

MOBILE RADIOTÉLEPHONE

MODEL STORNOPHONE 700

TYPE CQM713D x49 DK

TYPE CQM713D x46 N

TYPE CQM713D x63 N

Storno

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TYPE CQM713D x49 DK
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TECHNICAL SPECIFICATIONS

The stated specifications apply to all channels.

All measurements include antenna branching filter.

The receiver specifications are measured with simultaneously transmitting.

Figures given in brackets are typical values.

Measuring method references:

EIA: RS204

EIA: RS152A

TN: teledirektoratet Norge Nov. 73

MTD06 - 68181 - 1

GPO - W6289

GENERAL SPECIFICATIONS

Frequency range, transmitter

CQM713D x 49 DK: 159.4 MHz - 160.625 MHz
CQM713D x 46 N : 159.5 MHz - 160.625 MHz

Frequency range, receiver

CQM713D x 49 DK: 168.4 MHz - 169.625 MHz
CQM713D x 46 N : 167.5 MHz - 168.625 MHz

Duplex frequency separation

CQM713D x 49 DK: 9.0 MHz
CQM713D x 46 N : 8.0 MHz

RF Bandwidth

1.25 MHz

Channel frequency separation

25 KHz

Number of channels

CQM713D x 49 DK: 47
CQM713D x 46 N : 46

Type of modulation

Phase

Modulation frequency range

300 Hz to 3000 Hz

Maximum frequency deviation

± 5 KHz

Nominal frequency deviation

CQM713D x 49 DK: ± 3.3 KHz
CQM713D x 46 N : ± 3.0 KHz

Antenna impedance

50 Ω

Temperature range

Operating range: -25°C to +55°C
Functioning range: -30°C to +60°C

Dimensions

Locally controlled version: 180 x 250 x 70 mm
Extended local control: 180 x 210 x 70 mm
Antenna branching filter: 185 x 160 x 31 mm
Control unit CB704: 120 x 65 x 55 mm

Weight

Locally controlled version: 2.7 kg
Extended local control: 2.43 kg
Antenna branching filter: 0.8 kg
Control unit CB704: 0.2 kg.

RECEIVER SPECIFICATIONS

Sensitivity, e.m.f. for 12 dB SINAD, EIA.1.0 μ V, (0.7 μ V)Squelch sensitivity, EIA0.9 μ V, (0.5 μ V)Crystal oscillator frequency, RC712

CQM713D x 49 DK: 142.7 MHz

CQM713D x 46 N : 141.8 MHz

Frequency stability, -25⁰ C to +55⁰ C \pm 2 KHz (\pm 1.5 KHz)Modulation acceptance bandwidth, EIA \pm 5 KHz (\pm 7 KHz)Adjacent channel selectivity, EIA

70 dB (80 dB)

Spurious attenuation, EIA

75 dB (80 dB)

Spurious attenuation, TN

70 dB (75 dB)

Capture ratio, TN

8 dB (6 dB)

Intermodulation (EIA)

70 dB (80 dB)

Intermodulation (TN)

70 dB (75 dB)

Blocking (TN)90 dB / 1 μ V (96 dB / 1 μ V)Blocking (GPO)

< 1 dB

Spurious and harmonic emission
into an artificial load (TN)

< 2 nW (< 0.4 nW)

Loudspeaker impedance5 Ω Microtelephone impedance10.000 Ω AF output power, TN

2.0W (2.5W)

Harmonic distortion< 6% (3%) measured at 1 mV RF input,
1W AF output, $F_{mod} = 1$ KHz and
 Δf_{nom} Audio frequency characteristic, EIA-6 dB / octave + 0.5 dB / -3 dB (+ 0 dB / -1.5 dB)
300 - 3000 Hz

measured at the loudspeaker output.

Hum and noise60 dB (70 dB); squelched condition.
40 dB (45 dB); unsquelched condition.

TRANSMITTER SPECIFICATIONS

RF output

10 W - 1 dB

Crystal oscillator frequency, EX712

CQM713D x 49 DK: 144.4 MHz

CQM713D x 46 N : 144.5 MHz

Frequency stability, -25⁰C to +55⁰C \pm 2 KHz (\pm 1.5 KHz)Spurious radiationHarmonics, TN: < 2.5 μ W (< 0.2 μ W)
Adjacent channel, MTD: < 2 μ W (< 0.5 μ W)
Adjacent channel, TN: < 1 μ W (< 0.3 μ W)
Other frequencies, TN: < 0.5 μ W (< 0.2 μ W)Chassis radiation, TN< 300 μ V / m

AF input impedance560 Ω Modulation sensitivity, EIA110 mV \pm 1 dBModulation distortion, EIA

< 5% (2%)

Modulation distortion, TN

< 10% (3%)

Modulation frequency characteristic, TN+6 dB / octave +1 / -3 dB (+0 / -2 dB)
300 - 3000 HzFM hum and noise, EIA

-45 dB (-60 dB)

FM hum and noise, TN

-40 dB (-50 dB)

Transmitter load

Meets TN specifications pt. 7.1.

POWER SUPPLY SPECIFICATIONSNominal battery voltage

13,6 V

Current consumption

Receive, stand by: 1.0 A (0.8A)

Receive, 2W AF: 1.3 A (0.8A)

Transmit 10W : 4.0A (3.5A)

SR 781, TT781 and ID701 incl.

CQM713D

GENERAL DESCRIPTION

Introduction

The Sornophone CQM713D radiotelephone is a mobile transmitter/receiver for the duplex operated public radiotelephone systems in Denmark and Norway.

The only differences between the Danish system and the Norwegian system are the channel frequencies and the duplex spacing.

From the frequency allocation tables, it appears that channel numbers and channel frequencies are not systematized. This requires programmed frequency control units between the channel selector and the frequency synthesizer unit to produce the channels in the right order.

	Transmitter frequency range	Receiver frequency range	Duplex spacing
Denmark (DK)	159.4MHz - 160.625MHz	168.4MHz - 169.625MHz	9.0MHz
Norway (N)	159.5MHz - 160.625MHz	167.5MHz - 168.625MHz	8.0MHz

There are also two mechanical different systems available, local control and extended local control. Local control applies to the dashboard-mounted model with built-in loudspeaker, which is operated by controls on the front panel of the radio cabinet. Extended local control applies to the model which is operated from a dash-mounted control unit connecting to the radiotelephone proper via a cable and multiconnector. The radio chassis is then placed elsewhere in the vehicle. A separate loudspeaker must also be installed with the latter model.

Construction

The radio chassis slides into the cabinet from the front and is held in place by screws from the rear of the cabinet. The chassis consists of two circuit panels hinged on to the front control panel. When separated, the two chassis halves open out like a book.

A type plate located on the radio cabinet states the type designation of the radiotelephone, showing the service for which it is intended.

The upper circuit panel, designated RF713, contains all the circuits which are dependent upon channel frequencies. These are:

- preselector filter
- receiver synthesizer unit
- exciter
- RF amplifier
- transmitter power output amplifier

The lower circuit panel, designated BA702, contains:

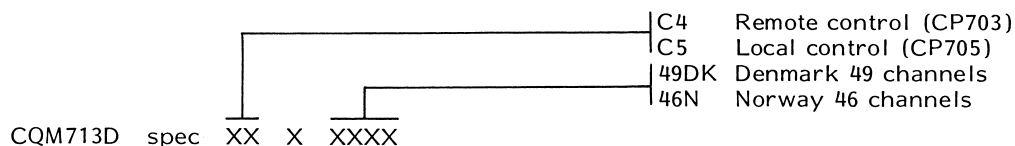
- intermediate frequency converter
- intermediate frequency amplifier
- squelch circuit
- voltage regulators
- tone equipment, where included.

Between the circuit panels and the front control panel are placed

- a frequency control unit
- a 5 volt switching regulator

The solid state circuitry is built up as functional modul units for ease in servicing.

Reading the type plate:



Control Equipment

The locally controlled model will have the following front panel:

CP705	Front panel with controls, built-in loudspeaker and channel selector.
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The CQM713D for extended local control will have a blank front panel with neither controls nor loudspeaker and is designated CP703.

One of the following types of control units, intended for dashboard-mounting, must also be installed for extended local control:

CB704	Control unit housed in a cast plastic cabinet and containing operating controls for the radiotelephone.
CB2706	Automatic control unit housed in a cast aluminium cabinet and containing operating controls for the radiotelephone.

Accessories

Accessories available for the CQM713D radiotelephone are listed in this section. Some of them, such as installation materials, antenna and microphone, are necessary in order to install and to operate the equipment.

Microphones

MC701	Fixed microphone with built-in amplifier.
MC703	Fixed microphone for mounting on steering wheel column.
MT702	Handset with built-in amplifier and transmitter keying switch.
HS702	Retainer for MT702.

All of the above items are supplied with cables for termination in a multiconnector providing connections between accessories and the radio cabinet.

MK704	To bring the microphone into close talk position this mounting kit consisting of 2 flexible metal tubes (goose necks), length 20 and 35cm, is available.
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Channel Indicator

ID701	Channel indicator for displaying the channel in operation. The indicator can be used with all types of control unit.
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Antenna

AN195	1/4 wave length whip antenna for the 146174MHz frequency band and the impedance matches 50 Ω . Base design permits mounting from the outside without damaging the car upholstery.
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Installation Kits

The installation of a CQM713D radio set will require some or all of the following installation kits.:

MN701	Mounting frame for radio cabinet.
CC704	Cable kit containing extension cable terminated in multiconnectors for control unit CB704 and accessories.
CC701	Battery cable.
CC2705	Extension cable for automatic control unit CB2706 and accessories.
MK701	Mounting kit containing connectors for connecting battery, antenna and accessories to the radio cabinet plus fuse box and fuses for installation in series with battery cable.

Loudspeakers

When using the extended control system it is necessary to install an external loudspeaker. The following type is available:

LS701	Loudspeaker enclosed in a plastic housing, complete with cable to be soldered to the accessory connector.
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External Switches, Relays, etc.

SU701	Transmitter keying device for mounting on steering column.
SU702	Transmitter keying device for mounting on dashboard.
SU703	Auto relay for equipment with built-in tone receivers, connects to external alarm devices such as auto horn, etc.

Power Supplies

PS701	Power supply for 24V car battery, any battery polarity.
PS702	Power supply for 24V car battery, negative pole to chassis.

CQM713D

CIRCUIT DESCRIPTION

General

The nominal 12V supply from the battery is applied to the connector designated "BATT". A reverse biased zener diode across the battery input protects the radiotelephone against incorrect supply polarity. The supply voltage is fed, via a transient filter, to both the ON/OFF switch and to the transmitter power amplifier through a transistor switch.

The filtered battery voltage is applied to two 9 volt regulators which supply the transmitter and receiver sections, to the receiver audio output amplifier and to the tone equipment.

The incoming signal passes through the antenna branching filter unit (BF) to the input of the receiver.

The audio from the receiver is applied to the loudspeaker (LS) or to the microtelephone (MT). The output level is adjusted by means of the volume control.

The squelch button is provided to override the squelch function of the receiver.

As may be seen from the simplified functional diagram, the receiver output may be connected to the sequential tone receiver SR781 used in selective tone signalling systems. The tone receiver enables the AF output circuits to be switched on and off.

In systems using selective calling, the loudspeaker will normally be switched off using the LS ON/OFF button.

When a tone call, correct for the tone receiver setting, is received, the loudspeaker will be switched on automatically. The tone receiver also controls the "CALL" and "ENGAGED" lamps indicating that a call has been received or that the radio channel is occupied. These lamps are not used in radiotelephones not fitted with tone receivers.

The modulating signal to the transmitter is derived from the microphone (MC) or the microtelephone (MT) via the tone generator TT781.

During transmissions of a tone signal, the microphone signal is switched off automatically so that the transmitter is modulated by the tone signal only.

The transmitter is keyed by depressing the transmit button, which operate the transmitter voltage regulator and a transistor switch to the transmitter power amplifier. The "transmitter on" condition is indicated by the transmit indicator lamp.

If the radiotelephone is fitted with a tone receiver, the transmitter cannot be operated until the loudspeaker has been switched ON manually by means of the loudspeaker ON/OFF button.

RECEIVER

The receiver is a double conversion superheterodyne using intermediate frequencies of 10.7MHz and 455KHz. The high RF sensitivity characteristic of the receiver is provided by a five element helix filter having low insertion loss.

Adjacent channel selectivity is obtained by using two band pass filters:

- a 10.7 MHz crystal filter and
- a 455 KHz ceramic filter.

The receiver comprises the following subunits:

- Antenna branching filter BF713
- Preselector filter BP712
- Receiver converter with
- 1st mixer, local oscillator
- and synthesizer mixer RC712
- Intermediate frequency
- converter with 10.7 MHz
- crystal filter, 2nd mixer,
- 2nd local oscillator and
- 455 kHz ceramic filter IC703

- 455 kHz intermediate frequency
- amplifier, squelch circuit, AF ampli-
- fier and voltage regulator CF702

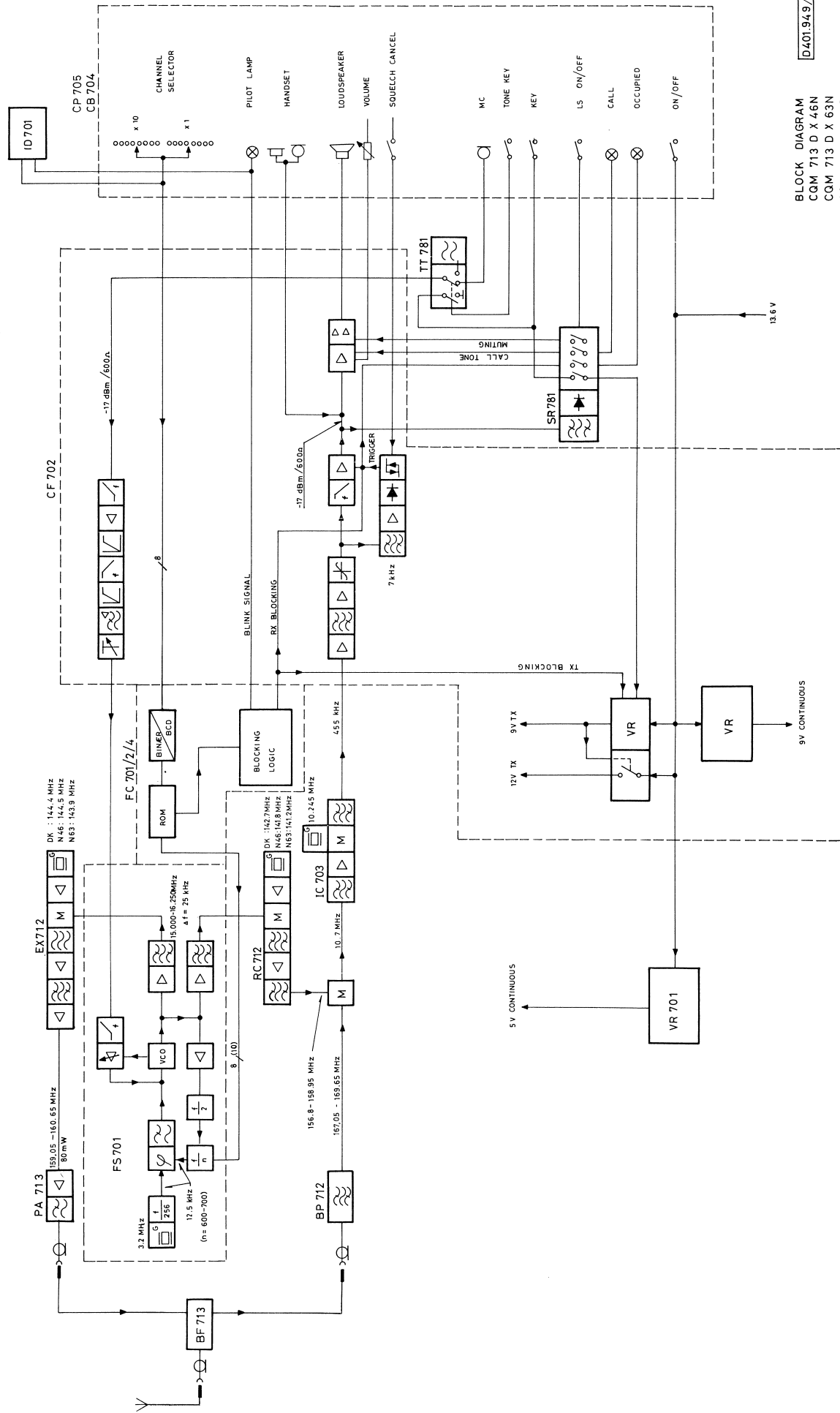
Signal Path

From the antenna branching filter unit the input signal is passed through the preselector filter and an impedance matching network directly to the mixer stage. Because of the low insertion loss in the filter, it has been possible to obtain excellent receiver sensitivity without an RF amplifier stage. This approach has resulted in superior blocking, selectivity, and intermodulation characteristics of the receiver. The BP712 filter consists of five tuned circuits which can be adjusted over the band. The coupling between the filter and the mixer stage is provided by an impedance matching network loaded to a low Q. This network transforms the output impedance of the filter to the impedance required by the field-effect transistor (FET) of the mixer stage.

The local oscillator signal and the received signals are applied to the gate of the FET. The mixer output at 10.7KHz is taken from the drain circuit.

The mixer injections signal is 10.7MHz below the antenna frequency and is produced by mixing the signal from a crystal oscillator with the synthesizer signal.

The crystal oscillator is a 7th overtone series resonance oscillator; which is followed by a double-gate-FET buffer amplifier. The buffer output is mixed with the synthesis signal in



D401.949/2

BLOCK DIAGRAM
COM 713 D X 46N
COM 713 D X 63N
COM 713 D X 49DK

a second FET and the mixer output is filtered and amplified in order to obtain adequate drive for the RF mixer. The filters are helix circuits in order to suppress spurious signals, especially the oscillator frequency.

The conversions can be expressed as follows:

$$f_{RX} = f_{xRX} + f_S + IF_1$$

f_{RX} = Antenna frequency

f_{xRX} = Crystal oscillator frequency

f_S = Synthesizer signal frequency

$IF_1 = 10.7\text{ MHz}$

Intermediate Frequency Circuits.

From the mixer in RC712 the 10.7 MHz signal passes to the intermediate frequency converter, type IC703, which provides the channel selectivity of the receiver. The first IF signal passes through the 10.7 MHz crystal filter and is then amplified in a single IF amplifier stage. It is then applied to the transistor in the 2nd mixer stage and converted to the second IF signal of 455 kHz.

The injection signal to the mixer stage is generated by a crystal oscillator whose frequency is 455 kHz below 10.7 MHz. The crystal frequency is calculated:

$$10.7\text{ MHz} - 0.455\text{ MHz} = 10.245\text{ MHz}$$

The second intermediate frequency signal from the mixer stage proceeds through the 455 kHz ceramic filter in the IC703 converter and is then applied to the intermediate frequency amplifier in CF702.

The 455 kHz intermediate frequency amplifier consists of two RC coupled stages followed by a double tuned filter and a three stage integrated circuit amplifier. The last two stages provide the required limiting of the signal.

The amplified and limited signal is then demodulated in a phase detector incorporated in the integrated circuit.

The balanced quadrature detector also provides efficient rejection of any amplitude modulated signals that may be present.

The detector has only one tuned circuit and is simple to adjust.

AF Circuits

The demodulated signal is fed through a de-emphasis network to a potentiometer, preset to suit the AF signal level obtained from the detector. This level depends on the maximum frequency deviation in use as determined by the channel spacing of the receiver.

The signal is then applied to a three stage amplifier in which a fieldeffect transistor, operating as an electronic on/off switch, has been placed between the second and third stages. This switch is controlled by the squelch circuit. The amplifier has a nominal output level of -17 dBm (110 mV).

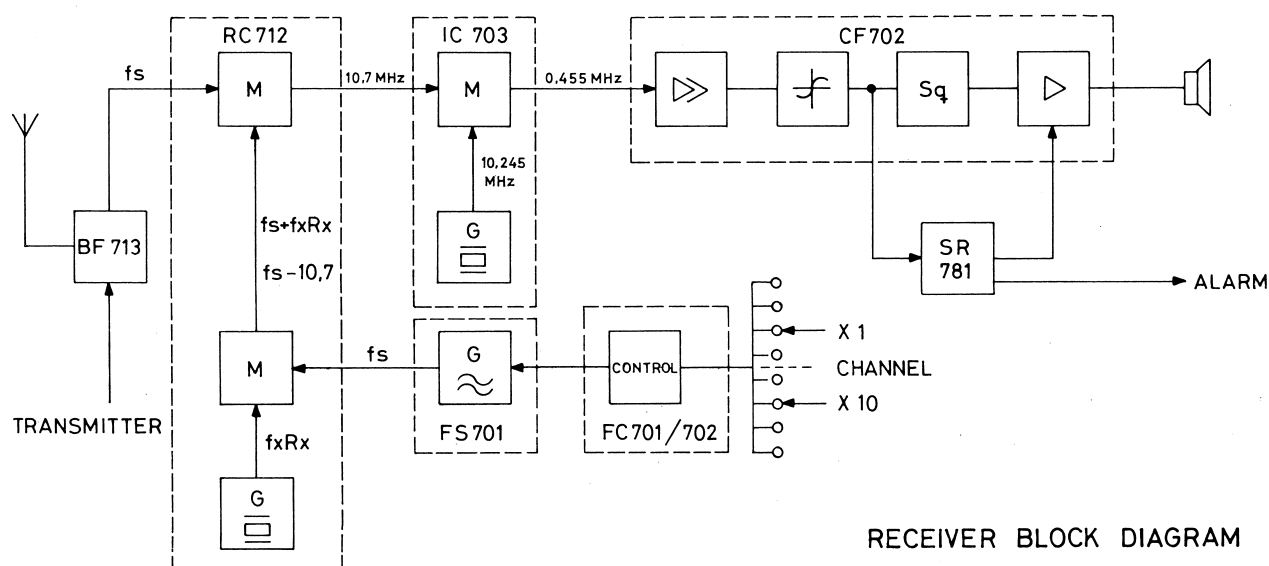
The signal is passed to the loudspeaker amplifier and to the tone receiver, if fitted.

The loudspeaker amplifier amplifies the AF input signal of 110 mV to an output level of 2W into a 5 Ω load. The input stage is a high-pass active filter which attenuates frequencies below 250 Hz.

A variable resistor, forming part of the collector load, permits a preset 12 dB adjustment of the gain.

Manual gain adjustment, and thus loudspeaker output level, is effected by the volume control on the control panel of the radiotelephone. Electrically, the volume control is connected between the first and second AF amplifier stages.

The AF output stage consists of two complementary power transistors operating in Class AB pushpull.



RECEIVER BLOCK DIAGRAM

Temperature compensation and negative feedback are employed in the output amplifier to improve stabilization.

By applying a positive voltage to a "muting terminal" on the output amplifier it is possible to mute the AF output to the loudspeaker. This muting occurs during periods of transmission and when controlled by tone equipment, if fitted.

Squelch Circuit

The squelch circuit in CQM700 is operated by noise components in the demodulated signal.

The AF signal from the discriminator is passed to a frequency selective amplifier with a resonant circuit as the collector load.

The noise signal is passed through an amplitude selective noise amplifier, rectified and applied to a Schmitt trigger, which controls the electronic switch in the AF circuit.

When the noise level exceeds a certain value, i. e. when the signal to noise ratio falls below a certain value, the trigger circuit is activated and the AF output signal is switched off.

The Schmitt trigger also controls a squelch signal circuit which, in conjunction with a tone receiver, will operate the "engaged" lamp when there is traffic on the channel.

The squelch sensitivity is adjusted by a potentiometer located at the input of the noise amplifier.

The Schmitt trigger can be blocked manually by means of the squelch button on the control panel of the radiotelephone, thus overriding the squelch circuit.

TRANSMITTER

The transmitter is phase modulated and the output frequency is produced by mixing the synthesizer signal with the signal from a crystal controlled oscillator.

The transmitter comprises the following subunits:

Exciter with crystal oscillator and mixer circuits	EX712
RF amplifier	RA711
RF power amplifier	PA713
Antenna Branching filter	BF713

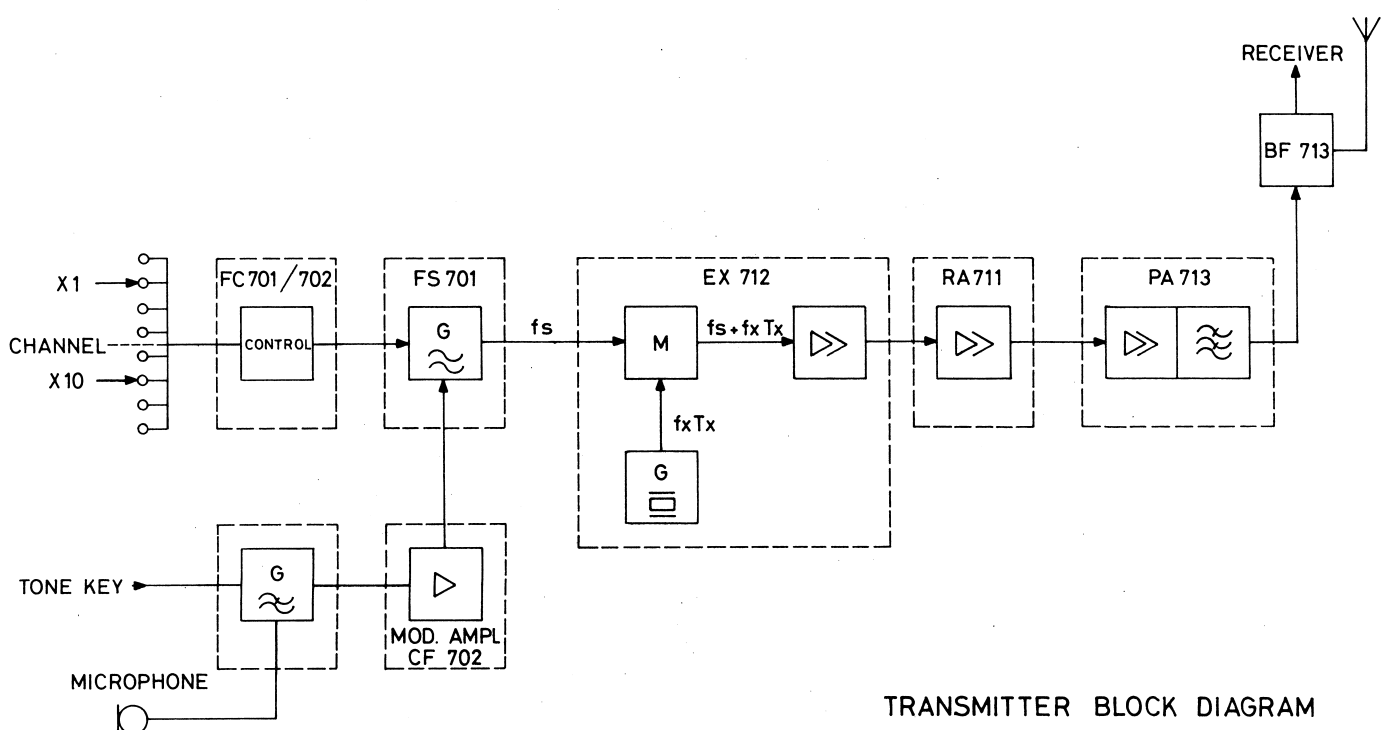
Modulation amplifier, transmitter switch and voltage regulator CF702 (these circuits constitute part of CF702).

AF Circuits

The modulating signal from the microphone is fed, through the tone generator to the modulation amplifier where it is differentiated, amplified, limited, integrated and filtered. The modulation amplifier transforms the microphone output to a signal suitable for the modulator and limits the signal amplitude so that the maximum permissible frequency deviation is not exceeded.

The modulation amplifier is designed around an integrated circuit containing two operational amplifiers. Differentiation is performed by an RC network at the input of the first amplifier. A high degree of negative feedback ensures constant gain of the amplifier which also operates as an amplitude limiter.

The output signal is then applied through an RC network to a second limiter consisting of two dual diodes.



TRANSMITTER BLOCK DIAGRAM

This limiter has been provided to prevent the modulator from being overdriven at low modulating frequencies. For normal frequencies and deviations the limiter will be inoperative.

Before being applied to the modulator, the modulating signal is filtered in a harmonic filter which has been designed as an active element using the second amplifier of the integrated circuit.

A potentiometer located at the output of the modulation amplifier is used to adjust the maximum frequency deviation.

RF Circuits

The RF signal is generated in a crystal controlled oscillator contained in the exciter EX712.

The oscillator signal is applied to a buffer amplifier, whose output is mixed with the synthesis signal. The mixer output is filtered and amplified in order to obtain an adequate signal for the RA711.

In order to suppress spurious signals, especially the oscillator frequency, 3 circuit helix filters are used.

The conversions can be expressed as follows:

$$f_{TX} = f_{xTX} + f_S$$

f_{TX} = Transmitting frequency

f_{xTX} = Crystal oscillator frequency

f_S = Synthesizer signal

The output signal from the exciter is fed to an RF amplifier (RA711) operating at the final frequency of the transmitter. Tuned input and output band pass filters of the amplifier provide additional selectivity and thus also attenuation of undesired signals. The amplifier raises the signal to the level required by the final RF power amplifier PA713. The nominal RF output power of RA711 is 100 mW into 50 Ω load.

RF Power Amplifier

The power amplifier contains three transistor amplifier stages. The coupling between the stages consists of tuned matching networks with low loaded Q values.

The RF power amplifier is a high efficiency Class C amplifier. An Automatic Drive Control (ADC) circuit in the power amplifier unit regulates the supply voltage to the first stage and consequently the drive to the following stages. The purpose of the ADC circuit is to prevent overloading the power transistor, and to reduce the dependence of the output of the RF power amplifier on supply voltage and ambient temperature.

The transmitter output power is adjusted to the required level by means of a potentiometer provided in the ADC circuit.

Antenna Circuits

The signal generated by the transmitter is passed through a low pass 7pole Chebich filter. The antenna filter having low insertion loss and ripple attenuates signals at undesired frequencies to an acceptable low level, e.g. harmonics of the transmitter frequency.

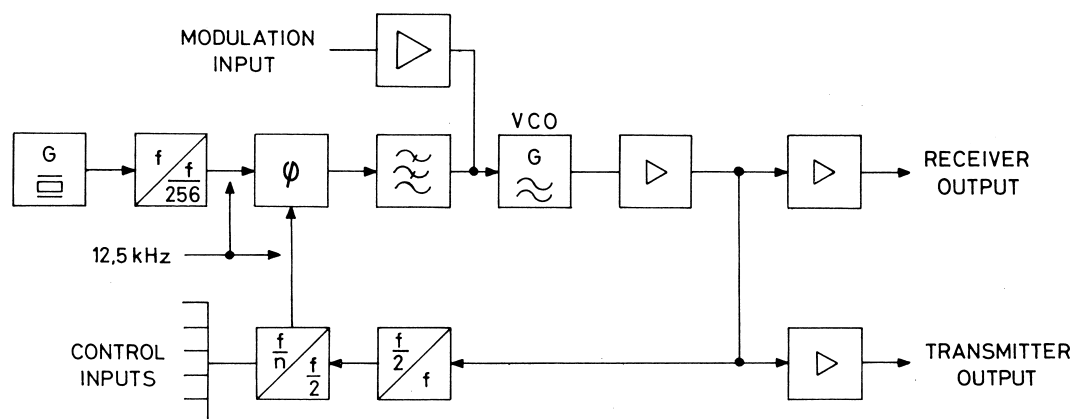
The antenna filter is not adjustable.

The transmitter signal at the output connector is fed through the antenna branching filter BF713 to the antenna.

Synthesizer Circuits.

The frequency synthesizer unit FS701 produces the synthesizer signal by the digital frequency synthesis method.

The signal is generated in a voltage controlled oscillator VCO whose output is amplified. The VCO is part of a phase locked loop consisting of a buffer amplifier, a programmable frequency divider, a phase detector, a prescaler and a low pass filter.



SYNTHESIZER BLOCK DIAGRAM

The phase detector compares the divided VCO frequency to a 12.5 KHz reference frequency. Any difference in frequency will be opposed by the DC voltage at the low pass filter output adjusting the VCO frequency up or down until it locks to the reference frequency.

The 12.5 kHz reference frequency is produced by dividing the output of a 3.2 MHz crystal controlled oscillator by 256.

The RC oscillator frequency and the EX oscillator frequency are so chosen, that the lowest transmitting frequency corresponds to dividing by 600 in the programmable divider. The three decades in the counter are controlled by the 9-complement of the divisor expressed in the BCD code.

Frequency control

The incoherency between channel numbers and frequencies requires a frequency control unit (FC701 or FC702) to convert the channel number to the corresponding divisor. The conversion takes place in two 256 bit ROMs (Read Only Memory) programmed to produce the 9-complement BCD code at the output when receiving the channel number BCD code at the input.

The inputs and the outputs of the two ROM's are connected in parallel and the enable input used to select the active ROM.

32 channels (00-31) are contained in the first ROM and the following 32 channels (32-63) in the second ROM.

The channel information from the channel selector is transmitted in the BCD code.

The ROM inputs, however, requires the number to be expressed in the binary code and the conversion is implemented by IC1 and IC2.

The circuits in FC701/FC702 allow conversion of maximum 64 channels, the remaining 36 channels are blocked by additional logic circuits.

Channels not used in the public radiotelephone service are also blocked, as the blocking information is programmed into the ROM's. When the channel selector is set to a blocked channel, the frequency control unit produces blocking voltages to blocking gates in the transmitter and receiver circuits, and an astable multivibrator flashes the channel display and the ON/OFF lamp.

The only difference between FC701 (DK) and FC702 (N) is the programming of the ROMs.

Power Supply and Switching Circuits

CQM713D is powered directly from a 12 volt car battery. The negative battery terminal connects directly to the cabinet of the radiotelephone.

A transient filter is provided to suppress noise and transients generated by the vehicle's electrical system.

A reverse biased zener diode connected across the battery input terminals limits the peak voltage to approx. 20 volts and protects the radiotelephone against damage caused by incorrect supply polarity. Incorrect battery connection will cause the diode to conduct and blow the fuses fitted in the battery cable.

The CQM700 contains two almost identical voltage regulator circuits which deliver 9 V stabilized supply voltages for operating the transmitter and receiver sections of the radiotelephone. The supply to the loudspeaker output amplifier and the transmitter RF power amplifier is taken from the battery and is unstabilized.

The voltage regulators are protected at the output against short circuit by limiting the maximum current to a safe value.

The transmitter regulator has a blocking transistor controlled by the transmit key button and the blocking voltage from the frequency control unit.

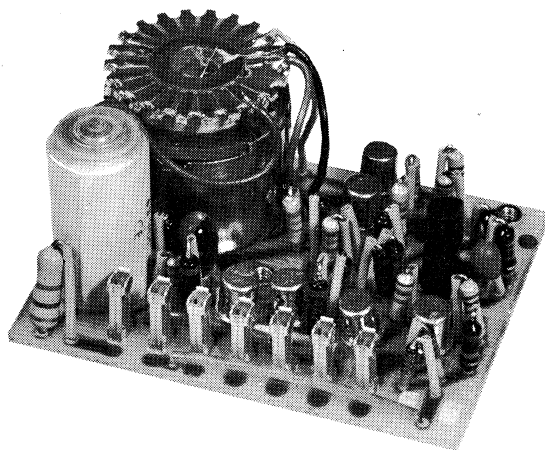
With the CQM713D in the standby or receive condition, the key button is in the "off" position, i.e. not depressed. The receiver voltage regulator operates normally and operation of the transmitter voltage regulator is blocked. When the key button is pressed the blocking is superseeded. However, this requires the channel selector not to be set to a blocked channel and the tone receiver to be in condition "LS IN", if fitted.

The supply voltage for the PA713 power amplifier in the transmitter is taken from the transient filter and applied to the amplifier unit through a transistor switch. This switch is supplied by the transmitter voltage regulator which is controlled by the transmit key button.

The voltage to the transistor switch cannot be turned off by means of the ON/OFF switch of the radiotelephone.

Supply voltage for the TTL logic circuits is derived from a selfoscillating switching regulator (VR701) ensuring low loss and high efficiency.

TONE TRANSMITTER

TT781
TT783


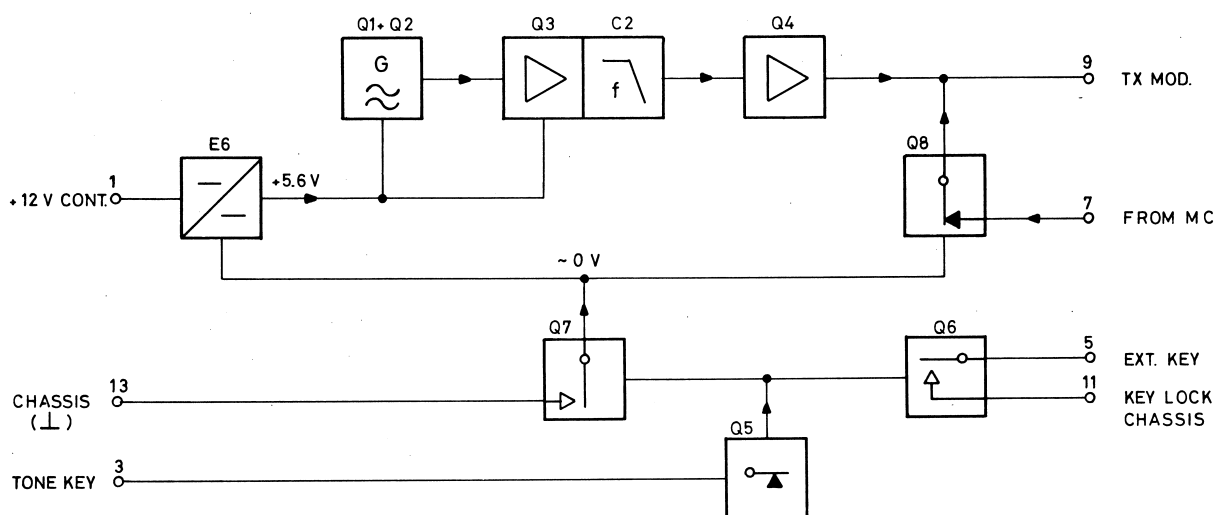
Description

TT781 and TT783 are single tone transmitters for CQM700 series radiotelephones. They are identical except for their tone coils.

The TT781 is for use in CQM700 equipment operating on the public telephone service. It generates a tone to seize, and upon termination of the call, to release the telephone circuit. Only the 2400 Hz and the 2900 Hz tones are used.

The TT783 can generate any of the 12 tones in the 825 to 2450 Hz series.

BLOCK DIAGRAM of TT781 / TT783 :
(refer to the schematic diagram,
D401.577, for TT783)



TT783 (SHOWN IN STAND BY)

In principle, Q1 and Q2 operate as a differential amplifier in a Hartley type oscillator configuration.

The supply voltage is stabilized with zener diode E6 to keep the oscillator output level constant.

Q3 serves to adjust (attenuate) the signal level and, with C2, to introduce de-emphasis before applying the signal to the output stage, Q4.

Emitter follower Q4 provides a low output impedance to match the input impedance of the modulator.

In stand by, R14 and E2 hold Q5 ON. Q5 holds Q6 and Q7 OFF. With Q7 OFF, there is no ground connection to Q1, Q2, Q3, and Q4. Q8 is forward biased by the high positive potential through R17, thus allowing the microphone signal to pass between terminals 7 and 9.

Depressing the tone key grounds terminal 3 and the positive potential through R14 disappears through E1. Without forward bias, Q5 cuts off and the collector voltage rises, driving Q6 and Q7 ON.

When Q6 goes ON, it establishes a ground path from terminal 11 to terminal 5. This switches the regulator voltage from RX to TX, keying the transmitter.

When Q7 conducts, it completes the ground connection to the tone generator circuits, and the tone signal is applied to the modulator via terminal 9. Q7 also cuts off Q8, preventing any microphone signal from interfering with the tone signal.

When the tone key is released the circuit returns to stand by.

Technical Specification

Power Supply

10.5 V - 16 V

Current Consumption

Stand by: 6 - 10 mA

Activated: 16 - 33 mA

Temperature Range

Operating range: -25°C - +60°C

Functioning range: -30°C - +80°C

Output Impedance

600 Ω ± 20%

TONE TRANSMITTER TT781

Tone Frequencies

2400, 2900 Hz

Frequency Accuracy

≤ 0.3%

Frequency Stability

≤ 0.6%

Output Level

- 21 dBm +1/-0dB (69 mV) at 2400 Hz

Frequency Response

6 dB pr. octave de-emphasis

$f_c = 1000 \text{ Hz}$

Distortion (voice modulation)

≤ 5%

AF Gate Attenuation

≥ 50 dB

Distortion (tone modulation)

≤ 3%

TONE TRANSMITTER TT783

Tone Frequencies

825, 1010, 1240, 1435, 1520, 1750,
1860, 1980, 2000, 2135, 2280, 2450 Hz.

Frequency Accuracy

≤ 0.5%

Frequency Stability

≤ 1%

Output Level

-17 dBm +1/0dB (110mV) at 1000 Hz

SEQUENTIAL TONE RECEIVER

SR781

Description

SR781 is a sequential tone receiver for selective calling. It was developed for use in Stornophone 700 radiotelephone equipment. The frequencies employed are the standard CCIR series: 960 Hz to 2110 Hz.

SR781 is designed to operate on a 5-tone sequence, but can also be set to accommodate a 4-tone sequence.

GENERAL DESCRIPTION

Upon reception of a signal having the correct tones in the proper sequence the following events take place (in the receiver):

The call Lamp lights, the AF Muting is cancelled and the Key Lock function "unlocks". An audio alarm signal of about 1.5 seconds in duration can be sent out over the radiotelephone's loudspeaker, and when the vehicle's traffic horn is connected to the tone receiver via an auxilliary relay, the horn will also sound for the same length of time.

There is also a provision for automatically turning off the car's broadcast band receiver when a call arrives.

The audio circuit and the Key Lock are both turned on and off manually by means of the LS IN/OUT push button. Since the switch that "unlocks" the Key Lock also turns on the loudspeaker, the operator is forced to check for the presence of another signal on the channel before being able to key his transmitter.

In addition, the tone receiver is equipped with an Occupied Lamp controlled by the

squelch circuit in the radiotelephone receiver. Thus, if an RF signal having that channel's frequency is present at the antenna input it will cause the Occupied Lamp to light as an indication that the channel is not free.

After reception of a correct call the speaker will remain open until the LS IN/OUT button is depressed.

Logic Terms

Positive logic is employed in SR781, logical references are:

1. low voltage level ($\sim 0V$) =
logic state "0" (LO)
2. high voltage level ($\sim 5V$) =
logic state "1" (HI)

Tone Signalling

The first tone of a sequential signal, arriving from input terminal 35, passes through the Amplifier/Limiter, IC1, where it becomes suitable for applying to the tuned circuit of L1 and C8.

In stand by the resonant frequency of the tuned Circuit is set up by the first Tone Gate, Q4, for the first tone of its code. If the first tone received corresponds to the circuit resonant frequency, it becomes selected, is then amplified by IC2 and detected by E1.

The correct tone will thus fire the Schmitt Trigger, IC3a, whose output drives the Clock Delay (CP Delay) circuit, IC3b. This circuit produces a Clock Pulse whose leading (positive going) edge is delayed

approximately 15 msec. from the Schmitt Trigger output signal.

The clock pulse is applied to the Counter circuit, IC6a, IC7a and IC6b. The counter is arranged as a Synchronous, divide-by-5 counter whose binary states are read out in BCD (binary coded decimal) mode in the Decoders, IC4a-d and IC5a-b.

The first five Decoders drive the Tone Gates, Q4-Q8. The output of the sixth Decoder, IC5b, is applied to the Readout circuit, IC7b.

The Readout flip-flop is also timed by the same clock pulses that toggle the Counter flip-flops.

At the end of a tone pulse, the Schmitt Trigger reverts to its quiescent state and the resultant trailing (negative going) pulse edge from the CP Delay output causes the Counter flip-flops to change state.

(So far, with just the first pulse completed, only Counter IC6a is affected.)

The Decoders sense the new binary state and turn Tone Gate Q4 OFF and Tone Gate Q5 ON, thus setting the resonant circuit up for the second tone in the sequential code.

Suppose that the next tone received does not match the receiver's code. It will not be selected by the resonant circuit and no signal will be available to fire the Schmitt Trigger. When the Schmitt Trigger was fired the first time, it also turned Q1 ON and activated the Clear Delay circuit, IC3c. The output of IC3c then enabled the Counters by applying a HI logical state to their Clear inputs. The Clear Delay output remains HI for about 220 msec. after the Schmitt Trigger has returned to "0". If the second tone does not activate the Schmitt Trigger by then, Q1 goes OFF and the Clear Delay output goes LO, clearing the counter and setting the Decoders back

to the stand by position, i.e. ready to receive the first tone again. This is what happens if the second, or any consequent tone fails (for instance, if the tone is not the correct one for the particular receiver under consideration).

The 2nd, 3rd, 4th and 5th tones of a sequence occur like the 1st, each time stepping the Decoder one position forward until the final tone has been received.

When all five tones have been received, at the end of the 5th tone, IC7b clears the Holding Circuit, IC8, and turns transistor Q2 ON.

Q2 drives the Alarm Delay circuit.

All the functions mentioned in the beginning of this description, i.e. Call Lamp, AF Muting, Key Lock, Alarm Tone Generator, etc. occur at this time.

The Call Lamp and the speaker will remain ON until switched OFF manually with the LS IN/OUT push button (via terminal 32).

If the operator later wants to make a call he must first "unlock" the Key Lock function with the LS IN/OUT push button again, thus turning the loudspeaker ON. If there is any traffic on his channel, he will hear it and be warned before he can key his transmitter.

CIRCUIT DESCRIPTION

Input Stage (IC1)

Input terminal 35 can be wired in either of two positions (marked DK and SV on schematic diagram D401.825):

DK = input signal through C2 and

R1, linear response

SV = input signal differentiated through C1 to match the modulation index used in Sweden and by Storno.

The amplifier circuit incorporates amplitude limiting for signal levels above the minimum required to activate the Schmitt Trigger.

Resistor R6 sets the amplifier sensitivity.

Amplifier Stage (IC2)

The signal is inductively coupled to the Amplifier via the parallel resonant circuit, L1 and C8.

Five of the taps on tone coil L1 are wired to Tone Gates Q4 to Q8, respectively (with a 4-tone code, Q8 is not used). When a Tone Gate is ON, i.e. conducting, it completes a path from its coil tap to chassis ground and the parallel resonant circuit for that particular tone frequency is formed.

NTC resistor R13 compensates for variations in circuit Q caused by changes in ambient temperature.

The selected signal passes to operational amplifier IC2, which is bootstrapped so as not to load the resonant circuit. Amplifier gain is determined by the ratio of R17 to R19.

Detector and Schmitt Trigger (E1, E2, IC3a)

The amplified tone signal is then rectified by the forward-biased diode, E1, and filtered by C13. The resultant DC voltage is present at the inverting input of IC3a.

When the rectified voltage exceeds the threshold level set by R21, R22, R25, R26 and diode E2, the output of the Schmitt Trigger switches from LO ($\sim 0V$) to HI ($\sim 5V$) and remains in that state for the duration of the tone pulse.

Feedback to the non-inverting input via R27 produces a circuit hysteresis of circa 0.2 V.

When the tone ends the Schmitt Trigger switches back to its quiescent state, i.e.: output LO.

Feedback through C14 and R29 will hold the Schmitt Trigger output LO for approx. 10 msec.

Clock Delay (E4, IC3b)

In stand by the Schmitt Trigger output state is LO, C15 is discharged through E4, and the potential at the non-inverting input is also LO (IC3b output is also LO).

Notice that the voltage divider network of R41 and R42 determines the threshold voltage at the inverting inputs of all 3 "delay" circuits, IC3b, IC3c and IC3d.

Now, when the Schmitt Trigger output goes HI, it reverse-biases diode E4 and capacitor C15 begins to charge through resistors R31 and R32. The moment the charge on C15, as seen at the non-inverting input of the comparator, reaches the threshold level, the output switches to the HI state.

It takes C15 approx. 15 msec. to charge up to the threshold level of IC3b. This is what determines the Clock Delay time, removing the short circuit across R30 lengthens the delay time.

At the end of the tone the Schmitt Trigger output returns to its LO state and C15 can once again discharge through E4 and R32. The time constant of this circuit provides a delay at the negative going trailing edge of the pulse, too. These delays prevent random noise pulses from operating the circuit erratically.

Clear Delay (Q1, IC3c)

In stand by, Q1 is OFF and C16 has no charge on it. When the Schmitt Trigger output goes HI it drives Q1 ON, and C16

builds up a charge via R37 and Q1, triggering comparator IC3c so its output goes HI.

The clear Delay circuit operates similarly to the Clock Delay circuit.

As long as the Schmitt Trigger keeps operating at the normal tone intervals, Q1 can maintain the charge on C16. At the end of the 5th tone, the Schmitt Trigger reverts to its quiescent state (output LO) and turns Q1 OFF, as the emitter of Q1 will be biased by the charge on C16. The discharge path for C16 is through R36 and R37. In about 220 msec. the voltage at the non-inverting input of IC3c will fall back to the threshold level and the comparator output switches state. The LO potential at the Clear Delay output clears the Counter and the Readout circuits. Since the interval between tones is normally much less than 220 msec., the Clear Delay will remain OFF (output HI) throughout the entire tone sequence.

Counter (IC6a, IC7a, IC6b)

The Counter elements are J-K master-slave flip-flops arranged as a synchronous, divide-by-five counter that is clocked by the Clock Delay output and is cleared by the Clear Delay output. All of the normal (Q) and complement (\overline{Q}) Counter outputs are wired to appropriate Decoder inputs (IC4 and IC5).

The binary information present at each flip-flop input when a clock pulse arrives will be transferred to the output by the trailing edge of the clock pulse. A 5-tone code sequence correct for the receiver in question, produces 5 clock pulses, one for each tone pulse.

220 msec. after the 5th tone ends, the logical "0" (LO) state at the Clear Delay output clears the Counter flip-flops. However, the Counter will not be able to start counting again until the flip-flops are enabled by the Clear Delay output being switched to logical "1" again by the Schmitt Trigger action.

Decoder (IC4a-d, IC5a) and Tone Gates (Q4 - Q8)

The wiring between the Counter outputs and Decoder NOR gate inputs is arranged to drive the Tone Gates one at a time.

The output of a NOR gate is HI (logical state "1") only when all of its inputs are LO (logical state "0"). If either or both of its inputs are HI, the NOR gate output will be LO.

In stand by, both inputs to IC4a are LO and the output is therefore HI. The other 5 Decoder NOR gates have at least one of their inputs HI, so their outputs will all be LO. Tone Gate Q4 is thus held ON by IC4a, while Q5-Q8 are held OFF by IC4b - IC5a.

Transistor Q4, conducting hard, acts as a virtual short circuit from chassis ground to whichever tone coil tap is specified for the first tone of the code sequence. At the end of the first clock pulse, one of the inputs to IC4a goes HI, the NOR gate output goes LO, and Q4 cuts off. At the same time both inputs to IC4b are now LO, its output goes HI, and Q5 goes ON to tune the resonant circuit for the 2nd tone of the code sequence.

One special consideration here is that the actual maximum HI potential measurable at the NOR gate output is limited to approx. 0.7 V by the conducting Tone Gate transistor's emitter-base junction.

With each correct pulse the Counter steps the Decoder one position forward until the final tone has been received.

Readout Circuit (IC5b, IC7b)

At the end of the 4th tone of a 5-tone signal (or the 3rd tone of a 4-tone signal) both inputs to IC5b will be LO, and the NOR gate output will go HI, driving the J input of IC7b HI, as well.

Now, with its J input driven HI and its K input held as chassis ground potential, IC7b can switch output states when the trailing (negative going) edge of the 5th (or 4th) tone pulse arrives. The normal (Q) output activates the Alarm Delay circuit, and the complement (\bar{Q}) output clears the Holding Circuit, IC8.

220 msec. later the Clear Delay, IC3c, clears the Counter and Readout circuits, and the Tone Receiver is set up for the first tone again by the Decoder and Tone Gate circuits.

A strapping arrangement at the input of IC5b allows for either 4 or 5-tone codes.

Alarm Delay (IC3d, Q2, Q3)

Transistor Q2 is normally OFF and the output of IC3d is HI, Q3, a PNP transistor, is held OFF, and so is Q13.

When the Q output of IC7b in the Readout circuit goes HI at the end of the last tone pulse, it drives Q2 ON. Then capacitor C18 quickly charges through the conducting transistor Q2. When the charge reaches the threshold established by the resistive divider circuit of R41 and R42 the output of IC3d goes LO, turning Q3, then Q13 ON.

Q13 acts as a switch capable of carrying 100 mA of current between ground and terminal 37, the connection for an auxillary alarm relay.

As long as the Clear Delay, IC3c, output remains HI, Q2 is held ON by IC7b and maintains the charge across C18. 220 msec. after the last pulse from the Clock Delay, IC3b, ends, IC3c switches state and clears the Counter and Readout IC's. The Q output of IC7b returns to logical "0", turning Q2 OFF. C 18 now discharges slowly through R43 and R44.

The time constant of C18, R43 and R44 is calculated so that the Alarm Delay,

IC3d, output switches back to logical "1" approx. 1.3 sec. after the end of the final clock pulse.

The Alarm Delay is a comparator circuit that operates in the same manner as the Clock Delay.

Holding Circuit (IC8, Q9, Q11) Call Lamp + Key Lock Switches (Q10, Q11)

The Holding Circuit is an integrated flip-flop with its J and K inputs both tied to logical "1" through R64. With both the J and the K inputs HI, the flip-flop output will complement itself for each clock pulse arriving at the CP (toggle) input. Notice that the CP input is also tied to +Vcc, through R62. This simulates the flat top portion of a clock pulse.

Now, whenever the LS IN/OUT push button on the radiotelephone control panel is pressed, terminal 32 is grounded. C30 at the CP input discharges quickly through the 27 Ω resistor, R63, and the flip-flop sees a negative going trailing edge of a "clock pulse" and switches state. When the push button is released again, C30 charges up to +Vcc through R62, forming the positive going leading edge of the next "clock pulse".

Only the normal (Q) output is used in this circuit, it switches Q11 ON and OFF.

As just seen, IC8 is designed so that it can only be toggled manually by means of the LS IN/OUT switch. However, the Clear input is operated electronically from the \bar{Q} output of Readout flip-flop IC7b.

C32 provides a drive pulse to the base of Q9, saturating the transistor as soon as the radiotelephone is turned on. This pulls the collector of Q9 down to ground, presetting IC8. In the preset state, the Q output is HI and Q11 is held OFF, and Q10 and Q12 are likewise OFF.

With the collector of Q9 LO, diode E3 keeps the Schmitt Trigger output at logical "0", as well, inhibiting both the Clock and the Clear Delay circuits.

As capacitor C32 accumulates a charge, the charging current decreases until it no longer can forward bias Q9. The transistor goes OFF, its collector voltage goes HI, and IC8 becomes enabled.

Diode E6 serves to discharge C32 when the equipment is turned off.

Each time the LS IN/OUT button is pressed, IC8 changes state, switching Q11 ON or OFF and, in turn, driving Q10 and Q12 into saturation or cut-off.

When Q10 conducts it provides a ground connection to light the Call Lamp and, when applicable to operate a relay for muting the car's broadcast band radio.

Q12, conducting simultaneously, turns the loudspeaker ON and also unlocks the Key Lock function.

At the end of the last tone pulse in a sequence, the complement output (\bar{Q}) of IC7b clears IC8, whose output goes LO and turns Q11 ON. Q10 and Q12 are then driven into saturation. 220 msec. after, the Clear Delay clears the Counter and Readout circuits and \bar{Q} of IC7b goes HI again. IC8 can be manually toggled via terminal 32 any time afterwards.

Note that whenever the speaker is in operation, whether turned on manually or by an incoming call, the Call Lamp will light.

Occupied Lamp Switch (Q14)

Whenever the channel is occupied a DC voltage from the Squelch circuit, via terminal 41, turns Q14 ON and establishes a ground connection to the Occupied Lamp, so it can light.

Alarm Tone Generator (IC5c, IC5d)

Two NOR gates, coupled to operate as a free-running (astable) multivibrator, generate an audio signal that is available at terminal 20. The Generator can be strapped to the output of IC3d or to +Vcc through R61.

In stand by, IC3d has a HI output, which would inhibit NOR gate IC5d. When a selective call comes through, the Alarm Delay output goes LO for approx. 1.5 sec. During that interval the multivibrator can oscillate at a frequency determined by the time constants of R57 / C27 and R58 / C26. When Alarm Delay output goes HI again the oscillator stops.

Regardless of the state of IC8 a correct tone signal will clear the flip-flop and turn Q11, then Q10 and Q12 ON. Thus, a tone call has higher priority than the manual switch.

Clock Pulse	Clear Delay	IC6a				IC7a				IC6b				IC4a	IC4b	IC4c	IC4d	IC5a	IC5b	IC7b \bar{Q}
		J	K	Q	\bar{Q}	J	K	Q	\bar{Q}	J	K	Q	\bar{Q}							
0	0	1	0	0	1	0	0	0	1	0	0	0	1	1	0	0	0	0	0	1
1	1	1	0	1	0	1	0	0	1	0	0	0	1	0	1	0	0	0	0	1
2	1	1	0	1	0	1	0	1	0	1	0	0	1	0	0	1	0	0	0	1
3	1	0	1	1	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	1
4	1	0	1	0	1	0	0	1	0	1	0	1	0	0	0	0	0	1	1	1
5	1	0	1	0	1	0	0	1	0	1	0	1	0	0	0	0	0	1	1	0
Δ	0	1	0	0	1	0	0	0	1	0	0	0	1	1	0	0	0	0	0	1

NOTE: Δ = 220 msec. after the end of the 5th tone

Technical SpecificationsSupply Power

Nominal : 13.6 V
 Minimum : 10.5 V
 Maximum : 16.0 V

Current Drain

Stand by: 24 mA + 4 mA

Regulated Voltage

Nominal 4.9 V

Temperature Range

Operating range: -25°C to +60°C
 Functioning range: -30°C to +60°C

Maximum Load Currents

Terminal 37 ALARM 100 mA (for 1.5 sec.)
 Terminal 47 CALL 100 mA
 Terminal 45 OCCUPIED 100 mA
 Terminal 51
 and 43 KEY LOCK 10 mA
 Terminal 34 AF MUTING I_{load} min. 0.75 mA
 for $V_{out} = 8$ V

Input Impedance

$\geq 6K\Omega$

Signal Input Level

Nominal at 1000 Hz: 110 mV

AF Muting

In conjunction with terminal 18 of CF701 or
 CF702:
 ≥ 60 dB.

Signalling Code

Sequence of 4 or 5 tone bursts of 100 ms
 + 10 ms duration with maximum 10 ms
 interval between tone bursts.

Tone Signal Frequencies

<u>Coil terminal</u>	<u>Tone frequency</u>
1	960Hz
2	1022Hz
3	1124Hz
4	1197Hz
5	1275Hz
6	1358Hz
7	1446Hz
8	1540Hz
9	1640Hz
10	1747Hz
11	1860Hz
12	1981Hz
13	2110Hz

Frequency Accuracy

Coil tuned for 1022Hz: $\leq 0.3\%$ for all tones

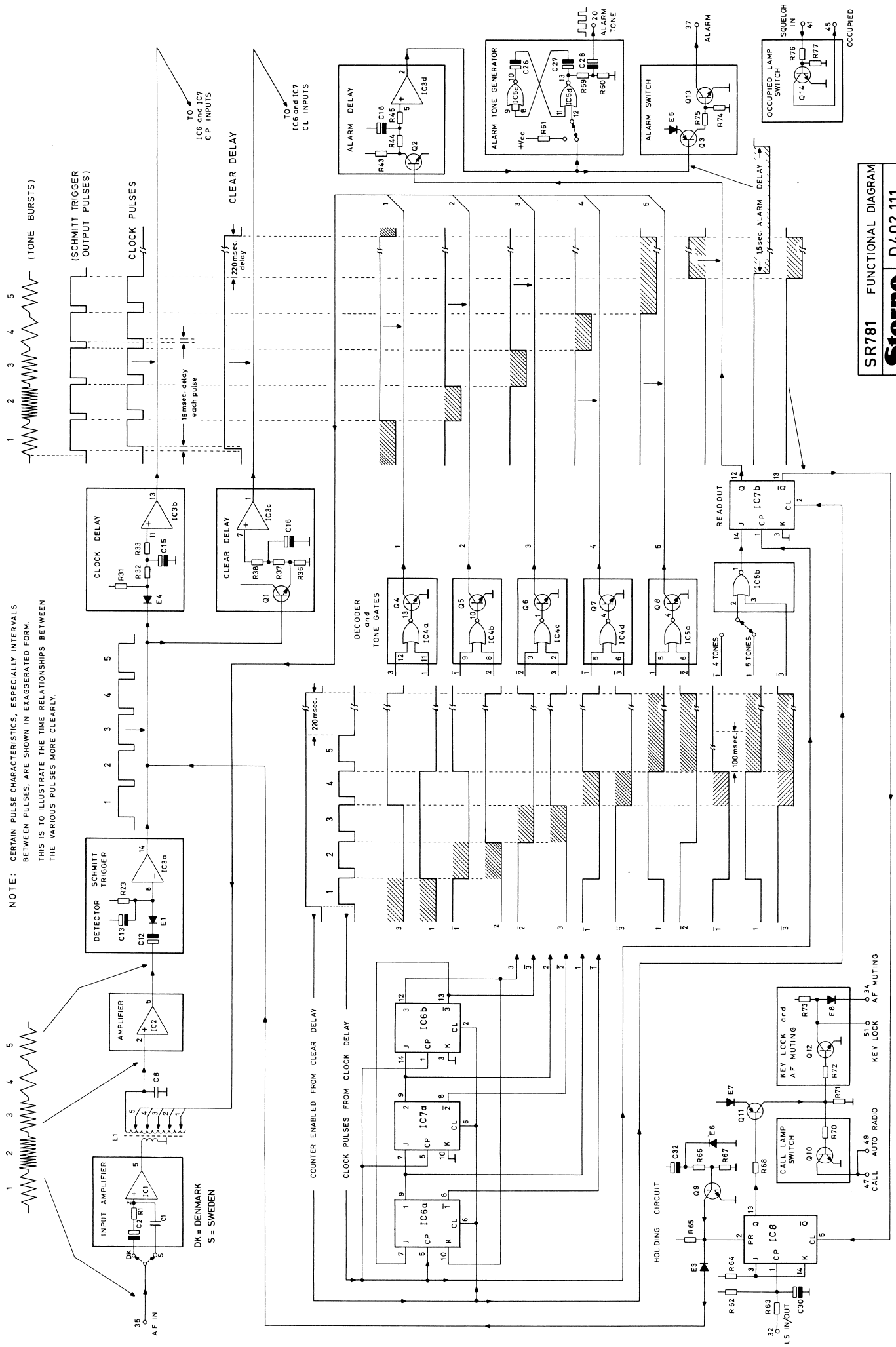
Frequency Stability

(typically $\leq 0.5\%$) $\leq 1.0\%$

Selectivity

Frequencies differing from f_o by 3% or
 more are unable to trigger the tone receiver.

NOTE: CERTAIN PULSE CHARACTERISTICS, ESPECIALLY INTERVALS BETWEEN PULSES, ARE SHOWN IN EXAGGERATED FORM. THIS IS TO ILLUSTRATE THE TIME RELATIONSHIPS BETWEEN THE VARIOUS PULSES MORE CLEARLY.



SR781 FUNCTIONAL DIAGRAM
Storno D402.111

CQM713D

ADJUSTMENT PROCEDURE

The following measuring instruments are required for making adjustments to the CQM713D radiotelephone.

RF Test probe	Storno code nr. 95.089
FM Signal generator	146 - 174 MHz
455 kHz crystal controlled generator	Storno G21b
Deviation meter	Radiometer BKF 6
Distortion meter	Storno E11
RF Wattmeter	0 - 0.1W / 0 - 10W
Multimeter	20 k Ω / V or better
Electronic DC Voltmeter	$R_{in} > 2 \text{ M}\Omega$ / 1 V
DC Amperemeters	0.1 / 2.0 / 4.0 A
Power Supply	10.5 V - 21 V Preset current limiter 0.1 A - 4.0 A

Frequency Counter

For testing toneequipment:

Tone Signalling Generator Storno G13

RECEIVER ALIGNMENT

Before switching on the CQM713D connect a power supply with the correct polarity to the battery connector.

Set the supply voltage to 13.6V and the current limiter to 100 mA.

With the station switched off increase the supply voltage until a current drain of 100 mA is reached.

Requirement: $V_{\text{supply}} \leq 21 \text{ V}$.

Keeping within these values ensures correct operation of the protective zener diode, E13, in CF702.

Decrease the supply voltage to 13.6V and set the current limiter to 1A.

The station may now be switched on.

Check the 9V RX at terminal 3 on the IF converter.

Requirement: $9\text{V} \pm 0.1\text{V}$

If necessary, adjust the RX voltage by means of potentiometer R64 in CF702. This potentiometer can be reached from the rear of the module tray BA702.

Check the regulated 5V supply at the output terminal of VR701.

Requirement: $5\text{V} \pm 0.1\text{V}$

If necessary, adjust the 5V by means of potentiometer R11 in VR701. This potentiometer can only be reached, when the front panel has been removed and the VR701 screen box opened.

ALIGNMENT OF 2nd IF AMPLIFIER

To protect the IF amplifier input stages, establish a good chassis connection between a 455 kHz generator and the station.

Apply a 455 kHz signal to the input of CF702. The IF generator STORNO G21 is well suited.

Connect a DC voltmeter with RF probe, STORNO 95.089, to test point **1** in CF702.

Adjust transformers T1 and T2 for maximum meter reading, attenuating the generator output before overloading the IF amplifier, causing limiting. The readings should be kept below approx. 10 μA if a multimeter is used, and below approx. 500 mV if an EVM (electronic voltmeter) is used, and in any case below the point where an increase in generator output voltage results in a constant or decreasing meter reading.

COARSE ADJUSTMENT OF L1 IN CF701

Disconnect the generator and disable the squelch by pushing the "Squelch out" button on the control panel/control box.

Connect an AC EVM to terminal 35 LINE OUT (AF 17 dBm) on the terminal board.

Adjust coil L1 in CF702 for maximum meter reading. If two maxima are obtainable, adjust for the greater.

If no reading can be obtained, the potentiometer R16 (AFRX) may be turned up. This potentiometer can be reached from the rear of the module tray BA702, and turns up counterclockwise.

ADJUSTMENT OF OSCILLATOR FREQUENCY IN IC700

If a frequency counter is available, the frequency may be read at test point **5**, IC703. If the input of the frequency counter is DC-coupled a capacitor (approx. 1 nF) should be connected in series. The frequency will be 10.245 MHz. Refer to circuit description, "Intermediate Frequency Circuits".

Where no counter is at hand, proceed as follows:

Connect a 455 kHz generator to the IF input of CF702 and a 10.7 MHz generator to the input of IC703. A modified G21 may be used, i.e. the two oscillators, 455 kHz and 10.7 MHz, both in operation at the same time by activating buttons. The 10.7 MHz output is fixed, and the 455 kHz variable by means of the attenuator. The accuracy of the generator signal should be checked to be 10.7 MHz \pm 20 Hz.

Adjust the output level of the 455 kHz generator until a beat note is produced in the speaker (LS in/out must be pressed if tone equipment is installed).

Adjust trimmer capacitor C12 in IC703 for zero beat.

The frequency difference may also be observed on an oscilloscope connected to the "Line out", 600 ohm audio output, which is accessible on the terminal board, terminal 35.

NOTE: The discriminator has no zero adjustment.

ALIGNMENT OF 1st IF AMPLIFIER (10.7 MHz)

Apply a 10.7 MHz signal to the input of IC703.

Connect a DC meter with an RF probe (95.089) to test point **1** in CF702.

Adjust coils L1, L2 and L3 in IC703 for maximum meter reading. The input level should be kept low enough to prevent limiting.

Gain of IC703: \geq 20 dB

Alignment of the frequency synthesizer reference oscillator.

Select the channel corresponding to an output frequency of 16.000 MHz.

DK (Denmark) = 01
N (Norway) = 24

Connect a frequency counter to the TX output of the FS701.

Adjust C1 in FS701 for 16.000000 MHz \pm 10 Hz.

Check all channels for correct synthesizer frequency according to the frequency allocation tables.

The receiver shall be blocked (no RF noise when pressing the SQ button and the LS in button) and the ON/OFF lamp and the channel display shall start flashing, when the channel selector is set to not used channels.

Alignment of mixer injection signal to RC712.

Connect a DC voltmeter to test points **1** and **2** in RC712.

Adjust L3 in RC712 for maximum meter reading. Distance between the tuning slug and the top of the coil form should be approx. 2mm.

The voltage with the oscillator stopped (short the crystal to chassis) will be approx. 0.25 V. Minimum increase with the oscillator working will be approx. 30 mV.

Connect the voltmeter to test point **4** in RC712.

Adjust L5 and L6, RC712, for maximum meter reading.

The voltage at test point **4** with the oscillator stopped will be approx. 0.7V.

Start the oscillator.

Requirement: Minimum increase must be \geq 0.25V
Typical: 0.6V

Adjustment of crystal oscillator frequency, RC712.

Connect a frequency counter to test point **3** in RC712. Adjust L1, RC712, for correct frequency.

Requirement: DK = Denmark; f = 142.700 MHz \pm 150 Hz.
N = Norway; f = 141.800 MHz \pm 150 Hz.

If the frequency cannot be pulled to the correct reading the strap in the oscillator circuit must be altered. Refer to RC712 diagram.

The frequency should be adjusted at 25°C ambient temperature.

Due to interaction between L1 and L3, the adjustment of L3 should be checked, and any readjustment requires the frequency to be readjusted.

Checking the FS701 output level.

Connect an RF probe 95.089 and a multimeter to terminal 5 in RC712.

Set the channel selector to the centre channel.

DK = channel 26
N = channel 03

Stop the RC crystal oscillator and measure the RF level (approx. 0.4V).

Select the channels having the higher frequency and the lower frequency and measure the RF level.

Maximum deviation relative to centre channel

2dB \approx approx. \pm 0.1V.

If the level is low in one position, L7 in RF amplifier I in FS701 is adjusted for best symmetry.

Alignment of filters and RF amplifier, RC712.

Connect a voltmeter to test point ⑤ in RC712.

Stop the crystal oscillator in RC712 (short the crystal to chassis).

Course tuning

Connect an RF generator to the input of BP-filter 1, and set the generator for 158MHz. Adjust L8, L9, L10, L14, L15, L16, and L17 for maximum reading on the voltmeter.

Fine tuning

Remove the RF generator and start the crystal oscillator.

Select the centre frequency channel

DK = channel 26
N = channel 03

Turn the tuning slug of L5 in BP712 flush with the outside of the chassis.

L8, L9, L10, L14, L15, L16, and L17 is adjusted for maximum meter reading in test point ⑤.

Due to interaction the adjustments should be repeated until no further increase in meter reading can be obtained.

As the crystal oscillator frequency is only 10% below the desired frequency, care must be taken not to resonate the filter circuits at the wrong frequency.

The voltage at test point ⑤ with the oscillator stopped will be approx. 3V.

Start the oscillator.

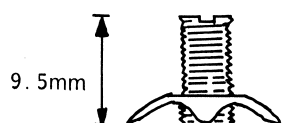
Requirement: Minimum increase at test point ⑤, is 1.0V

Check the voltage at the higher frequency and the lower frequency.

If the voltage drops at higher or lower frequencies, small corrections of the filter alignment may be implemented.

COARSE ADJUSTMENT OF BP712

The trimming slugs, L1, L2, L3, and L4 of the filter BP712 are to be set to the approximate positions. The picture indicate the mechanical position of the slugs. L5 is to remain in its position as set during the fine tuning of the filters.



FURTHER ALIGNMENT OF RC712, FINE TUNING OF BP712, and FINE TUNING OF IC703

Connect a DC EVM with an RF probe to test point ① in CF702. An multimeter with 20kΩ/V may be used, but the deflection will only be on the order of tens of microamperes.

Connect an unmodulated RF generator to the antenna input of the CQM700,

Select the centre frequency channel

DK = channel 26
N = channel 03

Set the generator to the receiver frequency. Fine tuning of the generator frequency may be done by loosely coupling a 455 kHz signal to the IF input of CF702, or 10.7 MHz to the IC703 input. (First connect CQM700 chassis to generator earth.) Tune the RF generator for zero beat with the LS in/out depressed if tone equipment is installed.

The RF generator output should be kept low enough to prevent limiting in CF702, i.e. a reading of approx. 500 mV on a DC EVM with an RF probe at test point ①, CF702.

The following coils are tuned for maximum meter reading in this order:

L17, RC712
L 5, BP712
L 4, BP712
L 3, BP712
L 2, BP712
L 1, BP712
L18, RC712
L 1, IC703
L 2, IC703
L 3, IC703

Due to interaction, especially between L17 in RC, and L5 in BP, the procedure should be repeated until no further increase in meter reading can be obtained.

By adjusting L17, RC712, the oscillator drive signal to the RF mixer will have decreased. L16, RC712, must be fine tuned for maximum reading on a DC voltmeter connected to test point ⑤, RC712.

Now, when stopping the oscillator, the voltage at test point ⑤ should fall at least 0.5V. L1, L2, and L3 in IC703, are now fine tuned for maximum reading at test point ①, CF702. The circuits in IC703 should be aligned two or three times, as they influence each other.

FINE TUNING OF L1 in CF702

Keep the RF generator connected as described and set its output attenuator for full limiting in the CQM713D, approx. 1 mV EMF from the generator.

Modulate the generator with 1 KHz to a frequency swing of ± 3.0 KHz.

Connect an audio voltmeter to test point ② in CF702. This test point becomes accessible by unscrewing the upper PC-board of CF702.

Peak coil L1 in CF702, for maximum meter reading.

Requirement: ≥ 65 mV

NOTE: Terminal 35 "Line out", on the terminal board or the connector "Line out" on the control

units may be used instead of test point [2].

However, this reading is dependent on the setting of potentiometer R16, AF-RX, in CF702, and it must be checked that an audio level of ≥ 110 mV can be obtained from "Line out" for the appropriate frequency deviation as shown below.

ADJUSTMENT AND CHECKING OF AUDIO CIRCUITS

Modulate the RF generator with 1 KHz, and set the frequency deviation to $0.7 \times \Delta f$ max.: 3.5 kHz.

Set the RF generator output level to approx. 1 mV EMF.

If the CQM713D is provided with tone equipment press the LS in/out button.

Check the frequency of the RF generator.

Back off the volume control on the control unit, and on the control box/control panel, if any.

Connect an audio voltmeter to "Line out".

Adjust the audio output level to 110 mV by means of R16 in CF702.

Connect a 5Ω load resistor across the loudspeaker output terminals instead of the loudspeaker.

Connect an audio voltmeter and a distortion meter across the loudspeaker terminals. Set the volume control for 2.25 V on the meter.

Check the distortion.

Requirement: $k \leq 5\%$

NOTE: Before leaving the factory, the audio output amplifier has been adjusted for:

- a power output of 2 W (by means of potentiometer R83 on CF702) for an audio input of 110 mV from LINE OUT (AF 17 dBm),
- a base bias to the output amplifier transistors ensuring a suitable no-signal current in the stage.

Consequent adjustment of the no-signal current in the output stage is performed in the following way:

Turn the station off, and the volume control down.

Turn potentiometer R99 fully counter-clockwise (viewed from the component side of CF702).

Set the supply voltage to 16 V.

Insert a milliammeter in the positive supply lead to the output amplifier (brown lead between the two PC-boards of CF702, terminals C / C of CF702).

Turn the station on. The reading will be approx. 15-25 mA.

Turn potentiometer R99 clockwise until the current drain has increased by 2 mA.

CHECKING THE AUDIO POWER OUTPUT

Set the volume control for 3.16 V across the audio output load (corresponding to a power

output of 2W) for an input signal of 1 KHz, 110 mV.

Connect the distortion meter across the output and read the distortion.

Requirement: $k \leq 7\%$.

RECEIVER SENSITIVITY MEASUREMENT

EIA (Electronic Industri's Association)

Standard, definition:

The SINAD sensitivity of a receiver is the minimum input signal that will provide at least 50% of the receiver's rated audio output power with 12 dB 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) and, disregarding the amplitude of the audio, this is adjusted to read 100 on the meter scale; 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 12 dB below the first condition, as read on the distortion meter scale. This corresponds to a reading of 25%, 25 being 12 dB below 100, which was our reference condition.
(100-6dB = 50, 50-6dB = 25).

In practice our first condition is achieved by feeding a minimum of 1000 μ V of RF-signal modulated with 1000 Hz at $0.7 \times \Delta f$ 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 being adjusted for a reading on the distortion meter scale of 25%.

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 12 dB ratio between signal + noise + distortion and noise + distortion, i. e. 12 dB SINAD sensitivity.

CHECKING RECEIVER SENSITIVITY

Modulate the RF generator with 1 kHz, and a frequency deviation of $0.7 \times \max. \Delta f$, i. e. ± 3.5 kHz.

Set the generator output to 1 mV EMF.

Connect the distortion meter across the loudspeaker terminals, substituting a 5Ω resistor for the speaker.

Set the volume control for 1 V across the load.

Reduce the calibrated RF voltage from the RF generator, until 12 dB SINAD is obtained.

Requirement: $\leq 1.0 \mu\text{V}$ EMF.

The procedure should be repeated on all channels.

ADJUSTMENT AND CHECK OF SQUELCH

Adjust the squelch by means of potentiometer R38 in CF702 to open the audio signal path for an antenna signal of 10 to 12 dB SINAD across the speaker terminals.

Remove the antenna signal and check that the squelch will close and block the audio output.

Check that the audio path reopens when the squelch button is activated.

CHECKING OVERALL CURRENT CONSUMPTION

Check the current drain at 13.6 V supply voltage.

Requirement: CQM713D with tone equipment, TT781, SR781, and channel indicator ID701.
 ≤ 900 mA.

TRANSMITTER ADJUSTMENT

Unless the receiver alignment procedure has been performed, check for correct operation of the protection diode, E13, on CF702. This test is described in the first paragraphs under "Receiver Alignment".

Then set the supply voltage to 13.6 V, and the current limiter to 4 A.

If tone equipment is installed, the LS in/out button must be pressed to establish a DC path for the transmitter keying function.

With the transmitter output loaded (antenna or dummy load connected), key the transmitter and check 9V TX at terminal 19 on the terminal board.

NOTE: If 9 V RX was not present or was set too low before keying the transmitter, the 9 V TX series regulator will not start.

Requirement: $9 \text{ V TX} = 9 \text{ V} \pm 0.1 \text{ V}$.

If necessary, adjust the TX voltage by means of potentiometer R72 on CF702. This potentiometer can be reached from the rear of module tray BA702.

Alignment of mixer injection signal to EX712.

Connect a DC voltmeter to test point ① and ② in EX712.

Adjust L3 in EX712 for maximum meter reading. Distance between the tuning slug and the top of the coil form should be approx. 2mm.

The voltage with the oscillator stopped (short circuit the crystal to chassis) will be approx. 0.25 V. Minimum increase with the oscillator working will be approx. 30 mV.

Connect the voltmeter to test point ④ in EX712.

Adjust L5 and L6, EX712, for maximum meter reading.

The voltage at test point ④ with the oscillator stopped will be approx. 0.7 V.

Start the oscillator.

Requirement: Minimum increase at test point ④, EX712 = 0.25 V.

Adjustment of crystal oscillator frequency, EX712.

Connect a frequency counter to test point ③.

Adjust L1, EX712, for correct frequency.

Requirement: DK = Denmark; $f = 144.400$ MHz.
N = Norway; $f = 144.500$ MHz.

If the frequency cannot be pulled to the correct reading the strap in the oscillator circuit must be altered. Refer to EX712 diagram.

The frequency should be adjusted at 25°C ambient temperature.

Due to interaction between L1 and L3, the adjustment of L3 should be checked and any readjustment requires the frequency to be readjusted.

Checking the FS701 output level.

Connect an RF probe 95.089 and a multimeter to terminal 5, EX712. Set the channel selector to the centre channel.

DK = channel 26
N = channel 03

Stop the RC crystal oscillator and measure the RF level (approx. 0.4V)

Select the channels having the higher frequency and the lower frequency and measure the RF level.

Maximum deviation relative to centre channel:

$2\text{dB} \sim \text{approx. } \pm 0.1\text{V}$.

If the level is low in one position, L6 in FS701 is adjusted for best symmetry.

Alignment of filters and RF amplifier, EX712.

Connect an RF probe 95.089 and a multimeter to testpoint 8 in EX712 (output terminal).

Stop the crystal oscillator in EX712 (short the crystal to chassis).

Course tuning

Connect an RF generator for the input of BP-filter 1, and set the generator for 160.0 MHz. Adjust L8, L9, L10, L14, L15, and L16 for maximum reading on the multimeter.

Fine tuning

Remove the RF generator and start the crystal oscillator.

Select the centre frequency channel.

DK = channel 26
N = channel 03

Adjust L8, L9, L10, L14, L15, and L16 for maximum meter reading, approx. 5.6V.

Due to interaction the adjustments should be repeated until no further increase in meter reading can be obtained.

As the crystal oscillator frequency is only 10% below the desired frequency, care must be taken not to resonate the filter circuits at the wrong frequency.

Alignment of RF amplifier RA711

Connect a voltmeter to test point ⑩ in RA711.

Adjust L16 in EX712 for minimum meter reading. Adjust L1, L2, L3, L4, and L5 in RA711 for minimum meter reading, approx. 4.0 V.

Remove the RF signal load between RA711 and PA713.

Connect an RF Watt meter 0 - 0.1 W to the RA711 output.

Adjust L6, RA711 for maximum output.

Adjust L1, L2, L3, L4, L5, and L6 for maximum output.

Repeat the adjustment until no further increase in meter reading can be obtained.

Requirement: $P_{OUT} \geq 80 \text{ mW}$.

The requirement should be fulfilled on all channels. The total variation in output power should be less than 1 dB within the bandwidth.

Alignment of RF Power Amplifier, PA713.

Reestablish the connection between RA711 and PA713.

Connect a wattmeter to the antenna output.

Select the centre frequency channel.

DK = channel 26
N = channel 03

Set the supply voltage to 13,6 V.

Turn the ADC potentiometer, R2, in PA713 up (clockwise).

Set all trimmer capacitors for half capacity.

NOTE: The PA713 should be aligned with its shielding lid in place, and insulated trimming tools should be used.

Install the lid and key the transmitter.

Remove shorting link designated "A" and insert a DC amperemeter instead.

Adjust trimmer capacitor C7 for maximum reading on DC amperemeter.

Remove shorting link designated "C" and insert the DC amperemeter.

If no current can be obtained increase the capacity of trimmer C22 and repeat the adjustment of C16.

Adjust trimmer capacitors C22 and C23 for maximum power output (repeat the adjustment a couple of times.)

Adjust trimmer capacitors C14 and C16 for maximum power output (repeat the adjustment a couple of times.)

Repeat the alignment of C22, C23, C14 and C16.

Adjust trimmer capacitors C10 and C11 for maximum power output.

Adjust trimmer capacitors C6 and C7 for maximum power output.

Make the final adjustments for C6, C7, C10, C11, C14, C16, C22, and C23, in that order, for maximum power output.

Set the ADC potentiometer, R2 in PA713, for 10 watts power output with 13,6V supply voltage from the power supply. This will ensure a power output of more than 8W if the supply voltage is increased to 16 volts taking into account that the ADC circuit will reduce the power output with increasing supply voltage.

The relationship between supply voltage, power output, and current consumption in the individual stages of PA713 is dependent on the antenna frequency.

The current in individual stages may be read by substituting an amperemeter for the shorting links, A, B, and C, in the collector leads of transistors Q1, Q2, and Q3 in PA713.

Requirements:

At 10.5V supply voltage,

Power output: $> 6 \text{ W}$

Current in "C": $< 1.6 \text{ A}$

At 13.6V supply voltage,

Power output: $= 10 \text{ W}$

Current in "C": $< 1.8 \text{ A}$

Current in "B": $< 0.6 \text{ A}$

Current in "A": $< 80 \text{ mA}$

At 16.0 V supply voltage,

Power output: $\geq 8 \text{ W}$

Current in "C": $< 1.8 \text{ A}$

Current in "B": $< 0.5 \text{ A}$

Current in "A": $< 80 \text{ mA}$

Correct values here also indicates that the ADC circuit is operating satisfactorily.

The power deviation between channels selected at random should not be greater than 0.5 dB.

Measure the total current consumption, tone equipment and channel display included, at 13.6 V.

Requirement: $I_{\text{total}} \leq 3.9 \text{ A}$

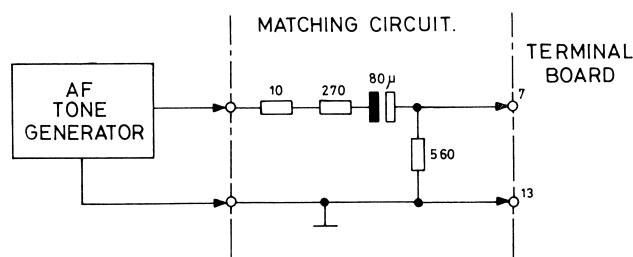
Adjustment of Modulation and Frequency Deviation

Connect the deviationmeter to the transmitter output put via an attenuation network (10 W capacity).

Connect a distortion meter to the audio output of the deviation meter.

Set the power supply voltage to the CQM713 to 13.6 V.

Connect a tonegenerator to terminal 7 and 13 (chassis) on the terminal board through a network as outlined below.



Select the channel having the higher frequency.

DK = Denmark = channel 05.
N = Norway = channel 15.

Set the generator for an audio output of 2.2 V. This value is 20 dB above the nominal modulation input level to ensure full limiting in the modulation amplifier on CF702. The 6 dB loss in the network is also taken into account, and the nominal input level will be found to be $2.2 \text{ V} \sim 26 \text{ dB} = 110 \text{ mV}$.

Find the audio generator frequency between 300 Hz and 3 KHz giving the greatest frequency deviation as read on the deviation meter with the transmitter keyed. At that audio frequency set the maximum deviation with R124 on CF702 to $\Delta f_{\text{max}} \geq \pm 5 \text{ kHz}$.

Select the centre frequency channel

DK = channel 26
N = channel 03

Set the audio generator to 1000 Hz and the output to 220 mV.

Adjust R133 in CF702 for nominal frequency deviation:

CQM713D x 49 DK: $\Delta f_{\text{nom}} = 3.3 \text{ kHz}$

CQM713D x 46 N: $\Delta f_{\text{nom}} = 3.0 \text{ kHz}$

Check the frequency deviation, Δf_{nom} , at 1000 kHz on all channels.

Requirement: $V_{\text{mod}} = 220 \text{ mV} \pm 26 \text{ mV}$

Check the distortion on the audio output of the deviation meter.

Requirement: $k \leq 7\%$ (without deemphasis).

Checking the Transmitter Stability

Transmitter instability appears as AM modulation of the transmitted carrier by a modulating frequency which may vary between 0.5-40 MHz.

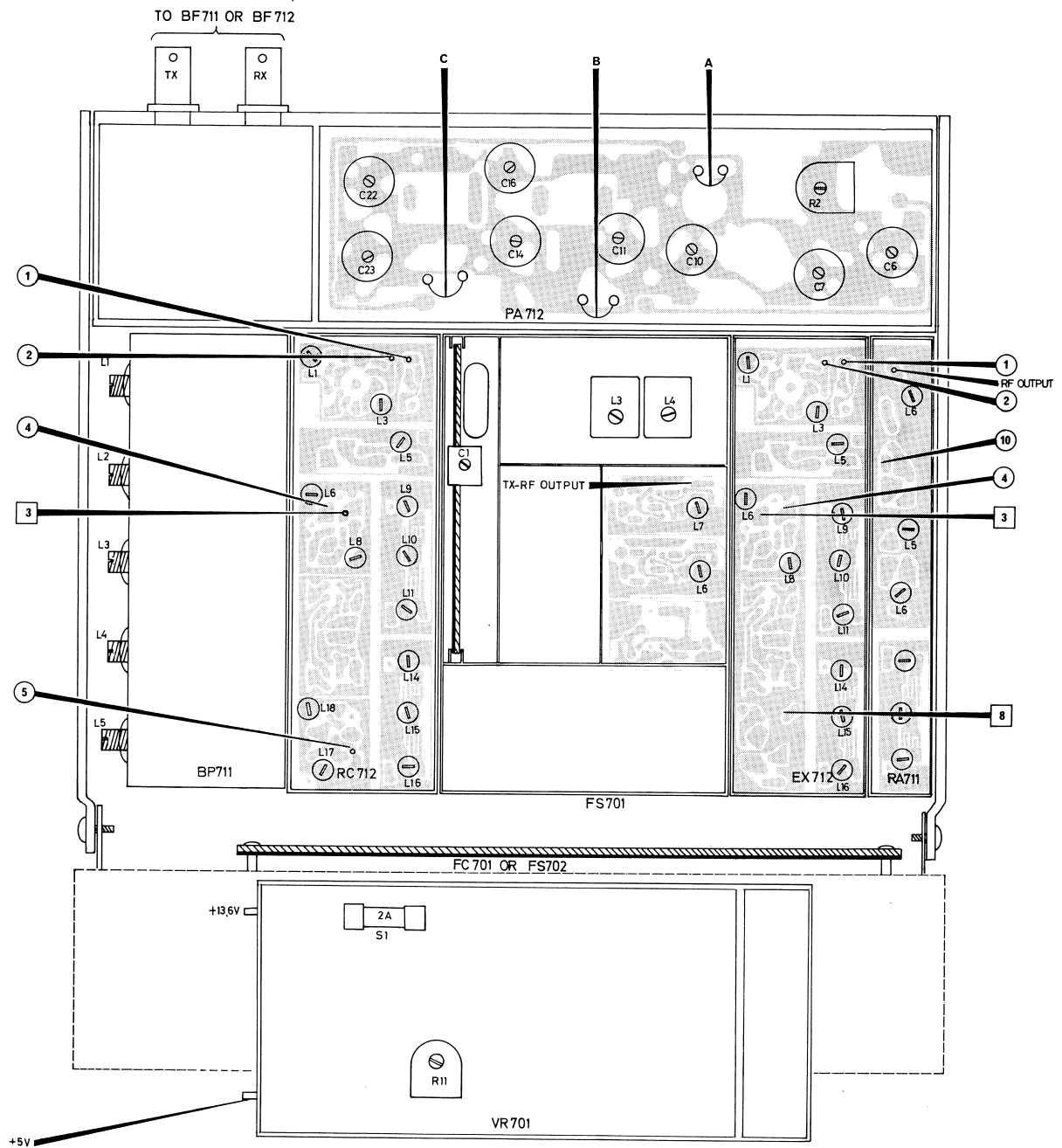
The existence of parametric oscillations can be determined by means of a detector followed by a filter, which removes the carrier, and an indicator, e.g. an oscilloscope, a millivoltmeter, or simply a multimeter with a diode detector. When using the latter, an amplifier is required, e.g. STORNO amplifier detector type TSF42A.

While varying the phase angle with W52C, check that no deflection appears on the AM indicator at any supply voltage between 10.5V and 16V.

For further details please refer to STORNO Service News No. 38 of May 1969.

Antenna Branching Filter

The filter is factory aligned and should never be touched.

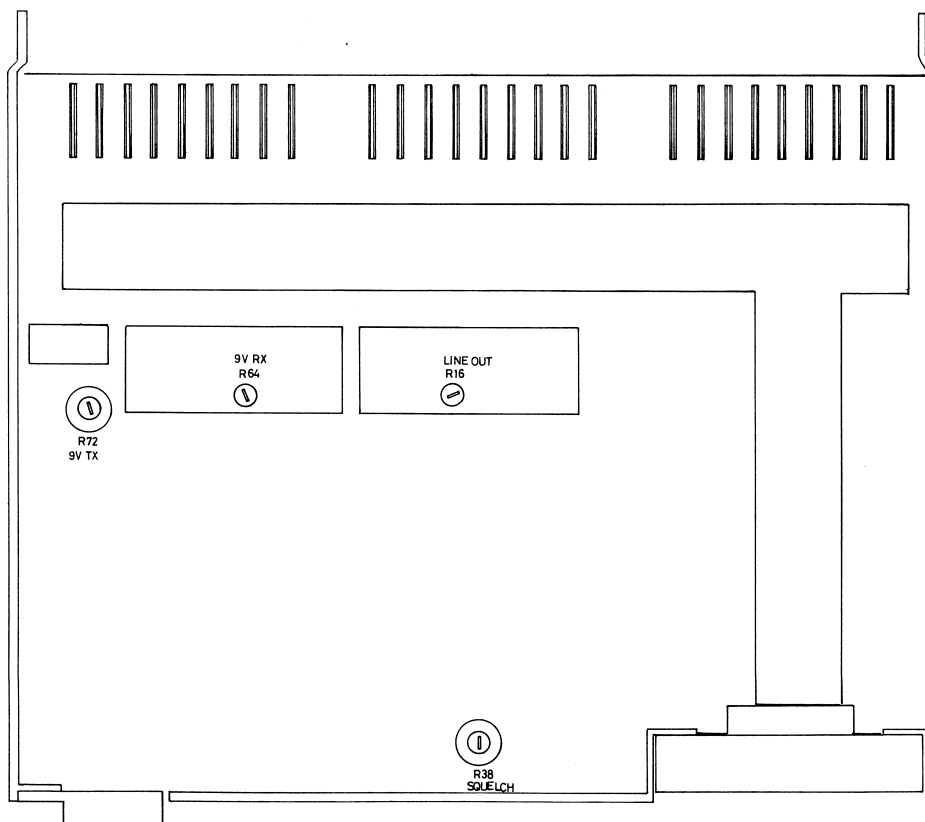
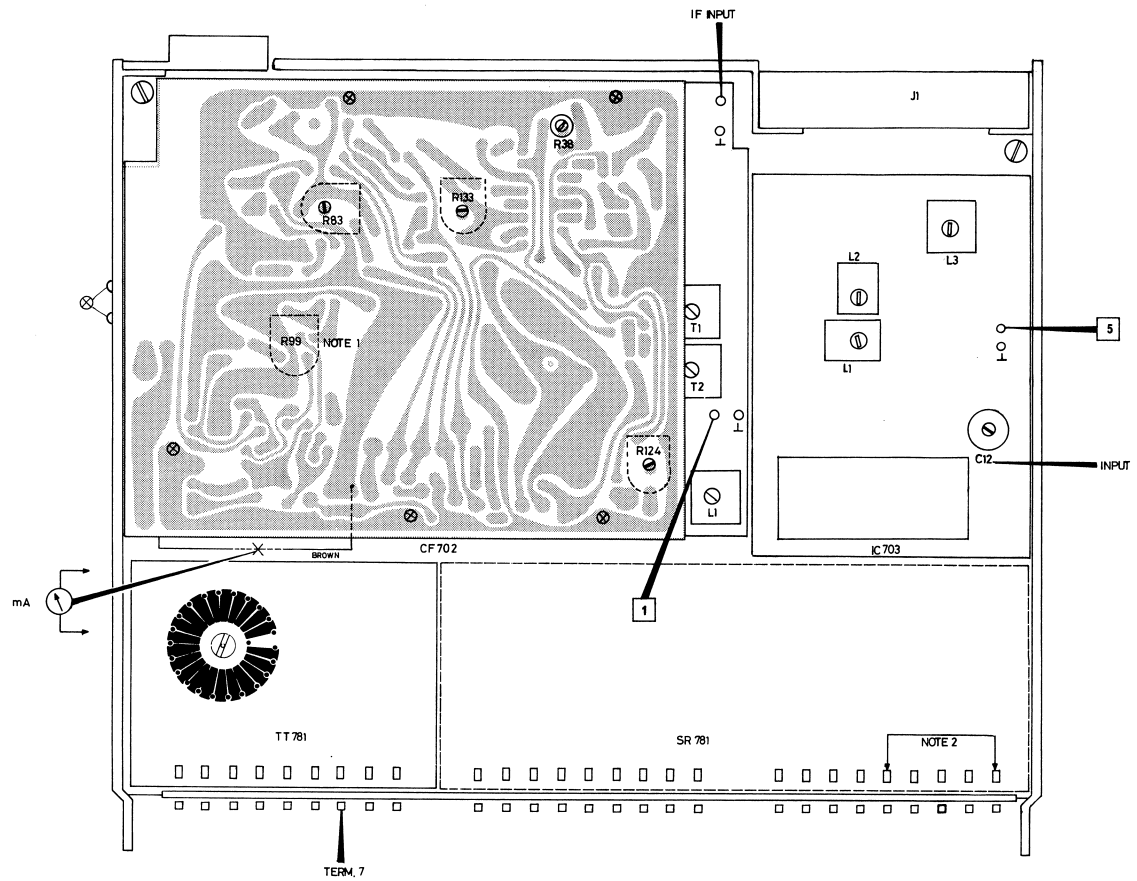


RADIO ASSEMBLY RF713 (CQM713D)

Location of Test Points and Adjustable Components

Storno

Storno

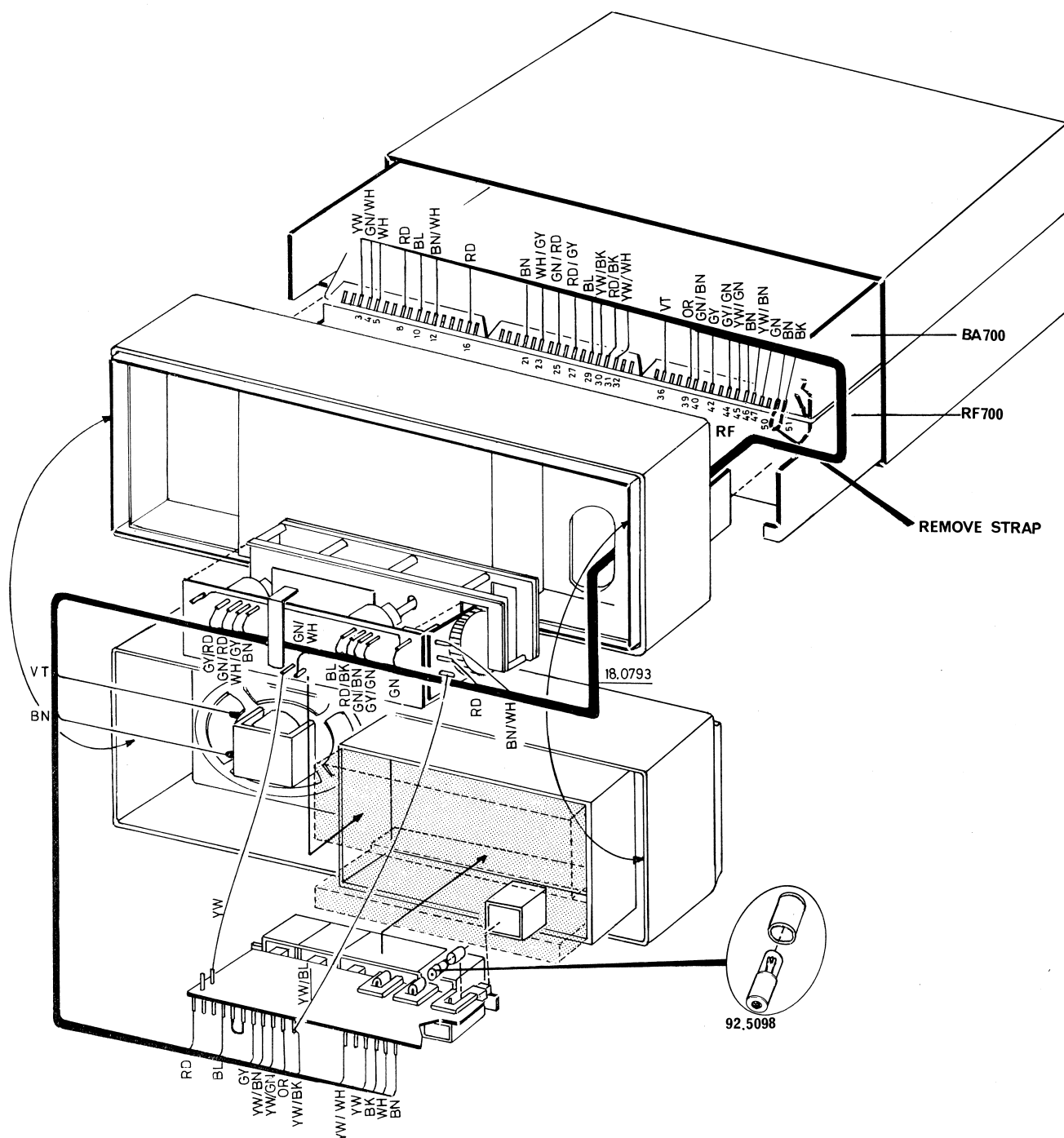


BASIC ASSEMBLY BA702 (CQM700D)
Location of Test Points and Adjustable Components

D402.233



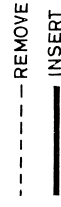




ASSEMBLY AND WIRING OF CONTROL HEAD

CQM713D, CQM763D





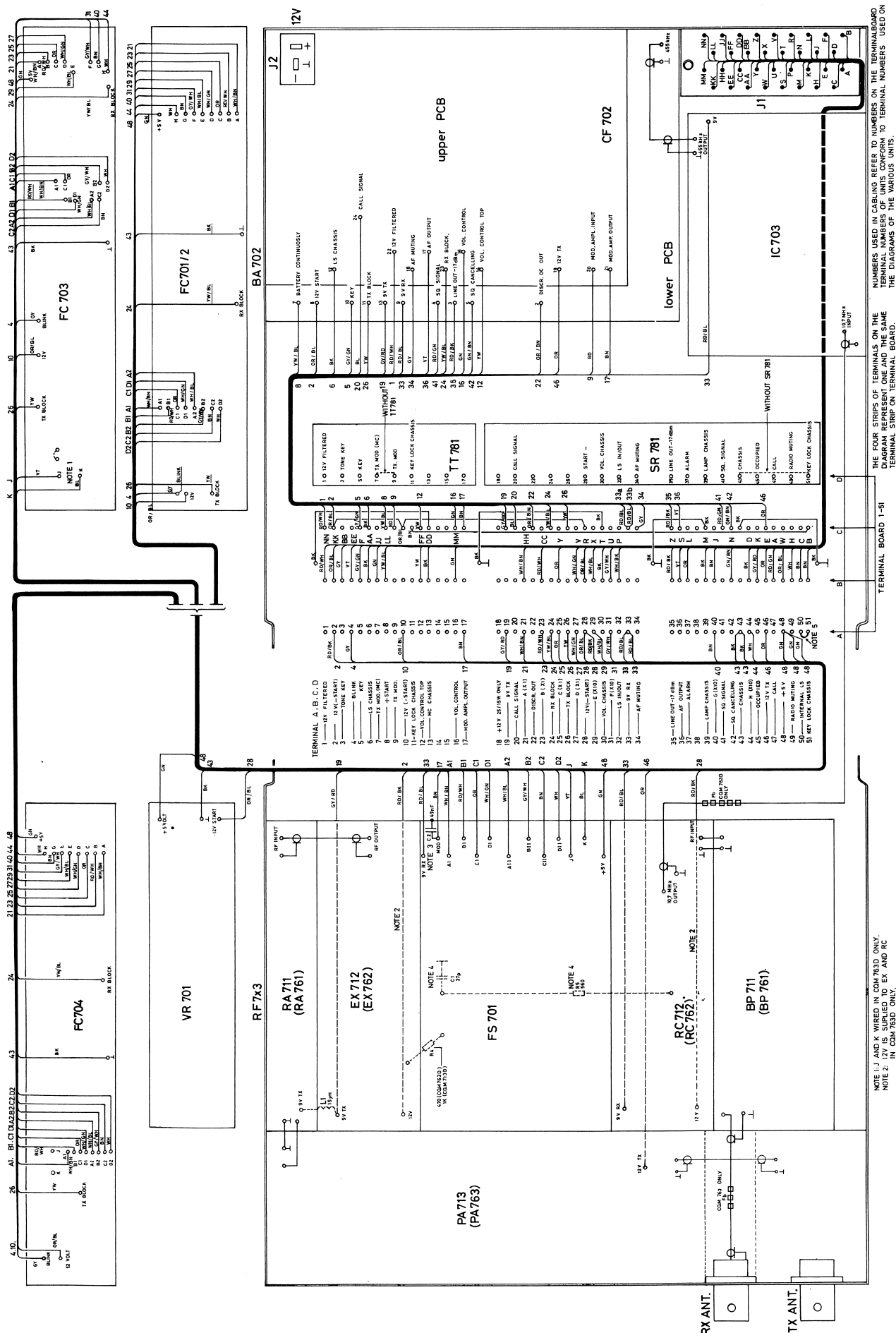
D402.344

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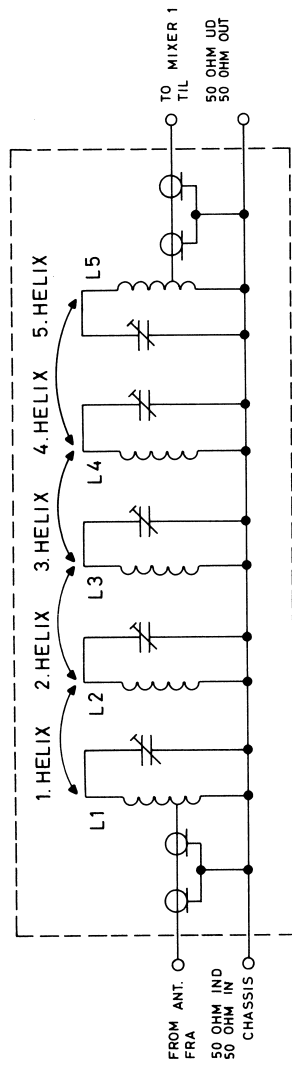


WIRING DIAGRAM CQM700D

D401.871/3



NOTE 1: 12V SUPPLY TO EX AND RC.
NOTE 2: 12V SUPPLY TO EX AND RC.
NOTE 3: 12V SUPPLY TO EX AND RC.
NOTE 4: 12V SUPPLY TO EX AND RC.
NOTE 5: 12V SUPPLY TO EX AND RC.



Storno

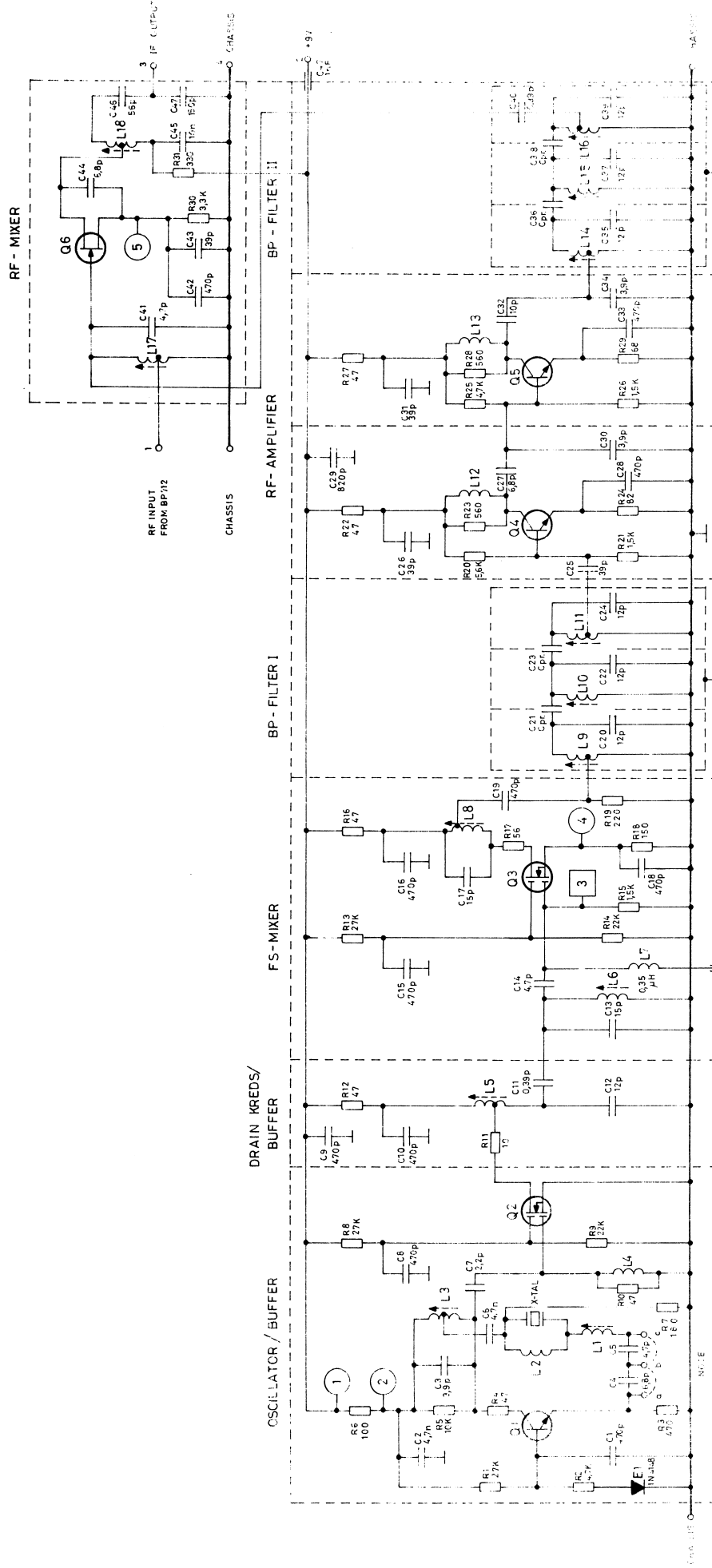
TYPE	Nº	CODE	DATA
BP712	L1 L2 L3 L4 L5	10.3114-00 62.0819 62.0819 62.0819 62.0819 62.0819	Band Pass Filter RF coil 146-174 MHz RF coil 146-174 MHz RF coil 146-174 MHz RF coil 146-174 MHz RF coil 146-174 MHz

Storno

TYPE	Nº	CODE	DATA

BAND PASS FILTER BP712

X402.270



NOTE:

FREQUENCY	STRAP
UP / 1	STRAP IN/13
NORMAL	3-5
DOWN / NEC	1-2

Q1



Q4, Q5



C2, Q3



Q6

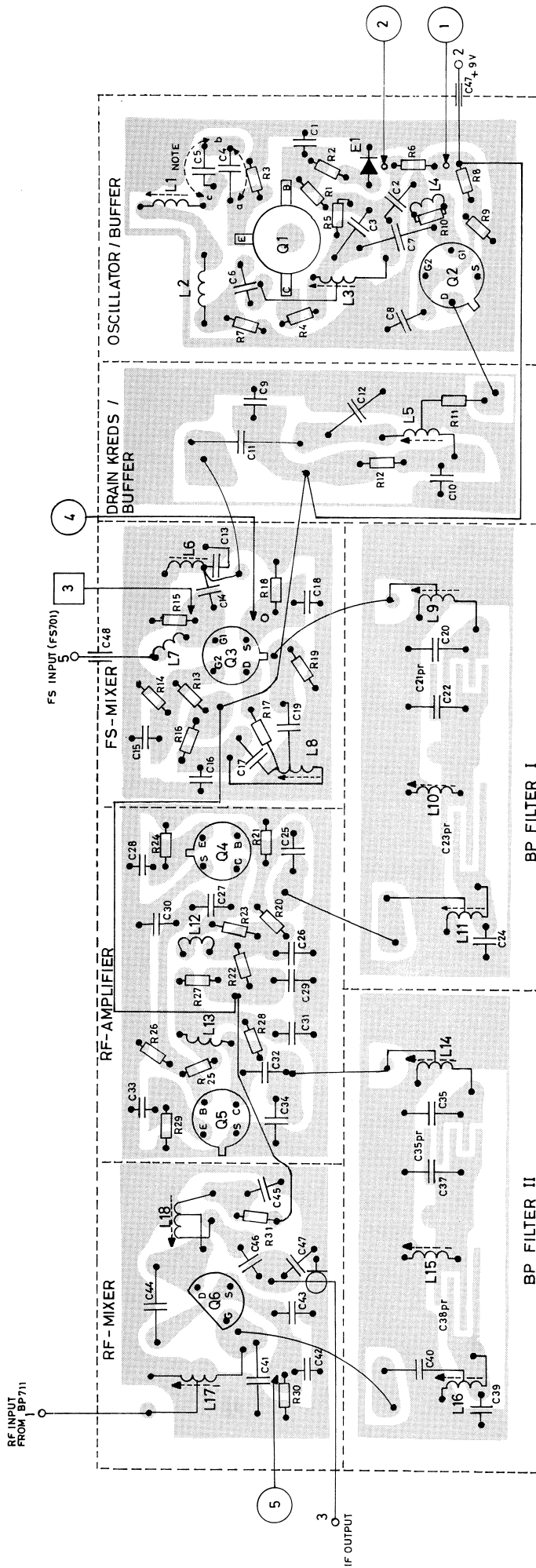


RECEIVER CONVERTER
MODTAGERKONVERTER

RC712

50 ohm

BOTTOM VIEW



RECEIVER CONVERTER RC712
MODTAGERKONVERTER

TYPE	NO.	CODE	DATA
RC712		10.2935	Receiver Converter
	C1	74.5162	ceram DI 400V
	C2	74.5108	ceram PL 20V
	C3	74.5302	ceram PL 63V
	C4	74.5321	ceram PL 100V
	C5	74.5318	ceram PL 100V
	C6	74.5108	ceram PL 20V
	C7	74.5299	ceram PL 63V
	C8	74.5161	ceram PL 63V
	C9	74.5162	ceram DI 400V
	C10	74.5120	ceram DI 400V
	C11	74.5136	ceram BD 250V
	C12	74.5137	ceram DI 250V
	C13	74.5131	ceram DI 250V
	C14	74.5131	ceram DI 250V
	C15	74.5162	ceram DI 400V
	C16	74.5162	ceram DI 400V
	C17	74.5137	ceram DI 250V
	C18	74.5162	ceram DI 250V
	C19	74.5161	ceram DI 400V
	C20	74.5308	ceram PL 63V
	C21	74.5308	ceram PL 63V
	C22	74.5308	ceram PL 63V
	C23	74.5308	ceram PL 63V
	C24	74.5308	ceram PL 63V
	C25	74.5308	ceram PL 63V
	C26	74.5308	ceram PL 63V
	C27	74.5305	ceram PL 63V
	C28	74.5162	ceram DI 400V
	C29	74.5314	ceram PL 63V
	C30	74.5302	ceram PL 63V
	C31	74.5316	ceram PL 63V
	C32	74.5307	ceram PL 63V
	C33	74.5162	ceram DI 400V
	C34	74.5302	ceram PL 63V
	C35	74.5308	ceram PL 63V
	C36	74.5308	ceram PL 63V
	C37	74.5308	ceram PL 63V
	C38	74.5308	ceram PL 63V
	C39	74.5120	ceram BD 250V
	C40	74.5131	ceram BD 250V
	C41	74.5131	ceram BD 250V
	C42	74.5162	ceram DI 400V
	C43	74.5117	ceram TB160V
	C44	74.5133	ceram BD250V
	C45	74.5109	ceram PL 20V

TYPE	NO.	CODE	DATA
	C46	74.5111	56pF 5%
	C47	76.5103	150pF 2.5%
	C48	74.5323	47pF 20%
	C49	74.5198	1nF -20/+50%
	R1	80.5063	27 K Ω 5%
	R2	80.5057	4.7 K Ω 5%
	R3	80.5043	470 Ω 5%
	R4	80.5033	47 Ω 5%
	R5	80.5066	10 K Ω 5%
	R6	80.5237	100 Ω 5%
	R7	80.5040	180 Ω 5%
	R8	80.5066	27 K Ω 5%
	R9	80.5065	22 K Ω 5%
	R10	80.5033	47 Ω 5%
	R11	80.5025	10 Ω 5%
	R12	80.5233	47 Ω 5%
	R13	80.5066	27 Ω 5%
	R14	80.5065	22 K Ω 5%
	R15	80.5051	1.5 K Ω 5%
	R16	80.5033	47 Ω 5%
	R17	80.5034	56 Ω 5%
	R18	80.5039	150 Ω 5%
	R19	80.5041	220 Ω 5%
	R20	80.5058	5.6 K Ω 5%
	R21	80.5051	1.5 K Ω 5%
	R22	80.5033	47 Ω 5%
	R23	80.5054	560 Ω 5%
	R24	80.5036	82 Ω 5%
	R25	80.5057	4.7 K Ω 5%
	R26	80.5051	1.5 K Ω 5%
	R27	80.5033	47 Ω 5%
	R28	80.5046	560 Ω 5%
	R29	80.5035	68 Ω 5%
	R30	80.5243	330 Ω 5%
	R31	80.5255	3.3 K Ω 5%
	L1	61.1234	RF coil
	L2	61.1230	RF coil
	L3	61.1229	RF coil 119 - 159 MHz
	L4	61.1231	RF choke (R10)

RECEIVER CONVERTER MODTAGERKONVERTER

RC712

X401.942

Storno

TYPE	NO.	CODE	DATA
L5	61.1253	RF coil	
L6	61.1252	RF coil	
L7	62.0659	0.35 μ H RF choke	
L8	61.1251	RF coil	
L9	61.1250	RF coil	
L10	61.1249	RF coil	
L11	61.1248	RF coil	
L12	62.0651	0.08 μ H RF choke	
L13	62.0651	0.08 μ H RF choke	
L14	61.1250	RF coil	
L15	61.1249	RF coil	
L16	61.1247	RF coil	
L17	61.1246	RF coil 146-174 MHz	
L18	61.1117	IF coil 10.7 MHz	
E1	99.5237	1N4148 Diode	
Q1	99.5290	BFR90 Transistor	
Q2	99.5291	3N205 Transistor FET	
Q3	99.5291	3N205 Transistor FET	
Q4	99.5240	BFX89 Transistor	
Q5	99.5240	BFX89 Transistor	
Q6	99.5245	2N5245 Transistor J-FET	

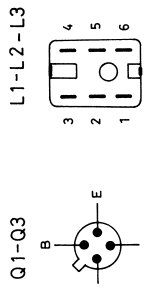
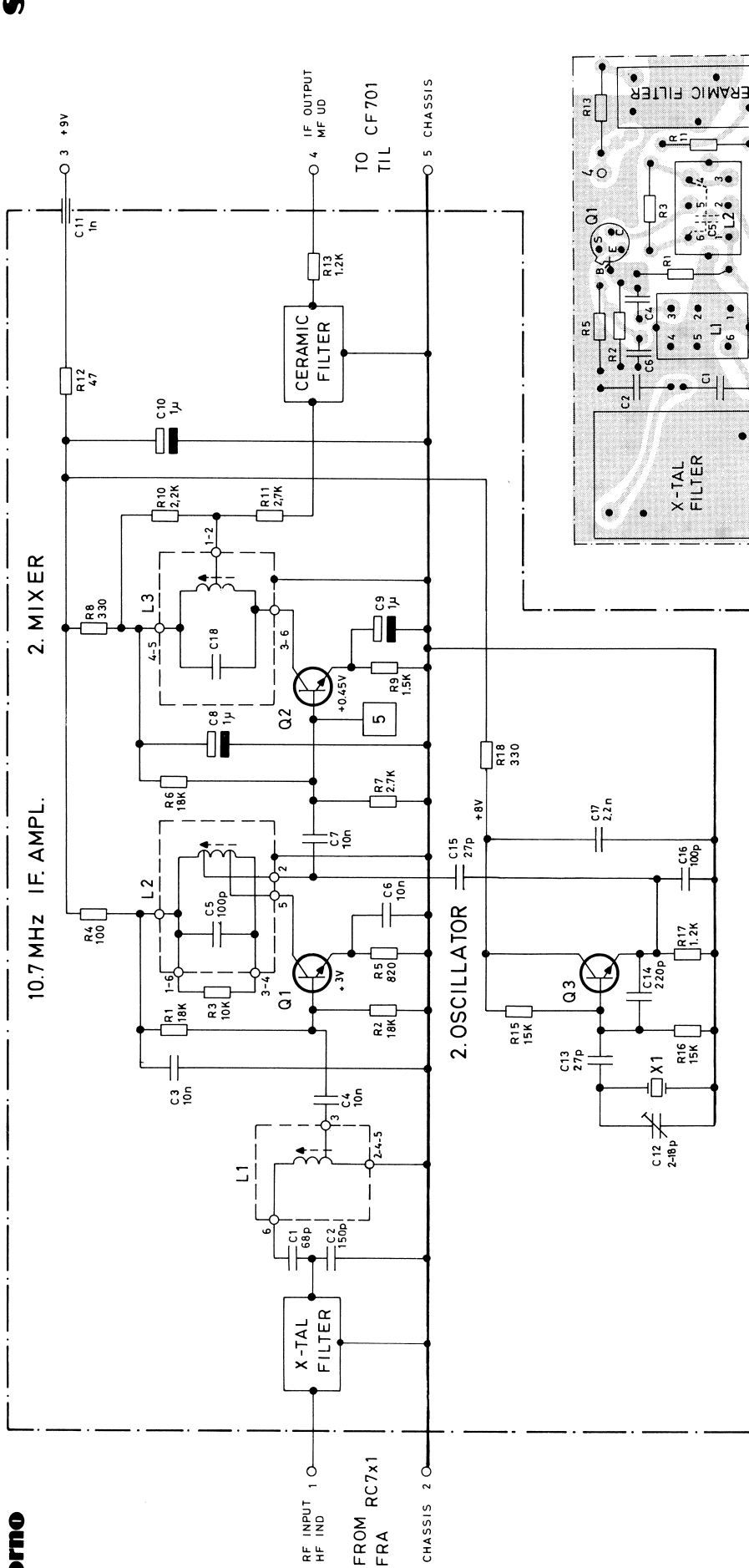
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TYPE	NO.	CODE	DATA

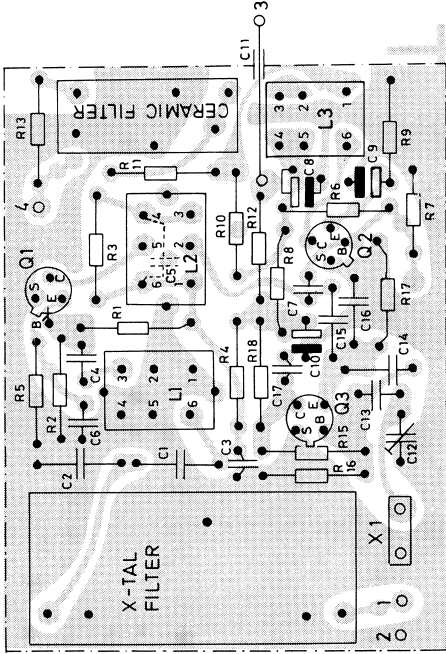
RECEIVER CONVERTER
MODTAGERKONVERTER

RC712

X401.942



BOTTOM VIEW
SET FRA BUNDEN



IF CONVERTER
MF KONVERTER

Storno

Storno

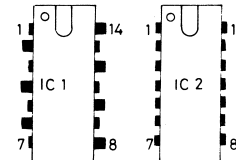
TYPE	NO.	CODE	DATA
IC703		10.2432	IF Converter
	C1	76.5101	68 pF 2.5% polystyr TB
	C2	76.5103	150 pF 2.5% polystyr TB
	C3	76.5070	10 nF 10% polyester. FL
	C4	76.5070	10 nF 10% polyester. FL
	C5	76.5102	100 pF 2.5% polystyr TB
	C6	76.5070	10 nF 10% polyester. FL
	C7	76.5070	10 nF 10% polyester. FL
	C8	73.5114	1μF 20% tantal
	C9	73.5114	1 μF 20% tantal
	C10	73.5114	1 μF 20% tantal
	C11	74.5167	1 nF -20 +80% ceram FT
	C12	78.5044	2-18 pF trimmer
	C13	74.5192	27 pF 5% ceram TB
	C14	76.5104	220 pF 2.5% polystyr TB
	C15	74.5107	27 pF 5% ceram TB
	C16	76.5102	100 pF 2.5% polystyr TB
	C17	76.5059	2.2 nF 10% polyester. FL
	C18	76.5106	470 pF 2.5% polystyr
	R1	80.5264	18 kΩ 5% carbon film
	R2	80.5264	18 kΩ 5% "
	R3	80.5261	10 kΩ 5% "
	R4	80.5237	100 Ω 5% "
	R5	80.5248	820 Ω 5% "
	R6	80.5264	18 kΩ 5% "
	R7	80.5254	2.7 kΩ 5% "
	R8	80.5243	330 Ω 5% "
	R9	80.5254	2.7 kΩ 5% "
	R10	80.5234	56 Ω 5% "
	R11	80.5254	2.7KΩ 5% "
	R12	80.5233	47 Ω 5% "
	R13	80.5250	1.2 kΩ 5% "
	R15	80.5263	15 kΩ 5% "
	R16	80.5263	15 kΩ 5% "
	R17	80.5250	1.2 kΩ 5% "
	R18	80.5243	330 Ω 5% "
	L1	61.1122	IF coil 10.7 MHz
	L2	61.1123	IF coil 10.7 MHz
	L3	61.1302	IF coil 0.455 MHz
	X1	98.5010	Crystal 10.2450 MHz Type 98-12
	X1	98.5011	Crystal 11.1550 MHz Type 98-12
		69.5016	Crystal Filter 10.7 MHz
		69.5014	Ceramic Filter 455 kHz

TYPE	NO.	CODE	DATA
	Q1	99.5168	BF173 Transistor
	Q2	99.5166	BF167 Transistor
	Q3	99.5168	BF173 Transistor

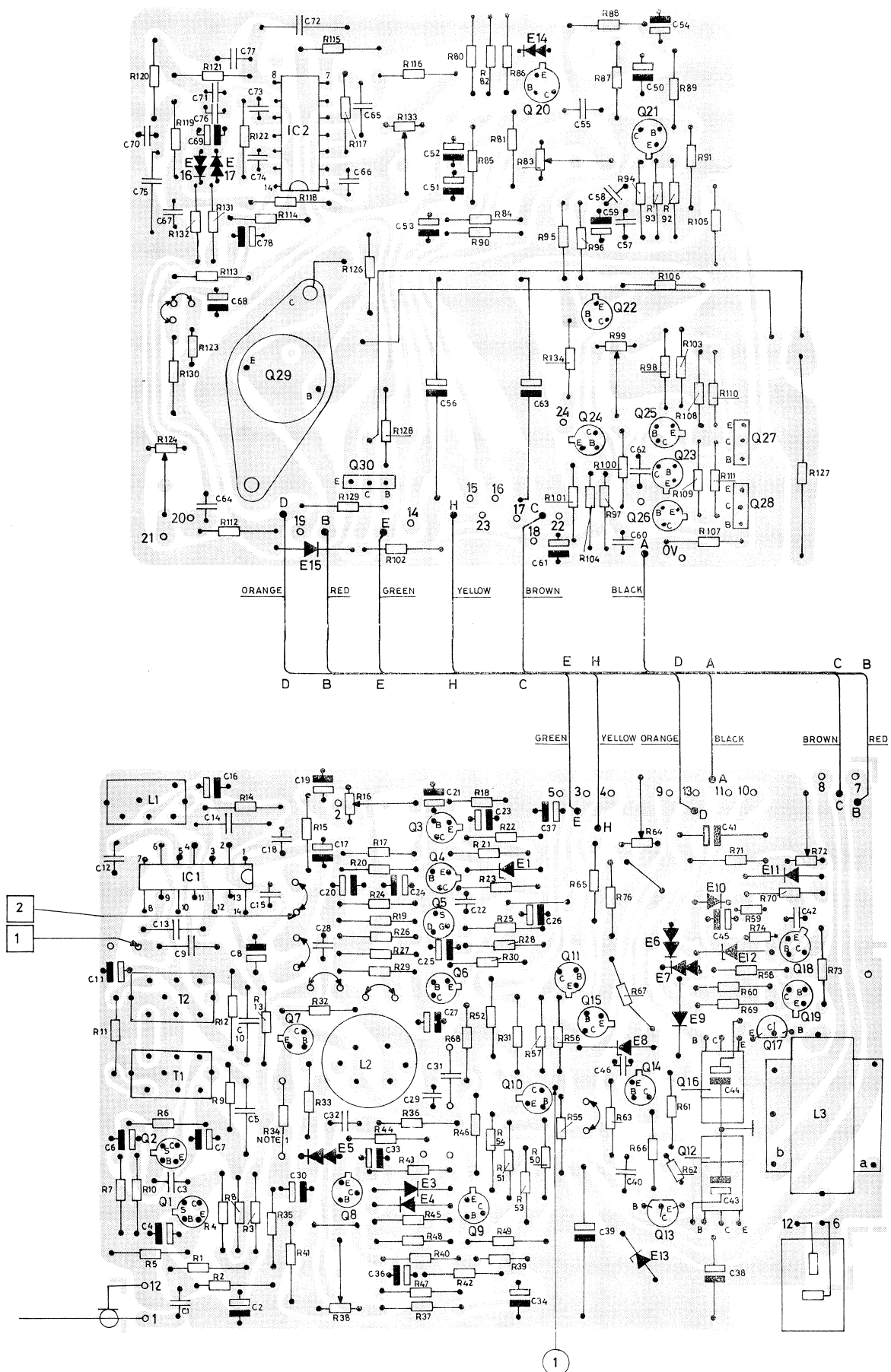
IF CONVERTER IC703

X401.314/3

UPPER PRINTED WIRING BOARD



D401.840



TYPE	NO.	CODE	DATA
	R13	80.5230	27 Ω 5% carbon film
	R14	80.5254	2.7 K Ω 5%
	R15	80.5253	2.2 K Ω 5%
	R16	86.5039	10 K Ω 20% potentiometer
	R17	80.5272	82 K Ω 5% carbon film
	R18	80.5266	27 K Ω 5%
	R19	80.5243	330 Ω 5%
	R20	80.5266	27 K Ω 5%
	R21	80.5240	180 Ω 5%
	R22	80.5254	2.7 K Ω 5%
	R23	80.5261	10 K Ω 5%
	R24	80.5249	1 K Ω 5%
	R25	80.5273	0.1 M Ω 5%
	R26	80.5244	390 Ω 5%
	R27	80.5264	18 K Ω 5%
	R28	80.5258	5.6 K Ω 5%
	R29	80.5247	680 Ω 5%
	R30	80.5241	220 Ω 5%
	R31	80.5267	33 K Ω 5%
	R32	80.5269	47 K Ω 5%
	R33	80.5265	22 K Ω 5%
	R34	80.5244	390 Ω 5%
	R35	80.5248	820 Ω 5%
	R36	80.5261	10 K Ω 5%
	R37	80.5278	0.27 M Ω 5%
	R38	86.5044	25 K Ω 20% potentiometer
	R39	89.5010	15 K Ω 2% NTC
	R40	80.5263	15 K Ω 5% carbon film
	R41	80.5266	27 K Ω 5%
	R42	80.5238	120 Ω 5%
	R43	80.5245	470 Ω 5%
	R44	80.5248	820 Ω 5%
	R45	80.5256	3.9 K Ω 5%
	R46	80.5269	47 K Ω 5%
	R47	80.5280	0.39 M Ω 5%
	R48	80.5261	10 K Ω 5%
	R49	80.5262	12 K Ω 5%
	R50	80.5266	27 K Ω 5%
	R51	80.5266	27 K Ω 5%
	R52	80.5266	27 K Ω 5%
	R53	80.5252	1.8 K Ω
	R54	80.5243	330 Ω 5%
	R55	80.5258	5.6 K Ω 5%
	R56	80.5263	15 K Ω 5%
	R57	80.5240	180 Ω 5%
	R58	80.5254	2.7 K Ω 5%
	R59	80.5274	120 K Ω 5%
	R60	80.5259	6.8 K Ω 5%

TYPE	NO.	CODE	DATA
	R61	80.5249	1 K Ω 5% carbon film
	R62	89.5046	50 Ω PTC
	R63	80.5246	560 Ω 5%
	R64	86.5068	1 K Ω 20% potentiometer
	R65	80.5264	18 K Ω 5% carbon film
	R66	80.5272	82 K Ω 5%
	R67	80.5254	2.7 K Ω 5%
	R68	80.5262	12 K Ω 5%
	R69	80.5257	4.7 K Ω 5%
	R70	80.5258	5.6 K Ω 5%
	R71	80.5258	5.6 K Ω 5%
	R72	86.5039	10 K Ω 20% potentiometer
	R73	80.5272	82 K Ω 5% carbon film
	R74	80.5254	2.7 K Ω 5%
	R76	80.5261	10 K Ω 5%
	R80	80.5246	560 Ω 5%
	R81	80.5275	0.15 M Ω 5%
	R82	80.5267	33 K Ω 5%
	R83	86.5042	500 Ω 20% potentiometer
	R84	80.5238	120 Ω 5% carbon film
	R85	80.5254	2.7 K Ω 5%
	R86	80.5238	120 Ω 5%
	R87	80.5240	180 Ω 5%
	R88	80.5269	47 K Ω 5%
	R89	80.5269	47 K Ω 5%
	R90	80.5261	10 K Ω 5%
	R91	80.5273	0.1 M Ω 5%
	R92	80.5258	5.6 K Ω 5%
	R93	80.5249	1 K Ω 5%
	R94	80.5249	1 K Ω 5%
	R95	80.5256	3.9 K Ω 5%
	R96	80.5233	47 Ω 5%
	R97	80.5251	1.5 K Ω 5%
	R98	80.5250	1.2 K Ω 5%
	R99	86.5043	2.5 K Ω 20% potentiometer
	R100	80.5254	2.7 K Ω 5% carbon film
	R101	80.5259	6.8 K Ω 5%
	R102	80.5253	2.2 K Ω 5%
	R103	80.5253	2.2 K Ω 5%
	R104	80.5225	10 Ω 5%
	R105	80.5242	270 Ω 5%
	R106	80.5253	2.2 K Ω 5%

COMMON FUNCTIONS UNIT CF702

X 401.868

Storno

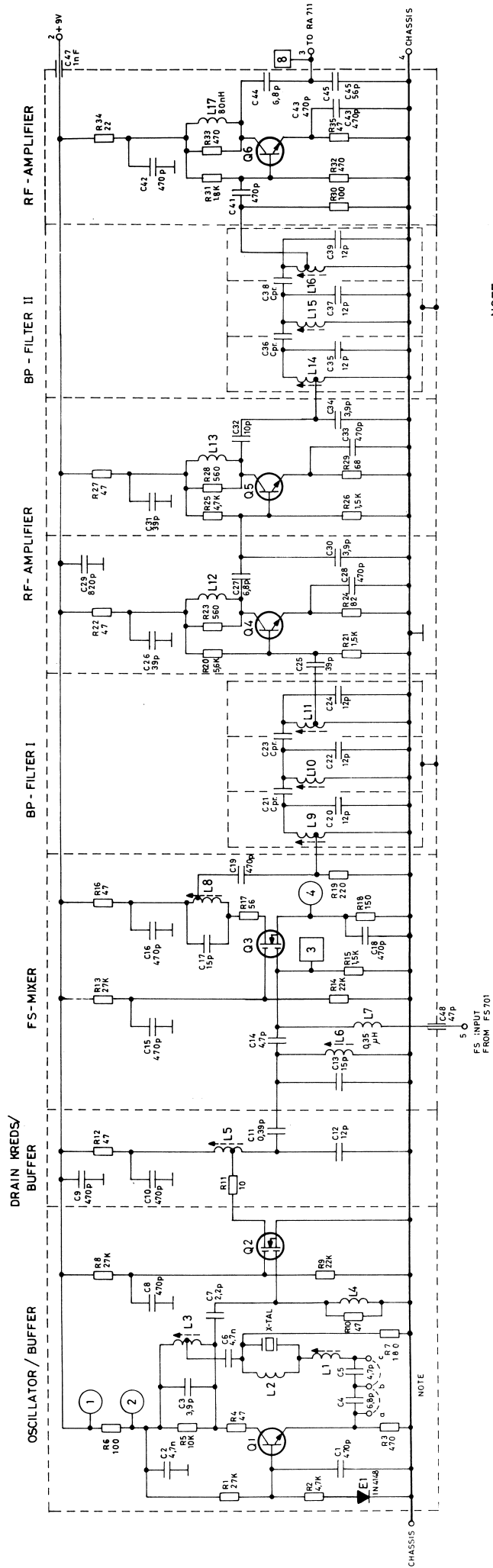
TYPE	NO.	CODE	DATA	
R107	80.5242		270 Ω 5% carbon film	1/8W
R108	80.5213		1 Ω 5%	1/8W
R109	80.5213		1 Ω 5%	1/8W
R110	80.5213		1 Ω 5%	1/8W
R111	80.5213		1 Ω 5%	1/8W
R112	80.5246		560 Ω 5%	1/8W
R113	80.5254		2.7 K Ω 5%	1/8W
R114	89.5062		22 K Ω 1% metal film	1/8W
R115	89.5062		22 K Ω 1% metal film	1/8W
R116	80.5277		0.22 M Ω 5% carbon film	1/8W
R117	80.5259		6.8 K Ω 5%	1/8W
R118	80.5263		15 K Ω 5%	1/8W
R119	89.5062		22 K Ω 1% metal film	1/8W
R120	89.5062		22 K Ω 1% metal film	1/8W
R121	89.5062		22 K Ω 1% metal film	1/8W
R122	80.5251		1.5 K Ω 5% carbon film	1/8W
R123	89.5061		68 Ω 20% NTC	0.5W
R124	86.5053		10 K Ω 20% potentiometer	0.1W
R126	80.5229		22 Ω 5% carbon film	1/8W
R127	84.5224		82 Ω 5% wire wound	4 W
R128	80.5238		120 Ω 5% carbon film	1/8W
R129	80.5443		330 Ω 5%	1/4W
R130	80.5238		120 Ω 5%	1/8W
R131	80.5251		1.5 K Ω 5%	1/8W
R132	80.5251		1.5 K Ω 5%	1/8W
R133	86.5038		500 K Ω 20% potentiometer	0.05W
R134	80.5273		100 K Ω 5% carbon film	1/8W
L1	61.1131		IF coil 455 kHz	
L2	61.1132		Coil 75 mH	
L3	60.5158		Choke	
T1	61.1130		IF Transformer 455 kHz	
T2	61.1130		IF Transformer 455 kHz	
E1	99.5210		Zenerdiode 3.3 V 5%	1/4W
E3	99.5237		1N4148 Diode	
E4	99.5237		1N4148 Diode	
E5	99.5209		Stab. diode 1.5 V	
E6	99.5209		Stab. diode 1.5 V	
E7	99.5209		Stab. diode 1.5 V	
E8	99.5224		Zenerdiode 4.7 V 5%	1/4W
E9	99.5237		1N4148 Diode	
E10	99.5237		1N4148 Diode	
E11	99.5237		1 N4148 Diode	
E12	99.5224		Zenerdiode 4.7 V 5%	1/4W
E13	99.5249		Zenerdiode BZY93/C20R	
E14	99.5209		Stab. diode 1.5 V	
E15				

Storno

TYPE	NO.	CODE	DATA
E15	99.5237		1N4148 Diode
E16	99.5209		Stab. diode 1.5 V
E17	99.5209		Stab. diode 1.5 V
Q1	99.5166		BF167 Transistor
Q2	99.5166		BF167 Transistor
Q3	99.5143		BC108 Transistor
Q4	99.5143		BC108 Transistor
Q5	99.5247		2N4302 Transistor FET
Q6	99.5143		BC108 Transistor
Q7	99.5143		BC108 Transistor
Q8	99.5143		BC108 Transistor
Q9	99.5115		BC179 Transistor
Q10	99.5115		BC179 Transistor
Q11	99.5143		BC108 Transistor
Q12	99.5246		TIP 31 Transistor
Q13	99.5144-01		BC214L Transistor
Q14	99.5243		BC108 Transistor
Q15	99.5243		BC108 Transistor
Q16	99.5246		TIP 31 Transistor
Q17	99.5144-01		BC214L Transistor
Q18	99.5143		BC108 Transistor
Q19	99.5143		BC108 Transistor
Q20	99.5201		BC109 Transistor
Q21	99.5201		BC109 Transistor
Q22	99.5115		BC179 Transistor
Q23	99.5143		BC108 Transistor
Q24	99.5143		BC108 Transistor
Q25	99.5143		BC108 Transistor
Q26	99.5115		BC179 Transistor
Q27	99.5236		BD136 Transistor
Q28	99.5235		BD135 Transistor
Q29	99.5248		SP2629 Transistor
Q30	99.5235		BD135 Transistor
IC1	14.5010		IF ampl./discr.
IC2	14.5006		MC1437P dual OP amp.

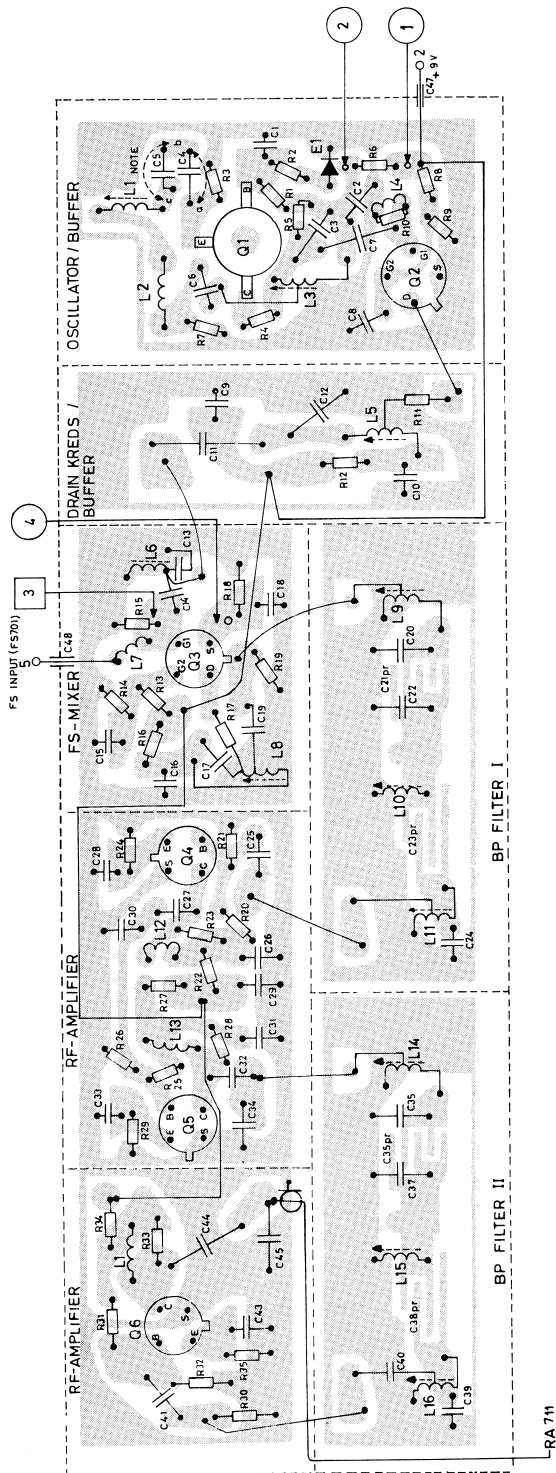
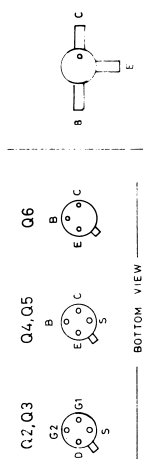
COMMON FUNCTIONS UNIT CF702

X 401.868



NOTE:

FREQUENCY FREKVEN	STRAP STRÄPNING
UP/OP NORMAL	NONE/INGEN a-b
DOWN/NED	b-c



EXCITER
STYRESENDER

EX712

D 401.847

Storno

TYPE	NO.	CODE	DATA
EX712		10.2936	Exciter
	C1	74.5162	ceram DI 400V
	C2	74.5108	ceram PL 20V
	C3	74.5302	ceram PL 63V
	C4	74.5321	ceram PL100V
	C5	74.5318	ceram PL100V
	C6	74.5198	ceram PL 20V
	C7	74.5299	ceram PL 63V
	C8	74.5161	ceram PL 63V
	C9	74.5162	ceram DI 400V
	C10	74.5162	ceram DI 400V
	C11	74.5129	ceram BD250V
	C12	74.5135	ceram DI 125V
	C13	74.5136	ceram DI 125V
	C14	74.5131	ceram DI 250V
	C15	74.5162	ceram DI 400V
	C16	74.5162	ceram DI 400V
	C17	74.5136	ceram DI 125V
	C18	74.5162	ceram DI 400V
	C19	74.5161	ceram PL 63V
	C20	74.5308	ceram PL 63V
	C21		ceram PL 63V
	C22	74.5308	12pF 5%
	C23		Printed Capacitor
	C24	74.5308	12pF 5%
	C25	74.5316	39pF 5%
	C26	74.5316	39pF 5%
	C27	74.5305	6.8pF ± 0.25pF
	C28	74.5162	470pF -20/+50%
	C29	74.5314	820pF -20/+80%
	C30	74.5302	3.9pF ± 0.25pF
	C31	74.5316	39pF 5%
	C32	74.5307	10pF 5%
	C33	74.5162	470pF -20/+50%
	C34	74.5302	3.9pF ± 0.25pF
	C35	74.5308	12pF 5%
	C36		Printed Capacitor
	C37	74.5308	12pF 5%
	C38		Printed Capacitor
	C39	74.5308	12pF 5%
	C40		Not used
	C41	74.5161	470pF -20/+80%
	C42	74.5161	470pF -20/+80%
	C43	74.5162	470pF -20/+50%
	C44	74.5133	6.8pF ± 0.25pF
	C45	74.5132	5.6pF ± 0.25pF

Storno

TYPE	NO.	CODE	DATA
	C46	74.5198	Not used
	C47	74.5323	InF -20/+80%
	C48		47pF 20%
	R1	80.5066	27 KΩ 5%
	R2	80.5057	4.7 KΩ 5%
	R3	80.5045	470 Ω 5%
	R4	80.5033	47 Ω 5%
	R5	80.5061	10 KΩ 5%
	R6	80.5237	100Ω 5%
	R7	80.5041	220 Ω 5%
	R8	80.5066	27 KΩ 5%
	R9	80.5065	22 KΩ 5%
	R10	80.5033	47 Ω 5%
	R11	80.5025	10 Ω 5%
	R12	80.5233	47 Ω 5%
	R13	80.5066	27 KΩ 5%
	R14	80.5065	22 KΩ 5%
	R15	80.5051	1.5 KΩ 5%
	R16	80.5033	47 Ω 5%
	R17	80.5034	56 Ω 5%
	R18	80.5039	150 Ω 5%
	R19	80.5041	220 Ω 5%
	R20	80.5058	5.6 KΩ 5%
	R21	80.5051	1.5 KΩ 5%
	R22	80.5033	47 Ω 5%
	R23	80.5054	560 Ω 5%
	R24	80.5036	82 Ω 5%
	R25	80.5057	4.7 KΩ 5%
	R26	80.5051	1.5 KΩ 5%
	R27	80.5033	47 Ω 5%
	R28	80.5046	560 Ω 5%
	R29	80.5035	68 Ω 5%
	R30	80.5037	100 Ω 5%
	R31	80.5052	1.8 KΩ 5%
	R32	80.5045	470 Ω 5%
	R33	80.5045	470 Ω 5%
	R34	80.5029	22 Ω 5%
	R35	80.5033	47 Ω 5%
	L1	61.1234	RF coil

EXCITER
STYRESENDER

EX712

X401.945/2

Storno

TYPE	NO.	CODE	DATA
	L2	61.1230	RF coil
	L3	61.1229	RF coil 119 - 159 MHz
	L4	61.1231	RF choke (R 10)
	L5	61.1253	RF coil
	L6	61.1252	RF coil
	L7	62.0659	0.35 μ H RF choke
	L8	61.1251	RF coil
	L9	61.1256	RF coil
	L10	61.1257	RF coil
	L11	61.1258	RF coil
	L12	62.0651	0.08 μ H RF choke
	L13	62.0651	0.08 μ H RF choke
	L14	61.1256	RF coil
	L15	61.1257	RF coil
	L16	61.1258	RF coil
	L17	62.0561	0.08 μ H RF choke
	E1	99.5237	1N4148 Diode
	Q1	99.5290	BFR90 Transistor
	Q2	99.5291	3N205 Transistor FET
	Q3	99.5291	3N205 Transistor FET
	Q4	99.5240	BFX89 Transistor
	Q5	99.5240	BFX89 Transistor
	Q6	99.5240	BFX89 Transistor

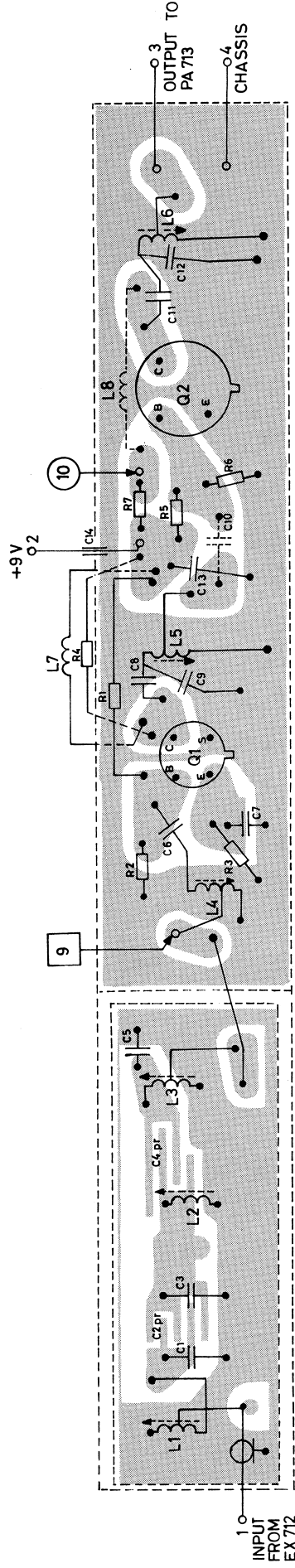
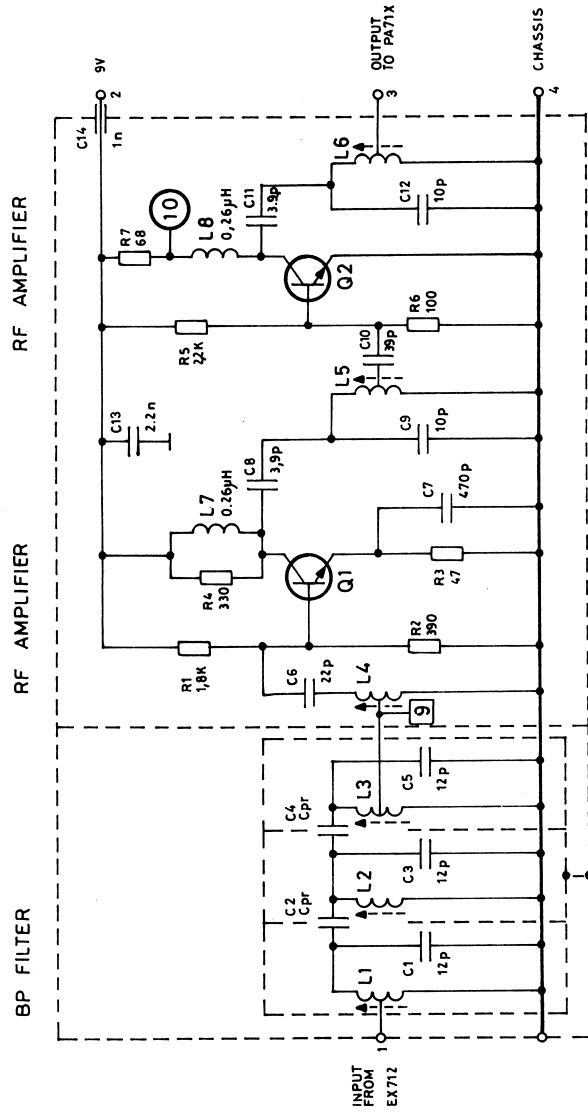
Storno

TYPE	NO.	CODE	DATA

EXCITER
STYRESENDER

EX712

X401.945/2



RF AMPLIFIER RA711
HF FORSTÆRKER

D401.848/2

Storno

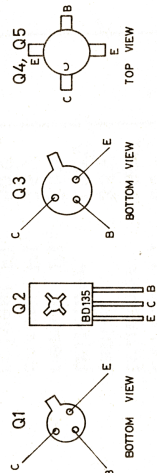
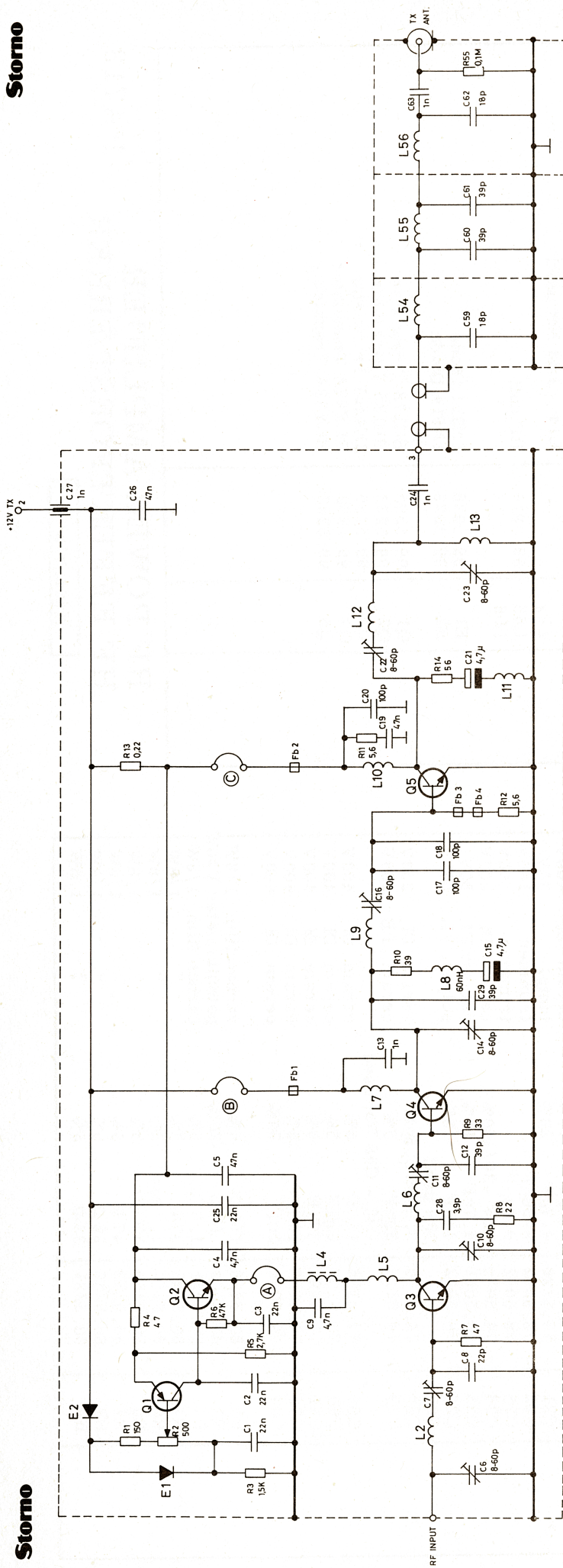
TYPE	NO.	CODE	DATA
RA 711	C1	10.2937	RF Amplifier
	C2	74.5308	12pF 5% ceram PL 63V
	C3	74.5308	Printed Capacitor
	C4	74.5308	12pF 5% ceram PL 63V
	C5	74.5308	Printed capacitor
	C6	74.5106	22pF 5% ceram Pl 63V
	C7	74.5162	470pF -20/+50% ceram TB 160V
	C8	74.5130	3.9pF ± 0.25pF ceram DI 400V
	C9	74.5135	10pF 5% ceram DI 250V
	C10	74.5117	39pF 5% ceram DI 125V
	C11	74.5130	3.9pF ± 0.25pF ceram TB 160V
	C12	74.5135	10pF 5% ceram DI 250V
	C13	74.5163	2.2nF -20/+80% ceram DI 125V
	C14	74.5198	1nF -20/+50% ceram PL 63V
	R1	80.5052	1.8KΩ carbon film
	R2	80.5044	390 Ω "
	R3	80.5033	47 Ω "
	R4	80.5043	330 Ω "
	R5	80.5053	2.2 KΩ "
	R6	80.5037	100 Ω "
	R7	80.5236	82 Ω "
	L1	61.1256	RF coil 146-174 MHz
	L2	61.1257	RF coil 146-174 MHz
	L3	61.1258	RF coil 146-174 MHz
	L4	61.1254	RF coil 146-174 MHz
	L5	61.1255	RF coil 146-174 MHz
	L6	61.1255	RF coil 146-174 MHz
	L7	62.0614	0.26 μH RF choke
	L8	62.0614	0.26 μH RF choke
	Q1	99.5240	BFX89 Transistor
	Q2	99.5229	2N4427 Transistor

TYPE	NO.	CODE	DATA

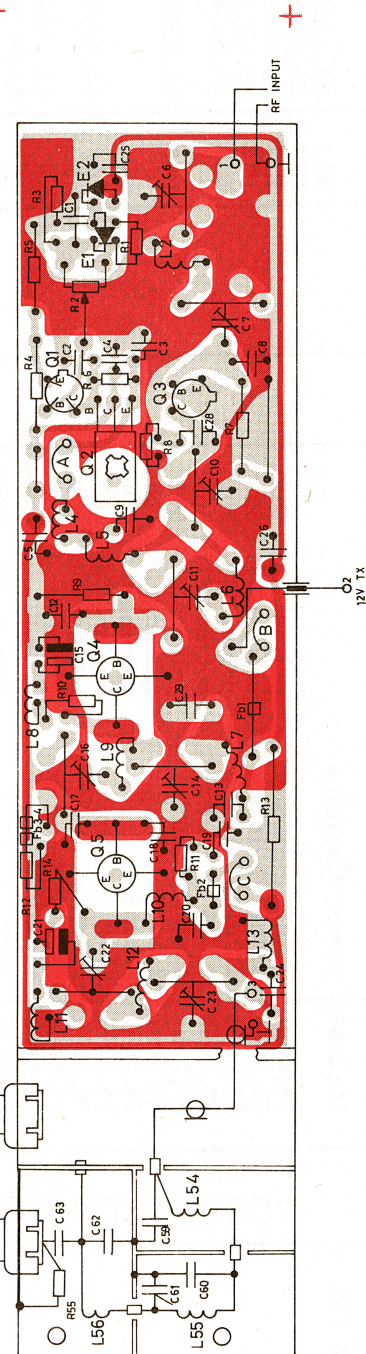
RF AMPLIFIER HF FORSTÆRKER

RA711

X401.941



PRINTED CIRCUIT VIEWED FROM COMPONENT SIDE



RF POWER AMPLIFIER
HF EFFEKTFORSTÆRKER

PA713

D401952

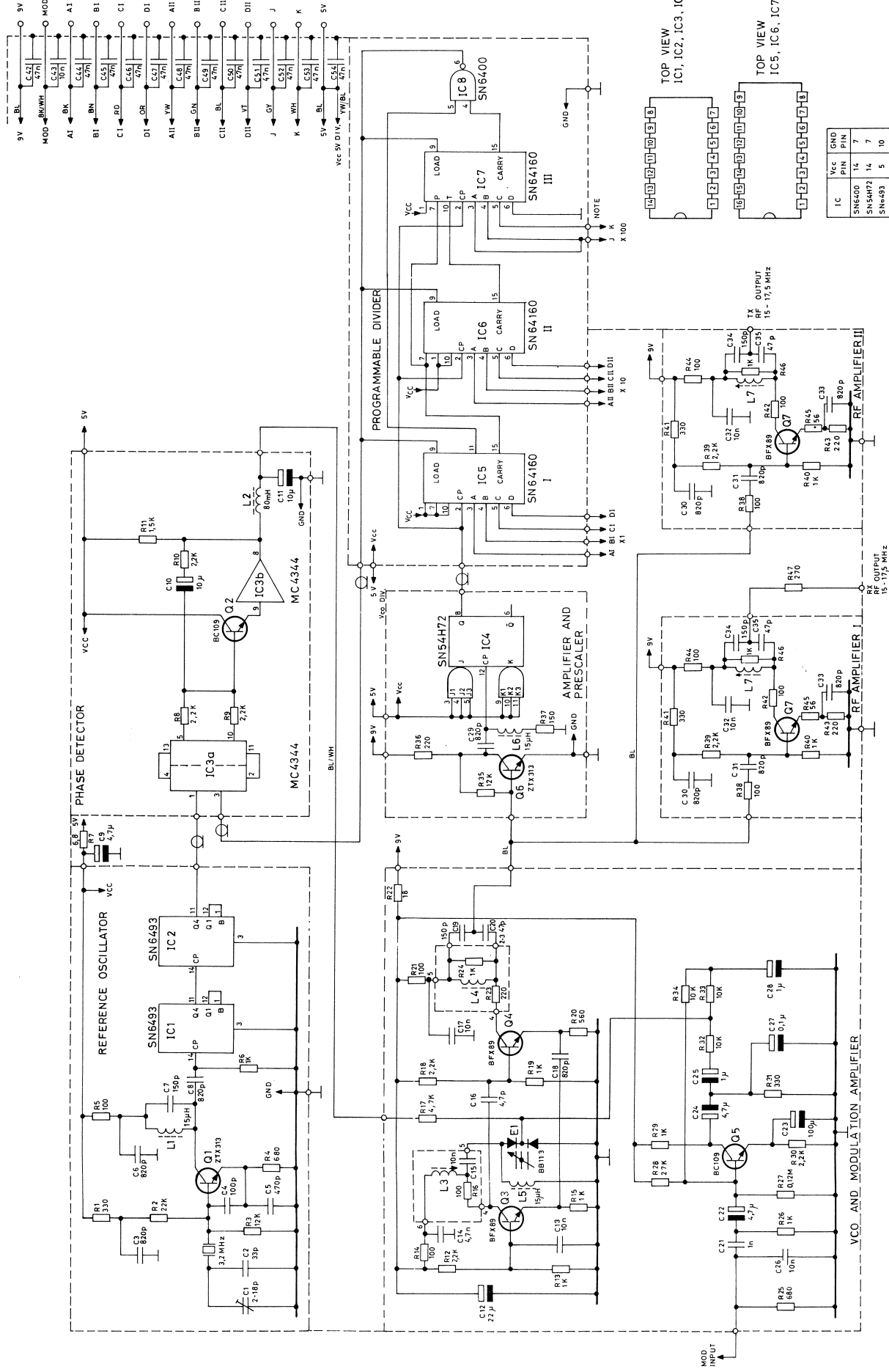
TYPE	NO.	CODE	DATA
PA 713		10.2938	Power Amplifier
	C1	76.5061	4.7nF 10% polyester FL 50V
	C2	76.5061	4.7nF 10% polyester FL 50V
	C3	76.5061	4.7nF 10% polyester FL 50V
	C4	76.5061	4.7nF 10% polyester FL 50V
	C5	76.5062	47nF 10% polyester FL 50V
	C6	78.5052	8-60pF trimmer 100V
	C7	78.5052	8-60pF trimmer 100V
	C8	74.5106	22pF 5% ceram TB 160V
	C9	76.5061	4.7nF 10% polyester FL 50V
	C10	78.5052	8-60pF trimmer 100V
	C11	78.5052	8-60pF trimmer 100V
	C12	74.5117	39pF 5% ceram TB 160V
	C13	74.5155	1nF-20/+50% ceram PL 63V
	C14	78.5062	8-60pF trimmer 100V
	C15	73.5126	4.7μF 20% tantal 35V
	C16	78.5062	8-60pF trimmer 100V
	C17	74.5199	100pF 20% ceram PL 25V
	C18	74.5199	100pF 20% ceram PL 25V
	C19	76.5052	47nF 10% polyester FL 50V
	C20	74.5013	100pF 20% ceram DI 400V
	C21	73.5126	4.7μF 20% tantal 35V
	C22	78.5052	8-60pF trimmer 100V
	C23	78.5052	8-60pF trimmer 100V
	C24	74.5015	1nF -20/+50% ceram DI 400V
	C25	76.5061	4.7nF 10% polyester FL 50V
	C26	76.5072	47nF 10% polyester FL 50V
	C27		Not used
	C28	74.5130	3.9pF±2.5pF ceram DI 250V
	C29	74.5117	39pF 5% ceram TB 160V
	C59	74.5196	18pF 5% ceram DI 400V
	C60	74.5197	39pF 5% ceram DI 400V
	C61	74.5197	39pF 5% ceram DI 400V
	C62	74.5196	18pF 5% ceram DI 400V
	C63	74.5015	1nF 20% ceram DI 400V
	R1	80.5239	150 Ω 5% carbon film 1/8W
	R2	86.5042	500 Ω 20% potentiometer 1/10W
	R3	80.5251	1.5 KΩ 5% carbon film 1/8W
	R4	80.5233	47 Ω 5% " 1/8W
	R5	80.5254	2.7 KΩ 5% " 1/8W
	R6	80.5269	47 KΩ 5% " 1/8W
	R7	80.5233	47 Ω 5% " 1/8W
	R8	80.5229	22 Ω 5% " 1/8W
	R9	80.5231	33 Ω 5% " 1/8W

TYPE	NO.	CODE	DATA
	R10	80.5432	39 Ω 5% carbon film 1/4W
	R11	80.5222	5.6 Ω 5% " 1/8W
	R12	80.5222	5.6 Ω 5% " 1/8W
	R13	82.5205	0.22 Ω 10% wire wound 1W
	R14	80.5434	56 Ω 5% carbon film 1/8W
	R55	80.5273	R15-R54 Not used carbon film 1/8W
	L1		Not used
	L2	62.0822	RF coil 146-174 MHz
	L3		Not used
	L4	63.5008	0.47 μH 20% RF choke
	L5	62.0822	RF coil 146-174 MHz
	L6	62.0823	RF coil 146-174 MHz
	L7	62.0824	RF coil 146-174 MHz
	L8	61.5011	0.06 μH 20% RF choke
	L9	62.0825	RF coil 146-174 MHz
	L10	62.0825	RF coil 146-174 MHz
	L11	61-5011	0.06 μH 20% RF choke
	L12	62.0827	RF coil 146-174 MHz
	L13	62.0826	RF coil 146-174 MHz
	L54		L14 - L53 Not used
	L55	62.0816	RF coil
	L56		
	E1	99.5028	1N914 Diode
	E2	99.5028	1N914 Diode
	Q1	99.5230	BC178 Transistor
	Q2	99.5235	BD135 Transistor
	Q3	99.5229	2N4427 Transistor
	Q4	99.5252	BLY87A Transistor
	Q5	99.5253	BLY88A Transistor

RF POWER AMPLIFIER
HF EFFEKTFORSTÆRKER

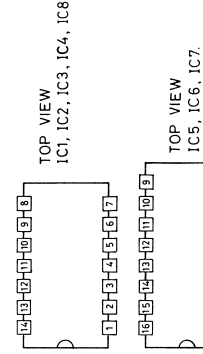
PA713

X401.948



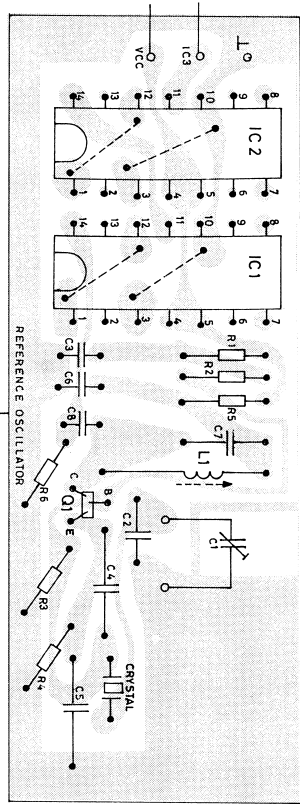
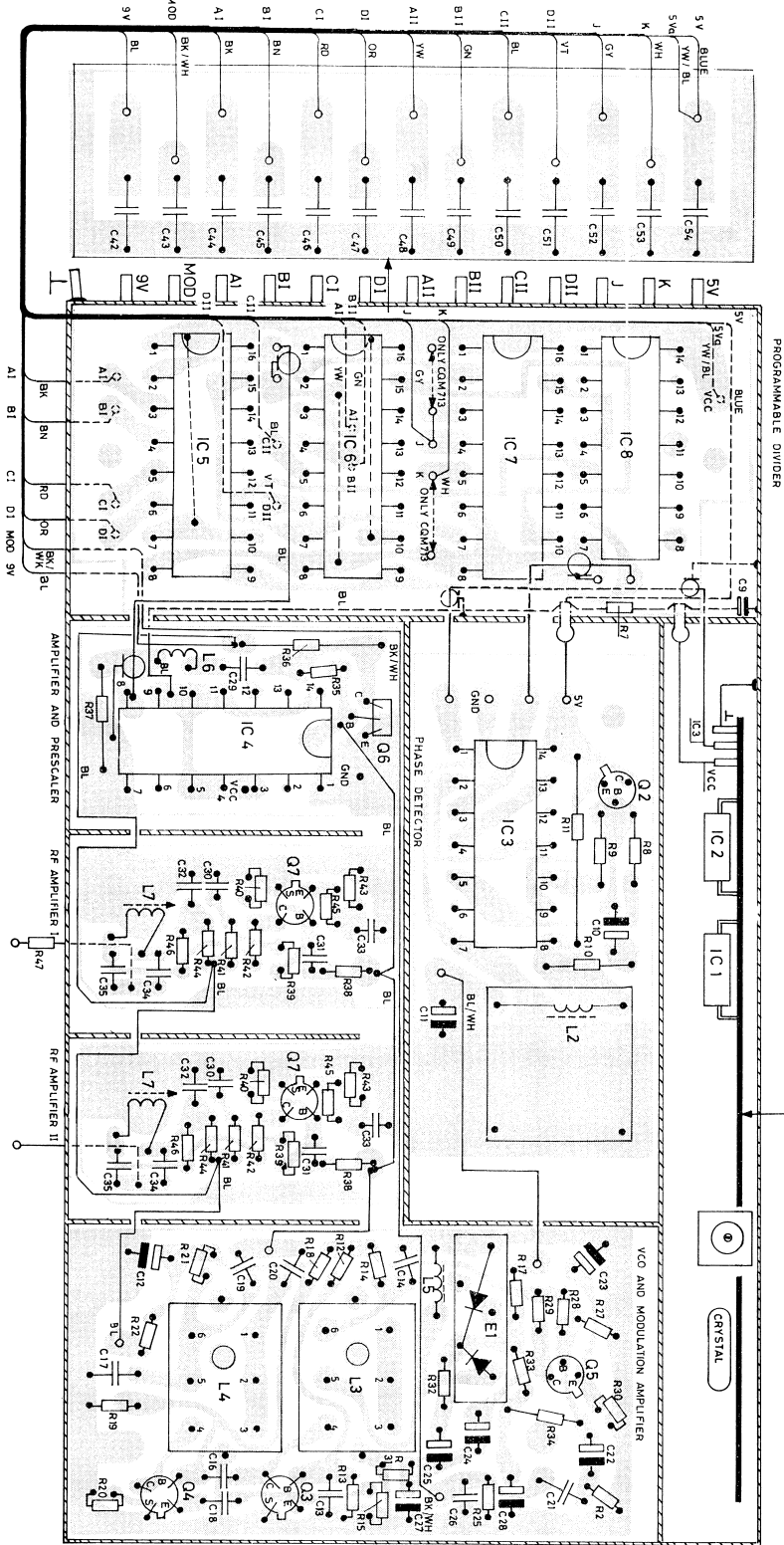
NOTE: IN COM713 (X49DK AND X46N) J AND K ARE CONNECTED INTERNALLY IN THE PROGRAMMABLE DIVIDER TO +5V AND CHASSIS RESPECTIVELY. THESE CONNECTIONS ARE NOT MADE IN COM763D.
 1 COM713D (X49DK OG X46N) ER J OG K STRAPPET TIL H.V. 5V OG STL.
 1 COM763D ER OVENNÆVNT STRAPPET IKKE INDØRT.

IC	Vcc	GND	Pin
SN6400	14	7	
SN54H72	14	7	
SN6493	5	10	
SN64160	16	8	
MC4344	14	7	



FREQUENCY SYNTHESIZER FREKVENSSYNTESSEHED

FS701



FREQUENCY SYNTHESIZER
FREKVENSSYNTETISERENHED

FS701

D401.891

Storno

TYPE	NO.	CODE	DATA
FS701		10. 2923	Frequency Synthesizer
			PC BOARD
	C9	73. 5126	4. 7 μ F 20% tantal
	R7	80. 5223	6. 8 Ω 5% carbon film
	R47	80. 5042	270 Ω 5%
			35 V 1/8W 1/10W
	C42	74. 5283	CAPACITANCE BOARD
	C43	74. 5281	47 nF 20% ceram CP
	C44 -		10 nF 20% ceram CP
	- C54	74. 5283	47 nF 20% ceram CP
			50 V 50 V 50 V
			REFERENCE OSCILLATOR
	C1	78. 5044	2-13 pF trimmer
	C2	74. 5116	33 pF 5% ceram TB
	C3	74. 5314	820 pF -20+80% ceram PL
	C4	76. 5102	100 pF 2. 5 % polystyr TB
	C5	76. 5065	470 pF 5% polystyr TB
	C6	74. 5314	820 pF -20+80% ceram PL
	C7	76. 5103	150 pF 2. 5 % polystyr TB
	C8	74. 5314	820 pF -20+80% ceram PL
			160 V 63 V 25 V 160 V 63 V 25 V 63 V
	R1	80. 5043	330 Ω 5% carbon film
	R2	80. 5065	22 K Ω 5%
	R3	80. 5062	12 K Ω 5%
	R4	80. 5047	680 Ω 5%
	R5	80. 5037	100 Ω 5%
	R6	80. 5049	1 K Ω 5%
	L1	63. 5007	15 μ H 20% choke
			1/10W 1/10W 1/10W 1/10W 1/10W 1/10W
	Q1	99. 5293	Transistor ZTX313
	IC1	14. 5043	SN6493 4-bit binary counter
	IC2	14. 5043	SN6493 4-bit binary counter
			PHASE DETECTOR
	C10	73. 5109	10 μ F 20% tantal
	C11	73. 5109	10 μ F 20% tantal
			16 V 16 V
	R8	80. 5053	2. 2 K Ω 5% carbon film.
	R9	80. 5053	2. 2 K Ω 5%
	R10	80. 5053	2. 2 K Ω 5%
			1/10W 1/10W 1/10W

F5701

X401.863

Storno

TYPE	NO.	CODE	DATA
	C33	74.5314	820 pF -20+80% ceram PL
	C34	76.5103	150 pF 2.5 % polvestyren TB
	C35	74.5319	47 pF 2% ceram PL
	R38	80.5037	100Ω 5% carbon film
	R39	80.5053	2.2 KΩ
	R40	80.5049	1 KΩ 5%
	R41	80.5043	330Ω 5%
	R42	80.5037	100 Ω 5%
	R43	80.5041	220Ω 5%
	R44	80.5037	100 Ω 5%
	R45	80.5034	56 Ω 5%
	R46	80.5049	1 KΩ 5%
	L7	61.1233	RF coil
	Q7	99.5240	Transistor BFX89

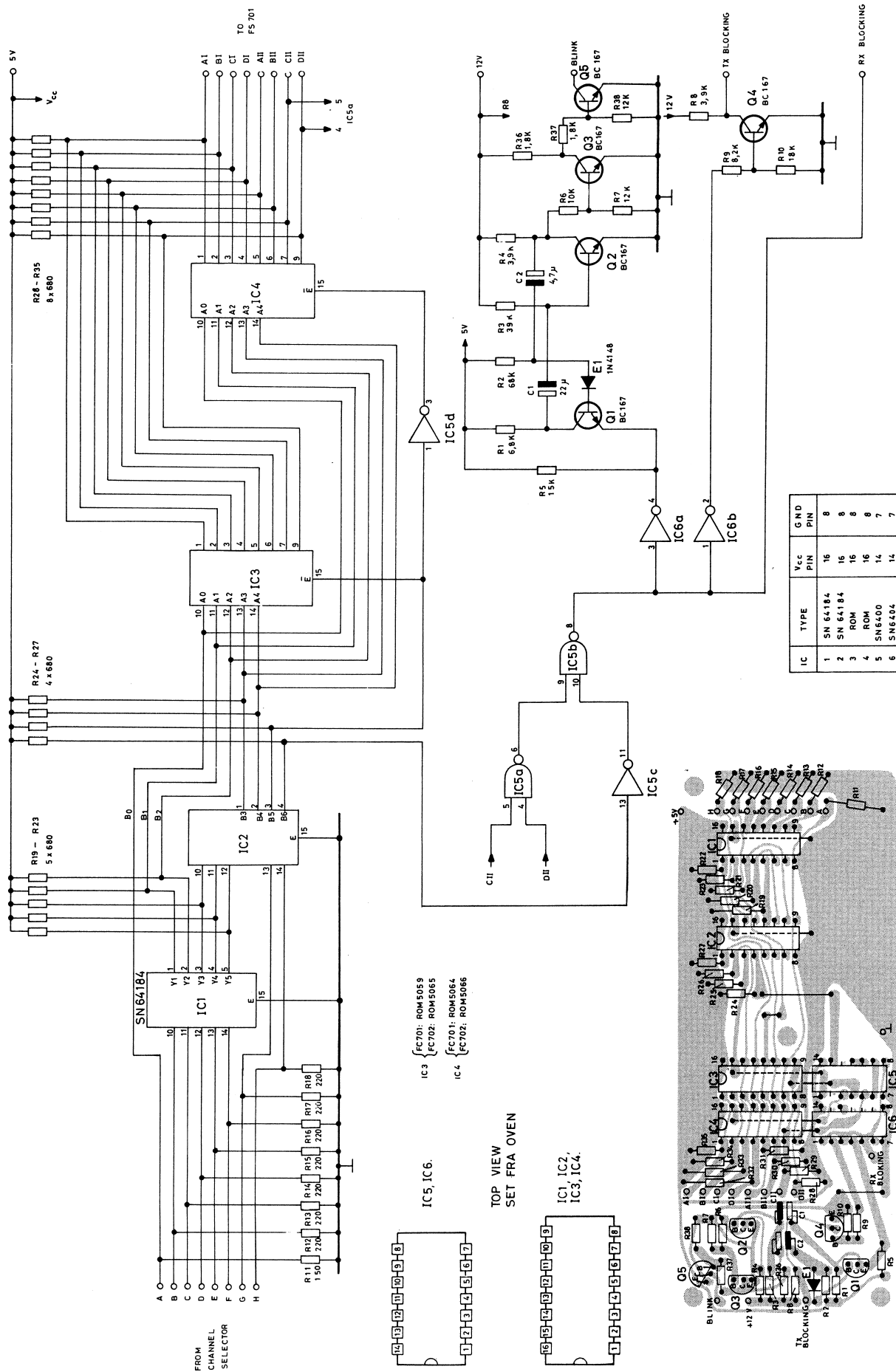
FREQUENCY SYNTHESIZER
FREKV ENSSYNT ESEENHED

FS701

N401.363

Storno

TYPE	NO.	CODE	DATA
	R26	80.5049	1 KΩ 5% carbon film
	R27	80.5074	120 KΩ 5%
	R28	80.5066	27 KΩ 5%
	R29	80.5049	1 KΩ 5%
	R30	80.5053	2.2. KΩ 5%
	R31	80.5043	330 Ω 5%
	R32	80.5061	10 KΩ 5%
	R33	80.5061	10 KΩ 5%
	R34	80.5061	10 KΩ 5%
	L3	61.1220	RF coil
	L4	61.1221	RF coil
	L5	63.5007	15 μH 20% choke
	E1	99.5292	Triple cap. diode BB113
	Q3	99.5240	Transistor BFX89
	Q4	99.5240	Transistor BFX89
	Q5	99.5201	Transistor BC109
			AMPLIFIER AND PRESCALER
	C29	74.5314	820 pF -20+80% ceram PL
	R35	80.5062	12 KΩ 5% carbon film
	R36	80.5241	220Ω 5%
	R37	80.5039	150Ω 5%
	L6	63.5007	15 μH 20% choke
	Q6	99.5293	Transistor ZTX313
	IC4	14.5062	SN54H72 Gated J-K flip-flop
			PROGRAMMABLE DIVIDER
	IC5	14.5061	SN64160 Synkronous decade counter
	IC6	14.5061	SN64160
	IC7	14.5061	SN64160
	IC8	14.5024	SN6400 Quadr. 2-input NAND-gate
			RF AMPLIFIERS (2 identical modules)
	C30	74.5314	820 pF -20+80 % ceram PL
	C31	74.5314	820 pF -20+80% ceram PL
	C32	76.5070	10 nF 10% polyester FL



FREQUENCY CONTROL UNIT FC701, FC702
FREKVENSKONTROLLENHED

Storno

Storno

TYPE	NO.	CODE	DATA
FC701 FC702		10. 2939	Frequency Control Unit DK
		10. 2940	Frequency Control Unit N
	C1	73. 5127	22 μ F 20% tantal 16V
	C2	73. 5126	4. 7 μ F 20% tantal 35V
	R1	80. 5059	6. 8k Ω 5% carbon film 1/10W
	R2	80. 5071	68k Ω 5% carbon film 1/10W
	R3	80. 5068	39k Ω 5% carbon film 1/10W
	R4	80. 5056	3. 9k Ω 5% carbon film 1/10W
	R5	80. 5063	15k Ω 5% carbon film 1/10W
	R6	80. 5061	10k Ω 5% carbon film 1/10W
	R7	80. 5062	12k Ω 5% carbon film 1/10W
	R8	80. 5056	3. 9k Ω 5% carbon film 1/10W
	R9	80. 5060	8. 2k Ω 5% carbon film 1/10W
	R10	80. 5064	18k Ω 5% carbon film 1/10W
	R11	80. 5439	150 Ω 5% carbon film 1/4W
	R12	80. 5041	220 Ω 5% carbon film 1/10W
	R13	80. 5041	220 Ω 5% carbon film 1/10W
	R14	80. 5041	220 Ω 5% carbon film 1/10W
	R15	80. 5041	220 Ω 5% carbon film 1/10W
	R16	80. 5041	220 Ω 5% carbon film 1/10W
	R17	80. 5041	220 Ω 5% carbon film 1/10W
	R18	80. 5041	220 Ω 5% carbon film 1/10W
	R19-35	80. 5047	680 Ω 5% carbon film 1/10W
	R36	80. 5052	1. 8k Ω 5% carbon film 1/10W
	R37	80. 5052	1. 8k Ω 5% carbon film 1/10W
	R38	80. 5062	12k Ω 5% carbon film 1/10W
	E1	99. 5237	1N4148 Diode
	Q1	99. 5117	BC167 Transistor
	Q2	99. 5117	BC167 Transistor
	Q3	99. 5117	BC167 Transistor
	Q4	99. 5117	BC167 Transistor
	Q5	99. 5117	BC167 Transistor
	IC1	14. 5063	SN64184 BCD to binary converter
	IC2	14. 5063	SN64184 BCD to binary converter
FC701	IC3	14. 5059	5059 DK ROM
FC702	IC3	14. 5065	5065 N ROM
FC701	IC4	14. 5064	5064 DK ROM
FC702	IC4	14. 5066	5066 N ROM
	IC5	14. 5024	SN6400 Quadruple 2-input NAND Gate
	IC6	14. 5034	SN6404 Hex Inverter

FREQUENCY CONTROL UNIT
FREKV ENSKONTROL ENHED

FC701, FC702

X401, 964

CHANNELS	IC COMPLEMENT
MAX. 31	1, 2, 6 OG 7 + { 3 AND 4, EVT. 9, 3, 4, 5 OG 8
MAX. 63	
MAX. 95	

NOTE 2

5x4.68K

4x4.68K

5x4.68K

4x4.68K

5x4.68K

4x4.68K

5x4.68K

4x4.68K

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5x4.68K

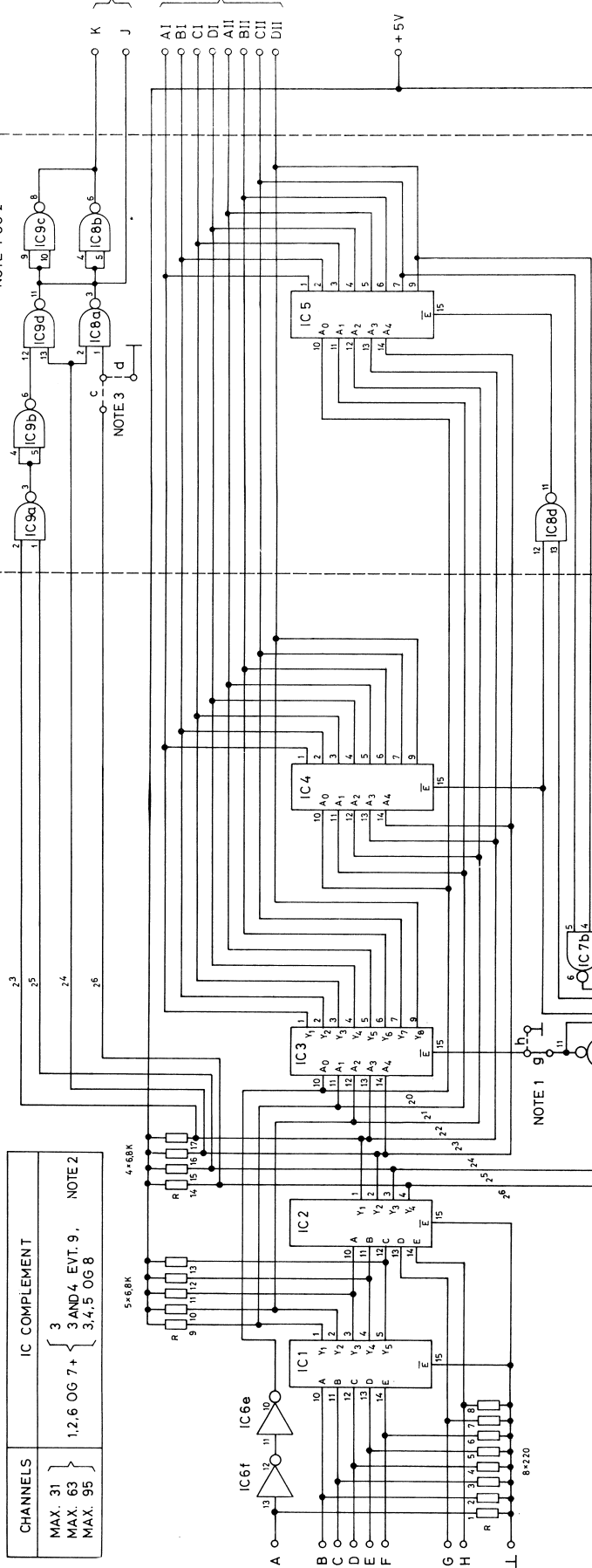
4x4.68K

5x4.68K

4x4.68K

5x4.68K

4x4.68K



SPECIALVERSIONER :

- Note 1: Ved kanalantal på max. 31, strap a, f og h. Kanalantal på max. 63, strap a, e og g. Kanalantal på max. 95, sæt IC8 og strap b, d, e og g.
- Note 2: IC9 sættes kun ved kanalantal på max 63, og kun hvis der ønskes omstyring af 100-dekaden i FS700 for kanal 56 - 63.
- Note 3: Ønskes omstyring af 100-dekaden i FS700 for kanal 80 - 95, strap c:-- Normal ~ ingen omstyring, strap d.
- Note 4: Den normale strapning af J og K i FS700 kan fjernes, således, at omstyring af 100-dekaden kan indføres som nævnt i note 2 og 3. Deleforhold 6xx: J=1 og K=0 (NORMAL) Deleforhold 5xx: J=0 og K=1

FC 704:

STRAPNINGER : a, e, f og g.
IC'ER : IC1, 2, 3, 4, 6 OG 7
TERMINALERNE J OG K FORBINDES IKKE.

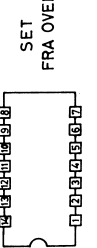
FC704

CONFIGURATION USED:
CONNECTIONS : a, e, and g.
ICs : 1, 2, 3, 4, 6, and 7.
TERMINALS : J AND K NOT CONNECTED.

SPECIAL VERSIONS

- NOTE 1: FOR MAXIMUM 31 CHANNELS, CONNECT a, f, and g. FOR MAXIMUM 63 CHANNELS, CONNECT a, e, and g. FOR MAXIMUM 95 CHANNELS, CONNECT b, d, e, and g AND INSERT IC8.
- NOTE 2: IC9 IS ONLY INSERTED FOR A MAXIMUM OF 63 CHANNELS AND ONLY WHEN THE 100 DECADE CONTROL CODE IN FS701 IS TO BE REVERSED FOR CHANNEL 56 - 63.
- NOTE 3: FOR REVERSING OF THE 100 DECADE CONTROL CODE FOR CHANNEL 80 - 95, CONNECT c. NORMAL CONDITION, i. e. NO REVERSING, CONNECT d.
- NOTE 4: THE NORMAL CONNECTION OF J AND K IN FS701 CAN BE OMITTED IN ORDER TO REVERSE THE 100 DECADE AS STATED IN NOTE 2 AND 3.

IC	Vcc PIN	GND PIN
1	SN64184	16
2	SN64184	16
3	PROM 5102	16
4	PROM 5102	16
5	PROM	16
6	SN6404	14
7	SN6404	14
8	SN6400	14
9	SN6400	14



IC6, IC7, IC8, IC9

FREQUENCY CONTROL UNIT FREKVENSKONTROLLENHED

FC 704

D402.145

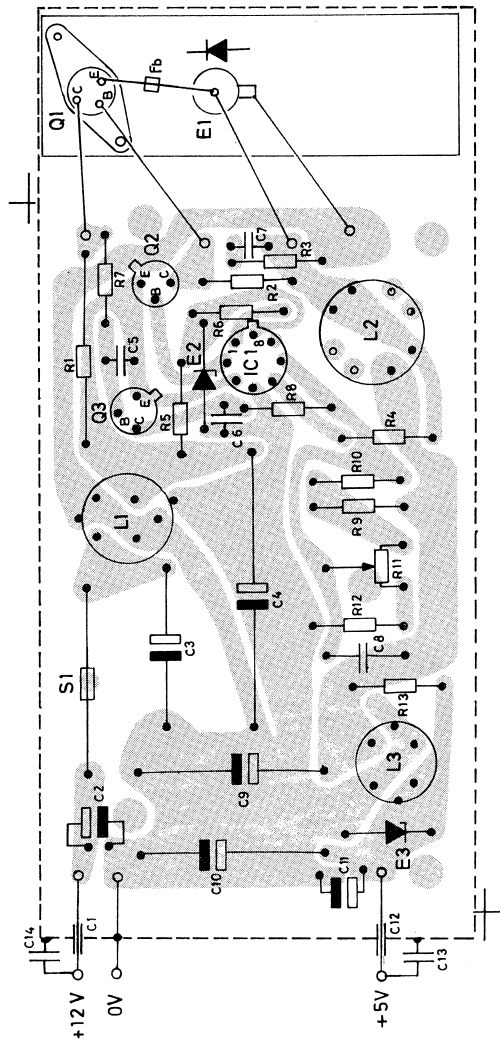
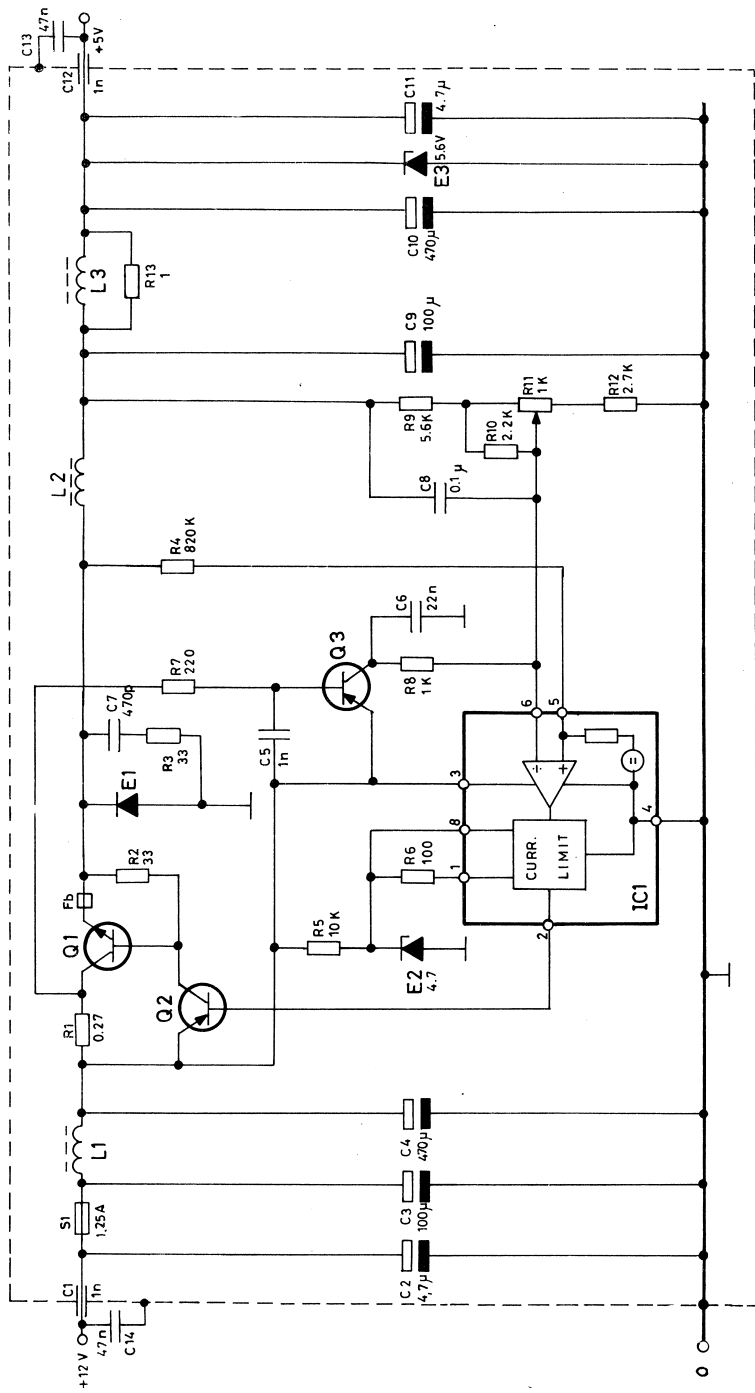
Storno

Storno

TYPE	Nº	CODE	DATA
FC704		10. 3236	Frequency Control Unit (CQM713Dx63N)
	C1	73. 5127	22 µF 20% tantal 16 V
	C2	73. 5126	4. 7 µF 20% tantal 16 V
	R1-R8	80. 5241	220 Ω 5% carbon film 1/8 W
	R9-R19	80. 5259	6. 8 KΩ 5% " 1/8 W
	R20	80. 5241	68 KΩ 5% " 1/8 W
	R21	80. 5268	39 KΩ 5% " 1/8 W
	R22	80. 5256	3. 9 KΩ 5% " 1/8 W
	R23	80. 5261	10 KΩ 5% " 1/8 W
	R24	80. 5261	12 KΩ 5% " 1/8 W
	R25	80. 5252	1. 8 KΩ 5% " 1/8 W
	R26	80. 5252	1. 8 KΩ 5% " 1/8 W
	R27	80. 5262	12 KΩ 5% " 1/8 W
	R28	80. 5260	8. 2 KΩ 5% " 1/8 W
	R29	80. 5264	18 KΩ 5% " 1/8 W
	R30	80. 5256	3. 9 KΩ 5% " 1/8 W
	E1	99. 5237	1 N 4148 Diode
	Q1	99. 5117	BC 167 Transistor
	Q2	99. 5117	BC 167 Transistor
	Q3	99. 5117	BC 167 Transistor
	Q4	99. 5117	BC 167 Transistor
	Q5	99. 5117	BC 167 Transistor
	IC1	14. 5063	SN 64184 N BCD to binary converter
	IC2	14. 5063	SN 64184 N BCD to binary converter
	IC3	14. 5102	5102 N ROM (Read Only Memory)
	IC4	14. 5103	5103 N ROM (Read Only Memory)
	IC5		Not used
	IC6	14. 5034	SN 6404 Hex. Inverter
	IC7	14. 5024	SN 6400 Quad 2-input NAND gate.

FREQUENCY CONTROL UNIT FC704

X402.365



VOLTAGE REGULATOR SPÆNDINGSREGULATOR

VR701

D401.780

Storno

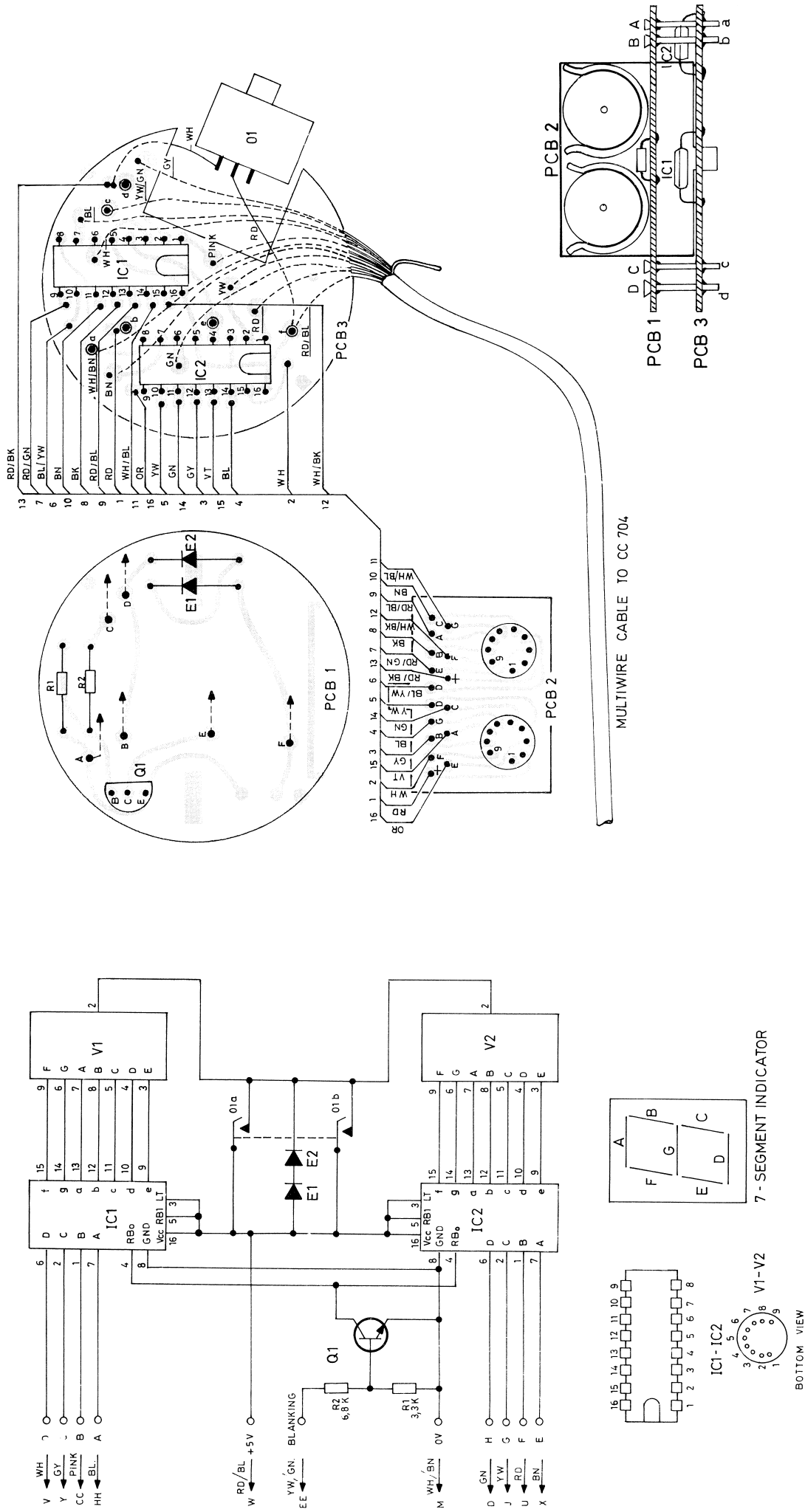
Storno

TYPE	NO.	CODE	DATA	
VR701		10. 2928	Voltage Regulator	
	C1	74. 5167	1 nF -20+80% ceram FT	300 V
	C2	73. 5126	4. 7 μ F 20% tantal	35 V
	C3	73. 5151	100 μ F -10+50% elco	16 V
	C4	73. 5137	470 μ F -10+50% elco	16 V
	C5	74. 5155	1 nF -20+50% ceram PL	63 V
	C6	76. 5071	22 nF 10% polyester FL	50 V
	C7	74. 5161	470 pF -20+50%	63 V
	C8	76. 5091	0. 1 μ F 20% polyester FL	100 V
	C9	73. 5071	100 μ F -10+50% elco	40 V
	C10	73. 5150	470 μ F -10+50% elco	6 V
	C11	73. 5126	4. 7 μ F 20% tantal	35 V
	C12	74. 5167	1 nF -20+80% ceram FT	300 V
	C13	76. 5072	47 nF 10% polyester FL	50 V
	C14	76. 5072	47 nF 10% polyest FL	50 V
	R1	82. 5209	0. 27 Ω 10% wire wound	1 W
	R2	80. 5231	33 Ω 5% carbon film	1/8 W
	R3	80. 5231	33 Ω 5%	1/8 W
	R4	80. 5284	820 K Ω 5%	1/8 W
	R5	80. 5261	10 K Ω 5%	1/8 W
	R6	80. 5237	100 Ω 5%	1/8 W
	R7	80. 5241	220 Ω 5%	1/8 W
	R8	80. 5249	1 K Ω 5%	1/8 W
	R9	80. 5258	5. 6 K Ω 5%	1/8 W
	R10	80. 5253	2. 2 K Ω 5%	1/8 W
	R11	86. 5058	1 K Ω potentiometer	0. 1 W
	R12	80. 5254	2. 7 K Ω 5% carbon film	1/8 W
	R13	80. 5213	1 Ω 5%	1/8 W
	L1	61. 1199	Filter coil 160 μ H	
	L2	61. 1200	Filter coil 200 μ H	
	L3	61. 1201	Filter coil 65 μ H	
	E1	99. 5289	BYX50-200R Diode	
	E2	99. 5224	4. 7 V 5% Zenerdiode	
	E3	99. 5282	5. 6 V 5% Zenerdiode	
	Q1	99. 5288	BSV64 Transistor	
	Q2	99. 5215	2N2905 Transistor	
	Q3	99. 5215	2N2905 Transistor	
	IC1	14. 5054	LM305 Voltage regulator	

TYPE	NO.	CODE	DATA

VOLTAGE REGULATOR VR701
SPÆNDINGSREGULATOR

X 401. 858



CHANNEL INDICATOR ID701
KANALINDIKATOR

D401.885/2

Storno

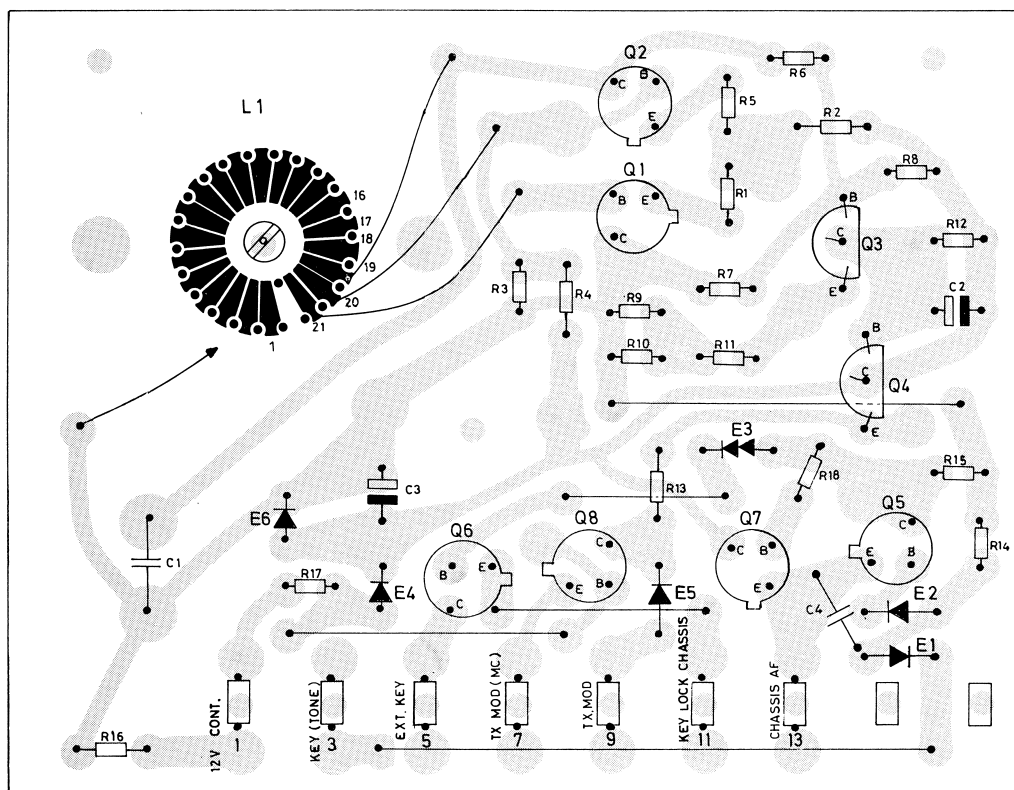
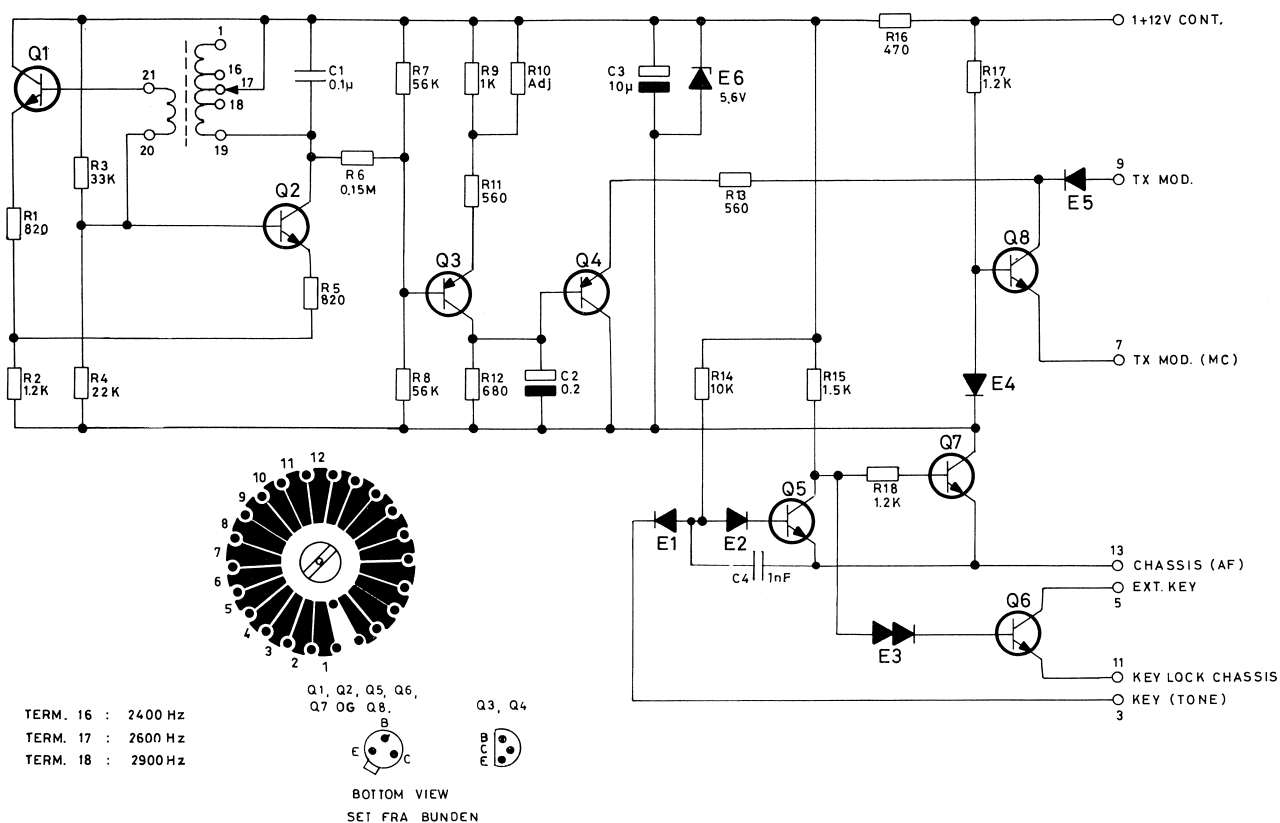
TYPE	NO.	CODE	DATA
ID701		10.2930-00	Channel Indicator 00-99
	R1	80.5255	3.3K Ω 5%
	R2	80.5259	6.8K Ω 5% carbon film 1/8W
	E1	99.5020	1N4004 Diode
	E2	99.5020	1N4004 Diode
	01	47.5062	Switch
	Q1	99.5117	BC167 Transistor
	IC1	14.5058	SN6447A 7-segment decoder-driver
	IC2	14.5058	SN6447A 7-segment decoder-driver
	V1	99.5106	7-segment display
	V2	99.5106	7-segment display

Storno

TYPE	NO.	CODE	DATA

CHANNEL INDICATOR ID701
KANALINDIKATOR

X402_105



TONE TRANSMITTER TONESENDER

TT781

Storno

Storno

TYPE	NO.	CODE	DATA	
TT781		10. 3042-00	Tone Transmitter	
	C1	76. 5068	0. 1 μ F 1%	polystyr TB 63V
	C2	73. 5118	0. 22 μ F 20%	tantal 35V
	C3	73. 5109	10 μ F 20%	tantal 16V
	C4	74. 5155	1 nF -20% +80% ceram	PL 63V
	R1	80. 5248	820 Ω 5%	carbon film 1/8W
	R2	80. 5250	1. 2K Ω 5%	" 1/8W
	R3	80. 5267	33K Ω 5%	" 1/8W
	R4	80. 5265	22K Ω 5%	" 1/8W
	R5	80. 5248	820 Ω 5%	" 1/8W
	R6	80. 5275	0. 15M Ω 5%	" 1/8W
	R7	80. 5270	56K Ω 5%	" 1/8W
	R8	80. 5270	56K Ω 5%	" 1/8W
	R9	80. 5249	1K Ω 5%	" 1/8W
	R10	80. 52xx	Adjusted 5%	" 1/8W
	R11	80. 5246	560 Ω 5%	" 1/8W
	R12	80. 5247	680 Ω 5%	" 1/8W
	R13	80. 5246	560 Ω 5%	" 1/8W
	R14	80. 5261	10K Ω 5%	" 1/8W
	R15	80. 5251	1. 5K Ω 5%	" 1/8W
	R16	80. 5445	470 Ω 5%	" 1/8W
	R17	80. 5250	1. 2K Ω 5%	" 1/8W
	R18	80. 5250	1. 2K Ω 5%	" 1/8W
	L1	61. 1133	Tone coil	
	E1	99. 5028	IN914 Diode	
	E2	99. 5028	IN914 Diode	
	E3	99. 5209	1. 5V Stab. Diode	
	E4	99. 5219	AAZ15 Diode	
	E5	99. 5219	AAZ15 Diode	
	E6	99. 5114	5. 6V Zenerdiode	5% 1/4W
	Q1	99. 5143	BC108 Transistor	
	Q2	99. 5143	BC108 Transistor	
	Q3	99. 5144	BC214L Transistor	
	Q4	99. 5144	BC214L Transistor	
	Q5	99. 5143	BC108 Transistor	
	Q6	99. 5143	BC108 Transistor	
	Q7	99. 5143	BC108 Transistor	
	Q8	99. 5143	BC108 Transistor	

TT781
TONE TRANSMITTER

X402.162



NOTE 6: R60 ADJUSTS THE ALARM TONE LEVEL
ALARM TONESTYRKEN INDSTILLES MED R60

SR781
SEQUENTIAL TONE RECEIVER
SEKVENSTONEMODTAGER

D401.825

Storno

Storno

TYPE	NO.	CODE	DATA
SR781		10.2965	Sequential Tone Receiver
	C1	74.5061	4.7nF 10% polyester. FL
	C2	73.5118	0.22μF 20% tantal
	C3	73.5102	2.2μF 20% tantal
	C4	74.5116	33pF 5% ceram TB
	C5	76.5059	2.2nF 10% polyester. FL
	C6	73.5109	10μF 20% tantal
	C7	73.5089	0.1μF 20% tantal
	C8	76.5068	0.1μF 1% polystyr TB
	C9	73.5102	2.2μF 20% tantal
	C10	73.5114	1μF 20% tantal
	C11	74.5116	33pF 5% ceram TB
	C12	73.5114	1μF 20% tantal
	C13	73.5118	0.22μF 20% tantal
	C14	73.5089	0.1μF 20% tantal
	C15	73.5102	2.2μF 20% tantal
	C16	73.5102	2.2μF 20% tantal
	C17	76.5071	22nF 10% polyester. FL
	C18	73.5109	10μF 20% tantal
	C19	76.5071	22nF 10% polyester. FL
	C20	76.5070	10nF 10% polyester. FL
	C21	73.5114	1μF 20% tantal
	C22	73.5124	47μF 20% tantal
	C23	74.5165	100pF 10% ceram PL
	C24	73.5126	4.7μF 20% tantal
	C25	76.5070	10nF 10% polyester. FL
	C26	73.5118	0.22μF 20% tantal
	C27	73.5118	0.22μF 20% tantal
	C28	73.5089	0.1μF 20% tantal
	C29	73.5109	10μF 20% tantal
	C30	73.5126	4.7μF 20% tantal
	C31	74.5155	1nF -20+80% ceram PL
	C32	73.5126	4.7μF 20% tantal
	C33	76.5070	10nF 10% polyester. FL
	C34	73.5114	1μF 20% tantal
	R1	80.5262	12kΩ 5% carbon film
	R2	80.5268	39kΩ 5% carbon film
	R3	80.5264	18kΩ 5% carbon film
	R4	80.5261	10kΩ 5% carbon film
	R5	80.5261	10kΩ 5% carbon film
	R6	80.52xx	Adjusted
	R7	80.5253	2.2kΩ 5% carbon film
	R8	80.5279	0.33 MΩ 5% carbon film
	R9	80.5259	6.8kΩ 5% carbon film
	R10	80.5261	10kΩ 5% carbon film
	R11	80.5265	22kΩ 5% carbon film

TYPE	NO.	CODE	DATA
	R12	80.5264	18kΩ 5% carbon film
	R13	89.5009	15kΩ 20% NTC
	R14	80.5262	12kΩ 5% carbon film
	R15	80.5264	18kΩ 5% carbon film
	R16	80.5265	22kΩ 5% carbon film
	R17	80.5260	8.2kΩ 5% carbon film
	R18	80.5273	0.1 MΩ 5% carbon film
	R19	80.5274	0.12 MΩ 5% carbon film
	R20	80.5258	5.6kΩ 5% carbon film
	R21	80.5256	3.9kΩ 5% carbon film
	R22	80.5249	1kΩ 5% carbon film
	R23	80.5278	0.27MΩ 5% carbon film
	R24	80.5271	68kΩ 5% carbon film
	R25	80.5258	5.6kΩ 5% carbon film
	R26	80.5276	0.18 MΩ 5% carbon film
	R27	80.5274	0.12 MΩ 5% carbon film
	R28	80.5261	10kΩ 5% carbon film
	R29	80.5276	0.18 MΩ 5% carbon film
	R30	80.5259	6.8kΩ 5% carbon film
	R31	80.5261	10kΩ 5% carbon film
	R32	80.5251	1.5kΩ 5% carbon film
	R33	80.5264	18kΩ 5% carbon film
	R34	80.5278	0.27 MΩ 5% carbon film
	R35	80.5261	10kΩ 5% carbon film
	R36	80.5276	0.18 MΩ 5% carbon film
	R37	80.5253	2.2kΩ 5% carbon film
	R38	80.5264	18kΩ 5% carbon film
	R39	80.5276	0.18 MΩ 5% carbon film
	R40	80.5261	10kΩ 5% carbon film
	R41	80.5261	10kΩ 5% carbon film
	R42	80.5261	10kΩ 5% carbon film
	R43	80.5276	0.18 MΩ 5% carbon film
	R44	80.5250	1.2kΩ 5% carbon film
	R45	80.5264	18kΩ 5% carbon film
	R46	80.5276	0.18 MΩ 5% carbon film
	R47	80.5261	10kΩ 5% carbon film
	R48	80.5262	12kΩ 5% carbon film
	R49	80.5261	10kΩ 5% carbon film
	R50	80.5261	10kΩ 5% carbon film
	R51	80.5262	12kΩ 5% carbon film
	R52	80.5226	12Ω 5% carbon film
	R53	80.5251	1.5kΩ 5% carbon film

SEQUENTIAL TONE RECEIVER
SEKVENSTONEMODTAGER

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Storno

TYPE	NO.	CODE	DATA
	R54	80. 5253	2. 2kΩ 5% carbon film 1/8W
	R55	80. 5258	5. 6kΩ 5% carbon film 1/8W
	R56		Not used
	R57	80. 5251	1. 5kΩ 5% carbon film 1/8W
	R58	80. 5251	1. 5kΩ 5% carbon film 1/8W
	R59	80. 5269	47kΩ 5% carbon film 1/8W
	R60	80. 5061	10kΩ 5% carbon film 1/10W
	R61	80. 5268	39kΩ 5% carbon film 1/8W
	R62	80. 5268	39kΩ 5% carbon film 1/8W
	R63	80. 5230	27Ω 5% carbon film 1/8W
	R64	80. 5268	39kΩ 5% carbon film 1/8W
	R65	80. 5263	15kΩ 5% carbon film 1/8W
	R66	80. 5265	22kΩ 5% carbon film 1/8W
	R67	80. 5268	39kΩ 5% carbon film 1/8W
	R68	80. 5257	4. 7kΩ 5% carbon film 1/8W
	R69	80. 5257	4. 7kΩ 5% carbon film 1/8W
	R70	80. 5246	680Ω 5% carbon film 1/8W
	R71	80. 5261	10kΩ 5% carbon film 1/8W
	R72	80. 5255	3. 3kΩ 5% carbon film 1/8W
	R73	80. 5253	2. 2kΩ 5% carbon film 1/8W
	R74	80. 5261	10kΩ 5% carbon film 1/8W
	R75	80. 5246	680Ω 5% carbon film 1/8W
	R76	80. 5246	680Ω 5% carbon film 1/8W
	R77	80. 5261	10kΩ 5% carbon film 1/8W
	L1	61. 1172	Tone coil
	E1	99. 5237	1N4148 Diode
	E2	99. 5237	1N4148 Diode
	E3	99. 5237	1N4148 Diode
	E4	99. 5237	1N4148 Diode
	E5	99. 5237	1N4148 Diode
	E6	99. 5237	1N4148 Diode
	E7	99. 5237	1N4148 Diode
	E8	99. 5237	1N4148 Diode
	Q1	99. 5143	BC108 Transistor
	Q2	99. 5143	BC108 Transistor
	Q3	99. 5144	S5144 Transistor
	Q4	99. 5201	BC109 Transistor
	Q5	99. 5201	BC109 Transistor
	Q6	99. 5201	BC109 Transistor
	Q7	99. 5201	BC109 Transistor
	Q8	99. 5201	BC109 Transistor
	Q9	99. 5143	BC108 Transistor
	Q10	99. 5143	BC108 Transistor
	Q11	99. 5144	S5144 Transistor
	Q12	99. 5143	BC108 Transistor

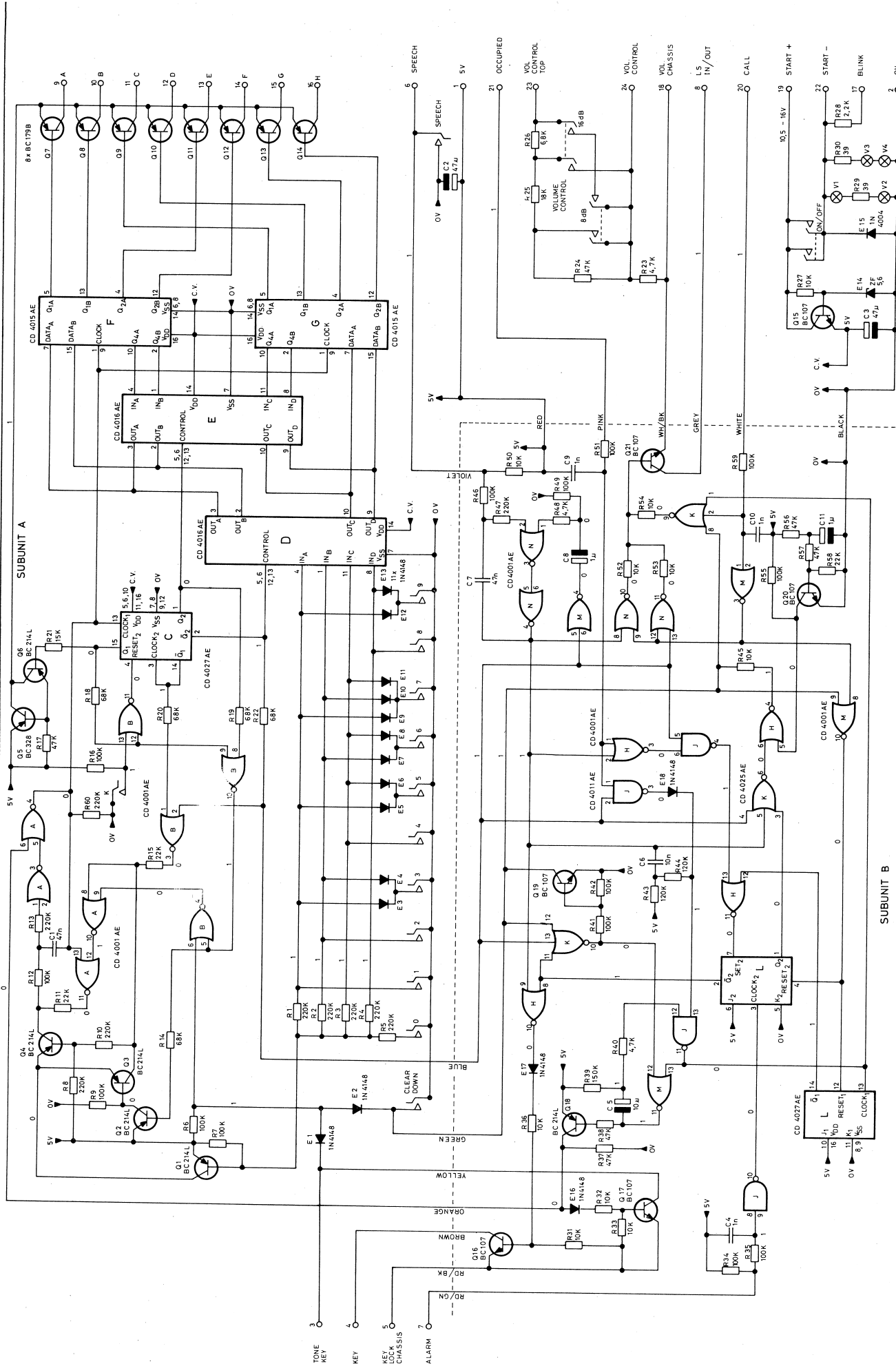
Storno

TYPE	NO.	CODE	DATA
	Q13	99. 5143	BC108 Transistor
	Q14	99. 5143	BC108 Transistor
	IC1	14. 5017	Operational Amplifier
	IC2	14. 5017	Operational Amplifier
	IC3	14. 5019	Quadruple comparator
	IC4	14. 5018	Quadruple 2-input pos. NOR Gate
	IC5	14. 5018	Quadruple 2-input pos. NOR Gate
	IC6	14. 5008	Dual J-K master-Slave Flip-Flop
	IC7	14. 5008	Dual J-K master-Slave Flip-Flop
	IC8	14. 5056	Dual J-K master-Slave Flip-Flop
	IC9	14. 5055	Voltage regulator

SEQUENTIAL TONE RECEIVER
SEKVENSTONEMODTAGER

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TYPE	NO.	CODE	DATA
		15. 0232-00	Subunit A. Part of CB2706
C1		76. 5072-00	47 nF 10% Polyester FL 50 V
C2		73. 5124-00	47 µF 20% Tantalum 6, 3 V
C3		73. 5124-00	47 µF 20% Tantalum 6, 3 V
R1		80. 5277-00	220 KΩ 5% Carbon film 1/8 W
R2		80. 5277-00	220 KΩ 5% Carbon film 1/8 W
R3		80. 5277-00	220 KΩ 5% Carbon film 1/8 W
R4		80. 5277-00	220 KΩ 5% Carbon film 1/8 W
R5		80. 5277-00	220 KΩ 5% Carbon film 1/8 W
R6		80. 5273-00	100 KΩ 5% Carbon film 1/8 W
R7		80. 5273-00	100 KΩ 5% Carbon film 1/8 W
R8		80. 5277-00	220 KΩ 5% Carbon film 1/8 W
R9		80. 5273-00	100 KΩ 5% Carbon film 1/8 W
R10		80. 5277-00	220 KΩ 5% Carbon film 1/8 W
R11		80. 5265-00	22 KΩ 5% Carbon film 1/8 W
R12		80. 5273-00	100 KΩ 5% Carbon film 1/8 W
R13		80. 5277-00	220 KΩ 5% Carbon film 1/8 W
R14		80. 5271-00	68 KΩ 5% Carbon film 1/8 W
R15		80. 5265-00	22 KΩ 5% Carbon film 1/8 W
R16		80. 5273-00	100 KΩ 5% Carbon film 1/8 W
R17		80. 5269-00	47 KΩ 5% Carbon film 1/3 W
R18		80. 5271-00	68 KΩ 5% Carbon film 1/8 W
R19		80. 5271-00	68 KΩ 5% Carbon film 1/8 W
R20		80. 5271-00	68 KΩ 5% Carbon film 1/8 W
R21		80. 5263-00	15 KΩ 5% Carbon film 1/8 W
R22		80. 5271-00	68 KΩ 5% Carbon film 1/8 W
R23		80. 5257-00	4, 7 KΩ 5% Carbon film 1/8 W
R24		80. 5269-00	47 KΩ 5% Carbon film 1/8 W
R25		80. 5264-00	18 KΩ 5% Carbon film 1/8 W
R26		80. 5259-00	6, 8 KΩ 5% Carbon film 1/8 W
R27		80. 5261-00	10 KΩ 5% Carbon film 1/8 W
R28		80. 5253-00	2, 2 KΩ 5% Carbon film 1/8 W
R29		80. 5232-00	39 Ω 5% Carbon film 1/8 W
R30		80. 5232-00	39 Ω 5% Carbon film 1/8 W
E1		99. 5237-00	1N4148 Diode
E2		99. 5237-00	1N4148 Diode
E3		99. 5237-00	1N4148 Diode
E4		99. 5237-00	1N4148 Diode
E5		99. 5237-00	1N4148 Diode
E6		99. 5237-00	1N4148 Diode
E7		99. 5237-00	1N4148 Diode
E8		99. 5237-00	1N4148 Diode
E9		99. 5237-00	1N4148 Diode
E10		99. 5237-00	1N4148 Diode
E11		99. 5237-00	1N4148 Diode

TYPE	NO.	CODE	DATA
E12		99. 5237-00	1N4148 Diode
E13		99. 5237-00	1N4148 Diode
E14		99. 5114-00	5, 6 V 5% Zener diode 0, 25 W
E15		99. 5020-00	1N4004 Diode
IC A		14. 5074-00	CD4001 AE Quad 2-input NOR
IC B		14. 5074-00	CD4001 AE Quad 2-input NOR
IC C		14. 5094-00	CD4027 AE Dual J-K Master-slave F-F
IC D		14. 5092-00	CD4016 AE Quad Bilateral switch
IC E		14. 5092-00	CD4016 AE Quad Bilateral switch
IC F		14. 5091-00	CD4015 AE Dual 4-stage static shift reg.
IC G		14. 5091-00	CD4015 AE Dual 4-stage static shift reg.
Q1		99. 5144-00	BC214L Transistor PNP
Q2		99. 5144-00	BC214L Transistor PNP
Q3		99. 5144-00	BC214L Transistor PNP
Q4		99. 5144-00	BC214L Transistor PNP
Q5		99. 5305-00	BC328 Transistor PNP
Q6		99. 5344-00	BC214L Transistor PNP
Q7		99. 5115-01	BC179 B Transistor PNP
Q8		99. 5115-01	BC179 B Transistor PNP
Q9		99. 5115-01	BC179 B Transistor PNP
Q10		99. 5115-01	BC179 B Transistor PNP
Q11		99. 5115-01	BC179 B Transistor PNP
Q12		99. 5115-01	BC179 B Transistor PNP
Q13		99. 5115-01	BC179 B Transistor PNP
Q14		99. 5115-01	BC179 B Transistor PNP
Q15		99. 5121-00	BC109 Transistor NPN
O 1		47. 5064-00	Push button 1
O 2		47. 5064-00	Push button 1
O 3		47. 5064-00	Push button 1
O 4		47. 5064-00	Push button 1
O 5		47. 5064-00	Push button 1
O 6		47. 5064-00	Push button 1
O 7		47. 5064-00	Push button 1
O 8		47. 5064-00	Push button 1
O 9		47. 5064-00	Push button 1
O 10		47. 5064-00	Push button 1
O 11		47. 5064-00	Push button 1
O 12		47. 5064-00	Push button 1
O 13		47. 5064-00	Push button 1

CONTROL UNIT CB2706
Subunit A

X402. 029

Storno

TYPE	NO.	CODE	DATA
	O 14 O 15 O 16	47.5065-00 47.5065-00 47.5065-00	Push button 1-1 Push button 1-1 Push button 1-1
	V 1 V 2 V 3 V 4	92.5101-00 92.5101-00 92.5101-00 92.5101-00	6 V 30mA Indicator lamp 6 V 30mA Indicator lamp 6V 30mA Indicator lamp 6 V 30mA Indicator lamp

Storno

TYPE	NO.	CODE	DATA

CONTROL UNIT CB2706
Subunit A

X402.029

Storno

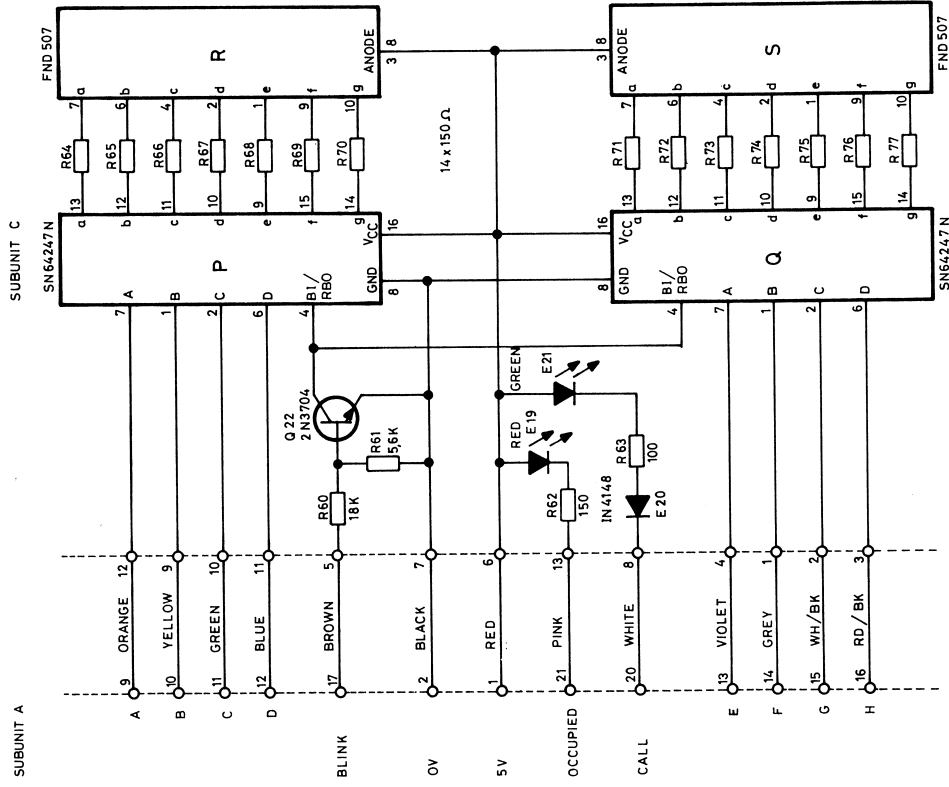
TYPE	NO.	CODE	DATA
		15. 0233-00	Subunit B. Part of CB2706
	C4	76. 5069-00	1 nF 10% Polyester FL 50 V
	C5	73. 5109-00	10 µF 20% Tantalum 50 V
	C6	76. 5070-00	10 nF 10% Polyester FL 50 V
	C7	76. 5072-00	47 nF 10% Polyester FL 50 V
	C8	73. 5114-00	1 µF 20% Tantalum 35 V
	C9	76. 5069-00	1 nF 10% Polyester FL 50 V
	C10	76. 5069-00	1 nF 10% Polyester FL 50 V
	C11	73. 5114-00	1 µF 20% Tantalum 35 V
	R31	80. 5261-00	10 KΩ 5% Carbon film 1/8 W
	R32	80. 5261-00	10 KΩ 5% Carbon film 1/8 W
	R33	80. 5261-00	10 KΩ 5% Carbon film 1/8 W
	R34	80. 5273-00	100 KΩ 5% Carbon film 1/8 W
	R35	80. 5273-00	100 KΩ 5% Carbon film 1/8 W
	R36	80. 5261-00	10 KΩ 5% Carbon film 1/8 W
	R37	80. 5269-00	47 KΩ 5% Carbon film 1/8 W
	R38	80. 5269-00	47 KΩ 5% Carbon film 1/8 W
	R39	80. 5275-00	150 KΩ 5% Carbon film 1/8 W
	R40	80. 5257-00	4,7 KΩ 5% Carbon film 1/8 W
	R41	80. 5273-00	100 KΩ 5% Carbon film 1/8 W
	R42	80. 5273-00	100 KΩ 5% Carbon film 1/8 W
	R43	80. 5274-00	120 KΩ 5% Carbon film 1/8 W
	R44	80. 5274-00	120 KΩ 5% Carbon film 1/8 W
	R45	80. 5261-00	10 KΩ 5% Carbon film 1/8 W
	R46	80. 5273-00	100 KΩ 5% Carbon film 1/8 W
	R47	80. 5277-00	220 KΩ 5% Carbon film 1/8 W
	R48	80. 5257-00	4,7 KΩ 5% Carbon film 1/8 W
	R49	80. 5273-00	100 KΩ 5% Carbon film 1/8 W
	R50	80. 5261-00	10 KΩ 5% Carbon film 1/8 W
	R51	80. 5273-00	100 KΩ 5% Carbon film 1/8 W
	R52	80. 5261-00	10 KΩ 5% Carbon film 1/8 W
	R53	80. 5261-00	10 KΩ 5% Carbon film 1/8 W
	R54	80. 5261-00	10 KΩ 5% Carbon film 1/8 W
	R55	80. 5273-00	100 KΩ 5% Carbon film 1/8 W
	R56	80. 5269-00	47 KΩ 5% Carbon film 1/8 W
	R57	80. 5269-00	47 KΩ 5% Carbon film 1/8 W
	R58	80. 5265-00	22 KΩ 5% Carbon film 1/8 W
	R59	80. 5273-00	100 KΩ 5% Carbon film 1/8 W
	E16	99. 5237-00	1N4148 Diode
	E17	99. 5237-00	1N4148 Diode
	E18	99. 5237-00	1N4148 Diode
	IC H	14. 5074-00	CD 4001 AE Quad 2-input NOR
	IC J	14. 5051-00	CD 4011 AE Quad 2-input NAND

Storno

TYPE	NO.	CODE	DATA
	IC K	14. 5093-00	CD 4025 AE Triple 3-input NOR-Gates
	IC L	14. 5094-00	CD 4027 AE Dual J-K Master-slave F-F
	IC M	14. 5074-00	CD 4001 AE Quad 2-input NOR
	IC N	14. 5074-00	CD 4001 AE Quad 2-input NOR
	Q16	99. 5121-00	BC 107 Transistor NPN
	Q17	99. 5121-00	BC 107 Transistor NPN
	Q18	99. 5144-00	BC 214 L Transistor PNP
	Q19	99. 5121-00	BC 107 Transistor NPN
	Q20	99. 5121-00	BC 107 Transistor NPN
	Q21	99. 5121-00	BC 107 Transistor NPN

CONTROL UNIT CB2706
Subunit B

X402. 036



Storno

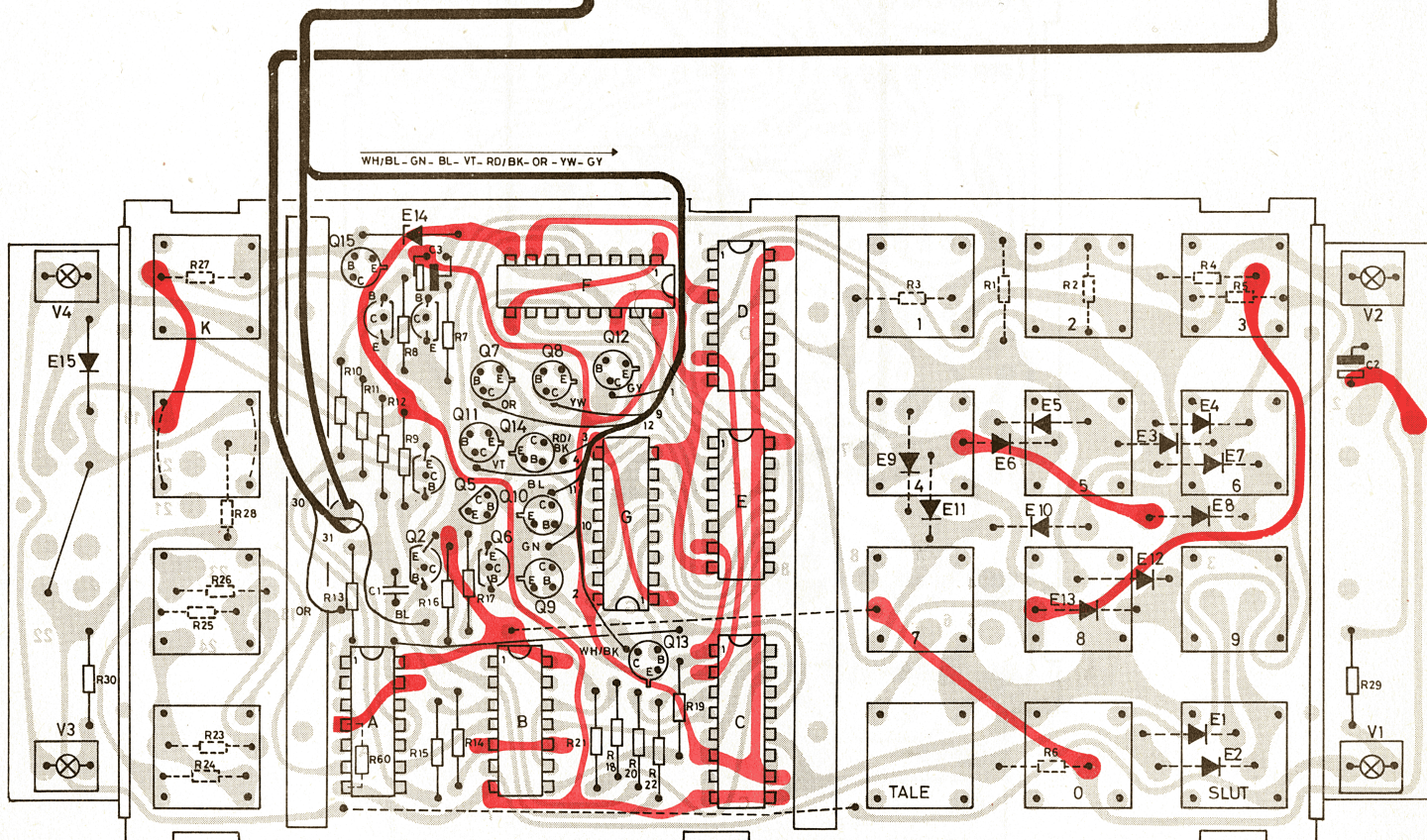
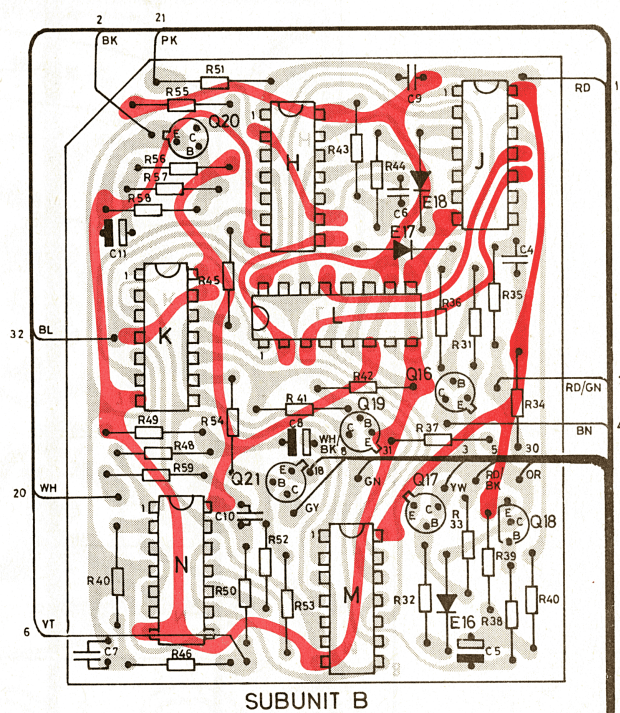
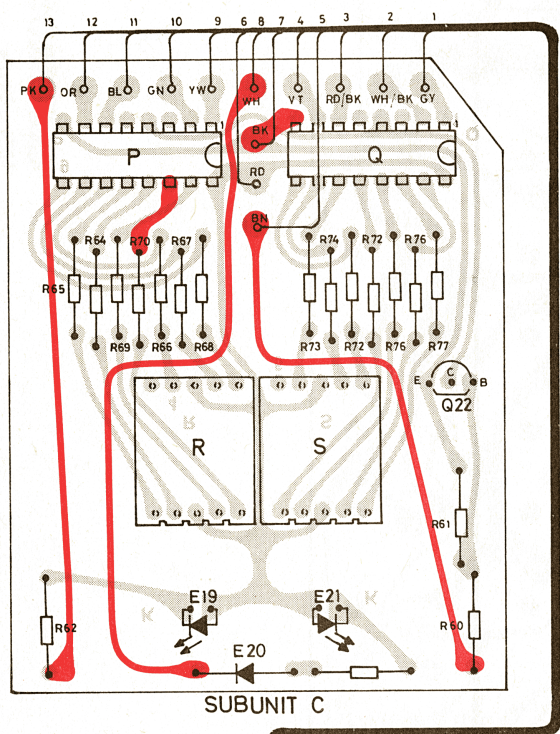
TYPE	NO.	CODE	DATA
		15. 0233-00	Subunit B. Part of CB2706
C4		76. 5069-00	1 nF 10% Polyester FL 50 V
C5		73. 5109-00	10 µF 20% Tantalum 16 V
C6		76. 5070-00	10 nF 10% Polyester FL 50 V
C7		76. 5072-00	47 nF 10% Polyester FL 50 V
C8		73. 5114-00	1 µF 20% Tantalum 35 V
C9		76. 5069-00	1 nF 10% Polyester FL 50 V
C10		76. 5069-00	1 nF 10% Polyester FL 50 V
C11		73. 5114-00	1 µF 20% Tantalum 35 V
R31		80. 5261-00	10 KΩ 5% Carbon film 1/8 W
R32		80. 5261-00	10 KΩ 5% Carbon film 1/8 W
R33		80. 5261-00	10 KΩ 5% Carbon film 1/8 W
R34		80. 5273-00	100 KΩ 5% Carbon film 1/8 W
R35		80. 5273-00	100 KΩ 5% Carbon film 1/8 W
R36		80. 5261-00	10 KΩ 5% Carbon film 1/8 W
R37		80. 5269-00	47 KΩ 5% Carbon film 1/8 W
R38		80. 5269-00	47 KΩ 5% Carbon film 1/8 W
R39		80. 5275-00	150 KΩ 5% Carbon film 1/8 W
R40		80. 5257-00	4,7 KΩ 5% Carbon film 1/8 W
R41		80. 5273-00	100 KΩ 5% Carbon film 1/8 W
R42		80. 5273-00	100 KΩ 5% Carbon film 1/8 W
R43		80. 5274-00	120 KΩ 5% Carbon film 1/8 W
R44		80. 5274-00	120 KΩ 5% Carbon film 1/8 W
R45		80. 5261-00	10 KΩ 5% Carbon film 1/8 W
R46		80. 5273-00	100 KΩ 5% Carbon film 1/8 W
R47		80. 5277-00	220 KΩ 5% Carbon film 1/8 W
R48		80. 5257-00	4,7 KΩ 5% Carbon film 1/8 W
R49		80. 5273-00	100 KΩ 5% Carbon film 1/8 W
R50		80. 5261-00	10 KΩ 5% Carbon film 1/8 W
R51		80. 5273-00	100 KΩ 5% Carbon film 1/8 W
R52		80. 5261-00	10 KΩ 5% Carbon film 1/8 W
R53		80. 5261-00	10 KΩ 5% Carbon film 1/8 W
R54		80. 5261-00	10 KΩ 5% Carbon film 1/8 W
R55		80. 5273-00	100 KΩ 5% Carbon film 1/8 W
R56		80. 5269-00	47 KΩ 5% Carbon film 1/8 W
R57		80. 5269-00	47 KΩ 5% Carbon film 1/8 W
R58		80. 5265-00	22 KΩ 5% Carbon film 1/8 W
R59		80. 5273-00	100 KΩ 5% Carbon film 1/8 W
E16		99. 5237-00	1N4148 Diode
E17		99. 5237-00	1N4148 Diode
E18		99. 5237-00	1N4148 Diode
IC H		14. 5074-00	CD 4001 AE Quad 2-input NOR
IC J		14. 5051-00	CD 4011 AE Quad 2-input NAND

Storno

TYPE	NO.	CODE	DATA
	IC K	14. 5093-00	CD 4025 AE Triple 3-input NOR-Gates
	IC L	14. 5094-00	CD 4027 AE Dual J-K Master-slave F-F
	IC M	14. 5074-00	CD 4001 AE Quad 2-input NOR
	IC N	14. 5074-00	CD 4001 AE Quad 2-input NOR
	Q16	99. 5121-00	BC 107 Transistor NPN
	Q17	99. 5121-00	BC 107 Transistor NPN
	Q18	99. 5144-00	BC 214 L Transistor PNP
	Q19	99. 5121-00	BC 107 Transistor NPN
	Q20	99. 5121-00	BC 107 Transistor NPN
	Q21	99. 5121-00	BC 107 Transistor NPN

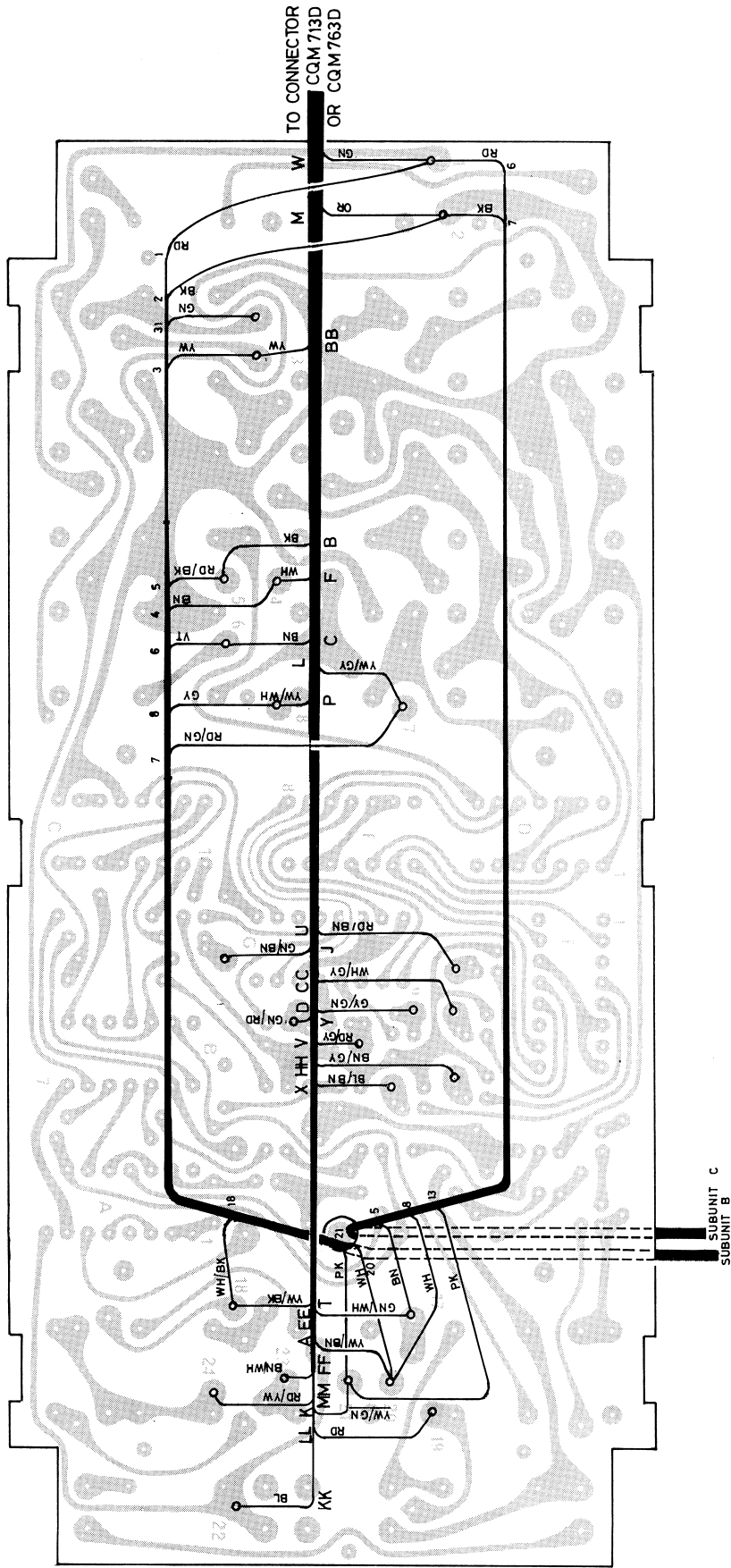
CONTROL UNIT CB2706
Subunit B

X402. 036



CONTROL UNIT CB2706

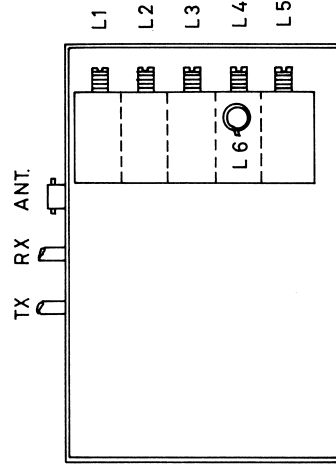
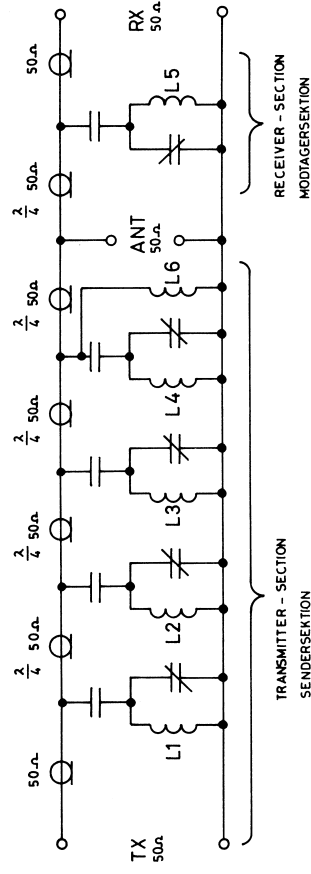
D402.167



CONTROL UNIT CB2706

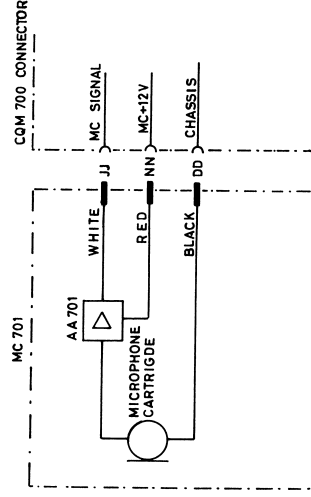
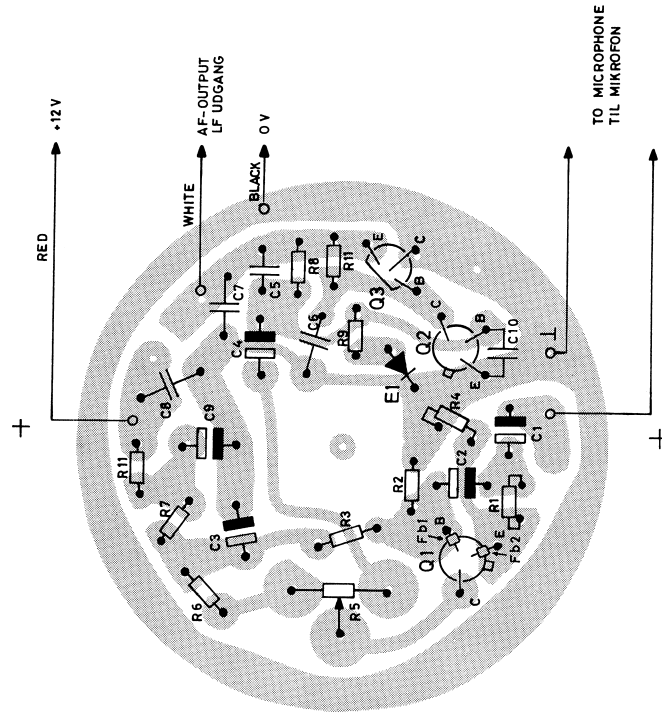
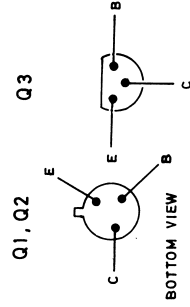
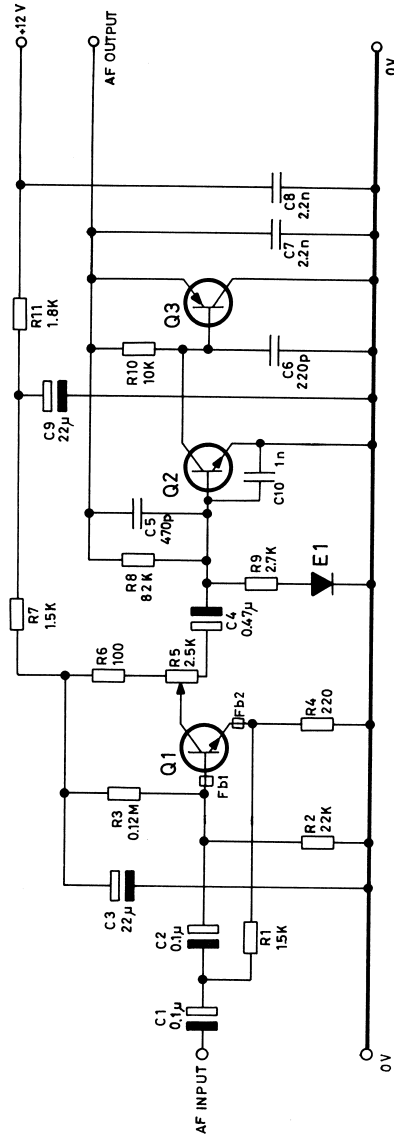
Wiring

D402.031/2



ANTENNA BRANCHING FILTER BF713

D401990



AF AMPLIFIER AA701 LF FORSTÆRKER

PRINTED CIRCUIT VIEWED FROM COMPONENT SIDE.

Storno

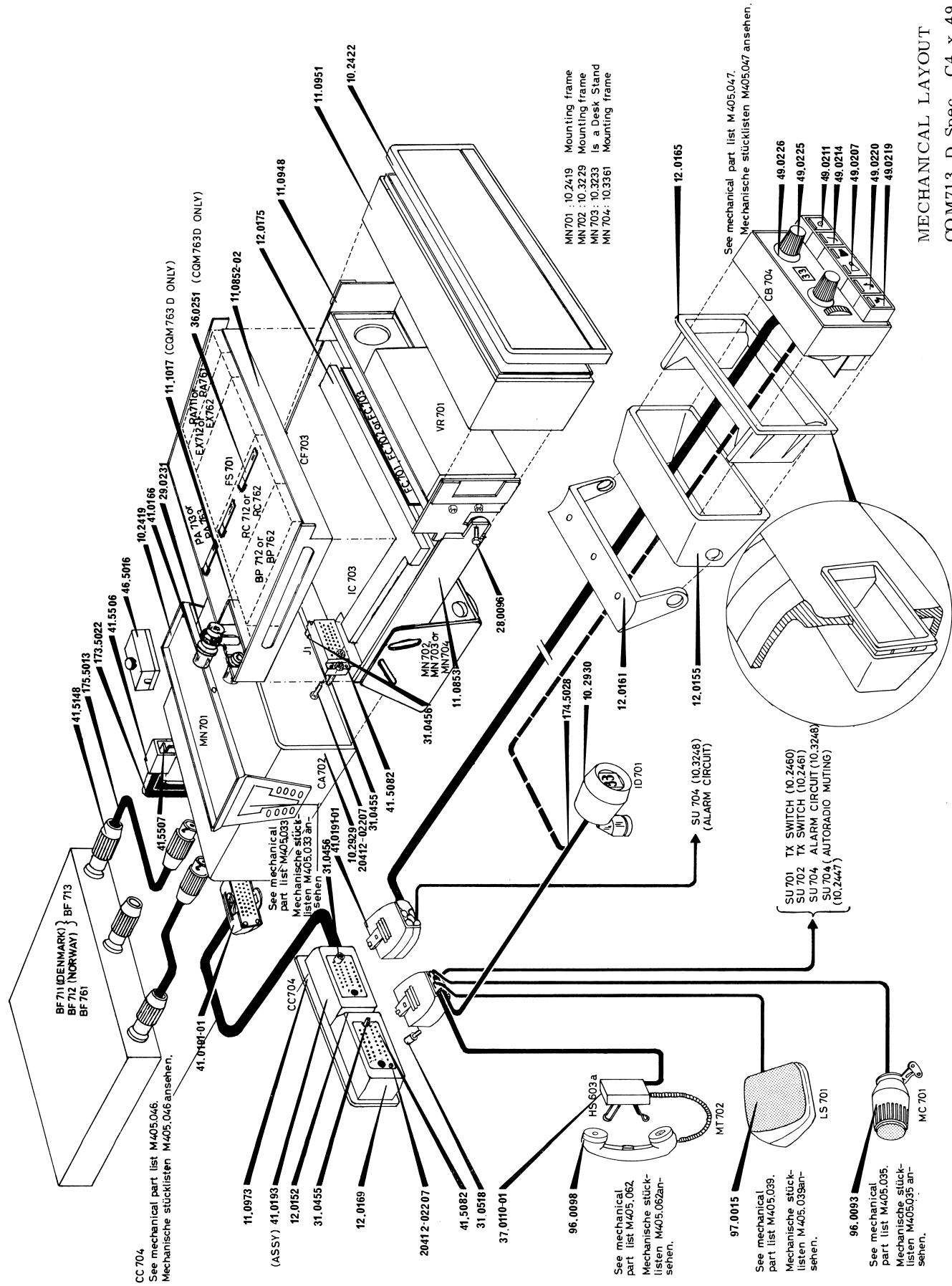
Storno

TYPE	NO.	CODE	DATA
AA701		10. 2488	Microphone Amplifier
	C1	73. 5130	0.1 μ F -20 +60% tantal
	C2	73. 5130	0.1 μ F -20 +60% tantal
	C3	73. 5127	22 μ F 20% tantal
	C4	73. 5134	0.47 μ F -20 +60% tantal
	C5	76. 5106	470 pF 5% polystyr TB
	C6	76. 5104	220 pF 5% polystyr TB
	C7	76. 5059	2.2 nF 10% polyester. FL
	C8	76. 5059	2.2 nF 10% polyester. FL
	C9	73. 5127	22 μ F 20% tantal
	C10	74. 5155	1 nF ceram PL
	R1	80. 5251	1.5 K Ω 5% carbon film
	R2	80. 5265	22 K Ω 5% carbon film
	R3	80. 5274	0.12 M Ω 5% carbon film
	R4	89. 5241	220 Ω 5% carbon film
	R5	86. 5067	2.5 K Ω 20% potentiometer
	R6	80. 5237	100 Ω 5% carbon film
	R7	80. 5251	1.5 K Ω 5% carbon film
	R8	80. 5272	82 K Ω 5% carbon film
	R9	80. 5254	2.7 K Ω carbon film
	R10	80. 5261	10 K Ω 5% carbon film
	E1	99. 5028	1N914 Diode
	Q1	99. 5121	BC107 Transistor
	Q2	99. 5121	BC107 Transistor
	Q3	99. 5144-02	BC214 L Transistor
	Fb1	65. 5102	Ferrit bead
	Fb2	65. 5102	Ferrit bead

MICROPHONE AMPLIFIER
MIKROFONFORSTÆRKER

AA701

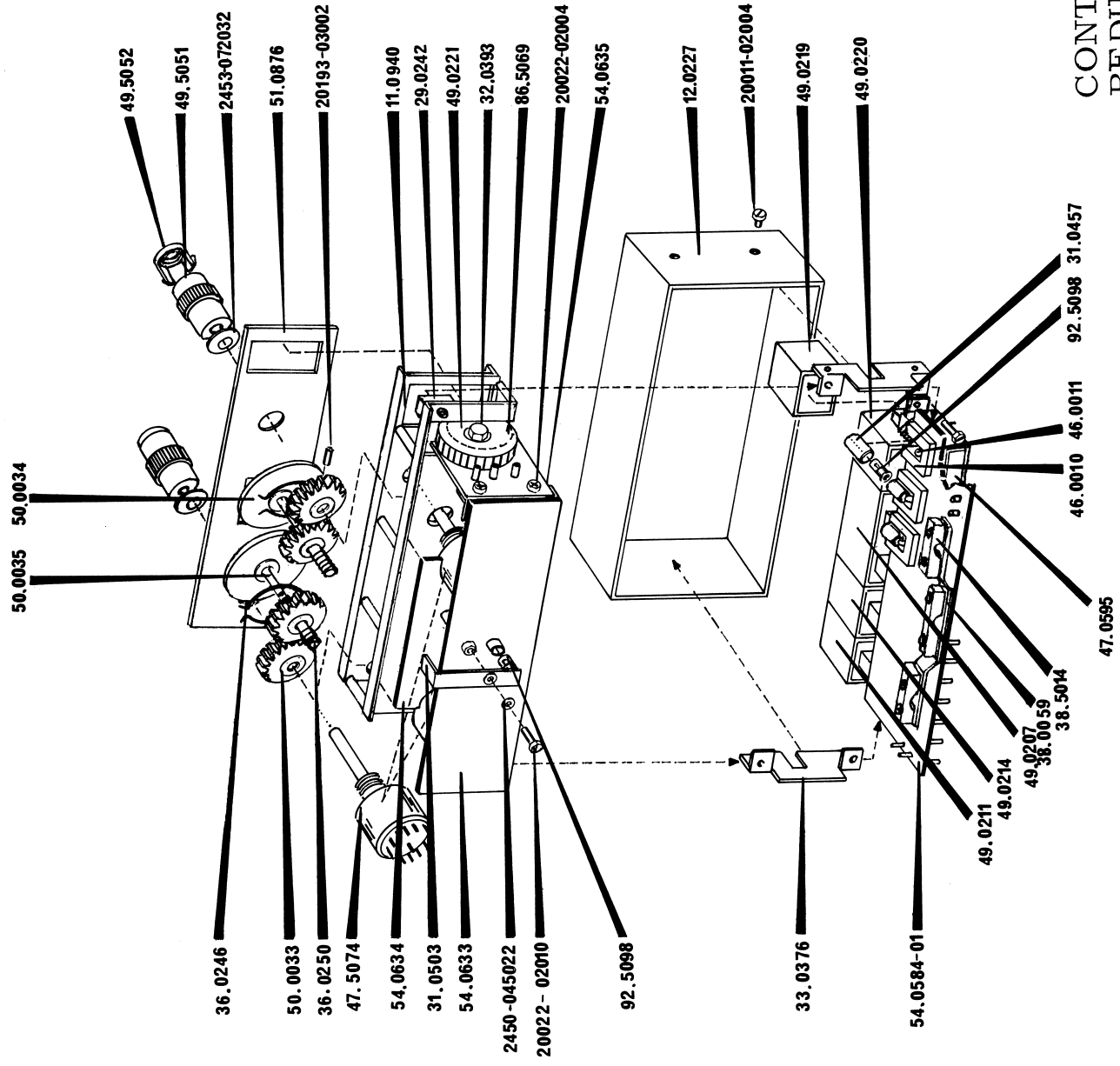
X401.318/3



MECHANICAL LAYOUT

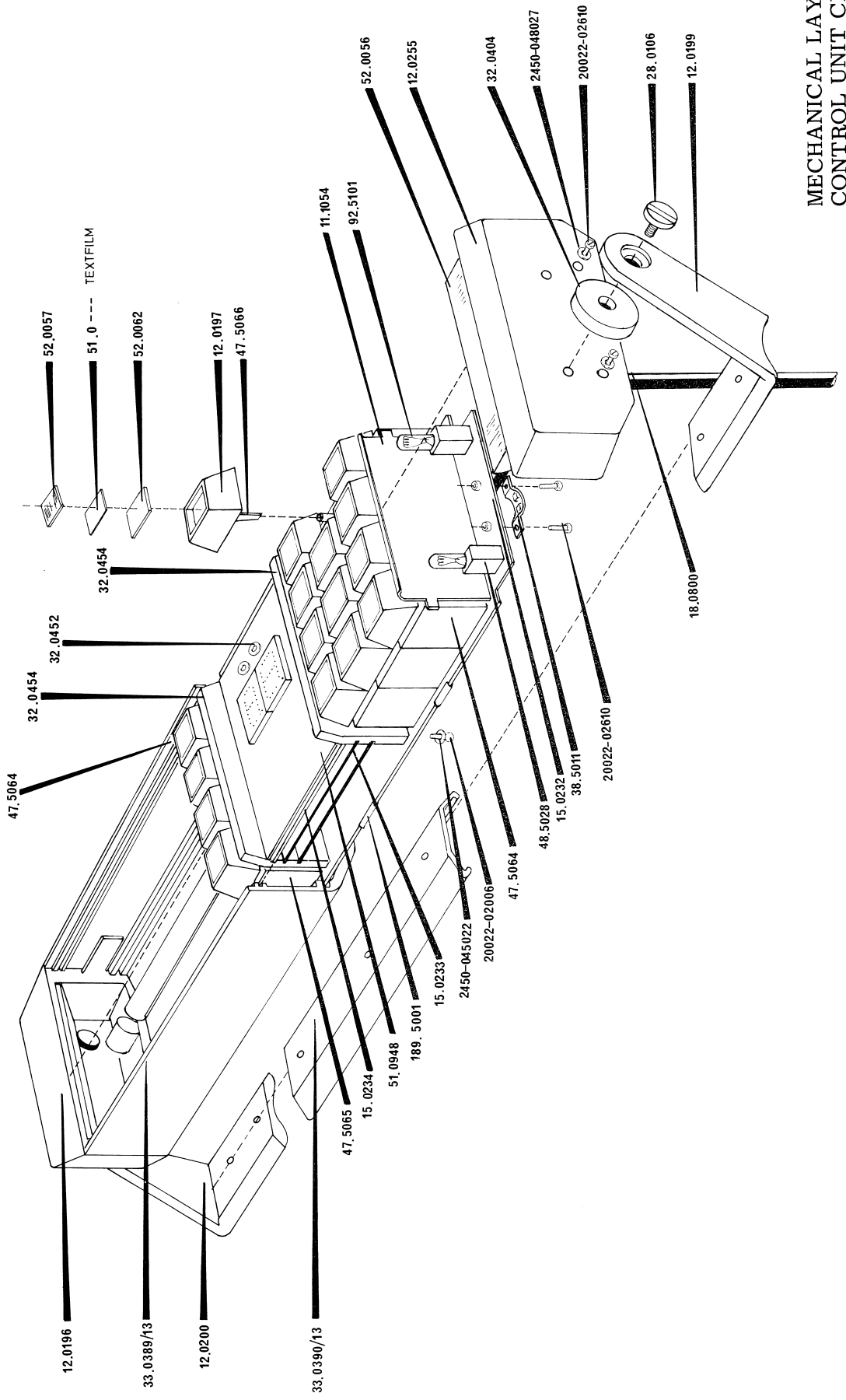
CQM713 D Spec. C4 x 49 DK
CQM713 D Spec. C4 x 46 N
CQM763 D Spec. C4 x 80 S
CQM763 D Spec. C4 x 80 DK

M405.046/4

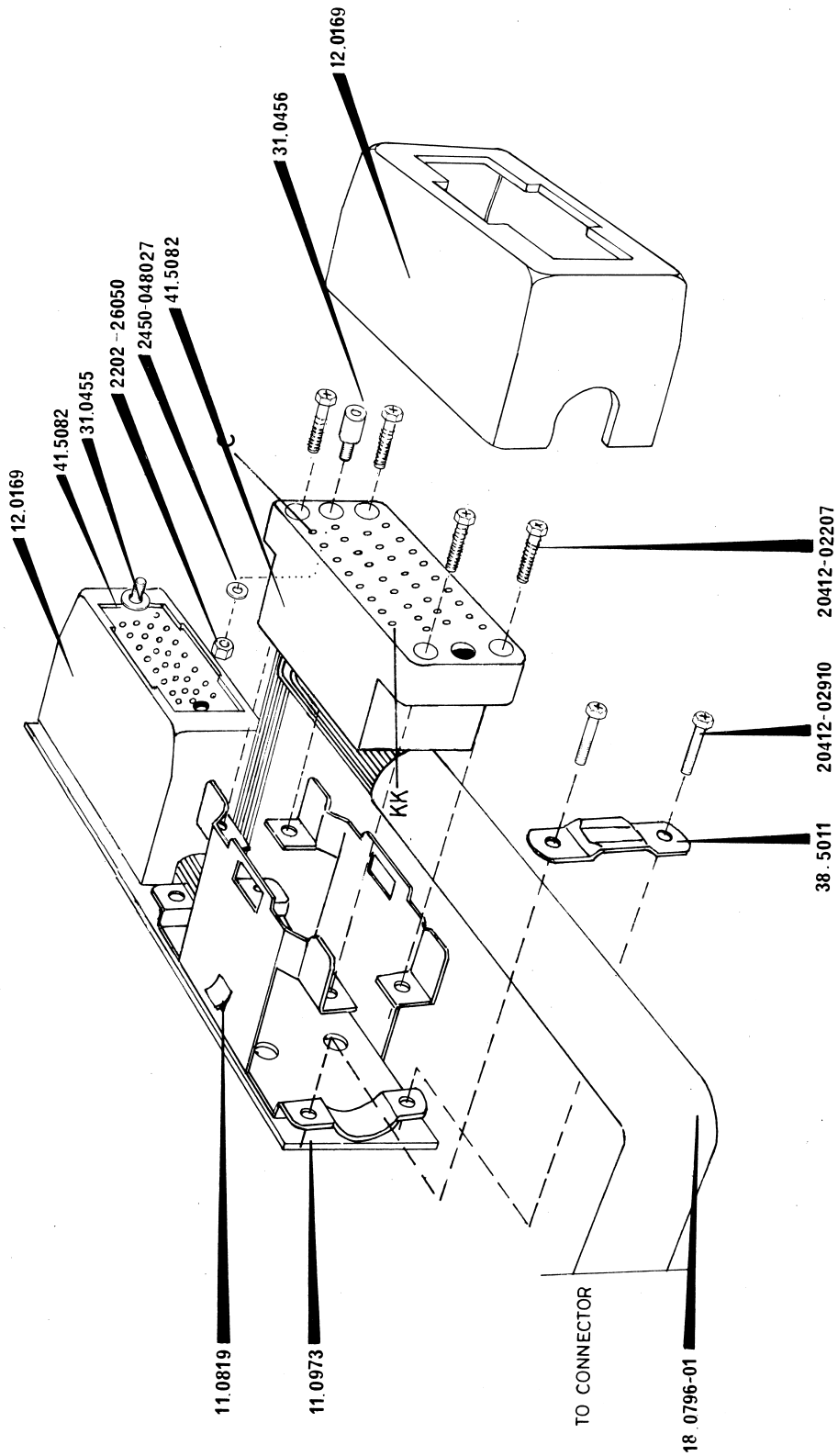


CONTROL UNIT
BEDIENGERÄTE

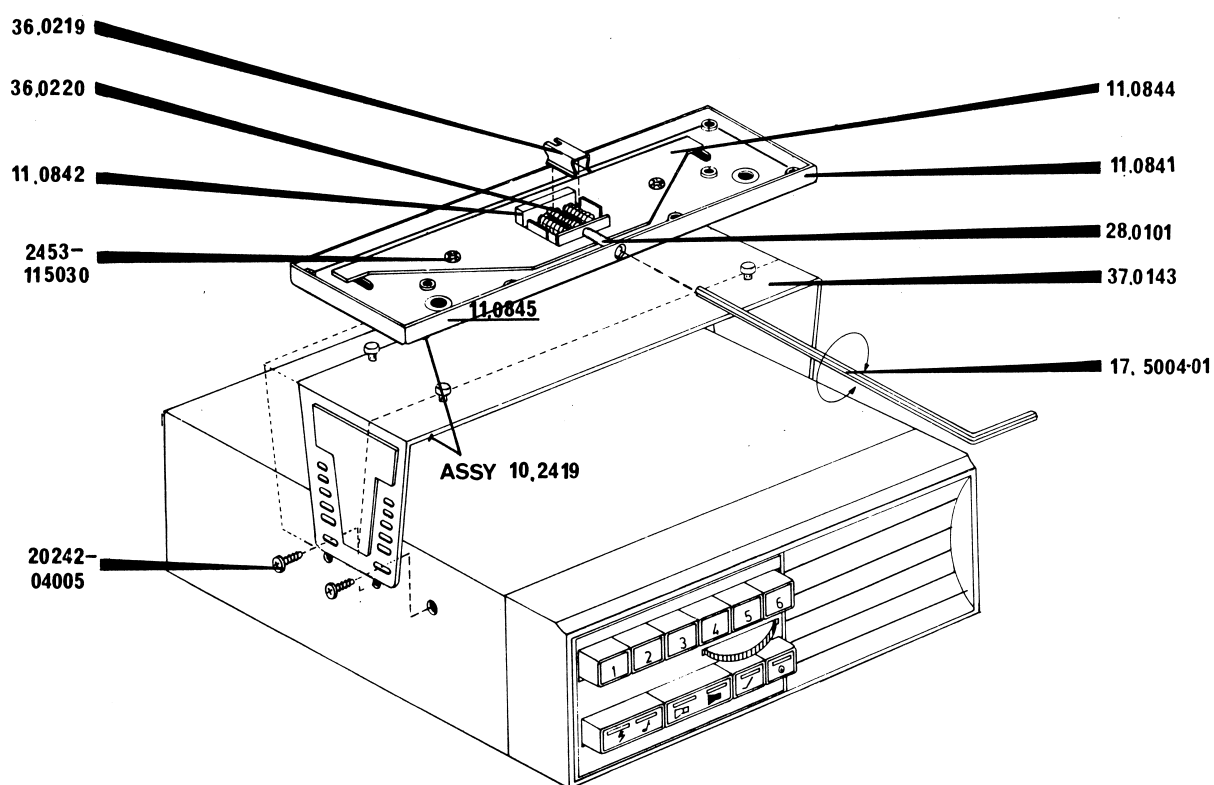
CB704



MECHANICAL LAYOUT
CONTROL UNIT CB 2706

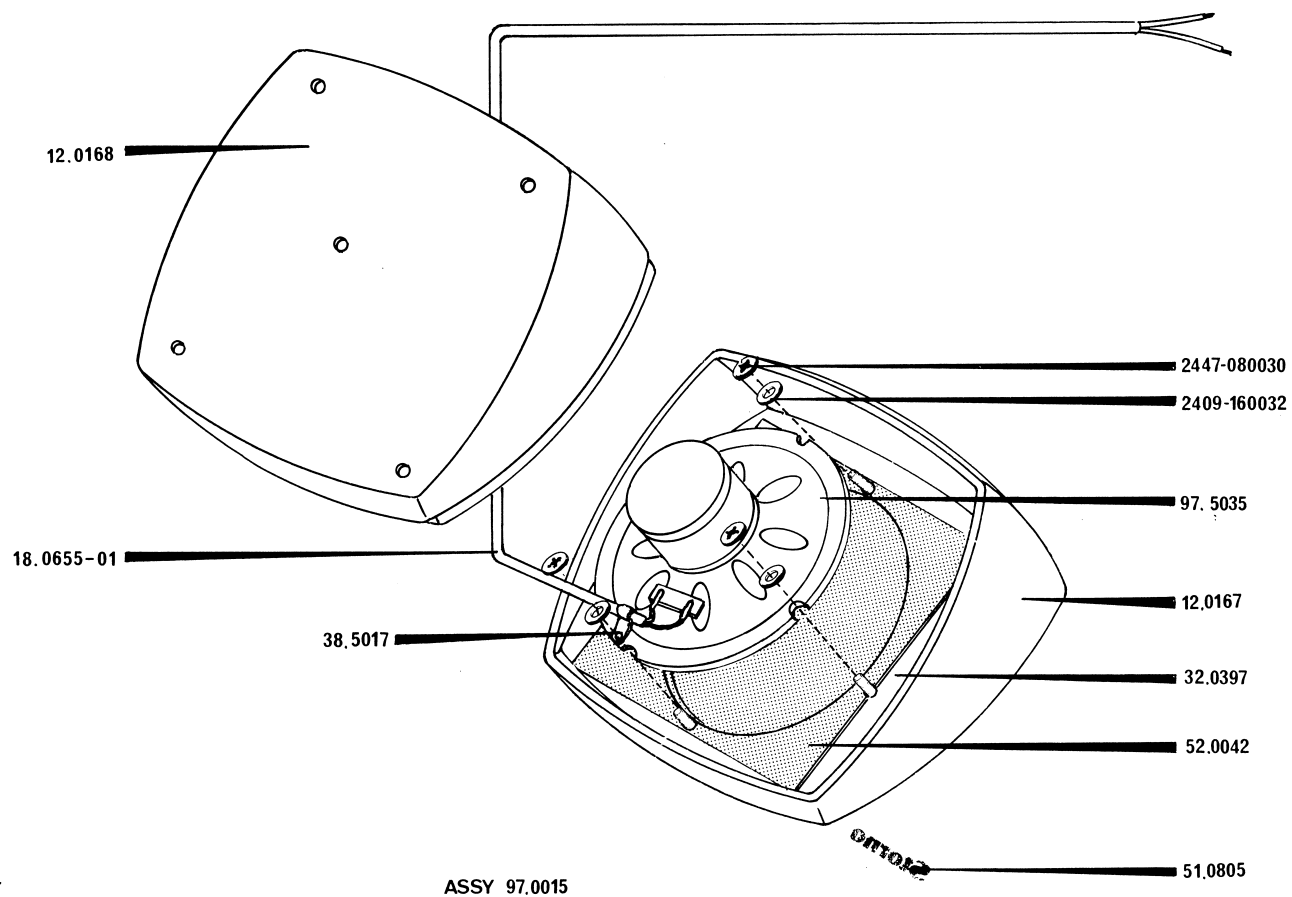


MULTICONNECTOR
VIELFACHSTECKER



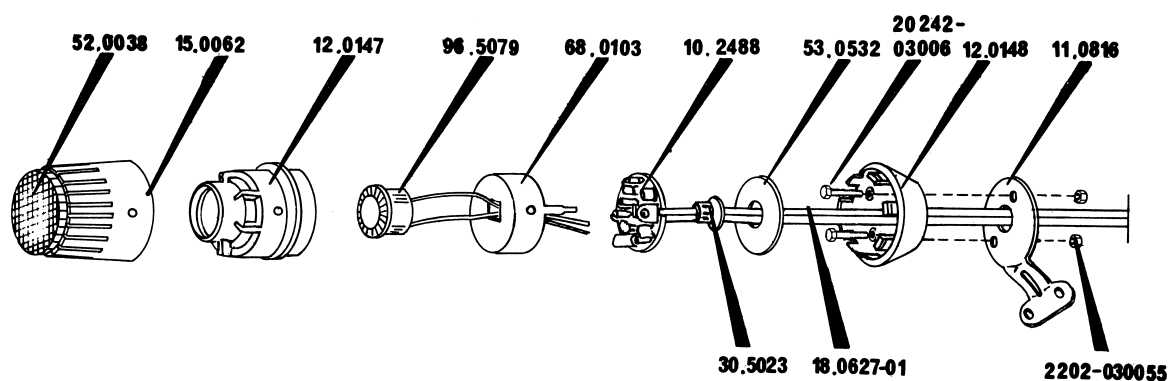
Storno

Storno



LOUDSPEAKER LS701

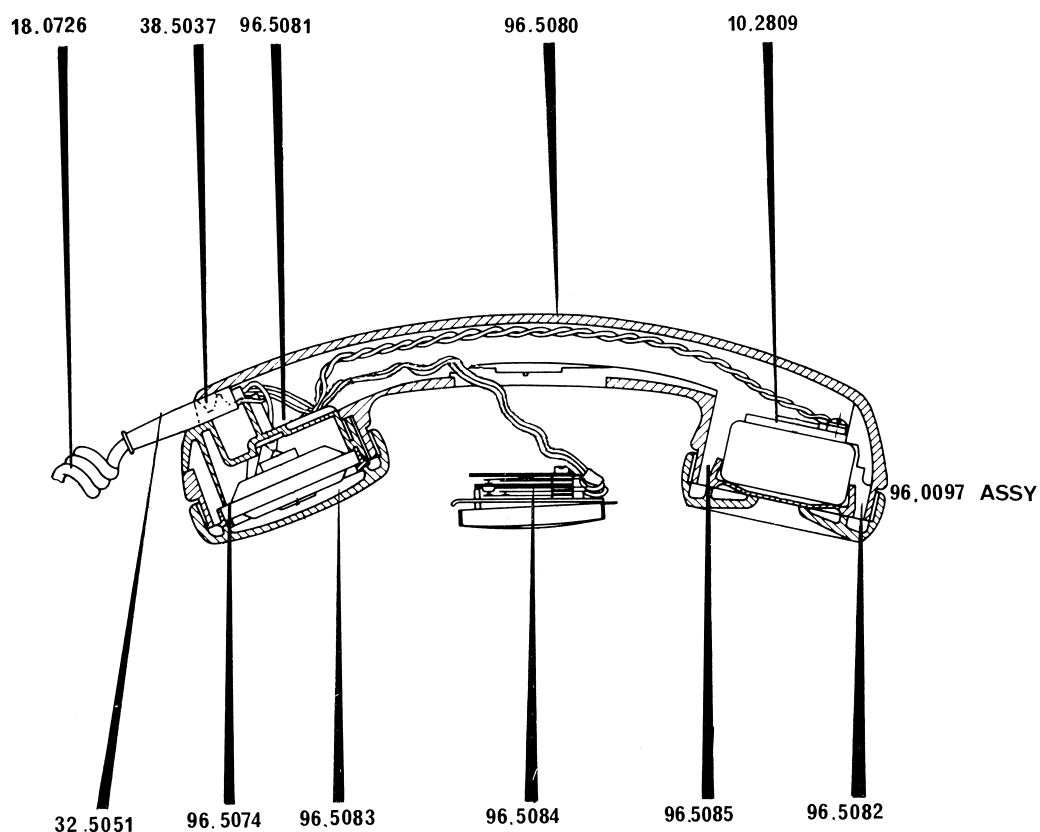
M405.039/2



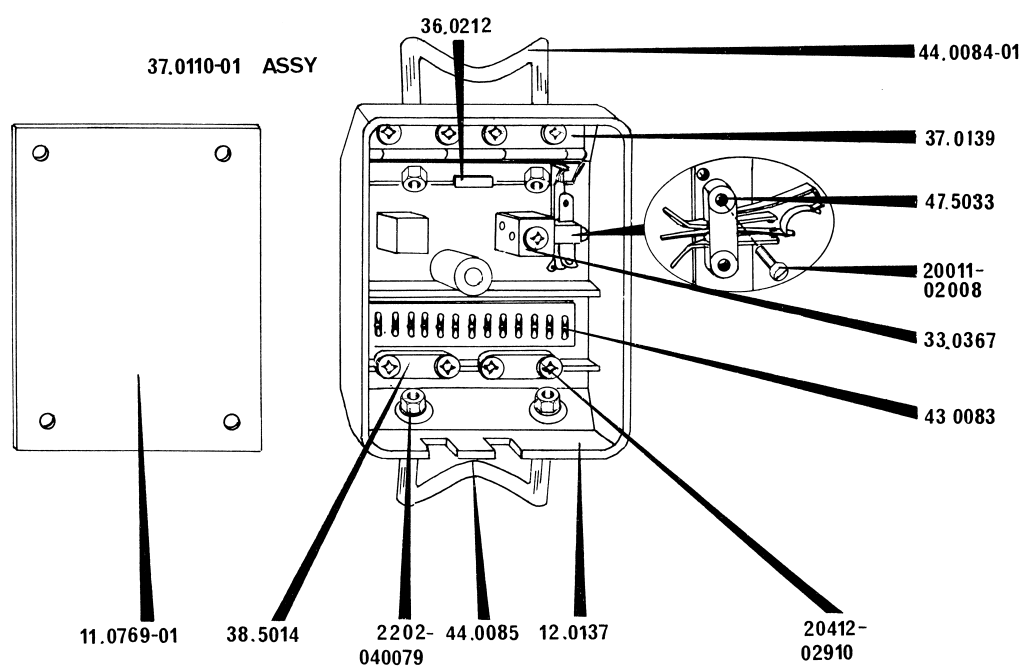
Exploded view diagram of the front panel assembly. The diagram shows the following components and their part numbers:

- 37.0141: Cable (30 cm)
- 37.0140: Cable (20 cm)
- 20193-03002: Connector
- 20193-03002: Connector
- 12-03006: Mounting bracket
- 63-03006: Mounting bracket
- 28.0099: Mounting bracket
- 32.0381: Mounting bracket
- 28.0100: Mounting bracket
- 20412 03913: Mounting bracket
- 2441-180105: Mounting bracket
- 28.0065: Mounting bracket

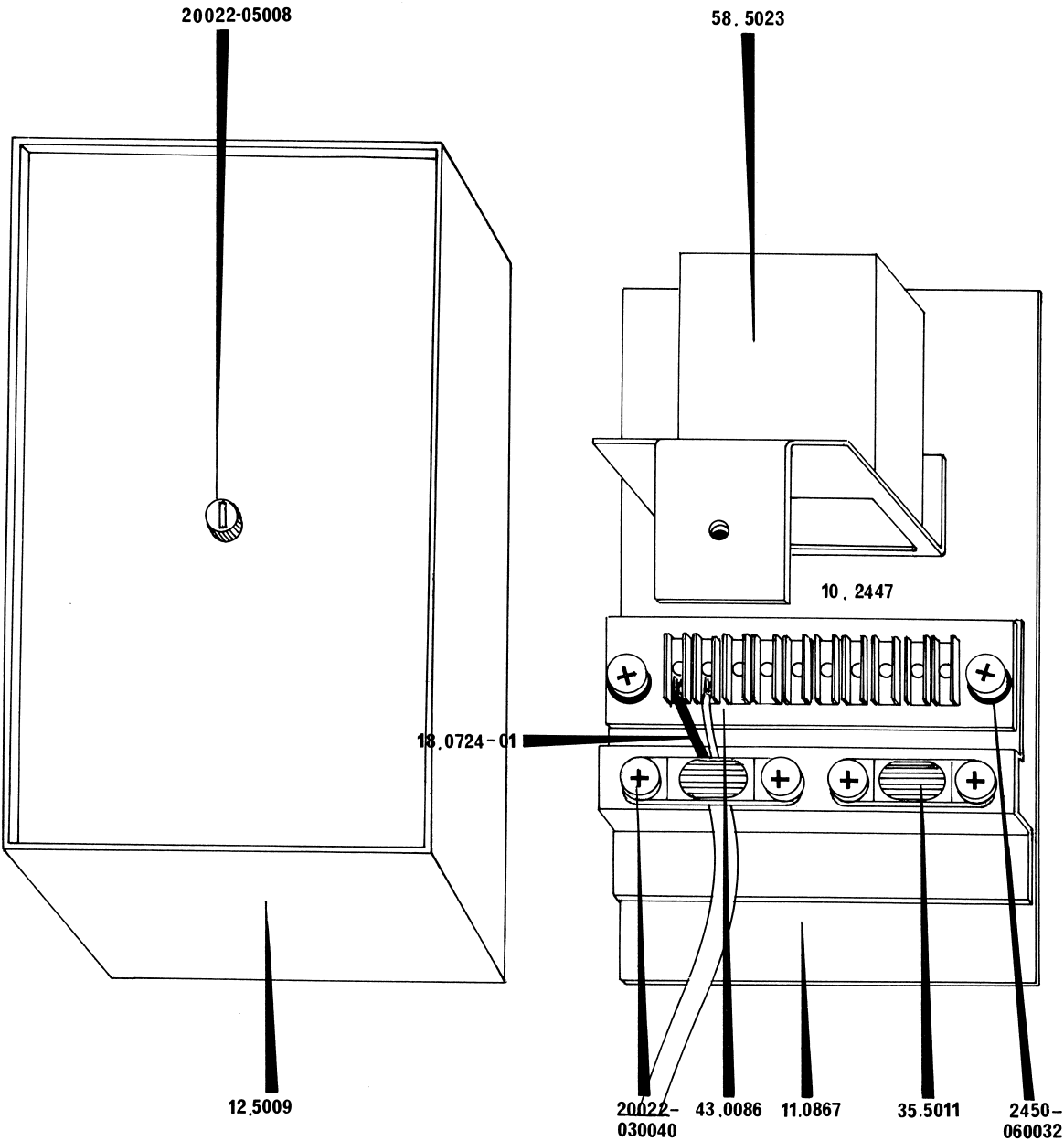
FIXED MICROPHONE MC701, MOUNTING KIT MK704
FEST MIKROFON MC702, EINBAU SATZ MK704



HS 602 a



MICROTELEPHONE HANDSET MT701/HS602a



SWITCHING UNIT SU703