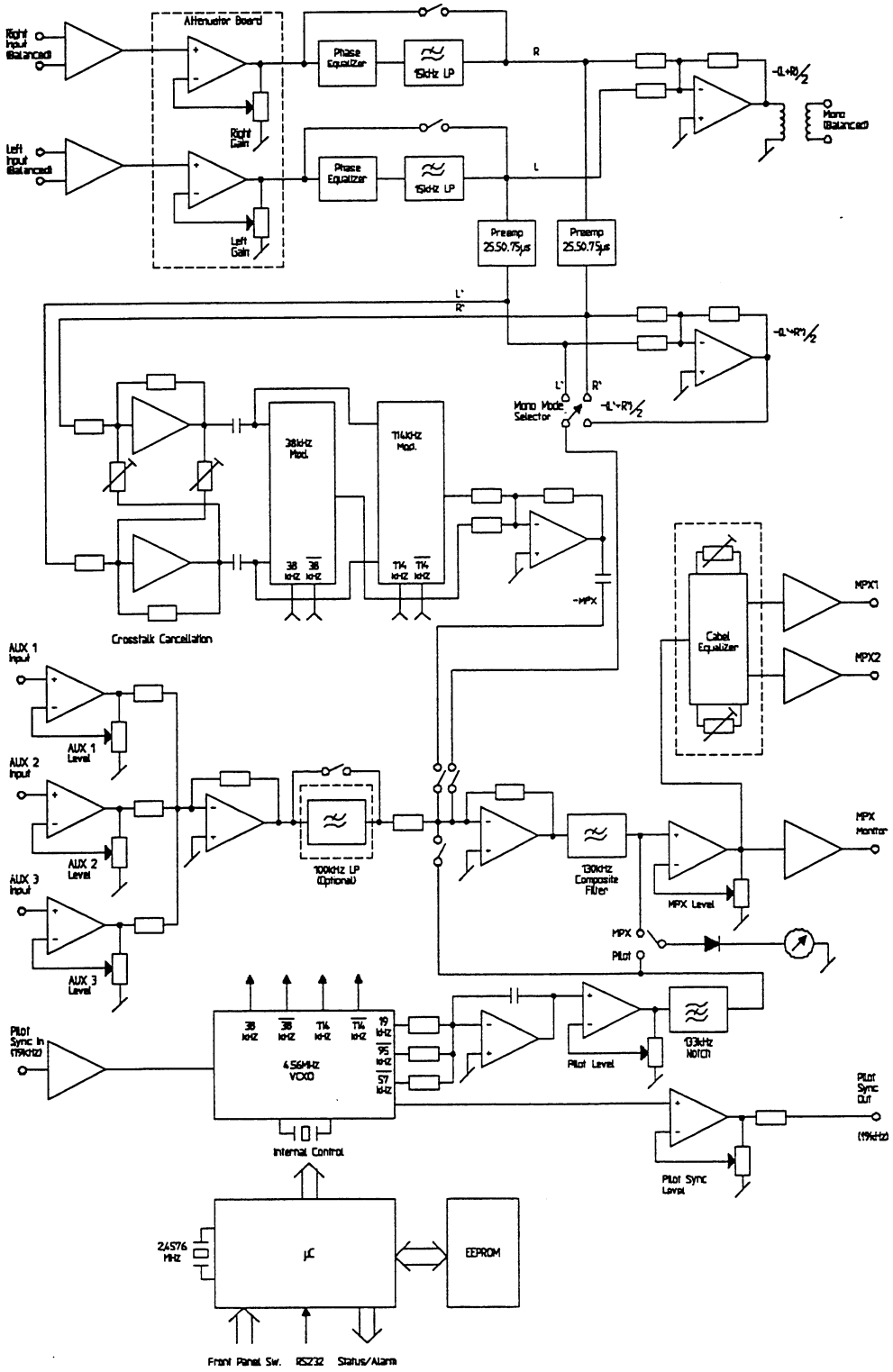

Fig. 4.1 - Block Diagram of RE 521

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5. PROGRAMMING

This section contains information on how to control the RE 521 from the serial RS232 interface in the Remote Control connector.

NOTE

The serial interface is always set up to receive commands in the following format:

1200 baud
8 data bits
no parity
1 stop bit

The interface is ONLY A ONE WAY communication link, in order to check the result of the commands one must monitor the status outputs or watch the front panel indicators.

5.1 Commands

Four functions may be controlled by means of the serial interface:

Preemphasis on/off
Pilot on/off
Select input A/B
Select Mono/Stereo.

Modified Backus-Naur notation has been used in the description of the syntax of the commands:

Symbol	Meaning
=	is Defined to be
|	OR
.	End of Definition
(x | yz)	Grouping: Any one of x, yz
"xy"	The terminal symbol xy

The syntax of the commands are the following:

Command-string	=	Command ("CR" | "CR LF").
Command	=	Mnemonic Parameter-separator Parameter.
Mnemonic	=	"First_Letter" "Last_Letter".
Parameter-separator	=	",".
Parameter	=	Alphabetical-parameter | Numerical-parameter.
First_Letter	=	"Letter".
Last_Letter	=	"Letter".
Alphabetical parameter	=	"Letter".
Numerical-parameter	=	"Digit".
Letter	=	"A" | "B" | "C" | "E" | "F" | "I" | "M" | "P" | "S" | "T".
Digit	=	"0" | "1".

All commands begin with a mnemonic, i.e. a two-letter abbreviation of the command name. Following the mnemonic, the parameter is given separated by a comma. The command is terminated by a [CR] or a [CR, LF]; in the latter case the LF is ignored.

5.1.1 Control Commands

The control commands are used to activate or deactivate some of the built-in features.

The commands are: Preemphasis control (PE)

Pilot control (PT)

Preemphasis control (PE)

"PE" Parameter-separator "Digit"

Parameter: Preemphasis control

Range: "0" Preemphasis off
"1" Preemphasis on

Example: PE,1

Explanation: Enable the preemphasis in the RE 521

Comments: This command will route the input signal through the preemphasis circuit. The time constant will be the one selected by means of the solder links inside the RE 521.

Pilot signal control (PT)

"PT" Parameter-separator "Digit"

Parameter: Pilot signal control

Range: "0" Pilot signal off
"1" Pilot signal on

Example: PT,0

Explanation: Disable the Pilot signal in the RE 521

Comments: This command will stop the RE 521 in adding the pilot signal to the MPX signal.

5.1.2 Selection Commands

The selection commands are used to select between two different inputs or functions.

The commands are: Input selection (IP)

Function control (FC)

Input Selection (IP)

"IP" Parameter-separator "Letter"

Parameter: Input selection

Range:	"A"	Input A selected
	"B"	Input B selected

Example: IP,B

Explanation: Select audio input B in the RE 521

Comments: This command will pass the audio signals from input B through the RE 521.

Function Selection (FC)

"FC" Parameter-separator "Letter"

Parameter: RE 521 function selection

Range:	"M"	Mono mode selected
	"S"	Stereo mode selected

Example: FC,S

Explanation: Switch the RE 521 to stereo mode

Comments: This command will make the RE 521 output a Stereo MPX signal.

5.2 Errors

A flashing Local indicator indicates that one or more errors have been found in the command string sent to the RE 521 - a new (correct) command, or activation of any switch on the front panel, resets the error indicator.

6. DISMANTLING

This section describes in details how you gain access to the individual printed circuit boards of the RE 521. Reassembling is not described as it is principally the reverse operation.

CAUTION

Before dismantling the RE 521 it is important that the instrument is disconnected from the AC mains supply. We recommend that you unplug the power cord from the power plug.

The RE 521 is mounted in a chassis frame with a top plate and a bottom plate. Fig 6.1 shows the position of the screws that must be unscrewed in order to remove the top plate.

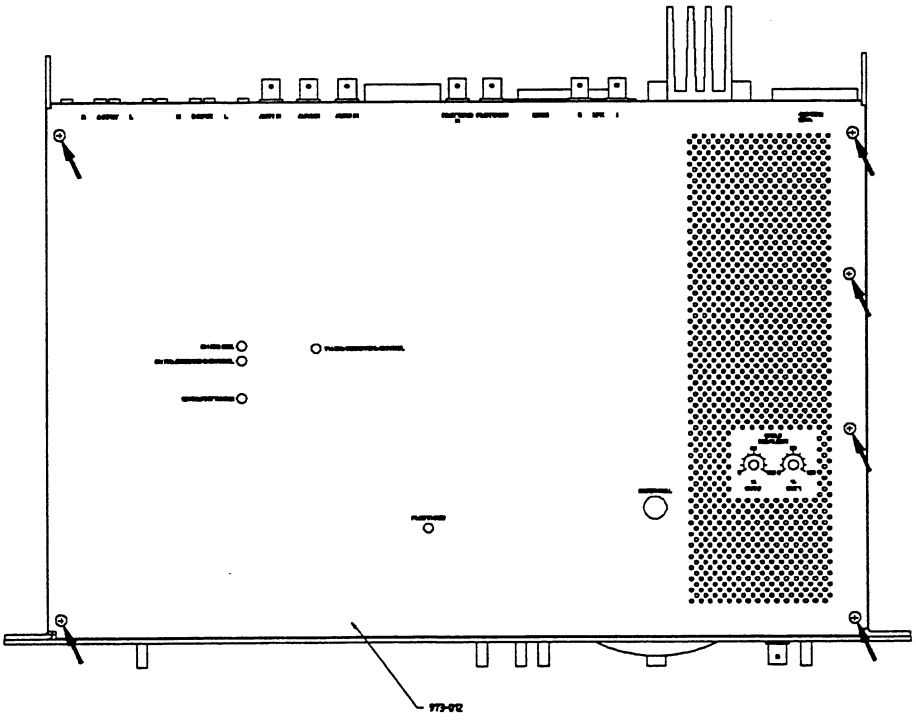

Fig. 6.1 - Position of Screws for Top Plate

From the top it is possible to get access to the main board (902-103), the input attenuator board (902-104) and the cable equalizer board (902-127). Also all adjustment points are accessible from the top.

By removing the bottom plate you get access to the solder side of the main board. Fig. 6.2 shows the position of the screws that must be removed in order to get access.

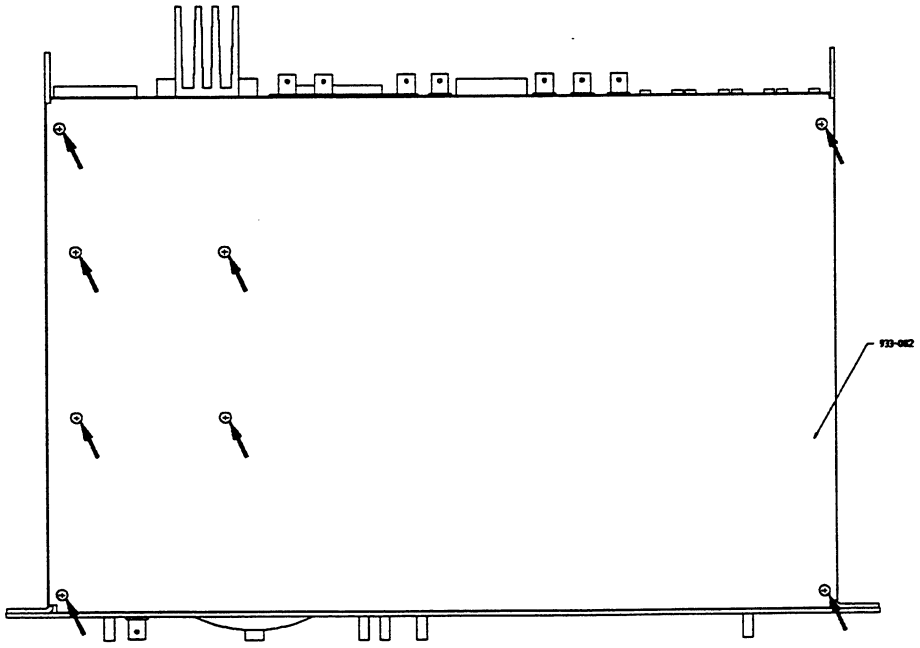

Fig. 6.2 - Position of Screws for Bottom Plate

6.1 Removal of Cable Equalizer Board

The position of the cable equalizer board is shown in fig. 6.3.

You start by removing the screw from the angular holder (933-062). It is then possible to pull the board upwards and free of the RE 521.

When you mount the board again remember to turn the solder side towards the mains transformer.

6.2 Removal of Input Attenuator Board

The position of the input attenuator board is shown in fig. 6.3.

First you have to unscrew the 3 main screws holding the board in place. Then you remove the plastic holder (038-726). Next step is to loosen the buttons (852-650) from the switches by means of a 1.5 mm Allen key. If it is difficult to get the board out, you can loosen the front plate (978-319) a bit.

6.3 Removal of Main Board

We do NOT recommend that you remove the main board from the chassis. All components and solder points are accessible from the top or the bottom so removal should be referred back to the factory.

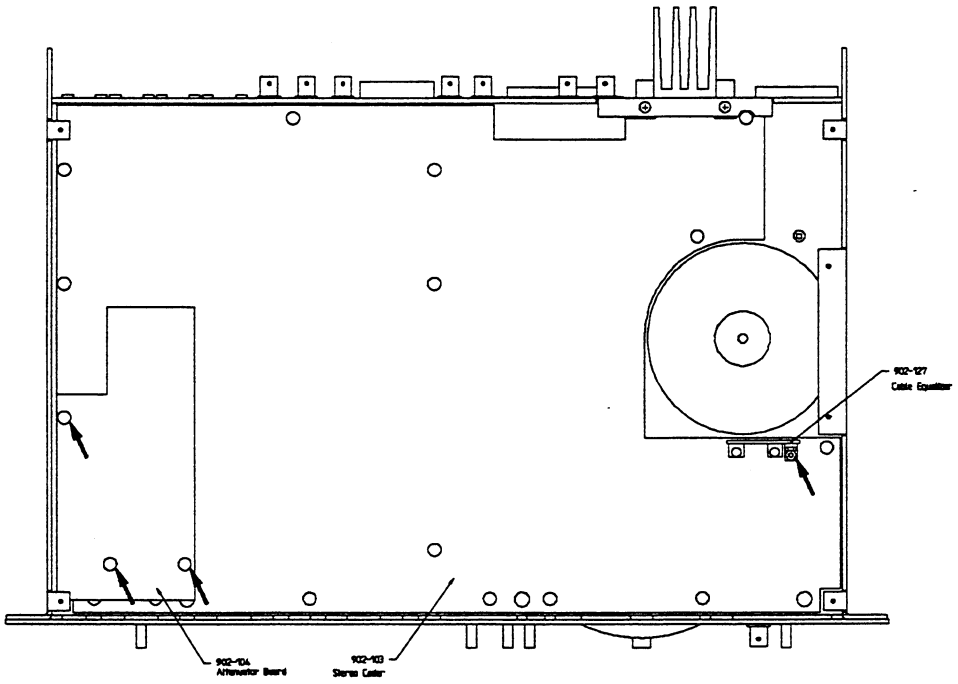

Fig. 6.3 - Location of the Cable Equal. Board and the Attenuator Board

7. ADJUSTMENT AND MAINTENANCE

This section describes in details how to adjust and maintain the RE 521. Not all adjustments are recommended to the service people in the field.

Before adjustments are initiated the RE 521 must be allowed a warm-up period of at least one hour.

As general test equipment, an oscilloscope, an AF-generator, a precision multimeter and a spectrumanalyzer are needed.

7.1 Test of Power Supply

Before the AC main power is applied please do the following:

Check that all controls on the front panel are in position 0.

Adjust the meter null.

Apply main voltage to the RE 521. The current consumption at 220 V should be app. 165 mA.

Check the following voltages on the main board (Test point TP13 and TP16):

Pin-number	Designation	Measured value
TP13,1	+15 Vout	+15 V ±500 mV
TP13,2	NC	No connection
TP13,3	GND	Ground
TP13,4	-15 Vout	-15 V ±500 mV
Pin-number	Designation	Measured value
TP16,1	+5 V	+5 V ±200 mV
TP16,2	NC	Ground
TP16,3	GND	Ground
TP16,4	NC	No connection
TP16,5	+15 V	+15 V ±500 mV
TP16,6	-15 V	-15 V ±500 mV

Table 7.1 - Voltages on TP13 and TP16

7.2 Frequency Check

Adjust the VCXO frequency to 4.56000 MHz ± 5 Hz on TP17,2 by means of R291. TP17,1 and TP17,3 are grounded.

Check that the frequency on the pilot sync out is 19.000 Hz and check that pilot level can be varied from 1 Vpp to 1.8 Vpp by means of R293.

7.3 Offset Check

RE 521 is set to the following setting on the front panel:

PREEMP: off
PILOT: off
MONO: off

Keep this setting unless otherwise recommended.

Short-circuit L and R on the A and B inputs and apply a 1000 Hz 0 dBm signal.

Check that all potentiometers on the front panel are in position 0.

a) Check that the DC voltage on TP18 can be adjusted to <1 mV by means of R426.
b) Check that the DC level on MPX monitor out can be adjusted to <1 mV by means of R437.
c) Check that the DC level on MPX out 1 can be adjusted to <1 mV by means of R408.
d) Check that the DC level on MPX out 2 can be adjusted to <1 mV by means of R424.

7.4 CMRR Check

RE 521 must have the same front panel settings as under point 7.3 with the same shorted inputs and the same 1000 Hz 0 dBm signal applied between the shorted inputs and ground.

The rotary switches on the attenuator board must also be at 0 dB.

Select channel A. Adjust to minimum signal on TP1 (< -60 dBm) by means of R5.

Select channel B. Adjust to minimum signal on TP1 (< -60 dBm) by means of R55.

Adjust to minimum signal on TP3 (< -60 dBm) by means of R77.

Select channel A. Adjust to minimum signal on TP3 (< -60 dBm) by means of R34.

7.5 Adjustment of 15 kHz Low-Pass Filter

RE 521 must have the same front panel settings as under point 7.3 with Channel A selected.

The rotary switches on the attenuator board must also be at 0 dB.

Apply the same 20.491 Hz signal to L and R input on Channel A with a level of 0 dBm.

Adjust to minimum signal on TP2 by means of R138.
Adjust to minimum signal on TP4 by means of R186.

Change the frequency to 19.000 Hz at 0 dBm level.

Adjust to minimum signal on TP2 by means of R137.
Adjust to minimum signal on TP4 by means of R185.

7.6 Adjustment of LP Filter Gain

7.6.1 Adjustment of Right Channel Gain

Apply a signal of 1000 Hz to the input. Adjust the level until you measure 0 dBm on TP1 (equal to L=R)

Note down the measured value on TP2.

Apply a signal of 13.000 Hz to the input, and adjust the level until you measure 0 dBm on TP1. Adjust the level on TP2 to the earlier noted value by means of R95.

Repeat the last measurement with a signal of 20 Hz. Adjust the level on TP2 to the earlier noted value by means of R98.

7.6.2 Adjustment of Left Channel Gain

Apply a signal of 1000 Hz to the input. Adjust the level until you measure 0 dBm on TP3 (equal to L=R)

Note down the measured value on TP4.

Apply a signal of 13.000 Hz to the input and adjust the level until you measure 0 dBm on TP3. Adjust the level on TP4 to the earlier noted value by means of R143.

Repeat the last measurement with a signal of 20 Hz. Adjust the level on TP4 to the earlier noted value by means of R146.

7.7 Control of 38 kHz Residual

RE 521 must have the same front panel settings as under point 7.3.

The rotary switches on the attenuator board must also be at 0 dB.

Adjust R239 (fine adjustment) and R244 (course adjustment) till minimum 38 kHz spurious (< -58 dBm measured on the MPX output).

7.7.1 Control of 114 kHz Spurious

Adjust L3 to minimum 114 kHz spurious (< -54 dBm) on the MPX output.

7.7.2 Control of 133 kHz Spurious

Adjust L3 to minimum 133 kHz spurious (< -54 dBm) on the MPX output.

7.7.3 Control of 124 kHz Spurious

Apply 10 kHz to L only. Adjust R204 to minimum 124 kHz spurious (< -54 dBm) on the MPX output.

Apply 10 kHz to R only. Adjust R240 to minimum 124 kHz spurious (< -54 dBm) on the MPX output.

7.8 L/R Separation

RE 521 must have the same front panel settings as under point 7.3.

The rotary switches on the attenuator board must also be at 0 dB.

For this measurement an oscilloscope with the capability of 40 dB overdrive without distortion of zero line and a sensitivity of 5 mV/div must be used.

Apply a 1000 Hz signal at 0 dBm to L.

Adjust by means of R209 until maximum channel separation is reached (> 65 dBm), i.e. until the "bottom line" of the signal is horizontal - refer to fig. 7.1

Apply a 1000 Hz signal at 0 dBm to R.

Adjust by means of R212 until maximum channel separation is reached (> 65 dBm), ie. until the "bottom line" of the signal is horizontal - refer to fig. 7.1

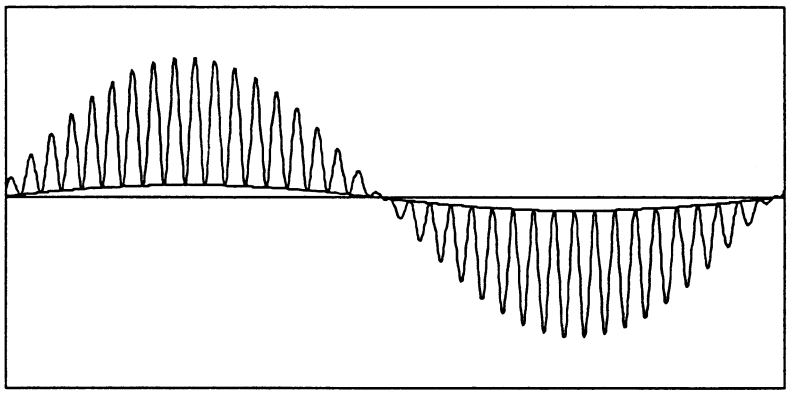

Fig. 7.1 - Adjustment of L/R Separation

7.9 M/S Separation

Apply a 1000 Hz signal at 0 dBm to L and R.

Adjust the sideband at 39 kHz to minimum in channel A by means of R470.

Adjust the sideband at 39 kHz to minimum in channel B by means of R472.

Reverse the phase of the signal in R and apply a 3 kHz 0 dBm signal.

Adjust the sideband at 3 kHz to minimum by means of R497.

7.10 Gain adjustment

RE 521 must have the same front panel settings as under point 7.3.

The rotary switches on the attenuator board must also be at 0 dB.

Apply a 1000 Hz signal at 0 dBm to L and R.

Ensure that R470, R472 and R497 is app. in middle position.

Select channel A. Adjust to 0 dBm on TP11 by means of R2 on the attenuator board.

Select channel B. Adjust to 0 dBm on TP11 by means of R30 on the attenuator board.

Adjust to 0 dBm on TP12 by means of R11 on the attenuator board.

Select channel A. Adjust to 0 dBm on TP12 by means of R19 on the attenuator board.

7.11 MPX Level

RE 521 must have the same front panel settings as under point 7.3.

The rotary switches on the attenuator board must also be at 0 dB.

Apply a 1000 Hz signal at 0 dBm to L and R.

Check that MPX1 and MPX2 outputs are at 0 dBm.

Select the following settings on the front panel:

PREEMP:	off
PILOT:	off
MONO:	on

Apply a 1000 Hz signal at 0 dBm to L and R.

Adjust R481 until MPX monitor output is 0 dBm.

7.12 Pilot Level

RE 521 is set to the following settings from the front panel:

PREEMP: off
PILOT: on
MONO: off

Adjust R276 until MPX monitor output is -9.5 dBm (19 kHz).

7.13 Meter Circuit

RE 521 must have the same front panel settings as under point 7.3.

The rotary switches on the attenuator board must also be at 0 dB.

Apply a 1000 Hz signal at 0 dBm to L and R.

Check that MPX monitor output is at 0 dBm level.

Adjust till the meter reads 0 dBm by means of R387.

Increase level to +12 dBm on the MPX monitor output.

Adjust till the meter reads +12 dBm by means of R393.

7.13.1 Pilot Meter Circuit

Select the meter function "Pilot".

Adjust to 9.5 dBm on the meter by means of R499.

7.14 Mono Output

Check that the mono output is 0 dBm $\pm$0.1 dB.

7.15 Remote/Alarm Control

Start by grounding "local Lockout" (pin 20 in the remote plug). This prepares the RE 521 for the remote/alarm control.

Do the following checks:

Mono:	pin 21 grounded	Mono LED on front panel active.
Stereo:	pin 1 grounded	Mono LED on front panel inactive.
Preemp on:	pin 3 grounded	Preemp LED on front panel active.
Preemp off:	pin 22 grounded	Preemp LED on front panel inactive.
Pilot on:	pin 5 grounded	Pilot LED on front panel active.
Pilot off:	pin 24 grounded	Pilot LED on front panel inactive.
A-input:	pin 4 grounded	Input A LED on front panel active.
B-input:	pin 23 grounded	Input B LED on front panel active.

During test of pilot on/off RE 521 must be in Stereo mode.

7.16 Distortion

RE 521 must have the same front panel settings as under point 7.3.

The rotary switches on the attenuator board must also be at 0 dB.

Apply a 1000 Hz signal at 6 dBm to L and R.

Check that THD on MPX monitor output is < -70 dBm.

7.16.1 Mono

RE 521 is set to the following settings from the front panel:

PREEMP:	off
PILOT:	off
MONO:	on

Apply a 1000 Hz signal at 6 dBm to L and R.

Check that THD on MPX monitor output is < -80 dBm.

7.17 Phaselock to Pilot Sync In

Apply 19 kHz external signal to pilot sync input and regulate the frequency ± 2 Hz. Check that the pilot sync output is following the variations in pilot sync in.

7.18 Pilot Phase Adjustment

RE 521 is set to the following settings from the front panel:

PREEMP: off
PILOT: on
MONO: off

Apply 400 Hz, 0.4 Vpp 50% duty cycle to the inputs.

By means of R 324 adjust to minimum difference between the waveform above and below the zero line and symmetrical zero crossings on an oscilloscope. See fig. 7.2

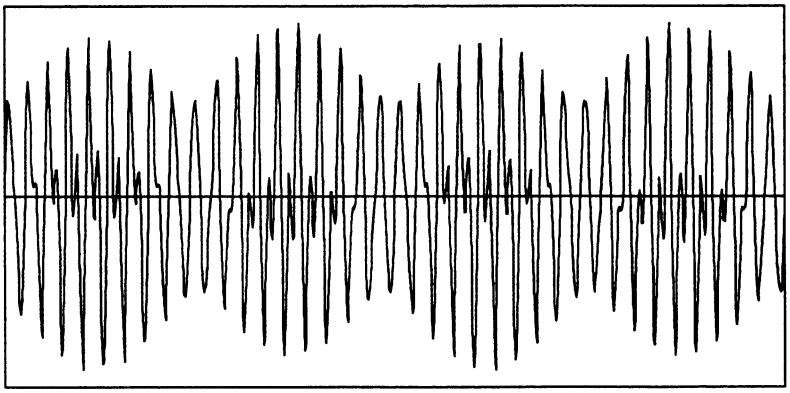

Fig. 7.2 - Pilot Phase Adjustment

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8. TECHNICAL DESCRIPTION OF MAIN BOARD

This section contains a technical description of the various circuits that make up the RE 521 FM Stereo Coder Main Board. Each circuit is described separately followed by a circuit diagram and a component location overview. At the end of this section a complete parts list is included.

8.1 Input Amplifiers

The RE 521 is provided with two audio inputs each containing a Left and Right input plug. The following circuit description only covers one of the four identical circuits, we will describe the Right input amplifier in channel A. The circuits are shown on the diagram in section 8.1.2.

8.1.1 Circuit Description

The balanced input W1 can have either a 600 Ω input impedance or a 47 kΩ input impedance. This is selected by means of solder link SP1. A closed link will put resistor R9 (604 Ω) across the input giving the wanted 600 Ω input impedance.

The network R4, R20, C4, C10, CR3 and CR6 established a ± 9 V supply from the standard ± 15 V supply. Through the diodes CR1, CR2, CR7 and CR8 this supply is used to protect the input amplifier against overvoltages.

A standard instrumentation amplifier is formed by QA1, QA4 and QA2A making the balanced signal into a single ended signal. R5 is used to fine adjust the CMRR and R470 is used to outbalance the small variations between Left and Right channel.

R13 establishes the actual gain of the input amplifier, but in order to ensure a much higher level of accuracy this resistor is removed and the input attenuator board put in instead (please refer to the description of this board, section 9).

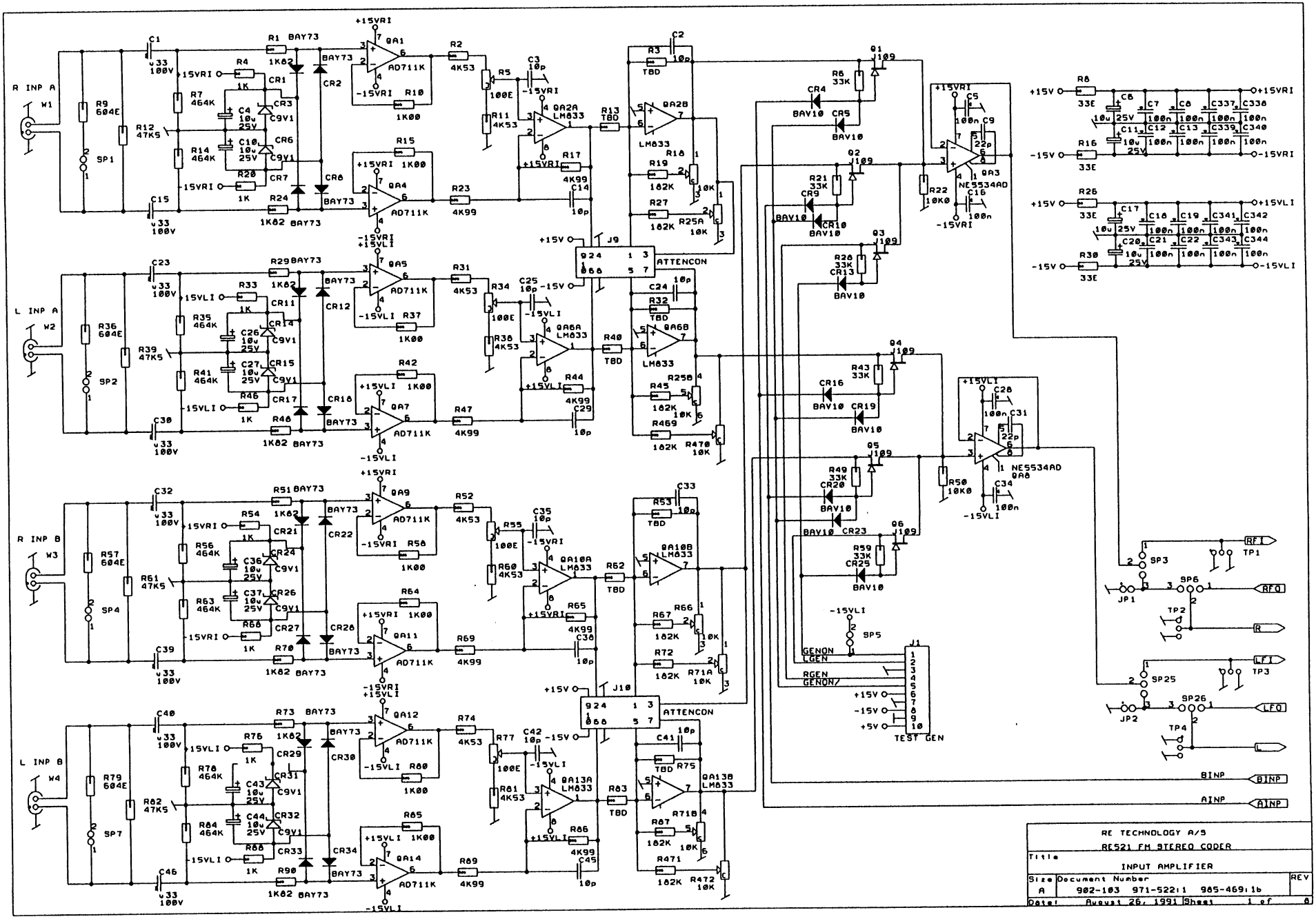
R18 is used from the front plate to adjust the balance between L and R and R25 is likewise used to fine adjust the total level ± 0.5 dB from the front plate.

The FET switches Q1 to Q6 are used by the microcomputer to select either channel A, channel B or a test generator (specific to RE 523).

Finally the signal passes through a buffer made by QA3 to the input filter. The links SP3, SP6, TP1, TP2 and JP1 can be used to bypass this filter (see section 2, Installation).

8.1.2 Schematic Diagrams

The schematic diagram for the input amplifiers is located on the following page. The diagram number is 985-469 Sheet 1.


R INP A
L INP A
R INP B
L INP B
ATTENCON
TEST GEN
NE5534AD
AD711K
LM833
BAV10
BAV73
+15VRI
-15VRI
+15VLI
-15VLI
BINP
AINP
RE TECHNOLOGY A/S
RE521 FM STEREO CODER
INPUT AMPLIFIER
Document Number
902-103 971-5221 985-4691b
August 26, 1991

8.1.3 Component Locations

The component locations on the main board for the input amplifiers are shown on the following page.

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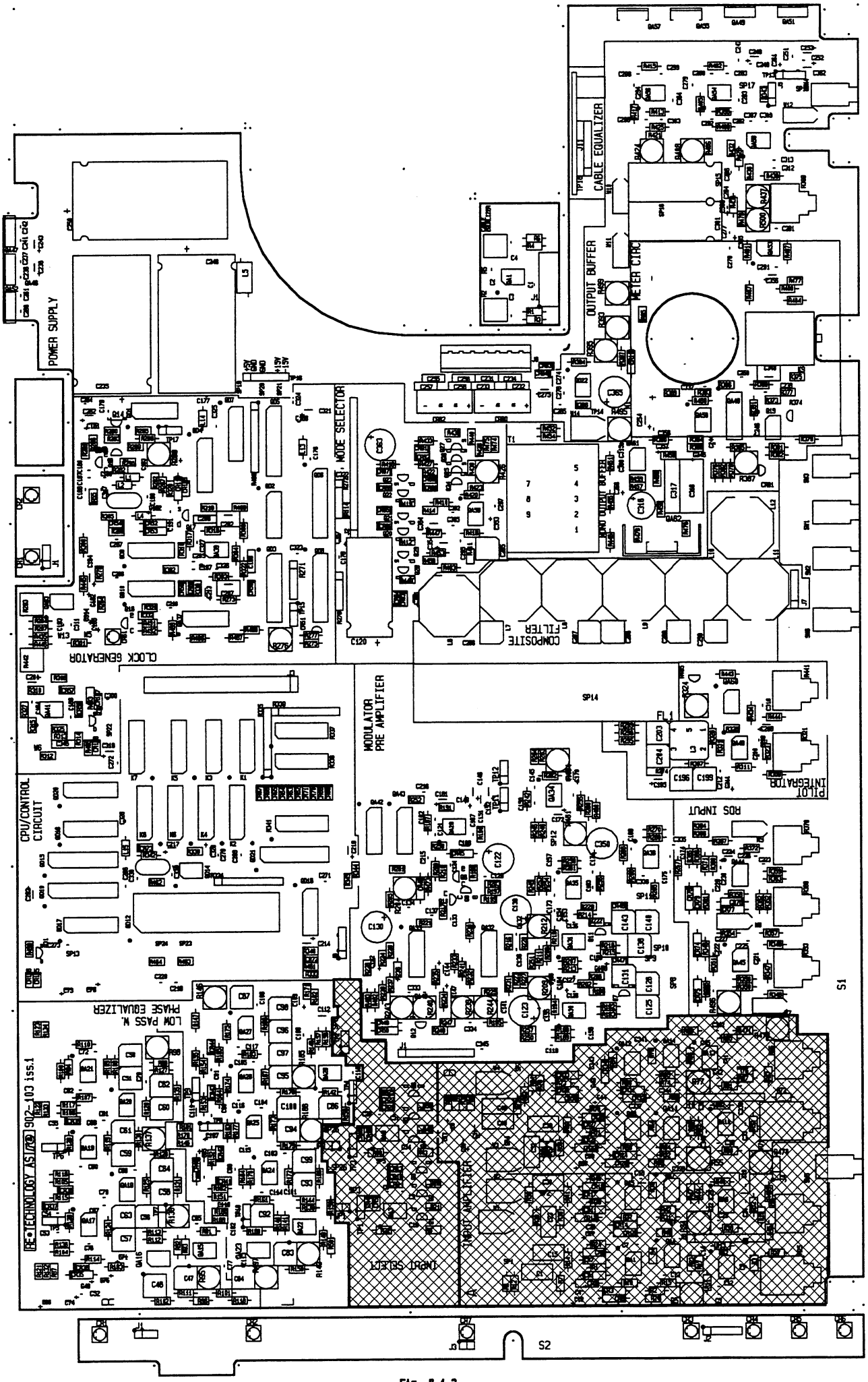
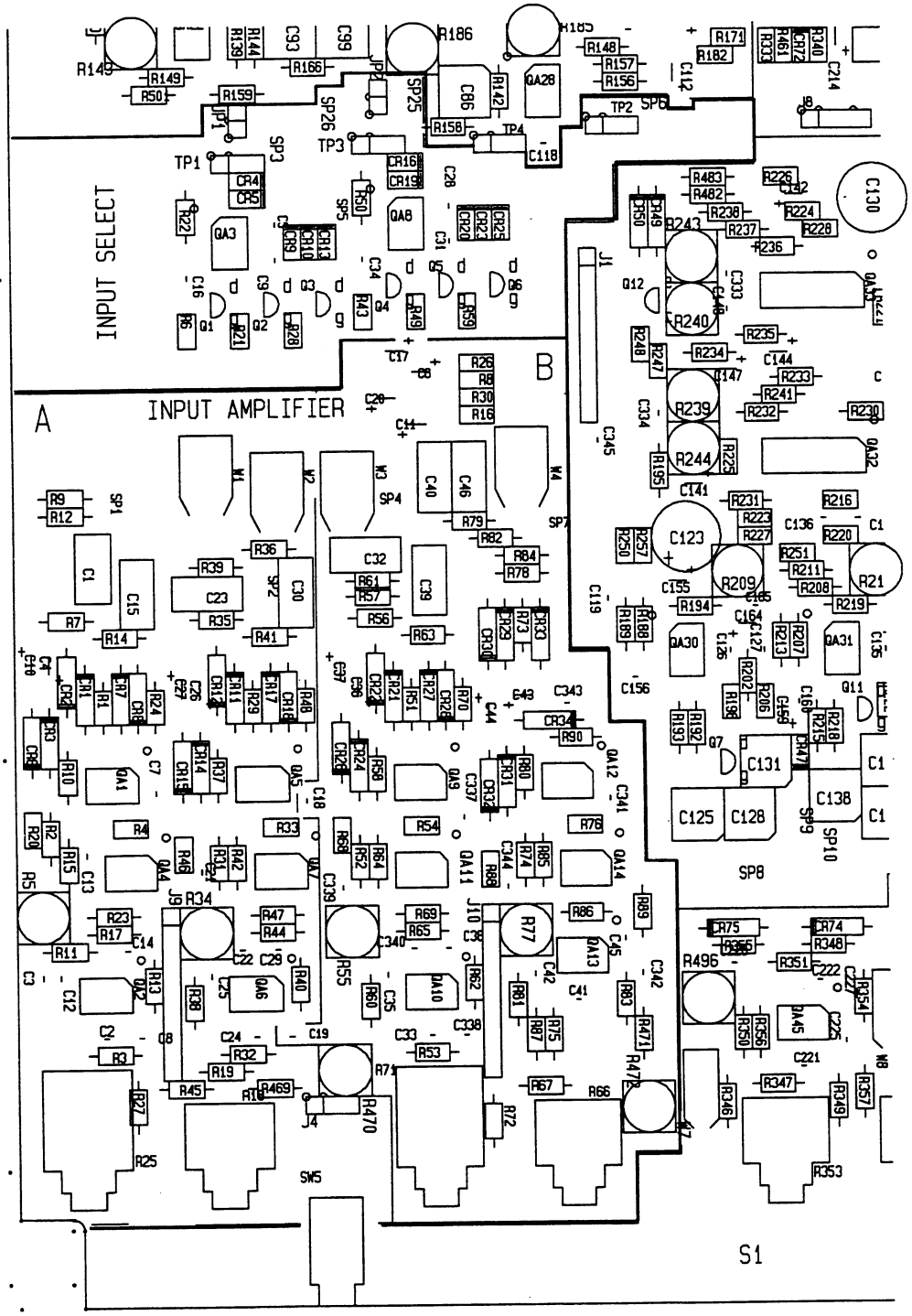

POWER SUPPLY
CABLE EQUALIZER
OUTPUT BUFFER
METER CIRC
MODE SELECTOR
COMPOSITE FILTER
CLOCK GENERATOR
MODULATOR PRE AMPLIFIER
CPU/CONTROL CIRCUIT
PILOT INTEGRATOR
RDS INPUT
LOW PASS & PHASE EQUALIZER
INPUT SELECT
S1
S2

Fig. 8.1.3


INPUT SELECT
A
INPUT AMPLIFIER
B
S1

8.2 15 kHz Low-Pass Filter with Phase Equalization

The purpose of the input filter is to attenuate possible signal components, i.e. any frequencies above 15 kHz. The filter is a 9th order elliptical low-pass filter with a ripple of 0.03 dB which attenuates 60 dB above 19 kHz and 65 dB at 19 kHz. The filter has been implemented using FDNRs (Frequency Dependent Negative Resistances) in order to eliminate problems related to conventional inductors, such as large size, low Q, non-linearity, etc. The diagram shows both left and right channel, but the description will only cover the right channel. The circuits are shown on the diagram in section 8.1.2.

8.2.1 Circuit Description

Before the input filter you will find a 2nd order allpass filter formed by QA16 and QA16. Together with another 1st order allpass filter in the output, formed by QA21 the constitute a 3th order allpass filter used to compensate for the phase variations of the input filter. The left channel has a slight variation of the allpass filter as R497 is used to outbalance small variations in the phase between the two channels.

Gain at low frequencies is adjusted by means of R98 and for the high end by R95. The two zeros nearest to the cut-off frequency (15 kHz) are also corrected by R137 and R138. The gain in the filter should be one in the frequency band 20 Hz to 15 kHz measured between RFI and RFO.

The actual 9th order elliptical low-pass filter is realized with QA17-QA20 as the active elements.

The diodes CR36-CR39 in conjunction with the zener diode CR35 are included to protect against latch-up during power up.

8.2.2 Schematic Diagrams

The schematic diagram for the low-pass filter is located on the following page. The diagram number is 985-469 Sheet 2.

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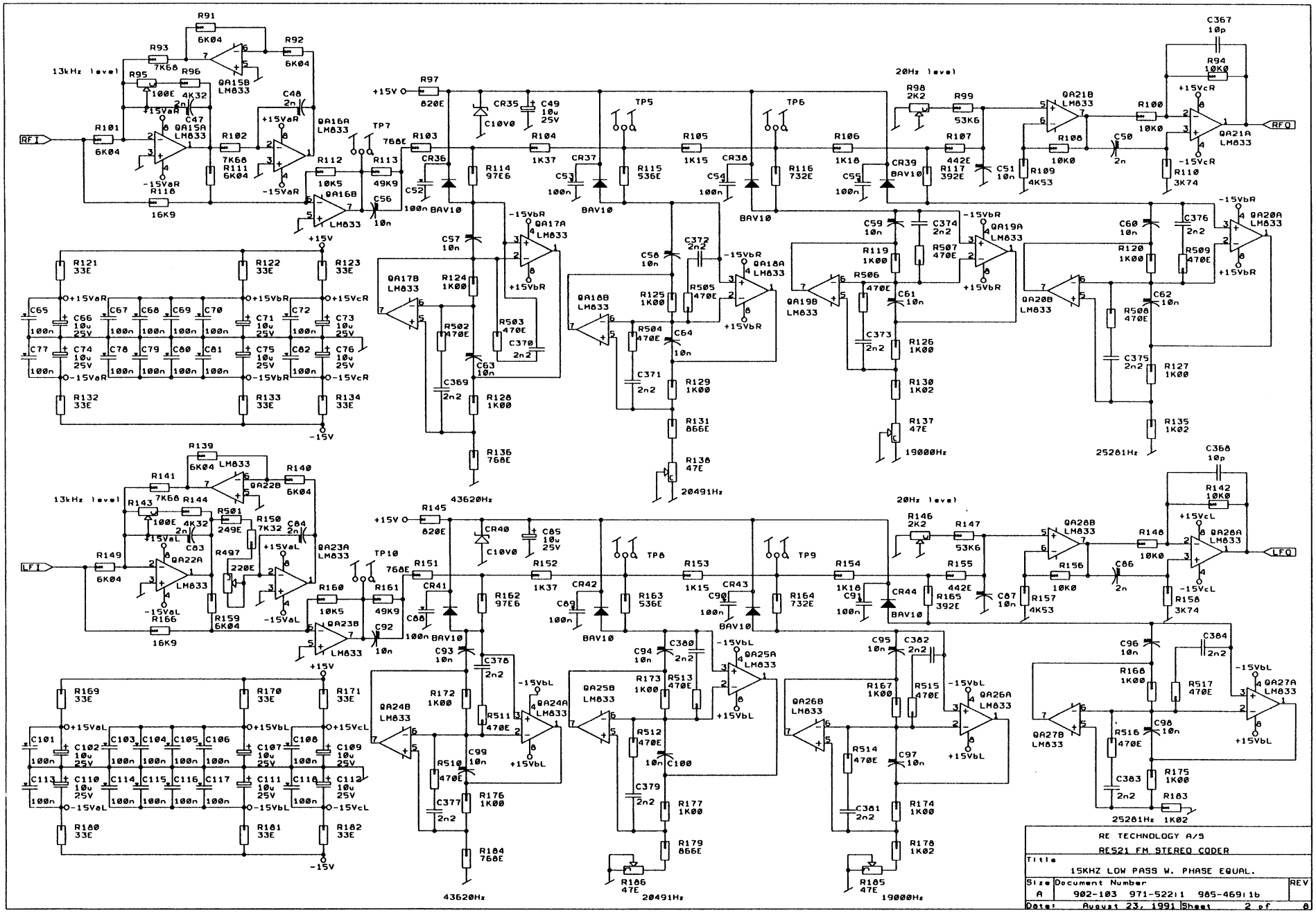
13kHz level
20Hz level
RFI
RFQ
LFI
LFQ
+15V
-15V
43620Hz
20491Hz
19000Hz
25281Hz
1K02
RE TECHNOLOGY A/S
RE521 FM STEREO CODER
15KHZ LOW PASS W. PHASE EQUAL.
Size A
Document Number 902-103 971-52211 985-46911b
REV
Date: August 23, 1991
Sheet 2 of 8

8.2.3 Component Locations

The component locations on the main board for the input amplifiers are shown on the following page.

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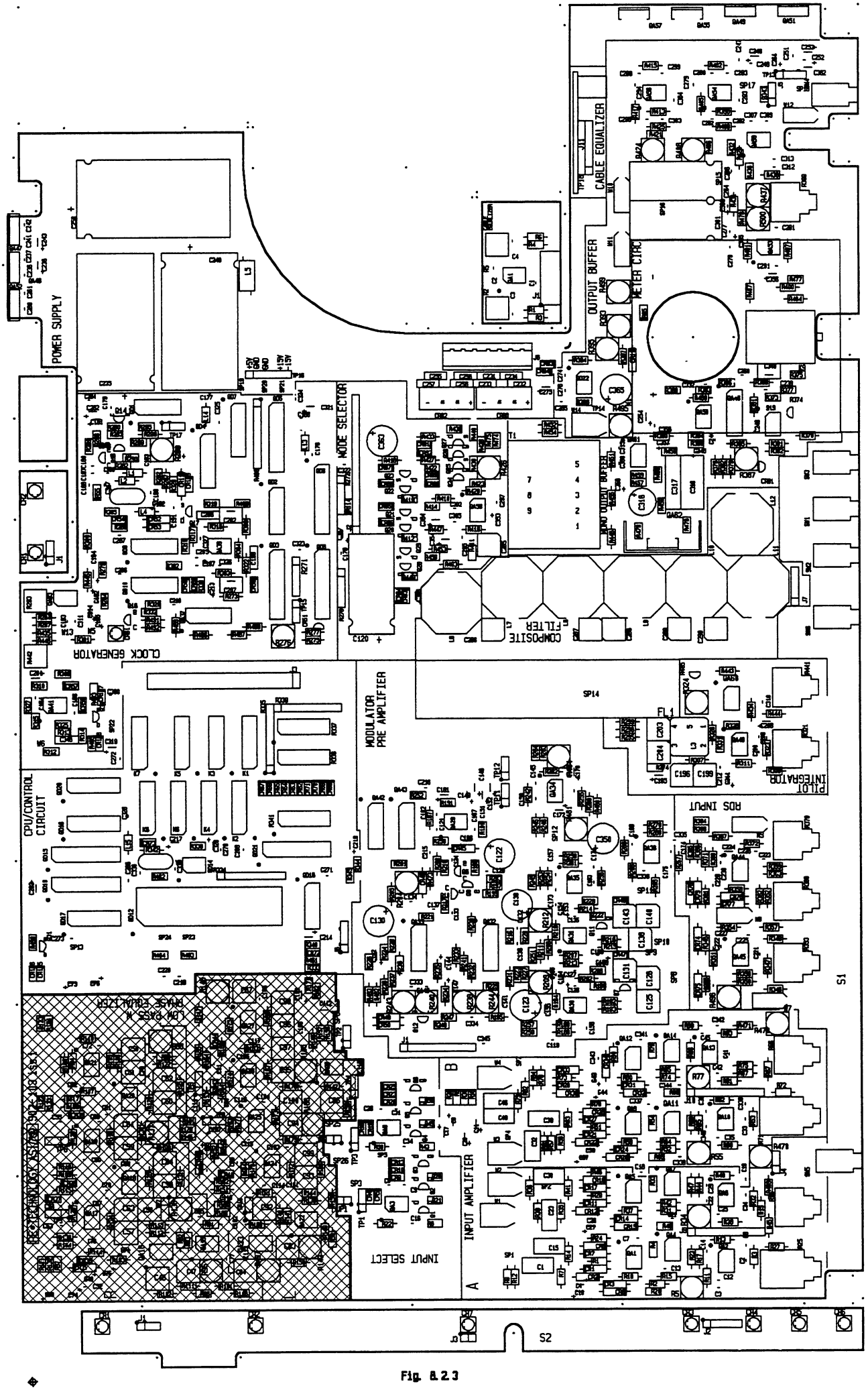

POWER SUPPLY
CABLE EQUALIZER
OUTPUT BUFFER
METER CIRC
MODE SELECTOR
COMPOSITE FILTER
CLOCK GENERATOR
MODULATOR PRE AMPLIFIER
CPU/CONTROL CIRCUIT
PILOT INTEGRATOR
RDS INPUT
INPUT AMPLIFIER
INPUT SELECT
S1
S2

Fig. 8.2.3

RE•TECHNOLOGY AS
902-103 iss.1
LOW PASS W.
PHASE EQUALIZER

8.3 Preemphasis, Modulators and Mono Signals

Following the input filter, the signal passes through a preemphasis circuit that sets the appropriate time constant and then enters into the modulator. The output is the final multiplexed baseband signal but without the pilot tone added. This diagram also shows the circuits that generate the mono signal (R+L)/2 for the mono output. The detailed circuit description covers both left and right channel. The circuits are shown on the diagram in section 8.3.2.

8.3.1 Circuit Description

QA30A and QA31A forms the active elements of the preemphasis circuit and by means of solder links SP8 and SP9 (SP10 and SP11) various time constants can be selected. Through the FET-switches Q7 and Q11 the microcomputer can switch the preemphasis off completely on command from the front panel switch.

Before the signals are fed to the modulator a small amount of crosstalk is introduced to compensate for the crosstalk generated in the modulator. The circuit is formed around QA30B and QA31B and the resulting crosstalk can be eliminated by adjusting R209 and R212.

The composite signal is generated by an integrated balanced switch modulator, operating at 38 kHz (QA32). The sidebands at the third harmonic of 38 kHz, i.e. 114 kHz, are balanced out by a signal from a 114 kHz modulator (QA33) similar to and synchronized to the 38 kHz modulator. Both modulators consist of two dual-transistors having individual current sources.

The L and R signals are connected to each half of the modulators. The current from each current source will alternately pass through the first and the second half of that dual-transistor to which it is connected, as the bases of the two dual-transistors are fed with complementary square wave voltages with an amplitude of approx. 500 mV.

Due to this, the current through R210 (the output of the 38 kHz modulator QA32) in the first half period of the 38 kHz equals the current of the current generator connected to the L signal while the current in the second half period of the 38 kHz equals the current from the current generator connected to the R signal. As the DC current from the two current generators are equal - adjusted by R233 - the DC current through R210 will be constant, thus providing suppression of the 38 kHz signal from the modulator.

The 114 kHz modulator operates in a similar way.

The currents from the two modulators are fed to the summing amplifier QA29. Because the current from the 114 kHz modulator is 3 times less than the current from the 38 kHz modulator, the sidebands in the vicinity of 114 kHz will be compensated.

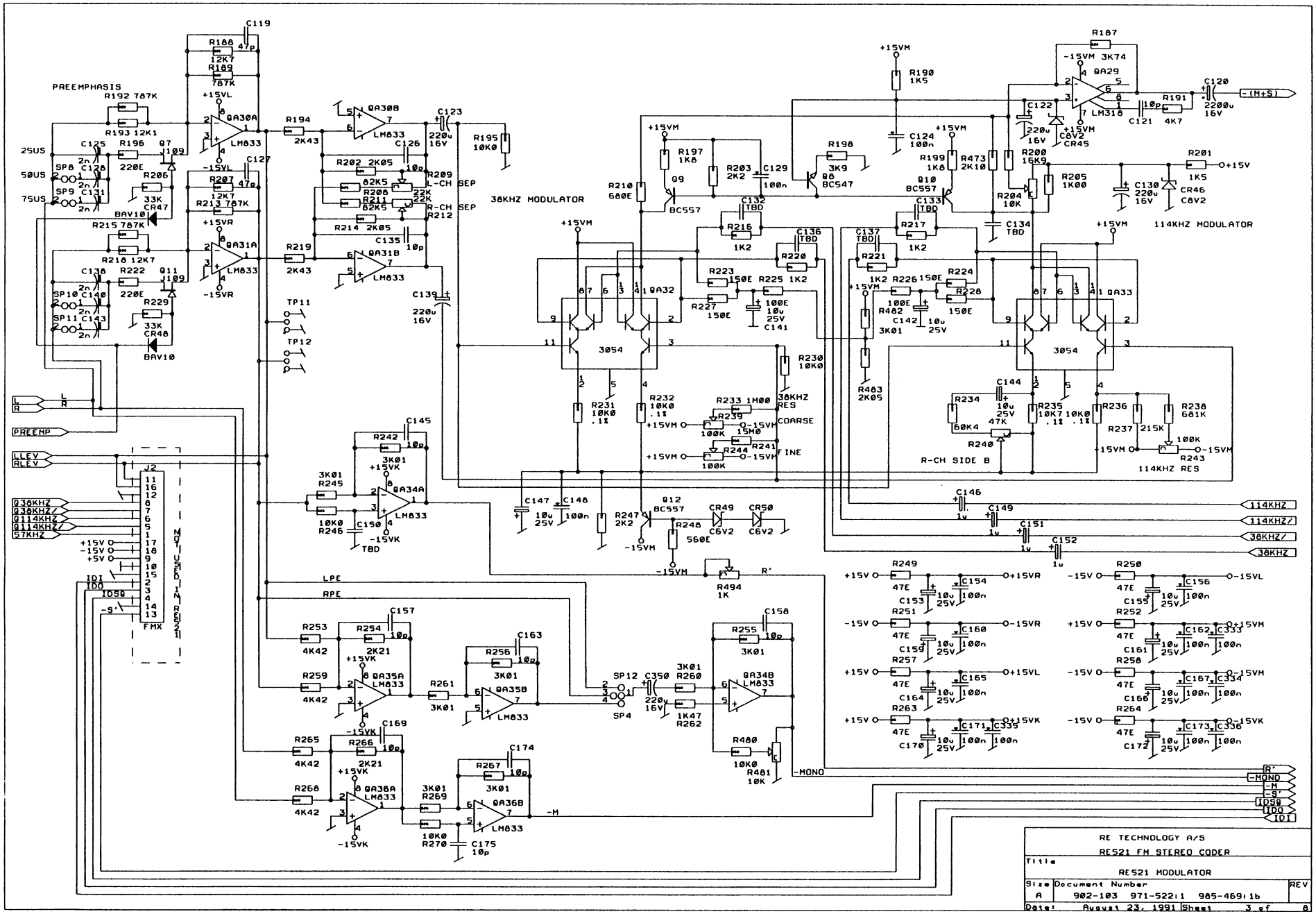
Adjustment of the L signal current is made by R204, R signal current by R243. C136/C137 provide the correct phasing of the current from the 114 kHz modulator.

The signal for mono mode is generated by adding the two channels before the modulator in order to get the best possible signal to noise ratio. This happens in QA35A and B. The resulting signal, (R+L)/2 is fed to the buffer QA34B through a solder link SP12 where the mono signal can be selected to be either R, L or (R+L)/2.

QA36A and B is used to generate the permanent mono signal for the balanced mono output.

8.3.2 Schematic Diagrams

The schematic diagram for the modulator is located on the following page. The diagram number is 985-469 Sheet 3.


PREEMPHASIS
38KHZ MODULATOR
114KHZ MODULATOR
R-CH SIDE B
114KHZ RES
COARSE
FINE
L-CH SEP
R-CH SEP
RE TECHNOLOGY A/S
RE521 FM STEREO CODER
RE521 MODULATOR
Size A
Document Number 902-103 971-522:1 985-469:1b
REV
Date: August 23, 1991
Sheet 3 of 8

8.3.3 Component Locations

The component locations on the main board for the input amplifiers are shown on the following page.

SECTION 8 _____ TECHNICAL DESCRIPTION OF PRINT/MODULES

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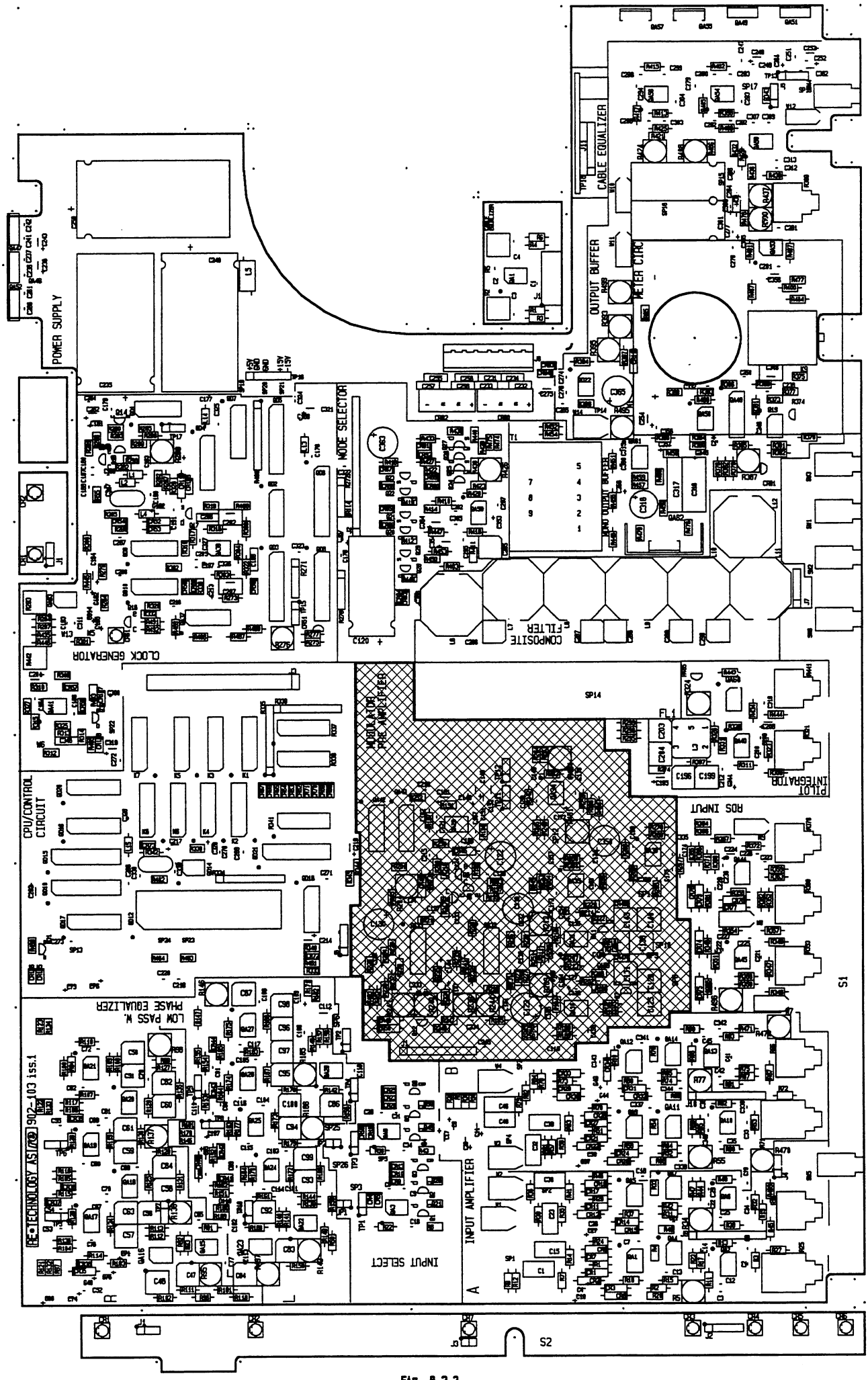
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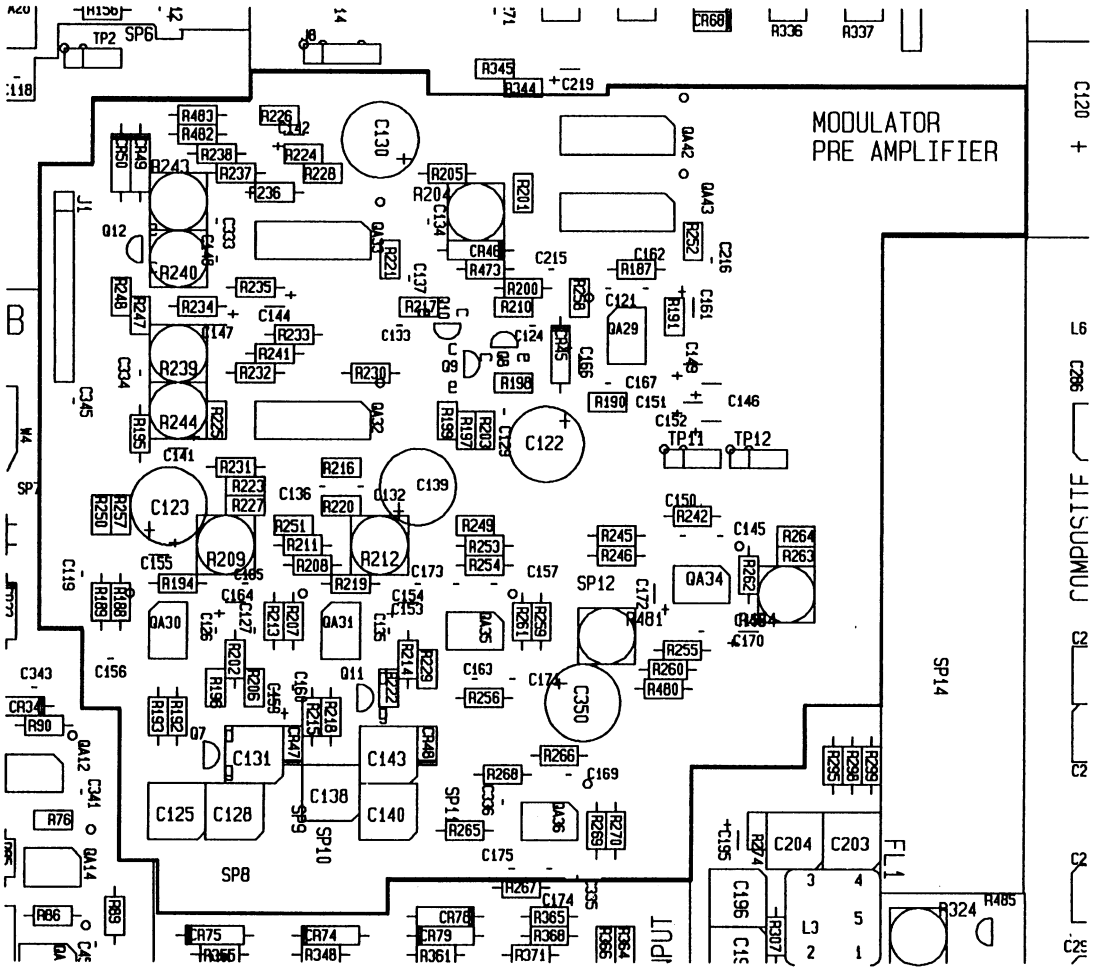
OUTPUT BUFFER
METER CIRC
MODE SELECTOR
COMPOSITE FILTER
CLOCK GENERATOR
CPU/CONTROL CIRCUIT
MODULATOR PRE-AMPLIFIER
PILOT INTEGRATOR
RDS INPUT
PHASE EQUALIZER
LOW PASS M.
INPUT SELECT
INPUT AMPLIFIER
S1
S2
902-103 iss.1

Fig. 8.3.3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C131
C143
C138
C140
C125
C128
C350
C204
C203
C196
FL1
L3
J1
Q12
Q11
Q07
QA42
QA43
QA29
QA34
QA30
QA31
QA35
QA36
QA32
QA33
CR46
CR68
CR34
CR74
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R240
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R481
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C219
C120
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8.4 Clock Generator/Sync

In order to generate the internal timing and pilot signals, RE 521 is equipped with a clock generator built around a 4.56 MHz VCXO. This VCXO is used to derive the 19 kHz pilot signal and the frequencies of two higher uneven harmonics of the pilot tone. These frequencies are then used to outbalance the harmonics by adding the inverse signal at a proper lower level. The circuits are shown on the diagram in section 8.4.2.

8.4.1 Circuit Description

The digital circuitry generating the driver signals for the modulators and the pilot generator comprises a X-tal oscillator (VCXO) built around Q15 and Q16. The frequency is determined by a crystal Y1 (4.56 MHz) coupled with a capacitance diode CR55. When the oscillator is free running there is 0 V on the cathode of CR55 and the other end is fed a negative voltage from R291. This trimmer is used to adjust the frequency when there is no external sync. The signal, buffered by Q14, is fed to a NAND gate with schmitt-trigger input which in turn feeds the frequency to the 8-bit counters QD4 and QD7. The counters, counting a cycle of 240 (4.56 MHz ÷ 240 = 19 kHz), addresses a PROM (QD5) which outputs the actual timing signals with the correct phase relationship, and finally passed through two latches/buffers (QD3/QD8) that are clocked from the 4.56 MHz clock thereby eliminating variations in the access time of different PROMs.

The outputs of QD8 are used for the pilot signal generation and the pilot sync output. A 19 kHz signal from the clock generator (QD5, pin 9), is fed to the pilot integrator QA40A, together with a 57 kHz (QD5, pin 8) and a 95 kHz (QD5, pin 7). The phase relationship and the current level, set by R295/R298/R299, are such, that the 3rd and 5th harmonics of the 19 kHz square wave are compensated (eliminated). Only harmonics of 7th and 9th order and upwards are present in the output of the pilot integrator. The phase of the pilot signal relative to the 38 kHz subcarrier is adjusted by changing the time constant of the pilot integrator by means of R324 (through a hole in the top plate).

The 7th harmonic, 133 kHz is eliminated by a 133 kHz notch filter which is a parallel resonance circuit (L3/C203/C204/R274). The 7th harmonic is thus attenuated approx. 20 dB. The remaining harmonic components are attenuated either by the composite filter for use in the composite signal or by a dedicated pilot sync filter for use at the Pilot Sync output. The resulting pilot at the composite output has a THD of approx. 0.1%.

Following the pilot integrator and the 133 kHz trap, the signal is routed to the pilot attenuator for use in the composite output signal as well as to the meter circuit for level measurement (see sheet 6).

The pilot level is adjustable from -13 dBm to -6 dBm by means of R321 on the front panel.

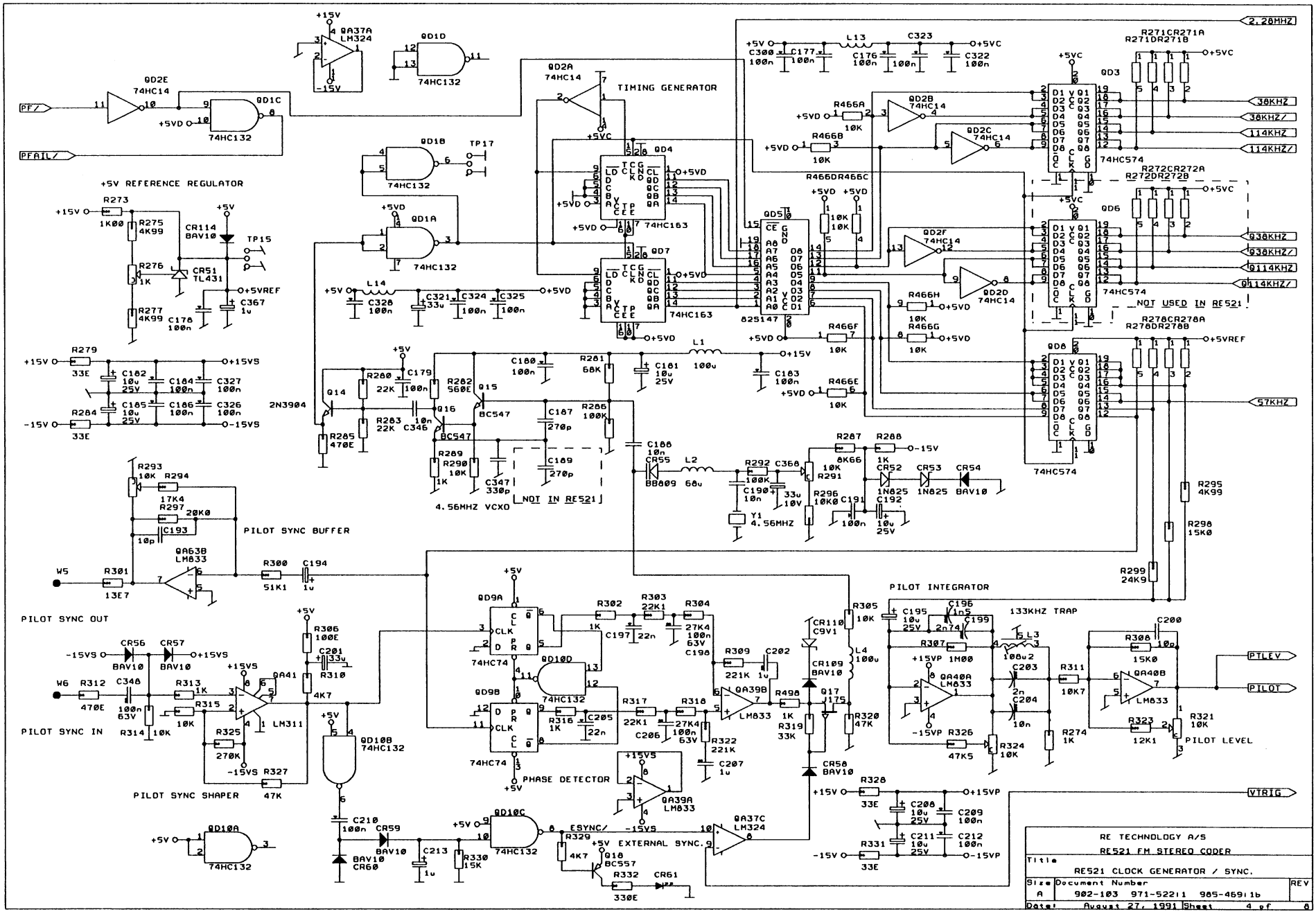
External synchronization can be obtained from a signal on the W6 input. QA41 serves as a shaper turning the signal into a square wave. The signal is fed to a voltage doubler CR59/CR60 through QD10B and to a phase detector formed by QD9 and QD10D. If there is external sync present the rectified signal from the voltage doublers are used to open switch Q17 that lets a control voltage from the phase detector control the VCXO. The 19 kHz signal from QD8 is also fed to the phase detector and any variations between its phase and the external signals phase will result in a voltage different from 0 V that will pull the VCXO into phase.

The resulting 19 kHz pilot signal, be it free running or externally synchronized, is fed to the sync output W5 through the buffer and level shifter QA63B.

The pilot level can be varied slightly by changing the supply voltage to QD8. Being CMOS, variations in supply voltage will show as variations in output voltage. The supply voltage can be varied by means of R276.

8.4.2 Schematic Diagrams

The schematic diagram for the clock generator is located on the following page. The diagram number is 985-469 Sheet 4.


2.20MHZ
TIMING GENERATOR
+5V REFERENCE REGULATOR
PILOT SYNC BUFFER
4.56MHZ VCXO
NOT IN RE521
PILOT INTEGRATOR
133KHZ TRAP
PILOT SYNC OUT
PILOT SYNC IN
PILOT SYNC SHAPER
PHASE DETECTOR
EXTERNAL SYNC.
PILOT LEVEL
30KHZ
30KHZ/
114KHZ
114KHZ/
38KHZ
38KHZ/
9114KHZ
9114KHZ/
57KHZ
PTLEV
PILOT
VTRIG
RE TECHNOLOGY A/S
RE521 FM STEREO CODER
RE521 CLOCK GENERATOR / SYNC.
Size A
Document Number 902-103 971-52211 985-46911b
REV
Date: August 27, 1991
Sheet 4 of 8

8.4.3 Component Locations

The component locations on the main board for the input amplifiers are shown on the following page.

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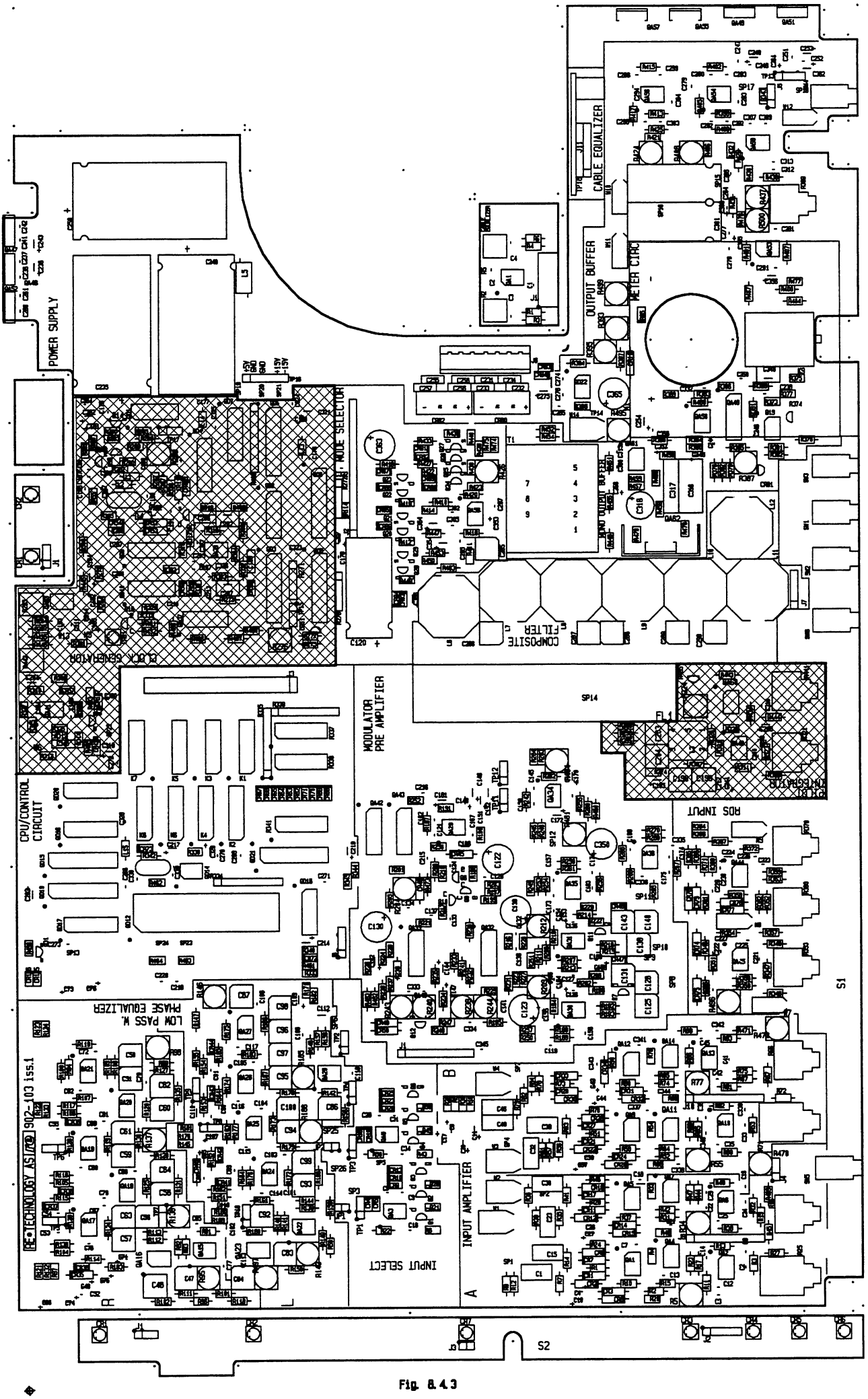
POWER SUPPLY
CABLE EQUALIZER
OUTPUT BUFFER
METER CIRC
MODE SELECTION
CLOCK GENERATOR
COMPOSITE FILTER
MODULATOR PRE AMPLIFIER
CPU/CONTROL CIRCUIT
ROS INPUT
LOW PASS & PHASE EQUALIZER
INPUT SELECT
INPUT AMPLIFIER
S1
S2
902-103 iss.1

Fig. 8.4.3

CONTROL UIT
CLOCK GENERATOR
MODE SELECTOR
MODULATOR PRE AMPLIFIER
COMPOSITE FILTER
MONO OUTPUT BUFFER
PILOT INTEGRATOR
BUS INPUT
FL1
SP14
SP19
SP20
SP21
SP22
J1
J2
J3
J7
T1
SW1
SW2
SW3
SW6

8.5 CPU/Control Circuit

The RE 521 is controlled from a microcomputer which takes care of all the internal switching on command from the switches on the front panel or from commands from the remote plug or the serial interface. All settings are stored in an EEPROM at power down and is reloaded at power up to ensure the RE 521 continues with the right setting. The circuits are shown on the diagram in section 8.5.2.

8.5.1 Circuit Description

QD12 is a 68HC05 stand alone microcomputer with built-in RAM, ROM and timer. It is clocked at 2.4576 MHz from Y2 in order to derive the correct baud rates for the built-in serial communication port. The only peripheral chip is QD14, a 64 times 16-bit EEPROM. It has a shadow RAM for quick access to the data and in order to limit the number of writes to the PROM. It is used to store all the settings of the RE 521 and at power down the content of the RAM is written into the PROM. SW1 to SW6 are the switches on the front panel and the computer controls the indicators on the front panel through the plugs J4, J5 and J7. The remote commands are read from J3 and the relay outputs are driven through QD15/QD19 and QD16/QD20. The relays are bistable meaning you have to actively switch them on and off. The relays will only be switched when QD17B pin 12 is pulsed. Solder link SP13 is used to decide if the relays shall be active in local mode (2 and 3 connected). The control signals are converted to ± 15 V signals that control the FET switches in the RE 521.

8.5.2 Schematic Diagrams

The schematic diagram for the CPU/Control Circuit is located on the following page. The diagram number is 985-469 Sheet 5.

SECTION 8 _____ TECHNICAL DESCRIPTION OF PRINT/MODULES

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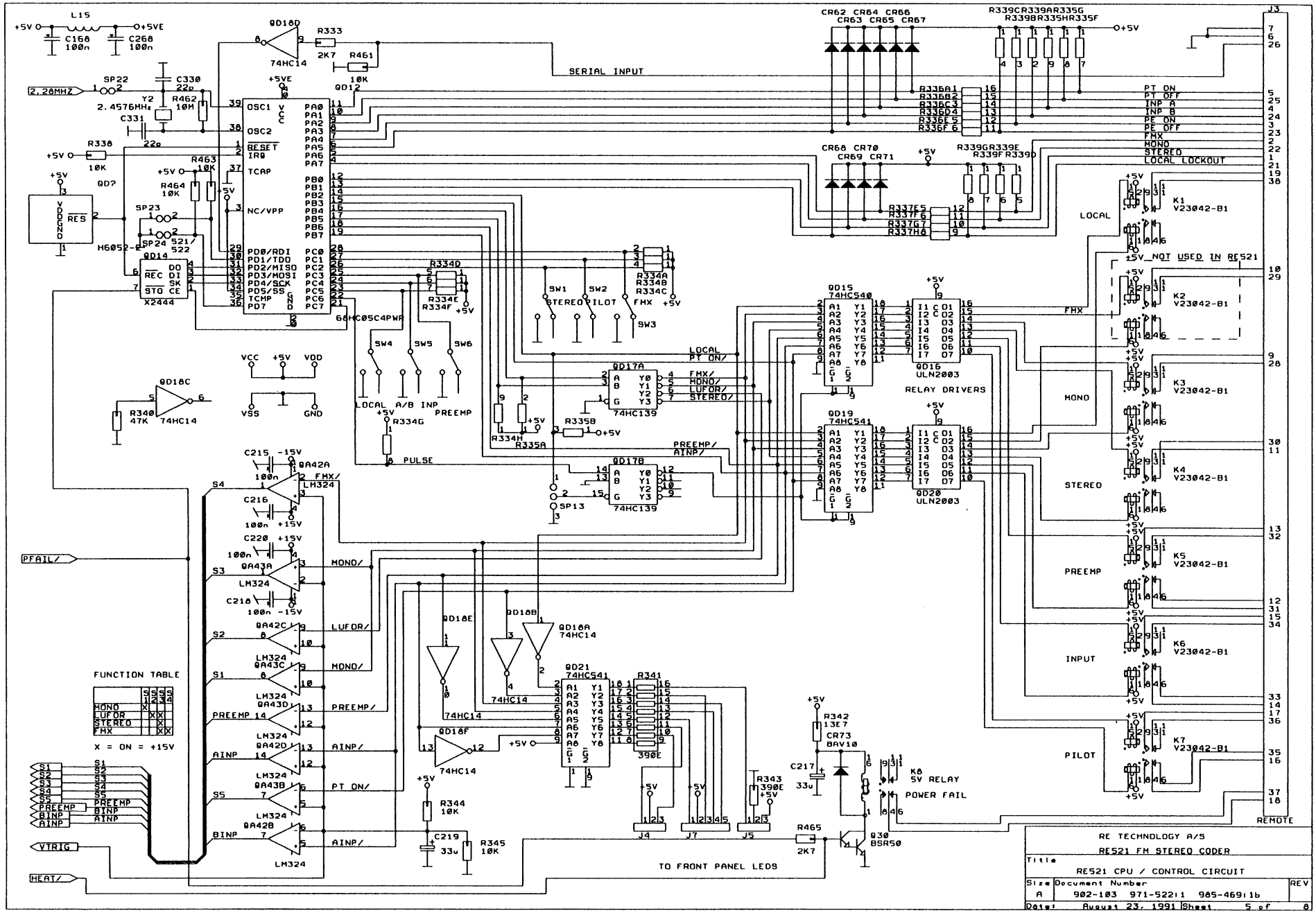
L15
C168 100n
C268 100n
2.26MHZ
Y2 2.4576MHz
SP22
C330 22p
R462 10M
C331 22p
R336 10K
R463 10K
R464 10K
SP23
SP24 521/522
H6052-2
X2444
QD14
QD7
QD18D
74HC14
R333 2K7
R461 10K
QD12
SERIAL INPUT
OSC1
OSC2
RESET
IRQ
TCAP
NC/VPP
PD0/RDI
PD1/TDO
PD2/MISO
PD3/MOSI
PD4/SCK
PD5/SS
TCMP
PD7
PA0
PA1
PA2
PA3
PA4
PA5
PA6
PA7
PB0
PB1
PB2
PB3
PB4
PB5
PB6
PB7
PC0
PC1
PC2
PC3
PC4
PC5
PC6
PC7
68HC05C4PWR
R334D
R334E
R334F
R334A
R334B
R334C
SW1 STEREO
SW2 PILOT
SW3 FMX
SW4
SW5
SW6
LOCAL A/B INP
PREEMP
R334G
PULSE
R334H
R335A
R335B
SP13
QD18C
R340 47K
VCC +5V VDD
VSS GND
QD17A
QD17B
74HC139
LOCAL PT ON/
FMX/
MONO/
LUFOR/
STEREO/
PREEMP/ AINP/
QD15 74HC540
QD19 74HC541
QD16 ULN2003
QD20 ULN2003
RELAY DRIVERS
CR62 CR64 CR66
CR63 CR65 CR67
R339C R339A R335G
R339B R335H R335F
R336A1
R336B2
R336C3
R336D4
R336E5
R336F6
CR68 CR70
CR69 CR71
R339G R339E
R339F R339D
R337E5
R337F6
R337G7
R337H8
PT ON
PT OFF
INP A
INP B
PE ON
PE OFF
FMX
MONO
STEREO
LOCAL LOCKOUT
LOCAL
NOT USED IN RE521
K1 V23042-B1
K2 V23042-B1
K3 V23042-B1
K4 V23042-B1
K5 V23042-B1
K6 V23042-B1
K7 V23042-B1
K8 5V RELAY
POWER FAIL
PFAIL/
C215 -15V
C216
C220 +15V
C218
QA42A
QA43A
QA42C
QA43C
QA43D
QA42D
QA43B
QA42B
LM324
S4
S3
S2
S1
S5
PREEMP
AINP
BINP
VIRTIG
HEAT/
MONO/
LUFOR/
PREEMP/
AINP/
PT ON/
FUNCTION TABLE
X = ON = +15V
QD18E
QD18B
QD18A
QD18F
74HC14
QD21 74HC541
R341 390E
R343 390E
R342 13E7
CR73 BAV10
C217 33u
R465 2K7
Q30 BSR50
R344 10K
C219 33u
R345 10K
J4
J7
J5
TO FRONT PANEL LEDS
J3
REMOTE
RE TECHNOLOGY A/S
RE521 FM STEREO CODER
Title
RE521 CPU / CONTROL CIRCUIT
Size A
Document Number 902-103 971-52211 985-46911b
REV
Date: August 23, 1991
Sheet 5 of 8

8.5.3 Component Locations

The component locations on the main board for the CPU/Control circuit are shown on the following page.

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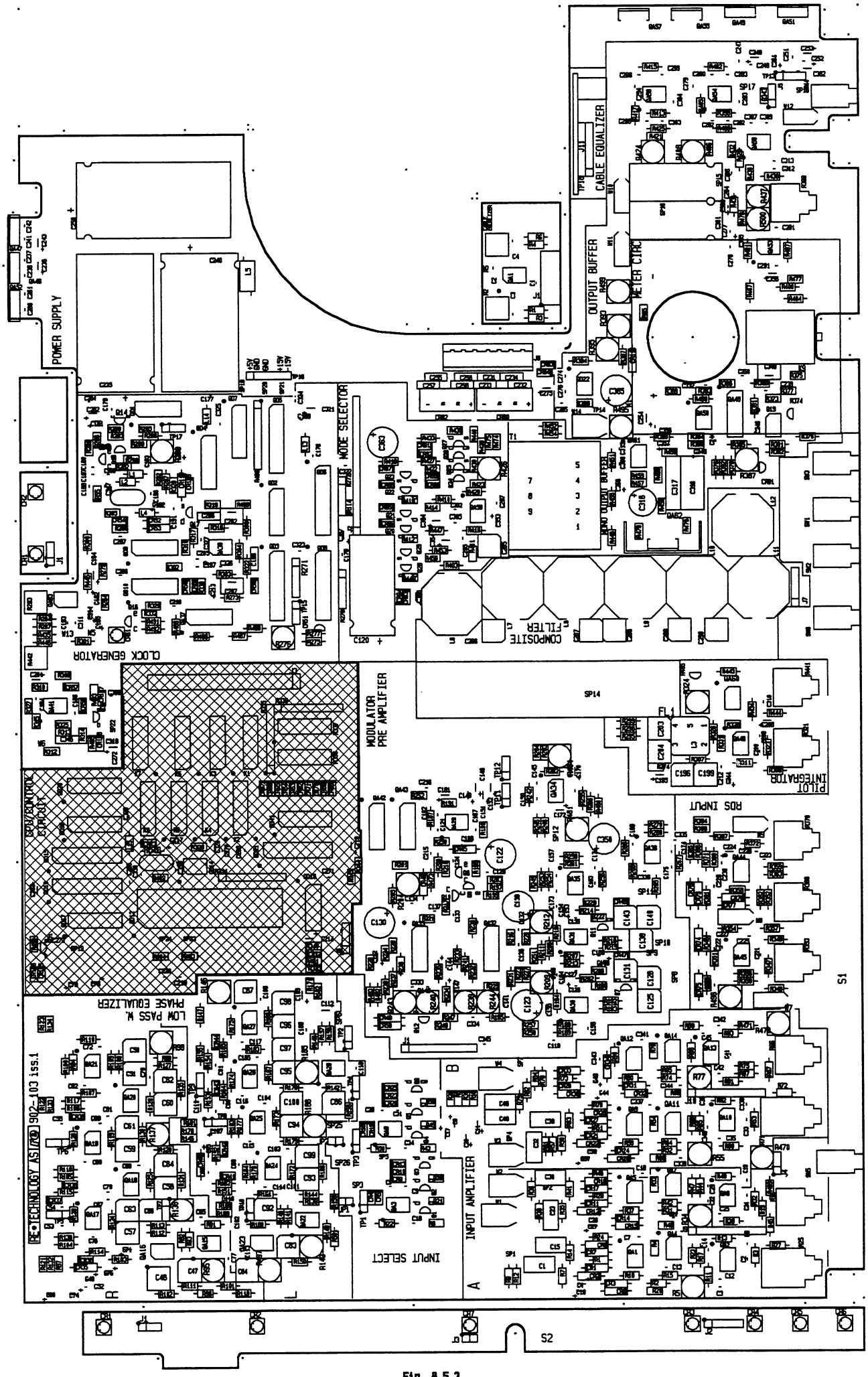

POWER SUPPLY
CABLE EQUALIZER
OUTPUT BUFFER
METER CIRC.
MODE SELECTOR
COMPOSITE FILTER
CLOCK GENERATOR
MODULATOR PRE AMPLIFIER
PILOT INTEGRATOR
RDS INPUT
LOW PASS M. PHASE EQUALIZER
INPUT SELECT
INPUT AMPLIFIER
S1
S2

Fig. 8.5.3

LOW PASS W.
PHASE EQUALIZER
CPU/CONTROL
CIRCUIT
MODULATOR
PRE AMPLIFIER
CLOCK GENERATOR

8.6 RDS Inputs/Power Supply

RE 521 is equipped with three auxiliary inputs that can be used to add various SCA signals to the composite signal (typically RDS signals). After being buffered the signals can be filtered in a 100 kHz low-pass filter if the broadcaster is unsure of the spectral content of the SCA-signal. The SCA-signals are then added to the composite signal in the summing point.

This section also covers the power supply for the RE 521 including the heat sensitive circuit that starts and stops the built-in fan.

The circuits are shown on the diagram in section 8.6.2.

8.6.1 Circuit Description

The 3 RDS/AUX inputs W7 to W9 are buffered by three identical non inverting buffers with the possibility of adjusting the level of the input. Diodes CR74/CR75, CR76/CR77 and CR78/CR79 protect the inputs from voltages higher than $\pm$15 V. The three signals are added in QA45B before the combined signal is sent around the 100 kHz optional input filter by means of solder link SP14 before it is added to the composite signal in QA58 (see sheet 7).

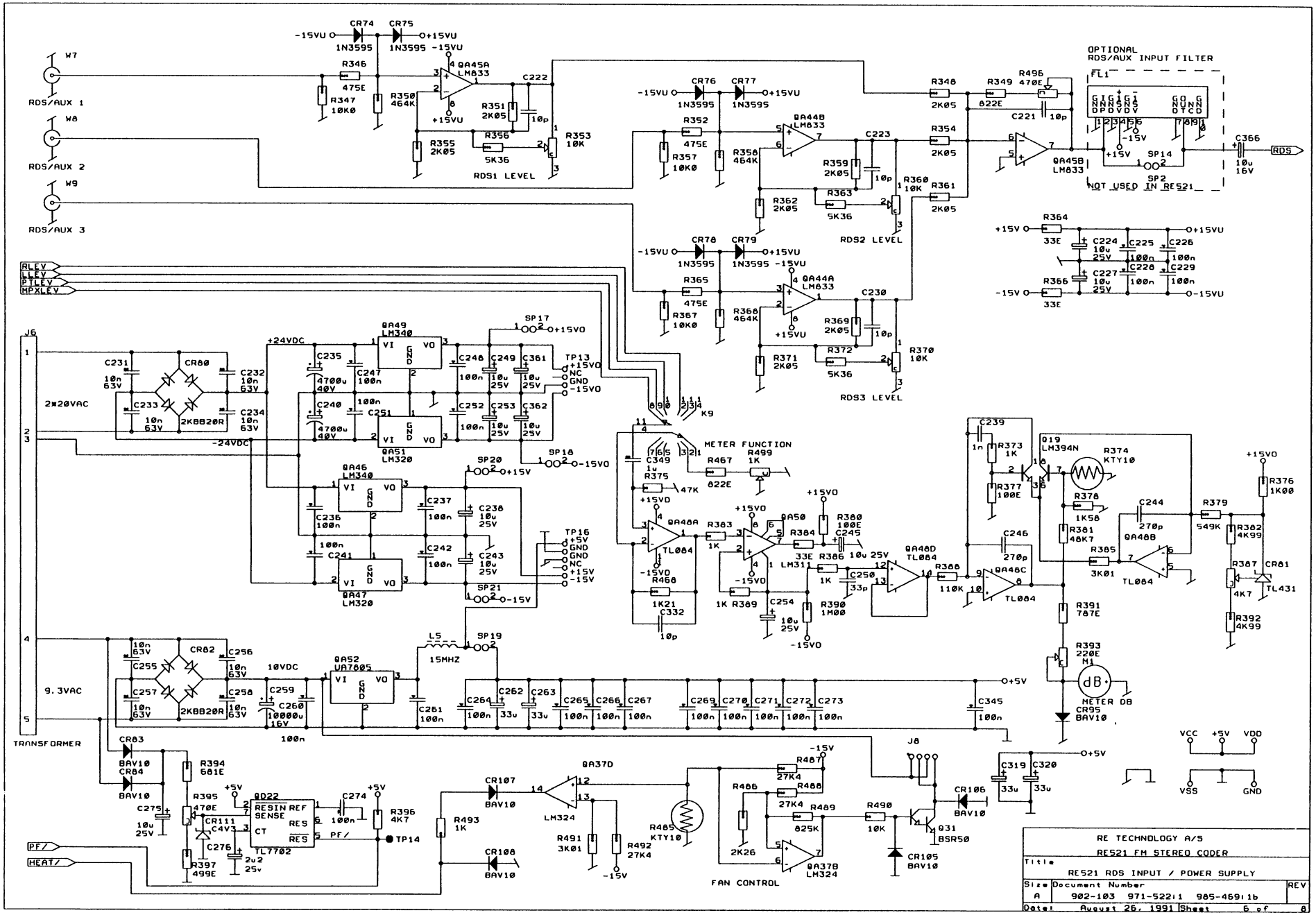
Power from the mains transformer enters the board via J6. There are two conventional $\pm$15 V supplies, one for the output and meter circuit and one for the rest of RE 521. This distributes the power dissipation over more regulators and reduces the requirements to the heat sink. QD22 is a comparator that as soon as the mains voltage drops signals the status "power fail" to the status port and inhibits the EEPROM with the default settings in order to avoid accidental writings to it during power down.

The diagram also contains the meter circuit with the meter switch that selects between MPX, Pilot, R and L. This is followed by a buffer QA48A that amplifies the pilot signal when this signal is selected as its level is lower than the others. QA50 is a comparator coupled as a peak voltage rectifier and the voltage across C254 will represent the peak value of the AC signal measured. QA48B and QA48D is coupled as a logarithmic amplifier with Q19 as the logarithmic element in order to show the measured values in dB. The circuit is temperature compensated by means of R374.

Finally another temperature controlled circuit is shown at the bottom of the diagram. QA37D is used to send a heat alarm when the voltage from the resistor chain R485/R487 rises above the voltage from R491/R492.

8.6.2 Schematic Diagrams

The schematic diagram for the RDS Inputs/Power Supply is located on the following page. The diagram number is 985-469 Sheet 6.


W7
RDS/AUX 1
W8
RDS/AUX 2
W9
RDS/AUX 3
CR74
CR75
1N3595
-15VU
+15VU
R346
475E
R347
10K0
R350
464K
QA45A
LM833
R351
2K05
10p
C222
R356
5K36
R353
10K
RDS1 LEVEL
CR76
CR77
R352
475E
R357
10K0
R358
464K
QA44B
LM833
C223
R359
2K05
R363
5K36
R360
10K
R362
2K05
R361
2K05
RDS2 LEVEL
CR78
CR79
R365
475E
R367
10K0
R368
464K
QA44A
LM833
C230
R369
2K05
R372
5K36
R370
10K
R371
2K05
RDS3 LEVEL
R348
2K05
R349
822E
R495
470E
C221
10p
QA45B
LM833
OPTIONAL
RDS/AUX INPUT FILTER
FL1
SP14
SP2
NOT USED IN RE521
C366
10u
16V
RDS
R364
33E
C224
10u
25V
C225
100n
C226
100n
C228
100n
C229
100n
C227
10u
25V
R366
33E
RLEV
LLEV
PILEV
MPXLEV
K9
J6
TRANSFORMER
2x20VAC
9.3VAC
10VDC
CR80
CR82
2KBB20R
C231
C232
C233
C234
C255
C256
C257
C258
C259
C260
10000u
16V
+24VDC
-24VDC
QA49
LM340
QA51
LM320
QA46
LM340
QA47
LM320
QA52
UA7805
C235
4700u
40V
C247
100n
C240
C251
C248
C249
C361
C252
C253
C362
C236
C237
C241
C242
C243
10u
25V
SP17
SP18
SP20
SP21
TP13
TP16
+15VO
-15VO
GND
NC
+15V
-15V
L5
15MHZ
SP19
C261
C262
C263
C264
C265
C266
C267
C269
C270
C271
C272
C273
C345
33u
100n
+5VO
METER FUNCTION
R467
R499
1K
822E
C349
1u
R375
47K
QA48A
TL084
R468
1K21
C332
10p
QA48B
LM311
R383
1K
R384
33E
R386
1K
C250
33p
R380
100E
C245
10u 25V
R390
1M00
C254
10u
25V
QA48D
TL084
R388
110K
QA48C
TL084
C239
1n
R373
1K
R377
100E
QA9
LM394N
R374
KTY10
R378
1K58
R381
48K7
C244
270p
C246
270p
R385
3K01
QA48B
TL084
R379
549K
R382
4K99
R387
4K7
CR81
TL431
R376
1K00
R392
4K99
R391
787E
R393
220E
M1
METER DB
CR95
BAV10
CR83
BAV10
CR84
BAV10
R394
681E
R395
470E
C275
10u
25V
QD22
RESIN SENSE
REF
RES
RES
PF/
CT
TL7702
CR111
C4V3
C276
2u2
25v
R397
499E
C274
100n
R396
4K7
TP14
PF/
HEAT/
CR107
BAV10
CR108
BAV10
R493
1K
QA37D
LM324
R491
3K01
R492
27K4
R485
KTY10
FAN CONTROL
R487
27K4
R486
27K4
R488
825K
R489
2K26
QA37B
LM324
R490
10K
Q31
BSR50
CR105
BAV10
CR106
BAV10
J8
C319
C320
33u
VCC
+5V
VDD
VSS
GND
RE TECHNOLOGY A/S
RE521 FM STEREO CODER
Title
RE521 RDS INPUT / POWER SUPPLY
Size
A
Document Number
902-103 971-522i1 985-469i1b
REV
Date: August 26, 1991
Sheet 6 of 8

8.6.3 Component Locations

The component locations on the main board for the input amplifiers are shown on the following page.

SECTION 8 _____ TECHNICAL DESCRIPTION OF PRINT/MODULES

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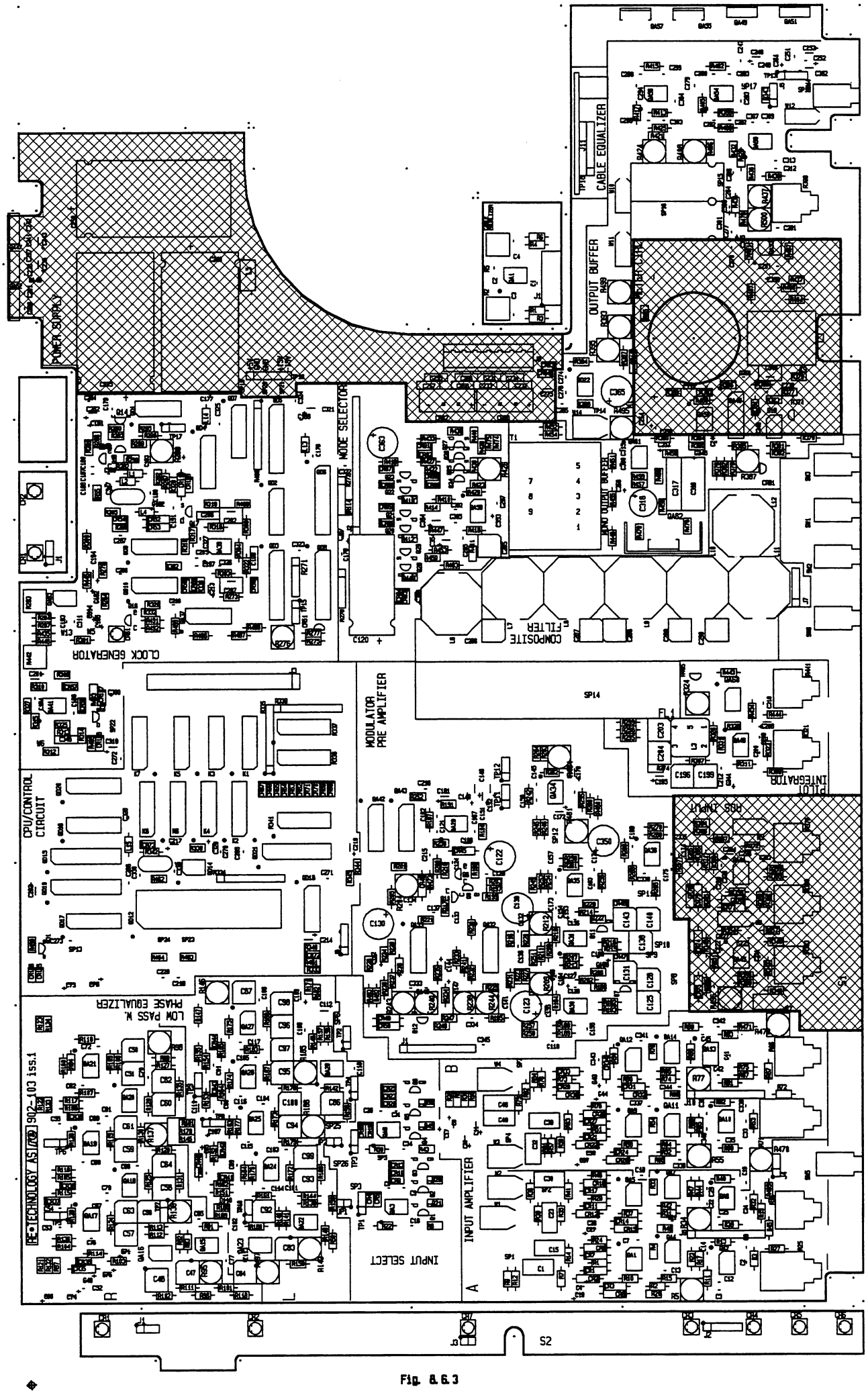
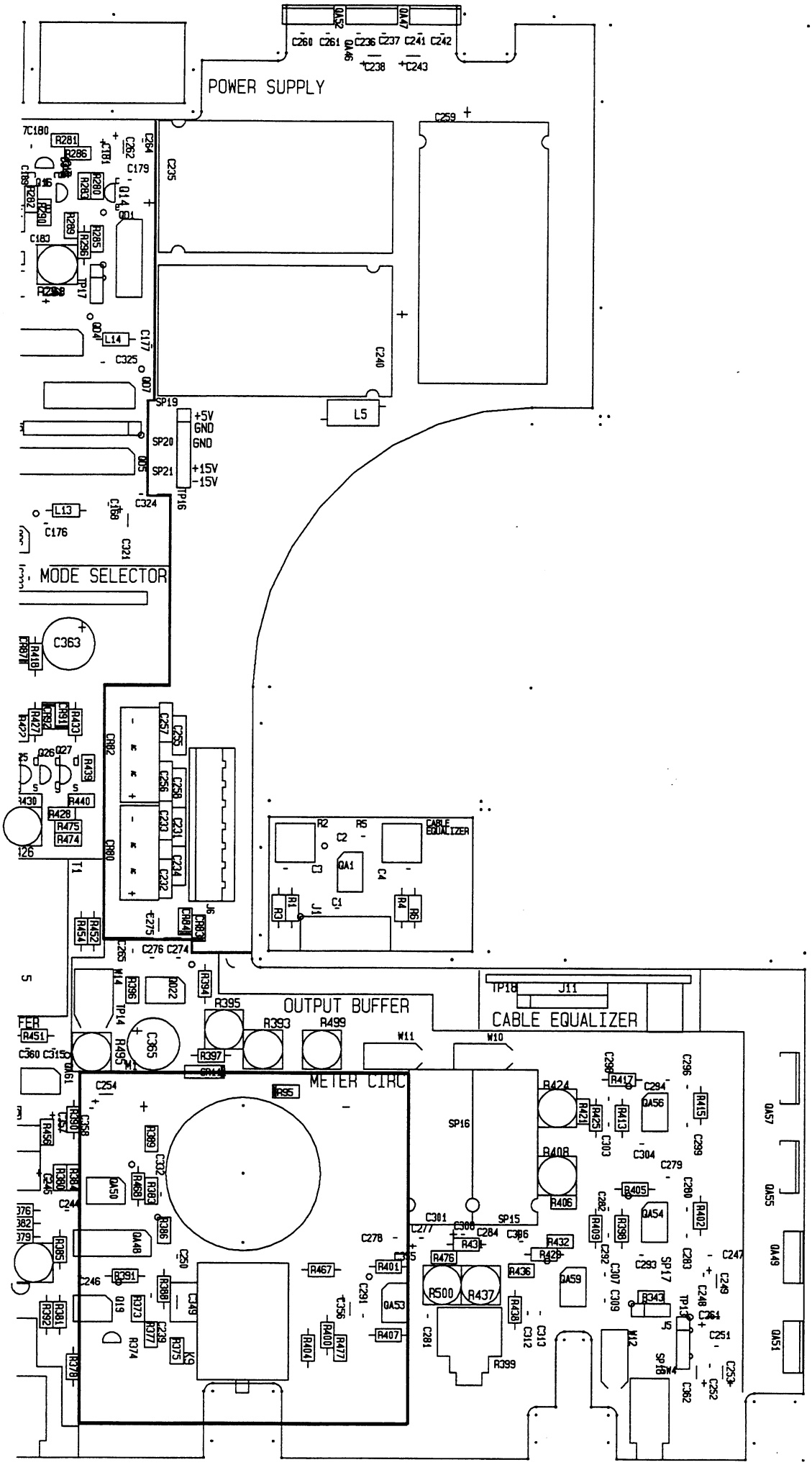

POWER SUPPLY
CABLE EQUALIZER
OUTPUT BUFFER
MODE SELECTOR
COMPOSITE FILTER
CLOCK GENERATOR
MODULATOR PRE AMPLIFIER
CPU/CONTROL CIRCUIT
LOW PASS N. PHASE EQUALIZER
INPUT SELECT
INPUT AMPLIFIER
PILOT INTEGRATOR
RDS INPUT
RF-TECHNOLOGY AS 902-103 iss.1
S2

Fig. 8.6.3

C131
C143
C125
C128
C138
C140
SP9
SP10
SP11
SP8
R266
R268
C169
C336
R265
DA36
R269
R270
C175
R267
C335
C174
R365
R368
R364
R366
R371
R369
R367
C230
C224
C226
R372
W9
C223
R362
R352
R359
R363
R370
R360
R353
R347
R349
R357
R346
R350
R356
R354
R358
R361
R348
R351
C222
C227
C229
C225
C221
W8
R496
R471
R472
R66
R83
R89
C342
C45
C241
R76
DA14
DA13
DA12
CR75
CR74
CR79
CR78
CR77
CR76
DA45
C195
C196
C199
R307
C212
C244
R311
R308
RDS INPUT
PILOT INTEGRATOR
S1


POWER SUPPLY
MODE SELECTOR
OUTPUT BUFFER
CABLE EQUALIZER
METER CIRC
+5V
GND
GND
+15V
-15V
C363
L5

8.7 Composite Filter and Outputs

Before the composite signal reaches the output buffers it passes a summing point where pilot signal and mono signals can be added/selected by the computer. The signal goes through a composite filter where the higher harmonics are removed and then it is fed through two buffers with high driving capabilities to the MPX output plugs. The MPX signal is also fed to the plug at the front for monitoring purposes through a standard buffer. The mono output is also buffered here. The circuits are shown on the diagram in section 8.7.2.

8.7.1 Circuit Description

Q20 to Q29 are used by the microcomputer to select which signal is passed to the composite filter. The deselected signals are grounded by the second switch in order to eliminate signals leaking through to the summing amplifier. The only signal that always goes through is the AUX-signal, here marked RDS. The selected signal is buffered in QA58 and then fed to the composite filter.

The composite filter is a 6-link low-pass filter with the following characteristics:

* Linear phase characteristic up to 53 kHz.

* Flat amplitude response up to 15 kHz and a max. attenuation of approx. 0.3% at 53 kHz.

* Fine cut-off characteristics.

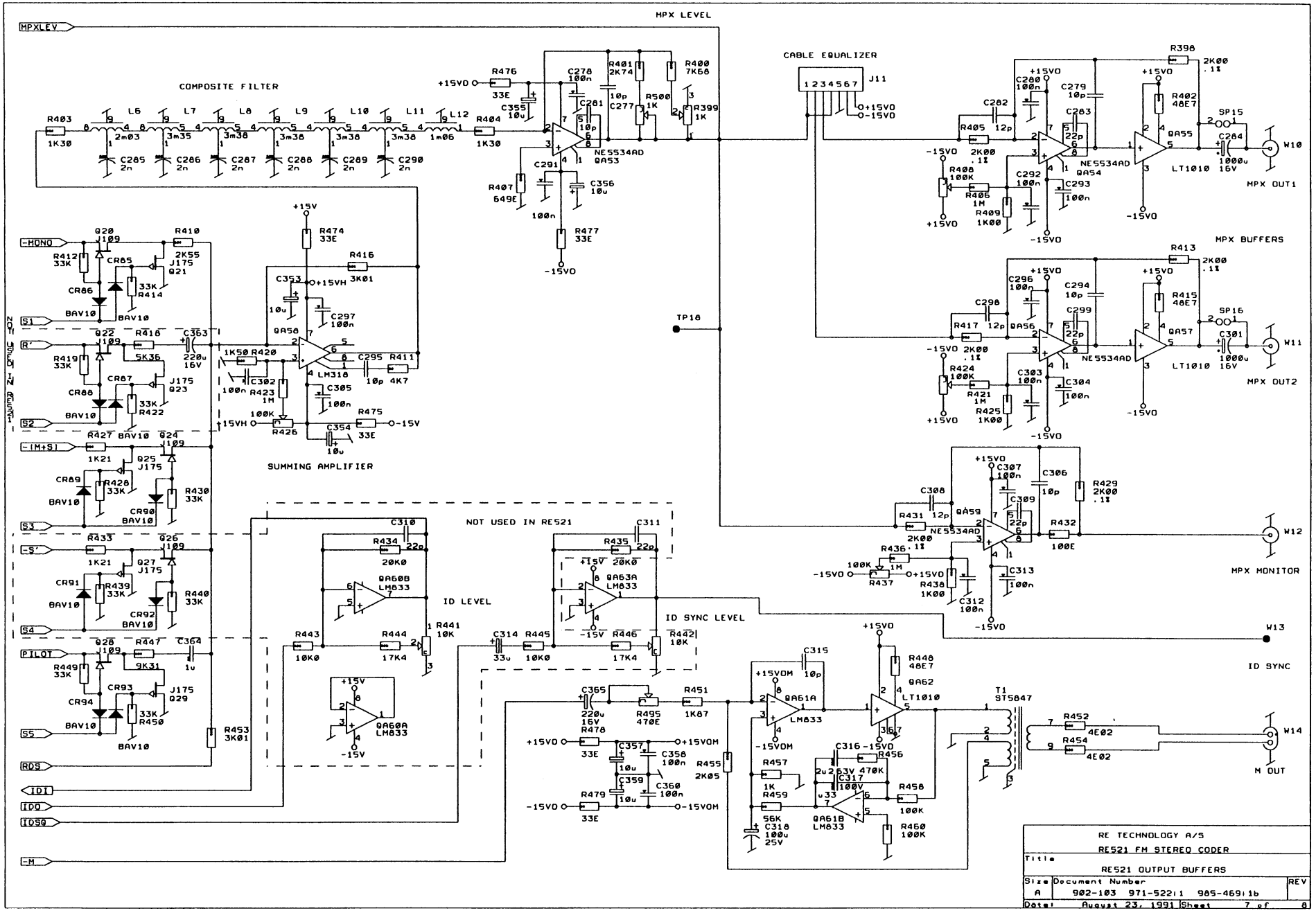
The filter output is buffered by QA53 where the MPX-level is adjusted by means of R399 (the potentiometer accessible from the front panel). R500 is used to adjust the gain for the whole output section so that the MPX levels are correct with R399 in middle position.

Finally MPX1 output is buffered by QA54/QA55 and MPX2 output by QA56/QA57 after going through the cable equalizer circuit (see section 8.8). QA55 and QA57 has high drive capability into 75 Ω in parallel with 5 nf. The MPX Monitor output is buffered by QA59 with a much lower drive capability. All three buffers have a gain of one ensuring the same level on all three MPX outputs.

The mono signal (R+L)/2 goes through a buffer amplifier (QA62) that drives an output transformer T1. The coil 4-5 is used to generate a feedback signal to QA61A ensuring linear frequency range at high frequencies. A DC servo loop (QA61B) ensures that the DC level on the output of QA62 is 0 V. Finally the third coil on T1 feeds the balanced mono signal to W14.

8.7.2 Schematic Diagrams

The schematic diagram for the output buffers is located on the following page. The diagram number is 985-469 sheet 7.


MPX LEVEL
MPXLEV
COMPOSITE FILTER
CABLE EQUALIZER
J11
TP18
SUMMING AMPLIFIER
NOT USED IN RE521
ID LEVEL
ID SYNC LEVEL
MPX BUFFERS
MPX OUT1
MPX OUT2
MPX MONITOR
ID SYNC
M OUT
-MONO
-(M+S)
-S'
PILOT
RDS
IDI
IDQ
IDSQ
-M
RE TECHNOLOGY A/S
RE521 FM STEREO CODER
RE521 OUTPUT BUFFERS
Size A
Document Number 902-103 971-52211 985-46911b
REV
Date: August 23, 1991
Sheet 7 of 8

8.7.3 Component Locations

The component locations on the main board for the input amplifiers are shown on the following page.

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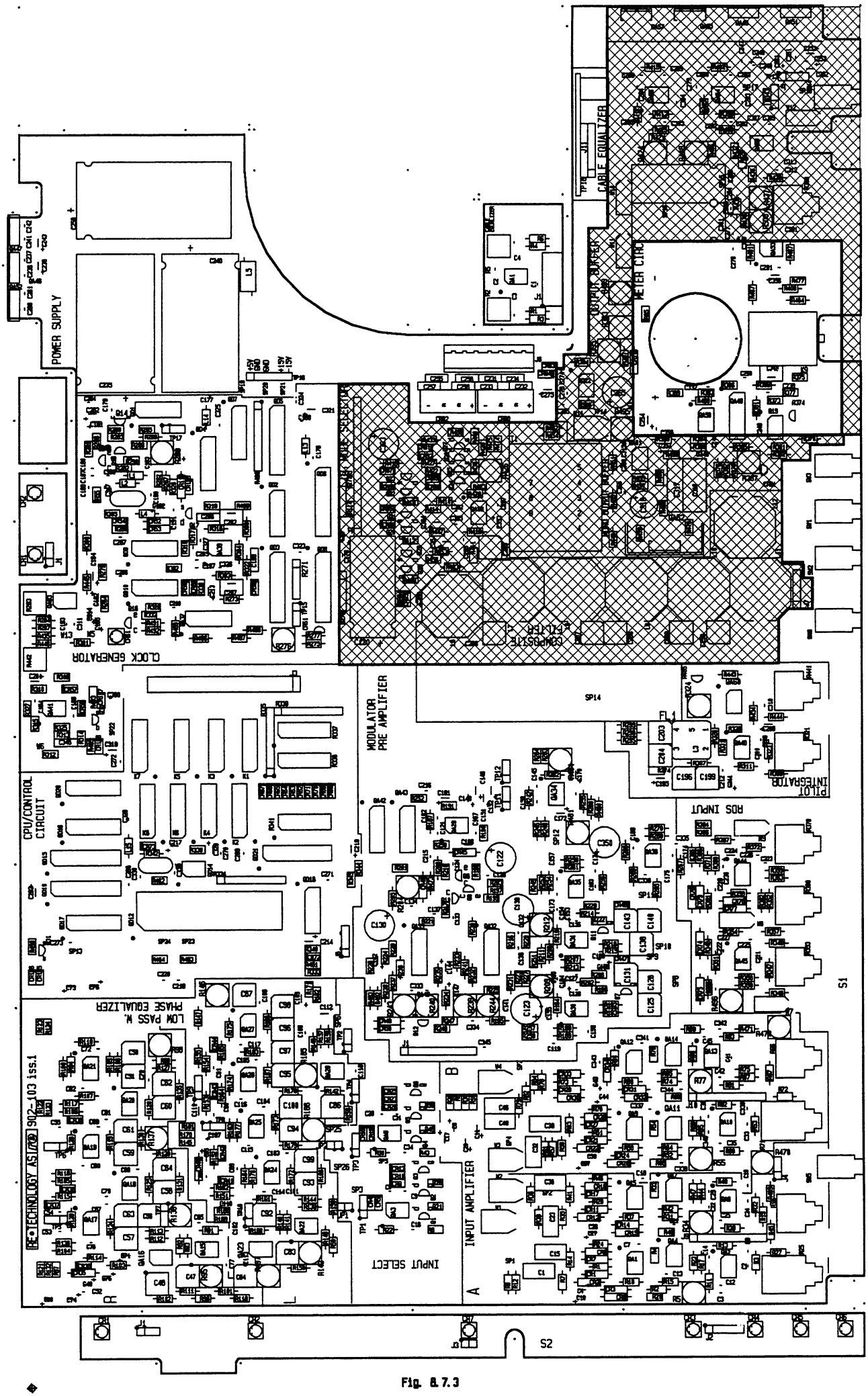
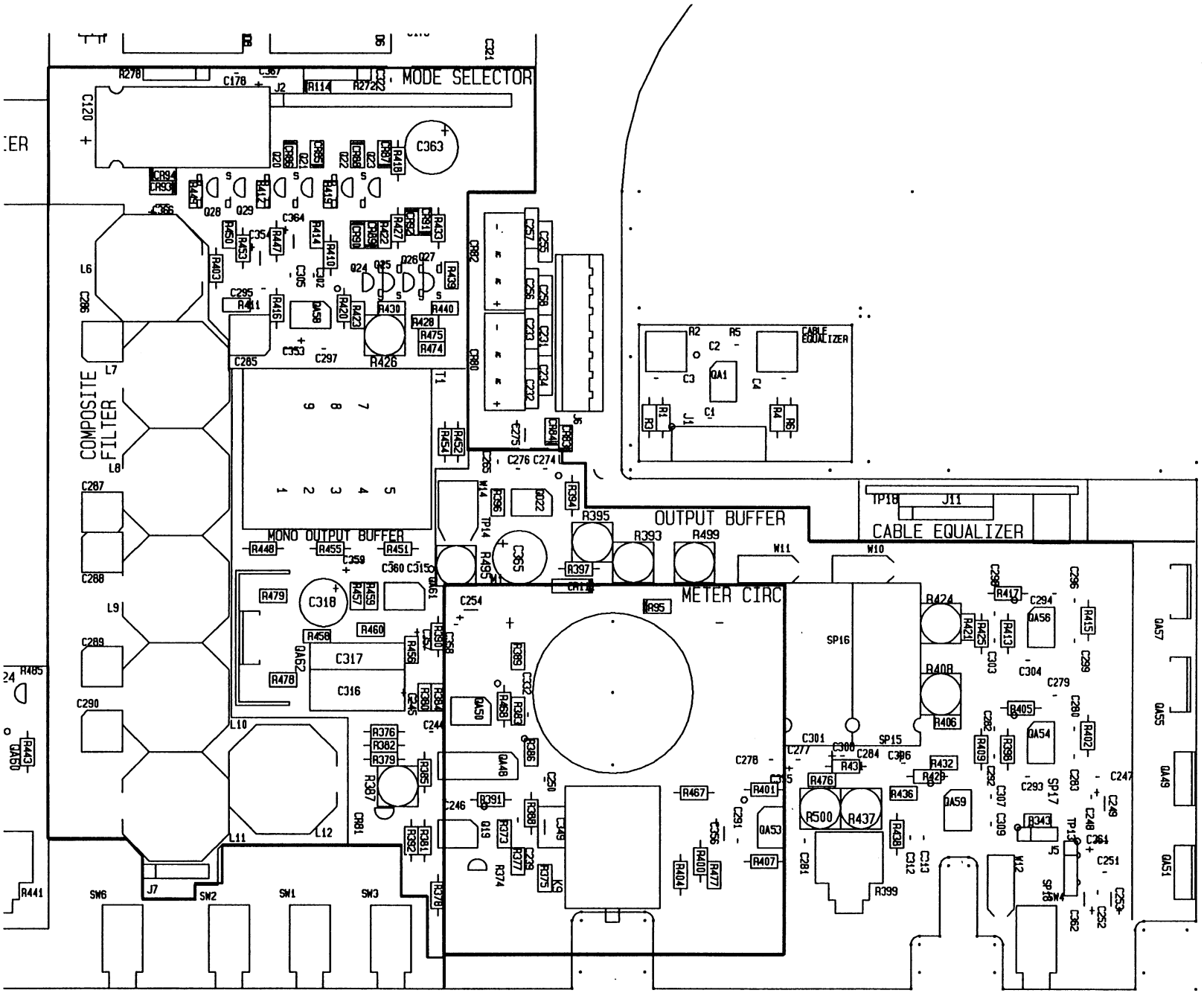

POWER SUPPLY
CABLE EQUALIZER
METER CIRC.
CLOCK GENERATOR
COMPOSITE FILTER
MODULATOR PRE AMPLIFIER
CPU/CONTROL CIRCUIT
PILOT INTEGRATOR
RDS INPUT
LOW PASS N. PHASE EQUALIZER
INPUT SELECT
INPUT AMPLIFIER
S1
S2

Fig. 8.7.3


MODE SELECTOR
COMPOSITE FILTER
MONO OUTPUT BUFFER
OUTPUT BUFFER
METER CIRC
CABLE EQUALIZER
CABLE EQUALIZER
J11
TP18
J2
J7
J1
J5
J6
SW6
SW2
SW1
SW3
SW4
C363
C318
C317
C316
R426
R500
R437
R399
L6
L7
L8
L9
L10
L11
L12
T1

8.8 Front Panels and Cable Equalizer

The circuits are shown on the diagram in section 8.8.2.

8.8.1 Circuit Description

This diagram shows how the LEDs on the front panel interface to the main board through connectors J1, J2 and J3.

The cable equalizer circuit is mounted on a separate board and its purpose is to compensate for the small loss at high frequencies introduced by long cables that lead to reduced stereo separation. The active element is QA1.C and when R2.C or R5.C are turned to zero QA1.C acts as a buffer with unity gain. The more you turn the trimmers the more you increase the lift at high frequencies. Max. lift is around 0.1 dB at 100 kHz. The cable equalizer has one input, J1.C pin 1 and 4 and two outputs, pin 2 and 3 each feeding a MPX output.

8.8.2 Schematic Diagrams

The schematic diagram for the front panel/cable equalizer is located on the following page. The diagram number is 985-469 Sheet 8.

SECTION 8 _____ TECHNICAL DESCRIPTION OF PRINT/MODULES

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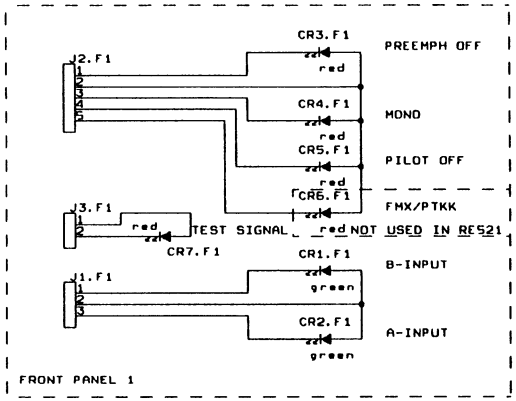
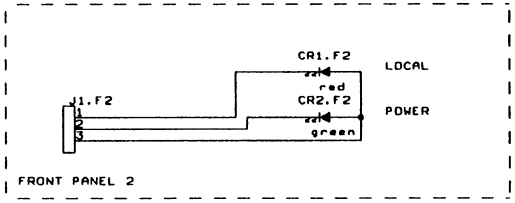
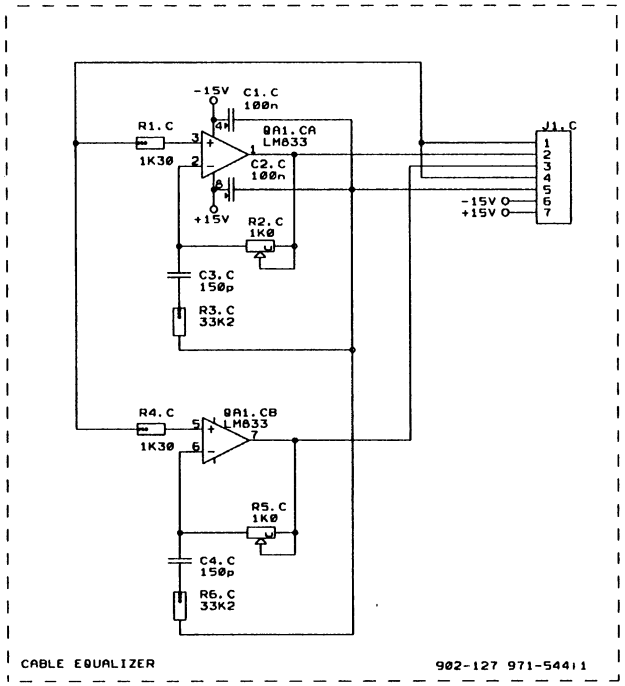






RE TECHNOLOGY A/S		
RE521 FM STEREO CODER		
Title: RE521 FRONT PANELS AND CABLE EQUALIZER		
Size: A	Document Number: 902-103/127 971-5221 1/5441 1 985-4691	REV: 1b
Date: September 2, 1991	Sheet: 8 of 8	

8.8.3 Component Locations

The component locations for the cable equalizer are shown on the following page.

This page is intentionally left blank.

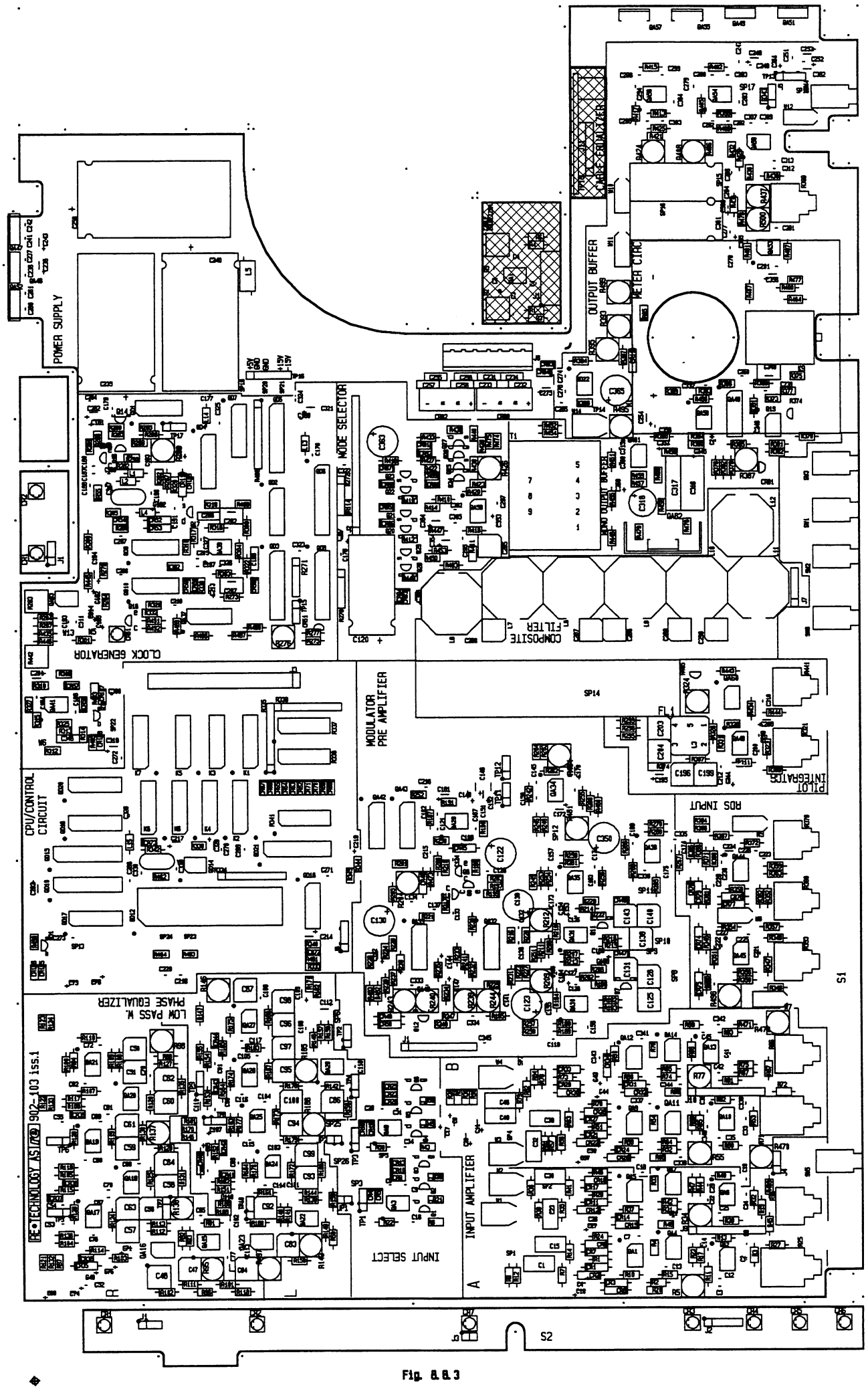
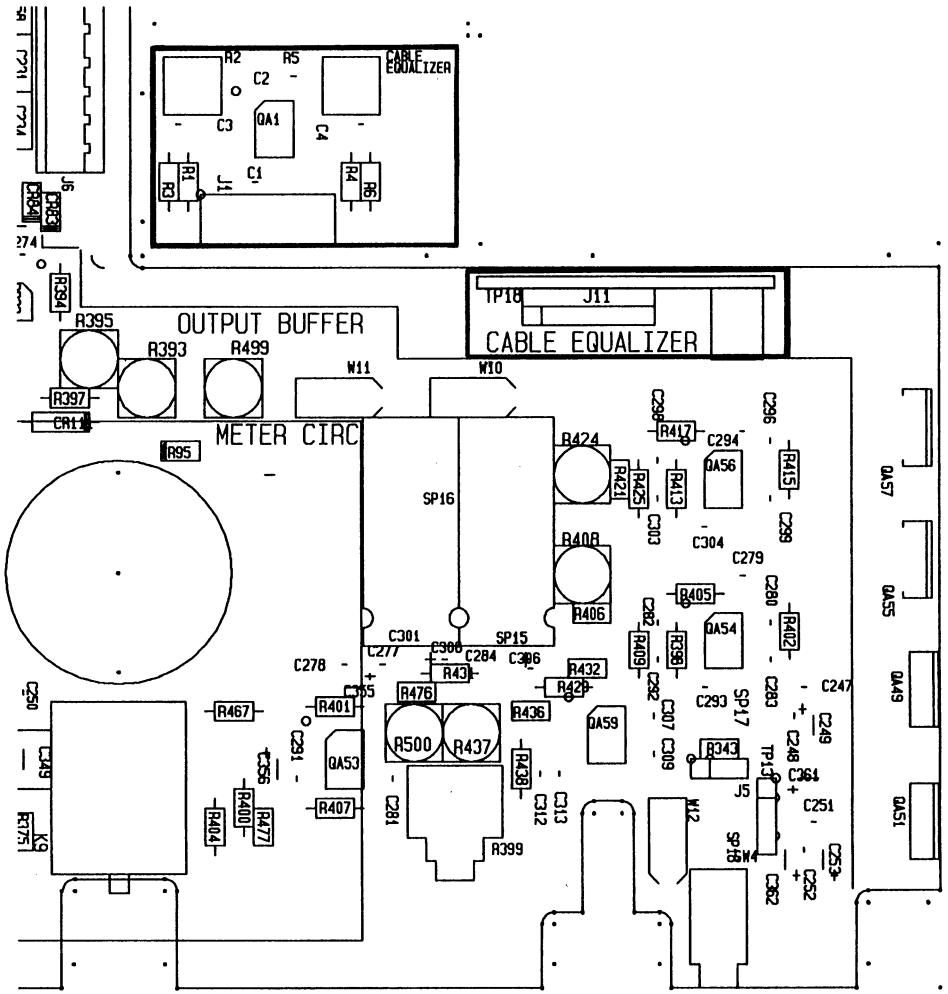

POWER SUPPLY
OUTPUT BUFFER
METER CIRC
MODE SELECTOR
COMPOSITE FILTER
CLOCK GENERATOR
MODULATOR PRE AMPLIFIER
PILOT INTEGRATOR
RDS INPUT
CPU/CONTROL CIRCUIT
LOW PASS M. PHASE EQUALIZER
INPUT SELECT
INPUT AMPLIFIER
RE•TECHNOLOGY AS 902-103 iss.1
S1
S2

Fig. 8.8.3


CABLE EQUALIZER
OUTPUT BUFFER
METER CIRC
CABLE EQUALIZER
TP18
J11
R2
R5
C2
C3
C4
QA1
R1
R3
J1
C1
R4
R6
J6
R394
R395
R393
R499
W11
W10
R397
CR11
R95
SP16
R424
R408
R406
R417
R421
R425
R413
C303
C304
C279
R405
R402
R409
R398
C282
C292
C307
C309
C293
SP17
R343
TP13
J5
W12
SP18
W4
C362
C252
C253
C251
C361
C248
C249
C247
C283
C280
C294
C296
C299
QA56
QA54
QA59
QA57
QA55
QA49
QA51
C301
SP15
C277
C300
C284
C286
C278
C285
R431
R432
R429
R476
R436
R500
R437
R438
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C313
C312
C281
R401
R467
C291
C256
QA53
R400
R477
R404
R407
C250
C249
K9
R375

8.9 Parts List for Main Board

The following pages show the parts list for the main board.

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Main Board (902-103)

CAPACITORS

C 1	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 2	C Ceramic 10p0 2% 100V NP0	213-205
C 3	C Ceramic 10p0 2% 100V NP0	213-205
C 4	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 5	C Ceramic 100n 20% 50V	213-401
C 6	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 7	C Ceramic 100n 20% 50V	213-401
C 8	C Ceramic 100n 20% 50V	213-401
C 9	C Ceramic 22p0 2% 100V NP0	213-206
C 10	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 11	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 12	C Ceramic 100n 20% 50V	213-401
C 13	C Ceramic 100n 20% 50V	213-401
C 14	C Ceramic 10p0 2% 100V NP0	213-205
C 15	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 16	C Ceramic 100n 20% 50V	213-401
C 17	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 18	C Ceramic 100n 20% 50V	213-401
C 19	C Ceramic 100n 20% 50V	213-401
C 20	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 21	C Ceramic 100n 20% 50V	213-401
C 22	C Ceramic 100n 20% 50V	213-401
C 23	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 24	C Ceramic 10p0 2% 100V NP0	213-205
C 25	C Ceramic 10p0 2% 100V NP0	213-205
C 26	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 27	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 28	C Ceramic 100n 20% 50V	213-401
C 29	C Ceramic 10p0 2% 100V NP0	213-205
C 30	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 31	C Ceramic 22p0 2% 100V NP0	213-206
C 32	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 33	C Ceramic 10p0 2% 100V NP0	213-205
C 34	C Ceramic 100n 20% 50V	213-401
C 35	C Ceramic 10p0 2% 100V NP0	213-205
C 36	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 37	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 38	C Ceramic 10p0 2% 100V NP0	213-205
C 39	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 40	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 41	C Ceramic 10p0 2% 100V NP0	213-205
C 42	C Ceramic 10p0 2% 100V NP0	213-205
C 43	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 44	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 45	C Ceramic 10p0 2% 100V NP0	213-205
C 46	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 47	C Polyst 2n00 1% 63V	243-305
C 48	C Polyst 2n00 1% 63V	243-305
C 49	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 50	C Polyst 2n00 1% 63V	243-305

C 51	C Ceramic 10n 1% 50V NPO RM2	213-629
C 52	C Ceramic 100n 20% 50V	213-401
C 53	C Ceramic 100n 20% 50V	213-401
C 54	C Ceramic 100n 20% 50V	213-401
C 55	C Ceramic 100n 20% 50V	213-401
C 56	C Ceramic 10n 1% 50V NPO RM2	213-629
C 57	C Ceramic 10n 1% 50V NPO RM2	213-629
C 58	C Ceramic 10n 1% 50V NPO RM2	213-629
C 59	C Ceramic 10n 1% 50V NPO RM2	213-629
C 60	C Ceramic 10n 1% 50V NPO RM2	213-629
C 61	C Ceramic 10n 1% 50V NPO RM2	213-629
C 62	C Ceramic 10n 1% 50V NPO RM2	213-629
C 63	C Ceramic 10n 1% 50V NPO RM2	213-629
C 64	C Ceramic 10n 1% 50V NPO RM2	213-629
C 65	C Ceramic 100n 20% 50V	213-401
C 66	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 67	C Ceramic 100n 20% 50V	213-401
C 68	C Ceramic 100n 20% 50V	213-401
C 69	C Ceramic 100n 20% 50V	213-401
C 70	C Ceramic 100n 20% 50V	213-401
C 71	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 72	C Ceramic 100n 20% 50V	213-401
C 73	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 74	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 75	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 76	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 77	C Ceramic 100n 20% 50V	213-401
C 78	C Ceramic 100n 20% 50V	213-401
C 79	C Ceramic 100n 20% 50V	213-401
C 80	C Ceramic 100n 20% 50V	213-401
C 81	C Ceramic 100n 20% 50V	213-401
C 82	C Ceramic 100n 20% 50V	213-401
C 83	C Polyst 2n00 1% 63V	243-305
C 84	C Polyst 2n00 1% 63V	243-305
C 85	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 86	C Polyst 2n00 1% 63V	243-305
C 87	C Ceramic 10n 1% 50V NPO RM2	213-629
C 88	C Ceramic 100n 20% 50V	213-401
C 89	C Ceramic 100n 20% 50V	213-401
C 90	C Ceramic 100n 20% 50V	213-401
C 91	C Ceramic 100n 20% 50V	213-401
C 92	C Ceramic 10n 1% 50V NPO RM2	213-629
C 93	C Ceramic 10n 1% 50V NPO RM2	213-629
C 94	C Ceramic 10n 1% 50V NPO RM2	213-629
C 95	C Ceramic 10n 1% 50V NPO RM2	213-629
C 96	C Ceramic 10n 1% 50V NPO RM2	213-629
C 97	C Ceramic 10n 1% 50V NPO RM2	213-629
C 98	C Ceramic 10n 1% 50V NPO RM2	213-629
C 99	C Ceramic 10n 1% 50V NPO RM2	213-629
C 100	C Ceramic 10n 1% 50V NPO RM2	213-629
C 101	C Ceramic 100n 20% 50V	213-401
C 102	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 103	C Ceramic 100n 20% 50V	213-401
C 104	C Ceramic 100n 20% 50V	213-401

C 105	C Ceramic 100n 20% 50V	213-401
C 106	C Ceramic 100n 20% 50V	213-401
C 107	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 108	C Ceramic 100n 20% 50V	213-401
C 109	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 110	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 111	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 112	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 113	C Ceramic 100n 20% 50V	213-401
C 114	C Ceramic 100n 20% 50V	213-401
C 115	C Ceramic 100n 20% 50V	213-401
C 116	C Ceramic 100n 20% 50V	213-401
C 117	C Ceramic 100n 20% 50V	213-401
C 118	C Ceramic 100n 20% 50V	213-401
C 119	C Ceramic 47p0 2% 100V NP0	213-209
C 120	Electrolytic 2000/16, 2000h/85°, A:12.5*30, RM14	260-063
C 121	C Ceramic 10p0 2% 100V NP0	213-205
C 122	Electrolytic 220/35, 2000h/105°, R:10*12.5, RM2	261-092
C 123	Electrolytic 220/35, 2000h/105°, R:10*12.5, RM2	261-092
C 124	C Ceramic 100n 20% 50V	213-401
C 125	C Polyst 2n00 1% 63V	243-305
C 126	C Ceramic 10p0 2% 100V NP0	213-205
C 127	C Ceramic 47p0 2% 100V NP0	213-209
C 128	C Polyst 2n00 1% 63V	243-305
C 129	C Ceramic 100n 20% 50V	213-401
C 130	Electrolytic 220/35, 2000h/105°, R:10*12.5, RM2	261-092
C 131	C Polyst 2n00 1% 63V	243-305
C 132	Factory adjusted	213-000
C 133	Factory adjusted	213-000
C 134	Factory adjusted	213-000
C 135	C Ceramic 10p0 2% 100V NP0	213-205
C 136	Factory adjusted	213-000
C 137	Factory adjusted	213-000
C 138	C Polyst 2n00 1% 63V	243-305
C 139	Electrolytic 220/35, 2000h/105°, R:10*12.5, RM2	261-092
C 140	C Polyst 2n00 1% 63V	243-305
C 141	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 142	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 143	C Polyst 2n00 1% 63V	243-305
C 144	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 145	C Ceramic 10p0 2% 100V NP0	213-205
C 146	C Solid Aluminium 1u0 20% 25V Short Type	265-101
C 147	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 148	C Ceramic 100n 20% 50V	213-401
C 149	C Solid Aluminium 1u0 20% 25V Short Type	265-101
C 150	Factory adjusted	213-000
C 151	C Solid Aluminium 1u0 20% 25V Short Type	265-101
C 152	C Solid Aluminium 1u0 20% 25V Short Type	265-101
C 153	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 154	C Ceramic 100n 20% 50V	213-401
C 155	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 156	C Ceramic 100n 20% 50V	213-401
C 157	C Ceramic 10p0 2% 100V NP0	213-205
C 158	C Ceramic 10p0 2% 100V NP0	213-205

C 159	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 160	C Ceramic 100n 20% 50V	213-401
C 161	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 162	C Ceramic 100n 20% 50V	213-401
C 163	C Ceramic 10p0 2% 100V NP0	213-205
C 164	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 165	C Ceramic 100n 20% 50V	213-401
C 166	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 167	C Ceramic 100n 20% 50V	213-401
C 168	C Ceramic 100n 20% 50V	213-401
C 169	C Ceramic 10p0 2% 100V NP0	213-205
C 170	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 171	C Ceramic 100n 20% 50V	213-401
C 172	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 173	C Ceramic 100n 20% 50V	213-401
C 174	C Ceramic 10p0 2% 100V NP0	213-205
C 175	C Ceramic 10p0 2% 100V NP0	213-205
C 176	C Ceramic 100n 20% 50V	213-401
C 177	C Ceramic 100n 20% 50V	213-401
C 178	C Ceramic 100n 20% 50V	213-401
C 179	C Ceramic 100n 20% 50V	213-401
C 180	C Ceramic 100n 20% 50V	213-401
C 181	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 182	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 183	C Ceramic 100n 20% 50V	213-401
C 184	C Ceramic 100n 20% 50V	213-401
C 185	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 186	C Ceramic 100n 20% 50V	213-401
C 187	C Ceramic 270p 2% 100V N750	213-213
C 188	C Ceramic 10n0 -20+80% 63V	213-020
C 190	C Ceramic 10n0 -20+80% 63V	213-020
C 191	C Ceramic 100n 20% 50V	213-401
C 192	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 193	C Ceramic 10p0 2% 100V NP0	213-205
C 194	C Solid Aluminium 1u0 20% 25V Short Type	265-101
C 195	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 196	C Polystyrene 1n5 1% 63V	243-312
C 197	C Ceramic 22n0 -20+80% 63V	213-011
C 198	MKT, 0.1/63/10, R:2.5*6.5*7.2, RM2	241-070
C 199	C Polystyrene 2n74 1% 63V	243-318
C 200	C Ceramic 10p0 2% 100V NP0	213-205
C 201	C Solid Aluminium 33u 20% 10V Short Type	265-105
C 202	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 203	C Polyst 2n00 1% 63V	243-305
C 204	C Polyst 10n0 1% 63V	243-302
C 205	C Ceramic 22n0 -20+80% 63V	213-011
C 206	MKT, 0.1/63/10, R:2.5*6.5*7.2, RM2	241-070
C 207	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 208	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 209	C Ceramic 100n 20% 50V	213-401
C 210	C Ceramic 100n 20% 50V	213-401
C 211	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 212	C Ceramic 100n 20% 50V	213-401
C 213	C Solid Aluminium 1u0 20% 25V Short Type	265-101

C 215	C Ceramic 100n 20% 50V	213-401
C 216	C Ceramic 100n 20% 50V	213-401
C 217	C Solid Aluminium 33u 20% 10V Short Type	265-105
C 218	C Ceramic 100n 20% 50V	213-401
C 219	C Solid Aluminium 33u 20% 10V Short Type	265-105
C 220	C Ceramic 100n 20% 50V	213-401
C 221	C Ceramic 10p0 2% 100V NP0	213-205
C 222	C Ceramic 10p0 2% 100V NP0	213-205
C 223	C Ceramic 10p0 2% 100V NP0	213-205
C 224	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 225	C Ceramic 100n 20% 50V	213-401
C 226	C Ceramic 100n 20% 50V	213-401
C 227	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 228	C Ceramic 100n 20% 50V	213-401
C 229	C Ceramic 100n 20% 50V	213-401
C 230	C Ceramic 10p0 2% 100V NP0	213-205
C 231	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 232	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 233	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 234	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 235	Electrolytic 4700/40, 2000h/85°, A:25*40, RM18	260-070
C 236	C Ceramic 100n 20% 50V	213-401
C 237	C Ceramic 100n 20% 50V	213-401
C 238	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 239	C Ceramic 1n 5% NP0 63V	213-616
C 240	Electrolytic 4700/40, 2000h/85°, A:25*40, RM18	260-070
C 241	C Ceramic 100n 20% 50V	213-401
C 242	C Ceramic 100n 20% 50V	213-401
C 243	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 244	C Ceramic 270p 2% 100V N750	213-213
C 245	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 246	C Ceramic 270p 2% 100V N750	213-213
C 247	C Ceramic 100n 20% 50V	213-401
C 248	C Ceramic 100n 20% 50V	213-401
C 249	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 250	C Ceramic 33p0 2% 100V NP0	213-208
C 251	C Ceramic 100n 20% 50V	213-401
C 252	C Ceramic 100n 20% 50V	213-401
C 253	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 254	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 255	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 256	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 257	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 258	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 259	Electrolytic 10000/16, 2000h/85°, A:22*40, RM18	260-064
C 260	C Ceramic 100n 20% 50V	213-401
C 261	C Ceramic 100n 20% 50V	213-401
C 262	C Solid Aluminium 33u 20% 10V Short Type	265-105
C 263	C Solid Aluminium 33u 20% 10V Short Type	265-105
C 264	C Ceramic 100n 20% 50V	213-401
C 265	C Ceramic 100n 20% 50V	213-401
C 266	C Ceramic 100n 20% 50V	213-401
C 267	C Ceramic 100n 20% 50V	213-401
C 268	C Ceramic 100n 20% 50V	213-401

C 269	C Ceramic 100n 20% 50V	213-401
C 270	C Ceramic 100n 20% 50V	213-401
C 271	C Ceramic 100n 20% 50V	213-401
C 272	C Ceramic 100n 20% 50V	213-401
C 273	C Ceramic 100n 20% 50V	213-401
C 274	C Ceramic 100n 20% 50V	213-401
C 275	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 276	C Solid Aluminium 2u2 20% 25V Short Type	265-102
C 277	C Ceramic 10p0 2% 100V NP0	213-205
C 278	C Ceramic 100n 20% 50V	213-401
C 279	C Ceramic 10p0 2% 100V NP0	213-205
C 280	C Ceramic 100n 20% 50V	213-401
C 281	C Ceramic 10p0 2% 100V NP0	213-205
C 282	C Ceramic 12p0 ±0p25 100V NPO	213-227
C 283	C Ceramic 22p0 2% 100V NP0	213-206
C 285	C Polyst 2n00 1% 63V	243-305
C 286	C Polyst 2n00 1% 63V	243-305
C 287	C Polyst 2n00 1% 63V	243-305
C 288	C Polyst 2n00 1% 63V	243-305
C 289	C Polyst 2n00 1% 63V	243-305
C 290	C Polyst 2n00 1% 63V	243-305
C 291	C Ceramic 100n 20% 50V	213-401
C 292	C Ceramic 100n 20% 50V	213-401
C 293	C Ceramic 100n 20% 50V	213-401
C 294	C Ceramic 10p0 2% 100V NP0	213-205
C 295	C Ceramic 10p0 2% 100V NP0	213-205
C 296	C Ceramic 100n 20% 50V	213-401
C 297	C Ceramic 100n 20% 50V	213-401
C 298	C Ceramic 12p0 ±0p25 100V NPO	213-227
C 299	C Ceramic 22p0 2% 100V NP0	213-206
C 300	C Ceramic 100n 20% 50V	213-401
C 302	C Ceramic 100n 20% 50V	213-401
C 303	C Ceramic 100n 20% 50V	213-401
C 304	C Ceramic 100n 20% 50V	213-401
C 305	C Ceramic 100n 20% 50V	213-401
C 306	C Ceramic 10p0 2% 100V NP0	213-205
C 307	C Ceramic 100n 20% 50V	213-401
C 308	C Ceramic 12p0 ±0p25 100V NPO	213-227
C 309	C Ceramic 22p0 2% 100V NP0	213-206
C 312	C Ceramic 100n 20% 50V	213-401
C 313	C Ceramic 100n 20% 50V	213-401
C 315	C Ceramic 10p0 2% 100V NP0	213-205
C 316	MKT, 2.2/63/10, R:8.5*15*18, RM6	241-031
C 317	MKT, 0.33/160/10, R:6*12*18, RM6	241-024
C 318	Electrolytic 100/25, 2000h/85°, R:6.3*11, RM2	261-073
C 319	C Solid Aluminium 33u 20% 10V Short Type	265-105
C 320	C Solid Aluminium 33u 20% 10V Short Type	265-105
C 321	C Solid Aluminium 33u 20% 10V Short Type	265-105
C 322	C Ceramic 100n 20% 50V	213-401
C 323	C Ceramic 100n 20% 50V	213-401
C 324	C Ceramic 100n 20% 50V	213-401
C 325	C Ceramic 100n 20% 50V	213-401
C 326	C Ceramic 100n 20% 50V	213-401
C 327	C Ceramic 100n 20% 50V	213-401

C 328	C Ceramic 100n 20% 50V	213-401
C 330	C Ceramic 22p0 2% 100V NP0	213-206
C 331	C Ceramic 22p0 2% 100V NP0	213-206
C 332	C Ceramic 10p0 2% 100V NP0	213-205
C 333	C Ceramic 100n 20% 50V	213-401
C 334	C Ceramic 100n 20% 50V	213-401
C 335	C Ceramic 100n 20% 50V	213-401
C 336	C Ceramic 100n 20% 50V	213-401
C 337	C Ceramic 100n 20% 50V	213-401
C 338	C Ceramic 100n 20% 50V	213-401
C 339	C Ceramic 100n 20% 50V	213-401
C 340	C Ceramic 100n 20% 50V	213-401
C 341	C Ceramic 100n 20% 50V	213-401
C 342	C Ceramic 100n 20% 50V	213-401
C 343	C Ceramic 100n 20% 50V	213-401
C 344	C Ceramic 100n 20% 50V	213-401
C 345	C Ceramic 100n 20% 50V	213-401
C 346	C Ceramic 10n0 -20+80% 63V	213-020
C 347	C Ceramic 330p 2% 100V N750	213-214
C 348	MKT, 0.1/63/10, R:2.5*6.5*7.2, RM2	241-070
C 349	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 350	Electrolytic 220/35, 2000h/105°, R:10*12.5, RM2	261-092
C 353	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 354	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 355	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 356	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 357	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 358	C Ceramic 100n 20% 50V	213-401
C 359	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 360	C Ceramic 100n 20% 50V	213-401
C 361	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 362	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 364	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 365	Electrolytic 220/35, 2000h/105°, R:10*12.5, RM2	261-092
C 366	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 367	C Ceramic 10p0 2% 100V NP0	213-205
C 368	C Ceramic 10p0 2% 100V NP0	213-205
C 369	C Ceramic 2n20 -20+80% 63V	213-012
C 370	C Ceramic 2n20 -20+80% 63V	213-012
C 371	C Ceramic 2n20 -20+80% 63V	213-012
C 372	C Ceramic 2n20 -20+80% 63V	213-012
C 373	C Ceramic 2n20 -20+80% 63V	213-012
C 374	C Ceramic 2n20 -20+80% 63V	213-012
C 375	C Ceramic 2n20 -20+80% 63V	213-012
C 376	C Ceramic 2n20 -20+80% 63V	213-012
C 377	C Ceramic 2n20 -20+80% 63V	213-012
C 378	C Ceramic 2n20 -20+80% 63V	213-012
C 379	C Ceramic 2n20 -20+80% 63V	213-012
C 380	C Ceramic 2n20 -20+80% 63V	213-012
C 381	C Ceramic 2n20 -20+80% 63V	213-012
C 382	C Ceramic 2n20 -20+80% 63V	213-012
C 383	C Ceramic 2n20 -20+80% 63V	213-012
C 384	C Ceramic 2n20 -20+80% 63V	213-012
C 385	C Solid Aluminium 33u 20% 10V Short Type	265-105

C 386	C Solid Aluminium 1u0 20% 25V Short Type	265-101
C 387	Electrolytic 220/35, 2000h/105°, R:10*12.5, RM2	261-092

DIODES

CR 1	Diode 1N3595 SI 100V 100mA	350-415
CR 2	Diode 1N3595 SI 100V 100mA	350-415
CR 3	Diode Zener BZX79-C9V1 0.4W	350-606
CR 4	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 5	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 6	Diode Zener BZX79-C9V1 0.4W	350-606
CR 7	Diode 1N3595 SI 100V 100mA	350-415
CR 8	Diode 1N3595 SI 100V 100mA	350-415
CR 9	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 10	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 11	Diode 1N3595 SI 100V 100mA	350-415
CR 12	Diode 1N3595 SI 100V 100mA	350-415
CR 13	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 14	Diode Zener BZX79-C9V1 0.4W	350-606
CR 15	Diode Zener BZX79-C9V1 0.4W	350-606
CR 16	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 17	Diode 1N3595 SI 100V 100mA	350-415
CR 18	Diode 1N3595 SI 100V 100mA	350-415
CR 19	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 20	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 21	Diode 1N3595 SI 100V 100mA	350-415
CR 22	Diode 1N3595 SI 100V 100mA	350-415
CR 23	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 24	Diode Zener BZX79-C9V1 0.4W	350-606
CR 25	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 26	Diode Zener BZX79-C9V1 0.4W	350-606
CR 27	Diode 1N3595 SI 100V 100mA	350-415
CR 28	Diode 1N3595 SI 100V 100mA	350-415
CR 29	Diode 1N3595 SI 100V 100mA	350-415
CR 30	Diode 1N3595 SI 100V 100mA	350-415
CR 31	Diode Zener BZX79-C9V1 0.4W	350-606
CR 32	Diode Zener BZX79-C9V1 0.4W	350-606
CR 33	Diode 1N3595 SI 100V 100mA	350-415
CR 34	Diode 1N3595 SI 100V 100mA	350-415
CR 35	Diode Zener BZX79-C10V 0.4W	350-657
CR 36	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 37	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 38	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 39	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 40	Diode Zener BZX79-C10V 0.4W	350-657
CR 41	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 42	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 43	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 44	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 45	Diode Zener BZX79-C8V2 0.4W	350-607
CR 46	Diode Zener BZX79-C8V2 0.4W	350-607
CR 47	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 48	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 49	Diode Zener BZX79-C6V2 0.4	350-604

CR 50	Diode Zener BZX79-C6V2 0.4	350-604
CR 51	IC TL431 ADJ. Precision Shunt Regulators	364-849
CR 52	Diode Zener 1N825 C6V2 0.4W	350-637
CR 53	Diode Zener 1N825 C6V2 0.4W	350-637
CR 54	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 55	Diode cap BB809 Vr-28V Ir-10nA	350-063
CR 56	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 57	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 58	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 59	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 60	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 61	LED 3mm red	350-043
CR 62	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 63	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 64	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 65	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 66	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 67	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 68	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 69	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 70	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 71	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 73	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 74	Diode 1N3595 SI 100V 100mA	350-415
CR 75	Diode 1N3595 SI 100V 100mA	350-415
CR 76	Diode 1N3595 SI 100V 100mA	350-415
CR 77	Diode 1N3595 SI 100V 100mA	350-415
CR 78	Diode 1N3595 SI 100V 100mA	350-415
CR 79	Diode 1N3595 SI 100V 100mA	350-415
CR 80	Bridge Rectifier Vin:140V Io:1.9A	340-208
CR 81	IC TL431 ADJ. Precision Shunt Regulators	364-849
CR 82	Bridge Rectifier Vin:140V Io:1.9A	340-208
CR 83	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 84	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 85	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 86	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 89	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 90	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 93	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 94	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 95	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 105	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 106	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 107	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 108	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 109	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 110	Diode Zener BZX79-C9V1 0.4W	350-606
CR 111	Diode Zener BZX79-C4V3 0.4W	350-639
CR 114	Diode BAV10 Si Vr-60V If-600mA	350-022

CONNECTORS

J 3	DIN 41651 Low Profile Headers 40Pol Str.Male PCB	806-015
J 4	Cable For RE521 Frontpanel	618-071
J 5	Cable For RE521 Frontpanel	618-071
J 6	8 Pin AMP mod. I Terminal List, Straight	806-001
J 7	Cable For RE521 Frontpanel	618-071
J 8	4 Pin Connector Male mod II W. Lock	805-901
J 11	Terminal strip 7-pol Mod.II W.lock	805-897

RELAYS & JUMPERS

JP 1	2-pol amp connector	805-951
JP 2	2-pol amp connector	805-951
K 1	Miniature Relay D2 V23042-B1201-B101	570-088
K 3	Miniature Relay D2 V23042-B1201-B101	570-088
K 4	Miniature Relay D2 V23042-B1201-B101	570-088
K 5	Miniature Relay D2 V23042-B1201-B101	570-088
K 6	Miniature Relay D2 V23042-B1201-B101	570-088
K 7	Miniature Relay D2 V23042-B1201-B101	570-088
K 8	Relay Double Throw 4,5V	570-082
K 9	Rotary Switch 2x6 Positions	547-007

CHOKES

L 1	Choke HF Mini 100U/10% 192MA	703-009
L 2	Choke HF Mini 68u 10% 95mA	703-073
L 3	*Potcore Coil	740-016
L 4	Choke HF Mini 100U/10% 192MA	703-009
L 5	RF-choke six-hole core green	731-204
L 6	*Potcore Coil	740-012
L 7	*Potcore Coil	740-013
L 8	*Potcore Coil	740-014
L 9	*Potcore Coil	740-014
L 10	*Potcore Coil	740-014
L 11	*Potcore Coil	740-014
L 12	*Potcore Coil	740-015
L 13	Choke HF Mini 100U/10% 192MA	703-009
L 14	Choke HF Mini 100U/10% 192MA	703-009
L 15	Choke HF Mini 100U/10% 192MA	703-009

METERS

M 1	Panel Meter 2mA	480-297

TRANSISTORS

Q 1	Transistor J109-18 n Fet	360-188
Q 2	Transistor J109-18 n Fet	360-188
Q 3	Transistor J109-18 n Fet	360-188
Q 4	Transistor J109-18 n Fet	360-188
Q 5	Transistor J109-18 n Fet	360-188
Q 6	Transistor J109-18 n Fet	360-188
Q 7	Transistor J109-18 n Fet	360-188

Q 8	Transistor BC547B npn	360-159
Q 9	Transistor BC557B pnp	360-160
Q 10	Transistor BC557B pnp	360-160
Q 11	Transistor J109-18 n Fet	360-188
Q 12	Transistor BC557B pnp	360-160
Q 14	Transistor 2N3904 pnp	360-064
Q 15	Transistor BC547B npn	360-159
Q 16	Transistor BC547B npn	360-159
Q 17	Transistor J175-18 p jfet	360-252
Q 18	Transistor BC557B pnp	360-160
Q 19	LM394 Supermatch Pair	360-273
Q 20	Transistor J109-18 n Fet	360-188
Q 21	Transistor J175-18 p jfet	360-252
Q 24	Transistor J109-18 n Fet	360-188
Q 25	Transistor J175-18 p jfet	360-252
Q 28	Transistor J109-18 n Fet	360-188
Q 29	Transistor J175-18 p jfet	360-252
Q 30	Transistor BSR50 npn	360-201
Q 31	Transistor BSR50 npn	360-201

INTEGRATED ANALOG CIRCUITS

QA 1	IC LM833N Dual Low Noise OPamp	365-037
QA 2	IC LM833N Dual Low Noise OPamp	365-037
QA 3	IC 5534A op amp	364-639
QA 4	IC AD711K OP.AMP	364-792
QA 5	IC AD711K OP.AMP	364-792
QA 6	IC LM833N Dual Low Noise OPamp	365-037
QA 7	IC AD711K OP.AMP	364-792
QA 8	IC 5534A op amp	364-639
QA 9	IC AD711K OP.AMP	364-792
QA 10	IC LM833N Dual Low Noise OPamp	365-037
QA 11	IC AD711K OP.AMP	364-792
QA 12	IC AD711K OP.AMP	364-792
QA 13	IC LM833N Dual Low Noise OPamp	365-037
QA 14	IC AD711K OP.AMP	364-792
QA 15	IC LM833N Dual Low Noise OPamp	365-037
QA 16	IC LM833N Dual Low Noise OPamp	365-037
QA 17	IC LM833N Dual Low Noise OPamp	365-037
QA 18	IC LM833N Dual Low Noise OPamp	365-037
QA 19	IC LM833N Dual Low Noise OPamp	365-037
QA 20	IC LM833N Dual Low Noise OPamp	365-037
QA 21	IC LM833N Dual Low Noise OPamp	365-037
QA 22	IC LM833N Dual Low Noise OPamp	365-037
QA 23	IC LM833N Dual Low Noise OPamp	365-037
QA 24	IC LM833N Dual Low Noise OPamp	365-037
QA 25	IC LM833N Dual Low Noise OPamp	365-037
QA 26	IC LM833N Dual Low Noise OPamp	365-037
QA 27	IC LM833N Dual Low Noise OPamp	365-037
QA 28	IC LM833N Dual Low Noise OPamp	365-037
QA 29	IC LM318N OP-Amp	364-216
QA 30	IC LM833N Dual Low Noise OPamp	365-037
QA 31	IC LM833N Dual Low Noise OPamp	365-037
QA 32	IC 3054 transistor array	364-070

QA 33	IC 3054 transistor array	364-070
QA 34	IC LM833N Dual Low Noise OPamp	365-037
QA 35	IC LM833N Dual Low Noise OPamp	365-037
QA 36	IC LM833N Dual Low Noise OPamp	365-037
QA 37	IC LM324N Quad OP-Amp	364-176
QA 39	IC LM833N Dual Low Noise OPamp	365-037
QA 40	IC LM833N Dual Low Noise OPamp	365-037
QA 41	IC LM311N comparator	364-024
QA 42	IC LM324N Quad OP-Amp	364-176
QA 43	IC LM324N Quad OP-Amp	364-176
QA 44	IC LM833N Dual Low Noise OPamp	365-037
QA 45	IC LM833N Dual Low Noise OPamp	365-037
QA 46	IC LM340T-15 3-terminal positive regulators	364-210
QA 47	IC LM320T-15 3-terminal negative regulators	364-211
QA 48	IC TL084 quad op amp	364-276
QA 49	IC LM340T-15 3-terminal positive regulators	364-210
QA 50	IC LM311N comparator	364-024
QA 51	IC LM320T-15 3-terminal negative regulators	364-211
QA 52	IC 78MO5UC Voltage regulator 5V/1A	364-180
QA 53	IC 5534A op amp	364-639
QA 54	IC 5534A op amp	364-639
QA 55	IC LT1010CT Fast +-150mA Power Buffer	364-813
QA 56	IC 5534A op amp	364-639
QA 57	IC LT1010CT Fast +-150mA Power Buffer	364-813
QA 58	IC LM318N OP-Amp	364-216
QA 59	IC 5534A op amp	364-639
QA 61	IC LM833N Dual Low Noise OPamp	365-037
QA 62	IC LT1010CT Fast +-150mA Power Buffer	364-813
QA 63	IC LM833N Dual Low Noise OPamp	365-037

INTEGRATED DIGITAL CIRCUITS

QD 1	IC 74HC132 Quad 2-InP Nand Schmitt Tigger	364-825
QD 2	IC 74HC14 Hex inv. Schmitt Trig	364-800
QD 3	IC 74HCT574P octal d ff	364-716
QD 4	IC 74HC163P 4-bit binary counter	364-814
QD 5	Prog Prom For RE521/RE524	368-461
QD 7	IC 74HC163P 4-bit binary counter	364-814
QD 8	IC 74HCT574P octal d ff	364-716
QD 9	IC 74HC74P dual d ff	364-755
QD 10	IC 74HC132 Quad 2-InP Nand Schmitt Tigger	364-825
QD 12	Prog μProcessor F.RE521/524	368-462
QD 14	IC X2444 Nonvolatile Static Ram 16x16 bit	364-858
QD 15	IC 74HC540 Octal Buffer/line driver inverting	364-839
QD 16	Darlington Array ULN2003	360-274
QD 17	IC 74HC139 Decoder-Multiplex	364-771
QD 18	IC 74HC14 Hex inv. Schmitt Trig	364-800
QD 19	IC 74HC541 Octal buffer/line driver	364-781
QD 20	Darlington Array ULN2003	360-274
QD 21	IC 74HC541 Octal buffer/line driver	364-781
QD 22	IC TL7702A Supply Voltage supervisors	364-820
QD 23	IC H6052-2 Smart Reset Activ Low	365-168

RESISTORS

R 1	R Metal Film 1K82 1% 0.5W TC50	114-182
R 2	R Metal Film 4K53 1% 0.5W TC50	114-453
R 4	R Metal Film 1K00 5% 0.2W TC250	107-410
R 5	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 6	R Metal Film 33K0 5% 0.2W TC250	107-533
R 7	R Metal Film 464K 1% 0.5W TC50	116-464
R 8	R Metal Film 33E0 5% 0.2W TC250	107-233
R 9	R Metal Film 604E 1% 0.5W TC50	113-604
R 10	R Metal Film 1K00 1% 0.5W TC50	114-100
R 11	R Metal Film 4K53 1% 0.5W TC50	114-453
R 12	R Metal Film 47K5 1% 0.5W TC50	115-475
R 14	R Metal Film 464K 1% 0.5W TC50	116-464
R 15	R Metal Film 1K00 1% 0.5W TC50	114-100
R 16	R Metal Film 33E0 5% 0.2W TC250	107-233
R 17	R Metal Film 4K99 1% 0.5W TC50	114-499
R 18	Potentiometer 10K	180-306
R 19	R Metal Film 182K 1% 0.5W TC50	116-182
R 20	R Metal Film 1K00 5% 0.2W TC250	107-410
R 21	R Metal Film 33K0 5% 0.2W TC250	107-533
R 22	R Metal Film 10K0 1% 0.5W TC50	115-100
R 23	R Metal Film 4K99 1% 0.5W TC50	114-499
R 24	R Metal Film 1K82 1% 0.5W TC50	114-182
R 25	Potentiometer Tandem 2x10K LOG	180-305
R 26	R Metal Film 33E0 5% 0.2W TC250	107-233
R 27	R Metal Film 182K 1% 0.5W TC50	116-182
R 28	R Metal Film 33K0 5% 0.2W TC250	107-533
R 29	R Metal Film 1K82 1% 0.5W TC50	114-182
R 30	R Metal Film 33E0 5% 0.2W TC250	107-233
R 31	R Metal Film 4K53 1% 0.5W TC50	114-453
R 33	R Metal Film 1K00 5% 0.2W TC250	107-410
R 34	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 35	R Metal Film 464K 1% 0.5W TC50	116-464
R 36	R Metal Film 604E 1% 0.5W TC50	113-604
R 37	R Metal Film 1K00 1% 0.5W TC50	114-100
R 38	R Metal Film 4K53 1% 0.5W TC50	114-453
R 39	R Metal Film 47K5 1% 0.5W TC50	115-475
R 41	R Metal Film 464K 1% 0.5W TC50	116-464
R 42	R Metal Film 1K00 1% 0.5W TC50	114-100
R 43	R Metal Film 33K0 5% 0.2W TC250	107-533
R 44	R Metal Film 4K99 1% 0.5W TC50	114-499
R 45	R Metal Film 182K 1% 0.5W TC50	116-182
R 46	R Metal Film 1K00 5% 0.2W TC250	107-410
R 47	R Metal Film 4K99 1% 0.5W TC50	114-499
R 48	R Metal Film 1K82 1% 0.5W TC50	114-182
R 49	R Metal Film 33K0 5% 0.2W TC250	107-533
R 50	R Metal Film 10K0 1% 0.5W TC50	115-100
R 51	R Metal Film 1K82 1% 0.5W TC50	114-182
R 52	R Metal Film 4K53 1% 0.5W TC50	114-453
R 54	R Metal Film 1K00 5% 0.2W TC250	107-410
R 55	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 56	R Metal Film 464K 1% 0.5W TC50	116-464
R 57	R Metal Film 604E 1% 0.5W TC50	113-604

R 58	R Metal Film 1K00 1% 0.5W TC50	114-100
R 59	R Metal Film 33K0 5% 0.2W TC250	107-533
R 60	R Metal Film 4K53 1% 0.5W TC50	114-453
R 61	R Metal Film 47K5 1% 0.5W TC50	115-475
R 63	R Metal Film 464K 1% 0.5W TC50	116-464
R 64	R Metal Film 1K00 1% 0.5W TC50	114-100
R 65	R Metal Film 4K99 1% 0.5W TC50	114-499
R 66	Potentiometer 10K	180-306
R 67	R Metal Film 182K 1% 0.5W TC50	116-182
R 68	R Metal Film 1K00 5% 0.2W TC250	107-410
R 69	R Metal Film 4K99 1% 0.5W TC50	114-499
R 70	R Metal Film 1K82 1% 0.5W TC50	114-182
R 71	Potentiometer Tandem 2x10K LOG	180-305
R 72	R Metal Film 182K 1% 0.5W TC50	116-182
R 73	R Metal Film 1K82 1% 0.5W TC50	114-182
R 74	R Metal Film 4K53 1% 0.5W TC50	114-453
R 76	R Metal Film 1K00 5% 0.2W TC250	107-410
R 77	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 78	R Metal Film 464K 1% 0.5W TC50	116-464
R 79	R Metal Film 604E 1% 0.5W TC50	113-604
R 80	R Metal Film 1K00 1% 0.5W TC50	114-100
R 81	R Metal Film 4K53 1% 0.5W TC50	114-453
R 82	R Metal Film 47K5 1% 0.5W TC50	115-475
R 84	R Metal Film 464K 1% 0.5W TC50	116-464
R 85	R Metal Film 1K00 1% 0.5W TC50	114-100
R 86	R Metal Film 4K99 1% 0.5W TC50	114-499
R 87	R Metal Film 182K 1% 0.5W TC50	116-182
R 88	R Metal Film 1K00 5% 0.2W TC250	107-410
R 89	R Metal Film 4K99 1% 0.5W TC50	114-499
R 90	R Metal Film 1K82 1% 0.5W TC50	114-182
R 91	R Metal Film 6K04 1% 0.5W TC50	114-604
R 92	R Metal Film 6K04 1% 0.5W TC50	114-604
R 93	R Metal Film 7K68 1% 0.5W TC50	114-768
R 94	R Metal Film 10K0 1% 0.5W TC50	115-100
R 95	R Cermet Trimpot 200E 20% 0.5W TC70	182-315
R 96	R Metal Film 4K12 1% 0.5W TC50	114-412
R 97	R Metal Film 820E 5% 0.2W TC250	107-382
R 98	R Cermet Trimpot 2K2 20% 0.5W	182-313
R 99	R Metal Film 53K6 1% 0.5W TC50	115-536
R 100	R Metal Film 10K0 1% 0.5W TC50	115-100
R 101	R Metal Film 6K04 1% 0.5W TC50	114-604
R 102	R Metal Film 7K68 1% 0.5W TC50	114-768
R 103	R Metal Film 768E 1% 0.5W TC50	113-768
R 104	R Metal Film 1K37 1% 0.5W TC50	114-137
R 105	R Metal Film 1K15 1% 0.5W TC50	114-115
R 106	R Metal Film 1K18 1% 0.5W TC50	114-118
R 107	R Metal Film 442E 1% 0.5W TC50	113-442
R 108	R Metal Film 10K0 1% 0.5W TC50	115-100
R 109	R Metal Film 4K53 1% 0.5W TC50	114-453
R 110	R Metal Film 3K74 1% 0.5W TC50	114-374
R 111	R Metal Film 6K04 1% 0.5W TC50	114-604
R 112	R Metal Film 10K5 1% 0.5W TC50	115-105
R 113	R Metal Film 49K9 1% 0.5W TC50	115-499
R 114	R Metal Film 97E6 1% 0.5W TC50	112-976

R 115	R Metal Film 536E 1% 0.5W TC50	113-536
R 116	R Metal Film 732E 1% 0.5W TC50	113-732
R 117	R Metal Film 392E 1% 0.4W TC50	113-392
R 118	R Metal Film 16K9 1% 0.5W TC50	115-169
R 119	R Metal Film 1K00 1% 0.5W TC50	114-100
R 120	R Metal Film 1K00 1% 0.5W TC50	114-100
R 121	R Metal Film 33E0 5% 0.2W TC250	107-233
R 122	R Metal Film 33E0 5% 0.2W TC250	107-233
R 123	R Metal Film 33E0 5% 0.2W TC250	107-233
R 124	R Metal Film 1K00 1% 0.5W TC50	114-100
R 125	R Metal Film 1K00 1% 0.5W TC50	114-100
R 126	R Metal Film 1K00 1% 0.5W TC50	114-100
R 127	R Metal Film 1K00 1% 0.5W TC50	114-100
R 128	R Metal Film 1K00 1% 0.5W TC50	114-100
R 129	R Metal Film 1K00 1% 0.5W TC50	114-100
R 130	R Metal Film 1K02 1% 0.5W TC50	114-102
R 131	R Metal Film 866E 1% 0.5W TC50	113-866
R 132	R Metal Film 33E0 5% 0.2W TC250	107-233
R 133	R Metal Film 33E0 5% 0.2W TC250	107-233
R 134	R Metal Film 33E0 5% 0.2W TC250	107-233
R 135	R Metal Film 1K02 1% 0.5W TC50	114-102
R 136	R Metal Film 768E 1% 0.5W TC50	113-768
R 137	R Cermet Trimpot 47E 20% 0.5W TC70	182-322
R 138	R Cermet Trimpot 47E 20% 0.5W TC70	182-322
R 139	R Metal Film 6K04 1% 0.5W TC50	114-604
R 140	R Metal Film 6K04 1% 0.5W TC50	114-604
R 141	R Metal Film 7K68 1% 0.5W TC50	114-768
R 142	R Metal Film 10K0 1% 0.5W TC50	115-100
R 143	R Cermet Trimpot 200E 20% 0.5W TC70	182-315
R 144	R Metal Film 4K12 1% 0.5W TC50	114-412
R 145	R Metal Film 820E 5% 0.2W TC250	107-382
R 146	R Cermet Trimpot 2K2 20% 0.5W	182-313
R 147	R Metal Film 53K6 1% 0.5W TC50	115-536
R 148	R Metal Film 10K0 1% 0.5W TC50	115-100
R 149	R Metal Film 6K04 1% 0.5W TC50	114-604
R 150	R Metal Film 7K32 1% 0.5W TC50	114-732
R 151	R Metal Film 768E 1% 0.5W TC50	113-768
R 152	R Metal Film 1K37 1% 0.5W TC50	114-137
R 153	R Metal Film 1K15 1% 0.5W TC50	114-115
R 154	R Metal Film 1K18 1% 0.5W TC50	114-118
R 155	R Metal Film 442E 1% 0.5W TC50	113-442
R 156	R Metal Film 10K0 1% 0.5W TC50	115-100
R 157	R Metal Film 4K53 1% 0.5W TC50	114-453
R 158	R Metal Film 3K74 1% 0.5W TC50	114-374
R 159	R Metal Film 6K04 1% 0.5W TC50	114-604
R 160	R Metal Film 10K5 1% 0.5W TC50	115-105
R 161	R Metal Film 49K9 1% 0.5W TC50	115-499
R 162	R Metal Film 97E6 1% 0.5W TC50	112-976
R 163	R Metal Film 536E 1% 0.5W TC50	113-536
R 164	R Metal Film 732E 1% 0.5W TC50	113-732
R 165	R Metal Film 392E 1% 0.4W TC50	113-392
R 166	R Metal Film 16K9 1% 0.5W TC50	115-169
R 167	R Metal Film 1K00 1% 0.5W TC50	114-100
R 168	R Metal Film 1K00 1% 0.5W TC50	114-100

R 169	R Metal Film 33E0 5% 0.2W TC250	107-233
R 170	R Metal Film 33E0 5% 0.2W TC250	107-233
R 171	R Metal Film 33E0 5% 0.2W TC250	107-233
R 172	R Metal Film 1K00 1% 0.5W TC50	114-100
R 173	R Metal Film 1K00 1% 0.5W TC50	114-100
R 174	R Metal Film 1K00 1% 0.5W TC50	114-100
R 175	R Metal Film 1K00 1% 0.5W TC50	114-100
R 176	R Metal Film 1K00 1% 0.5W TC50	114-100
R 177	R Metal Film 1K00 1% 0.5W TC50	114-100
R 178	R Metal Film 1K02 1% 0.5W TC50	114-102
R 179	R Metal Film 866E 1% 0.5W TC50	113-866
R 180	R Metal Film 33E0 5% 0.2W TC250	107-233
R 181	R Metal Film 33E0 5% 0.2W TC250	107-233
R 182	R Metal Film 33E0 5% 0.2W TC250	107-233
R 183	R Metal Film 1K02 1% 0.5W TC50	114-102
R 184	R Metal Film 768E 1% 0.5W TC50	113-768
R 185	R Cermet Trimpot 47E 20% 0.5W TC70	182-322
R 186	R Cermet Trimpot 47E 20% 0.5W TC70	182-322
R 187	R Metal Film 3K74 1% 0.5W TC50	114-374
R 188	R Metal Film 12K7 1% 0.5W TC50	115-127
R 189	R Metal Film 787K 1% 0.5W TC50	116-787
R 190	R Metal Film 1K50 5% 0.2W TC250	107-415
R 191	R Metal Film 4K70 5% 0.2W TC250	107-447
R 192	R Metal Film 787K 1% 0.5W TC50	116-787
R 193	R Metal Film 12K7 1% 0.5W TC50	115-127
R 194	R Metal Film 2K43 1% 0.5W TC50	114-243
R 195	R Metal Film 10K0 1% 0.5W TC50	115-100
R 196	R Metal Film 220E 5% 0.2W TC250	107-322
R 197	R Metal Film 1K80 5% 0.2W TC250	107-418
R 198	R Metal Film 3K90 5% 0.2W TC250	107-439
R 199	R Metal Film 1K80 5% 0.2W TC250	107-418
R 200	R Metal Film 16K9 1% 0.5W TC50	115-169
R 201	R Metal Film 1K50 5% 0.2W TC250	107-415
R 202	R Metal Film 2K05 1% 0.4W TC50	114-205
R 203	R Metal Film 2K20 5% 0.2W TC250	107-422
R 204	R Cermet Trimpot 10K 20% 0.5W TC70	182-301
R 205	R Metal Film 1K00 1% 0.5W TC50	114-100
R 206	R Metal Film 33K0 5% 0.2W TC250	107-533
R 207	R Metal Film 12K7 1% 0.5W TC50	115-127
R 208	R Metal Film 82K5 1% 0.5W TC50	115-825
R 209	R Cermet Trimpot 22K 20% 0.3W TC70	182-303
R 210	R Metal Film 680E 5% 0.2W TC250	107-368
R 211	R Metal Film 82K5 1% 0.5W TC50	115-825
R 212	R Cermet Trimpot 22K 20% 0.3W TC70	182-303
R 213	R Metal Film 787K 1% 0.5W TC50	116-787
R 214	R Metal Film 2K05 1% 0.4W TC50	114-205
R 215	R Metal Film 787K 1% 0.5W TC50	116-787
R 216	R Metal Film 1K20 5% 0.2W TC250	107-412
R 217	R Metal Film 1K20 5% 0.2W TC250	107-412
R 218	R Metal Film 12K7 1% 0.5W TC50	115-127
R 219	R Metal Film 2K43 1% 0.5W TC50	114-243
R 220	R Metal Film 1K20 5% 0.2W TC250	107-412
R 221	R Metal Film 1K20 5% 0.2W TC250	107-412
R 222	R Metal Film 220E 5% 0.2W TC250	107-322

R 223	R Metal Film 150E 5% 0.2W TC250	107-315
R 224	R Metal Film 150E 5% 0.2W TC250	107-315
R 225	R Metal Film 100E 5% 0.2W TC250	107-310
R 226	R Metal Film 100E 5% 0.2W TC250	107-310
R 227	R Metal Film 150E 5% 0.2W TC250	107-315
R 228	R Metal Film 150E 5% 0.2W TC250	107-315
R 229	R Metal Film 33K0 5% 0.2W TC250	107-533
R 230	R Metal Film 10K0 1% 0.5W TC50	115-100
R 231	R Metal Film 10K0 0.1% 0.1W TC25	141-010
R 232	R Metal Film 10K0 0.1% 0.1W TC25	141-010
R 233	R Metal Film 1M00 1% 0.5W TC50	117-100
R 234	R Metal Film 60K4 1% 0.5W TC50	115-604
R 235	R Metal Film 10K7 0.5% 0.4W TC50	140-840
R 236	R Metal Film 10K0 0.1% 0.1W TC25	141-010
R 237	R Metal Film 215K 1% 0.5W TC50	116-215
R 238	R Metal Film 681K 1% 0.5W TC50	116-681
R 239	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 240	R Cermet Trimpot 47K 20% 0.5W TC70	182-314
R 241	R Carbon Film 15M 10% 1/8W 140PPM	109-016
R 242	R Metal Film 3K01 1% 0.5W TC50	114-301
R 243	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 244	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 245	R Metal Film 3K01 1% 0.5W TC50	114-301
R 246	R Metal Film 10K0 1% 0.5W TC50	115-100
R 247	R Metal Film 2K20 5% 0.2W TC250	107-422
R 248	R Metal Film 560E 5% 0.2W TC250	107-356
R 249	R Metal Film 47E0 5% 0.2W TC250	107-247
R 250	R Metal Film 47E0 5% 0.2W TC250	107-247
R 251	R Metal Film 47E0 5% 0.2W TC250	107-247
R 252	R Metal Film 47E0 5% 0.2W TC250	107-247
R 253	R Metal Film 4K42 1% 0.5W TC50	114-442
R 254	R Metal Film 2K21 1% 0.5W TC50	114-221
R 255	R Metal Film 3K01 1% 0.5W TC50	114-301
R 256	R Metal Film 3K01 1% 0.5W TC50	114-301
R 257	R Metal Film 47E0 5% 0.2W TC250	107-247
R 258	R Metal Film 47E0 5% 0.2W TC250	107-247
R 259	R Metal Film 4K42 1% 0.5W TC50	114-442
R 260	R Metal Film 3K01 1% 0.5W TC50	114-301
R 261	R Metal Film 3K01 1% 0.5W TC50	114-301
R 262	R Metal Film 1K47 1% 0.5W TC50	114-147
R 263	R Metal Film 47E0 5% 0.2W TC250	107-247
R 264	R Metal Film 47E0 5% 0.2W TC250	107-247
R 265	R Metal Film 4K42 1% 0.5W TC50	114-442
R 266	R Metal Film 2K21 1% 0.5W TC50	114-221
R 267	R Metal Film 3K01 1% 0.5W TC50	114-301
R 268	R Metal Film 4K42 1% 0.5W TC50	114-442
R 269	R Metal Film 3K01 1% 0.5W TC50	114-301
R 270	R Metal Film 10K0 1% 0.5W TC50	115-100
R 271	R Thick Film SIL 4*10K 5% 0.1W	146-017
R 273	R Metal Film 1K00 1% 0.5W TC50	114-100
R 274	R Metal Film 1K00 5% 0.2W TC250	107-410
R 275	R Metal Film 4K99 1% 0.5W TC50	114-499
R 276	R Cermet Trimpot 1K 10% 0.5W TC70	182-310
R 277	R Metal Film 4K99 1% 0.5W TC50	114-499

R 278	R Thick Film SIL 4*10K 5% 0.1W	146-017
R 279	R Metal Film 33E0 5% 0.2W TC250	107-233
R 280	R Metal Film 22K0 5% 0.2W TC250	107-522
R 281	R Metal Film 68K0 5% 0.2W TC250	107-568
R 282	R Metal Film 560E 5% 0.2W TC250	107-356
R 283	R Metal Film 22K0 5% 0.2W TC250	107-522
R 284	R Metal Film 33E0 5% 0.2W TC250	107-233
R 285	R Metal Film 470E 5% 0.2W TC250	107-347
R 286	R Metal Film 100K 5% 0.2W TC250	107-610
R 287	R Metal Film 8K66 1% 0.5W TC50	114-866
R 288	R Metal Film 1K00 5% 0.2W TC250	107-410
R 289	R Metal Film 1K00 5% 0.2W TC250	107-410
R 290	R Metal Film 10K0 5% 0.2W TC250	107-510
R 291	R Cermet Trimpot 10K 20% 0.5W TC70	182-301
R 292	R Metal Film 100K 5% 0.2W TC250	107-610
R 293	R Cermet Trimpot 10K 20% 0.75W TC70	182-320
R 294	R Metal Film 17K4 1% 0.5W TC50	115-174
R 295	R Metal Film 4K99 1% 0.5W TC50	114-499
R 296	R Metal Film 10K0 1% 0.5W TC50	115-100
R 297	R Metal Film 20K0 1% 0.5W TC50	115-200
R 298	R Metal Film 15K0 1% 0.5W TC50	115-150
R 299	R Metal Film 24K9 1% 0.5W TC50	115-249
R 300	R Metal Film 51K1 1% 0.5W TC50	115-511
R 301	R Metal Film 13E7 1% 0.5W TC50	112-137
R 302	R Metal Film 1K00 5% 0.2W TC250	107-410
R 303	R Metal Film 22K1 1% 0.5W TC50	115-221
R 304	R Metal Film 27K4 1% 0.5W TC50	115-274
R 305	R Metal Film 10K0 5% 0.2W TC250	107-510
R 306	R Metal Film 100E 5% 0.2W TC250	107-310
R 307	R Metal Film 1M00 1% 0.5W TC50	117-100
R 308	R Metal Film 15K0 1% 0.5W TC50	115-150
R 309	R Metal Film 221K 1% 0.5W TC50	116-221
R 310	R Metal Film 4K70 5% 0.2W TC250	107-447
R 311	R Metal Film 10K7 1% 0.5W TC50	115-107
R 312	R Metal Film 470E 5% 0.2W TC250	107-347
R 313	R Metal Film 1K00 5% 0.2W TC250	107-410
R 314	R Metal Film 10K0 5% 0.2W TC250	107-510
R 315	R Metal Film 10K0 5% 0.2W TC250	107-510
R 316	R Metal Film 1K00 5% 0.2W TC250	107-410
R 317	R Metal Film 22K1 1% 0.5W TC50	115-221
R 318	R Metal Film 27K4 1% 0.5W TC50	115-274
R 319	R Metal Film 33K0 5% 0.2W TC250	107-533
R 320	R Metal Film 47K0 5% 0.2W TC250	107-547
R 321	Potentiometer 10K	180-306
R 322	R Metal Film 221K 1% 0.5W TC50	116-221
R 323	R Metal Film 12K1 1% 0.5W TC50	115-121
R 324	R Cermet Trimpot 10K 20% 0.5W TC70	182-301
R 325	R Metal Film 270K 5% 0.2W TC250	107-627
R 326	R Metal Film 47K5 1% 0.5W TC50	115-475
R 327	R Metal Film 47K0 5% 0.2W TC250	107-547
R 328	R Metal Film 33E0 5% 0.2W TC250	107-233
R 329	R Metal Film 4K70 5% 0.2W TC250	107-447
R 330	R Metal Film 15K0 5% 0.2W TC250	107-515
R 331	R Metal Film 33E0 5% 0.2W TC250	107-233

R 332	R Metal Film 330E 5% 0.2W TC250	107-333
R 333	R Metal Film 2K70 5% 0.2W TC250	107-427
R 334	R Thick Film SIL 8*18K	146-008
R 335	R Thick Film SIL 8*18K	146-008
R 336	R Thick Film DIL 8*560E 2% 0.2W	146-019
R 337	R Thick Film DIL 8*560E 2% 0.2W	146-019
R 338	R Metal Film 10K0 5% 0.2W TC250	107-510
R 339	R Thick Film SIL 8*18K	146-008
R 341	R Thick Film DIL 8*390E 2% 0.2W	146-020
R 342	R Metal Film 13E7 1% 0.5W TC50	112-137
R 343	R Metal Film 390E 5% 0.2W TC250	107-339
R 344	R Metal Film 10K0 5% 0.2W TC250	107-510
R 345	R Metal Film 10K0 5% 0.2W TC250	107-510
R 346	R Metal Film 475E 1% 0.5W TC50	113-475
R 347	R Metal Film 10K0 1% 0.5W TC50	115-100
R 348	R Metal Film 2K05 1% 0.4W TC50	114-205
R 349	R Metal Film 825E 1% 0.4W TC50	113-825
R 350	R Metal Film 464K 1% 0.5W TC50	116-464
R 351	R Metal Film 2K05 1% 0.4W TC50	114-205
R 352	R Metal Film 475E 1% 0.5W TC50	113-475
R 353	Potentiometer 10K	180-306
R 354	R Metal Film 2K05 1% 0.4W TC50	114-205
R 355	R Metal Film 2K05 1% 0.4W TC50	114-205
R 356	R Metal Film 5K36 1% 0.5W TC50	114-536
R 357	R Metal Film 10K0 1% 0.5W TC50	115-100
R 358	R Metal Film 464K 1% 0.5W TC50	116-464
R 359	R Metal Film 2K05 1% 0.4W TC50	114-205
R 360	Potentiometer 10K	180-306
R 361	R Metal Film 2K05 1% 0.4W TC50	114-205
R 362	R Metal Film 2K05 1% 0.4W TC50	114-205
R 363	R Metal Film 5K36 1% 0.5W TC50	114-536
R 364	R Metal Film 33E0 5% 0.2W TC250	107-233
R 365	R Metal Film 475E 1% 0.5W TC50	113-475
R 366	R Metal Film 33E0 5% 0.2W TC250	107-233
R 367	R Metal Film 10K0 1% 0.5W TC50	115-100
R 368	R Metal Film 464K 1% 0.5W TC50	116-464
R 369	R Metal Film 2K05 1% 0.4W TC50	114-205
R 370	Potentiometer 10K	180-306
R 371	R Metal Film 2K05 1% 0.4W TC50	114-205
R 372	R Metal Film 5K36 1% 0.5W TC50	114-536
R 373	R Metal Film 1K00 5% 0.2W TC250	107-410
R 374	Sensistor 2K AT 25C PTC KTY 10-7	160-055
R 375	R Metal Film 47K0 5% 0.2W TC250	107-547
R 376	R Metal Film 1K00 1% 0.5W TC50	114-100
R 377	R Metal Film 100E 5% 0.2W TC250	107-310
R 378	R Metal Film 1K58 1% 0.5W TC50	114-158
R 379	R Metal Film 549K 1% 0.5W TC50	116-549
R 380	R Metal Film 100E 5% 0.2W TC250	107-310
R 381	R Metal Film 48K7 1% 0.5W TC50	115-487
R 382	R Metal Film 4K99 1% 0.5W TC50	114-499
R 383	R Metal Film 1K00 5% 0.2W TC250	107-410
R 384	R Metal Film 33E0 5% 0.2W TC250	107-233
R 385	R Metal Film 3K01 1% 0.5W TC50	114-301
R 386	R Metal Film 1K00 5% 0.2W TC250	107-410

R 387	R Cermet Trimpot 4K7 20% 0.5W TC70	182-312
R 388	R Metal Film 110K 1% 0.5W TC50	116-110
R 389	R Metal Film 1K00 5% 0.2W TC250	107-410
R 390	R Metal Film 1M00 1% 0.5W TC50	117-100
R 391	R Metal Film 887E 1% 0.5W TC50	113-887
R 392	R Metal Film 4K99 1% 0.5W TC50	114-499
R 393	R Cermet Trimpot 200E 20% 0.5W TC70	182-315
R 394	R Metal Film 681E 1% 0.5W TC50	113-681
R 395	R Cermet Trimpot 470E 20% 0.5W TC70	182-302
R 396	R Metal Film 4K70 5% 0.2W TC250	107-447
R 397	R Metal Film 499E 1% 0.5W TC50	113-499
R 398	R Metal Film 2K00 1% 0.5W TC50	114-200
R 399	R Potentiometer 1K 20% 1W	180-307
R 400	R Metal Film 7K68 1% 0.5W TC50	114-768
R 401	R Metal Film 2K74 1% 0.5W TC50	114-274
R 402	R Metal Film 48E7 1% 0.5W TC50	112-487
R 403	R Metal Film 1K30 1% 0.5W TC50	114-130
R 404	R Metal Film 1K30 1% 0.5W TC50	114-130
R 405	R Metal Film 2K00 1% 0.5W TC50	114-200
R 406	R Metal Film 1M00 5% 0.2W TC250	107-710
R 407	R Metal Film 649E 1% 0.5W TC50	113-649
R 408	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 409	R Metal Film 1K00 1% 0.5W TC50	114-100
R 410	R Metal Film 2K55 1% 0.5W TC50	114-255
R 411	R Metal Film 4K70 5% 0.2W TC250	107-447
R 412	R Metal Film 33K0 5% 0.2W TC250	107-533
R 413	R Metal Film 2K00 1% 0.5W TC50	114-200
R 414	R Metal Film 33K0 5% 0.2W TC250	107-533
R 415	R Metal Film 48E7 1% 0.5W TC50	112-487
R 416	R Metal Film 3K01 1% 0.5W TC50	114-301
R 417	R Metal Film 2K00 1% 0.5W TC50	114-200
R 420	R Metal Film 1K50 1% 0.5W TC50	114-150
R 421	R Metal Film 1M00 5% 0.2W TC250	107-710
R 423	R Metal Film 1M00 5% 0.2W TC250	107-710
R 424	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 425	R Metal Film 1K00 1% 0.5W TC50	114-100
R 426	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 427	R Metal Film 1K21 1% 0.5W TC50	114-121
R 428	R Metal Film 33K0 5% 0.2W TC250	107-533
R 429	R Metal Film 2K00 1% 0.5W TC50	114-200
R 430	R Metal Film 33K0 5% 0.2W TC250	107-533
R 431	R Metal Film 2K00 1% 0.5W TC50	114-200
R 432	R Metal Film 100E 5% 0.2W TC250	107-310
R 435	R Metal Film 20K0 1% 0.5W TC50	115-200
R 436	R Metal Film 1M00 5% 0.2W TC250	107-710
R 437	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 438	R Metal Film 1K00 1% 0.5W TC50	114-100
R 447	R Metal Film 9K31 1% 0.5W TC50	114-931
R 448	R Metal Film 48E7 1% 0.5W TC50	112-487
R 449	R Metal Film 33K0 5% 0.2W TC250	107-533
R 450	R Metal Film 33K0 5% 0.2W TC250	107-533
R 451	R Metal Film 1K87 1% 0.5W TC50	114-187
R 452	R Metal Film 4E02 1% 0.5W TC50	111-402
R 453	R Metal Film 3K01 1% 0.5W TC50	114-301

R 454	R Metal Film 4E02 1% 0.5W TC50	111-402
R 455	R Metal Film 2K05 1% 0.4W TC50	114-205
R 456	R Metal Film 470K 5% 0.2W TC250	107-647
R 457	R Metal Film 1K00 5% 0.2W TC250	107-410
R 458	R Metal Film 100K 5% 0.2W TC250	107-610
R 459	R Metal Film 56K0 5% 0.2W TC250	107-556
R 460	R Metal Film 100K 5% 0.2W TC250	107-610
R 461	R Metal Film 10K0 5% 0.2W TC250	107-510
R 462	R Metal Film 10M 1% TC50 0.6W	118-100
R 463	R Metal Film 10K0 5% 0.2W TC250	107-510
R 464	R Metal Film 10K0 5% 0.2W TC250	107-510
R 465	R Metal Film 2K70 5% 0.2W TC250	107-427
R 466	R Thick Film SIL 8*10K	146-003
R 467	R Metal Film 825E 1% 0.4W TC50	113-825
R 468	R Metal Film 1K21 1% 0.5W TC50	114-121
R 469	R Metal Film 182K 1% 0.5W TC50	116-182
R 470	R Cermet Trimpot 10K 20% 0.5W TC70	182-301
R 471	R Metal Film 182K 1% 0.5W TC50	116-182
R 472	R Cermet Trimpot 10K 20% 0.5W TC70	182-301
R 473	R Metal Film 2K10 1% 0.5W TC50	114-210
R 474	R Metal Film 33E0 5% 0.2W TC250	107-233
R 475	R Metal Film 33E0 5% 0.2W TC250	107-233
R 476	R Metal Film 33E0 5% 0.2W TC250	107-233
R 477	R Metal Film 33E0 5% 0.2W TC250	107-233
R 478	R Metal Film 33E0 5% 0.2W TC250	107-233
R 479	R Metal Film 33E0 5% 0.2W TC250	107-233
R 480	R Metal Film 10K0 1% 0.5W TC50	115-100
R 481	R Cermet Trimpot 10K 20% 0.5W TC70	182-301
R 482	R Metal Film 3K01 1% 0.5W TC50	114-301
R 483	R Metal Film 2K05 1% 0.4W TC50	114-205
R 485	Sensistor 2K AT 25C PTC KTY 10-7	160-055
R 486	R Metal Film 464E 1% 0.4W TC50	113-464
R 487	R Metal Film 27K4 1% 0.5W TC50	115-274
R 488	R Metal Film 5K49 1% 0.5W TC50	114-549
R 489	R Metal Film 825K 1% 0.5W TC50	116-825
R 490	R Metal Film 10K0 5% 0.2W TC250	107-510
R 491	R Metal Film 3K01 1% 0.5W TC50	114-301
R 492	R Metal Film 27K4 1% 0.5W TC50	115-274
R 493	R Metal Film 1K00 5% 0.2W TC250	107-410
R 494	R Cermet Trimpot 1K 10% 0.5W TC70	182-310
R 495	R Cermet Trimpot 470E 20% 0.5W TC70	182-302
R 496	R Cermet Trimpot 470E 20% 0.5W TC70	182-302
R 497	R Cermet Trimpot 470E 20% 0.5W TC70	182-302
R 498	R Metal Film 1K00 5% 0.2W TC250	107-410
R 499	R Cermet Trimpot 1K 10% 0.5W TC70	182-310
R 500	R Cermet Trimpot 1K 10% 0.5W TC70	182-310
R 501	R Metal Film 124E 1% 0.4W TC50	113-124
R 502	R Metal Film 470E 5% 0.2W TC250	107-347
R 503	R Metal Film 470E 5% 0.2W TC250	107-347
R 504	R Metal Film 470E 5% 0.2W TC250	107-347
R 505	R Metal Film 470E 5% 0.2W TC250	107-347
R 506	R Metal Film 470E 5% 0.2W TC250	107-347
R 507	R Metal Film 470E 5% 0.2W TC250	107-347
R 508	R Metal Film 470E 5% 0.2W TC250	107-347

R 509	R Metal Film 470E 5% 0.2W TC250	107-347
R 510	R Metal Film 470E 5% 0.2W TC250	107-347
R 511	R Metal Film 470E 5% 0.2W TC250	107-347
R 512	R Metal Film 470E 5% 0.2W TC250	107-347
R 513	R Metal Film 470E 5% 0.2W TC250	107-347
R 514	R Metal Film 470E 5% 0.2W TC250	107-347
R 515	R Metal Film 470E 5% 0.2W TC250	107-347
R 516	R Metal Film 470E 5% 0.2W TC250	107-347
R 517	R Metal Film 470E 5% 0.2W TC250	107-347
R 518	R Metal Film 1E00 1% 0.4W TC50	111-100

TRANSFORMERS

T 1	AF Output Transformer ST5847	772-014

TESTPOINTS

TP 1	3 Pin AMP mod II Terminal List, Straight	805-894
TP 2	3 Pin AMP mod II Terminal List, Straight	805-894
TP 3	3 Pin AMP mod II Terminal List, Straight	805-894
TP 4	3 Pin AMP mod II Terminal List, Straight	805-894
TP 5	3 Pin AMP mod II Terminal List, Straight	805-894
TP 6	3 Pin AMP mod II Terminal List, Straight	805-894
TP 7	3 Pin AMP mod II Terminal List, Straight	805-894
TP 8	3 Pin AMP mod II Terminal List, Straight	805-894
TP 9	3 Pin AMP mod II Terminal List, Straight	805-894
TP 10	3 Pin AMP mod II Terminal List, Straight	805-894
TP 11	3 Pin AMP mod II Terminal List, Straight	805-894
TP 12	3 Pin AMP mod II Terminal List, Straight	805-894
TP 13	4 Pin Connector Male mod II W. Lock	805-901
TP 14	Term. strip 50pol mod 2	806-072
TP 15	3 Pin AMP mod II Terminal List, Straight	805-894
TP 16	6 Pin Connector Male mod II W. Lock	805-896
TP 17	3 Pin AMP mod II Terminal List, Straight	805-894
TP 18	Term. strip 50pol mod 2	806-072

CABLES

W 1	Cable For RE521 A&B Input	618-074
W 2	Cable For RE521 A&B Input	618-074
W 3	Cable For RE521 A&B Input	618-074
W 4	Cable For RE521 A&B Input	618-074
W 5	Term. strip 50pol mod 2	806-072
W 6	Term. strip 50pol mod 2	806-072
W 7	Cable For RE521 Aux 1 Aud 2	618-072
W 8	Cable For RE521 Aux 1 Aud 2	618-072
W 9	Cable For RE521 Aux 1 Aud 2	618-072
W 10	Cable For RE521 MPX-OUT	618-073
W 11	Cable For RE521 MPX-OUT	618-073
W 13	Term. strip 50pol mod 2	806-072
W 14	Cable For RE521 Mono Output	618-075

CRYSTALS

Y 1	Crystal 4.56 MHz	910-105
Y 2	X-Tal 2.4576MHz 50ppm	910-248

MISCELLANEOUS

	Screw Pozidrive panhead M3x6	008-306
	Screw Pozidrive panhead M3x35	008-335
	Screw Pozidrive panhead M5x30	008-530
	Nut hexagon M2,5	031-250
	Nut Rectangular M3 for to220	035-909
	Threadad Socket M3X25	037-325
	Lock washer D2,7/4,8x0,45	046-404
	Lock washer D5,3/9x0,6	046-408
	Scale For RE521	484-087
	D-Sub access, screw lock for chassis	805-470
	AMP mod IV 4 Pin Housing	805-854
	AMP mod I 8 Pin Housing	805-909
	Connector 10p Male 29mm	806-052
	Socket DIL 14 pol, h:4.95 300mil	816-131
	Mounting Acc. for TO-220	816-163
	Socket DIL 40 pol, h:4.95 600mil	816-179
	Socket DIL 20 pol, h:4.95 300mil	816-184
	Insulation Bushing F. TO-220	816-214
	Heat Sink for TO-220 Case - FK216/SA-CB	816-250
	Isolating Plate F.Crystal	816-287
	TY-Wrap 150X3.6mm	832-200
	Attachment for TY-Wrap	832-204
	Angle For Potmeter RE521	933-060
	Angle For RE521	933-062
	Angle For 9 Potmeter For RE521	933-066
	PCB For RE521 Mainboart''	971-522
	Pcb F.RE52X Cable Equalizer	971-544
	Diagram F.RE521 Stereo Coder	985-469
C1.C	C Ceramic 100n 20% 50V	213-401
C2.C	C Ceramic 100n 20% 50V	213-401
C3.C	C Ceramic 150p 2% 100V N750	213-212
C4.C	C Ceramic 150p 2% 100V N750	213-212
CR1.F1	LED 3mm green	350-060
CR1.F2	LED 3mm red	350-043
CR2.F1	LED 3mm green	350-060
CR2.F2	LED 3mm green	350-060
CR3.F1	LED 3mm red	350-043
CR4.F1	LED 3mm red	350-043
CR5.F1	LED 3mm red	350-043
J1.C	Conn 7 Pol W.Cat Ear Ter	806-151
QA1.C	IC LM833N Dual Low Noise OPamp	365-037
R1.C	R Metal Film 1K30 1% 0.5W TC50	114-130
R2.C	R Cermet Trimpot 1K 20% 0.75W TC70	182-325
R3.C	R Metal Film 33K2 1% 0.5W TC50	115-332
R4.C	R Metal Film 1K30 1% 0.5W TC50	114-130
R5.C	R Cermet Trimpot 1K 20% 0.75W TC70	182-325
R6.C	R Metal Film 33K2 1% 0.5W TC50	115-332

SW 1	Toggle Switch For PCB W/Loch	500-203
SW 2	Toggle Switch For PCB W/Loch	500-203
SW 4	Toggle Switch For PCB W/Loch	500-203
SW 5	Toggle Switch For PCB W/Loch	500-203
SW 6	Toggle Switch For PCB W/Loch	500-203

9. TECHNICAL DESCRIPTION OF ATTENUATOR BOARD

The circuits are shown on the diagram in section 9.2.

9.1 Circuit Description

The two attenuator sections simply consist of switches QA1 to QA4 which in turn connect 15 high precision resistors across R13/R40 and R62/R83 (see section 8.1, input amplifiers).

9.2 Schematic Diagrams

The schematic diagram for the input attenuators is located on the following page. The diagram number is 985-366 Sheet 1.

SECTION 9 _____ TECHNICAL DESCRIPTION OF ATTENUATOR BOARD

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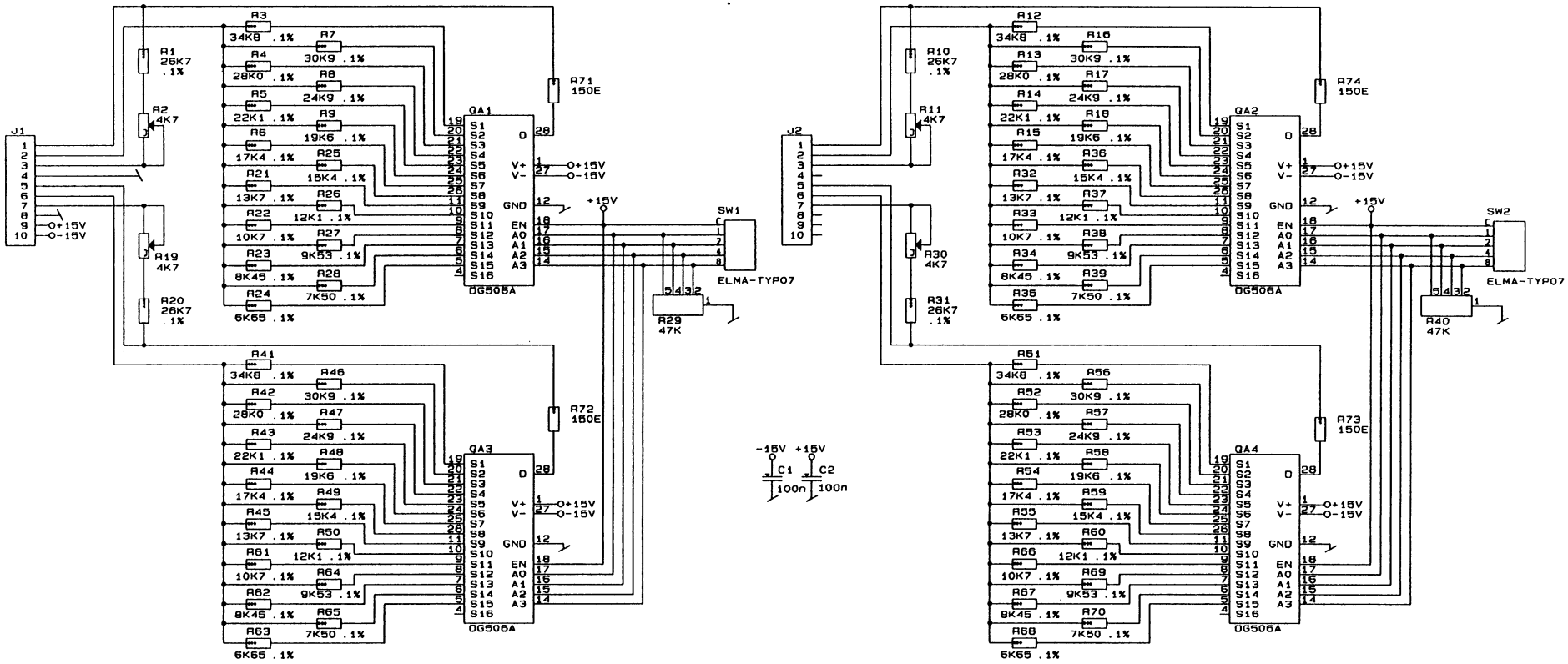
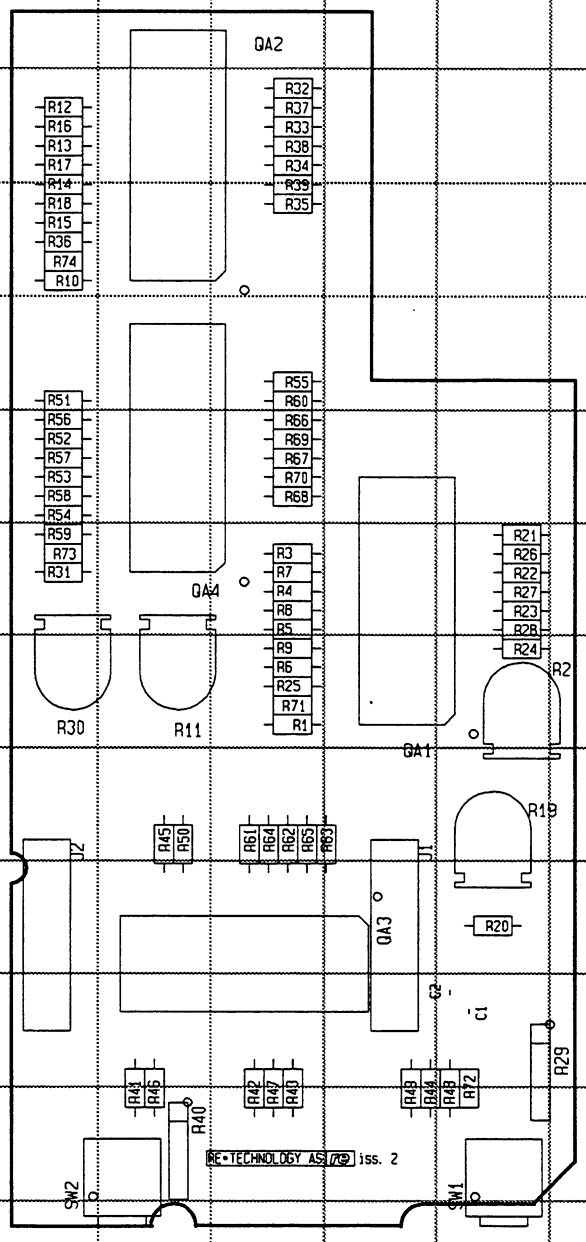


RE TECHNOLOGY A/S		
RE521 FM STEREO CODER		
Title: INPUT ATTENUATOR		
Size: A	Document Number: 902-104 971-521 985-366	REV: 2a
Date: November 18, 1992	Sheet 1 of 1	


QA2
R32
R37
R33
R38
R34
R39
R35
R12
R16
R13
R17
R14
R18
R15
R36
R74
R10
R55
R60
R66
R69
R67
R70
R68
R51
R56
R52
R57
R53
R58
R54
R59
R73
R31
QA4
R3
R7
R4
R8
R5
R9
R6
R25
R71
R1
R21
R26
R22
R27
R23
R28
R24
R2
R30
R11
QA1
R19
R45
R50
R61
R64
R62
R65
R63
J2
J1
QA3
R20
C2
C1
R29
R41
R46
R42
R47
R40
R48
R44
R43
R72
R40
SW2
SW1
RE•TECHNOLOGY AS
iss. 2
971-52112 ATTENUATOR BOARD

COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC
C1	H13	R68	F8																				
C2	H13	R69	F8																				
J1	G11	R70	F8																				
J2	D11	R71	F10																				
QA1	G10	R72	H13																				
QA2	F4	R73	D9																				
QA3	G12	R74	D6																				
QA4	F9	SW1	H15																				
R1	F10	SW2	D15																				
R2	J10	2	G14																				
R3	F9																						
R4	F9																						
R5	F9																						
R6	F10																						
R7	F9																						
R8	F9																						
R9	F10																						
R10	D6																						
R11	E10																						
R12	D5																						
R13	D5																						
R14	D6																						
R15	D6																						
R16	D5																						
R17	D5																						
R18	D6																						
R19	J11																						
R20	H12																						
R21	H9																						
R22	H9																						
R23	H9																						
R24	H10																						
R25	F10																						
R26	H9																						
R27	H9																						
R28	H9																						
R29	J13																						
R30	D10																						
R31	D9																						
R32	F5																						
R33	F5																						
R34	F5																						
R35	F6																						
R36	D6																						
R37	F5																						
R38	F5																						
R39	F5																						
R40	E14																						
R41	E14																						
R42	F14																						
R43	F14																						
R44	G14																						
R45	E11																						
R46	E14																						
R47	F14																						
R48	H14																						
R49	G14																						
R50	E11																						
R51	D7																						
R52	D8																						
R53	D8																						
R54	D8																						
R55	F7																						
R56	D8																						
R57	D8																						
R58	D8																						
R59	D9																						
R60	F7																						
R61	F11																						
R62	F11																						
R63	F11																						
R64	F11																						
R65	F11																						
R66	F8																						
R67	F8																						

COMPONENT SIDE

9.3 Component Locations

The component locations for the input attenuators are shown on the following page.

SECTION 9 _____ TECHNICAL DESCRIPTION OF ATTENUATOR BOARD

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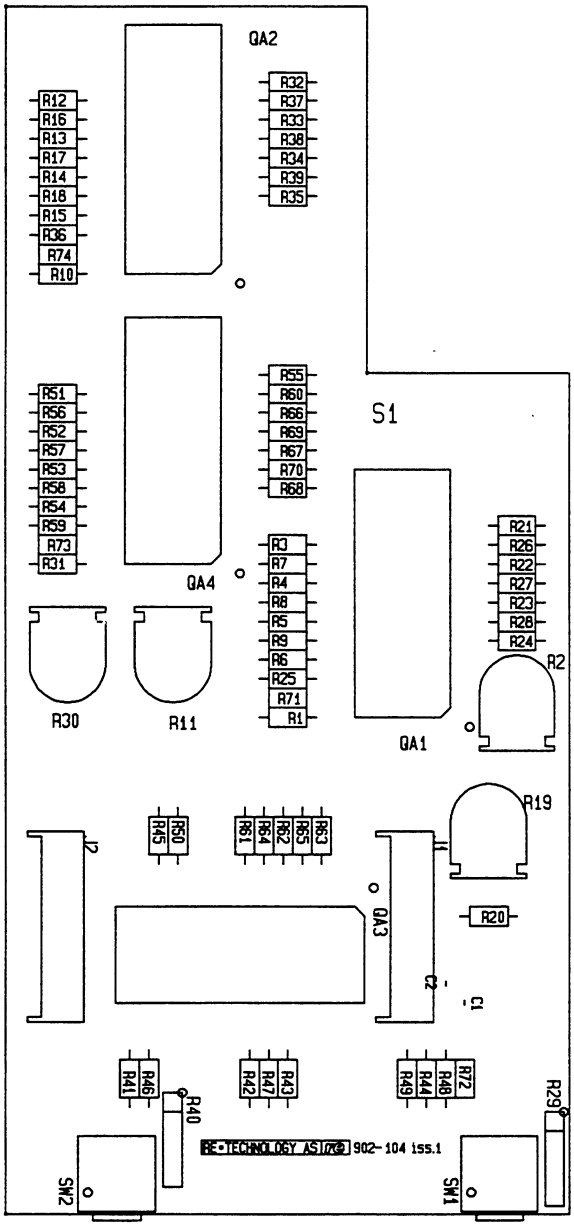
QA2
R12
R16
R13
R17
R14
R18
R15
R36
R74
R10
R32
R37
R33
R38
R34
R39
R35
R51
R56
R52
R57
R53
R58
R54
R59
R73
R31
R55
R60
R66
R69
R67
R70
R68
QA4
R30
R11
R3
R7
R4
R8
R5
R9
R6
R25
R71
R1
S1
QA1
R21
R26
R22
R27
R23
R28
R24
R2
R19
R20
R50
R45
R61
R64
R62
R65
R63
J2
J1
QA3
C2
C1
R46
R41
R40
R42
R47
R43
R72
R49
R44
R48
R29
SW2
SW1
RE•TECHNOLOGY AS
902-104 iss.1

9.4 Parts List for Input Attenuator Board

The following pages show the parts list for the input attenuator board.

SECTION 9 _____ TECHNICAL DESCRIPTION OF ATTENUATOR BOARD

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Attenuator Board (902-104)

CAPACITORS

C 1	C Ceramic 100n 20% 50V	213-401
C 2	C Ceramic 100n 20% 50V	213-401

CONNECTORS

J 1	Con Straight Header 10p Top Entry	806-051
J 2	Con Straight Header 10p Top Entry	806-051

INTEGRATED ANALOG CIRCUITS

QA 1	IC DG506ACG Monolithic Cmos Analog Multiplexer	365-030
QA 2	IC DG506ACG Monolithic Cmos Analog Multiplexer	365-030
QA 3	IC DG506ACG Monolithic Cmos Analog Multiplexer	365-030
QA 4	IC DG506ACG Monolithic Cmos Analog Multiplexer	365-030

RESISTORS

R 1	R Metal Film 27K0 0.5% 1/8W TC50	140-451
R 2	R Cermet Trimpot 4K7 20% 0.5W	182-002
R 3	R Metal Film 34K8 0.1% 0.25W TC25	141-342
R 4	R Metal Film 28K0 0.1% 0.25W TC25	141-346
R 5	R Metal Film 22K1 0.1% 0.25W TC25	141-339
R 6	R Metal Film 17K4 0.1% 0.25W TC25	141-330
R 7	R Metal Film 30K9 0.1% 0.25W TC25	141-341
R 8	R Metal Film 24K9 0.1% 0.25W TC25	141-293
R 9	R Metal Film 19K6 0.1% 0.25W TC25	141-338
R 10	R Metal Film 27K0 0.5% 1/8W TC50	140-451
R 11	R Cermet Trimpot 4K7 20% 0.5W	182-002
R 12	R Metal Film 34K8 0.1% 0.25W TC25	141-342
R 13	R Metal Film 28K0 0.1% 0.25W TC25	141-346
R 14	R Metal Film 22K1 0.1% 0.25W TC25	141-339
R 15	R Metal Film 17K4 0.1% 0.25W TC25	141-330
R 16	R Metal Film 30K9 0.1% 0.25W TC25	141-341
R 17	R Metal Film 24K9 0.1% 0.25W TC25	141-293
R 18	R Metal Film 19K6 0.1% 0.25W TC25	141-338
R 19	R Cermet Trimpot 4K7 20% 0.5W	182-002
R 20	R Metal Film 27K0 0.5% 1/8W TC50	140-451
R 21	R Metal Film 13K7 0.1% 0.25W TC25	141-337
R 22	R Metal Film 10K7 0.5% 0.4W TC50	140-840
R 23	R Metal Film 8K45 0.1% 0.25W TC25	141-345
R 24	R Metal Film 6K65 0.1% 0.25W TC25	141-343
R 25	R Metal Film 15K4 0.1% 0.25W TC25	141-336
R 26	R Metal Film 12K1 0.1% 0.25W TC25	141-327
R 27	R Metal Film 9K53 0.1% 0.25W TC25	141-347
R 28	R Metal Film 7K50 0.1% 0.25W TC25	141-344
R 29	R Thick Film SIL 4*47K 5% 0.1W	146-018
R 30	R Cermet Trimpot 4K7 20% 0.5W	182-002
R 31	R Metal Film 27K0 0.5% 1/8W TC50	140-451
R 32	R Metal Film 13K7 0.1% 0.25W TC25	141-337
R 33	R Metal Film 10K7 0.5% 0.4W TC50	140-840

R 34	R Metal Film 8K45 0.1% 0.25W TC25	141-345
R 35	R Metal Film 6K65 0.1% 0.25W TC25	141-343
R 36	R Metal Film 15K4 0.1% 0.25W TC25	141-336
R 37	R Metal Film 12K1 0.1% 0.25W TC25	141-327
R 38	R Metal Film 9K53 0.1% 0.25W TC25	141-347
R 39	R Metal Film 7K50 0.1% 0.25W TC25	141-344
R 40	R Thick Film SIL 4*47K 5% 0.1W	146-018
R 41	R Metal Film 34K8 0.1% 0.25W TC25	141-342
R 42	R Metal Film 28K0 0.1% 0.25W TC25	141-346
R 43	R Metal Film 22K1 0.1% 0.25W TC25	141-339
R 44	R Metal Film 17K4 0.1% 0.25W TC25	141-330
R 45	R Metal Film 13K7 0.1% 0.25W TC25	141-337
R 46	R Metal Film 30K9 0.1% 0.25W TC25	141-341
R 47	R Metal Film 24K9 0.1% 0.25W TC25	141-293
R 48	R Metal Film 19K6 0.1% 0.25W TC25	141-338
R 49	R Metal Film 15K4 0.1% 0.25W TC25	141-336
R 50	R Metal Film 12K1 0.1% 0.25W TC25	141-327
R 51	R Metal Film 34K8 0.1% 0.25W TC25	141-342
R 52	R Metal Film 28K0 0.1% 0.25W TC25	141-346
R 53	R Metal Film 22K1 0.1% 0.25W TC25	141-339
R 54	R Metal Film 17K4 0.1% 0.25W TC25	141-330
R 55	R Metal Film 13K7 0.1% 0.25W TC25	141-337
R 56	R Metal Film 30K9 0.1% 0.25W TC25	141-341
R 57	R Metal Film 24K9 0.1% 0.25W TC25	141-293
R 58	R Metal Film 19K6 0.1% 0.25W TC25	141-338
R 59	R Metal Film 15K4 0.1% 0.25W TC25	141-336
R 60	R Metal Film 12K1 0.1% 0.25W TC25	141-327
R 61	R Metal Film 10K7 0.5% 0.4W TC50	140-840
R 62	R Metal Film 8K45 0.1% 0.25W TC25	141-345
R 63	R Metal Film 6K65 0.1% 0.25W TC25	141-343
R 64	R Metal Film 9K53 0.1% 0.25W TC25	141-347
R 65	R Metal Film 7K50 0.1% 0.25W TC25	141-344
R 66	R Metal Film 10K7 0.5% 0.4W TC50	140-840
R 67	R Metal Film 8K45 0.1% 0.25W TC25	141-345
R 68	R Metal Film 6K65 0.1% 0.25W TC25	141-343
R 69	R Metal Film 9K53 0.1% 0.25W TC25	141-347
R 70	R Metal Film 7K50 0.1% 0.25W TC25	141-344
R 71	R Metal Film 150E 5% 0.2W TC250	107-315
R 72	R Metal Film 150E 5% 0.2W TC250	107-315
R 73	R Metal Film 150E 5% 0.2W TC250	107-315
R 74	R Metal Film 150E 5% 0.2W TC250	107-315

MISCELLANEOUS

SW 1	Miniature Codig Switchs Type 07	551-168
SW 2	Miniature Codig Switchs Type 07	551-168

10. EQUIPMENT AND ACCESSORIES

This section contains a list of the accessories supplied with the RE 521 FM Stereo Coder and a list of available options.

10.1 Standard Equipment and Accessories

The following equipment and accessories should be found when unpacking the RE 521 FM Stereo Coder:

Code	Type	Description
380-312	RE 521	FM Stereo Coder
615-303	220 V	Line cord, 2.5 m
450-017	0.5 A	Fuse, slow blow
983-401		Operating/Servicing Manual
983-707		Installation Instructions

Table 10.1 - Standard Equipment and Accessories

10.2 Available Options

Presently there are no available options for the RE 521.

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11. SPECIFICATIONS

This section contains a full specification for the instrument. The listed data is guaranteed data unless otherwise indicated.

L and R Inputs

Frequency response	< ± 0.1 dB, 20 Hz to 15 kHz < -65 dB, 19 kHz < -60 dB, > 19 kHz
Group delay variation, each channel	< ± 1 μsec, 20 Hz to 9 kHz
Group delay difference, between channels	< ± 1 μsec, 20 Hz to 9 kHz < ± 3 μsec, 9 kHz to 15 kHz
Limiting level	> 15 dBu
Impedance	600 Ω or 47 kΩ, balanced
CMRR	> 60 dB, 20 Hz to 20 kHz > 55 dB, 20 kHz to 75 kHz

RDS/ARI/SCA Inputs

Number of independent inputs	3
Frequency response	< ± 0.1 dB, 50 kHz to 75 kHz < ± 0.3 dB, 50 kHz to 100 kHz
Impedance	10 kΩ, unbalanced
Nominal gain to MPX output	0 dB

Pre-emphasis

Time constants	0,25,50,75 μsec

Composite Outputs

Impedance	< 1 Ω, unbalanced
Load	> 5 nF//75 Ω
Limiting level	> 15 dBm
DC level	< ± 10 mV or AC coupled

M Output

Impedance	< 25 Ω, balanced floating
Load	≥ 300 Ω
Limiting level	> 15 dBm

Separation

L to R	> 65 dB, 80 Hz to 5 kHz > 60 dB, 40 Hz to 10 kHz > 55 dB, 20 Hz to 15 kHz > 66 dB, L = R > 60 dB, L = -R

Distortion (Stereo)

THD @ +6 dB	< -70 dB (0.03%)
DIN 45403 intermodulation at +6 dBm,14/15 kHz	< -65 dB, 2nd order < -65 dB, 3rd order

Distortion (Mono)

THD @ +6 dB	< -80 dB
DIN 45403 intermodulation at +6 dBm,14/15 kHz	< -75 dB, 2nd order < -75 dB, 3rd order

Residuals

38 kHz	< -64 dB rel. to +6 dBm
Spurious above 53 kHz	< -60 dB rel. to +6 dBm

Hum and Noise (Stereo)

Unweighted S/N ratio	DIN BP	> 83 dB rel. to +6 dBm
	CCIR BP	> 80 dB rel. to +6 dBm
Weighted S/N ratio	DIN A	> 83 dB rel. to +6 dBm
	CCIR 468	> 77 dB rel. to +6 dBm

Hum and Noise (Mono)

Unweighted S/N ratio	DIN BP	> 86 dB rel. to +6 dBm
	CCIR BP	> 82 dB rel. to +6 dBm
Weighted S/N ratio	DIN A	> 86 dB rel. to +6 dBm
	CCIR 468	> 80 dB rel. to +6 dBm

Pilot

Frequency	19 kHz ± 0.5 Hz
Level	-13 dBm to -6 dBm
Phase deviation	< ± 0.3° (ref.38 kHz)
Sync Output	0.9 Vpp to 1.8 Vpp square wave
Sync Input	1 Vpp, 19 kHz ±2 Hz

Meter

MPX	+6.0 dBm, ±6 dB range
Pilot	-9.5 dBm, ±6 dB range
L,R	+6.0 dBm, ±6 dB range

Remote Control/Status

Preemphasis on/off
Input A/B selection
Mono/Stereo
Pilot on/off
Power fail alarm
Local lockout on/off

General

Temperature

Operating	5° to 45° C (41° to 113°F)
Storage	-40° to +70° C (-40° to 158°F)
Relative humidity	20 to 80%, non condensing

Line

Voltage	95 V to 130 V AC (Optional) 190 V to 260 V AC
Frequency	47,5 Hz to 63 Hz
Power consumption	< 35 VA

Dimensions and weight

Height	44 mm (1,7")
Width	440 mm (17,3")
Depth	400 mm (15,8")
Net weight	4 kg (8,8 lbs)
Shipping weight	8 kg (17,6 lbs)

Data subject to change

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  Selecting in Local Mode 12

Unpacking 5

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13. MISCELLANEOUS

13.1 RE 521 Mechanical Assembly

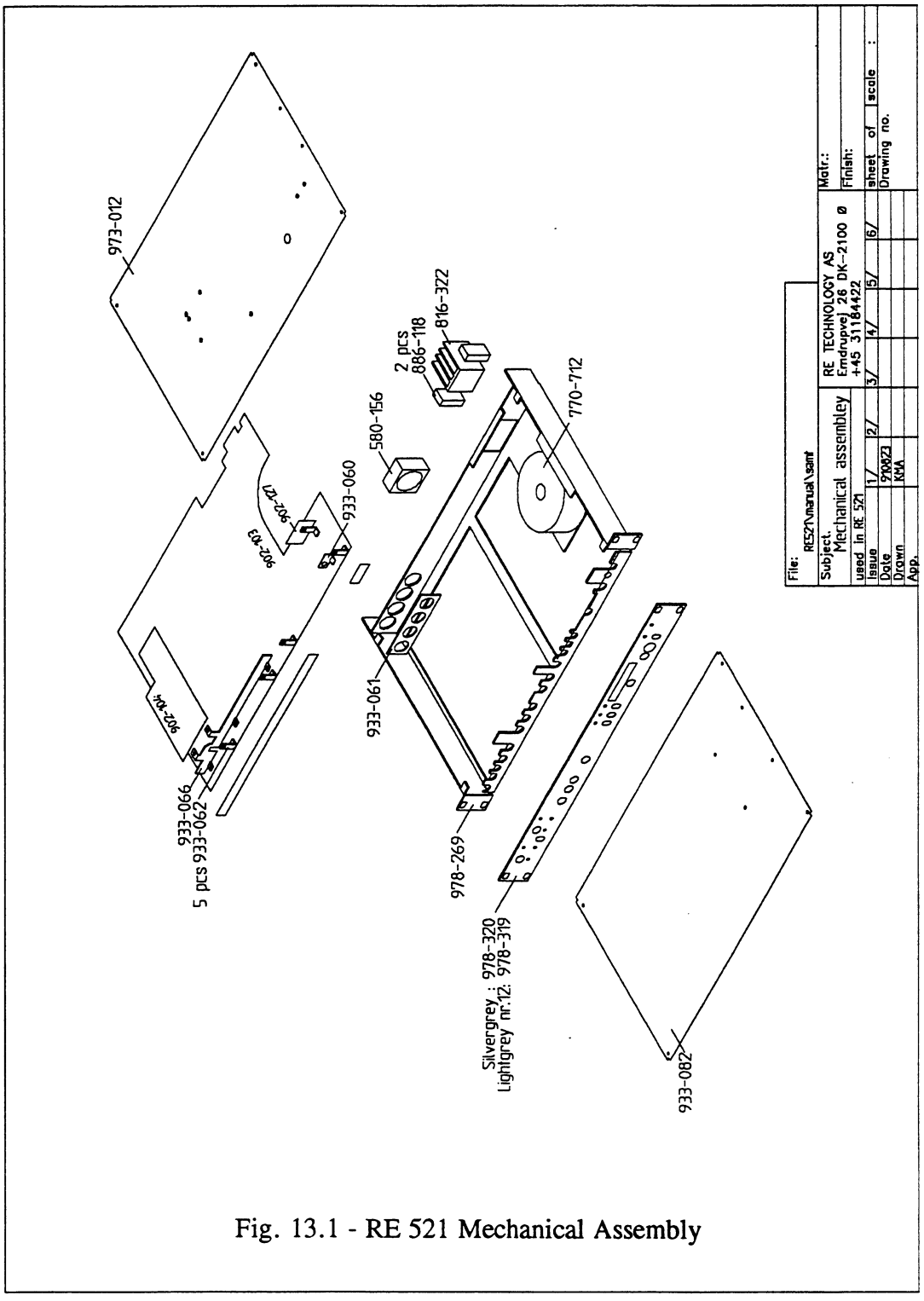
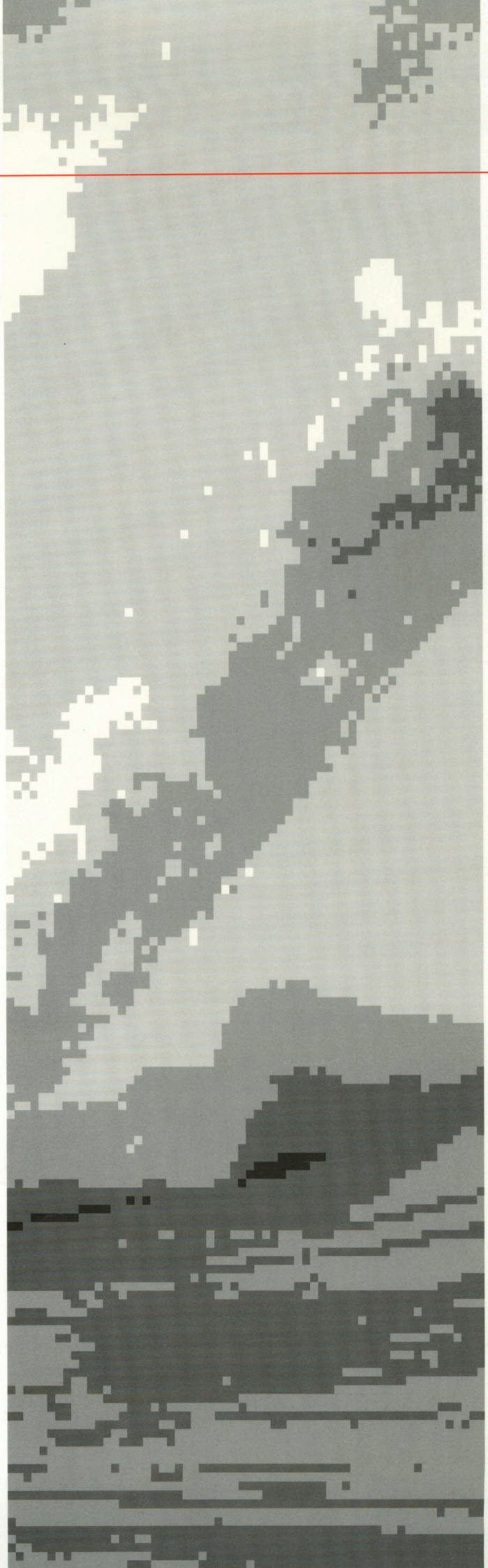


Fig. 13.1 - RE 521 Mechanical Assembly



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