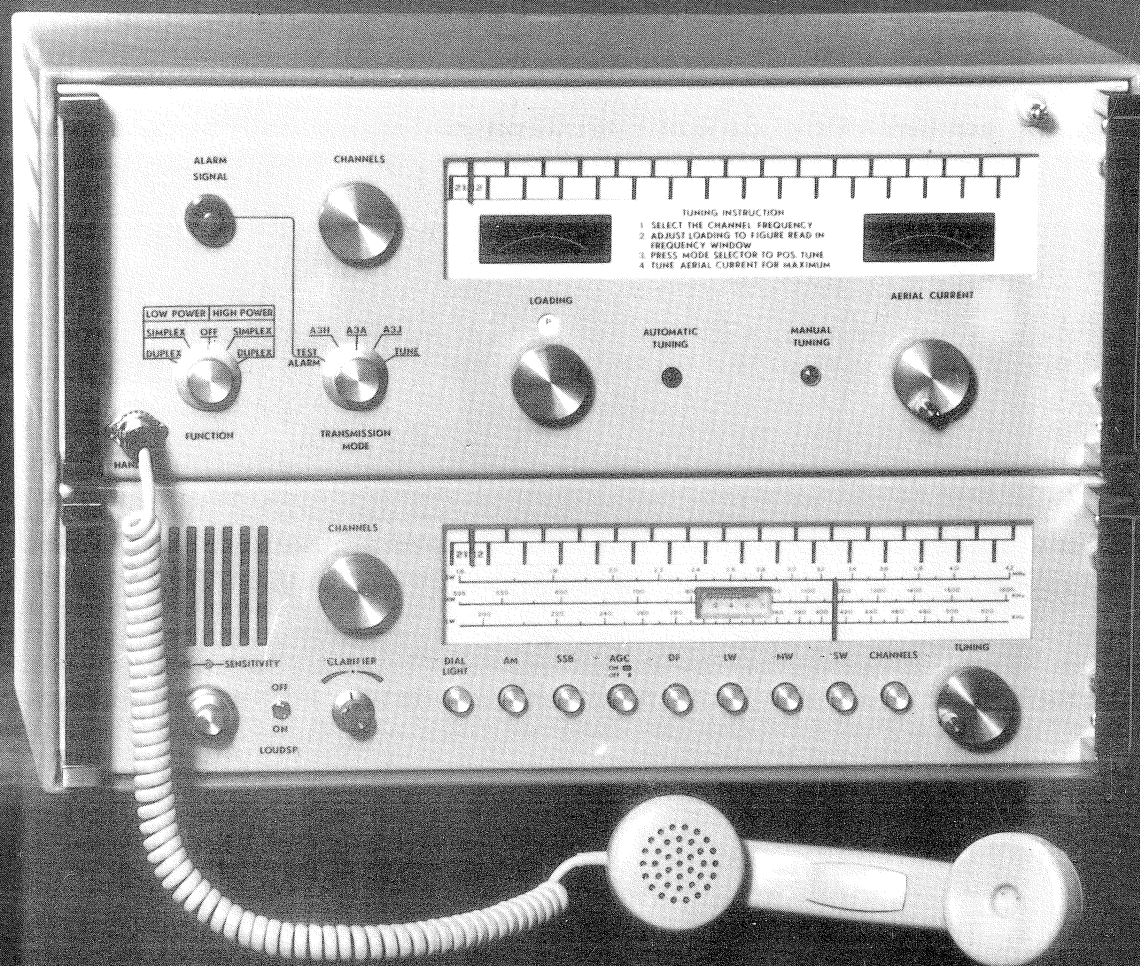


Maritimt
elektronisk
udstyr

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HANDBOOK FOR 200 W P.E.P. MARINE RADIO TELEPHONE

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- C. AM reception.
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1. OPERATION

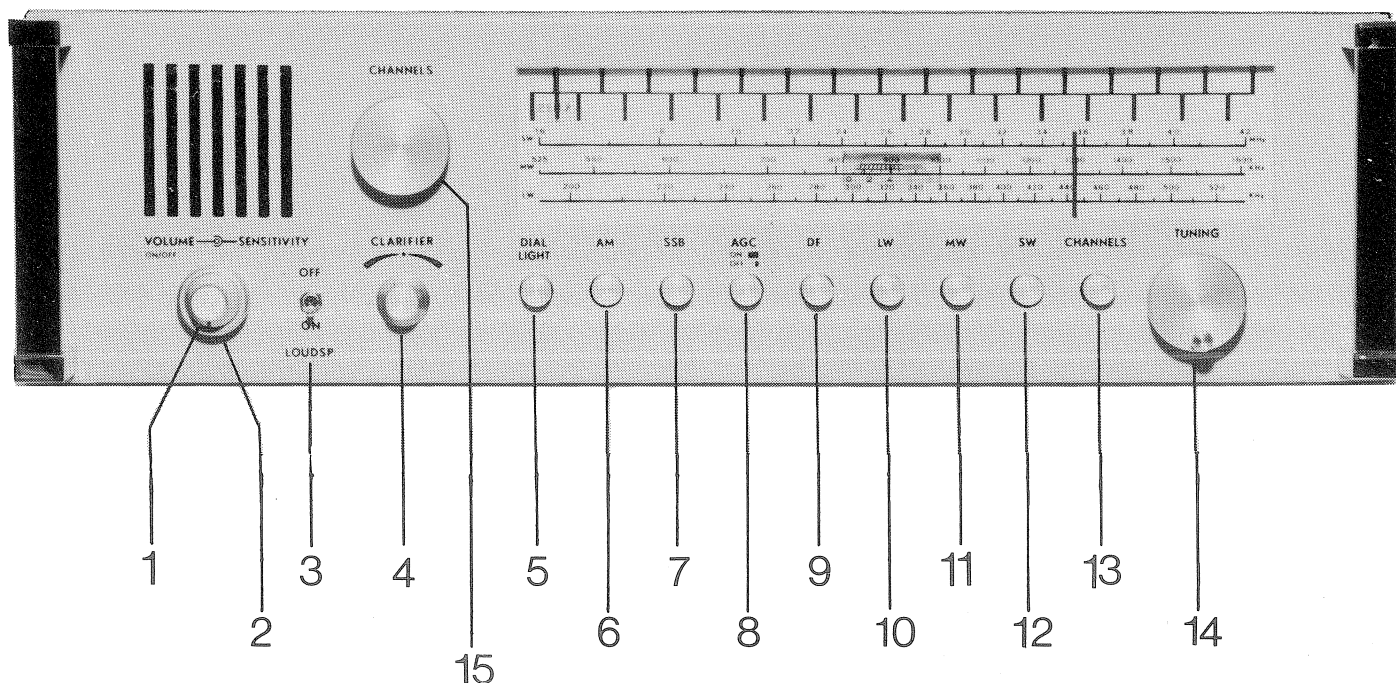
The Radiotelephone RT 101 is designed to be used on board all types of ships up to 1600 tons as an efficient medium wave radiotelephone.

The equipment can operate on 30 transmit- and 30 receive frequencies in the frequency range 1600 to 4200 KHz, using A2A, A3E or A3J modes.

Gorm Helt-Hansen

The receiver in the set can also be used as telephony receiver for the old AM-system.

By variable tuning of the LW, MW and SW bands, it is also possible to listen to broadcast or news transmissions in those bands. Direction finding on all three bands is possible, by means of a ferrite or loop aerial.



1. A. RECEIVER CONTROLS

1. **VOLUME. ON/OFF.** Controls the sound output from the speaker, "on/off" power switch at extreme counterclockwise position.
2. **SENSITIVITY.** Controls the RF sensitivity.
3. **LOUDSPEAKER ON/OFF.** Connects both the internal and external loudspeaker in or out of circuit.
4. **CLARIFIER.** Fine tuning of frequency on SSB. Set for optimum voice quality.
5. **DIAL LIGHT ON/OFF.**
6. **AM** Switches the receiver to AM reception mode.
7. **SSB.** Switches the receiver to SSB mode.
8. **AGC ON/OFF** Switches from automatic gain control to manual RF gain control.
9. **DF.** Switches the DF aerial (if connected) to the receiver.
10. **LW.**
11. **MW.** Band switches.
12. **SW.**
13. **CHANNELS.** Switches from variable tuning to crystal controlled channels.
14. **TUNING.** Variable tuning control.
15. **CHANNELS.** Switch for channel frequencies.

1. B. S.S.B. RECEPTION

1. Switch on the receiver by turning the VOLUME control 1. clockwise.
2. Turn the SENSITIVITY control 2. fully clockwise.
3. Push SSB button 7 and CHANNELS button 13. and set AGC 8. to ON pos.
4. Select the desired channel with the CHANNEL selector 15.
5. Adjust to a comfortable listening level with VOLUME 1.
6. Adjust for the most natural voice quality with CLARIFIER 4.
7. In some cases it can be advantageous to switch out the automatic volume control.

This is done by pushing the AGC 8. to OFF position and then adjusting the SENSITIVITY 2. to the point where the receiver is not overloaded.

1. C. A.M. RECEPTION

Use the same procedure as under 1 B SSB RECEPTION except for the following:

Push AM 6. instead of SSB 7. Delete point 6.

1. D. BROADCAST RECEPTION

Example: Tune to BBC on 200 KHz, LW.

1. Connect the receiver by turning the VOLUME control 1. clockwise.
2. Turn SENSITIVITY control 2. fully clockwise.
3. Push AM button 6. and LW lo. Set AGC 8. to position OFF.
4. Turn by TUNING 14. the dial pointer to 200 KHz in the LW range on the dial.
5. Adjust to a comfortable listening level with VOLUME.
6. Retune finally by TUNING 14. for best sound quality and max. deflection on the "S" meter.

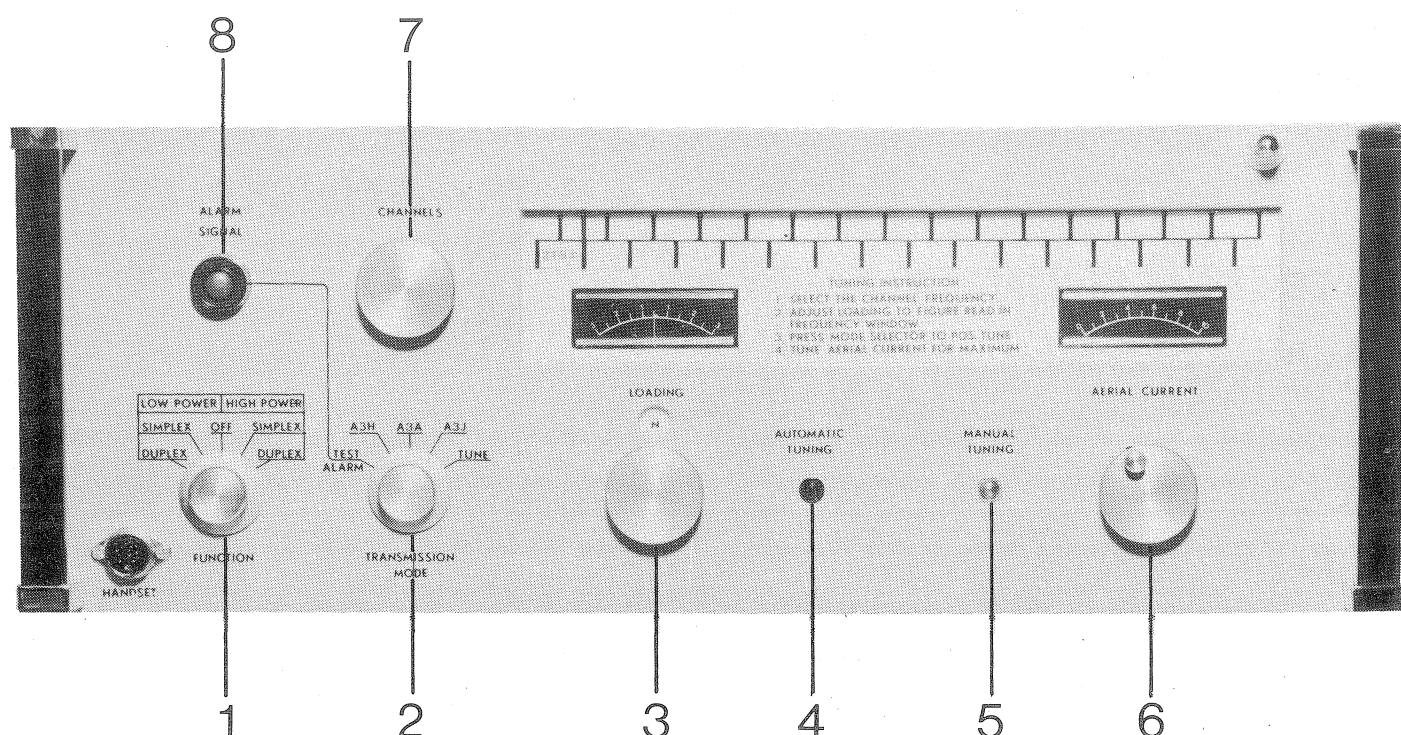
1. E. DIRECTION FINDING

Example: Direction finding by use of a Radio Phare on the frequency 308 KHz.

1. Repeat the procedure as under BROADCAST RECEPTION. except, of course, that you now tune to 308 KHz. When the Radio Phare is heard and has been identified, the receiver is switched to Direction finding by pushing DF button 9.
2. The bearing of maximum null (minimum signal strength) can now be obtained by rotating the DF aerial. Adjustment of the sensitivity control 2. will make the null more obvious.

1. F. TRANSMITTER CONTROLS

1. FUNCTION. Mains power switch, switches between SIMPLEX/DUPLEX and HIGH or LOW power.
2. TRANSMISSION MODES. Switches between A3A, A3H and A3J, test for ALARM SIGNAL and TUNE.
3. LOADING Matching of the aerial.
4. AUTOMATIC TUNING. Indicates that the automatic tuning is in operation.
5. MANUAL TUNING. Indicates that the transmitter is ready for manual tuning.
6. AERIAL CURRENT. Tunes the aerial for max. current.
7. CHANNELS. Switch for channel frequencies.
8. ALARM SIGNAL. Push button for transmission of the ALARM SIGNAL.



1. G. TRANSMITTER OPERATION

1. Turn FUNCTION 1. to HIGH POWER and to SIMPLEX or DUPLEX.
2. Select the channel wanted by CHANNELS 7.
3. Adjust LOADING 3. to letter shown in frequency window.
4. Press TRANSMISSION MODE 2. to position TUNE.
5. Tune AERIAL CURRENT 6. for max. aerial current.
6. Release TRANSMISSION MODE 2. and the transmitter is ready for use.

OBSERVE. The transmitter has three possible transmission modes: A3A, A3H and A3J.

A3J is pure SSB, and this is the mode with the longest range of communication.

A3H is a SSB transmission mode which can be used with AM, but the communication range is more limited.

A3A is a special SSB transmission mode, where it is possible to synchronise the receiver, at the reception site, to the transmitter carrier wave. This system is little used at the present time because it needs a special receiver.

NOTE

Familiarize yourself with the operation of the two tone alarm signal by reference to this handbook and the use of the TEST ALARM position on the transmission mode switch (refer to section 1.H.)

UNDER NO CIRCUMSTANCES, EXCEPT A GENUINE EMERGENCY OPERATE

THE RED BUTTON MARKED

"ALARM SIGNAL" (8)

REMEMBER THAT AN ABORTIVE ALERT OF THE RESCUE SERVICES AND OTHER SHIPPING COULD RESULT IN LOSS OF LIFE.

1. H. ALARM SIGNAL TEST

1. Turn the FUNCTION switch 1. to one of the ON positions.
2. Place TRANSMISSION MODE 2. in position TEST ALARM.
3. Listen to the alarm signal in the microtelephone and be sure that the alarm signal generator, generates alternating two tones, one at 1300 Hz and one at 2200 hz. Also make sure that the alarm generator stops automatically after about 45 sec.

1. J. TRANSMISSION OF ALARM SIGNAL

1. Turn FUNCTION switch 1. to HIGH POWER and SIMPLEX.
2. Select by CHANNELS 7. the 2182 KHz channel. Fully anticlockwise.
3. Adjust LOADING 3. to letter shown in the frequency window.
4. Press TRANSMISSION MODE 2. to position TUNE.
5. Tune AERIAL CURRENT 6. for max. aerial current.
6. Place TRANSMISSION MODE 2. in position TEST ALARM and push ALARM SIGNAL 8.
7. Listen to alarm signal in the microtelephone and control the aerial current to be sure that the signal is being transmitted.

1. J. B. TRANSMISSION OF ALARM WITH FIXED TUNED 2182 CHANNEL

1. Turn FUNCTION switch 1. to HIGH POWER and SIMPLEX
2. Select by CHANNELS 7. the 2182 KHz channel. Fully anticlockwise.
3. Press TRANSMISSION MODE 2. to position TUNE.
4. Place TRANSMISSION MODE 2. in position TEST ALARM and push ALARM SIGNAL 8.
5. Listen to alarm signal in the microtelephone and control the aerial current to be sure that the signal is being transmitted.

2. INSTALLATION

2. A. GENERAL

In order to provide effective results, the radiotelephone and antenna system must be installed properly. The paragraphs below outline the requirements for proper installation.

Observe the precautions and suggestions in the paragraphs to ensure that your installation will provide troublefree and efficient operation.

Keep the distance from the transmitter antenna terminal to the antenna feed-through as short as possible.

Avoid the use of coax-cable for the transmitter aerial.

Use a copperband 50 to 100 mm wide for the earth connection and make it as short as possible.

Use the proper size of power conductor. See paragraph 2 D.

To guarantee best duplex results, keep the distance between the transmitter aerial and receiver aerial as great as possible.

2. B. LOCATION

The equipment should be located on the bridge, in the chartroom or other suitable place where it is ready accessible and reasonably protected from spray. The antenna should be located as high as practicable and in an area which is relatively free from obstructions.

A typical marine installation is shown on page 10. Although installation will vary somewhat from ship to ship the principles are common and the following suggestions will aid in making an efficient installation.

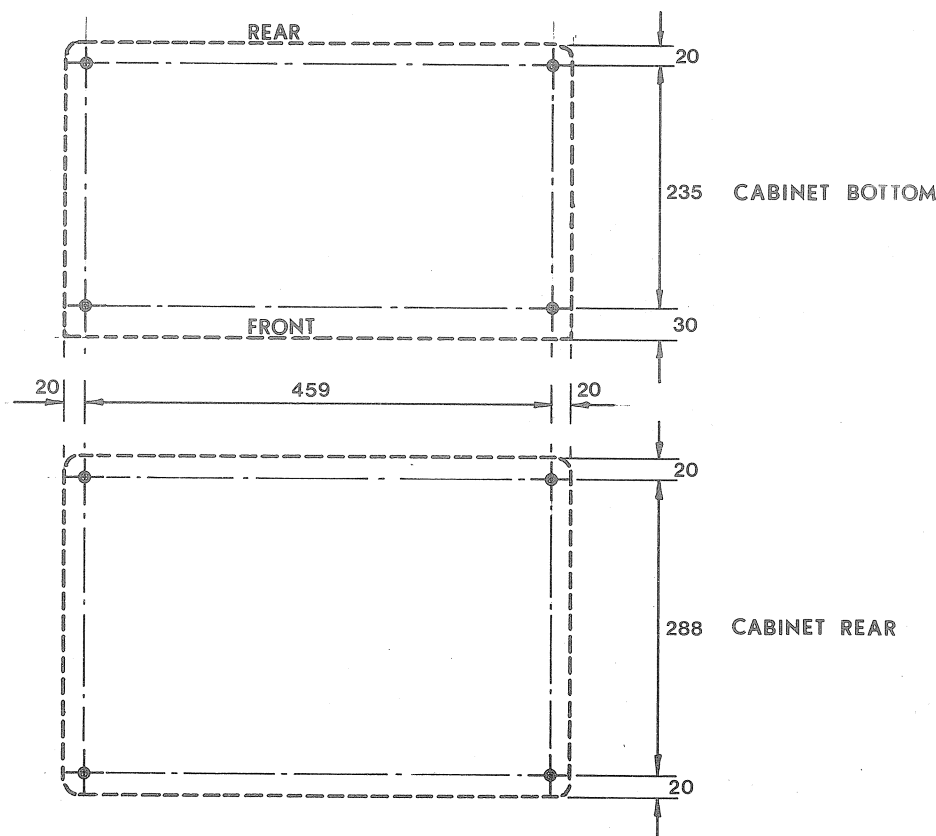
Mount the set on a table or shelf or alternatively it can be mounted directly on a bulkhead.

Keep a free air space behind and under the cabinet to allow air circulation through the cabinet. At least 15 mm free space.

2. C. MOUNTING

4 holes in the cabinet bottom and rear allow it to be fitted to a table, a shelf or a bulkhead.

Use four 6mm bolts or four coach screws. These bolts or screws are not supplied, but use an adequate length according to the thickness of the material on which the equipment is to be mounted.



OUTLINE AND MOUNTING DIMENSIONS

2. D. POWER CONDUCTERS

The power conductor size should be selected from the below table which is calculated for a maximum voltage drop of 2%.

At 24 volt the max. resistance is 30 milli ohms.

At 12 volt the max. resistance is 8 milli ohms.

12 volt battery		24 volt battery	
Cable length to battery in meter	Conductor area in square mm	Cable length to battery in meter	Conductor area in square mm
3 (1,5)	6	10 (5,0)	6
5 (2,5)	10	18 (9,0)	10
8 (4,0)	16	30 (15)	16
10 (5,0)	20		
16 (8,0)	32		

Figures in brackets indicate distance from the battery to the set.

NOTE

The radiotelephone will not ground the battery although the receiver main chassis is connected to the negative terminal. The chassis is isolated from the cabinet and the front panel. Care should be taken, not to create short circuits, when the chassis is removed from the cabinet and operated standing on a bench.

The power consumption when transmitting is:

(12 volt DC) 35 Amp.
(24 volt DC) 17 Amp.

When the set is receiving and the transmitter on standby the power consumption is reduced to

(12 volts DC) 3,7 Amps.
(24 volts DC) 2,7 Amps.

2. E. TRANSMITTER AERIAL

It is necessary that the transmitting aerial is always capacitive, that is say, that the total aerial length is limited by the highest frequency the transmitter should work on.

If the transmitter for instance, should work on the frequency 4200 KHz, it is possible to calculate the aerial length as a fourth of the wavelength corresponding to the frequency, 4200 KHz.

this is: $\frac{300}{4,2} = 71,5$ meter

the aerial length is $\frac{71,5}{4} = 17,8$ meter

This is the theoretical length of the aerial but in practise, it will normally be shorter than that, by 25%.

then the length is 13,3 meter

Using a whip aerial, the length is determined as the length of the whip plus the length of connection wire.

If the aerial is too long, it is shown by the fact that it is impossible to tune the aerial current to max. by tuning the aerial variometer through its tuning range.

If the highest frequencies are not to be used, it is of course possible to use a longer aerial. A calculation can then be made as mentioned in the 4200 KHz case.

The connection from the aerial to the transmitter is best made with a direct and short connection from the aerial outlet on the transmitter to the aerial feed-through.

It is not always practicable to do this, often it is necessary to use a piece of coaxial cable from the feed-through to the transmitter.

The length of the coax cable shall under all circumstances be as short as possible and never longer than 3 meters. By using longer lengths of coax cable, the transmitter efficiency is degraded significantly, because of the high circulating currents caused by the coax cable capacity.

It is advisable always to use a heavy size of coax cable for example the RG-8-U type.

When using coax cable, the screening hose must be connected to the earth point at the transmitter, preferably directly to the copper band.

Where, because of special reasons, the use of a longer length of coaxial cable cannot be avoided it can often be of advantage to use the coax cable without the screening hose, but with the isolating material still in place. This will keep the aerial capacitance down.

2. F. EARTH CONNECTION

To ensure maximum radiation from the transmitter, the set must be equipped with an effective earth connection.

Use the ship's keel, the hull on a steel ship, or an earth plate mounted under water line on the hull exterior.

The connection from the transmitter to the earth is made by a copper band 50 to 100 mm wide, depending on the total distance from the transmitter to the earth. Use 100 mm in case of a long distance.

In case of using external earth plate, the size of this is 1 x 1 meter.

To obtain the best duplexing quality from the set it is sometimes necessary to equip the receiver with a separate earth connection. This is possible as the earth connector has been brought out separately and isolated from the cabinet.

Even the earth connection for the receiver must be made of copper band of the same size as used for the transmitter.

2. G. RECEIVING AERIAL

Both whip and wire aerials can be used as receiving aerial.

Normally a length of e.g. 8 to 10 meters will do very well.

Don't use very long lengths of coax cable connection between receiver and aerial inlet.

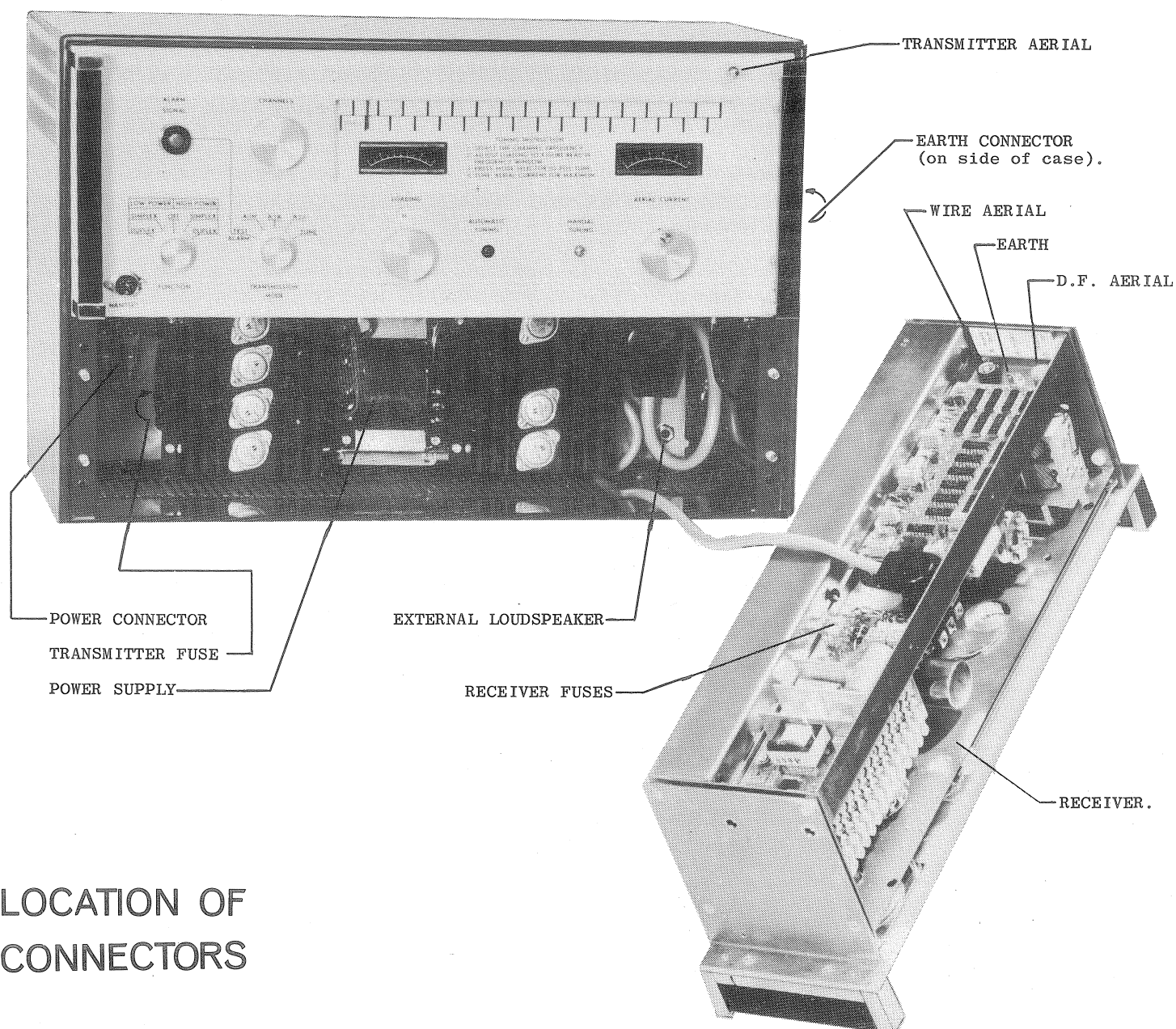
Remember to tune the aerial trimmer in the receiver input circuit both when the receiver is installed the first time, and when it is reinstalled after repair or maintenance.

Instructions for tuning the aerial trimmer are found in the section "FINAL TESTS CHECK-UP".

2. H. ACCESS TO THE CONNECTORS

There is easy access to the connectors when the receiver is removed from the cabinet. Both the power connectors and the jack for external loudspeaker, is placed on the power supply which is placed just behind the receiver.

Connectors for wire aerial, DF-aerial and earth connections are located on the rear side of the receiver. The main connector for the receiver is also placed on this place.



LOCATION OF CONNECTORS

2. J. FINAL CHECK

This section outlines the ordinary procedure. When there is reason to suspect degraded performance reference is made to the chapter dealing with maintenance, trouble shooting, repair and alignment.

Before finally connecting to the supply, measure the DC voltage with a DC voltmeter and check that the set has been converted to the correct value (12 or 24 volt)

Converting instructions are given in chapter 2.E.

Connect the aerial, and earth leads to the transmitter and receiver, also connect the microtelephone and possibly extra loudspeaker.

After about 10 minutes, when the oven has been heated, the transmitter and receiver are placed to ON positions.

TRANSMITTER

Place the loading to position 2 and tune the transmitter to the lowest channel frequency.

Tune aerial current to maximum and correct the loading to the position where the loading meter pointer is at center reading.

Write the loading letter found by the above procedure in the circle of the frequency window on the channel dial.

Find the loading figure for each channel by using the method outlined above.

Place the channel dial in its normal position.

RECEIVER.

Remove the receiver from the cabinet but leave all connections on their place (aerial and earth leads).

Remove the top cover from the receiver and find the aerial trimmer. See also instructions on top cover.

Place the receiver on the 2182 channel and listen for traffic.

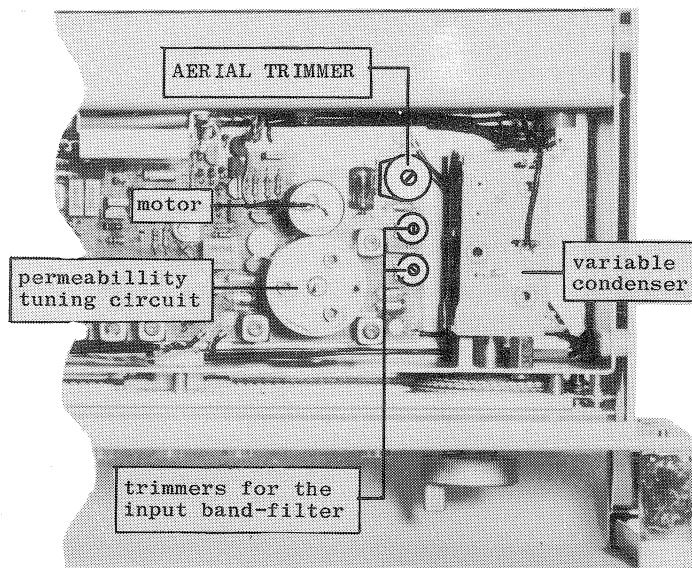
Tune the aerial trimmer for max. signal strength indicated as max. deflection on the "S" meter.

If no traffic is at hand, it is also possible to tune the aerial trimmer for max. noise heard in the loudspeaker.

Replace the top cover and the receiver into the cabinet.

Make a listening test on the additional channels to make sure that the receiver is working properly.

Also try the whole set in real communication with a coast station.



RECEIVER TOP VIEW SHOWING AERIAL TRIMMER.

2. K. ADDING A NEW CHANNEL

The following points must be executed:

TRANSMITTER.

Insert a new crystal in the socket.

Write the channel frequency on the channel dial.

Preset the tank circuit.

Find the correct loading.

Adjust crystal frequency.

RECEIVER.

Insert a new crystal in the socket.

Adjust crystal frequency.

TRANSMITTER.

The crystal is inserted in an empty holder. The holder number is printed on the crystal board.

Write the channel frequency in the corresponding frequency window on the channel dial.

The crystal frequency is calculated after the following method:

$$fx = 8700 \text{ KHz} - fa \text{ KHz.}$$

$$fx = \text{crystal frequency.}$$

$$fa = \text{transmitting frequency.}$$

Example:

$$\text{transmitting frequency: } 2182 \text{ KHz.}$$

$$fx = 8700 - 2182 = 6518 \text{ KHz.}$$

$$\text{Crystal frequency} = 6518 \text{ KHz.}$$

The tank circuit has to be tuned to one of four ranges.

This is done by placing a tap on the P-A pre-tuning board in one of four positions named A, B, C and D.

The four frequency ranges are the following:

Ranges.	Transmitting frequency.
A	1600 to 1859 KHz.
B	1850 to 2350 KHz.
C	2350 to 3100 KHz.
D	3100 to 4200 KHz.

Example:

transmitting frequency: 2182 KHz.

Assume that the crystal has been placed in holder number 3, find the tap with number 3 and place the tap in range B.

To find the correct loading letter, tune the transmitter on the new channel with the loading set to a low figure, for example 1 or 2.

Tune the aerial current for max. and find the loading position where the loading meter pointer is at center reading.

This is the right loading. Write the letter in the circle of the window indicating the frequency on the channel dial.

Control the crystal frequency by using a counter.

This is done by transmitting A3H without modulation and peaking up the signal by the counter.

If the transmitted signal is not correct, it is possible to adjust it by turning the trimmer placed just beside the crystal holder on the crystal board.

RECEIVER.

The new crystal is inserted in an empty holder.

Write the channel frequency in the corresponding frequency window on the channels dial.

Use the method for calculating the crystal frequency as described for the transmitter.

Place the channel selector on the new channel, and be sure that the automatic system is working on that channel too.

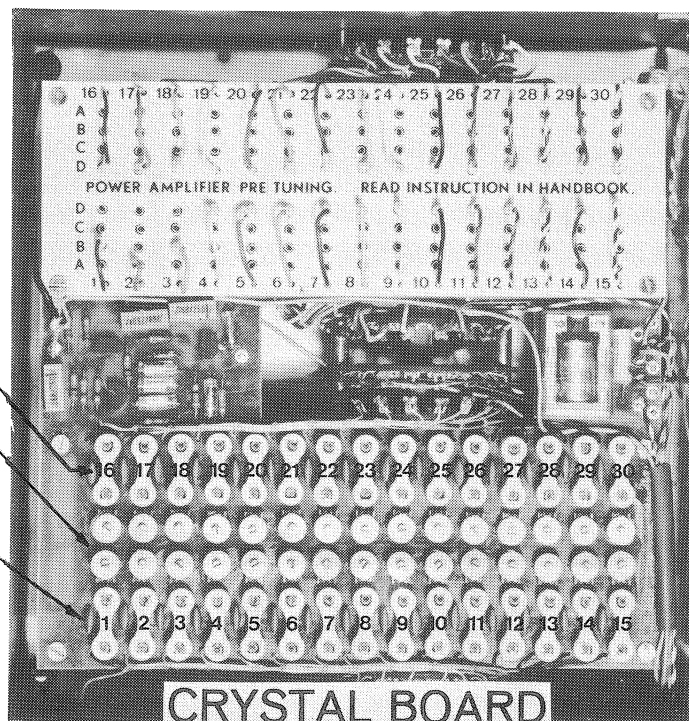
Control the channel frequency.

Place the receiver on SSB reception and place the clarifier on center position.

Feed the signal from a signal generator to the aerial input and tune the generator to the signal frequency plus 1 KHz either by using a counter or a synthesizer.

Count the beat note heard in the loudspeaker and tune the trimmer just beside the new crystal until the counter reads 1000 Hz.

POWER AMPLIFIER PRE-TUNING

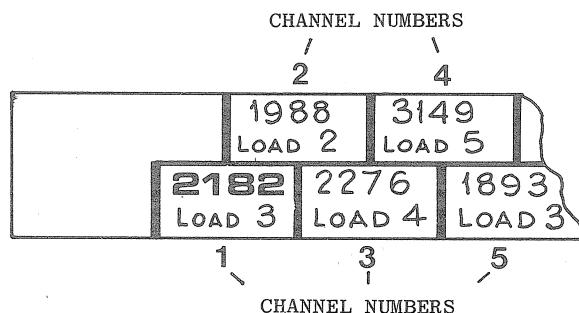
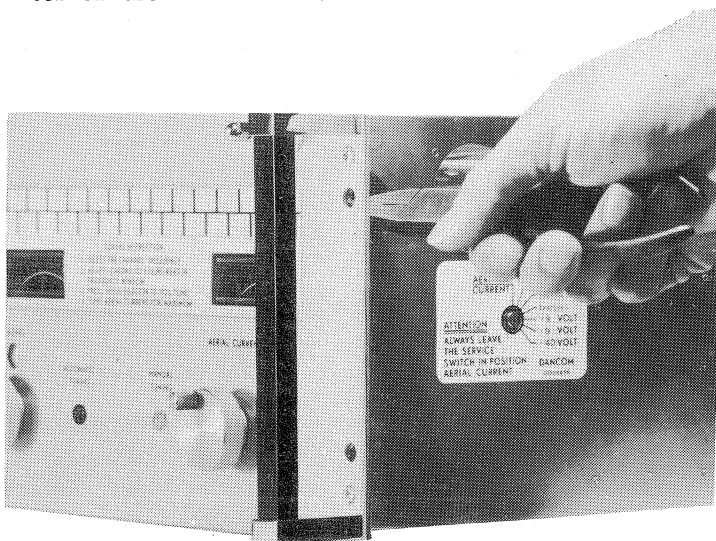


CHANNELS DIAL

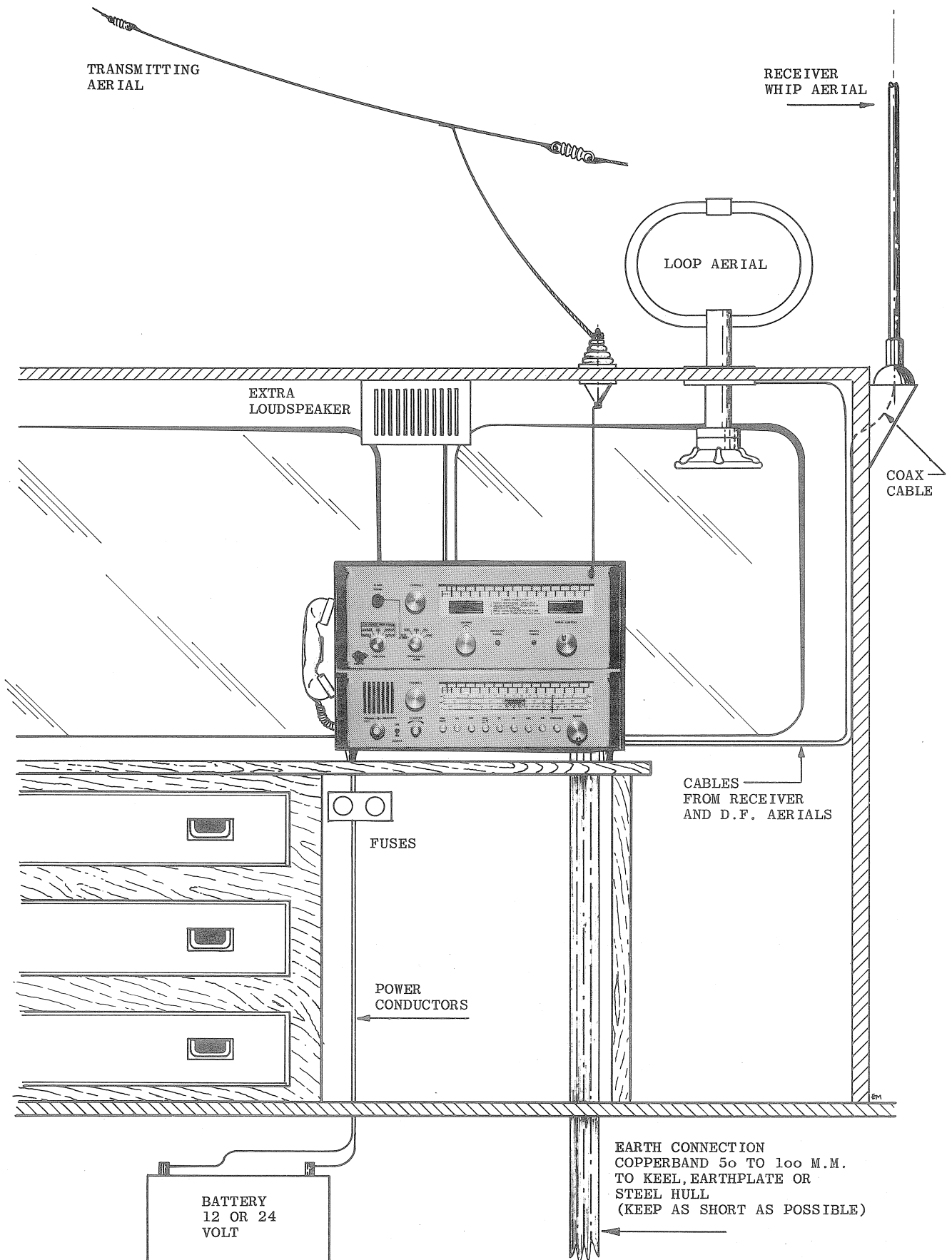
The channels dial is made in the form of a strip which can be drawn out to make it possible to write the channel frequencies and loading figures in their respective windows.

The dial can be removed from its normal position with a pair of pliers.

Replacing and adjusting the dial is done by sliding it into position with the CHANNELS-SWITCH in the fully anti clockwise position (2182) and adjusting it so the dial pointer is just in center of the 2182 window.

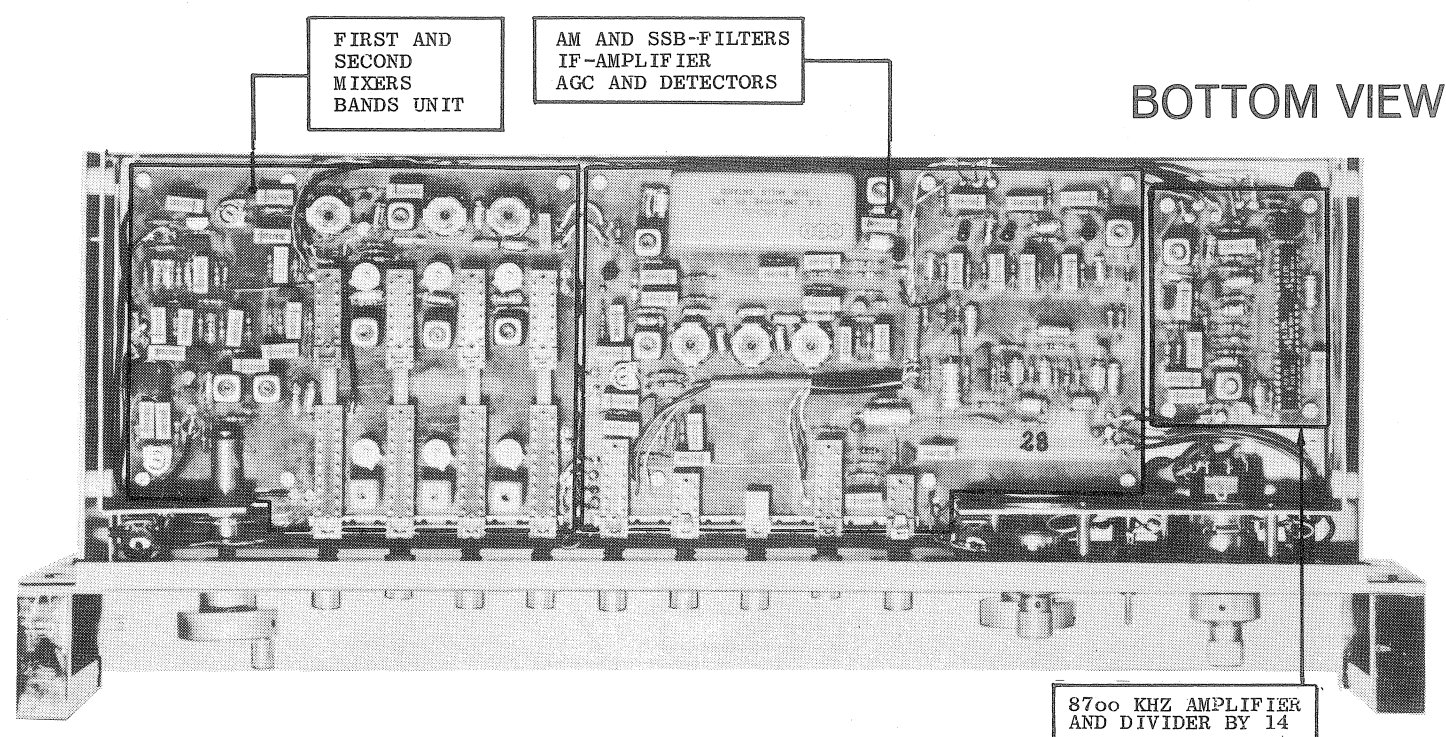
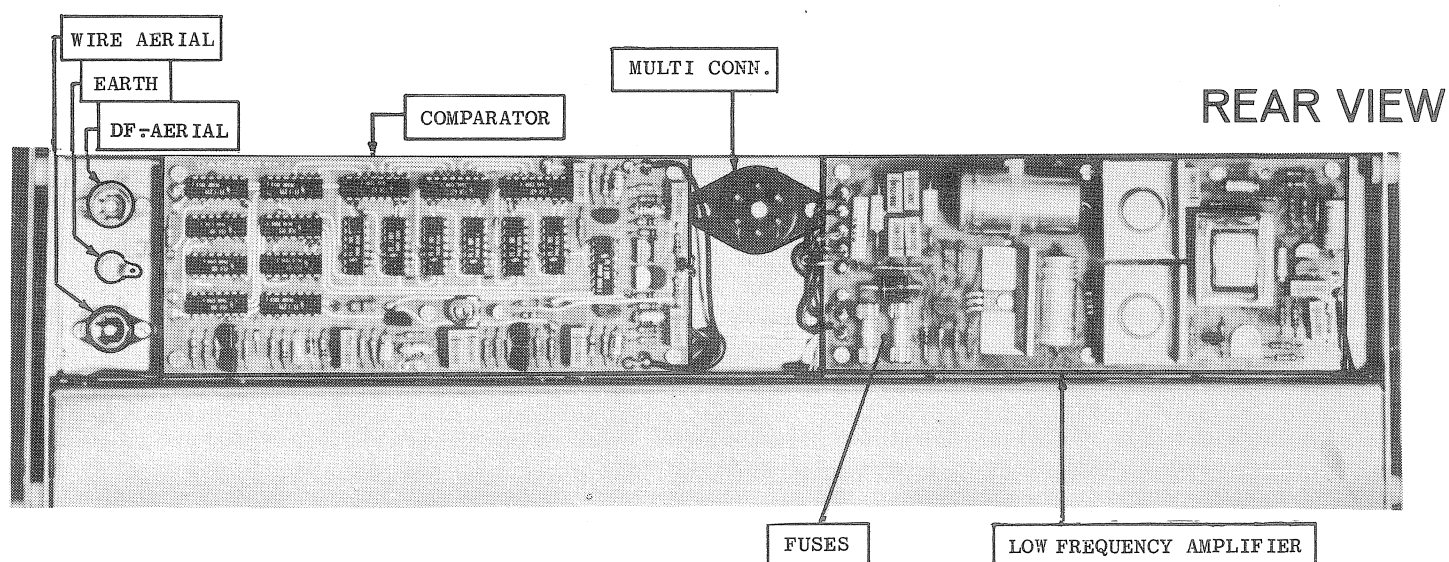
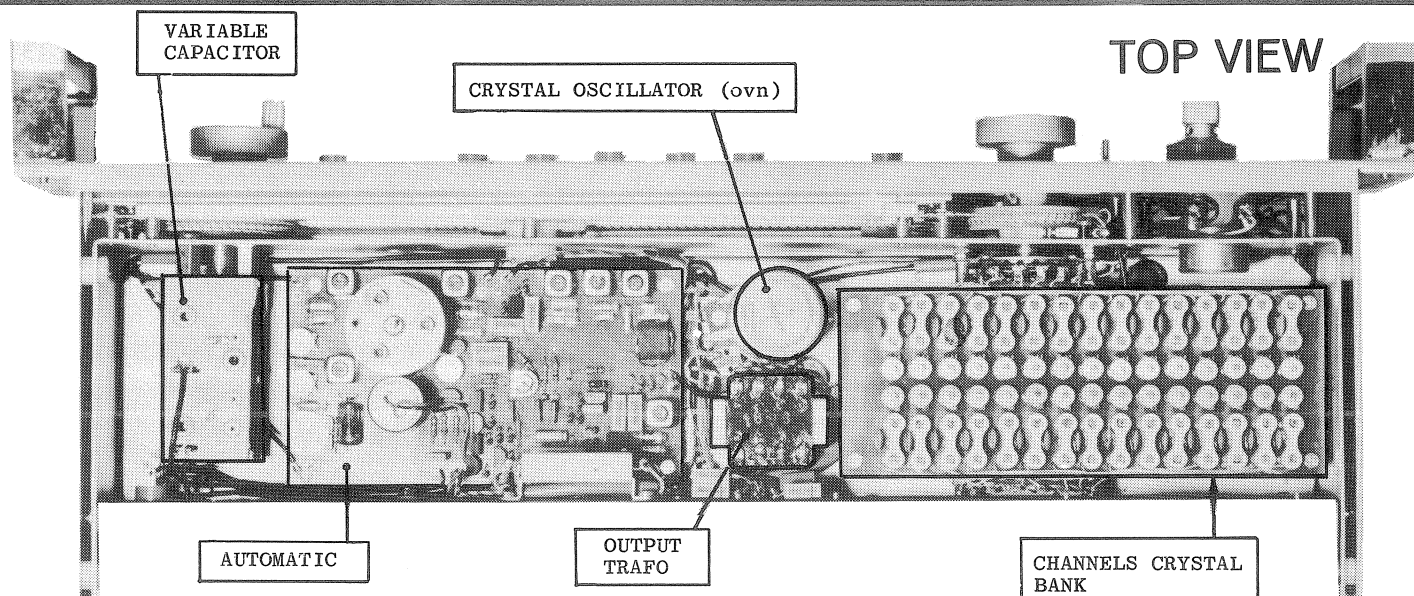


The channels dial is made of a material which is easy to write on with a pencil. The above example illustrates how this can be done.



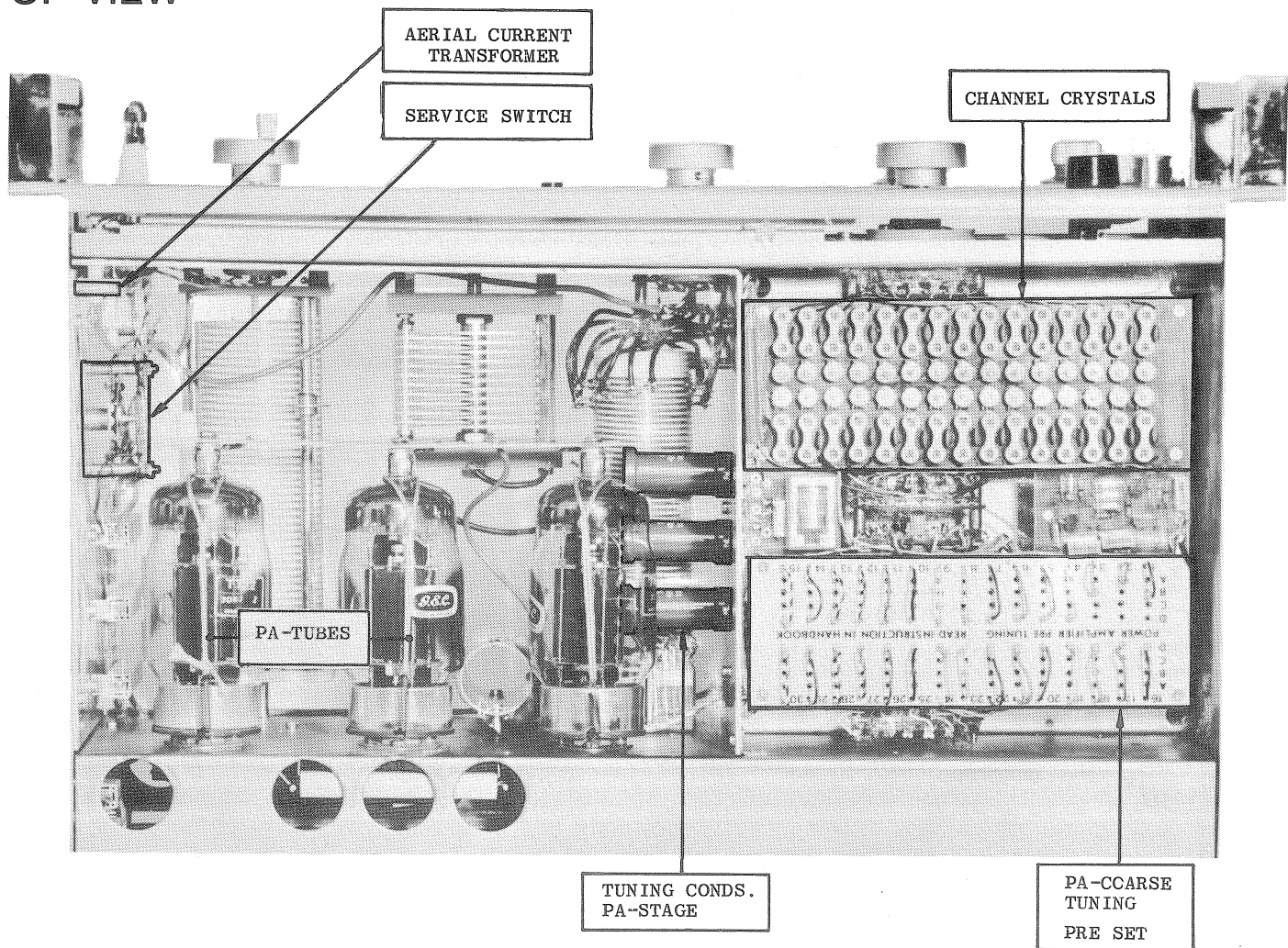
To allow free air circulation through the set it is necessary to keep at least 15 mm free air space under the bottom and behind the cabinet.

TYPICAL MARINE INSTALLATION

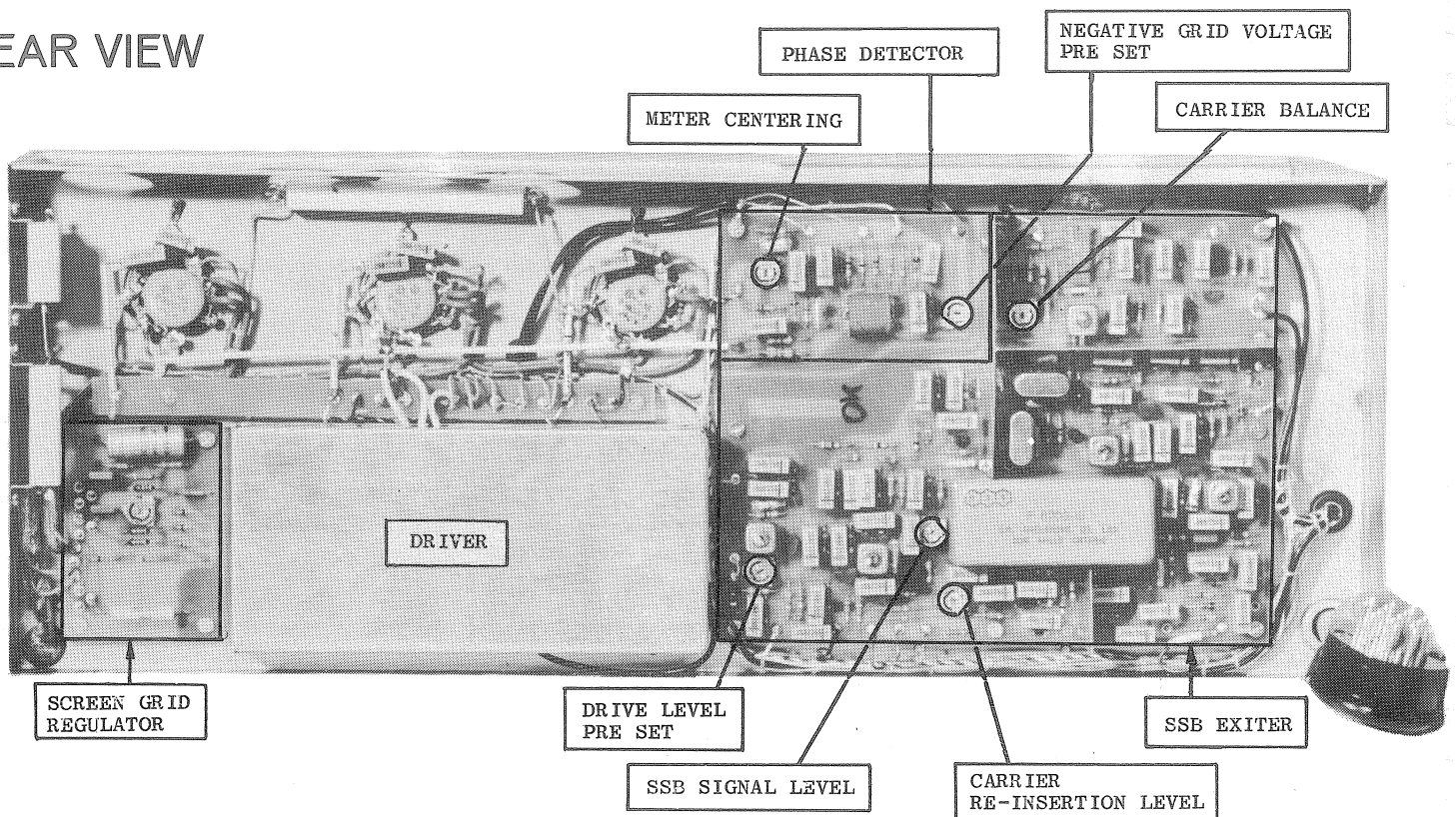


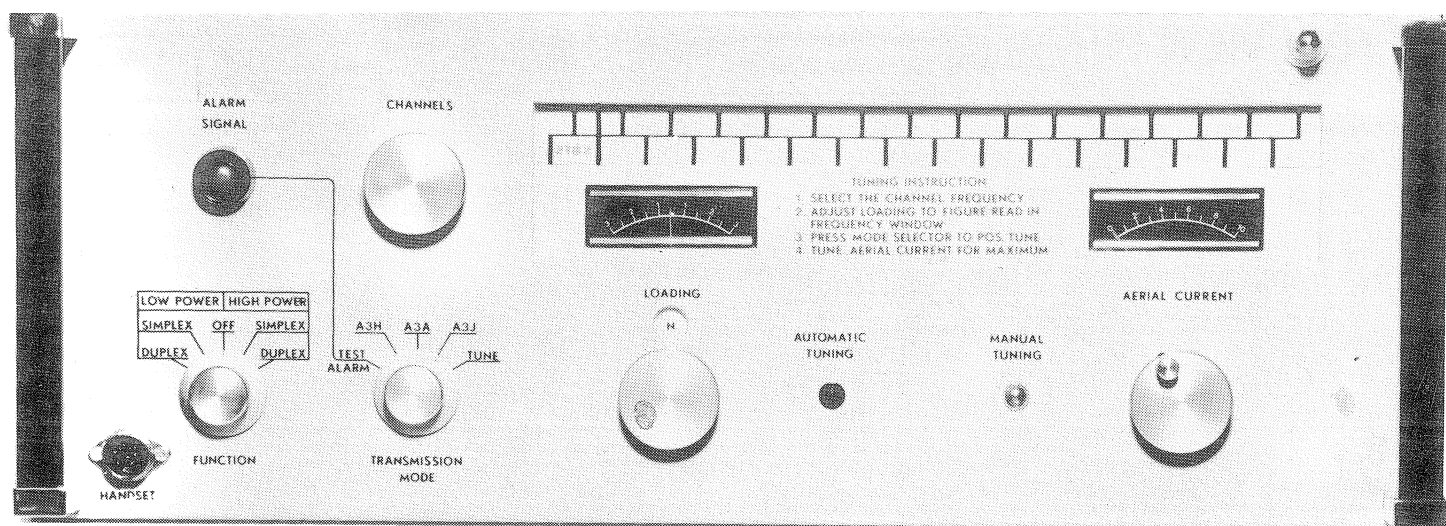
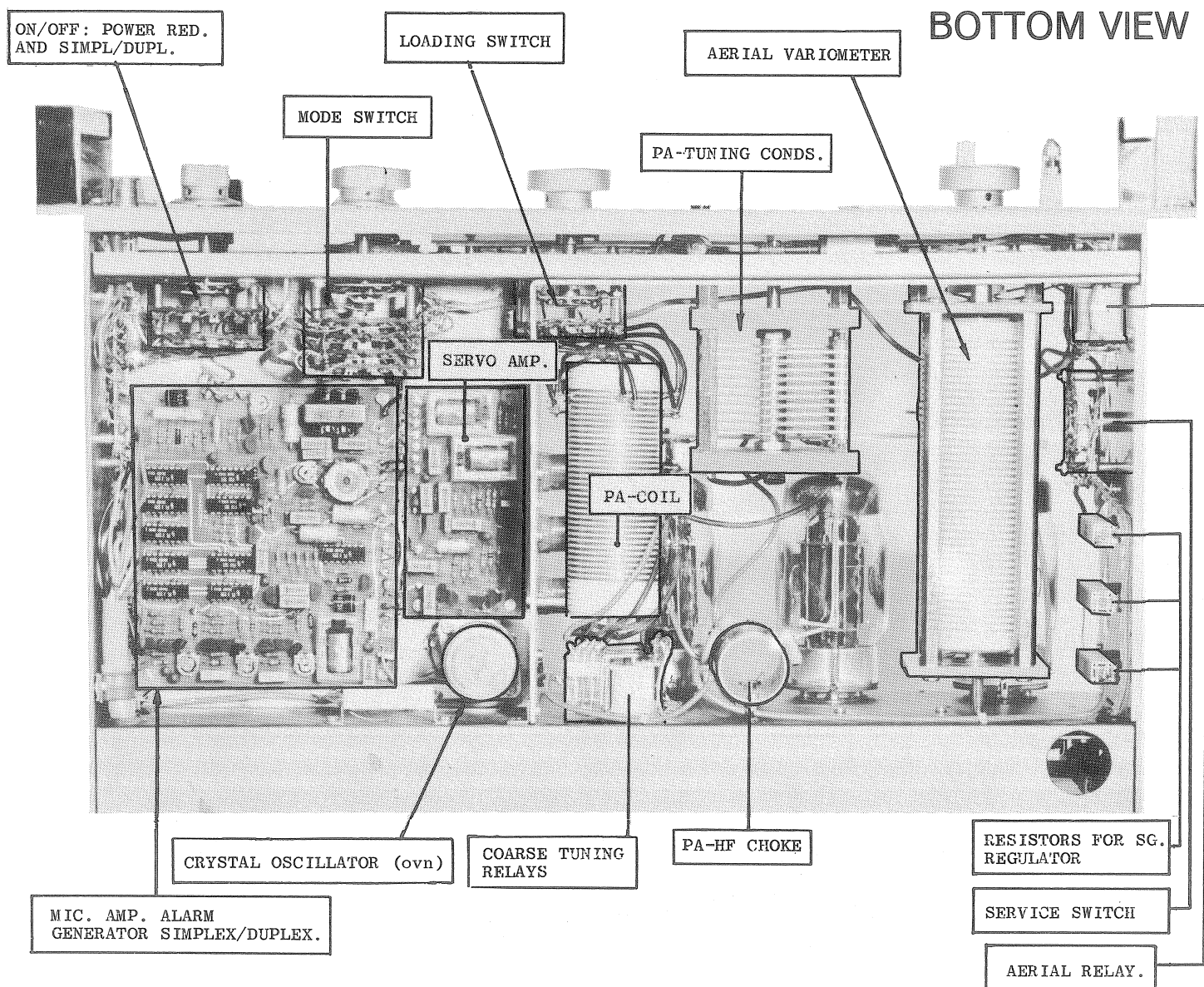
LOCATION OF MAIN PARTS IN RECEIVER

TOP VIEW



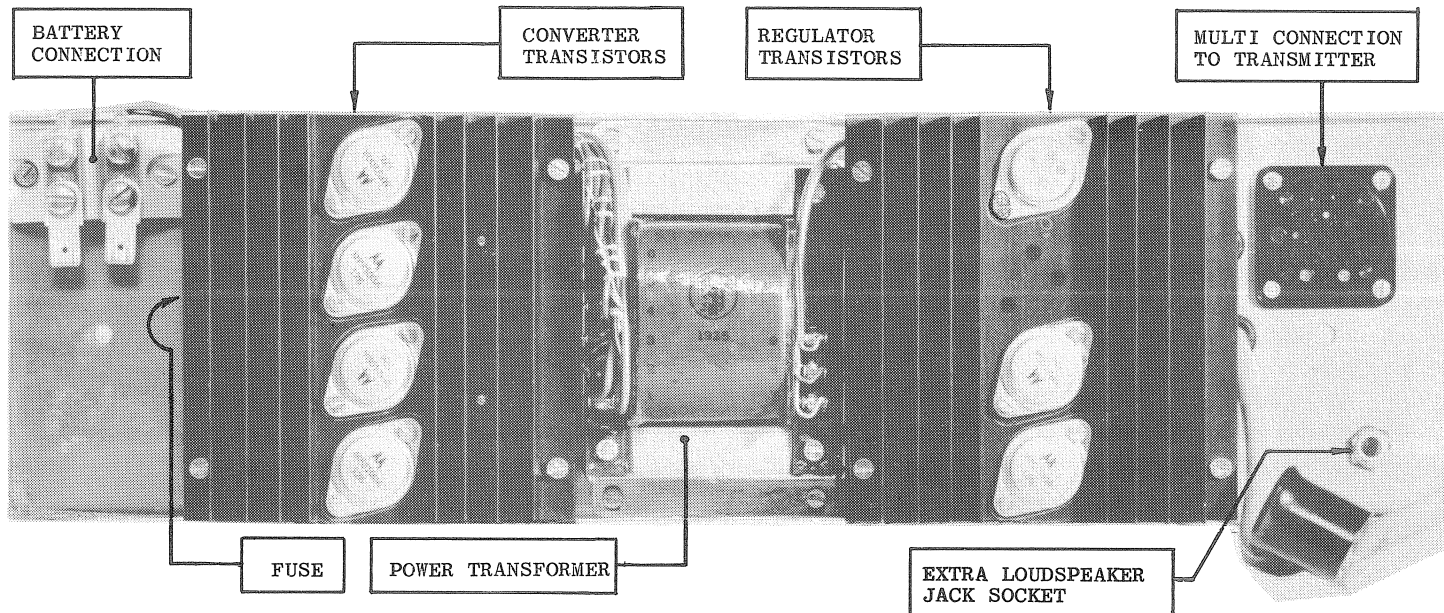
REAR VIEW

LOCATION OF MAIN PARTS IN TRANSMITTER

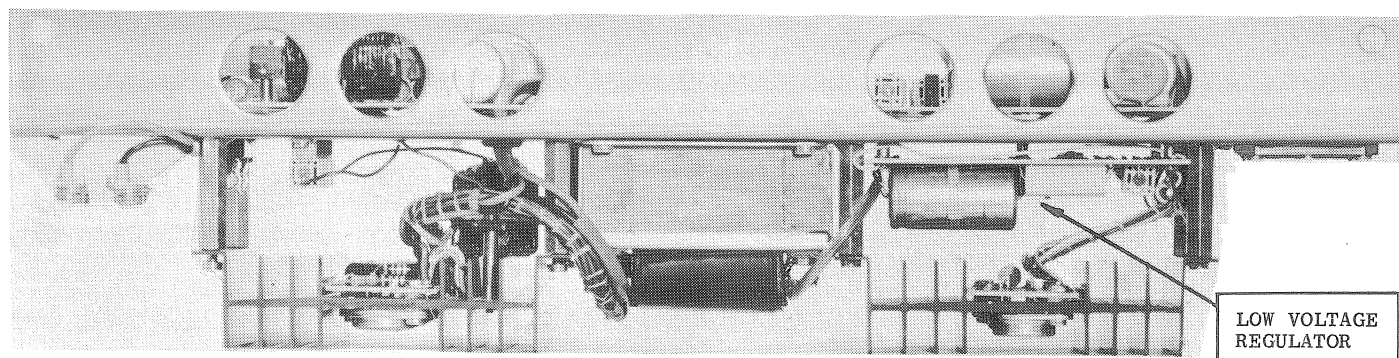


LOCATION OF MAIN PARTS IN TRANSMITTER

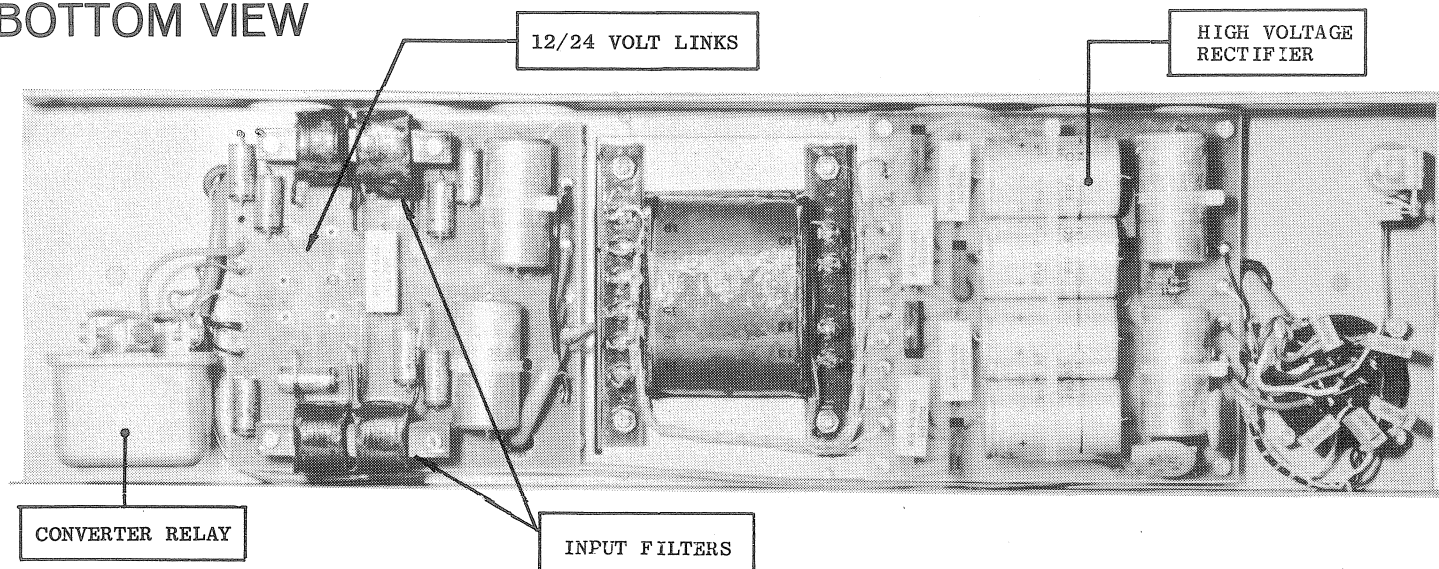
TOP VIEW



SIDE VIEW



BOTTOM VIEW

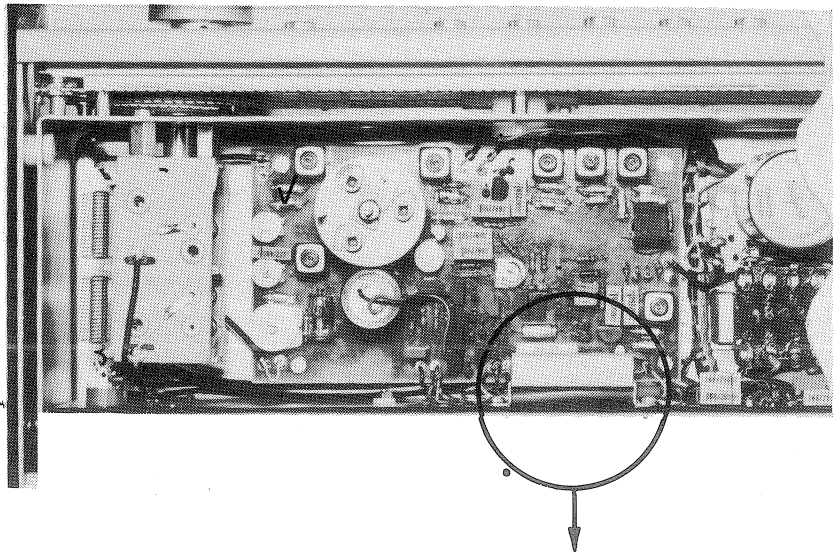


LOCATION OF MAIN COMPONENTS IN CONVERTER

2.L. CONVERTING FROM 24VOLT TO 12VOLT OPERATION

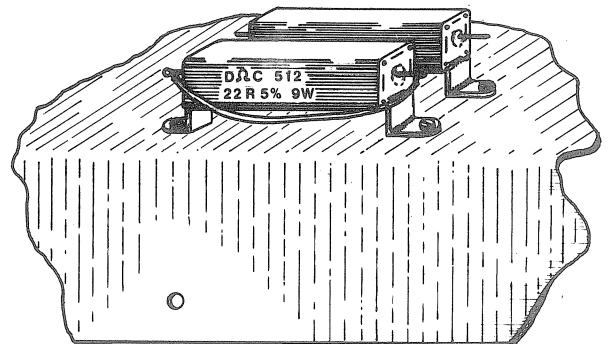
RECEIVER

RECEIVER
TOP VIEW



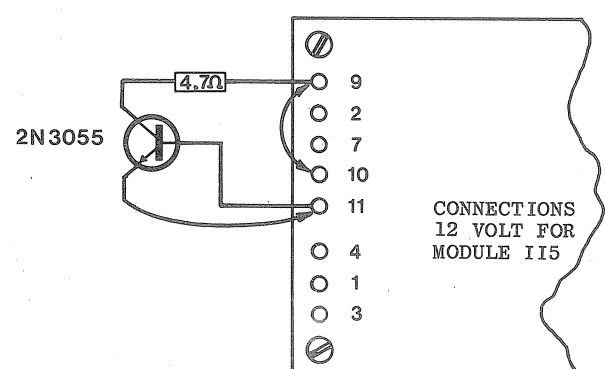
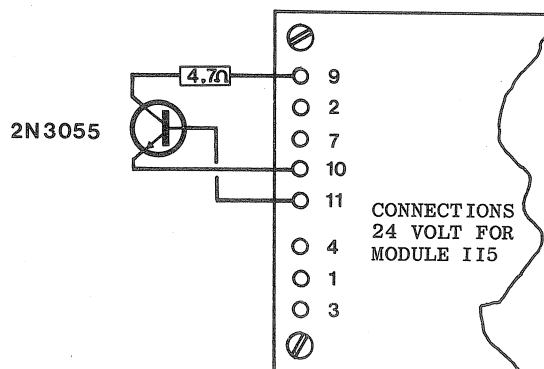
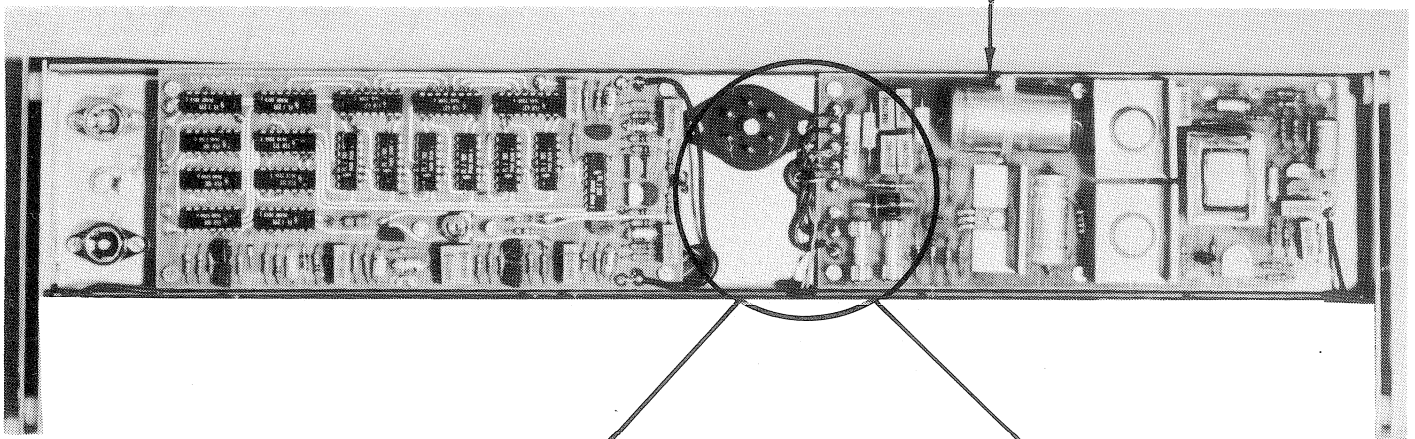
THE FOLLOWING CHANGES MUST BE MADE.

1. SHORT OUT THE RESISTOR R1 (22 OHM 9 W) IN OVEN HEATER CIRCUIT.
2. TRANSISTOR T7, 2N3055: CONNECT EMITTER TO BASE BY MOVING LEAD FROM TERMINAL 10 TO 11. (ON MODULE II5)
3. BRIDGE TERMINAL 9 TO 10. (ON MODULE II5)



RECEIVER REAR
SIDE VIEW

LF-AMPLIFIER AND
POWERSUPPLY

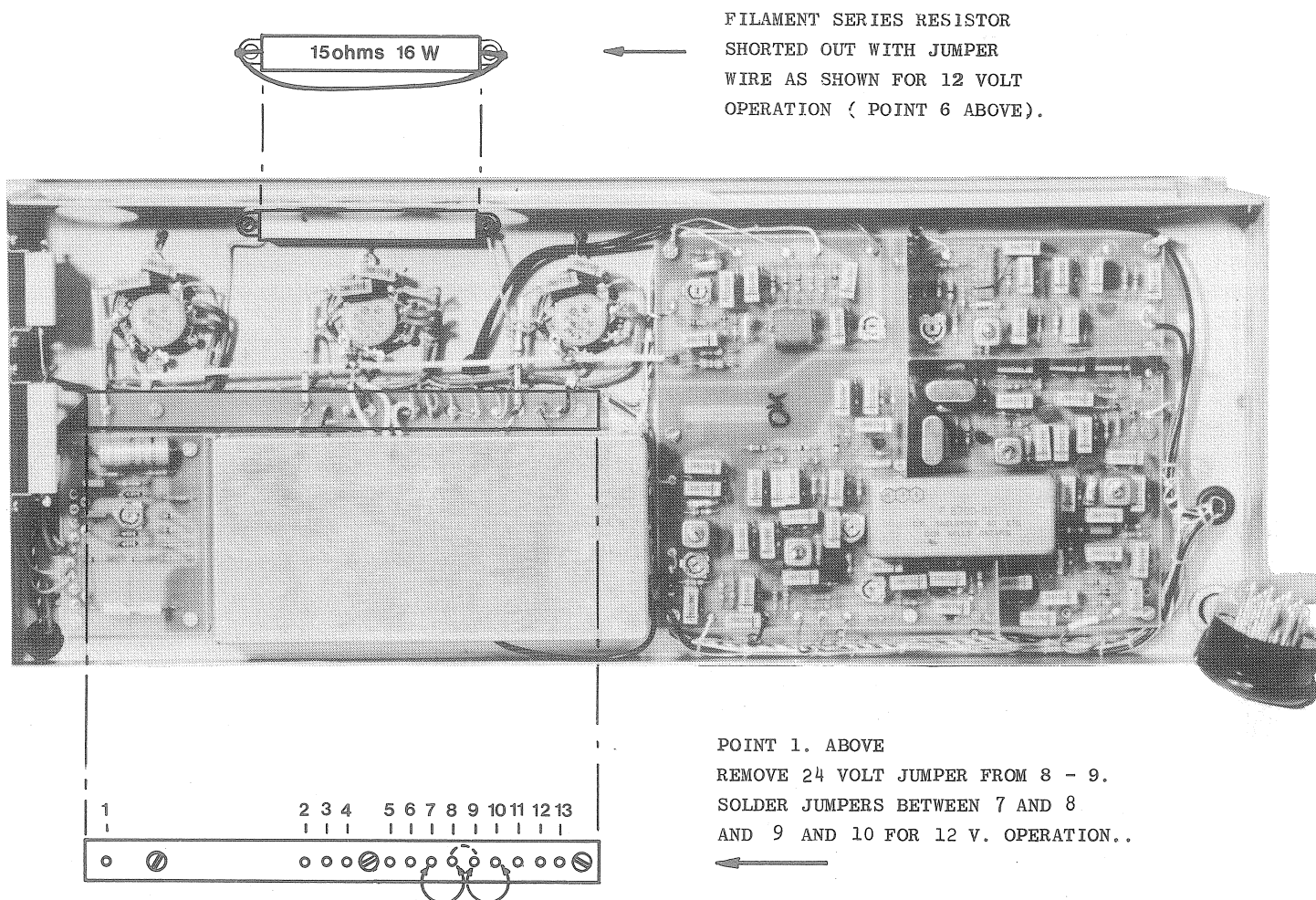


TRANSMITTER

CONVERTING THE TRANSMITTER FROM 24 VOLT TO 12 VOLT DC.

THE FOLLOWING CHANGES MUST BE MADE:

1. REWIRE TUBE FILAMENTS FOR PARALLEL OPERATION
(CONNECTED IN SERIES FOR 24 V DC OPERATION)
2. SHORT OUT WITH JUMPER WIRE RESISTOR R 51
(330 2 W) SERIES RESISTOR FOR RELAY RE 1.
(MODULE IO3)
3. SHORT OUT WITH JUMPER WIRE RESISTOR R 52
(120HM 5 W) SERIES RESISTOR FOR 5 VOLT
POWER SUPPLY (MODULE IO3 .
4. SHORT OUT WITH JUMPER WIRE RESISTOR R 22
(22 OHM 9 W) SERIES RESISTOR OVEN HEATER
(MOUNTED ON THE CHASSIS).
5. SHORT OUT WITH JUMPER WIRE RESISTOR R1
(330 OHM 2 W) SERIES RESISTOR FOR RELAY
RE 1 (ON MODULE IO1).
6. SHORT OUT WITH JUMPER WIRE RESISTOR R 29
(15 OHM 16 W) SERIES RESISTOR FOR FILAMENT.



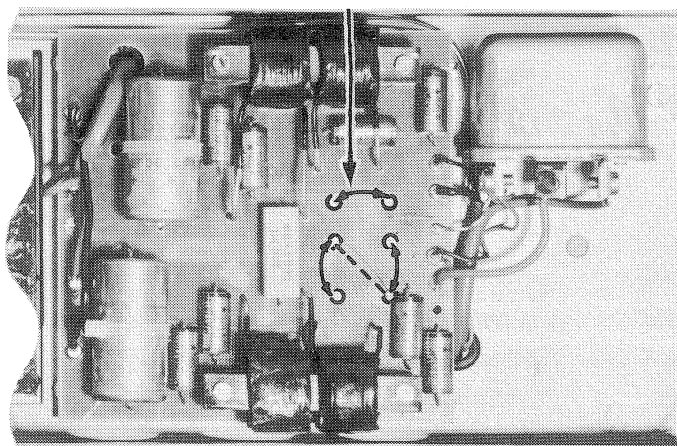
TRANSMITTER SHOWN
FROM REAR VIEW

TRANSMITTER BOTTOM VIEW

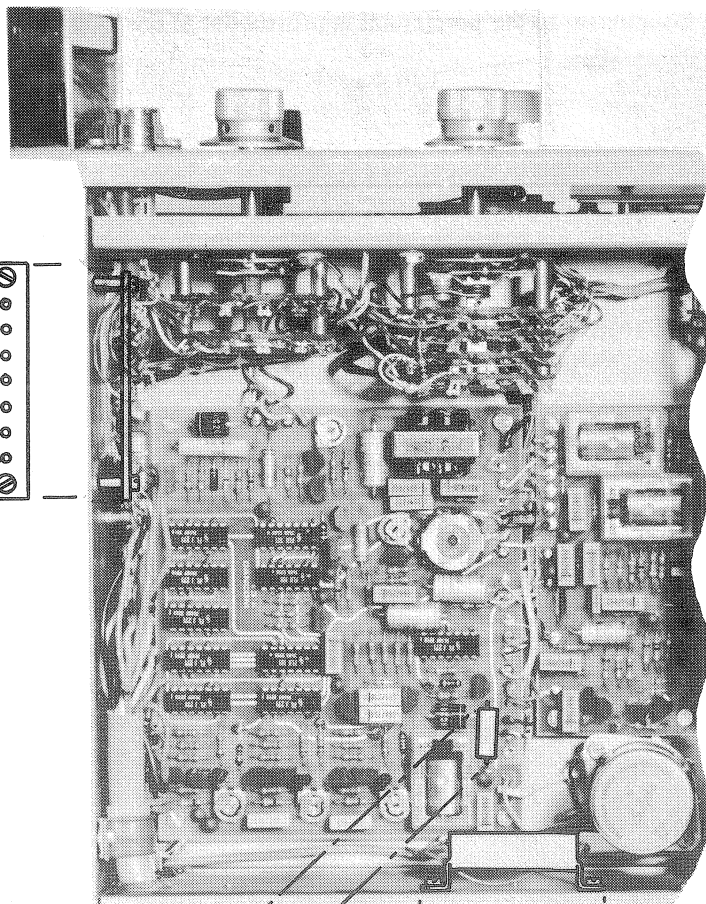
JUMPER WIRE ACROSS
THESE 2 POINTS FOR
12 VOLT OPERATION
(SERIES RESISTOR FOR
5 VOLT POWER SUPPLY)

3 JUMPER WIRES
TO BE PLACED AS
SHOWN FOR 12 VOLTS
OPERATION

EXISTING JUMPER
WIRE FOR 24 VOLTS
SHOWN DOTTED
TO BE REMOVED



POWER SUPPLY BOTTOM VIEW

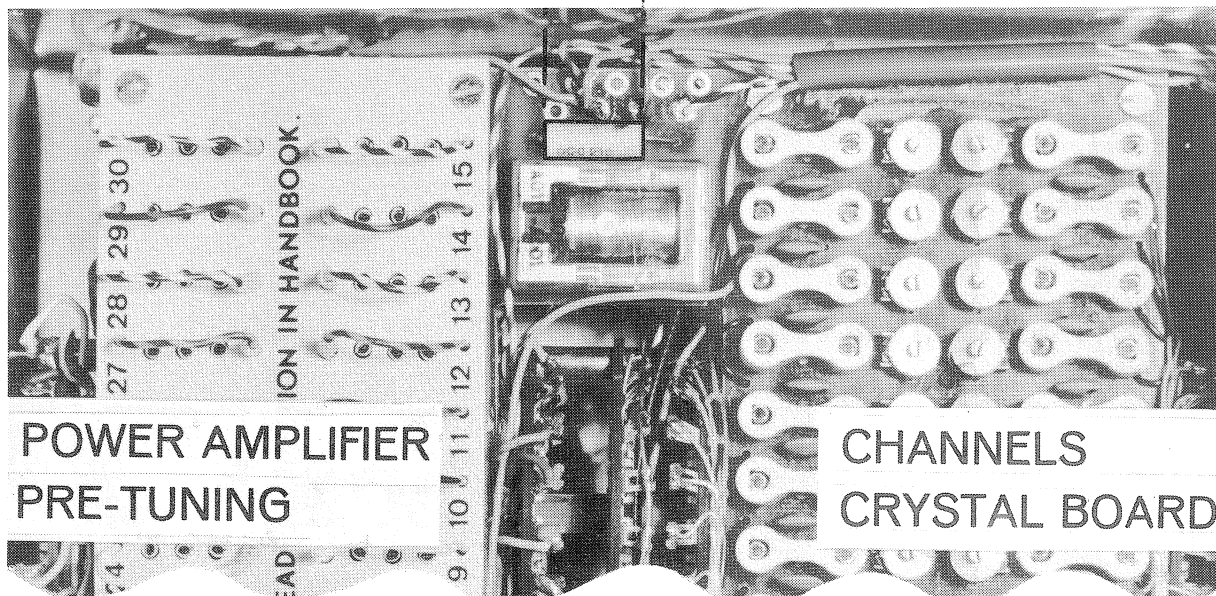


JUMPER WIRE ACROSS
330 OHM RESISTOR
FOR 12 VOLT OPERATION

JUMPER WIRE ACROSS
22 OHM. 9 W RESISTOR
FOR 12 VOLT OPERATION

JUMPER WIRE ACROSS
330 OHMS 2 W RESISTOR
FOR 12 VOLT OPERATION.

TRANSMITTER TOP VIEW



POWER AMPLIFIER
PRE-TUNING

CHANNELS
CRYSTAL BOARD

Conditional to the permanent improvement of our products, the delivered sets may slightly differ from this declaration.

3. Technical Data:

General:

Modes of operation	Simplex/Duplex
Power supply standard	12/24 volts d.c. battery +25% -15%
	consumption on 24 volts operation: receive: approx. 1 Amp stand-by: approx. 3 Amps transmit/receive (duplex operation): approx. 15 Amps
via additional power supply	110/220 volts a.c. $\pm 10\%$ consumption: approx. 350 VA
Dimensions and weight	Height: 325 mm Width: 497 mm Depth: 270 mm Weight: approx. 35 kg

Transmitter:

Frequency range	1.6 – 4.2 MHz
Frequency tolerance	
Frequency incon-	
stancy at an ambient	
temperature between	
+10° C and +40° C	short term (15 min) < 25 Hz
at an ambient tem-	
perature of +25° C	long term (1 year) < 75 Hz

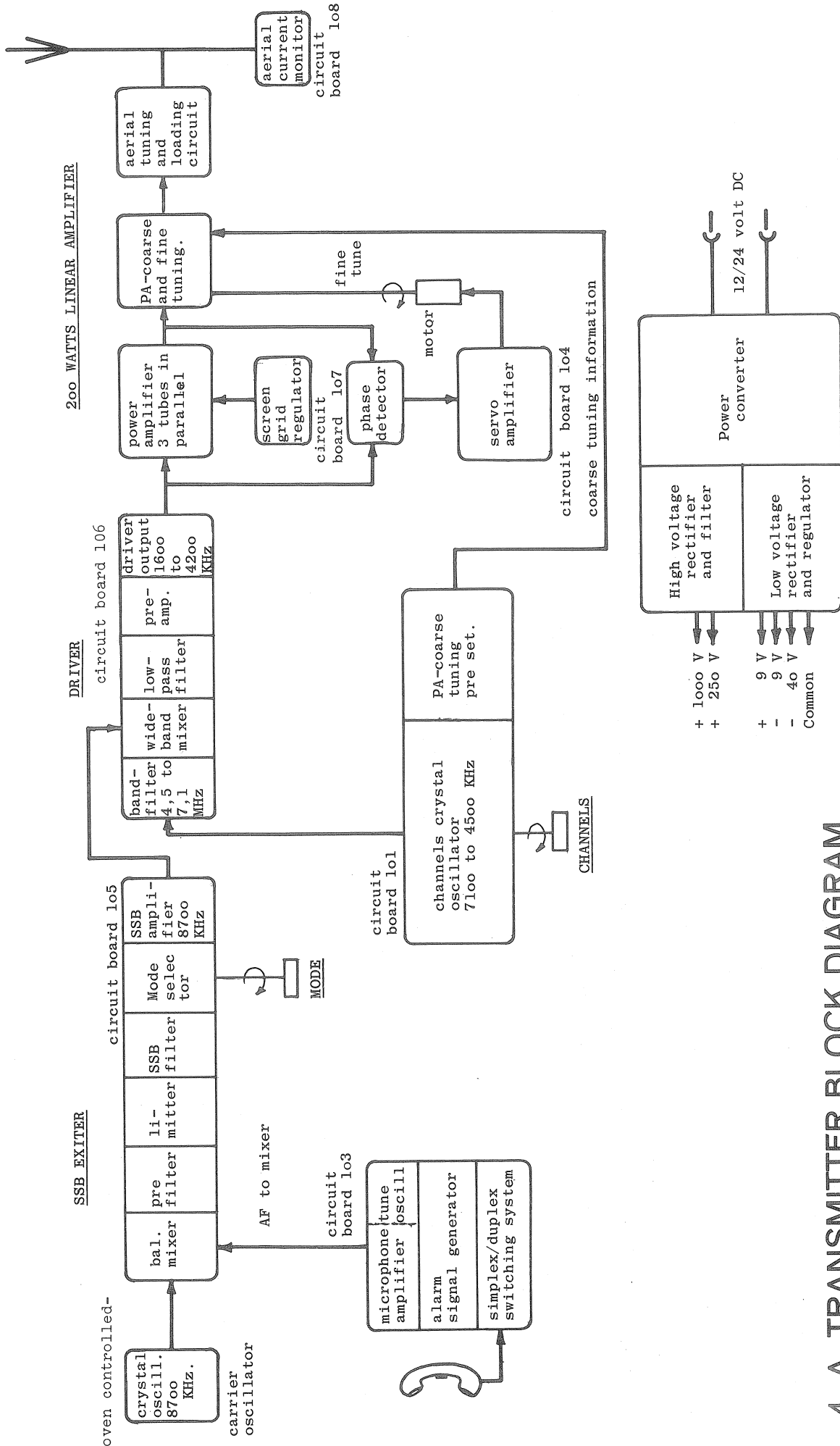
Types of emission	A3H, A3A, A3J (USB)
Spotfrequencies	30, crystal-controlled
Power output	200 watts p.e.p.
Power reduction	selectable: 50 watts p.e.p.
Antenna impedance	10 Ω + 150 pF 20 Ω + 300 pF
Audio response	< 6 dB (350–2700 Hz)
A.f.-distortion	$\leq 10\%$
Intermodulation products	out of band: 3rd order: ≥ 30 dB below p.e.p. 5th order: ≥ 36 dB below p.e.p. 7th order: ≥ 43 dB below p.e.p.
Spurious and r.f. harmonic suppression	≥ 40 dB
Carrier suppression	A3H = 5– 6 dB below p.e.p. A3A = 16 ± 2 dB below p.e.p. A3J = > 40 dB below p.e.p.
Residual F. M.	< ± 10 Hz
Ambient temperature	-15° C to +55° C
Warm-up period	35 s
Power amplifier tubes	3 x TT 22
Crystals used	HC – 6 – U
Two-tone alarm generator	incorporated

Multichannel-Receiver:

Frequency range	1.6 – 4.2 MHz 30 channels, with automatic tuning of the pre-amplifier
Frequency stability frequency incon- stancy in any 15 min. period with constant ambient temperature and a supply variation of $\pm 10\%$	$< \pm 20$ Hz in the temperature range 0°C to $+40^{\circ}\text{C}$ $< \pm 100$ Hz
Modes of reception	A3, A3H, A3A, A3J
Sensitivity	A3: $\leq 5 \mu\text{V}$ for 10 dB signal/noise ratio A3H, A3A, A3J: $\leq 1.5 \mu\text{V}$ for 10 dB signal/noise ratio
Selectivity	A3: 6 kHz bandwidth at -6 dB 20 kHz at -60 dB A3H, A3A, A3J: 2.7 kHz bandwidth at -3 dB
Crossmodulation	Interference of unwanted carrier 20 kHz off-tune 90 dB above $1 \mu\text{V}$, is > 30 dB below standard output
Intermodulation	20 dB below standard output for two spurious signals each of 90 mV
Blocking	unwanted carrier 20 kHz off-tune, 100 dB above $1 \mu\text{V}$ effects output by < 3 dB (wanted signal 60 dB above $1 \mu\text{V}$)
Image rejection	> 80 dB
Intermediate frequencies	1st i.f. = 8.7 MHz 2nd i.f. = 580 kHz
I.f.-rejection	> 86 dB
Automatic gain control (AGC)	< 0.5 dB change of the output-level, for a 50 dB increase of the input signal
Time constants	attack: 15 m sec decay: 3 sec
Clarifier	± 200 Hz
Carrier insertion (crystal-controlled)	580 kHz
Audio output	
built-in loudspeaker	max. 2 watts into 8Ω
external speaker	2 watts into 8Ω
earphones	1 mW into 2000 Ω

Audio response ≤ 3 dB (300 Hz – 4 kHz)Radiation typically: $20 \cdot 10^{-12}$ watts
max.: $400 \cdot 10^{-12}$ wattsAntenna input 10Ω / 250 pF (standard)
2–40 Ω , tunable to
100–400 pFAntenna input for
D.F. equipment 1Ω , 8 μH **Continuously tunable receiver:**

Frequency ranges	1. 200– 525 kHz 2. 525–1600 kHz 3. 1600–4200 kHz
Modes of reception	A1, A2, A3
Sensitivity	range 1: A1 $\leq 5 \mu\text{V}$ for 10 dB signal/noise ratio A3 $\leq 15 \mu\text{V}$ for 10 dB signal/noise ratio range 2: A1 $\leq 5 \mu\text{V}$ for 20 dB signal/noise ratio A3 $\leq 15 \mu\text{V}$ for 20 dB signal/noise ratio range 3: A1 $\leq 5 \mu\text{V}$ for 20 dB signal/noise ratio A3 $\leq 15 \mu\text{V}$ for 20 dB signal/noise ratio
Selectivity	AM (A3): 6 dB at -6 kHz 60 dB at -20 kHz A1: 3 dB at 2.7 kHz
Image suppression	≥ 40 dB
Intermediate frequency	580 kHz
I.f.-suppression	≥ 50 dB
Automatic gain control (AGC)	< 0.5 dB change of the output level for a 50 dB increase of the input level
Time constants (A3)	attack: 50 m sec decay: 0.2 m sec
A.f.-output	
built-in loudspeaker	max. 2 watts into 8Ω
external speaker	2 watts into 8Ω
earphones	1 mW into 2000 Ω
Audio response	≤ 3 dB (300 Hz – 4 kHz)
Radiation	typically: $20 \cdot 10^{-12}$ watts max.: $400 \cdot 10^{-12}$ watts



4. A. TRANSMITTER BLOCK DIAGRAM

4. B. TECHNICAL DESCRIPTION, TRANSMITTER

This technical manual describes the SSB-radiotelephone type RT 101. Information is provided to allow qualified service technicians to maintain and repair the equipment.

The complete station consists of the transmitter, the power supply, and the receiver housed in one common cabinet.

The receiver and power supply are fully transistorized, and the transmitter is transistorized up to the power amplifier which uses three tubes connected in parallel.

The SSB-Exciter.

The transmitter is designed as a filter type transmitter. The carrier wave signal is generated in a crystal oven oscillator on the frequency 8700 KHz.

This signal is fed to a balanced mixer. The mixer is a part of the SSB-exciter. The balanced mixer receives in addition to the carrier signal, an audio signal from the microphone via its amplifier. On the same printed circuit T3, a two tone oscillator and an alarm signal generator are also mounted both signals can be connected to the balanced Mixer through the MODE SWITCH

A DSB signal without Carrier is produced in the mixer. This signal is fed through a SSB filter which attenuates the lower sideband by about 20 db. From the filter the signal is fed to an HF clipper where the USB signal is clipped up to 20 db. The clipped USB signal amplitude is now almost independent of the microphone signal amplitude and is, with nearly constant amplitude, fed to one further SSB filter. This filter only allows the wanted SSB frequency range to pass so that the transmitted signal is in strict accordance with the requirements of the authorities.

The USB signal from the SSB filter is then fed to the "MODE" selector where one of the transmission types A3H, A3A or A3J is selected. The "MODE" selector chooses the right relation ship between carrier and sideband power in these three transmission modes.

After the "MODE" selector the SSB signal is amplified to a level of about 100 mV. After this amplification the SSB signal is ready to be converted to the right transmission frequency and is, therefore, fed to the DRIVE-module.

THE DRIVE MODULE

In this module a conversion between the SSB signal at 8,7 MHz. and the signal from the channel crystal oscillator is performed. The channel oscillator can, depending on the wanted transmitting frequency, be brought to operate in the frequency range 7,1 to 4,5 MHz. The difference frequency will then lie in the frequency range 1,6 to 4,2 MHz.

In the driver the signal from the crystal oscillator is first fed through a high-pass filter to prevent any unwanted feedback from the transmitter's power amplifier in the transmitting frequency range 1,6 to 4,2 MHz.

After this filter the signal is amplified and fed through a low-pass filter which removes unwanted harmonic products from the channel signal to avoid unwanted mixing products in the following wide band mixer.

In the mixer the channel signal 7,1 to 4,5 MHz. is mixed with the 8,7 MHz. SSB signal. The difference between those two signals, 1,6 to 4,2 MHz. is fed through a low-pass filter to the driver pre-amplifier. This amplifier is working as a wideband amplifier in the frequency range up to 4,5 MHz. and amplifying the signal sufficiently to drive the driver output stage.

In the driver output amplifier the signal is amplified to an amplitude of about 40 Volt peak and is thereby ready to drive the transmitter linear output amplifier.

THE POWER AMPLIFIER

The power amplifier is equipped with tubes. Three tubes are connected in parallel. The signal from the driver is fed to the three tube grids in parallel and is amplified up to a level of about 250 W PEP. The tubes are delivering the amplified signal across a resonant circuit. The circuit is connected as a parallel circuit, and the aerial tuning system is connected to a tap on the coil at the correct impedance.

The connection is made through a switch which can be operated from the front panel and is marked "LOADING".

The aerial reactance is matched by means of a variometer (variable coil) which can also be operated from the front panel and is marked "AERIAL TUNE".

AUTOMATIC TUNING

Automatic tuning is used in the transmitter output stage. The system performs a coarse and fine tuning. The coarse tuning is guided from a patch board where, dependent of the wanted transmitting frequency it is possible to programme the tuning, channel by channel.

The coarse tuning is performed by HF-relays which can switch L and C in and out of the parallel resonance circuit.

The fine tuning is performed by a motor driven variable condenser. The motor is driven through a servo amplifier on the basis of a signal from a phase detector, which is measuring the phase between the delivered grid alternating voltage and the anode alternating voltage.

The coarse tuning is therefore, made at the same time as the channelswitching, and the fine tuning is performed by turning the "MODE" selector to position "TUNE". In this position the power amplifier is driven by a two-tone SSB signal and the automatic tuning is performed with the aerial automatically disconnected. In position "TUNE" manual tuning of the aerial is also made. A blue lamp on the front plate indicates that the automatic tuning is in operation. When the automatic tuning has ended, it is indicated by a yellow lamp and this shows that manual tuning of the antenna current can be started.

THE AERIAL CIRCUIT

The transmitter is designed always to be connected to a capacitive aerial and is, therefore, equipped with a variable coil which can be tuned to compensate for the aerial capacitive reactance.

Through a tap on the PA coil the real part of the aerial can be matched and through this, the PA stage can be loaded correctly. When the automatic tuning is operating, the aerial is automatically disconnected. The aerial current is detected by the aerial current detector and is indicated by a moving coil instrument on the front panel.

THE MICROPHONE AMPLIFIER

The signal from the microphone is fed through the microphone transformer to a low-pass filter and from this to an emitter follower which is feeding the signal direct to the SSB exciter.

THE TWO TONE TEST GENERATOR

When the transmitter is tuned, it is driven by a two-tone signal with the frequencies of 1200 and 2400 Hz.

The signal on 2400 Hz. is generated in a free running multivibrator. From this the signal is fed to a dividing stage and is divided by two to the frequency 1200 Hz. Both signals are fed through a resistance network to a common amplifier, which the "MODE" switch in position "TUNE" connects the two-tone signal to the microphone amplifier input.

THE ALARM SIGNAL GENERATOR

The alarm signal is generated in two unijunction oscillators on the frequencies 4400 HZ. and 2600 Hz. The frequencies are both divided by two and after the division as square wave signals with the frequencies 2200 Hz and 1300 Hz.

A third unijunction oscillator generates 250 msec. pulses. The pulses are fed to a binary stage which alternatively switches two further dividers at 250 msec. intervals thus giving alternating two tones at 2200 Hz and 1300 Hz.

By this the alarm signal is produced with right characteristics and is fed through two gates to a common amplifier and then, with the "MODE" selector in position ALARM TEST to the microphone amplifier input.

By means of a divider with a division ratio of 192:1 which is connected to the 250 m sec. generator a stop signal is produced after about 45 sec.

This signal stops the transmission after the alarm signal has been transmitted for the required 45 sec. period by disconnecting the two gates from the common amplifier and instead connecting the driver to the transmitter through the Keying system.

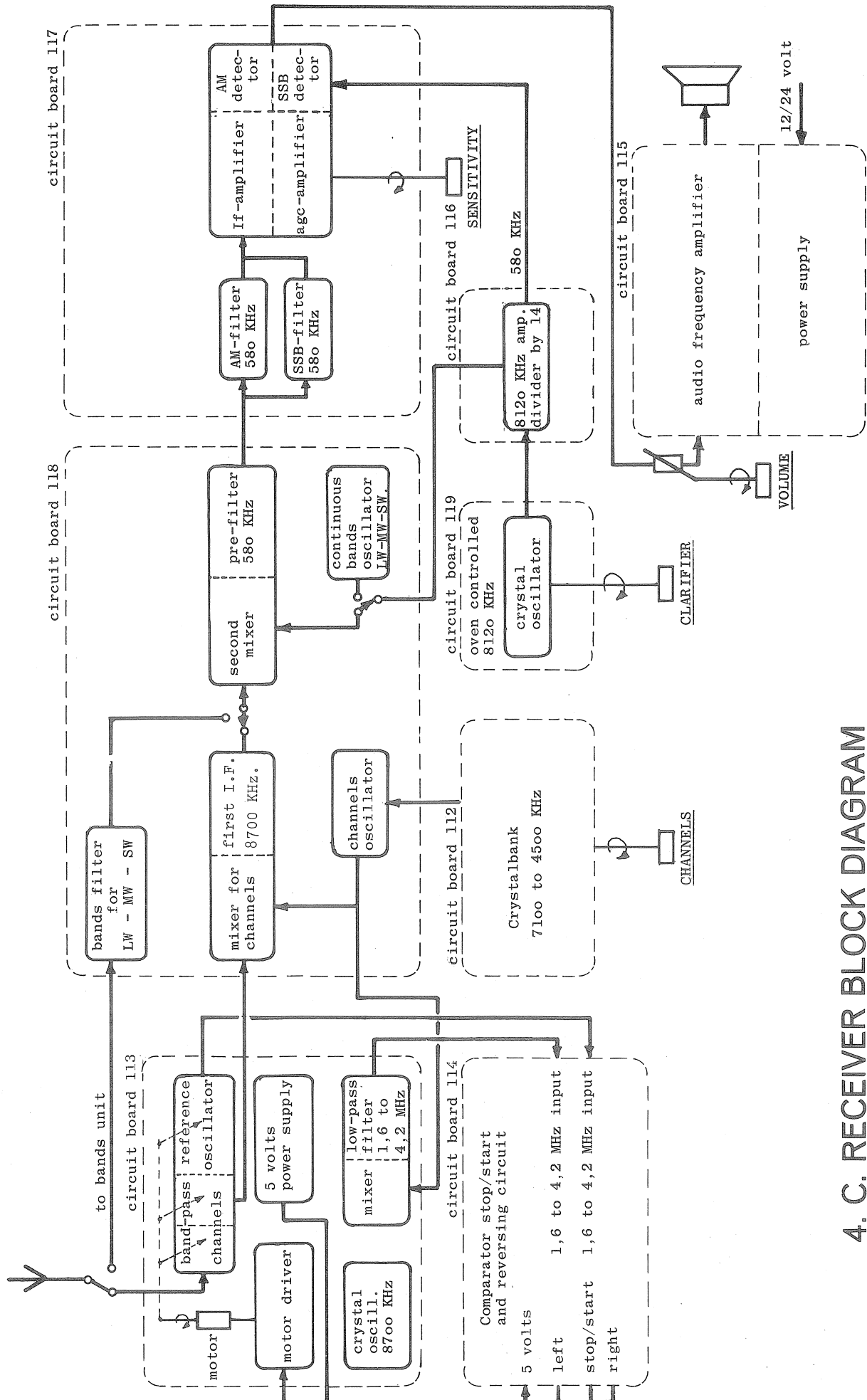
When the alarm signal generator has ended a transmission, it can be started again by pushing the red ALARM button on the front plate. The alarm push button activates the reset generator so it resets all the integrated dividers to zero position and returns the stop/start circuit to start position.

KEYING CIRCUIT

Through the switch in the microtelephone two relays are operated, one in the power converter and one in the transmitter. The relay in the transmitter is connecting the +9 Volt power supply to the 8,7 MHz. oscillator, the SSB generator and to the driver. A second set of contacts disconnects during transmission any connected loudspeakers. The LF signal, in position simplex, is connected to the earpiece of the microtelephone from the same source as the loudspeaker and is, therefore, also disconnected when transmitting simplex. When transmitting duplex, the LF to the earpiece is connected to a point before relay contact and is, therefore, not disconnected when transmitting.

THE TEST CIRCUIT

By means of a switch mounted on the right chassis frame, the moving coil instrument which is used for aerial current measurements can be switched to check different important currents and voltages. The switch is a labelled showing at which point the measurement is being made.



4. C. RECEIVER BLOCK DIAGRAM

INTRODUCTION

The R 101 is a single and double sideband radio-telephone receiver for telephony communication in the 1,6 to 4,2 MHz coastal telephony band. The receiver is crystal controlled and has a total of 30 channels.

The receiver is designed for reception of signals of type A3, A3H, and upper sideband A3A and A3J. In addition to the 30 crystal controlled channels in the coastal telephony band the receiver is also equipped with facilities for continuous tuning of the long, medium and short wave bands. It can also be used as a direction finding receiver in LW, MW, and SW bands in conjunction with either a ferrite or a loop antenna.

By using a very selective automatic ally tuned band-filter in the front end of the receiver and by feeding the signal direct to a balanced field effect mixer without using a HF amplifier, the receiver has been provided with first-class duplex facilities.

Adding new channels to the receiver is very simple. The only adjustment required is adjustment of the crystal frequency. The crystals are accessible after removal of the top cover plate of the receiver. Crystal trimmer capacitors permit making correction for the natural ageing of the crystals which might otherwise bring the frequencies outside the specification limits in a few years.

The receiver is fully transistorized, it can be powered from either 12 or 24 Volt DC. A monitoring loudspeaker is built-in and an external loudspeaker can be connected if required.

4. D. TECHNICAL DESCRIPTION RECEIVER

Construction.

The receiver is built on a sturdy chromatised steel chassis which is designed so that it provides RF-screening between the various receiver sections. The chassis has 2 outside cover plates, top and bottom. These provide internal screening in the receiver as well as protect it from direct signal pick-up from outside.

The front panel is electrically insulated from the chassis. This feature permits connecting the chassis to a separate earth when receiver is mounted in the same rack as the transmitter.

The receiver is divided into 8 modules, all built on printed circuit boards. The bands section, intermediate frequency amplifier and divider modules are located underneath the chassis. The channel crystal board, crystal oven and automatic tuning (motor board) is located on the upper side of the chassis. The audio frequency amplifier and comparator modules are located on the rear side of the chassis. Also power and aerial connectors are located on this part of the chassis.

Circuit description, general.

The circuit diagram is divided into a wiring diagram showing interconnections between the individual modules, and circuit diagrams of individual modules.

The mode of operation is apparent from the block diagram which shows the signal path and the process of frequency generation respectively.

The dimensions match a 19 inch standard rack, and the receiver is intended for mounting in the same cabinet with the type T 101 transmitter.

When so mounted, the receiver and transmitter in conjunction with the transmitter power pack constitute the RT 101 transmitter/receiver combination.

The receiver is also available as a separate cabinet model.

The signal from the wire aerial is fed via the DF-switch in module, II7 to the bands module II8, where in position channels it is fed to the automatically tuned band-pass filter.

From the filter the signal is fed back to the bands unit II8 to the first mixer where it is mixed with a signal from the channel crystal oscillator up to the first intermediate frequency on 8700 Khz.

From the IF-filter the 8700 Khz. signal is fed to the second mixer and mixed down to the second intermediate frequency on 580 Khz.

The oscillator signal for this mixing procedure is produced in the oven oscillator module II9 at a frequency of 8120 KHz. The frequency of this signal can be varied by an amount of ± 200 Hz. to satisfy the requirement for a clarifying function. The signal from the 8120 Khz. oscillator is fed to the divider module II6, and after amplification here it enters into the second mixer.

The second mixer is connected to a pre-filter at a frequency of 580 KHz. This filter serves to attenuate signals from adjacent channels to a low level to avoid interference in the following 580 KHz IF-amplifier.

The signal at 580 KHz. is fed to an amplifier which is a part of the IF-module II7. From this amplifier the signal can be switched to either a SSB-crystal filter or to an AM-filter. The output from the filters can then be diode switched to the input of the following IF-amplifier.

The IF-amplifier consists of 2 AGC regulated wide-band-amplifiers. They are delivering the amplified 580 Khz. signal to both the FET-product detector and to the AGC-amplifier and AM-detector.

The product detector receives its carrier frequency signal from the divider module II6 where the 8120 KHz. signal is divided by a ratio of 14:1 down to 580 KHz. After filtering and amplification the signal is fed to the product detector.

The audio frequency signal from the two detectors AM and SSB, are then by means of the switches AM or SSB fed to a pre-amplifier. After this amplification the audio frequency signal is fed to the volume control and then to the AF-amplifier module II5.

In the AF-amplifier the audio frequency signal is amplified to a level of about 5 Watts and then brought to the internal loudspeaker and to the socket for connection to the transmitter and external loudspeaker if applicable. On the AF-module II5, are also located the necessary components for the power supply voltage regulator. This regulator delivers both 12 and 9 Volts regulated for the different modules of the receiver.

The AGC system receives a DC voltage from AM detector diode. This DC voltage is amplified in a two stage DC amplifier and through a diode system fed to an emitter follower which drives the two regulated transistors in the IF amplifier. The AGC system has a very fast rise time and in SSB mode, a slow decay time

When using the receiver as a tunable receiver, it operates as a single conversion receiver only using the second mixer. By switching to one of the continuous bands the aerial is disconnected from the channels band filter and connected to one of the bands input resonance circuits relevant to the selected band, at the same moment the oscillator input to the mixer is switched from the 8120 KHz. crystal oscillator to a variable oscillator. The frequency from this oscillator and the resonance of tuned circuit between the aerial and the mixer is controlled manually by the Bands Tuning knob and the receiving frequency is indicated on the slide rule type dial.

When switching the receiver to DF, the wire aerial is disconnected and the signal from the DF-aerial, through its amplifier, is connected to the bands input circuit instead of the wire aerial.

In the DF position the receiver is using the high selectivity of the SSB-crystal filter and the linearity of the product detector. Also the AGC is disconnected in this position.

The automatic tuning system, which tunes the front-end band-filters when using crystal controlled channels, uses a system where an oscillator operating at a frequency equal to the resonance frequency of the band filters is compared with the crystal frequency, and the information obtained from this comparison is used to drive a motor connected to the tuneable band filter and thereby correcting the frequency of this and the reference oscillator to coincide with the receiving frequency.

By using a system where the reference oscillator is running at the same frequency as the band-pass filters the problem with tracking is eliminated.

The system is located on two modules, one containing the frequency comparator and one containing the band-pass filter, motor and the mixer for the channels crystal frequency.

The comparator receives two signals, one from the reference oscillator and one from the channel crystal oscillator mixed with 8700 KHz. by this, giving the same frequency as the reference oscillator, (7100 to 4500 KHz. mixed with 8700 KHz. gives 1600 to 4200 KHz.) When the comparator, which is built up of integrated circuits, receives the two signals, it compares them, and on basis of this it controls the direction of the tuning motor (left or right).

As the reference oscillator is tuned to the same frequency, as the mixing product, derived from the mixing between the channels oscillator frequency and the 8700 KHz oscillator, a stop pulse is given from the comparator, but because of the high running speed of the motor, the band filter is tuned to a frequency away from the correct frequency.

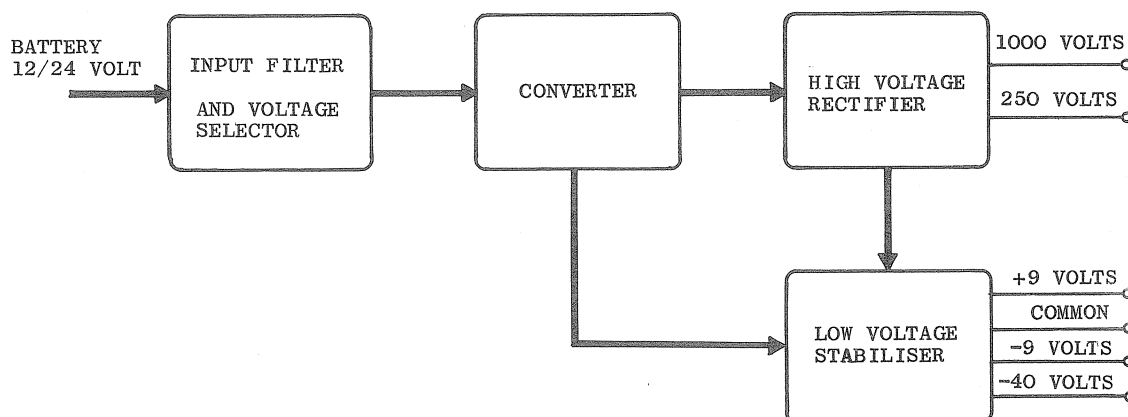
Therefore, the stop pulse is bypassed in a logic system. At the same moment the frequency from the reference oscillator has passed the coincidence frequency point the motor is braked by the reverse polarity information from the comparator.

This reversing information is also a signal to a system which lowers the speed of the motor so that it approaches the coincidence point at a much reduced speed.

When the stop pulse again arises, it is allowed to pass the stop information to the voltage regulator on module II3, cutting off the power to the automatic tuning system.

In the comparator there is a built-in sense system, sensing the alternating voltage from the channel crystal oscillator. The function of the system is to sense whether the channel oscillator is oscillating or not, thereby giving the automatic tuning system instruction to tune or not.

4. E. POWER SUPPLY BLOCK DIAGRAM



4. F. DESCRIPTION OF POWER SUPPLY

The Power supply has a two section converter circuit so that it may be easily changed from 12 volts to 24 volts input and vice. versa.

This arrangement avoids the neccessity of purchasing a further power supply should the user re-install the equipment in a vessel with the alternative supply voltage.

For 12 volt use the two sections are connected in parallel and are re-conected in series for 24 volt operation.

The Power supply is controlled by a relay (RE 1).The contacts of which are in series with the battery supply voltage.

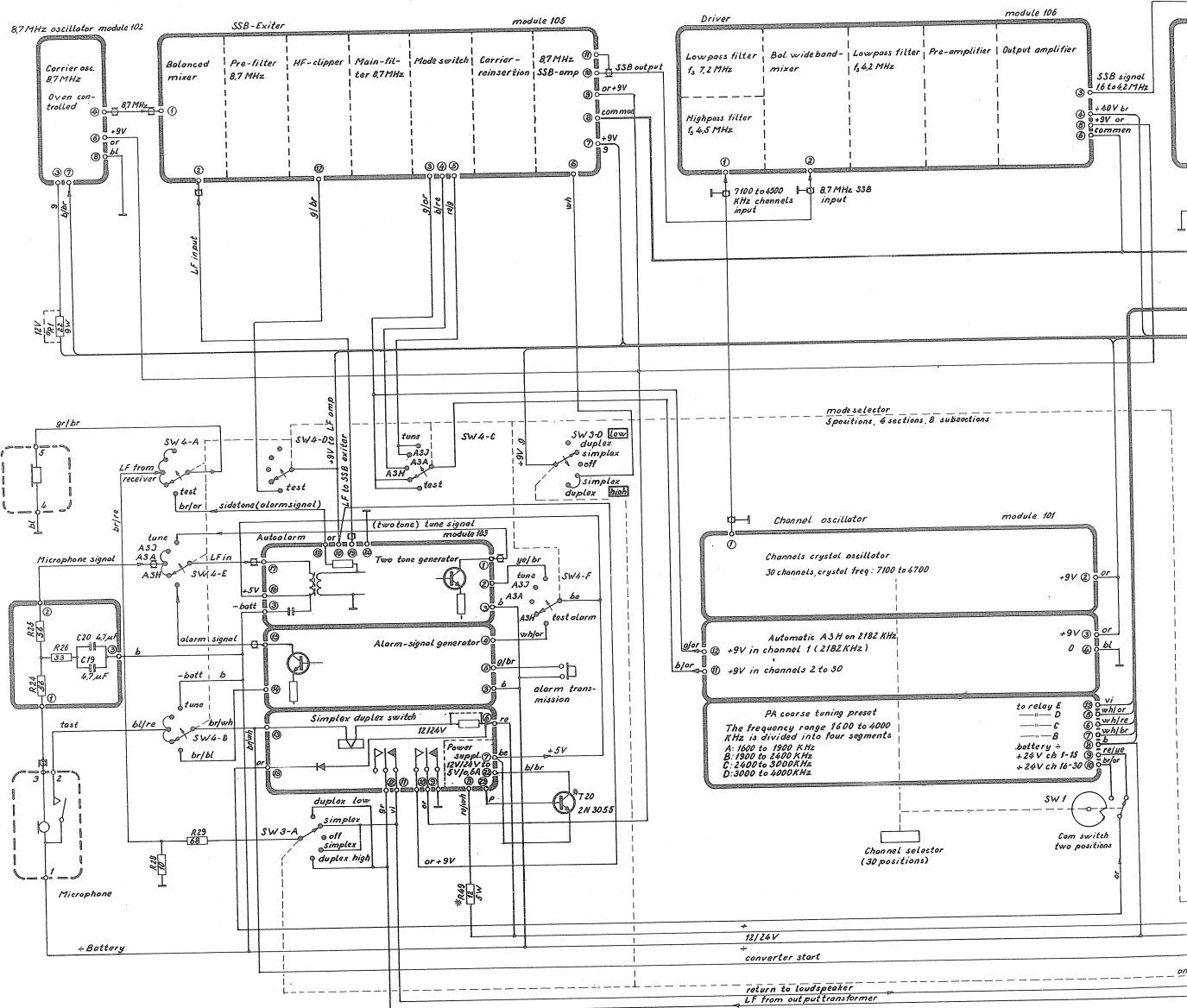
At the input there is an Input Filter consisting of 2 π circuits, one for each section. These effectively suppress any noise spikes generated in the converter and also equalize any transient voltages on the supply leads.

The main transformer (TR 2) has 6 secondary windings. Four of these windings each give 250 volts to the four rectifier bridges. The output from these four circuits are series connected to give 1000 volts, the high voltage requirements

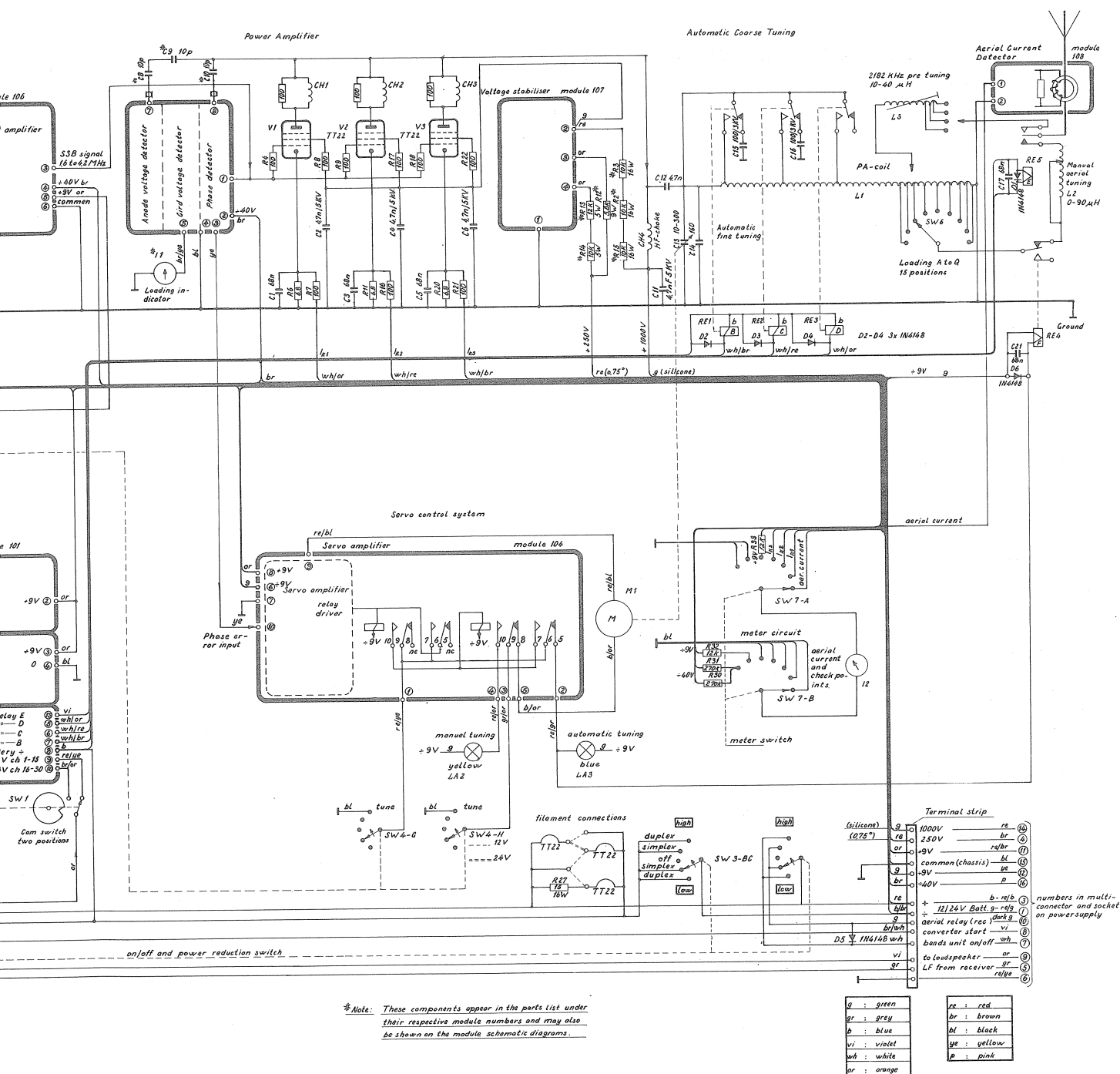
The screen voltage requirements of 250 volts is obtained from the bridge circuit nearest to chassis potential (D 6)

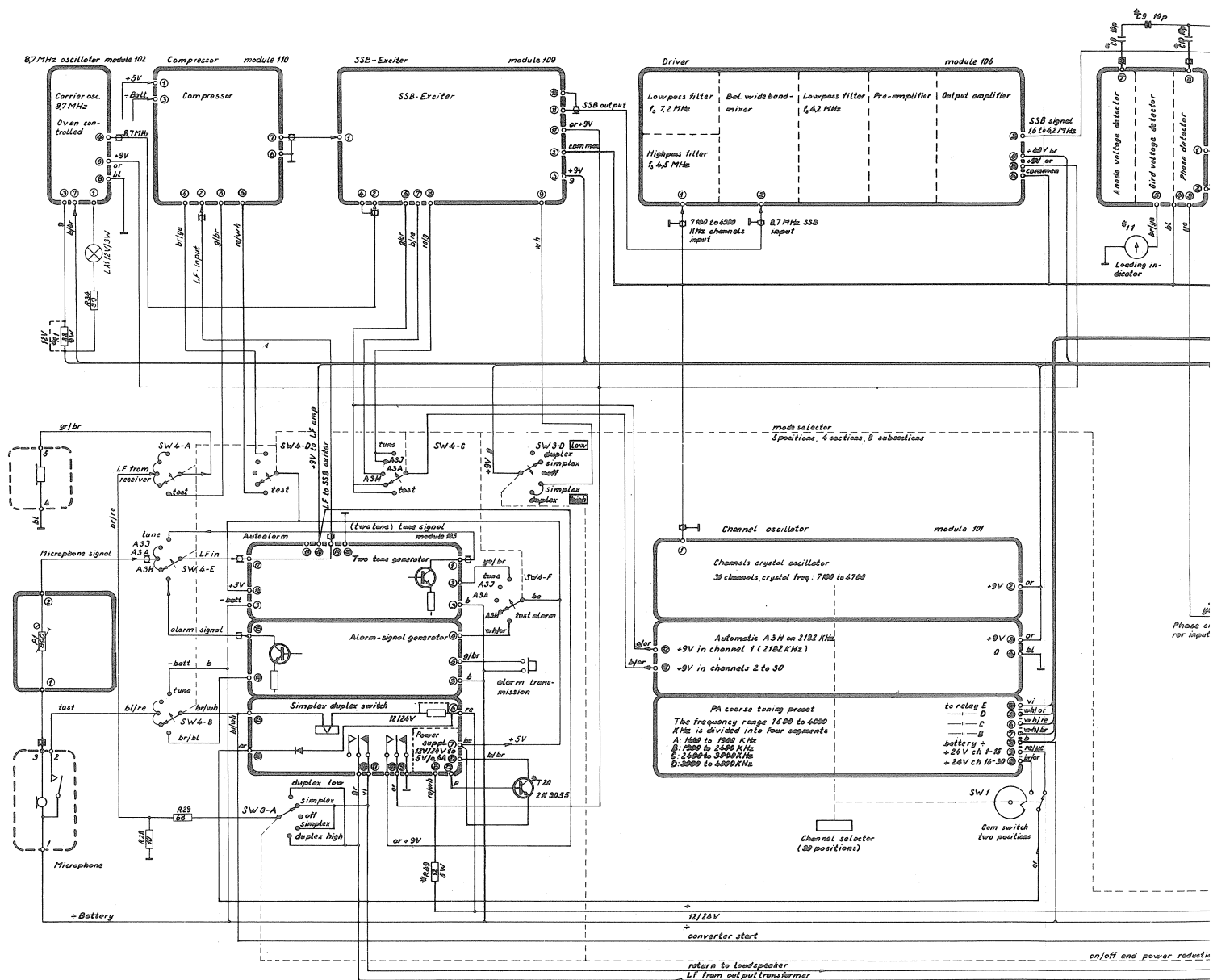
The 5th secondary winding supplies 55 volts which is regulated and stabilized down to -40 volts for the negative grid supply.

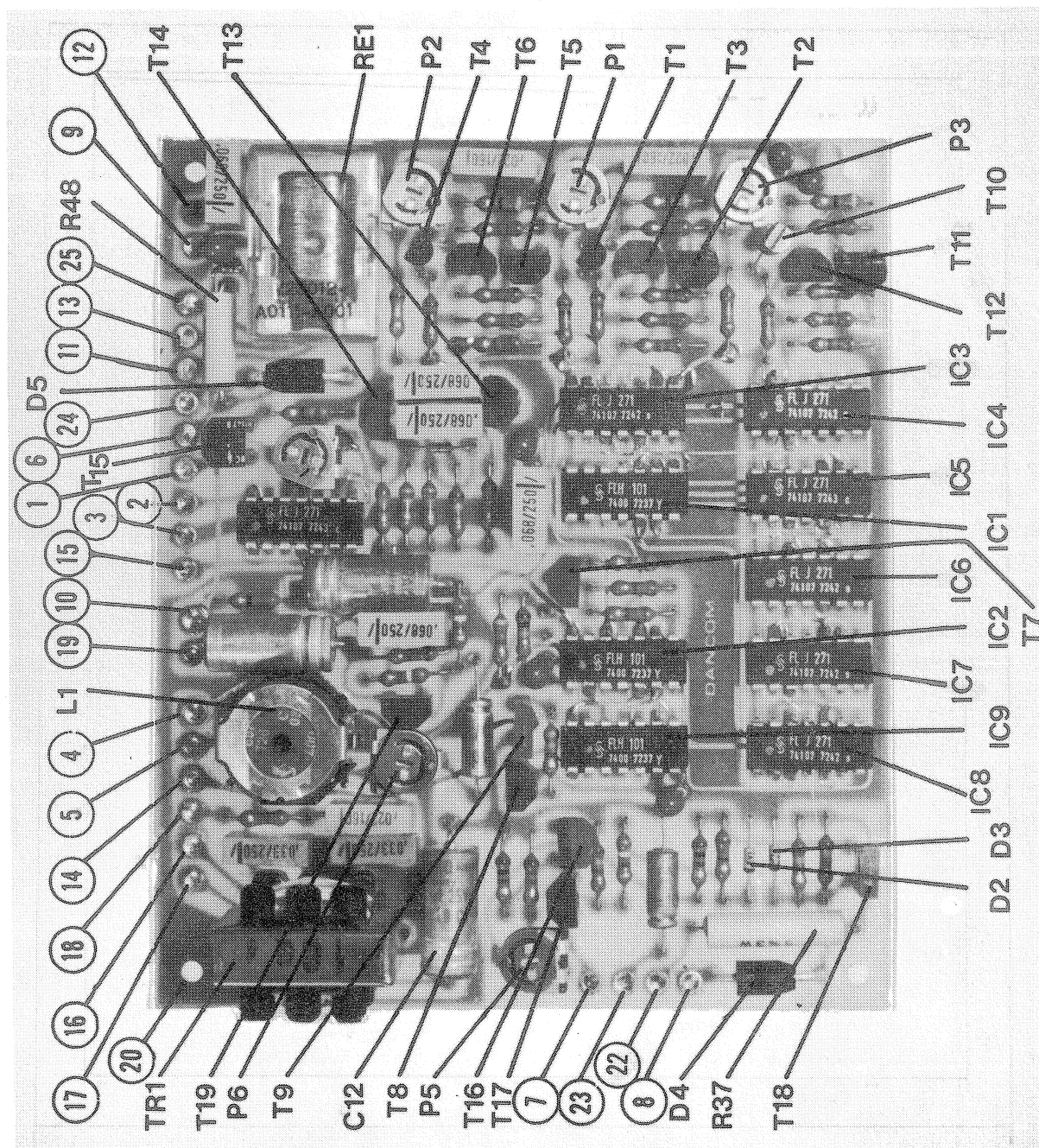
The 6th and final winding delivers 30 volts center-tapped which is rectified to deliver +15 volts and -15 volts relative to chassis and fed to a series stabilizer which controls the low voltage for the small signal circuits of the transmitter at +9 volts and -9 volts relative to chassis.

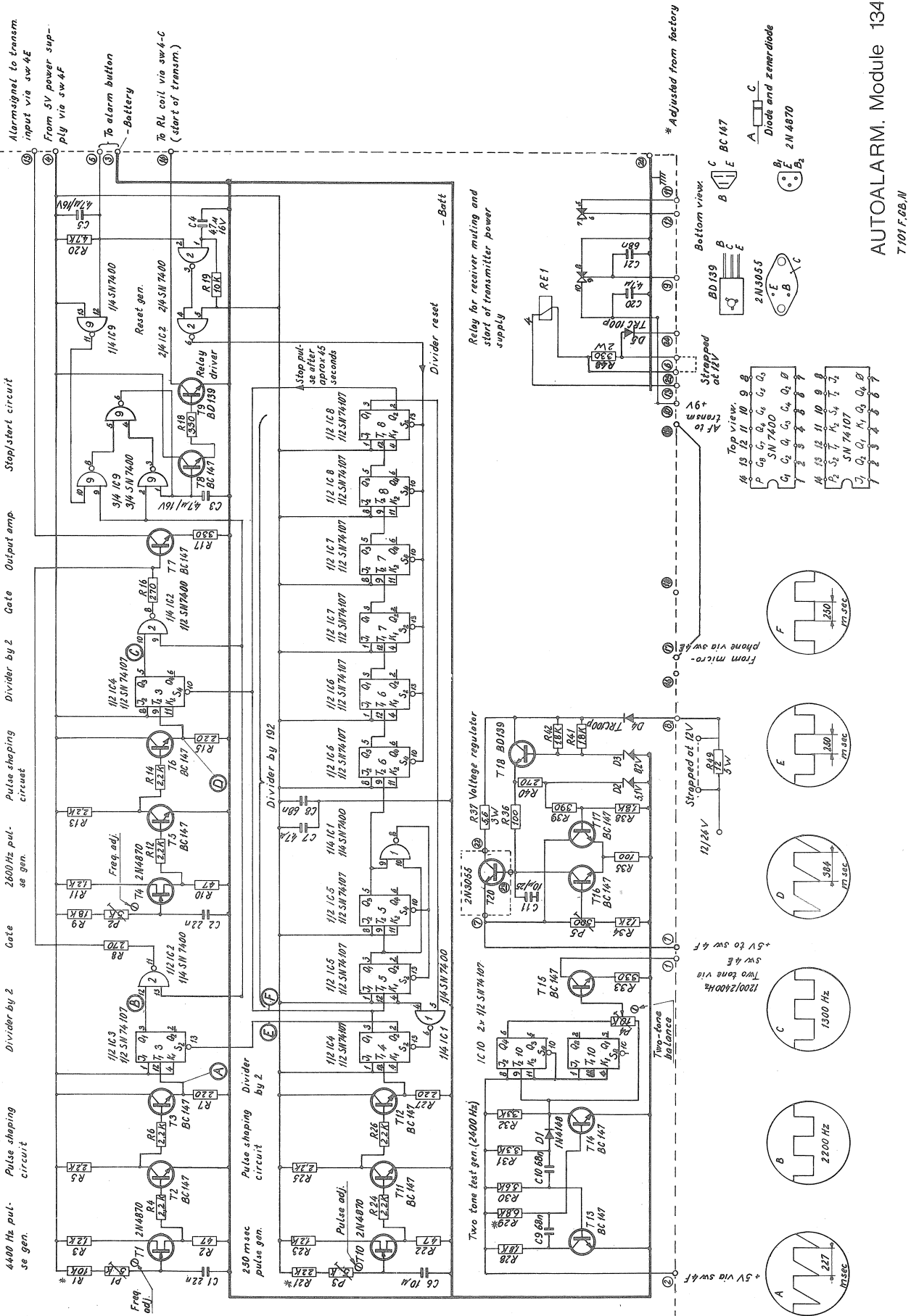


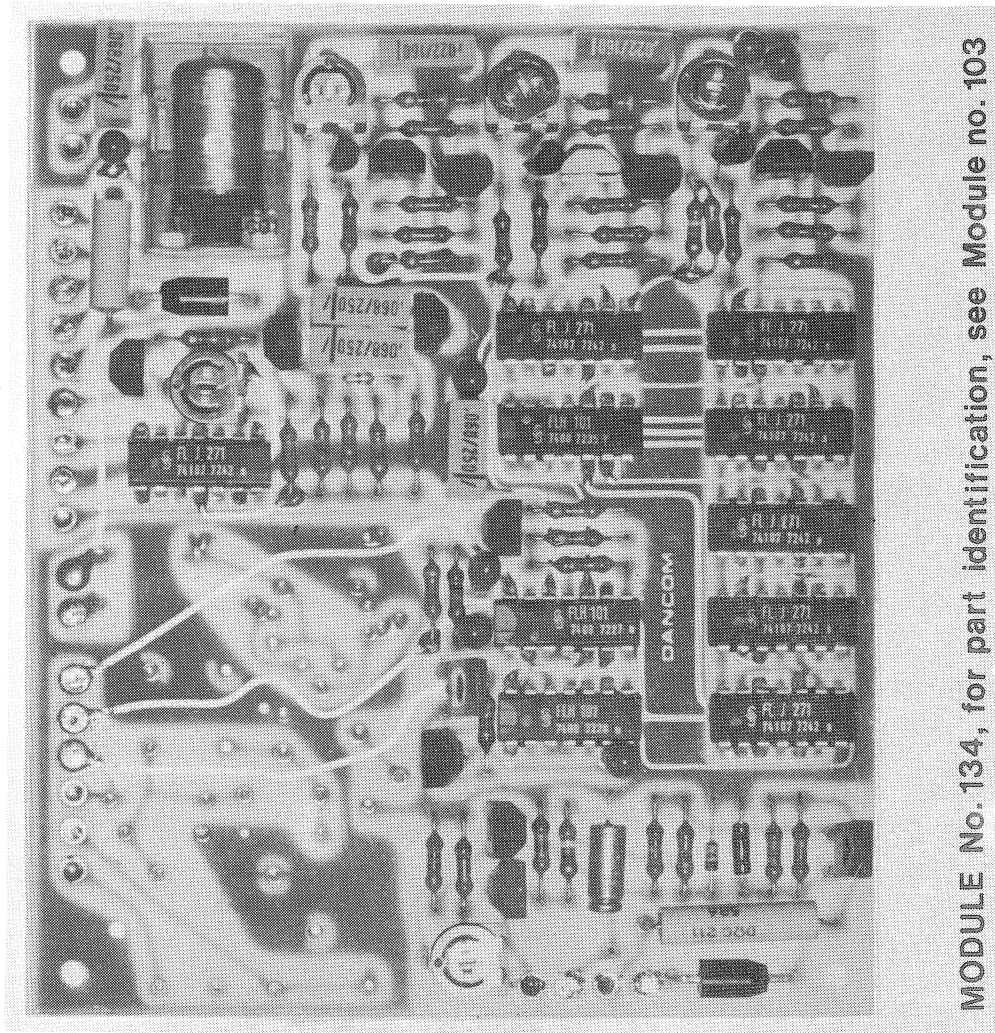
5. A. TRANSMITTER DIAGRAMS

TRANSMITTER INTERCONNECTION DIAGRAM
AND FINAL AMPLIFIER T101, DK., D., NL.

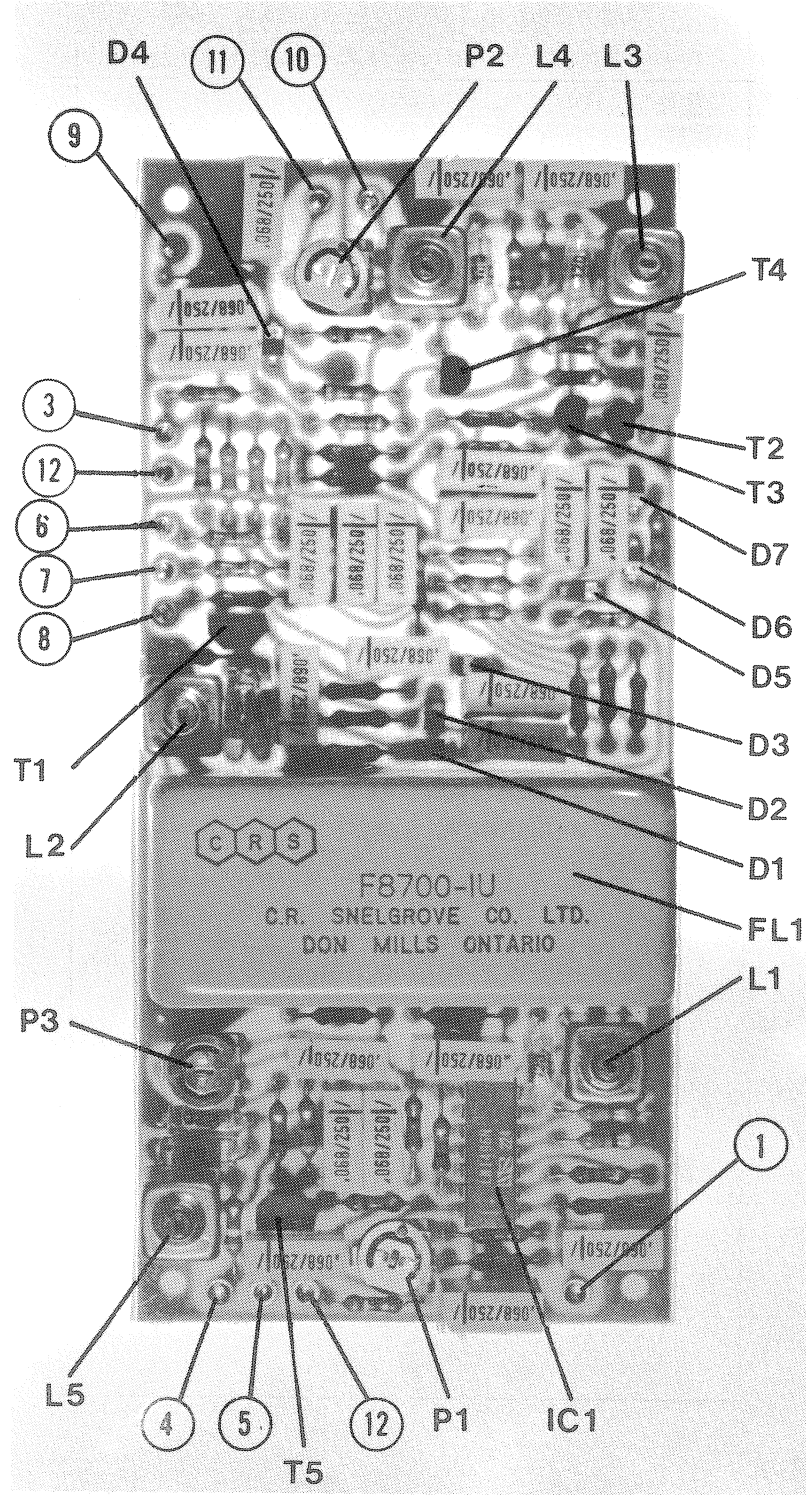


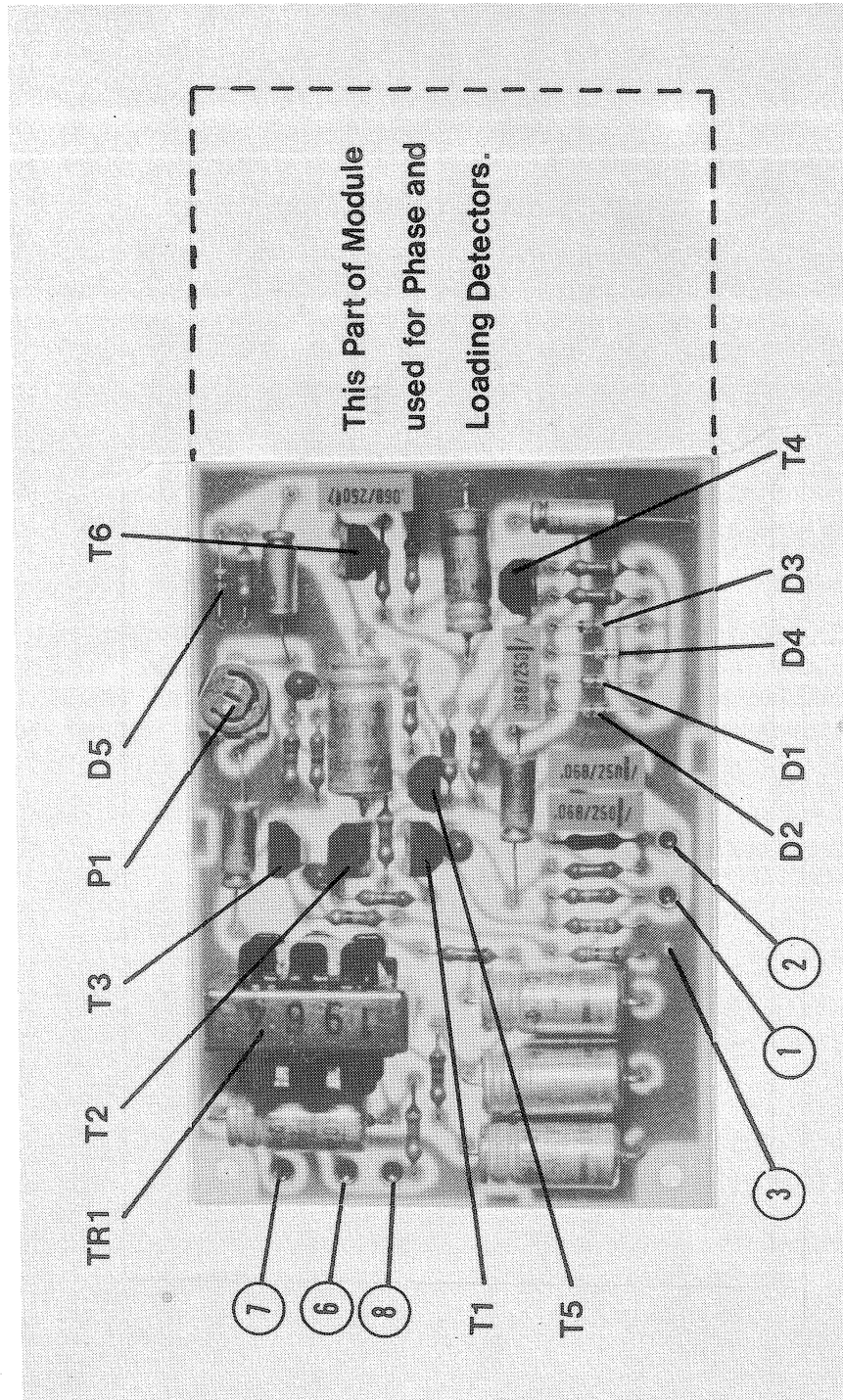


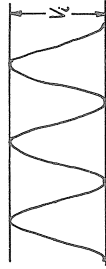




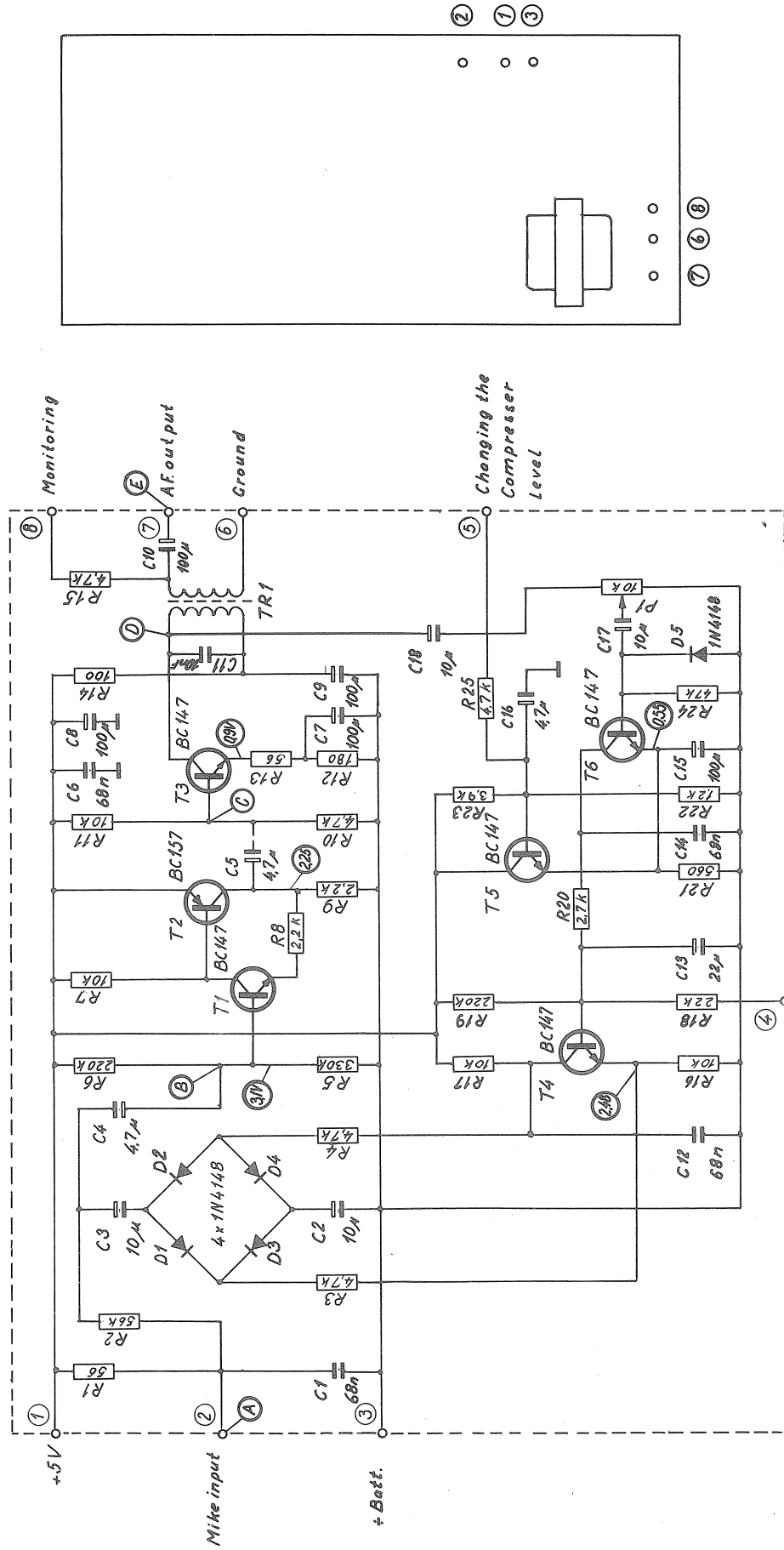
MODULE No. 134, for part identification, see Module no. 103





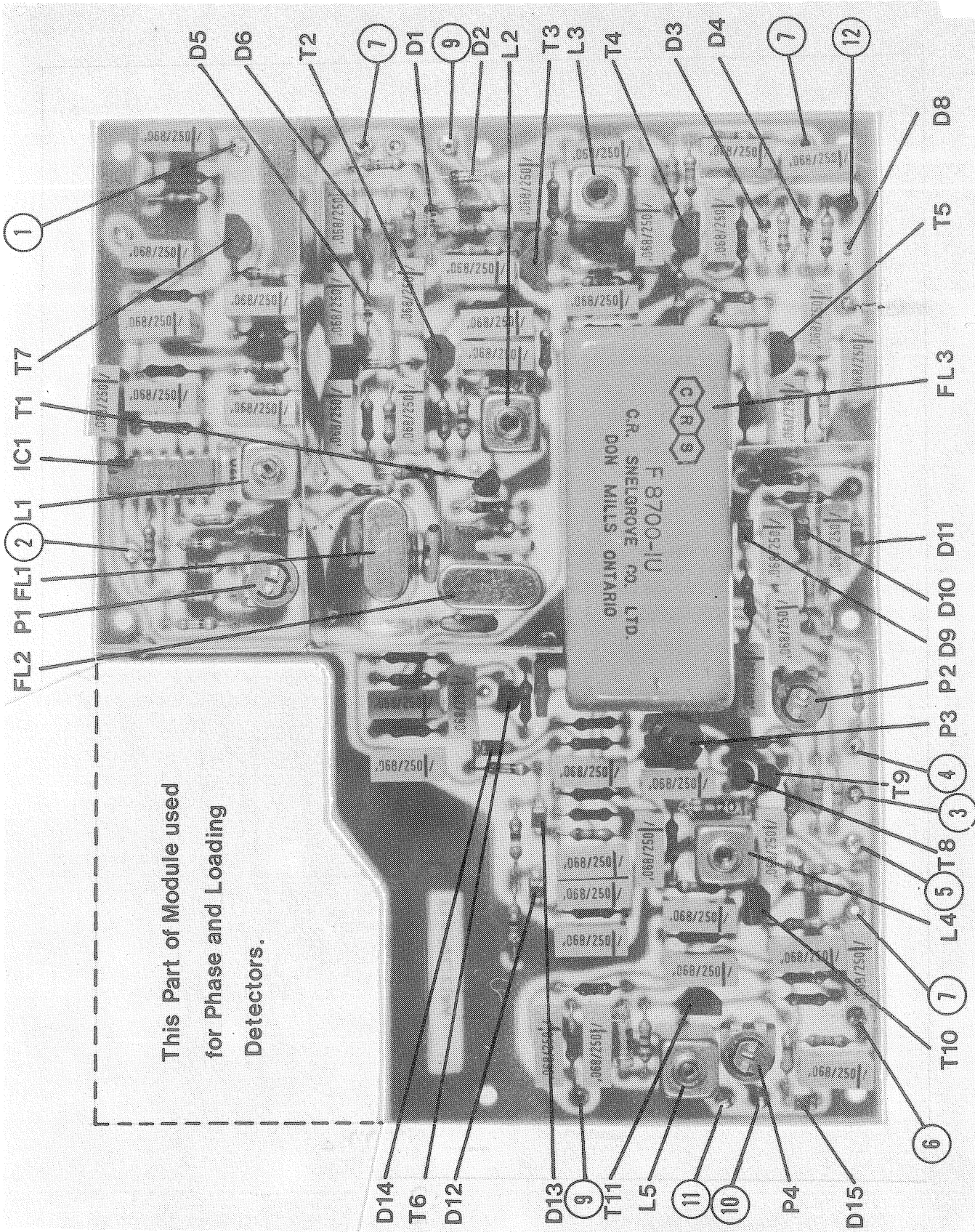


Typical Voltages					
	A	B	C	D	E
V_i mV	250	150	150	2000	420
Freq. Hz	1100				

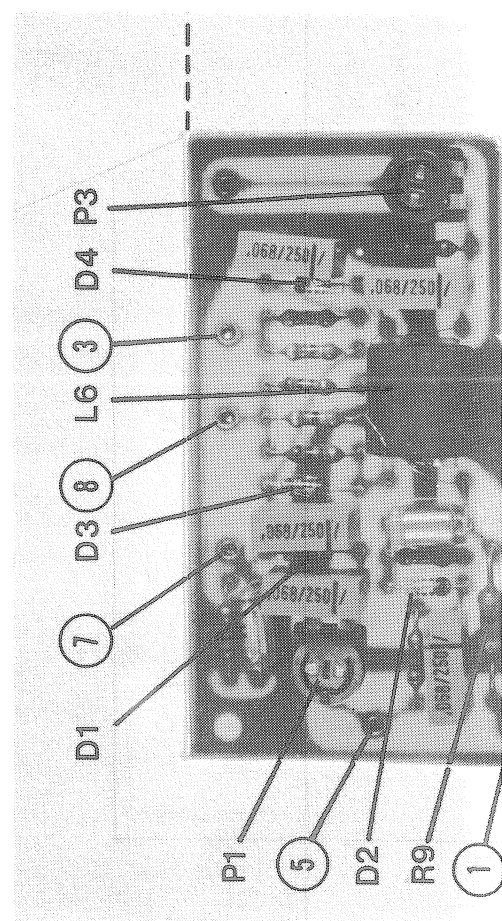
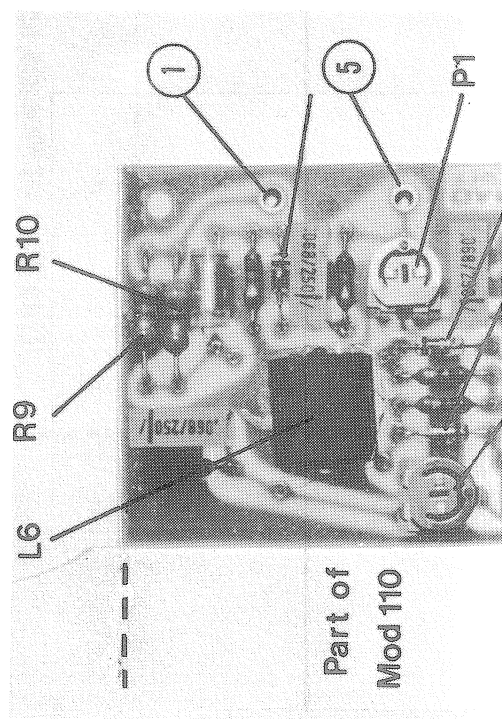
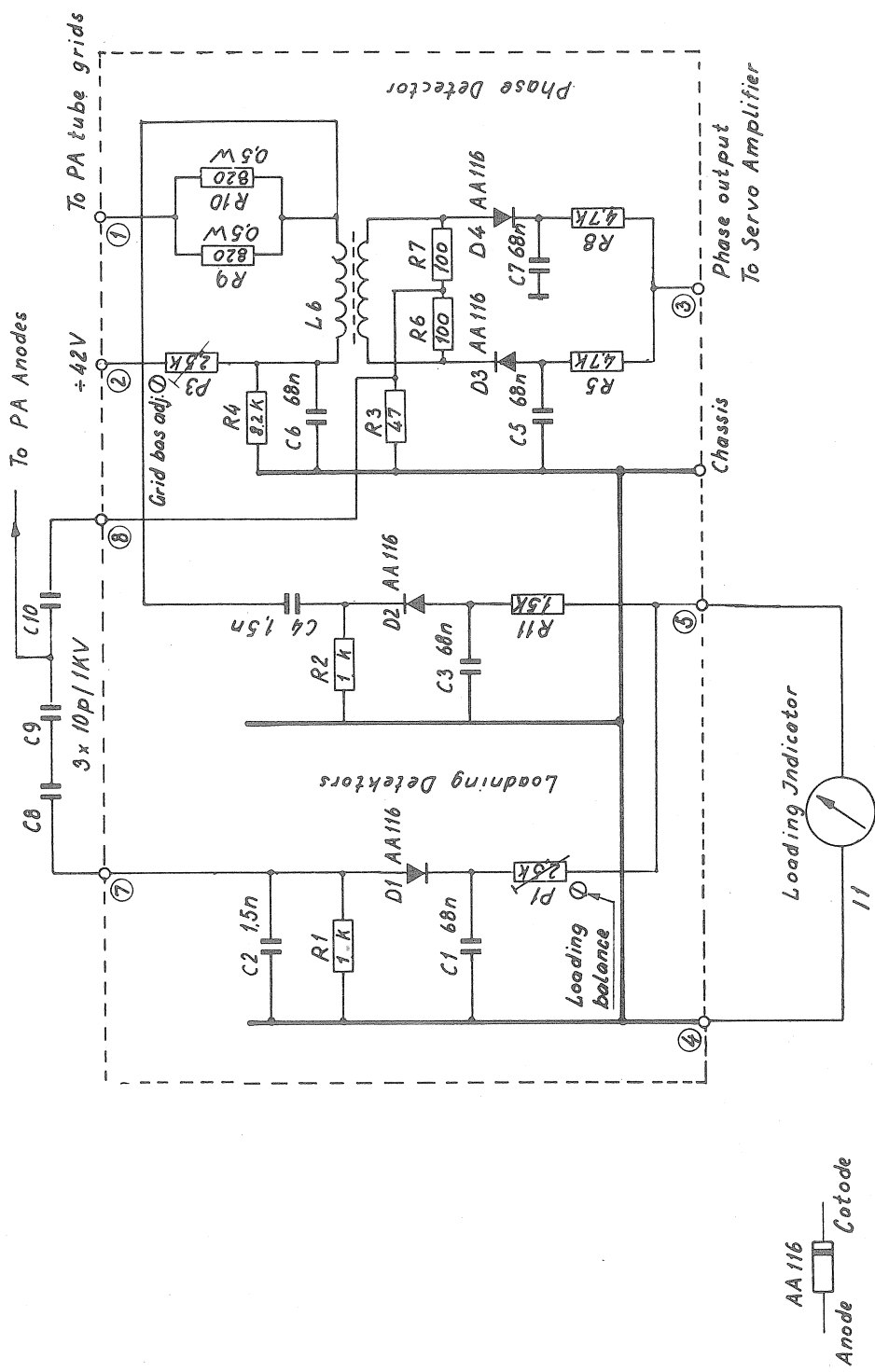


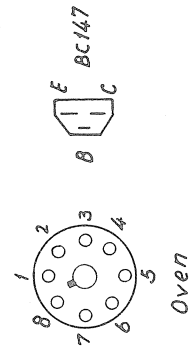
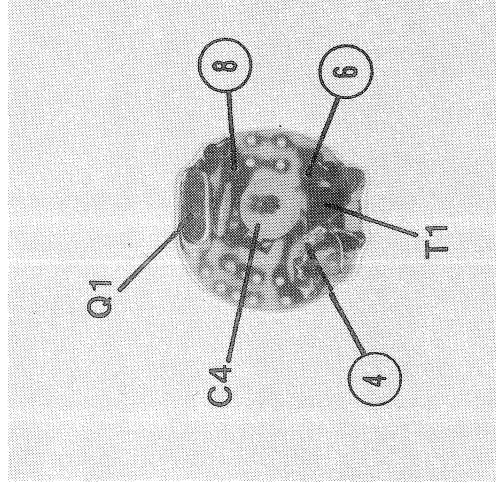
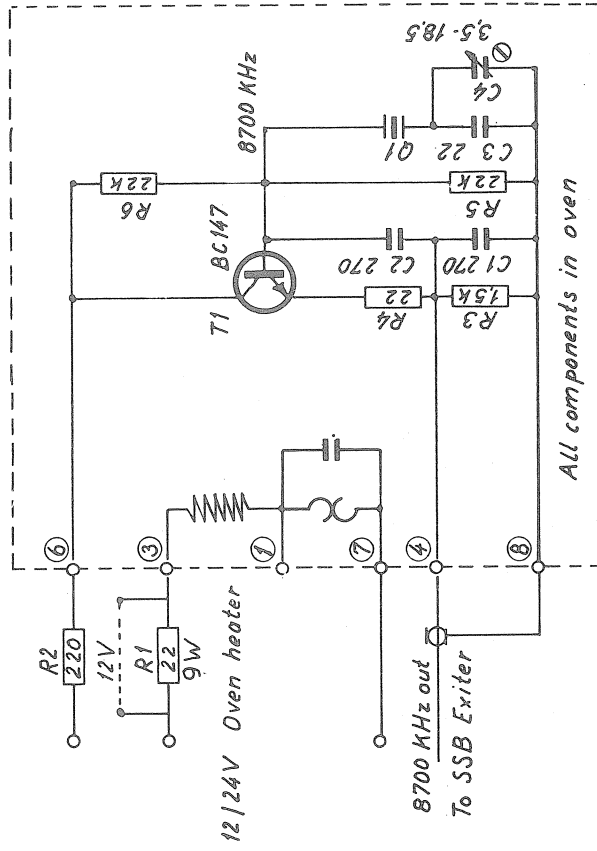
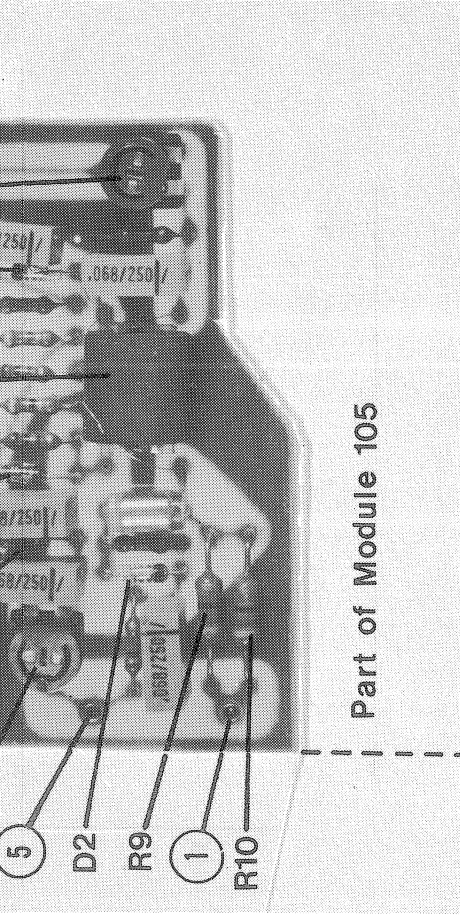
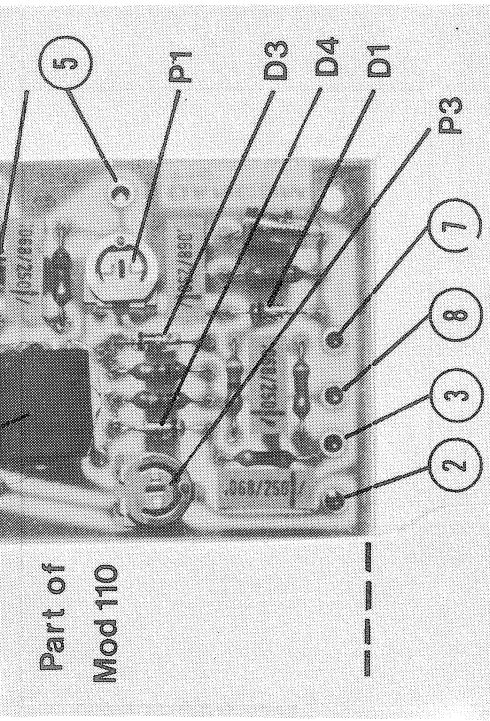
COMPRESSOR. Module 110.

T 101, F, CB and N

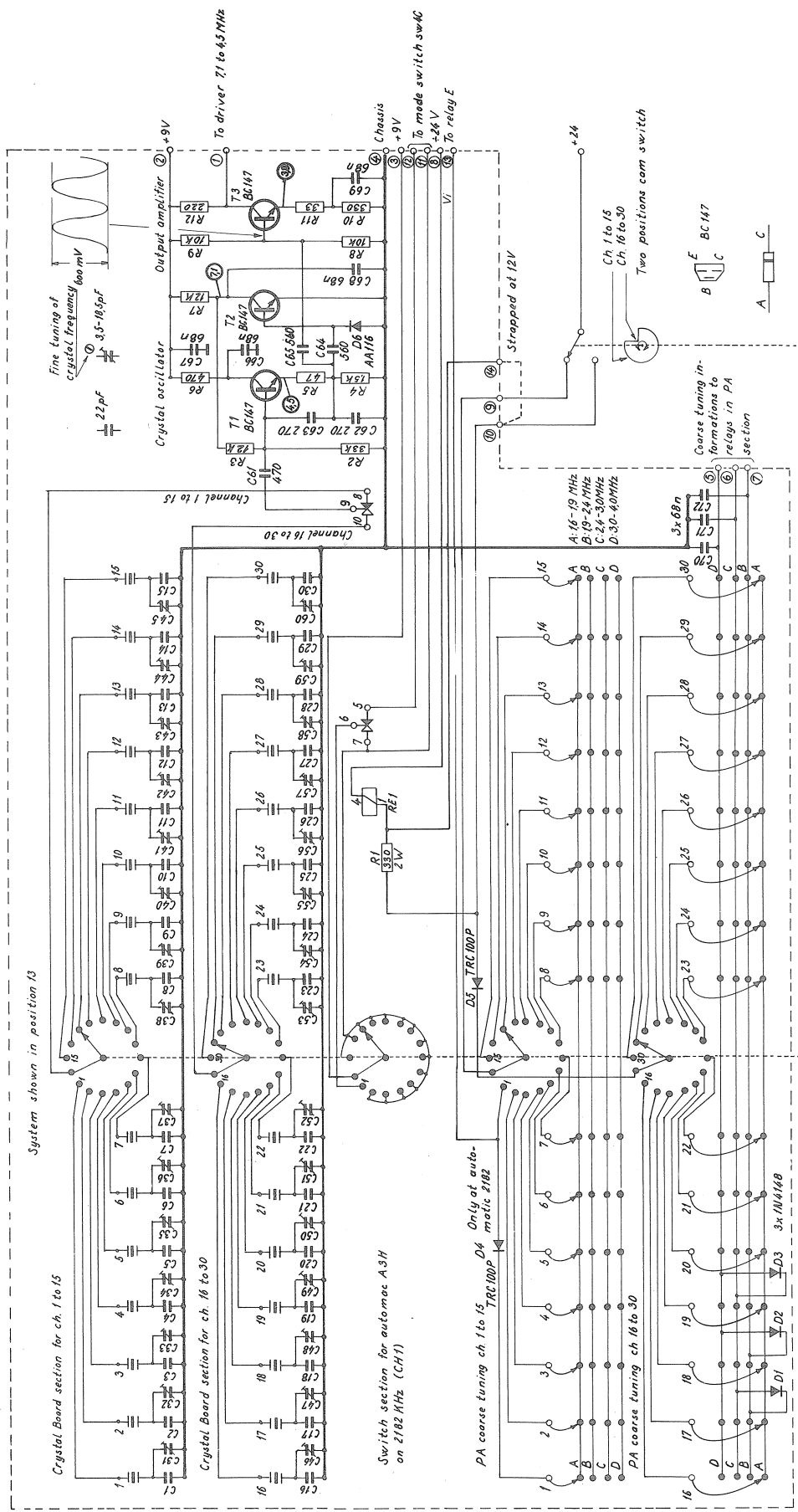


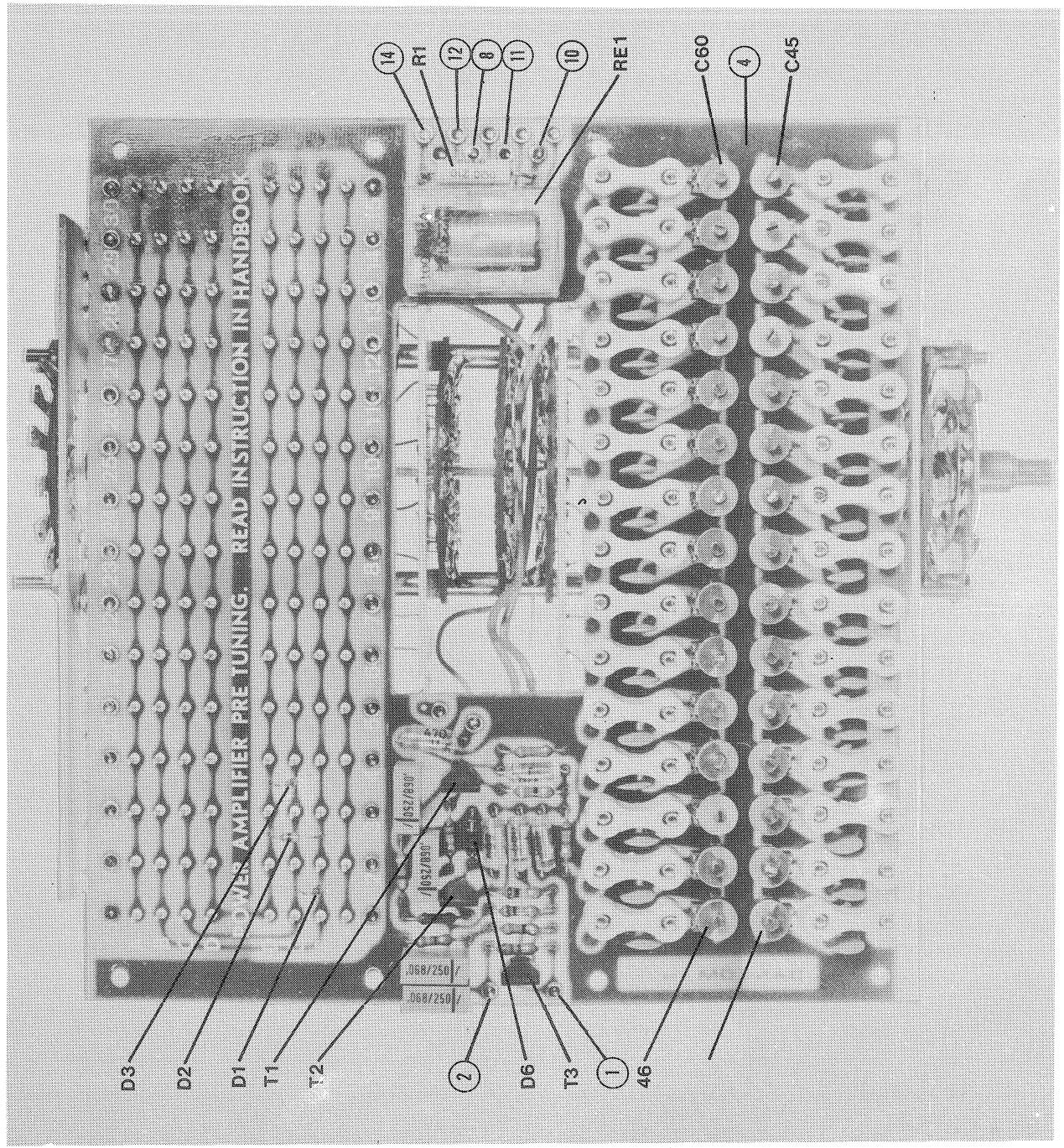
PHASE & LOADING DETECTORS.,

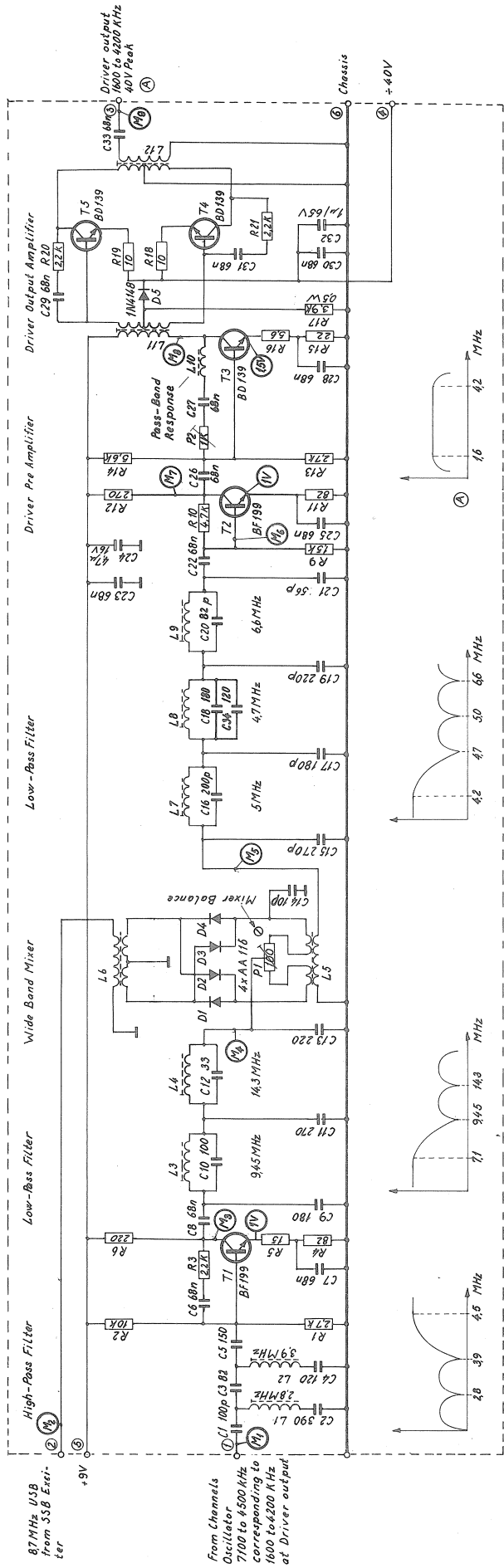




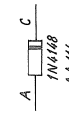
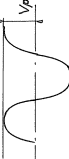
8.7MHz CRYSTAL OSC. Module 102.



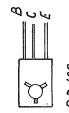




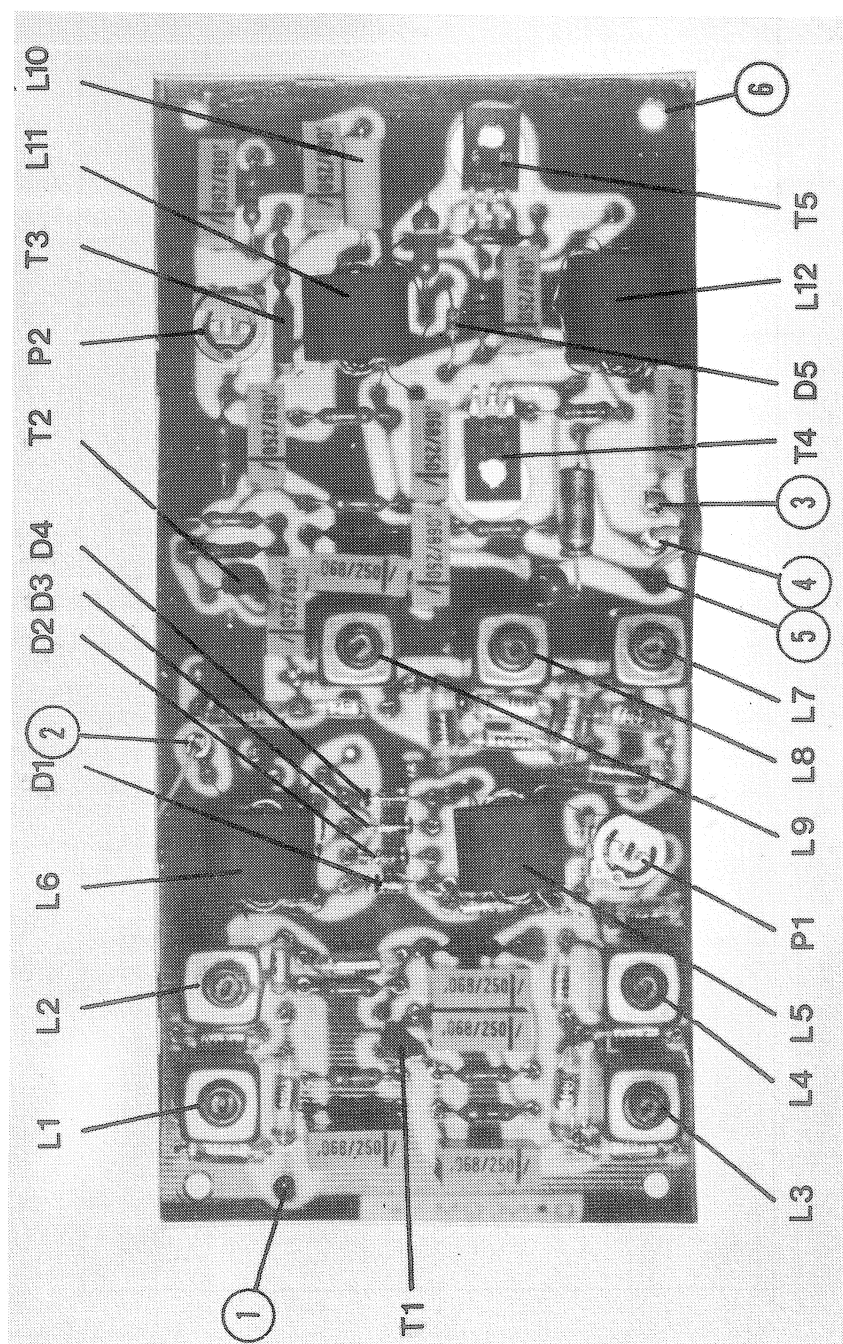
M ₁	M ₂	M ₃	M ₄	M ₅	M ₆	M ₇	M ₈	M ₉
300m	75m	1.5	10	35m	0.35	20	40	

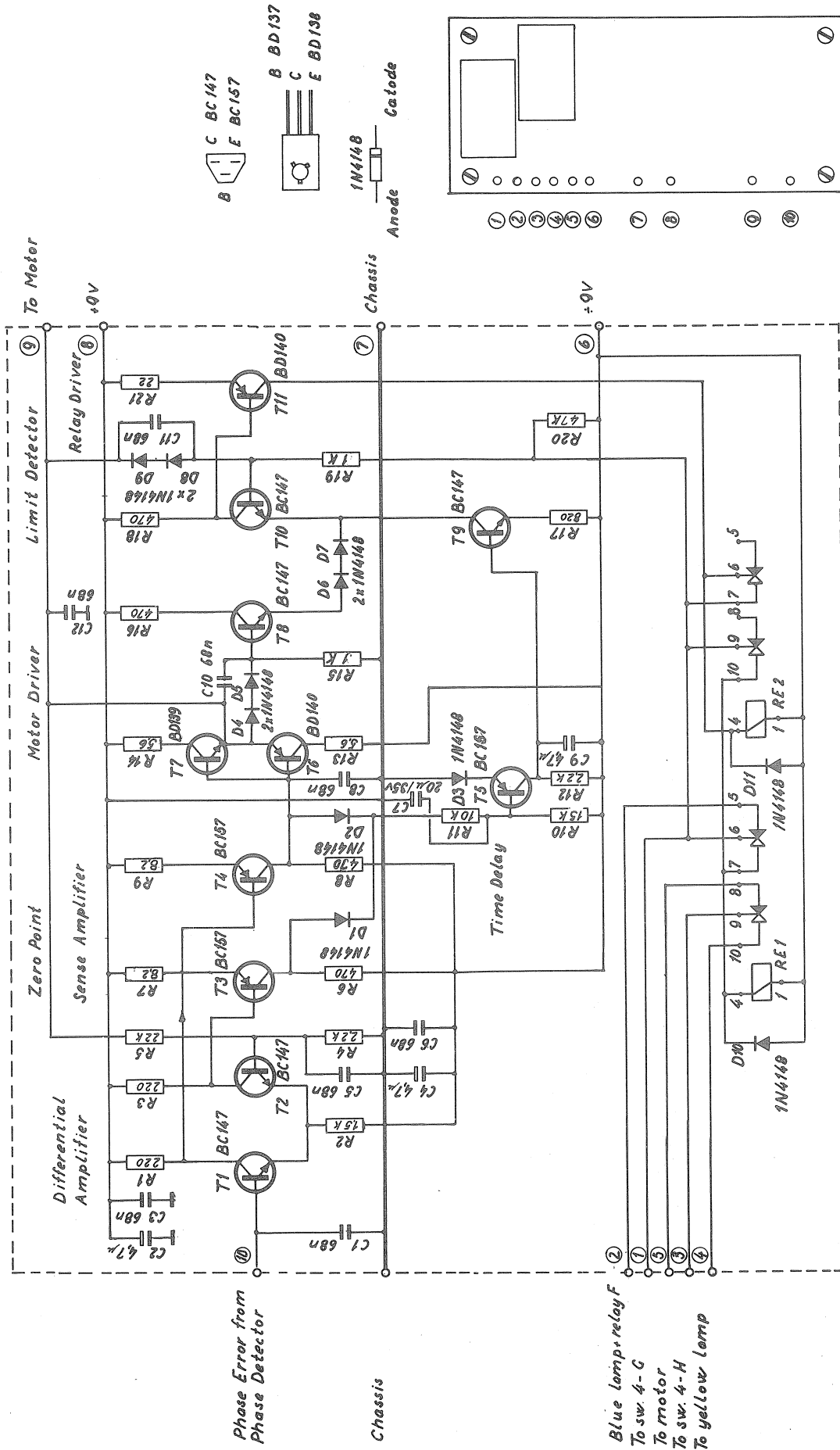


BF 173

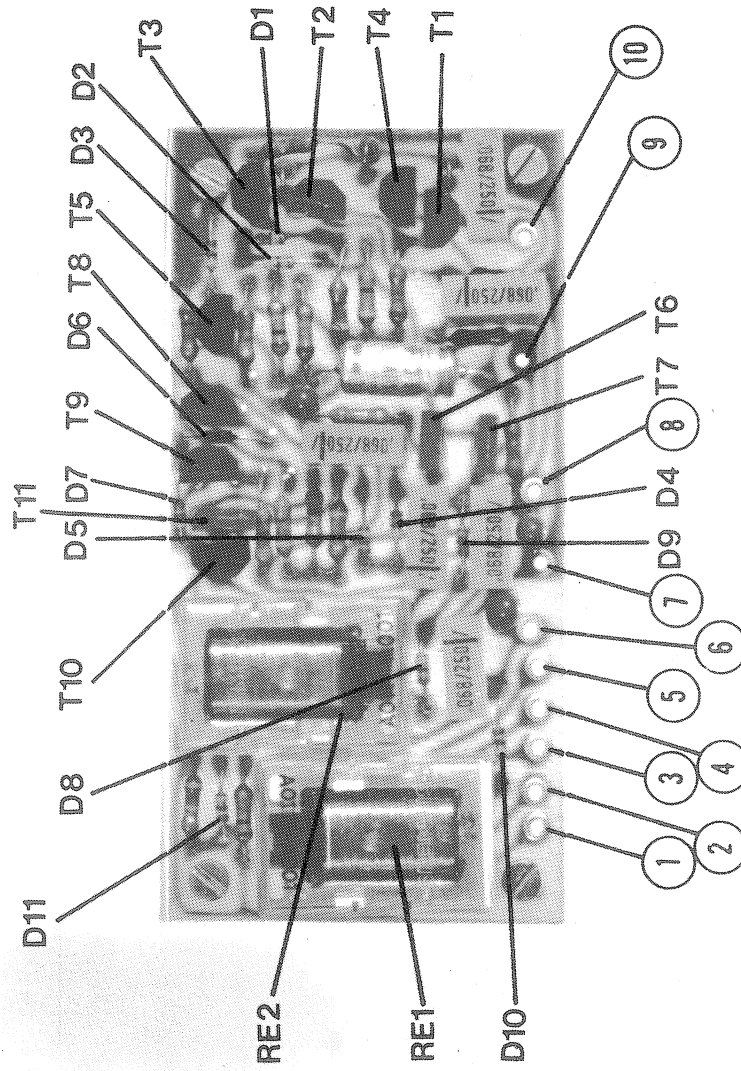


DRIVER. Module 106.
7101, all versions





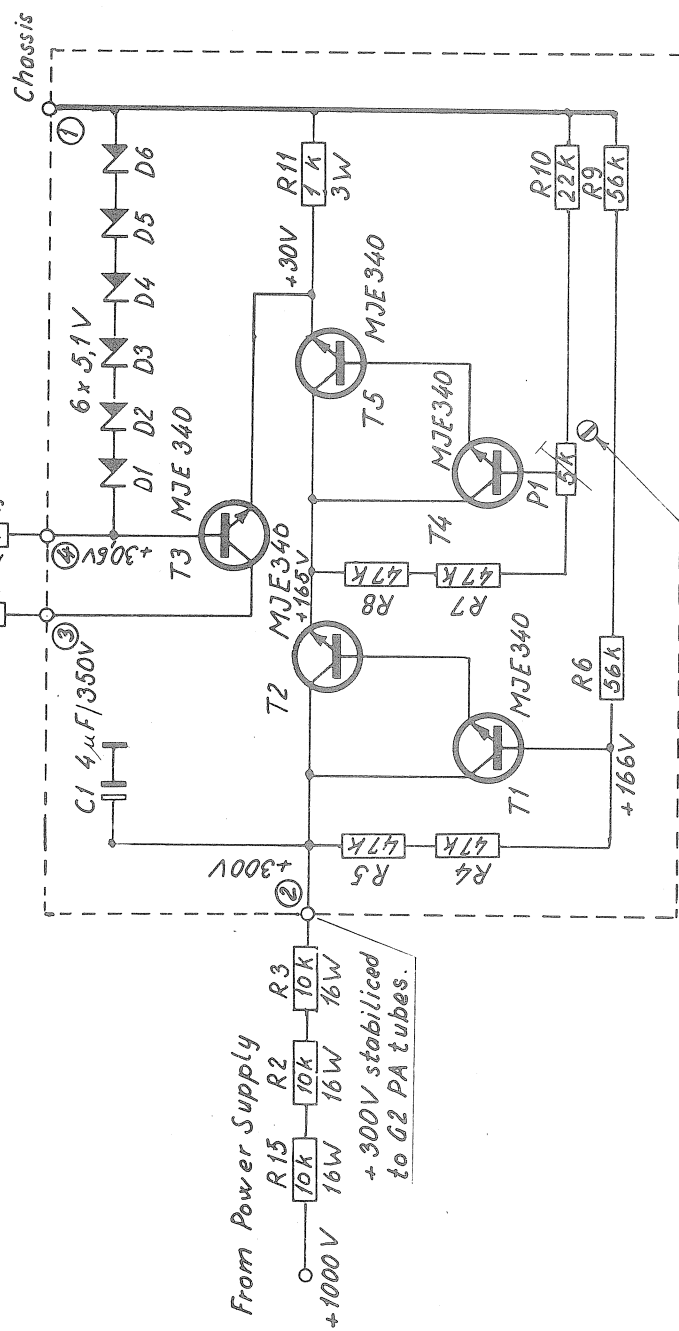
SERVO AMPLIFIER, Module 104.
T101, all versions



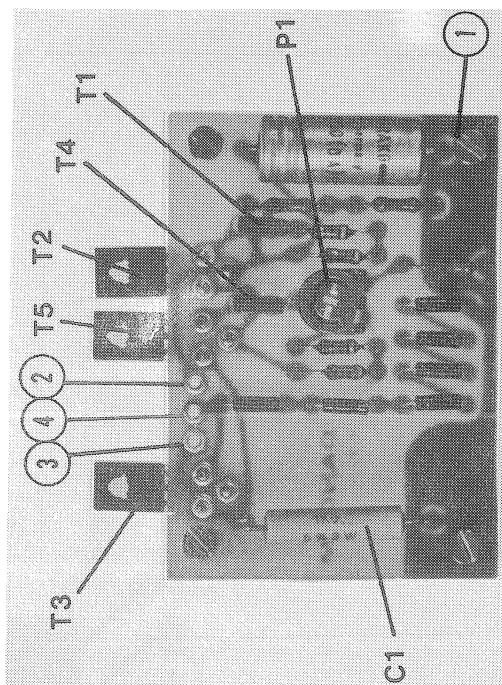
+250V From Power Supply



Zener Diode
Anode Cathode

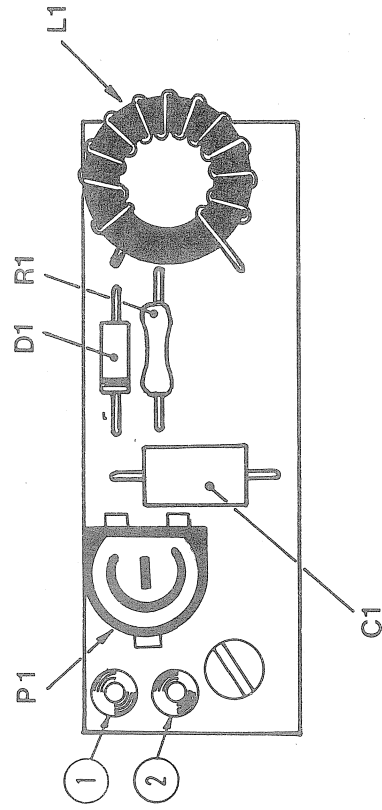
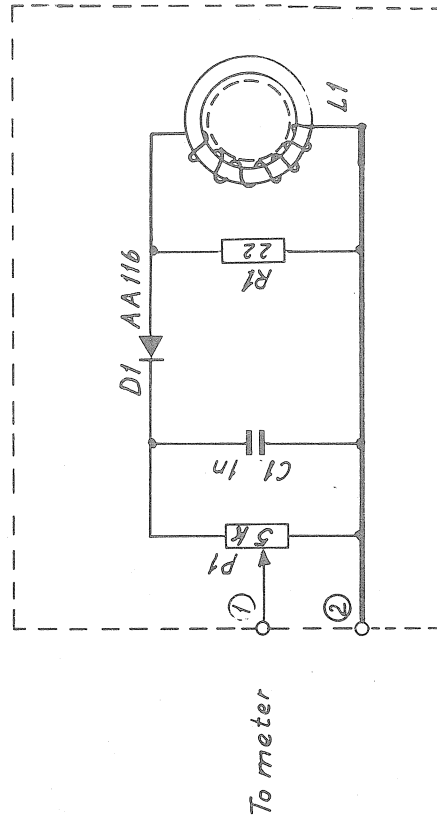


Output volta-
ge adj.



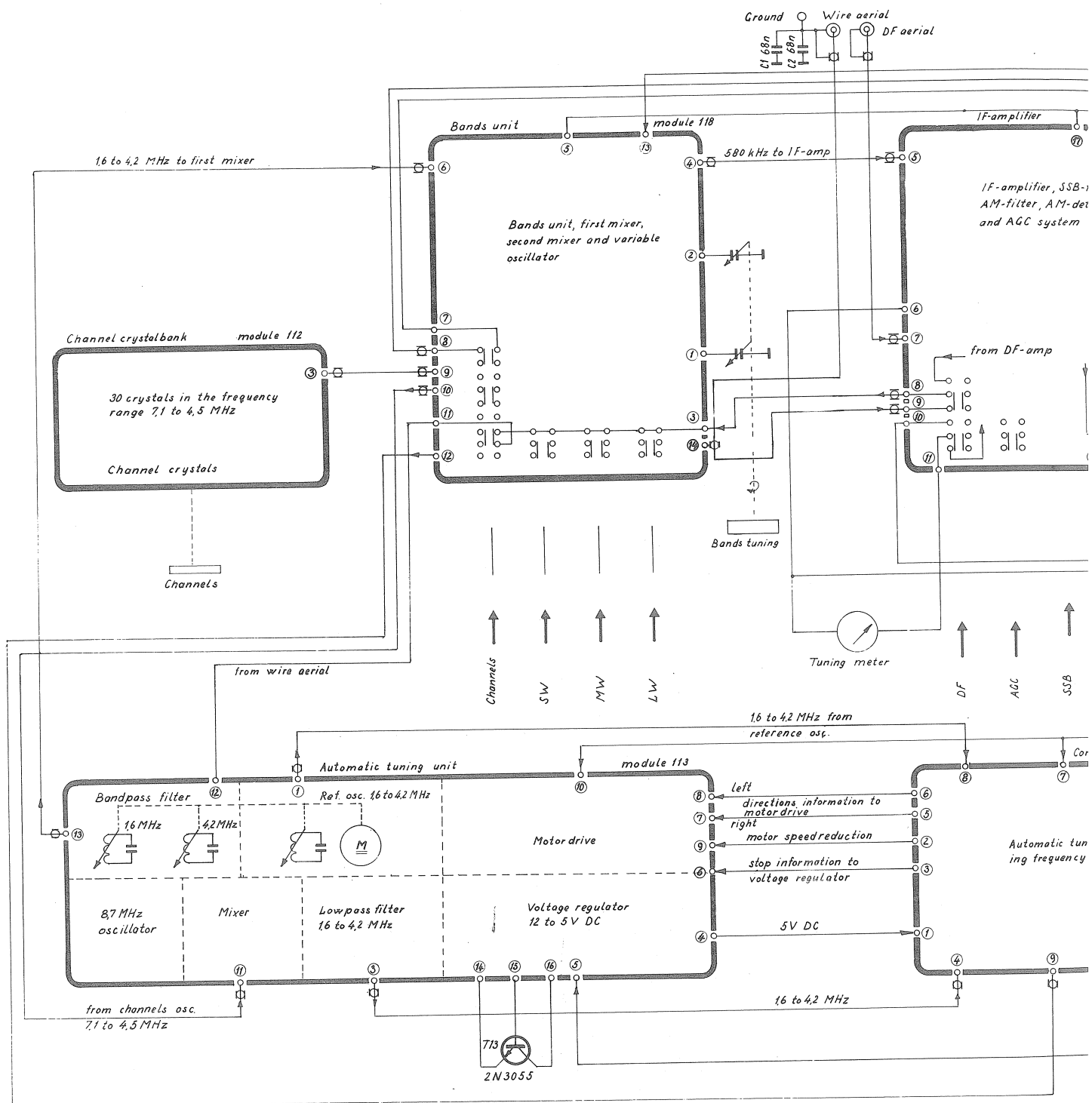
VOLTAGE STABILISER. Module 107. *T101, all versions.*

T101, all versions.

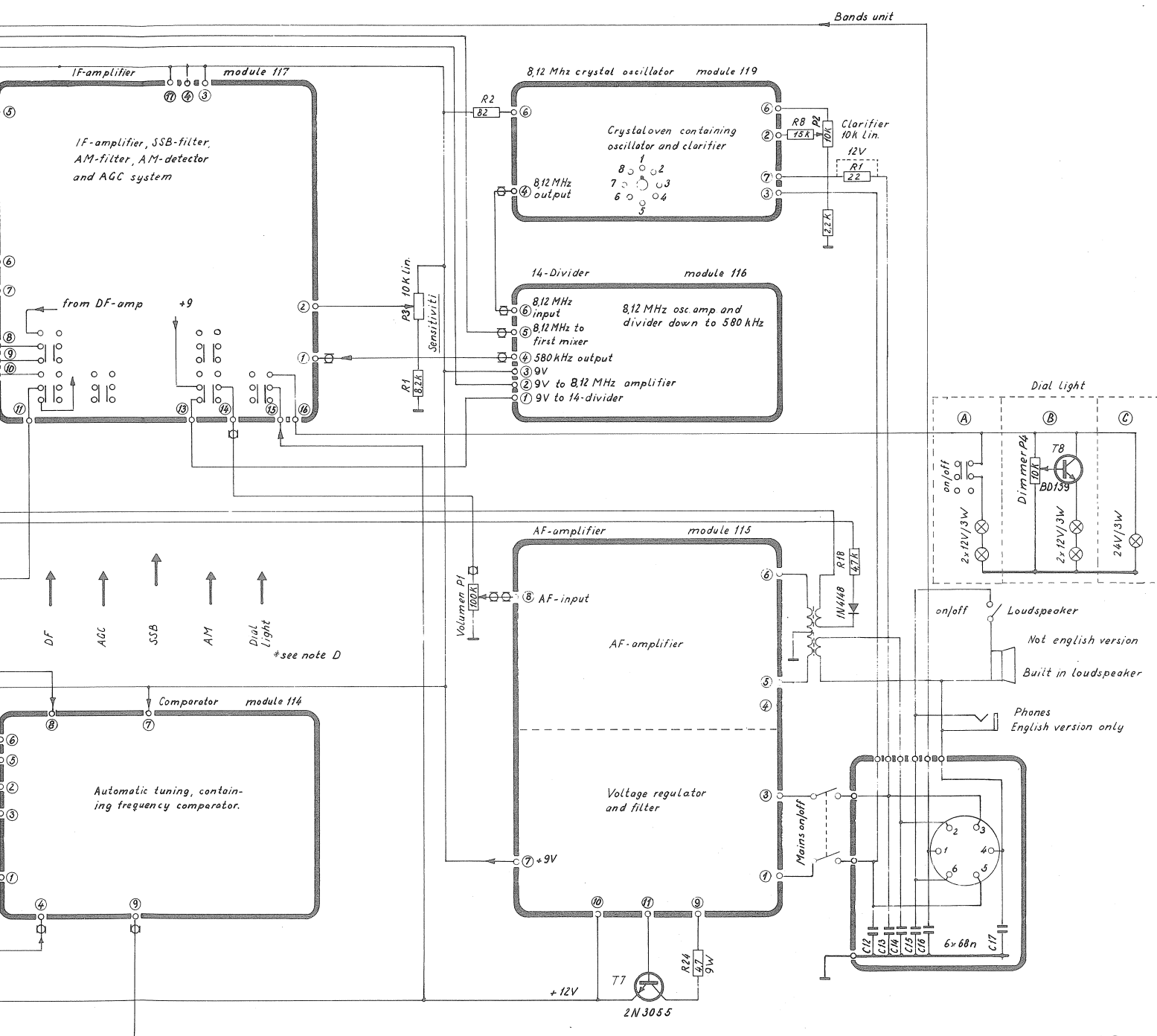


AERIAL CURRENT DETECTOR. Module 108.

T101 all versions.



5. B. RECEIVER DIAGRAMS



Note: (A) Only for R101 D, N, NL
 (B) Only for R101 GB
 (A) + (C) Only for R101 F
 (D) This switch is used as
 loudspeaker switch on
 R101, GB version.

RECEIVER INTERCONNECTION DIAGRAM
 R101, D, F, GB, N & NL

580 kHz. to IF-filter

Chassis

Chassis

+9V

To comparator ③

+9V to clarifier

To wide band mixer (Automatic tuning unit)

To transmitter

From channels crystal section 7.1 MHz to 4.5 MHz

Aerial signal to ch band-pass filter

Ant signal from MF print

Osc. circuits

Aerial circuits

Channels

Bands switch SL

Osc. amp

Buffer amp

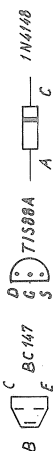
BANDS UNIT, Module 118

R101, D, F, GB, N and NL

Bands Unit 118

R101, D, F, GB, N and NL

Note: R30 ⑩

24V Battery: 2.2 K Ω 0.5WR101GB only: 12V Battery: 12 K Ω 0.5W

1N4148

A

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S

T

U

V

W

X

Y

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J

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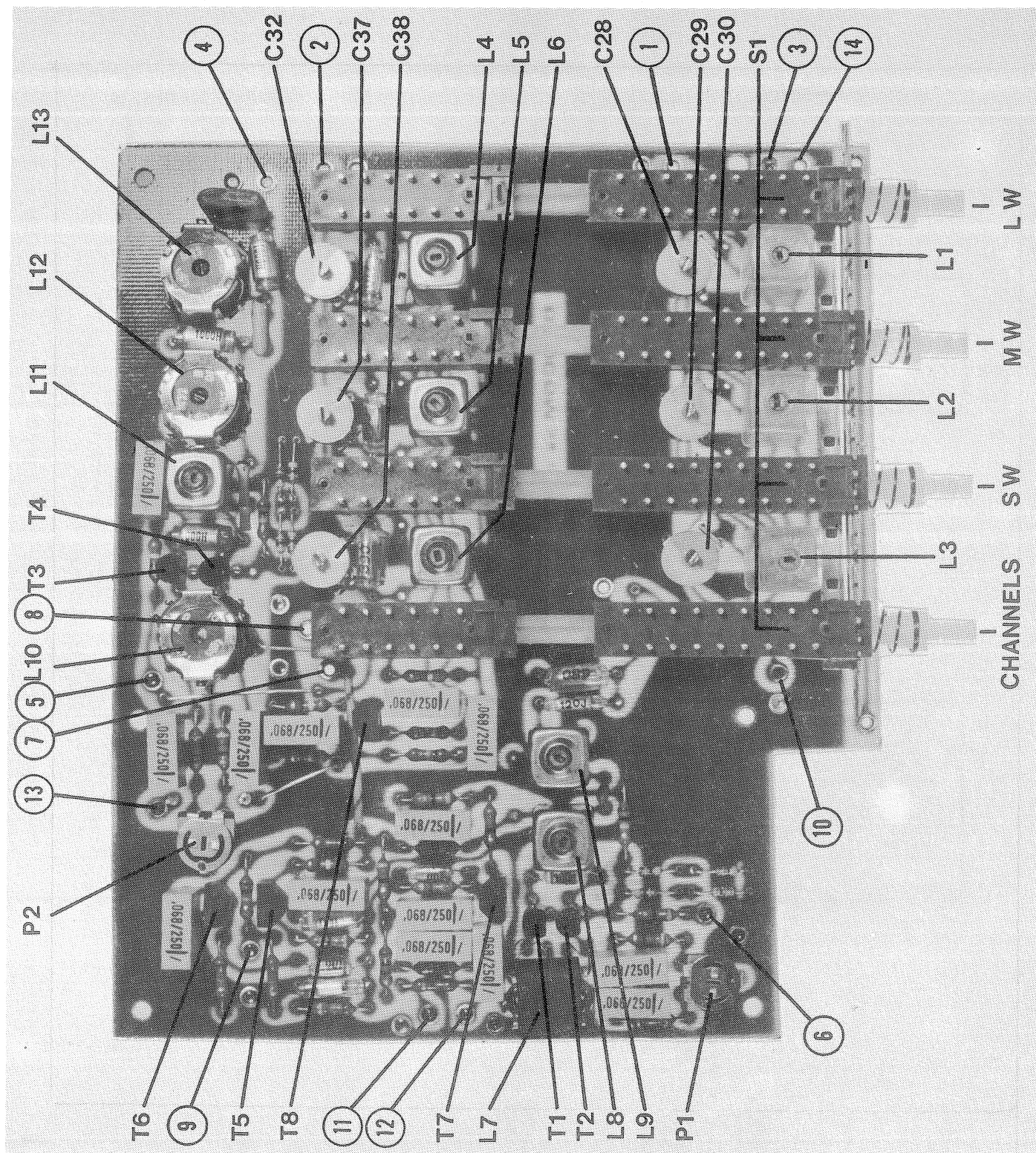
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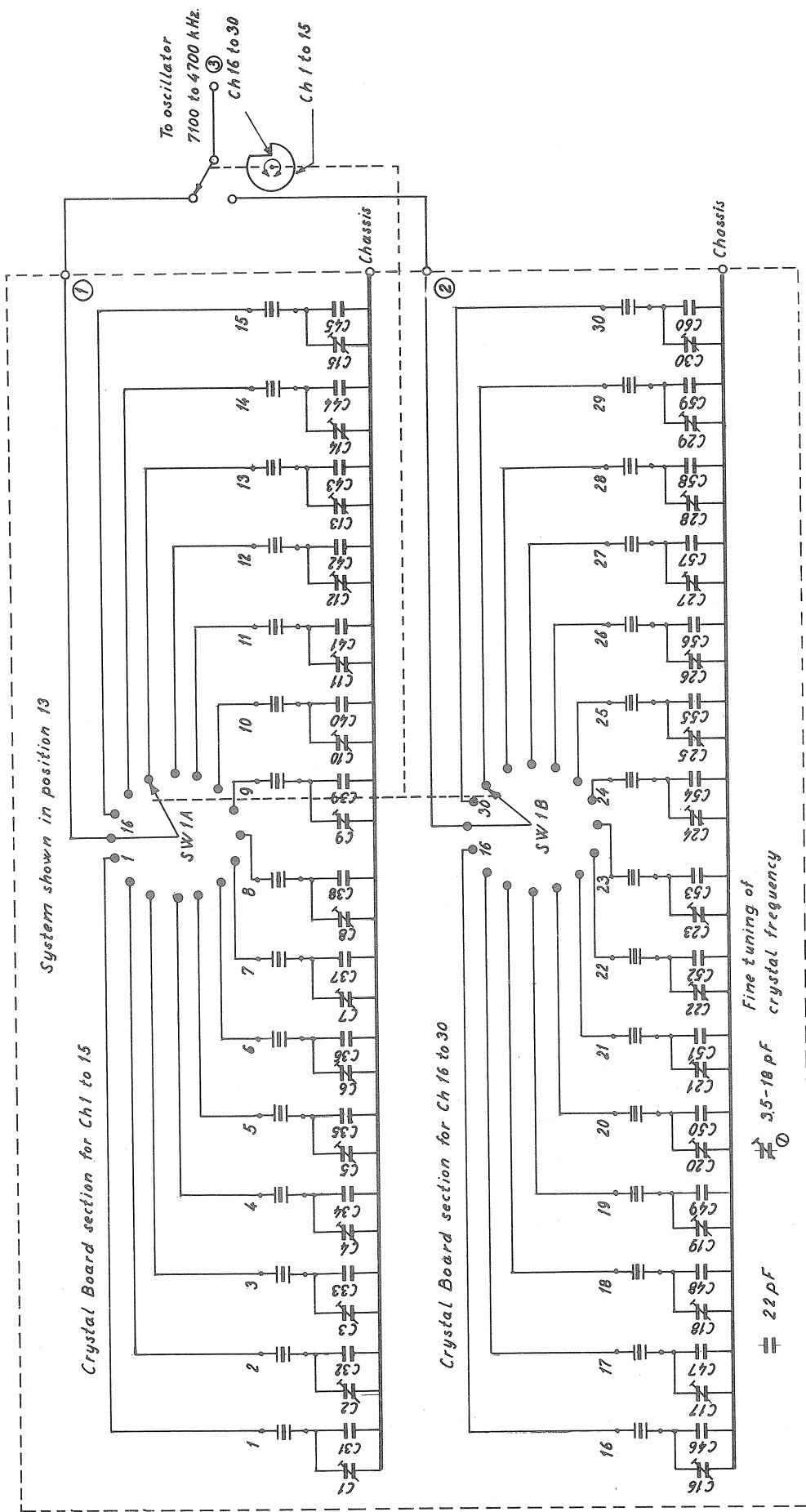
K

L

M

N



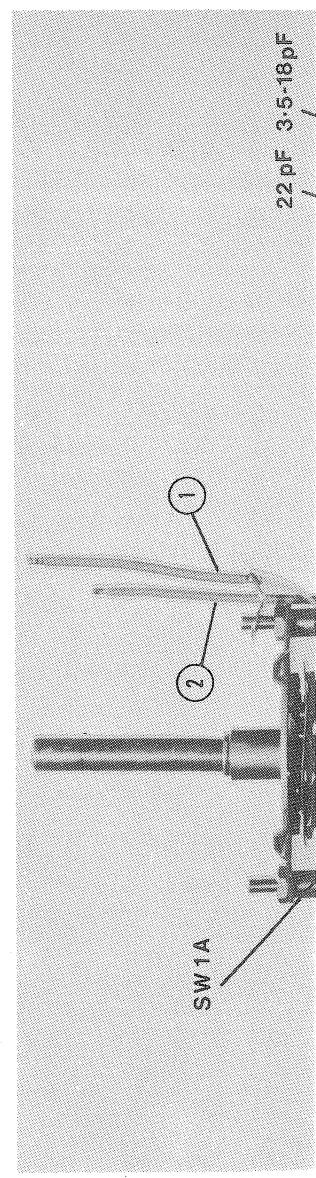


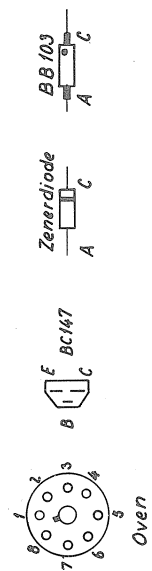
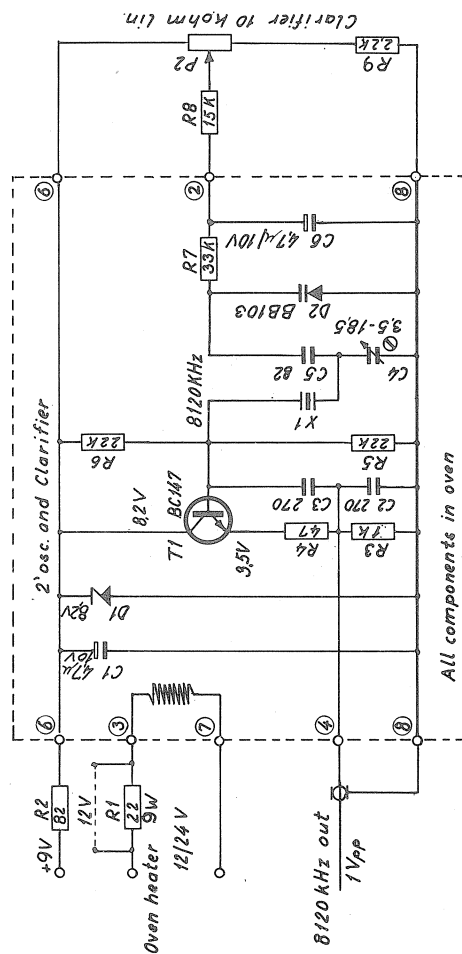
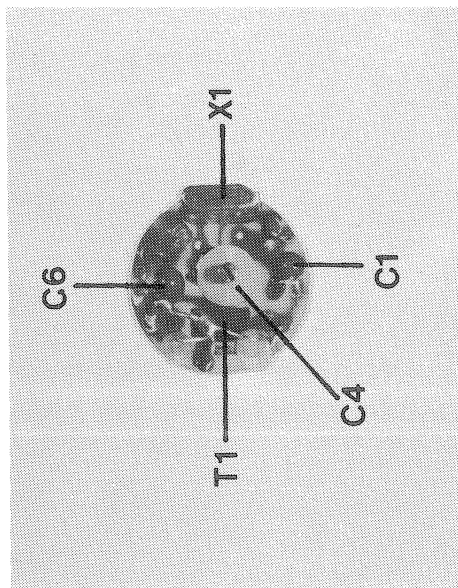
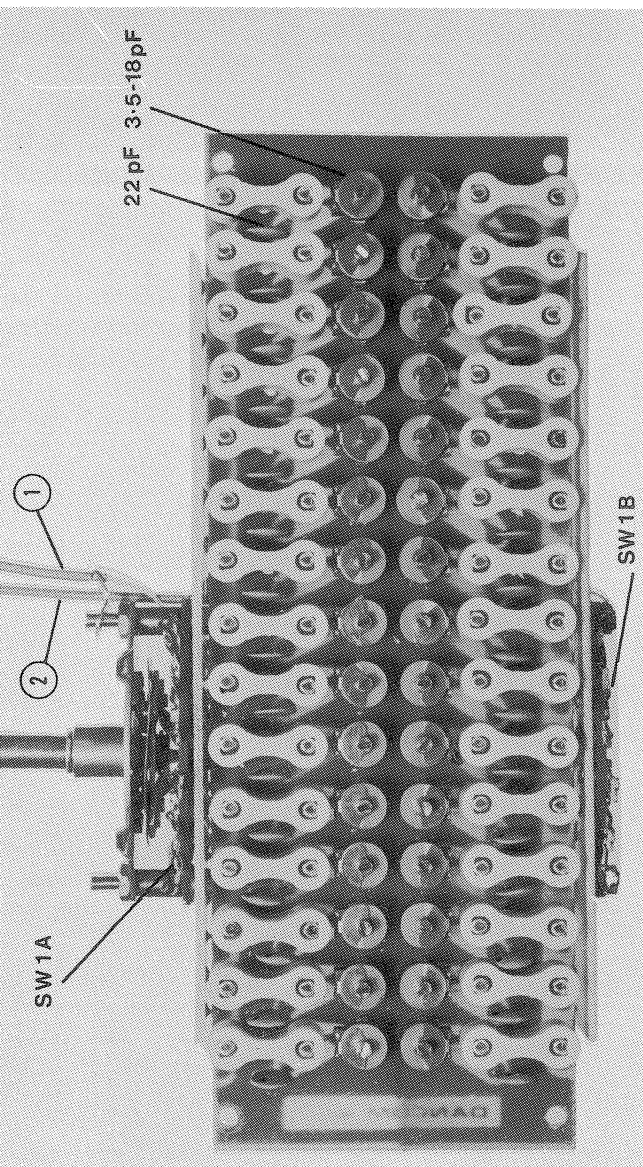
CRYSTAL BANK, Module 112

R101, D, F, GB, N & NL

Crystal Bank 112

R 101, D, F, GB, N and NL

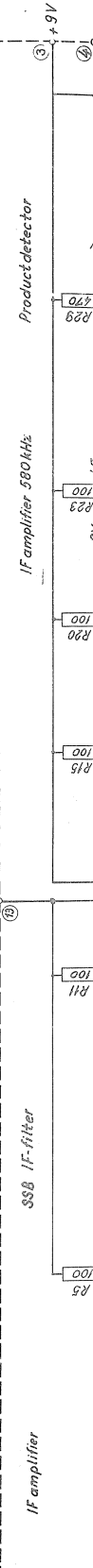
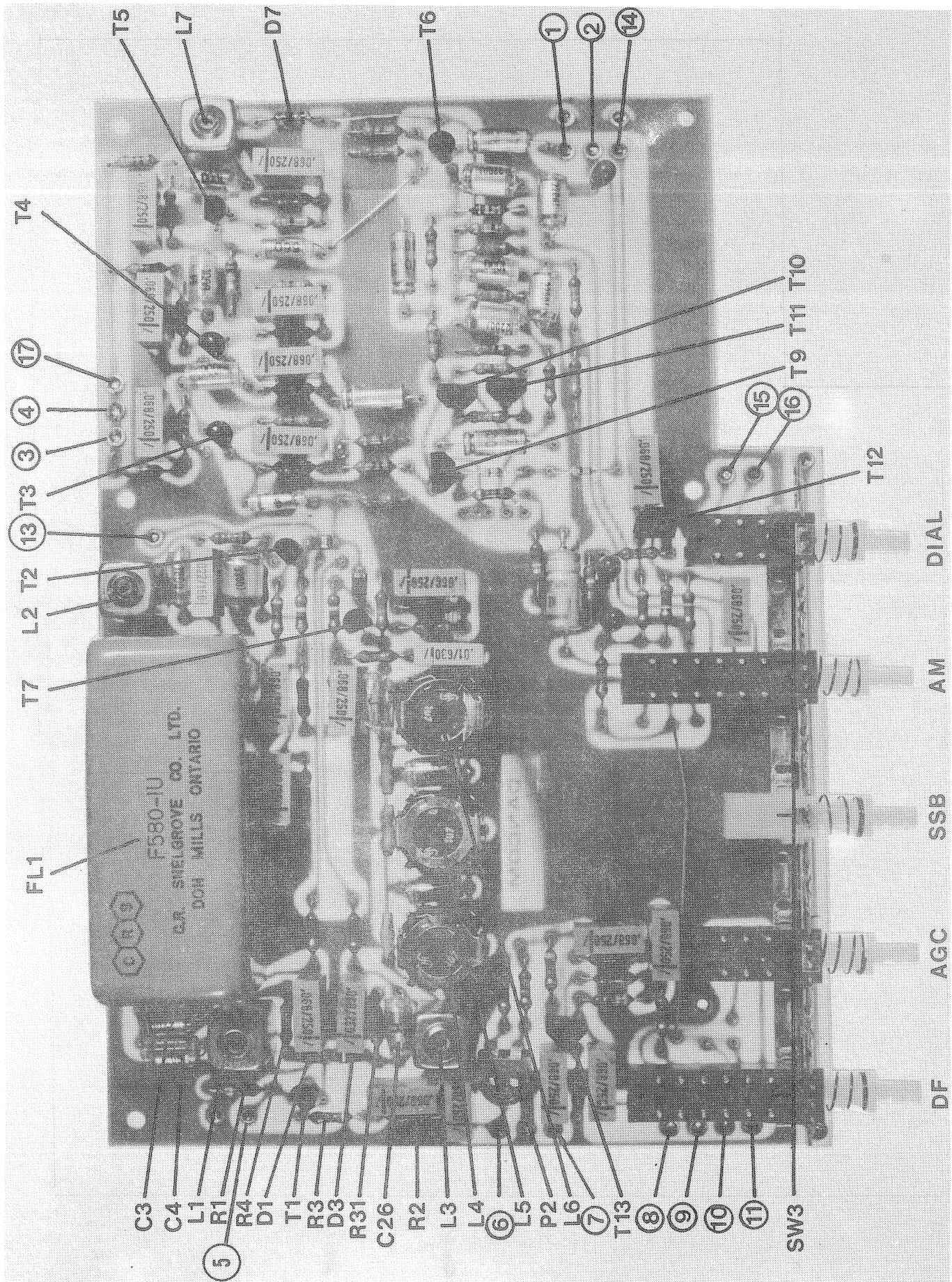




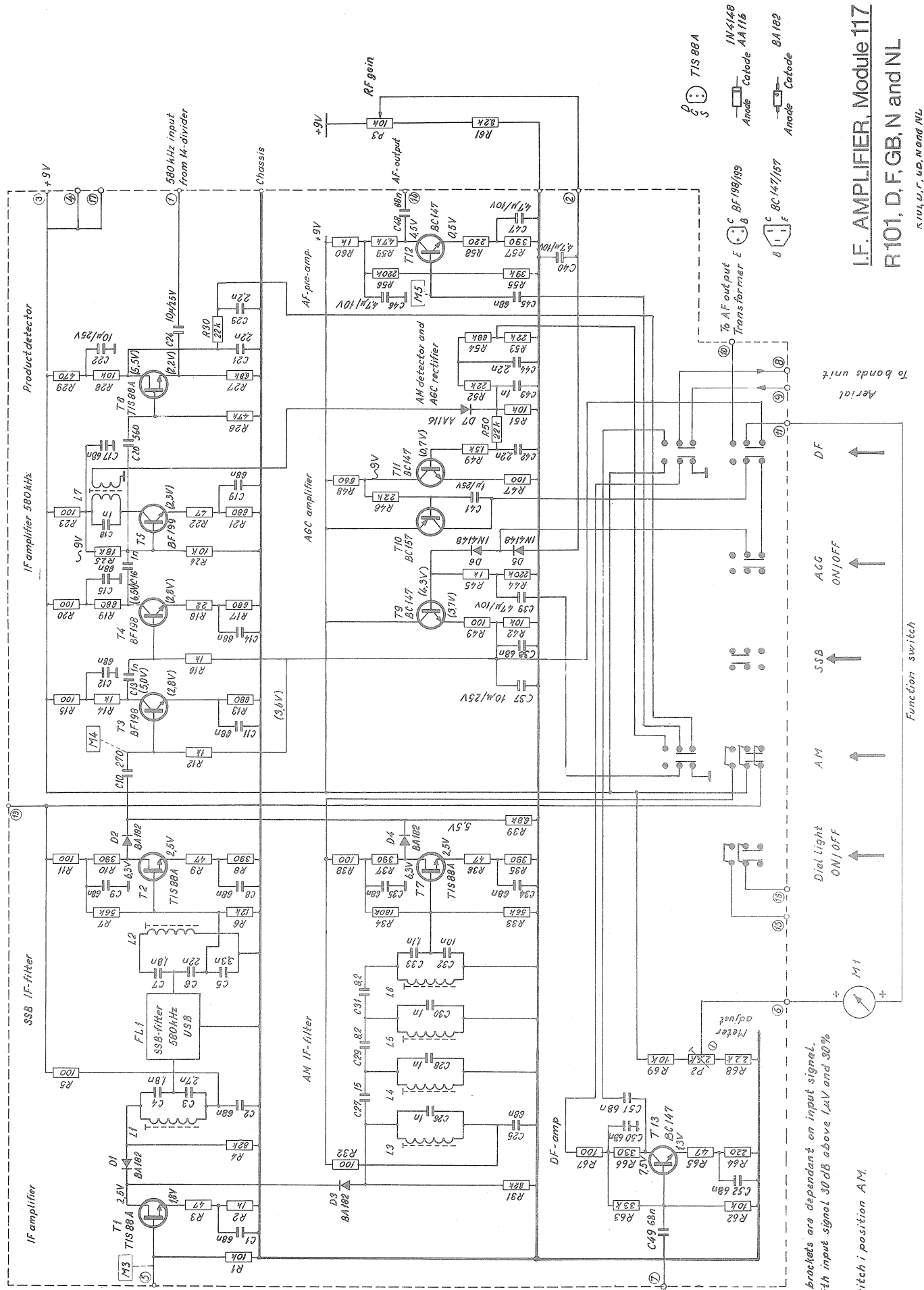
8120 KHz. CRYSTAL OSC., Module 119

R105 R107 R108

R101, D, F, GB, N and NL



+9V To 14-divider



I.F. AMPLIFIER, Module 117 R101, D, F, GB, N and NL

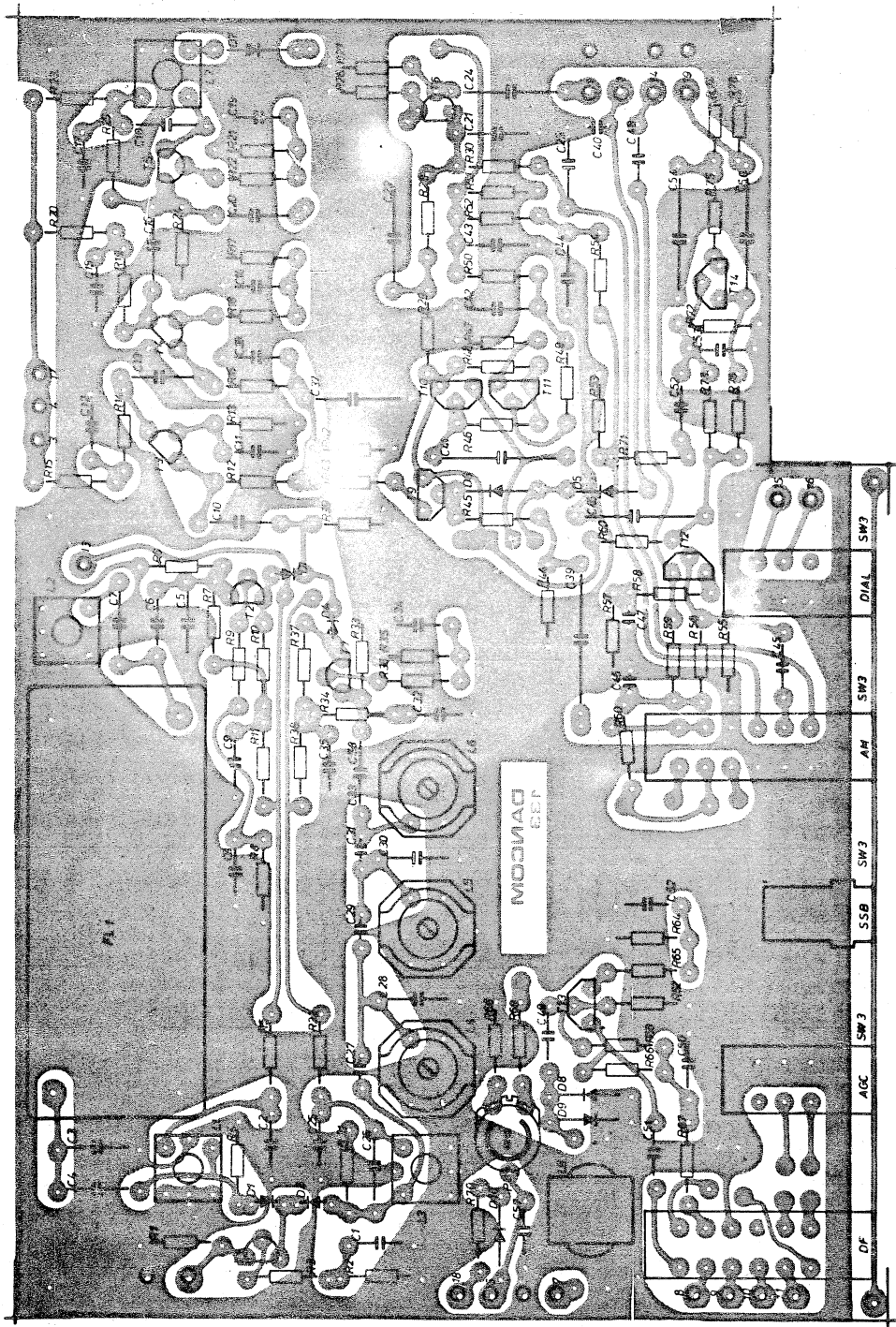
K101, D, F, GB, N and NL

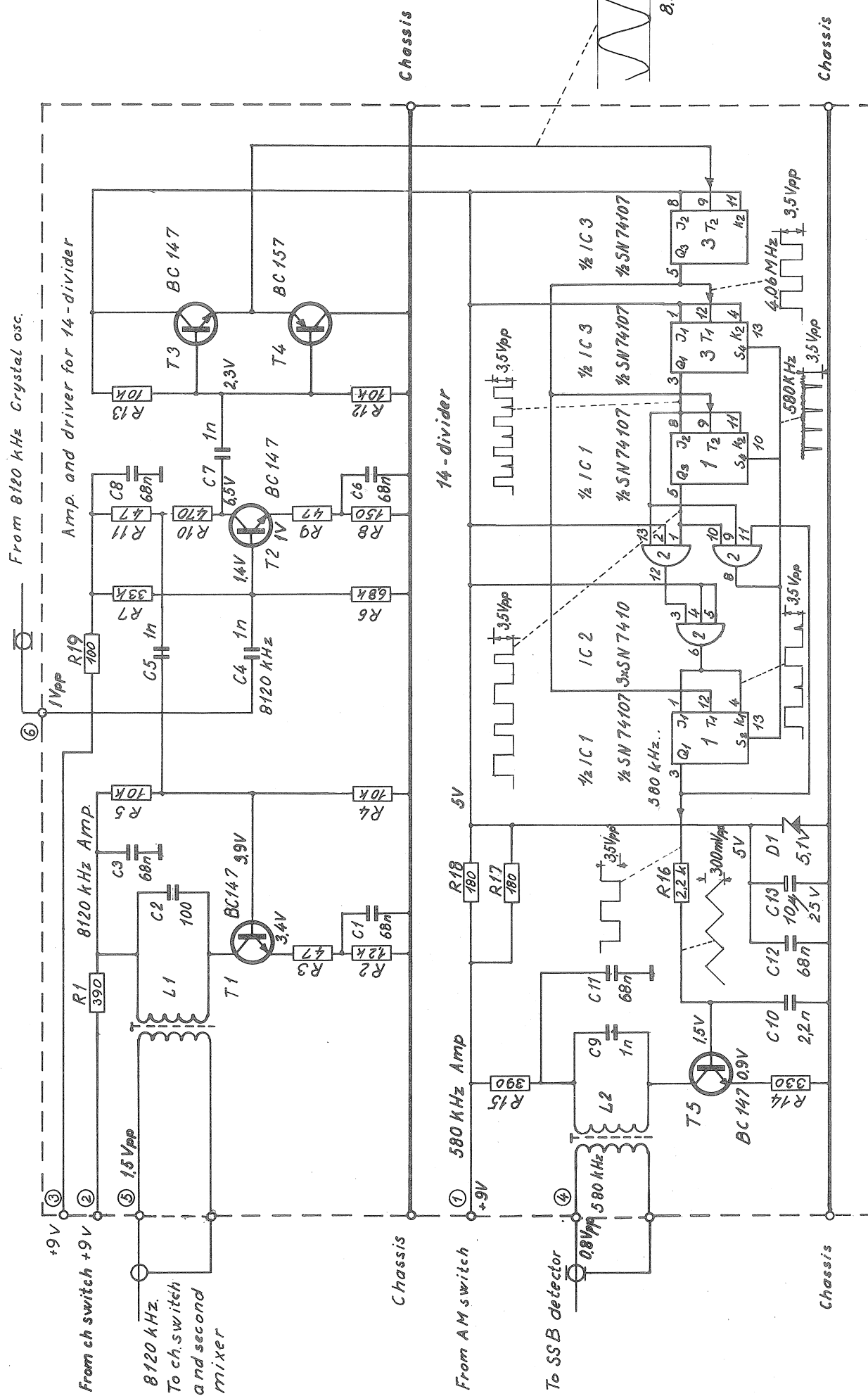
DC values in brackets are dependant on input signal.
Measured with input signal 30 dB above 14V and 30% modulated.
Function switch position AM.

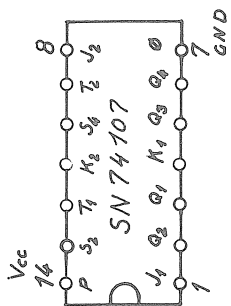
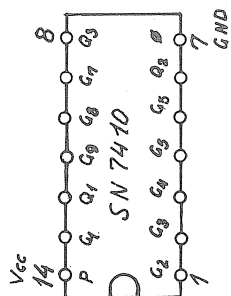
From DF aerial



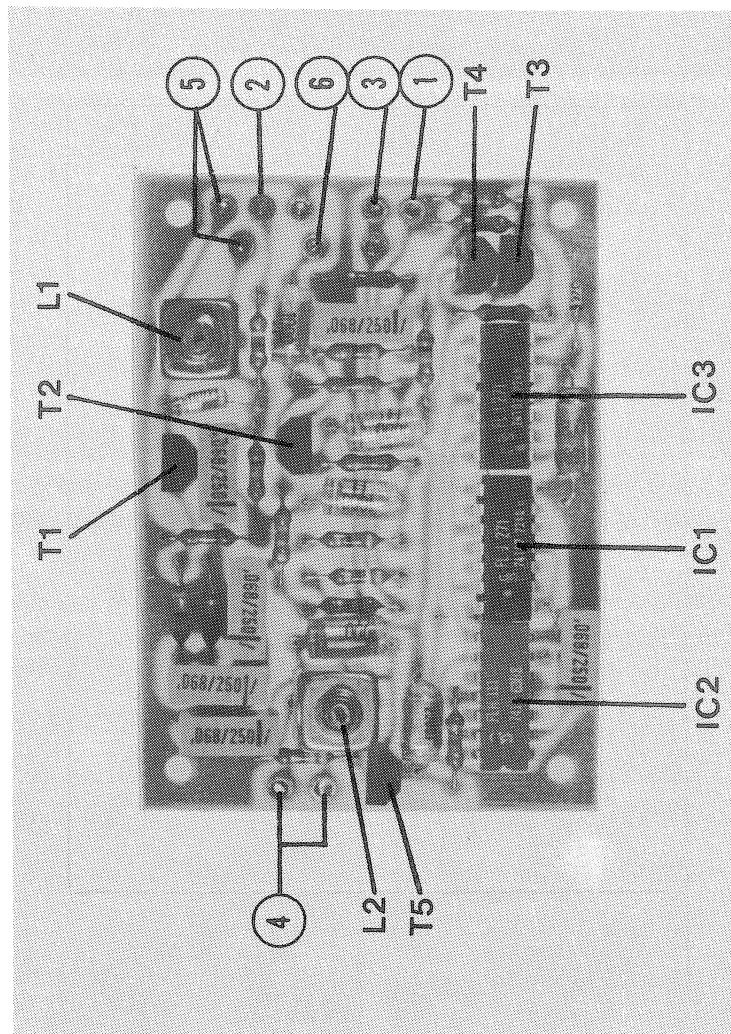
DC values in brackets are dependant on input signal.
Measured with input signal 30 dB above 1 kV and 30% modulated.
Function switch: position AM

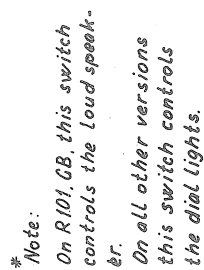




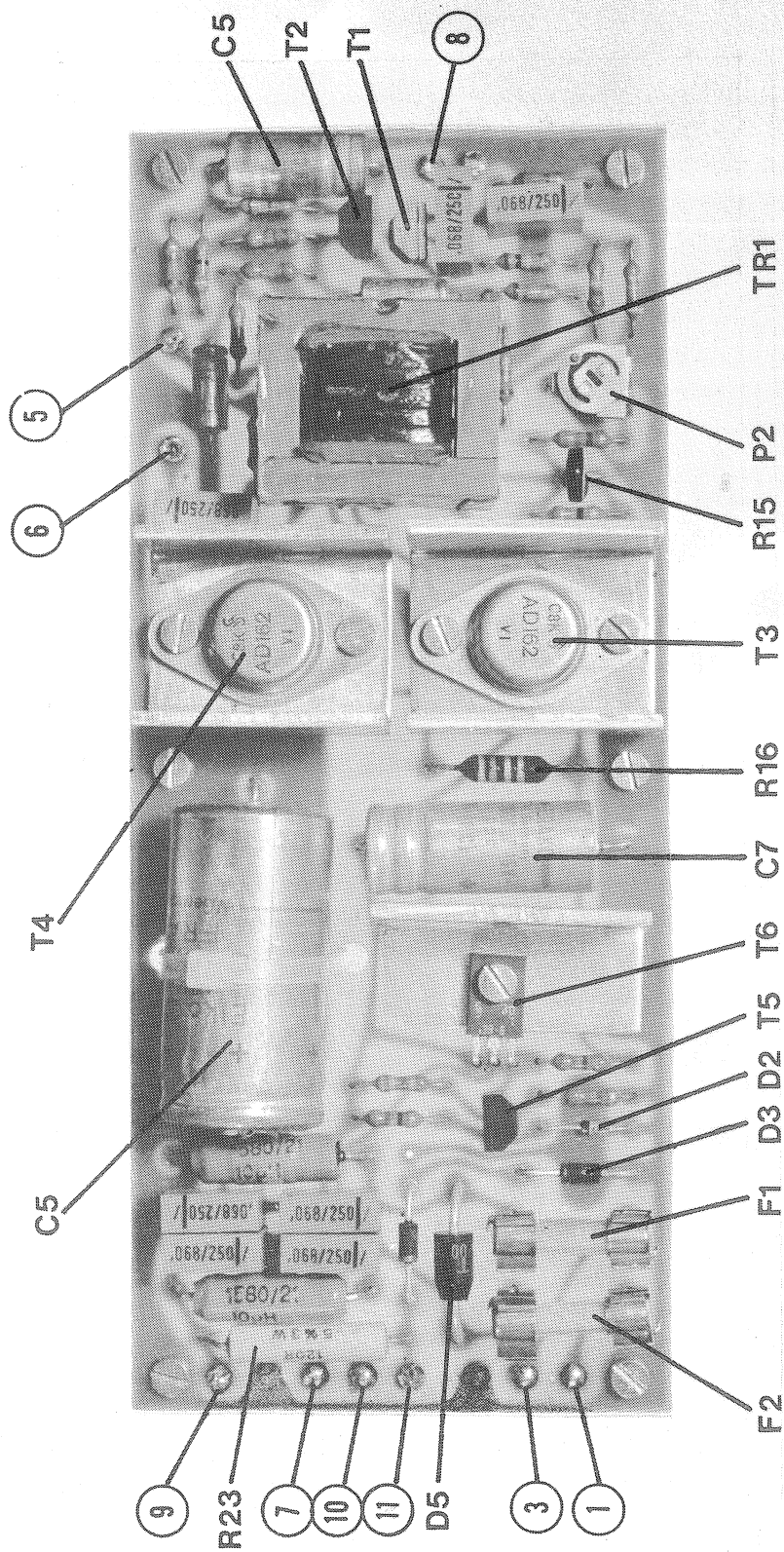


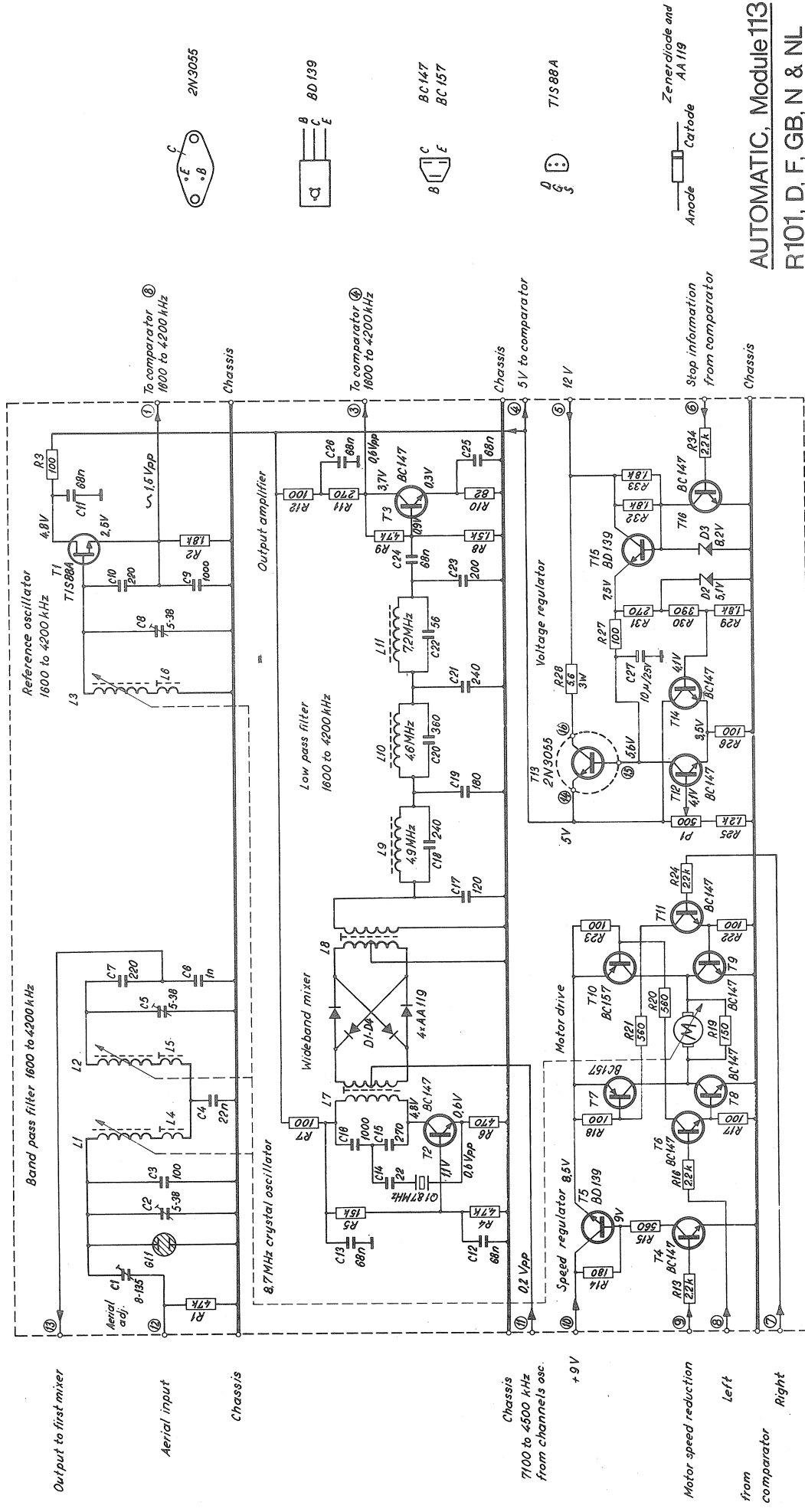
14 DIVIDER, Module 116 R101, D, F, GB, N and NL 14 Divider 116 R101, D, F, GB, N and NL





(A) R101D, N and NL
(B) R101CB
(A+C) R101F





2N3055

B
C
E
BD139

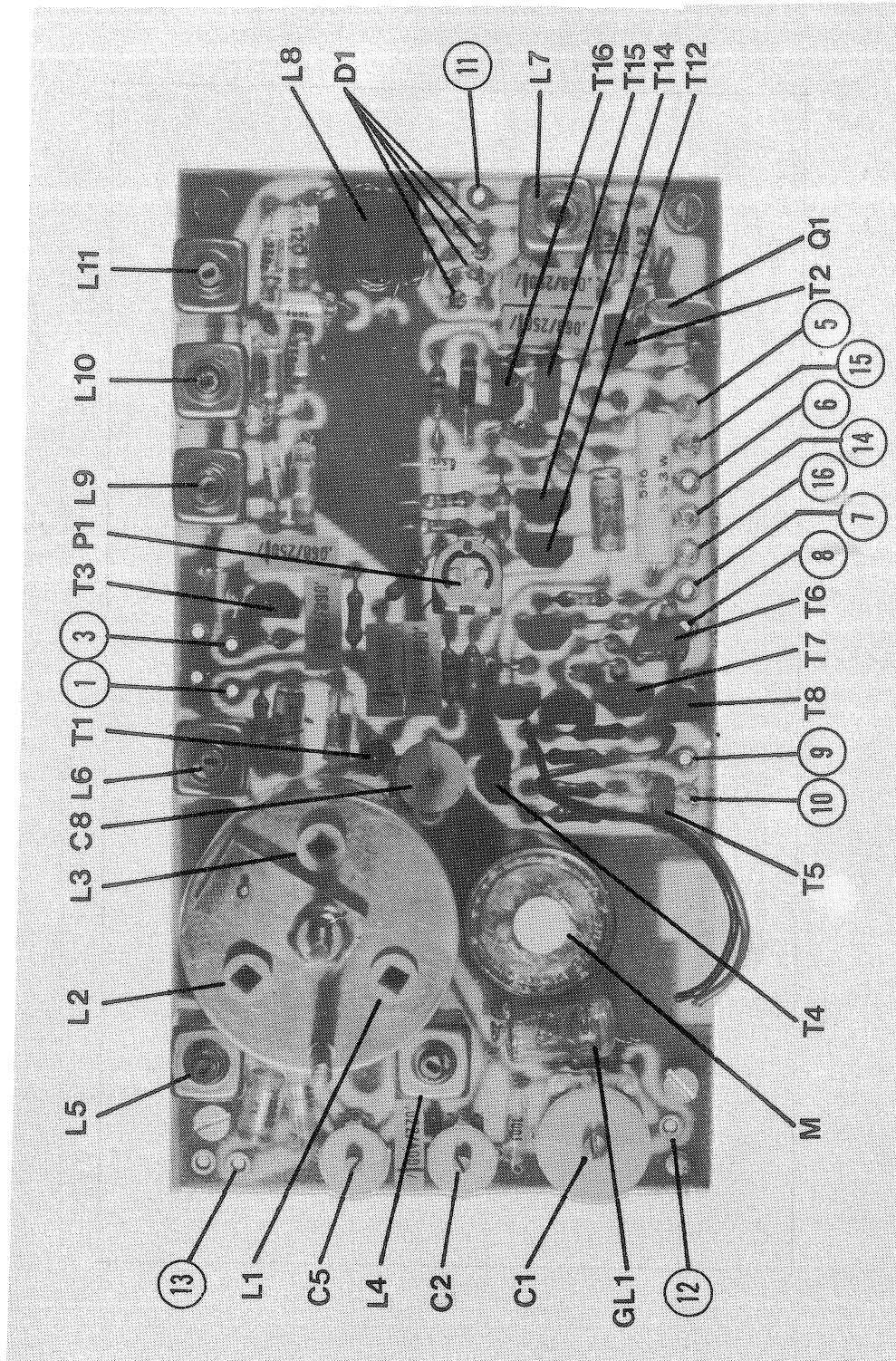
B
C
E
BC147
BC157

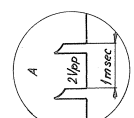
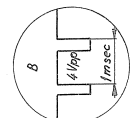
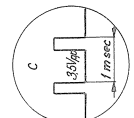
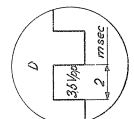
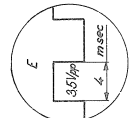
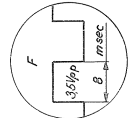
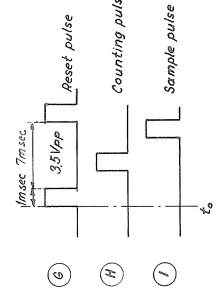
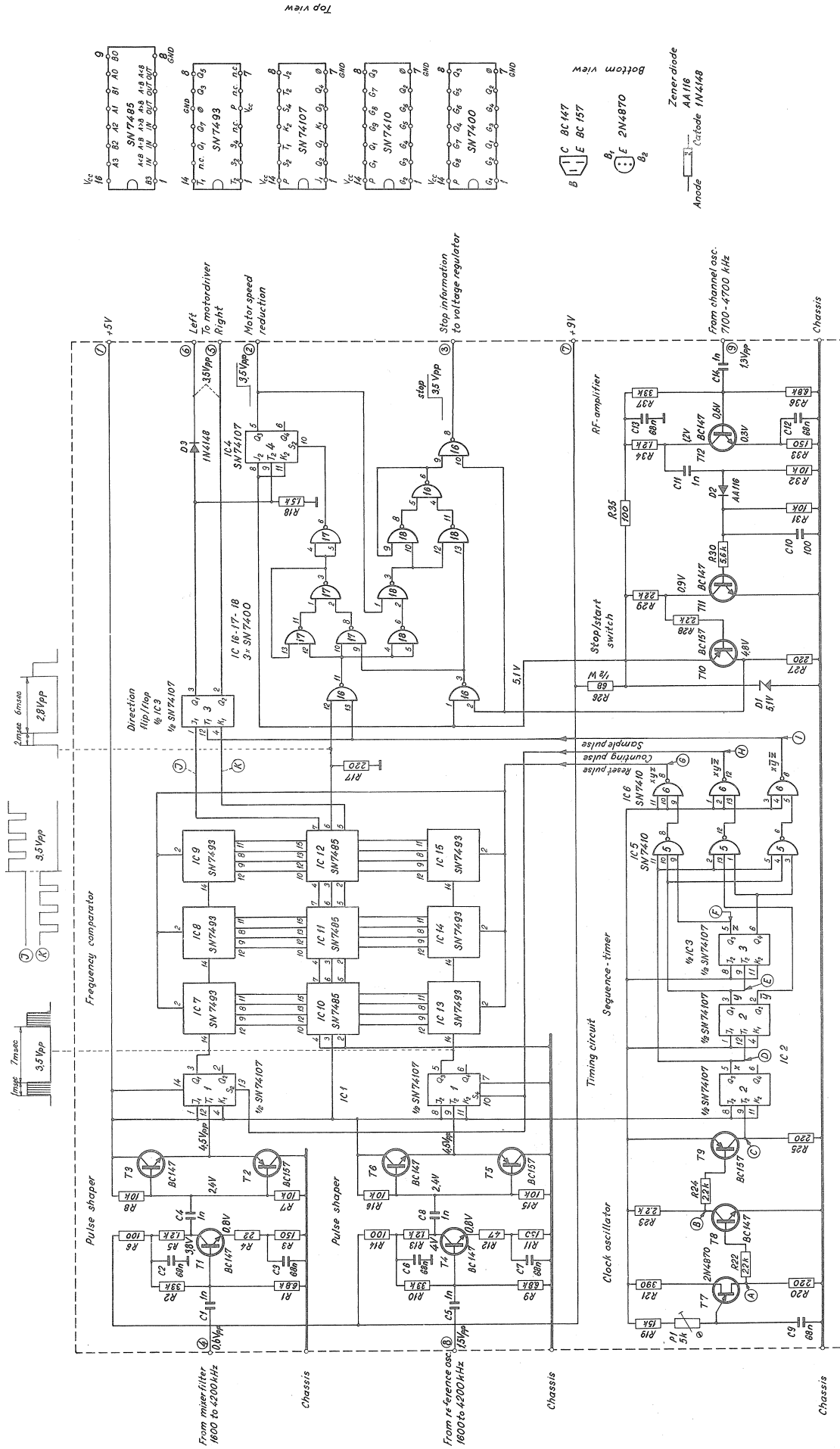
D
G
S
T1S88A

Anode
Cathode
Zener diode and
AA119

AUTOMATIC, Module113

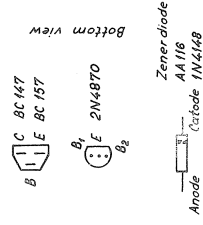
R101, D, F, GB, N & NL

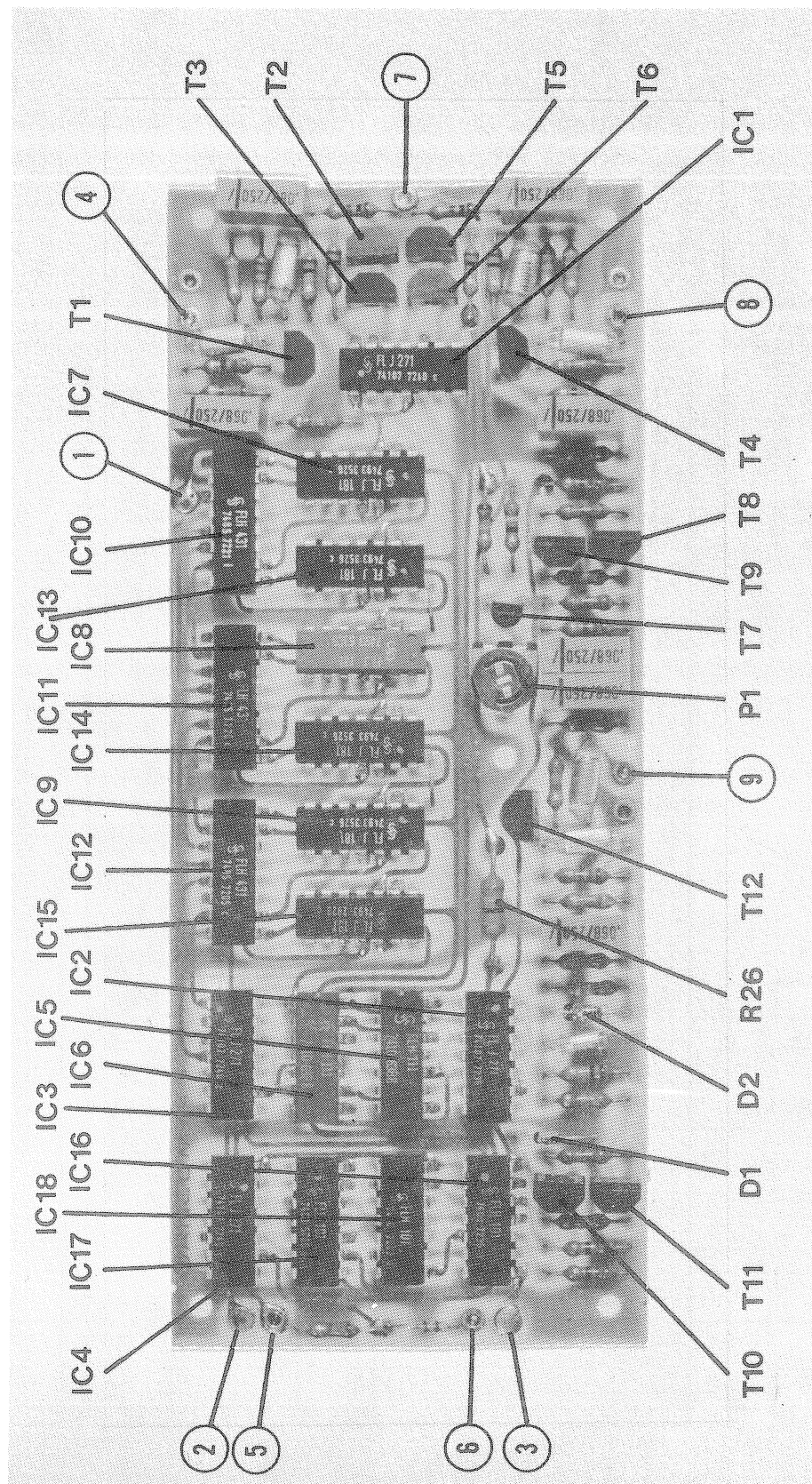


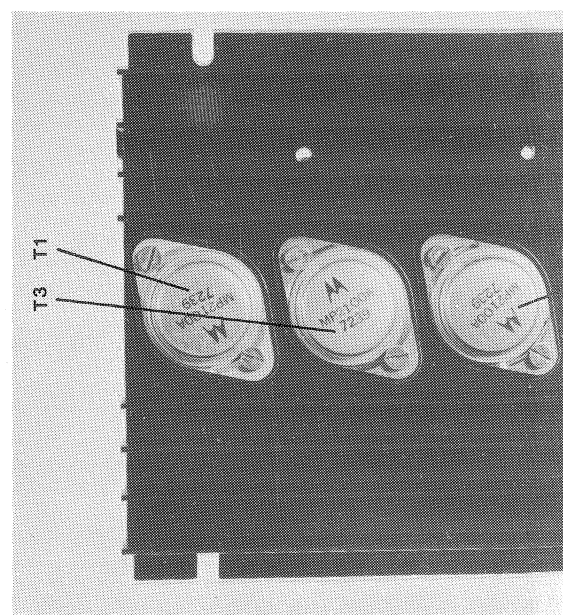


FREQUENCY COMPARATOR, Module 114

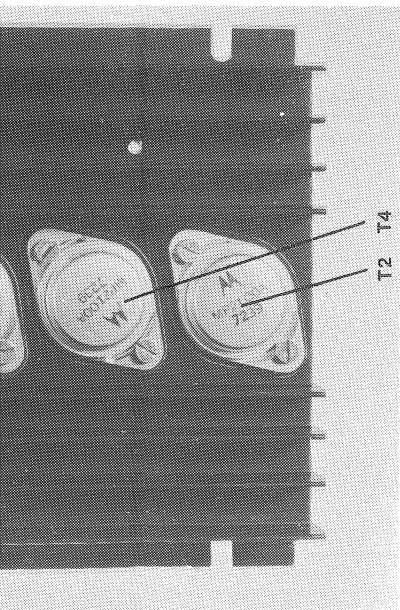
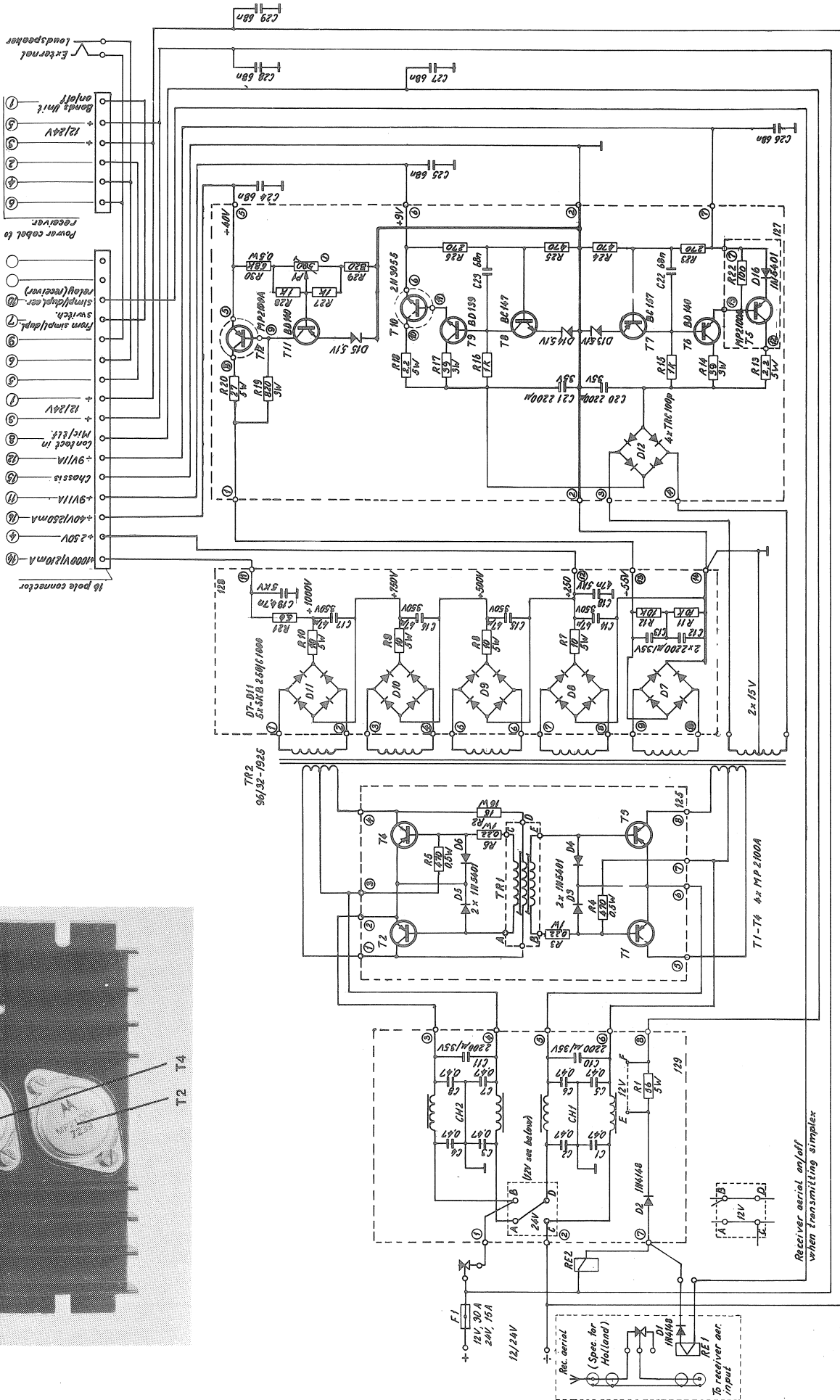
R101, D, F, GB, N & NL

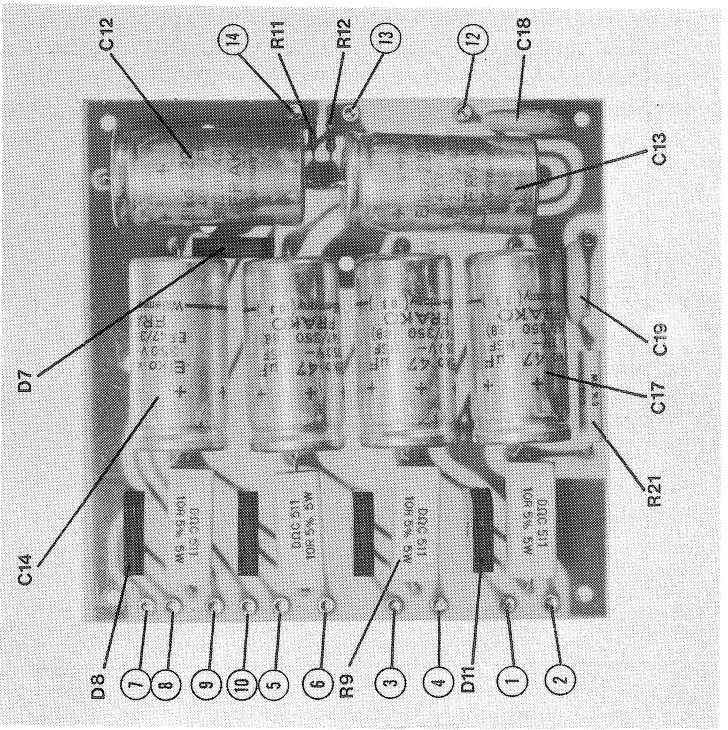
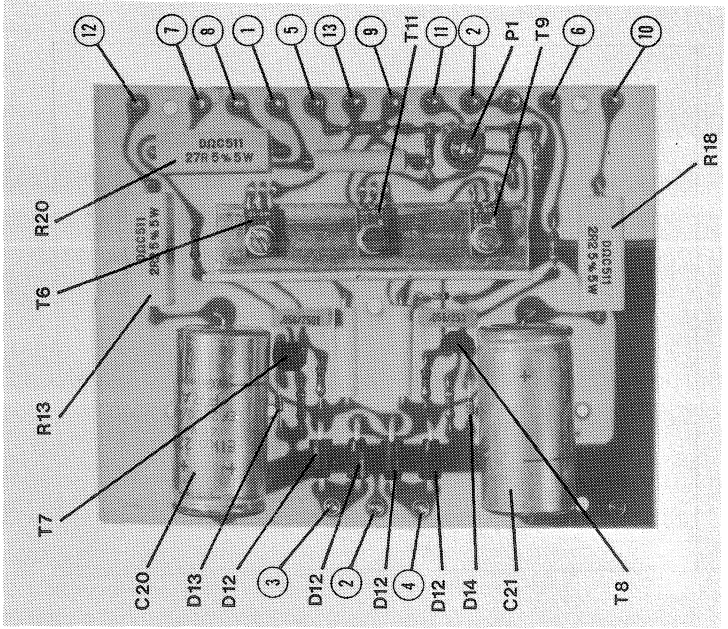


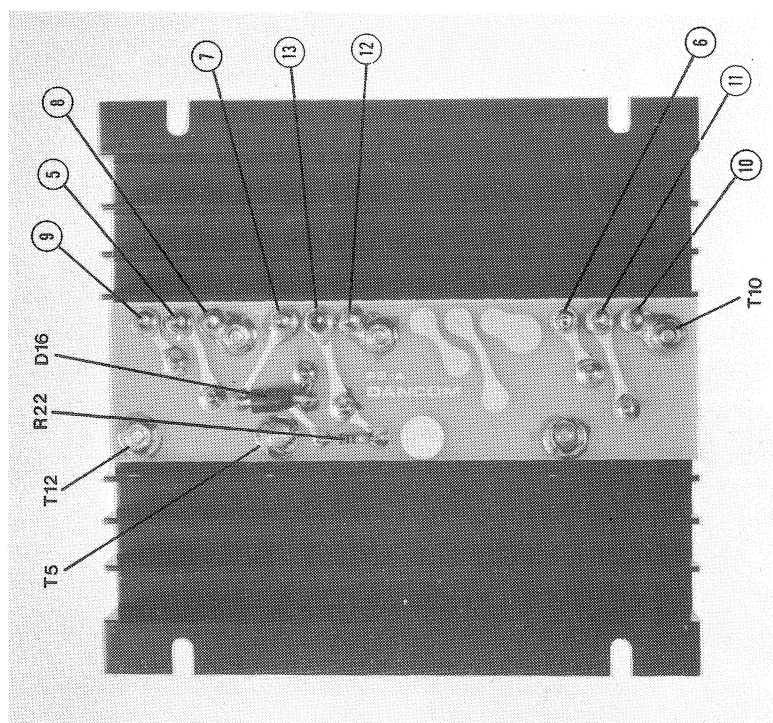
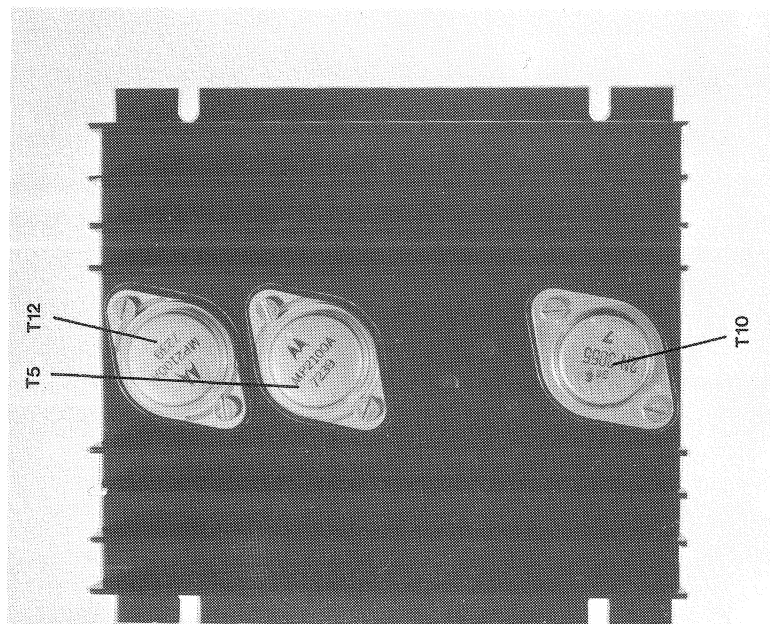




5. C. POWER SUPPLY DIAGRAMS







FINAL AMPL.

FINAL AMPL.										**P1	Potentiometer, carbon 500 ohm	0,2W	04,145
R1-3	See module part list	100 ohm	5%	0,33W	01,137								
R4	Resistor, carbon												
R5	Not assigned												
R6	Resistor, carbon	6,8 ohm	5%	0,33W	01,123								
R7-9	Resistor, carbon	100 ohm	5%	0,33W	01,137								
R10	Not assigned												
R11	Resistor, carbon	6,8 ohm	5%	0,33W	01,123								
R12-15	See module part list	100 ohm	5%	0,33W	01,137								
R16-18	Resistor, carbon												
R19	Not assigned												
R20	Resistor, carbon	6,8 ohm	5%	0,33W	01,123								
R21-22	Resistor, carbon	100 ohm	5%	0,33W	01,137								
R23	Not assigned												
R24-25	Resistor, carbon	56 ohm	5%	0,33W	01,134								
R26	Resistor, carbon	33 ohm	5%	0,33W	01,131								
R27	Resistor, w-w	15 ohm	5%	16W	02,527								
R28	Resistor, carbon	10 ohm	5%	0,33W	01,225								
R29	Resistor, carbon	68 ohm	5%	0,33W	01,235								
R30-31	Resistor, carbon	270 ohm	5%	0,33W	01,178								
R32-33	Resistor, carbon	12 Kohm	5%	0,33W	01,162								
R34	Resistor, carbon	39 ohm	5%	3W	02,232								
C1	Capacitor, mkt	68 nF		250V	11,223								
C2	Capacitor, cer	4,7 nF		5KV	15,201								
C3	Capacitor, mkt	68 nF		250V	11,223								
C4	Capacitor, cer	4,7 nF		5KV	15,201								
C5	Capacitor, mkt	68 nF		250V	11,223								
C6	Capacitor, cer	4,7 nF		5KV	15,201								
C7	Not assigned												
C8-10	See module part list												
C11-12	Capacitor, cer	4,7 nF		5KV	15,201								
C13	Capacitor, var	10-300 pF			02,0131								
C14	Capacitor, cer	160 pF		3KV	15,302								
C15-16	Capacitor, cer	100 pF		3KV	15,301								
C17	Capacitor, mkt	68 nF		250V	11,223								
C18	Not assigned												
*C19-20	Capacitor, tantal	4,7 uF		10V	13,121								
C21	Capacitor, mkt	68 nF		250V	11,223								
D1-6	Diode	IN 4148			39,103								
T1-3	Tube	TT 22			55,101								
CH1-3	Anode choke				01,237								
CH4	High freq choke				02,0133								
L1	Pa coil				02,0132								
L2	Manual aer. tuning	0-90 uH			02,0130								
L3	Coil 2182 KHz				02,0138								
RE1-4	Relay	type 52			27,102								
RE5	Relay	BV 509			27,103								
J1	See module part list												
J2	Aerial current meter												
M1	Motor												
SW1-2	Not assigned				86,102								
SW3	Switch				86,103								
SW4	Switch												
SW5	Not assigned				86,105								
SW6	Switch				86,106								
SW7	Switch												

**P1	Potentiometer, carbon 500 ohm	0,2W	04,145
**LA1	Lamp	12V/3W	55,301
LA2	Lamp	12V/3W	55,301
LA3	Lamp	12V/3W	55,301
Microtelephone			
Parts marked * are only used on			
T101, DK, D and NL			
Parts marked ** are only used on			
T101, F GB and N			

AUTOALARM. Module 103.

R1	Resistor, carbon	10 Kohm	5%	0,33W	01,161
R2	Resistor, carbon	47 ohm	5%	0,33W	01,133
R3	Resistor, carbon	1,2 Kohm	5%	0,33W	01,150
R4-6	Resistor, carbon	2,2 Kohm	5%	0,33W	01,153
R7	Resistor, carbon	220 ohm	5%	0,32W	01,141
R8	Resistor, carbon	270 ohm	5%	0,33W	01,142
R9	Resistor, carbon	18 Kohm	5%	0,33W	01,164
R10	Resistor, carbon	47 ohm	5%	0,33W	01,133
R11	Resistor, carbon	1,2 Kohm	5%	0,33W	01,150
R12-14	Resistor, carbon	2,2 Kohm	5%	0,33W	01,153
R15	Resistor, carbon	220 ohm	5%	0,33W	01,141
R16	Resistor, carbon	270 ohm	5%	0,33W	01,142
R17	Resistor, carbon	330 ohm	5%	0,33W	01,143
R18	Resistor, carbon	330 ohm	5%	0,33W	01,143
R19	Resistor, carbon	10 Kohm	5%	0,33W	01,161
R20	Resistor, carbon	4,7 Kohm	5%	0,33W	01,157
R21	Resistor, carbon	22 Kohm	5%	0,33W	01,165
R22	Resistor, carbon	47 ohm	5%	0,33W	01,133
R23	Resistor, carbon	1,2 Kohm	5%	0,33W	01,150
R24-26	Resistor, carbon	2,2 Kohm	5%	0,33W	01,153
R27	Resistor, carbon	220 ohm	5%	0,33W	01,141
R28	Resistor, carbon	1,8 Kohm	5%	0,33W	01,152
R29	Resistor, carbon	6,8 Kohm	5%	0,33W	01,159
R30	Resistor, carbon	5,6 Kohm	5%	0,33W	01,158
R31-32	Resistor, carbon	3,3 Kohm	5%	0,33W	01,155
R33	Resistor, carbon	330 ohm	5%	0,33W	01,143
R34	Resistor, carbon	1,2 Kohm	5%	0,33W	01,150
R35-36	Resistor, carbon	100 ohm	5%	0,33W	01,137
R37	Resistor, w-w	5,6 ohm	5%	3W	02,222
R38	Resistor, carbon	1,8 Kohm	5%	0,33W	01,152
R39	Resistor, carbon	390 ohm	5%	0,33W	01,144
R40	Resistor, carbon	270 ohm	5%	0,33W	01,142
R41-42	Resistor, carbon	1,8 Kohm	5%	0,33W	01,152
*R43	Resistor, carbon	8,2 Kohm	5%	0,33W	01,160
*R44-45	Resistor, carbon	3,9 Kohm	5%	0,33W	01,156
*R46	Resistor, carbon	120 ohm	5%	0,33W	01,138
*R47	Resistor, carbon	56 ohm	5%	0,33W	01,134
R48	Resistor, w-w	330 ohm	5%	2W	02,143
R49	Resistor, w-w	12 ohm	5%	5W	
P1-3	Pot. carbon	5Kohm			04,157
P4	Pot. carbon	10 Kohm			04,161
P5	Pot. carbon	500 ohm			04,145

AUTOALARM. Module 103.

	Resistor,	carbon	10 Kohm	5%	0,33W	01,161
R1	Resistor,	carbon	47 ohm	5%	0,33W	01,133
R2	Resistor,	carbon	1,2 Kohm	5%	0,33W	01,150
R3	Resistor,	carbon	2,2 Kohm	5%	0,33W	01,153
R4-6	Resistor,	carbon	220 ohm	5%	0,33W	01,141
R7	Resistor,	carbon	270 ohm	5%	0,33W	01,142
R8	Resistor,	carbon	18 Kohm	5%	0,33W	01,164
R9	Resistor,	carbon	47 ohm	5%	0,33W	01,133
R10	Resistor,	carbon	1,2 Kohm	5%	0,33W	01,150
R11	Resistor,	carbon	2,2 Kohm	5%	0,33W	01,153
R12-14	Resistor,	carbon	220 ohm	5%	0,33W	01,141
R15	Resistor,	carbon	270 ohm	5%	0,33W	01,142
R16	Resistor,	carbon	330 ohm	5%	0,33W	01,143
R17	Resistor,	carbon	330 ohm	5%	0,33W	01,143
R18	Resistor,	carbon	10 Kohm	5%	0,33W	01,161
R19	Resistor,	carbon	4,7 Kohm	5%	0,33W	01,157
R20	Resistor,	carbon	22 Kohm	5%	0,33W	01,165
R21	Resistor,	carbon	47 ohm	5%	0,33W	01,133
R22	Resistor,	carbon	1,2 Kohm	5%	0,33W	01,150
R23	Resistor,	carbon	2,2 Kohm	5%	0,33W	01,153
R24-26	Resistor,	carbon	220 ohm	5%	0,33W	01,141
R27	Resistor,	carbon	1,8 Kohm	5%	0,33W	01,152
R28	Resistor,	carbon	6,8 Kohm	5%	0,33W	01,159
R29	Resistor,	carbon	5,6 Kohm	5%	0,33W	01,158
R30	Resistor,	carbon	3,3 Kohm	5%	0,33W	01,155
R31-32	Resistor,	carbon	330 ohm	5%	0,33W	01,143
R33	Resistor,	carbon	1,2 Kohm	5%	0,33W	01,150
R34	Resistor,	carbon	100 ohm	5%	0,33W	01,137
R35-36	Resistor,	w-w	5,6 ohm	5%	3W	02,222
R37	Resistor,	w-w	1,8 Kohm	5%	0,33W	01,152
R38	Resistor,	carbon	390 ohm	5%	0,33W	01,144
R39	Resistor,	carbon	270 ohm	5%	0,33W	01,142
R40	Resistor,	carbon	1,8 Kohm	5%	0,33W	01,152
R41-42	Resistor,	carbon	8,2 Kohm	5%	0,33W	01,160
R43	Resistor,	carbon	3,9 Kohm	5%	0,33W	01,156
R44-45	Resistor,	carbon	120 ohm	5%	0,33W	01,138
R46	Resistor,	carbon	56 ohm	5%	0,33W	01,134
R47	Resistor,	w-w	330 ohm	5%	2W	02,143
R48	Resistor,	w-w	12 ohm	5%	5W	
R49	Resistor,	w-w	5Kohm			
P1-3	Pot. carbon		10 Kohm		0,2W	04,157
P4	Pot. carbon		500 ohm		0,2W	04,161
P5	Pot. carbon				0,2W	04,145

S.S.B. EXCITER. Module 109.

*P6	Pot. carbon	2,5 Kohm	O, 2W	04, 154
C1-2	Capacitor, mkt	22 nF	250V	11, 217
C3-5	Capacitor, tantal	4,7 uF	10V	13, 121
C6	Capacitor, ellyt	10 uF	25V	12, 225
C7	Capacitor, tantal	4,7 uF	10V	13, 121
C8-10	Capacitor, mkt	68 nF	250V	11, 223
C11	Capacitor, ellyt	10 uF	25V	12, 225
*C12	Capacitor, ellyt	100 uF	25V	12, 237
*C13	Capacitor, mkt	33 nF	250V	11, 219
*C14	Capacitor, mkt	22 nF	250V	11, 217
*C15	Capacitor, mkt	33 nF	250V	11, 219
*C16	Capacitor, electrolytic	10 uF	25V	12, 225
*C17	Capacitor, electrolytic	100 uF	25V	12, 237
*C18	Capacitor, mkt	68 nF	250V	11, 223
*C19	Capacitor, electrolytic	100 uF	25V	12, 237
C20	Capacitor, tantal	4,7 uF	10V	13, 121
C21	Capacitor, mkt	68 nF	250V	11, 223
D1	Diode	IN 4148		39, 103
D2	Diode	BZX 55 C5V1	5, 1V	39, 707
D3	Diode	BZX 55 C8V2	8, 2V	39, 708
D4-5	Diode	TRC 100 P		39, 101
T1	Transistor, unj	2N 4870		37, 102
T2-3	Transistor	BC 147		32, 101
T4	Transistor, unj	2N 4870		37, 102
T5-7	Transistor	BC 147		32, 101
T8	Transistor	BC 147		32, 101
T9	Transistor, unj	BD 139		30, 101
T10	Transistor	2N4870		37, 102
T11-17	Transistor	BC 147		32, 101
T18	Transistor	BD 139		30, 101
*T19	Transistor	BC 147		32, 101
T20	Transistor	2N3055		30, 105
M1-2	Integrated circuit	SN 7400		36, 102
IC3-8	Integrated circuit	SN 74107		36, 101
IC9	Integrated circuit	SN 7400		36, 102
IC10	Integrated circuit	SN 74107		33, 101
*L1	Coil, low pass filter			04, 0122
RE1	Relay	V23012-A0111-A001	9V	27, 104
*TR1	Transformer	1964		26, 101
R1-2	Resistor, carbon			
R3-4	Resistor, carbon			
R5-7	Resistor, carbon			
R8	Resistor, carbon			
R9	Resistor, carbon			
R10	Resistor, carbon			
R11	Resistor, carbon			
R12	Resistor, carbon			
R13	Resistor, carbon			
R14	Resistor, carbon			
R15	Resistor, carbon			
R16	Resistor, carbon			
R17-19	Resistor, carbon			
R20	Resistor, carbon			
R21	Resistor, carbon			
R22	Resistor, carbon			
R23	Resistor, carbon			
R24	Resistor, carbon			
R25-26	Resistor, carbon			
R27	Resistor, carbon			
R28	Resistor, carbon			
R29	Resistor, carbon			
R30	Resistor, carbon			
R31	Resistor, carbon			
R32	Resistor, carbon			
R33	Resistor, carbon			
R34	Resistor, carbon			
R35-36	Resistor, carbon			
R37	Resistor, carbon			
R38	Resistor, carbon			
R39	Resistor, carbon			
R40-42	Resistor, carbon			
R43-45	Resistor, carbon			
R46-48	Resistor, carbon			
C1-2	Capacitor, mkt			
C3	Capacitor, styroflex			
C4	Capacitor, mkt			
C5	Capacitor, styroflex			
C6	Capacitor, styroflex			
C7-12	Capacitor, mkt			
C13	Capacitor, styroflex			
C14-17	Capacitor, mkt			
C18	Capacitor, styroflex			
C19-20	Capacitor, mkt			
C21	Capacitor, styroflex			
C22	Capacitor, styroflex			
C23-31	Capacitor, mkt			

Autoalarm module 134 has a similar parts list except that components marked * are not used.

P1	Potentiometer, carbon	47 Kohm	0,2W	04,169	C1	Capacitor, mkt	68 nF	250V	11,223
P2	Potentiometer, carbon	100 ohm	0,2W	04,137	C2	Capacitor, electro	10 uF	16V	12,225
P3	Potentiometer, carbon	500 ohm	0,2W	04,145	C3	Capacitor, electro	10 uF	16V	12,225
L1	Coil, pre. filter			04,0131	C4	Capacitor, tantal	4,7 uF	10V	13,121
L2	Coil, SSB amp. 8700			04,0132	C5	Capacitor, tantal	4,7 uF	10V	13,121
L3	Coil, SSB amp. 8700			04,0118	C6	Capacitor, mkt	68 nF	250V	11,223
L4	Coil, carrier reinsertion			04,0125	C7-10	Capacitor, ellyt	100 uF	16V	12,237
L5	Coil, SSB amp. power reduction			04,0132	C11	Capacitor, mkt	10 nF	630V	11,213
ICI	Integrated circuit	LM 1496		35,101	C12	Capacitor, mkt	68 nF	250V	11,223
FLI	SSB filter 8,7 MHz USB			50,202	C13	Capacitor, ellyt	22 uF	25V	12,329
T1	Transistor	BC 147		32,101	C14	Capacitor, mkt	68 nF	250V	11,223
T2	Transistor	TJS 88A		34,101	C15	Capacitor, ellyt	100 uF	16V	12,237
T3	Transistor	BF 199		33,102	C16	Capacitor, tantal	4,7 uF	10V	13,121
T4	Transistor	BC 147		32,101	C17-18	Capacitor, ellyt	10 uF	16V	12,225
T5	Transistor				P1	Potentiometer	10 Kohm		04,161
D1-7	Diode	BA 182		39,101	T1	Transistor	BC 147		32,101
					T2	Transistor	BC 151		32,102
					T3-6	Transistor	BC 147		32,101
					D1-4	Diode	IN 4148		39,103
					D5	Diode	IN 4148		39,103
					TR1	Transformer			26,101

PHASE DETECTOR and LOADING DETECTOR.

PART OF MODULE 105 AND MODULE 110. DEPENDANT ON VERSION

R1	Resistor, carbon	56 ohm	5%	0,33W	R1	Resistor, carbon	1 Kohm	5%	0,33W	01,149
R2	Resistor, carbon	56 Kohm	5%	0,33W	R2	Resistor, carbon	1 Kohm	5%	0,33W	01,149
R3-4	Resistor, carbon	4,7 Kohm	5%	0,33W	R3	Resistor, carbon	47 ohm	5%	0,33W	01,169
R5	Resistor, carbon	330 ohm	5%	0,33W	R4	Resistor, carbon	8,2 Kohm	5%	0,33W	01,160
R6	Resistor, carbon	220 Kohm	5%	0,33W	R5	Resistor, carbon	4,7 Kohm	5%	0,33W	01,157
R7	Resistor, carbon	10 Kohm	5%	0,33W	R6	Resistor, carbon	100 ohm	5%	0,33W	01,137
R8	Resistor, carbon	2,2 Kohm	5%	0,33W	R7	Resistor, carbon	100 ohm	5%	0,33W	01,137
R9	Resistor, carbon	2,2 Kohm	5%	0,33W	R8	Resistor, carbon	4,7 Kohm	5%	0,33W	01,157
R10	Resistor, carbon	4,7 Kohm	5%	0,33W	R9	Resistor, carbon	820 ohm	5%	0,33W	01,148
R11	Resistor, carbon	10 Kohm	5%	0,33W	R10	Resistor, carbon	820 ohm	5%	0,33W	01,148
R12	Resistor, carbon	180 ohm	5%	0,33W	R11	Resistor, carbon	1,5 Kohm	5%	0,33W	01,151
R13	Resistor, carbon	56 ohm	5%	0,33W	P1-3	Potentiometer, carbon	2,5 Kohm		0,2W	04,154
R14	Resistor, carbon	100 ohm	5%	0,33W	C1	Capacitor, mkt	68 nF		250V	11,223
R15	Resistor, carbon	4,7 Kohm	5%	0,33W	C2	Capacitor, styroflex	1,5 nF		160V	10,153
R16-17	Resistor, carbon	10 Kohm	5%	0,33W	C3	Capacitor, mkt	68 nF		250V	11,223
R18	Resistor, carbon	22 Kohm	5%	0,33W	C4	Capacitor, styroflex	1,5 nF		160V	10,153
R19	Resistor, carbon	220 Kohm	5%	0,33W	C5	Capacitor, mkt	68 nF		250V	11,223
R20	Resistor, carbon	2,7 Kohm	5%	0,33W	C6	Capacitor, mkt	68 nF		250V	11,223
R21	Resistor, carbon	560 ohm	5%	0,33W	C7	Capacitor, mkt	68 nF		250V	11,223
R22	Resistor, carbon	1,2 Kohm	5%	0,33W	C8-10	Capacitor, cer	10 pF		1 KV	15,101
R23	Resistor, carbon	3,9 Kohm	5%	0,33W	L6	Coil, phase detector				
R24	Resistor, carbon	47 Kohm	5%	0,33W	D1-4	Diode	AAL16			39,102
R25	Resistor, carbon	4,7 Kohm	5%	0,33W						

COMPRESSOR. Module 110.

S.S.B. EXCITER, PHASE and LOADING DETECTORS, Module 105.

R1	Resistor, carbon	5%	10 Kohm	0,33W	01,161
R2-3	Resistor, carbon	5%	1 Kohm	0,33W	01,149
R4	Resistor, carbon	5%	10 Kohm	0,33W	01,161
R5-7	Resistor, carbon	5%	56 ohm	0,33W	01,134
R8	Resistor, carbon	5%	1 Kohm	0,33W	01,149
R9	Resistor, carbon	5%	6,8 Kohm	0,33W	01,159
R10	Resistor, carbon	5%	220 ohm	0,33W	01,141
R11	Resistor, carbon	5%	1,5 Kohm	0,33W	01,151
R12	Resistor, carbon	5%	100 ohm	0,33W	01,137
R13	Resistor, carbon	5%	560 ohm	0,33W	01,146
R14	Resistor, carbon	5%	100 ohm	0,33W	01,137
R15	Resistor, carbon	5%	680 ohm	0,33W	01,147
R16	Resistor, carbon	5%	270 ohm	0,33W	01,142
R17	Resistor, carbon	5%	100 ohm	0,33W	01,137
R18	Resistor, carbon	5%	220 ohm	0,33W	01,141
R19	Resistor, carbon	5%	4,7 Kohm	0,33W	01,157
R20	Resistor, carbon	5%	680 ohm	0,33W	01,147
R21	Resistor, carbon	5%	220 ohm	0,33W	01,141
R22	Resistor, carbon	5%	470 ohm	0,33W	01,145
R23	Resistor, carbon	5%	15 Kohm	0,33W	01,163
R24	Resistor, carbon	5%	10 Kohm	0,33W	01,161
R25	Resistor, carbon	5%	15 Kohm	0,33W	01,163
R26	Resistor, carbon	5%	470 ohm	0,33W	01,145
R27	Resistor, carbon	5%	1,2 Kohm	0,33W	01,150
R28	Resistor, carbon	5%	220 ohm	0,33W	01,141
R29	Resistor, carbon	5%	100 ohm	0,33W	01,137
R30	Resistor, carbon	5%	220 ohm	0,33W	01,141
R31	Resistor, carbon	5%	4,7 Kohm	0,33W	01,157
R32	Resistor, carbon	5%	680 ohm	0,33W	01,147
R33	Resistor, carbon	5%	220 ohm	0,33W	01,141
R34	Resistor, carbon	5%	470 ohm	0,33W	01,145
R35	Resistor, carbon	5%	10 Kohm	0,33W	01,161
R36	Resistor, carbon	5%	2,7 Kohm	0,33W	01,157
R37	Resistor, carbon	5%	4,7 Kohm	0,33W	01,161
R38	Resistor, carbon	5%	1,5 Kohm	0,33W	01,145
R39	Resistor, carbon	5%	820 ohm	0,33W	01,148
R40	Resistor, carbon	5%	1,5 Kohm	0,33W	01,151
R41	Resistor, carbon	5%	470 ohm	0,33W	01,145
R42	Resistor, carbon	5%	820 ohm	0,33W	01,151
R43	Resistor, carbon	5%	820 ohm	0,33W	01,148
R44	Resistor, carbon	5%	1,5 Kohm	0,33W	01,151
R45	Resistor, carbon	5%	470 ohm	0,33W	01,145
R46	Resistor, carbon	5%	1 Kohm	0,33W	01,149
R47	Resistor, carbon	5%	330 ohm	0,33W	01,143
R48	Resistor, carbon	5%	330 ohm	0,33W	01,113
R49	Resistor, carbon	5%	1 Kohm	0,33W	01,149
R50	Resistor, carbon	5%	390 ohm	0,33W	01,144
R51	Resistor, carbon	5%	220 ohm	0,33W	01,141
R52	Resistor, carbon	5%	27 ohm	0,33W	01,130
R53	Resistor, carbon	5%	68 ohm	0,33W	01,135
R54	Resistor, carbon	5%	47 ohm	0,33W	01,133
R55	Resistor, carbon	5%	39 ohm	0,33W	01,132
R56	Resistor, carbon	5%	15 ohm	0,33W	01,127
R57-62	Resistor, carbon	5%	1,8 Kohm	0,33W	01,152
R63-65	Resistor, carbon	5%	47 Kohm	0,33W	01,169
R66	Resistor, carbon	5%	2,2 Kohm	0,33W	01,153
R67	Resistor, carbon	5%	470 ohm	0,33W	01,145
R68	Resistor, carbon	5%	2,2 Kohm	0,33W	01,153
R69	Resistor, carbon	5%	4,7 Kohm	0,33W	01,157
R70	Resistor, carbon	5%	1,5 Kohm	0,33W	01,151
R71-72	Resistor, carbon	5%	470 ohm	0,33W	01,145
R73	Resistor, carbon	5%	220 ohm	0,33W	01,141
R74	Resistor, carbon	5%	2,2 Kohm	0,33W	01,153
R75	Resistor, carbon	5%	390 ohm	0,33W	01,144
R76	Resistor, carbon	5%	100 ohm	0,33W	01,137
R77	Resistor, carbon	5%	220 ohm	0,33W	01,141
R78	Resistor, carbon	5%	2,2 Kohm	0,33W	01,143
R79	Resistor, carbon	5%	100 ohm	0,33W	01,173
R80-82	Resistor, carbon	5%	220 ohm	0,33W	01,141
R83	Resistor, carbon	5%	470 ohm	0,33W	01,145
P1	Potentiometer, carbon		47 Kohm	0,2W	04,169
P2-3	Potentiometer, carbon		500 ohm	0,2W	04,145
P4	Potentiometer, carbon		100 ohm	0,2W	04,137
C1	Capacitor, mkt		68 nF	250V	11,223
C2	Capacitor, styroflex		100 pF	160V	10,125
C3	Capacitor, mkt		68 nF	250V	11,223
C4	Capacitor, cer		12 pF	250V	14,226
C5	Capacitor, cer		3 pF	160V	14,219
C6	Capacitor, cer		56 pF	250V	14,219
C7	Capacitor, cer		3 pF	160V	14,219
C8	Capacitor, cer		12 pF	250V	14,226
C9	Capacitor, styroflex		120 pF	160V	10,127
C10-17	Capacitor, mkt		68 nF	250V	11,223
C18	Capacitor, styroflex		120 pF	160V	10,127
C19-26	Capacitor, mkt		68 nF	250V	11,223
C27-28	Capacitor, cer		5,6 pF	250V	14,222
C29-47	Capacitor, mkt		68 uF	250V	11,223
C48	Capacitor, styroflex		120 pF	160V	10,127
C49-56	Capacitor, mkt		68 uF	250V	11,223
D1-4	Diode		AA 116		39,102
D5-8	Diode		IN 4148		39,103
D9-15	Diode		BA 182		39,101
T1	Transistor		BF 199		33,102
T2-5	Transistor		BC 147		32,101
T6	Transistor		BP 199		32,101
T7	Transistor		BC 147		34,101
T8-9	Transistor, field eff		TJS 88A		32,101
T10-11	Transistor		BC 147		32,101
L1	Coil, pre-filter				04,0131
L2	Coil, SSB amplifier		8700 KHz		04,0132
L3	Coil, SSB amplifier		8700 KHz		04,0118
L4	Coil, carrier re-insertion				04,0125
L5	Coil, SSB amplifier and power reduction				04,0132
ICI	Integrated circuit		MC 1496		35,101
FLI-2	Crystal filter		MF 8700-1		50,203
FL3	Crystal filter		F-8700-IU		50,202

CHANNEL OSC. Module 101.

PHASE DETECTOR and LOADING DETECTOR.
PART OF MODULE 105 AND MODULE 110. DEPENDANT ON VERSION

R1	Resistor, carbon	1 Kohm	5%	0,33W	01,149
R2	Resistor, carbon	1 Kohm	5%	0,33W	01,149
R3	Resistor, carbon	47 ohm	5%	0,33W	01,169
R4	Resistor, carbon	8,2 Kohm	5%	0,33W	01,160
R5	Resistor, carbon	4,7 Kohm	5%	0,33W	01,157
R6	Resistor, carbon	100 ohm	5%	0,33W	01,137
R7	Resistor, carbon	100 ohm	5%	0,33W	01,137
R8	Resistor, carbon	4,7 Kohm	5%	0,33W	01,157
R9	Resistor, carbon	820 ohm	5%	0,33W	01,148
R10	Resistor, carbon	820 ohm	5%	0,33W	01,148
R11	Resistor, carbon	1,5 Kohm	5%	0,33W	01,151
R12	Resistor, carbon	1,5 Kohm	5%	0,33W	01,151
P1-3	Potentiometer, carbon	2,5 Kohm		0,2W	04,154
C1	Capacitor, mkt	68 nF		250V	11,223
C2	Capacitor, styroflex	1,5 nF		160V	10,153
C3	Capacitor, mkt	68 nF		250V	11,223
C4	Capacitor, styroflex	1,5 nF		160V	10,153
C5	Capacitor, mkt	68 nF		250V	11,223
C6	Capacitor, mkt	68 nF		250V	11,223
C7	Capacitor, mkt	68 nF		250V	11,223
C8-10	Capacitor, cer	10 pF		1 KV	15,101
L6	Coil, phase detector				
D1	Diode	AA116			39,102
D2	Diode	AA116			39,102
D3	Diode	AA116			39,102
D4	Diode	AA116			39,102

8,7MHz CRYSTAL OSC. Module 102.

R1	Resistor, w-w	22 ohm	5%	9W	02,429
R2	Resistor, carbon	220 ohm	5%	0,33W	01,241
R3	Resistor, carbon	1,5 Kohm	5%	0,33W	01,251
R4	Resistor, carbon	22 ohm	5%	0,33W	01,229
R5	Resistor, carbon	22 Kohm	5%	0,33W	01,265
R6	Resistor, carbon	22 Kohm	5%	0,33W	01,265
C1	Capacitor, styroflex	270 pF		160V	10,135
C2	Capacitor, styroflex	270 pF		160V	10,135
C3	Capacitor, cer	22 pF		400V	14,329
C4	Capacitor, trimmer	3,5-18,5 pF			17,101
T1	Transistor	BC 147			32,101
Q1	Crystal Dan 3	8700 KHz			50,103
O1	Crystal oven 75°C			12V	50,301

DRIVER. Module 106.

R1	Resistor, carbon	2,7 Kohm	5%	0,33W	01,154
R2	Resistor, carbon	10 Kohm	5%	0,33W	01,161
R3	Resistor, carbon	2,2 Kohm	5%	0,33W	01,153
R4	Resistor, carbon	82 ohm	5%	0,33W	01,136
R5	Resistor, carbon	15 ohm	5%	0,33W	01,127
R6	Resistor, carbon	220 ohm	5%	0,33W	01,141
R7	Resistor, carbon			not assigned	
R8	Resistor, carbon	1,5 Kohm	5%	0,33W	01,151
R9	Resistor, carbon	4,7 Kohm	5%	0,33W	01,157
R10	Resistor, carbon	82 ohm	5%	0,33W	01,136
R11	Resistor, carbon	270 ohm	5%	0,33W	01,142
R12	Resistor, carbon	2,7 Kohm	5%	0,33W	01,154
R13	Resistor, carbon	5,6 Kohm	5%	0,33W	01,158
R14	Resistor, carbon	22 ohm	5%	0,33W	01,129
R15	Resistor, carbon	5,6 Kohm	5%	0,33W	01,122
R16	Resistor, carbon	3,9 Kohm	5%	0,33W	01,356
R17	Resistor, carbon	10 ohm	5%	0,33W	01,125
R18-19	Resistor, carbon	2,2 Kohm	5%	0,33W	01,153
R20-21	Resistor, carbon				

SERVO AMPLIFIER. Module 104.

P1	Pot. carbon	100 ohm	5%	0,33W	04,137	R1	Resistor, carbon	220 ohm	5%	0,33W	01,141
P2	Pot. carbon	1 Kohm	5%	0,33W	04,154	R2	Resistor, carbon	1,5 Kohm	5%	0,33W	01,151
C1	Capacitor, styroflex	100 pF		160V	10,125	R3	Resistor, carbon	220 ohm	5%	0,33W	01,141
C2	Capacitor, styroflex	390 pF		160V	10,139	R4	Resistor, carbon	2,2 Kohm	5%	0,33W	01,153
C3	Capacitor, styroflex	82 pF		160V	10,123	R5	Resistor, carbon	22 Kohm	5%	0,33W	01,165
C4	Capacitor, styroflex	120 pF		160V	10,127	R6	Resistor, carbon	470 ohm	5%	0,33W	01,145
C5	Capacitor, styroflex	150 pF		160V	10,129	R7	Resistor, carbon	8,2 Kohm	5%	0,33W	01,160
C6-8	Capacitor, mkt	68 nF		250V	11,223	R8	Resistor, carbon	470 ohm	5%	0,33W	01,145
C9	Capacitor, styroflex	180 pF		160V	10,131	R9	Resistor, carbon	8,2 Kohm	5%	0,33W	01,160
C10	Capacitor, styroflex	100 pF		160V	10,125	R10	Resistor, carbon	15 Kohm	5%	0,33W	01,163
C11	Capacitor, styroflex	270 pF		160V	10,135	R11	Resistor, carbon	10 Kohm	5%	0,33W	01,161
C12	Capacitor, styroflex	33 pF		160V	10,113	R12	Resistor, carbon	2,2 Kohm	5%	0,33W	01,153
C13	Capacitor, styroflex	220 pF		160V	10,133	R13-14	Resistor, carbon	5,6 Kohm	5%	0,33W	01,158
C14	Capacitor, styroflex	10 pF		160V	10,101	R15	Resistor, carbon	1 Kohm	5%	0,33W	01,149
C15	Capacitor, styroflex	270 pF		160V	10,135	R16	Resistor, carbon	470 ohm	5%	0,33W	01,145
C16	Capacitor, styroflex	200 pF		160V	10,132	R17	Resistor, carbon	820 ohm	5%	0,33W	01,148
C17	Capacitor, styroflex	180 pF		160V	10,131	R18	Resistor, carbon	470 ohm	5%	0,33W	01,145
C18	Capacitor, styroflex	180 pF		160V	10,131	R19	Resistor, carbon	1 Kohm	5%	0,33W	01,149
C19	Capacitor, styroflex	220 pF		160V	10,131	R20	Resistor, carbon	47 Kohm	5%	0,33W	01,169
C20	Capacitor, styroflex	82 pF		160V	10,123	R21	Resistor, carbon	22 ohm	5%	0,33W	01,122
C21	Capacitor, styroflex	56 pF		160V	10,119	C1	Capacitor, mkt	68 nF		250V	11,223
C22-23	Capacitor, mkt	68 nF		250V	11,223	C2	Capacitor, tantal	4,7 uF		10V	13,121
C24	Capacitor, tantal	4,7 uF		16V	13,121	C3	Capacitor, mkt	68 nF		250V	11,223
C25-31	Capacitor, mkt	68 nF		250V	11,223	C4	Capacitor, tantal	4,7 uF		10V	13,121
C32	Capacitor, mkt	1 uF		65V	12,613	C5-6	Capacitor, mkt	68 nF		250V	11,223
C33	Capacitor, mkt	68 nF		250V	11,223	C7	Capacitor, ellyt	20 uF		35V	12,329
C34	Capacitor, styroflex	120 pF		160V	10,127	C8	Capacitor, mkt	68 nF		250V	11,223
D1-4	Diode, balanced mixer	AA 116		39,102		C9	Capacitor, tantal	4,7 uF		10V	13,121
D5	Diode	IN 4148		39,103		C10-12	Capacitor, mkt	68 nF		250V	11,223
T1-2	Transistor	BF 199		33,102		D1-11	Diode	IN 4148			39,103
T3-5	Transistor	BD 139		30,101		T1-2	Transistor	BC 147			32,101
L1	Coil, high pass filter			04,0121		T3-5	Transistor	BC 157			32,102
L2	Coil, high pass filter			04,0127		T6	Transistor	BD 140			30,102
L3	Coil, low pass filter			04,0120		T7	Transistor	BD 139			30,101
L4	Coil, low pass filter			04,0120		T8-10	Transistor	BC 147			32,101
L5	Coil, balance mixer			04,0128		T11	Transistor	BD 140			30,102
L6	Coil, balance mixer			04,0128		RE1-2	Relay	V23012-A0111-A001			21,104
L7	Coil, low pass filter			04,0120							
L8	Coil, low pass filter			04,0120							
L9	Coil, low pass filter			04,0121							
L10	Coil, choke 15 uH 0,60 A			04,0107							
L11	Coil, driver output amplifier			04,0129							
L12	Coil, driver output amplifier			04,0129							

AERIAL CURRENT DETECTOR.
Module 108.

R1	Resistor, carbon	22 ohm	5%	0,33W	01,129
C1	Capacitor	1 nF	5%	0,33W	10,149
P1	Pot. carbon	5 Kohm		0,2W	04,157
D1	Diode	AA 116			39,102
L1	Coil, aerial trafo				04,0130

VOLTAGE STABILISER. Module 107.

R1	Resistor, w-w	10 Kohm	5%	16W	02,561		P1	Pot. carbon	500 ohm	0,2W	04,145
R2	Resistor, w-w	10 Kohm	5%	16W	02,561		C1-8	Capacitor, mkt	0,47 uF	250V	11,433
R3	Resistor, w-w	10 Kohm	5%	16W	02,561		C9	Capacitor, mkt	2,200 uF	Not assigned	
R4	Resistor, carbon	47 Kohm	5%	0,33W	01,169		C10-13	Capacitor, ellyt	47 uF	35V	12,453
R5	Resistor, carbon	47 Kohm	5%	0,33W	01,169		C14-17	Capacitor, ellyt	4,7 uF	350V	12,733
R6	Resistor, carbon	56 Kohm	5%	0,33W	01,169		C18-19	Capacitor, cer	2,200 uF	5KV	15,201
R7	Resistor, carbon	47 Kohm	5%	0,33W	01,170		C20-21	Capacitor, ellyt	68 uF	35V	12,453
R8	Resistor, carbon	47 Kohm	5%	0,33W	01,169		C22-29	Capacitor, mkt	IN 4148 special for Holland	250V	11,223
R9	Resistor, carbon	47 Kohm	5%	0,33W	01,169		D1	Diode	IN 4148	39,103	
R10	Resistor, carbon	56 Kohm	5%	0,33W	01,170		D2	Diode	TRC loop/IN5401	38,101	
R11	Resistor, carbon	22 Kohm	5%	0,33W	01,165		D3-6	Diode	SKB 250 C1000	250V 1 amp	
R12	Resistor, w-w	1 Kohm	5%	3W	02,249		D7-11	Diode, bridge	4xTRC loop	38,101	
R13	Resistor, w-w	5,6 Kohm	5%	9W	02,458		D12	Diode	BZX 55 C5V1	5,1V	39,707
R14	Resistor, w-w	12 Kohm	5%	5W	02,362		D13-15	Diode, zener	TRC loop/IN5401	38,101	
	Resistor, w-w	10 Kohm	5%	5W	02,361		D16	Diode			
P1	Pot. carbon	5 Kohm		0,2W	04,157		T1-5	Transistor	MP 2100A	30,104	
C1	Capacitor, electrolytic	4 uF		350V	12,720		T6	Transistor	BD 140	30,102	
D1-6	Diode, zener	BZX 55 C5V1		5,1V	39,707		T7	Transistor	BC 157	32,102	
T1-5	Transistor	MJE 340			37,101		T8	Transistor	BC 147	32,101	
							T9	Transistor	BD 139	30,101	
							T10	Transistor	2N 3055	30,105	
							T11	Transistor	BD 140	30,102	
							T12	Transistor	MP 2100A	30,104	

POWER SUPPLY.

R1	Resistor, w-w	56 ohm	5%	5W	02,333		F1	Fuse	15 Amp./30 Amp. dependant on voltage	22,105	
R2	Resistor, w-w	15 ohm	5%	16W	02,527		CH1-2	Choke	1961	26,104	
R3	Resistor, carbon	0,22 ohm	5%	1W made up from 2x0,47 ohm			TR1	Transformer	38/7-1926	26,105	
R4-5	Resistor, carbon	470 ohm	5%	0,5W	01,345		TR2	Transformer	96/32-1925		
R6	Resistor, carbon	0,22 ohm	5%	1W made up from 2x0,47 ohm							
R7-10	Resistor, w-w	10 ohm	5%	5W	02,325						
R11-12	Resistor, carbon	10 Kohm	5%	0,33W	01,161						
R13	Resistor, w-w	2,2 ohm	5%	5W	02,305						
R14	Resistor, w-w	39 ohm	5%	5W	02,232						
R15-16	Resistor, carbon	1 Kohm	5%	0,33W	01,149						
R17	Resistor, w-w	39 ohm	5%	5W	02,232						
R18	Resistor, w-w	2,2 ohm	5%	5W	02,305						
R19	Resistor, w-w	820 ohm	5%	3W	02,248						
R20	Resistor, w-w	27 ohm	5%	5W	02,330						
R21	Resistor, w-w	5,6 ohm	5%	3W	02,222						
R22	Resistor, carbon	100 ohm	5%	0,33W	01,137						
R23	Resistor, carbon	270 ohm	5%	0,33W	01,142						
R24-25	Resistor, carbon	470 ohm	5%	0,33W	01,145						
R26	Resistor, carbon	270 ohm	5%	0,33W	01,145						
R27-28	Resistor, carbon	1 Kohm	5%	0,33W	01,149						
R29	Resistor, carbon	820 ohm	5%	0,33W	01,148						
R30	Resistor, carbon	6,8 Kohm	5%	0,5W	01,359						

BANDS UNIT. Module 118.

R1	Resistor, carbon	47 ohm	5%	0,33W	01,133	C18	Capacitor, styroflex	180 pF	160V	10,131
R2	Resistor, carbon	100Kohm	5%	0,33W	01,173	C19	Capacitor, styroflex	100 pF	160V	10,125
R3	Resistor, carbon	470 ohm	5%	0,33W	01,145	C20	Capacitor, styroflex	100 pF	250V	11,223
R4	Resistor, carbon	470 ohm	5%	0,33W	01,145	C21	Capacitor, mkt	68 nF	250V	11,223
R5	Resistor, carbon	390 ohm	5%	0,33W	01,144	C22	Capacitor, mkt	68 nF	250V	11,223
R6	Resistor, carbon	100 Kohm	5%	0,33W	01,173	C23	Capacitor, mkt	68 nF	250V	11,223
R7	Resistor, carbon	470 ohm	5%	0,33W	01,145	C24	Capacitor, mkt	68 nF	250V	11,223
R8	Resistor, carbon	470 ohm	5%	0,33W	01,145	C25	Capacitor, mkt	68 nF	250V	11,223
R9	Resistor, carbon	390 ohm	5%	0,33W	01,144	C26	Capacitor, mkt	68 nF	250V	11,223
R10	Resistor, carbon	220 ohm	5%	0,33W	01,141	C27	Capacitor, preset	5-38 pF	not assigned	17,102
R11	Resistor, carbon	56 Kohm	5%	0,33W	01,170	C28	Capacitor, preset	5-38 pF	160V	17,102
R12	Resistor, carbon	10 kohm	5%	0,33W	01,161	C29	Capacitor, preset	5-38 pF	160V	10,135
R13	Resistor, carbon	1,5 Kohm	5%	0,33W	01,151	C30	Capacitor, styroflex	270 pF	160V	10,145
R14	Resistor, carbon	47 ohm	5%	0,33W	01,133	C31	Capacitor, preset	680 pF	160V	10,249
R15	Resistor, carbon	390 ohm	5%	0,33W	01,144	C32	Capacitor, styroflex	1 nF	160V	10,139
R16	Resistor, carbon	15 Kohm	5%	0,33W	01,163	C33	Capacitor, styroflex	390 pF	5%	17,102
R17	Resistor, carbon	12 Kohm	5%	0,33W	01,162	C34	Capacitor, ceramic	56 pF	5%	17,102
R18	Resistor, carbon	10 Kohm	5%	0,33W	01,161	C35	Capacitor, preset	5-38 pF	250V	11,223
R19	Resistor, carbon	6.8 Kohm	5%	0,33W	01,159	C36	Capacitor, preset	68 nF	250V	11,223
R20	Resistor, carbon	47 ohm	5%	0,33W	01,133	C37	Capacitor, mkt	68 nF	250V	11,223
R21	Resistor, carbon	33 ohm	5%	0,33W	01,131	C38	Capacitor, mkt	68 nF	250V	11,223
R22	Resistor, carbon	47 ohm	5%	0,33W	01,133	C39	Capacitor, mkt	68 nF	250V	11,223
R23	Resistor, carbon	10 ohm	5%	0,33W	01,125	C40	Capacitor, mkt	68 nF	250V	11,223
R24	Resistor, carbon	47 ohm	5%	0,33W	01,133	C41	Capacitor, mkt	68 nF	250V	11,223
R25	Resistor, carbon	390 ohm	5%	0,33W	01,144	C42	Capacitor, variable	2 gang 13-530 pF	18,101	
R26	Resistor, carbon	390 ohm	5%	0,33W	01,144					
R27	Resistor, carbon	390 ohm	5%	0,33W	01,144					
R28	Resistor, carbon	3,9 ohm	5%	0,33W	01,156					
R29	Resistor, carbon	10 Kohm	5%	0,33W	01,161					
R30 *	Resistor, carbon	2,2Kohm	5%	0,50W	01,353					
-	Resistor, carbon	1,2Kohm	5%	0,50W	01,350					
C1	Capacitor, mkt	68 nF	250V	11,223	P1	Pot. carbon	2,5Kohm	0,2W	04,154	
C2	Capacitor, mkt	68 nF	250V	11,223	P2	Pot. carbon	2,5Kohm	0,2W	04,154	
C3	Capacitor, mkt	68 nF	250V	11,223	D1-8	Diode	1N4148		39,103	
C4	Capacitor, styroflex	100 pF	160V	10,125	T1-T4	Transistor	FET, TIS 88A		34,101	
C5	Capacitor, ceramic	2,2 pF	250V	14,117	T5-T8	Transistor	BC 147A		32,101	
C6	Capacitor, styroflex	680 pF	160V	10,145	L7	Coil	First mixer		04,0107	
C7	Capacitor, styroflex	120 pF	160V	10,127	L8	Coil	8,7 MHz IF		04,0108	
C8	Capacitor, mkt	68 nF	250V	11,225	L9	Coil	8,7 MHz IF		04,0109	
C9	Capacitor, mkt	68 nF	250V	11,225	L10	Coil	Second mixer		04,0110	
C10	Capacitor, mkt	68 nF	250V	11,225	L11	Coil	580 kHz IF		04,0111	
C11	Capacitor, styroflex	1 nF	160V	10,249	L12	Coil	580 kHz IF		04,0112	
C12	Capacitor, ceramic	39 pF	250V	14,232	L13	Coil	580 kHz IF		04,0112	
C13	Capacitor, styroflex	1 nF	160V	10,149	L1	Coil	LW Ant.		04,0101	
C14	Capacitor, ceramic	8,2 pF	250V	14,224	L2	Coil	MW Ant.		04,0102	
C15	Capacitor, mkt	6,8 nF	250V	11,111	L3	Coil	SW Ant.		04,0103	
C16	Capacitor, styroflex	1.1 nF	160V	10,311	L4	Coil	LW osc.		04,0104	
C17	Capacitor, styroflex	180 pF	160V	10,311	L5	Coil	MW osc.		04,0105	
					L6	Coil	SW osc.		04,0106	

* Dependant on input voltage.

CRYSTAL BANK. Module 112.

C1-30	Capacitor, preset	3,5 - 18 pF	5%	17,101
C31-60	Capacitor, ceramic	22 pF	5%	14,329
SW1	Switch			400V
				86,101

8120 KHz CRYSTAL OSC. Module 119.

R1	Resistor, w-w	22 ohm	5%	02,429
R2	Resistor, carbon	82 ohm	5%	01,236
R3	Resistor, carbon	1 Kohm	5%	01,249
R4	Resistor, carbon	47 ohm	5%	01,233
R5	Resistor, carbon	22 Kohm	5%	01,253
R6	Resistor, carbon	22 Kohm	5%	01,253
R7	Resistor, carbon	33 Kohm	5%	01,267
R8	Resistor, carbon	15 Kohm	5%	01,263
R9	Resistor, carbon	2,2 Kohm	5%	01,253
P2	Pot. carbon	10 Kohm lin.	0,5W	05,201
C1	Capacitor, Tantal	4,7 uF	10V	13,121
C2	Capacitor, styroflex	270 pF	160V	10,135
C3	Capacitor, styroflex	270 pF	160V	10,135
C4	Capacitor, trimmer	3,5-18,5 pF		17,101
C5	Capacitor, styroflex	82 pF	160V	10,123
C6	Capacitor, tantal	4,7 uF	10V	13,121
D1	Diode, zener	BZX 55 C8V2	8,2V	39,708
D2	Diode, cap.	BB 103		39,401
T1	Transistor	BC 147		32,101
X1	Crystal	8120 KHz	DAN-1	50,101

I.F. AMPLIFIER. Module 117.

R1	Resistor, carbon	10 Kohm	5%	01,161
R2	Resistor, carbon	1 Kohm	5%	01,149
R3	Resistor, carbon	47 ohm	5%	01,133
R4	Resistor, carbon	82 Kohm	5%	01,160
R5	Resistor, carbon	100 ohm	5%	01,137
R6	Resistor, carbon	12 Kohm	5%	01,162
R7	Resistor, carbon	56 Kohm	5%	01,170
R8	Resistor, carbon	390 ohm	5%	01,144

R9	Resistor, carbon	47 ohm	5%	01,133
R10	Resistor, carbon	390 ohm	5%	01,144
R11	Resistor, carbon	100 ohm	5%	01,137
R12	Resistor, carbon	1 Kohm	5%	01,149
R13	Resistor, carbon	680 ohm	5%	01,147
R14	Resistor, carbon	1 Kohm	5%	01,149
R15	Resistor, carbon	100 ohm	5%	01,137
R16	Resistor, carbon	1 Kohm	5%	01,149
R17	Resistor, carbon	680 ohm	5%	01,147
R18	Resistor, carbon	22 ohm	5%	01,129
R19	Resistor, carbon	680 ohm	5%	01,147
R20	Resistor, carbon	100 ohm	5%	01,137
R21	Resistor, carbon	680 ohm	5%	01,147
R22	Resistor, carbon	47 ohm	5%	01,133
R23	Resistor, carbon	100 ohm	5%	01,137
R24	Resistor, carbon	10 Kohm	5%	01,161
R25	Resistor, carbon	18 Kohm	5%	01,164
R26	Resistor, carbon	47 Kohm	5%	01,169
R27	Resistor, carbon	6,8 Kohm	5%	01,159
R28	Resistor, carbon	10 Kohm	5%	01,161
R29	Resistor, carbon	470 ohm	5%	01,145
R30	Resistor, carbon	22 Kohm	5%	01,165
R31	Resistor, carbon	82 Kohm	5%	01,172
R32	Resistor, carbon	100 ohm	5%	01,137
R33	Resistor, carbon	56 Kohm	5%	01,170
R34	Resistor, carbon	180 Kohm	5%	01,144
R35	Resistor, carbon	390 ohm	5%	01,133
R36	Resistor, carbon	47 ohm	5%	01,144
R37	Resistor, carbon	100 ohm	5%	01,137
R38	Resistor, carbon	390 ohm	5%	01,144
R39	Resistor, carbon	1 Kohm	5%	01,149
R40	Resistor, carbon	22 Kohm	5%	01,165
R41	Resistor, carbon	100 ohm	5%	01,137
R42	Resistor, carbon	560 ohm	5%	01,146
R43	Resistor, carbon	1,5 Kohm	5%	01,151
R44	Resistor, carbon	22 Kohm	5%	01,165
R45	Resistor, carbon	10 Kohm	5%	01,161
R46	Resistor, carbon	22 Kohm	5%	01,165
R47	Resistor, carbon	68 Kohm	5%	01,171
R48	Resistor, carbon	39 Kohm	5%	01,168
R49	Resistor, carbon	220 Kohm	5%	01,177
R50	Resistor, carbon	390 ohm	5%	01,144
R51	Resistor, carbon	220 ohm	5%	01,141
R52	Resistor, carbon	4,7 Kohm	5%	01,157
R53	Resistor, carbon	1 Kohm	5%	01,149
R54	Resistor, carbon	8,2 Kohm	5%	01,160
R55	Resistor, carbon			
R56	Resistor, carbon			
R57	Resistor, carbon			
R58	Resistor, carbon			
R59	Resistor, carbon			
R60	Resistor, carbon			
R61	Resistor, carbon			

not assigned

not assigned

A.F. AMPLIFIER. Module 115.

14. DIVIDER. Module 116.

and CONNECTOR. Module 120.

R1	Resistor	390 ohm	5%	0,33W	01,144	R1	Resistor	1 Kohm	5%	0,33V	01,149
R2	Resistor	1,2 Kohm	5%	0,33W	01,150	R2	Resistor	100 Kohm	5%	0,33V	01,173
R3	Resistor	47 ohm	5%	0,33W	01,133	R3	Resistor	47 Kohm	5%	0,33V	01,169
R4	Resistor	10 Kohm	5%	0,33W	01,161	R4	Resistor	220 Kohm	5%	0,33V	01,177
R5	Resistor	10 Kohm	5%	0,33W	01,161	R5	Resistor	1,8 Kohm	5%	0,33V	01,152
R6	Resistor	8 Kohm	5%	0,33W	01,159	R6	Resistor	12 Kohm	5%	0,33V	01,162
R7	Resistor	33 Kohm	5%	0,33W	01,167	R7	Resistor	8,2 Kohm	5%	0,33V	01,160
R8	Resistor	150 ohm	5%	0,33W	01,189	R8	Resistor	22 Kohm	5%	0,33V	01,165
R9	Resistor	47 ohm	5%	0,33W	01,133	R9	Resistor	1,5 Kohm	5%	0,33V	01,151
R10	Resistor	470 ohm	5%	0,33W	01,145	R10	Resistor	47 ohm	5%	0,33V	01,133
R11	Resistor	47 ohm	5%	0,33W	01,133	R11	Resistor	180 ohm	5%	0,33V	01,146
R12	Resistor	10 Kohm	5%	0,33W	01,161	R12	Resistor	560 ohm	5%	0,33V	01,152
R13	Resistor	10 Kohm	5%	0,33W	01,161	R13	Resistor	1,8 Kohm	5%	0,33V	01,129
R14	Resistor	330 ohm	5%	0,33W	01,143	R14	Resistor	22 ohm	5%	0,33V	03,101
R15	Resistor	390 ohm	5%	0,33W	01,144	R15	Resistor	40 ohm	10%	0,7W	01,409
R16	Resistor	2,2 Kohm	5%	0,33W	01,153	R16	Resistor	0,47 ohm	5%	0,33W	01,128
R17	Resistor	180 ohm	5%	0,33W	01,140	R17	Resistor	18 ohm	5%	0,33W	01,157
R18	Resistor	180 ohm	5%	0,33W	01,140	R18	Resistor	4,7 Kohm	5%	0,33W	
R19	Resistor	100 ohm	5%	0,33W	01,137						
C1	Capacitor	68 nF	250V		11,223	R19	Resistor	5,6 Kohm	5%	0,33W	01,158
C2	Capacitor, styroflex	100 pF	160V		10,125	R20	Resistor	3,3 Kohm	5%	0,33W	01,155
C3	Capacitor, mkt	68 nF	250V		11,223	R21	Resistor	820 ohm	5%	0,33W	01,148
C4-5	Capacitor, styroflex	1 nF	160V		10,149	R22	Resistor	220 ohm	5%	0,33W	01,141
C6	Capacitor, mkt	68 nF	250V		11,223	R23	Resistor	120 ohm	5%	3W	02,238
C7	Capacitor, styroflex	1 nF	160V		10,125	R24	Resistor	4,7 ohm	5%	9W	02,421
C8	Capacitor, mkt	68 nF	250V		11,223	P1	Pot.carbon	100 Kohm		0,5W	05,101
C9	Capacitor, styroflex	1 nF	160V		10,125	P2	Pot.carbon	500 ohm		0,2W	04,145
G10	Capacitor, styroflex	2,2 nF	160V		10,151	P3 *	Pot.carbon	10 Kohm			05,202
G11	Capacitor, mkt	68 nF	250V		11,223						
C12	Capacitor, mkt	68 nF	250V		11,223	C1	Capacitors	68 nF		250V	11,223
C13	Capacitor, electrolytic	10 uF	25V		12,225	C2	Capacitors	10 uF		25V	12,325
						C3	Capacitors	68 nF		250V	11,223
D1	Diode Zener	BZX 55	5,1V		39,707	C4	Capacitors	10 uF		25V	12,325
T1-3	Transistor	BC 147			32,101	C5	Capacitors	100 uF		25V	12,237
T4	Transistor	BC 157			32,102	C6	Capacitors	68 nF		250V	11,223
T5	Transistor	BC 147			32,101	C7	Capacitors	1000 uF		16V	12,249
						C8	Capacitors	2200 uF		35V	12,453
						C9-C17	Capacitors	68 nF		250V	11,223
IC1	Integrated circuit	SN 74107			36,101	* English version only. (R101GB)					
IC2	Integrated circuit	SN 7410			36,103	D1	Diode	IN4148		5,1V	39,103
IC3	Integrated circuit	SN 74107			36,101	D2	Zener	BZX 55 C5V1		6,8V	39,703
						D3	Zener	LMZ 6,8 1W		6,8V	39,709
						D4	Zener	LMZ 6,8 1W		6,8V	39,709
L1	Coil	8120 KHz			04-0115	D5	Diode	TRC 100P/IN5401			
L2	Coil	580 KHz			04-0116						

continued

T1-2	Transistor	BC 147	32, 101	C4	Capacitor, mkt	22 nF	250V	11, 317
T3-4	Transistor	AD 162	30, 103	C5	Capacitor, trimmer	5-38 pF	160V	17, 102
T5	Transistor	BC 147	32, 101	C6	Capacitor, styroflex	1 nF	160V	10, 149
T6	Transistor	BD 139	30, 101	C7	Capacitor, styroflex	220 pF	160V	10, 133
T7	Transistor	2N3055	30, 101	C8	Capacitor, trimmer	5-38 pF	160V	17, 102
T8	Transistor	BD 139	30, 101	C9	Capacitor, styroflex	1 nF	160V	10, 149
F1-2	Fuse	2 amp.	30, 105	C10	Capacitor, styroflex	220 pF	250V	10, 133
CH1-2	Choke	1530/21	30, 101	C11-13	Capacitor, mkt	68 nF	250V	11, 223
TR1	Transformer	Driver 1899	55, 401	C14	Capacitor, cer	22 pF	250V	14, 329
TR2	Transformer	Output 1898	22, 103	C15	Capacitor, styroflex	270 pF	160V	10, 135
LS1	Loudspeaker	0050 P.	26, 102	C16	Capacitor, styroflex	1 nF	160V	10, 149
LAL-2	Lamp.	12875 D	26, 103	C17	Capacitor, styroflex	120 pF	160V	10, 127
			28, 101	C18	Capacitor, styroflex	240 pF	160V	10, 134
			55, 301	C19	Capacitor, styroflex	180 pF	160V	10, 131
				C20	Capacitor, styroflex	360 pF	160V	10, 138
				C21	Capacitor, styroflex	240 pF	160V	10, 134
				C22	Capacitor, styroflex	56 pF	160V	10, 119
				C23	Capacitor, styroflex	200 pF	160V	10, 132
				C24-26	Capacitor, mkt	68 nF	250V	11, 223
				C27	Capacitor, electrolyt	10 uF	25V	12, 225

8 ohm

AUTOMATIC. Module 113.

R1	Resistor, carbon	47 Kohm	0, 33W	01, 157	D1	Diode	4xAA 119	39, 102
R2	Resistor, carbon	1,8 Kohm	0, 33W	01, 152	D2	Diode, zener	BZX 55 C5V1	39, 707
R3	Resistor, carbon	100 ohm	0, 33W	01, 137	D3	Diode, zener	BZX 55 C8V2	39, 708
R4	Resistor, carbon	4,7 Kohm	0, 33W	01, 157	T1	Transistor, field eff	TIS 88A	34, 101
R5	Resistor, carbon	15 Kohm	0, 33W	01, 163	T2-4	Transistor	BC 147	32, 101
R6	Resistor, carbon	470 ohm	0, 33W	01, 145	T5	Transistor	BD 139	30, 101
R7	Resistor, carbon	100 ohm	0, 33W	01, 137	T6	Transistor	BC 147	32, 101
R8	Resistor, carbon	1,5 Kohm	0, 33W	01, 151	T7	Transistor	BC 157	32, 102
R9	Resistor, carbon	4,7 Kohm	0, 33W	01, 157	T8-9	Transistor	BC 147	32, 101
R10	Resistor, carbon	82 ohm	0, 33W	01, 172	T10	Transistor	BC 157	32, 102
R11	Resistor, carbon	270 ohm	0, 33W	01, 142	T11-12	Transistor	BC 147	32, 101
R12	Resistor, carbon	100 ohm	0, 33W	01, 137	T13	Transistor	2N 3055	30, 105
R13	Resistor, carbon	2,2 Kohm	0, 33W	01, 153	T14	Transistor	BC 147	32, 101
R14	Resistor, carbon	180 ohm	0, 33W	01, 140	T15	Transistor	BD 139	30, 101
R15	Resistor, carbon	560 ohm	0, 33W	01, 146	T16	Transistor	BC 147	32, 101
R16	Resistor, carbon	2,2 Kohm	0, 33W	01, 153	GL1	Glim Lamp	GL 14	55, 201
R17-18	Resistor, carbon	100 ohm	0, 33W	01, 137	Q1	Crystal	8,7 MHz	50, 102
R19	Resistor, carbon	150 ohm	0, 33W	01, 139	L1	Coil, band pass filter		04, 0117
R20-21	Resistor, carbon	560 ohm	0, 33W	01, 146	L2	Coil, band pass filter		04, 0117
R22-23	Resistor, carbon	100 ohm	0, 33W	01, 137	L3	Coil, reference osc.		04, 0117
R24	Resistor, carbon	2,2 Kohm	0, 33W	01, 153	L4	Coil, band pass filter		04, 0118
R25	Resistor, carbon	1,2 Kohm	0, 33W	01, 150	L5	Coil, band pass filter		04, 0118
R26-27	Resistor, carbon	100 ohm	0, 33W	01, 137	L6	Coil, reference osc.		04, 0119
R28	Resistor, w-w	5,6 ohm	0, 33W	02, 222	L7	Coil, crystal osc		04, 0107
R29	Resistor, carbon	1,8 Kohm	0, 33W	01, 152	L8	Coil, wide band mixer		04, 0120
R30	Resistor, carbon	390 ohm	0, 33W	01, 144	L9	Coil, low pass filter		04, 0120
R31	Resistor, carbon	270 ohm	0, 33W	01, 142	L10	Coil, low pass filter		04, 0120
R32-33	Resistor, carbon	1,8 Kohm	0, 33W	01, 152	L11	Coil, low pass filter		04, 0121
R34	Resistor, carbon	2,2 Kohm	0, 33W	01, 153	M	Motor		
P1	Pot. carbon	500 ohm	0, 2W	04, 145				
C1	Capacitor, trimmer	8-135 pF		17, 104				
C2	Capacitor, trimmer	5-38 pF		17, 102				
C3	Capacitor, styroflex	100 pF	160V	10, 125				

FREQUENCY COMPARATOR. Module 114.

R1	Resistor	6, 8 Kohm	5%	1/3W	01, 159	C1	Capacitor, styroflex	1 nF	160V	10, 149
R2	Resistor	33 Kohm	5%	1/3W	01, 167	C2-3	Capacitor, mkt	68 nF	250V	11, 223
R3	Resistor	150 ohm	5%	1/3W	01, 139	C4-5	Capacitor, styroflex	1 nF	160V	10, 149
R4	Resistor	22 ohm	5%	1/3W	01, 129	C6-7	Capacitor, mkt	68 nF	250V	11, 228
R5	Resistor	1, 2 Kohm	5%	1/3W	01, 150	C8	Capacitor, styroflex	1 nF	160V	10, 149
R6	Resistor	100 ohm	5%	1/3W	01, 137	C9	Capacitor, mkt	68 nF	250V	11, 223
R7	Resistor	10 Kohm	5%	1/3W	01, 161	C10	Capacitor, styroflex	100 pF	160V	10, 125
R8	Resistor	10 Kohm	5%	1/3W	01, 161	C11	Capacitor, styroflex	1 nF	160V	10, 149
R9	Resistor	6, 8 Kohm	5%	1/3W	01, 159	C12	Capacitor, mkt	68 nF	250V	11, 223
R10	Resistor	33 Kohm	5%	1/3W	01, 167	C13	Capacitor, mkt	68 nF	250V	11, 223
R11	Resistor	150 ohm	5%	1/3W	01, 139	C14	Capacitor, styroflex	1 nF	160V	10, 149
R12	Resistor	47 ohm	5%	1/3W	01, 133					
R13	Resistor	1, 2 Kohm	5%	1/3W	01, 150					
R14	Resistor	100 ohm	5%	1/3W	01, 137					
R15	Resistor	10 Kohm	5%	1/3W	01, 161	D1	Diode, zener	BZX 55 C5V1	5, 1V	39, 707
R16	Resistor	10 Kohm	5%	1/3W	01, 161	D2	Diode	AA 116		39, 102
R17	Resistor	220 ohm	5%	1/3W	01, 141	D3	Diode	IN 4148		
R18	Resistor	1, 5 Kohm	5%	1/3W	01, 151					
R19	Resistor	15 Kohm	5%	1/3W	01, 163					
R20	Resistor	220 ohm	5%	1/3W	01, 141					
R21	Resistor	390 ohm	5%	1/3W	01, 144	T1	Transistor	BC 147		32, 101
R22	Resistor	2, 2 Kohm	5%	1/3W	01, 153	T2	Transistor	BC 157		32, 102
R23	Resistor	2, 2 Kohm	5%	1/3W	01, 153	T3-4	Transistor	BC 147		32, 101
R24	Resistor	2, 2 Kohm	5%	1/3W	01, 153	T5	Transistor	BC 157		32, 102
R25	Resistor	220 ohm	5%	1/3W	01, 141	T6	Transistor	BC 147		32, 101
R26	Resistor	68 ohm	5%	1/3W	01, 335	T7	Transistor, unj	2N 4870		37, 102
R27	Resistor	220 ohm	5%	1/3W	01, 141	T8	Transistor	BC 147		32, 101
R28	Resistor	2, 2 Kohm	5%	1/3W	01, 153	T9-10	Transistor	BC 157		32, 102
R29	Resistor	2, 2 Kohm	5%	1/3W	01, 153	T11-12	Transistor	BC 147		32, 101
R30	Resistor	5, 6 Kohm	5%	1/3W	01, 158					
R31	Resistor	10 Kohm	5%	1/3W	01, 161					
R32	Resistor	10 Kohm	5%	1/3W	01, 161					
R33	Resistor	150 ohm	5%	1/3W	01, 139					
R34	Resistor	1, 2 Kohm	5%	1/3W	01, 150					
R35	Resistor	100 ohm	5%	1/3W	01, 137	IC1-4	Integrated circuit	SN 74107		36, 101
R36	Resistor	6, 8 Kohm	5%	1/3W	01, 159	IC5-6	Integrated circuit	SN 7410		36, 103
R37	Resistor	33 Kohm	5%	1/3W	01, 167	IC7-9	Integrated circuit	SN 7493		36, 105
						IC10-12	Integrated circuit	SN 7485		36, 104
						IC13-15	Integrated circuit	SN 7493		36, 105
						IC16-18	Integrated circuit	SN 7400		36, 102
P1	Carbon preset, Pot.	5 Kohm		0, 2W	04, 157					

