



# Sailor

# Sailor

INSTRUKTIONSBOG FOR  
SAILOR RECEIVER R2022

INSTRUCTION BOOK FOR  
SAILOR RECEIVER R2022

INSTRUKTIONSBUCH FÜR  
SAILOR RECEIVER R2022

INSTRUCTIONS POUR  
SAILOR RECEIVER R2022

INSTRUCCIONES PARA  
SAILOR RECEIVER R2022



A/S S. P. RADIO · AALBORG · DENMARK



# INTRODUCTION

The SAILOR R2022 radiotelephone receiver has been designed to be used with the SAILOR Compact 2000 module programme.

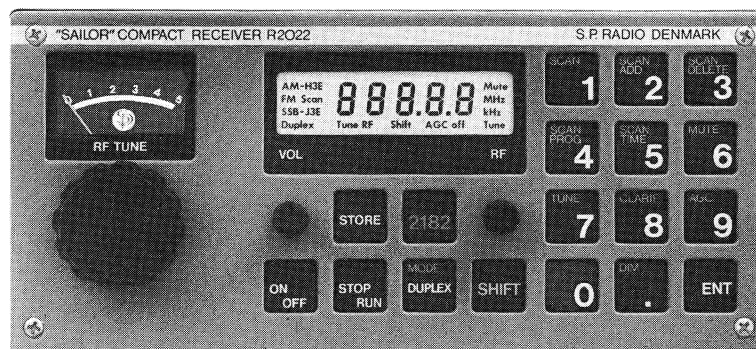
The SAILOR R2022 can be installed and operated either as an independent unit or in combination with the other elements of the Compact 2000 programme. These include a 400 Watt SSB coast telephony transmitter T2031, a duplex VHF RT2047 and a scrambler CRY2001.

The SAILOR R2022 is an advanced SSB coast telephony receiver which also operates on AM and FM. The compact, nylon-treated metal cabinet contains power supply, duplex filter and receiver. Fly-wheel tuning, 94 quick-select frequencies, keyboard controls, LCD display and scanning facilities make the SAILOR R2022 simple and speedy to operate.

The SAILOR R2022 has been constructed to withstand the most extreme conditions experienced in small, semi-open boats. The compact, weatherproof construction ensures a degree of resistance to sea spray. The printed circuits, which have made possible a combination of compactness and exceptional performance, are coated with a special moisture-repellent lacquer.

In the design of this communication receiver, S. P. Radio have taken into account all the circumstances it will be exposed to in day-to-day operating. However, even a product of this high quality requires regular service and maintenance, and we recommend a close observance of the directions contained in the instruction book.

S. P. Radio is one of Europe's leading producers of maritime radio communication equipment - a position which has been maintained by means of constant and extensive product development. We have a world-wide network of dealers with general agencies in fifty countries. All our dealers are well-trained and able to service all SAILOR products.



# 1.1 GENERAL DESCRIPTION

## INTRODUCTION

SAILOR R2o22 is an all solid state constructed marine SSB duplex communication receiver intended for reception of J3E, R3E, H3E, and A3E signals in the frequency range 16o5 - 45oo kHz.

SAILOR R2o22 offers in addition reception of general broadcasting in the frequency ranges 14o - 16o5 and 87 - 1o8 MHz.

SAILOR R2o22 has 94 user programmed quick select frequencies.

SAILOR R2o22 has six scanning programmes, one standard programme containing all the programmed quick select frequencies and 5 user programmed scanning sequences.

SAILOR R2o22 has one key operation of the distress frequency 2182 kHz.

SAILOR R2o22 is fully synthesized and the frequency stability is controlled from a crystal oscillator.

SAILOR R2o22 is almost completely controlled by a micro computer controlling the frequency synthesizer, the readings from the EEPROM, the display, the scanning sequency, and the simplex protection circuits.

SAILOR R2o22 can be supplied from a 1o - 32V DC mains.

SAILOR R2o22 is provided with membrane switches for controls, easy to use reliable, and hard wearing. Cutouts in the metal front serve as a safe finger guide.

SAILOR R2o22 is fitted with night illumination, all lettering can be illuminated.

SAILOR R2o22 employs the most modern circuit technology housed in a corrosion resistant aluminium cabinet with a green nylon finish.

GENERAL DESCRIPTION cont.

SAILOR R2022 has built in preference setting of the mode, the AGC, the RF gain, and the input selectivity.

From 140 - 1605 kHz the preferences are AM mode, AGC on, RF gain off, and simplex selectivity.

From 1605 - 4500 kHz the preferences are SSB mode, AGC on, RF gain on, and simplex selectivity.

From 87 - 108 mhz the preferences are FM mode, AGC on, RF gain off.



## 1.2 TECHNICAL DATA

The receiver is fully synthesized and has a frequency resolution of 100 Hz (10 kHz).

The receiver is intended for reception of the following wave types:

- 140 kHz - 1605 kHz A3E (A3)
- 1605 kHz - 4500 kHz J3E (A3J), R3E (A3A), H3E (A3H), and A3E (A3)
- 87.2 MHz - 108 MHz F3E (F3)

Frequency Ranges Simplex: 140 kHz - 384.9 kHz  
385 kHz - 1604.9 kHz  
1605 kHz - 4499.9 kHz

Frequency Range Duplex: 1605 kHz - 4499.9 kHz

Tuning Error: less than 20 Hz

Frequency Drift, short time: less than 5 Hz

Frequency Drift, long time: less than 20 Hz

Frequency Drift: 0-40°C: less than 40 Hz

IF-Band Width:

Mode	Min. Pass-band at -6 dB	Max. Pass-band at -60 dB
SSB-J3E	+ 350 Hz +2700 Hz	-1075 Hz +3825 Hz
AM-A3E	+3.3 kHz	+11 kHz

Sensitivity 20 dB SN/N: 140 - 1605 kHz, A3E:  $\leq$  30 dB/uV  
1605 - 4000 kHz, J3E:  $\leq$  15 dB/uV  
4000 - 4500 kHz, J3E:  $\leq$  10 dB/uV

### DUPLEX FILTER

1605 - 4000 kHz, J3E:  $\leq$  4 dB/uV  
4000 - 4500 kHz, J3E:  $\leq$  7 dB/uV

Adjacent Channel Selectivity:

J3E:	50 dB at - 1 kHz and + 4 kHz 60 dB at -24 kHz and + 5 kHz 75 dB at - 5 kHz and + 8 kHz
A3E:	50 dB at -10 kHz and +10 kHz 65 dB at -20 kHz and +20 kHz

Blocking: Wanted signal 60 dB/1 uV  
Blocking level  $\geq$  110 dB/1 uV

Cross Modulation: Wanted signal 60 dB/1 uV  
Cross modulation level  $\geq$  100 dB/1 uV

TECHNICAL DATA cont.:

Intermodulation, second order: Ref. signal 30 dB/1 uV  
Intermodulation level  $\geq 90$  dB/1 uV

Intermodulation, Third order: Ref. signal 30 dB/1 uV  
Frequency separation  $f = 30$  kHz  
Intermodulation level  $\geq 90$  dB/1 uV

Temperature Range: Specification  $0^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$   
Operating  $-15^{\circ}\text{C}$  to  $+55^{\circ}\text{C}$   
Storage  $-20^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$

Spurious Rejection: IF  $\geq 70$  dB  
Image  $\geq 70$  dB  
All others  $\geq 70$  dB

Spurious Emission:  $P_{\text{out}} < 0.1$  nW into dummy aerial

Audio Outputs:  $V_{\text{in}} = 24\text{V}$  Loudspeaker 7W into 8 ohms  
Earpiece fixed 0 dBm into 600 ohms (J3E)

Automatic Gain Control: J3E AGC attack time approx. 2 msec.  
 $\Delta V_{\text{in}} = 30$  dB decay time approx. 2.5 sec.  
A3E AGC attack time approx. 35 msec.  
decay time approx. 100 msec.

IF-Frequency: 10,7008 MHz

Quick Select Frequencies: 94 operator-programmed freely chosen  
in all the frequency ranges.

Scanning Facilities: 5 independent operator-programmed  
scanning programmes.  
The scanning frequencies are freely  
chosen among the 94 quick-select  
frequencies.

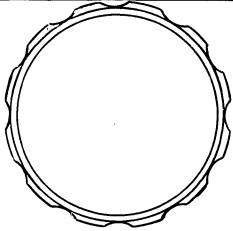
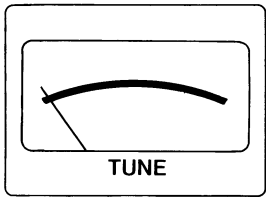
POWER SUPPLY

Input Voltage: 10 to 32V DC

Power Consumption: approx. 20 W

Output Voltage: +5V 0.70 A max.  
+18V 0.65 A max.  
-18V 0.20 A max.  
+24V 0.05 A max.

Switch Frequency: approx. 50 kHz



AM-H3E	888.8	Mute
FM Scan	888.8	MHz
SSB-J3E	888.8	kHz
Duplex	Tune RF	Shift AGC off Tune
VOL		RF

SCAN 1	SCAN ADD 2	SCAN DELETE 3
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SCAN PROG 4	SCAN TIME 5	MUTE 6
-------------------	-------------------	-----------

	STORE	2182	
--	-------	------	--

TUNE 7	CLARIF 8	AGC 9
-----------	-------------	----------

ON OFF	STOP RUN	MODE DUPLEX	SHIFT
-----------	-------------	----------------	-------

0	DIM .	ENT
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## 1.3 CONTROLS



Turns the receiver on or off.

VOL



Controls volume.



Stores the keyed-in frequency in the memory.



Stops and starts scanning sequence.



Inactivates the simplex protective circuit and mutes the receiver until the duplex filter is tuned.



Quick-select of the distress and call frequency.  
2182 kHz in A3E mode.

RF



Controls receiver RF amplification or sets scanning mute threshold.



Activates the orange functions on the keyboard.



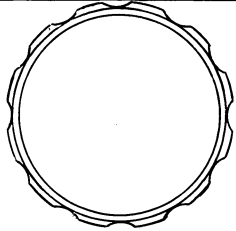
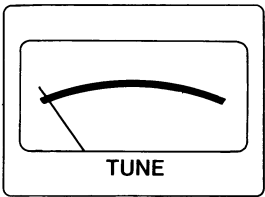
Digits from 0 to 9.



Decimal point.



Enters a new frequency in the microprocessor or starts a selected scanning programme.



AM-H3E	<b>888.8.8</b>	Mute
FM Scan		MHz
SSB-J3E		kHz
Duplex	Tune RF Shift AGC off	Tune
VOL		RF

SCAN <b>1</b>	SCAN ADD <b>2</b>	SCAN DELETE <b>3</b>
------------------	-------------------------	----------------------------

SCAN PROG <b>4</b>	SCAN TIME <b>5</b>	MUTE <b>6</b>
--------------------------	--------------------------	------------------

TUNE <b>7</b>	CLARIF <b>8</b>	AGC <b>9</b>
------------------	--------------------	-----------------

	STORE	<b>2182</b>	
ON OFF	STOP RUN	MODE DUPLEX	SHIFT

<b>0</b>	DIM .	ENT
----------	----------	-----

CONTROLS cont.

SHIFT FUNCTIONS



Switches between A3E and J3E.



Selects scanning programmes.



Adds a quick-select number to the scanning programme.



Deletes a quick-select number from the scanning programme.



Stores the current scanning programme in the memory.



Opens for programming of the "Scan Time", which is the demuting time of the receiver when receiving a signal in the scanning mode.



Mutes the receiver when the AGC voltage is below a value determined by the RF control. (Shown on receiver meter).



Activates the continuous tuning knob.



Converts the tuning knob to clarifier function with a range of +/- 150 Hz and a resolution of 10 Hz.



Switches between automatic and manual amplification control.



Turns the panel illumination on or off.



Activates the noise generator when the duplex filter is being tuned. Varies the receiver frequency in 100 Hz/1 kHz/50 kHz steps or the clarifier in 10 Hz steps.



## 1.4 PRINCIPLE OF OPERATION

### RECEIVER R2o22

SAILOR R2o22 is a fully synthesized single superheterodyne receiver with an IF frequency of 1o.7oo8 MHz.

The signal from the aerials is led through the AERIAL SWITCH & SIMPLEX RELAY section to the RF selectivity, either the simplex filters or the duplex filter, to the mixer where it is mixed with the LO1 signal which has a frequency resolution of 1oo Hz. 1o Hz is the clarifier mode.

The produced IF signal is led through one of the two monolithic IF filters to the IF AMP., DET., AGC, and AF PRE. AMP. where it is amplified and output regulated.

The signal is then fed on to the detectors where, dependent on the received signal, it is detected in the quadrature detector. For SSB detection a carrier reinjection is provided from the x-tal oscillator.

The detected signal is fed on to the active AF filters whose bandwidth is determined by the micro processor. The AF signal is then fed to both the earpiece and the AF pre. amplifier.

In FM mode the aerial signal is fed to the FM TUNER consisting of a tuned RF amplifier followed by a FET mixer producing an IF signal on 1o.7oo8 MHz.

### FREQUENCY GENERATION

The necessary oscillator frequencies are generated by a frequency synthesizer according to fractional synthese phase loop principle.

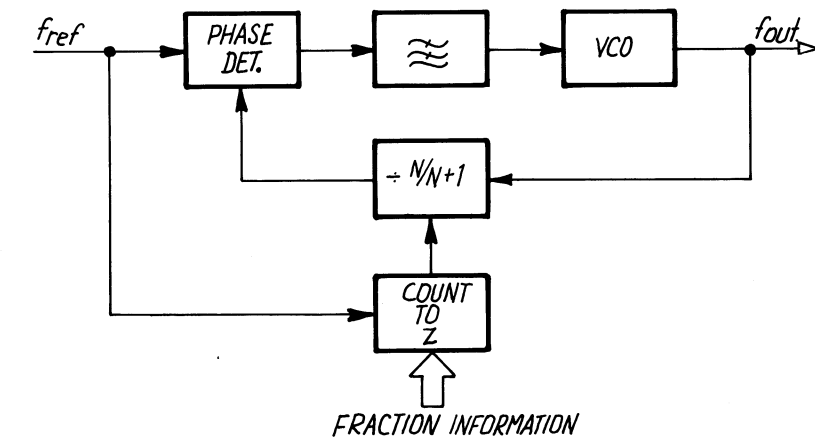
The master frequency is generated in a x-tal oscillator on 1o.7oo8 MHz. This frequency is led on to the SSB detector and the reference divider where it is divided down to 1o.24 kHz, which is the reference frequency for the phase detector.

The voltage controlled oscillators (VCO) generate the signals, which are either divided by 4 or multiplied by 2 to get the proper mixer frequencies.

The VCO signal is fed to the modulus prescaler where the dividing figure can be changed from N to N + 1, determined by the z register, to obtain a fraction in the total dividing figure. The signal is then divided by P and fed to the phase detector, which corrects for frequency offset via the loop filter and the VCO.

All the dividing figures are controlled by the micro processor.

**FRACTIONAL SYNTHESIS PHASE LOCKED LOOP.**



NO FRACTION:  $f_{out} = f_{ref} \times N$

EG:  $f_{out} = 10 \times 10 = 100$

WITH FRACTION:  $z = 10, N = 10, f_{ref} = 10$

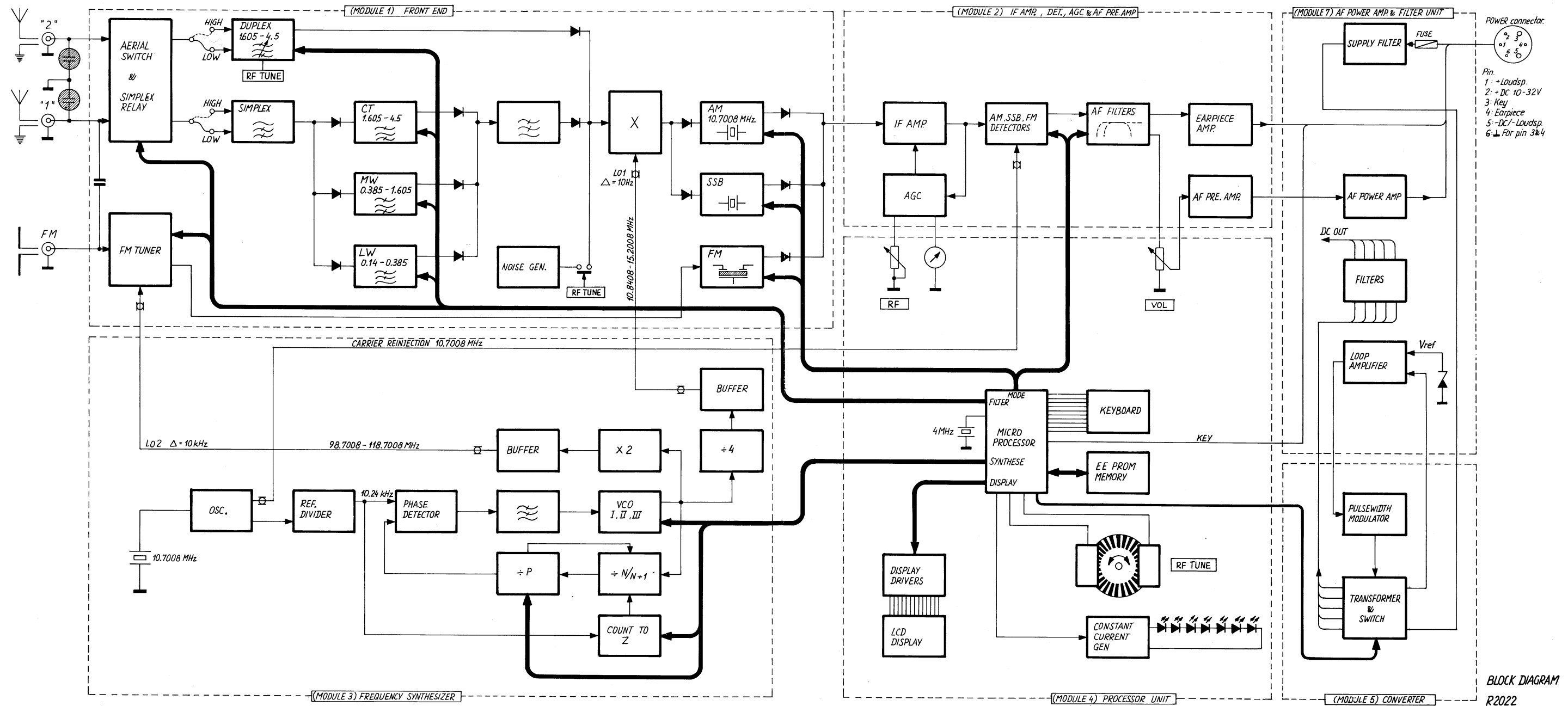
$f_{out} = 9 \times 10 + 1 \times 11 = 101$

**MICRO PROCESSOR**

The micro processor supervises the keyboard, calculated the dividing figures for the synthesizer, chooses the aerial filter in question, controls the detector mode and the AF filter, reads/programmes the EEPROMS, controls the display, and stores the frequency setting when the receiver is switched off.

**POWER SUPPLY.**

The converter unit is constructed for supplying the coasttelefoni receiver R2022 from 12V DC or 24V DC without change over. (10-32V DC continuously). The audio amplifier is fully integrated in a single chip. It operates directly on the 12 or 24V DC battery and performs a powerfull amplifier.



BLOCK DIAGRAM R2022

R2022 4-0-24391B

## 2. INSTALLATION

2.1 MOUNTING POSSIBILITIES

2.2 DIMENSIONS AND DRILLING PLAN

2.3 ELECTRICAL CONNECTIONS

2.4 AERIAL AND EARTH

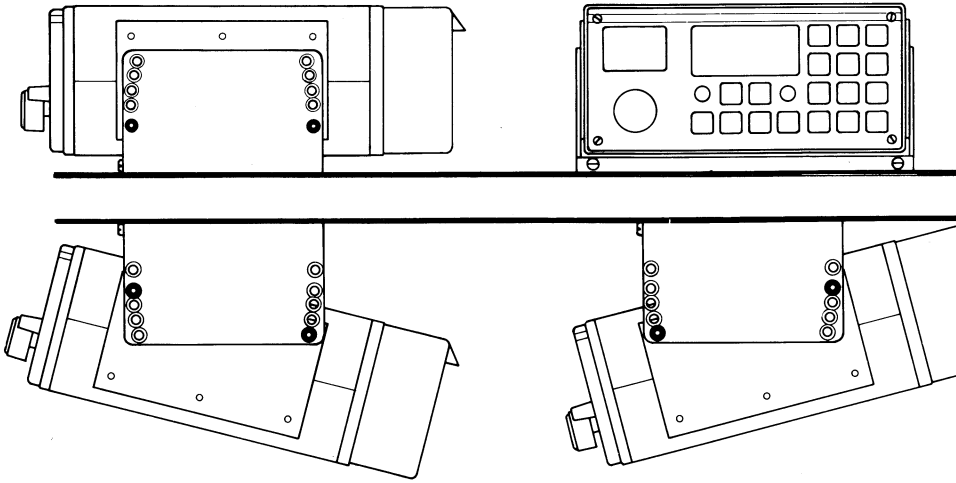
2.5 AERIAL TUNE PROCEDURE

2.6 R2022 USED IN CONJUNCTION WITH T121, T122, T124, T126 OR T128

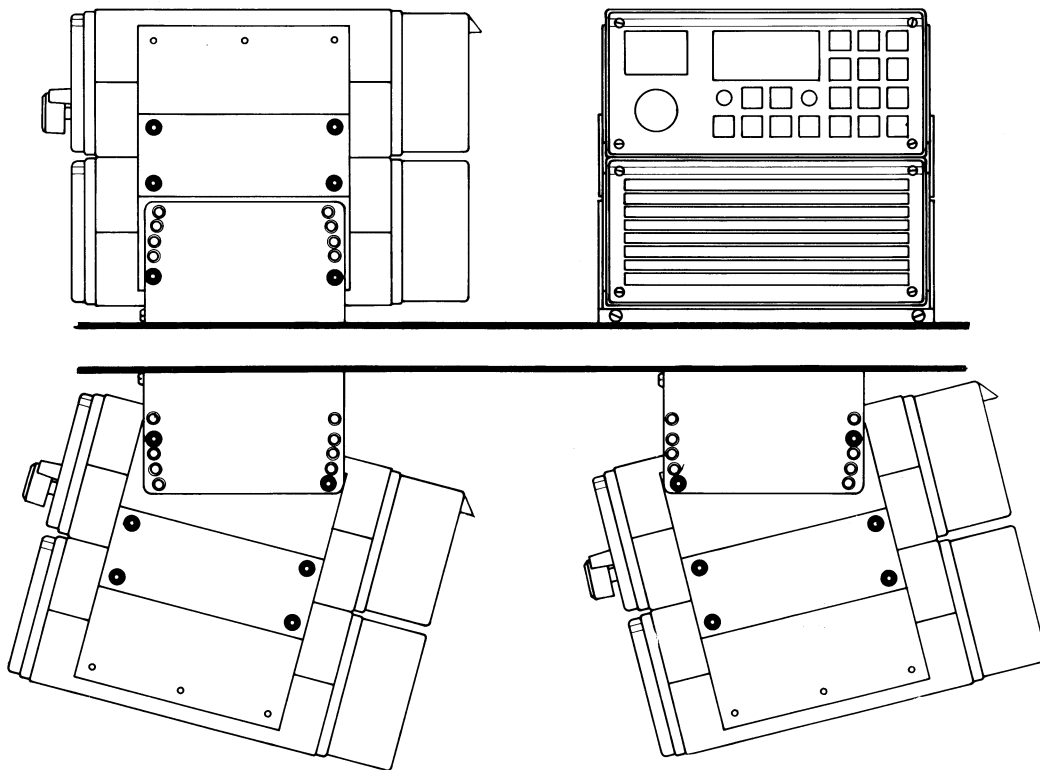


## 2.1 MOUNTING POSSIBILITIES

### TABLETOP AND DECKHEAD

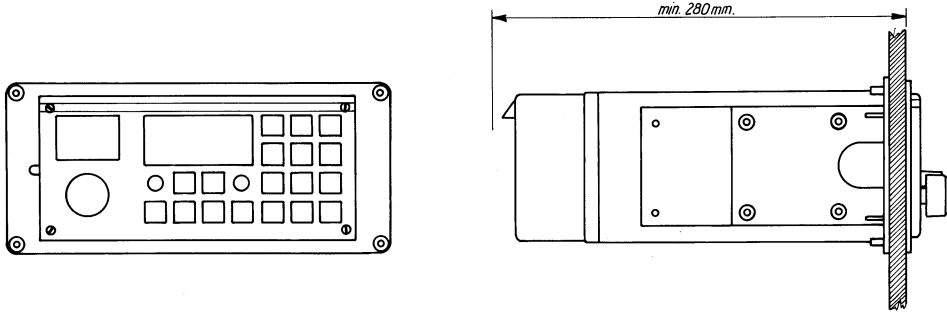


Mounting bracket H2055, which offers the same possibilities for the loudspeakers H2054 and H2074.

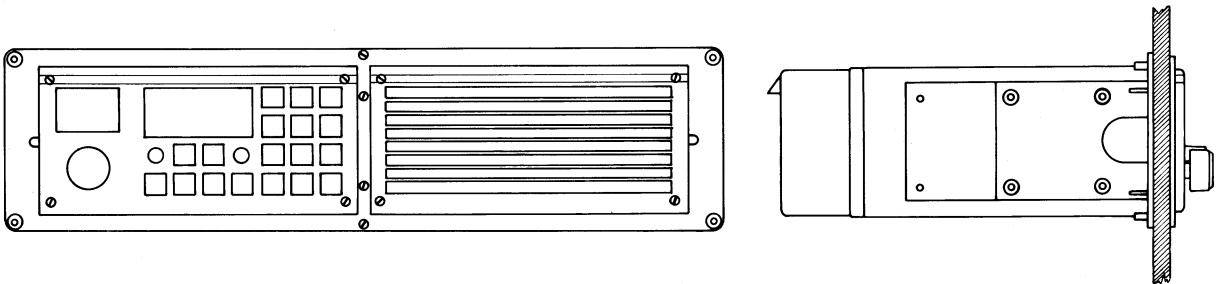


Mounting kit H2068 and H2055.

BULKHEAD AND CONSOLE

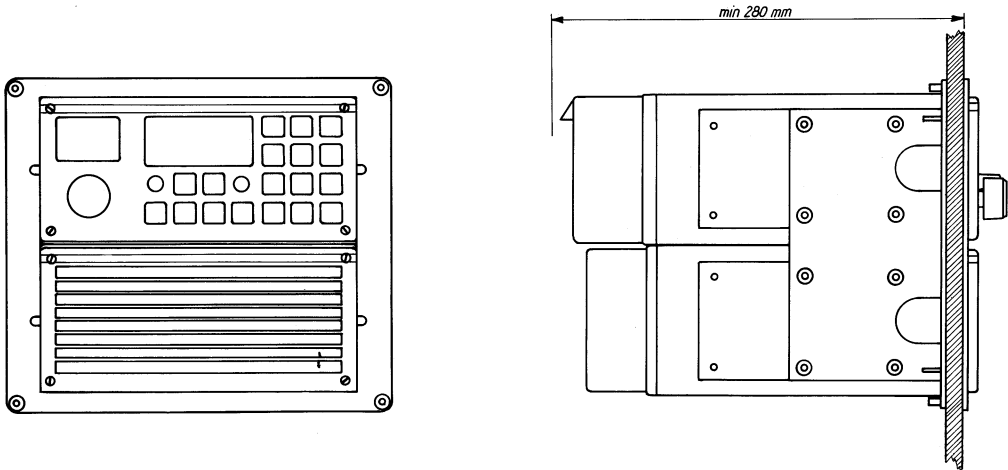


Mounting kit H2o63, which offers the same possibility for the loudspeakers H2o54 and H2o74.



Mounting kit H2062.

or



Mounting kit H2064.

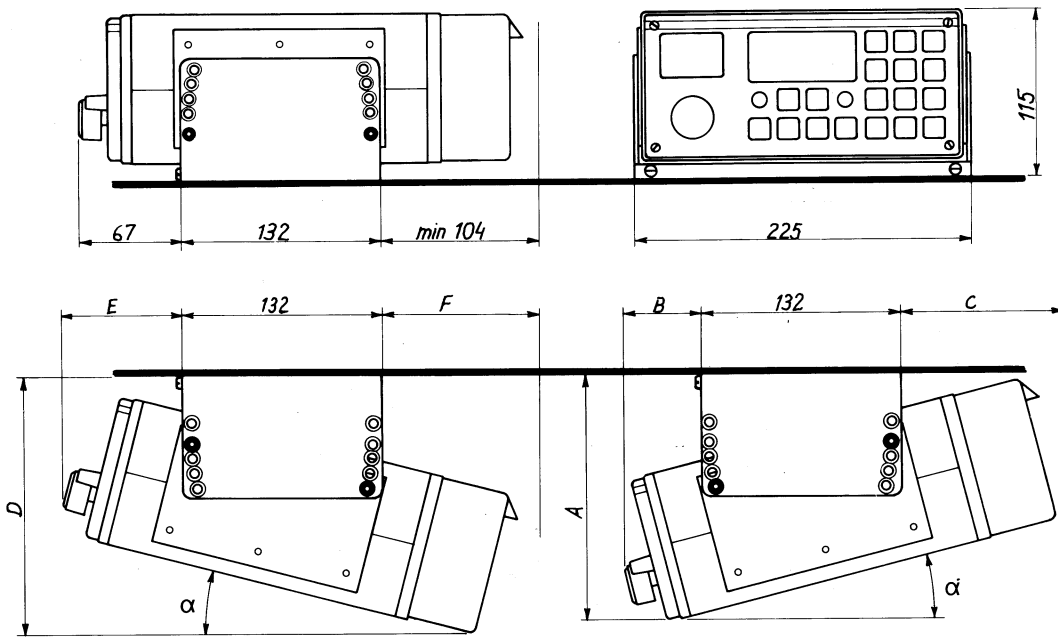
IN CONJUNCTION WITH OTHER "SAILOR" EQUIPMENT

Look up the INSTALLATION section for the SAILOR unit in question

## 2.2 DIMENSIONS AND DRILLING PLAN

### UNIVERSAL MOUNTING BRACKET H2055

permits a wide variety of installation possibilities, such as on table top, bulkhead or deckhead. For other possibilities such as console installation, the SAILOR 19" rack or all units in the Compact programme assembled on the bulkhead, see special information concerning installation of the Compact programme.

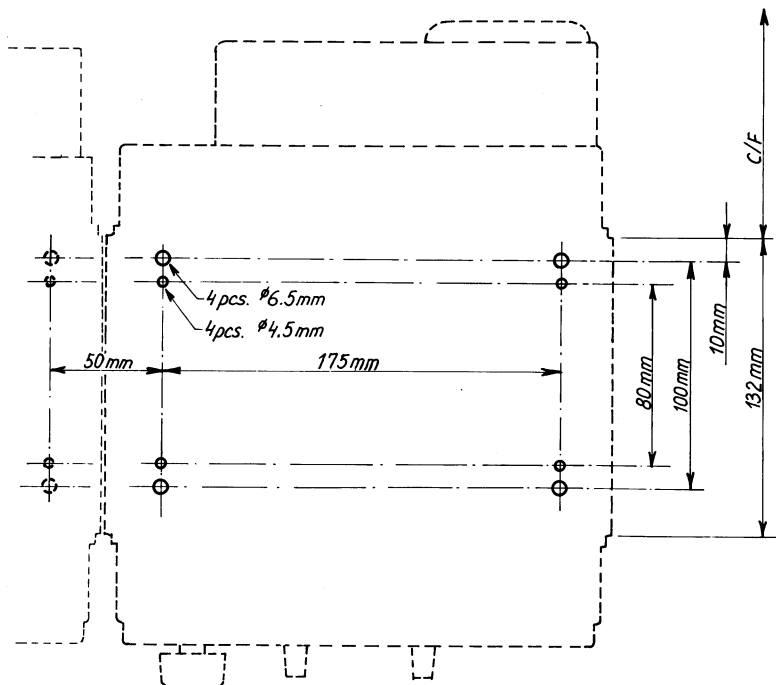


$\alpha$	A	B	C	D	E	F
0°	130	67	104	130	67	104
4.8°	142	67	104	146	72	104
9.6°	155	65	105	163	78	103
14.4°	167	62	120	178	84	101

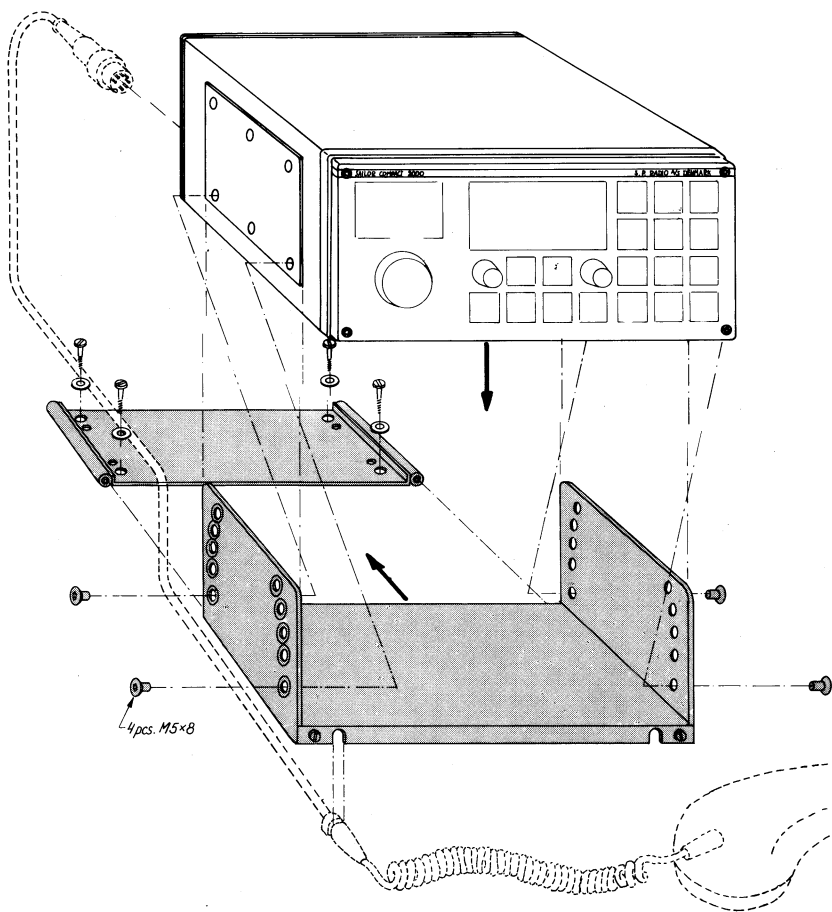
Dimensioner i mm

#### WEIGHT

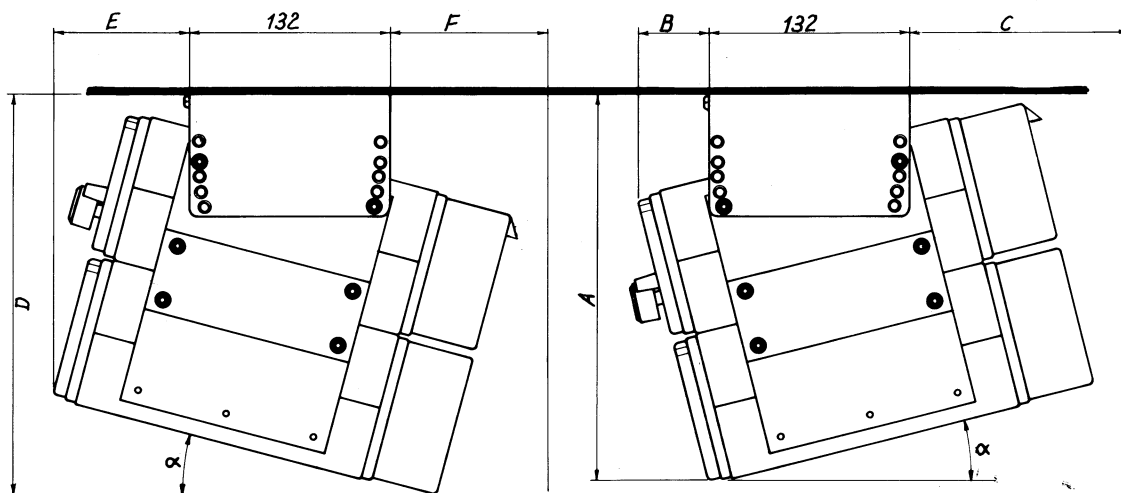
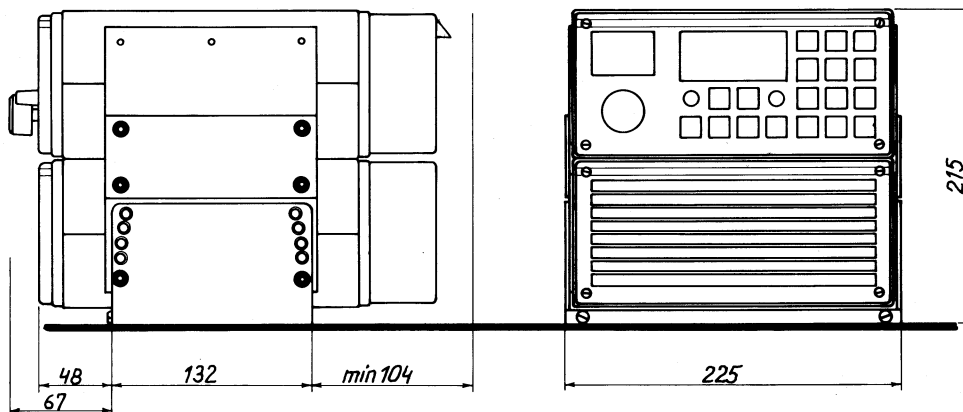
Mounting kit H2055:	1,5 kg
R2022	: 4,5 kg
H2054	: 5,5 kg
H2074	: 4,0 kg







MOUNTING KIT H2068 and H2055



$\alpha$	A	B	C	D	E	F
0°	230	67	105	230	67	105
4.8°	243	67	117	245	72	105
9.6°	255	65	130	262	78	103
14.4°	265	62	143	270	89	100

Dimensions in mm

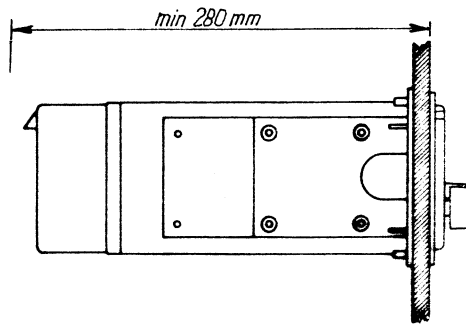
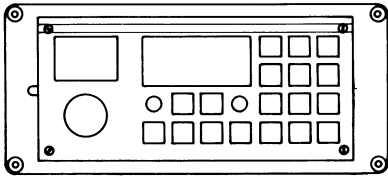
WEIGHT

Mounting kit H2068 and H2055: 1,5 kg  
 R2022 : 4,5 kg  
 H2054 : 5,5 kg  
 H2074 : 4,0 kg

R2022 4-0-24766/  
 4-0-24767/4-0-24768

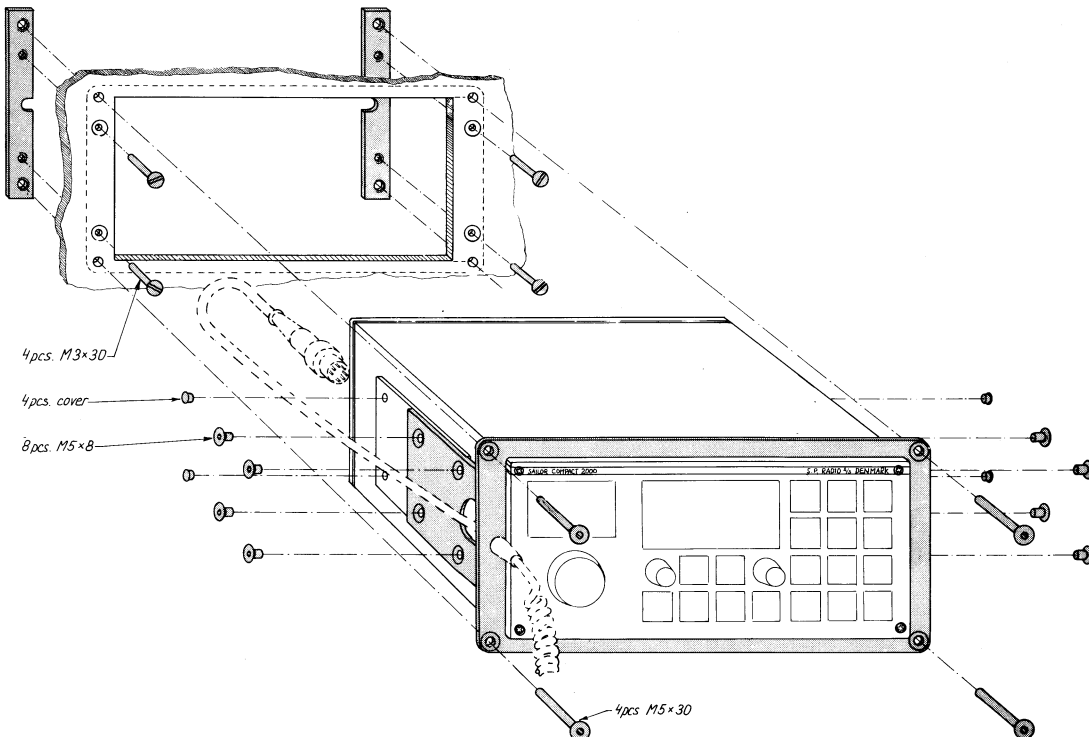
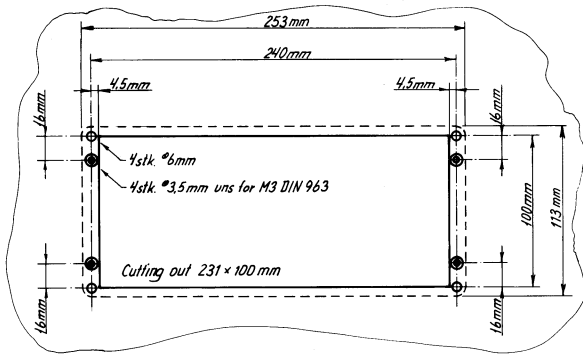
DIMENSIONS AND DRILLING PLAN cont.

MOUNTING KIT H2063

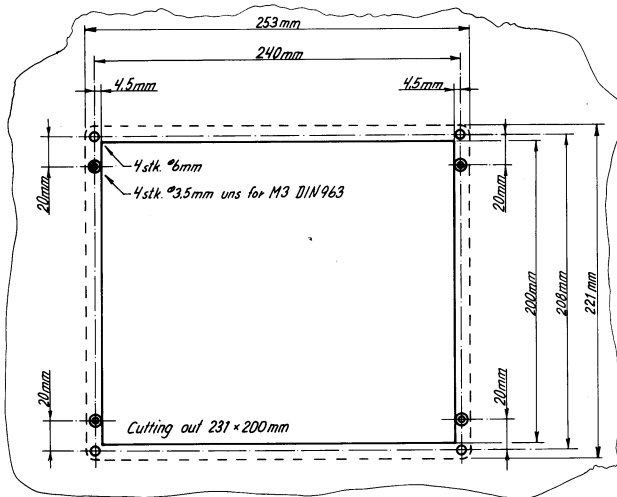
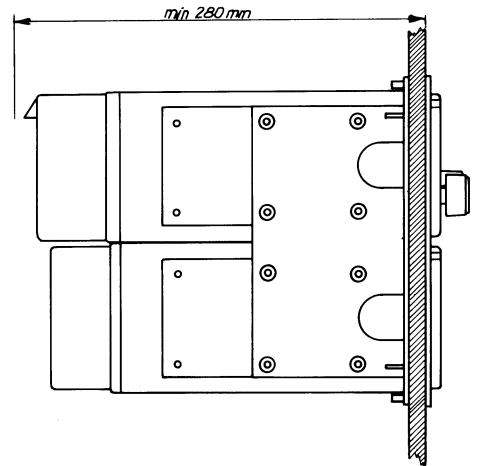
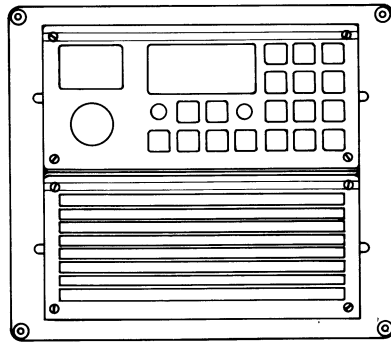


Free distance must be kept to allow free air circulation ambient temperature max. 40°C.

WEIGHT	
Mounting kit H2063:	1,0 kg
R2022	: 4,5 kg
H2054	: 5,5 kg
H2074	: 4,0 kg

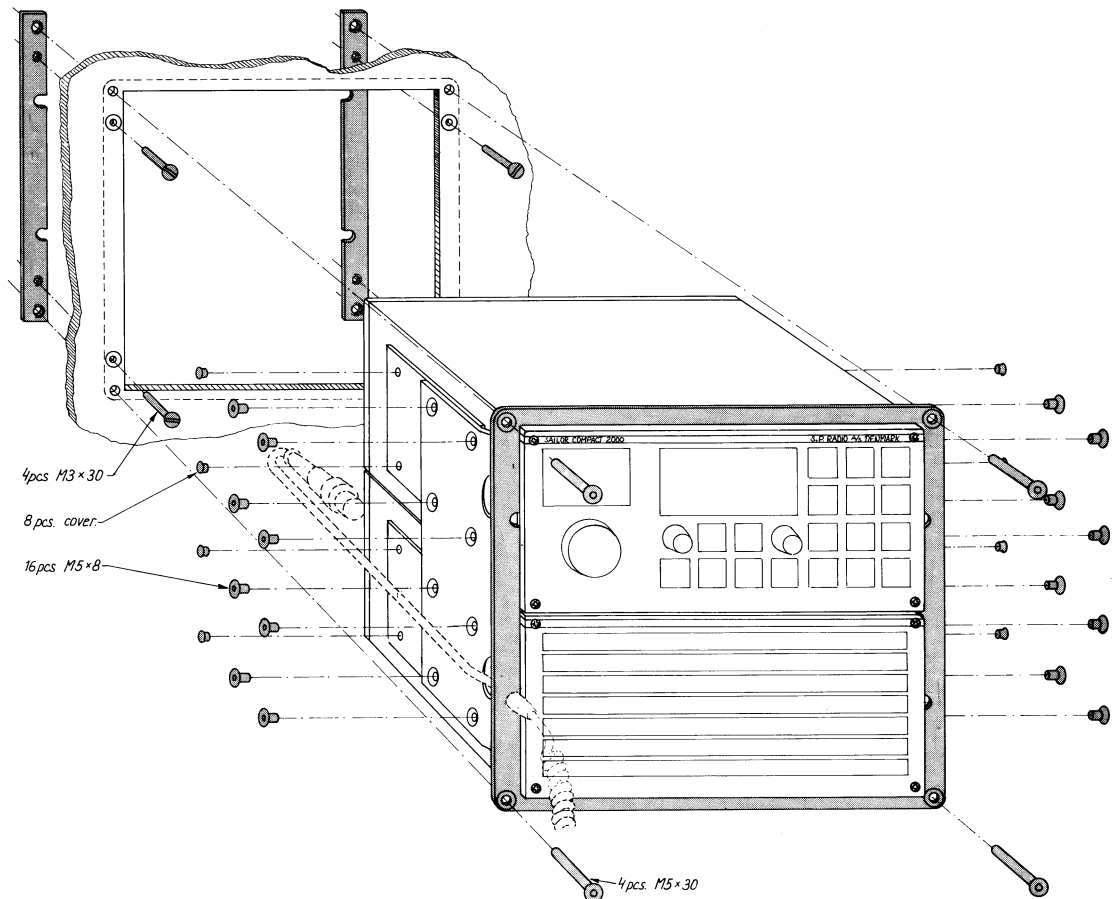


MOUNTING KIT H2064



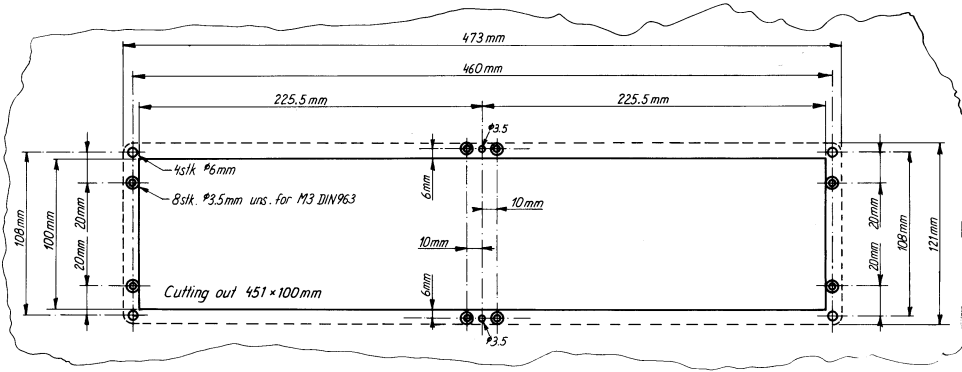
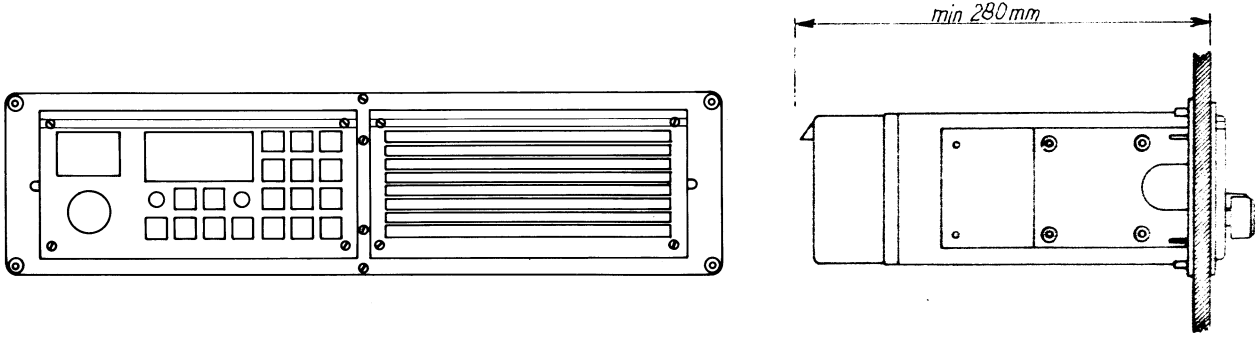
Free distance must be kept to allow free air circulation ambient temperature max. 40°C.

WEIGHT	
Mounting kit H2064:	1,5 kg
R2022	: 4,5 kg
H2054	: 5,5 kg
H2074	: 4,0 kg



R2022 4-0-24771/  
4-0-24704/4-0-24772

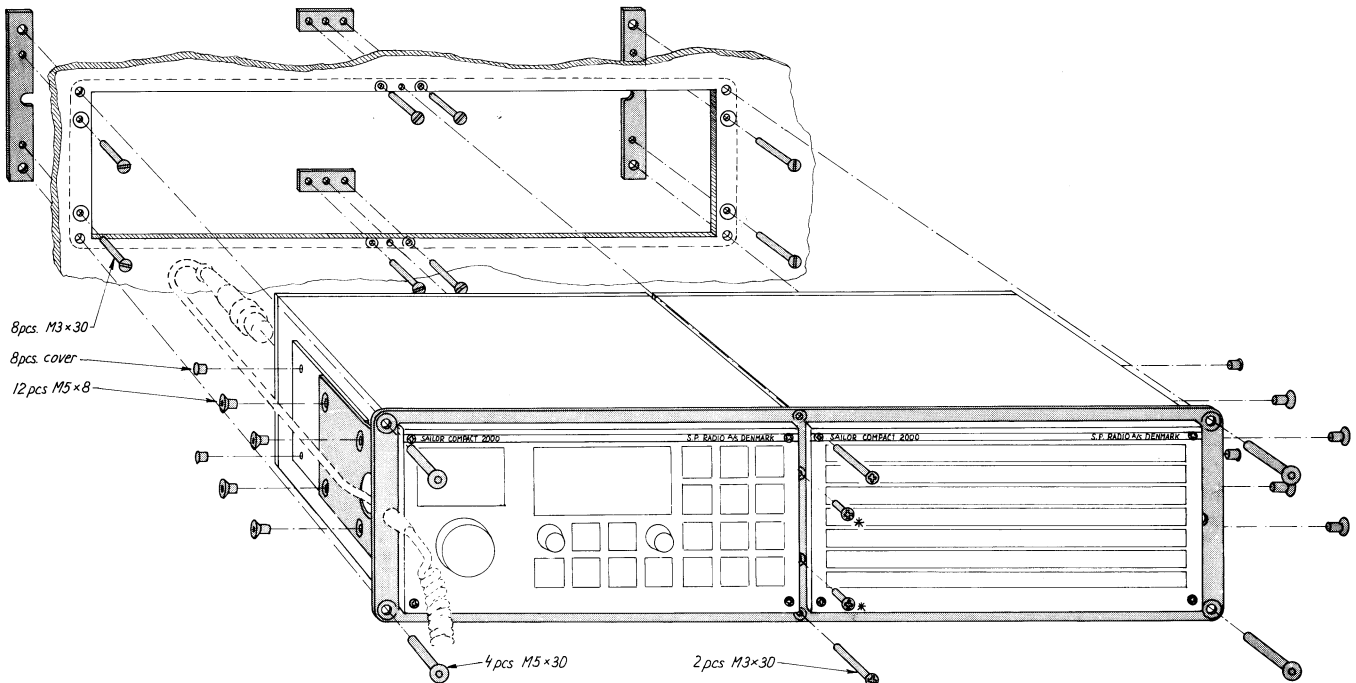
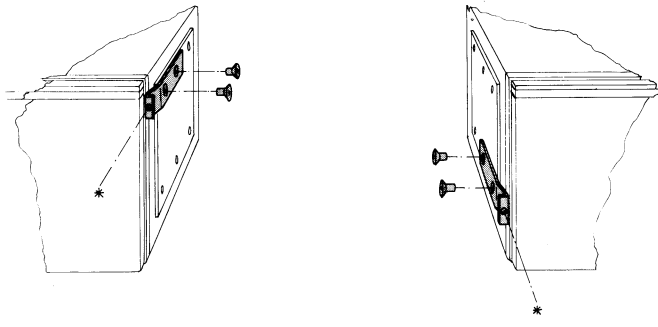
MOUNTING KIT H2062



Free distance must be kept to allow free air circulation ambient temperature max. 40°C.

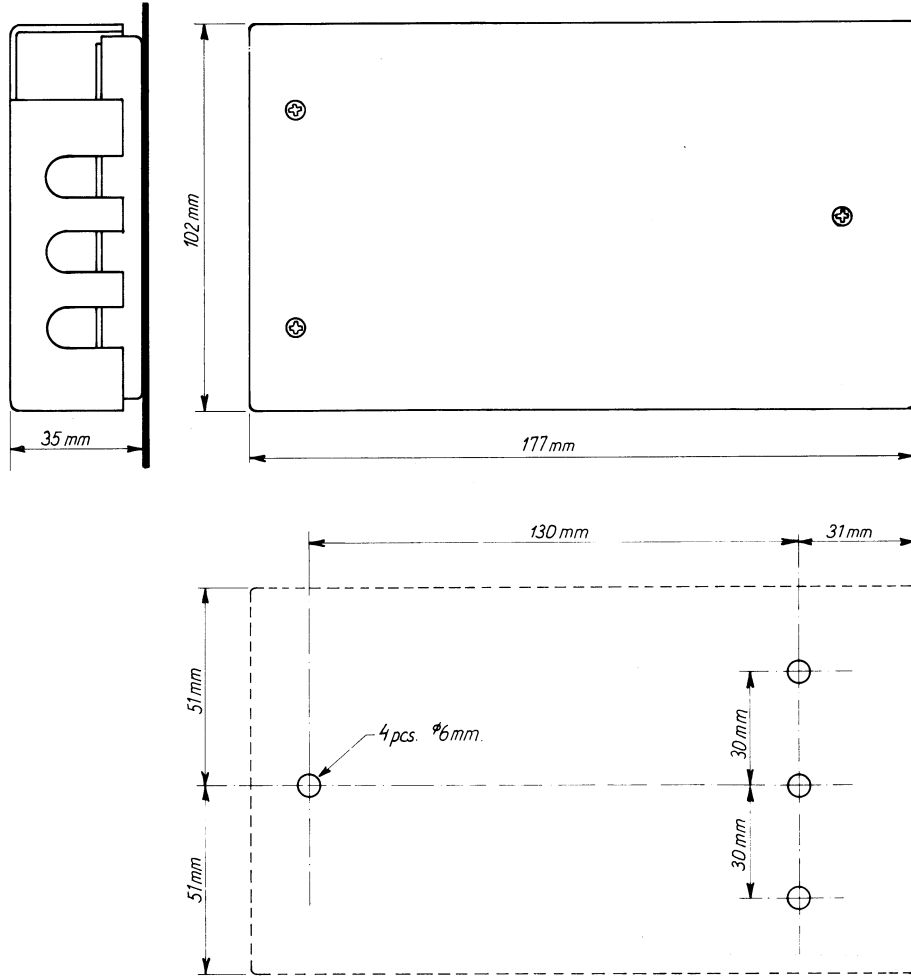
WEIGHT

Mounting kit H2062:	1,5 kg
R2022	: 4,5 kg
H2054	: 5,5 kg
H2074	: 4,0 kg

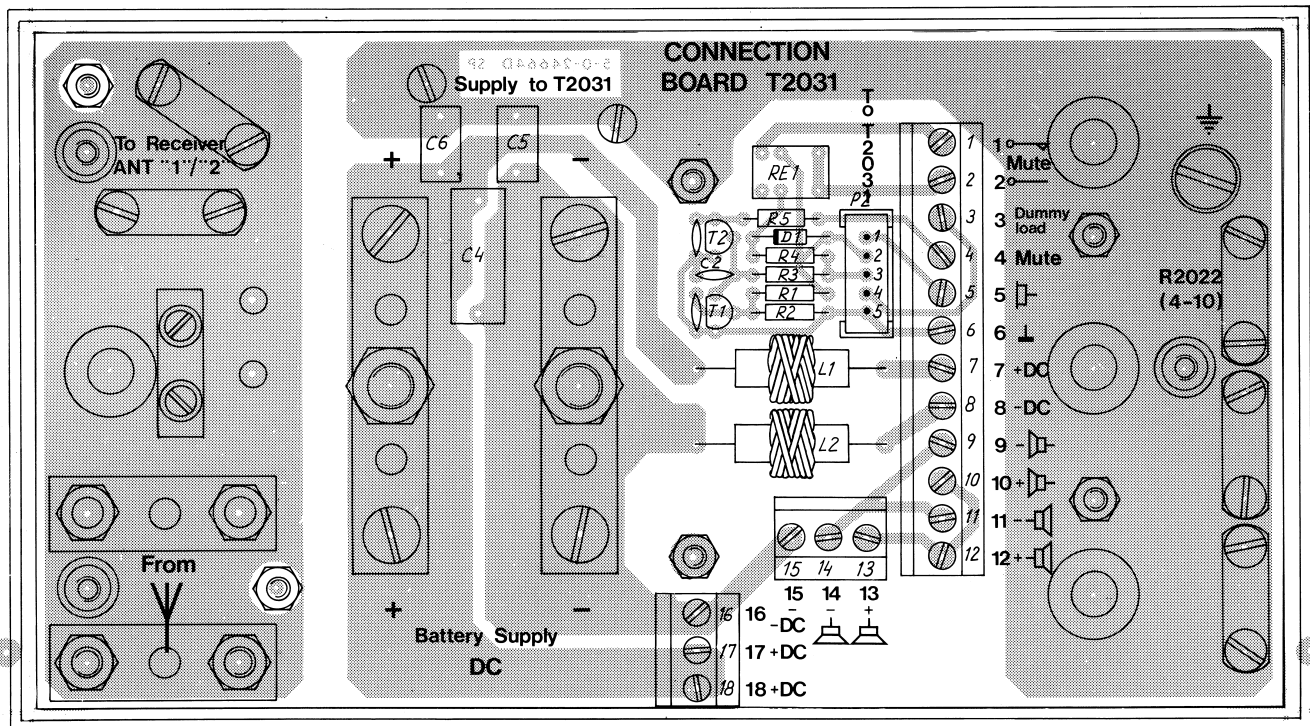
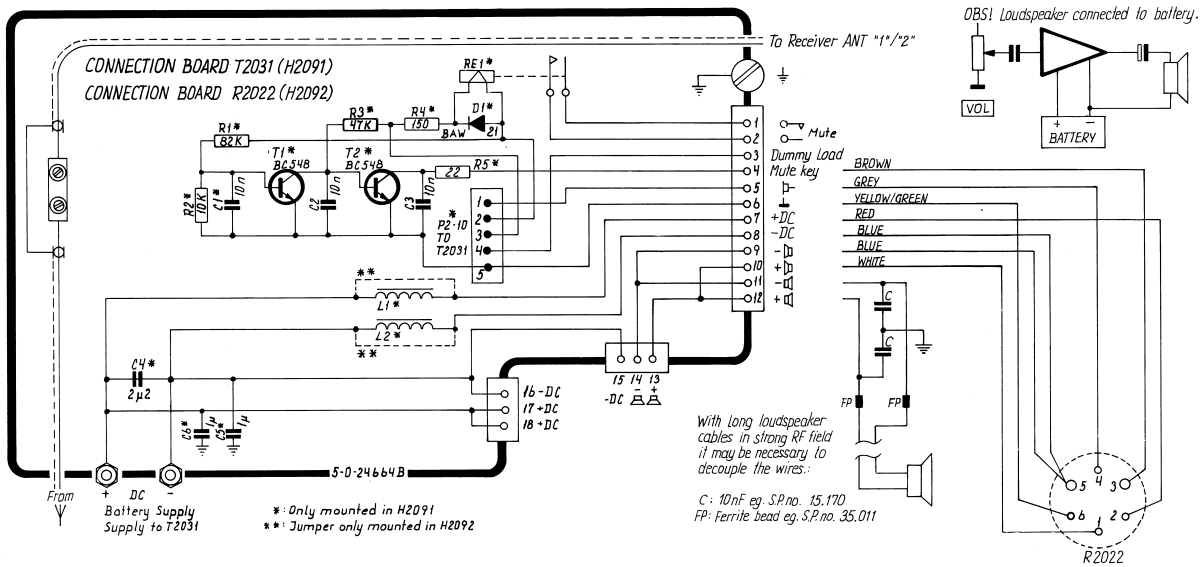


R2022 4-0-24769/  
 4-0-24732/4-0-24773

CONNECTION BOX H2091 or H2092

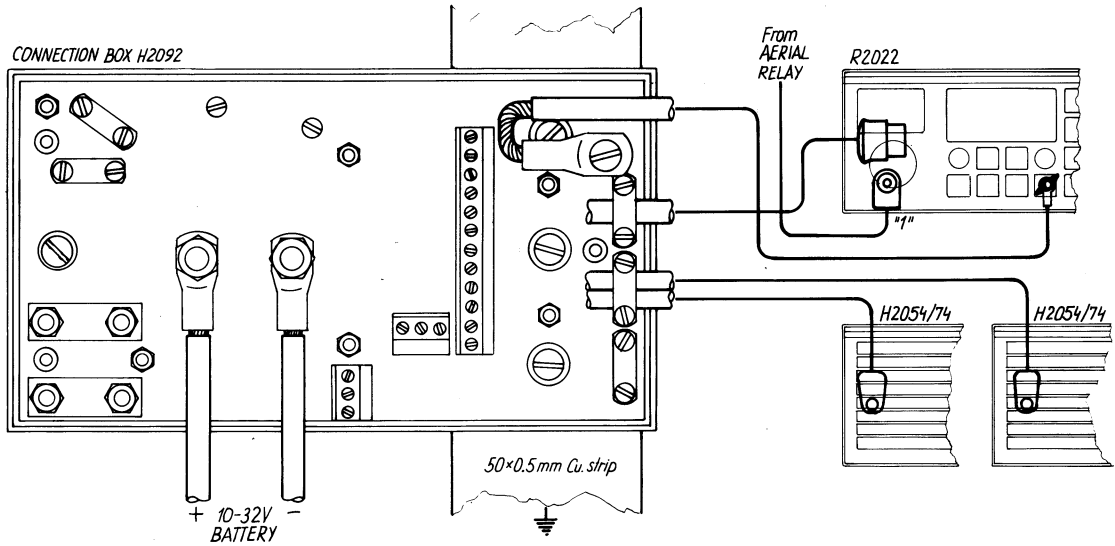


# DIAGRAM AND COMPONENT LOCATION H2091/H2092



## 2.3 ELECTRICAL CONNECTIONS

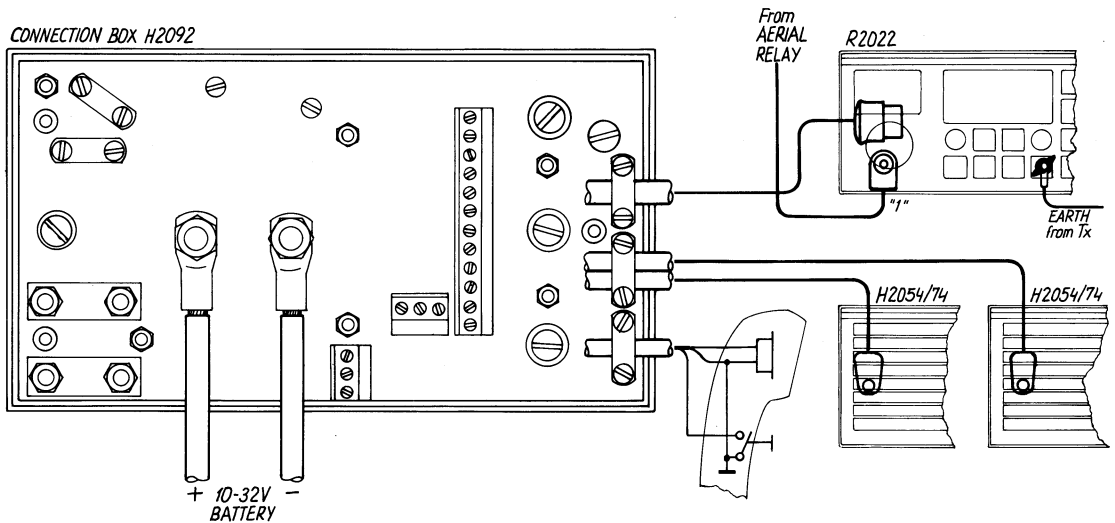
### RECEIVER ALONE.



#### NOTE:

The receiver must be programmed for one aerial simplex installation.  
Look up the AERIAL TUNE PROCEDURE.

### SIMPLEX



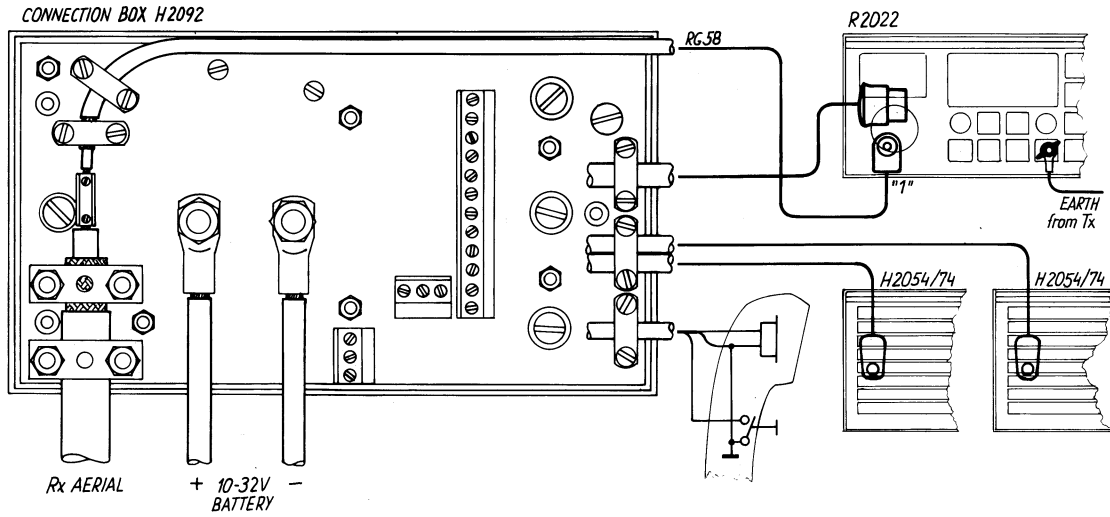
#### NOTE:

The receiver must be programmed for one aerial simplex installation.  
Look up the AERIAL TUNE PROCEDURE.

R2022 4-0-24774/4-0-24775



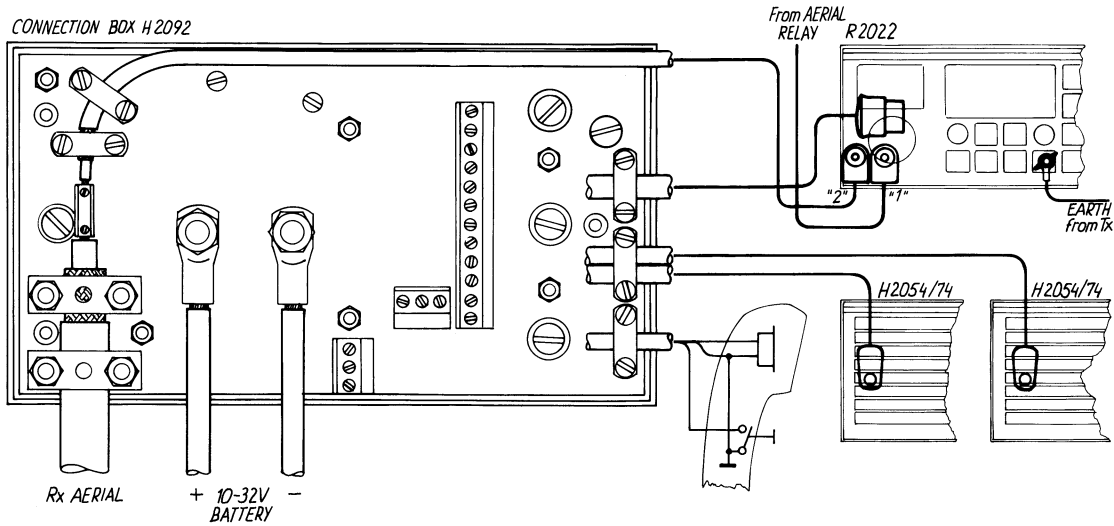
ONE AERIAL DUPLEX



NOTE:

The receiver must be programmed for one aerial duplex installation.  
Look up the AERIAL TUNE PROCEDURE.

TWO AERIAL DUPLEX



NOTE:

The receiver must be programmed for two aerial duplex installation.  
Look up the AERIAL TUNE PROCEDURE.

## 2.4 AERIAL AND EARTH

### AERIAL

For receiver aerial use either a whip aerial of at least 6 metres length or a wire aerial of 6 - 30 metres length.

For lead downs of less than 12 metres use a low capacitance cable, e.g. ET10MA  
For longer lead downs use a good quality of 50 ohms coaxial cable, e.g. RG213 and shift from HIGH to LOW (50 ohms) input impedance of the duplex filter.

To determine which pos. is the most advantageous search for a weak station near 1605 kHz, note the meter reading. Shift to the other input impedance and check if the meter reading has increased. Remember to tune the aerial capacitor. Look up the AERIAL TUNE PROCEDURE.

In noisy environments it may be advantageous to use a triaxial cable, e.g. SAILOR H1213 where the outer screen acts as static shield, this means that outer and inner screen has to be connected at the receiver.

The aerial must be placed as high and as much in the clear as possible, and for duplex reasons as far from the transmitter aerial as possible.

If wire aerial is used keep the angle between the aerial lead-in and the transmitter aerial as perpendicular as possible.

For aerial and cable connection use a junction box mounted at the foot point of the aerial. The junction box must be designed for outdoor mounting in maritime environments. E.g. SAILOR H1209.

### EARTH

#### RECEIVER WITHOUT TRANSMITTER

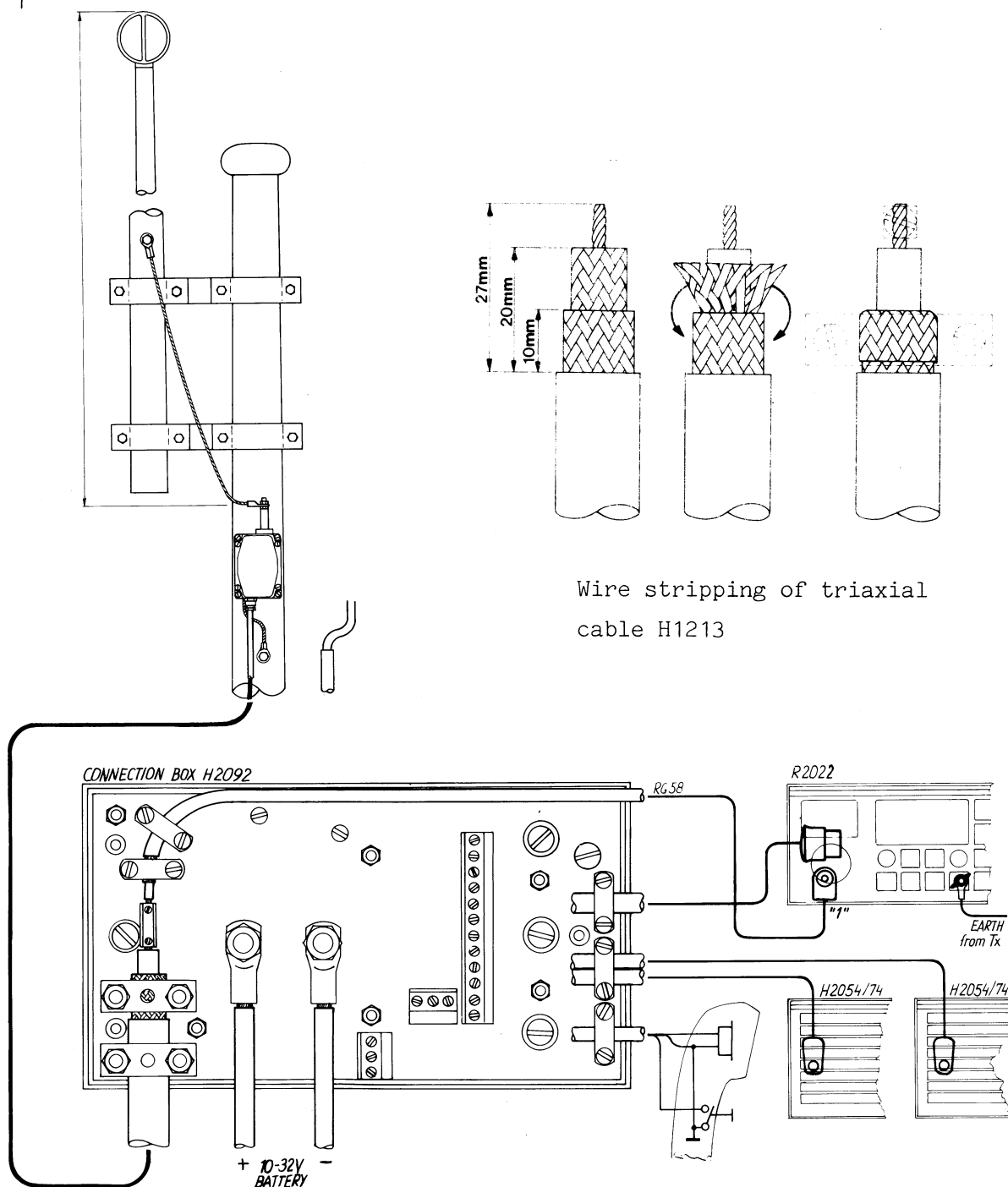
In iron vessels the earthband is led to the deck (hull) of the vessel or to the deckhouse.

In fibre-glass and wooden vessels the earthband is led either to a keel bolt, if the vessel has an external ballast keel (sailing vessels), or to an external metal plate of at least 1 sqm. on the hull below the water line.

RECEIVER IN CONJUNCTION WITH A TRANSMITTER:

Connect the earthband to the transmitter earth terminal in the shortest possible way to keep the receiver at the same RF potential as the transmitter.

Fig. 1



AERIAL AND EARTH cont.

To be grounded effectively.

If metal mast to mast.

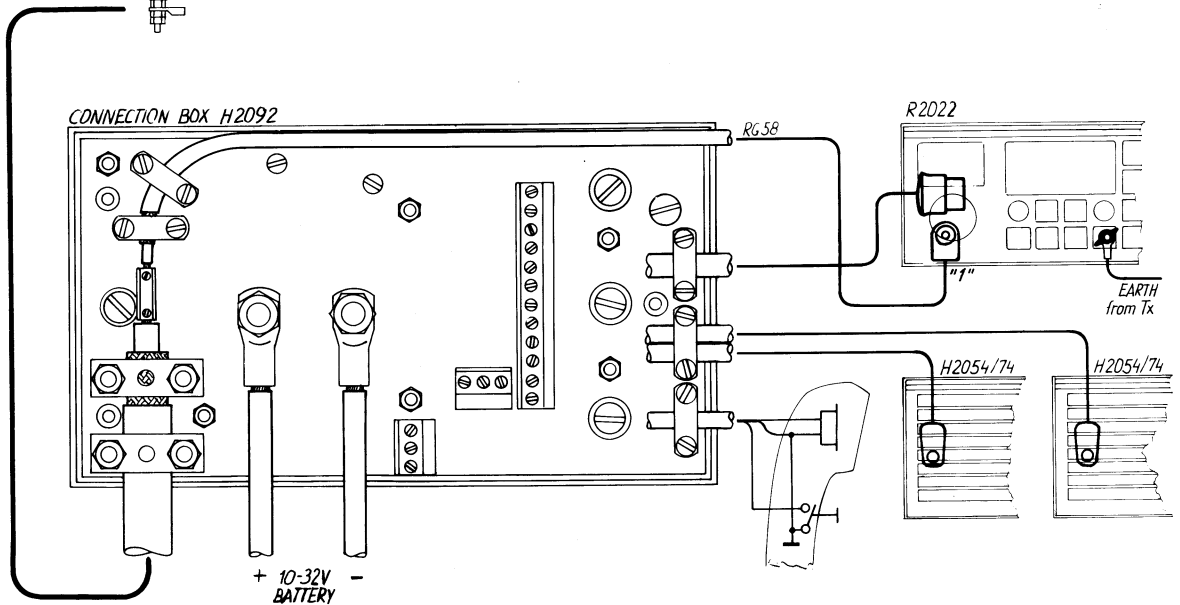
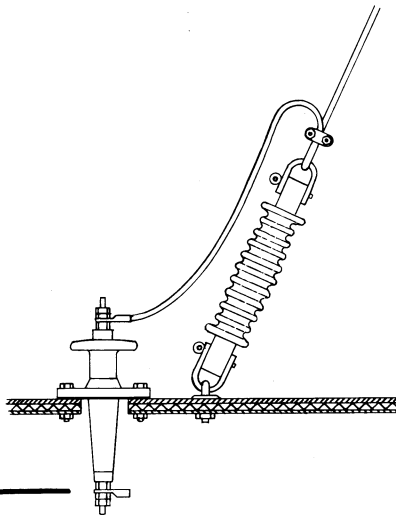
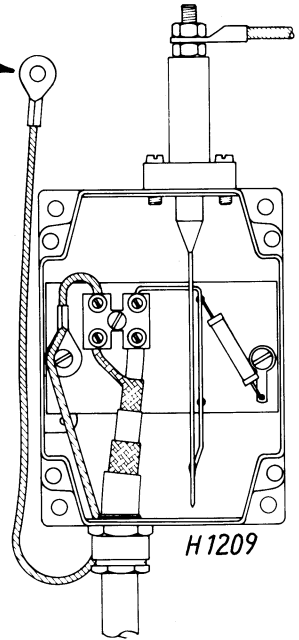
Metal mast must be connected to either metal hull or to grounding system.

If wooden mast to cu-strip (5x1) fastened to the mast.

In the lower end the strip must be connected to hull (if metal ship) or to separate grounding system (equal to transmitter system) close to mast.

All standing rigging must in the top end be connected to metal mast or cu-strip and in the receiver end to cu-strip or grounding system.

To avoid crackling noise make all connections by welding, bolting or solering.



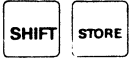
R2022 4-0-22171/  
4-0-22128/4-0-24776

## 2.5 AERIAL TUNE PROCEDURE

When the receiver has been installed it has to be programmed for the installation in question. There are 3 possibilities, either one aerial simplex or one aerial duplex or two aerial duplex. The 3 configurations are stored in a "roll stack" entered by the **TUNE** **SHIFT** **STORE** keys and it is rolled by pressing the **SHIFT** key.

Readouts are:

Keep **TUNE** activated and press



Release TUNE

2Adu0



1A5.0



1Adu1

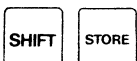


2Adu0

### HOW TO PROGRAMME THE RECEIVER AERIAL CONFIGURATION

E.g. one aerial simplex

Keep **TUNE** activated and press



Release TUNE

2Adu0



1A5.0



The frequency in  
file no 0 is shown.

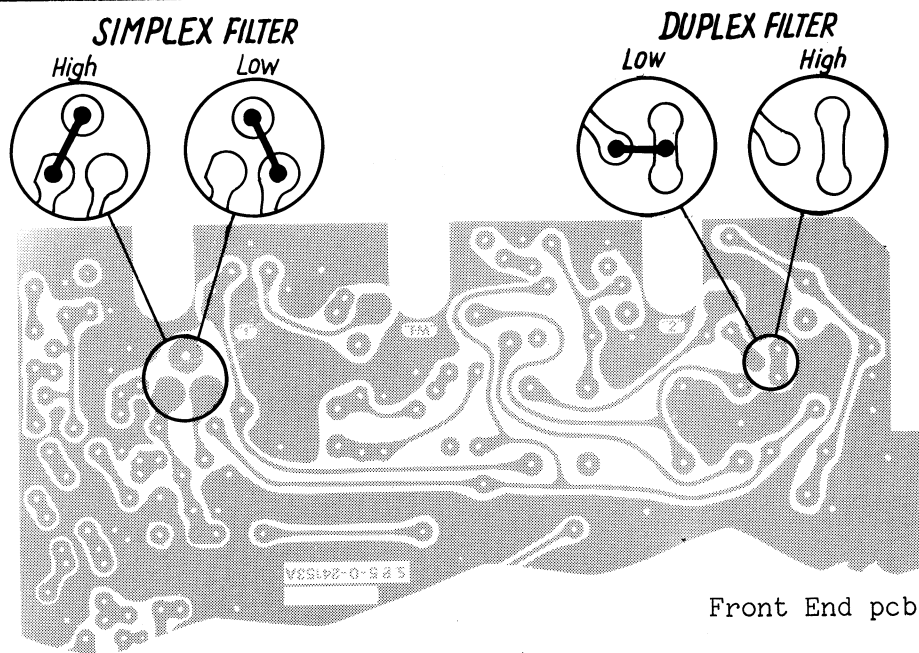
AERIAL TUNE PROCEDURE cont.

SAILOR R2o22 has two aerial input impedances, HIGH 500 ohms approx. and LOW 50 ohms approx.

The low impedance is to be used in installations with long coax. cable of approx. 12 metres or more.

The receiver is factory set for HIGH aerial impedance.

HOW TO SHIFT FROM HIGH TO LOW INPUT IMPEDANCE



SAILOR R2o22 has three aerial sockets, FM, ANT "1", and ANT "2".

FM socket is intended for a FM diapole aerial. (75 ohms)

ANT "1" is intended for a one aerial installation, either the transmitter aerial in a simplex installation or a foremast aerial for duplex installation.

ANT "2" is intended for a two aerial installation where the simplex aerial is the transmitter aerial connected to the ANT "1" connector, and the duplex foremast aerial is connected to the ANT "2" connector.

R2022A

Anyway the aerial trimmer for the duplex filter has to be tuned.

HOW TO ADJUST THE DUPLEX FILTER AERIAL TRIMMER

SIMPLEX INSTALLATION.

- 1) Key in a low frequency in the CT. band e.g. 1610 kHz.
- 2) Press the   keys and search for a weak station in the low end of the CT band. Then press the   keys again.
- 3) Activate the noise generator by pressing the RF TUNE knob, and tune for maximum meter reading.
- 4) Adjust by means of an insulated trimming stick the aerial trimmer for max meter reading.
- 5) Repeat 3) and 4) until no essential improvement is achieved.

DUPLEX INSTALLATION.

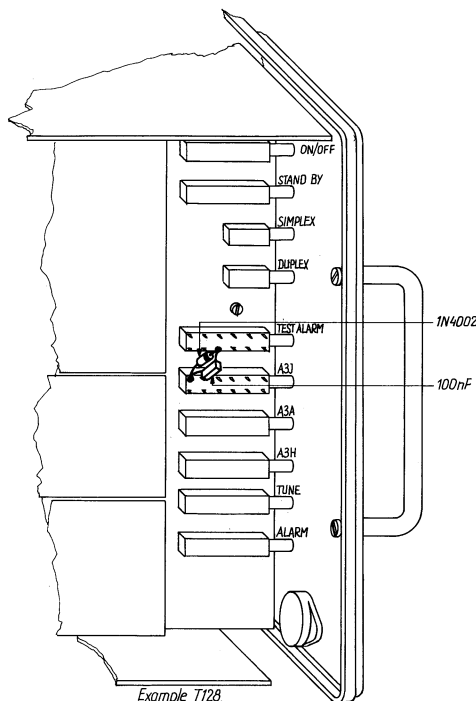
- 1) Key in a low frequency in the CT band e.g. 1610 kHz.
- 2) Press the   keys and search for a weak station in the low end of the CT band. Then press the   keys again.
- 3) Press the  key.
- 4) Activate the noise generator by pressing the RF TUNE knob, and tune for maximum meter reading.
- 5) Adjust by means of an insulated trimming stick the aerial trimmer for max. meter reading.
- 6) Repeat 4) and 5) until no essential improvement is achieved.



## 2.6. R2022 USED IN CONJUNCTION WITH T121, T122, T124, T126 OR T128.

Connection box H2093 is used when R2022 is installed in conjunction with SAILOR T12X.

When used in conjunction with SAILOR T121, T124, T126 and T128 a minor modification must be made in the transmitter to secure that the station operates properly (see fig. 1).



**NOTE!**  
No need for modification in T122.

R2022/H2093.  
4-0-25017.

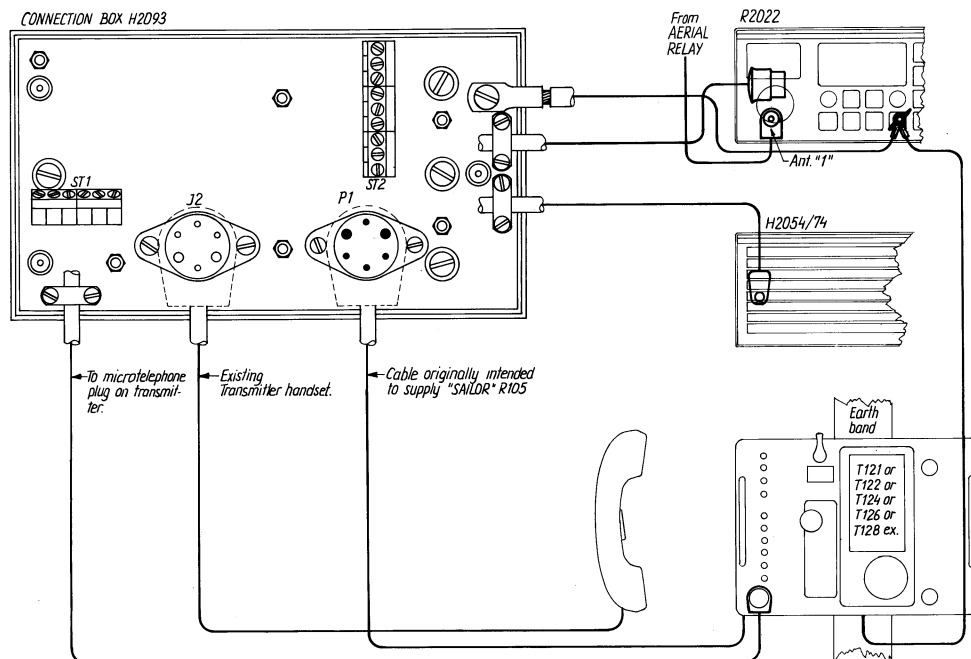
How to interconnect R2022, H2093 and T12X: look up sections 2.6.1. and 2.6.2. of this manual.

**IMPORTANT!** When R2022 is installed in conjunction with T12X there are a few changes to the operation of the station.

- a) The simplex/duplex mode switch on the transmitter must always be placed in duplex position.  
Simplex/duplex mode shift is handled through keyboard on R2022 (look up the green covered operating manual).
- b) Test alarm function is carried out in the following way:
  - 1) Press a digit on the receiver keyboard to avoid AF signal from the receiver in the handset.
  - 2) Activate test alarm function on the transmitter, and the alarm signal is now heard in the handset.  
**NOTE!** The procedures 1) and 2) are not to be followed if send alarm function is activated on the transmitter. In that case the receiver is automatically muted.
- c) Earpiece level is adjusted through potentiometer R15 located on H2093 PCB.

## 2.6.1. ELECTRICAL CONNECTIONS OF R2022 AND T12X

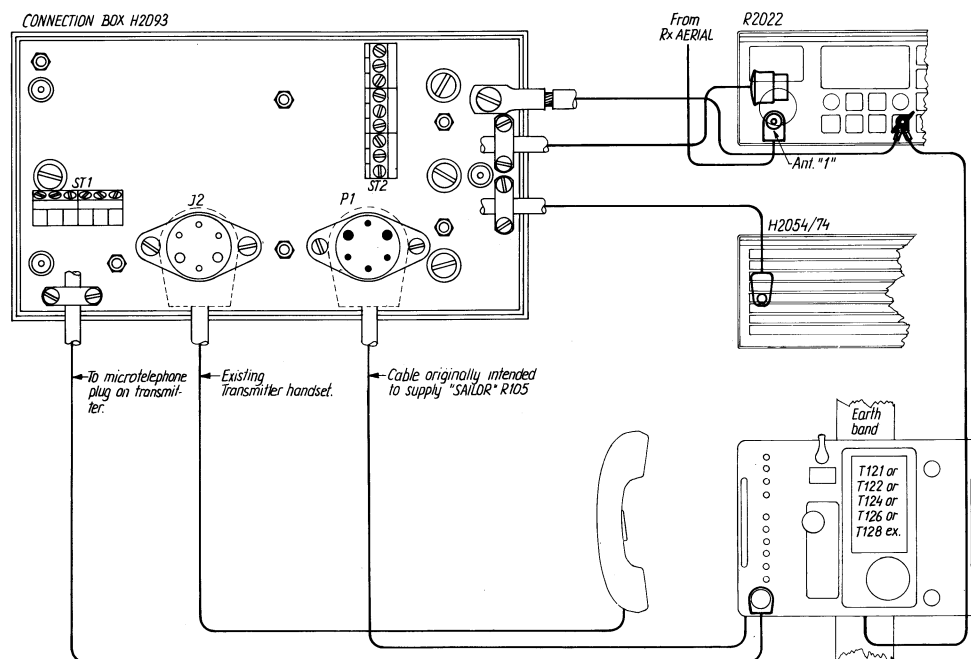
### SIMPLEX



#### NOTE:

The receiver must be programmed for one aerial simplex installation. Look up the AERIAL TUNE PROCEDURE.

### ONE AERIAL DUPLEX

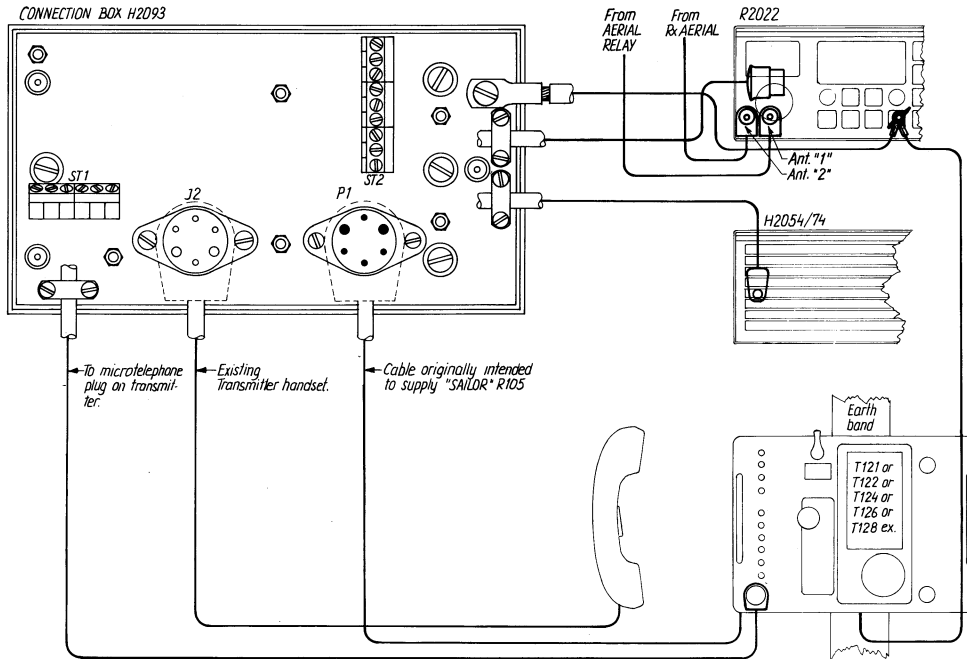


#### NOTE:

The receiver must be programmed for one aerial duplex installation. Look up the AERIAL TUNE PROCEDURE.

ELECTRICAL CONNECTIONS OF R2022 AND T12X cont.

TWO AERIAL DUPLEX

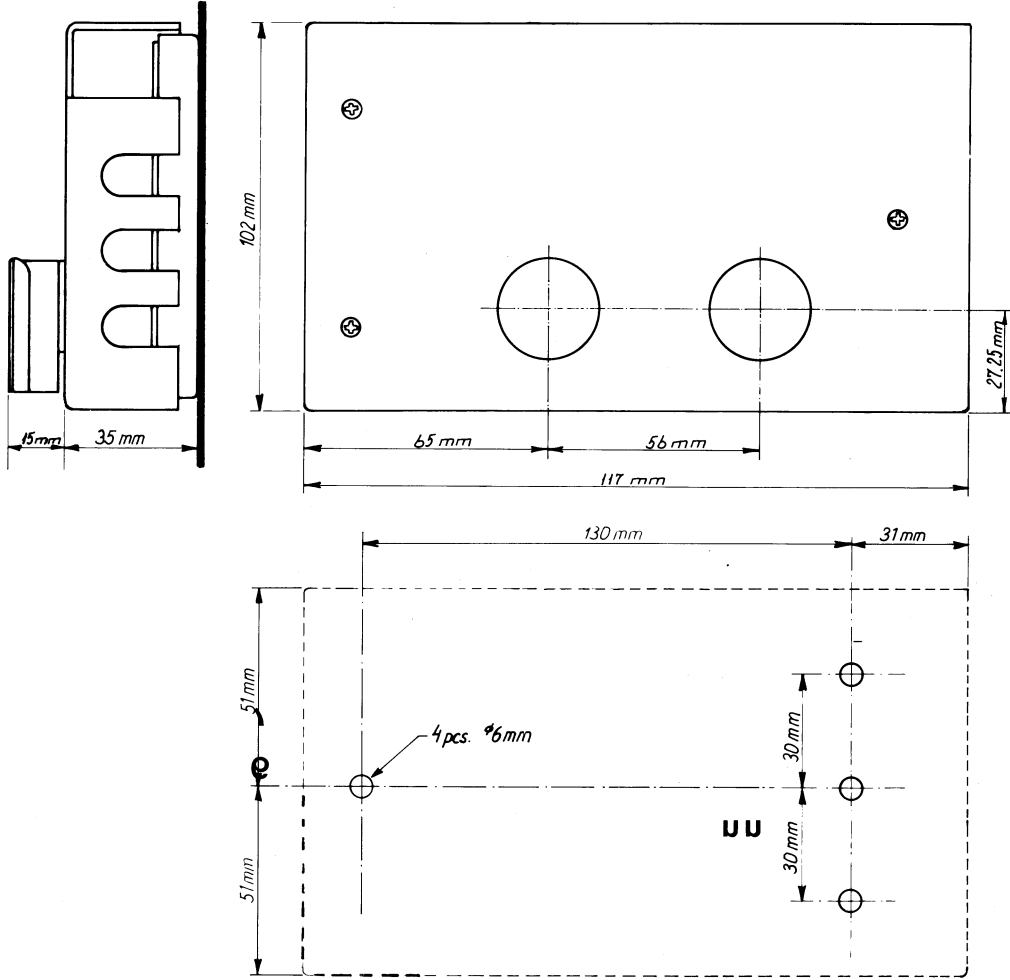


NOTE:

The receiver must be programmed for two aerial duplex installation.  
Look up the AERIAL TUNE PROCEDURE.

2.6.2 DIMENSION AND DRILLING PLAN FOR H2093

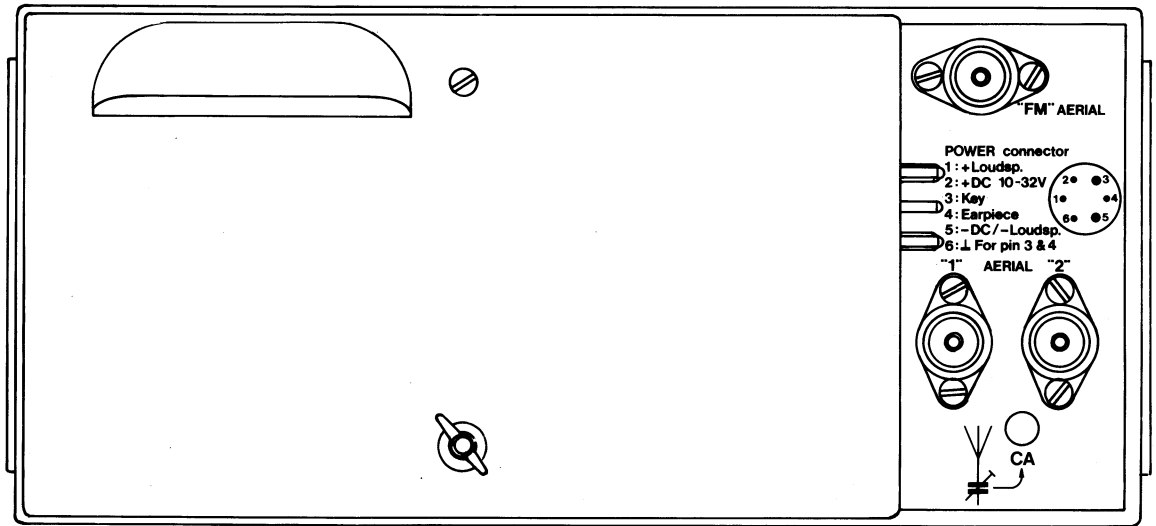
CONNECTION BOX H2093



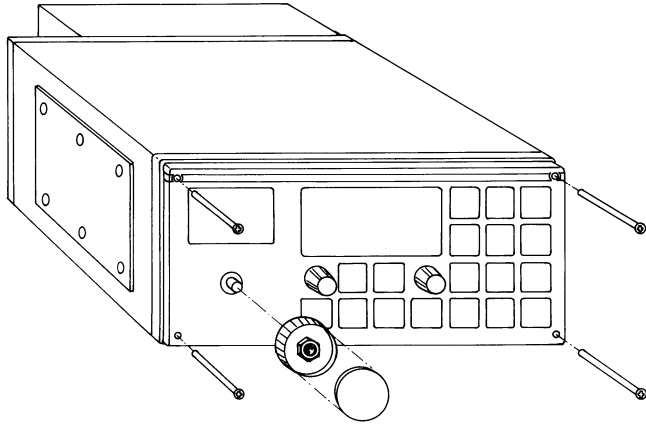
R2022/H2093.  
4-0-24990.



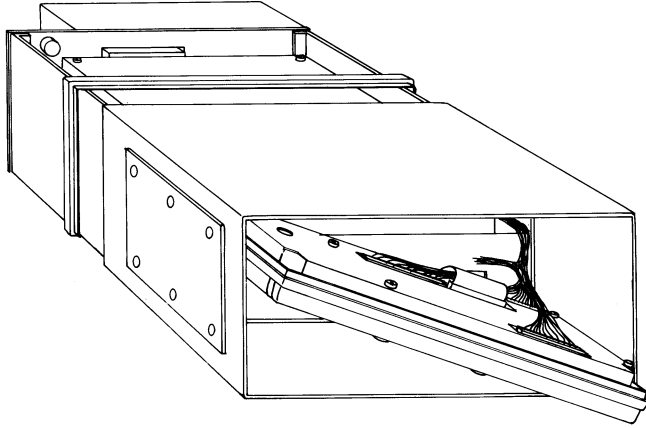
REAR VIEW



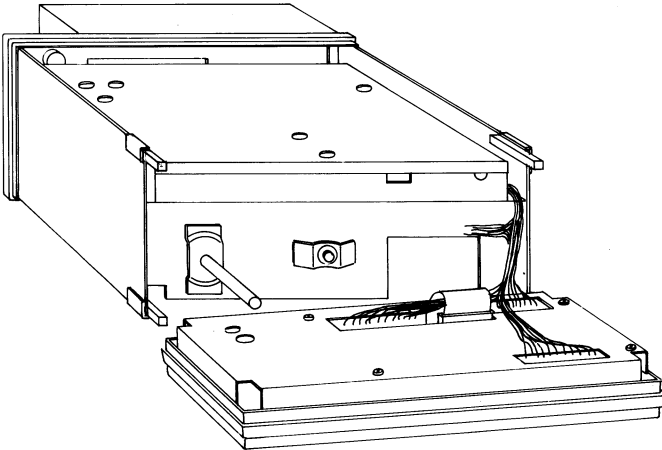
1.



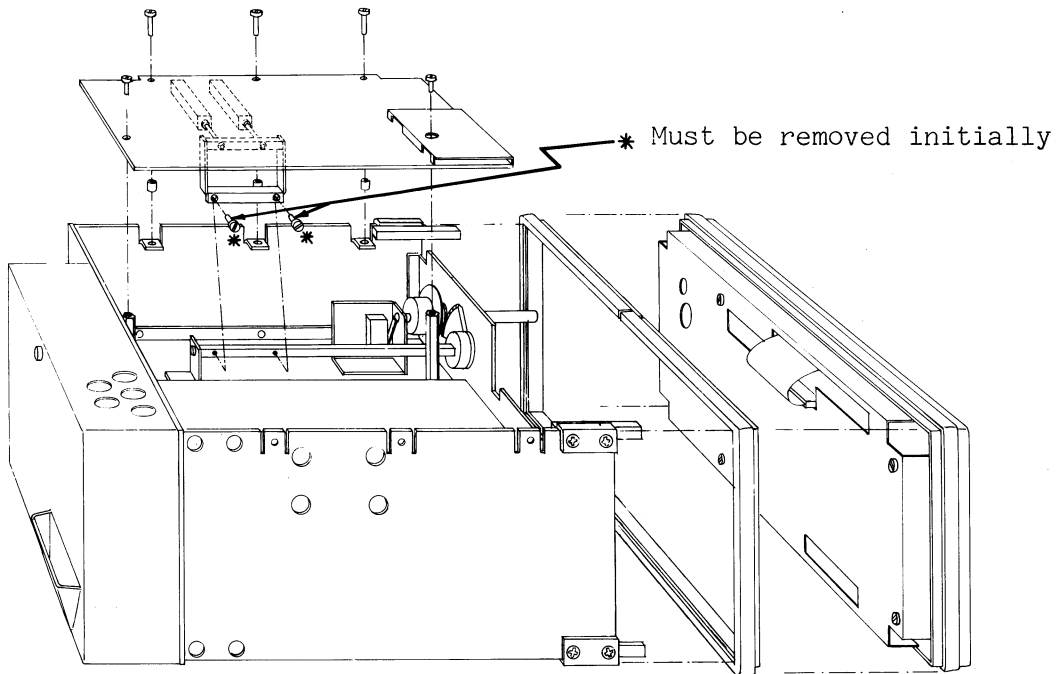
2.



3.



4. HOW TO DISASSEMBLE THE FRONT END PCB



## 5.0. CIRCUIT DESCRIPTION

### 5.1. FRONT END (MODULE 1)

This unit contains the following parts:

- Aerial Switch and Simplex Relay
- Truth Table for Aerial Switch
- Duplex Filter and Noise Generator
- Simplex Filters
- Mixer and Crystal Filters
- FM Tuner and IF Filter
- Miscellaneous

#### AERIAL SWITCH AND SIMPLEX RELAY

The aerial signal enters the receiver via the aerial socket(s) "1" - "2". The switching between duplex and simplex filters takes place by means of RE1 controlled from the microprocessor and T1.

The simplex relay is controlled from the microprocessor and T2.

#### TRUTH TABLE FOR AERIAL SWITCH

Aerial programming	Filter	Socket "1"	Socket "2"	RE1	RE2	D8	D12
One Aerial Simplex	Simplex	ON	Duplex	ON	ON	OFF	ON
	Duplex	ON	⊥	OFF	ON	ON	OFF
One Aerial Duplex	Simplex	ON	Duplex	ON	ON	OFF	ON
	Duplex	ON	⊥	OFF	ON	ON	OFF
Two Aerial Duplex	Simplex	ON	Duplex	ON	ON	OFF	ON
	Duplex	Simplex	ON	ON	ON	ON	OFF

#### DUPLEX FILTER AND NOISE GENERATOR

The aerial signal enters the duplex filter through the protection resistor R3 and the aerial tuning capacitor C3, which is a part of the tuning capacitor for L1, and leaves the capacitive coupled filter at the impedance transformer C11 and C12. The reversed biased diode D2 is part of the aerial coil protection circuit.

The noise generator consist of D14 and T3, which is switched on and off by means of a 10.24 kHz square wave signal activated by the switch S1-6.



### **SIMPLEX FILTERS**

The aerial signal enters the simplex filters through the HP filter consisting of L2, C10 and L4 and leaves the filter at the diodes D5, D6 or D7. D3 is part of the aerial coil protection circuit. There are three filters, namely the LW LP filter consisting of C17, L8 and C24, the MW BP filter consisting of L6, C18, L9, C26, C28 and L12 and the CT BP filter consisting of L7, C19, L10, C21, L11, C29, C31 and L13.

The signal is fed on through D9, D10, or D11 to an LP filter consisting of L14, C63, C33, L15, C35 and C36 through D12 to the mixer.

The switching in and out is controlled by the microprocessor IC1 (LW, CT) and IC2 (MW).

### **MIXER AND CRYSTAL FILTERS**

From the input selectivity the signal is fed to the double balanced mixer through the balanced transformer TR2 to the FET mixer T6 and T7. The local oscillator signal from the buffer transistor T1-3 is fed into the sources of the FET's. D15, C46 and D17 are the self bias circuit for the mixer. The difference frequency at the drains of the FET's is filtered out in the tuned circuit TR4, C53 and C55 and led through one of the two high order monolithic crystal filters FL2 and FL3 to the IF amplifier. The filter selection is controlled by the microprocessor IC1 and IC2.

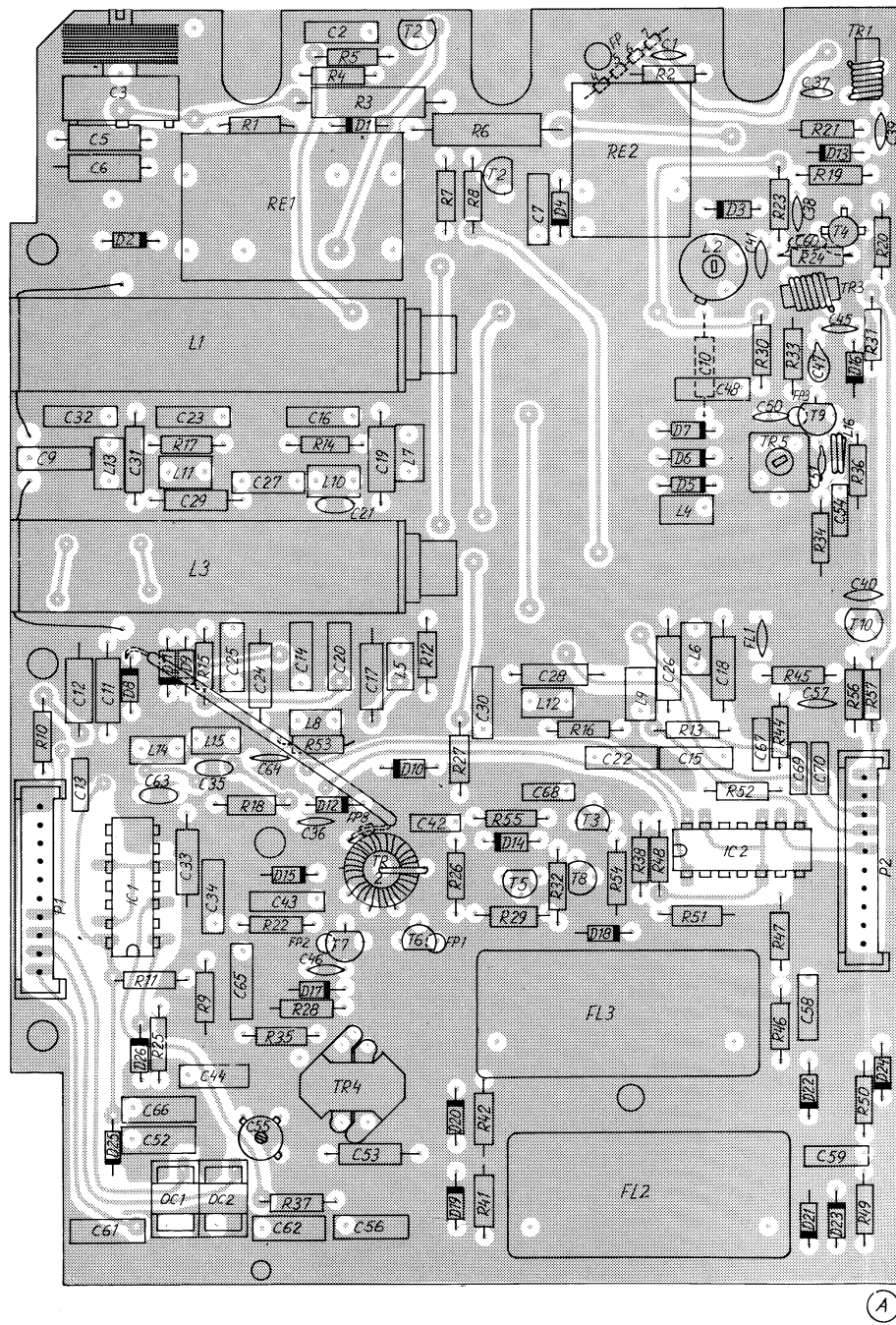
### **FM TUNER AND IF FILTER**

The aerial signal is led through the tuned input transformer TR1, C37, C39 and capacitance diode D13 to the tuned RF amplifier T4. The amplified signal is led through the tuned collector transformer TR3, C45 and capacitance diode D16 to the FET mixer T9. The local oscillator signal from the doubler transistor T3-3 is fed into the source of the FET. R34 and C51 ensure correct termination of the L02 coaxial cable. L16 and C54 are resonated at the IF frequency to increase the mixer gain. The difference frequency at the drain of the FET is filtered out in the tuned circuit TR5 and C50 and led through the ceramic resonator filter FL1 to the IF amplifier. The selection of FM mode is controlled by the microprocessor IC2, T8 and T5.

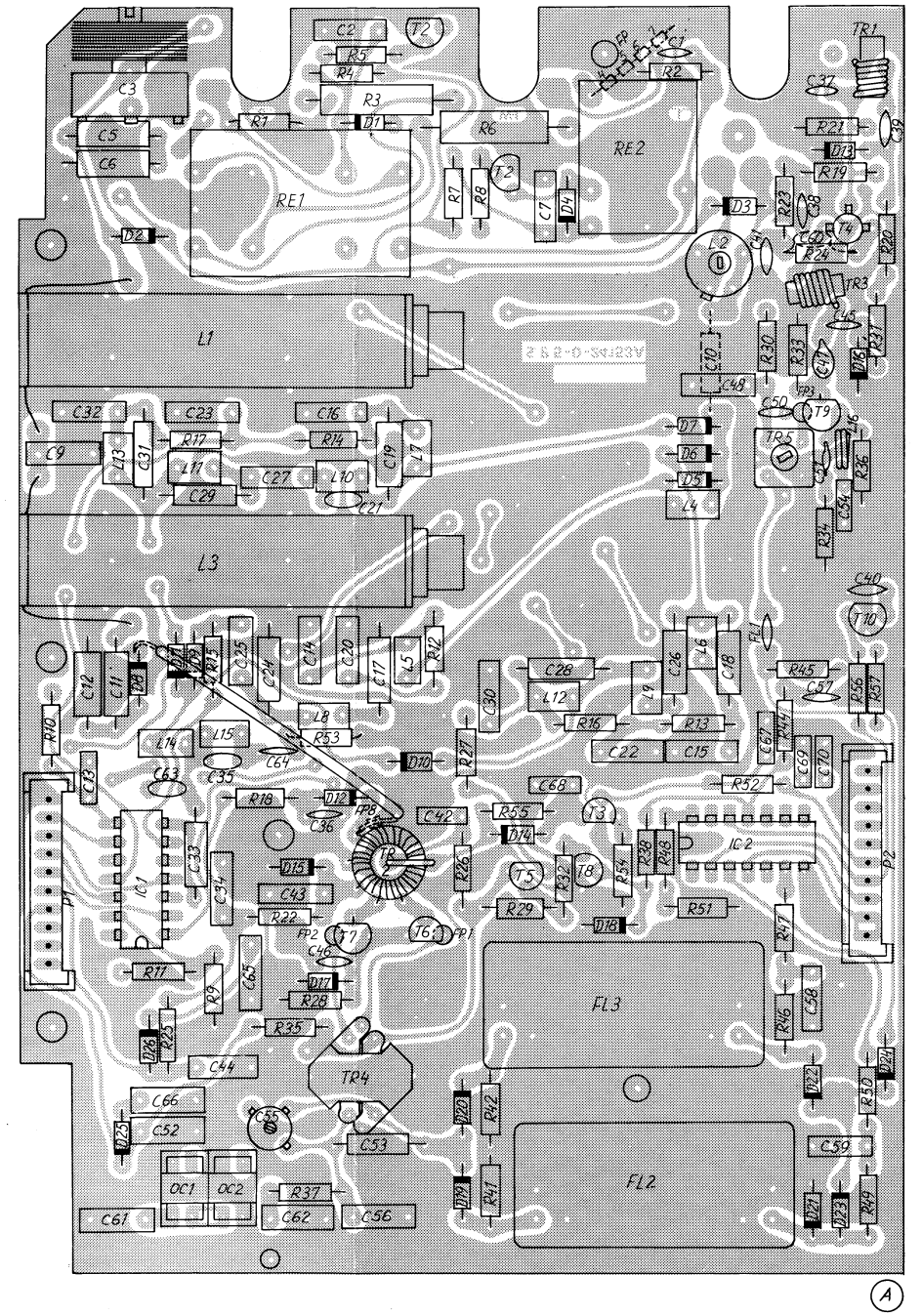
### **MISCELLANEOUS**

OC1 and OC2 are optocouplers giving pulses when tuning wheel is rotated in the TUNE or CLARIF. mode.

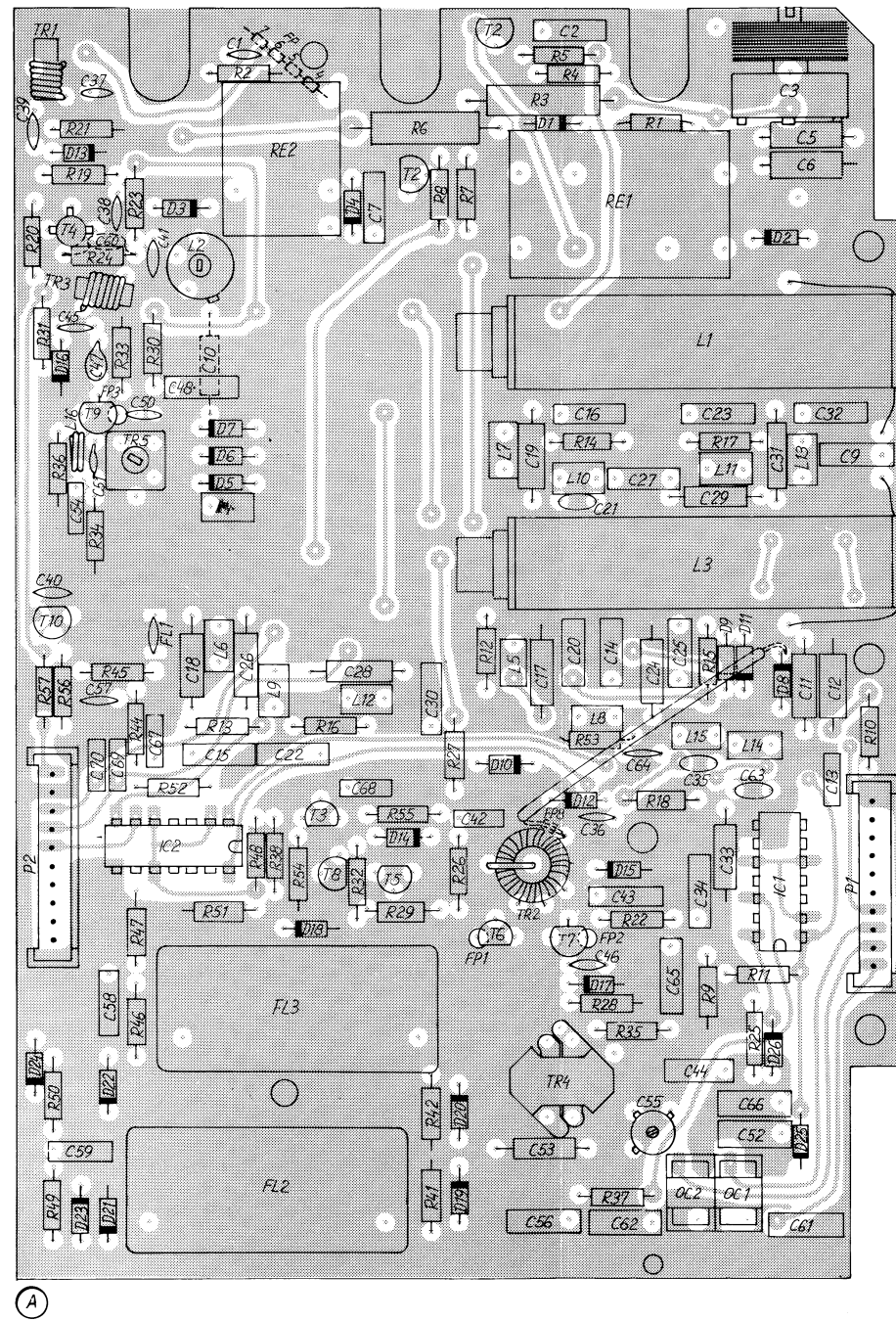
T10 short-circuits the tune voltage for D13 and D16 when the FM tuner is switched off, to prevent L02 radiation from the aerial.



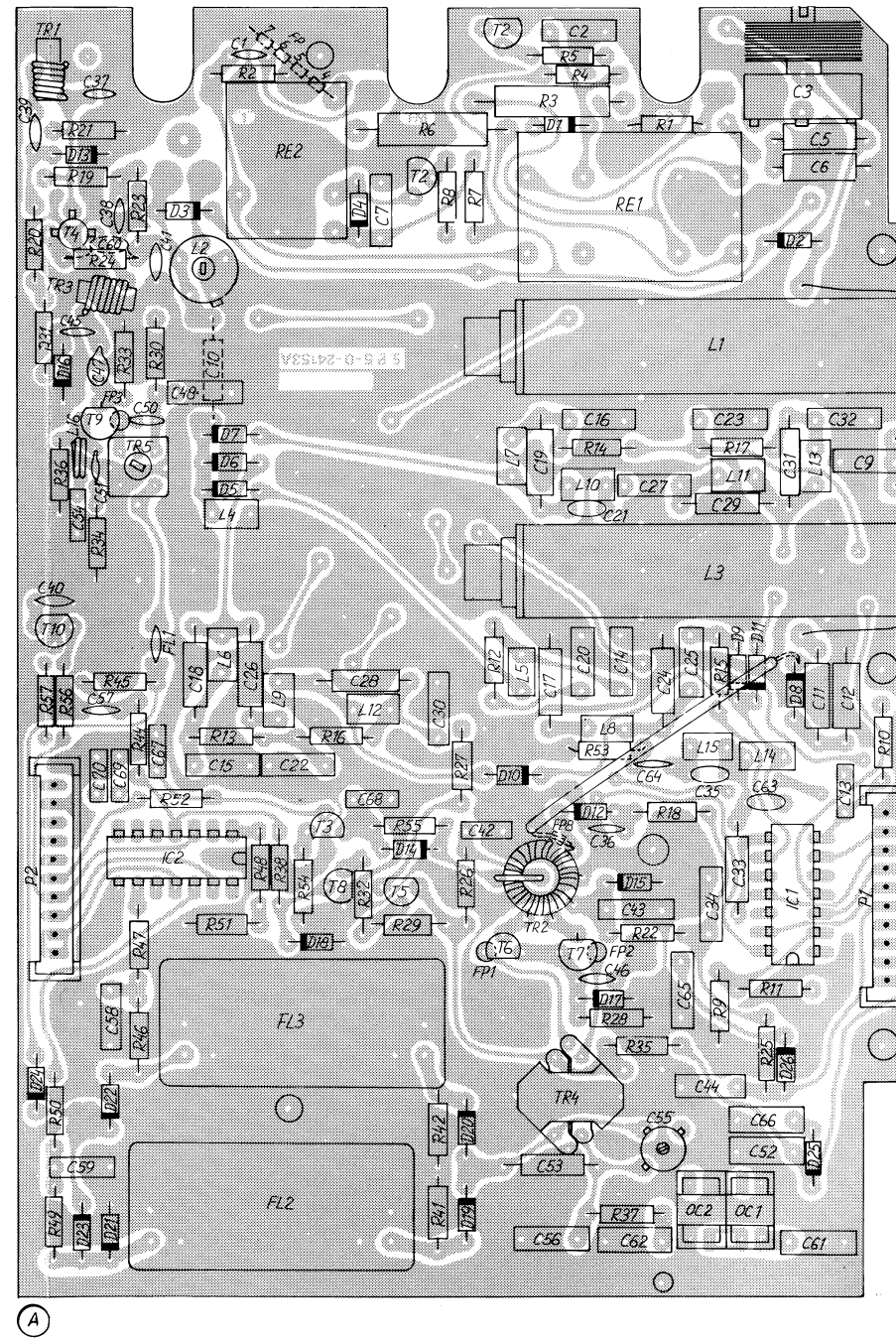
View from component side with lower side tracks.



View from component side with upper side tracks.

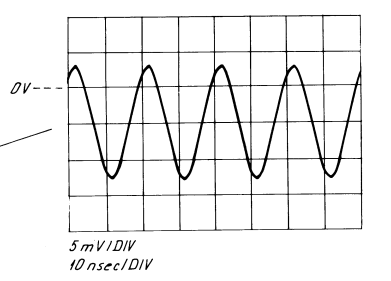
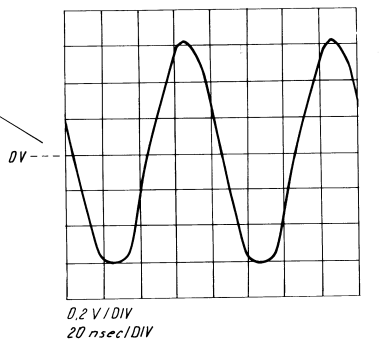
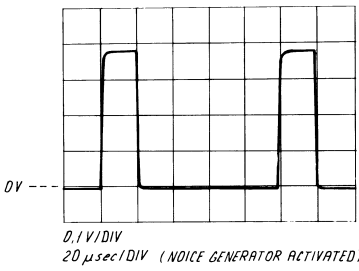
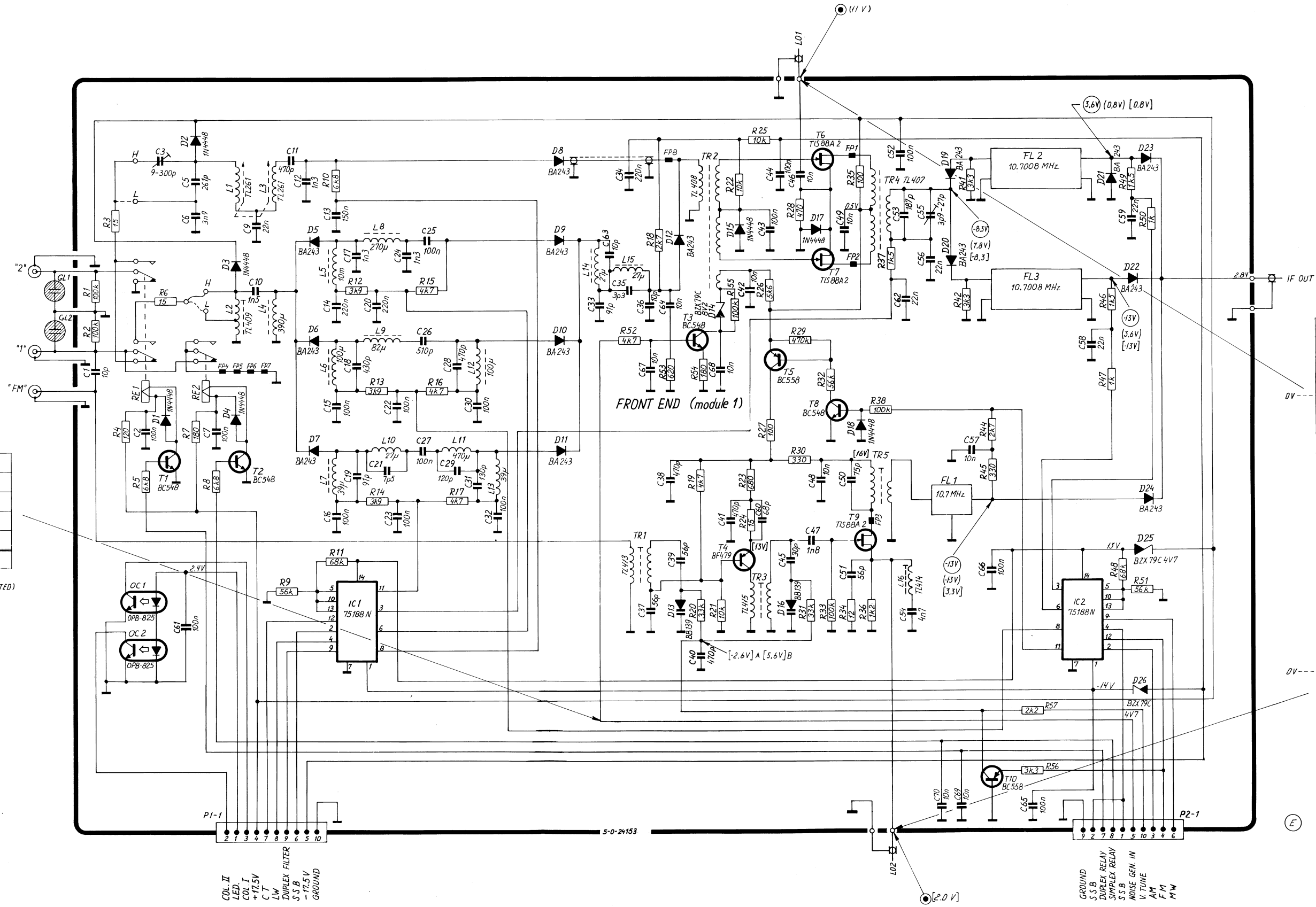


View from soldering side with lower side tracks.



View from soldering side with upper side tracks.

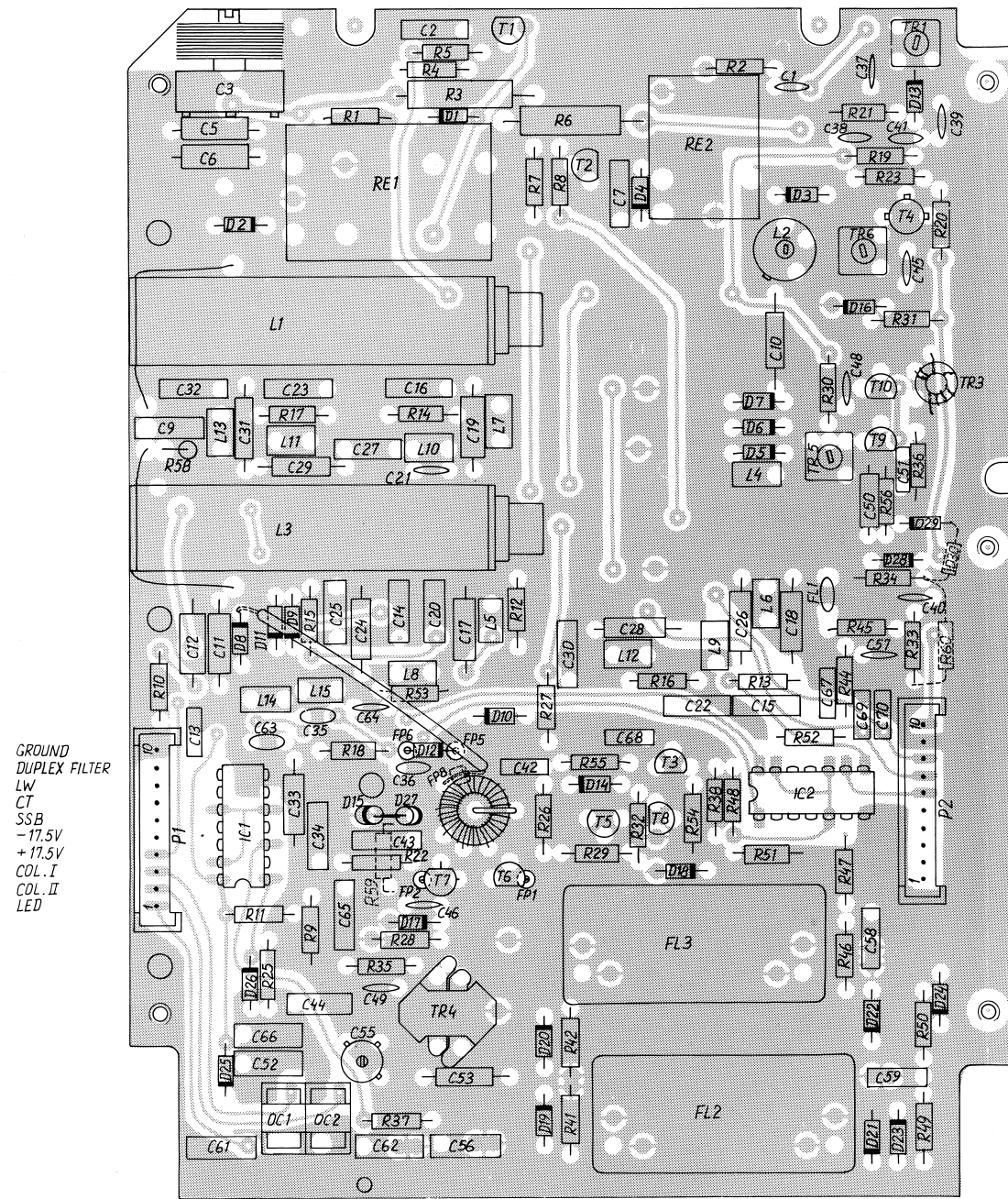




- test conditions
- : AM
- ( ) : SSB
- [ ] : FM
- A : 88 MHz
- B : 100 MHz

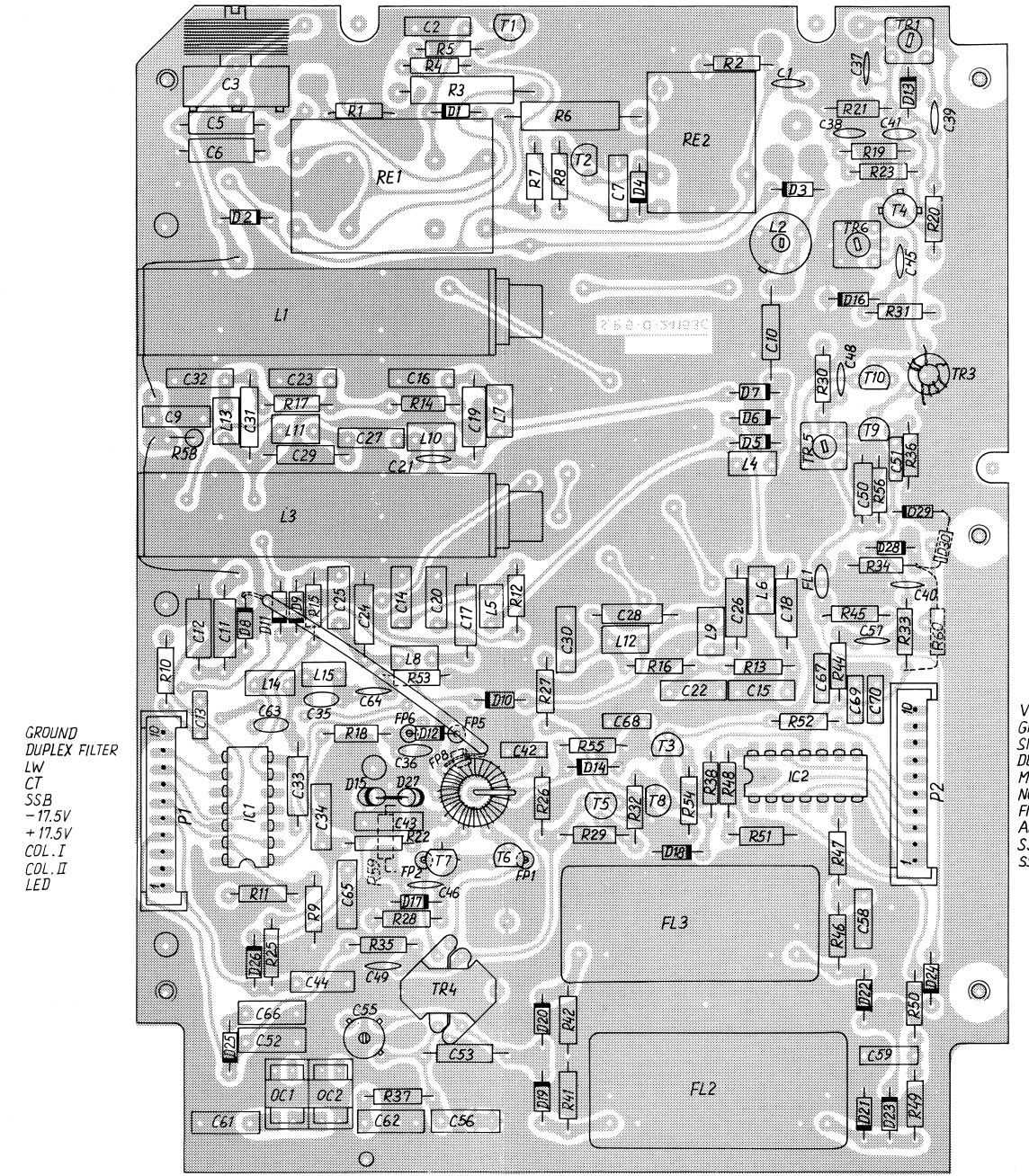
PI-1  
COL II  
LED  
COL I  
+17.5V  
C T  
L M  
DUPLEX FILTER  
S S B  
-17.5 V  
GROUND

P2-1  
GROUND  
S S B  
DUPLEX RELAY  
SIMPLEX RELAY  
S S B  
NOISE GEN IN  
V TUNE  
A M  
F M  
M W



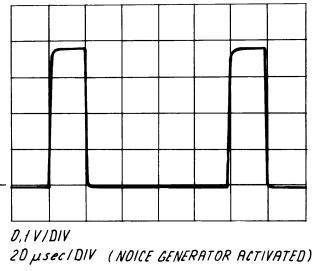
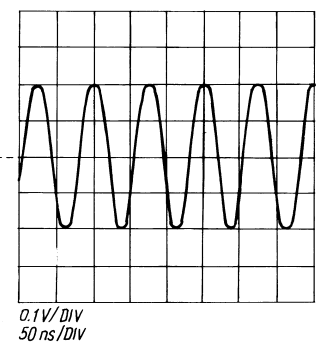
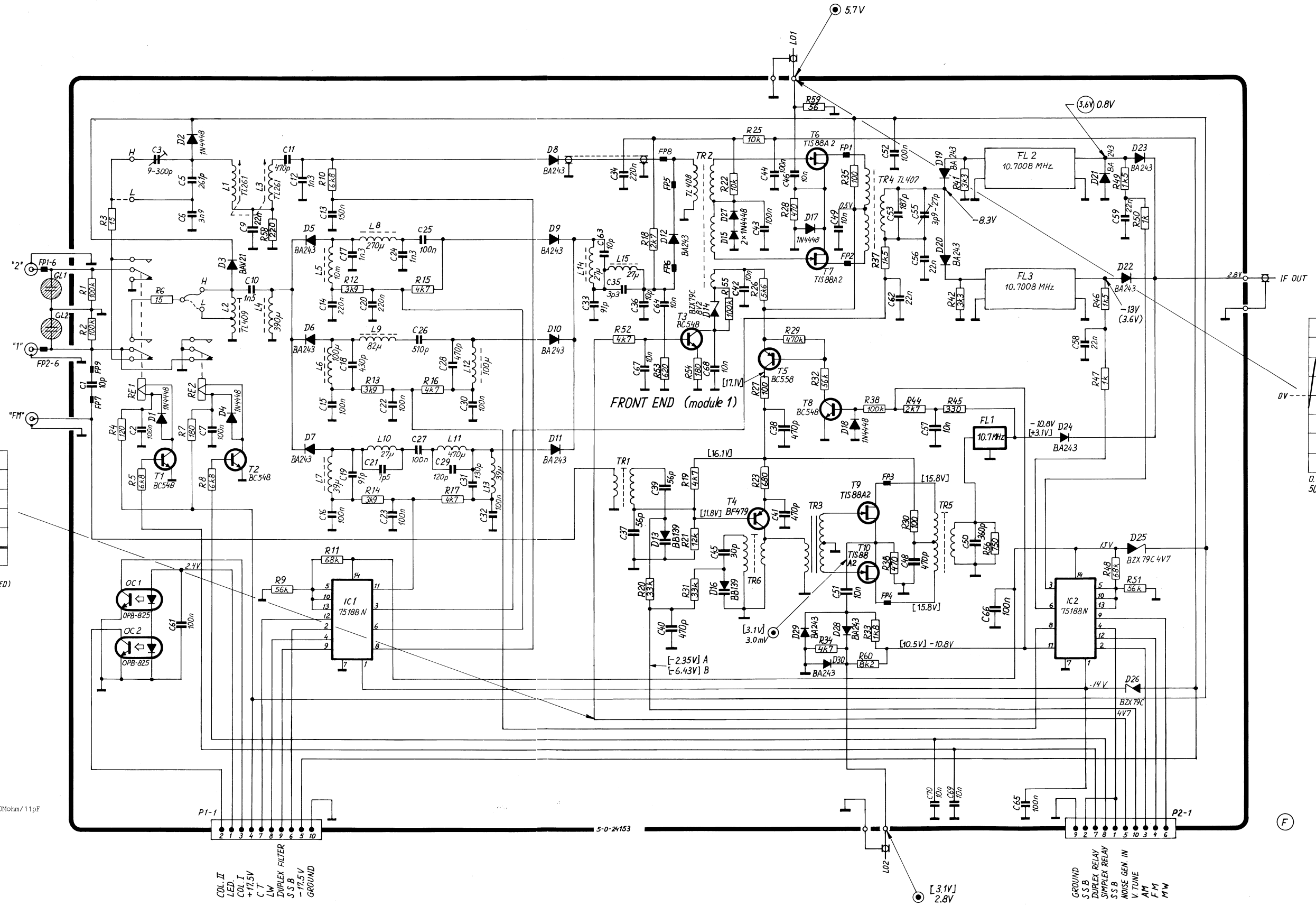
View from component side with lower side tracks.

V. TUNE  
GROUND  
SIMPLEX RELAY  
DUPLEX RELAY  
MW  
NOISE GEN. IN  
FM  
AM  
SSB  
SSB



View from component side with upper side tracks.

V. TUNE  
GROUND  
SIMPLEX RELAY  
DUPLEX RELAY  
MW  
NOISE GEN. IN  
FM  
AM  
SSB  
SSB



Test conditions.  
 Oscilloscope input: Passive probe 10Mohm/11pF  
 DC Voltmeter input: 10Mohm.  
 ● : Diode probe measurements  
 ○ : Only AM  
 ( ) : Only SSB  
 [ ] : Only FM  
 A : 88MHz  
 B : 100MHz

P1-1  
 2 COL II  
 3 LED  
 4 COL I  
 5 +17.5V  
 6 C.T  
 7 LW  
 8 DUPLEX FILTER  
 9 S.S.B  
 10 -17.5V  
 GROUND

P2-1  
 1 GROUND  
 2 S.S.B  
 3 DUPLEX RELAY  
 4 SIMPLEX RELAY  
 5 S.S.B  
 6 NOISE GEN IN  
 7 V TUNE  
 8 AM  
 9 FM  
 10 MW

5-0-24153

(F)

## 5.2. IF AMP., DET., AGC AND AF. PRE. AMP. (MODULE 2)

This unit contains the following parts:

- Pin Diode Attenuator
- IF Amp.
- AGC Generator
- Detector
- AF Filters
- AF. PRE. Amp.

### **PIN DIODE ATTENUATOR**

The IF signal is led from the front end into the pin diode attenuator, consisting of R114, R10, R11, R15, and D2 through transformer TR1 and led out by transformer TR2 into the IF amp.

The attenuation level is controlled by the AGC voltage, which is led into IC1a, where it is filtered out and amplified. IC1a then provides the voltage which determines the diode current in D2. With increasing AGC voltage the diode current decreases and the attenuation level increases and vice versa.

### **IF AMP.**

From the pin diode attenuator the signal is fed on to IC2 and from IC2 to IC3. Both these integrated circuits are operational amplifiers. The actual voltage gain in both amplifiers is controlled by the AGC voltage applied to pin 7. From IC3 the signal is led into an amplifier built-up around T3 and further on to the ceramic filter FL1.

This filter FL1 reduces the noise bandwidth to approx. 300 kHz. From the ceramic filter the signal is fed on to a common collector amplifier T6, which buffers the detector circuits.

### **AGC GENERATOR**

From the ceramic filter FL1 the signal is fed on to a common emitter amplifier T5. The voltage gain in this amplifier determines through the AGC system the magnitude of the IF-amp. output from FL1.

From T5 there are two different ways to generate the necessary AGC voltage, depending on whether AM/FM mode or SSB mode is chosen.

All mode shifts etc. in the AGC system are controlled by the microprocessor through IC4.

RF-gain voltage is added to the AGC system through D4 and contemporary led to IC1d, which compares RF-gain voltage with AGC voltage and generates the scan control signal.

### SSB-AGC

From the amplifier T5 the signal is fed on to transistor T4, which together with R44, C20, R45 and C21 forms a magnitude detector. The voltage on R44 and C20 is led right on to the gain controllable circuits IC2 and IC3 through D13, R28, D10 and T1 and ensures fast control of the AGC level in the system. Together with the fast AGC-system a slow control of the AGC level is activated by the detector output voltage, which is fed on to the voltage follower IC1b through R31. IC1b buffers the charging of C10 through R25 and D9. The voltage on D10 is amplified by IC1c and led through D3 to the cathode of D13, where it is added to the actual voltage level from the detector. The fast AGC system ensures noise immunity and the slow AGC system will decrease distortion caused by the AGC of an SSB-signal.

### AM/FM-AGC

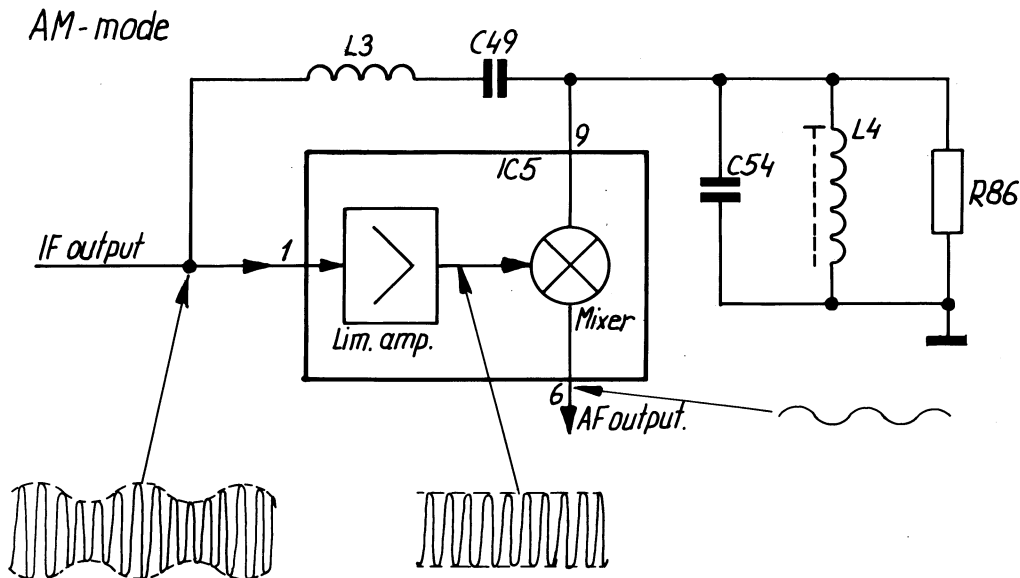
When chosen AM/FM-AGC C18 is connected parallel to C27 through T2. This decreases both rise and fall time for the AGC system, so modulation compression does not occur. The slow SSB-AGC is disabled by applying high voltage to pin 6 IC1b through D14.

### DETECTOR

The detector circuit is built up around IC5, and through the diode arrangement D17 - D24 it is made possible to demodulate A3, A3H, A3A, A3J and FM using the same detector circuit.

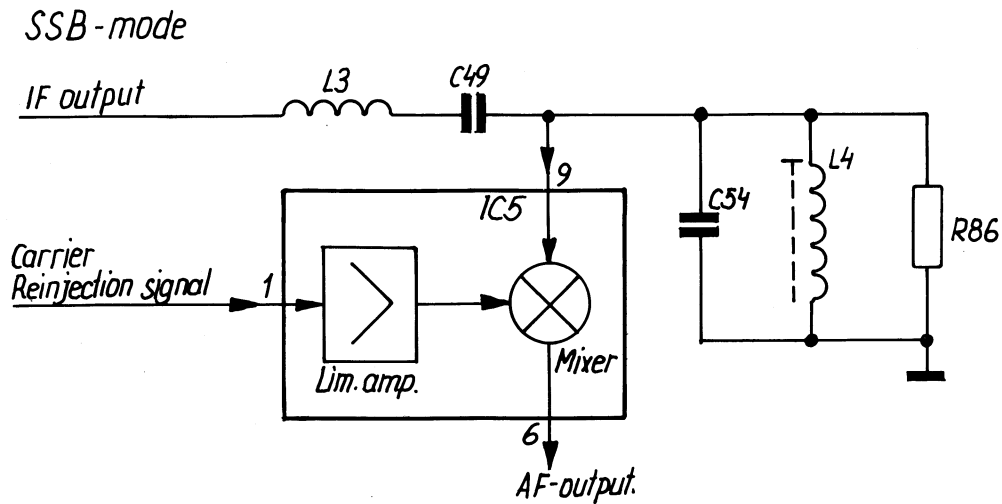
Through microprocessor control there are 3 different detector modes to select, these are shown and explained in principle below.

IC5 features a muting facility controlled by microprocessor through applying voltage to pin 5.



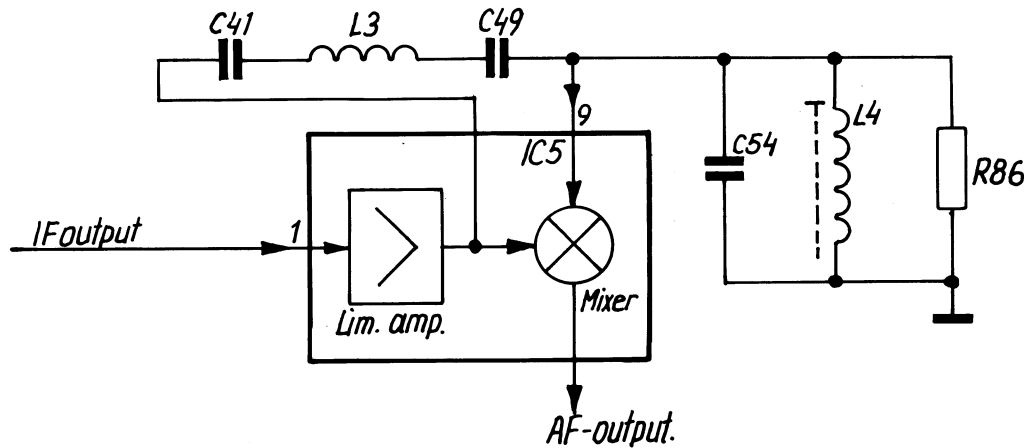


In AM-mode the principle is to remove the modulation from the IF-signal through the limiting amplifier and leave just the carrier signal. This signal is then mixed with the original IF-signal to create the wanted AF out.



In SSB-mode the carrier reinjection signal is simply mixed with the IF-signal, and the AF-signal is then created. The IF-signal is fed on into the mixer through pin 9, so it is possible to maintain the amplitude information in it.

*FM-mode*



In FM-mode the IF-signal is led into pin 1 IC5. The limiting amplifier removes amplitude modulation from the signal. A phase difference between the signal on pin 8 and the signal on pin 9 proportional to frequency difference between the IF-signal frequency and the resonance frequency of C54 and L4 is created, and this phase difference is detected in the mixer and the AF out signal created.

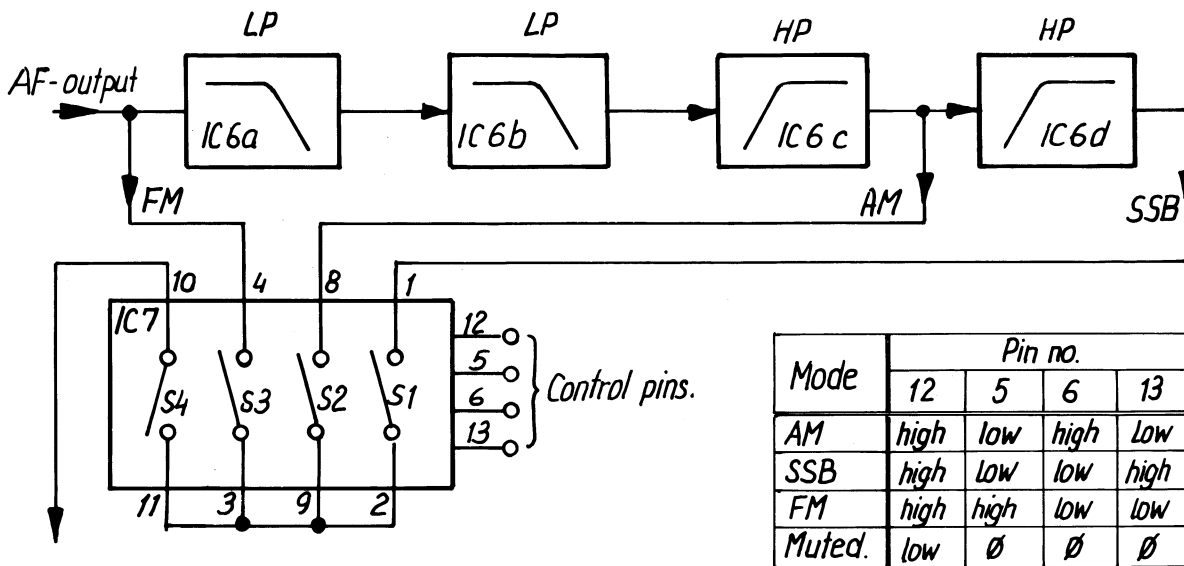
TRUTH TABLE FOR DIODE ARRANGEMENT

	D17	D18	D19	D20	D21	D22	D23	D24
AM	OFF	ON	OFF	OFF	ON	ON	OFF	ON
FM	OFF	ON	OFF	OFF	ON	OFF	ON	OFF
SSB	ON	OFF	ON	ON	OFF	OFF	OFF	ON

**AF FILTERS**

To reduce white noise from the non-tuned IF-amp. in AM and SSB-mode, 4 active AF filters are built in, as shown below, which are switched in and out by the multiplexer IC7.

The multiplexer is controlled by the microprocessor through T8, T9, T10, and IC4 depending on which receiver mode is chosen.



In SSB-mode the detector output enters the AF-filters through R79 and is led through all 4 filters by switching S1 on.

In AM-mode the signal is led out before the last AF-filter by switching S2 on.

In FM-mode the detector output is led through the multiplexer by switching S3 on and the AF-filters are disabled.

From pin 2, pin 9, pin 3, IC7 the signal is fed on to the earpiece amplifier T12. From pin 10 IC7 the signal is led to the AF-potentiometer located on the microprocessor PCB.

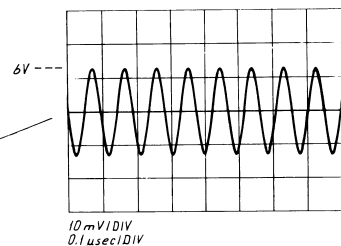
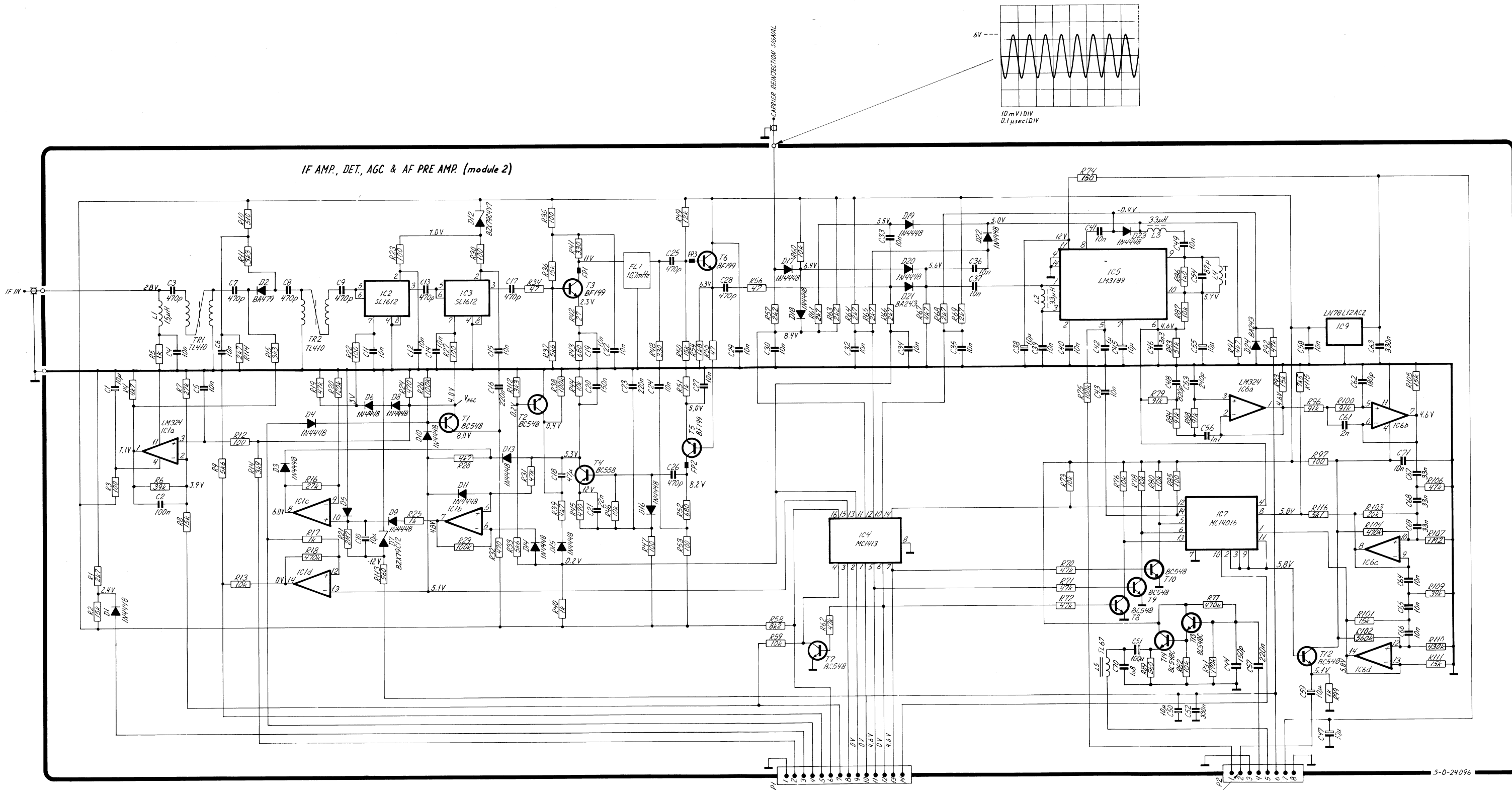
Multiplexer switch S4 is used to mute AF-signal to the AF-potentiometer. When S4 is switched off, muting of the external loudspeaker is implied without muting the earpiece.

**AF. PRE. AMP.**

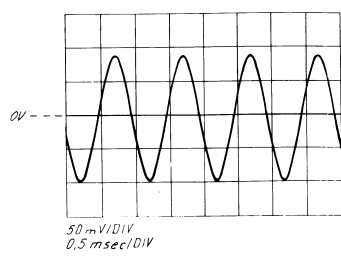
From the AF-potentiometer located on microprocessor PCB the signal is fed into T13 and then led on to T14, which buffers the AF power amplifier placed on AF-AMP. and FILTER UNIT (module 7) PCB.



IF AMP, DET, AGC & AF PRE AMP (module 2)



- 1 AF GROUND
- 2 - METRE
- 3 RF-IN
- 4 SCAN CONTROL
- 5 RF OUT
- 6 5V
- 7 AF-MUTE
- 8 AGC-OFF
- 9 4.5V
- 10 PE-SHIFT
- 11 4.5V
- 12 5.5V
- 13 4.5V
- 14 AF OUT



- 1 DETECTOR MUTE
- 2 CARPANEL OUT
- 3 AF-IN
- 4 AF-OUT
- 5 -175V
- 6 +175V
- 7 GROUND P-5

### 5.3. FREQUENCY SYNTHESIZER (MODULE 3)

The synthesizer which is generating the needed L.O.-signals is working as a fractional synthesizer. This means that the division ratio in the loop divider can be a non-integer number, making it possible to get a frequency resolution at the output which is smaller than the reference frequency in the loop. In this synthesizer the reference frequency is 10.24 kHz and the frequency resolution in the loop is 40 Hz.

The loop reference frequency is generated by means of the crystal controlled oscillator built around T2 and the reference divider in IC16 followed by the divider IC12. So the reference output for the loop will be at pin 8 on IC12.

The synthesizer module comprises among other things the normal building blocks included in a phase-locked loop, VCO, a programmable divider, a phase detector, and a loop filter.

The VCO is built around transistors T12 and T18. Coil L11 alone or paralleled by L9 or L10 in combination with C60, C58, and capacitance diodes D9 - D16 form the main part of the frequency determining elements. So the VCO can be tuned by means of diodes D9 - D16, with increasing frequency for increasing control voltage. The VCO covers the frequency range from about 43 MHz to about 61 MHz in three bands.

The programmable divider consists of a dual modulus divider IC3, dividing by 15/16 and a programmable divider included in IC16. The output pulses will be at pin 15 on IC16.

The integer part of the division ratio is determined by the number latched into IC16 and the fractional part by the number latched into IC15.

When the division ratio is an integer, the divider works as a conventional dual modulus divider with the modulus control output from IC16 controlling IC13. When the division ratio includes a fractional part called F, the fraction accumulator IC5, 9, 10, and 15 in conjunction with IC7 increase the division ratio with 1 for every 1/F reference cycles, which means that

the mean division ratio will be increased with the fraction F. By using an 8 bit accumulator and a reference frequency of 10.24 kHz =  $40 \times 2^8$  Hz, a synthesizer resolution of 40 Hz is reached.

The increase in division ratio by 1 is done by pulling the modulus control input, pin 6, on IC3 low for one output cycle of this divider; IC7 secures a correct timing in this cycle.

The phase/frequency detector is of the sample and hold type.

IC20 with C61, C62 forms an integrator. When a constant current is drawn through diode D8, the output voltage at pin 6 of IC20 will increase linearly with time. Diodes D6 and D8 constitute a switch controlled by flip-flop 1 in IC1 and level shifting transistor T13. When the output from the reference divider (pin 8 on IC12) goes high, the Q1 output (pin 5 on IC1) goes low, turning T13 off, so the constant current drawn by T14 is forced to flow through D8 with a linearly increasing output voltage of IC20 as a result. When the programmable divider delivers an output pulse, the flip-flop output (pin 5, IC1) changes back high, turning T13 on, which forces the current drawn by T14 to flow through D6, resulting in a constant output voltage at the integrator. The output voltage reached by IC20 is sampled by the sampling circuit formed by T17, C72, and IC23, every reference cycle.

The output voltage will be a measure of the phase difference between the reference signal and the variable divider output signal. If the input frequency/phase of the divider input increases, the integrator output voltage decreases, and vice versa.

The phase detector constant,  $\Delta V_{out}/\Delta \phi_{in}$ , is determined by C61, C62 and the current drawn through T14. Increasing current means increasing phase detector constant.

The current drawn through T14 is determined by the constant current sink, formed around IC19, and the diode switch with D3 and D4. The switch is controlled by counters IC13, 14 through flip-flop 2 in IC1 and level shifting transistor T10. By counting a constant number of output pulses from the prescaler IC3, in every reference cycle, the synthesizer output frequency variation is converted linearly to a duty-cycle variation of the square wave produced at pin 9 on IC1. By controlling the diode switch D3 and D4, and so the current through T14, with this square wave, the phase detector constant will increase proportional to the synthesizer output frequency, or the loop division ratio as you wish, and so keeping loop gain constant over the entire frequency range. The nominal value of the phase detector constant is adjusted by means of potentiometer R44.

IC6 and IC11 generate the necessary control pulses for the phase detector, which includes a short delay from the integrator has ramped up to the sample pulse to T17 is generated, followed by a short-circuit of integrating capacitors C61, C62 via T16, preparing the integrator to the next cycle.

The loop filter is made up partly by the feed-back loop in the phase detector, via C65 and R72, and the low pass filter formed by C89, C91, R106, R105, and C90.

When a non-integer division ratio is used in the loop, some unwanted spurious sidebands, caused by the digitizing process, will appear at the VCO output. To reduce the level of these sidebands, a so-called A.P.I. (Analog Phase Interpolator) formed by the phase accumulator IC5, 9, 10 and 15 and D/A-converter IC4, generates a correction signal to the phase detector output.

The VCO control voltage is corrected by drawing the correction-current from IC4 through R73 via T15. The reference current for the D/A-converter is taken from the current-mirror formed around IC19, to get the correction term matched to the phase detector constant over the entire temperature range. The nominal value of the reference current is adjusted by means of the potentiometer R57.

The VCO signal is fed to the common buffer amplifier formed around T9 and T11. The amplifier output is split into three signal paths, i.e. to the loop divider through T6 and T8 and to the L.O.-1 output divider through T5 and T7 and to the L.O.-2 output doubler with T4 as a buffer amplifier and T3 as the doubling transistor.

The loop signal is fed to the fixed divide by 4 circuit formed by IC17, thus resulting in an output frequency range of about 10.7 MHz to about 15.2 MHz with 10 Hz resolution.

The divider output is amplified in T1 before the final filtering.

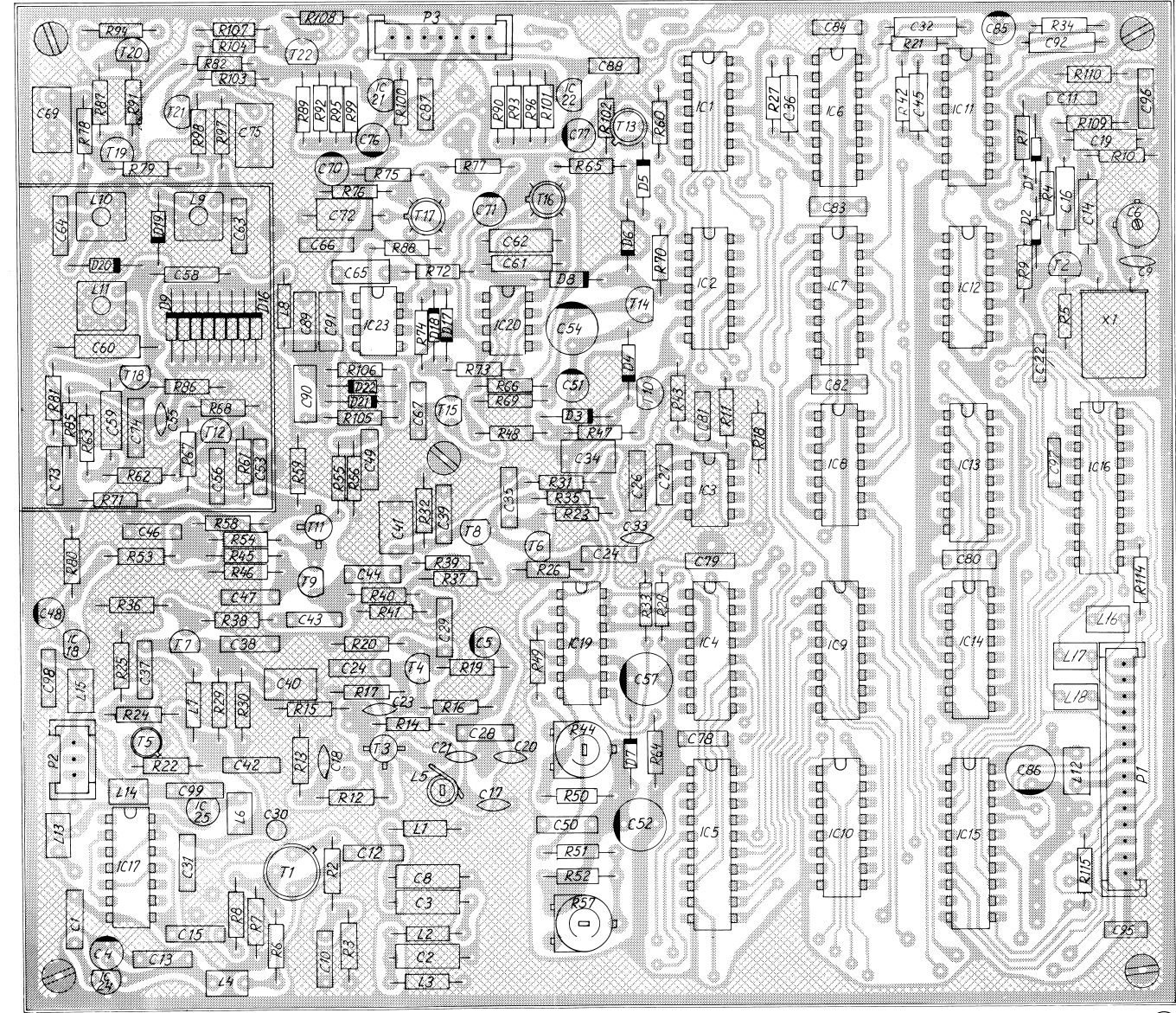
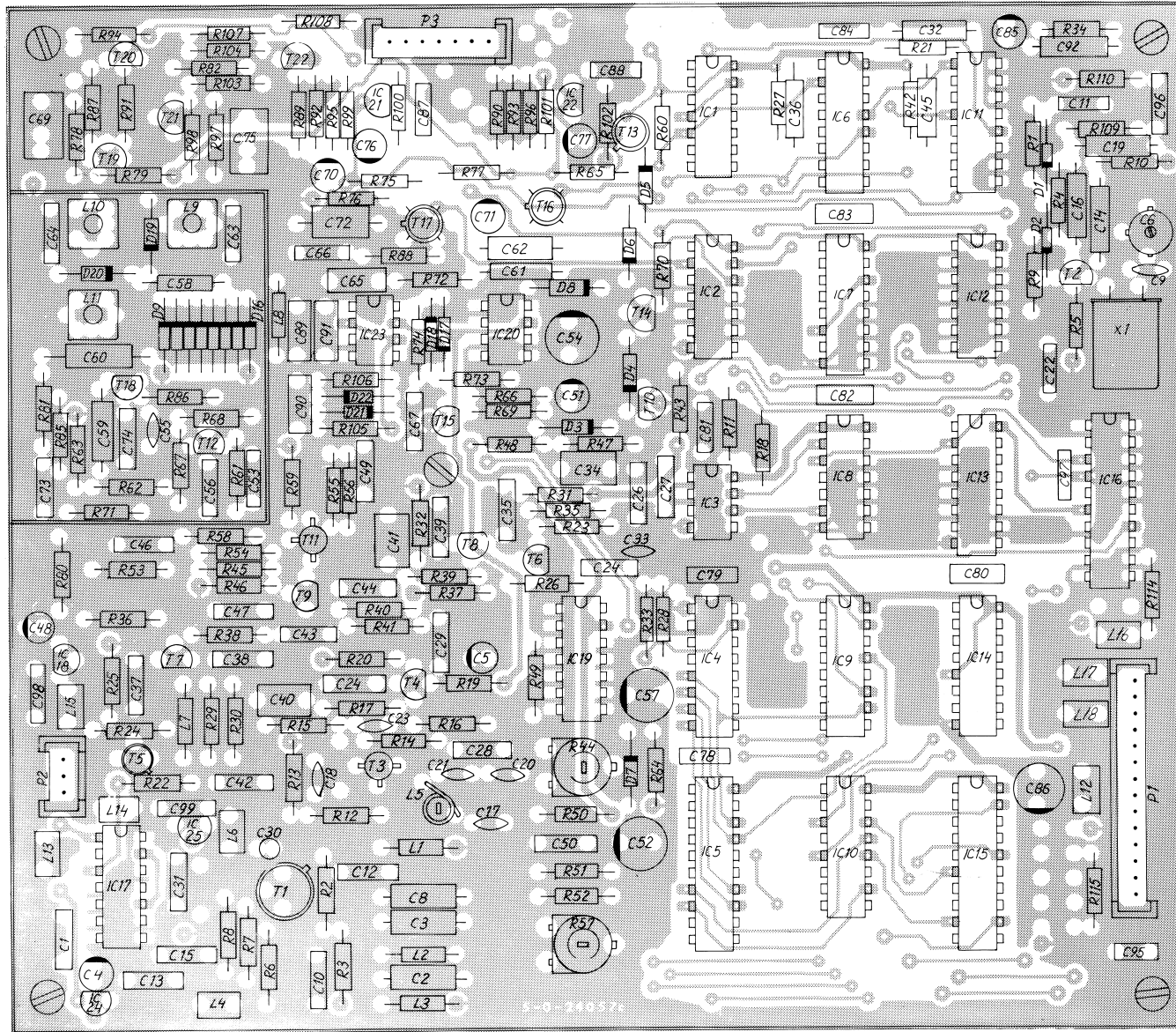
The carrier reinjection signal is taken from the crystal oscillator at the capacitive tap formed by C16 and C19.

Besides the above mentioned function determined blocks, the synthesizer board includes several internal voltage regulators with the filtering belonging to them.

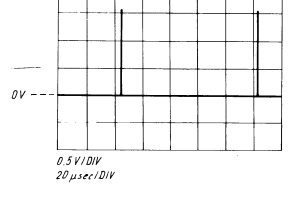
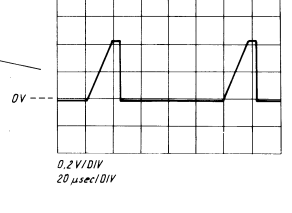
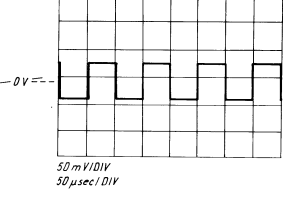
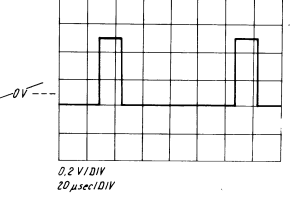
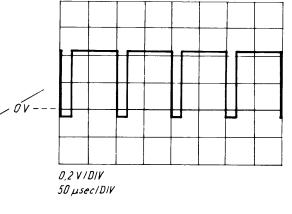
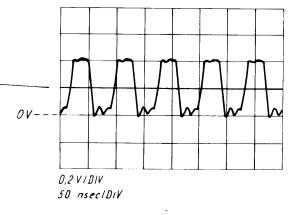
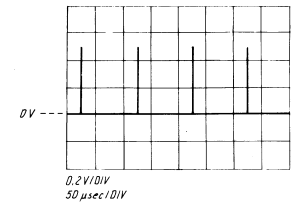
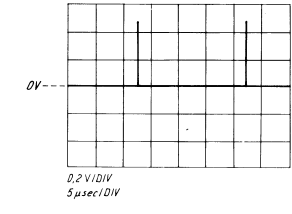
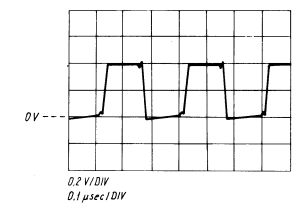
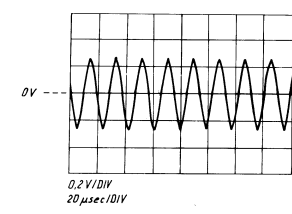
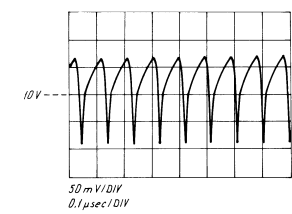
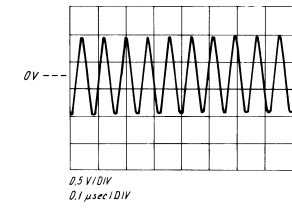
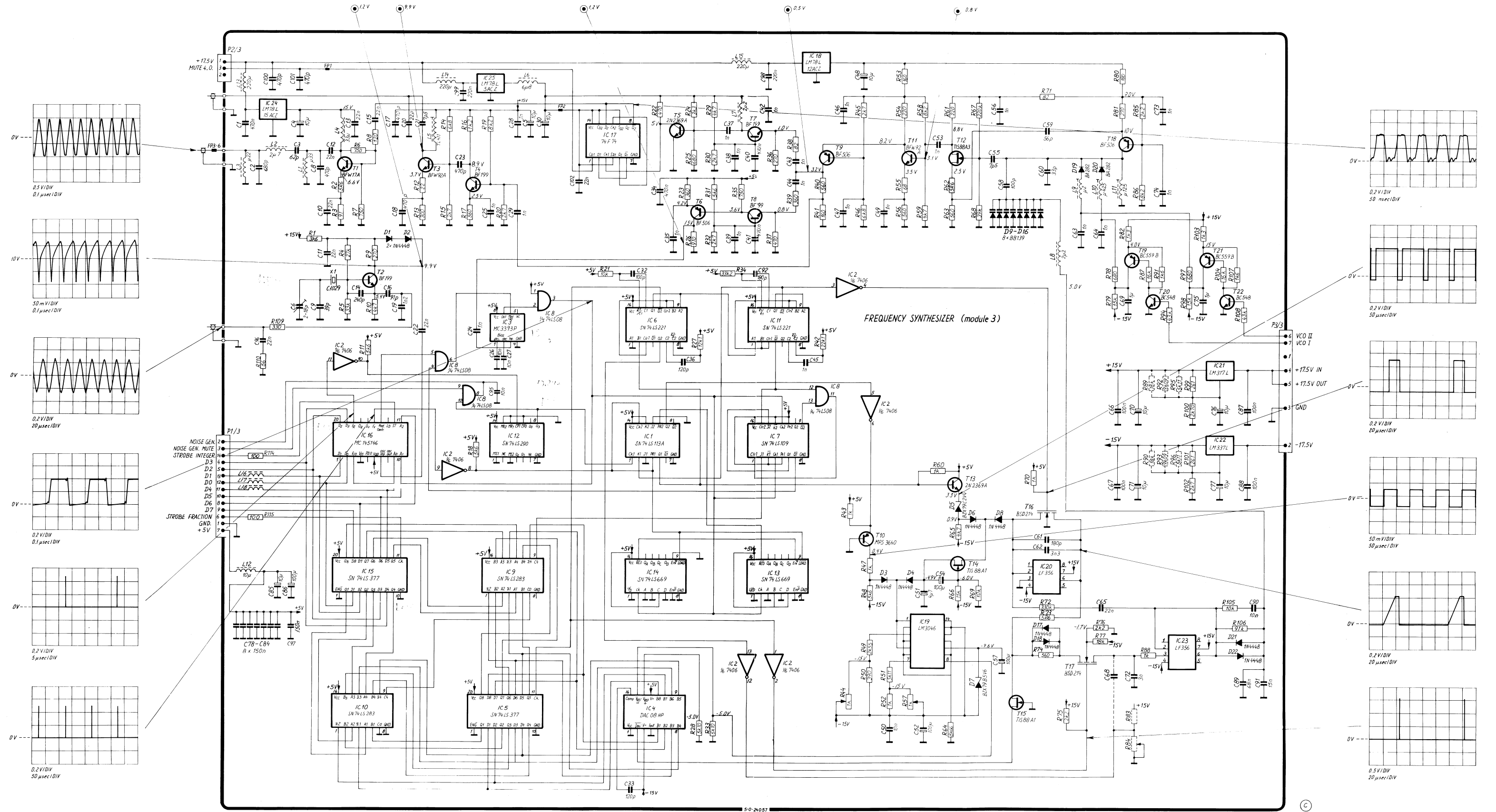
IC18, 24 and 25 are fixed regulators supplying respectively, VCO with buffer amplifier, L.O.-1 output amplifier and the fixed output divider.

IC21 and 22 are adjustable regulators, generating the internal +15.0V DC-supply. By means of the resistor-sets R89, R92, R95, and R99 respectively R90, R93, R96, and R101, the appropriate resistor combination is selected to get an output voltage error below 1%.









## 5.4. PROCESSOR UNIT (MODULE 4)

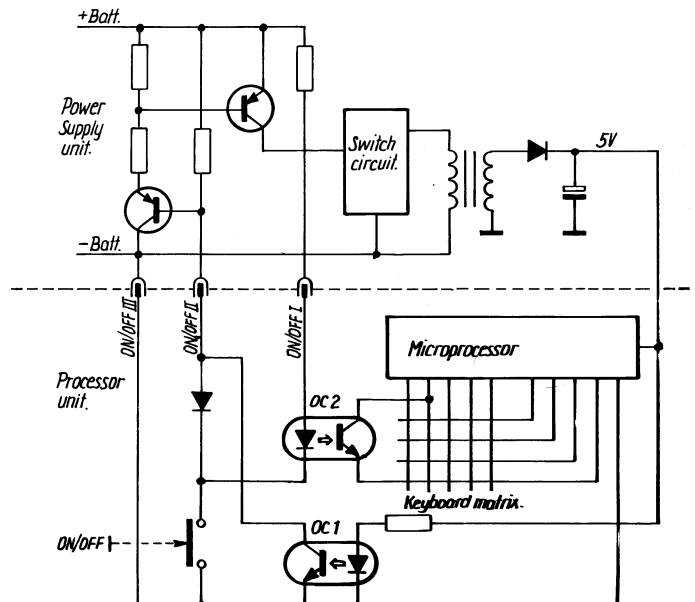
The processor unit is a supervising and controlling unit, which scans the inputs and sets up the receiver operating conditions according to the given commands. The main functions are as follows:

- on/off control of power supply
- keyboard Matrix scanning
- display driving
- frequency setting of the synthesis
- communication with EEPROMS
- scan of external inputs and
- controlling the IF and RF-sections according to the keyboard commands.

### POWER SUPPLY CONTROL

A press on the on/off button turns on the switch circuit (fig. 1) in the power supply, which hereby powers up the microprocessor. By scanning the keyboard, the processor ensures that OC2 is on before it turns on OC1, which hereby holds the supply to the switch circuit. After release of the on/off button another press on it will cause the processor to turn off OC1 and then the supply to the switch circuit will disappear when the on/off button is released. If the processor is reset it checks the condition of the on/off button and if this is not activated the processor will turn off the power supply. This will happen if the 5V supply is lowered below approx. 4.1V or if the backplane drive to the display disappears. The circuit, which handles the mentioned events, is formed by T3, IC14b, D11, and 1/8 IC15.

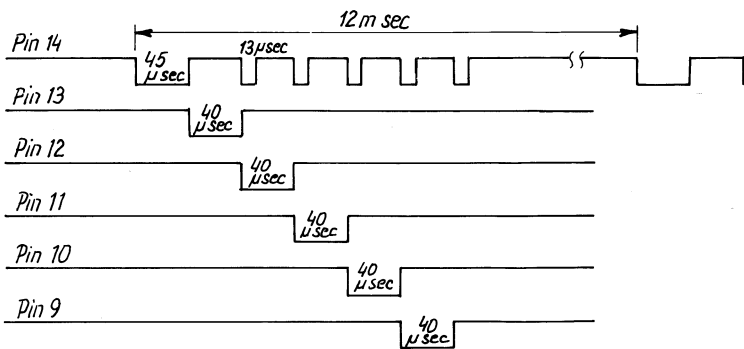
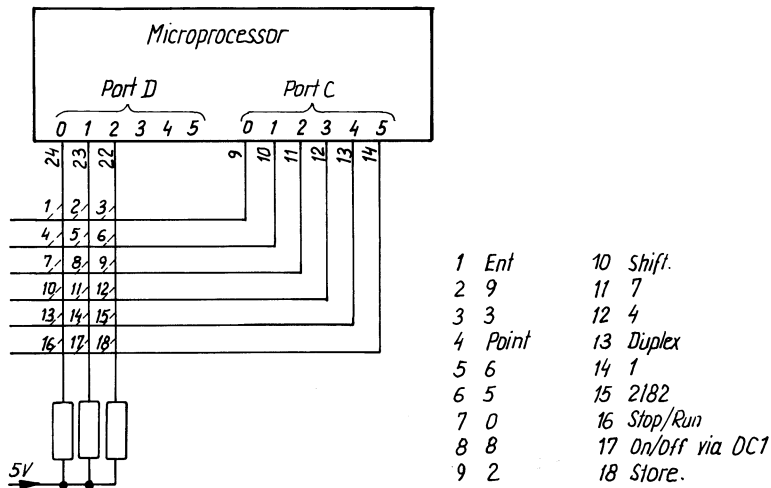
Fig. 1



### KEYBOARD SCANNING

The keyboard is a 6x3 Matrix, which is scanned every 12 msec. The scanning takes place as shown in fig. 2. The output pins at port C are turned low one at a time and between every shift the state of the input pins at port D is measured. If they are all high the keyboard is not activated. If one of the input pins is low, then the processor leaves the scanning sequence and performs the command indicated by the activated button.

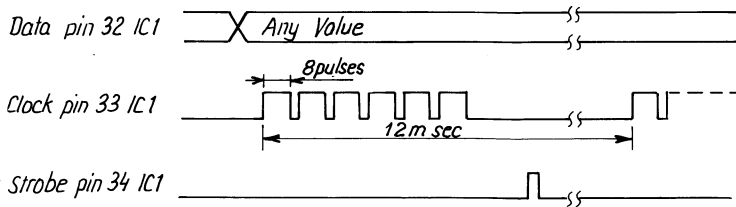
Fig. 2



**DISPLAY DRIVING**

The display is an LCD type which demands an alternating voltage across the segments. This is done by inverting the display driver data (IC8 - IC13) every 12 msec. Simultaneously the backplane is inverted via IC2F and IC2C. The display drivers are loaded serially by the microprocessor with data, clock, and strobe pulses from pin 32, 33, and 34. The timing is shown in fig. 3.

Fig. 3

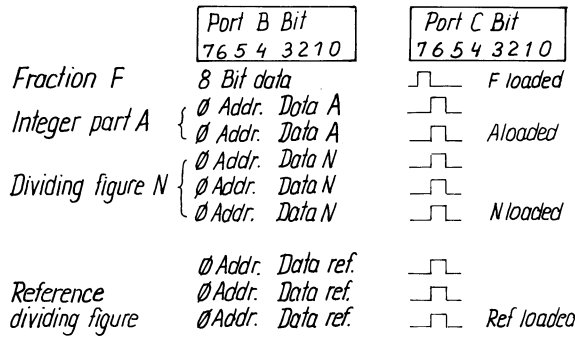


**FREQUENCY SETTING OF THE SYNTHESIS**

After a frequency is entered, the microprocessor calculates three figures which are necessary for the frequency setting of the synthesis. These figures (dividing figure N, integer part A, fraction F) are in parallel mode loaded into the synthesis via the processor port B and two strobe lines. Additionally the synthesis is loaded with a reference dividing figure every time the other figures are loaded in. The fraction is loaded as an eight bit word. The other figures are splitted up in a four bit data word together with a three bit address. The loading order is shown in fig. 4.

Fig. 4

**DATA TO SYNTHESIS**



VCO Selection via IC7

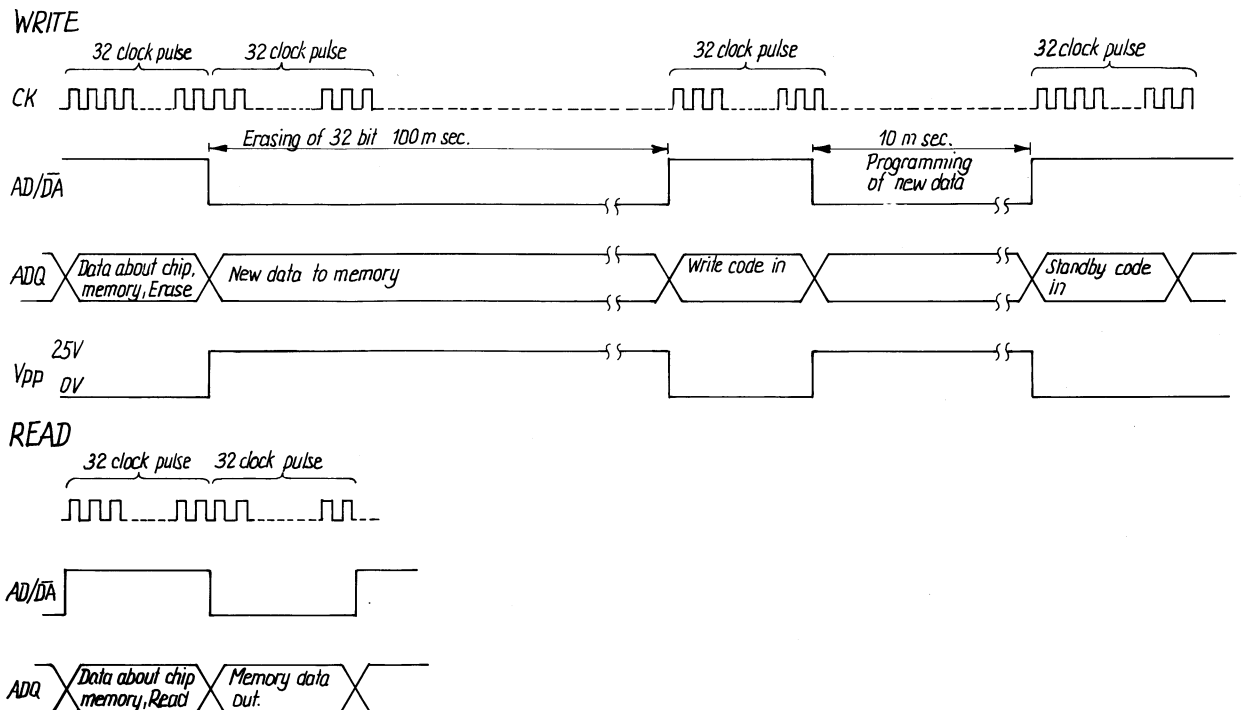
IC7 pin 12 VCO II	IC7 pin 13 VCO I	
0	0	0 - 1604.9 kHz
0	1	1605.0 - 3048.9 kHz, 87.2 - 98.87 MHz
1	0	3049.0 - 4499.9 kHz, 98.88 - 107.99 MHz

**EEPROM COMMUNICATION**

The memory is formed by three EEPROMS, which are accessed on three lines named ADQ, CK, and AD/DA. The data exchange runs serial on the ADQ line controlled by the CK line. The AD/DA line controls the data direction in the EEPROMS. Further it is used when erasing and programming the EEPROMS. The three mentioned control lines are paralleled on the three EEPROMS which are accessed separately by an address input in the first data word every time access is wanted. The individual address is set up with the inputs C1, C2, C3, C4 on the chips. Additionally the first data word contains an operating code which indicates what to be done in the addressed EEPROM (erase, write, read).

If an EEPROM is addressed with opcode erase or write pin 1 will turn low and cause pin 4 on 24.5V, which is necessary for erasing or writing in an EEPROM.

The EEPROMS are built as 32x 32 bit memories which causes all data exchange formed as 32 bit words. The actual timing of the data transfer is shown in fig. 5.

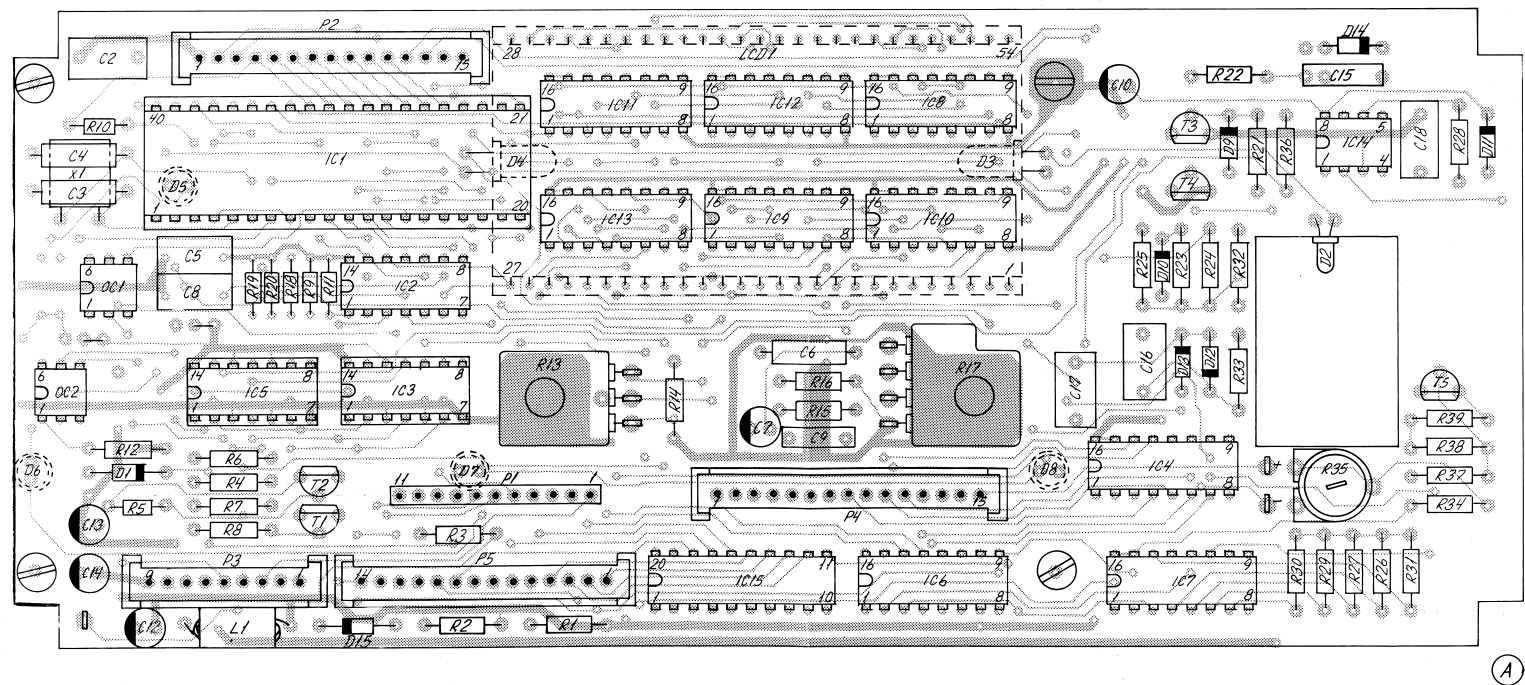
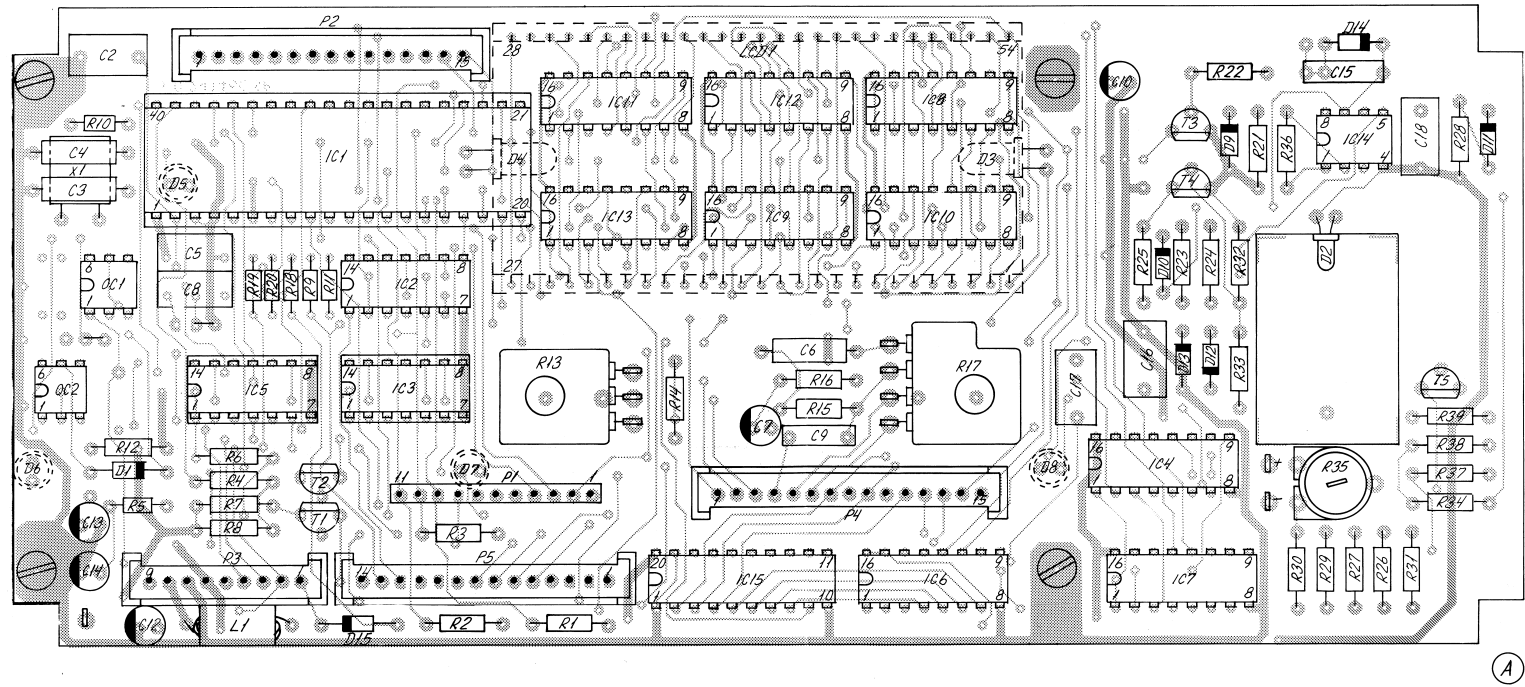


## IF AND RF SECTIONS CONTROL, EXTERNAL INPUT.

Besides the already mentioned things the processor unit selects or controls the following circuits; front end filter, IF controls (mode, AGC on/off, mute), front end relays and tune voltage for FM front end filter. These circuits are on/off controlled by means of three latches IC4, IC6, and IC7. The latches are loaded serially from the processor using data, clock and strobe lines. They are loaded once every time the ENT button is activated. The tune voltage to the FM tuner is created in a current summation network. A five bit code held by IC7 creates via a resistor network a current in R36. This current causes the output of IC14a to assume a voltage indicated by the five bit code.

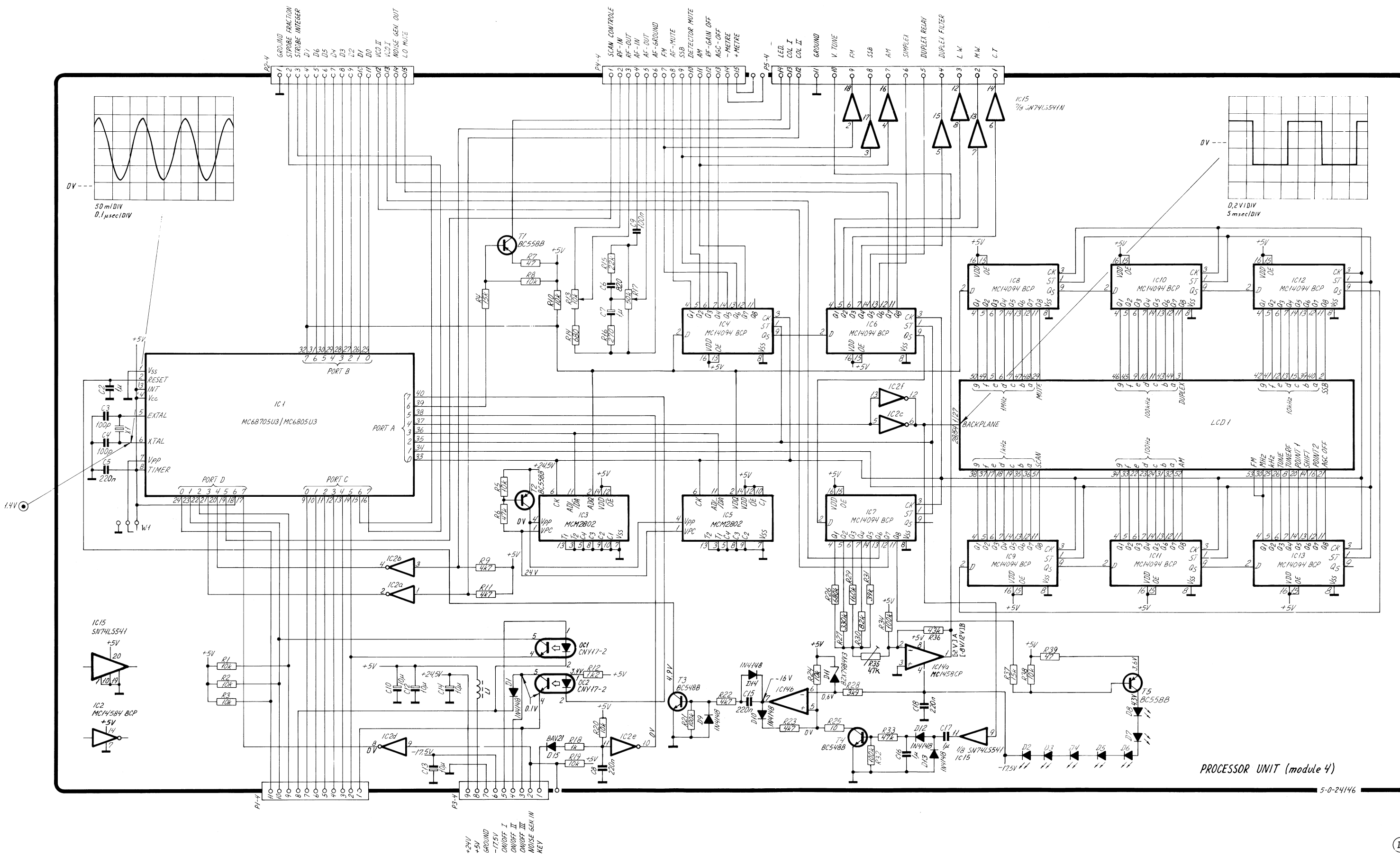
External inputs are noise generator, key and pulses from the flywheel optocouplers.

Noise generator input is active when the tune knob is pressed. The key input turns the processor into a protected mode (depending on duplex or simplex mode selected) when it is activated. The inputs from noise generator and key are shaped in the Schmitt triggers IC2d and IC2e. Finally this unit supervises the slotted optocouplers on the front end module. When TUNE or CLARIF is selected, T1 is current source for the optocoupler diodes. To determine the rotation direction it is necessary to have two pulse sources with a mutual phase difference of  $90^{\circ}$ . The two pulse trains created by rotating the wheel are shaped in Schmitt triggers IC2a and IC2b.



PROCESSOR UNIT (MODULE 4)

R2022 4-0-24146D



- +24V
- +5V
- GROUND
- 17.5V
- ON/OFF I
- ON/OFF II
- ON/OFF III
- NOISE GEN IN
- KEY

PROCESSOR UNIT (module 4)

5-0-24146

(D)

## CIRCUIT DESCRIPTION

### CONVERTER UNIT MODULE 5

The regulation works after the Puls Width Modulation principle. The switch transistor T6 is controlled by IC1 which produces a square wave signal. The "ON-time" (duty-cycle) mainly depends upon the input voltage. The windings of the transformer TR1 are connected in such a way that the output diodes is reverse-biased when the transistor T6 is conducting. Because of this, a current is established in the primary windings which increases linearly in relation to time and energy is stored in the primary inductance. When T6 is on the load current is supplied from the output capacitors. The switch-off of the transistor T6 produces polarity inversion of the voltage across the secondary windings. The output diodes conduct and the energy stored in the transformer TR1 is fed to the output capacitors and through the filters to the load. For stabilizing the output voltages a feed-back regulation signal created in module 7, is led to IC1 pin 1 and controls the duty-cycle. The switch transistor T6 is a power mosfet and for protecting it against electrostatic discharge and transient over voltage a zener diode D1 is placed across the transistor T6. The resistors R8 and R18 and the capacitors C6 and C11 forms two RC-snubbers which reduce the overvoltage transients and unwanted oscillations on primary and secondary windings. Transistor T3 is producing a regulated voltage for the drivers T4 and T5 and for the relay in modul 7. The frequency of the Puls Width Modulator IC1 is determined by R2 and C3. The duty-cycle is limited by the resistors R4 and R7 to 50%. In ordre to limit the inrush current during switching on the converter a capacitor C5 is charged through resistor R7 and gives a soft start of 50-250ms depending of the input voltage. Pushing the ON/OFF button on front panel the micro computer turns on the transistors T1, T2 and IC1 then the converter starts up. Push again the ON/OFF button the micro computer then turns off T1, T2 and IC1 and the converter then stops.



## CIRCUIT DESCRIPTION

### AF AMP. & FILTER UNIT MODULE 7

The AF signal from the detector is led through transformer TR2 and to the integrated power amplifier IC2. AF-gain is determined by the resistor R7 and R10. The amplified AF-signal is led through capacitor C14 to the loudspeaker. The other wire to the loudspeaker must be connected to  $\pm$ DC input voltage and should be handled carefully because of the DC mains. The amplifier is turned on and off by means of the relay RE1, which is controlled from the converter unit.

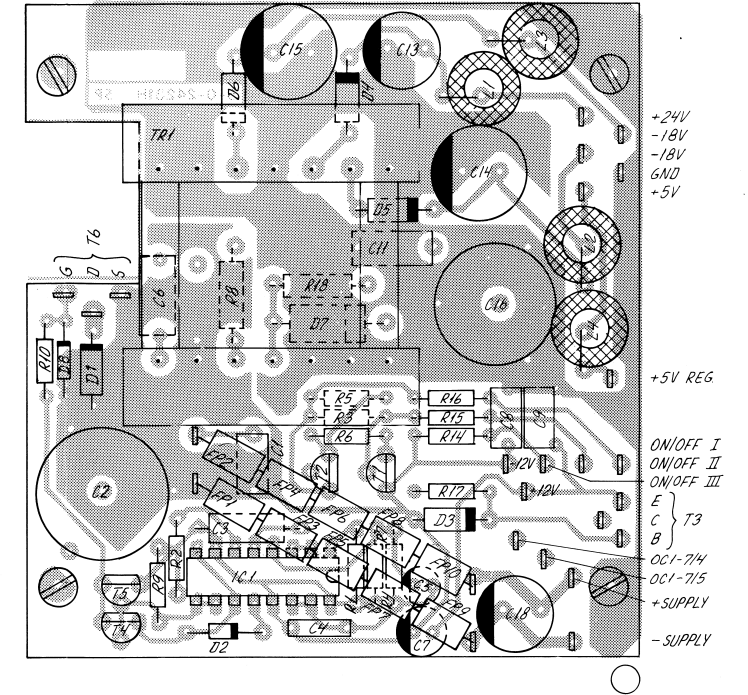
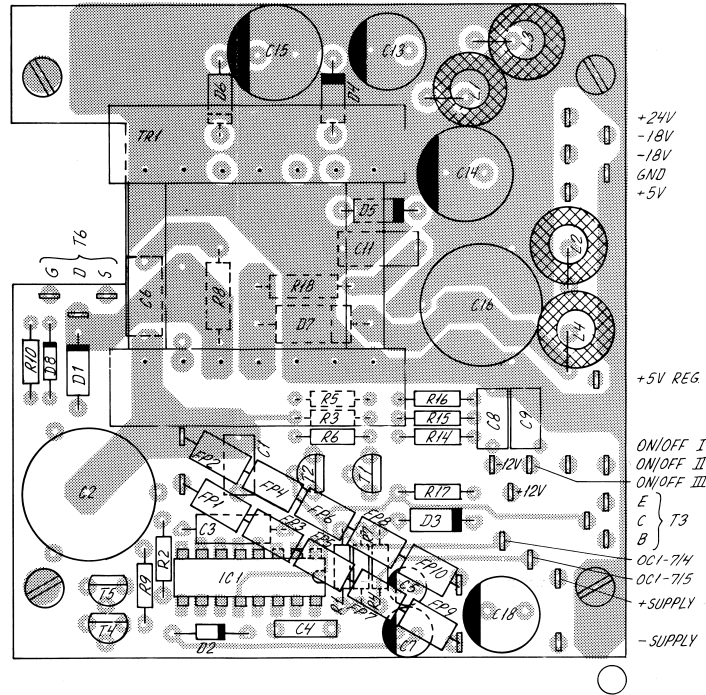
The converter output voltage is controlled by the error amplifier IC1. Reference voltage is taken from diode D1 and output voltage is adjusted by means of resistor R16.

If regulation should fail, output voltage increases and causes damage to sensitive circuits, a "crowbar" is connected across 5V output.

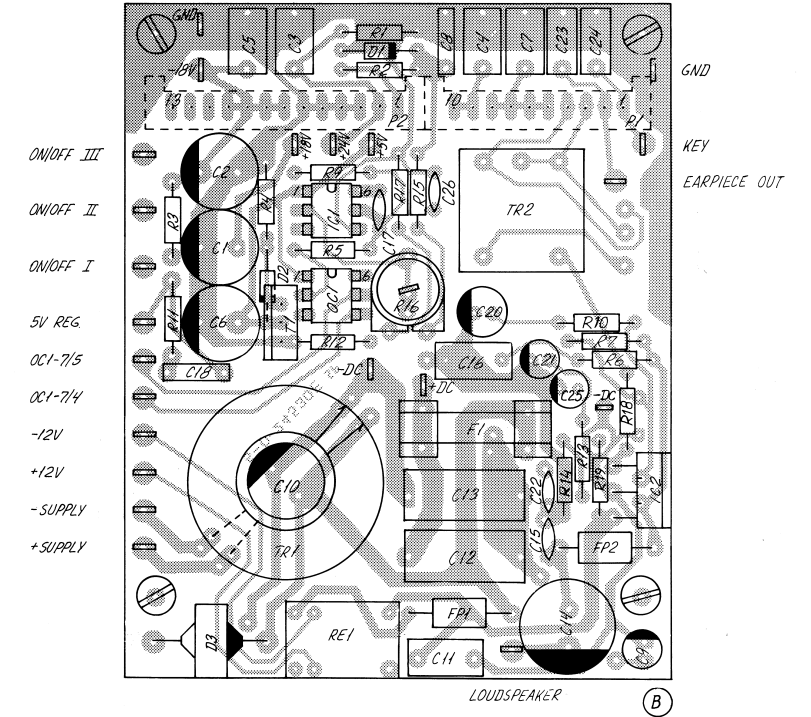
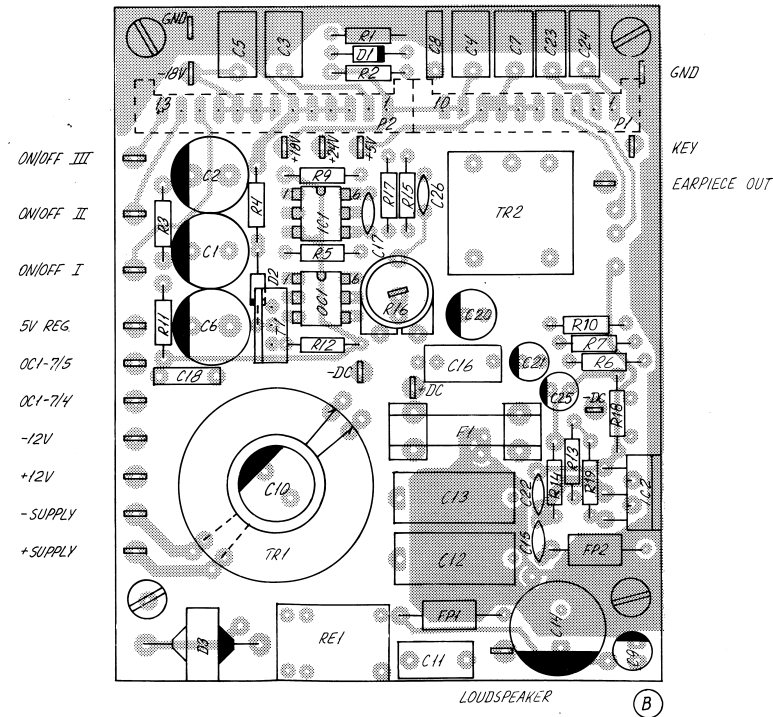
If 5V output comes over app. 5,7V, thyristor T1 turns on and pulls down the voltage. This is detected by the "watch dog" in the computer unit which then turns off the converter.

By means of capacitors, ferrit beads and trafo TR1, switching noise is suppressed so that the power supply fullfils the CISPR noise regulations.

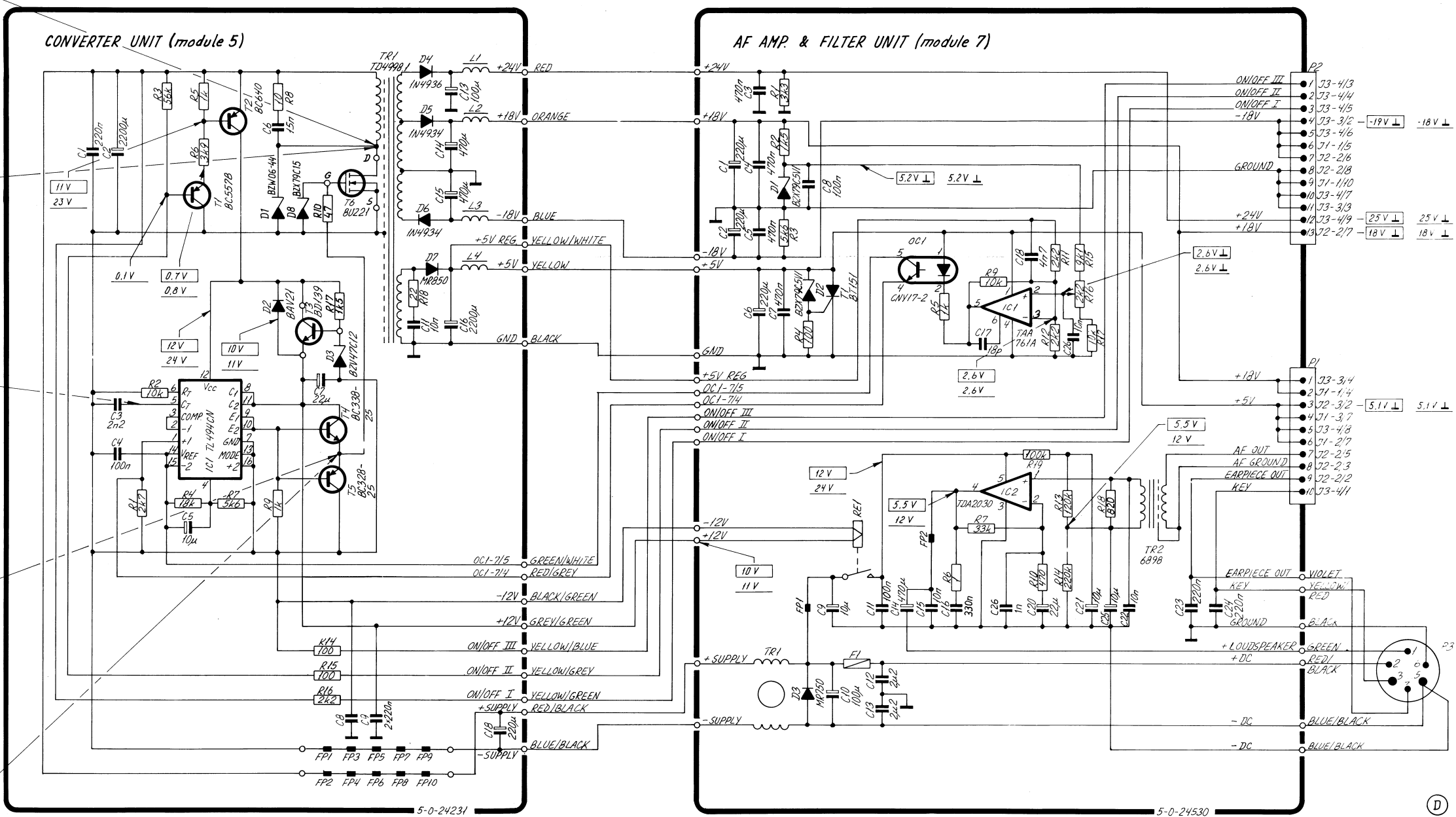
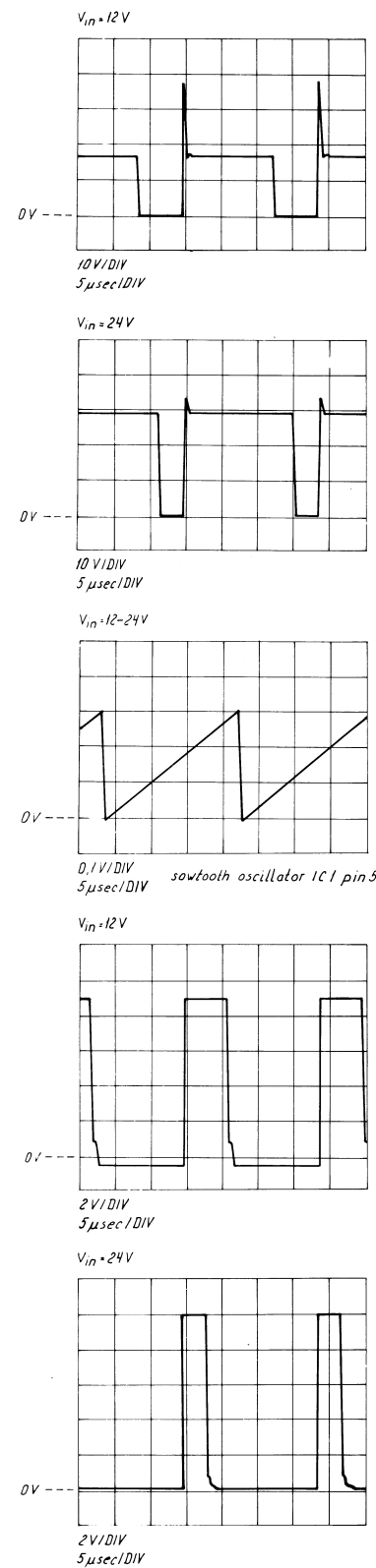
R2022  
4-6-24231B  
4-6-24530B



CONVERTER UNIT (MODULE 5)



AF POWER AMP. & FILTER UNIT (MODULE 7)



□ voltages measured at 12V DC supply  
 ▽ voltages measured at 24V DC supply  
 the voltages are measured relative to -DC (P3 - 7 pin 5)  
 ⊥ voltages measured relative to signal ground

R2022 4-0-24397E

POWER SUPPLY (7)

IF (2)

FRONT END (1)

MICROPROCESSOR (4)

MICROPROCESSOR (4)

FREQ. SYNTH. (3)

J1-7

1	J3-3/4	ORANGE	+18V
2	J1-1/4	ORANGE	+18V
3	J2-3/2	YELLOW	+5V
4	J1-3/7	YELLOW	+5V
5	J3-4/8	YELLOW	+5V
6	J1-2/7	YELLOW	+5V
7	J2-2/5	BROWN	AF OUT
8	J2-2/3	BLACK	AF GROUND
9	J2-2/2	VIOLET	EARPIECE OUT
10	J3-4/1	YELLOW/RED	KEY

J1-2

1	J4-4/6	BLACK	GROUND AF
2	J4-4/15	GREEN/WHITE	METRE +
3	J4-4/14	GREEN/GREY	METRE -
4	J4-4/3	BROWN/ORANGE	RF-IN
5	J4-4/1	BROWN/BLACK	SCAN CONTROLE
6	J4-4/2	BROWN/RED	RF-OUT
7	J1-7/6	YELLOW	5V
8	J4-4/8	BROWN/GREEN	AF-MUTE
9	J4-4/13	GREEN/BLUE	AGC-OFF
10	J4-4/12	BROWN/WHITE	RF-GAIN OFF
11	J4-4/11	BROWN/GREY	AM
12	J4-4/9	BROWN/BLUE	SSB
13	J4-4/7	BROWN/YELLOW	FM
14	J4-4/4	BLUE/YELLOW	AF-OUT

J1-1

1	J5-4/14	WHITE/GREY	LED
2	J5-4/12	WHITE/VIOLET	COL. II
3	J5-4/13	ORANGE/WHITE	COL. I
4	J1-7/2	ORANGE	+18V
5	J2-7/6	BLUE	-18V
6	J2-1/1	BLACK/GREY	SSB
7	J5-4/1	BLACK/BROWN	CT
8	J5-4/3	GREY	LW
9	J5-4/4	BLACK/YELLOW	DUPLEX FILTER
10	J2-7/9	BLACK	GROUND

J2-4

10	J1-3/1	BLACK	GROUND
20	J1-3/6	GREY/RED	STROBE FRACTION
30	J1-3/14	RED/WHITE	STROBE INTEGER
40	J1-3/9	VIOLET	D7
50	J1-3/8	BLUE	D6
60	J1-3/10	GREEN	D5
70	J1-3/11	ORANGE/GREY	D4
80	J1-3/4	ORANGE	D3
90	J1-3/5	RED	D2
100	J1-3/13	BROWN	D1
110	J1-3/12	BROWN/BLUE	D0
120	J3-3/6	ORANGE/RED	VCO II
130	J3-3/7	RED/YELLOW	VCO I
140	J1-3/3	GREEN/RED	NG OUT
150	J2-3/3	RED/BLUE	MUTE LO

J4-4

10	J1-2/5	BROWN/BLACK	SCAN CONTROLE
20	J1-2/6	BROWN/RED	RF-IN
30	J1-2/4	BROWN/ORANGE	RF-OUT
40	J1-2/14	BLUE/YELLOW	AF-IN
50	J2-2/4	BLUE/GREY	AF-OUT
60	J1-2/1	BLACK	AF-GROUND
70	J1-2/13	BROWN/YELLOW	FM
80	J1-2/8	BROWN/GREEN	AF-MUTE
90	J1-2/12	BROWN/BLUE	SSB
100	J2-2/1	BLUE/WHITE	DETEKTOR MUTE
110	J1-2/11	BROWN/GREY	AM
120	J1-2/10	BROWN/WHITE	RF-GAIN OFF
130	J1-2/9	GREEN/BLUE	AGC-OFF
140	J1-2/3	GREEN/GREY	METRE -
150	J1-2/2	GREEN/WHITE	METRE +

J1-3

10	J2-4/1	BLACK	GROUND
20	J2-1/5	GREEN/YELLOW	NOISE GEN. OUT
30	J2-4/14	GREEN/RED	NOISE GEN. MUTE
40	J2-4/8	ORANGE	D3
50	J2-4/9	RED	D2
60	J2-4/2	GREY/RED	STROBE FRACTION
70	J1-7/4	YELLOW	+5V
80	J2-4/5	BLUE	D6
90	J2-4/4	VIOLET	D7
100	J2-4/6	GREEN	D5
110	J2-4/7	ORANGE/GREY	D4
120	J2-4/11	BROWN/BLUE	D0
130	J2-4/10	BROWN	D1
140	J2-4/3	RED/WHITE	STROBE INTEGER

J2-7

1	J3-4/3	YELLOW/BLUE	ON/OFF III
2	J3-4/4	YELLOW/GREY	ON/OFF II
3	J3-4/5	YELLOW/WHITE	ON/OFF I
4	J3-3/2	BLUE	-18V
5	J3-4/6	BLUE	-18V
6	J1-1/5	BLUE	-18V
7	J2-2/6	BLUE	-18V
8	J2-2/8	BLACK	GROUND
9	J1-1/10	BLACK	GROUND
10	J3-4/7	BLACK	GROUND
11	J3-3/3	BLACK	GROUND
12	J3-4/9	RED	+24V
13	J2-2/7	ORANGE	+18V

J2-2

1	J4-4/10	BLUE/WHITE	DETECTOR MUTE
2	J1-7/9	VIOLET	EARPIECE OUT
3	J1-7/8	BLACK	AF-GROUND
4	J4-4/5	BLUE/GREY	AF-IN
5	J1-7/7	BROWN	AF-OUT
6	J2-7/7	BLUE	-18V
7	J2-7/13	ORANGE	+18V
8	J2-7/8	BLACK	GROUND PS.

J2-1

1	J1-1/6	BLACK/GREY	SSB
2	J5-4/8	BLACK/GREY	SSB
3	J5-4/7	BLACK/WHITE	AM
4	J5-4/9	ORANGE/GREEN	FM
5	J1-3/2	GREEN/YELLOW	NOISE GEN. IN
6	J5-4/2	BLACK/RED	MW
7	J5-4/5	BLACK/GREEN	DUPLEX RELAY
8	J5-4/6	BLACK/BLUE	SIMPLEX RELAY
9	J5-4/11	BLACK	GROUND
10	J5-4/10	ORANGE/BLUE	V. TUNE

J3-4

10	J1-7/10	YELLOW/RED	KEY
20	S1-6	YELLOW/GREEN	NOISE GEN. IN
30	J2-7/1	YELLOW/BLUE	ON/OFF III
40	J2-7/2	YELLOW/GREY	ON/OFF II
50	J2-7/3	YELLOW/WHITE	ON/OFF I
60	J2-7/5	BLUE	-18V
70	J2-7/10	BLACK	GROUND
80	J1-7/5	YELLOW	+5V
90	J2-7/12	RED	+24V

J5-4

10	J1-1/7	BLACK/BROWN	CT
20	J2-1/6	BLACK/RED	MW
30	J1-1/8	GREY	LW
40	J1-1/9	BLACK/YELLOW	DUPLEX FILTER
50	J2-1/7	BLACK/GREEN	DUPLEX RELAY
60	J2-1/8	BLACK/BLUE	SIMPLEX
70	J2-1/3	BLACK/WHITE	AM
80	J2-1/2	BLACK/GREY	SSB
90	J2-1/4	ORANGE/GREEN	FM
100	J2-1/10	ORANGE/BLUE	V. TUNE
110	J2-1/9	BLACK	GROUND
120	J1-1/2	WHITE/VIOLET	COL. II
130	J1-1/3	WHITE/DRANGE	COL. I
140	J1-1/1	WHITE/GREY	LED

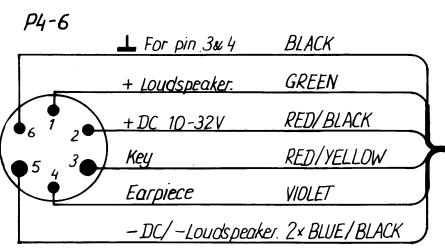
J3-3

10	J2-7/4	BLUE	-18V
20	J2-7/11	BLACK	GROUND
30	J1-7/1	ORANGE	+18V
40	J2-3/1	ORANGE	+18V
50	J2-4/12	ORANGE/RED	VCO II
60	J2-4/13	RED/YELLOW	VCO I
70			

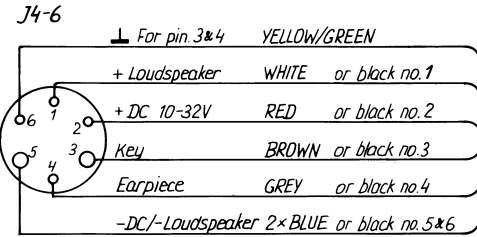
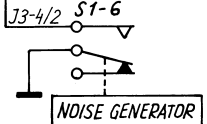
J2-3

10	J3-3/5	ORANGE	+18V
20	J1-7/3	YELLOW	+5V
30	J2-4/15	RED/BLUE	LD MUTE

CHASSIS (6)



POWER SUPPLY (7)



POWER CABLE 7x1mm<sup>2</sup>  
To Connection Box H2091/2

INTERCONNECTION CABLE DIAGRAM FOR R2022

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMB	
	MAIN CHASSIS R2022	MODULE 6	ESPERA	CT RECEIVER	802022
VARIOUS	FRONT PLATE R2022		MELSEN TRYK	141.554 LAK	143.554
VARIOUS	KEYBOARD FOIL R2022		ESPERA	1-0-24179D *	200262
VARIOUS	KNOB	Ø35mm	ESPERA	2-0-24376A *	200265
VARIOUS	BLACK SEALING FOR 1/4 BOX	(THIN)	A.SANDER	TG.0-3-23955	48.570
VARIOUS	BLACK SEALING FOR 1/4 BOX	(WIDE)	A.SANDER	TG.0-3-24522A	48.571
VARIOUS	POWERCABLE R2022	LENGHT 1 METER	ESPERA	500539 POWERCABLE R2022	500539
VARIOUS	1/4 BOX KABINET FOR R2022	GREEN NYLON COATING	ESPERA	KABINET R2022 SERVICE	700533
VARIOUS	COVER FOR KNOB Ø35mm	040-6025/200265	ELMA	040-6025	83.154
VARIOUS	KNOB	10mm	SIFAM	S100.004 BLACK	84.146
VARIOUS	COVER FOR KNOB Ø10mm		SIFAM	C100 BLACK	84.250
VARIOUS	SCREW M3x30mm LHXR A2		HFC	HFC 8004 DIN 966	86.827
VARIOUS	FELT PAD	BLACK Ø9xØ3.5x1mm	OPPENHEJM	PA SORT	89.600
VARIOUS	FELT PAD	BLACK Ø25xØ5.6x1.5mm	OPPENHEJM A/S	TG.1-3-24388A	89.611
-1	FRONT END	R2022 MODULE 1	ESPERA	PRINT NR.5-0-24153C	600177
-2	IFamp DET.AGC & AFamp	R2022 MODULE 2	ESPERA	PRINT NR.5-0-24096D	600178
				R2022	
-3	FREQUENCY SYNTHESIZER	R2022 MODULE 3	ESPERA	PRINT NR.5-0-24057D	600179
-4	PROCESSOR UNIT	R2022 MODULE 4	ESPERA	PRINT NR.5-0-24146E	600181
				R2022	
-5	CONVERTER UNIT	R2022 MODULE 5	ESPERA	PRINT NR.5-0-24231H	600182
-7	AF amp. & FILTER UNIT	R2022 MODULE 7	ESPERA	PRINT NR.5-0-24530E	600381
FP1-6	FERRITE BEAD	4B1	*PHILIPS	4322 020 34420	35.181
FP2-6	FERRITE BEAD	4B1	*PHILIPS	4322 020 34420	35.181
FP3-6	FERRITE BEAD	4B1	*PHILIPS	4322 020 34420	35.181
GL1-6	NEON LAMP	90V 5kA/5A	*SIEMENS	B1-C90/20-Q69-X151	45.074
GL2-6	NEON LAMP	90V 5kA/5A	*SIEMENS	B1-C90/20-Q69-X151	45.074
J1-4	MEMBRANESWITCH 4+7	11 POLE CONNECTOR	MELSEN	0-3-24240A	44.501
J1-6	COAX SOCKET (FEMALE)	L603/B	BELLING LEE	L603/B	78.445
J2-6	COAX SOCKET (FEMALE)	L603/B	BELLING LEE	L603/B	78.445
J3-6	COAX SOCKET (FEMALE)	L603/B	BELLING LEE	L603/B	78.445
ME1-6	INSTRUMENT	R2022	NKW	KL-243E-19B/9-3-24178B	23.105
P1-6	COAX PLUG (MALE)	RS 299-999	R.S.	RS 299-999	78.370
				110-177 SORT KAPPE	
P2-6	COAX PLUG (MALE)	RS 299-999	R.S.	RS 299-999	78.370
				110-177 SORT KAPPE	
P3-6	COAX PLUG (MALE)	RS 299-999	R.S.	RS 299-999	78.370
				110-177 SORT KAPPE	
P4-6	SUPPLY JACK (FEMALE)	MEK 60 BZ	HIRSCHMANN	973025-100	78.309
				6 pole Female for Cable	
S1-6	MICROSWITCH	E62-10H PDT	CHERRY	E62-10H PDT	44.025

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMB
	CONNECTION BOX H2093 FOR T12X	ESPERA	PRINT NR.5-0-24963	600784
C1	CAPACITOR MKT	1uF 10% 63V	*ERO	MKT1818 11.138
C2	CAPACITOR CERAMIC	10nF -20/+80% 50V	#KCK	HE70SJYF103Z 15.170
C3	CAPACITOR CERAMIC	10nF -20/+80% 50V	#KCK	HE70SJYF103Z 15.170
C4	CAPACITOR MKT	1uF 10% 63V	*ERO	MKT1818 11.138
C5	CAPACITOR CERAMIC	10nF -20/+80% 50V	#KCK	HE70SJYF103Z 15.170
C6	CAPACITOR ELECTROLYTIC	22uF 35V	* ERO	EK100BB222F 14.516
C7	CAPACITOR MKT	0.22uF 10% 63V	* ERO	MKT1818 11.090
C8	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EK100AA210F 14.512
C9	CAPACITOR ELECTROLYTIC	22uF 35V	* ERO	EK100BB222F 14.516
C10	CAPACITOR CERAMIC	10nF -20/+80% 50V	#KCK	HE70SJYF103Z 15.170
C11	CAPACITOR MKT	0.22uF 10% 63V	* ERO	MKT1818 11.090
C12	CAPACITOR CERAMIC	1nF 10% 400V	FERROPERM	97012979 16.098
C13	CAPACITOR CERAMIC	10nF -20/+80% 50V	#KCK	HE70SJYF103Z 15.170
C14	CAPACITOR MKT	680nF 20% 63V	ERO	MKT1818 11.092
C15	CAPACITOR POLYESTER	22nF 10% 100V	ERO	MKT 1817 11.175
C16	CAPACITOR MKT	0.22uF 10% 63V	* ERO	MKT1818 11.090
C17	CAPACITOR CERAMIC	10nF -20/+80% 50V	#KCK	HE70SJYF103Z 15.170
C18	CAPACITOR CERAMIC	10nF -20/+80% 50V	#KCK	HE70SJYF103Z 15.170
C19	CAPACITOR MKT	100nF 10% 100V	* ERO	MKT1818 11.180
C20	CAPACITOR POLYESTER	22nF 10% 100V	ERO	MKT 1817 11.175
C21	CAPACITOR MKT	0.22uF 10% 63V	* ERO	MKT1818 11.090
D1	DIODE	1N4448	* ITT	1N4448 25.147
D2	DIODE	1N4448	* ITT	1N4448 25.147
D3	DIODE	1N4448	* ITT	1N4448 25.147
FP1	FERRITE BEAD	HZ4-2/2-1/7A K1201	KASCHKE	HZ4-2/2-1/7A K1201 35.011
IC1	INTEGRATED CIRCUIT	74LS123N	TEXAS	74LS123N 33.872
IC2	INTEGRATED CIRCUIT	AF POWER AMP.TD2030H	AEG	TDA2030H 31.484
IC3	VOLTAGE REGULATOR	MC7805CT	* MOTOROLA	MC7805CT 31.250
J2	PLUG (FEMALE)	MEB 60HDK	HIRSCHMANN	973031-100DK 78.316
L1	CHOKE	TL079	ESPERA	TL079 400079
OC1	OPTO-COUPLER	CNY17-2	*SIEMENS	Q62703-N87 32.530
P1	SUPPLY PLUG (MALE)	MESEI 60F	HIRSCHMANN	973021-100 78.311
R1	RESISTOR	22 KOHM 5% 0.33W	PHILIPS	2322 181 53223 01.233
R2	RESISTOR	22 KOHM 5% 0.33W	PHILIPS	2322 181 53223 01.233
R3	RESISTOR	470 KOHM 5% 0.33W	PHILIPS	2322 181 53474 01.266
R4	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103 01.225
R5	RESISTOR	47 KOHM 5% 0.33W	PHILIPS	2322 181 53473 01.241

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMB
R6	RESISTOR	1 OHM 5% 0.33W	PHILIPS	2322 181 53108 01.125
R7	RESISTOR	47 KOHM 5% 0.33W	PHILIPS	2322 181 53473 01.241
R8	RESISTOR	470 KOHM 5% 0.33W	PHILIPS	2322 181 53474 01.266
R9	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103 01.225
R10	RESISTOR	2.2 KOHM 5% 0.33W	PHILIPS	2322 181 53222 01.208
R11	RESISTOR	270 OHM 5% 0.33W	PHILIPS	2322 181 53271 01.185
R12	RESISTOR	120 KOHM 5% 0.33W	PHILIPS	2322 181 53124 01.252
R13	RESISTOR	120 KOHM 5% 0.33W	PHILIPS	2322 181 53124 01.252
R14	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101 01.175
R15	POTENTIOMETER TRIMMING	1 KOHM 20% 0.3W	NOBLE	TM8-KV2-1S 07.784
R16	RESISTOR	2.2 KOHM 5% 0.33W	PHILIPS	2322 181 53222 01.208
R17	RESISTOR	270 OHM 5% 0.33W	PHILIPS	2322 181 53271 01.185
R18	RESISTOR	560 OHM 5% 0.33W	PHILIPS	2322 181 53561 01.193
R19	RESISTOR	470 KOHM 5% 0.33W	PHILIPS	2322 181 53474 01.266
ST1	SUPPLY TERMINAL BLOCK		PHØNIX	SMKDS 1,5/3-1716034 81.036
ST2	SUPPLY TERMINAL BLOCK		PHØNIX	SMKDS 3/3-5-1711039 81.031
T1	TRANSISTOR	BC548B	* PHILIPS	BC548B 28.076
T2	TRANSISTOR	BC548B	* PHILIPS	BC548B 28.076
TR1	TRANSFORMER	6598	SCANELECTRIC	6598 22.501

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMB
	CONNECTION BOX H2091 FOR T2031	ESPERA	PRINT NR.5-0-24664D	600544
C1	CAPACITOR CERAMIC	10nF -20/+80% 50V	#KCK	HE70SJYF103Z 15.170
C2	CAPACITOR CERAMIC	10nF -20/+80% 50V	#KCK	HE70SJYF103Z 15.170
C3	CAPACITOR CERAMIC	10nF -20/+80% 50V	#KCK	HE70SJYF103Z 15.170
C4	CAPACITOR MKT	2.2uF 5% 63V	ERO	MKT1822 11.141
C5	CAPACITOR MKT	1uF 10% 63V	*ERO	MKT1818 11.138
C6	CAPACITOR MKT	1uF 10% 63V	*ERO	MKT1818 11.138
D1	DIODE	BAV21	PHILIPS	BAV21 25.340
L1	CHOKE	700 OHM / 15 MHZ	*SIEMENS	B82114-R-A3 20.052
L2	CHOKE	700 OHM / 15 MHZ	*SIEMENS	B82114-R-A3 20.052
P2	PLUG (MALE)	5 POLE	AMP	0-826375-5 78.105
R1	RESISTOR	82 KOHM 5% 0.33W	PHILIPS	2322 181 53823 01.247
R2	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103 01.225
R3	RESISTOR	47 KOHM 5% 0.33W	PHILIPS	2322 181 53473 01.241
R4	RESISTOR	150 OHM 5% 0.33W	PHILIPS	2322 181 53151 01.179
R5	RESISTOR	22 OHM 5% 0.33W	PHILIPS	2322 181 53229 01.158
RE1	RELAY	12V 1 SK	OUC	OUC-S-112D 21.300
T1	TRANSISTOR	BC548	* PHILIPS	BC548 28.070
T2	TRANSISTOR	BC548	* PHILIPS	BC548 28.070

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMB	
	FRONT END	R2022 MODULE 1	ESPERA	PRINT NR.5-0-24153C	600177
C1-1	CAPACITOR CERAMIC	10pF 10% 400V	FERROPERM	9/0112.9	15.566
C2-1	CAPACITOR MKT	100nF 10% 100V	* ERO	MKT1818	11.180
C3-1	CAPACITOR TRIMMING	9-300pF	DAU	016.8601.300	17.252
C5-1	CAPACITOR POLYSTYRENE	261pF 1% 630V	PHILIPS	2222 427 42611	10.412
C6-1	CAPACITOR POLYSTYRENE	3.9nF 1% 63V	*PHILIPS	2222 428 83902	10.215
				2222 424 43902	
C7-1	CAPACITOR MKT	100nF 10% 100V	* ERO	MKT1818	11.180
C9-1	CAPACITOR MKT	22nF 5% 250V	ERO	MKT1818-322/254	11.174
C10-1	CAPACITOR POLYSTYRENE	1.5nF 1% 160V	PHILIPS	2222 425 41502	10.280
C11-1	CAPACITOR POLYSTYRENE	470pF 1% 630V	PHILIPS	2222 427 44701	10.429
C12-1	CAPACITOR POLYSTYRENE	1.3nF 1% 160V	PHILIPS	2222 425 41302	10.279
C13-1	CAPACITOR MKT	150nF 5% 63V	ERO	MKT1817	11.181
C14-1	CAPACITOR MKT	0.22uF 10% 63V	* ERO	MKT1818	11.090
C15-1	CAPACITOR MKT	100nF 10% 100V	* ERO	MKT1818	11.180
C16-1	CAPACITOR MKT	100nF 10% 100V	* ERO	MKT1818	11.180
C17-1	CAPACITOR POLYSTYRENE	1.3nF 1% 160V	PHILIPS	2222 425 41302	10.279
C18-1	CAPACITOR POLYSTYRENE	430pF 1% 630V	PHILIPS	2222 427 44301	10.428
C19-1	CAPACITOR POLYSTYRENE	91pF 1% 630V	PHILIPS	2222 427 49109	10.399
C20-1	CAPACITOR MKT	0.22uF 10% 63V	* ERO	MKT1818	11.090
C21-1	CAPACITOR CERAMIC	7.5pF +- .25pF NPO 400V	FERROPERM	9/0112.9	15.557
C22-1	CAPACITOR MKT	100nF 10% 100V	* ERO	MKT1818	11.180
C23-1	CAPACITOR MKT	100nF 10% 100V	* ERO	MKT1818	11.180
C24-1	CAPACITOR POLYSTYRENE	1.3nF 1% 160V	PHILIPS	2222 425 41302	10.279
C25-1	CAPACITOR MKT	100nF 10% 100V	* ERO	MKT1818	11.180
C26-1	CAPACITOR POLYSTYRENE	510pF 1% 630V	PHILIPS	2222 427 45101	10.431
C27-1	CAPACITOR MKT	100nF 10% 100V	* ERO	MKT1818	11.180
C28-1	CAPACITOR POLYSTYRENE	470pF 1% 630V	PHILIPS	2222 427 44701	10.429
C29-1	CAPACITOR POLYSTERENE	120pF 1% 630V	PHILIPS	2222 427 41201	10.403
C30-1	CAPACITOR MKT	100nF 10% 100V	* ERO	MKT1818	11.180
C31-1	CAPACITOR POLYSTYRENE	130pF 1% 630V	PHILIPS	2222 427 41301	10.404
C32-1	CAPACITOR MKT	100nF 10% 100V	* ERO	MKT1818	11.180
C33-1	CAPACITOR POLYSTYRENE	91pF 1% 630V	PHILIPS	2222 427 49109	10.399
C34-1	CAPACITOR MKT	0.22uF 10% 63V	* ERO	MKT1818	11.090
C35-1	CAPACITOR CERAMIC	3.3pF +- .25pF NPO 400V	FERROPERM	9/0112.9	15.521
C36-1	CAPACITOR CERAMIC	10pF 5% N150 400V	FERROPERM	9/0116.9	16.113
C37-1	CAPACITOR CERAMIC	56pF 5% NPO	*KCK	HE60S3CH560J	15.111
C38-1	CAPACITOR CERAMIC	470pF -20/+80% 400V	FERROPERM	9/0129.9	16.097
C39-1	CAPACITOR CERAMIC	56pF 5% NPO	*KCK	HE60S3CH560J	15.111
C40-1	CAPACITOR CERAMIC	470pF -20/+80% 400V	FERROPERM	9/0129.9	16.097
C41-1	CAPACITOR CERAMIC	470pF -20/+80% 400V	FERROPERM	9/0129.9	16.097
C42-1	CAPACITOR MKT	10nF 20% 100V	ERO	MKT1817	11.168

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMB	
C43-1	CAPACITOR MKT	100nF 10% 100V	* ERO	MKT1818	11.180
C44-1	CAPACITOR MKT	100nF 10% 100V	* ERO	MKT1818	11.180
C45-1	CAPACITOR CERAMIC	30pF 5% 500V	KCK	HM60S3CH300J	15.064
C46-1	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C48-1	CAPACITOR CERAMIC	470pF -20/+80% 400V	FERROPERM	9/0129.9	16.097
C49-1	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C50-1	CAPACITOR POLYSTYRENE	360pF 1% 630V	PHILIPS	2222 427 43601	10.418
C51-1	CAPACITOR MKT	10nF 20% 100V	ERO	MKT1817	11.168
C52-1	CAPACITOR MKT	100nF 10% 100V	* ERO	MKT1818	11.180
C53-1	CAPACITOR POLYSTYRENE	180pF 1% 630V	PHILIPS	2222 427 41801	10.407
C55-1	CAPACITOR TRIMMING	5-45pF PTFE	DAU	107.5901.045	17.130
C56-1	CAPACITOR MKT	22nF 5% 250V	ERO	MKT1818-322/254	11.174
C57-1	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C58-1	CAPACITOR MKT	22nF 5% 250V	ERO	MKT1818-322/254	11.174
C59-1	CAPACITOR MKT	22nF 5% 250V	ERO	MKT1818-322/254	11.174
C61-1	CAPACITOR MKT	100nF 10% 100V	* ERO	MKT1818	11.180
C62-1	CAPACITOR MKT	22nF 5% 250V	ERO	MKT1818-322/254	11.174
C63-1	CAPACITOR CERAMIC	10pF 5% N150 400V	FERROPERM	9/0116.9	16.113
C64-1	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C65-1	CAPACITOR MKT	100nF 10% 100V	* ERO	MKT1818	11.180
C66-1	CAPACITOR MKT	100nF 10% 100V	* ERO	MKT1818	11.180
C67-1	CAPACITOR MKT	10nF 20% 100V	ERO	MKT1817	11.168
C68-1	CAPACITOR MKT	10nF 20% 100V	ERO	MKT1817	11.168
C69-1	CAPACITOR MKT	10nF 20% 100V	ERO	MKT1817	11.168
C70-1	CAPACITOR MKT	10nF 20% 100V	ERO	MKT1817	11.168
D1-1	DIODE	1N4448	* ITT	1N4448	25.147
D2-1	DIODE	1N4448	PHILIPS	1N4448	25.146
D3-1	DIODE	BAV21	PHILIPS	BAV21	25.340
D4-1	DIODE	1N4448	* ITT	1N4448	25.147
D5-1	DIODE	BA243	* AEG	BA243	25.386
D6-1	DIODE	BA243	* AEG	BA243	25.386
D7-1	DIODE	BA243	* AEG	BA243	25.386
D8-1	DIODE	BA243	* AEG	BA243	25.386
D9-1	DIODE	BA243	* AEG	BA243	25.386
D10-1	DIODE	BA243	* AEG	BA243	25.386
D11-1	DIODE	BA243	* AEG	BA243	25.386
D12-1	DIODE	BA243	* AEG	BA243	25.386
D13-1	DIODE	BB139 QUINT	* ITT	BB139 QUINTET	26.140
D14-1	DIODE ZENER	8.2V 5% 0.4W BZX79C8V2	PHILIPS	BZX79C8V2	26.543
D15-1	DIODE	1N4448	* ITT	1N4448	25.147
D16-1	DIODE	BB139 QUINT	* ITT	BB139 QUINTET	26.140
D17-1	DIODE	1N4448	* ITT	1N4448	25.147
D18-1	DIODE	1N4448	* ITT	1N4448	25.147
D19-1	DIODE	BA243	* AEG	BA243	25.386

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P. NUMB
D20-1	DIODE	BA243	* AEG	BA243	25.386
D21-1	DIODE	BA243	* AEG	BA243	25.386
D22-1	DIODE	BA243	* AEG	BA243	25.386
D23-1	DIODE	BA243	* AEG	BA243	25.386
D24-1	DIODE	BA243	* AEG	BA243	25.386
D25-1	DIODE ZENER	4.7V 5% 0.4W BZX79C4V7	* PHILIPS	BZX79C4V7	26.524
D26-1	DIODE ZENER	4.7V 5% 0.4W BZX79C4V7	* PHILIPS	BZX79C4V7	26.524
D27-1	DIODE	1N4448	* ITT	1N4448	25.147
D28-1	DIODE	BA243	* AEG	BA243	25.386
D29-1	DIODE	BA243	* AEG	BA243	25.386
FL1-1	CERAMIC FILTER	10.7MHz	ELMATOK	FFE-1070-NA	41.511
FL2-1	CRYSTAL FILTER	10.7008MHz	NDK	SP SPEC. C1034	40.028
FL3-1	CRYSTAL FILTER	10.7008MHz	NDK	SP SPEC. C1028	40.027
FP1-1	FERRITE BEAD	4B1	*PHILIPS	4322 020 34420	35.181
FP2-1	FERRITE BEAD	4B1	*PHILIPS	4322 020 34420	35.181
FP3-1	FERRITE BEAD	4B1	*PHILIPS	4322 020 34420	35.181
FP4-1	FERRITE BEAD	4B1	*PHILIPS	4322 020 34420	35.181
FP5-1	FERRITE BEAD	4B1	*PHILIPS	4322 020 34420	35.181
FP6-1	FERRITE BEAD	4B1	*PHILIPS	4322 020 34420	35.181
FP7-1	FERRITE BEAD	4B1	*PHILIPS	4322 020 34420	35.181
FP8-1	FERRITE BEAD	4B1	*PHILIPS	4322 020 34420	35.181
FP9-1	FERRITE BEAD	4B1	*PHILIPS	4322 020 34420	35.181
IC1-1	INTEGRATED CIRCUIT	MC1488	* TEXAS	SN75188N	34.304
IC2-1	INTEGRATED CIRCUIT	MC1488	* TEXAS	SN75188N	34.304
L1-1	COIL	TL261	S.P.RADIO	6-0-21662A	400261
L2-1	COIL	TL409	ESPERA	6-0-24241	400409
L3-1	COIL	TL261	S.P.RADIO	6-0-21662A	400261
L4-1	CHOKE	390uH 5% SD75	NEOSID	006122 19	20.188
L5-1	CHOKE	10mH 5% SD75	NEOSID	006122 36	20.215
L6-1	CHOKE	100uH 5% SD75	NEOSID	006122 12	20.169
L7-1	CHOKE	39uH 5% SD75	NEOSID	006122 07	20.193
L8-1	CHOKE	270uH 5% SD75	NEOSID	006122 17	20.187
L9-1	CHOKE	82uH 5%	NEOSID	006122 11	20.168
L10-1	CHOKE	27uH 5% SD75	NEOSID	006122 05	20.191
L11-1	CHOKE	470uH 5% SD75	NEOSID	006122 20	20.186
L12-1	CHOKE	100uH 5% SD75	NEOSID	006122 12	20.169
L13-1	CHOKE	39uH 5% SD75	NEOSID	006122 07	20.193
L14-1	CHOKE	27uH 5% SD75	NEOSID	006122 05	20.191
L15-1	CHOKE	27uH 5% SD75	NEOSID	006122 05	20.191
OC1-1	OPTOCOUPLER	OPB-825	OPTRON-INC.	OPB-825	32.520
OC2-1	OPTOCOUPLER	OPB-825	OPTRON-INC.	OPB-825	32.520
P1-1	PLUG (MALE)	10 POLE	AMP	1-826375-0	78.110
P2-1	PLUG (MALE)	10 POLE	AMP	1-826375-0	78.110
R1-1	RESISTOR	100 KOHM 5% 0.33W	PHILIPS	2322 181 53104	01.250

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P. NUMB
R2-1	RESISTOR	100 KOHM 5% 0.33W	PHILIPS	2322 181 53104	01.250
R3-1	RESISTOR	15 OHM 5% 2.5W	PHILIPS	2322 192 31509	04.654
R4-1	RESISTOR	120 OHM 5% 0.33W	PHILIPS	2322 181 53121	01.177
R5-1	RESISTOR	6.8 KOHM 5% 0.33W	PHILIPS	2322 181 53682	01.220
R6-1	RESISTOR	15 OHM 5% 2.5W	PHILIPS	2322 192 31509	04.654
R7-1	RESISTOR	180 OHM 5% 0.33W	PHILIPS	2322 181 53181	01.181
R8-1	RESISTOR	6.8 KOHM 5% 0.33W	PHILIPS	2322 181 53682	01.220
R9-1	RESISTOR	56 KOHM 5% 0.33W	PHILIPS	2322 181 53563	01.243
R10-1	RESISTOR	6.8 KOHM 5% 0.33W	PHILIPS	2322 181 53682	01.220
R11-1	RESISTOR	68 KOHM 5% 0.33W	PHILIPS	2322 181 53683	01.245
R12-1	RESISTOR	3.9 KOHM 5% 0.33W	PHILIPS	2322 181 53392	01.214
R13-1	RESISTOR	3.9 KOHM 5% 0.33W	PHILIPS	2322 181 53392	01.214
R14-1	RESISTOR	3.9 KOHM 5% 0.33W	PHILIPS	2322 181 53392	01.214
R15-1	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 181 53472	01.216
R16-1	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 181 53472	01.216
R17-1	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 181 53472	01.216
R18-1	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 181 53272	01.210
R19-1	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 181 53472	01.216
R20-1	RESISTOR	33 KOHM 5% 0.33W	PHILIPS	2322 181 53333	01.237
R21-1	RESISTOR	12 KOHM 5% 0.33W	PHILIPS	2322 181 53123	01.227
R22-1	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R23-1	RESISTOR	680 OHM 5% 0.33W	PHILIPS	2322 181 53681	01.195
R25-1	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R26-1	RESISTOR	5.6 KOHM 5% 0.33W	PHILIPS	2322 181 53562	01.218
R27-1	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101	01.175
R28-1	RESISTOR	470 OHM 5% 0.33W	PHILIPS	2322 181 53471	01.191
R29-1	RESISTOR	470 KOHM 5% 0.33W	PHILIPS	2322 181 53474	01.266
R30-1	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101	01.175
R31-1	RESISTOR	33 KOHM 5% 0.33W	PHILIPS	2322 181 53333	01.237
R32-1	RESISTOR	56 KOHM 5% 0.33W	PHILIPS	2322 181 53563	01.243
R33-1	RESISTOR	3.3 KOHM 5% 0.33W	PHILIPS	2322 181 53332	01.212
R34-1	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 181 53472	01.216
R35-1	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101	01.175
R36-1	RESISTOR	470 OHM 5% 0.33W	PHILIPS	2322 181 53471	01.191
R37-1	RESISTOR	1.5 KOHM 5% 0.33W	PHILIPS	2322 181 53152	01.204
R38-1	RESISTOR	100 KOHM 5% 0.33W	PHILIPS	2322 181 53104	01.250
R41-1	RESISTOR	3.3 KOHM 5% 0.33W	PHILIPS	2322 181 53332	01.212
R42-1	RESISTOR	3.3 KOHM 5% 0.33W	PHILIPS	2322 181 53332	01.212
R44-1	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 181 53272	01.210
R45-1	RESISTOR	330 OHM 5% 0.33W	PHILIPS	2322 181 53331	01.187
R46-1	RESISTOR	1.5 KOHM 5% 0.33W	PHILIPS	2322 181 53152	01.204
R47-1	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 53102	01.200
R48-1	RESISTOR	68 KOHM 5% 0.33W	PHILIPS	2322 181 53683	01.245
R49-1	RESISTOR	1.5 KOHM 5% 0.33W	PHILIPS	2322 181 53152	01.204



POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P. NUMB
R50-1	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 53102	01.200
R51-1	RESISTOR	56 KOHM 5% 0.33W	PHILIPS	2322 181 53563	01.243
R52-1	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 181 53472	01.216
R53-1	RESISTOR	620 OHM 5% 0.33W	PHILIPS	2322 181 53621	01.194
R54-1	RESISTOR	180 OHM 5% 0.33W	PHILIPS	2322 181 53181	01.181
R55-1	RESISTOR	100 KOHM 5% 0.33W	PHILIPS	2322 181 53104	01.250
R56-1	RESISTOR	750 OHM 5% 0.33W	PHILIPS	2322 181 53751	01.196
R58-1	RESISTOR	220 OHM 5% 0.33W	PHILIPS	2322 181 33221	01.683
R59-1	RESISTOR	56 OHM 5% 0.33W	PHILIPS	2322 181 53569	01.168
RE1-1	RELAY	NF2E-12V	*MEW	NF2E-12V	21.193
RE2-1	RELAY	LZ12H-12V	TAKAMISAWA	LZ12H-12V	21.136
T1-1	TRANSISTOR	BC548	* PHILIPS	BC548	28.070
T2-1	TRANSISTOR	BC548	* PHILIPS	BC548	28.070
T3-1	TRANSISTOR	BC548	* PHILIPS	BC548	28.070
T4-1	TRANSISTOR	BF479	*AEG	BF479	28.198
T5-1	TRANSISTOR	BC558	* MOTOROLA	BC558	28.095
T6-1	TRANSISTOR SELECTED	TIS 88 GROUP A2 RED	ESPERA	C1055	700315
T7-1	TRANSISTOR SELECTED	TIS 88 GROUP A2 RED	ESPERA	C1055	700315
T8-1	TRANSISTOR	BC548	* PHILIPS	BC548	28.070
T9-1	TRANSISTOR SELECTED	TIS 88 GROUP A2 RED	ESPERA	C1055	700315
T10-1	TRANSISTOR SELECTED	TIS 88 GROUP A2 RED	ESPERA	C1055	700315
TR1-1	TRANSFORMER	0.2uH ADJUSTABLE	*MITSUMI	R12-E517-X	38.421
TR2-1	COIL	TL408	ESPERA	6-0-24244	400408
TR3-1			ESPERA	6-0-24980	400454
TR4-1	COIL	TL407	ESPERA	6-0-24246A	400407
TR5-1	TRANSFORMER	0.6uH ADJUSTABLE	*MITSUMI	R12-E518-A	38.422
TR6-1	TRANSFORMER	0.2uH ADJUSTABLE	*MITSUMI	R12-E517-X	38.421

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P. NUMB
	IFamp DET.AGC & AFamp	R2022 MODULE 2	ESPERA	PRINT NR.5-0-24096D R2022	600178
C1-2	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EKI00AA210F	14.512
C2-2	CAPACITOR MKT	100nF 10% 100V	* ERO	MKT1817	11.180
C3-2	CAPACITOR CERAMIC	470pF -20/+80% 400V	FERROPERM	9/0129,9	16.097
C4-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C5-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C6-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C7-2	CAPACITOR CERAMIC	470pF -20/+80% 400V	FERROPERM	9/0129,9	16.097
C8-2	CAPACITOR CERAMIC	470pF -20/+80% 400V	FERROPERM	9/0129,9	16.097
C9-2	CAPACITOR CERAMIC	470pF -20/+80% 400V	FERROPERM	9/0129,9	16.097
C10-2	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EKI00AA210F	14.512
C11-2	CAPACITOR MKT	10nF 20% 100V	ERO	MKT1817	11.168
C12-2	CAPACITOR MKT	10nF 20% 100V	ERO	MKT1817	11.168
C13-2	CAPACITOR CERAMIC	470pF -20/+80% 400V	FERROPERM	9/0129,9	16.097
C14-2	CAPACITOR MKT	10nF 20% 100V	ERO	MKT1817	11.168
C15-2	CAPACITOR MKT	10nF 20% 100V	ERO	MKT1817	11.168
C16-2	CAPACITOR MKT	220nF 20% 63V	ERO	MKT1817	11.183
C17-2	CAPACITOR CERAMIC	470pF -20/+80% 400V	FERROPERM	9/0129,9	16.097
C18-2	CAPACITOR ELECTROLYTIC	47uF 20% 25V	* ERO	EKI00BB247E	14.524
C19-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C20-2	CAPACITOR MKT	150nF 5% 63V	ERO	MKT1817	11.181
C21-2	CAPACITOR POLYSTYRENE	22nF 5% 100V	ERO	MKT1817	11.169
C22-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C23-2	CAPACITOR MKT	220nF 20% 63V	ERO	MKT1817	11.183
C24-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C25-2	CAPACITOR CERAMIC	470pF -20/+80% 400V	FERROPERM	9/0129,9	16.097
C26-2	CAPACITOR CERAMIC	470pF -20/+80% 400V	FERROPERM	9/0129,9	16.097
C27-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C28-2	CAPACITOR CERAMIC	470pF -20/+80% 400V	FERROPERM	9/0129,9	16.097
C29-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C30-2	CAPACITOR MKT	10nF 20% 100V	ERO	MKT1817	11.168
C32-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C33-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C34-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C35-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C36-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C37-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C38-2	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EKI00AA210F	14.512
C39-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C40-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170
C41-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70S3YF103Z	15.170

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P. NUMB	
C42-2	CAPACITOR MKT	1uF 10% 63V	*ERO	MKT1818	11.138
C43-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70SJYF103Z	15.170
C44-2	CAPACITOR CERAMIC	150nF 20% 400V	FERROPERM	97012979	16.081
C45-2	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EK100AA210F	14.512
C46-2	CAPACITOR MKT	3.3nF 20% 630V	ERO	MKT1818	11.144
C47-2	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EK100AA210F	14.512
C48-2	CAPACITOR POLYSTYRENE	820pF 1% 250V	PHILIPS	2222 426 48201	10.348
C49-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70SJYF103Z	15.170
C50-2	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EK100AA210F	14.512
C51-2	CAPACITOR ELECTROLYTIC	100uF 25V	ERO	EB	14.558
C52-2	CAPACITOR MKT	330nF 10% 63V	* ERO	MKT1818	11.122
C53-2	CAPACITOR POLYSTYRENE	240pF 1% 630V	PHILIPS	2222 427 42401	10.410
C54-2	CAPACITOR POLYSTYRENE	82pF 1% 630V	PHILIPS	2222 427 48209	10.398
C55-2	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EK100AA210F	14.512
C56-2	CAPACITOR POLYSTYRENE	1.1nF 1% 160V	PHILIPS	2222 425 41102	10.351
C57-2	CAPACITOR MKT	0.22uF 10% 63V	* ERO	MKT1818	11.090
C58-2	CAPACITOR MKT	10nF 5% 250V	ERO	MKT1818-310/254	11.167
C59-2	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EK100AA210F	14.512
C61-2	CAPACITOR POLYSTYRENE	2nF 1% 160V	PHILIPS	2222 425 42002	10.283
C62-2	CAPACITOR POLYSTYRENE	180pF 1% 630V	PHILIPS	2222 427 41801	10.407
C63-2	CAPACITOR MKT	330nF 10% 63V	* ERO	MKT1818	11.122
C64-2	CAPACITOR MKT	10nF 5% 250V	ERO	MKT1818-310/254	11.167
C65-2	CAPACITOR MKT	10nF 5% 250V	ERO	MKT1818-310/254	11.167
C66-2	CAPACITOR MKT	10nF 5% 250V	ERO	MKT1818-310/254	11.167
C67-2	CAPACITOR MKT	33nF 5% 250V	ERO	MKT1818	11.172
C68-2	CAPACITOR MKT	33nF 5% 250V	ERO	MKT1818	11.172
C69-2	CAPACITOR MKT	33nF 5% 250V	ERO	MKT1818	11.172
C70-2	CAPACITOR CERAMIC	1.8nF -20/+80% 400V	FERROPERM	97014179	15.735
C71-2	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70SJYF103Z	15.170
D1-2	DIODE	1N4448	* ITT	1N4448	25.147
D2-2	DIODE PIN	BA479S	AEG	BA479S	25.395
D3-2	DIODE	1N4448	* ITT	1N4448	25.147
D4-2	DIODE	1N4448	* ITT	1N4448	25.147
D5-2	DIODE	1N4448	* ITT	1N4448	25.147
D6-2	DIODE	1N4448	* ITT	1N4448	25.147
D7-2	DIODE ZENER	12V 5% 0.4W BZX79C12	* MOTOROLA	BZX79C12	26.554
D8-2	DIODE	1N4448	* ITT	1N4448	25.147
D9-2	DIODE	1N4448	* ITT	1N4448	25.147
D10-2	DIODE	1N4448	* ITT	1N4448	25.147
D11-2	DIODE	1N4448	* ITT	1N4448	25.147
D12-2	DIODE ZENER	4.7V 5% 0.4W BZX79C4V7	* PHILIPS	BZX79C4V7	26.524
D13-2	DIODE	1N4448	* ITT	1N4448	25.147
D14-2	DIODE	1N4448	* ITT	1N4448	25.147
D15-2	DIODE	1N4448	* ITT	1N4448	25.147

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P. NUMB	
D16-2	DIODE	1N4448	* ITT	1N4448	25.147
D17-2	DIODE	BA243	* AEG	BA243	25.386
D18-2	DIODE	1N4448	* ITT	1N4448	25.147
D19-2	DIODE	1N4448	* ITT	1N4448	25.147
D20-2	DIODE	BA243	* AEG	BA243	25.386
D21-2	DIODE	BA243	* AEG	BA243	25.386
D22-2	DIODE	1N4448	* ITT	1N4448	25.147
D23-2	DIODE	1N4448	* ITT	1N4448	25.147
D24-2	DIODE	BA243	* AEG	BA243	25.386
FL1-2	CERAMIC FILTER	10.7MHz	ELMATOK	FFE-1070-NA	41.511
FP1-2	FERRITE BEAD	4B1	*PHILIPS	4322 020 34420	35.181
FP2-2	FERRITE BEAD	4B1	*PHILIPS	4322 020 34420	35.181
FP3-2	FERRITE BEAD	4B1	*PHILIPS	4322 020 34420	35.181
IC1-2	INTEGRATED CIRCUIT	LM324N	* NATIONAL	LM324N	31.065
IC2-2	INTEGRATED CIRCUIT	SL1612	PLESSEY	SL1612	31.532
IC3-2	INTEGRATED CIRCUIT	SL1612	PLESSEY	SL1612	31.532
IC4-2	INTEGRATED CIRCUIT	MC1413P	* MOTOROLA	MC1413P	31.077
IC5-2	INTEGRATED CIRCUIT	LM3189	* NATIONAL	LM3189	31.752
IC6-2	INTEGRATED CIRCUIT	LM324N	* NATIONAL	LM324N	31.065
IC7-2	INTEGRATED CIRCUIT	MC14016BCP	* MOTOROLA	MC14016BCP	33.084
IC9-2	VOLTAGE REGULATOR	12V 5%	NATIONAL	LM78L12ACZ 5% PL.HUS	31.139
L1-2	CHOKE	15uH 5%	NEOSID	006122 02	20.153
L2-2	CHOKE	33uH 5%	NEOSID	006122 06	20.162
L3-2	CHOKE	22uH 5%	NEOSID	006122 04	20.156
L4-2	COIL	2.7uH ADJUSTABLE	MITSUMI	IFT 41M7-D R12-2881-A	38.420
L5-2	CHOKE	900 OHM / 60 MHZ	*SIEMENS	B82114-R-A4	20.053
P1-2	PLUG (MALE)	14 POLE	AMP	1-826375-4	78.114
P2-2	PLUG (MALE)	8 POLE	AMP	0-826375-8	78.108
R1-2	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 181 53272	01.210
R2-2	RESISTOR	15 KOHM 5% 0.33W	PHILIPS	2322 181 53153	01.229
R3-2	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101	01.175
R4-2	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 181 53472	01.216
R5-2	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 53102	01.200
R6-2	RESISTOR	39 KOHM 5% 0.33W	PHILIPS	2322 181 53393	01.239
R7-2	RESISTOR	27 KOHM 5% 0.33W	PHILIPS	2322 181 53273	01.235
R8-2	RESISTOR	15 KOHM 5% 0.33W	PHILIPS	2322 181 53153	01.229
R9-2	RESISTOR	5.6 KOHM 5% 0.33W	PHILIPS	2322 181 53562	01.218
R10-2	RESISTOR	510 OHM 5% 0.33W	PHILIPS	2322 181 53511	01.192
R11-2	RESISTOR	3.3 KOHM 5% 0.33W	PHILIPS	2322 181 53332	01.212
R12-2	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101	01.175
R13-2	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R14-2	RESISTOR	3.9 KOHM 5% 0.33W	PHILIPS	2322 181 53392	01.214
R15-2	RESISTOR	3.3 KOHM 5% 0.33W	PHILIPS	2322 181 53332	01.212
R16-2	RESISTOR	27 KOHM 5% 0.33W	PHILIPS	2322 181 53273	01.235

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POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMB
R17-2	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 53102	01.200
R18-2	RESISTOR	470 KOHM 5% 0.33W	PHILIPS	2322 181 53474	01.266
R19-2	RESISTOR	47 KOHM 5% 0.33W	PHILIPS	2322 181 53473	01.241
R20-2	RESISTOR	120 KOHM 5% 0.33W	PHILIPS	2322 181 53124	01.252
R21-2	RESISTOR	2.7 MOHM 5% 0.33W	PHILIPS	2322 181 53275	01.285
R22-2	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101	01.175
R23-2	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101	01.175
R24-2	RESISTOR	470 OHM 5% 0.33W	PHILIPS	2322 181 53471	01.191
R25-2	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 53102	01.200
R26-2	RESISTOR	100 KOHM 5% 0.33W	PHILIPS	2322 181 53104	01.250
R27-2	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101	01.175
R28-2	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 181 53472	01.216
R29-2	RESISTOR	100 KOHM 5% 0.33W	PHILIPS	2322 181 53104	01.250
R30-2	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101	01.175
R31-2	RESISTOR	47 KOHM 5% 0.33W	PHILIPS	2322 181 53473	01.241
R32-2	RESISTOR	470 OHM 5% 0.33W	PHILIPS	2322 181 53471	01.191
R33-2	RESISTOR	5.6 KOHM 5% 0.33W	PHILIPS	2322 181 53562	01.218
R34-2	RESISTOR	47 OHM 5% 0.33W	PHILIPS	2322 181 53479	01.166
R35-2	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101	01.175
R36-2	RESISTOR	15 KOHM 5% 0.33W	PHILIPS	2322 181 53153	01.229
R37-2	RESISTOR	5.6 KOHM 5% 0.33W	PHILIPS	2322 181 53562	01.218
R38-2	RESISTOR	100 KOHM 5% 0.33W	PHILIPS	2322 181 53104	01.250
R39-2	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 181 53472	01.216
R40-2	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 53102	01.200
R41-2	RESISTOR	330 OHM 5% 0.33W	PHILIPS	2322 181 53331	01.187
R42-2	RESISTOR	27 OHM 5% 0.33W	PHILIPS	2322 181 53279	01.160
R43-2	RESISTOR	680 OHM 5% 0.33W	PHILIPS	2322 181 53681	01.195
R44-2	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R45-2	RESISTOR	470 OHM 5% 0.33W	PHILIPS	2322 181 53471	01.191
R46-2	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R47-2	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101	01.175
R48-2	RESISTOR	330 OHM 5% 0.33W	PHILIPS	2322 181 53331	01.187
R49-2	RESISTOR	12 KOHM 5% 0.33W	PHILIPS	2322 181 53123	01.227
R50-2	RESISTOR	15 KOHM 5% 0.33W	PHILIPS	2322 181 53153	01.229
R51-2	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 53102	01.200
R52-2	RESISTOR	680 OHM 5% 0.33W	PHILIPS	2322 181 53681	01.195
R53-2	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101	01.175
R54-2	RESISTOR	1.8 KOHM 5% 0.33W	PHILIPS	2322 181 53182	01.206
R55-2	RESISTOR	47 OHM 5% 0.33W	PHILIPS	2322 181 53479	01.166
R56-2	RESISTOR	47 OHM 5% 0.33W	PHILIPS	2322 181 53479	01.166
R57-2	RESISTOR	2.2 KOHM 5% 0.33W	PHILIPS	2322 181 53222	01.208
R58-2	RESISTOR	8.2 KOHM 5% 0.33W	PHILIPS	2322 181 53822	01.222
R59-2	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R60-2	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMB
R61-2	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 181 53272	01.210
R62-2	RESISTOR	47 KOHM 5% 0.33W	PHILIPS	2322 181 53473	01.241
R63-2	RESISTOR	2.2 KOHM 5% 0.33W	PHILIPS	2322 181 53222	01.208
R64-2	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 181 53272	01.210
R65-2	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 181 53272	01.210
R66-2	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 181 53272	01.210
R67-2	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 181 53472	01.216
R68-2	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 181 53272	01.210
R69-2	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 181 53272	01.210
R70-2	RESISTOR	47 KOHM 5% 0.33W	PHILIPS	2322 181 53473	01.241
R71-2	RESISTOR	47 KOHM 5% 0.33W	PHILIPS	2322 181 53473	01.241
R72-2	RESISTOR	47 KOHM 5% 0.33W	PHILIPS	2322 181 53473	01.241
R73-2	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R74-2	RESISTOR	150 OHM 5% 0.33W	PHILIPS	2322 181 53151	01.179
R75-2	RESISTOR	100 KOHM 5% 0.33W	PHILIPS	2322 181 53104	01.250
R76-2	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R77-2	RESISTOR	470 KOHM 5% 0.33W	PHILIPS	2322 181 53474	01.266
R78-2	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R79-2	RESISTOR	91 KOHM 5% 0.33W	PHILIPS	2322 181 53913	01.248
R80-2	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R81-2	RESISTOR	470 KOHM 5% 0.33W	PHILIPS	2322 181 53474	01.266
R82-2	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R83-2	RESISTOR	51 KOHM 5% 0.33W	PHILIPS	2322 181 53513	01.242
R84-2	RESISTOR	91 KOHM 5% 0.33W	PHILIPS	2322 181 53913	01.248
R85-2	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101	01.175
R86-2	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 53102	01.200
R87-2	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R88-2	RESISTOR	91 KOHM 5% 0.33W	PHILIPS	2322 181 53913	01.248
R89-2	RESISTOR	560 OHM 5% 0.33W	PHILIPS	2322 181 53561	01.193
R91-2	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 181 53472	01.216
R92-2	RESISTOR	47 KOHM 5% 0.33W	PHILIPS	2322 181 53473	01.241
R93-2	RESISTOR	15 KOHM 5% 0.33W	PHILIPS	2322 181 53153	01.229
R96-2	RESISTOR	91 KOHM 5% 0.33W	PHILIPS	2322 181 53913	01.248
R97-2	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101	01.175
R99-2	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 53102	01.200
R100-2	RESISTOR	91 KOHM 5% 0.33W	PHILIPS	2322 181 53913	01.248
R101-2	RESISTOR	15 KOHM 5% 0.33W	PHILIPS	2322 181 53153	01.229
R102-2	RESISTOR	560 KOHM 5% 0.33W	PHILIPS	2322 181 53564	01.268
R103-2	RESISTOR	20 KOHM 5% 0.33W	PHILIPS	2322 181 53203	01.232
R104-2	RESISTOR	470 KOHM 5% 0.33W	PHILIPS	2322 181 53474	01.266
R105-2	RESISTOR	15 KOHM 5% 0.33W	PHILIPS	2322 181 53153	01.229
R106-2	RESISTOR	47 KOHM 5% 0.33W	PHILIPS	2322 181 53473	01.241
R107-2	RESISTOR	1.2 MOHM 5% 0.33W	PHILIPS	2322 181 53125	01.277
R109-2	RESISTOR	39 KOHM 5% 0.33W	PHILIPS	2322 181 53393	01.239

POSITION	DESCRIPTION		MANUFACTURER	TYPE	S.P. NUMB
R110-2			PHILIPS	2322 181 53434	01.265
R111-2	RESISTOR	15 KOHM 5% 0.33W	PHILIPS	2322 181 53153	01.229
R112-2	RESISTOR	3.3 KOHM 5% 0.33W	PHILIPS	2322 181 53332	01.212
R113-2	RESISTOR	560 OHM 5% 0.33W	PHILIPS	2322 181 53561	01.193
R114-2	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 181 53272	01.210
R115-2	RESISTOR	7.5 KOHM 5% 0.33W	PHILIPS	2322 181 53752	01.221
R116-2	RESISTOR	5.1 KOHM 5% 0.33W	PHILIPS	2322 181 53512	01.217
T1-2	TRANSISTOR	BC548	* PHILIPS	BC548	28.070
T2-2	TRANSISTOR	BC548C	* MOTOROLA	BC548C	28.079
T3-2	TRANSISTOR	BF199	PHILIPS	BF199	28.179
T4-2	TRANSISTOR	BC558	* MOTOROLA	BC558	28.095
T5-2	TRANSISTOR	BF199	PHILIPS	BF199	28.179
T6-2	TRANSISTOR	BF199	PHILIPS	BF199	28.179
T7-2	TRANSISTOR	BC548	* PHILIPS	BC548	28.070
T8-2	TRANSISTOR	BC548	* PHILIPS	BC548	28.070
T9-2	TRANSISTOR	BC548	* PHILIPS	BC548	28.070
T10-2	TRANSISTOR	BC548	* PHILIPS	BC548	28.070
T12-2	TRANSISTOR	BC548	* PHILIPS	BC548	28.070
T13-2	TRANSISTOR	BC548C	* MOTOROLA	BC548C	28.079
T14-2	TRANSISTOR	BC548C	* MOTOROLA	BC548C	28.079
TR1-2	COIL	TL410	ESPERA	6-0-24226A	400410
TR2-2	COIL	TL410	ESPERA	6-0-24226A	400410

POSITION	DESCRIPTION		MANUFACTURER	TYPE	S.P. NUMB
	FREQUENCY SYNTHESIZER	R2022 MODULE 3	ESPERA	PRINT NR.5-0-24057D	600179
C1-3	CAPACITOR MKT	470nF 10% 100V	SIEMENS	B32510-D1474-K000	11.231
C2-3	CAPACITOR POLYSTERENE	680pF 1% 250V	PHILIPS	2222 426 46801	10.346
C3-3	CAPACITOR POLYSTYRENE	62pF 1% 630V	PHILIPS	2222 427 46209	10.395
C4-3	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EK100AA210F	14.512
C5-3	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EK100AA210F	14.512
C6-3	CAPACITOR TRIMMING	2-18pF PTFE	DAU	107.2901.018	17.100
C8-3	CAPACITOR POLYSTYRENE	470pF 1% 630V	PHILIPS	2222 427 44701	10.429
C9-3	CAPACITOR CERAMIC	39pF 5% NPO	KCK	HE50S3CH390J	15.085
C10-3	CAPACITOR MKT	22nF 10% 250V	SIEMENS	B32510-D3223-K000	11.297
C11-3	CAPACITOR MKT	22nF 10% 250V	SIEMENS	B32510-D3223-K000	11.297
C12-3	CAPACITOR MKT	22nF 10% 250V	SIEMENS	B32510-D3223-K000	11.297
C13-3	CAPACITOR MKT	22nF 10% 250V	SIEMENS	B32510-D3223-K000	11.297
C14-3	CAPACITOR POLYSTYRENE	240pF 1% 630V	PHILIPS	2222 427 42401	10.410
C15-3	CAPACITOR MKT	22nF 10% 250V	SIEMENS	B32510-D3223-K000	11.297
C16-3	CAPACITOR POLYSTYRENE	91pF 1% 630V	PHILIPS	2222 427 49109	10.399
C17-3	CAPACITOR CERAMIC	470pF -20/+80% 400V	FERRPERM	9/0129,9	16.097
C18-3	CAPACITOR CERAMIC	470pF -20/+80% 400V	FERRPERM	9/0129,9	16.097
C19-3	CAPACITOR POLYSTYRENE	1.2nF 1% 160V	PHILIPS	2222 425 41202	10.278
C20-3	CAPACITOR CERAMIC	22pF 5% NPO 500V	KCK	HM60S3CH220J	15.080
C21-3	CAPACITOR CERAMIC	7.5pF +/-25pF NPO 400V	FERRPERM	9/0112,9	15.557
C22-3	CAPACITOR MKT	22nF 10% 250V	SIEMENS	B32510-D3223-K000	11.297
C23-3	CAPACITOR CERAMIC	470pF -20/+80% 400V	FERRPERM	9/0129,9	16.097
C24-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360
C25-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360
C26-3	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C27-3	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C28-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360
C29-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360
C30-3	CAPACITOR TANTALUM	10uF 25V 20%	ERO	FTP-3F	14.130
C32-3	CAPACITOR POLYSTYRENE	100pF 1% 630V	PHILIPS	2222 427 41001	10.400
C33-3	CAPACITOR CERAMIC	120pF 10% 400V	FERRPERM	9/0126,9	15.755
C34-3	CAPACITOR MKT	470nF 10% 100V	SIEMENS	B32510-D1474-K000	11.231
C35-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360
C36-3	CAPACITOR POLYSTERENE	120pF 1% 630V	PHILIPS	2222 427 41201	10.403
C37-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360
C38-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360
C39-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360
C40-3	CAPACITOR MKT	470nF 10% 100V	SIEMENS	B32510-D1474-K000	11.231
C41-3	CAPACITOR MKT	470nF 10% 100V	SIEMENS	B32510-D1474-K000	11.231
C42-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360
C43-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMB
C44-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360
C45-3	CAPACITOR POLYSTYRENE	1nF 1% 250V	PHILIPS	2222 426 41002	10.350
C46-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360
C47-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360
C48-3	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EK100AA210F	14.512
C49-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360
C50-3	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C51-3	CAPACITOR ELECTROLYTIC	4.7uF 20% 50V	* ERO	EK100AA147H	14.510
C52-3	CAPACITOR ELECTROLYTIC	100uF -10/+50% 25V	ERO	EKM00CC310E	14.610
C53-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360
C54-3	CAPACITOR ELECTROLYTIC	100uF -10/+50% 25V	ERO	EKM00CC310E	14.610
C55-3	CAPACITOR CERAMIC	7.5pF +- .25pF NPO 400V	FERROPERM	970112,9	15.557
C56-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360
C57-3	CAPACITOR ELECTROLYTIC	100uF -10/+50% 25V	ERO	EKM00CC310E	14.610
C58-3			SIEMENS	B33063-B6101-F7	11.701
C59-3	CAPACITOR POLYSTYRENE	56pF 1% 630V	PHILIPS	2222 427 45609	10.394
C60-3	CAPACITOR	33pF 1% 630V	SIEMENS	B33063-B6330-F7	11.700
C61-3	CAPACITOR POLYSTYRENE	180pF 1% 630V	PHILIPS	2222 427 41801	10.407
C62-3	CAPACITOR POLYSTYRENE	3.3nF 1% 160V	#PHILIPS	2222 425 43302	10.288
C63-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360
C64-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360
C65-3	CAPACITOR MKT	22nF 5% 250V	ERO	MKT1818-322/254	11.174
C66-3	CAPACITOR MKT	100nF 10% 100V	*SIEMENS	B32510-D1104-K000	11.219
C67-3	CAPACITOR MKT	100nF 10% 100V	*SIEMENS	B32510-D1104-K000	11.219
C69-3	CAPACITOR MKT	1uF 10% 63V	*ERO	MKT1818	11.138
C70-3	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EK100AA210F	14.512
C71-3	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EK100AA210F	14.512
C72-3	CAPACITOR POLYSTYRENE	3nF 1% 160V	PHILIPS	2222 425 43002	10.287
C73-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360
C74-3	CAPACITOR MKT	1nF 10% 400V	SIEMENS	B32510-D6102-K000	11.360
C75-3	CAPACITOR MKT	1uF 10% 63V	*ERO	MKT1818	11.138
C76-3	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EK100AA210F	14.512
C77-3	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EK100AA210F	14.512
C78-3	CAPACITOR MKT	150nF 10% 100V	SIEMENS	B32510-D1154-K000	11.222
C79-3	CAPACITOR MKT	150nF 10% 100V	SIEMENS	B32510-D1154-K000	11.222
C80-3	CAPACITOR MKT	150nF 10% 100V	SIEMENS	B32510-D1154-K000	11.222
C81-3	CAPACITOR MKT	150nF 10% 100V	SIEMENS	B32510-D1154-K000	11.222
C82-3	CAPACITOR MKT	150nF 10% 100V	SIEMENS	B32510-D1154-K000	11.222
C83-3	CAPACITOR MKT	150nF 10% 100V	SIEMENS	B32510-D1154-K000	11.222
C84-3	CAPACITOR MKT	150nF 10% 100V	SIEMENS	B32510-D1154-K000	11.222
C85-3	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EK100AA210F	14.512
C86-3	CAPACITOR ELECTROLYTIC	100uF -10/+50% 25V	ERO	EKM00CC310E	14.610
C87-3	CAPACITOR MKT	100nF 10% 100V	*SIEMENS	B32510-D1104-K000	11.219
C88-3	CAPACITOR MKT	100nF 10% 100V	*SIEMENS	B32510-D1104-K000	11.219

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMB
C89-3	CAPACITOR MKT	68nF 5% 100V	ERO	MKT1818-368/014	11.177
C90-3	CAPACITOR MKT	10nF 5% 250V	ERO	MKT1818-310/254	11.167
C91-3	CAPACITOR MKT	15nF 5% 250V	ERO	MKT1818	11.170
C92-3	CAPACITOR POLYSTYRENE	180pF 1% 630V	PHILIPS	2222 427 41801	10.407
C95-3	CAPACITOR MKT	10nF 20% 100V	ERO	MKT1817	11.168
C96-3	CAPACITOR MKT	22nF 10% 250V	SIEMENS	B32510-D3223-K000	11.297
C97-3	CAPACITOR MKT	150nF 10% 100V	SIEMENS	B32510-D1154-K000	11.222
C98-3	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32510-D1224-K000	11.225
C99-3	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32510-D1224-K000	11.225
C10-3	CAPACITOR CERAMIC	470pF -20/+80% 400V	FERROPERM	970129,9	16.097
C101-3	CAPACITOR CERAMIC	470pF -20/+80% 400V	FERROPERM	970129,9	16.097
C102-3	CAPACITOR POLYSTYRENE	22nF 5% 100V	ERO	MKT1817	11.169
D1-3	DIODE	1N4448	* ITT	1N4448	25.147
D2-3	DIODE	1N4448	* ITT	1N4448	25.147
D3-3	DIODE	1N4448	* ITT	1N4448	25.147
D4-3	DIODE	1N4448	* ITT	1N4448	25.147
D5-3	DIODE ZENER	2.4V 5% 0.4W BZX79C2V4	PHILIPS	BZX79C2V4	26.505
D6-3	DIODE	1N4448	* ITT	1N4448	25.147
D7-3	DIODE ZENER	5.6V 2% 0.4W BZX79B5V6	PHILIPS	BZX79B5V6	26.500
D8-3	DIODE	1N4448	* ITT	1N4448	25.147
D9-3	DIODE	BB139	ITT	BB139	26.130
D10-3	DIODE	BB139	ITT	BB139	26.130
D11-3	DIODE	BB139	ITT	BB139	26.130
D12-3	DIODE	BB139	ITT	BB139	26.130
D13-3	DIODE	BB139	ITT	BB139	26.130
D14-3	DIODE	BB139	ITT	BB139	26.130
D15-3	DIODE	BB139	ITT	BB139	26.130
D16-3	DIODE	BB139	ITT	BB139	26.130
D17-3	DIODE	1N4448	* ITT	1N4448	25.147
D18-3	DIODE	1N4448	* ITT	1N4448	25.147
D19-3	DIODE SWITCH	BA282	"ITT	BA282	25.390
D20-3	DIODE SWITCH	BA282	"ITT	BA282	25.390
D21-3	DIODE	1N4448	* ITT	1N4448	25.147
D22-3	DIODE	1N4448	* ITT	1N4448	25.147
FP1-3	FERRITE BEAD	HZ4,2/2,1/7A K1201	KASCHKE	HZ4,2/2,1/7A K1201 405 442 075 021	35.011
FP2-3	FERRITE BEAD	HZ4,2/2,1/7A K1201	KASCHKE	HZ4,2/2,1/7A K1201 405 442 075 021	35.011
FP3-3	FERRITE BEAD	4B1	#PHILIPS	4322 D20 34420	35.181
IC1-3	INTEGRATED CIRCUIT	SN74LS113AN	* TEXAS	74LS113AN	33.841
IC2-3	INTEGRATED CIRCUIT	7406N	TEXAS	7406N	33.521
IC3-3	INTEGRATED CIRCUIT	MC3393P	MOTOROLA	MC3393P	31.237
IC4-3	INTEGRATED CIRCUIT	DAC08H	*MOTOROLA	DAC08HP	31.000
IC5-3	INTEGRATED CIRCUIT	74LS377N	*TEXAS	SN74LS377N	34.267

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMB	
IC6-3	INTEGRATED CIRCUIT	74LS221N	*TEXAS	74LS221N	34.180
IC7-3	INTEGRATED CIRCUIT	74LS109N	* TEXAS	SN74LS109AN	33.831
IC8-3	INTEGRATED CIRCUIT	74LS08N	* TEXAS	74LS08N	33.527
IC9-3	INTEGRATED CIRCUIT	74LS283N	* TEXAS	SN74LS283N	34.245
IC10-3	INTEGRATED CIRCUIT	74LS283N	* TEXAS	SN74LS283N	34.245
IC11-3	INTEGRATED CIRCUIT	74LS221N	*TEXAS	74LS221N	34.180
IC12-3	INTEGRATED CIRCUIT	SN74LS290N	* MOTOROLA	SN74LS290N	34.251
IC13-3	INTEGRATED CIRCUIT	74LS669N	*TEXAS	SN74LS669N	34.310
IC14-3	INTEGRATED CIRCUIT	74LS669N	*TEXAS	SN74LS669N	34.310
IC15-3	INTEGRATED CIRCUIT	74LS377N	*TEXAS	SN74LS377N	34.267
IC16-3	INTEGRATED CIRCUIT	MC145146P	* MOTOROLA	MC145146P	33.490
IC17-3	INTEGRATED CIRCUIT	74F74	*FAIRCHILD	IC DIG.TTL 74F74	33.724
IC18-3	VOLTAGE REGULATOR	12V 5%	NATIONAL	LM78L12ACZ 5% PL.HUS	31.139
IC19-3	INTEGRATED CIRCUIT	LM3046N	* NATIONAL	LM3046N	31.025
IC20-3	INTEGRATED CIRCUIT	LF356N	NATIONAL	LF356N	31.076
IC21-3	VOLTAGE REGULATOR	LM317LZ	NATIONAL	LM317LZ	31.145
IC22-3	VOLTAGE REGULATOR	LM337LZ	*NATIONAL	LM337LZ	31.147
IC23-3	INTEGRATED CIRCUIT	LF356N	NATIONAL	LF356N	31.076
IC24-3	VOLTAGE REGULATOR	LM78L15ACZ	NATIONAL	LM78L15ACZ 5% PL.HUS	31.140
IC25-3	VOLTAGE REGULATOR	MC78L05ACP	MOTOROLA	MC78L05ACP 5% PL.HUS	31.137
L1-3	CHOKE	0.33uH 5%	FRONTIER	1303-07K	20.107
L2-3	CHOKE	2.7uH 5%	FRONTIER	1303-18K	20.132
L3-3	CHOKE	0.22uH 5%	FRONTIER	1303-05K	20.105
L4-3	CHOKE	33uH 5%	NEOSID.	006122 06	20.162
L5-3	COIL	TL411	ESPERA	6-0-24230B	400411
L6-3			NEOSID	006122-60 5%	20.116
L7-3	CHOKE	2.2uH 10%	FRONTIER	1303-17K	20.128
L8-3	CHOKE	2.2uH 10%	FRONTIER	1303-17K	20.128
L9-3	COIL	0.2uH ADJUSTABLE	MITSUMI	R12.3266K	38.412
L10-3	COIL	0.425uH ADJUSTABLE	MITSUMI	R12.3255K	38.415
L11-3	COIL	0.125uH ADJUSTABLE	MITSUMI	R12.3267K	38.410
L12-3	CHOKE	10uH 5% SD075	NEOSID	006122 00	20.118
L13-3			NEOSID	006122-60 5%	20.116
L14-3			NEOSID	006122-60 5%	20.116
L15-3			NEOSID	006122-60 5%	20.116
L16-3	CHOKE	39uH 5% SD75	NEOSID	006122 07	20.193
L17-3	CHOKE	39uH 5% SD75	NEOSID	006122 07	20.193
L18-3	CHOKE	39uH 5% SD75	NEOSID	006122 07	20.193
P1-3	PLUG (MALE)	14 POLE	AMP	1-826375-4	78.114
P2-3	PLUG (MALE)	3 POLE	AMP	0-826375-3	78.103
P3-3	PLUG (MALE)	7 POLE	AMP	0-826375-7	78.107
R1-3	RESISTOR	3.6 KOHM 5% 0.33W	PHILIPS	2322 181 53362	01.213
R2-3	RESISTOR	5.6 OHM 5% 0.33W	PHILIPS	2322 181 53568	01.143
R3-3	RESISTOR	91 OHM 5% 0.33W	PHILIPS	2322 181 53919	01.174

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMB	
R4-3	RESISTOR	27 KOHM 5% 0.33W	PHILIPS	2322 181 53273	01.235
R5-3	RESISTOR	33 KOHM 5% 0.33W	PHILIPS	2322 181 53333	01.237
R6-3	RESISTOR	750 OHM 5% 0.33W	PHILIPS	2322 181 53751	01.196
R7-3	RESISTOR	750 OHM 5% 0.33W	PHILIPS	2322 181 53751	01.196
R8-3	RESISTOR	120 OHM 5% 0.33W	PHILIPS	2322 181 53121	01.177
R9-3	RESISTOR	270 OHM 5% 0.33W	PHILIPS	2322 181 53271	01.185
R10-3	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 181 53472	01.216
R11-3	RESISTOR	5.6 KOHM 5% 0.33W	PHILIPS	2322 181 53562	01.218
R12-3	RESISTOR	22 OHM 5% 0.33W	PHILIPS	2322 181 53229	01.158
R13-3	RESISTOR	300 OHM 5% 0.33W	PHILIPS	2322 181 53301	01.186
R14-3	RESISTOR	6.8 KOHM 5% 0.33W	PHILIPS	2322 181 53682	01.220
R15-3	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 181 53272	01.210
R16-3	RESISTOR	1.2 KOHM 5% 0.33W	PHILIPS	2322 181 53122	01.202
R17-3	RESISTOR	560 OHM 5% 0.33W	PHILIPS	2322 181 53561	01.193
R18-3	RESISTOR	5.6 KOHM 5% 0.33W	PHILIPS	2322 181 53562	01.218
R19-3	RESISTOR	8.2 KOHM 5% 0.33W	PHILIPS	2322 181 53822	01.222
R20-3	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 181 53272	01.210
R21-3	RESISTOR	10 KOHM 1% 0.4W	PHILIPS	2322 151 51003	03.427
R22-3	RESISTOR	470 OHM 5% 0.33W	PHILIPS	2322 181 53471	01.191
R23-3	RESISTOR	360 OHM 5% 0.33W	PHILIPS	2322 181 53361	01.188
R24-3	RESISTOR	3.3 KOHM 5% 0.33W	PHILIPS	2322 181 53332	01.212
R25-3	RESISTOR	680 OHM 5% 0.33W	PHILIPS	2322 181 53681	01.195
R26-3	RESISTOR	910 OHM 5% 0.33W	PHILIPS	2322 181 53911	01.199
R27-3	RESISTOR	12 KOHM 1% 0.4W	PHILIPS	2322 151 51203	03.461
R28-3	RESISTOR	5.10 KOHM 1% 0.4W	*PHILIPS	2322 151 55112	03.413
R29-3	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 181 53472	01.216
R30-3	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 181 53272	01.210
R31-3	RESISTOR	5.6 KOHM 5% 0.33W	PHILIPS	2322 181 53562	01.218
R32-3	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 181 53272	01.210
R33-3	RESISTOR	5.10 KOHM 1% 0.4W	*PHILIPS	2322 151 55112	03.413
R34-3	RESISTOR	33 KOHM 1% 0.4W	PHILIPS	2322 151 53303	03.443
R35-3	RESISTOR	750 OHM 5% 0.33W	PHILIPS	2322 181 53751	01.196
R36-3	RESISTOR	270 OHM 5% 0.33W	PHILIPS	2322 181 53271	01.185
R37-3	RESISTOR	470 OHM 5% 0.33W	PHILIPS	2322 181 53471	01.191
R38-3	RESISTOR	82 OHM 5% 0.33W	PHILIPS	2322 181 53829	01.172
R39-3	RESISTOR	360 OHM 5% 0.33W	PHILIPS	2322 181 53361	01.188
R40-3	RESISTOR	560 OHM 5% 0.33W	PHILIPS	2322 181 53561	01.193
R41-3	RESISTOR	160 OHM 5% 0.33W	PHILIPS	2322 181 53161	01.180
R42-3	RESISTOR	22 KOHM 1% 0.4W	*PHILIPS	2322 151 52213	03.441
R43-3	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 53102	01.200
R44-3	POTENTIOMETER TRIMMING	1 KOHM 10% 0.5W	* PHILIPS	2322 482 22102	07.660
R45-3	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 181 53272	01.210
R46-3	RESISTOR	6.8 KOHM 5% 0.33W	PHILIPS	2322 181 53682	01.220
R47-3	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 53102	01.200

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMB
R48-3	RESISTOR	5.6 KOHM 5% 0.33W	PHILIPS	2322 181 53562	01.218
R49-3	RESISTOR	2.55 KOHM 1% 0.4W	PHILIPS	2322 151 52552	03.407
R50-3	RESISTOR	390 OHM 5% 0.33W	PHILIPS	2322 181 53391	01.189
R51-3	RESISTOR	5.10 KOHM 1% 0.4W	*PHILIPS	2322 151 55112	03.413
R52-3	RESISTOR	1.2 KOHM 5% 0.33W	PHILIPS	2322 181 53122	01.202
R53-3	RESISTOR	160 OHM 5% 0.33W	PHILIPS	2322 181 53161	01.180
R54-3	RESISTOR	220 OHM 5% 0.33W	PHILIPS	2322 181 53221	01.183
R55-3	RESISTOR	68 OHM 5% 0.33W	PHILIPS	2322 181 53689	01.170
R56-3	RESISTOR	560 OHM 5% 0.33W	PHILIPS	2322 181 53561	01.193
R57-3	POTENTIOMETER TRIMMING	1 KOHM 10% 0.5W	* PHILIPS	2322 482 22102	07.660
R58-3	RESISTOR	8.2 KOHM 5% 0.33W	PHILIPS	2322 181 53822	01.222
R59-3	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 181 53472	01.216
R60-3	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 53102	01.200
R61-3	RESISTOR	220 OHM 5% 0.33W	PHILIPS	2322 181 53221	01.183
R62-3	RESISTOR	5.6 OHM 5% 0.33W	PHILIPS	2322 181 53568	01.143
R63-3	RESISTOR	560 OHM 5% 0.33W	PHILIPS	2322 181 53561	01.193
R64-3	RESISTOR	8.66 KOHM 1% 0.4W	PHILIPS	2322 151 58662	03.425
R65-3	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 181 53472	01.216
R66-3	RESISTOR	15 KOHM 5% 0.33W	PHILIPS	2322 181 53153	01.229
R67-3	RESISTOR	220 KOHM 5% 0.33W	PHILIPS	2322 181 53224	01.258
R68-3	RESISTOR	39 KOHM 5% 0.33W	PHILIPS	2322 181 53393	01.239
R69-3	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R70-3	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 53102	01.200
R71-3	RESISTOR	82 OHM 5% 0.33W	PHILIPS	2322 181 53829	01.172
R72-3	RESISTOR	330 KOHM 5% 0.33W	PHILIPS	2322 181 53334	01.262
R73-3	RESISTOR	5.6 OHM 1% 0.4W	PHILIPS	2322 151 55608	03.350
R74-3	RESISTOR	560 OHM 5% 0.33W	PHILIPS	2322 181 53561	01.193
R75-3	RESISTOR	2.2 KOHM 5% 0.33W	PHILIPS	2322 181 53222	01.208
R76-3	RESISTOR	2.2 KOHM 5% 0.33W	PHILIPS	2322 181 53222	01.208
R77-3	RESISTOR	18 KOHM 5% 0.33W	PHILIPS	2322 181 53183	01.231
R78-3	RESISTOR	680 OHM 5% 0.33W	PHILIPS	2322 181 53681	01.195
R79-3	RESISTOR	15 KOHM 5% 0.33W	PHILIPS	2322 181 53153	01.229
R80-3	RESISTOR	180 OHM 5% 0.33W	PHILIPS	2322 181 53181	01.181
R81-3	RESISTOR	270 OHM 5% 0.33W	PHILIPS	2322 181 53271	01.185
R82-3	RESISTOR	1.3 KOHM 5% 0.33W	PHILIPS	2322 181 53132	01.203
R85-3	RESISTOR	2.2 KOHM 5% 0.33W	PHILIPS	2322 181 53222	01.208
R86-3	RESISTOR	8.2 KOHM 5% 0.33W	PHILIPS	2322 181 53822	01.222
R87-3	RESISTOR	16 KOHM 5% 0.33W	PHILIPS	2322 181 53163	01.230
R88-3	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 53102	01.200
R89-3	RESISTOR	18 KOHM 1% 0.4W	PHILIPS	2322 151 51803	03.440
R90-3	RESISTOR	18 KOHM 1% 0.4W	PHILIPS	2322 151 51803	03.440
R91-3	RESISTOR	1.6 KOHM 5% 0.33W	PHILIPS	2322 181 53162	01.205
R92-3	RESISTOR	9.09 KOHM 1% 0.4W	*PHILIPS	2322 151 59092	03.426
R93-3	RESISTOR	9.09 KOHM 1% 0.4W	*PHILIPS	2322 151 59092	03.426

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMB
R94-3	RESISTOR	43 KOHM 5% 0.33W	PHILIPS	2322 181 53433	01.240
R95-3	RESISTOR	5.10 KOHM 1% 0.4W	*PHILIPS	2322 151 55112	03.413
R96-3	RESISTOR	5.10 KOHM 1% 0.4W	*PHILIPS	2322 151 55112	03.413
R97-3	RESISTOR	680 OHM 5% 0.33W	PHILIPS	2322 181 53681	01.195
R98-3	RESISTOR	15 KOHM 5% 0.33W	PHILIPS	2322 181 53153	01.229
R99-3	RESISTOR	261 OHM 1% 0.4W	PHILIPS	2322 151 52611	03.386
R100-3	RESISTOR	2.7 KOHM 1% 0.4W	*PHILIPS	2322 151 52702	03.405
R101-3	RESISTOR	261 OHM 1% 0.4W	PHILIPS	2322 151 52611	03.386
R102-3	RESISTOR	2.7 KOHM 1% 0.4W	*PHILIPS	2322 151 52702	03.405
R103-3	RESISTOR	1.3 KOHM 5% 0.33W	PHILIPS	2322 181 53132	01.203
R104-3	RESISTOR	16 KOHM 5% 0.33W	PHILIPS	2322 181 53163	01.230
R105-3	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R106-3	RESISTOR	91 KOHM 5% 0.33W	PHILIPS	2322 181 53913	01.248
R107-3	RESISTOR	1.6 KOHM 5% 0.33W	PHILIPS	2322 181 53162	01.205
R108-3	RESISTOR	43 KOHM 5% 0.33W	PHILIPS	2322 181 53433	01.240
R109-3	RESISTOR	330 OHM 5% 0.33W	PHILIPS	2322 181 53331	01.187
R110-3	RESISTOR	56 OHM 5% 0.33W	PHILIPS	2322 181 53569	01.168
R114-3	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101	01.175
R115-3	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101	01.175
T1-3	TRANSISTOR	BFW17A	*SGS	BFW17A	29.151
T2-3	TRANSISTOR	BF199	PHILIPS	BF199	28.179
T3-3	TRANSISTOR	BFW92A	MOTOROLA	BFW92A	29.160
T4-3	TRANSISTOR	BF199	*MOTOROLA	BF199	28.178
T5-3	TRANSISTOR	2N2369A	*MOTOROLA	2N2369A	28.315
T6-3	TRANSISTOR	BF 506	SIEMENS	BF506	28.202
T7-3	TRANSISTOR	BF199	*MOTOROLA	BF199	28.178
T8-3	TRANSISTOR	BF199	*MOTOROLA	BF199	28.178
T9-3	TRANSISTOR	BF 506	SIEMENS	BF506	28.202
T10-3	TRANSISTOR	MPS364D	MOTOROLA	MPS-364D	28.405
T11-3	TRANSISTOR	BFW92A	MOTOROLA	BFW92A	29.160
T12-3	TRANSISTOR	TIS88 A3	*MOTOROLA	TM00044-3	29.737
T13-3	TRANSISTOR	2N2369A	*MOTOROLA	2N2369A	28.315
T14-3	TRANSISTOR	TIS88A 1	MOTOROLA	TM00044-1	29.735
T15-3	TRANSISTOR	TIS88A 1	MOTOROLA	TM00044-1	29.735
T16-3	TRANSISTOR	SD210DE	* SILICONIX	SD210DE	29.719
T17-3	TRANSISTOR	SD210DE	* SILICONIX	SD210DE	29.719
T18-3	TRANSISTOR	BF 506	SIEMENS	BF506	28.202
T19-3	TRANSISTOR	BC559B	*PHILIPS	BC559B	28.105
T20-3	TRANSISTOR	BC548	* PHILIPS	BC548	28.070
T21-3	TRANSISTOR	BC559B	*PHILIPS	BC559B	28.105
T22-3	TRANSISTOR	BC548	* PHILIPS	BC548	28.070
X1-3	CRYSTAL	10.700MHz	NDK	SP SPEC.C1029	39.845

POSITION	DESCRIPTION	MANUFACTURER	TYPE	S.P. NUMB	
	PROCESSOR UNIT	R2022 MODULE 4	ESPERA	PRINT NR.5-0-24146E R2022	600181
C2-4	CAPACITOR MKT	1uF 10% 63V	*ERO	MKT1818	11.138
C3-4	CAPACITOR POLYSTYRENE	100uF 1% 630V	PHILIPS	2222 427 41001	10.400
C4-4	CAPACITOR POLYSTYRENE	100uF 1% 630V	PHILIPS	2222 427 41001	10.400
C5-4	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32510-D1224-K000	11.225
C6-4	CAPACITOR POLYSTYRENE	820uF 1% 250V	PHILIPS	2222 426 48201	10.348
C7-4	CAPACITOR ELECTROLYTIC	1uF 20% 50V	*ERO	EK100AA110H	14.506
C8-4	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32510-D1224-K000	11.225
C9-4	CAPACITOR MKT	100nF 10% 100V	*SIEMENS	B32510-D1104-K000	11.219
C10-4	CAPACITOR ELECTROLYTIC	10uF 20% 35V	*ERO	EK100AA210F	14.512
C12-4	CAPACITOR ELECTROLYTIC	10uF 20% 35V	*ERO	EK100AA210F	14.512
C13-4	CAPACITOR ELECTROLYTIC	10uF 20% 35V	*ERO	EK100AA210F	14.512
C14-4	CAPACITOR ELECTROLYTIC	10uF 20% 35V	*ERO	EK100AA210F	14.512
C15-4	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32511-D1224-K000	11.227
C16-4	CAPACITOR MKT	1uF 10% 63V	*ERO	MKT1818	11.138
C17-4	CAPACITOR MKT	1uF 10% 63V	*ERO	MKT1818	11.138
C18-4	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32510-D1224-K000	11.225
D1-4	DIODE	1N4148	*ITT	1N4148	25.131
D2-4	DIODE LIGHT EMITTING	YELLOW 3mm	GI	MV5374C-25.4MM BEN	25.540
D3-4	DIODE LIGHT EMITTING	YELLOW 5mm	SANKEN	SEL1910D	25.630
D4-4	DIODE LIGHT EMITTING	YELLOW 5mm	SANKEN	SEL1910D	25.630
D5-4	DIODE LIGHT EMITTING	ORANGE 5mm	SANKEN	SEL 1913K	25.631
D6-4	DIODE LIGHT EMITTING	ORANGE 5mm	SANKEN	SEL 1913K	25.631
D7-4	DIODE LIGHT EMITTING	ORANGE 5mm	SANKEN	SEL 1913K	25.631
D8-4	DIODE LIGHT EMITTING	ORANGE 5mm	SANKEN	SEL 1913K	25.631
D9-4	DIODE	1N4148	*ITT	1N4148	25.131
D10-4	DIODE	1N4148	*ITT	1N4148	25.131
D11-4	DIODE ZENER	4.7V 2% 0.4W BZX79B4V3	*PHILIPS	BZX79B4V3	26.495
D12-4	DIODE	1N4148	*ITT	1N4148	25.131
D13-4	DIODE	1N4148	*ITT	1N4148	25.131
D14-4	DIODE	1N4148	*ITT	1N4148	25.131
D15-4	DIODE	BAV21	PHILIPS	BAV21	25.340
IC1-4	MIKROPROCESSOR	R2022 COMPUTER UNIT	ESPERA	SP C1043B	700192
IC2-4	INTEGRATED CIRCUIT	MC14584BCP	MOTOROLA	MC14584BCP	31.210
IC3-4	INTEGRATED CIRCUIT	MCM2802P	MOTOROLA	MCM2802P	33.495
IC4-4	INTEGRATED CIRCUIT	MC14094BCP	*MOTOROLA	MC14094BCP	33.305
IC5-4	INTEGRATED CIRCUIT	MCM2802P	MOTOROLA	MCM2802P	33.495
IC6-4	INTEGRATED CIRCUIT	MC14094BCP	*MOTOROLA	MC14094BCP	33.305
IC7-4	INTEGRATED CIRCUIT	MC14094BCP	*MOTOROLA	MC14094BCP	33.305
IC8-4	INTEGRATED CIRCUIT	MC14094BCP	*MOTOROLA	MC14094BCP	33.305
IC9-4	INTEGRATED CIRCUIT	MC14094BCP	*MOTOROLA	MC14094BCP	33.305

POSITION	DESCRIPTION	MANUFACTURER	TYPE	S.P. NUMB	
IC10-4	INTEGRATED CIRCUIT	MC14094BCP	*MOTOROLA	MC14094BCP	33.305
IC11-4	INTEGRATED CIRCUIT	MC14094BCP	*MOTOROLA	MC14094BCP	33.305
IC12-4	INTEGRATED CIRCUIT	MC14094BCP	*MOTOROLA	MC14094BCP	33.305
IC13-4	INTEGRATED CIRCUIT	MC14094BCP	*MOTOROLA	MC14094BCP	33.305
IC14-4	INTEGRATED CIRCUIT	MC1458CP1	*MOTOROLA	MC1458CP1	31.215
IC15-4	INTEGRATED CIRCUIT	SN74LS541N	*TEXAS	SN74LS541N	34.285
L1-4	CHOKE	700 OHM / 15 MHZ	*SIEMENS	B82114-R-A3	20.052
LCD1-4	LIQUID CRYSTAL DISPLAY	LCD-3423-365-023/R2022	HAMLIN	SP TG.0-3-23963 HAMLIN TG.3423-365-023	25.707
OC1-4			*SIEMENS	Q62703-N88	32.533
OC2-4			*SIEMENS	Q62703-N88	32.533
P1-4			BERG	75160-301-36	78.375
P2-4	PLUG (MALE)	15 POLE	AMP	1-826375-5	78.115
P3-4	PLUG (MALE)	9 POLE	AMP	0-826375-9	78.109
P4-4	PLUG (MALE)	15 POLE	AMP	1-826375-5	78.115
P5-4	PLUG (MALE)	14 POLE	AMP	1-826375-4	78.114
R1-4	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R2-4	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R3-4	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R4-4	RESISTOR	15 KOHM 5% 0.33W	PHILIPS	2322 181 53153	01.229
R5-4	RESISTOR	10 KOHM 5% 0.33W	BEYSCHLAG	MBA 0204-00-BX-5%	01.726
R6-4	RESISTOR	47 KOHM 5% 0.33W	PHILIPS	2322 181 53473	01.241
R7-4	RESISTOR	47 OHM 5% 0.33W	PHILIPS	2322 181 53479	01.166
R8-4	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R9-4	RESISTOR	4.7 KOHM 5% 0.33W	BEYSCHLAG	MBA 0204-00-BX-5%	01.717
R10-4	RESISTOR	10 KOHM 5% 0.33W	BEYSCHLAG	MBA 0204-00-BX-5%	01.726
R11-4	RESISTOR	4.7 KOHM 5% 0.33W	BEYSCHLAG	MBA 0204-00-BX-5%	01.717
R12-4	RESISTOR	1.2 KOHM 5% 0.33W	PHILIPS	2322 181 53122	01.202
R13-4	POTENTIOMETER	10 KOHM LIN	NOBLE	E732-1116A	08.260
R14-4	RESISTOR	680 OHM 5% 0.33W	PHILIPS	2322 181 53681	01.195
R15-4	RESISTOR	22 KOHM 5% 0.33W	PHILIPS	2322 181 53223	01.233
R16-4	RESISTOR	270 OHM 5% 0.33W	PHILIPS	2322 181 53271	01.185
R17-4	POTENTIOMETER	50 KOHM LOG	NOBLE	E732-1117B	08.262
R18-4	RESISTOR	1 KOHM 5% 0.33W	BEYSCHLAG	MBA 0204-00-BX-5%	01.701
R19-4	RESISTOR	10 KOHM 5% 0.33W	BEYSCHLAG	MBA 0204-00-BX-5%	01.726
R20-4	RESISTOR	10 KOHM 5% 0.33W	BEYSCHLAG	MBA 0204-00-BX-5%	01.726
R21-4	RESISTOR	100 KOHM 5% 0.33W	PHILIPS	2322 181 53104	01.250
R22-4	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 181 53472	01.216
R23-4	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 181 53472	01.216
R24-4	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R25-4	RESISTOR	10 OHM 5% 0.33W	PHILIPS	2322 181 53109	01.150
R26-4	RESISTOR	680 KOHM 5% 0.33W	PHILIPS	2322 181 53684	01.270
R27-4	RESISTOR	330 KOHM 5% 0.33W	PHILIPS	2322 181 53334	01.262
R28-4	RESISTOR	3.9 KOHM 5% 0.33W	PHILIPS	2322 181 53392	01.214



POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P. NUME
R29-4			PHILIPS	2322 181 53164	01.255
R30-4	RESISTOR	82 KOHM 5% 0.33W	PHILIPS	2322 181 53823	01.247
R31-4	RESISTOR	39 KOHM 5% 0.33W	PHILIPS	2322 181 53393	01.239
R32-4	RESISTOR	100 KOHM 5% 0.33W	PHILIPS	2322 181 53104	01.250
R33-4	RESISTOR	47 KOHM 5% 0.33W	PHILIPS	2322 181 53473	01.241
R34-4	RESISTOR	100 KOHM 5% 0.33W	PHILIPS	2322 181 53104	01.250
R35-4	POTENTIOMETER TRIMMING	47 KOHM 10% 0.5W	PHILIPS	2322 482 22473	07.678
R36-4	RESISTOR	43 KOHM 5% 0.33W	PHILIPS	2322 181 53433	01.240
R37-4	RESISTOR	15 KOHM 5% 0.33W	PHILIPS	2322 181 53153	01.229
R38-4	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R39-4	RESISTOR	47 OHM 5% 0.33W	PHILIPS	2322 181 53479	01.166
R40-4	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
T1-4	TRANSISTOR	BC558B	* PHILIPS	BC558B	28.100
T2-4	TRANSISTOR	BC558B	* PHILIPS	BC558B	28.100
T3-4	TRANSISTOR	BC548B	* PHILIPS	BC548B	28.076
T4-4	TRANSISTOR	BC548B	* PHILIPS	BC548B	28.076
T5-4	TRANSISTOR	BC558B	* PHILIPS	BC558B	28.100
X1-4	RESONATOR CERAMIC	4MHz	TDK	FCR-4	41.510

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P. NUMB
	CONVERTER UNIT	R2022 MODULE 5	ESPERA	PRINT NR.5-0-24231H	600182
C1-5	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32510-D1224-K000	11.225
C2-5	CAPACITOR ELECTROLYTIC	2200uF 40V	PHILIPS	2222 021 47222	14.719
C3-5	CAPACITOR POLYSTYRENE	2.2nF 1% 160V	PHILIPS	2222 425 42202	10.284
C4-5	CAPACITOR MKT	100nF 10% 100V	*SIEMENS	B32510-D1104-K000	11.219
C5-5	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EK100AA210F	14.512
C6-5	CAPACITOR MKT	15nF 10% 400V	PHILIPS	2222 344 55153	11.732
C7-5	CAPACITOR ELECTROLYTIC	22uF 35V	* ERO	EK100BB222F	14.516
C8-5	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32510-D1224-K000	11.225
C9-5	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32510-D1224-K000	11.225
C11-5	CAPACITOR MKT	10nF 10% 400V	PHILIPS	2222 344 55103	11.731
C13-5	CAPACITOR ELECTROLYTIC	100uF 40V	ERO	EKM00DD310G	14.561
C14-5	CAPACITOR ELECTROLYTIC	470uF 40V	*ERO	EKM00FG347G	14.650
C15-5	CAPACITOR ELECTROLYTIC	470uF 40V	*ERO	EKM00FG347G	14.650
C16-5	CAPACITOR ELECTROLYTIC	2200uF -10/+50% 16V	*ERO	EG03KE422D	14.714
C18-5	CAPACITOR ELECTROLYTIC	220uF 40V	ERO	EKM00DE322G	14.648
D1-5			THOMSON	BZ06-44	26.995
D2-5	DIODE	BAV21	PHILIPS	BAV21	25.340
D3-5	DIODE ZENER	12V	THOMSON-CSF	BZV47C12	26.750
D4-5	DIODE	1N4936	MOTOROLA	1N4936	25.157
D5-5	DIODE	1N4934	MOTOROLA	1N4934	25.155
D6-5	DIODE	1N4934	MOTOROLA	1N4934	25.155
D7-5	DIODE F.REC	3A/50V	* MOTOROLA	MR850	25.225
D8-5	DIODE ZENER	15V 5% 0.4W BZX79C15	MOTOROLA	BZX79C15	26.561
FP1-5	FERRITE BEAD	HZ4-2/2-1/7A K1201	KASCHKE	HZ4-2/2-1/7A K1201 405 442 075 021	35.011
FP2-5	FERRITE BEAD	HZ4-2/2-1/7A K1201	KASCHKE	HZ4-2/2-1/7A K1201 405 442 075 021	35.011
FP3-5	FERRITE BEAD	HZ4-2/2-1/7A K1201	KASCHKE	HZ4-2/2-1/7A K1201 405 442 075 021	35.011
FP4-5	FERRITE BEAD	HZ4-2/2-1/7A K1201	KASCHKE	HZ4-2/2-1/7A K1201 405 442 075 021	35.011
FP5-5	FERRITE BEAD	HZ4-2/2-1/7A K1201	KASCHKE	HZ4-2/2-1/7A K1201 405 442 075 021	35.011
FP6-5	FERRITE BEAD	HZ4-2/2-1/7A K1201	KASCHKE	HZ4-2/2-1/7A K1201 405 442 075 021	35.011
FP7-5	FERRITE BEAD	HZ4-2/2-1/7A K1201	KASCHKE	HZ4-2/2-1/7A K1201 405 442 075 021	35.011
FP8-5	FERRITE BEAD	HZ4-2/2-1/7A K1201	KASCHKE	HZ4-2/2-1/7A K1201 405 442 075 021	35.011
FP9-5	FERRITE BEAD	HZ4-2/2-1/7A K1201	KASCHKE	HZ4-2/2-1/7A K1201 405 442 075 021	35.011

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMB
FP10-5	FERRITE BEAD	HZ4,2/2,1/7A K1201	KASCHKE	HZ4,2/2,1/7A K1201 405 442 075 021	35.011
IC1-5	PWM REGULATOR	TL494CN	TEXAS	TL494CN	31.487
L1-5	CHOKE	TL079	ESPERA	TL079	400079
L2-5	CHOKE	TL079	ESPERA	TL079	400079
L3-5	CHOKE	TL079	ESPERA	TL079	400079
L4-5	CHOKE	TL079	ESPERA	TL079	400079
R1-5	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 181 53272	01.210
R2-5	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R3-5	RESISTOR	56 KOHM 5% 0.33W	PHILIPS	2322 181 53563	01.243
R4-5	RESISTOR	18 KOHM 5% 0.33W	PHILIPS	2322 181 53183	01.231
R5-5	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 53102	01.200
R6-5	RESISTOR	3.9 KOHM 5% 0.33W	PHILIPS	2322 181 53392	01.214
R7-5	RESISTOR	5.6 KOHM 5% 0.33W	PHILIPS	2322 181 53562	01.218
R8-5	RESISTOR	10 OHM 5% 0.5W	*PHILIPS	2322 212 13109	01.351
R9-5	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 53102	01.200
R10-5	RESISTOR	47 OHM 5% 0.33W	PHILIPS	2322 181 53479	01.166
R14-5	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101	01.175
R15-5	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101	01.175
R16-5	RESISTOR	2.2 KOHM 5% 0.33W	PHILIPS	2322 181 53222	01.208
R17-5	RESISTOR	1.5 KOHM 5% 0.33W	PHILIPS	2322 181 53152	01.204
R18-5	RESISTOR	22 OHM 5% 0.5W	PHILIPS	2322 182 13229	03.159
T1-5	TRANSISTOR	BC557B	* ITT	BC557B	28.091
T2-5	TRANSISTOR	BC640	PHILIPS	BC640	28.124
T3-5	TRANSISTOR	BD139	* MOTOROLA	BD139	29.060
T4-5	TRANSISTOR	BC338-25	* PHILIPS	BC338-25	28.058
T5-5	TRANSISTOR	BC328-25	* PHILIPS	BC328-25	28.052
T6-5	TRANSISTOR	BUZ21	*SIEMENS	C67078-A1308-A002	29.400
TR1-5	TRANSFORMER	TD4998.1	TRADANIA	TD 4998.1	22.503

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMB
	AF amp. & FILTER UNIT	R2022 MODULE 7	ESPERA	PRINT NR.5-0-24530E	600381
C1-7	CAPACITOR ELECTROLYTIC	220uF 25V	*ERO	EKM00DD322E	14.647
C2-7	CAPACITOR ELECTROLYTIC	220uF 25V	*ERO	EKM00DD322E	14.647
C3-7	CAPACITOR MKT	470nF 10% 100V	SIEMENS	B32510-D1474-K000	11.231
C4-7	CAPACITOR MKT	470nF 10% 100V	SIEMENS	B32510-D1474-K000	11.231
C5-7	CAPACITOR MKT	470nF 10% 100V	SIEMENS	B32510-D1474-K000	11.231
C6-7	CAPACITOR ELECTROLYTIC	220uF 25V	*ERO	EKM00DD322E	14.647
C7-7	CAPACITOR MKT	470nF 10% 100V	SIEMENS	B32510-D1474-K000	11.231
C8-7	CAPACITOR MKT	100nF 10% 100V	*SIEMENS	B32510-D1104-K000	11.219
C9-7	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EK100AA210F	14.512
C10-7	CAPACITOR ELECTROLYTIC	100uF 40V	ERO	EKM00DD310G	14.561
C11-7	CAPACITOR MKT	100nF 10% 100V	*SIEMENS	B32510-D1104-K000	11.219
C12-7	CAPACITOR MKT	2.2uF 10% 100V	SIEMENS	B32512-E1225-K000	11.406
C13-7	CAPACITOR MKT	2.2uF 10% 100V	SIEMENS	B32512-E1225-K000	11.406
C14-7	CAPACITOR ELECTROLYTIC	470uF 40V	*ERO	EKM00FG347G	14.650
C15-7	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70SJYF103Z	15.170
C16-7	CAPACITOR MKT	330nF 10% 63V	* ERO	MKT1818	11.122
C17-7	CAPACITOR CERAMIC	18 uF 10% NPO 400V	FERROPERM	9/0112,9	15.593
C18-7	CAPACITOR MKT	4.7nF 10% 400V	SIEMENS	B32510-D6472-K000	11.373
C20-7	CAPACITOR ELECTROLYTIC	22uF 35V	* ERO	EK100BB222F	14.516
C21-7	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EK100AA210F	14.512
C22-7	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70SJYF103Z	15.170
C23-7	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32510-D1224-K000	11.225
C24-7	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32510-D1224-K000	11.225
C25-7	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EK100AA210F	14.512
C26-7	CAPACITOR CERAMIC	10nF -20/+80% 50V	*KCK	HE70SJYF103Z	15.170
C27-7	CAPACITOR CERAMIC	1nF-20/+80% 40V	FERROPERM	9/0129,8	16.160
D1-7	DIODE ZENER	5.1V 5% 0.4W BZX79C5V1	* PHILIPS	BZX79C5V1	26.527
D2-7	DIODE ZENER	5.1V 5% 0.4W BZX79C5V1	* PHILIPS	BZX79C5V1	26.527
D3-7	DIODE	MR750	MOTOROLA	MR750	25.212
F1-7	FUSE	3.15A H 05x20mm	WICKMANN	919201	45.552
FP1-7	FERRITE BEAD	HZ4,2/2,1/7A K1201	KASCHKE	HZ4,2/2,1/7A K1201	35.011
FP2-7	FERRITE BEAD	HZ4,2/2,1/7A K1201	KASCHKE	HZ4,2/2,1/7A K1201	35.011
IC1-7	OP AMP	TAA761A	*SIEMENS	TAA761A	31.300
IC2-7	INTEGRATED CIRCUIT	AF POWER AMP.TD2030V	* AEG	TD2030 VERTICAL	31.483
OC1-7	OPTO-COUPLER	CNY17-2	*SIEMENS	Q62703-N87	32.530
P1-7	PLUG (MALE)	10 POLE	AMP	1-826375-0	78.110
P2-7	PLUG (MALE)	13 POLE	AMP	1-826375-3	78.113
P3-7	SUPPLY PLUG (MALE)	MESEI 60F	HIRSCHMANN	973021-100	78.311
				6 pole Male for Chassis	

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMB
R1-7	RESISTOR	3.3 KOHM 5% 0.33W	PHILIPS	2322 181 53332	01.212
R2-7	RESISTOR	1.5 KOHM 5% 0.33W	PHILIPS	2322 181 53152	01.204
R3-7	RESISTOR	5.6 KOHM 5% 0.33W	PHILIPS	2322 181 53562	01.218
R4-7	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 53101	01.175
R5-7	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 53102	01.200
R6-7	RESISTOR	1 OHM 5% 0.33W	PHILIPS	2322 181 53108	01.125
R7-7	RESISTOR	33 KOHM 5% 0.33W	PHILIPS	2322 181 53333	01.237
R9-7	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R10-7	RESISTOR	470 OHM 5% 0.33W	PHILIPS	2322 181 53471	01.191
R11-7	RESISTOR	2.2 KOHM 5% 0.33W	PHILIPS	2322 181 53222	01.208
R12-7	RESISTOR	2.2 KOHM 5% 0.33W	PHILIPS	2322 181 53222	01.208
R13-7	RESISTOR	120 KOHM 5% 0.33W	PHILIPS	2322 181 53124	01.252
R14-7	RESISTOR	220 KOHM 5% 0.33W	PHILIPS	2322 181 53224	01.258
R15-7	RESISTOR	9.1 KOHM 5% 0.33W	PHILIPS	2322 181 53912	01.224
R16-7	POTENTIOMETER TRIMMING	2.2KOHM 20% 0.5W	NOBLE	TM8-KH1-1S	07.785
R17-7	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R18-7	RESISTOR	820 OHM 5% 0.33W	PHILIPS	2322 181 53821	01.197
R19-7	RESISTOR	100 KOHM 5% 0.33W	PHILIPS	2322 181 53104	01.250
RE1-7	RELAY	12V 1 SK	OUC	OUA-S-112D	21.290
T1-7	THYRISTOR	BT151-500R	PHILIPS	BT151-500R	29.912
TR1-7	CHOKE	TL412	TRANS-ELECTRO	6-0-24232	400412
TR2-7	TRANSFORMER	6898	SCANELECTRIC	EE16/6898-1:4	22.504
				TG.1-0-24648/1-0-24649	