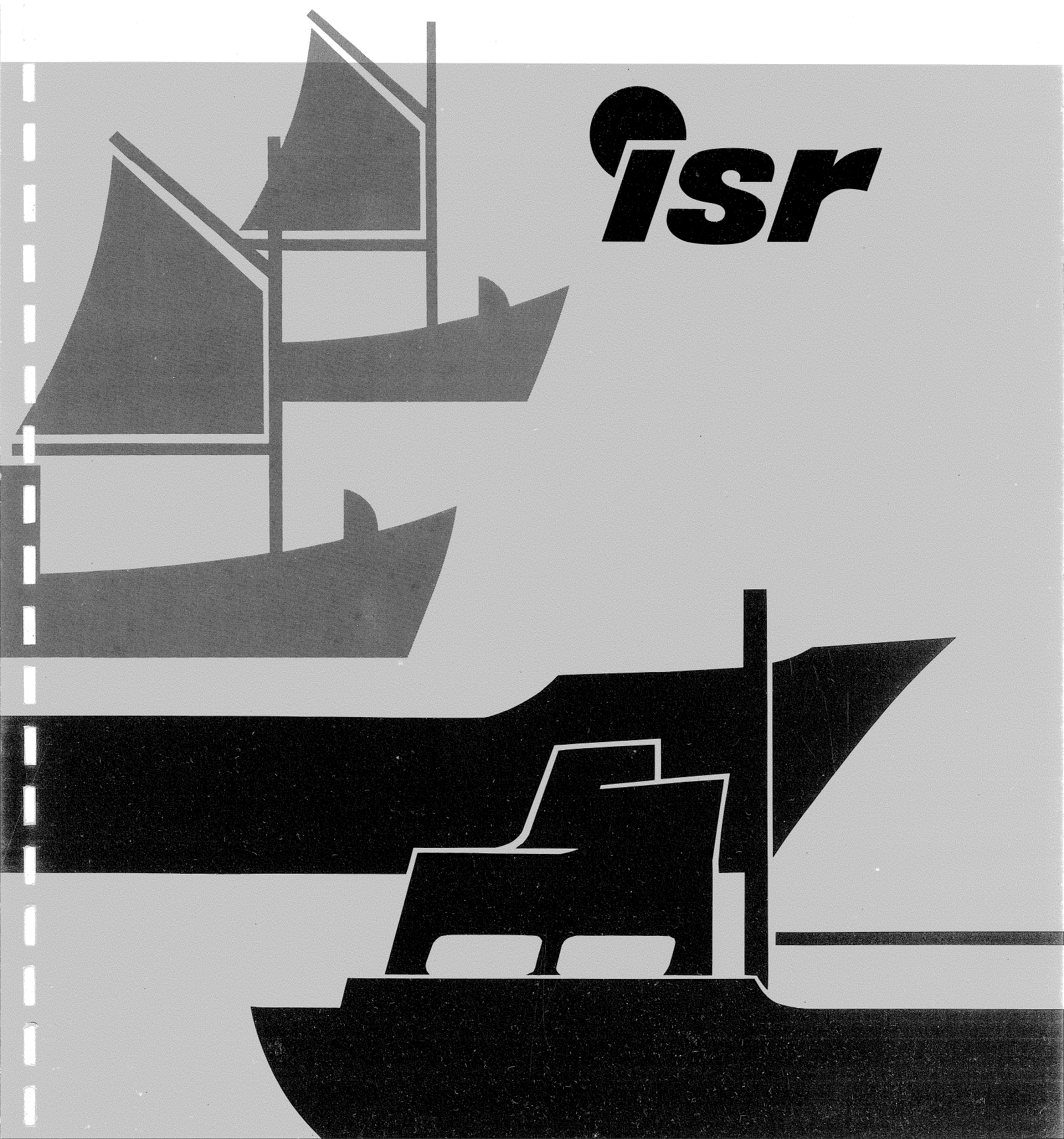


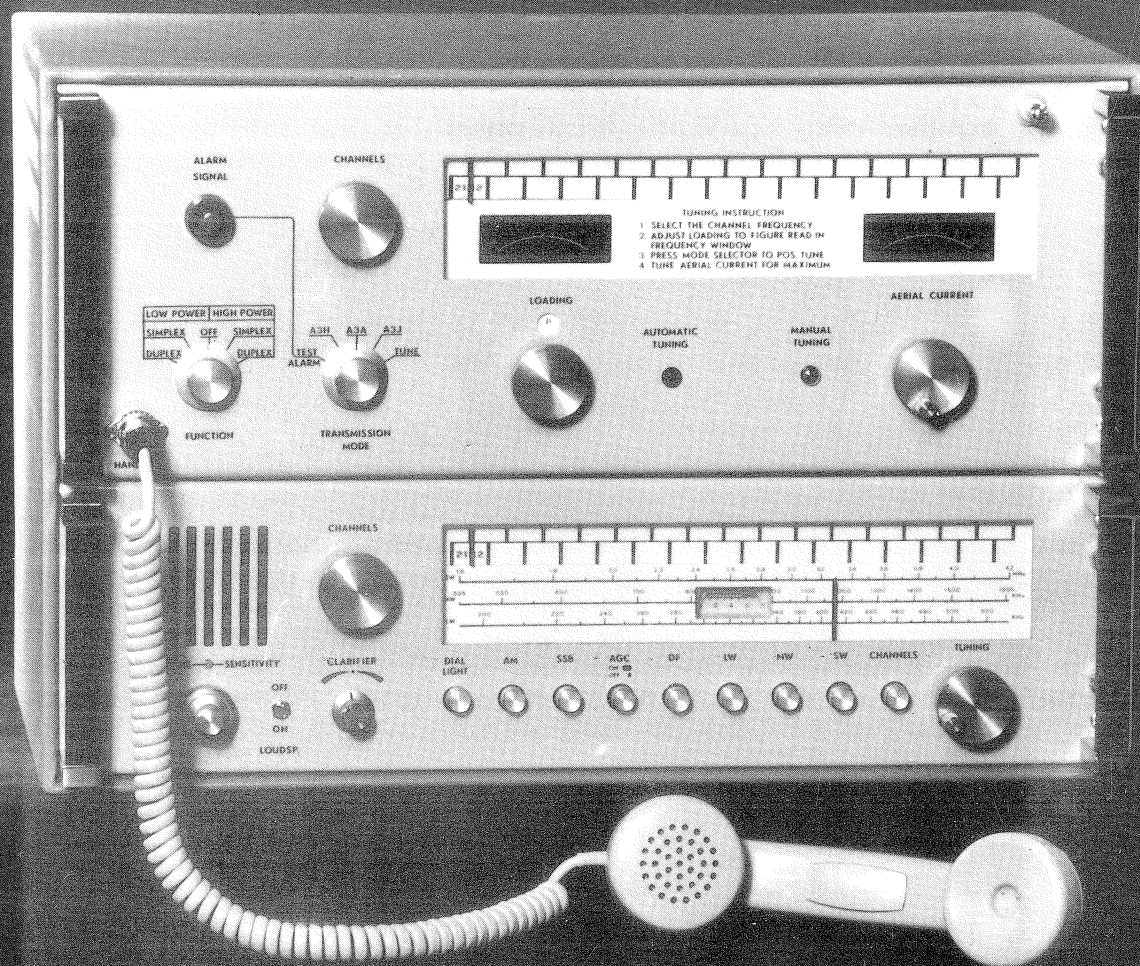
Maritimt  
elektronisk  
udstyr

**isr**











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

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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.

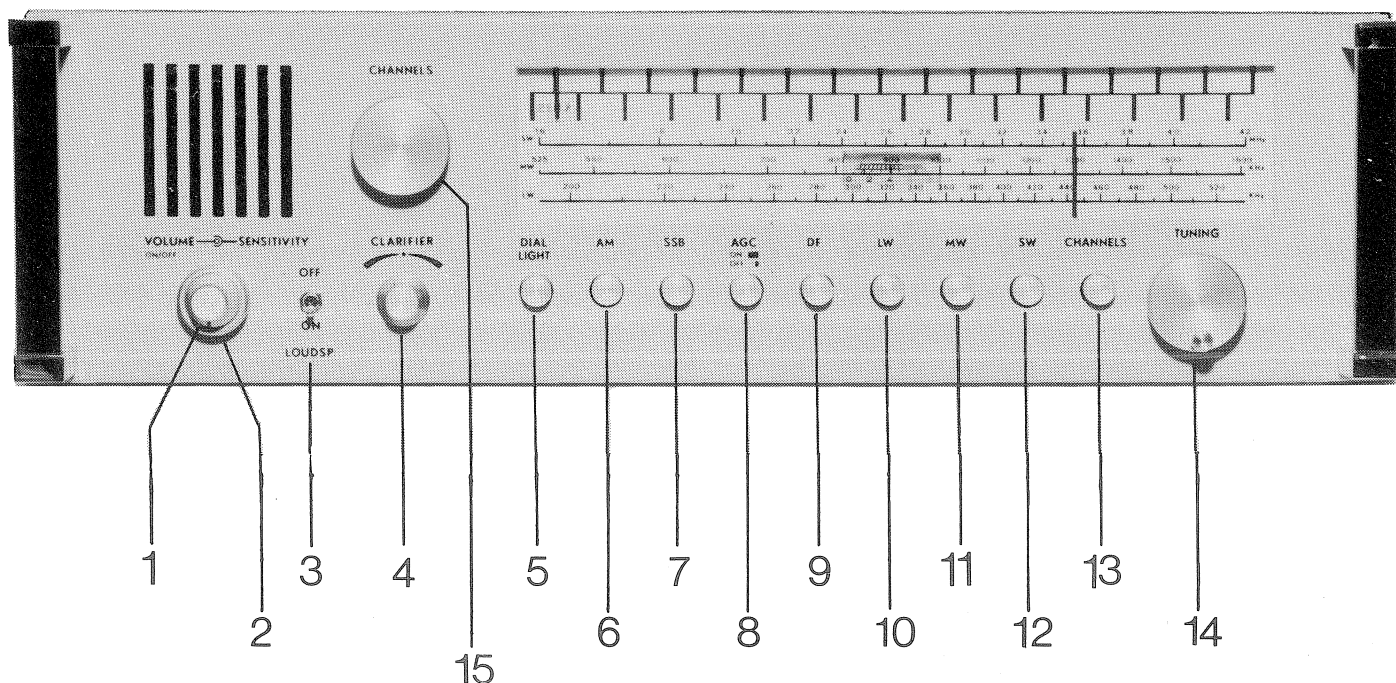
The equipment can operate on 30 transmit- and 30 receive frequencies in the frequency range 1600 to 4200 KHz, using A2A, A3E or A3J modes.

**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.

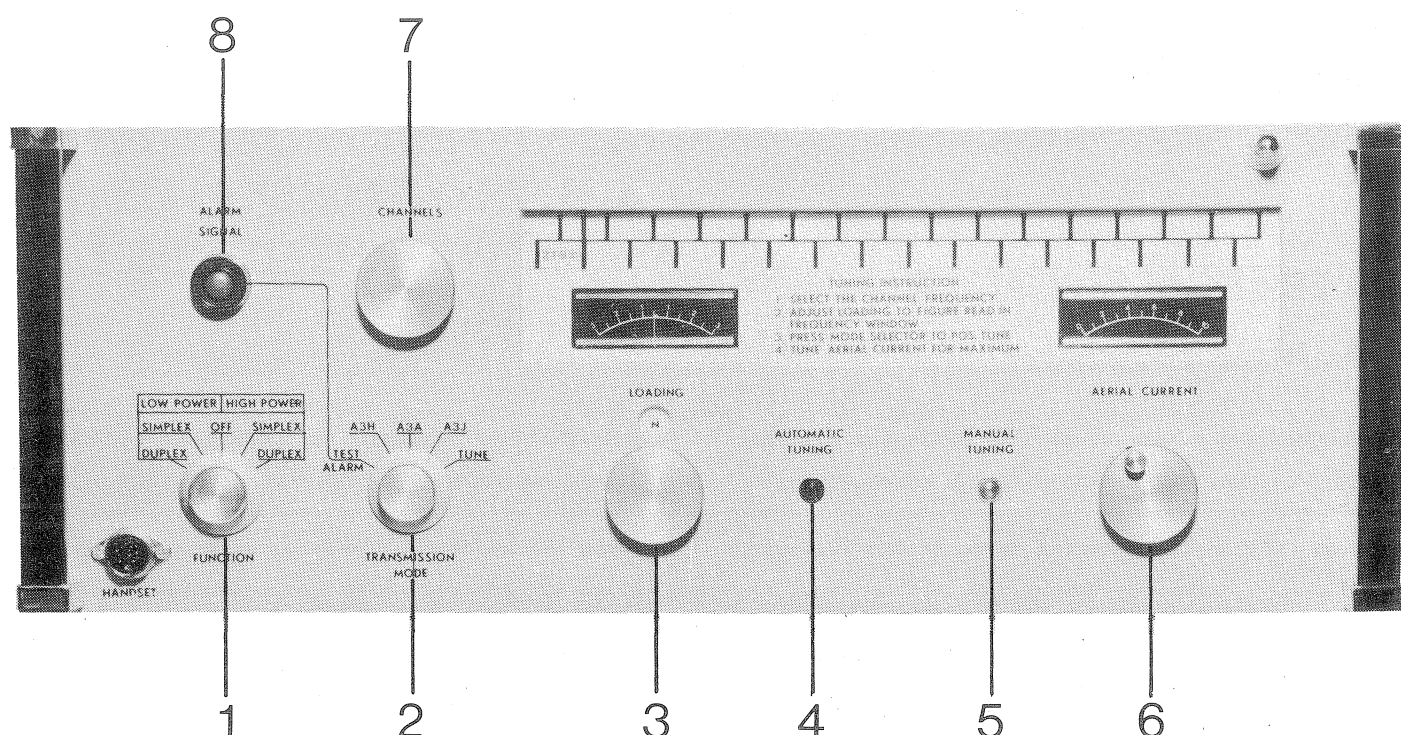
## 1. E. DIRECTION FINDING

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.

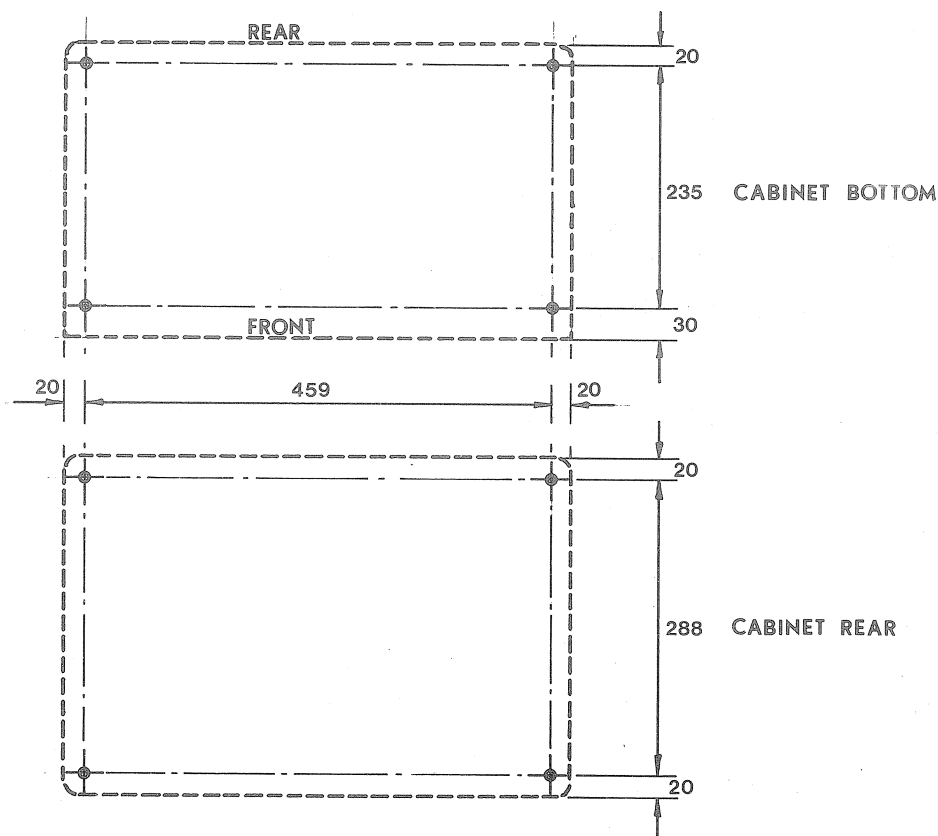
Mount the set on a table or shelf or alternatively it can be mounted directly on a bulkhead.

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.

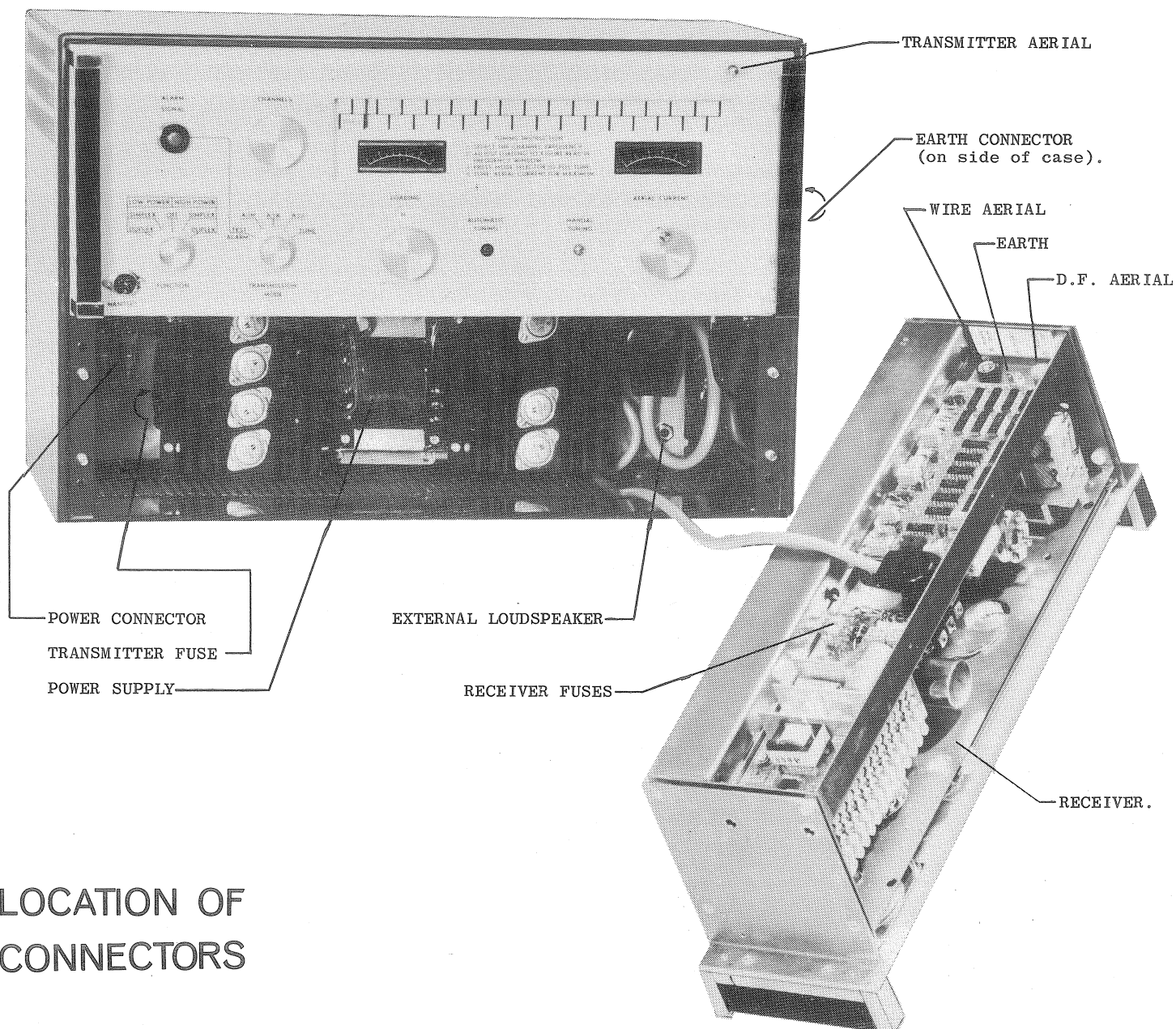
Remember to tune the aerial trimmer in the receiver input circuit both when the receiver is installed the first time, and when it is reinstalled after repair or maintenance.

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.

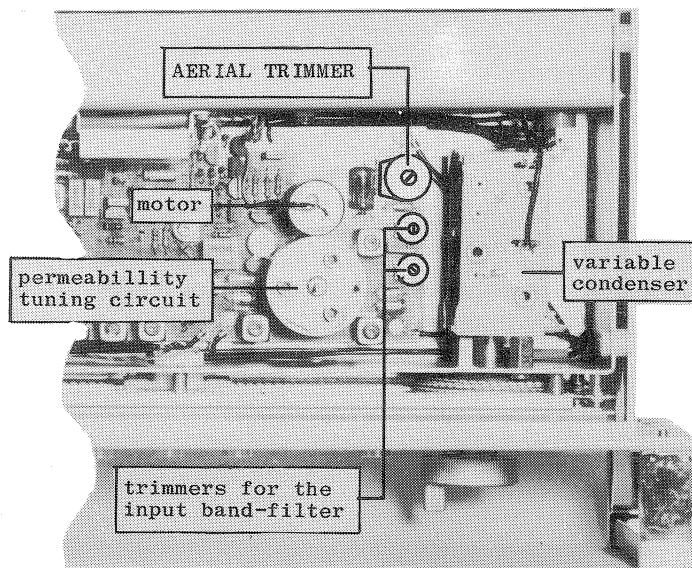
Tune the aerial trimmer for max. signal strength indicated as max. deflection on the "S" meter.

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.

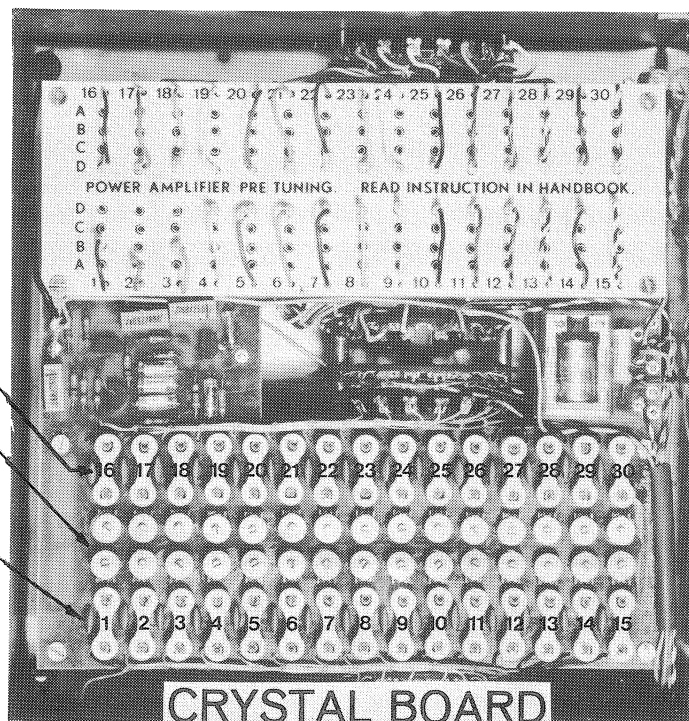
Control the channel frequency.

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

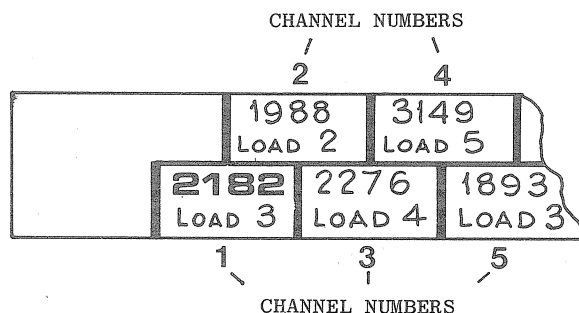
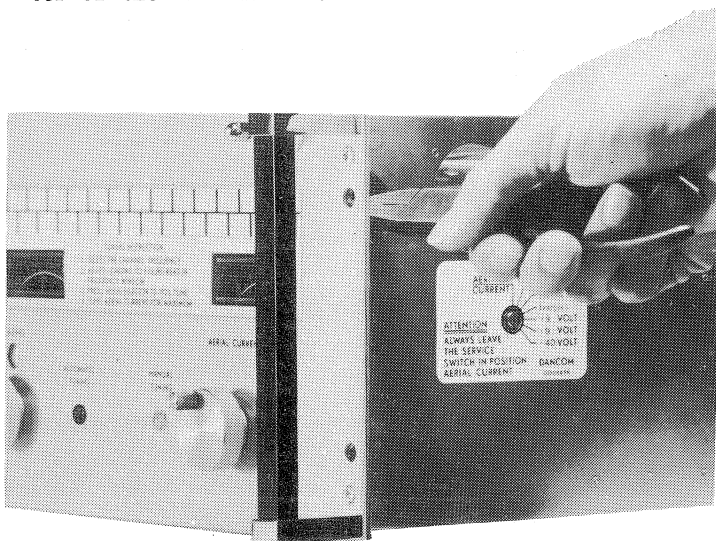


## CHANNELS DIAL

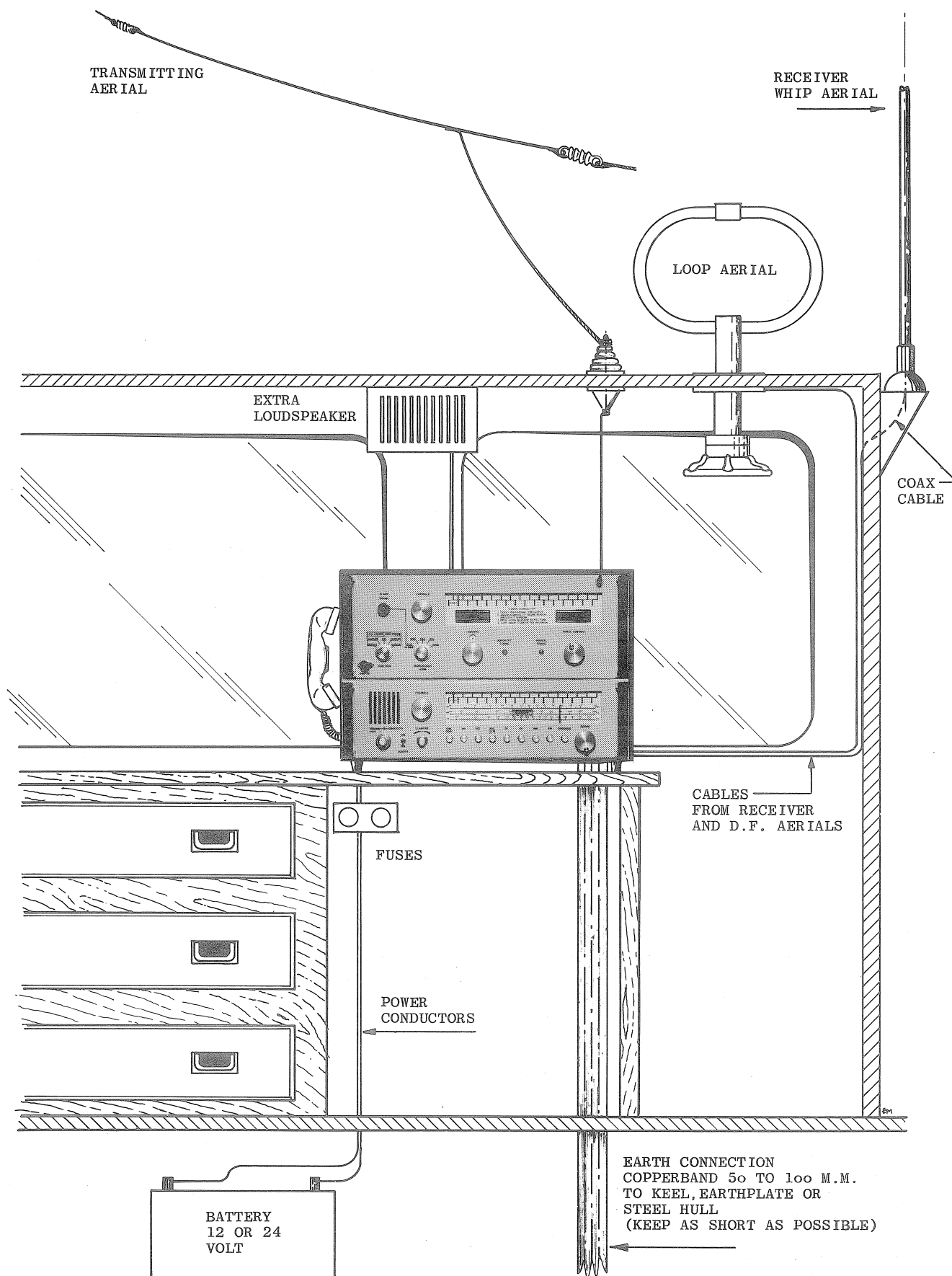
The channels dial is made in the form of a strip which can be drawn out to make it possible to write the channel frequencies and loading figures in their respective windows.

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.



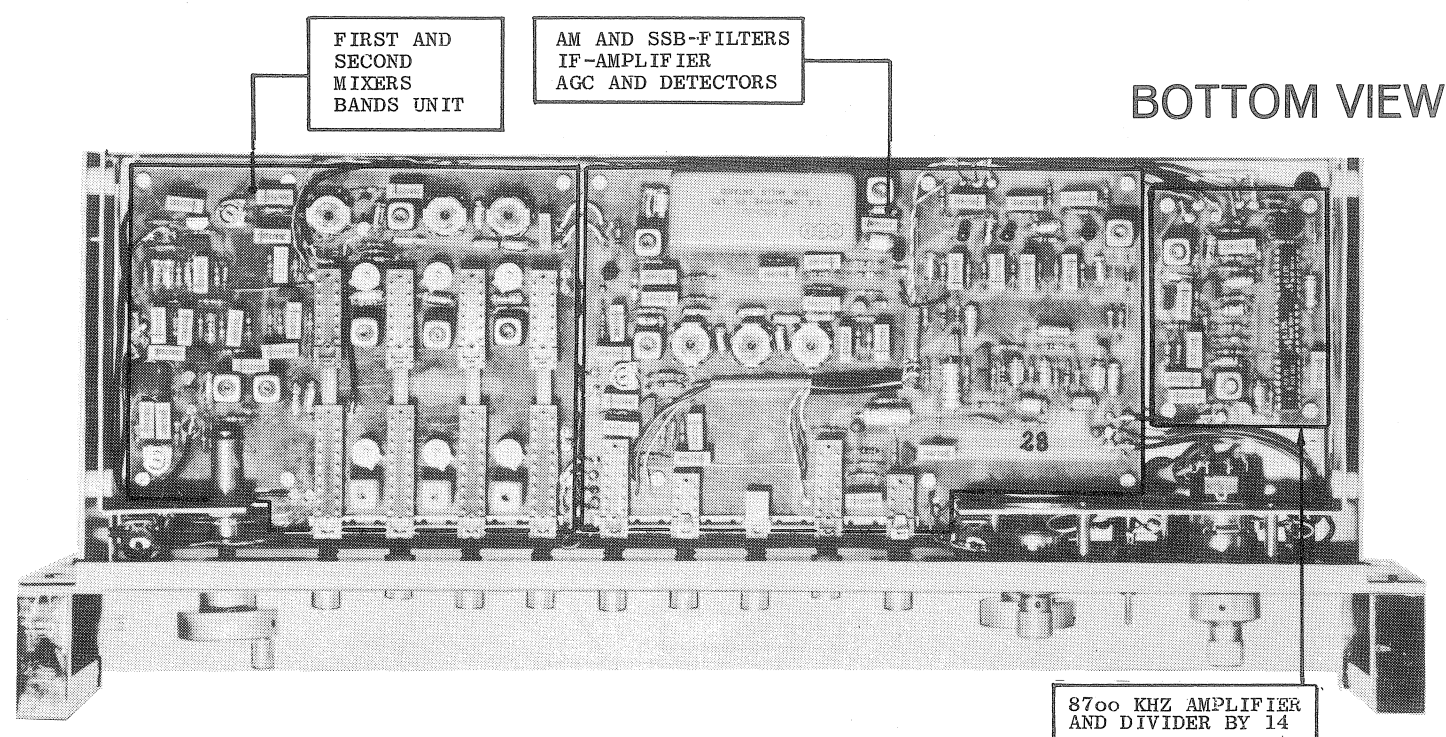
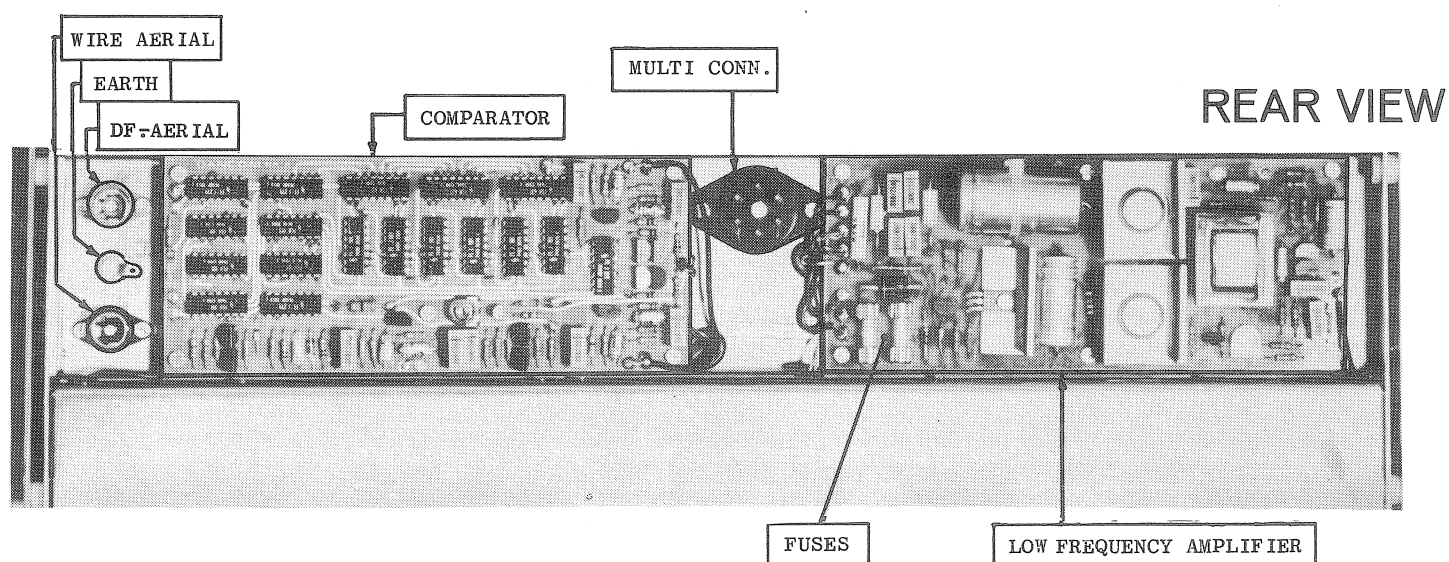
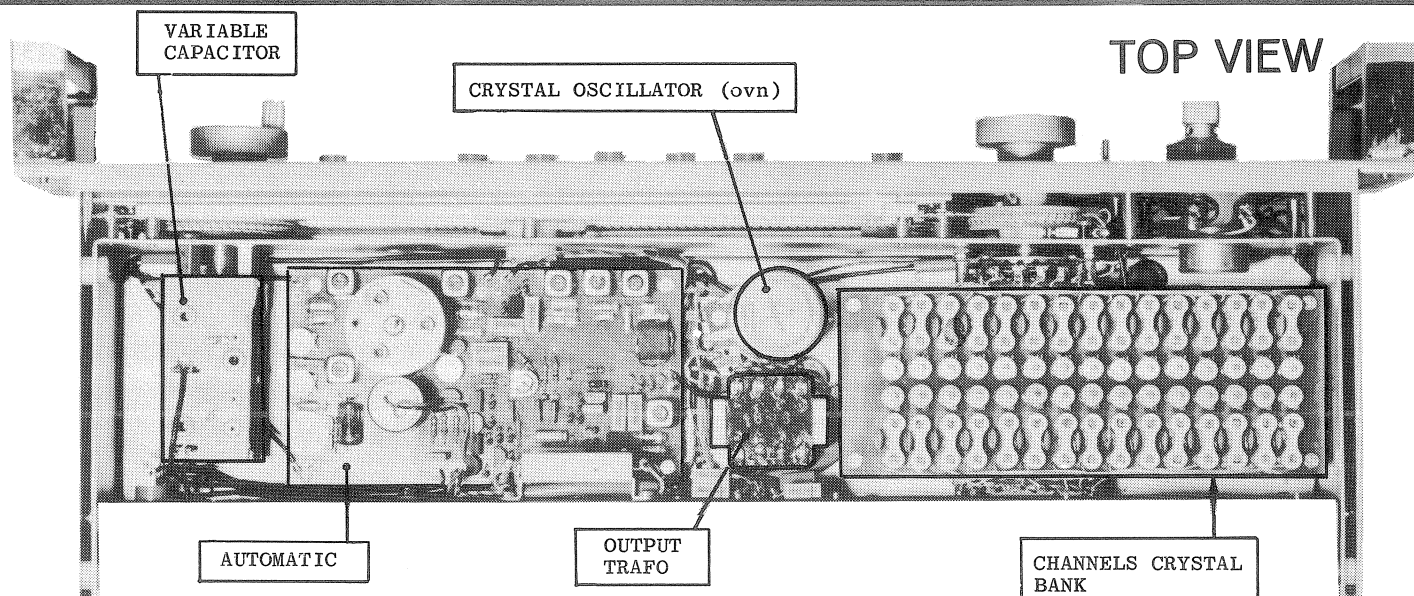
The channels dial is made of a material which is easy to write on with a pencil. The above example illustrates how this can be done.



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.

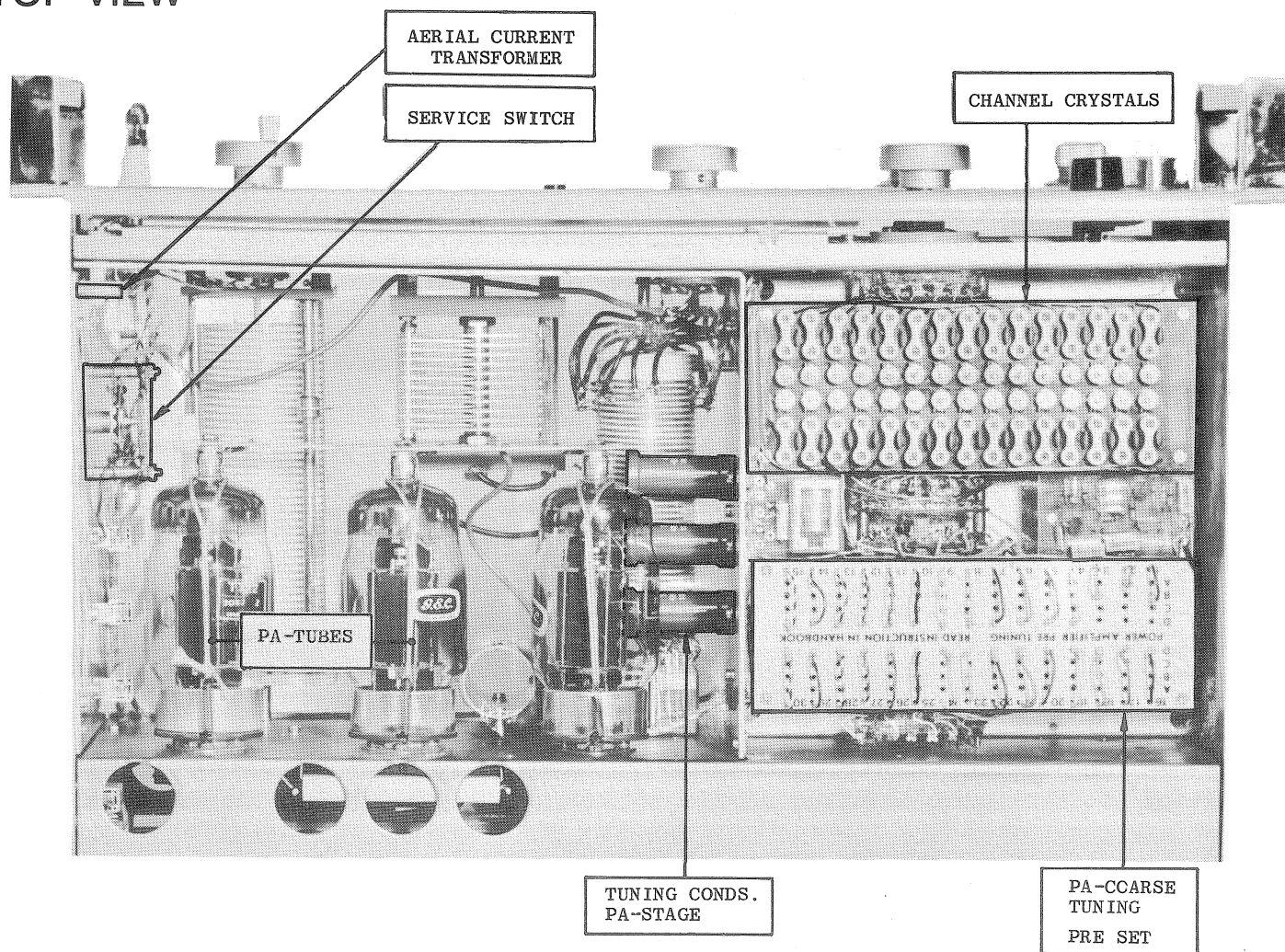
## TYPICAL MARINE INSTALLATION



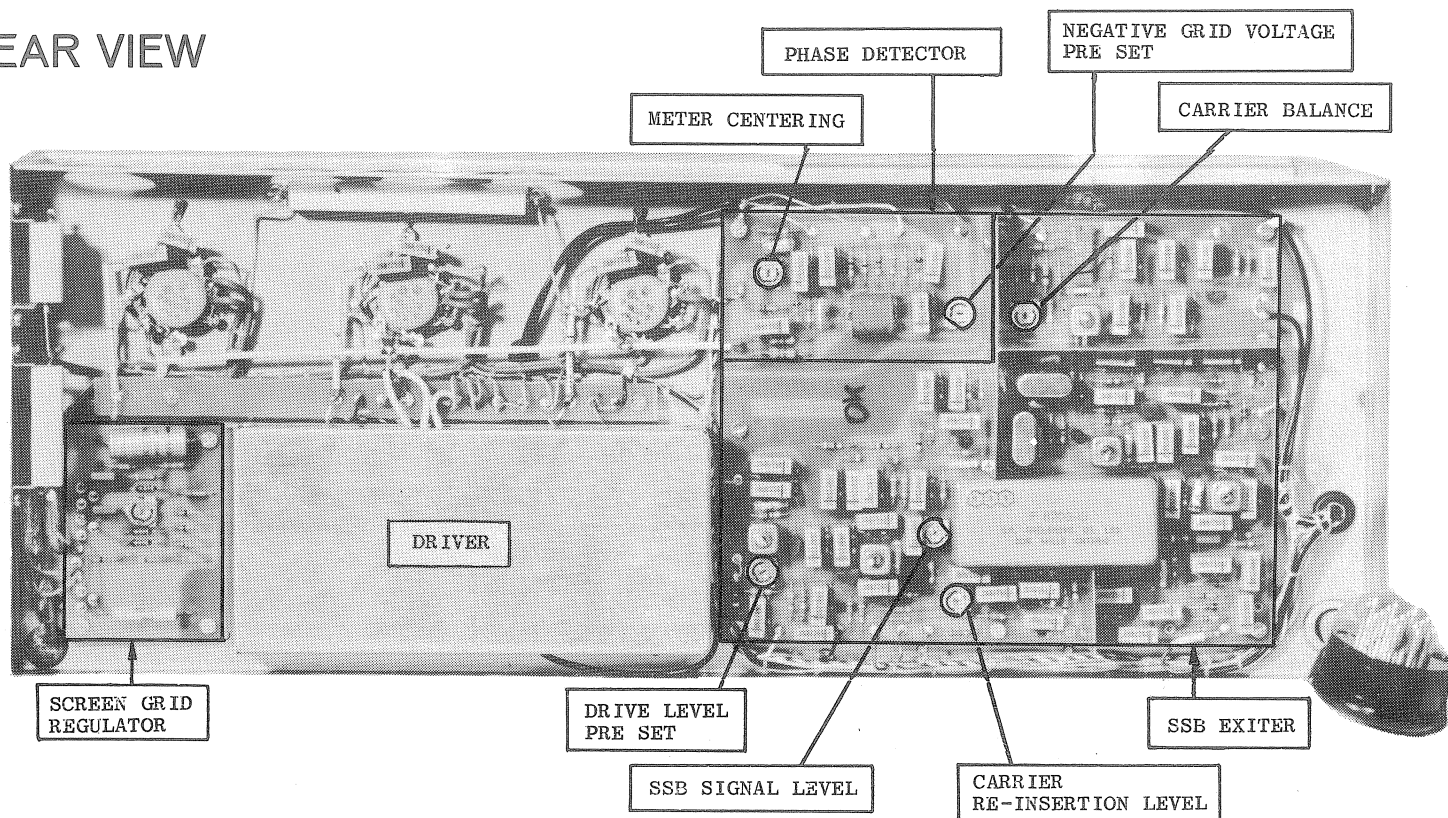


LOCATION OF MAIN PARTS IN RECEIVER

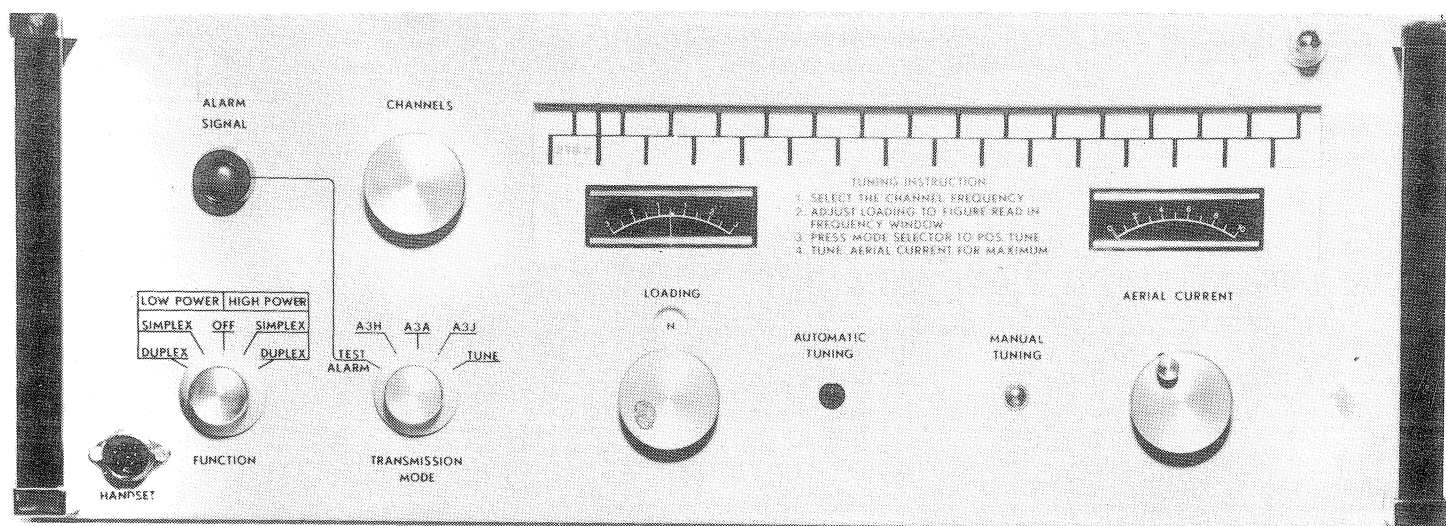
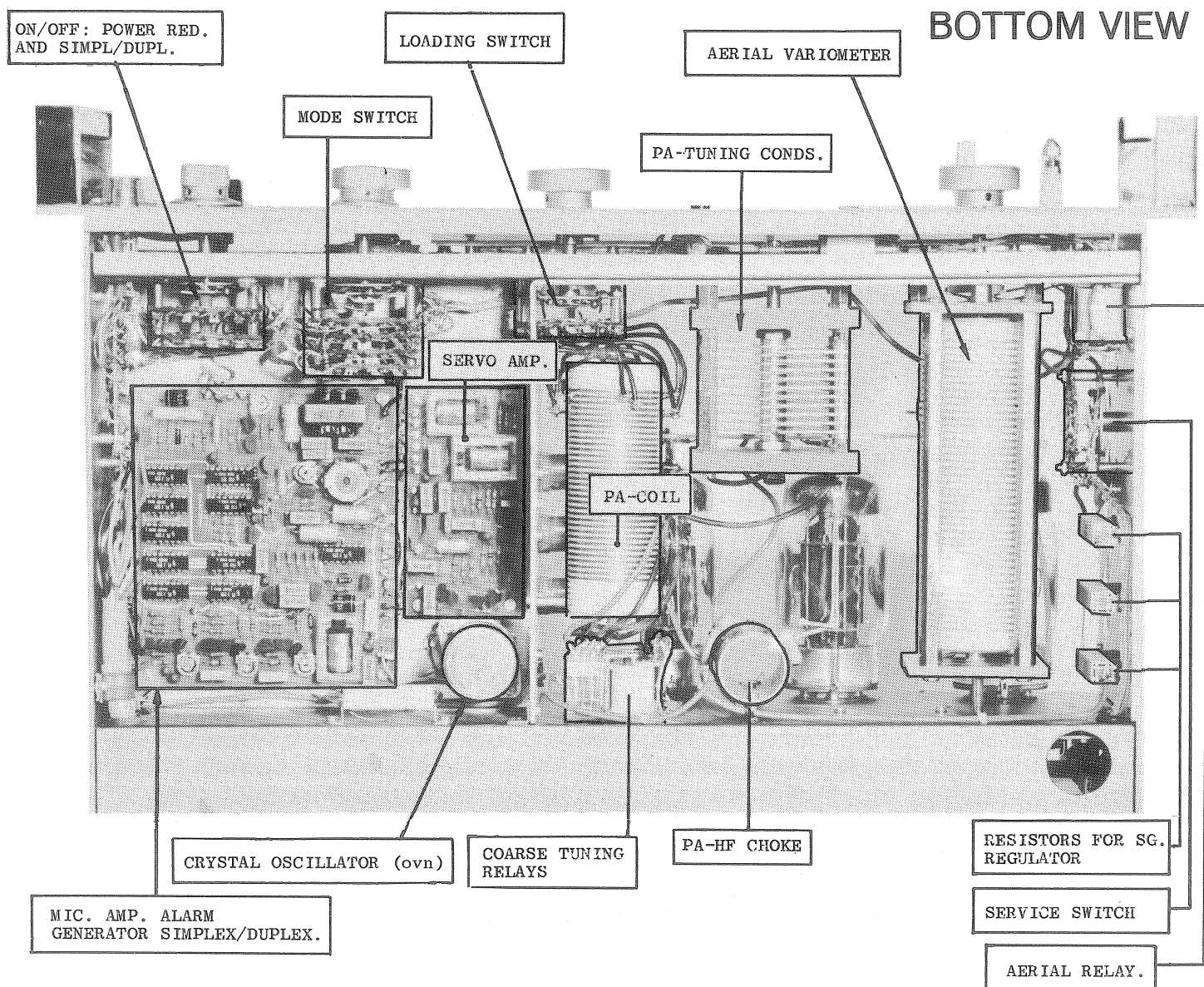
## TOP VIEW



## REAR VIEW

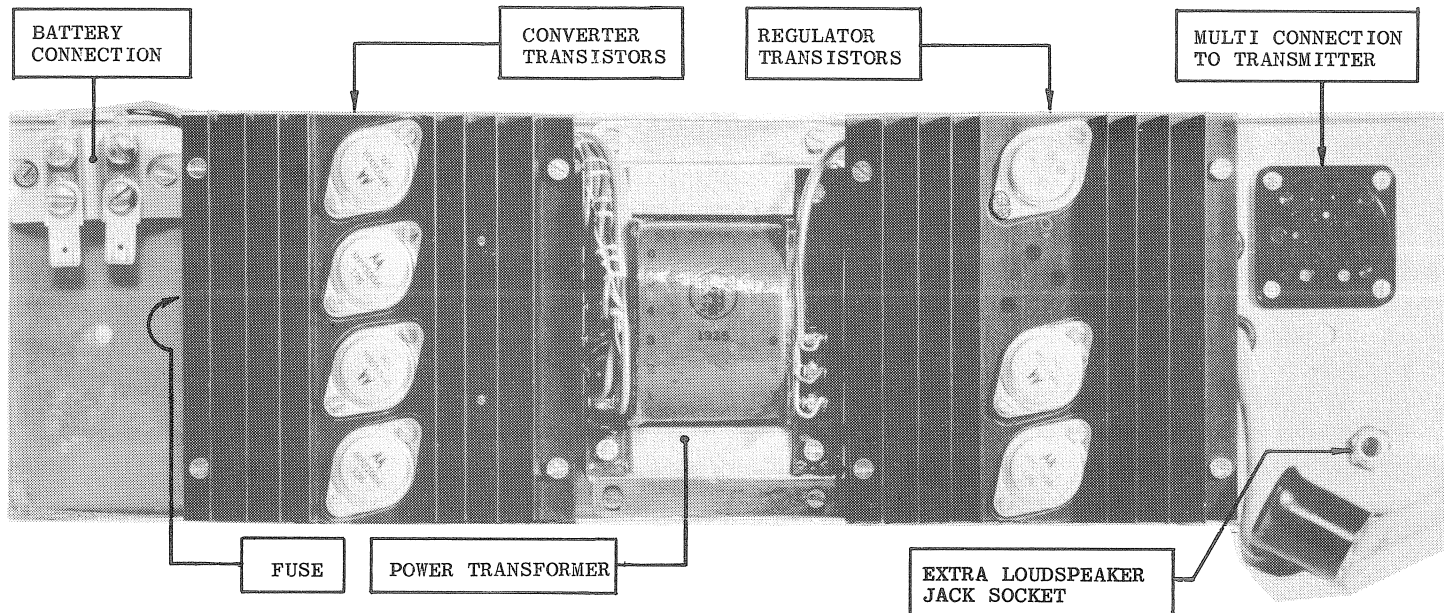
LOCATION OF MAIN PARTS IN TRANSMITTER



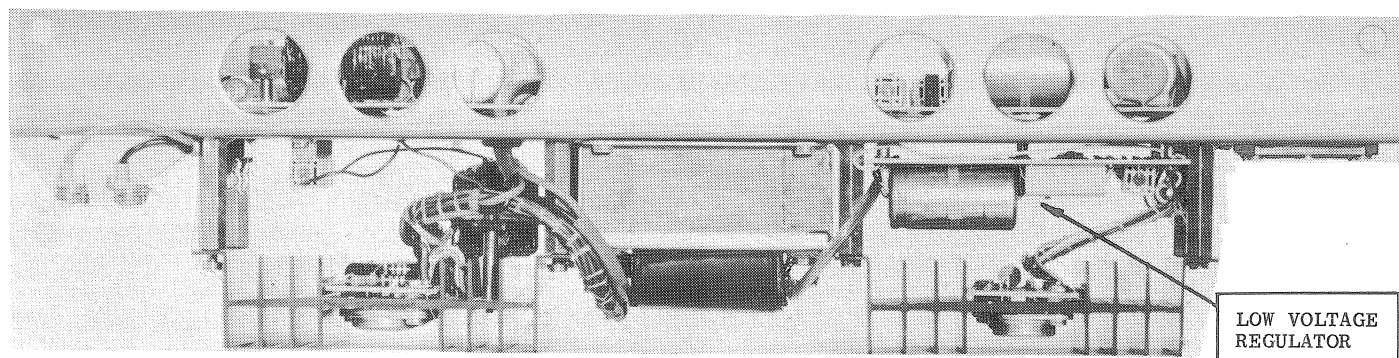


LOCATION OF MAIN PARTS IN TRANSMITTER

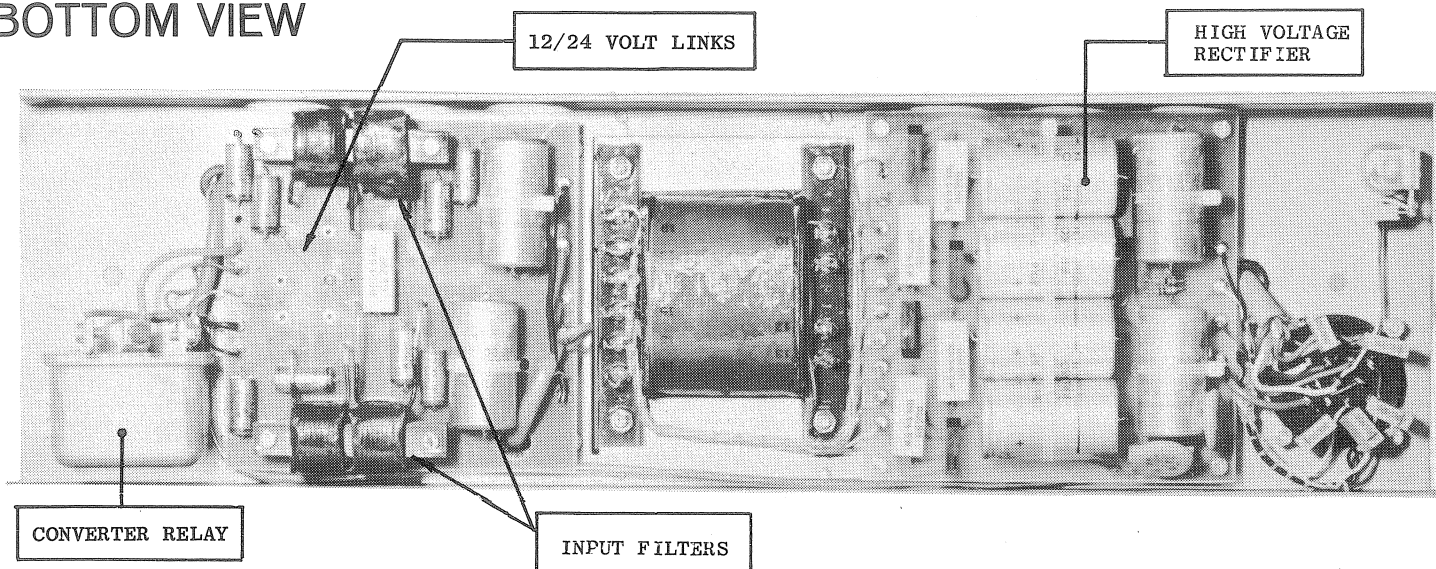
## TOP VIEW



## SIDE VIEW



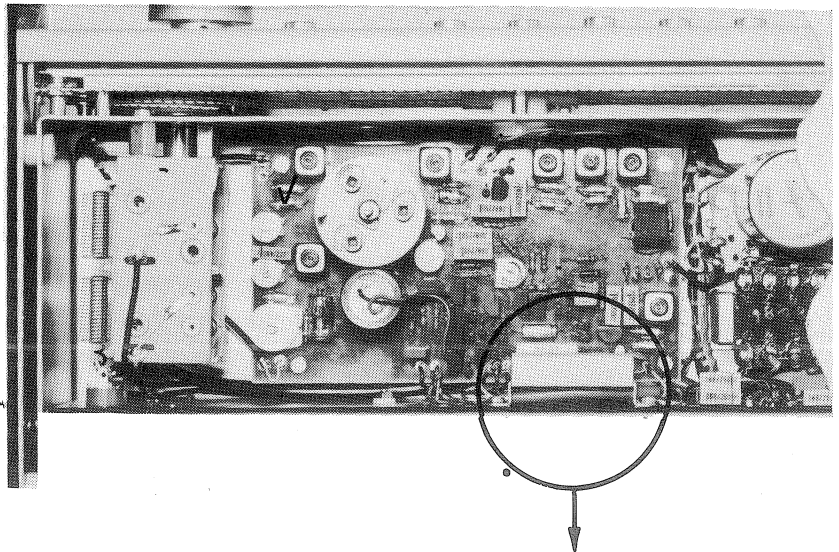
## BOTTOM VIEW



## LOCATION OF MAIN COMPONENTS IN CONVERTER

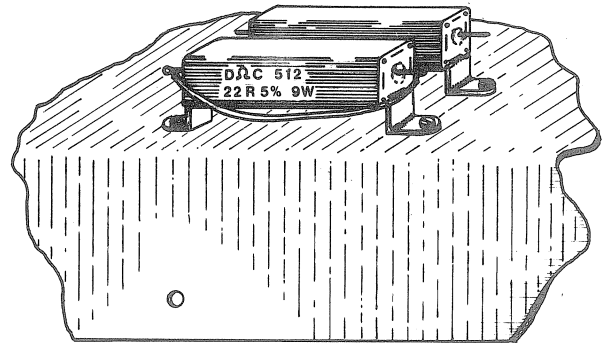
## 2.L. CONVERTING FROM 24VOLT TO 12VOLT OPERATION RECEIVER

RECEIVER  
TOP VIEW



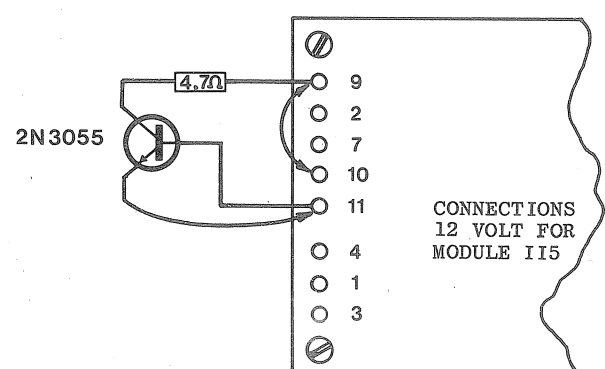
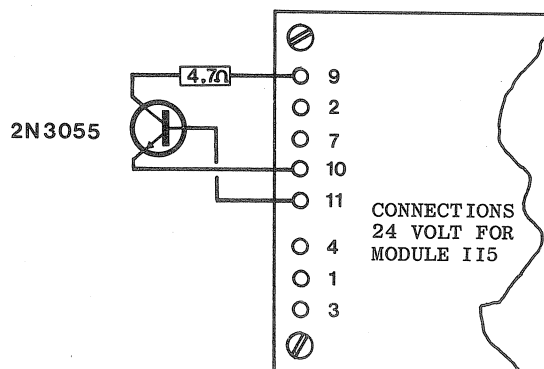
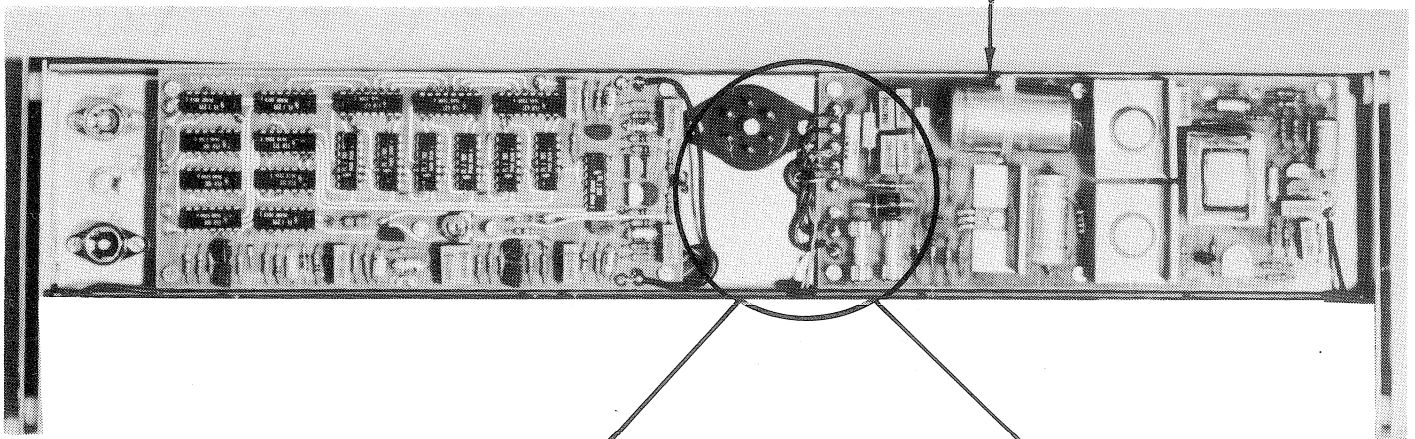
THE FOLLOWING CHANGES MUST BE MADE.

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



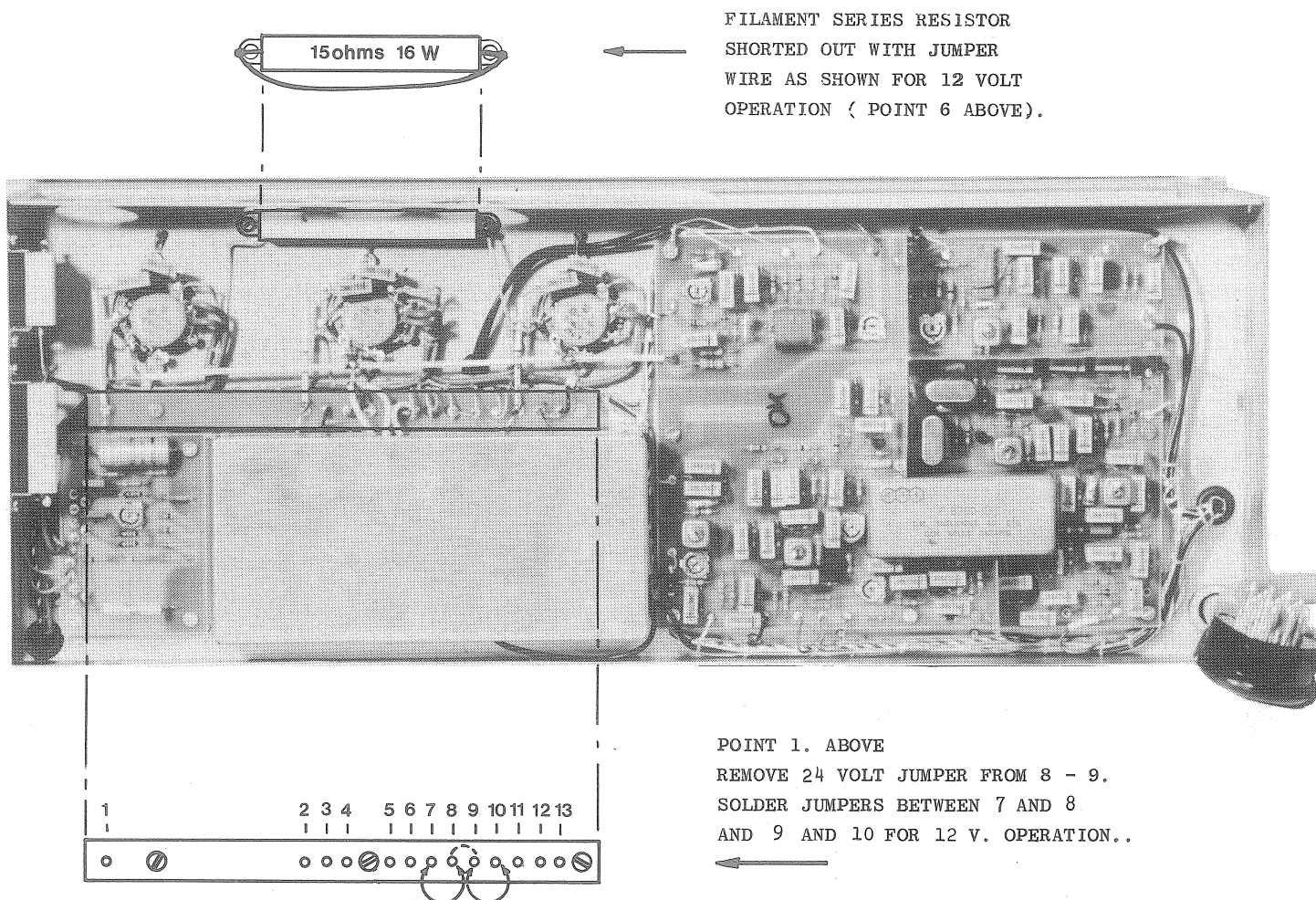


# TRANSMITTER

## 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.



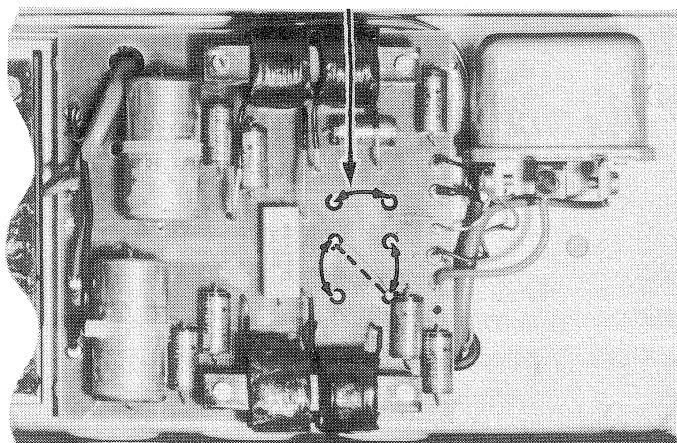
TRANSMITTER SHOWN  
FROM REAR VIEW

## TRANSMITTER BOTTOM VIEW

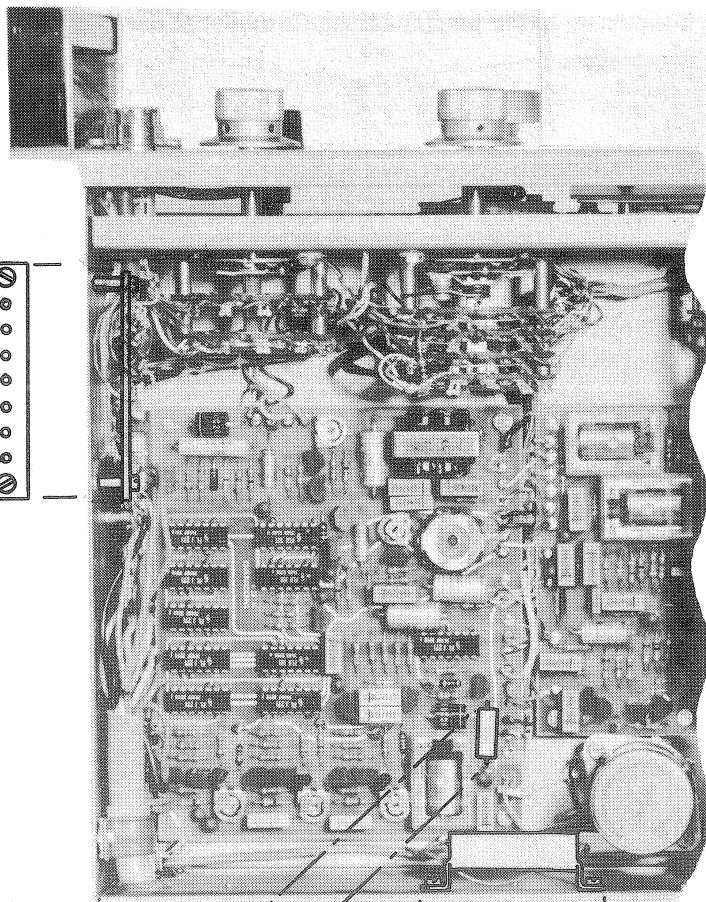
JUMPER WIRE ACROSS  
THESE 2 POINTS FOR  
12 VOLT OPERATION  
(SERIES RESISTOR FOR  
5 VOLT POWER SUPPLY)

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

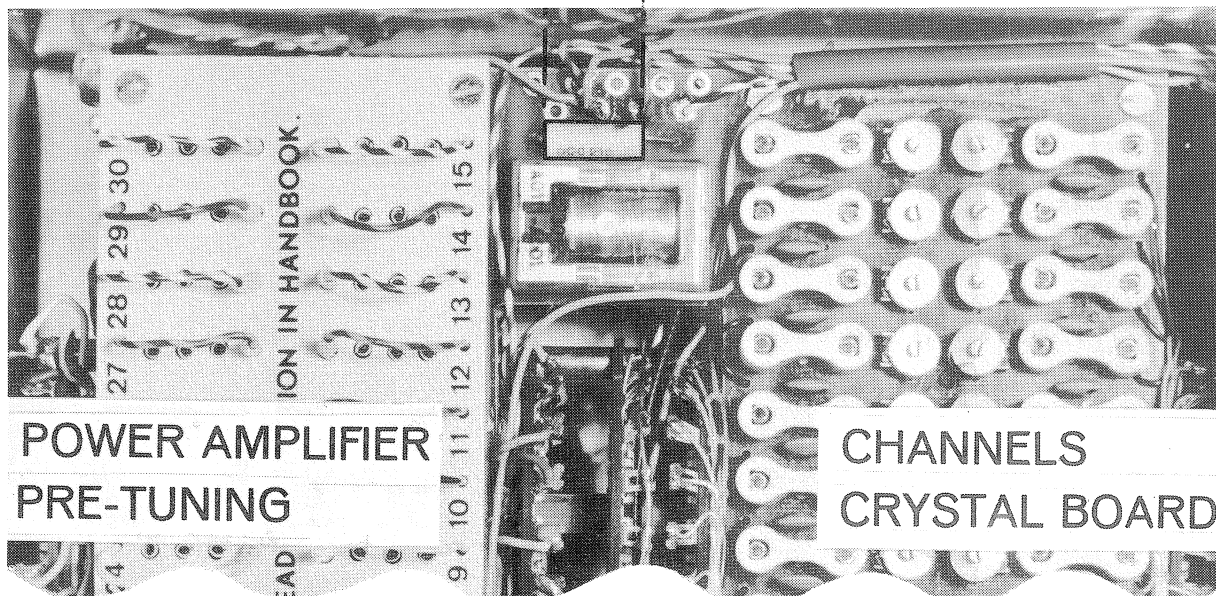


JUMPER WIRE ACROSS  
330 OHM RESISTOR  
FOR 12 VOLT OPERATION

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<br>+25% -15%   |
|                                | consumption on 24 volts<br>operation:<br>receive: approx. 1 Amp<br>stand-by: approx. 3 Amps<br>transmit/receive<br>(duplex operation):<br>approx. 15 Amps |
| via additional<br>power supply | 110/220 volts a.c. $\pm 10\%$<br>consumption:<br>approx. 350 VA   |
| Dimensions and weight          | Height: 325 mm<br>Width: 497 mm<br>Depth: 270 mm<br>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  |

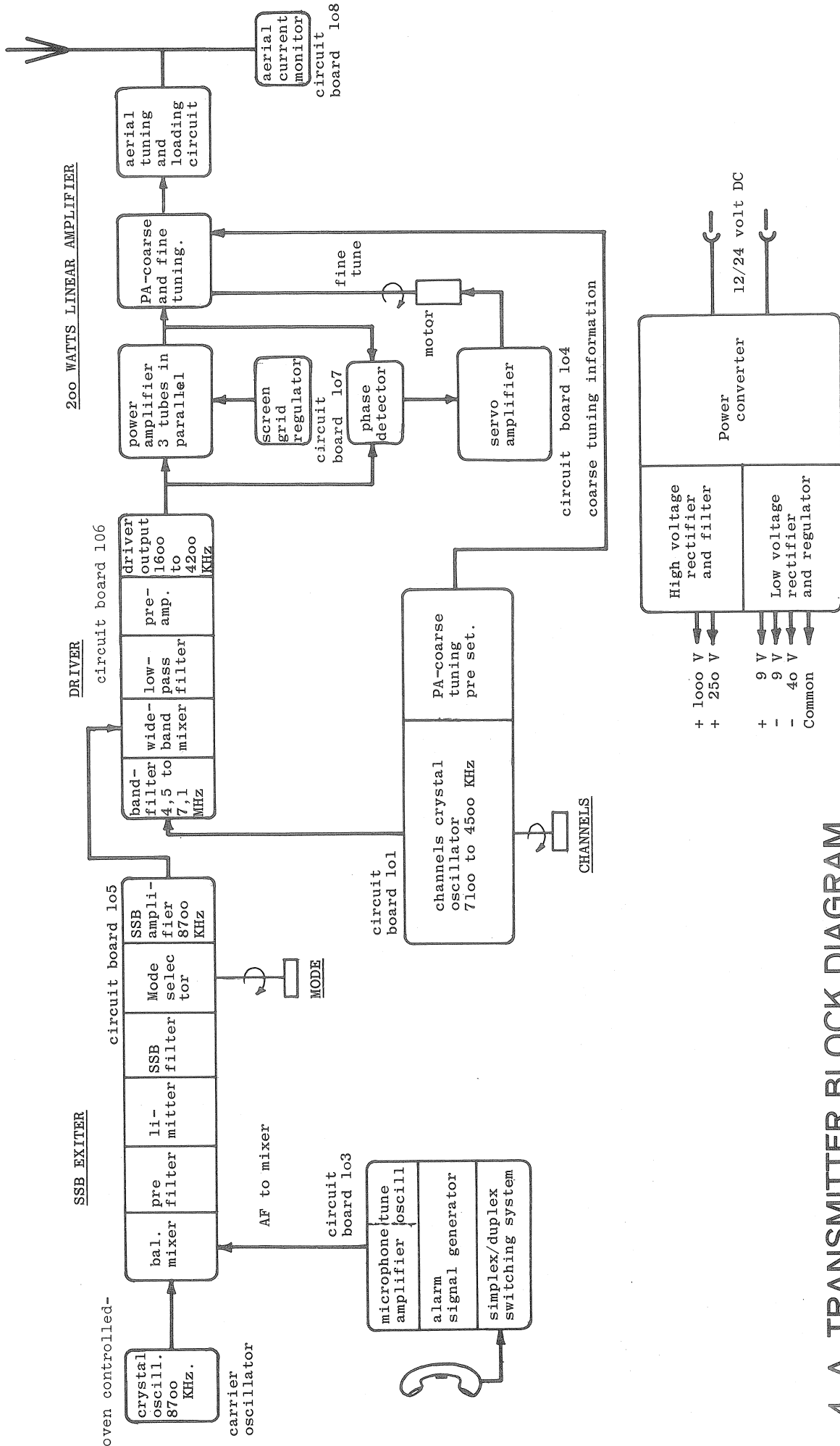
|   |   |
|---|---|
| Types of emission                         | A3H, A3A, A3J (USB)   |
| Spotfrequencies                           | 30, crystal-controlled  |
| Power output                              | 200 watts p.e.p.  |
| Power reduction                           | selectable: 50 watts p.e.p.   |
| Antenna impedance                         | 10 $\Omega$ + 150 pF<br>20 $\Omega$ + 300 pF  |
| Audio response                            | < 6 dB (350–2700 Hz)  |
| A.f.-distortion                           | $\leq 10\%$   |
| Intermodulation<br>products               | out of band:<br>3rd order:<br>$\geq 30$ dB below p.e.p.<br>5th order:<br>$\geq 36$ dB below p.e.p.<br>7th order:<br>$\geq 43$ dB below p.e.p. |
| Spurious and r.f.<br>harmonic suppression | $\geq 40$ dB  |
| Carrier suppression                       | A3H = 5– 6 dB below p.e.p.<br>A3A = $16 \pm 2$ dB below p.e.p.<br>A3J = > 40 dB below p.e.p.  |
| Residual F. M.                            | < $\pm 10$ 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<br>generator               | incorporated  |

**Multichannel-Receiver:**

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

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

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

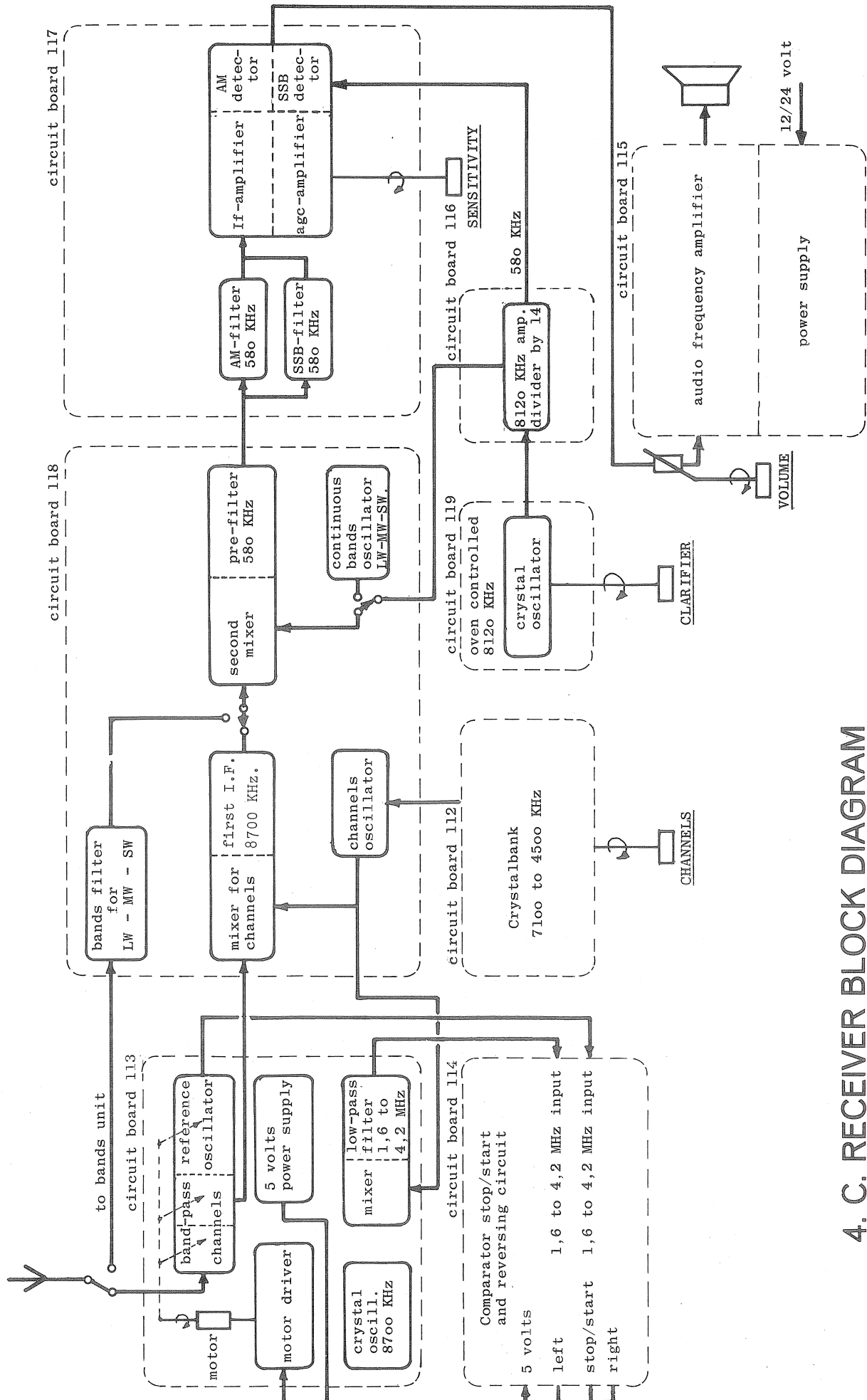
When the alarm signal generator has ended a transmission, it can be started again by pushing the red ALARM button on the front plate. The alarm push button activates the reset generator so it resets all the integrated dividers to zero position and returns the stop/start circuit to start position.

## 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  $\pm 200$  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.

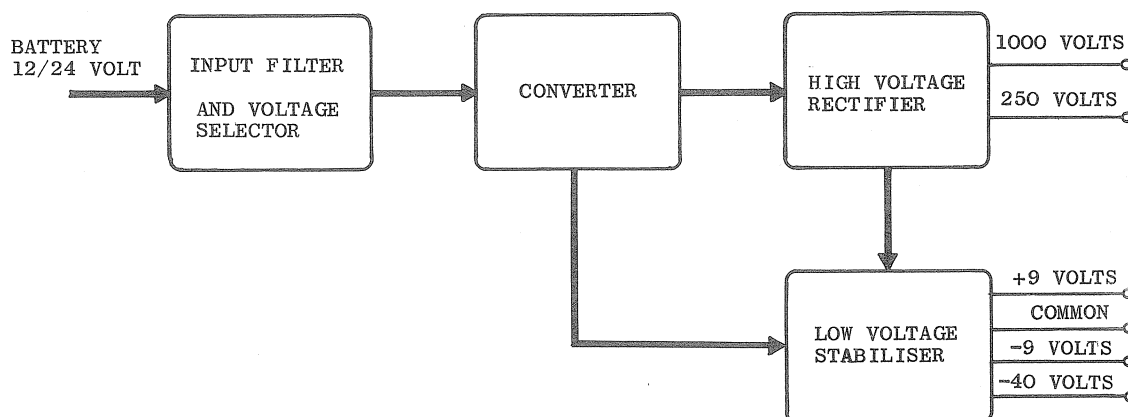
This reversing information is also a signal to a system which lowers the speed of the motor so that it approaches the coincidence point at a much reduced speed.

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-connected 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  $\pi$  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.

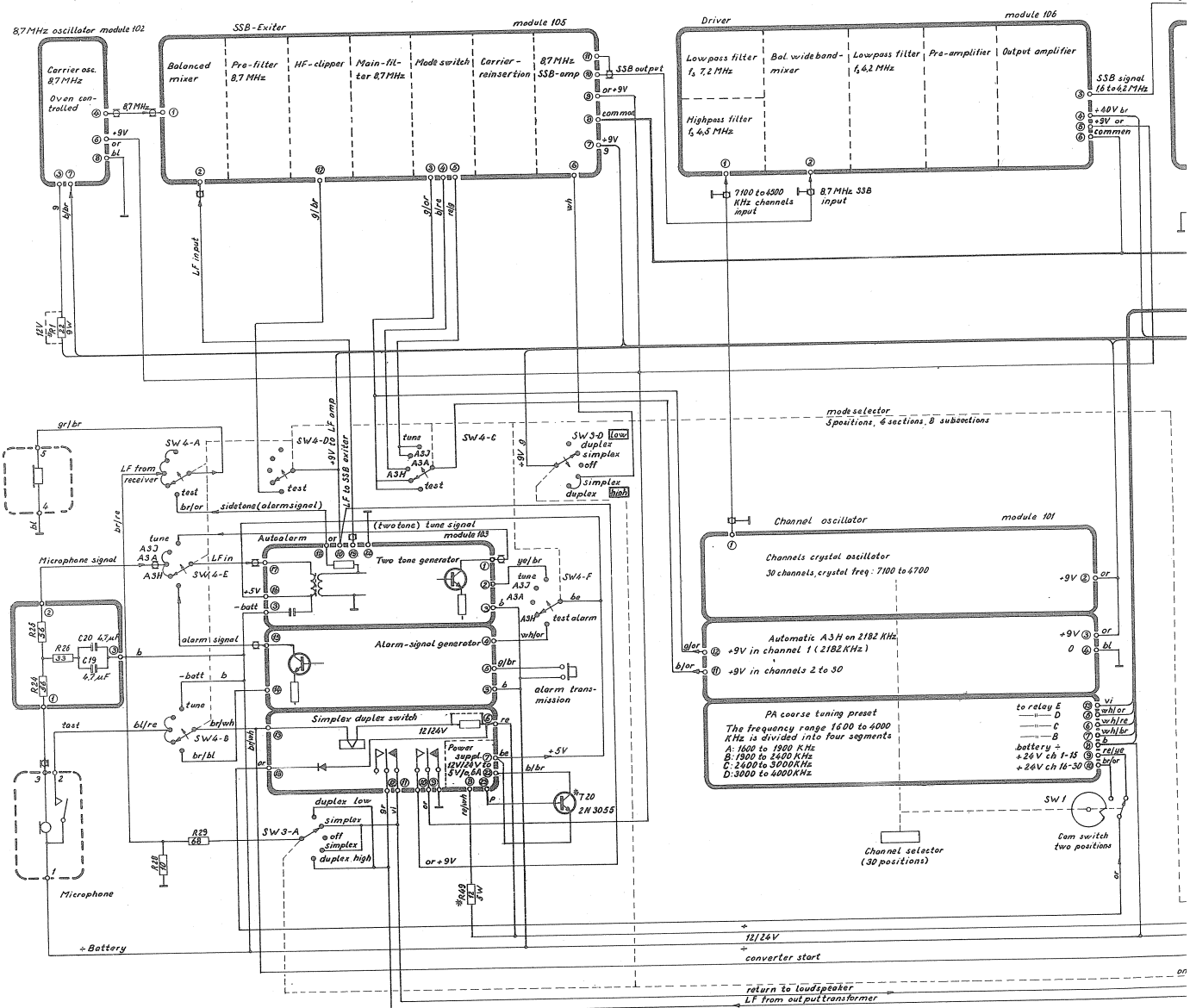
The main transformer (TR 2) has 6 secondary windings. Four of these windings each give 250 volts to the four rectifier bridges. The output from these four circuits are series connected to give 1000 volts, the high voltage requirements

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

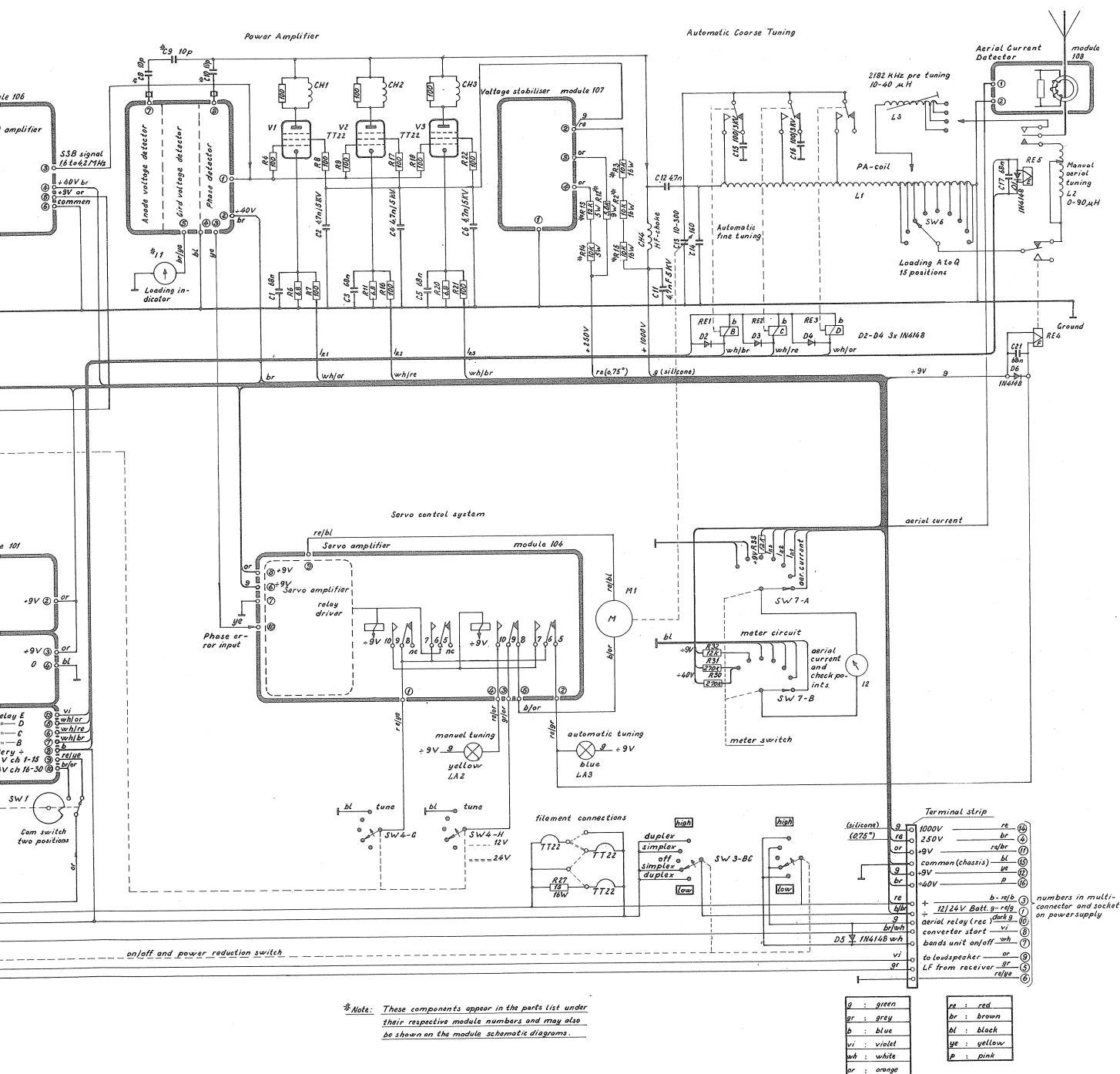
The 5th secondary winding supplies 55 volts which is regulated and stabilized down to -40 volts for the negative grid supply.

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.



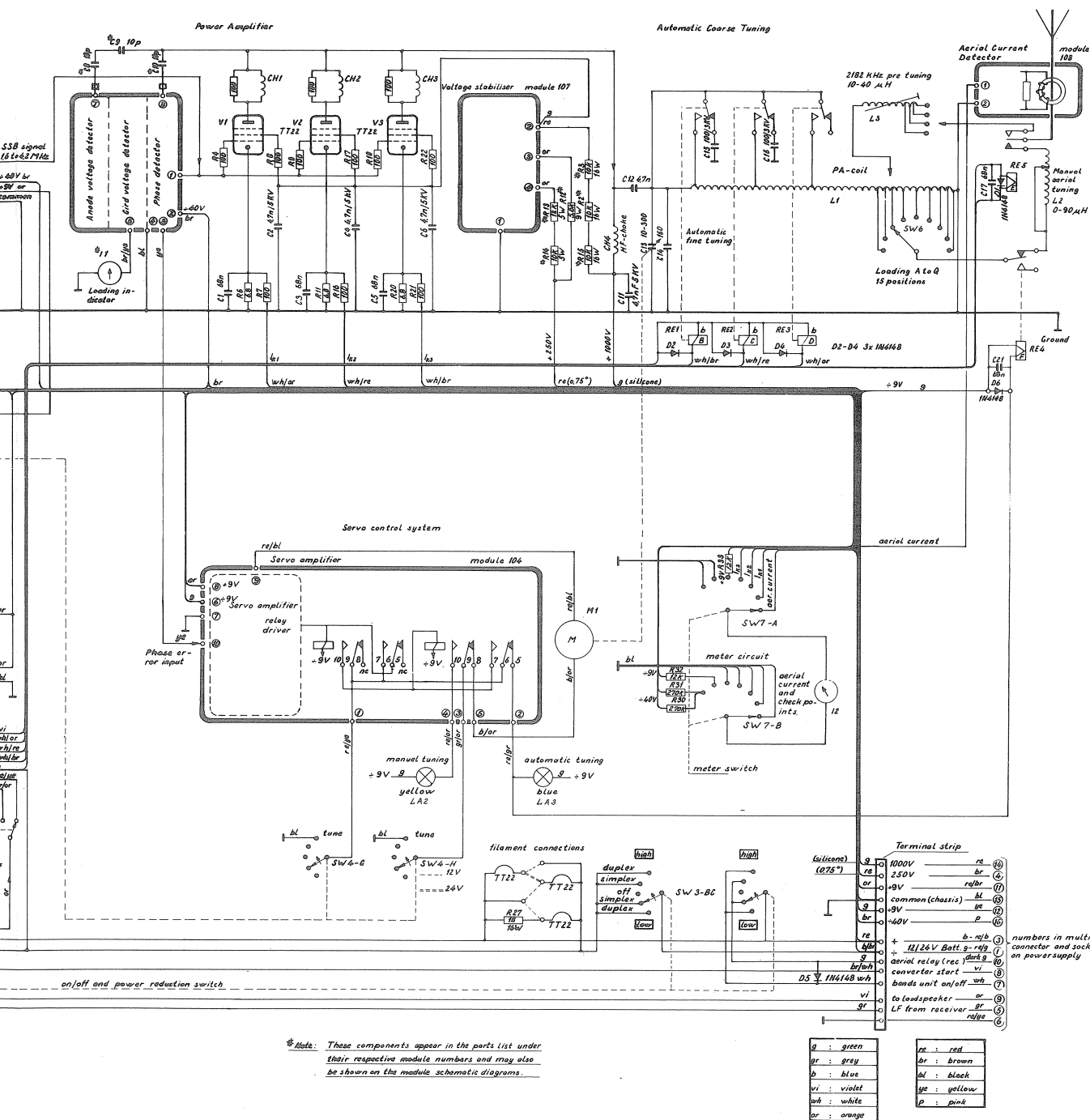


## 5. A. TRANSMITTER DIAGRAMS

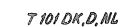
TRANSMITTER INTERCONNECTION DIAGRAM  
AND FINAL AMPLIFIER T101, DK., D., NL.

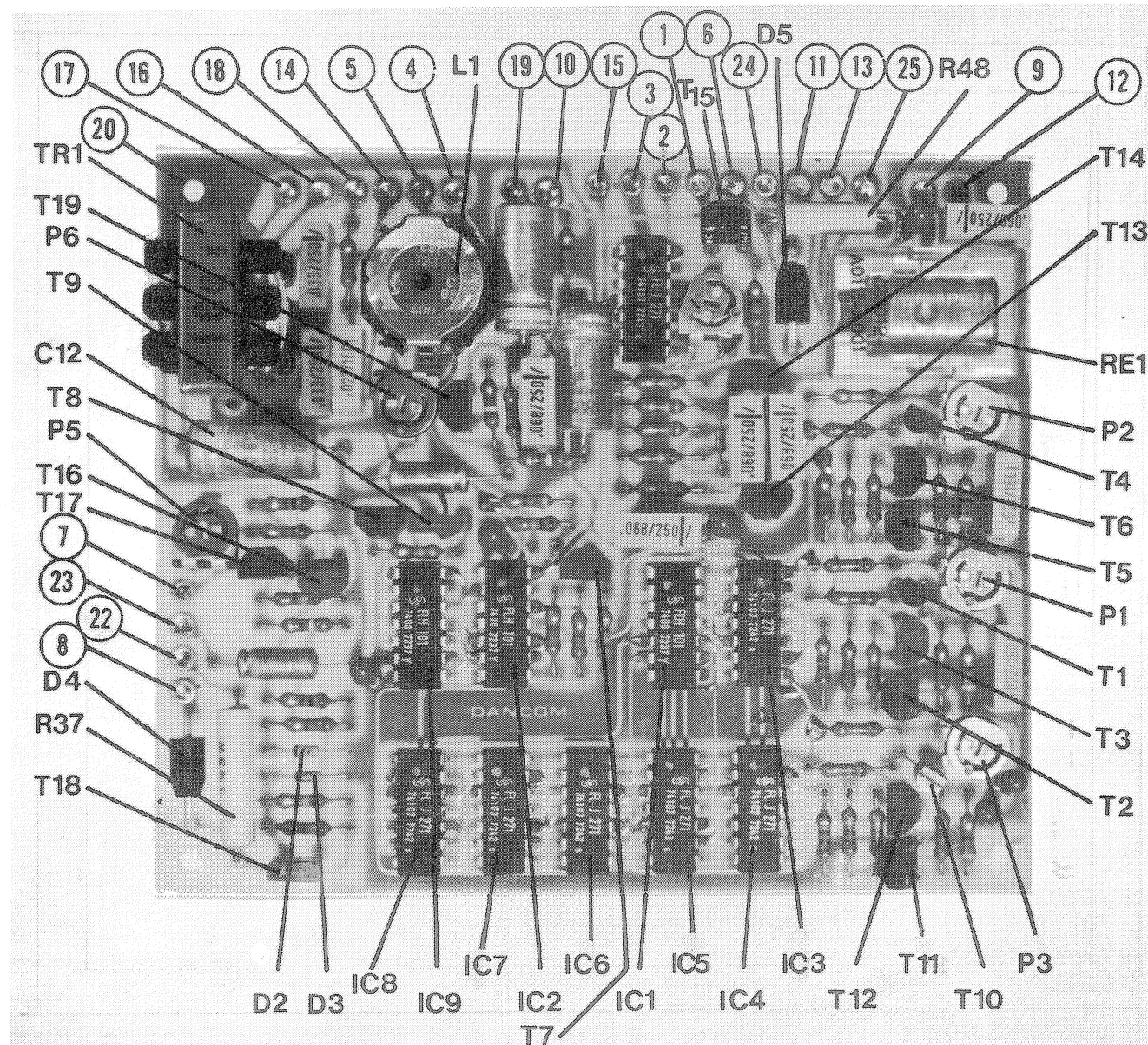


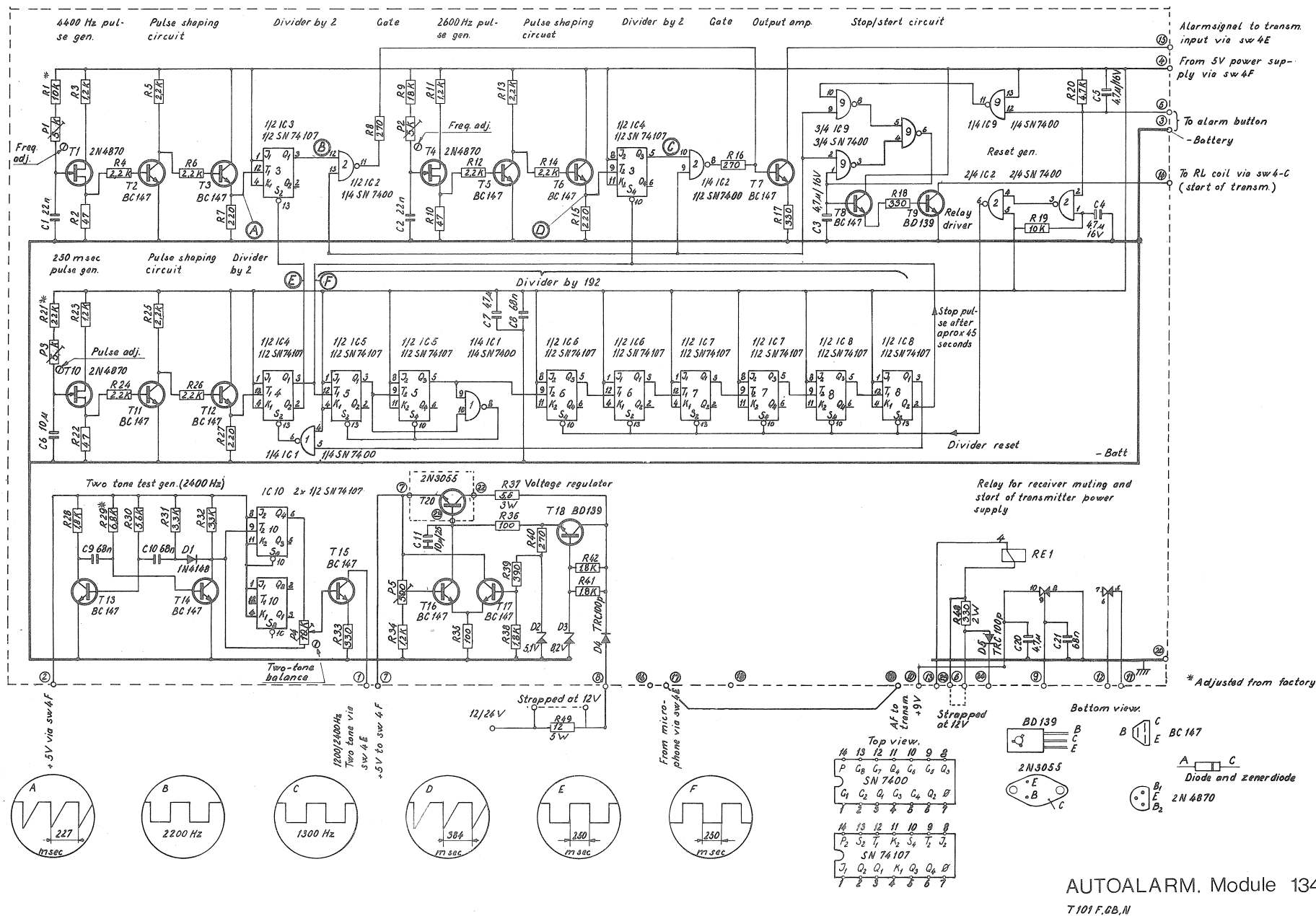


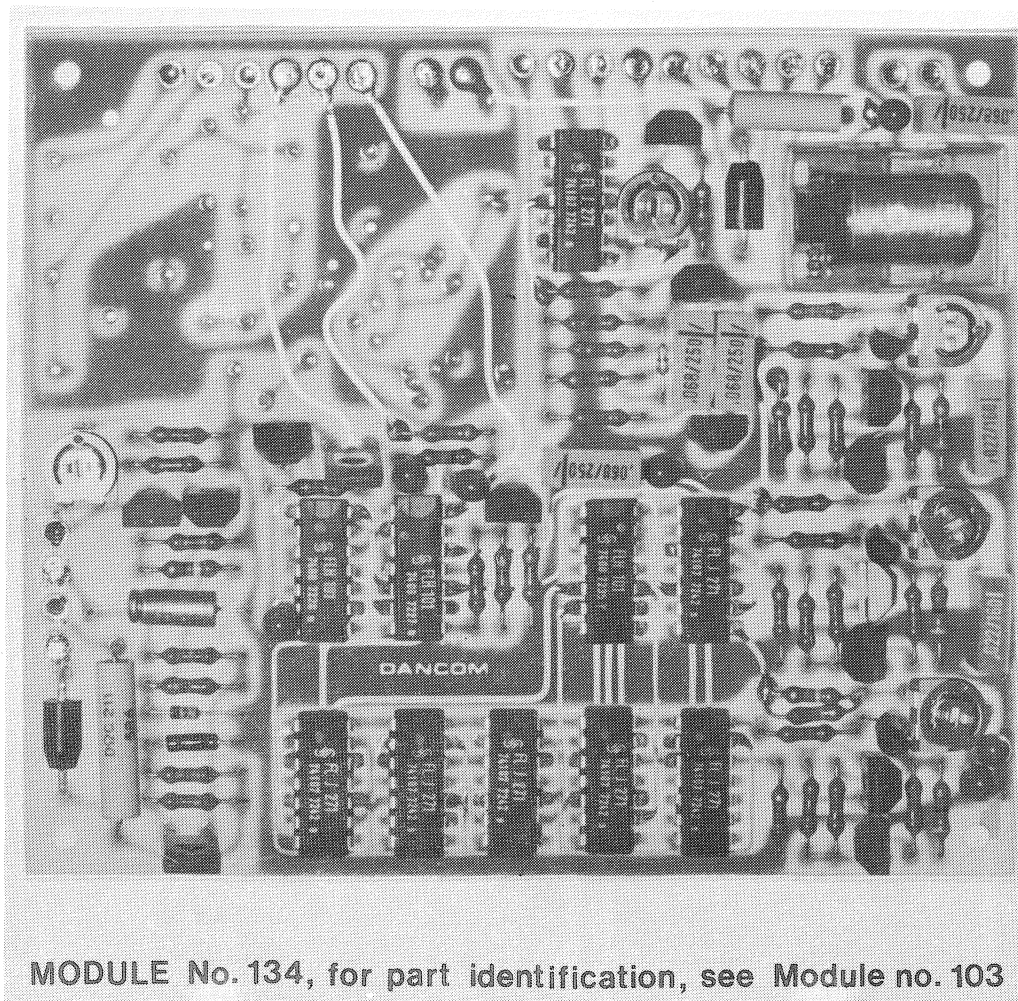


TRANSMITTER INTERCONNECTION DIAGRAM  
AND FINAL AMPLIFIER T101, F., G.B., N.

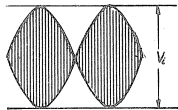




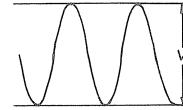




MODULE No. 134, for part identification, see Module no. 103

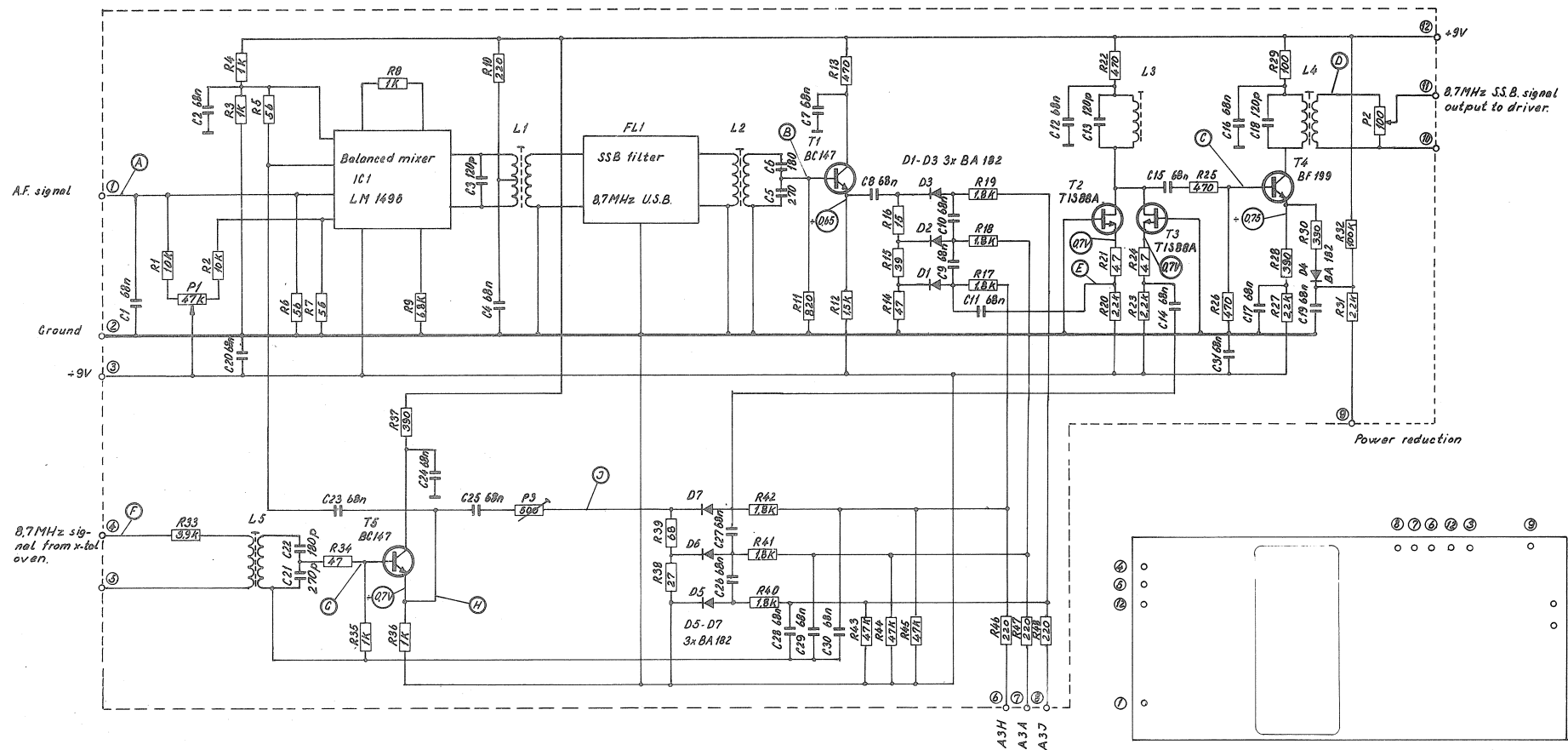


| Typical Voltages |                  |     |     |     |     |     |
|------------------|------------------|-----|-----|-----|-----|-----|
|                  |                  | A   | B   | C   | D   | E   |
| $V_i$            | mV               | 450 | 130 | 200 | 340 | 100 |
| Frq.             | 1100 and 1900 Hz |     |     |     |     |     |



| Typical Voltages |          |      |     |     |     |
|------------------|----------|------|-----|-----|-----|
|                  |          | F    | G   | H   | J   |
| $V_x$            | mV       | 1000 | 250 | 230 | 100 |
| Freq.            | 8700 KHz |      |     |     |     |

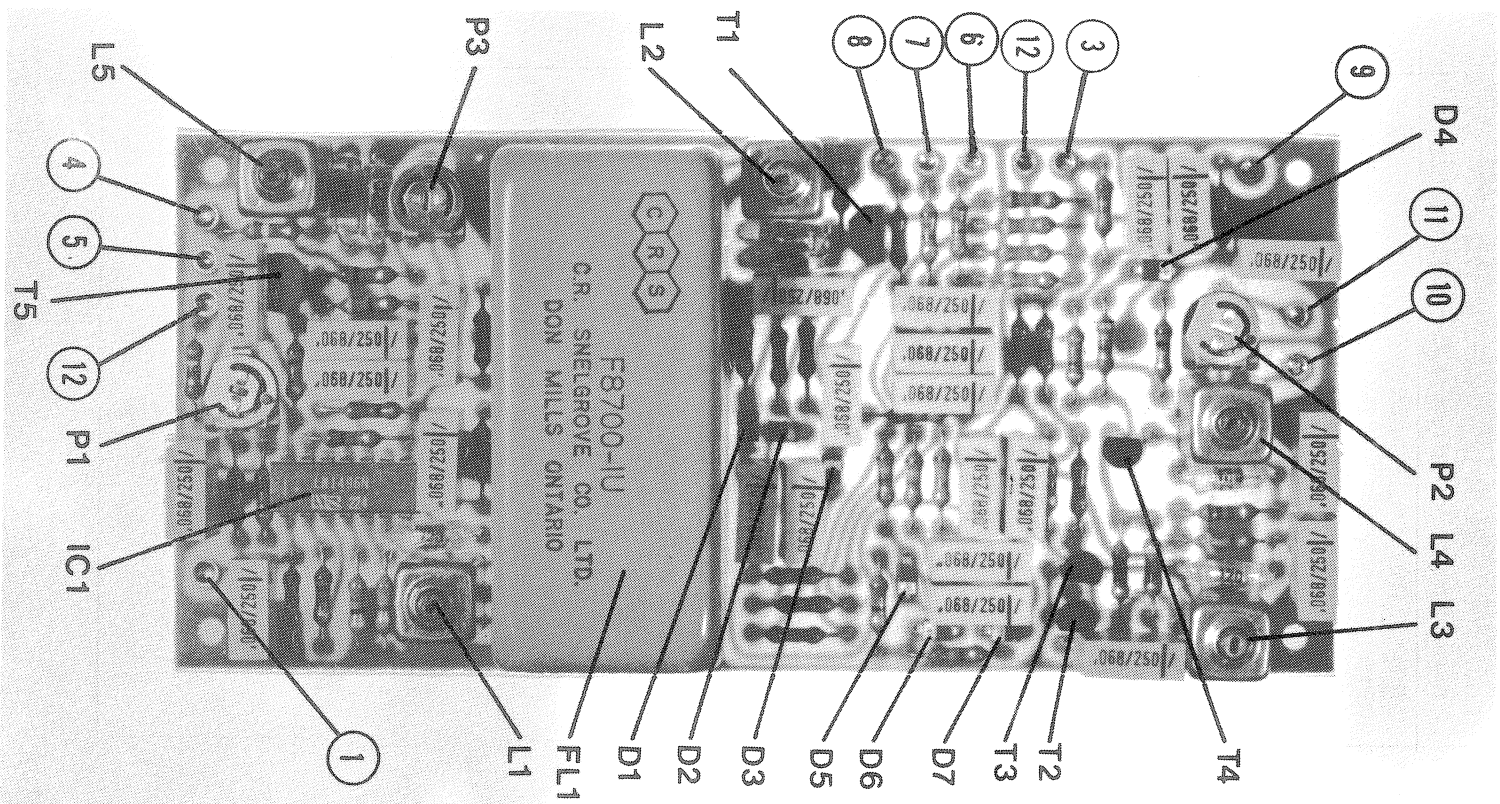
DC voltage measured at high power without AF signal and mode switch in position A3J.  
 HF signal are measured with power reduction in pos. high and mode switch in pos. A3J and AF signal to input1.

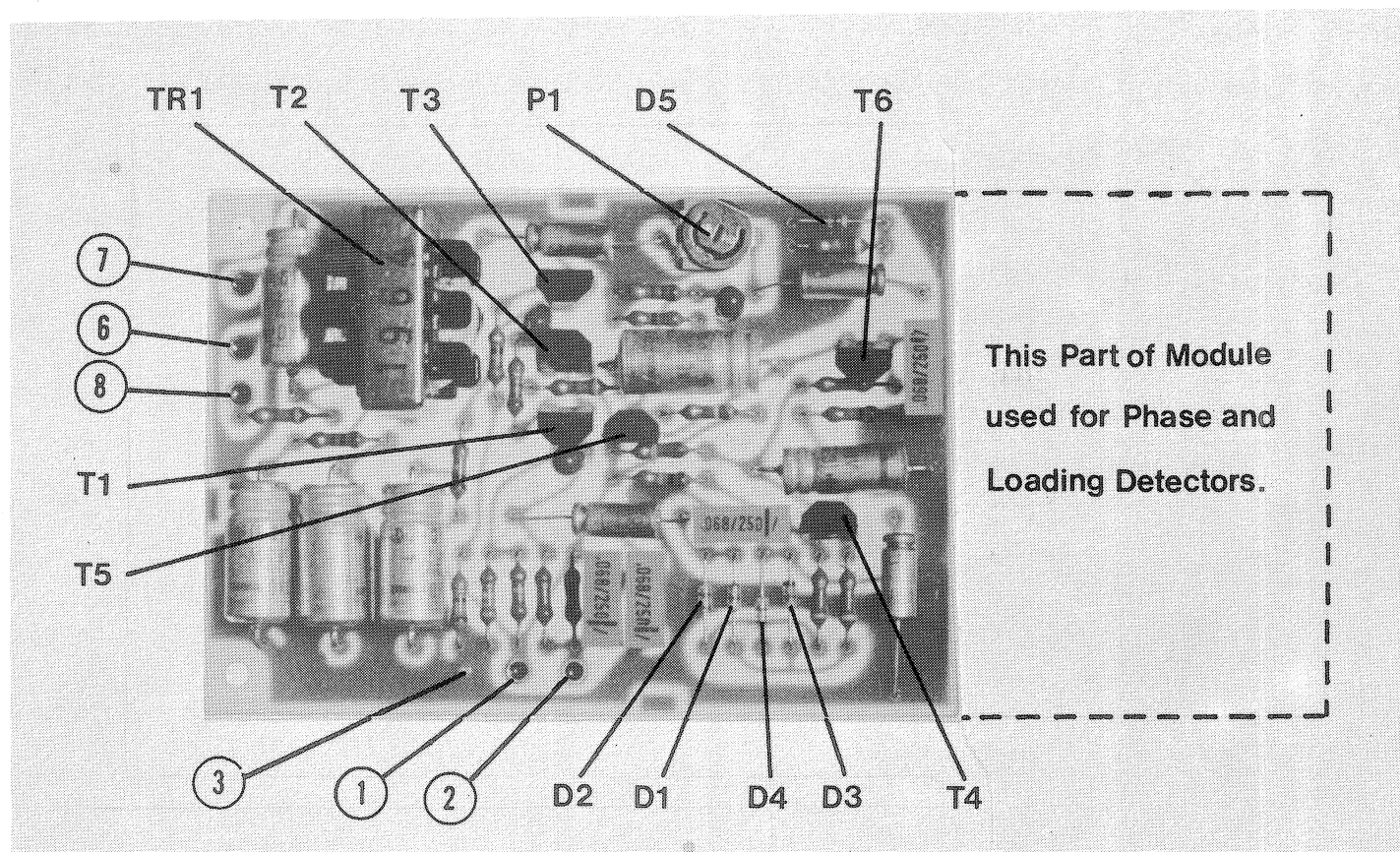


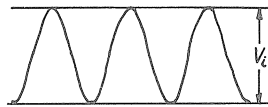
S.S.B. EXCITER. Module 109.

T 101, G2, F and N

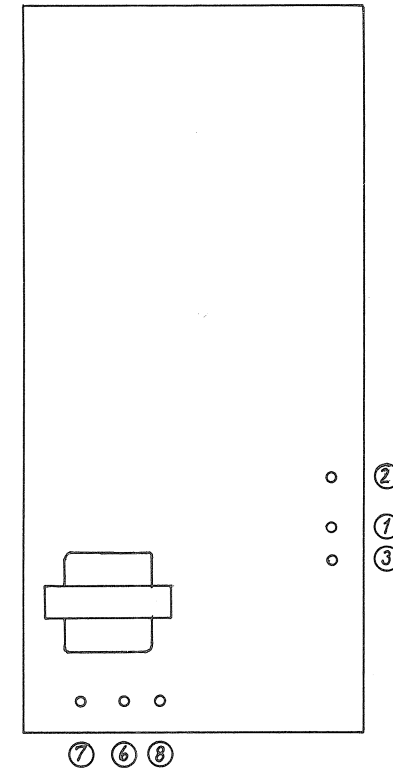
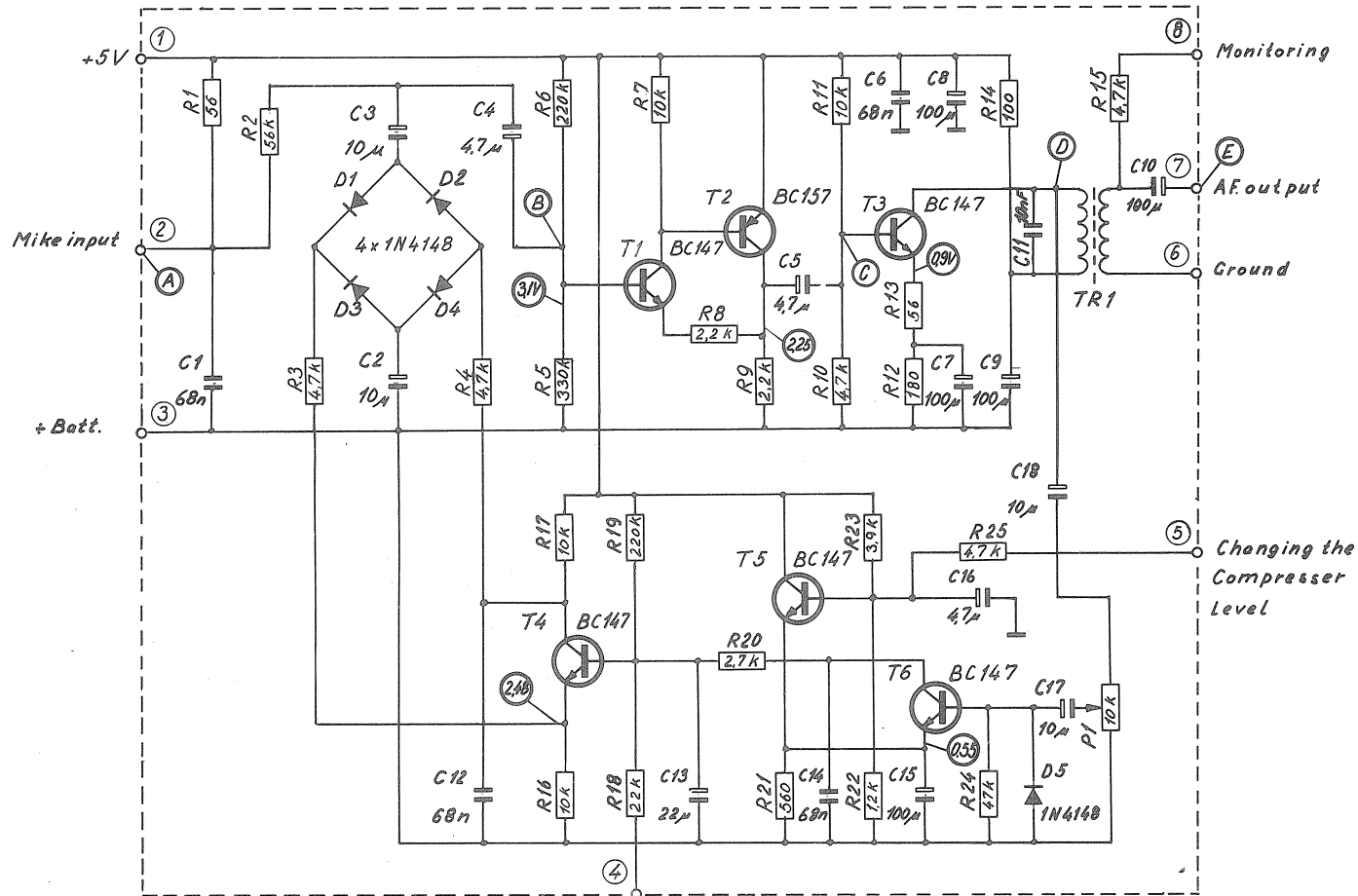








| Typical Voltages |    |      |     |     |      |     |
|------------------|----|------|-----|-----|------|-----|
|                  |    | A    | B   | C   | D    | E   |
| $V_i$            | mV | 250  | 150 | 150 | 2000 | 420 |
| Freq.            | Hz | 1100 |     |     |      |     |

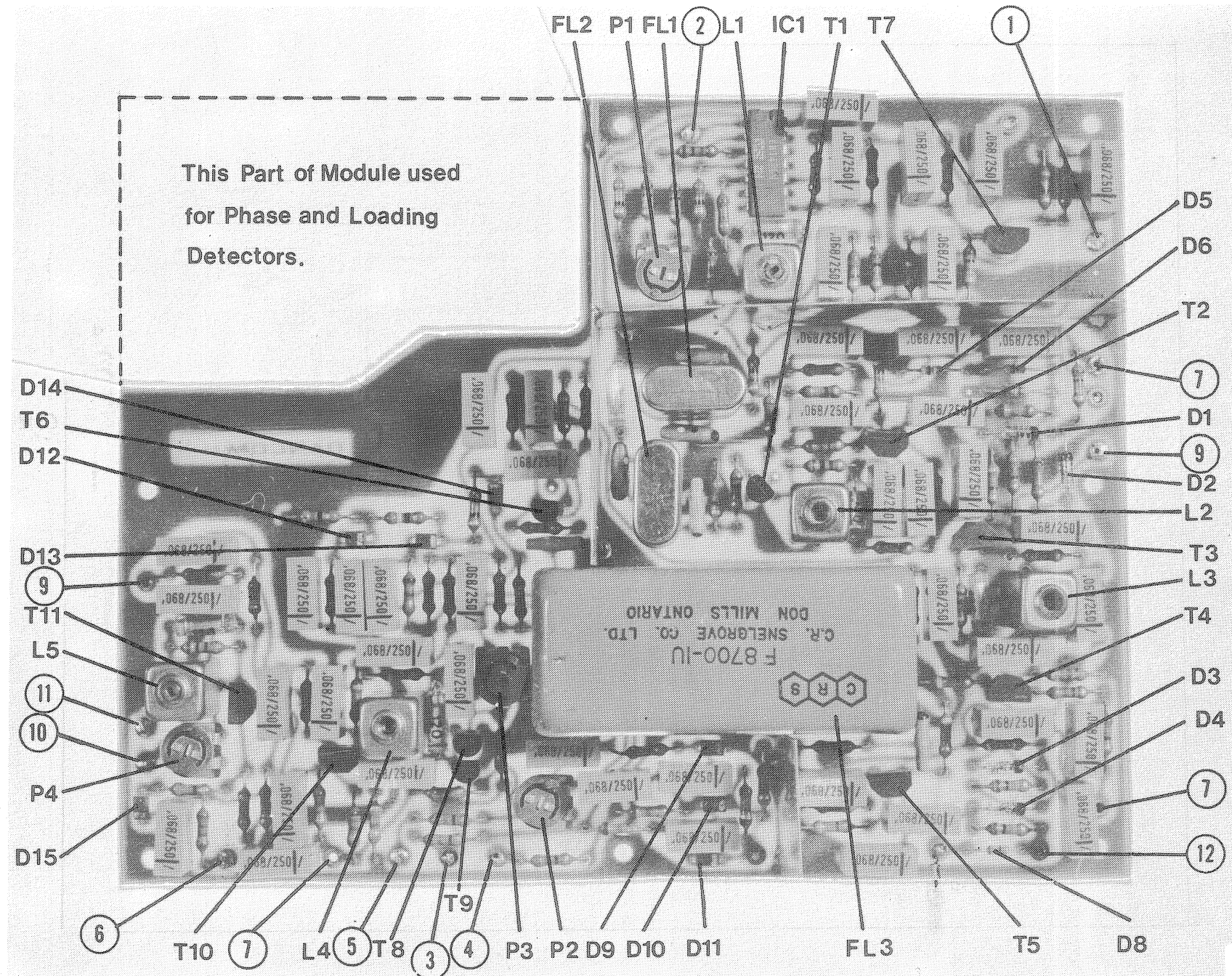


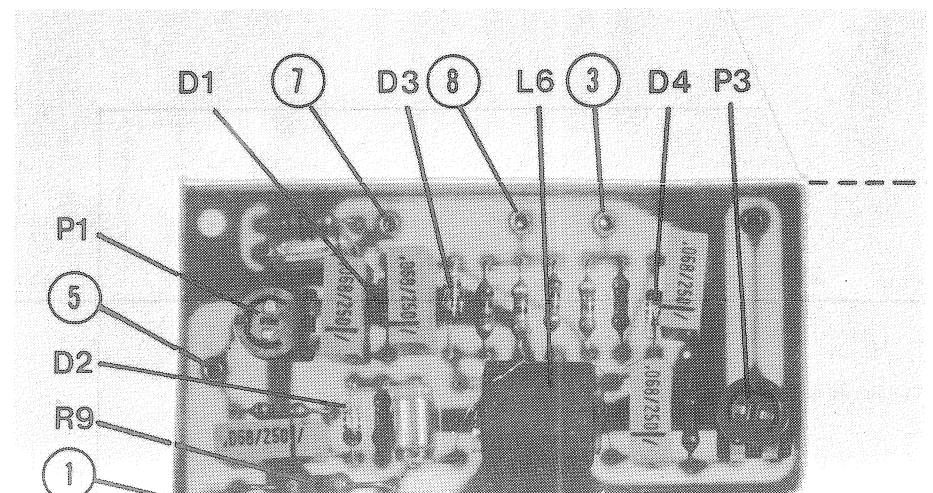
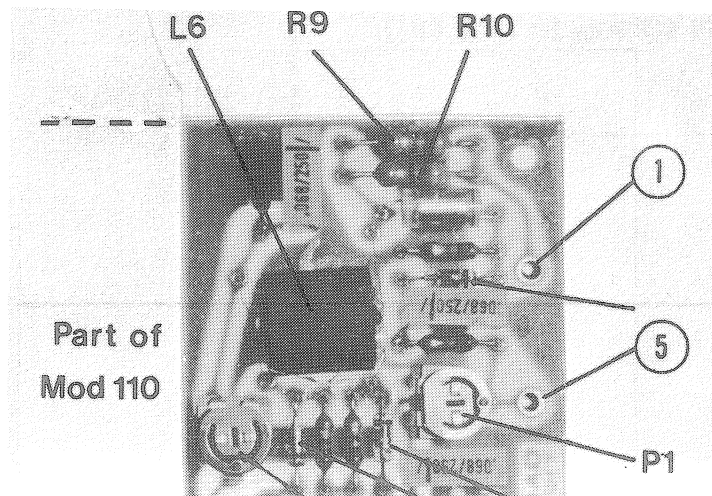
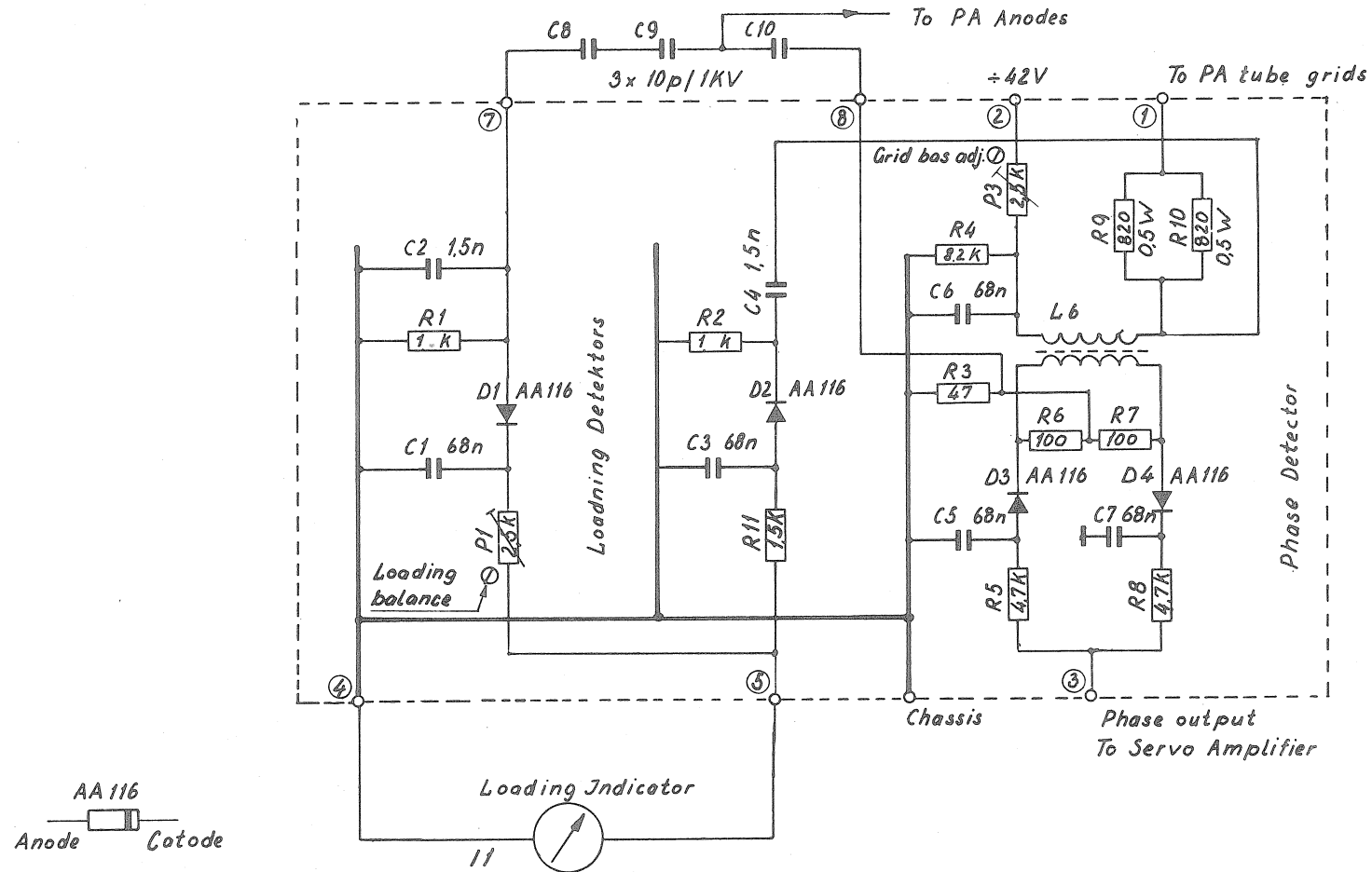
COMPRESSOR. Module 110.

T 101, F, C B and N



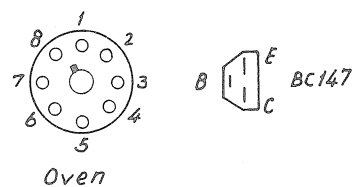
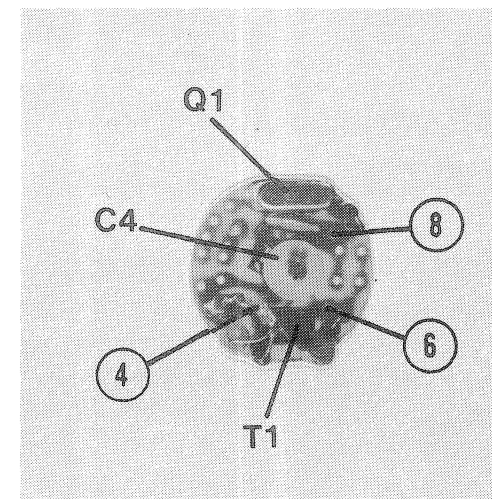
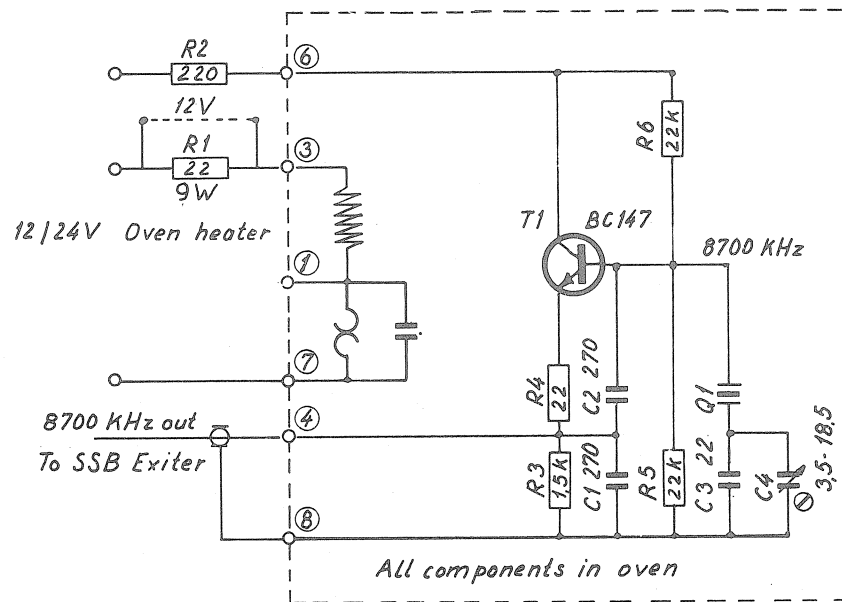
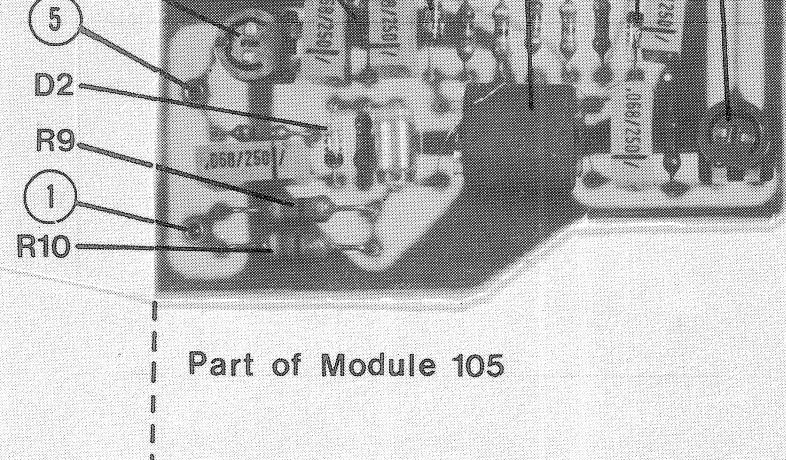
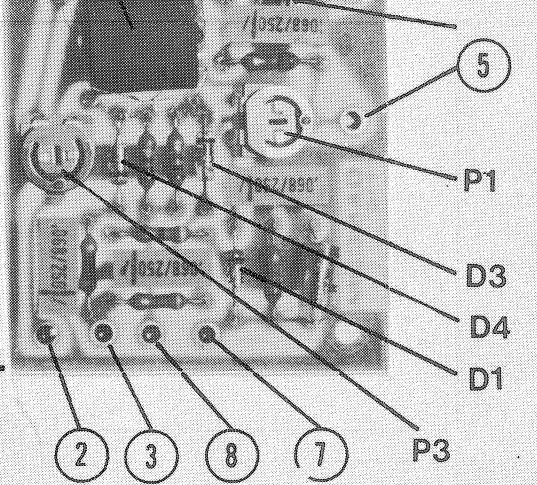




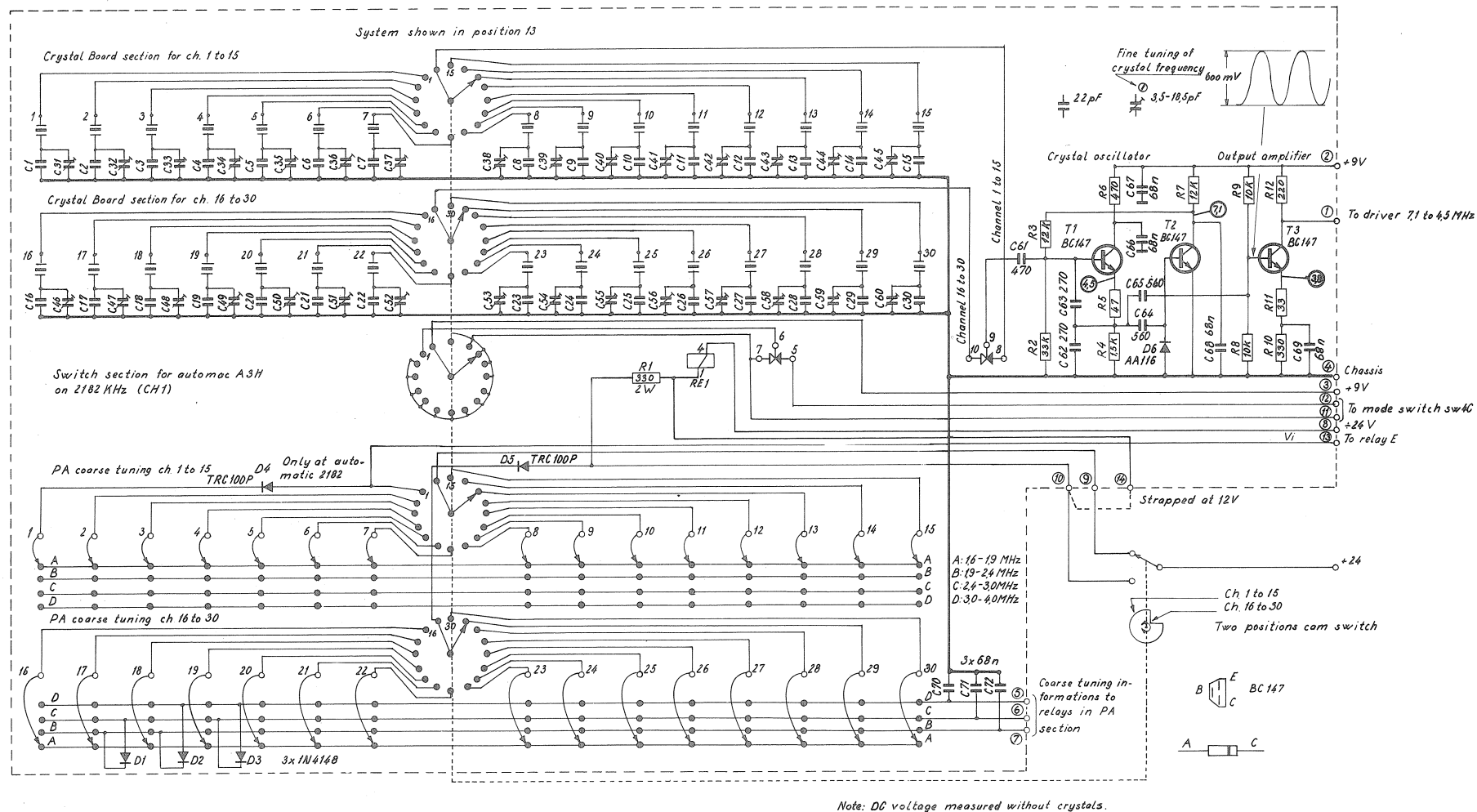




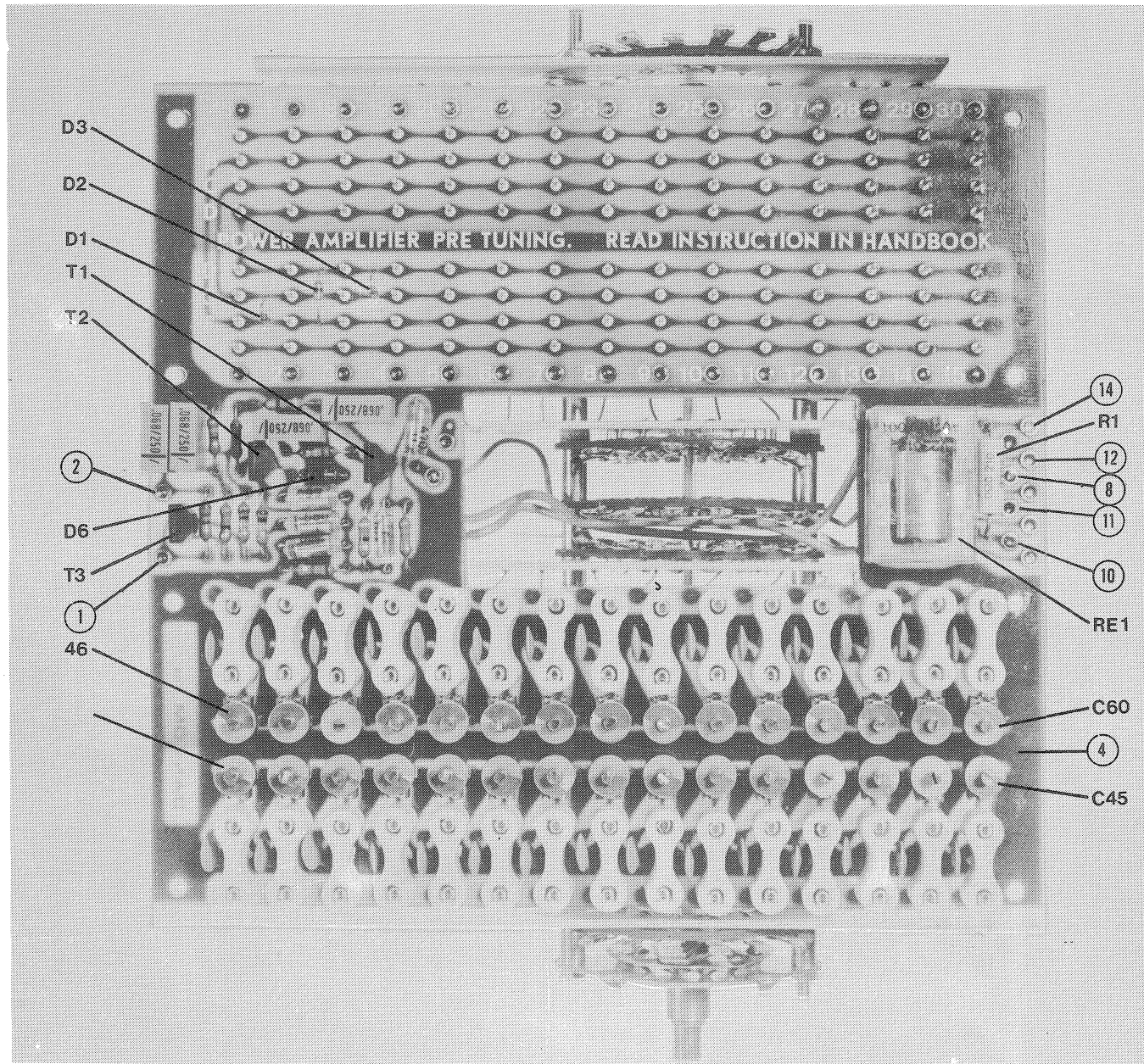
Part of  
Mod 110

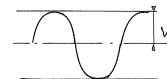
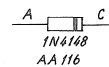
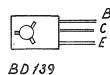
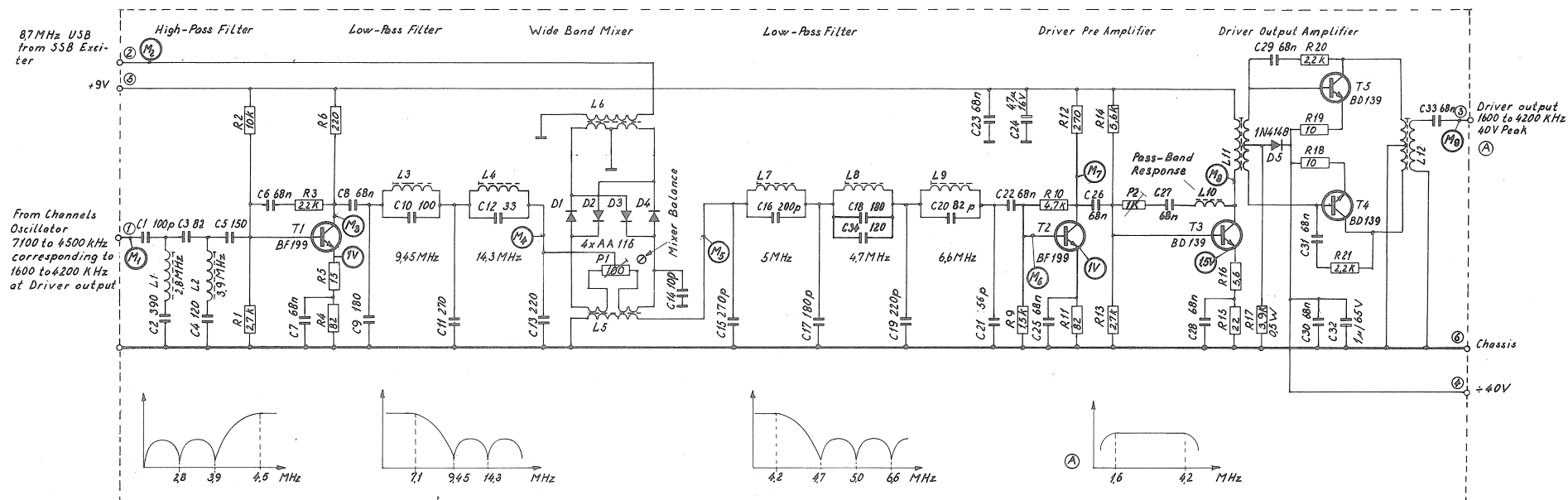


8,7MHz CRYSTAL OSC. Module 102.



CHANNEL OSC. Module 101.  
T 101, all versions

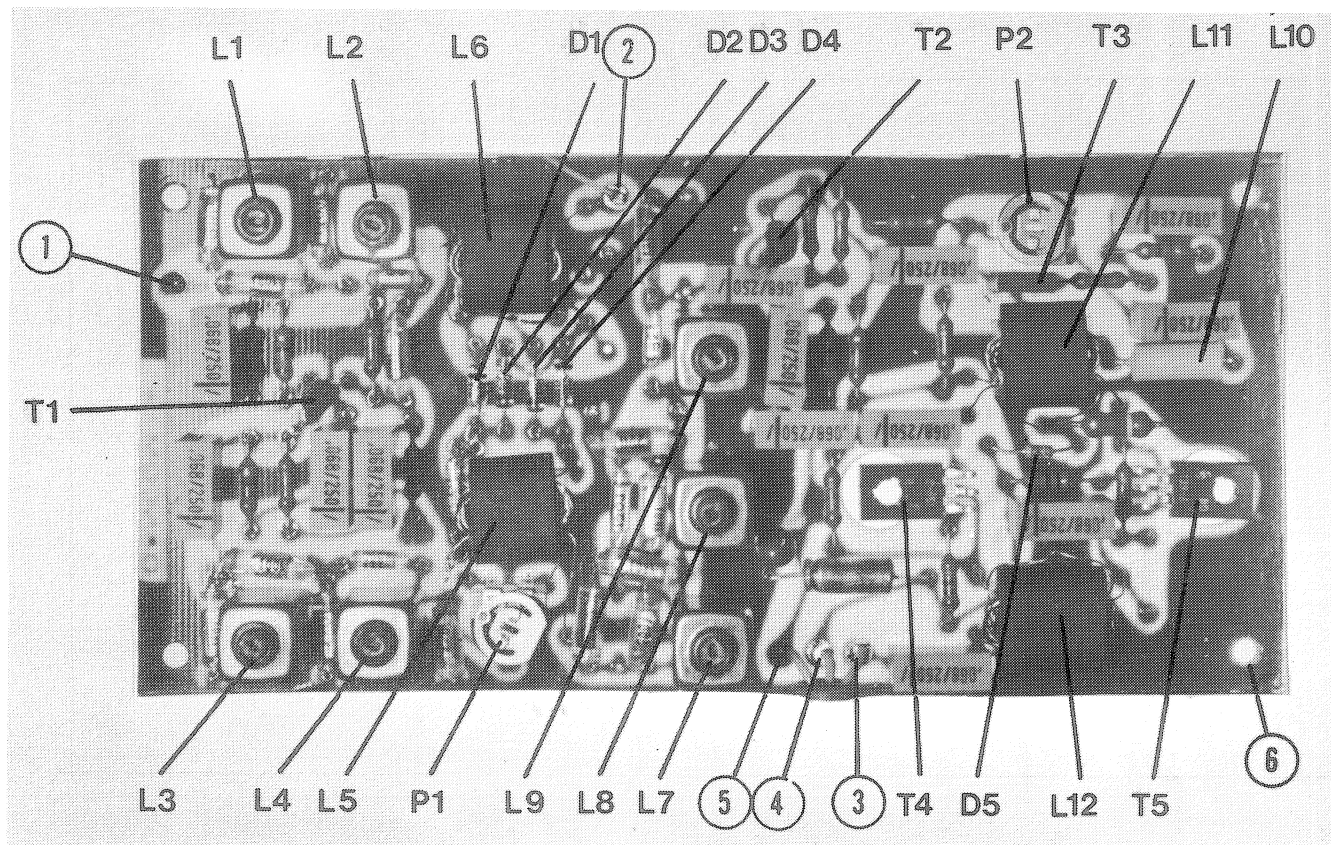




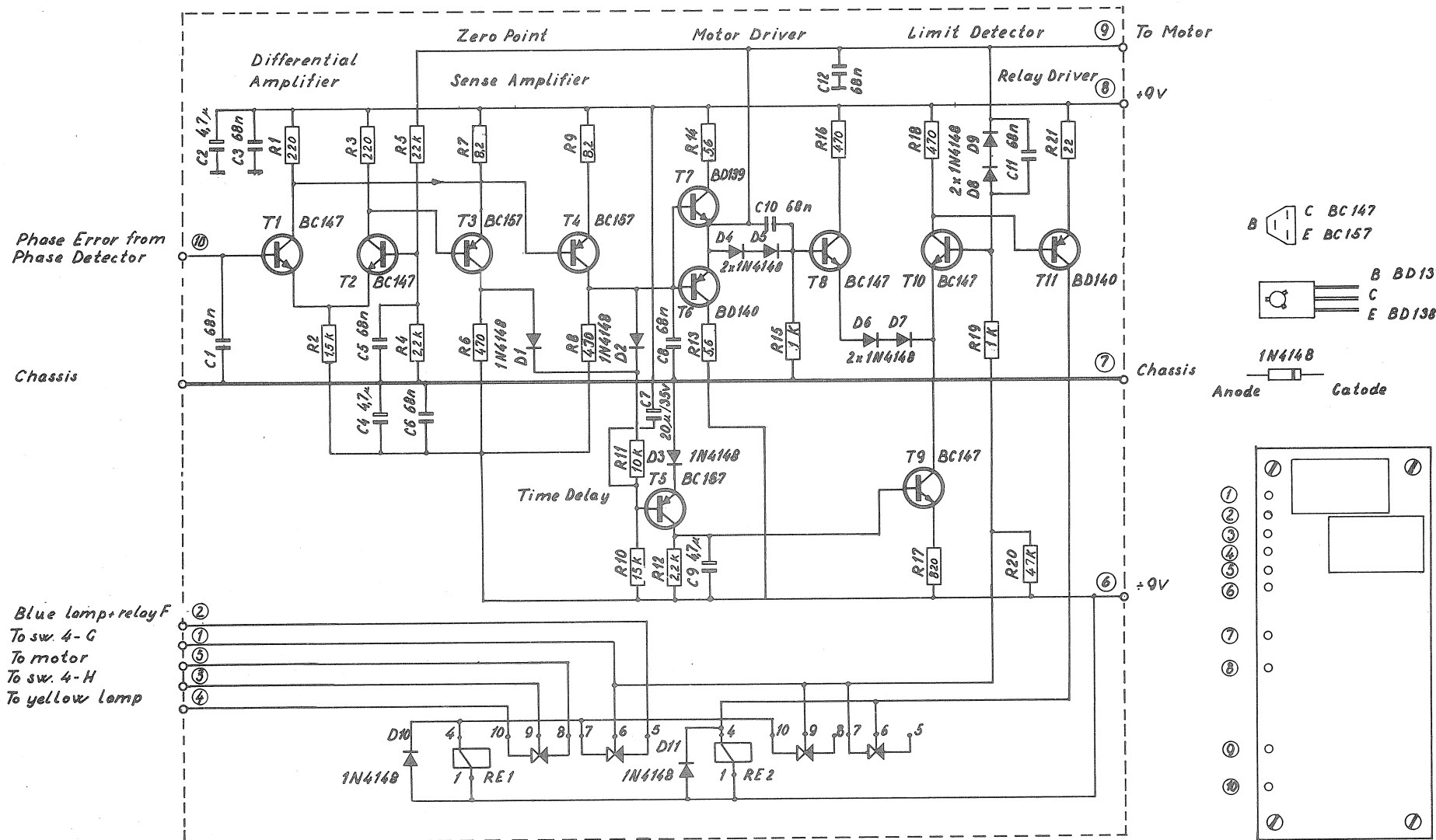
| $M_i$ | $M_1$ | $M_2$ | $M_3$ | $M_6$ | $M_5$ | $M_6$ | $M_7$ | $M_8$ | $M_9$ |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| $V_p$ | 300m  | 75m   | 1.5   | 10    |       | 35m   | 0.35  | 2.0   | 40    |

DRIVER. Module 106.

T101, all versions



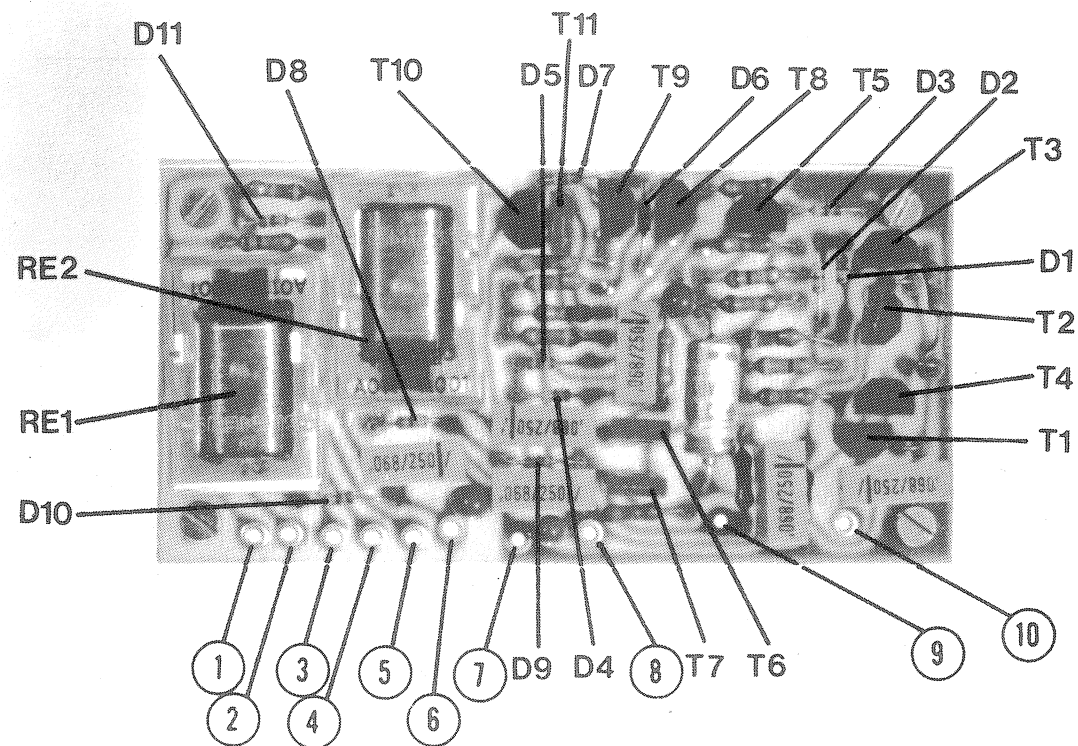


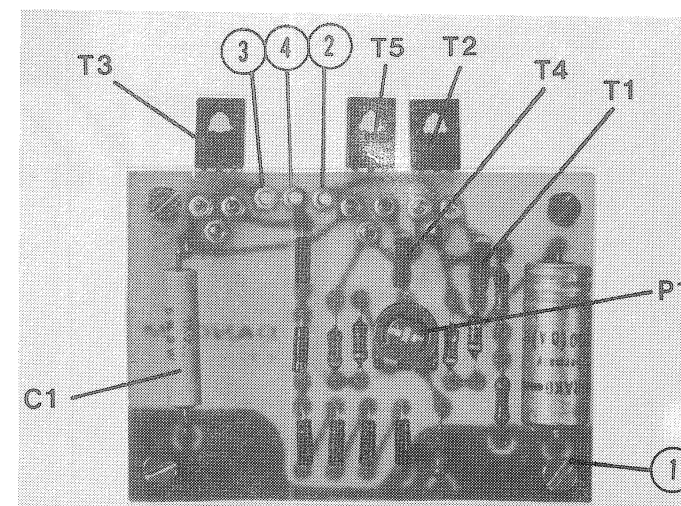
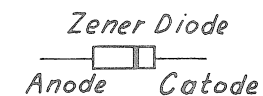
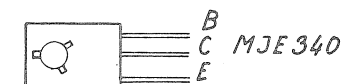
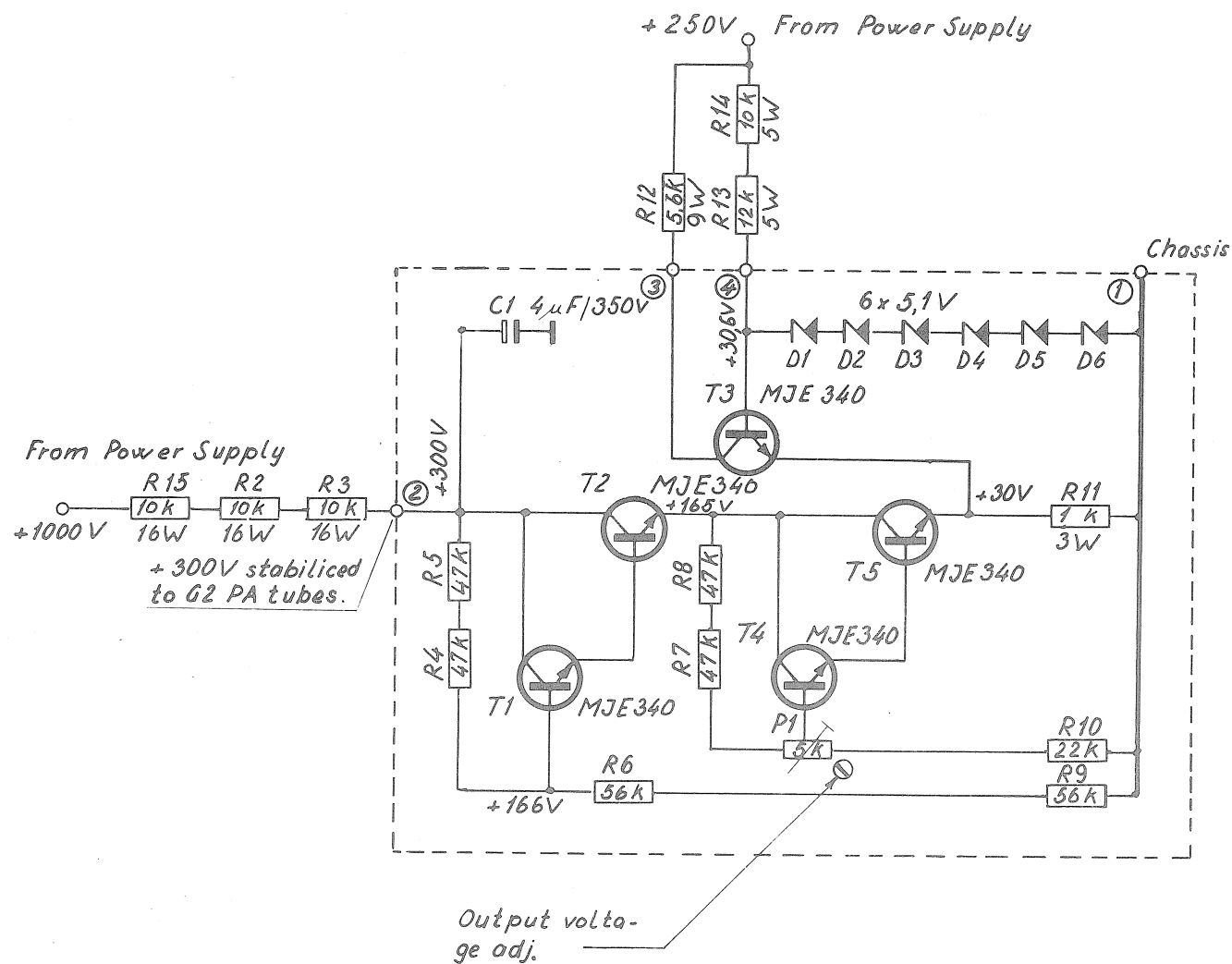


SERVO AMPLIFIER. Module 104.

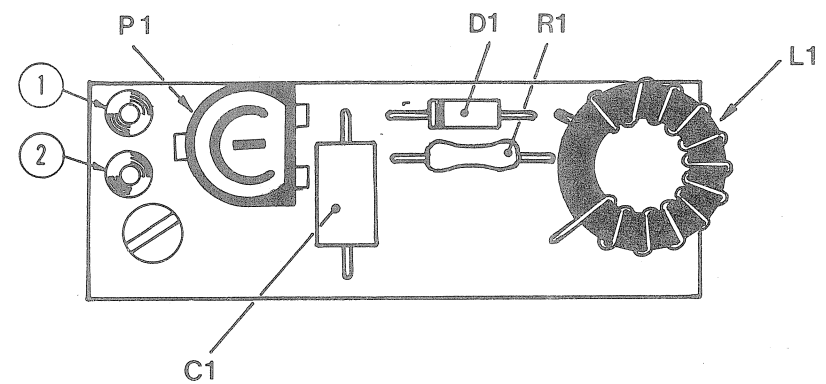
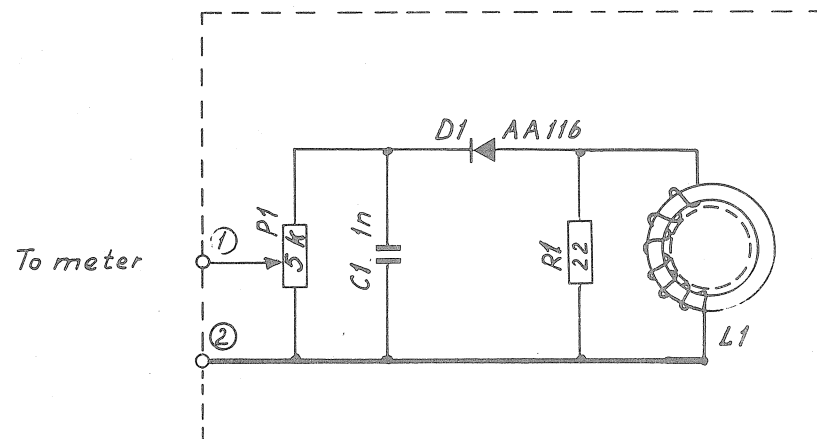
T101, all versions





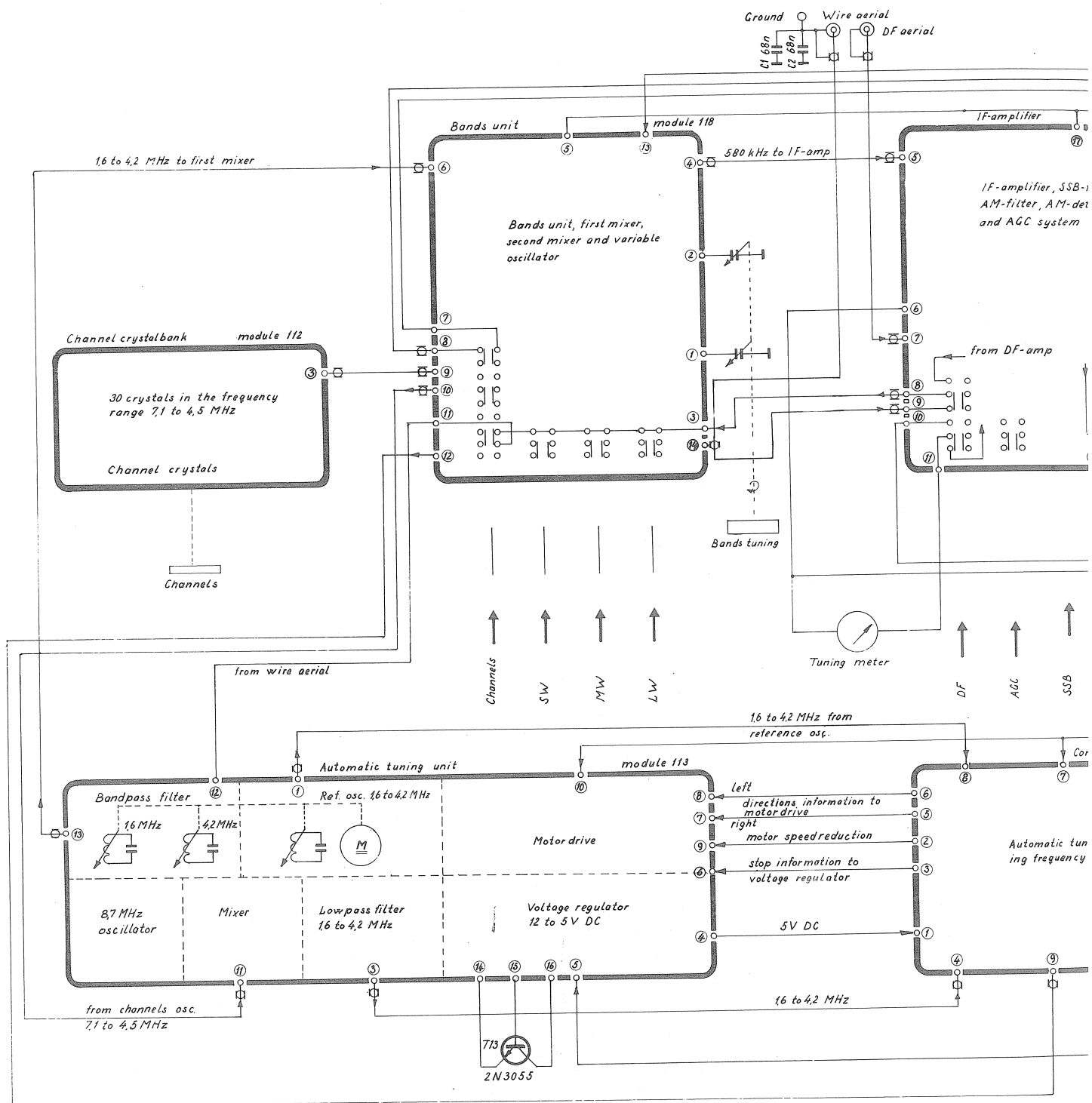


VOLTAGE STABILISER. Module 107. T101, all versions.

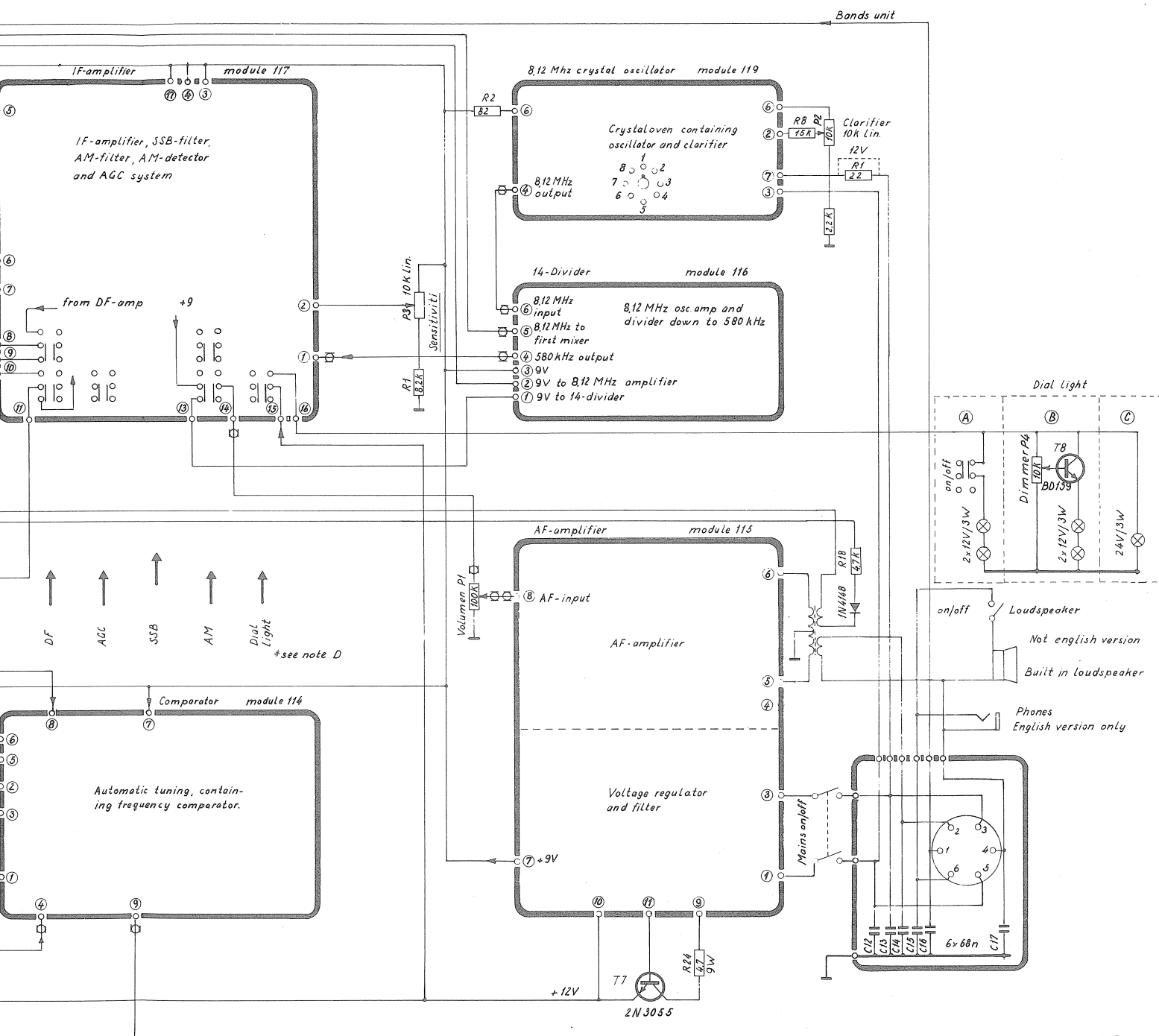


## AERIAL CURRENT DETECTOR. Module 108.

*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



Aerial signal from  
bandfilter 1600  
to 4200 kHz

Chassis

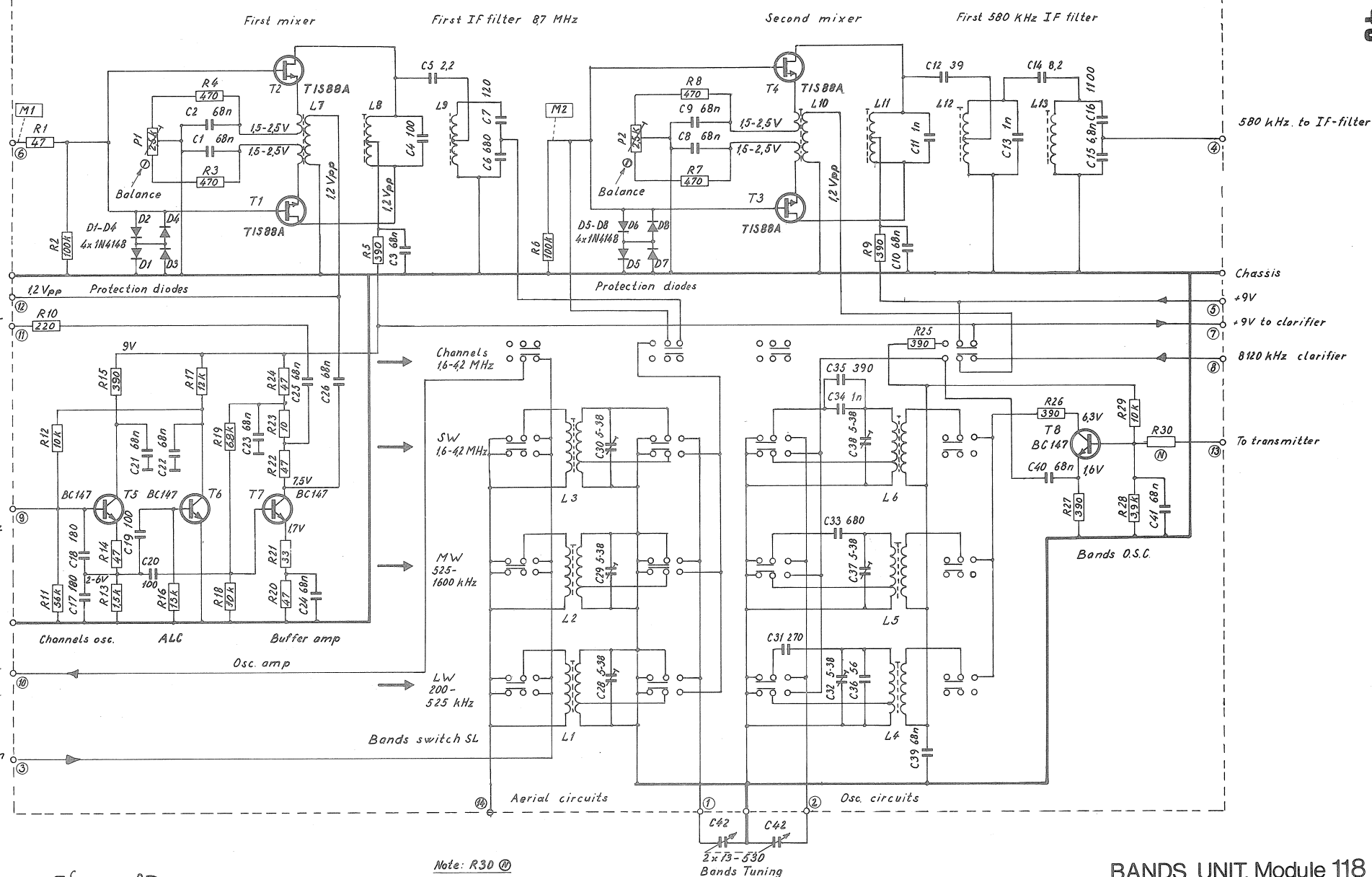
To comparator ⑨

To wide band mixer  
(Automatic tuning  
unit)

From channels  
crystal section  
7.1 MHz to 4.5 MHz

Aerial signal to  
ch band-pass filter

Ant signal from  
MF print



**BANDS UNIT, Module 118**

**R101, D, F, GB, N and NL**

*Bands Unit 118*

*R101, D, F, GB, N and NL*

P2

13

7

5

L10

8

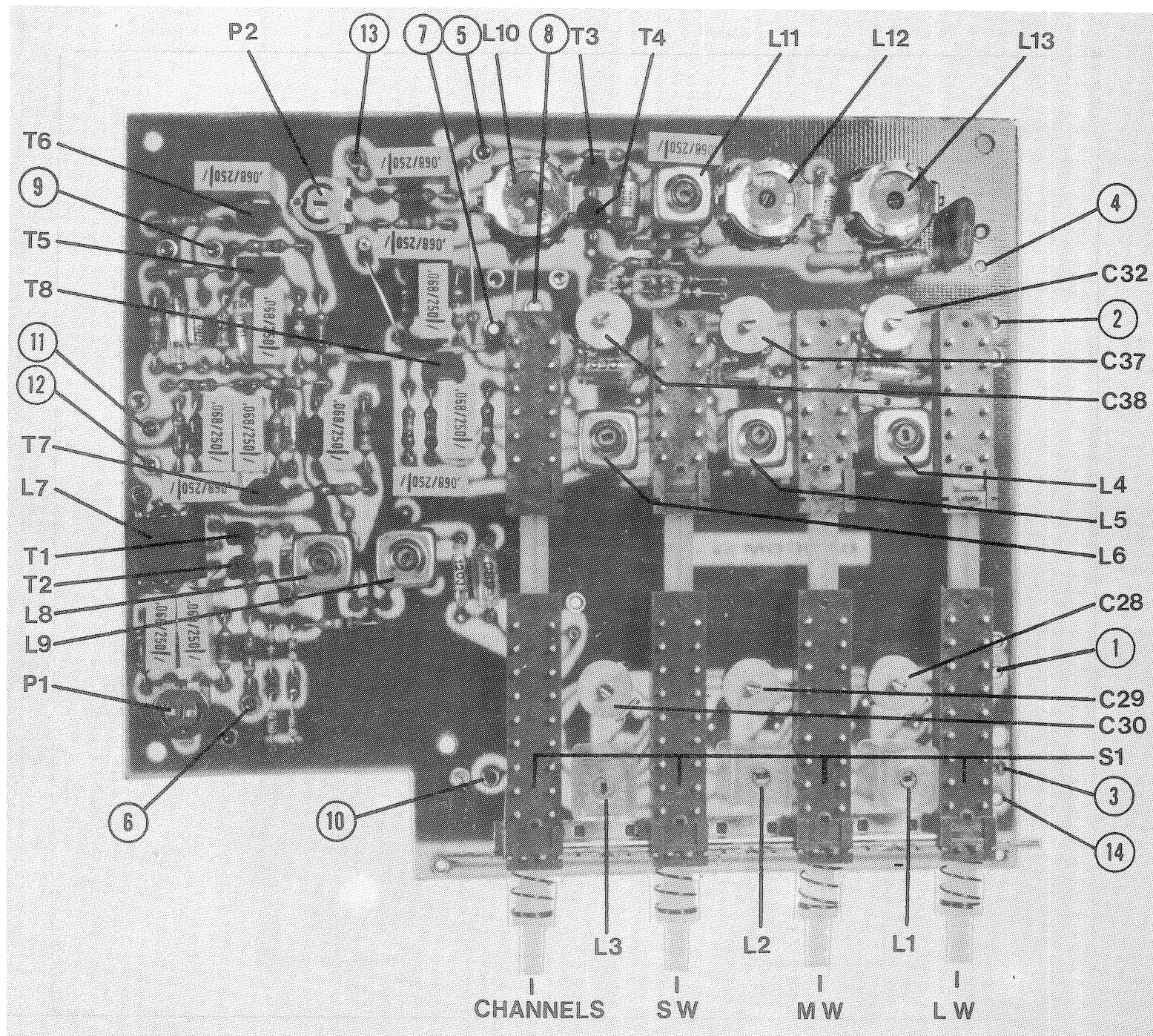
T3

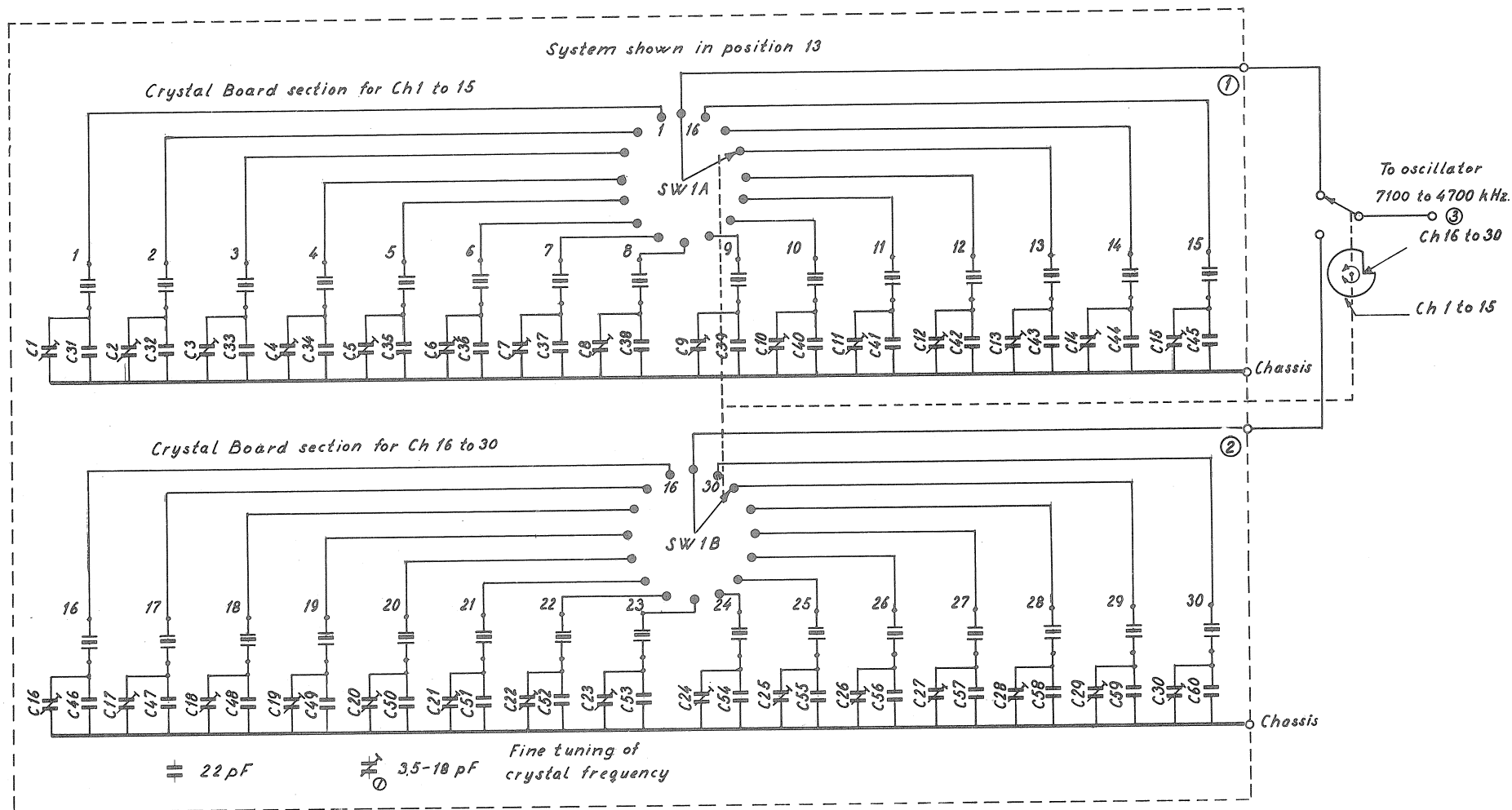
T4

L11

L12

L13



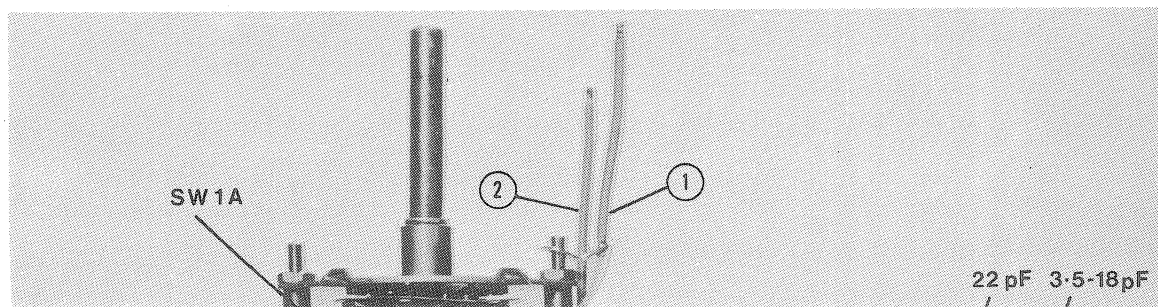


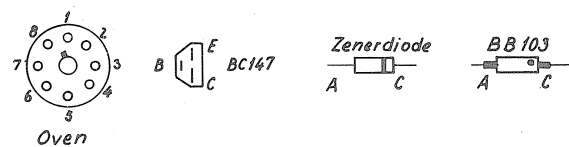
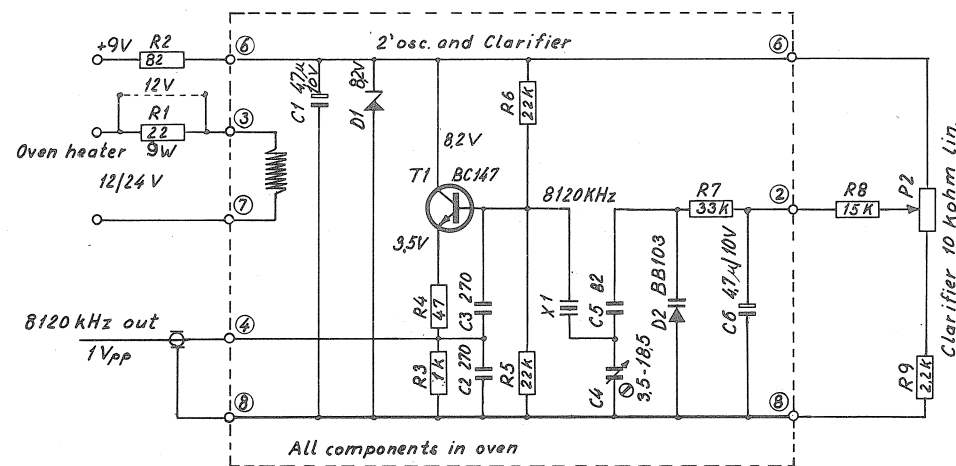
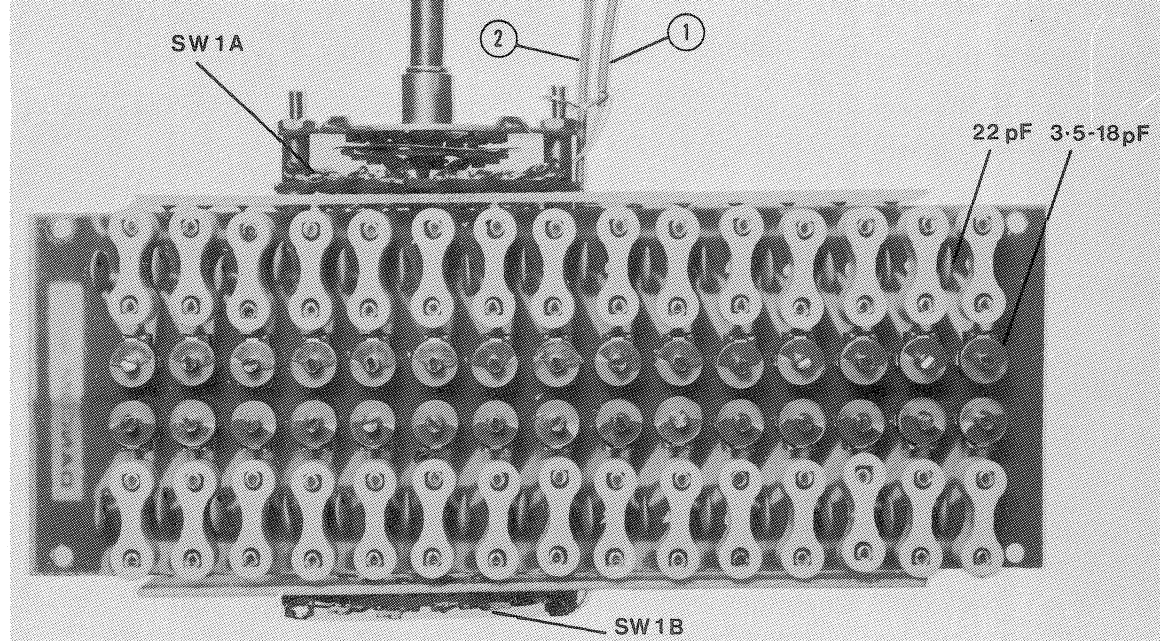
## CRYSTAL BANK, Module 112

### R101, D, F, GB, N & NL

*Crystal Bank 112*

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

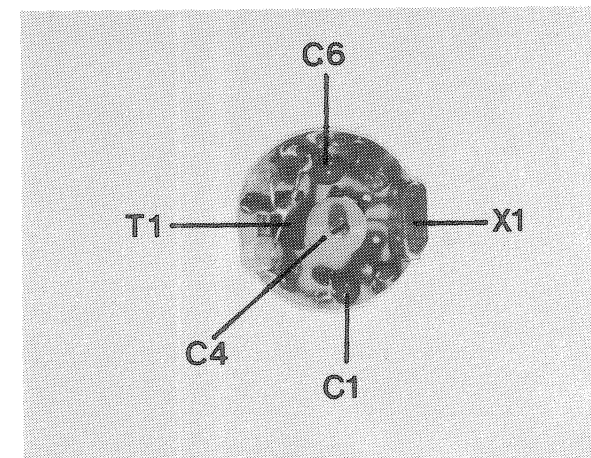




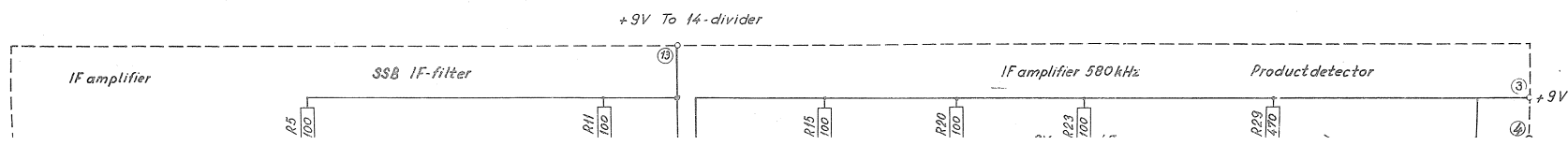
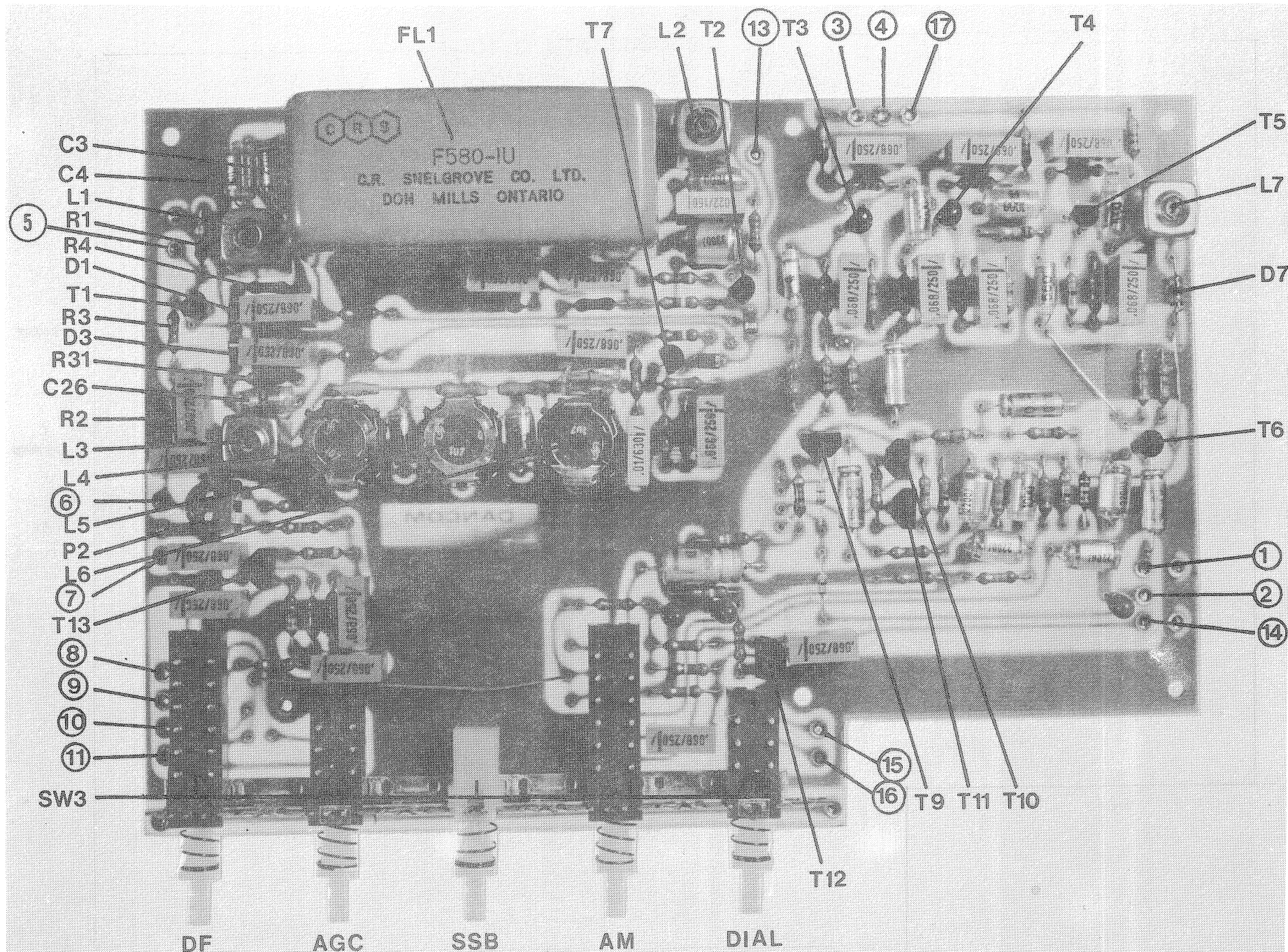
8120 KHz. CRYSTAL OSC., Module 119

R105 R107 R108

R101, D, F, GB, N and NL





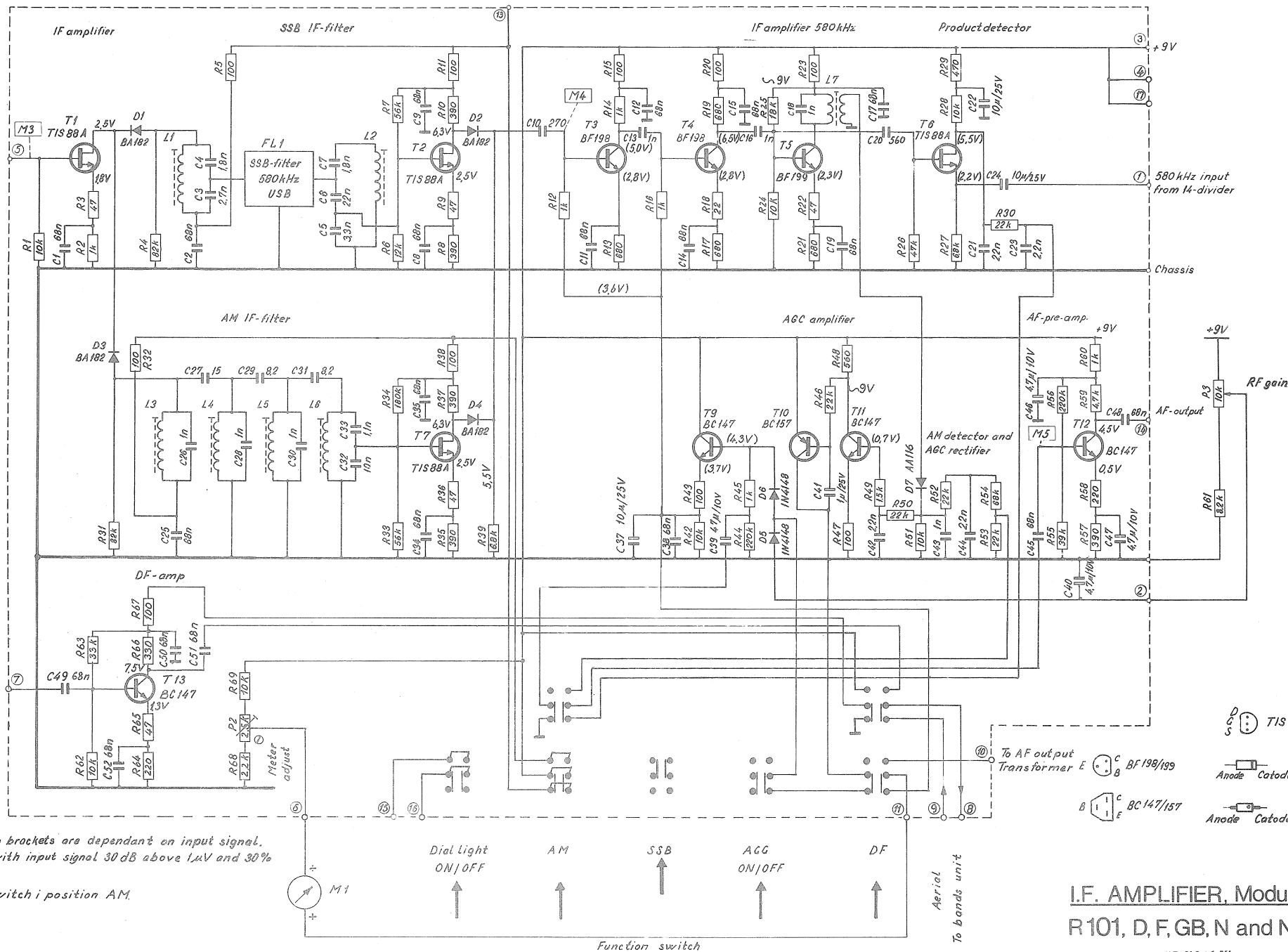


+9V To 14-divider

580 kHz IF from second mixer

From DF aerial

DC values in brackets are dependant on input signal.  
Measured with input signal 30 dB above 1  $\mu$ V and 30% modulated.  
Function switch in position AM.

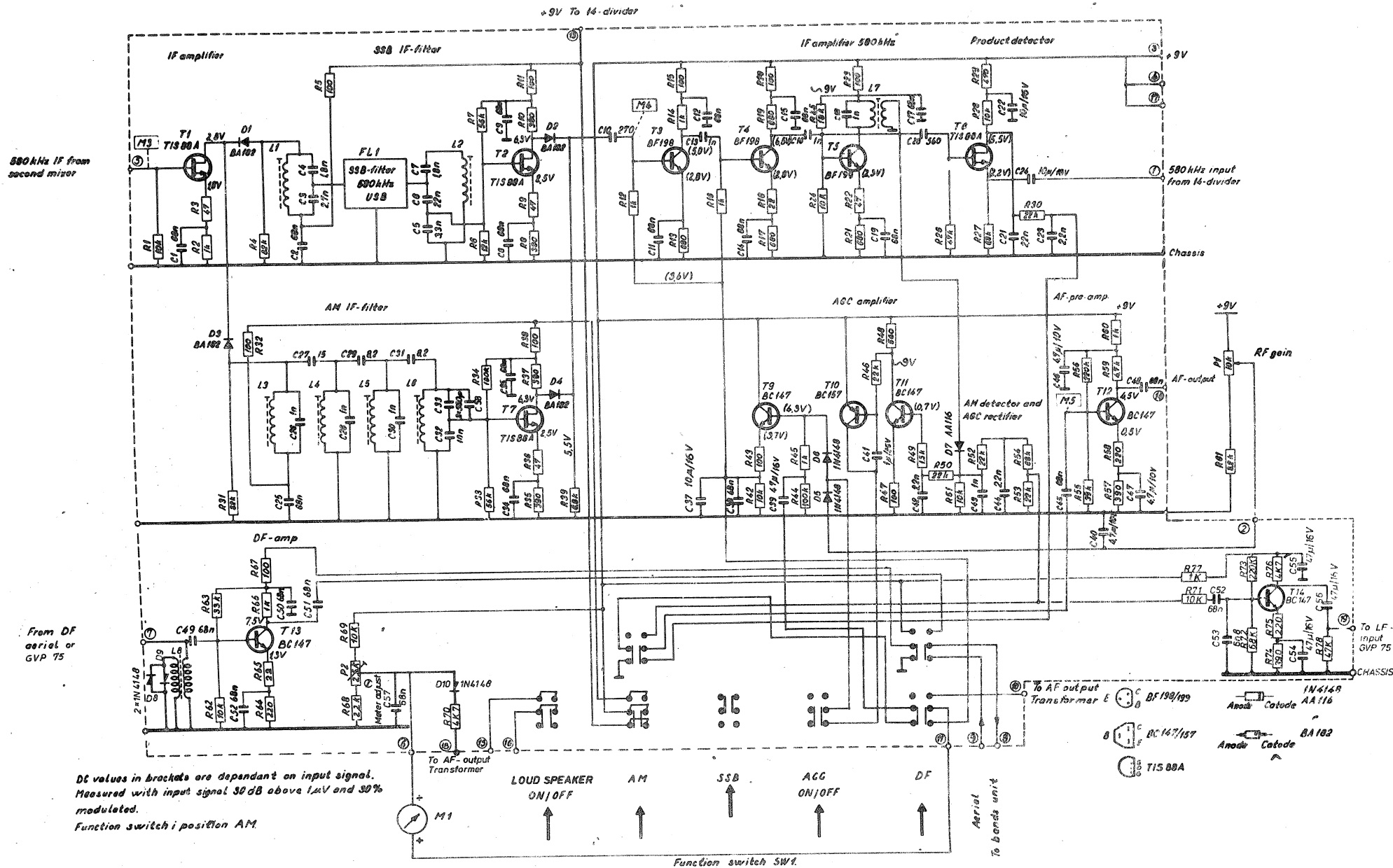


# I.F. AMPLIFIER, Module 117

R101, D, F, GB, N and NL

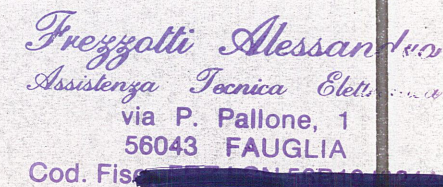
R101, D, F, GB, N and NL



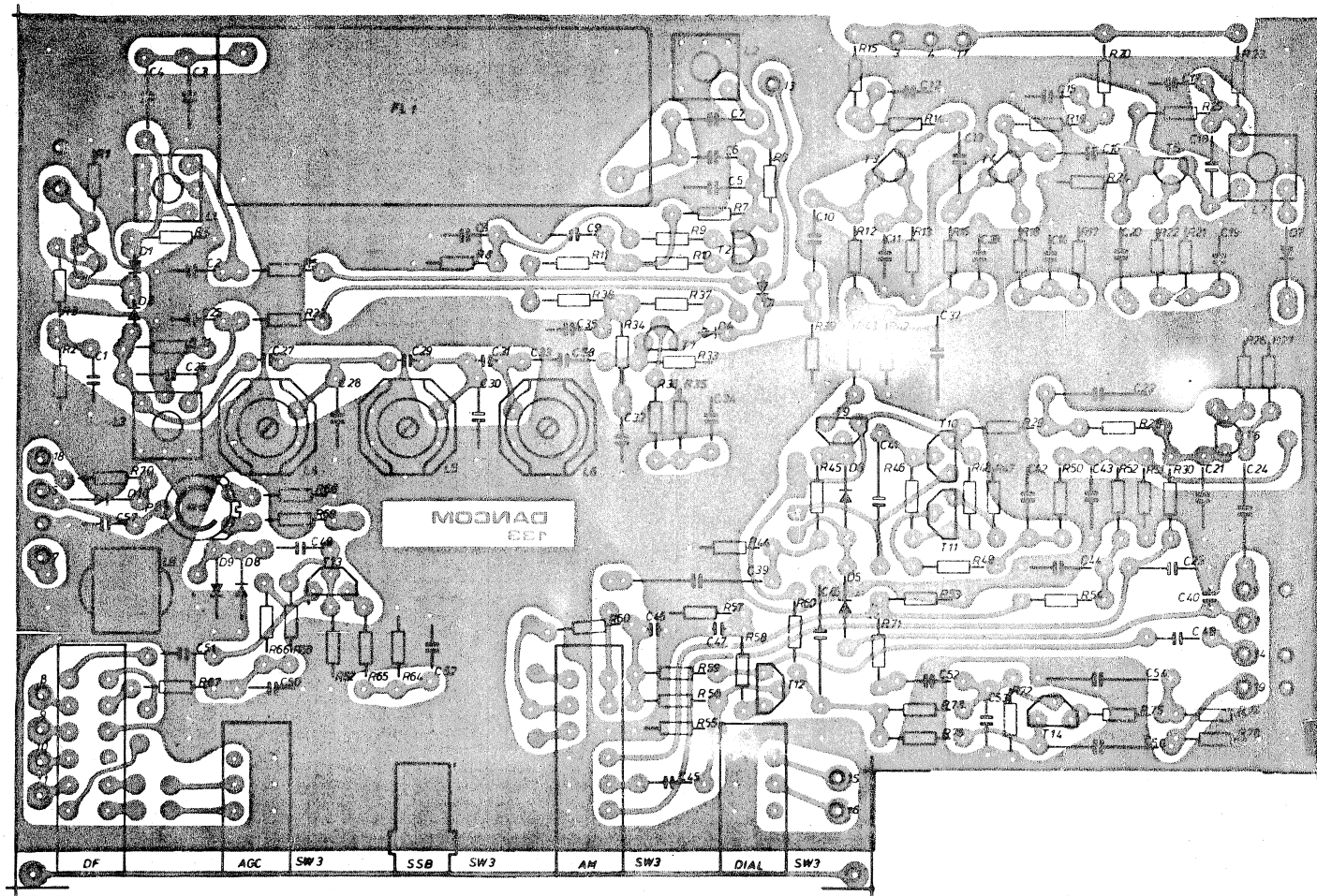


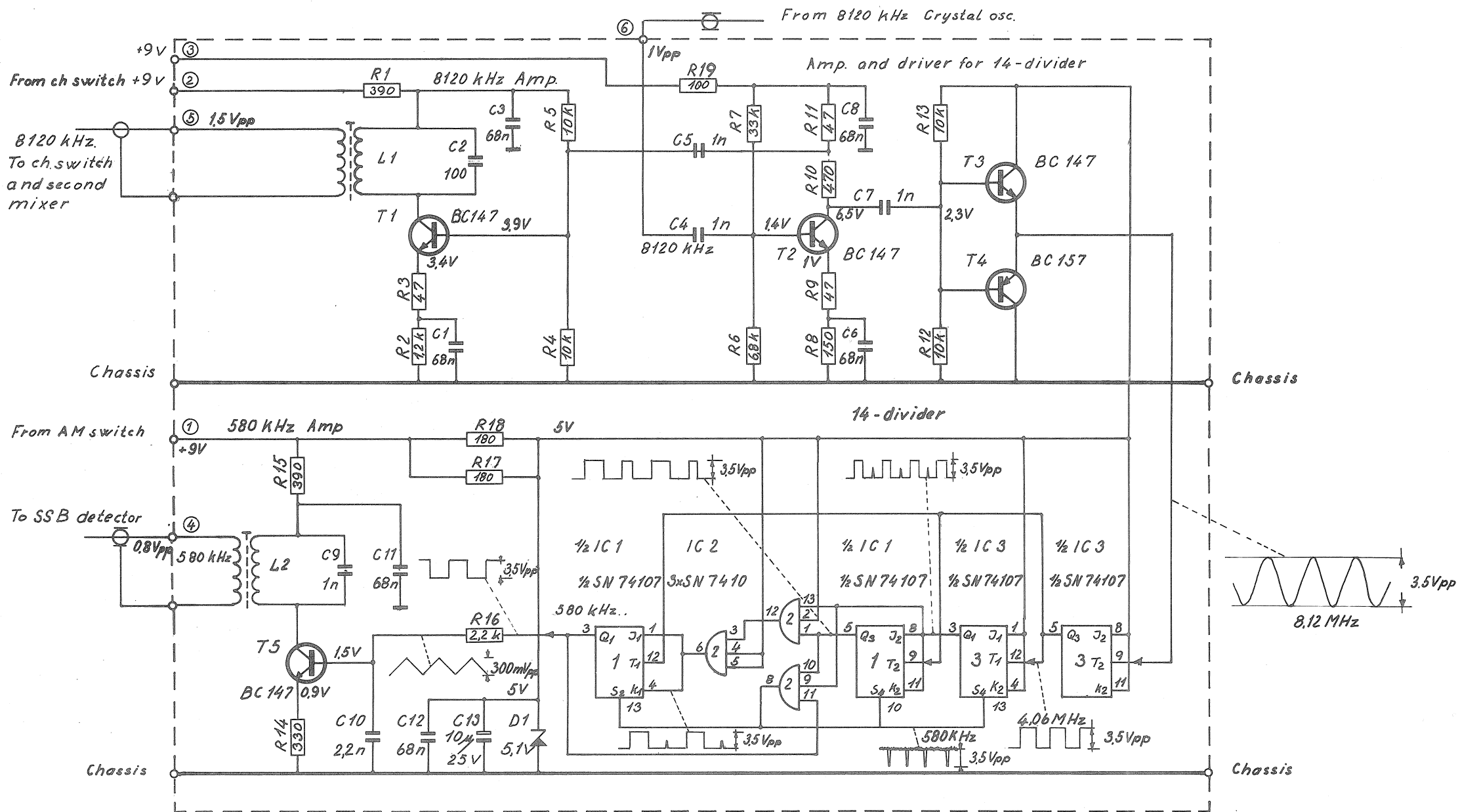
IF. AMPLIFIER. Module 117.  
R101, D, F, GB, N and NL.

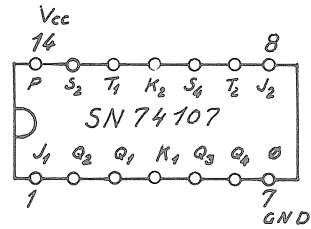
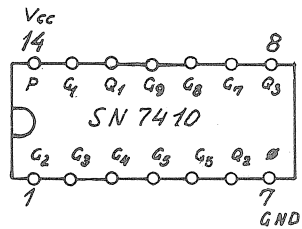












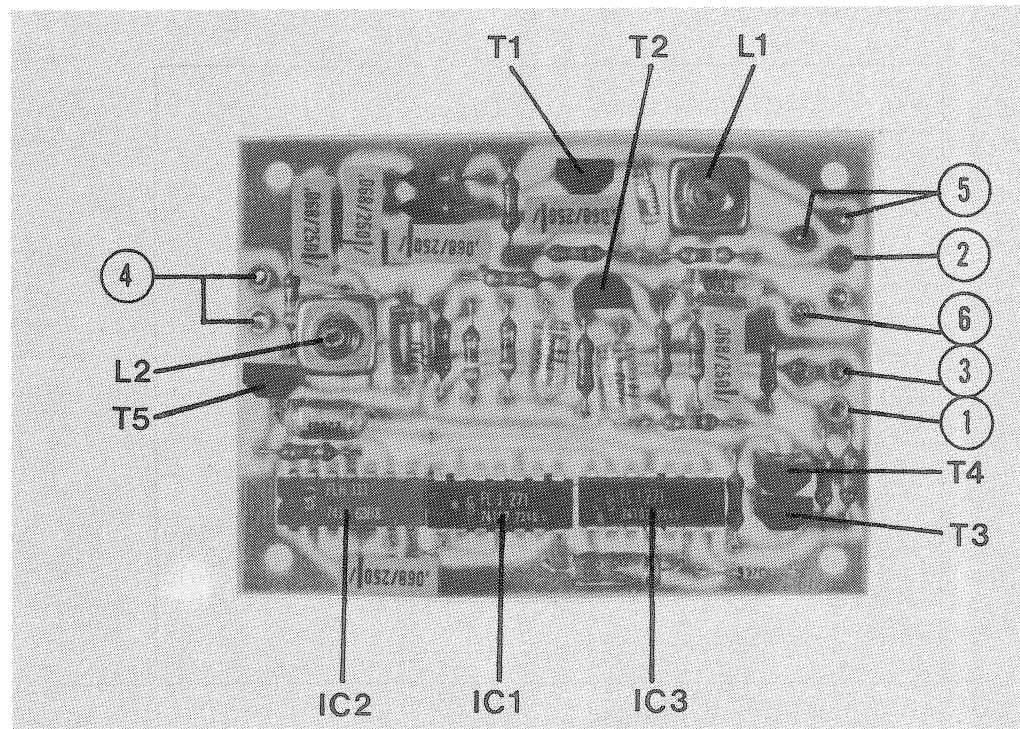
$\begin{matrix} B \\ \text{BC} \end{matrix}$ 
 $\begin{matrix} E \\ C \end{matrix}$ 
 $\begin{matrix} BC147 \\ BC157 \end{matrix}$

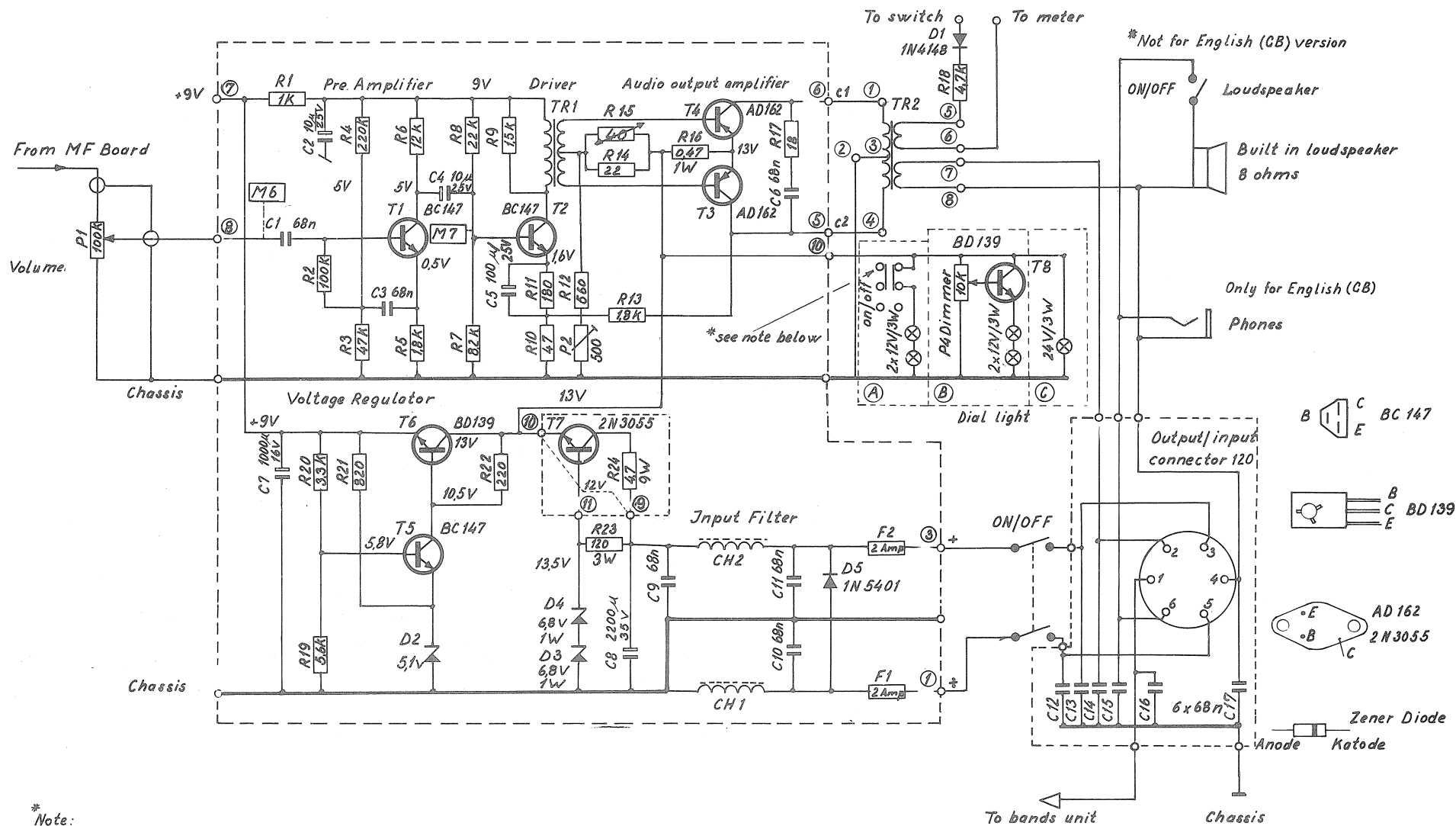
## 14 DIVIDER, Module 116

R101, D, F, GB, N and NL

14 Divider 116

R101, D, F, GB, N and NL





**\* Note:**

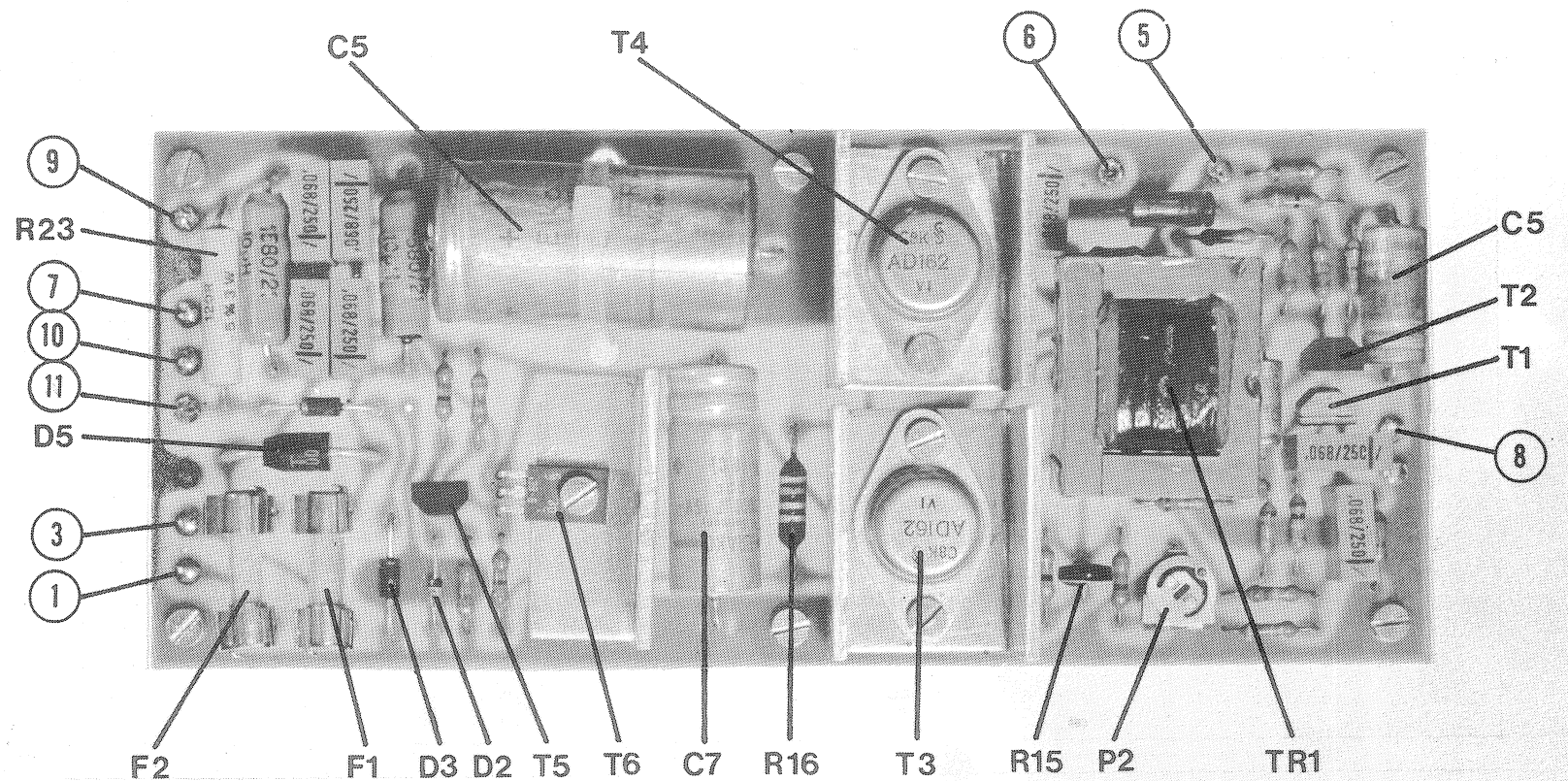
On R101, GB, this switch controls the loud speaker.

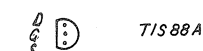
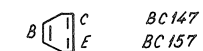
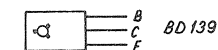
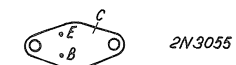
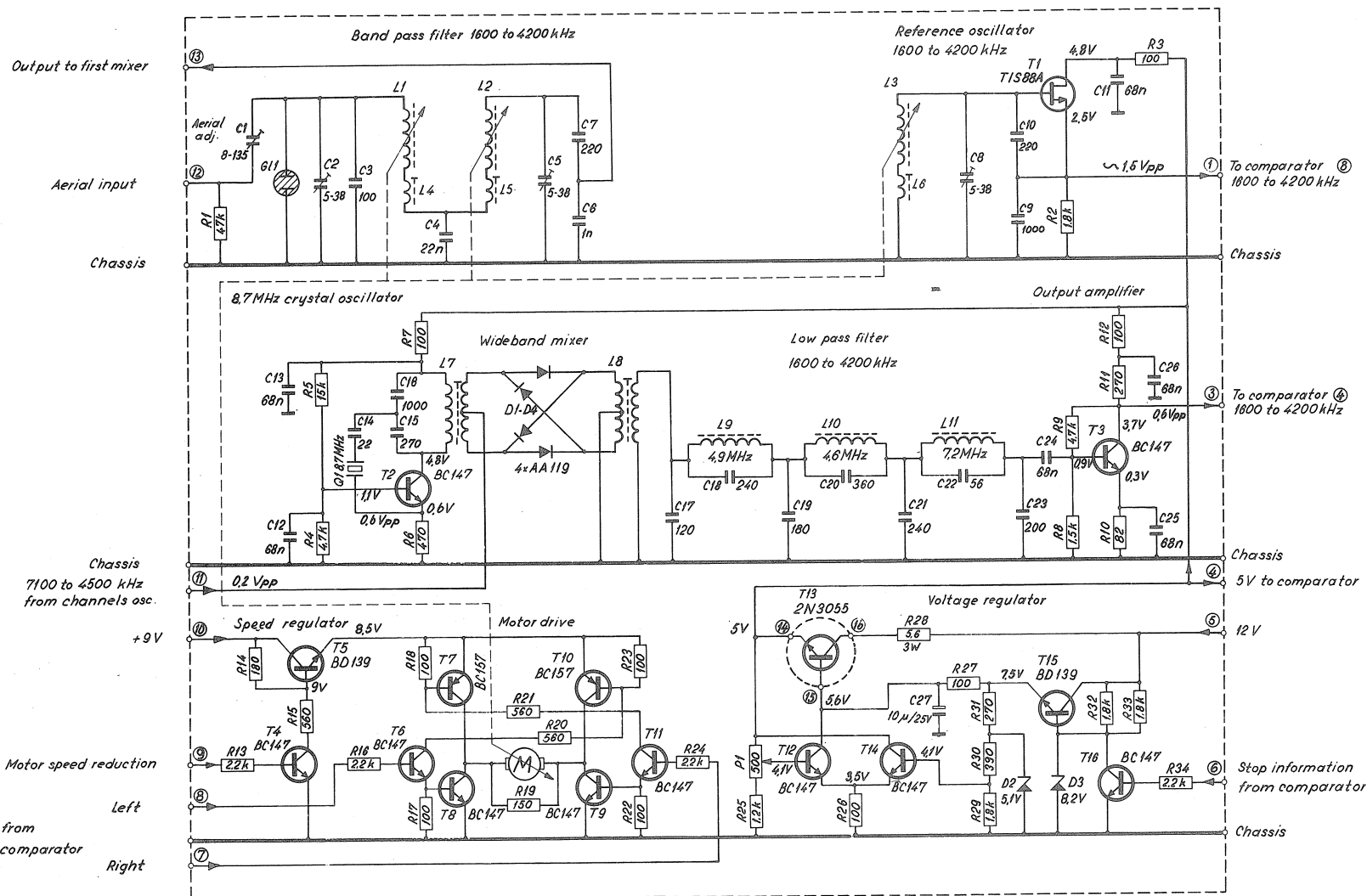
On all other versions this switch controls the dial lights.

- (A) R101, D, N and NL  
 (B) R101 GB  
 (A+C) R101 F

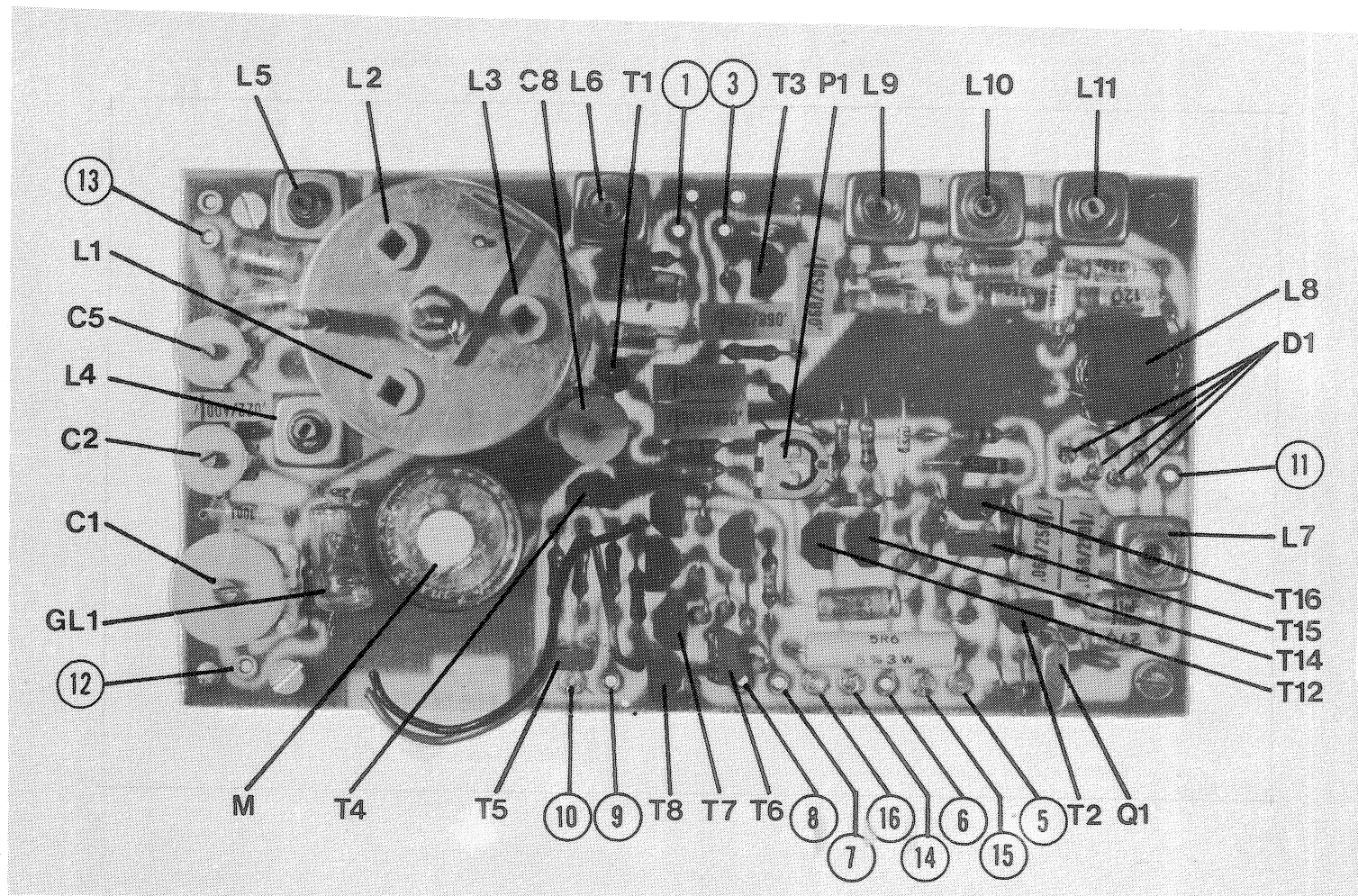
**A.F. AMPLIFIER, Module 115  
 and CONNECTOR, Module 120**  
 R101, D, F, GB, N and NL

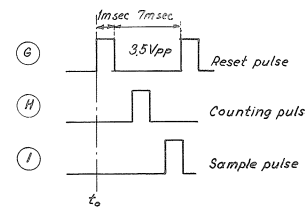
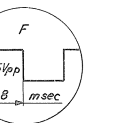
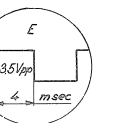
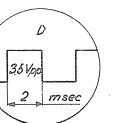
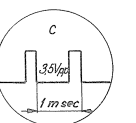
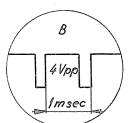
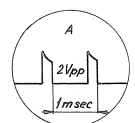
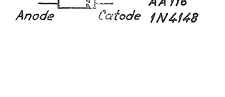
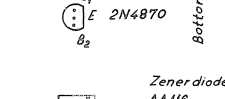
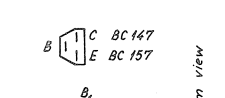
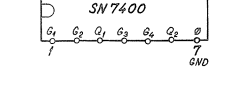
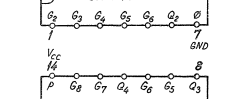
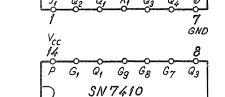
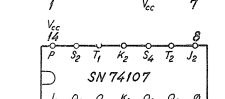
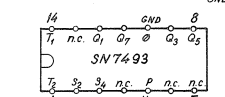
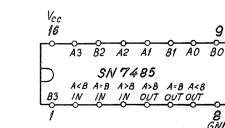
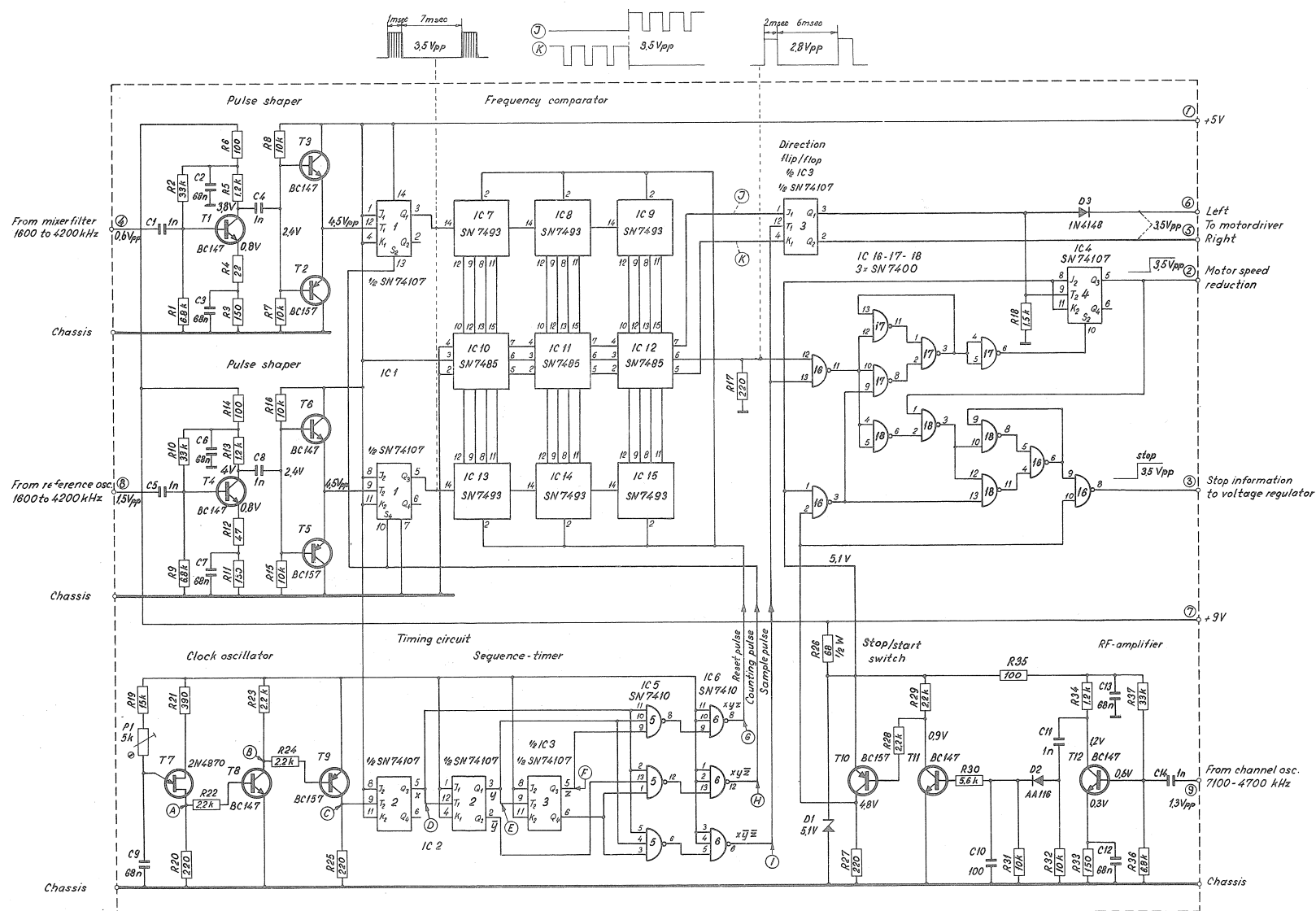




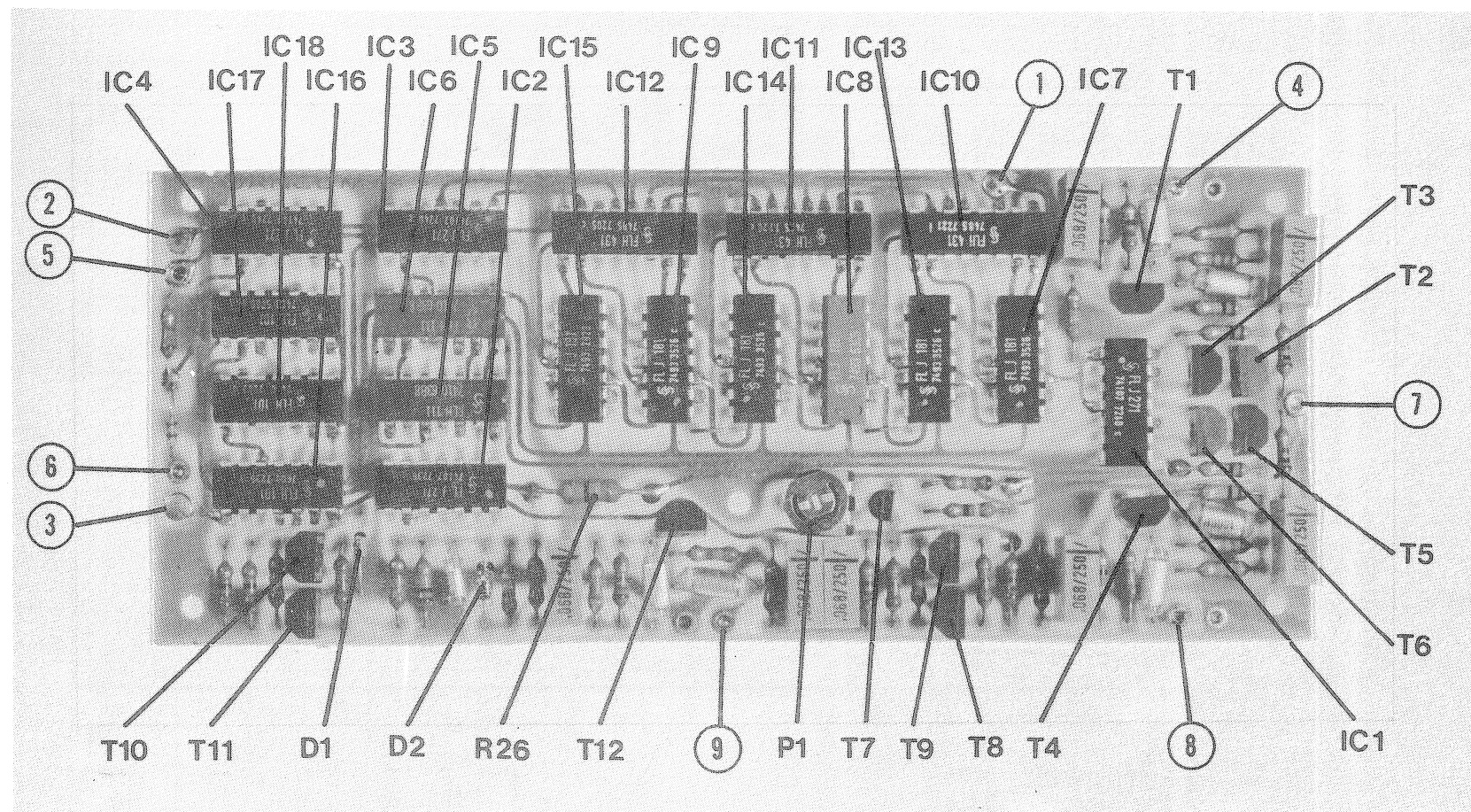


AUTOMATIC, Module 113  
R101, D, F, GB, N & NL

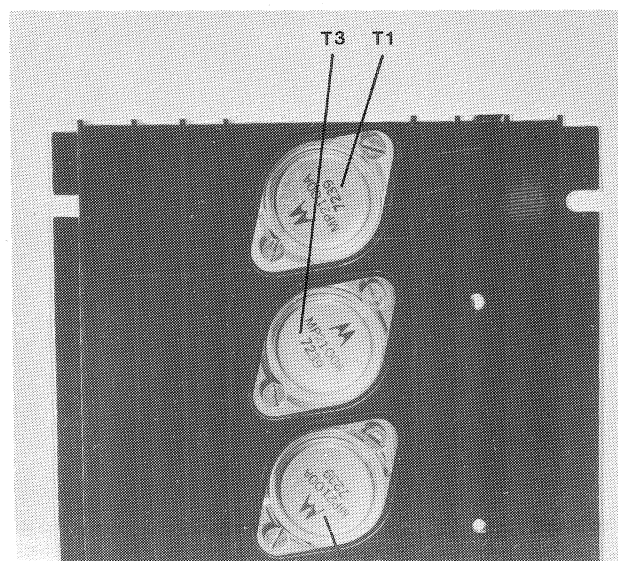
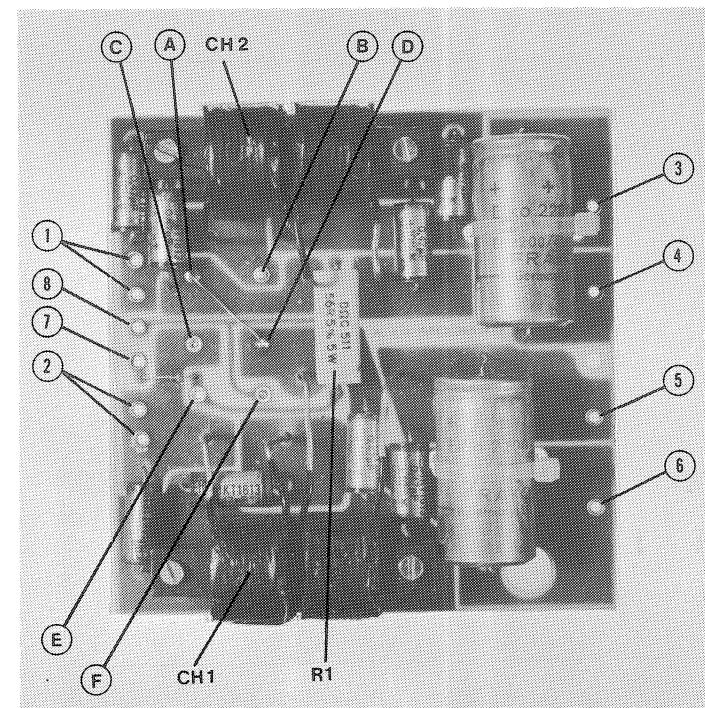
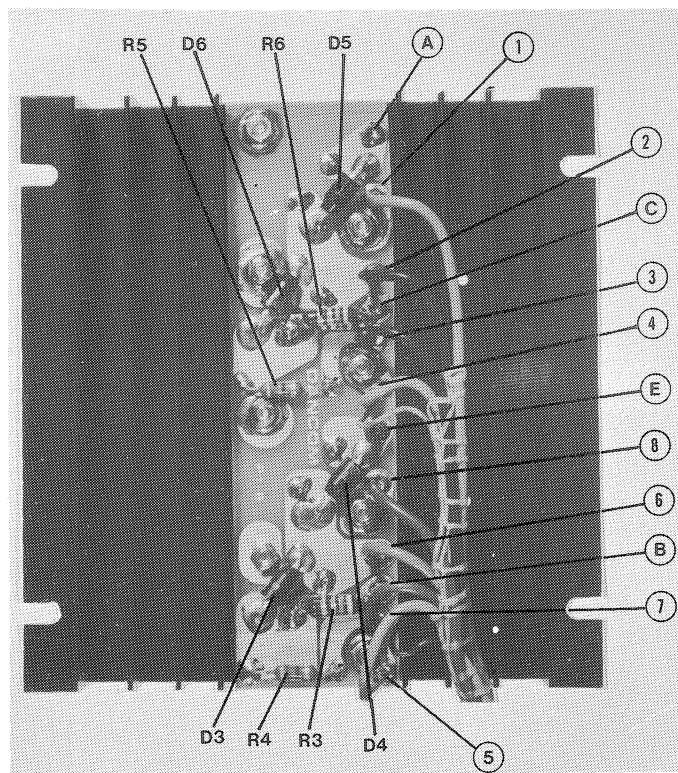




FREQUENCY COMPARATOR, Module 114  
 \* R101, D, F, GB, N & NL

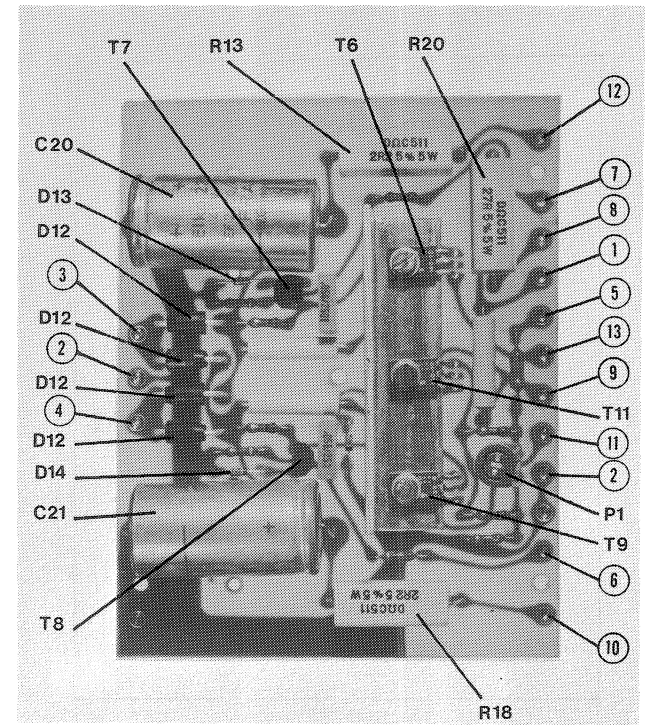
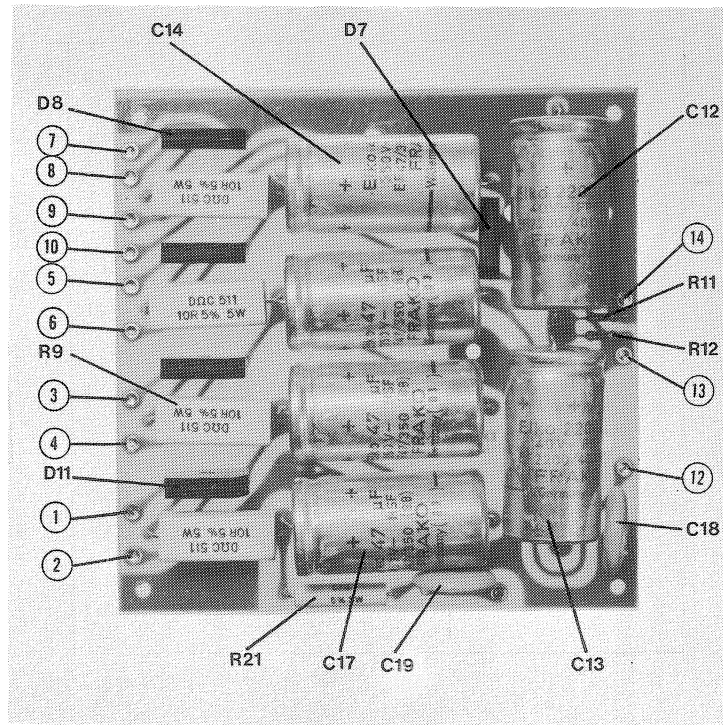


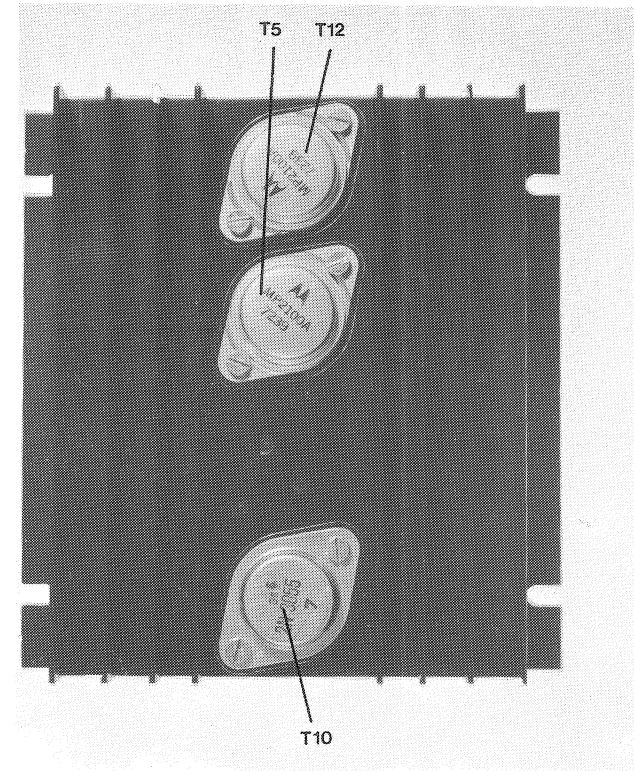
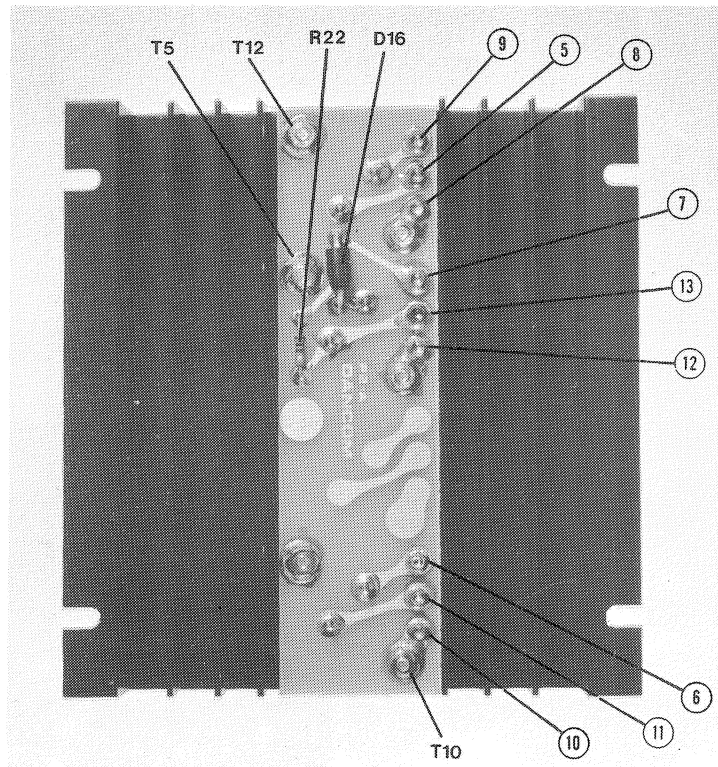
















## S.S.B. EXCITER. Module 109.

| *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, electrolyt   | 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, electrolyt   | 10 uF             | 25V      | 12, 225 |
| *C12     | Capacitor, electrolyt   | 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    |         |
| D3       | Diode                   | BZX 55 C8V2       | 8, 2V    |         |
| 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  |         |
| IC1-2    | 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          |                   |          |         |
| 10 Kohm  |                         |                   |          |         |
| 56 ohm   |                         |                   |          |         |
| 1 Kohm   |                         |                   |          |         |
| 6,8 Kohm |                         |                   |          |         |
| 220 ohm  |                         |                   |          |         |
| 820 ohm  |                         |                   |          |         |
| 1,5 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 39 ohm   |                         |                   |          |         |
| 15 ohm   |                         |                   |          |         |
| 1,8 Kohm |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |
| 100 ohm  |                         |                   |          |         |
| 330 ohm  |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 100 Kohm |                         |                   |          |         |
| 3,9 Kohm |                         |                   |          |         |
| 47 ohm   |                         |                   |          |         |
| 2,2 Kohm |                         |                   |          |         |
| 470 ohm  |                         |                   |          |         |







|      |                                |         |      |         |        |                    |         |      |        |
|------|--------------------------------|---------|------|---------|--------|--------------------|---------|------|--------|
| 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      | 1 Kohm   | 5% | 0,33W | R1    | Resistor, carbon      | 1 Kohm   | 5% | 0,33W | 01,149 |
| R2    | Resistor, carbon      | 1 Kohm   | 5% | 0,33W | R2    | Resistor, carbon      | 1 Kohm   | 5% | 0,33W | 01,149 |
| R3    | Resistor, carbon      | 47 ohm   | 5% | 0,33W | R3    | Resistor, carbon      | 47 ohm   | 5% | 0,33W | 01,169 |
| R4    | Resistor, carbon      | 8,2 Kohm | 5% | 0,33W | R4    | Resistor, carbon      | 8,2 Kohm | 5% | 0,33W | 01,160 |
| R5    | Resistor, carbon      | 4,7 Kohm | 5% | 0,33W | R5    | Resistor, carbon      | 4,7 Kohm | 5% | 0,33W | 01,157 |
| R6    | Resistor, carbon      | 100 ohm  | 5% | 0,33W | R6    | Resistor, carbon      | 100 ohm  | 5% | 0,33W | 01,137 |
| R7    | Resistor, carbon      | 100 ohm  | 5% | 0,33W | R7    | Resistor, carbon      | 100 ohm  | 5% | 0,33W | 01,137 |
| R8    | Resistor, carbon      | 4,7 Kohm | 5% | 0,33W | R8    | Resistor, carbon      | 4,7 Kohm | 5% | 0,33W | 01,157 |
| R9    | Resistor, carbon      | 820 ohm  | 5% | 0,33W | R9    | Resistor, carbon      | 820 ohm  | 5% | 0,33W | 01,148 |
| R10   | Resistor, carbon      | 820 ohm  | 5% | 0,33W | R10   | Resistor, carbon      | 820 ohm  | 5% | 0,33W | 01,148 |
| R11   | Resistor, carbon      | 1,5 Kohm | 5% | 0,33W | R11   | Resistor, carbon      | 1,5 Kohm | 5% | 0,33W | 01,151 |
| P1-3  | Potentiometer, carbon | 2,5 Kohm |    | 0,2W  | P1-3  | Potentiometer, carbon | 2,5 Kohm |    | 0,2W  | 04,154 |
| C1    | Capacitor, mkt        | 68 nF    |    | 250V  | C1    | Capacitor, mkt        | 68 nF    |    | 250V  | 11,223 |
| C2    | Capacitor, styroflex  | 1,5 nF   |    | 160V  | C2    | Capacitor, styroflex  | 1,5 nF   |    | 160V  | 10,153 |
| C3    | Capacitor, mkt        | 68 nF    |    | 250V  | C3    | Capacitor, mkt        | 68 nF    |    | 250V  | 11,223 |
| C4    | Capacitor, styroflex  | 1,5 nF   |    | 160V  | C4    | Capacitor, styroflex  | 1,5 nF   |    | 160V  | 10,153 |
| C5    | Capacitor, mkt        | 68 nF    |    | 250V  | C5    | Capacitor, mkt        | 68 nF    |    | 250V  | 11,223 |
| C6    | Capacitor, mkt        | 68 nF    |    | 250V  | C6    | Capacitor, mkt        | 68 nF    |    | 250V  | 11,223 |
| C7    | Capacitor, mkt        | 68 nF    |    | 250V  | C7    | Capacitor, mkt        | 68 nF    |    | 250V  | 11,223 |
| C8-10 | Capacitor, cer        | 10 pF    |    | 1 KV  | C8-10 | Capacitor, cer        | 10 pF    |    | 1 KV  | 15,101 |
| L6    | Coil, phase detector  |          |    |       | L6    | Coil, phase detector  |          |    |       |        |
| D1-4  | Diode                 | AAL16    |    |       | D1-4  | Diode                 |          |    |       | 39,102 |

## COMPRESSOR. Module 110.

|        |                  |          |    |       |        |
|--------|------------------|----------|----|-------|--------|
| R1     | Resistor, carbon | 56 ohm   | 5% | 0,33W | 01,134 |
| R2     | Resistor, carbon | 56 Kohm  | 5% | 0,33W | 01,170 |
| R3-4   | Resistor, carbon | 4,7 Kohm | 5% | 0,33W | 01,157 |
| R5     | Resistor, carbon | 330 ohm  | 5% | 0,33W | 01,179 |
| R6     | Resistor, carbon | 220 Kohm | 5% | 0,33W | 01,177 |
| R7     | Resistor, carbon | 10 Kohm  | 5% | 0,33W | 01,161 |
| R8     | Resistor, carbon | 2,2 Kohm | 5% | 0,33W | 01,153 |
| R9     | Resistor, carbon | 2,2 Kohm | 5% | 0,33W | 01,153 |
| R10    | Resistor, carbon | 4,7 Kohm | 5% | 0,33W | 01,157 |
| R11    | Resistor, carbon | 10 Kohm  | 5% | 0,33W | 01,161 |
| R12    | Resistor, carbon | 180 ohm  | 5% | 0,33W | 01,140 |
| R13    | Resistor, carbon | 56 ohm   | 5% | 0,33W | 01,134 |
| R14    | Resistor, carbon | 100 ohm  | 5% | 0,33W | 01,137 |
| R15    | Resistor, carbon | 4,7 Kohm | 5% | 0,33W | 01,157 |
| R16-17 | Resistor, carbon | 10 Kohm  | 5% | 0,33W | 01,161 |
| R18    | Resistor, carbon | 22 Kohm  | 5% | 0,33W | 01,165 |
| R19    | Resistor, carbon | 220 Kohm | 5% | 0,33W | 01,177 |
| R20    | Resistor, carbon | 2,7 Kohm | 5% | 0,33W | 01,154 |
| R21    | Resistor, carbon | 560 ohm  | 5% | 0,33W | 01,146 |
| R22    | Resistor, carbon | 1,2 Kohm | 5% | 0,33W | 01,150 |
| R23    | Resistor, carbon | 3,9 Kohm | 5% | 0,33W | 01,156 |
| R24    | Resistor, carbon | 47 Kohm  | 5% | 0,33W | 01,169 |
| R25    | Resistor, carbon | 4,7 Kohm | 5% | 0,33W | 01,157 |

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

|        |   |           |    |       |         |
|--------|---|-----------|----|-------|---------|
| R1     | Resistor, carbon                        | 10 Kohm   | 5% | 0,33W | 01,161  |
| R2-3   | Resistor, carbon                        | 1 Kohm    | 5% | 0,33W | 01,149  |
| R4     | Resistor, carbon                        | 1 Kohm    | 5% | 0,33W | 01,161  |
| R5-7   | Resistor, carbon                        | 56 ohm    | 5% | 0,33W | 01,134  |
| R8     | Resistor, carbon                        | 1 Kohm    | 5% | 0,33W | 01,149  |
| R9     | Resistor, carbon                        | 6,8 Kohm  | 5% | 0,33W | 01,159  |
| R10    | Resistor, carbon                        | 220 ohm   | 5% | 0,33W | 01,141  |
| R11    | Resistor, carbon                        | 1,5 Kohm  | 5% | 0,33W | 01,151  |
| R12    | Resistor, carbon                        | 100 ohm   | 5% | 0,33W | 01,137  |
| R13    | Resistor, carbon                        | 560 ohm   | 5% | 0,33W | 01,146  |
| R14    | Resistor, carbon                        | 100 ohm   | 5% | 0,33W | 01,137  |
| R15    | Resistor, carbon                        | 680 ohm   | 5% | 0,33W | 01,147  |
| R16    | Resistor, carbon                        | 270 ohm   | 5% | 0,33W | 01,142  |
| R17    | Resistor, carbon                        | 100 ohm   | 5% | 0,33W | 01,137  |
| R18    | Resistor, carbon                        | 220 ohm   | 5% | 0,33W | 01,141  |
| R19    | Resistor, carbon                        | 4,7 Kohm  | 5% | 0,33W | 01,157  |
| R20    | Resistor, carbon                        | 680 ohm   | 5% | 0,33W | 01,147  |
| R21    | Resistor, carbon                        | 220 ohm   | 5% | 0,33W | 01,141  |
| R22    | Resistor, carbon                        | 470 ohm   | 5% | 0,33W | 01,145  |
| R23    | Resistor, carbon                        | 15 Kohm   | 5% | 0,33W | 01,163  |
| R24    | Resistor, carbon                        | 10 Kohm   | 5% | 0,33W | 01,161  |
| R25    | Resistor, carbon                        | 15 Kohm   | 5% | 0,33W | 01,163  |
| R26    | Resistor, carbon                        | 470 ohm   | 5% | 0,33W | 01,145  |
| R27    | Resistor, carbon                        | 1,2 Kohm  | 5% | 0,33W | 01,150  |
| R28    | Resistor, carbon                        | 220 ohm   | 5% | 0,33W | 01,141  |
| R29    | Resistor, carbon                        | 100 ohm   | 5% | 0,33W | 01,137  |
| R30    | Resistor, carbon                        | 220 ohm   | 5% | 0,33W | 01,141  |
| R31    | Resistor, carbon                        | 4,7 Kohm  | 5% | 0,33W | 01,157  |
| R32    | Resistor, carbon                        | 680 ohm   | 5% | 0,33W | 01,147  |
| R33    | Resistor, carbon                        | 220 ohm   | 5% | 0,33W | 01,141  |
| R34    | Resistor, carbon                        | 470 ohm   | 5% | 0,33W | 01,145  |
| R35    | Resistor, carbon                        | 10 Kohm   | 5% | 0,33W | 01,161  |
| R36    | Resistor, carbon                        | 2,7 Kohm  | 5% | 0,33W | 01,157  |
| R37    | Resistor, carbon                        | 4,7 Kohm  | 5% | 0,33W | 01,161  |
| R38    | Resistor, carbon                        | 1,5 Kohm  | 5% | 0,33W | 01,145  |
| R39    | Resistor, carbon                        | 820 ohm   | 5% | 0,33W | 01,148  |
| R40    | Resistor, carbon                        | 1,5 Kohm  | 5% | 0,33W | 01,151  |
| R41    | Resistor, carbon                        | 1,5 Kohm  | 5% | 0,33W | 01,145  |
| R42    | Resistor, carbon                        | 820 ohm   | 5% | 0,33W | 01,151  |
| R43    | Resistor, carbon                        | 820 ohm   | 5% | 0,33W | 01,148  |
| R44    | Resistor, carbon                        | 1,5 Kohm  | 5% | 0,33W | 01,151  |
| R45    | Resistor, carbon                        | 470 ohm   | 5% | 0,33W | 01,145  |
| R46    | Resistor, carbon                        | 1 Kohm    | 5% | 0,33W | 01,149  |
| R47    | Resistor, carbon                        | 330 ohm   | 5% | 0,33W | 01,143  |
| R48    | Resistor, carbon                        | 330 ohm   | 5% | 0,33W | 01,113  |
| R49    | Resistor, carbon                        | 1 Kohm    | 5% | 0,33W | 01,149  |
| R50    | Resistor, carbon                        | 390 ohm   | 5% | 0,33W | 01,144  |
| R51    | Resistor, carbon                        | 220 ohm   | 5% | 0,33W | 01,141  |
| R52    | Resistor, carbon                        | 27 ohm    | 5% | 0,33W | 01,130  |
| R53    | Resistor, carbon                        | 68 ohm    | 5% | 0,33W | 01,135  |
| R54    | Resistor, carbon                        | 47 ohm    | 5% | 0,33W | 01,133  |
| R55    | Resistor, carbon                        | 39 ohm    | 5% | 0,33W | 01,132  |
| R56    | Resistor, carbon                        | 15 ohm    | 5% | 0,33W | 01,127  |
| R57-62 | Resistor, carbon                        | 1,8 Kohm  | 5% | 0,33W | 01,152  |
| R63-65 | Resistor, carbon                        | 47 Kohm   | 5% | 0,33W | 01,169  |
| R66    | Resistor, carbon                        | 2,2 Kohm  | 5% | 0,33W | 01,153  |
| R67    | Resistor, carbon                        | 470 ohm   | 5% | 0,33W | 01,145  |
| R68    | Resistor, carbon                        | 2,2 Kohm  | 5% | 0,33W | 01,153  |
| R69    | Resistor, carbon                        | 4,7 Kohm  | 5% | 0,33W | 01,157  |
| R70    | Resistor, carbon                        | 1,5 Kohm  | 5% | 0,33W | 01,151  |
| R71-72 | Resistor, carbon                        | 470 ohm   | 5% | 0,33W | 01,145  |
| R73    | Resistor, carbon                        | 220 ohm   | 5% | 0,33W | 01,141  |
| R74    | Resistor, carbon                        | 2,2 Kohm  | 5% | 0,33W | 01,153  |
| R75    | Resistor, carbon                        | 390 ohm   | 5% | 0,33W | 01,144  |
| R76    | Resistor, carbon                        | 100 ohm   | 5% | 0,33W | 01,137  |
| R77    | Resistor, carbon                        | 220 ohm   | 5% | 0,33W | 01,141  |
| R78    | Resistor, carbon                        | 2,2 Kohm  | 5% | 0,33W | 01,143  |
| R79    | Resistor, carbon                        | 100 ohm   | 5% | 0,33W | 01,173  |
| R80-82 | Resistor, carbon                        | 220 ohm   | 5% | 0,33W | 01,141  |
| R83    | Resistor, carbon                        | 470 ohm   | 5% | 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.

| VOLTAGE STABILISER. Module 107. |                         |             |    |                 |                     |              |  |  |  |
|---------------------------------|-------------------------|-------------|----|-----------------|---------------------|--------------|--|--|--|
| R1                              | Resistor, w-w           | 10 Kohm     | 5% | 16W             | 02, 561             |              |  |  |  |
| R2                              | Resistor, w-w           | 10 Kohm     | 5% | 16W             | 02, 561             |              |  |  |  |
| R3                              | Resistor, w-w           | 10 Kohm     | 5% | 16W             | 02, 561             |              |  |  |  |
| R4                              | Resistor, carbon        | 47 Kohm     | 5% | 0, 33W          | 01, 169             |              |  |  |  |
| R5                              | Resistor, carbon        | 47 Kohm     | 5% | 0, 33W          | 01, 169             |              |  |  |  |
| R6                              | Resistor, carbon        | 56 Kohm     | 5% | 0, 33W          | 01, 170             |              |  |  |  |
| R7                              | Resistor, carbon        | 47 Kohm     | 5% | 0, 33W          | 01, 169             |              |  |  |  |
| R8                              | Resistor, carbon        | 47 Kohm     | 5% | 0, 33W          | 01, 169             |              |  |  |  |
| R9                              | Resistor, carbon        | 56 Kohm     | 5% | 0, 33W          | 01, 170             |              |  |  |  |
| R10                             | Resistor, carbon        | 22 Kohm     | 5% | 0, 33W          | 01, 165             |              |  |  |  |
| R11                             | Resistor, w-w           | 1 Kohm      | 5% | 3W              | 02, 249             |              |  |  |  |
| R12                             | Resistor, w-w           | 5, 6 Kohm   | 5% | 9W              | 02, 458             |              |  |  |  |
| R13                             | Resistor, w-w           | 12 Kohm     | 5% | 5W              | 02, 362             |              |  |  |  |
| R14                             | Resistor, w-w           | 10 Kohm     | 5% | 5W              | 02, 361             |              |  |  |  |
| P1                              | Pot. carbon             | 5 Kohm      |    | 0, 2W           | 04, 157             |              |  |  |  |
| C1                              | Capacitor, electrolytic | 4 uF        |    | 350V            | 12, 720             |              |  |  |  |
| D1-6                            | Diode, zener            | BZX 55 C5V1 |    | 5, 1V           | 39, 707             |              |  |  |  |
| T1-5                            | Transistor              | MJE 340     |    |                 | 37, 101             |              |  |  |  |
| P1                              | Pot. carbon             | 5 Kohm      |    | 0, 2W           | 04, 157             |              |  |  |  |
| C1                              | Capacitor, electrolytic | 4 uF        |    | 350V            | 12, 720             |              |  |  |  |
| D1-6                            | Diode, zener            | BZX 55 C5V1 |    | 5, 1V           | 39, 707             |              |  |  |  |
| T1-5                            | Transistor              | MJE 340     |    |                 | 37, 101             |              |  |  |  |
| P1                              | Pot. carbon             | 5 Kohm      |    | 0, 2W           | 04, 157             |              |  |  |  |
| C1-8                            | Capacitor, mkt          |             |    | 0, 47 uF        | 250V                | 11, 433      |  |  |  |
| C9                              | Capacitor, ellyt        |             |    | 2, 200 uF       | 35V                 | Not assigned |  |  |  |
| C10-13                          | Capacitor, ellyt        |             |    | 47 uF           | 350V                | 12, 453      |  |  |  |
| C14-17                          | Capacitor, ellyt        |             |    | 4, 7 uF         | 5KV                 | 15, 201      |  |  |  |
| C18-19                          | Capacitor, cer          |             |    | 2, 200 uF       | 35V                 | 12, 453      |  |  |  |
| C20-21                          | Capacitor, ellyt        |             |    | 68 uF           | 250V                | 11, 223      |  |  |  |
| C22-29                          | Capacitor, mkt          |             |    | IN 4148         | special for Holland |              |  |  |  |
| D1                              | Diode                   |             |    | IN 4148         | 39, 103             |              |  |  |  |
| D2                              | Diode                   |             |    | TRC loop/IN5401 | 38, 101             |              |  |  |  |
| D3-6                            | Diode                   |             |    | SKB 250 C1000   | 250V 1 amp          |              |  |  |  |
| D7-11                           | Diode, bridge           |             |    | 4xTRC loop      | 38, 101             |              |  |  |  |
| D12                             | Diode                   |             |    | BZX 55 C5V1     | 5, 1V               |              |  |  |  |
| D13-15                          | Diode, zener            |             |    | TRC loop/IN5401 | 38, 101             |              |  |  |  |
| D16                             | Diode                   |             |    |                 |                     |              |  |  |  |
| T1-5                            | Transistor              |             |    | MP 2100A        | 30, 104             |              |  |  |  |
| T6                              | Transistor              |             |    | BD 140          | 30, 102             |              |  |  |  |
| T7                              | Transistor              |             |    | BC 157          | 32, 102             |              |  |  |  |
| 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.

[illegible]

## 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 | not assigned |
| R11   | Resistor, carbon     | 56 Kohm  | 5%   | 0.33W  | 01,170 | C28          | Capacitor, preset    | 5-38 pF          | 17,102       | 17,102       |
| R12   | Resistor, carbon     | 10 Kohm  | 5%   | 0.33W  | 01,161 | C29          | Capacitor, preset    | 5-38 pF          | 17,102       | 17,102       |
| R13   | Resistor, carbon     | 1.5 Kohm | 5%   | 0.33W  | 01,151 | C30          | Capacitor, styroflex | 270 pF           | 160V         | 10,135       |
| R14   | Resistor, carbon     | 47 ohm   | 5%   | 0.33W  | 01,133 | C31          | Capacitor, preset    | 5-38 pF          | 160V         | 10,145       |
| R15   | Resistor, carbon     | 390 ohm  | 5%   | 0.33W  | 01,163 | C32          | Capacitor, styroflex | 680 pF           | 160V         | 10,249       |
| R16   | Resistor, carbon     | 15 Kohm  | 5%   | 0.33W  | 01,162 | C33          | Capacitor, styroflex | 1 nF             | 160V         | 10,139       |
| R17   | Resistor, carbon     | 12 Kohm  | 5%   | 0.33W  | 01,161 | C34          | Capacitor, styroflex | 390 pF           | 160V         | 10,119       |
| R18   | Resistor, carbon     | 10 Kohm  | 5%   | 0.33W  | 01,159 | C35          | Capacitor, ceramic   | 56 pF            | 5%           | 17,102       |
| R19   | Resistor, carbon     | 6.8 Kohm | 5%   | 0.33W  | 01,133 | C36          | Capacitor, preset    | 5-38 pF          | 17,102       | 17,102       |
| R20   | Resistor, carbon     | 47 ohm   | 5%   | 0.33W  | 01,131 | C37          | Capacitor, preset    | 5-38 pF          | 250V         | 11,223       |
| R21   | Resistor, carbon     | 33 ohm   | 5%   | 0.33W  | 01,133 | C38          | Capacitor, mkt       | 68 nF            | 250V         | 11,223       |
| R22   | Resistor, carbon     | 47 ohm   | 5%   | 0.33W  | 01,125 | C39          | Capacitor, mkt       | 68 nF            | 250V         | 11,223       |
| R23   | Resistor, carbon     | 10 ohm   | 5%   | 0.33W  | 01,133 | C40          | Capacitor, mkt       | 68 nF            | 250V         | 11,223       |
| R24   | Resistor, carbon     | 47 ohm   | 5%   | 0.33W  | 01,144 | C41          | Capacitor, variable  | 2 gang 13-530 pF | 18,101       | 18,101       |
| R25   | Resistor, carbon     | 390 ohm  | 5%   | 0.33W  | 01,144 | C42          |                      |                  |              |              |
| 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       | 04,154       |
| C2    | Capacitor, mkt       | 68 nF    | 250V | 11,223 | P2     | Pot. carbon  | 2,5Kohm              | 0,2W             | 04,154       | 04,154       |
| C3    | Capacitor, mkt       | 68 nF    | 250V | 11,223 | D1-8   | Diode        | IN4148               |                  | 39,103       | 39,103       |
| C4    | Capacitor, styroflex | 100 pF   | 160V | 10,125 | T1-T4  | Transistor   | FET, TIS 88A         |                  | 34,101       | 34,101       |
| C5    | Capacitor, ceramic   | 2.2 pF   | 160V | 14,117 | T5-T8  | Transistor   | BC 147A              |                  | 32,101       | 32,101       |
| C6    | Capacitor, styroflex | 680 pF   | 160V | 10,145 | L7     | Coil         | First mixer          |                  | 04,0107      | 04,0107      |
| C7    | Capacitor, styroflex | 120 pF   | 160V | 10,127 | L8     | Coil         | 8,7 MHz IF           |                  | 04,0108      | 04,0108      |
| C8    | Capacitor, mkt       | 68 nF    | 250V | 11,225 | L9     | Coil         | 8,7 MHz IF           |                  | 04,0109      | 04,0109      |
| C9    | Capacitor, mkt       | 68 nF    | 250V | 11,225 | L10    | Coil         | Second mixer         |                  | 04,0110      | 04,0110      |
| C10   | Capacitor, mkt       | 68 nF    | 250V | 11,225 | L11    | Coil         | 580 kHz IF           |                  | 04,0111      | 04,0111      |
| C11   | Capacitor, styroflex | 1 nF     | 160V | 10,249 | L12    | Coil         | 580 kHz IF           |                  | 04,0112      | 04,0112      |
| C12   | Capacitor, ceramic   | 39 pF    | 250V | 14,232 | L13    | Coil         | 580 kHz IF           |                  | 04,0101      | 04,0101      |
| C13   | Capacitor, styroflex | 1 nF     | 160V | 10,149 | L1     | Coil         | LW Ant.              |                  | 04,0102      | 04,0102      |
| C14   | Capacitor, ceramic   | 8,2 pF   | 250V | 14,224 | L2     | Coil         | MW Ant.              |                  | 04,0103      | 04,0103      |
| C15   | Capacitor, mkt       | 6,8 nF   | 250V | 11,111 | L3     | Coil         | SW Ant.              |                  | 04,0104      | 04,0104      |
| C16   | Capacitor, styroflex | 1.1 nF   | 160V | 10,311 | L4     | Coil         | LW osc.              |                  | 04,0105      | 04,0105      |
| C17   | Capacitor, styroflex | 180 pF   | 160V |        | L5     | Coil         | MW osc.              |                  | 04,0106      | 04,0106      |
|       |                      |          |      |        | L6     | Coil         | SW osc.              |                  |              |              |
|       |                      |          |      |        | S1     | Switch unit. |                      |                  | 85,101       | 85,101       |

\* 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

## I.F. AMPLIFIER. Module 117. cont.

| I.L.F. AMPLIFIER, Module 117. cont. |                     |    |       |        |  |  |  |    |  |
|-------------------------------------|---------------------|----|-------|--------|--|--|--|----|--|
| R62                                 | Resistor, carbon    | 5% | 0,33W | 01,161 |  |  |  |    |  |
| R63                                 | Resistor, carbon    | 5% | 0,33W | 01,167 |  |  |  |    |  |
| R64                                 | Resistor, carbon    | 5% | 0,33W | 01,141 |  |  |  |    |  |
| R65                                 | Resistor, carbon    | 5% | 0,33W | 01,133 |  |  |  |    |  |
| R66                                 | Resistor, carbon    | 5% | 0,33W | 01,143 |  |  |  |    |  |
| R67                                 | Resistor, carbon    | 5% | 0,33W | 01,137 |  |  |  |    |  |
| R68                                 | Resistor, carbon    | 5% | 0,33W | 01,153 |  |  |  |    |  |
| R69                                 | Resistor, carbon    | 5% | 0,33W | 01,161 |  |  |  |    |  |
| D1-4                                | Diode               |    |       |        |  |  |  |    |  |
| D5                                  | Diode               |    |       |        |  |  |  |    |  |
| D6                                  | Diode               |    |       |        |  |  |  |    |  |
| D7                                  | Diode               |    |       |        |  |  |  |    |  |
| C45                                 | Capacitor, mkt      |    |       |        |  |  |  |    |  |
| C46                                 | Capacitor, tantalum |    |       |        |  |  |  |    |  |
| C47                                 | Capacitor, tantalum |    |       |        |  |  |  |    |  |
| C48                                 | Capacitor, mkt      |    |       |        |  |  |  |    |  |
| C49                                 | Capacitor, mkt      |    |       |        |  |  |  |    |  |
| C50                                 | Capacitor, mkt      |    |       |        |  |  |  |    |  |
| C51                                 | Capacitor, mkt      |    |       |        |  |  |  |    |  |
| C52                                 | Capacitor, mkt      |    |       |        |  |  |  |    |  |
| P3                                  | Pot. carbon         |    |       |        |  |  |  |    |  |
| P2                                  | Pot. carbon         |    |       |        |  |  |  |    |  |
| T1-2                                | Transistor          |    |       |        |  |  |  |    |  |
| T3-4                                | Transistor          |    |       |        |  |  |  |    |  |
| T5                                  | Transistor          |    |       |        |  |  |  |    |  |
| T6-7                                | Transistor          |    |       |        |  |  |  |    |  |
| T8                                  | Transistor          |    |       |        |  |  |  |    |  |
| T9                                  | Transistor          |    |       |        |  |  |  |    |  |
| T10                                 | Transistor          |    |       |        |  |  |  |    |  |
| T11                                 | Transistor          |    |       |        |  |  |  |    |  |
| T12                                 | Transistor          |    |       |        |  |  |  |    |  |
| T13                                 | Transistor          |    |       |        |  |  |  |    |  |
| FL1                                 | Xtal filter         |    |       |        |  |  |  |    |  |
| L1                                  | Coils               |    |       |        |  |  |  |    |  |
| L2                                  | Coils               |    |       |        |  |  |  |    |  |
| L3                                  | Coils               |    |       |        |  |  |  |    |  |
| L4                                  | Coils               |    |       |        |  |  |  |    |  |
| L5                                  | Coils               |    |       |        |  |  |  |    |  |
| L6                                  | Coils               |    |       |        |  |  |  |    |  |
| L7                                  | Coils               |    |       |        |  |  |  |    |  |
| S1                                  | Function Switch     |    |       |        |  |  |  |    |  |
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## 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                | 470 ohm  | 5%   | 0,33W | 01,133  | R9     | Resistor        | 1,5 Kohm        | 5%  | 0,33V | 01,151 |
| R10  | Resistor                | 47 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 N.T.C. | 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 N.T.C. | 120 ohm         | 5%  | 3W    | 02,238 |
| C7   | Capacitor, styroflex    | 1 nF     | 160V |       | 10,125  | R24    | Resistor N.T.C. | 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  |        |                 |                 |     |       |        |
| IC2  | Integrated circuit      | SN 7410  |      |       | 36,103  |        |                 |                 |     |       |        |
| IC3  | Integrated circuit      | SN 74107 |      |       | 36,101  |        |                 |                 |     |       |        |
|      |                         |          |      |       |         |        |                 |                 |     |       |        |
| L1   | Coil                    | 8120 KHz |      |       | 04-0115 | D1     | Diode           | IN4148          |     | 5,1V  | 39,103 |
| L2   | Coil                    | 580 KHz  |      |       | 04-0116 | 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 |
|      |                         |          |      |       |         | D5     | Diode           | TRC 100P/IN5401 |     |       |        |

\* English version only. (R101GB)

continued

|       |             |             |         |
|-------|-------------|-------------|---------|
| T1-2  | Transistor  | BC 147      | 32, 101 |
| T3-4  | Transistor  | AD 162      | 30, 103 |
| T5    | Transistor  | BC 147      | 32, 101 |
| T6    | Transistor  | BD 139      | 30, 101 |
| T7    | Transistor  | 2N3055      | 30, 105 |
| T8    | Transistor  | BD 139      | 30, 101 |
| F1-2  | Fuse        | 2 amp.      | 55, 401 |
| CH1-2 | Choke       | 1530/21     | 22, 103 |
| TR1   | Transformer | Driver 1899 | 26, 102 |
| TR2   | Transformer | Output 1898 | 26, 103 |
| LS1   | Loudspeaker | 0050 P.     | 28, 101 |
| LAL-2 | Lamp.       | 12875 D     | 55, 301 |

8 ohm

## AUTOMATIC. Module 113.

|        |                  |          |        |         |
|--------|------------------|----------|--------|---------|
| R1     | Resistor, carbon | 47 Kohm  | 0, 33W | 01, 157 |
| R2     | Resistor, carbon | 1,8 Kohm | 5%     | 01, 152 |
| R3     | Resistor, carbon | 100 ohm  | 5%     | 01, 137 |
| R4     | Resistor, carbon | 4,7 Kohm | 5%     | 01, 157 |
| R5     | Resistor, carbon | 15 Kohm  | 5%     | 01, 163 |
| R6     | Resistor, carbon | 470 ohm  | 5%     | 01, 145 |
| R7     | Resistor, carbon | 100 ohm  | 5%     | 01, 137 |
| R8     | Resistor, carbon | 1,5 Kohm | 5%     | 01, 151 |
| R9     | Resistor, carbon | 4,7 Kohm | 5%     | 01, 157 |
| R10    | Resistor, carbon | 82 ohm   | 5%     | 01, 172 |
| R11    | Resistor, carbon | 270 ohm  | 5%     | 01, 142 |
| R12    | Resistor, carbon | 100 ohm  | 5%     | 01, 137 |
| R13    | Resistor, carbon | 2,2 Kohm | 5%     | 01, 153 |
| R14    | Resistor, carbon | 180 ohm  | 5%     | 01, 140 |
| R15    | Resistor, carbon | 560 ohm  | 5%     | 01, 146 |
| R16    | Resistor, carbon | 2,2 Kohm | 5%     | 01, 153 |
| R17-18 | Resistor, carbon | 100 ohm  | 5%     | 01, 137 |
| R19    | Resistor, carbon | 150 ohm  | 5%     | 01, 139 |
| R20-21 | Resistor, carbon | 560 ohm  | 5%     | 01, 146 |
| R22-23 | Resistor, carbon | 100 ohm  | 5%     | 01, 137 |
| R24    | Resistor, carbon | 2,2 Kohm | 5%     | 01, 153 |
| R25    | Resistor, carbon | 1,2 Kohm | 5%     | 01, 150 |
| R26-27 | Resistor, carbon | 100 ohm  | 5%     | 01, 137 |
| R28    | Resistor, w-w    | 5,6 ohm  | 5%     | 02, 222 |
| R29    | Resistor, carbon | 1,8 Kohm | 5%     | 01, 152 |
| R30    | Resistor, carbon | 390 ohm  | 5%     | 01, 144 |
| R31    | Resistor, carbon | 270 ohm  | 5%     | 01, 142 |
| R32-33 | Resistor, carbon | 1,8 Kohm | 5%     | 01, 152 |
| R34    | Resistor, carbon | 2,2 Kohm | 5%     | 01, 153 |

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|----|-------------|---------|-------|---------|
| P1 | Pot. carbon | 500 ohm | 0, 2W | 04, 145 |
|----|-------------|---------|-------|---------|

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|----|----------------------|----------|---------|
| C1 | Capacitor, trimmer   | 8-135 pF | 17, 104 |
| C2 | Capacitor, trimmer   | 5-38 pF  | 17, 102 |
| C3 | Capacitor, styroflex | 100 pF   | 10, 125 |

|        |                       |         |      |         |
|--------|-----------------------|---------|------|---------|
| C4     | Capacitor, mkt        | 22 nF   | 250V | 11, 317 |
| C5     | Capacitor, trimmer    | 5-38 pF | 160V | 17, 102 |
| C6     | Capacitor, styroflex  | 1 nF    | 160V | 10, 149 |
| C7     | Capacitor, styroflex  | 220 pF  | 160V | 10, 133 |
| C8     | Capacitor, trimmer    | 5-38 pF | 160V | 17, 102 |
| C9     | Capacitor, styroflex  | 1 nF    | 160V | 10, 149 |
| C10    | Capacitor, styroflex  | 220 pF  | 160V | 10, 133 |
| C11-13 | Capacitor, mkt        | 68 nF   | 250V | 11, 223 |
| C14    | Capacitor, cer        | 22 pF   | 250V | 14, 329 |
| C15    | Capacitor, styroflex  | 270 pF  | 160V | 10, 135 |
| C16    | Capacitor, styroflex  | 1 nF    | 160V | 10, 149 |
| C17    | Capacitor, styroflex  | 120 pF  | 160V | 10, 127 |
| C18    | Capacitor, styroflex  | 240 pF  | 160V | 10, 134 |
| 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 |

|        |                       |             |         |
|--------|-----------------------|-------------|---------|
| D1     | Diode                 | 4xAA 119    | 39, 102 |
| D2     | Diode, zener          | BZX 55 C5V1 | 39, 707 |
| D3     | Diode, zener          | BZX 55 C8V2 | 39, 708 |
| T1     | Transistor, field eff | TIS 88A     | 34, 101 |
| T2-4   | Transistor            | BC 147      | 32, 101 |
| T5     | Transistor            | BD 139      | 30, 101 |
| T6     | Transistor            | BC 147      | 32, 101 |
| T7     | Transistor            | BC 157      | 32, 102 |
| T8-9   | Transistor            | BC 147      | 32, 101 |
| T10    | Transistor            | BC 157      | 32, 102 |
| T11-12 | Transistor            | BC 147      | 32, 101 |
| T13    | Transistor            | 2N 3055     | 30, 105 |
| T14    | Transistor            | BC 147      | 32, 101 |
| T15    | Transistor            | BD 139      | 30, 101 |
| T16    | Transistor            | BC 147      | 32, 101 |

|     |           |       |         |
|-----|-----------|-------|---------|
| GL1 | Glim Lamp | GL 14 | 55, 201 |
|-----|-----------|-------|---------|

|    |         |         |         |
|----|---------|---------|---------|
| Q1 | Crystal | 8,7 MHz | 50, 102 |
|----|---------|---------|---------|

|     |                        |          |
|-----|------------------------|----------|
| L1  | Coil, band pass filter | 04, 0117 |
| L2  | Coil, band pass filter | 04, 0117 |
| L3  | Coil, reference osc.   | 04, 0117 |
| L4  | Coil, band pass filter | 04, 0118 |
| L5  | Coil, band pass filter | 04, 0118 |
| L6  | Coil, reference osc.   | 04, 0119 |
| L7  | Coil, crystal osc      | 04, 0119 |
| L8  | Coil, wide band mixer  | 04, 0107 |
| L9  | Coil, low pass filter  | 04, 0120 |
| L10 | Coil, low pass filter  | 04, 0120 |
| L11 | Coil, low pass filter  | 04, 0121 |
| M   | Motor                  |          |

# 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 | IC1-4   | Integrated circuit   | SN 74107    |       | 36, 101 |
| R32 | Resistor            | 10 Kohm   | 5% | 1/3W  | 01, 161 | IC5-6   | Integrated circuit   | SN 7410     |       | 36, 103 |
| R33 | Resistor            | 150 ohm   | 5% | 1/3W  | 01, 139 | IC7-9   | Integrated circuit   | SN 7493     |       | 36, 105 |
| R34 | Resistor            | 1, 2 Kohm | 5% | 1/3W  | 01, 150 | IC10-12 | Integrated circuit   | SN 7485     |       | 36, 104 |
| R35 | Resistor            | 100 ohm   | 5% | 1/3W  | 01, 137 | IC13-15 | Integrated circuit   | SN 7493     |       | 36, 105 |
| R36 | Resistor            | 6, 8 Kohm | 5% | 1/3W  | 01, 159 | IC16-18 | Integrated circuit   | SN 7400     |       | 36, 102 |
| R37 | Resistor            | 33 Kohm   | 5% | 1/3W  | 01, 167 |         |                      |             |       |         |
| P1  | Carbon preset, Pot. | 5 Kohm    |    | 0, 2W | 04, 157 |         |                      |             |       |         |

