

SYSTEM APPROVING
Date: 13. 11. 79

MOBILE RADIOTELEPHONE

STORNOPHONE 5000

TYPE CQM5112

TYPE CQM5113

TYPE CQM5114

146 - 174 MHz

System Appr. bag.

Storno

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System Appr. beg.

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TECHNICAL SPECIFICATIONS

CQM5110

Guaranteed performance specifications unless otherwise noted.

Typical values are given in brackets.

GENERAL

Frequency Range

146 - 174 MHz

Channel Separation

CQM5112: 30/25kHz

CQM5113: 20kHz

CQM5114: 12.5kHz

Maximum Frequency Deviation

CQM5112: ± 5 kHz

CQM5113: ± 4 kHz

CQM5114: ± 2.5 kHz

Modulation Frequency Range

CQM5112: 300 - 3000Hz

CQM5113: 300 - 3000Hz

CQM5114: 300 - 2700Hz

Maximum RF Bandwidth

1.5MHz

Antenna Impedance

50 Ω

Maximum Number of Channels

6

Supply Voltage

Minimum : 10.8V

Nominal : 13.2V

Maximum : 16.6V

Negative potential to chassis

Temperature Range

-30 $^{\circ}$ C to + 60 $^{\circ}$ C

Dimensions

B x D x H: 180 x 190 x 60mm

Weight

1.8 Kg

RECEIVER

Sensitivity

12dB SINAD (EIA), $\frac{1}{2}$ e. m. f.

0.3 μ V (0.23 μ V)

Measuring conditions:

Δf . $\pm 2/3 \times \Delta f$ max; $f_{mod} = 1$ kHz

20dB SINAD (CEPT) e. m. f.

CQM5112: 0.75 μ V (0.55 μ V)

CQM5113: 0.75 μ V (0.55 μ V)

CQM5114: 1.0 μ V (0.75 μ V)

Δf 60% $\times \Delta f$ max; $f_{mod} = 1$ kHz.

Measured with psophometric filter.

Crystal Frequency Range

45.1 – 54.5MHz

Crystal Frequency Calculation (fx)

$$f_x = \frac{F_s - 10.7}{3} \text{MHz}$$

Frequency Stability

Conforms with government regulations

Modulation Acceptance Bandwidth (EIA)

CQM5112: ±7KHz (±7.5KHz)

Adjacent Channel Selectivity

EIA

CQM5112: 75dB (90dB)

FTZ

CQM5113: 70dB (88dB)

CEPT

CQM5112: 75dB (90dB)

CQM5114: 65dB (88dB)

Spurious Rejection

EIA

80dB (85dB)

Intermodulation Attenuation

EIA

CQM5112: 70dB (72dB)

CQM5113: 70dB (72dB)

CEPT

CQM5112: 70dB (75dB)

CQM5113: 70dB (75dB)

CQM5114: 70dB (73dB)

Blocking

90dB/uV (104dB/uV)

Radiation

CQM5112:

Conducted: max 0.8nW

CQM5113:

Radiated: max. 0.8nW

CQM5114:

Radiated: max. 0.8nW

AF Load Impedance (Loudspeaker)

4 Ω

AF Power Output

EIA: 3W (3.6W)

CEPT: 1.5W

AF Distortion

5% (1.5%)

Δf=60% Δf max., 1KHz, 1W, RF 1mV

Audio Frequency Response

+1/-3dB (+0/-1.5dB)

Relative to 1000Hz, -6dB/octave

fm: CQM5112: 300 – 3000Hz

CQM5113: 300 – 3000Hz

CQM5114: 300 – 2600Hz

Hum and Noise

Squelched : 80dB (better than 85dB)

Unsquelched : 55dB (60dB)

Squelch Recovery Time

100 ms (10 ms)

Squelch Attack Time

150 ms (110 ms)

Squelch Closing Time

150 ms (20 ms)

Current Consumption

Squelched: 150mA (130mA)

AF 2W : 500mA (450mA)

(1 channel, without tone equipment, 13.2V supply)

TRANSMITTER

RF Power Output

CQM5110-6/10: 6 or 10W

CQM5110-25: 25W

RL = 50Ω

Crystal Frequency Range

48.6 - 58MHz

Crystal Frequency Calculation (fx)

$$f_x = \frac{F_s}{3}$$

Frequency Stability

Conforms with government regulations

Undesired Radiation

max. 0.2uW

Sideband Noise Power, CEPT

less than 70db

AF Input Impedance

560 ohm

Modulation Sensitivity

70mV ± 2dB

(60% Δf max, 1kHz)

Modulation Response

300 - 3000 Hz

+1/-3.0dB (+0.5/-2dB)

relative to 1000Hz, 6dB/octave

400 - 2700Hz

+1/-1.5dB (+0.5/-1dB)

relative to 1000Hz, 6dB/octave

Modulation Distortion

fm = 1000Hz: max. 3%

Δf = ±3.0KHz

fm = 300Hz: max. 5%

Δf = ±0.9KHz

measured with 750 μ sec de-emphasis

FM Hum and Noise

70dB

CEPT (measured with 750 μsec de-emphasis)
and psophometric filter.Current Consumption

6W: less than 3.5A (2.5A)

10W: less than 4.0A (3.0A)

25W: less than 6.0A (5.0A)

GENERAL DESCRIPTION

CQM5110

The Stornophone 5000 is a mobile radiotelephone unit with self-contained controls and loudspeaker.

Although compact in size, it contains a transmitter /receiver, optional 5-tone sequential encoder/decoder or Channel Guard, and up to 6 transmit and receive channels.

A comparison of the various models are presented in the table below.

Type	CQM5112		CQM5113		CQM5114	
SPEC	6/10	25	6/10	25	6/10	25
Frequency Range MHz	146 - 174		146 - 174		146 - 174	
RF Power W	6/10	25	6/10	25	6/10	25
Channel Spacing kHz	30/25		20		12, 5	
Max. Number of Channels	6		6		6	

ACCESSORIES

Standard accessories include:

- Mounting frame
- Power cable
- Fist microphone with retainer or Fixed - mount microphone
- External loudspeaker
- External switches

MC5001

Fist microphone with retractable spiral cable for mobile installation.

HS5001 Retainer for MC5001

HS5002 Retainer, with switches, for MC5001

MC704

Microphone with chockabsorbing mounting bracket for mobile installation.

MC703

Desk microphone with PTT switch for fixed installations.

MN5001

Mounting frame for mobile installations allowing the radio to be fixed in 36 positions. Includes a base plate with locking screw.

MN703

Desk stand for fixed installations.

MK5001

Installation kit containing connectors, power cable, fuses and fuseholders.

MN704a

Mounting frame for mobile installations and direct attachment to the vehicle.

LS701

Loudspeaker enclosed in a plastic housing, complete with cable.

SU701

Transmitter keying switch for mounting on the steering column.

SU702

Transmitter keying switch for mounting on the dashboard.

PS702

Power supply regulator for 24V car battery installations.

PS5001

Power supply for 220V AC mains.

MECHANICAL AND ELECTRICAL DESCRIPTION

The internal construction of CQM5000 is on an H-frame chassis with a shelf separating the receiver/transmitter (RF) printed circuit board and the various option printed boards. Front panel controls are an integral part of the printed board assemblies.

The chassis is a die cast aluminium frame comprising the left and right sides, the back, and a shelf located midway between the top and bottom. The chassis front is open and looks like an "H" viewed from the front.

Interconnection to the package exterior and to internal options are made via a System Interconnect Board located on the option side of the H-frame. A test connector is also located on the system board and is accessible from the rear of the radio.

This board also serves as channel switch unit in sets with multichannel option.

The moulded plastic front is directly attached to the chassis and has the speaker mounted to it. A separate moulded speaker grill and aluminum nameplate are attached to the front.

The top and bottom covers slide under the edge of the front and are then secured by screws at the rear.

The tone signalling encoder/decoder board (TQ) and the multifrequency board (XS) mount in the top section of the chassis. Their switches and pushbutton mount directly on the boards and protrude through the front.

Thin casted shields with adjustment holes are placed over the transmitter and receiver oscillators and parts of the transmitter in order to reduce spurious radiation.

CIRCUIT DESCRIPTION

Receiver

The receiver circuitry is placed on the main board and can be divided into:

- Receiver front end
- 1st IF section with first and second oscillator
- 455kHz 2nd IF portion with demodulator.

(refer to functional block diagram)

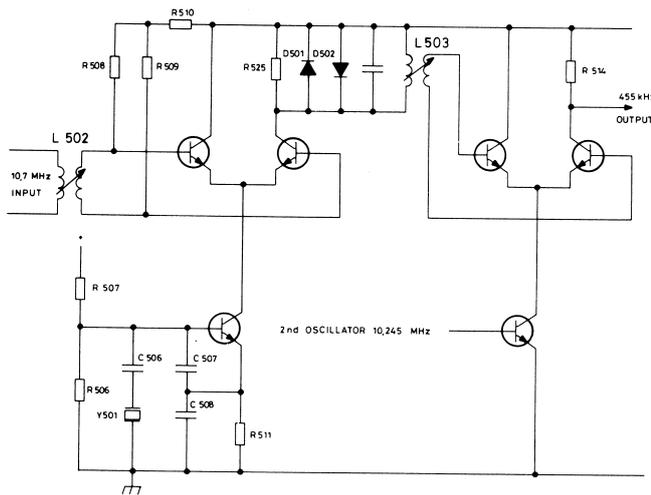
Front-End

The receiver front-end consists of a dual-resonator input filter, a transistor RF amplifier, Q401, a triple-resonator intermediate filter and a FET mixer, Q402. The drain of the FET is terminated in the first IF resonant circuit which adapts the output impedance to the crystal filter. The front-end, antenna relay, first

mixer and part of the transmitter PA inter-connections are design in micro-stripline techniques on the mainboard.

1st IF

The first IF frequency is 10.7MHz. The output from the crystal filter is fed to a dual-gate MOSFET amplifier, Q501, the output signal of which is fed to the second mixer, U501, a single balanced, self-oscillating, active mixer. Out of the second mixer comes the 455kHz IF signal. Two diodes, D501-502, limit the output from the mixer.



455kHz IF/Demodulator

The selectivity of the 455kHz IF amplifier is formed by a ceramic filter fed from a 455kHz amplifier/impedance transforming stage. The final 455kHz amplification and limiting is performed by an integrated circuit, U502, which also contains the quadrature FM detector and the AF amplifier/output emitter follower for the audio line signal.

SQUELCH AND AUDIO CIRCUITS

Squelch

The audio line signal (Vol/Sq - HI) is fed to a selective amplifier stage, where noise (frequencies around 8kHz) is extracted from the audio signal. Via the squelch potentiometer R607, this signal reaches an expander stage which improves the level discrimination characteristics of the circuit. A passive voltage doubler circuit (D603-D604) with high

source impedance performs the action of an average value rectifier. A Schmitt Trigger gives the necessary hysteresis and a well-defined output from the following buffer stage, Q605.

In the squelched condition and during transmissions this output is +1.5V and mutes the audio power amplifier.

The transmit indicator is part of the muting function.

A push button switch, S601, cancels the squelch function, when depressed, by grounding the base of Q601.

AUDIO

In sets with Pilot tone option, the audio line signal is fed to the Pilot tone board for filtering and back to the main board. In sets without CG this path is bypassed and the audio line signal is fed directly to the passive deemphasis network R629-C608 followed by the volume control. The volume control potentiometer R630 is mounted directly on the RF board and protrude through the front panel. The audio output amplifier U601 is a monolithic IC package capable of driving the loudspeaker at the desired power level. The output amplifier can be muted with a DC signal from the audio mute gate, which combines different logic signals to decide whether the amplifier should be active or not.

These inputs are:

- Regulated TX Voltage
- Squelch cancel
- Squelch signal

In sets equipped with Pilot tone and/or 5-tone sequential option, an RX mute function is routed from the option board to make the extra mute conditions possible. The value of C610 in the feed back loop is chosen as the best compromise between battery ripple rejection and receiver squelch attack time.

The pilot lamp in the channel knob is supplied from A+, but controlled by the regulated 8.5 V via transistor Q968.

TRANSMITTER

The transmitter consists of a modulation processor, an exciter, and a power amplifier, all assembled on the main board along with the receiver.

The exciter contains an FM oscillator, an audio processor, all frequency multiplier functions, and includes those stages operating at low enough power levels to avoid heat sinks. The exciter output is at the carrier frequency when applied to the power amplifier. The power amplifier boosts the signal to the proper level, and includes a low pass filter for suppressing harmonics and a circuitry which permits adjustment of the operating power level. The PA low pass filter connects to the antenna relay via a stripline on the board.

Modulation processor

The signal from the microphone load R901 on the XS board is applied to amplifier U101b. The transmitter audio frequency response is shaped by the feedback network R104-R103-C104.

The modulation limiting is obtained in the feedback network formed by D101, D102, R105, R106 and R107. The maximum permissible frequency deviation is set by R116 in single channel sets. In multichannel sets the potentiometer is turned to maximum and the deviation adjusted individually; refer to XS5111 and XS5112.

Amplifier U101A is operated as an active lowpass splatter filter feeding the modulating input of the FM oscillator.

Exciter

The exciter takes the third harmonic of the crystal oscillator, filters it to reduce spurious signals and amplifies it. Four amplifier stages (Q201-2-3-4) and four filters (L204-5-8-9) are

used in a narrow band design which limits the maximum frequency spread of the transmitter.

The exciter has three test points (TP201-2-3) for measurements and alignment.

Power Amplifier

The PA is constructed on the main board and employs two broadband untuned amplifier stages Q205, Q206. Two amplifier configurations are available providing options of power levels of 10 watts or 25 watts. A power control circuit is included to sense the output RF level and keep it constant with variations in temperature and supply voltage. This circuit also limits the peak power to less than maximum, as specified by the authorities, while still maintaining the output as near maximum as possible. The output power level can be set with a potentiometer, R215, over at least a 3:1 range. The transmitter delivers rated power into a 50-ohm load. A load SWR of 1.4:1 will result in more than 90% of the power being radiated. The transmitter will operate into a load with up to 3:1 SWR.

The power adjustment is achieved by controlling the supply voltage of power amplifier Q205 via transistor Q207. This series transistor is biased by a voltage generated by the feedback network C255, D201, Q201, Q209, Q208.

OSCILLATORS

The oscillators are located on the main board for single frequency radio sets. All parts for the oscillators and compensation network are soldered to the board except the crystal which is a plug-in type.

A multifrequency board is required for more than one frequency channel. This board is available in two versions; one (XS5111) has space for accommodating two transmit and two receive channels; one (XS5112) has space for up to six channels and an option for selecting the channels by a 3-digit BCD signal and a binary converter, U901-U902. The BCD signal is applied to three pins in J911. Separate active circuitry is used for each oscillator and all have their outputs connected to two buffer amplifiers Q927-Q967. The buffers' outputs are fed to their resonant circuit on the main board by a plug-in connection (J301-J151). The required oscillator is selected by switching the emitter of the oscillator transistor to the negative DC supply. The compensation voltage and audio for the oscillators is obtained from the same circuit on the main board via J902.

The maximum transmitter frequency deviation for the system is set by adjusting potentiometers, one for each channel, individually on each channel.

The oscillator uses a Colpitt's configuration with a bipolar transistor as the active element. The frequency is controlled by a third mode crystal which is operated at one third of the output frequency. This output frequency is selected by a tuned circuit in the transistor collector circuit. To provide modulation and compensation capability, the crystal, a variable inductor, and a varicap (variable capacitance diode) are connected in series. The inductor provides adjustment of the frequency to set the oscillator to the channel frequency. The varicap permits electrical adjustment of the frequency. Compensation voltage is generated by a resistor - thermistor network and applied to the varicap. A resistor in parallel with the crystal prevents oscillations with the crystal removed from the circuit.

Transmitter Oscillator

In the transmitter the circuit is used with the following additions. First, an inductor is placed across the crystal to resonate C_0 thus minimizing the audio distortion in the modulated output. Second, the audio voltage is superimposed on the compensating bias voltage to give the required deviation.

Receiver Oscillator

In the receiver the oscillator circuit has a buffer amplifier connected between the collector of the oscillator transistor and the tuned circuit, to provide the required power level.

SUPPLY VOLTAGE DISTRIBUTION SYSTEM

The battery voltage (A + BATT) enters the radio via two pins of the rear system connector to the interconnect board. Both inputs are connected to reverse polarity protection diodes D901, D902. The ground lead comes through the same connector and is connected to chassis ground through a fusible printed wiring path which will open in case of the ground wire being accidentally connected to A +.

One battery input goes directly from the interconnect board via a feed-through capacitor and a connector P201 to the transmitter PA stages. The other input feeds through P903 to the main board for two functions. One branch for the audio amplifier passes through an RC-ripple filter R638 - C618 and one of the ON/OFF switch sections S602. The other section of the ON/OFF switch controls the VB + to the voltage regulator U602 consisting of a monolithic regulator. The regulator output is fixed at 8.5V by means of a factory adjusted resistor.

Regulated 8.5V is switched to either the receiver or the transmitter by the antenna relay. The antenna relay is also supplied by the 8.5V regulated.

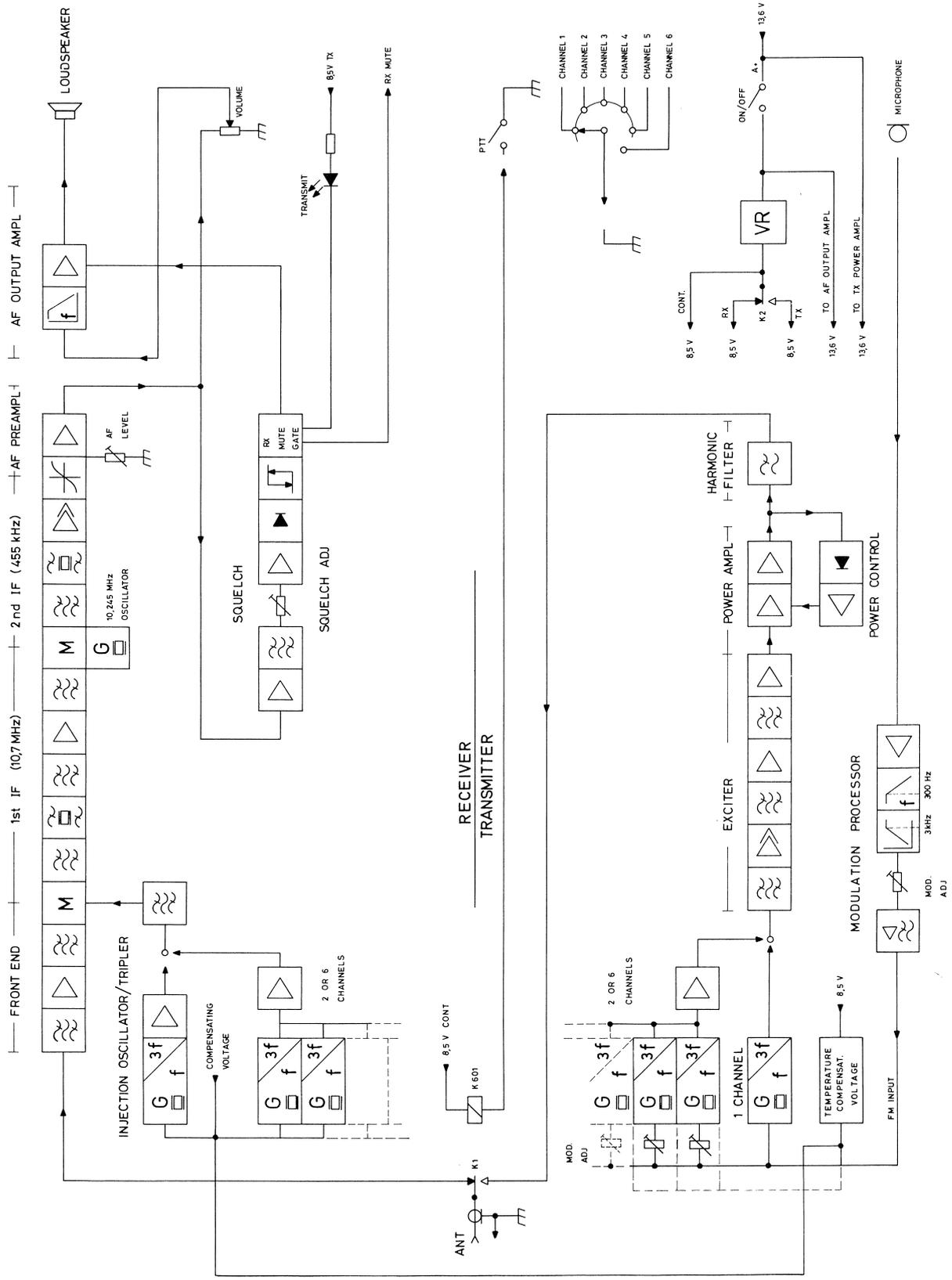
The squelch circuit, the modulation processor and parts of the IF amplifier U502 is supplied directly from the continuous 8.5 V.

The receiver front-end, the receiver oscillator, the 10.7 MHz IF stages and the second oscillator are supplied from 8.5V RX. The transmitter oscillator and the exciter are supplied from 8.5V TX.

In sets with 5-tone sequential option or Pilot tone, the PTT (Push to talk) lead runs through the option board to provide for correct tone keying function.

WARNING

The transmitter PA transistors contain Beryllia which is poisonous when absorbed by the human body. Dissection, filing, or grinding of these transistor may be hazardous.



FUNCTIONAL BLOCK DIAGRAM
CQM 5110

OPERATING INSTRUCTIONS

STORNOPHONE 5000

Introduction

The CQM5000 is available with local control only and four different control heads cover the various versions.

No unnecessary controls are accessible at the front, e.g. radios without tone equipment don't have any loudspeaker IN/OUT nor tone transmitter key on the control head.

The transmitter key button is on the microphone MC5001 or mounted separately, SU701, SU702.

Control heads for the four versions are shown below:

Stand-by

The radio is turned on by depressing the ON/OFF switch.

The thumb-wheel channel selector is accessible on the multichannel version and has the channel numbers on the rim. A lamp built into the channel selector illuminates the channel number from the inside. Single channel units have no 'power on' indicator. The radio is now ready to receive or transmit.

Receive without tone equipment

With the radio in standby the volume control is adjusted to an appropriate level.

If no signals are received the volume may be set by depressing the squelch button and monitor the noise from the loudspeaker. Received calls will now be heard in the loudspeaker.

By pressing the squelch cancel button, the intelligibility may be improved, even if the signal is very noisy. The squelch cancel button is self locking.

Receive with tone equipment

In radios with tone equipment only calls where the number complies with the coding of the tone equipment will be heard in the loudspeaker.

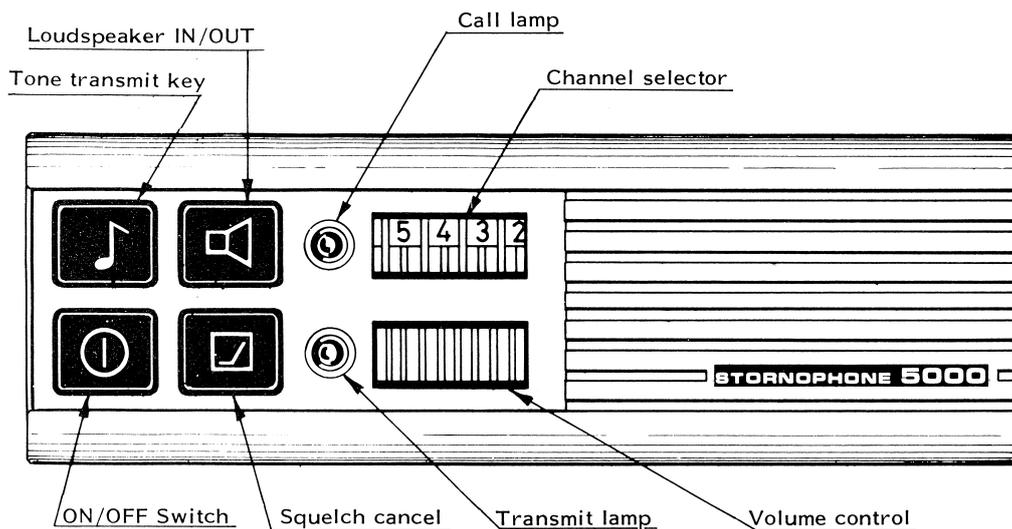
Reception of a call that matches the call number will cause the tone equipment to cancel the loudspeaker blocking so that the call can be heard. Simultaneously, the yellow call indicator will start flashing until the conversation is terminated by pressing the loudspeaker IN/OUT button.

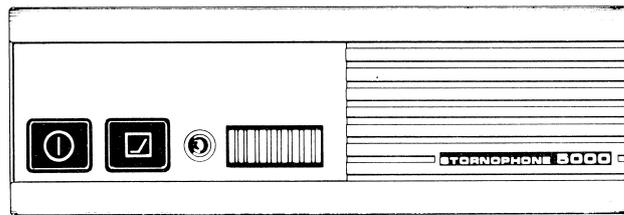
The loudspeaker will now again be blocked, and the call indicator will stop flashing.

Group Call - All Call

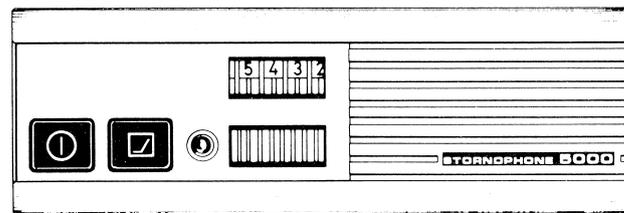
The tone unit TQ5001 function can be expanded with a group call unit SU5001 or All Call unit SU5002.

When receiving a group call or an all call, the yellow call indicator will only flash during the message. The call indicator will stop flashing when the received carrier disappears, or when the loudspeaker IN/OUT button is depressed.





Version
One channel without
tone equipment



Version
Six channel without
tone equipment

TRANSMIT without tone equipment

Before keying the transmitter the channel must be clear. In radios without tone equipment the operator can always hear when conversation takes place on the channel.

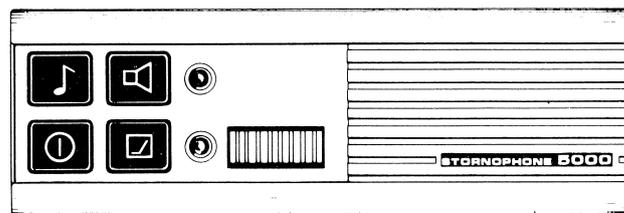
When the channel is clear, the transmitter is keyed by using the key button. The red transmit indicator will light up when the transmitter is keyed.

PRESS TO TALK-RELEASE TO LISTEN

TRANSMIT with tone equipment

When the radio is equipped with sequential tone equipment, the loudspeaker IN/OUT button must be pressed to open the loudspeaker. The yellow call indicator will then start flashing, indicating that the loudspeaker is open.

When the channel is clear, the call can be initiated by pressing the tone transmit key, for transmitting a tone call to the base station, in order to open the base station loudspeaker. When contact with the base station is established, the conversation can continue by using the normal transmitter key button on the microphone.



Version
One channel with
tone equipment

INSTALLATION

STORNOPHONE 5000

General

Proper installation of the Stornophone 5000 radiotelephone is most important as its performance can be seriously impaired if the installation work is done without due care. The instructions should be read carefully and followed by the person installing the equipment.

As precise instructions for all types and models of vehicles are impossible to give and customer requirements may differ, all instructions, illustrations and examples in this chapter must be adapted to the actual installation.

Unpacking

Each shipment should be checked against the packing list or invoice when arriving, and Storno must be notified immediately of any damage or shortage.

MOBILE INSTALLATION

Before the installation commences the cable run should be desired. The following hints should be noted:

- the cables shall be as short as possible.
- the cables shall be kept away from moving parts as handbrake, shock absorbers etc.

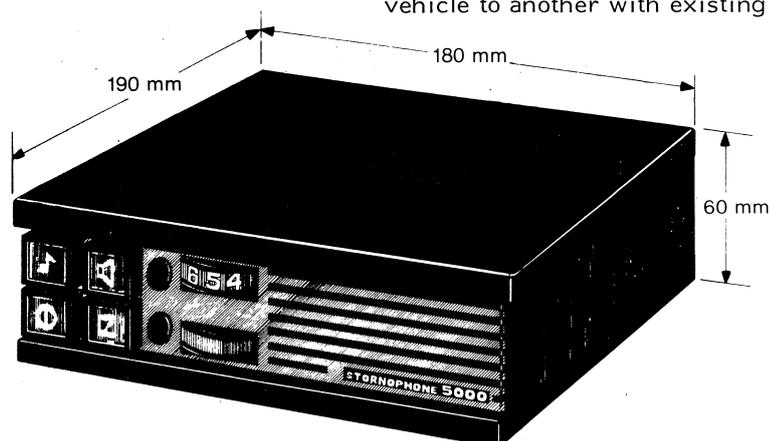
- the cables shall not run near the engine, exhaust manifold, pipes, and other hot items.
- the cables should, whenever possible, be run in parallel with existing cables and through the same holes in the chassis and car body. Suitable grommets must always be used if special holes are drilled in the metal work.
- the cables shall not be run externally underneath vehicles and cable clamps shall be used wherever the cable is likely to sag.
- to ensure that cables are not strained sharp bends should be avoided.
- the fuse in the battery cable should be placed as close to the battery as possible.

Positioning

When selecting a position in the vehicle to install the transmitter/receiver unit several important points should be noted:

- the unit must be allowed to dissipate heat.
- the unit must be within convenient reach of the operator.
- the unit must not be liable to cause damage to the operator or passengers in case of an accident.
- demand for a possible transfer from one vehicle to another with existing installation.

Volume: 2.0 litre
Weight: 1,8 kg



Temperature

The Stornophone 5000 circuitry is designed to operate over a wide range of temperature and the case is designed to provide maximum heat dissipation without vents. The ambient temperature during operation should normally not exceed -30°C to $+60^{\circ}\text{C}$. In cases of operation in hot climates adequate ventilation must be provided.

The equipment can be stored at higher or lower temperatures without damage.

Sufficient space must be left to enable a service engineer to remove the equipment and the cables shall be left free for the unit to be removed from its cradle.

Installation Material

Mobile operation of the Stornophone 5000 requires the following accessories:

- | | |
|--------|--|
| MK5001 | Installation kit containing: |
| | 8-position connector housing with crimp terminals |
| | 2-position connector housing with crimp terminals |
| | UHF antenna connector |
| | Power Supply cable |
| | Fuse holder |
| | 2 fuses, 8A |
| | Cable eyes |
| MN5001 | Cradle for the transmitter/receiver unit consisting of two parts locked together by a screw. |
| or | |
| MN704a | Cradle for direct attachment to the vehicle. |

Both cradles allow the radio to be fixed in 36 different angles and positions.

- | | |
|---------|---|
| MC704 | Microphone for fixed mounting. A bracket with rubber shock mounts are included. |
| MC5001 | Fist microphone with PTT button and hook. |
| HS5001 | Retainer for MC5001 |
| Antenna | Various types are available, refer to Storno Antenna Sales Programme. |

Mobile antennas are normally supplied with adequate lengths of coaxial cable.

Options

- | | |
|--------|---|
| HS5002 | Retainer for MC5001 with switches. |
| SU701 | Keying switch, long lever |
| SU702 | Keying switch, short lever |
| LS701 | External loudspeaker |
| CC5001 | Cable with fuse for installations using the ignition switch for turning the radio on and off. |
| PS702 | Voltage regulator for 24 V DC installations (busses, vessels, heavy trucks, etc.). |

Assemble and install the equipment as outlined on the installation diagram, refer to D402. 612.

Placing the antenna

The antenna should be placed as high and as much in the clear as possible in order to ensure the best matching and radiation pattern. On a vehicle, the roof must be considered the best place for the antenna. If the roof is non-metallic, a sheet of aluminium foil, at least 1 square metre in size, shall be glued to the roof below the antenna provided that the vehicle fittings make it possible. On passenger

cars, the boot cover is an alternative place for the antenna although this will impair its efficiency and introduce an unfavourable directivity. Hence the latter solution should be chosen only if these factors are of secondary importance, i. e. where maximum operating range is not a significant requirement.

All Storno standard antennas can be installed from the outside without need for drilling through the upholstery, if any.

Antennas supplied by Storno have an installation instruction packed with each unit.

The coaxial antenna cable, after having been routed to the radio unit, should be cut to length and fitted with the antenna connector, type PL259. The connector is a crimp-on type and hence soldering is not necessary.

If the antenna whip length must be cut to operating frequency, the transmitter frequency is the determinant. Refer to enclosed instructions.

For multichannel operation the mean frequency is calculated.

FIXED INSTALLATIONS

Fixed operations (base station) of the Stornophone 5000 requires the following accessories:

MK5001	Refer to mobile installation for specification of contents.
MN703	Desk Stand
PS703	220V AC Power Supply unit 10W
PS5001	220V AC Power Supply unit 25W
MC703a	Desk microphone with PTT button
Antenna	Various types are available, refer to Storno Antenna Sales Programme. Storno can also supply masts, towers, and special installation material on request.

The equipment should be assembled and installed as outlined on the installation diagram, refer to D402. ---.

FUNCTIONAL TEST

When the Stornophone 5000 radiotelephone has been properly installed the following points should be checked:

- that the multiway connector is strapped according to the instructions and inserted in its socket.
- that the battery cable is connected.
- that the battery polarity is correct.
- that the fuses is inserted in their holders and are of correct value.
- that the antenna and the antenna connector are properly connected.
- that the channel selector, if any, is set to the operating channel.

Test Calls

Turn the radiotelephone on and perform test calls with the associated base (mobile) station to ascertain that transmission quality is good and that reception is good.

In systems with selective calling the loudspeaker on/off button must be pressed to check if the channel is free before transmitting commences. When the channel is clear, the tone signal is transmitted, whereupon the base (mobile) station should reply, reporting the strength and quality of the signal. The station is then requested to call, and the loudspeaker on/off button is pressed to turn the loudspeaker off.

On reception of the call from the base station (mobile) the loudspeaker will be switch on and subsequent messages are transmitted without use of the selective calling.

Modulation Sensitivity Adjustment

The microphone gain of MC704 is adjusted by means of a potentiometer so that the speech level is set for correct modulation of the transmitter. This is best achieved by using the operator's voice.

The potentiometer must not be set so that the ambient background noise is able to modulate the transmitter. If the speech/ noise level is too low, then the microphone must be brought closer to the operator. First microphone MC5001 need not be adjusted.

Too high sensitivity will cause the message to be broken up and if it is too low, the message will be clear but weak. The optimum adjustment is found when loud shouting into the microphone just causes the message to break up.

NOISE SUPPRESSION

Noise interference in mobile radio communication equipment can either be caused by the vehicle's or vessel's own noise sources such as other vehicles, electrical generators, electrical wires, X-ray apparatus, etc.

The external noise cannot be avoided, but care has been taken in the design of STORNO radiotelephones to reduce the effect as much as possible. Such noisy periods can be an annoyance, but will normally be of short duration if the vehicle is on the move.

The electrical noise generated by the vehicle's or vessel's own electrical system can often be suppressed sufficiently by simple means. It should be noted that as long as the radiotelephone is being operated close to the base station the noise will normally not be noticed. The noise will only be heard in the loudspeaker, when the equipment moves away from the base station, where the received signal is somewhat weaker.

Complete noise suppression of an electrical system can be very difficult in certain cases, but normally it is possible to achieve satisfactory results if the simple advice given below is followed.

Moreover, recommendations about noise-suppression published by manufacturers of electrical automobile accessories and noise suppression components (such as Bosch, Lucas, etc.) should be studied.

Ignition Noise

The most common noise source is the ignition system of an engine, and this noise is characterized by a regular ticking sound, which is synchronized with the motor revolutions. In case the vehicle is not sufficiently noise suppressed from the factory it is necessary to insert suppression resistors in series with each spark plug or replace the spark plugs with types having builtin resistors. If suppression resistors are used wirewound resistors (5 Kohm) are recommended as these resistors suppress the noise better than the carbon types (10 - 15 kohm). Suppressor resistors in the spark plug leads must be placed as close as possible to the spark plugs and the spark gap should be increased. Consult the car instruction manual for the exact width.

Further noise suppression may be obtained by inserting a suppressor resistor in the cable between the ignition coil and the distributor as close to the latter as possible. The best solution is to replace the distributor rotor with a special rotor having a built-in resistor.

Screening of noisy components is expensive, but may be necessary in certain cases. Metal components, or metal coated components, such as distributor lids are used to incapsulate the noise source.

If the steps mentioned do not result in a satisfactory noise suppression, a 0,1uF coaxial capacitor must be mounted between the primary of the ignition coil and chassis. The capacitor should be fitted near the coil with the chassis wire as short as possible.

Finally, it should be born in mind that dirty or pitted distributor contacts may cause noise similar to ignition noise.

Dynamo Noise

The dynamo noise is characterized by a whine, where the frequency and pitch is synchronized with the motor revolutions.

Normally this noise is due to arching between dirty or worn brushes and the commutator. Cleaning, or possibly, replacement of the carbon brushes will normally remove the noise.

In some cases it may be necessary to insert a noise filter in the dynamo circuit. A noise suppressor capacitor may be inserted in the lead from the ignition coil (connection to ignition switch) and in the battery lead from the dynamo terminal. Do not remove more insulating material than absolutely necessary in order to minimize the risk of shorting the circuit.

Other Noise Sources

Noise from the voltage regulator can be identified by a rasping noise in the loudspeaker. This noise can normally be removed by mounting a coaxial capacitor in the dynamo lead, as close to the regulator housing as possible. The other end of the capacitor should be connected to chassis.

All electrical instruments and motors may introduce noise into the radiotelephone. The windscreen wiper motor can for example be suppressed by a conventional noise suppressor capacitor.

The different noise sources can easily be detected by switching on and off the suspected noise sources one by one. Other noise sources are the electric clock, the petrol gauge, the oil lamp, etc., and in all cases the noise can be sufficiently suppressed by correct use of capacitors.

The ventilator fan belt may be the cause of static noise. The cure is to replace the belt with one containing a graphite compound.

Tyre statics can sometimes produce interference and in such cases improvement may be obtained by mounting special shorting springs on each wheel.

Static noise may also be due to a nonmetallic suspension of the engine. Metal braids mounted between the engine and the chassis, or the firewall, will remove the noise. Corroded joints of existing braids may also cause static noise.

Different proposals for placing the radio telephone.

These are recommended, but other may be used depending on the type of vehicle. However, if a transfer from one vehicle to another is demanded, without using tools, installations must be fitted in both cars and the positioning in Fig. 1, Fig. 2, or Fig. 4 be used.

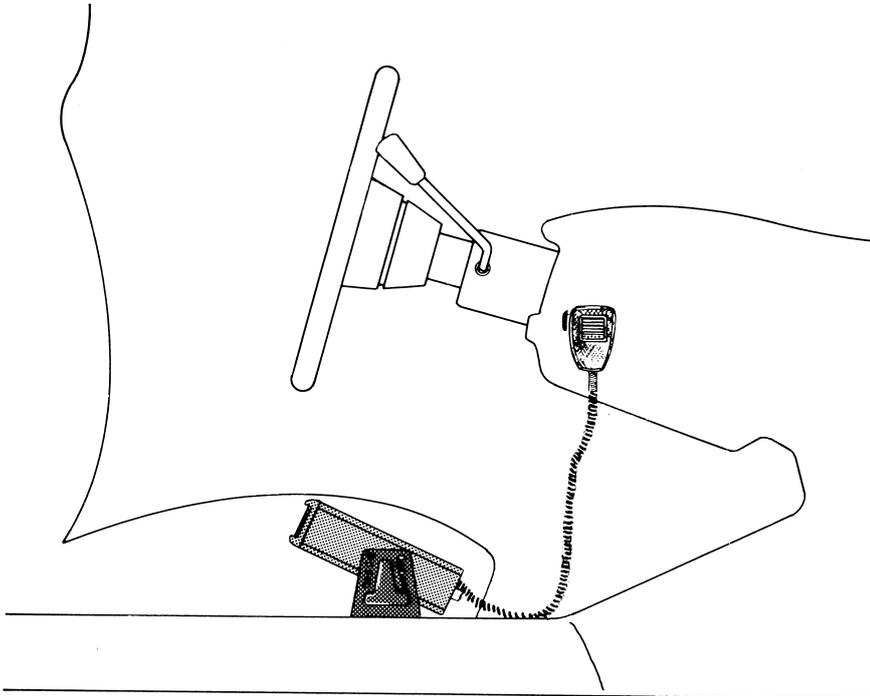


Fig. 1

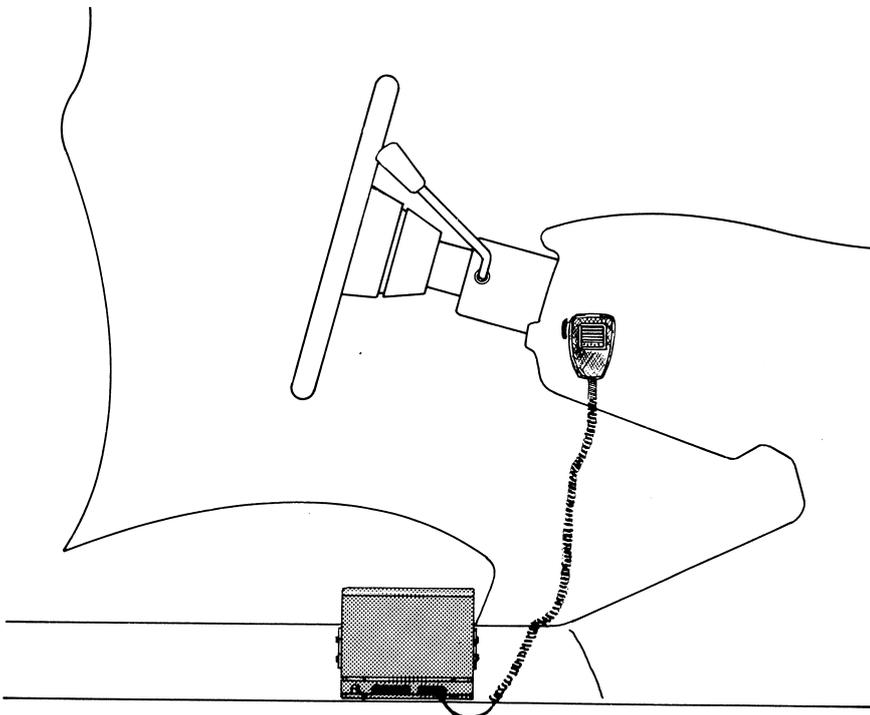


Fig. 2

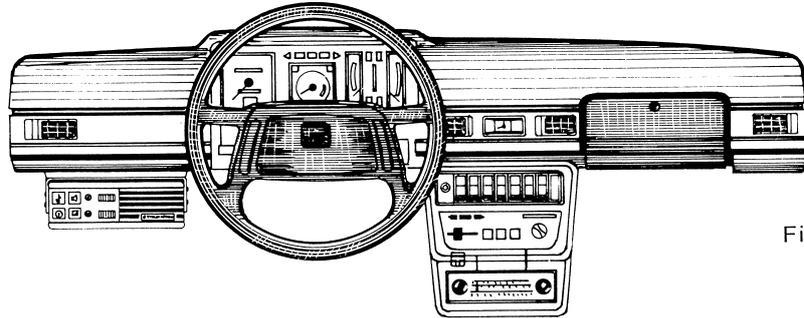


Fig. 3

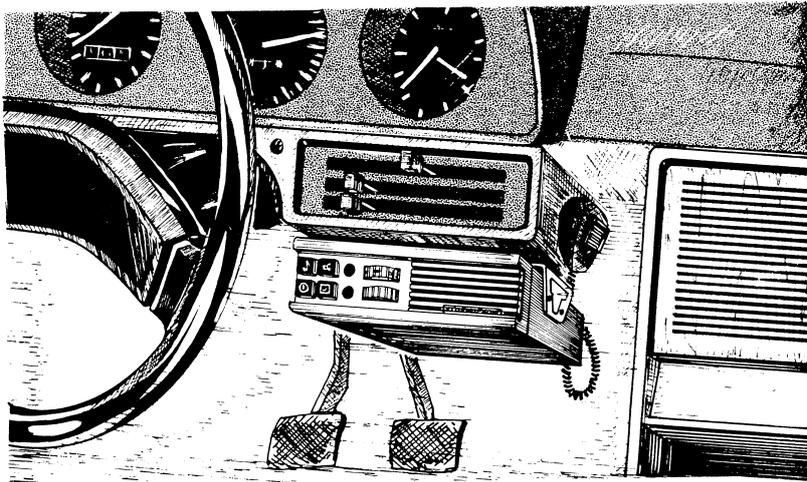


Fig. 4

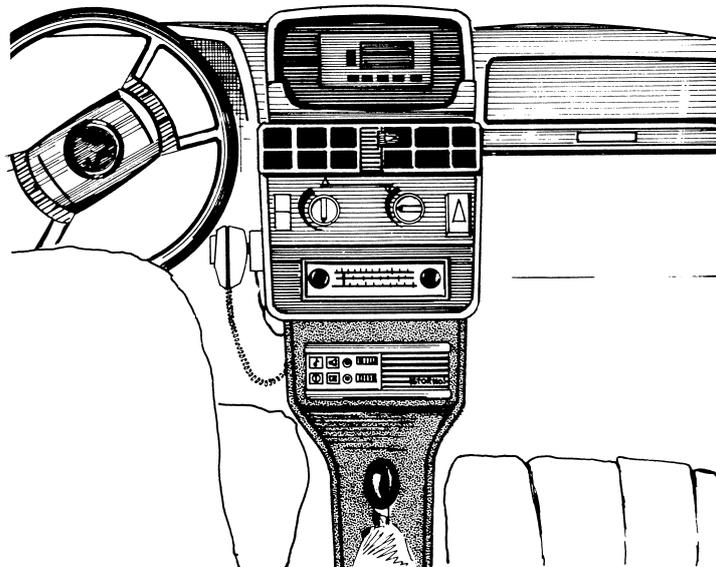


Fig. 5

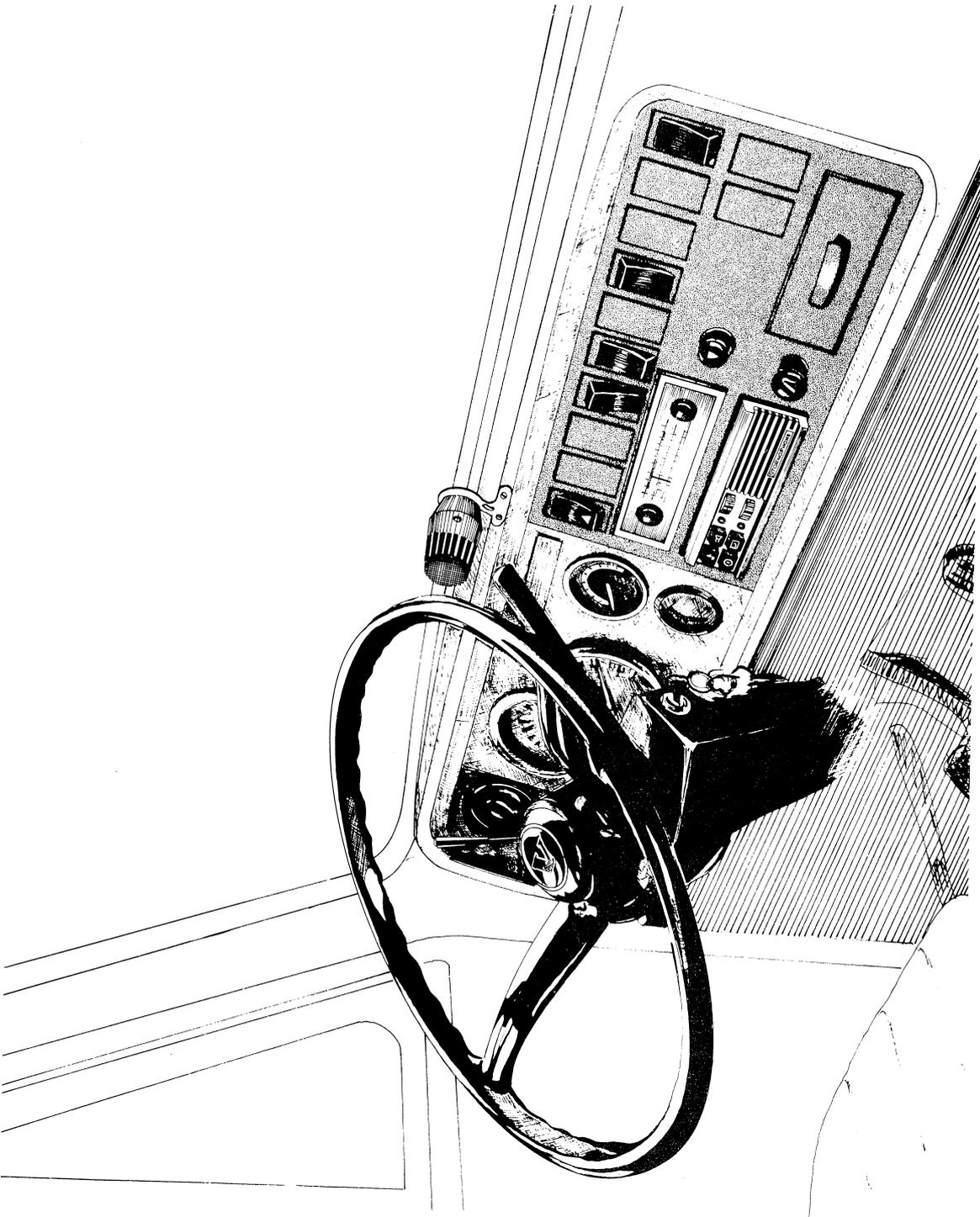


Fig. 6

If the antenna is mounted on the boot cover, or near the edge of the roof, the radiation pattern will change considerably. Fig. 7, Fig. 8, and Fig. 9 show the attenuation for different mountings, related to a $\lambda/2$ dipole. Reduction in coverage occurs as a result, but it is pos-

sible to compensate for higher losses by using $5/8 \lambda$ antennas which have approx. 2dB gain. Especially in the case of boot cover mounting, antennas with gain should be used if the operating range is a significant requirement.

ATTENUATION RELATED TO $\lambda/2$ DIPOLE (0 dB)

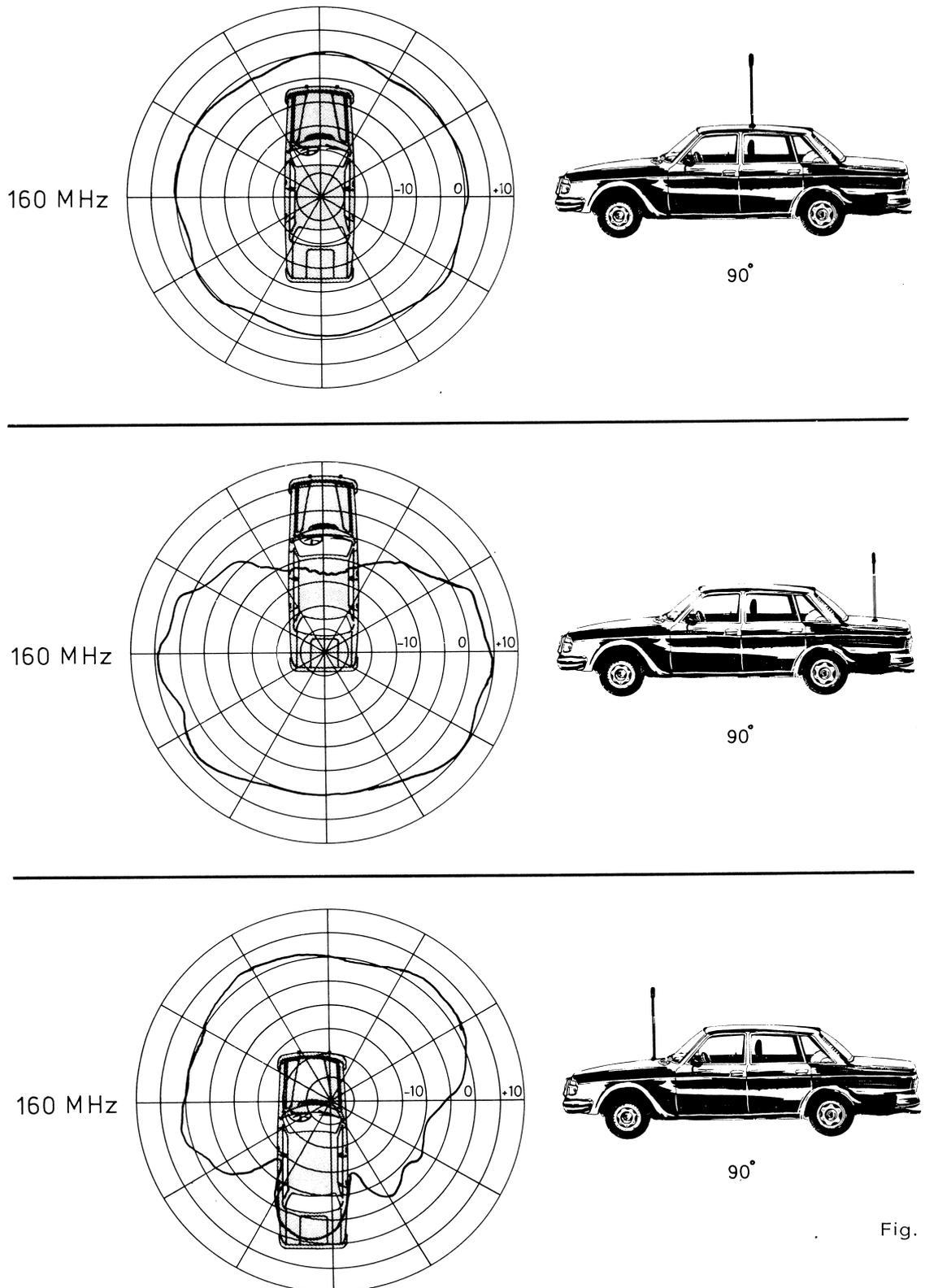


Fig. 7

ATTENUATION RELATED TO $\lambda/2$ DIPOLE (0 dB)

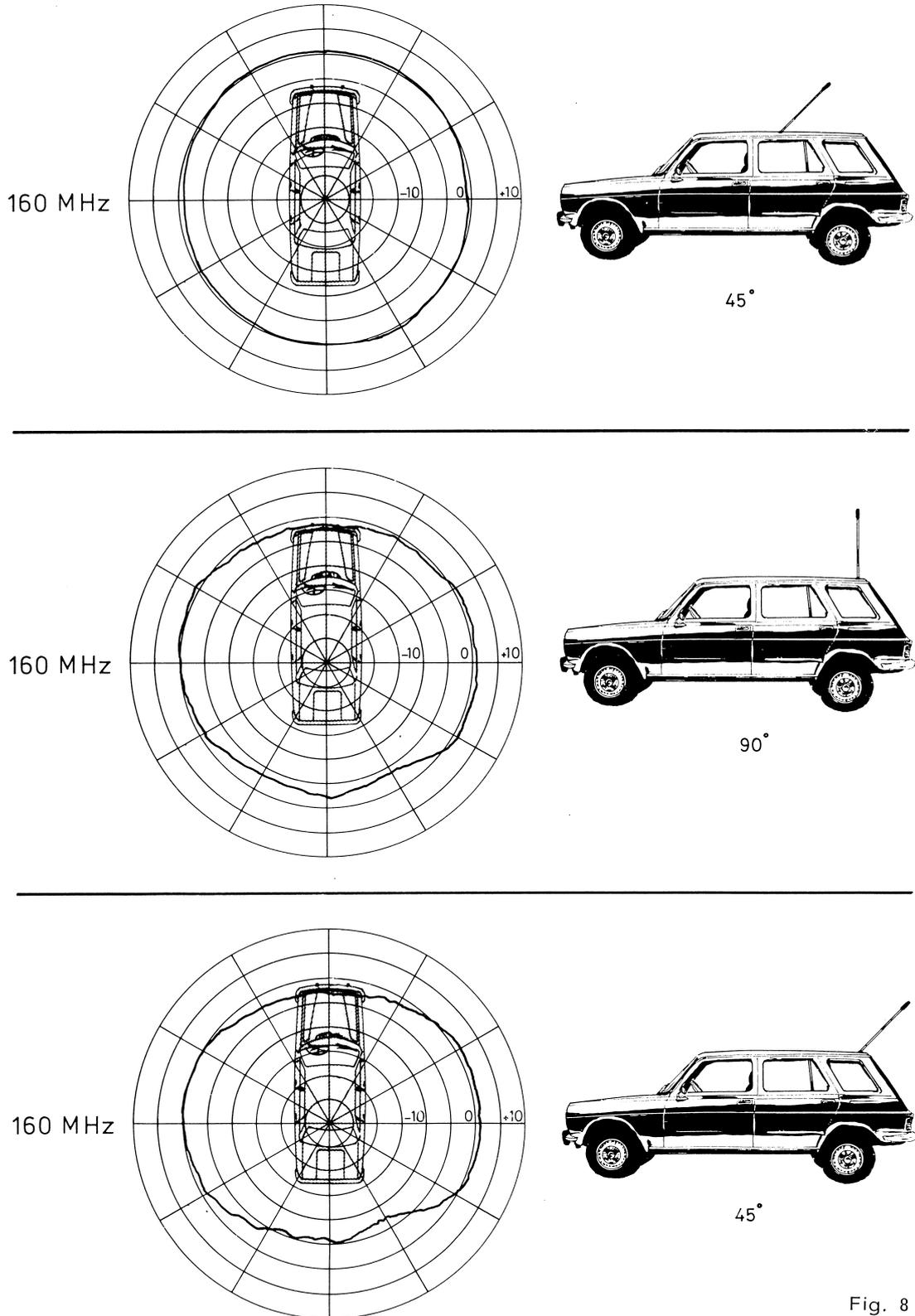


Fig. 8

ATTENUATION RELATED TO $\lambda/2$ DIPOLE (0 dB)

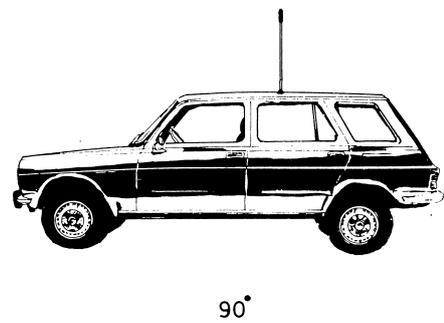
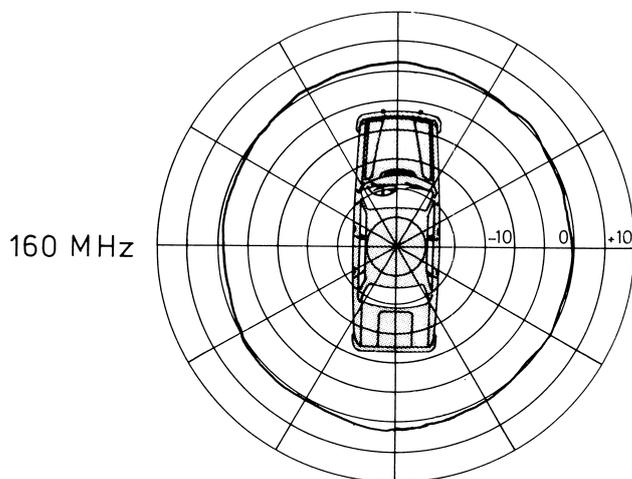
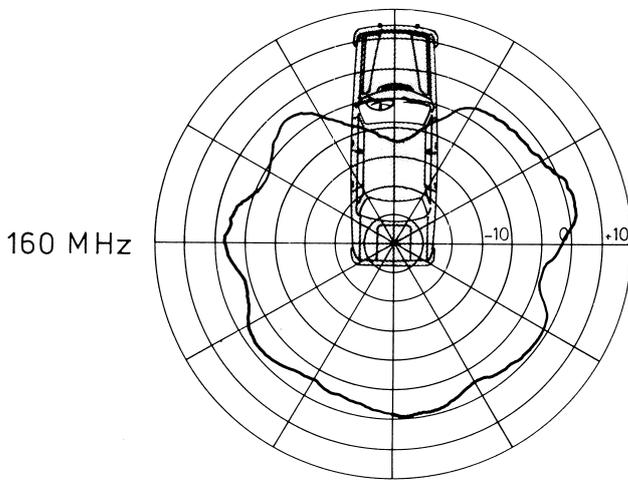
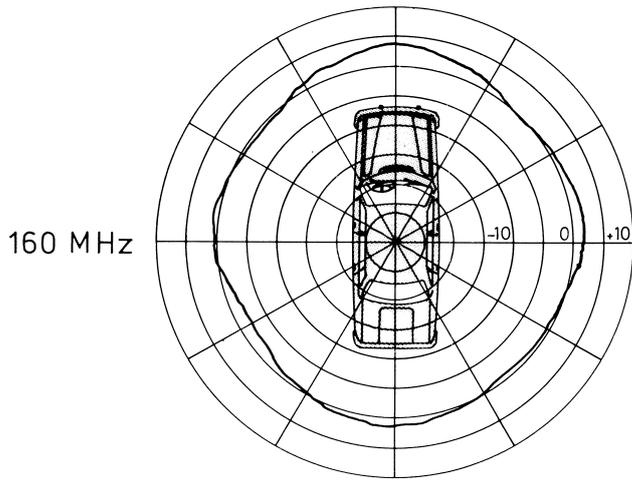


Fig. 9

ADJUSTMENT PROCEDURE

CQM5110

General

This adjustment procedure applies to the following radiotelephone types:

CQM5112	-	30/25 kHz Channel spacing
CQM5113	-	20 kHz Channel spacing
CQM5114	-	12,5 kHz Channel spacing

Before making adjustments to the radiotelephone transmitter/receiver, read the type label and note the channel frequencies. Check all straps according to the notes on the diagrams. Also check the selective calling tone equipment, if any, against the coding instructions; refer to description of tone equipment.

All screens must be in place and properly secured during the adjustments.

Measuring Instruments

The following list contains instruments necessary for adjusting the radiotelephone and checking its performance characteristics:

DC Voltmeter	$R_{in} \geq 1\text{Mohm}$
AC Voltmeter	$Z_{in} > 1\text{Mohm}/50\text{pF}$
Multimeter	$R_i \geq 20\text{Kohm/Volt}$
Distortion meter	e.g. Storno E11c
RF Watt meter	25 W/50 ohm/145-175MHz
RF generator	$Z_{out} = 50 \text{ ohm}; 145-175 \text{ MHz}$
10,7 MHz signal generator	e.g. Storno TS-G21B
Frequency counter with attenuator	$Z_{in} = 50\text{ohm}; \text{sensitivity } 100\text{mV af } 175 \text{ MHz}$
RF diode probe	Storno 95.0089-00
RF coaxial probe	Storno 95.0179-00
DC power supply	10.8 V - 16.6 V; 6A
Oscilloscope	0 - 5 MHz min.

Miscellaneous

4 ohm/3W resistor	3 x Storno code 82.5026
22 uF/40 V electrolytic capacitor	Storno code 73.5107-00
Connector, 11-pin house	Storno code 41.5543-00
Connector, 8-pin house	Storno code 41.5542-00
Pins for connectors	Storno code 41.5551-00

RECEIVER ADJUSTMENTS

Checking 8.5 V regulated supply

Turn the power supply ON and set the voltage to 13.2 V. Set the power supply current limiter to 1A.

Turn the radiotelephone ON by depressing the ON/OFF button. Note the light in the Channel selector, if any, is on.

Depress the Squelch button.

Set the volume control to minimum.

Connect the DC voltmeter to J 901 pin 3 and read the voltage.

Requirement: $8.5 \text{ V} \pm 0.15 \text{ V}$

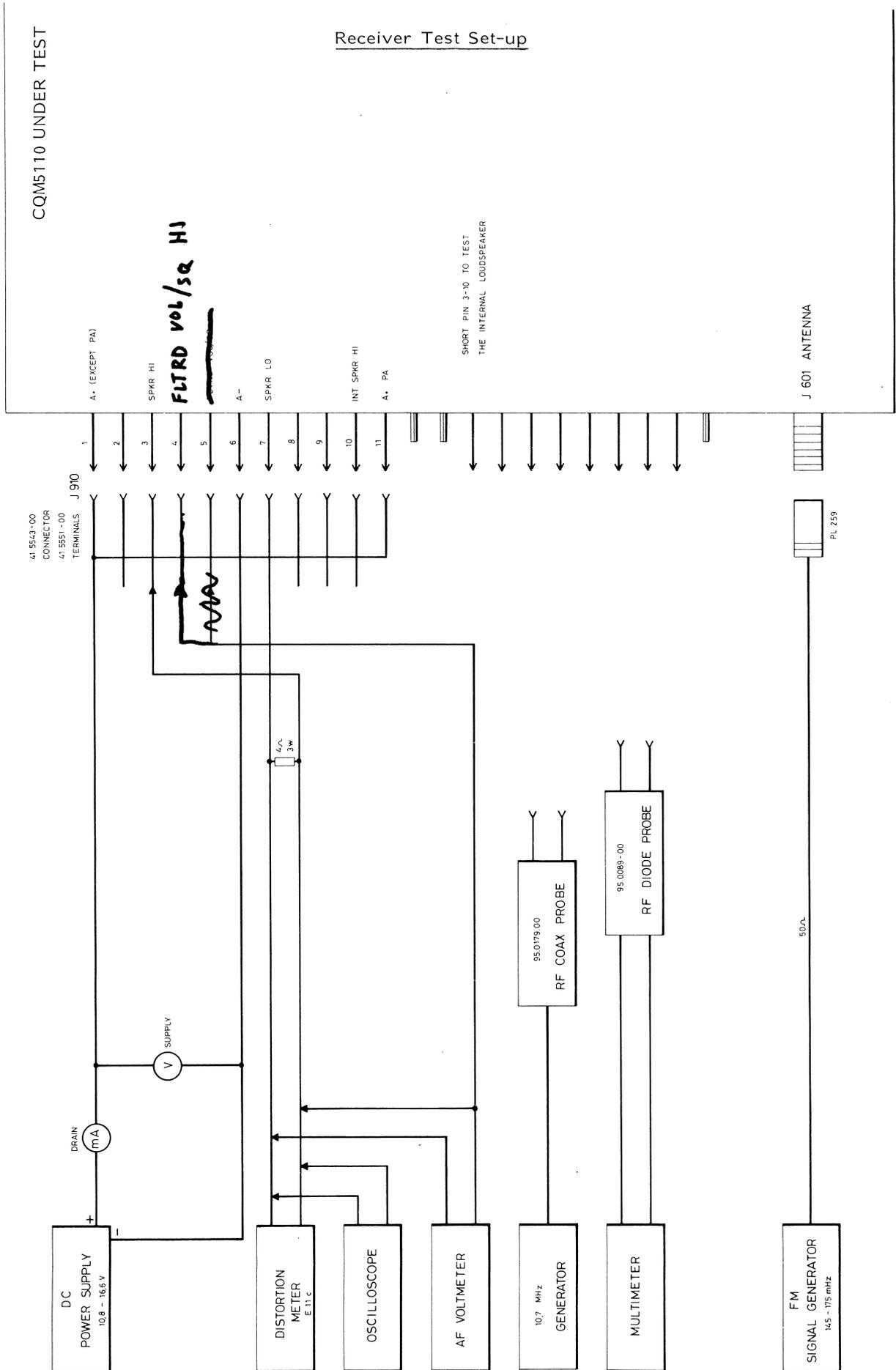
If the requirement is not fulfilled check resistor R636 against the colour code of U602.

U602 colour code	R636 Value
Brown	omit
Red	270
Orange	100
Yellow	47
Green	22
Blue	6.8

Adjust the power supply voltage to 16.6 V and read the 8.5 V regulated. Compare the change in the 8.5 volt regulated to the value obtained at 13.2 V.

Requirement: $\leq 50 \text{ mV}$

Repeat the procedure with the power supply adjusted for 10.8 V



Oscillator(s) and Frequency Multiplier

In single channel sets the receiver oscillator is located on the RF5110 board. In multichannel sets all oscillators are on the XS5111 board (2 Channels) or XS5112 (6 Channels).

Select the channel whose frequency is closest to center frequency. If not otherwise indicated adjustments should be performed on that channel.

Connect RF diode probe 95.0089-00 leads to the multimeter and select the most sensitive voltage range.

Connect the probe to TP401 with the dot to the live terminal.

Single channel sets

Adjust L301 for maximum deflection

Multichannel sets

Adjust the following coils for maximum deflection:

L961,	Channel 1
L962,	Channel 2
L963,	Channel 3
L964,	Channel 4
L965,	Channel 5
L966,	Channel 6

Adjust L303 and L305 for maximum deflection;
Typical 2 to 3 volts

Requirement: $\geq 1\text{ V}$

Receiver frequency adjustment

Connect coax probe 95.0179-00 to testpoint TP401. Connect the frequency counter to the probe, and read the frequency.

The frequency is measured after the tripler and shall be $F_{\text{antenna}} - 10,7\text{ MHz}$

Single channel sets

Adjust L301 for the specified frequency ($3x f_x$)

This adjustment shall be performed at 25°C

Requirement: $F_{\text{nom}} \pm 0.4\text{ppm}$ ($\pm 60\text{ Hz}$ at 150 MHz)

Multichannel sets

Adjust the following coils on the XS board to the specified receiver frequencies ($3x_{f_x}$)

L961,	Channel 1
L962,	Channel 2
L963,	Channel 3
L964,	Channel 4
L965,	Channel 5
L966,	Channel 6

Requirement: $F_{\text{nom}} \pm 0.4\text{ ppm}$ ($\pm 60\text{ Hz}$ at 150 MHz)
ppm = parts per million = $\times 10^{-6}$

IF Amplifiers

Connect a 10.7 MHz signal generator to TP401 via coax probe 95.0179-00.

Connect RF diode probe 95.0089-00 with multimeter to test point TP501. (50uA range).

During adjustment the RF generator output must be kept low enough to prevent limiting in the IF stages, i. e. a maximum reading of 50uA on the multimeter.

Adjust coils L503, L502, L501, and L406, in that order, for maximum deflection on the multimeter.

Front-end

Connect the RF probe 95.0089-00 and the multimeter to test point TP501. (50uA range).

Connect an unmodulated RF generator to the antenna connector, J601.

Set the generator frequency to the receiver frequency.

Adjust the generator output to produce a deflection on the multimeter, i. e. a maximum reading of 50uA on the multimeter.

Adjust L401 and L402 for maximum deflection. Detune L403 and 405 as much as possible.

Adjust L404 for maximum deflection on the multimeter. This is the only adjustment of L404 and it must not be touched during the rest of the procedure.

Adjust L403 and L405 for maximum deflection on the multimeter.

Readjust L401 and L402 for maximum deflection.

Remove the RF diode probe.

IF demodulator

Standard Test condition:

Connect the RF generator to antenna generator and adjust the output to 1 mV.

Modulate the RF generator with 1000 Hz to 60% of AF max.

CQM5112	= ± 3 KHz
CQM5113	= ± 2.4 KHz
CQM5114	= ± 1.5 KHz

Connect a 4 ohm/3W resistor load to connector J910/3-7 (SPKR HI-SPKR LO).

Connect an AF voltmeter to J910/4-7 (FLTD VOL- SPKR LO).

Turn R521 halfway up.

Adjust L504 for maximum reading on the AF voltmeter.

Connect a distortion meter and AF voltmeter across the 4 ohm resistor. (if Storno E11c distortion meter is used switch the function to AF voltmeter).

Adjust the volume control for approx. 2 V across the load.

Adjust L501 and L406 for minimum distortion. The demodulated signal may be monitored on an oscilloscope connected in parallel with the distortion meter.

Connect the AF voltmeter to J910/4-7 (FLTD VOL - SPKR LO).

Adjust R521 for a reading of 275 mV on the AF voltmeter.

Requirement: 275 mV ± 5 mV.

Read the distortion.

Typical Total Harmonic Distortion (THD) will be less than 5%.

Receiver Sensitivity, SINAD

EIA or CEPT method may be used.

The SINAD sensitivity of a receiver is the minimum input signal that will provide at least 50% of the receiver's rated audio power with 20dB signal + noise + distortion to noise + distortion.

Method of measurement.

The purpose of the measurement is to define the ratio of one condition to another.

The first condition is the one where a modulated RF-signal drives the receiver into full limiting. The audio output is measured with the distortion meter (in the CAL position) through a psophometric filter and, disregarding the amplitude of the audio, this is adjusted to read 100% on the meter; this is our reference condition consisting of signal + noise + distortion, where 'signal' is the modulation of the RF, 'noise' is the lowest possible amount achieved from that particular receiver, when receiving a strong carrier, and 'distortion' is the modulation being slightly distorted in passing through the receiver.

The second condition is the one where the signal (modulation) is removed with a notch filter and the RF-signal is lowered in amplitude until the remaining noise and distortion increases to 20dB below the first condition, as read on the distortion meter scale. This corresponds to a reading of 10%, 10 being 20dB below 100, which was our reference condition.

In practice our first condition is achieved by feeding a minimum of 1000 uV of RF-signal modulated with 1000 Hz at 60% Δf max. to the receiver.

The audio output (which must be at least 50% of the receiver's audio rating) is measured with the distortion meter in position CAL and adjusted with potentiometer ADJ. FSD. to a reading of 100.

The notch filter is then inserted in series with the audio by pressing one of the buttons marked in %. The meter needle immediately drops to indicate a low value, this being the receiver's inherent audio distortion.

By backing off the attenuator of the RF-generator thereby lowering the RF-input to the receiver, the noise will eventually increase; the attenuator is now adjusted for a 10% reading on the distortion meter scale.

At this stage it must be ensured that the increased noise and the signal (with the notch

filter switched out while checking) still equals 100 on the meter scale.

The RF-generator's calibrated attenuator now shows the value of RF-signal required to achieve a 20 dB ratio between signal + noise + distortion and noise + distortion, i. e. 12dB SINAD sensitivity.

The EIA method differ from CEPT by omitting the psophometric filter and adjusting the RF generator for $2/3 \times \Delta f_{max}$. The SINAD sensitivity is measured as a 12dB ratio between signal + noise + distortion and noise + distortion, which corresponds to a reading of 25% noise + distortion.

Lower the RF generator output to obtain 12dB SINAD (25% THD as measured with the distortion meter). Readjust L402 for the best SINAD value, e. i. lowest generator output for 10% THD.

Measuring 20dB SINAD

Adjust the volume control for 2.45 V as measured with an AF voltmeter across the load. Adjust the RF generator output to obtain 20dB SINAD condition.

Read the 20dB SINAD sensitivity (e. m. f.) Requirement: $\leq 0.75\mu V$

The sensitivity should be measured on all channels, if more than one.

Audio Frequency Response

Set the signal generator to Standard Test Condition.

Adjust the volume control for 0.82 V across the load. (4 ohm across (SPKR HI - LO)).

At 13,2 V supply, $\Delta F = 60\% \Delta F_{max}$ and 1000 Hz measure the output voltage according to the following table:

	Frequency	Level	Tol.
Type CQM5112 Type CQM5114	300 Hz	+9dB	+1dB/-3dB
	1000 Hz	0dB	
	3000 Hz	-9.5dB	+1dB/-3dB
Type CQM5113	300 Hz	+10.5dB	+1.5dB/-3dB
	400 Hz	+8dB	+1.5dB/-1.5dB
	1000 Hz	0dB	
	2700 Hz	-8.6dB	+1.5dB/-1.5dB
	3000 Hz	-9.5dB	+1.5dB/-3dB
	6000 Hz	<-20dB	

AF Power Output

Adjust the RF signal generator to Standard Test Condition.

Set the supply voltage to 13.2 V.

Adjust the volume control for 3 W output (3.46 V across the 4 Ω load).

Measure the distortion (THD).

Requirement: THD $\leq 5\%$.

Squelch

Release the squelch cancel button.

Adjust potentiometer R607 squelch adj. to open the receiver for an RF input signal corresponding to 8-10 dB SINAD.

Current consumption

Measure the current consumption at 13.2 V.

Requirements

Condition	1 channel	2 channels	6 channels
Standby	≤ 150 mA	≤ 160 mA	≤ 200 mA
Receive 2 W AF ~ 2,83 V r. m. s. across 4 ohm.	≤ 500 mA	≤ 510 mA	≤ 550 mA

For sets with selective calling facilities add current consumption of the tone unit to the figures above.

TRANSMITTER ADJUSTMENTS

Adjust the power supply voltage to 13.2 V and set current limiter as follows:

25 W transmitter:	6 A
10 W transmitter:	4 A

Refer to Receiver Alignment for measuring 8.5 V regulated supply.

Preset all transmitter tuning slugs, L151, L204, L205, L208, and L209, to be flush with the coil form top.

Connect a multimeter (2.5 volt range) to test point TP201.

Turn the power control potentiometer, R215, to minimum, anticlockwise (CCW).

Connect a Wattmeter, (25W) to the antenna connector, J601.

Oscillator adjustment

In single channel sets the transmitter oscillator is located on the RF5110 board. In multichannel sets all oscillators are on the XS5111 board (2 channels) or XS5112 (6 channels). Select the channel whose frequency is closest to the center frequency. If not otherwise indicated adjustments should be performed on that channel.

Key the Transmitter.

Single channel sets

Adjust L153 for maximum deflection on the multimeter. The increase deflection is small and gently tuning is required. If the frequency is in the low end of the band it may be necessary to turn the slug of L151 (L921 - L926) partly into the coil form to obtain a multimeter deflection.

Adjust L151 for maximum meter reading, typical 1.2 V.

Multichannel sets

Adjust the following coils for maximum deflection on the multimeter, typical 1.2 V.

L921,	channel 1
L922,	channel 2
L923,	channel 3
L924,	channel 4
L925,	channel 5
L926,	channel 6

Exciter, coarse adjustment

Connect a multimeter (2.5 V range) to test point TP201.

Adjust L204 for minimum deflection. The dip is small and careful tuning is required.

Connect the multimeter, (1 V range) to test point TP202.

Adjust L205 for maximum deflection on the multimeter, typical 0.4 V.

Adjust L208 for minimum reading. The dip is small and careful tuning is required.

Connect diode probe 95.0089-00 and the multimeter to test point TP203.

Adjust L209 for maximum reading on the multimeter, typical 10 V.

Adjust the PA power control, R215, for rated transmitter power, 6/10 W or 25 W.

Transmitter frequency adjustment

Connect a frequency counter through a suitable attenuator to the antenna connector J601.

Single channel sets

Adjust L151 to specified transmitter frequency.

Multichannel sets

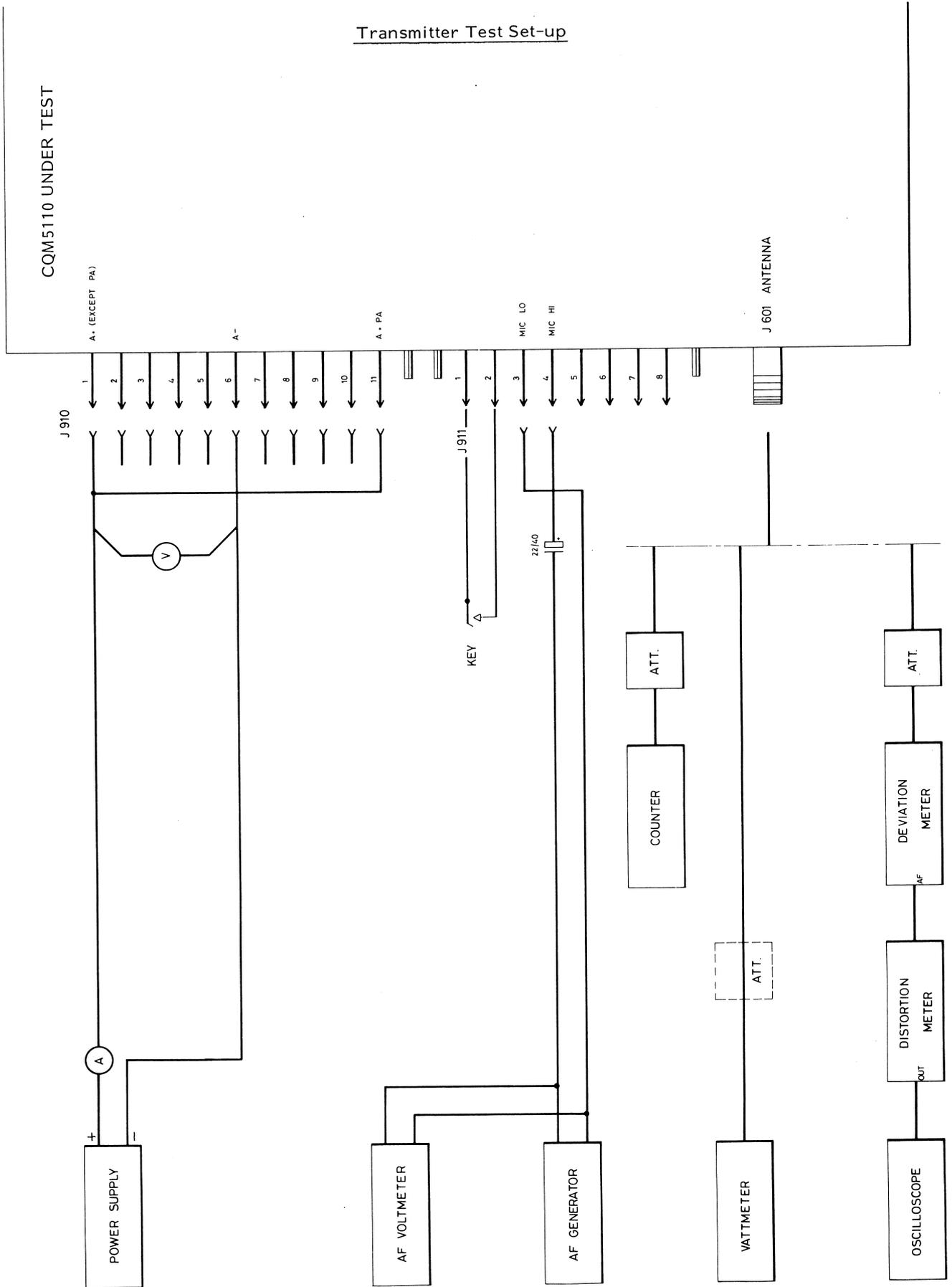
Adjust the following coils on the XS board to the specified transmitter frequencies:

L921,	channel 1
L922,	channel 2
L923,	channel 3
L924,	channel 4
L925,	channel 5
L926,	channel 6

The frequency adjustment shall be performed at 25°C.

Requirement: $F_{nom} \pm 0.4 \text{ ppm}$.

Transmitter Test Set-up



Exciter, fine adjustment

Connect the multimeter to test point TP201.
 Readjust L153 for maximum reading.
 Connect the multimeter to test point TP202.
 Peak L204 and L205 for maximum reading.
 If the maximum is not well defined detune L153 slightly, adjust L204 and L205, and repeat the adjustment of L153.
 Connect the 95.0089-00 RF probe and multimeter to test point TP203.
 Peak L208 and L209 for maximum reading.

RF power output, current consumption, and power control

Connect the Watt meter to the antenna connector, J601.
 Increase the supply voltage to 16 V. The voltage is measured directly at the input connector J910.
 Readjust the PA power control, R215, for rated transmitter power (P), 6/10 or 25 W.

Requirement: $P_{nom} \pm 0.1 \text{ dB}$.

Measure the RF power output at 16 V, 13.2 V and 10.8 V.

Requirements (25 W):

Voltage	Power	Current
16.6 V	25 W (ref)	$\leq 5.8 \text{ A}$
13.2 V	$\geq 24 \text{ W}$	$\leq 5.8 \text{ A}$
10.8 V	$\geq 20 \text{ W}$	$\leq 5.8 \text{ A}$

Requirements (10 W):

Voltage	Power	Current
16 V	10 W (ref)	$\leq 3.2 \text{ A}$
13.2 V	$\geq 9 \text{ W}$	$\leq 3.2 \text{ A}$
10.8 V	$\geq 8 \text{ W}$	$\leq 3.2 \text{ A}$

Requirements (6 W):

Voltage	Power	Current
16 V	6 W (ref)	$\leq 2.6 \text{ A}$
13.2 V	$\geq 5.5 \text{ W}$	$\leq 2.6 \text{ A}$
10.8 V	$\geq 5.2 \text{ W}$	$\leq 2.6 \text{ A}$

MODULATION ADJUSTMENT

Set the power supply voltage to 13.2 V.
 Connect a deviation meter through an attenuator to the antenna connector, J601.
 Connect a distortion meter and oscilloscope to the deviation meter output.
 Connect a AF generator and an AF voltmeter to the microphone input via a 22 uF capacitor; refer to test setup.
 Adjust the AF generator output to 1 V r. m. s. This voltage is approx. 20 dB above the nominal modulation input level (60% Δf max) to ensure full limiting in the modulation processor.
 Find the AF frequency between 200 Hz and 3000 Hz giving the greatest frequency deviation as read on the deviation meter with the transmitter keyed.
 Check the maximum deviation for both positive and negative deviation polarity. At that audio frequency set the maximum frequency deviation Δf max with R116.

Type	Channel spacing	Δf max
CQM5112	30/25 KHz	$\pm 5 \text{ KHz}$
CQM5113	20 KHz	$\pm 4 \text{ KHz}$
CQM5114	12.5 KHz	$\pm 2.5 \text{ KHz}$

Requirement

Difference between + and - deviation: $\leq 10\%$

Multichannel sets

In multichannel sets R116 is turned fully clockwise and the modulation adjustment is adjusted individually for each channel using the Δf max potentiometers on the XS board.

R956	= channel 1
R957	= channel 2
R958	= channel 3
R959	= channel 4
R960	= channel 5
R961	= channel 6

Modulation sensitivity and modulation distortion

Set the AF generator frequency to 1000 Hz
 Adjust the generator output until 60% of Δf max is obtained on the deviation meter.

- CQM5112 : ± 3.0 KHz
- CQM5113 : ± 2.4 KHz
- CQM5114 : ± 1.5 KHz

Read the AF generator output and measure the modulation distortion on the audio output of the deviation meter.

Requirements:

Modulating signal: 70 mV ± 2 dB

Distortion: $\leq 7\%$

(measured without deemphasis)

Modulation frequency response

Set the AF generator to 1000 Hz.
 Reduce the AF generator output until a deviation of $0.2 \times \Delta f$ max is obtained on the deviation meter.

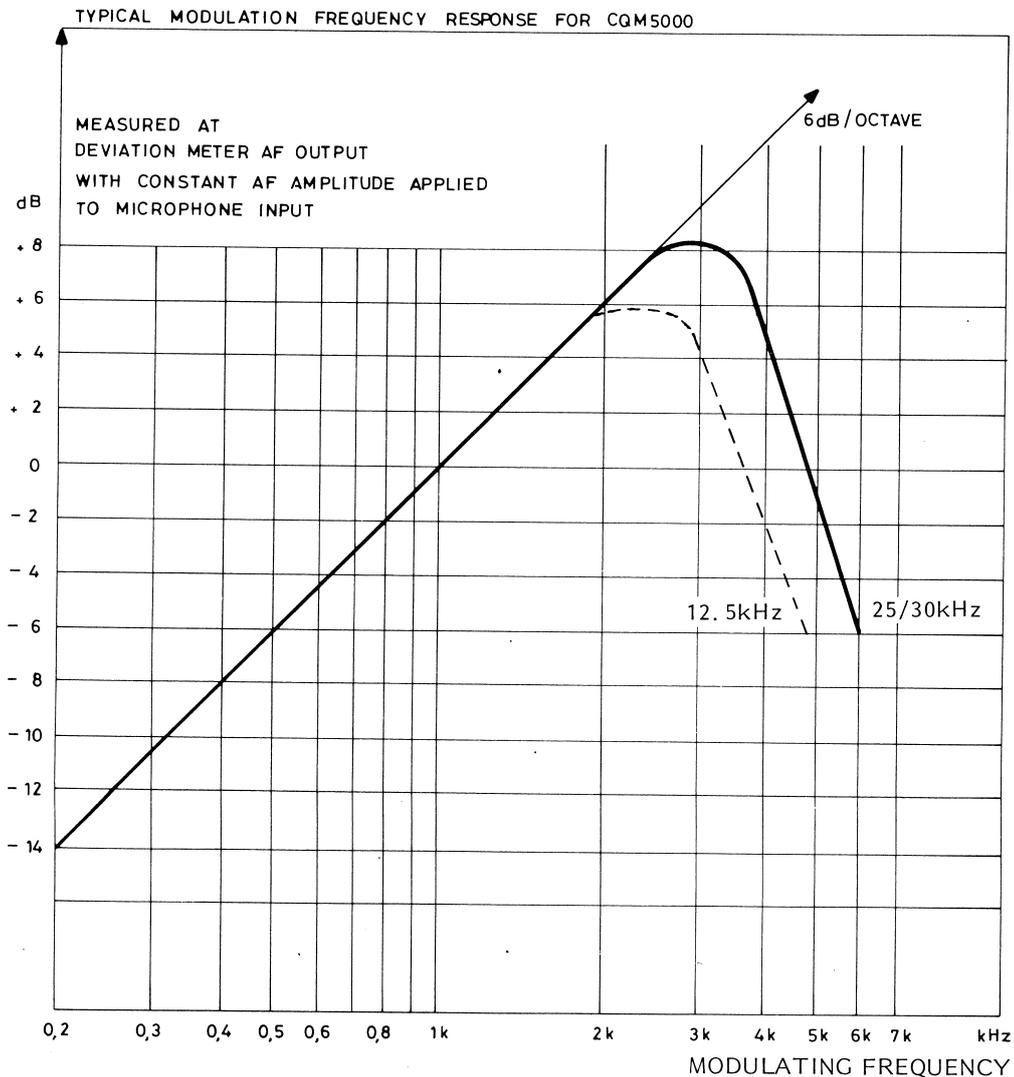
- CQM5112 : ± 1.0 KHz
- CQM5113 : ± 0.8 KHz
- CQM5114 : ± 0.5 KHz

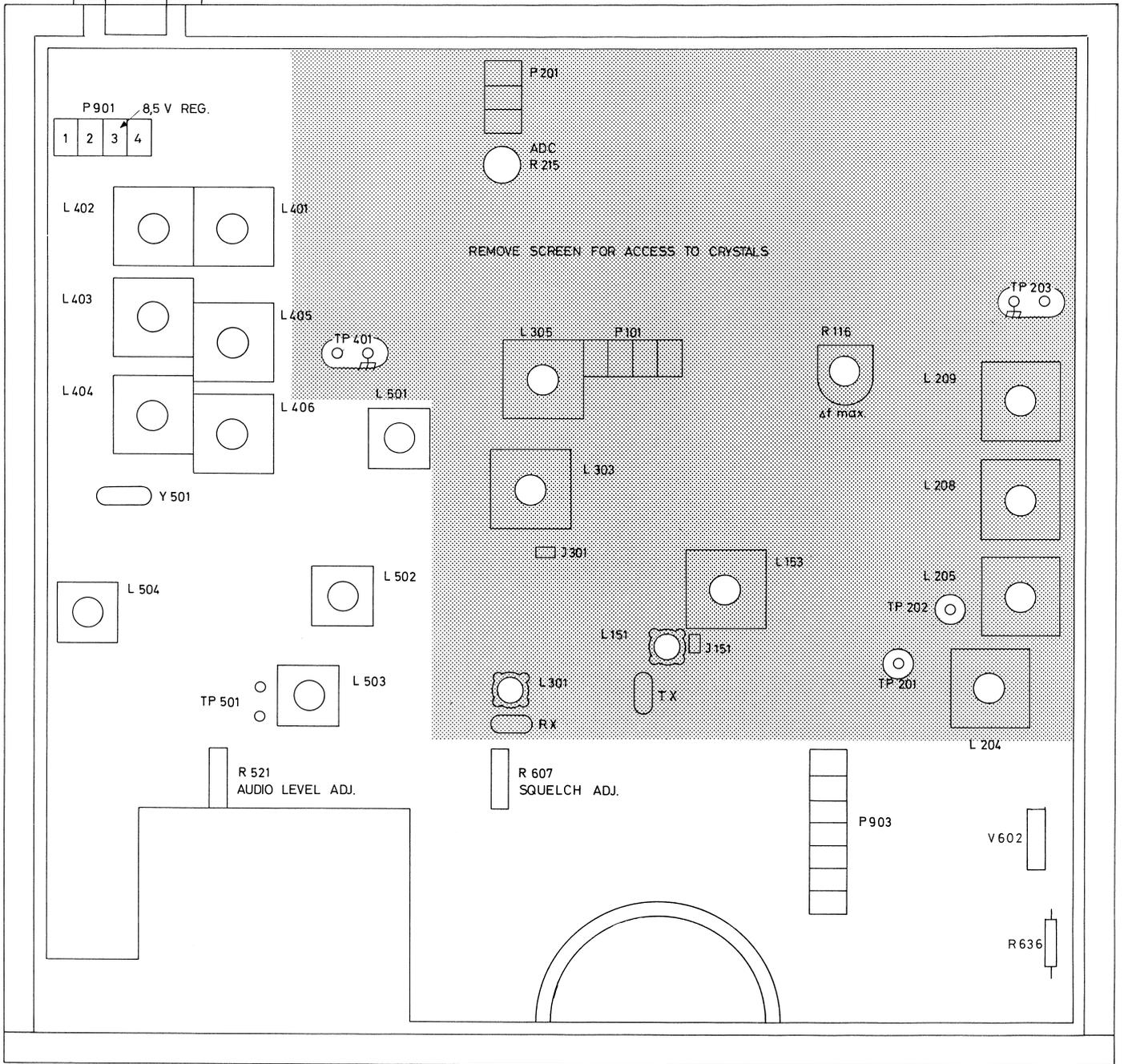
Vary the frequency of the generator and note the deviation changes as referred to the 1000 Hz value.

Requirement :

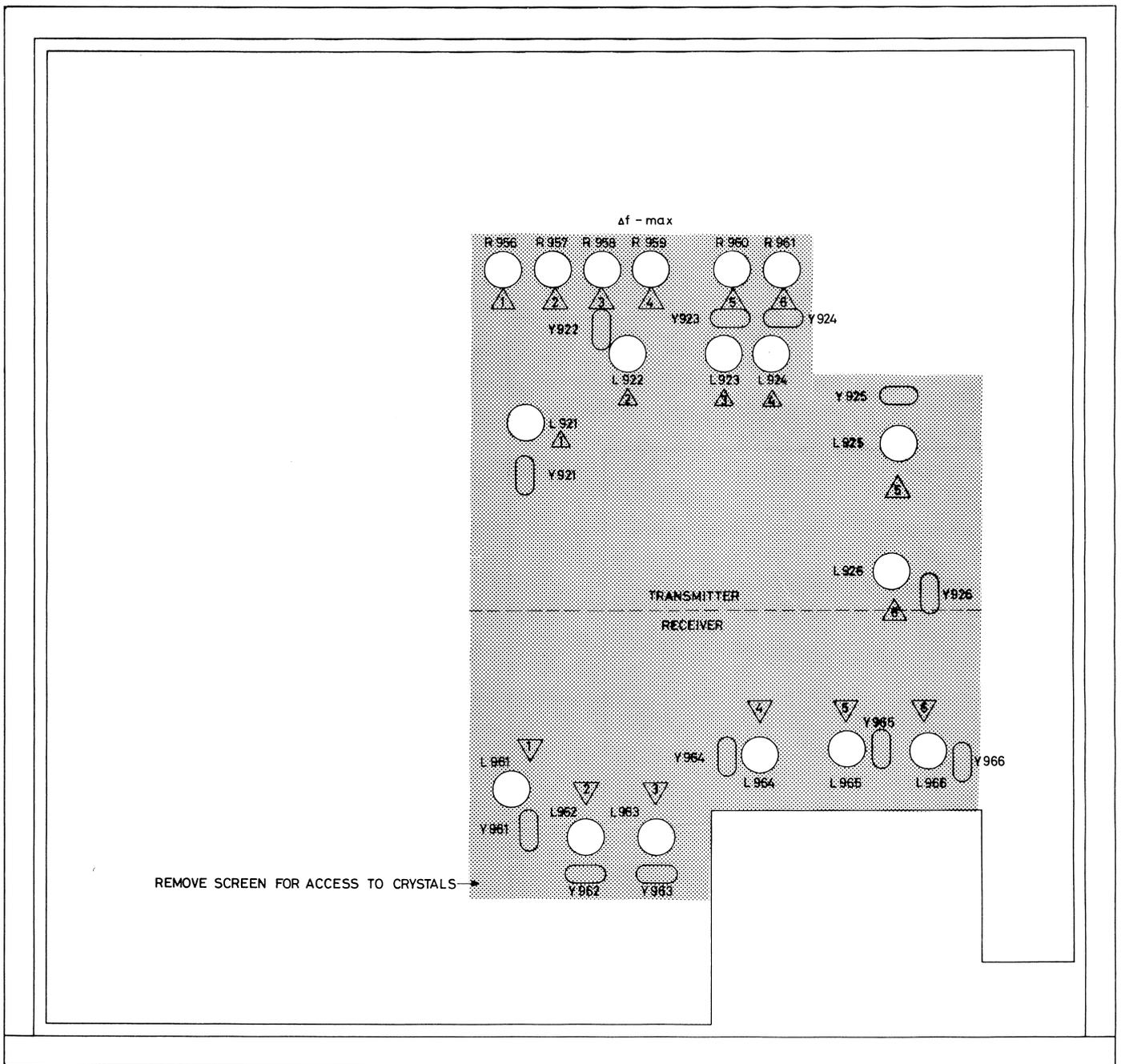
Within the frequency range 400-2700 Hz the frequency characteristic shall lie within + 1 dB/-1.5 dB related to a 6 dB/octave characteristic.

With 6 KHz modulation frequency the deviation shall be attenuated 6 dB below the 1 KHz value.





ADJUSTABLE COMPONENTS AND
TEST POINTS ON RF 5110



△x = RECEIVER CHANNEL

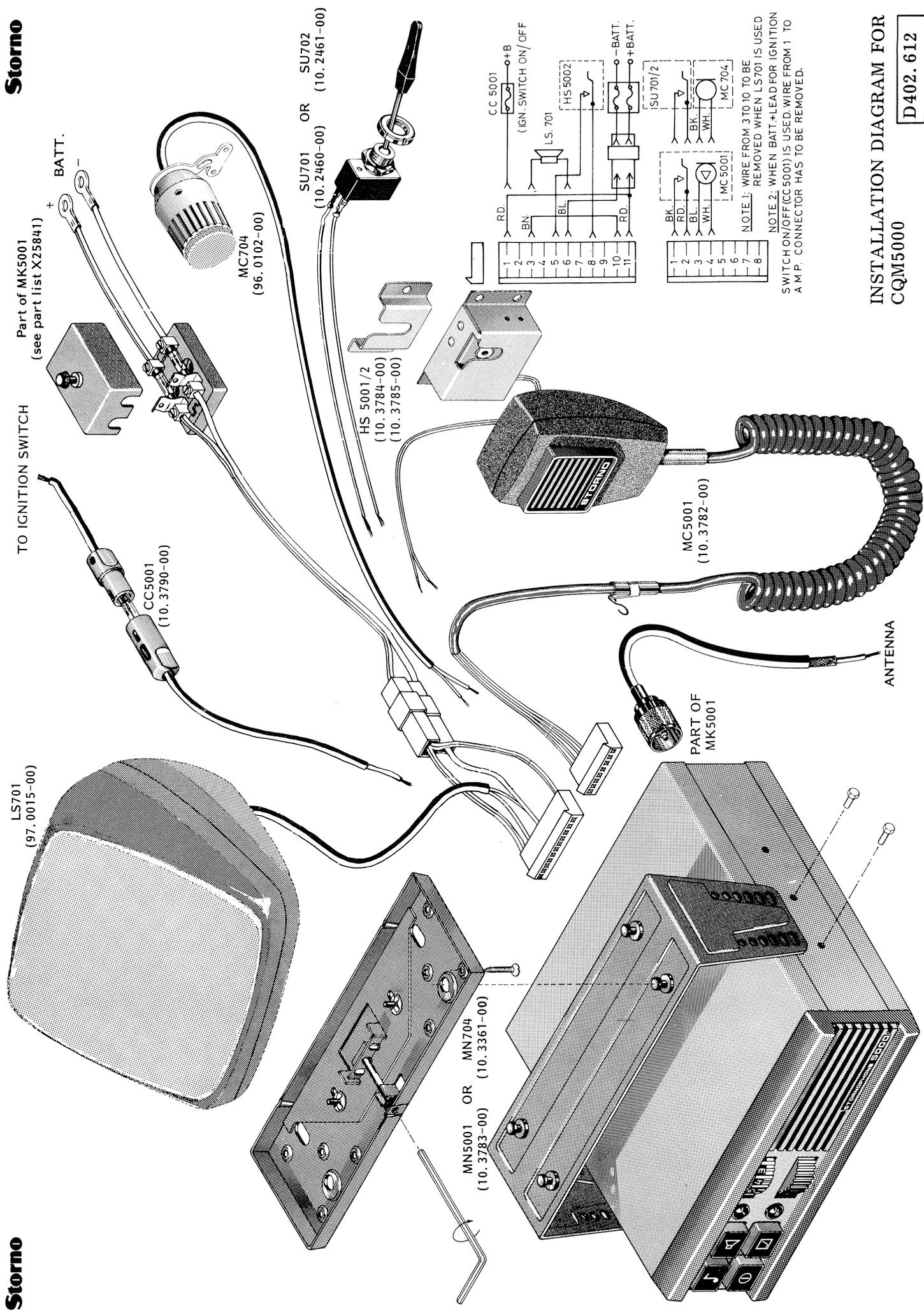
△x = TRANSMITTER CHANNEL

ADJUSTABLE COMPONENTS AND TEST POINTS ON XS5111 / XS5112

D402.624

Storno

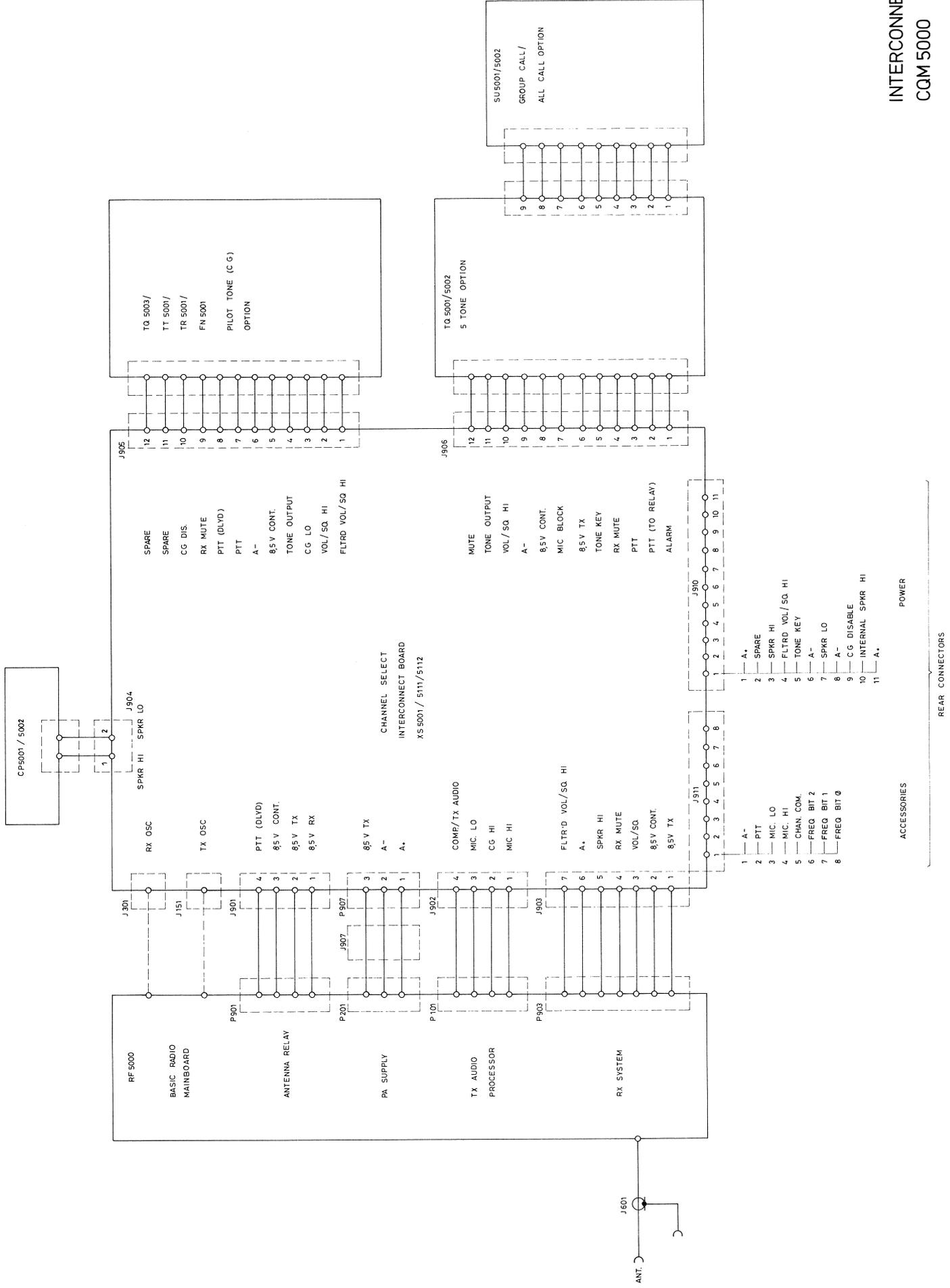
Storno

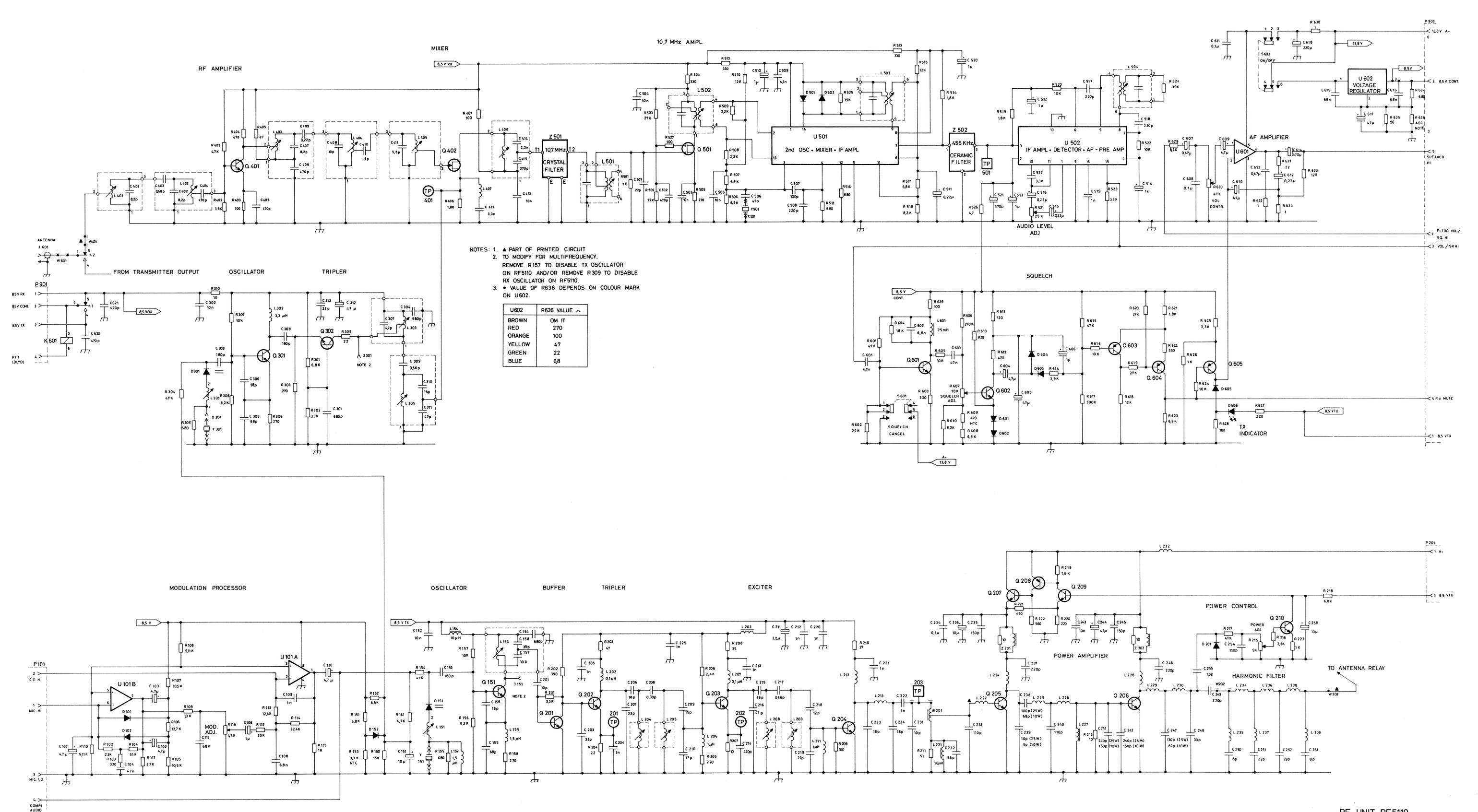


NOTE 1: WIRE FROM 3 TO 10 TO BE REMOVED WHEN LS701 IS USED

NOTE 2: WHEN BATT.-LEAD FOR IGNITION SWITCH ON/OFF (CC 5001) IS USED, WIRE FROM 1 TO A M.P. CONNECTOR HAS TO BE REMOVED.

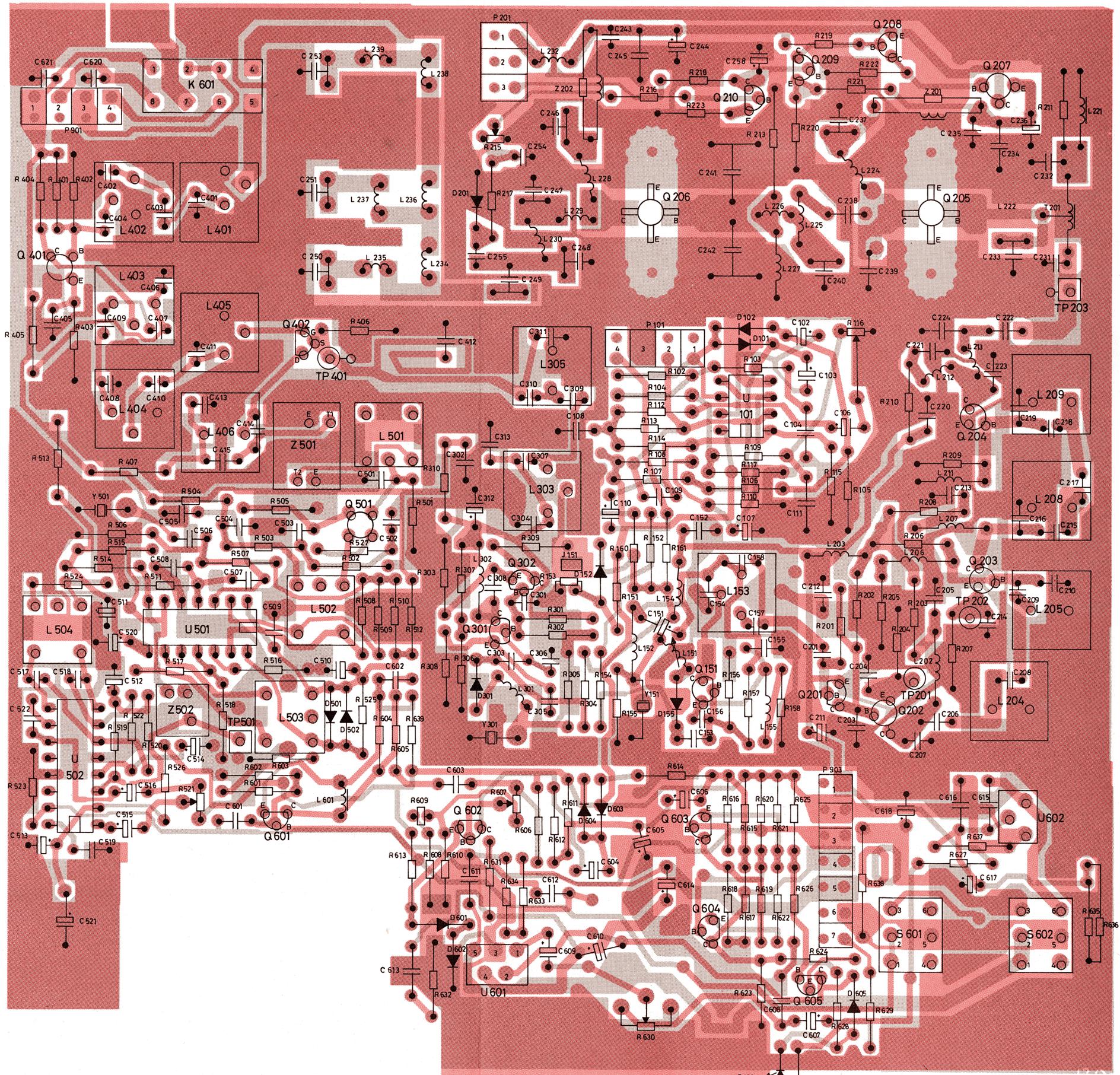
INSTALLATION DIAGRAM FOR
CQM5000
D402. 612

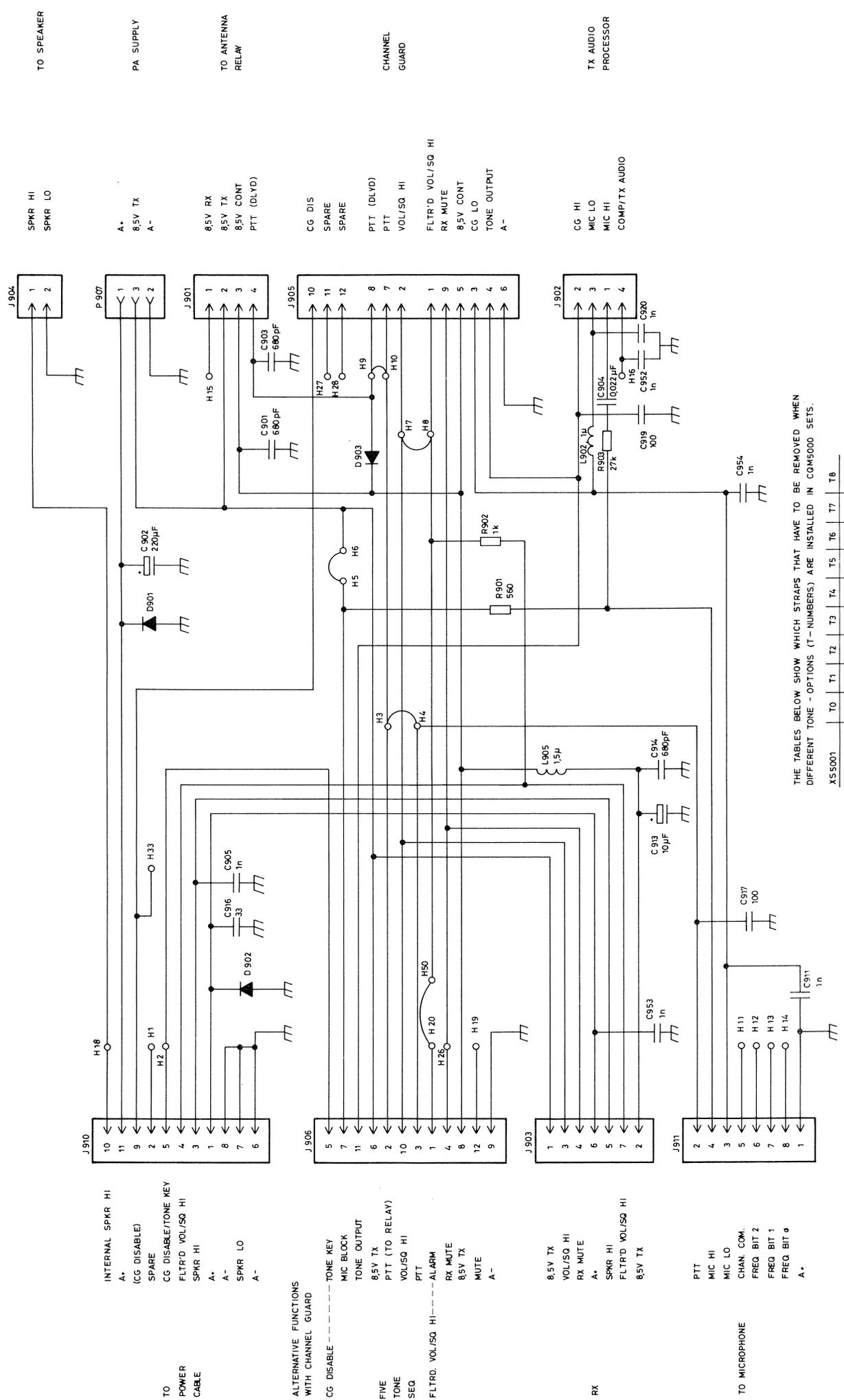




NOTES: 1. ▲ PART OF PRINTED CIRCUIT
 2. TO MODIFY FOR MULTIFREQUENCY, REMOVE R157 TO DISABLE TX OSCILLATOR ON RF5110 AND/OR REMOVE R309 TO DISABLE RX OSCILLATOR ON RF5110.
 3. * VALUE OF R636 DEPENDS ON COLOUR MARK ON U602.

U602	R636 VALUE
BROWN	OM IT
RED	270
ORANGE	100
YELLOW	47
GREEN	22
BLUE	6,8



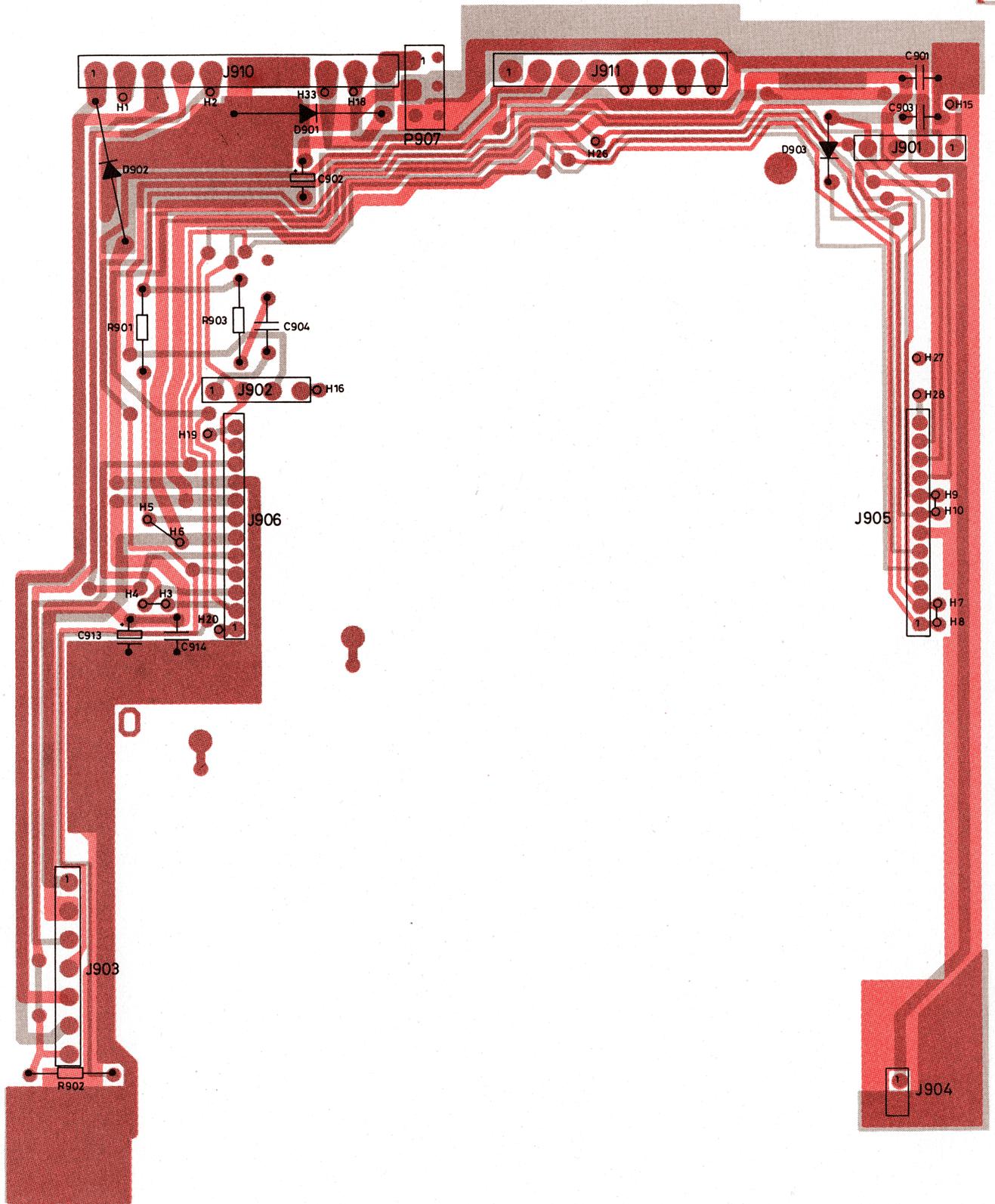


THE TABLES BELOW SHOW WHICH STRAPS THAT HAVE TO BE REMOVED WHEN DIFFERENT TONE - OPTIONS (T-NUMBERS) ARE INSTALLED IN COM5000 SETS.

XS5001	T0	T1	T2	T3	T4	T5	T6	T7	T8
H3 - H4	+	-	-	-	-	+	+	+	+
H5 - H6	+	-	-	-	-	+	+	+	+
H7 - H8	+	+	+	+	+	-	-	-	-
H9 - H10	+	+	+	+	+	-	-	-	-
H20 - H50	+	-	-	-	-	-	-	-	-

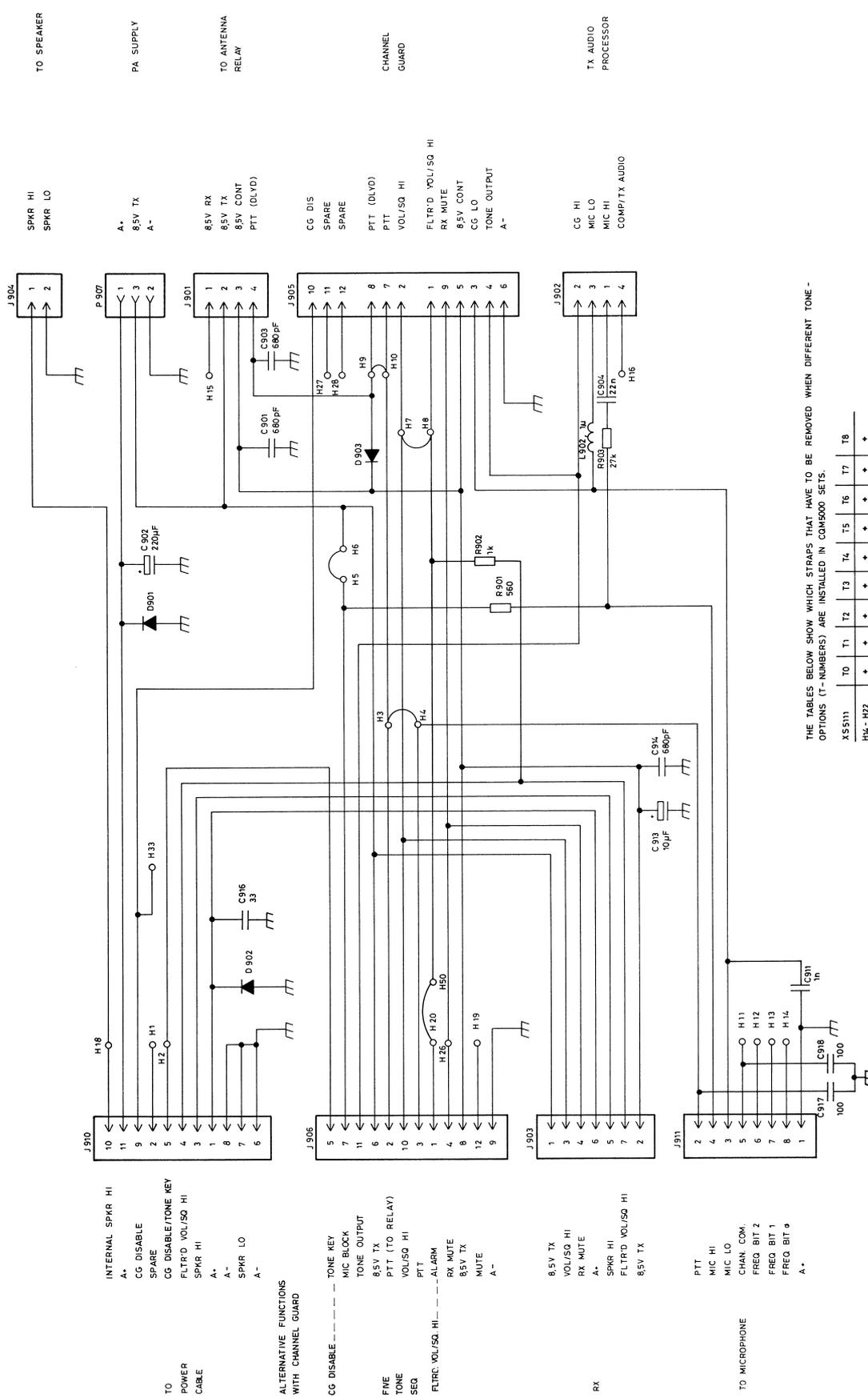
Storno

Storno



INTERCONNECT UNIT
XS 5001

D402.637

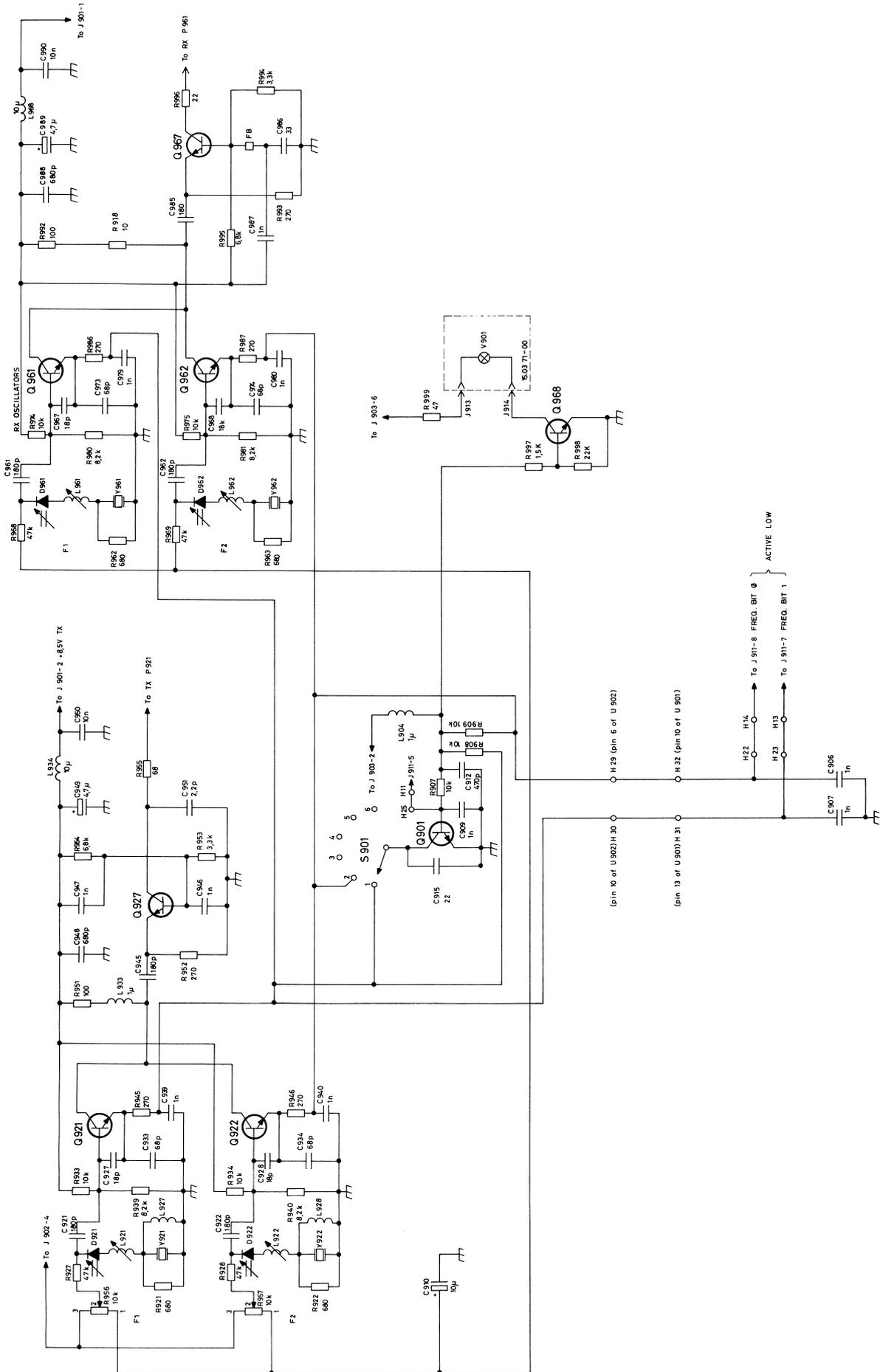


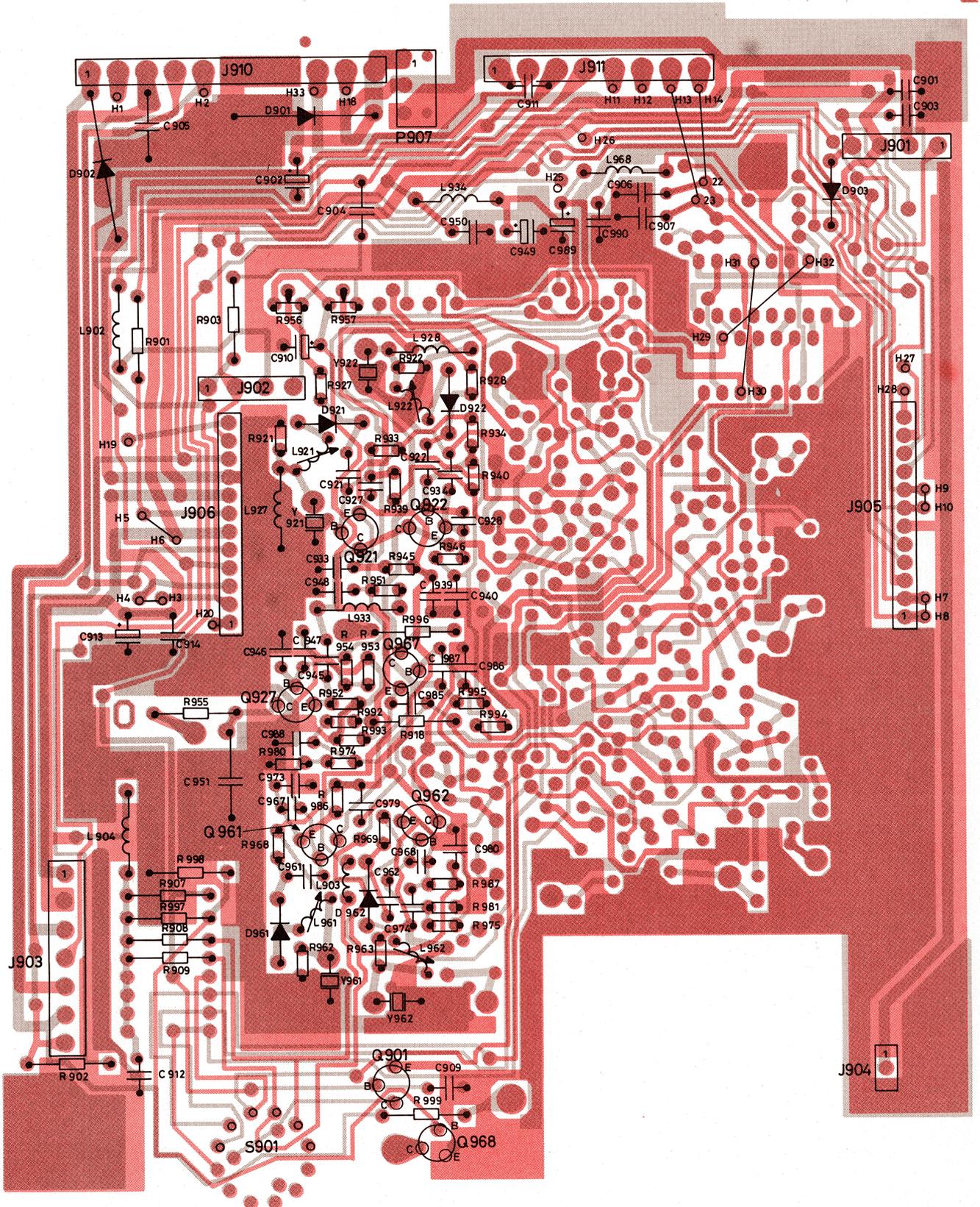
THE TABLES BELOW SHOW WHICH STRAPS THAT HAVE TO BE REMOVED WHEN DIFFERENT TONE-
OPTIONS (T-NUMBERS) ARE INSTALLED IN COM5000 SETS.

	T0	T1	T2	T3	T4	T5	T6	T7	T8
XS5111	+	+	+	+	+	+	+	+	+
H14 - H22	+	+	+	+	+	+	+	+	+
H13 - H23	+	+	+	+	+	+	+	+	+
H11 - H25	+	+	+	+	+	+	+	+	+
H32 - H29	+	+	+	+	+	+	+	+	+
H31 - H30	+	+	+	+	+	+	+	+	+
H3 - H4	+	+	+	+	+	+	+	+	+
H5 - H6	+	+	+	+	+	+	+	+	+
H7 - H8	+	+	+	+	+	+	+	+	+
H9 - H10	+	+	+	+	+	+	+	+	+
H20 - H50	+	+	+	+	+	+	+	+	+

CHANNEL SELECTOR UNIT
XS 5111

D.402.635





CHANNEL SELECTOR UNIT XS 511
INTERCONNECTION SECTION

D402.617

TO SPEAKER
 SPKR HI
 SPKR LO

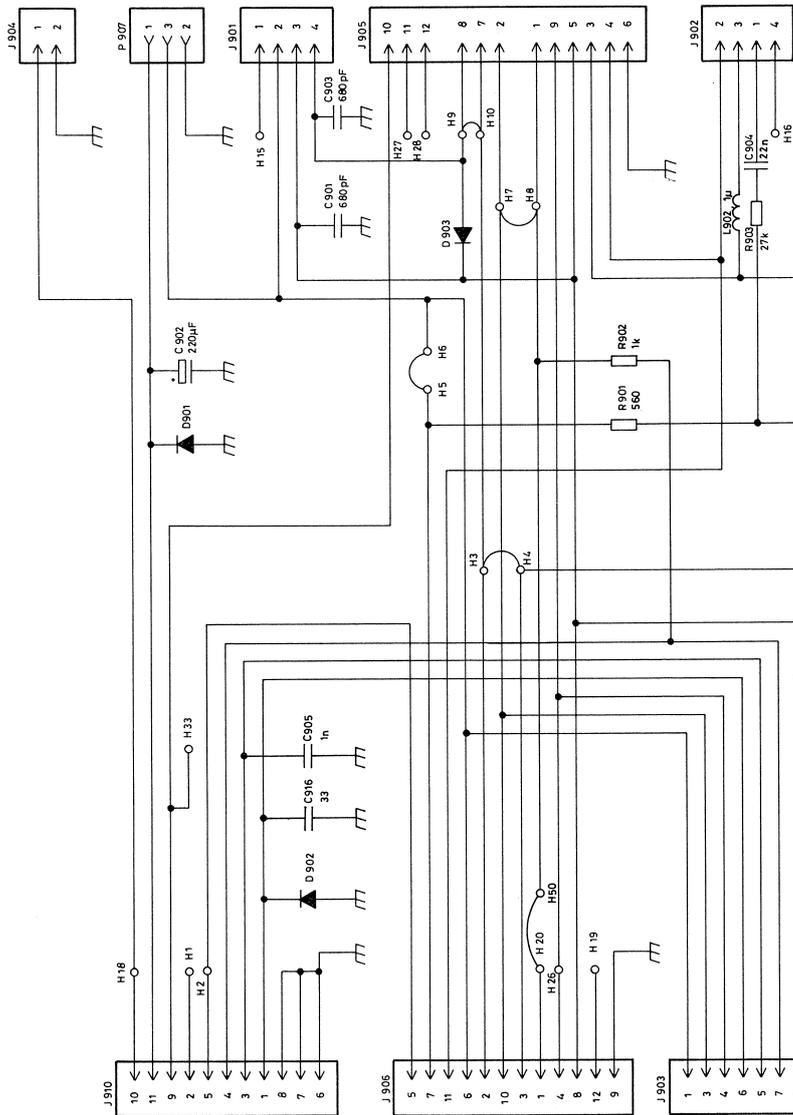
PA SUPPLY
 A+
 8.5V TX
 A-

TO ANTENNA
 RELAY
 8.5V RX
 8.5V TX
 8.5V CONT
 PTT (DLVD)

CHANNEL
 GUARD
 CG DIS
 SPARE
 PTT (DLVD)
 PTT
 VOL/SQ HI

FLTRD VOL/SQ HI
 RX MUTE
 8.5V CONT
 CG LO
 TONE OUTPUT
 A-

TX AUDIO
 PROCESSOR
 CG HI
 MIC LO
 MIC HI
 COMP/TX AUDIO



INTERNAL SPKR HI
 A+
 (CG DISABLE)
 SPARE
 CG DISABLE/TONE KEY
 FLTRD VOL/SQ HI
 SPKR HI
 A+
 A-
 SPKR LO
 A-

TO POWER
 CABLE

ALTERNATIVE FUNCTIONS
 WITH CHANNEL GUARD

CG DISABLE --- TONE KEY
 MIC BLOCK
 TONE OUTPUT
 8.5V TX
 PTT (TO RELAY)
 VOL/SQ HI
 PTT
 FLTRD VOL/SQ HI --- ALARM
 RX MUTE
 8.5V TX
 MUTE
 A-

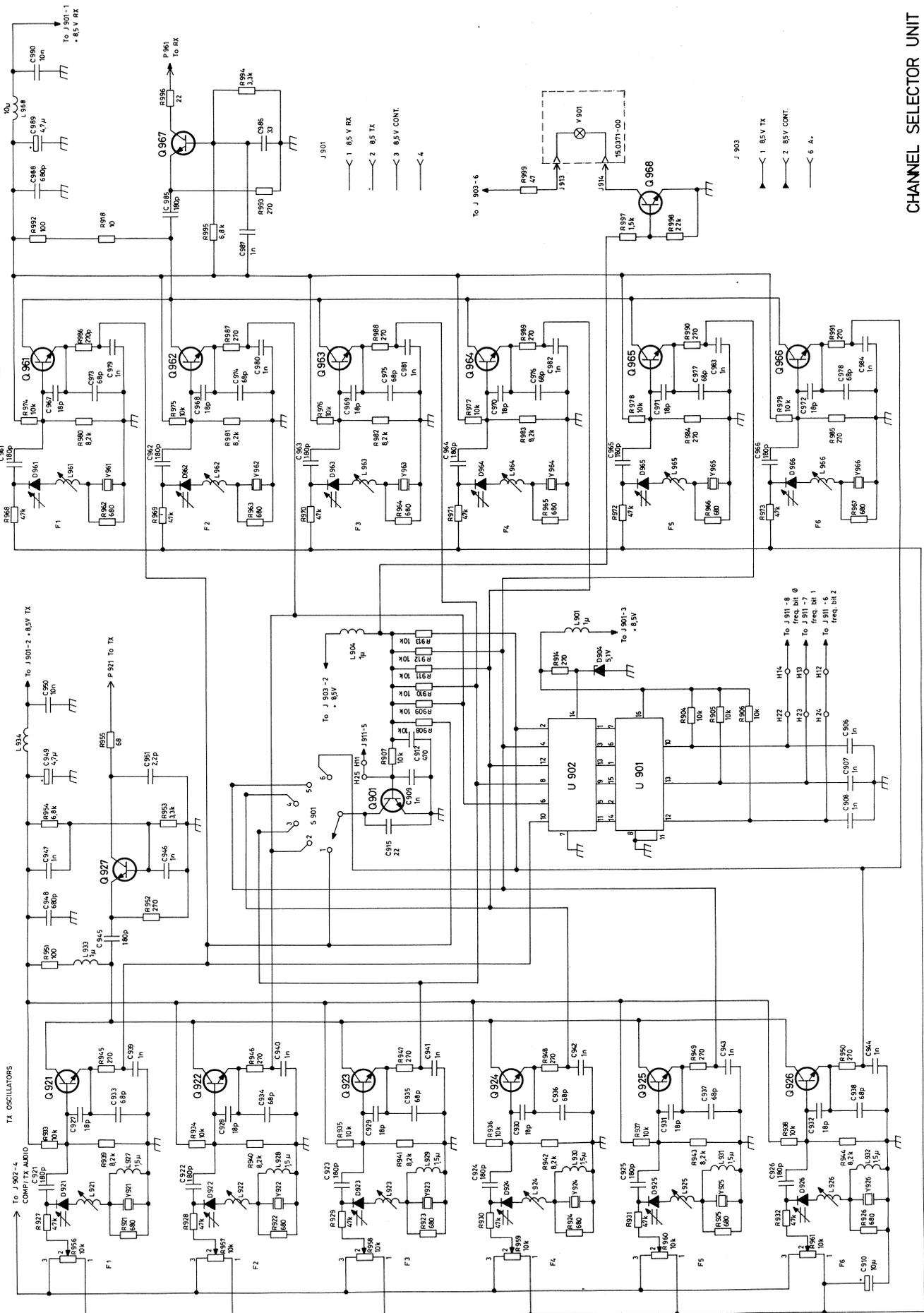
8.5V TX
 VOL/SQ HI
 RX MUTE
 A+
 SPKR HI
 FLTRD VOL/SQ HI
 8.5V TX

TO MICROPHONE

PTT
 MIC HI
 MIC LO
 CHAN COM
 FREQ BIT 2
 FREQ BIT 1
 FREQ BIT 0
 A+

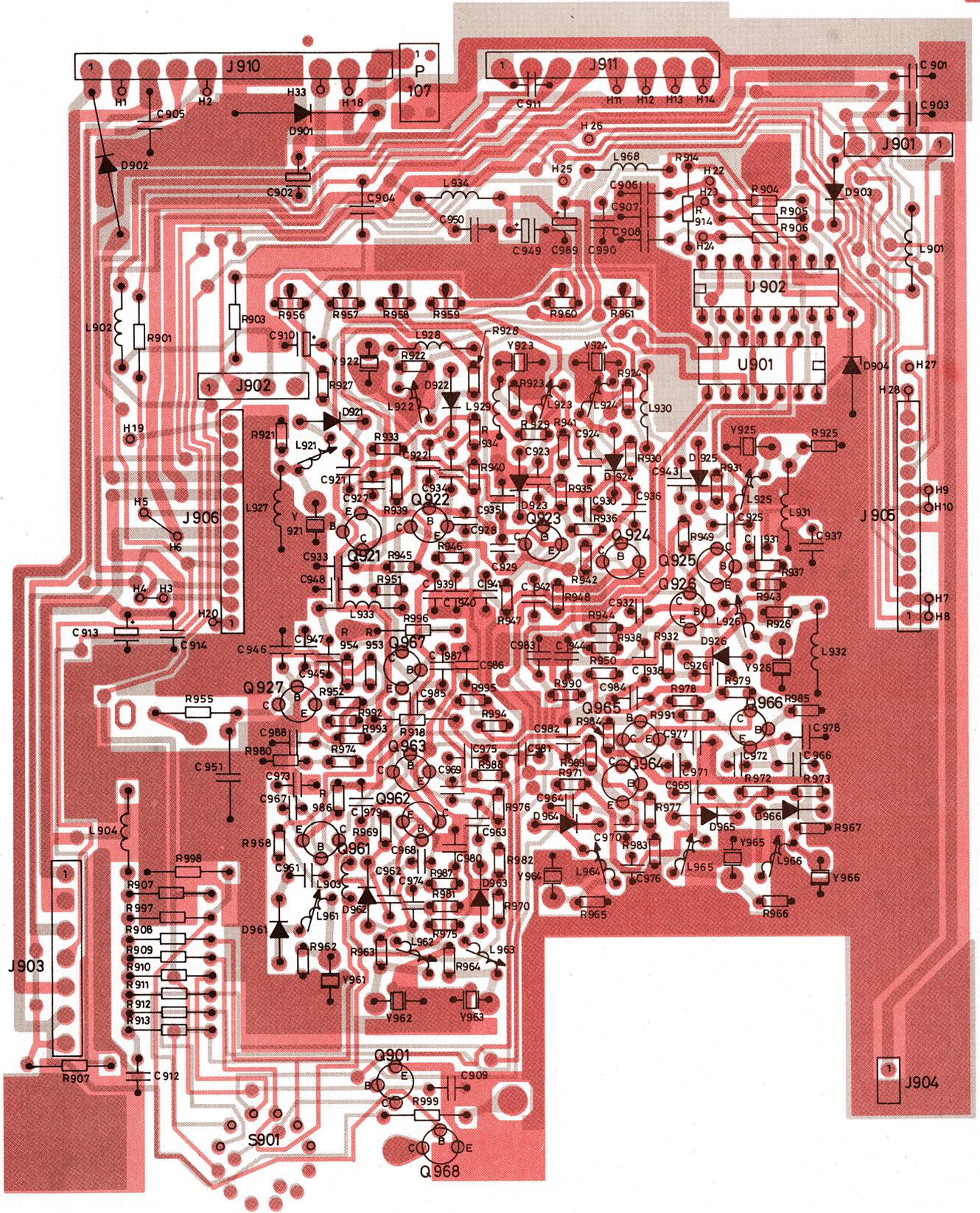
THE TABLES BELOW SHOW WHICH STRAPS THAT HAVE TO BE REMOVED WHEN DIFFERENT TONE - OPTIONS (T-NUMBERS) ARE INSTALLED IN COM5000 SETS.

XSS12	T0	T1	T2	T3	T4	T5	T6	T7	T8
H14 - H22	*	*	*	*	*	*	*	*	*
H13 - H23	*	*	*	*	*	*	*	*	*
H12 - H24	*	*	*	*	*	*	*	*	*
H11 - H25	*	*	*	*	*	*	*	*	*
H3 - H4	*	*	*	*	*	*	*	*	*
H5 - H6	*	*	*	*	*	*	*	*	*
H7 - H8	*	*	*	*	*	*	*	*	*
H9 - H10	*	*	*	*	*	*	*	*	*
H20 - H50	*	*	*	*	*	*	*	*	*



CHANNEL SELECTOR UNIT XS 5112
OSCILLATOR SECTION

D402.618



CHANNEL SELECTOR UNIT XS 5112
INTERCONNECTION SECTION

D402.619

TONE OUTPUT

VOL./SQ HI

+85V CONT.

+85V TX

ALARM

-A

MUTE

LS IN/OUT

TONE KEY

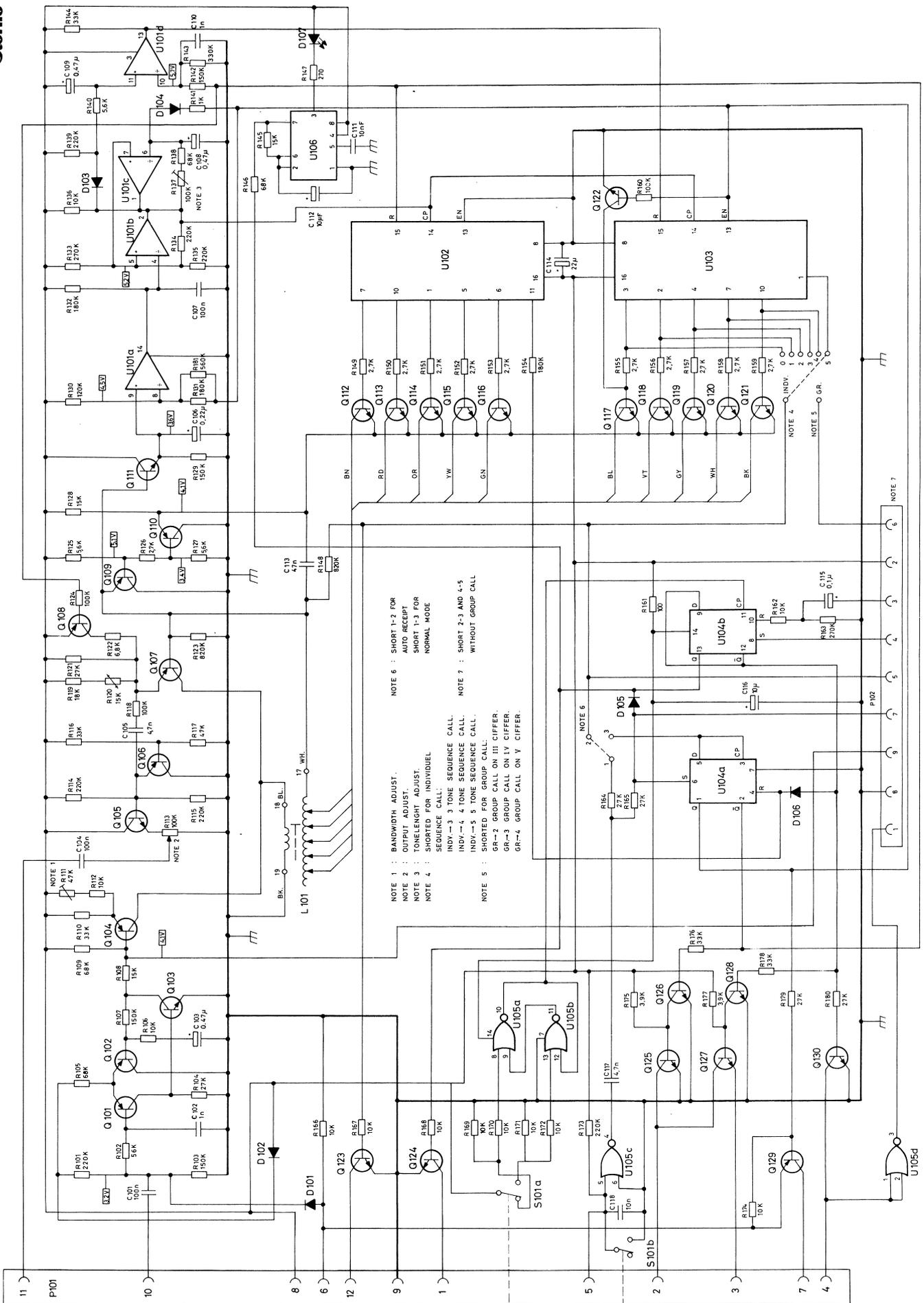
TONE KEY

PTT(TO RELAY)

PTT

MIC BLOCK

RX MUTE



NOTE 1 : BANDWIDTH ADJUST.

NOTE 2 : OUTPUT ADJUST.

NOTE 3 : TONELENGTH ADJUST.

NOTE 4 : SHORTED FOR INDIVIDUAL SEQUENCE CALL.

NOTE 5 : SHORT 2-3 AND 4-5 INDV -> 3 TONE SEQUENCE CALL.

NOTE 6 : SHORT 1-2 FOR AUTO RECEIPT.

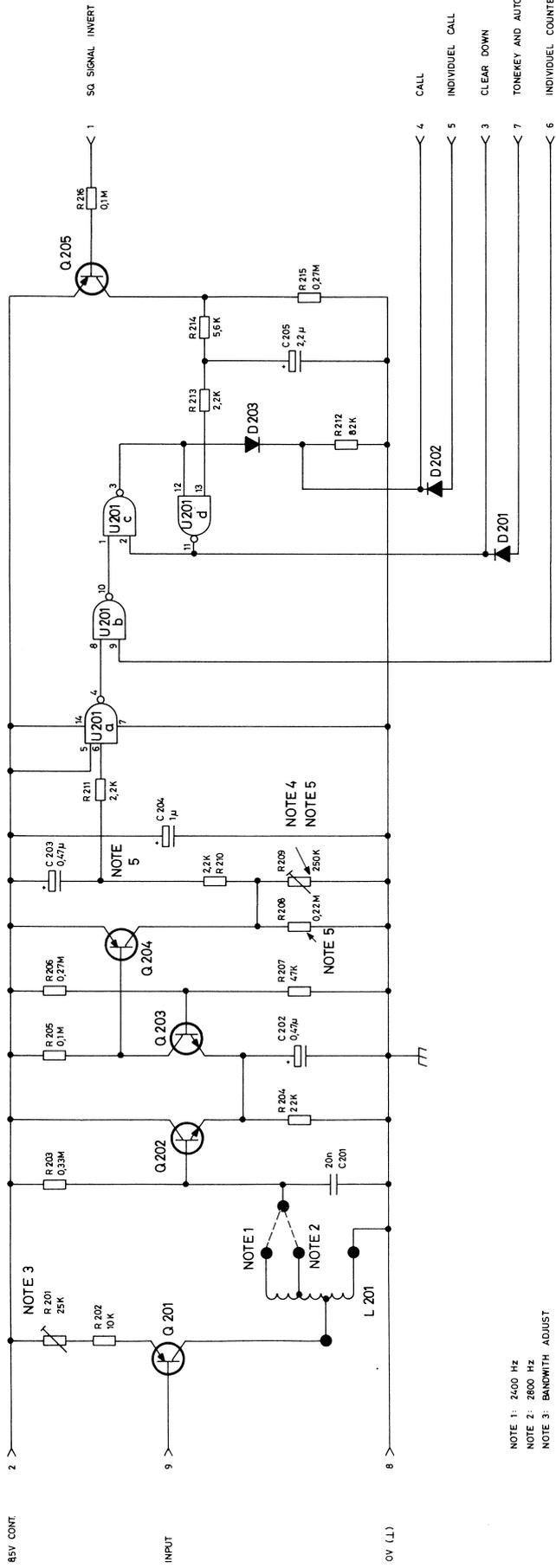
NOTE 7 : SHORT 1-3 FOR NORMAL MODE.

NOTE 8 : SHORTED FOR GROUP CALL.

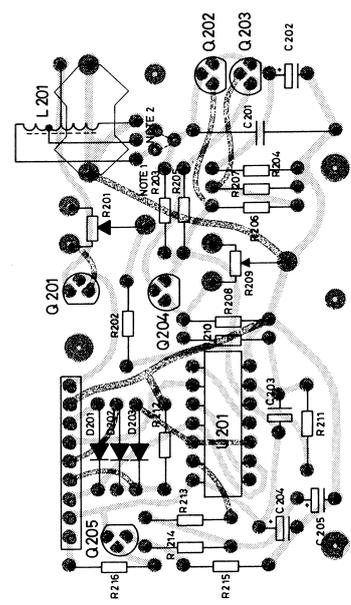
NOTE 9 : SHORTED FOR GROUP CALL ON III CIPHER.

NOTE 10 : SHORTED FOR GROUP CALL ON V CIPHER.

NOTE 11 : SHORTED FOR GROUP CALL ON V CIPHER.



- NOTE 1: 2400 HZ
- NOTE 2: 2800 HZ
- NOTE 3: BANDWIDTH ADJUST
- NOTE 4: SET UP TIME ADJUST
- NOTE 5: FOR SU 5002
- R 208 = 056 M
- R 209 = 500 K
- C 203 = 90UF716V

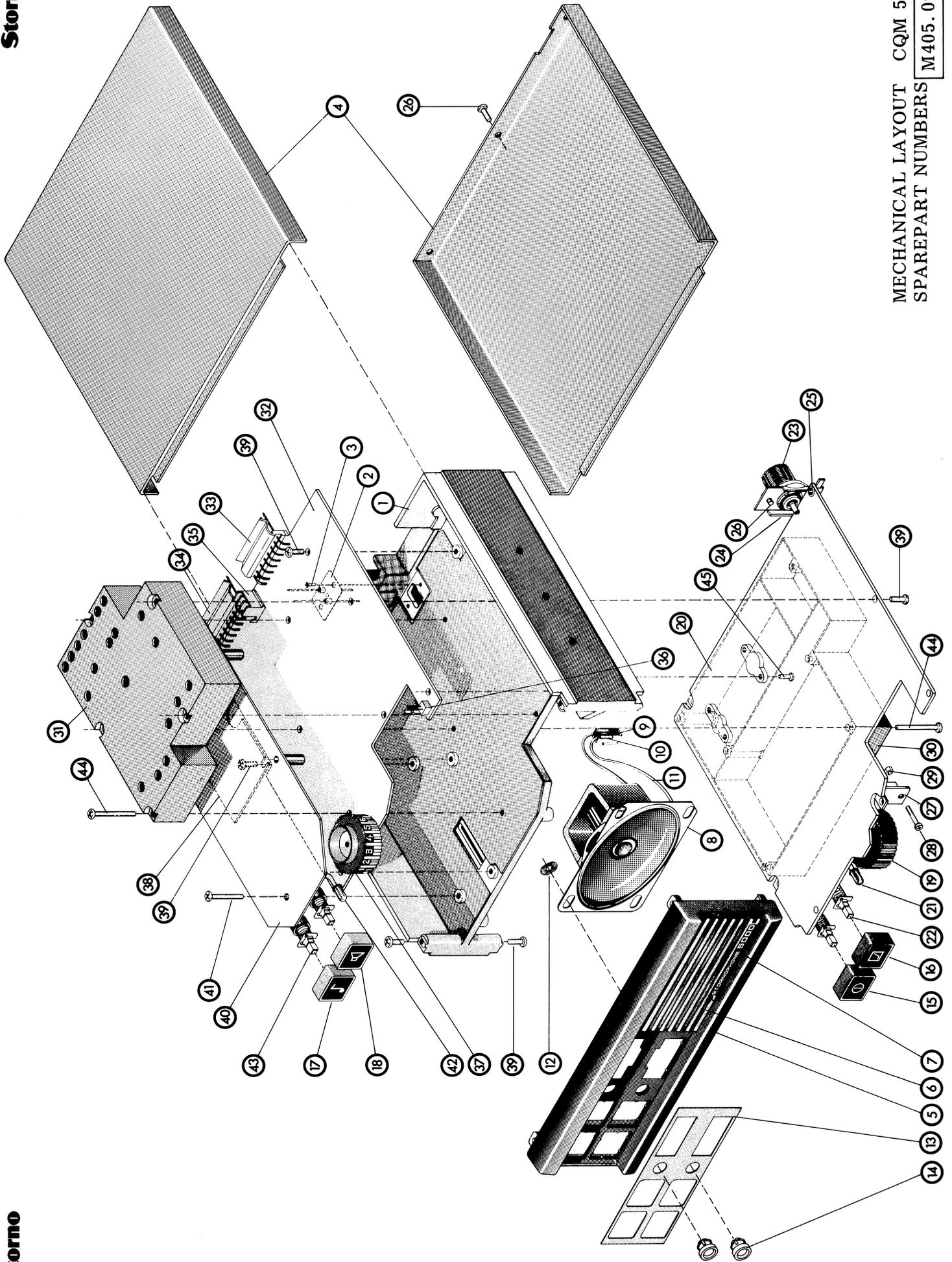


GROUP CALL - ALL CALL UNIT
 SU 5001, SU 5002

D402.620

Storno

Storno



MECHANICAL LAYOUT CQM 5000
SPAREPART NUMBERS M405.096

ITEM	CODE	DESCRIPTION
1	10. 3742-00	Cabinet Coffret
2	69. 0016-00	Feed through connector Connecteur d'alimentation
3	20022-02003	Screw M2x3mm Vis M2x3mm
4	11. 1177-00	Cover Couvercle
5	12. 0359-00	Front cap Moulded Avant (moulé)
6	12. 0360-00 12. 0363-00	L. S. grill, Eur. Colour (Ultrasonic Welded L. S. grill, U.S. Colour to item 5) Grill du H. P. couleur europ. (soudé à 5 Grill du H. P. couleur améric. par ultrasons)
7	51. 1167-00 51. 1168-00	Trade mark Eur. (Pasted on Trade mark U.S. item 6) Marque europ. (collée sur6) Marque améric.
8	97. 0018-00	Loudspeaker modified Haut-parleur modifié
9	41. 5546-00	Connector housing female Prise femelle pour connecteur
10	41. 5547-00	Crimp terminal for connector Embout pour connecteur
11	173. 5203-00	Wire for loudspeaker Fil du H. P.
12	2453-102040	Speed nut Ecrou
		Item No. 5 to 12 are assembled under one code No. 10. 3740-00 for Eur. and 10. 3741 for U. S.
		l'ensemble des pièces 5 à 12 a le numéro 10. 3740-00 (europ.) l'ensemble des pièces 5 à 12 a le numero 10. 3741 (améric.)
13	51. 1160-00 51. 1161-00 51. 1164-00 51. 1165-00	Nameplate } Nameplate } Eur. Version Nameplate } Plaque europ. Nameplate }
	51. 1169-00 51. 1170-00 51. 1173-00 51. 1174-00	Nameplate } Nameplate } U. S. version Nameplate } Plaque améric. Nameplate }
14	32. 0512-00	Bushing for led indicator Voyant pour diode lumineuse
15	490271-00 49. 0275-00	Push button (on/off) Eur. Bouton marche/arrêt europ. Push button (on/off) U. S. Bouton marche/arrêt améric.

ITEM	CODE	DESCRIPTION
16	490272-00 49.0276-00	Push button (SQ) Eur. Bouton de squelch europ. Push button (SQ) U.S. Bouton de squelch améric.
17	49.0273-00 49.0277-00	Push button (tone key) Eur. Bouton de tonalité europ. Push button (tone key) U.S. Bouton de tonalité améric.
18	49.0274-00 49.0278-00	Push button (LS. in/out) Eur. Bouton de H. P. europ. Push button (LS. in/out) U.S. Bouton de H. P. améric.
19	49.0267-00 49.0281-00	Knob volume control Eur. Bouton de volume europ. Knob volume control U.S. Bouton de volume améric.
		Item No. 13 to 19 are available as a Kit for name plate. At ordering of Kit or single item see choice sheet No. M405.096-4
		Les pièces 13 à 19 peuvent être com- mandées ensemble. Voir choice sheet M405.096-4
20	10.3732-00 10.3733-00 10.3734-00 10.3776-00 10.3735-00 10.3736-00	RF 5112-6/10 WATT RF 5112-25 WATT RF 5113-6/10 WATT RF 5113-25 WATT RF 5114-6/10 WATT RF 5114-25 WATT
21	99.5303-00	Light emitt. diode red Diode lumineuse rouge
22	470641-00	Switch Commutateur
23	41.5165-00	Connector UHF Connecteur UHF
24	33.0406-00	Braket Applique
25	305023-00	Tubular rivet Rivet tubulaire
26	20562-0306	Screw taptite M3x6 Vis M3x6
27	59.0049-00	Heat sink Radiateur
28	20022.02506	Screw M2, 5x6 Vis M2, 5x6
29	2202-025050	Nut M2, 5 Ecrou M2, 5
		Item No. 20 is fully assembled cir- cuit including item No. 21 to 29.
		20 complètement assemblé contient les pièces 21 à 29.

ITEM	CODE	DESCRIPTION
30	12.9358-00	Shield Ecran
31	12.0361-00	Shield Multifreq. Ecran multifreq.
32	10.3737-00 10.3738-00 20.3739-00	Channel selector unit XS5001 Channel selector unit XS5002 Channel selector unit XS5003 Sélecteur de canal XS5001, XS5002, XS5003
33	41.0231-00	Connector 8 pos. male Connecteur mâle 8 pos.
34	41.0232-00	Connector 11 pos. male Connecteur mâle 11 pos.
35	41.5545-00	Connector 3 pos. female Connecteur femelle 3 pos.
36	41.0225-00	Connector 2 pos. male Connecteur mâle 2 pos.
37	49.0268-00	Knob channel switch (only XS5002 and XS5003) Bouton de sélecteur de canal (pour XS5002 et XS5003 seul)
		Item No. 32 is fully assembled circuit including item No. 33 to 37.
		32 complètement assemblé contient les pièces 33 à 37.
38	10.3745-00 10.3746-00	Switching unit SU5001 Switching unit SU5002
39	20562-03008	Screw M3x8 mm Vis M3x8 mm
40	10.3743-00 10.3744-00	Tone transmitter/receiver TQ5001 Emetteur-récepteur de tonalité TQ5001 Tone transmitter/receiver TQ5002 Emetteur-récepteur de tonalité TQ5002
41	20562-03022	Screw M3x22 mm Vis M3x22 mm
42	99.5325-00	L.E.D. Yellow Diode lumineuse jaune
43	47.0642-00	Switch Commutateur
		Item No. 40 is fully assembled circuit including item No. 41 to 43.
		40 complètement assemblé contient les pièces 41 à 43.
44	20562-03028	Screw M3x28 mm Vis M3x18 mm
45	20022-2508	Screw M2, 5x8 mm Vis M2, 5x8 mm

* ONE CHANNEL ** MORE THAN ONE CHANNEL

TONE EQUIPMENT QOM 5000 T. No.	KIT WITH NAMEPLATE AND BUTTON		NAME PLATE						PUSH BUTTON								
	ONE CHANNEL	MORE THAN ONE CHANNEL	Eur.		US.				ON/OFF	SQ.	TS. IN/OUT	TS. IN/OUT					
	17.0116-00Eur. 17.0120-00Eur. 17.0122-00 US.	17.0117-00Eur. 17.0123-00 US.	17.0121-00Eur. 17.0127-00 US.	51.1160-00 *	51.1164-00 *	51.1161-00 **	51.1165-00 **	51.1169-00 *	51.1173-00 **	51.1170-00 **	51.1174-00 **	49.0267-00Eur. 49.0281-00 US.	49.0271-00Eur. 49.0275-00 US.	49.0272-00Eur. 49.0276-00 US.	49.0273-00Eur. 49.0277-00 US.	49.0274-00Eur. 49.0278-00 US.	
T0	1	1		1	1	1	1	1	1	1	1	1	1	1			
T1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T2		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T3		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T4		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T5	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T6	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T7	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T8	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T9		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T10		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T11		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T12		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T13		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T14		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T15		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T16		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T17		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T18		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T19		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T20		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T21		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T22		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T23		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T24		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

EXAMPLE: QOM 5112 Spec. 25x6 T2J → COMBINATIONS OF TONE EQUIPMENT
WATT → NUMBER OF CHANNELS

CHOICE OF NAMEPLATE KIT AND PUSH BUTTON

M40 5.096-4

The versions T9 - T24 incl. are not available until further notice is given.