TECHNICAL SPECIFICATIONS

CQM763D

The stated specifications apply to all channels.
All measurements include antenna branching filter.
The receiver specifications are measured with simultaneous transmitting.
Figures in brachets are typical values.

GENERAL SPECIFICATIONS

Frequency range, transmitter

CQM763D x 80 DK: 453.0 MHz to 455.0 MHz
CQM763D x 80 S : 452.5 MHz to 455.0 MHz [1]

Frequency range, receiver

CQM763D x 80 DK: 463.0 MHz to 465.0 MHz
CQM763D x 80 S : 462.5 MHz to 465.0 MHz [1]

[1] 19 private channels included.

Duplex frequency separation

10 MHz

RF bandwidth

CQM763D x 80 DK 2.0 MHz
CQM763D x 80 S 2.5 MHz (19 private channels incl.)

Channel frequency separation

25 KHz

Number of channels

CQM763D x 80 DK: 80
CQM763D x 80 S : 80 + 19

Type of modulation

Phase

Modulation frequency range

CQM763D x 80 DK: 300 Hz to 3000 Hz
CQM763D x 80 S : 300 Hz to 2400 Hz

Maximum frequency deviation

± 5 KHz

Nominal frequency Deviation

CQM763D x 80 DK: ± 3.3 KHz
CQM763D x 80 S : ± 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:	235 x 130 x 30 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:	1.07 kg
Control unit CB704:	0.2 kg

RECEIVER SPECIFICATIONS

Sensitivity, e.m.f. for 12 dB SINAD, EIA

Channel 01 - 80: 1.1 µV (0.85 µV)
Channel 81 - 99: 1.2 µV (1.0 µV)

Squelch sensitivity, EIA

1.0 µV (0.7 µV)

Crystal oscillator frequency, RC762

145.758 MHz

Frequency stability, -25°C to +55°C

± 2.5 KHz (± 2.0 KHz)

Modulation acceptance bandwidth

± 5 KHz (± 7 KHz)

Adjacent channel selectivity selectivity, EIA

70 dB (77 dB)

Adjacent channel selectivity, SEN

65 dB (72 dB)

Spurious attenuation, EIA

75 dB (85 dB)

Spurious attenuation, SEN

70 dB (80 dB)

Intermodulation, EIA

70 dB / 1 µV (75 dB / 1 µV

Blocking, MTD

86 dB / 1 µV (88 dB 1 µV

Blocking, GPO

< 1 dB

Spurious and harmonic SR mission into an artificial load (SEN)

< 2 nW 0.4 nW)

Loudspeaker impedance

5 Ω

Microphone impedance

10.000 Ω

AF output power

2 W (2.5 W)

Harmonic distortion

< 6% (3%) measured at 1 mV RF input, 1 W 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)

Hum and noise, EIA

60 dB (70 dB); squelched condition
40 dB (40 dB); unsquelched condition

Hum and noise, MTD

40 dB (45 dB); pt. 2.2.11a
30 dB (36 dB); pt. 2.2.11b

TRANSMITTER SPECIFICATIONS

RF output

6W

Crystal oscillator frequency, EX762

145.992 MHz

Frequency stability, -25°C to +55°C

± 2.5 KHz (± 2-0 KHz)

Spurious radiation

Harmonics: < 2 µW (< 0.2 µW)
Adjacent channels, MTD: < 2 µW (< 0.5 µW)
Other frequencies: < 0.2 µW (< 0.1 µW)

AF input impedance

560 Ω

Modulation sensitivity, EIA

110 mV ± 1 dB

Modulation distortion, EIA

Modulation distortion, MTD

< 7% (2%)

Modulation frequency characteristic, MTD

+6 dB / octave +1 dB / -3 dB (+0 dB / -2 dB)
CQM763D x 80 DK: 300 Hz to 3000 Hz
CQM763D x 80 S : 300 Hz to 2400 Hz

FM hum and noise, EIA

-45 dB (-60 dB)

FM hum and noise, MTD

35 dB (40 dB); pt. 2.1.9a
30 dB (35 dB); pt. 2.1.9b

AM, MTD

7% (1.5%)

Transmitter load

Meets the MTD requirements pt. 2.1.2a, b and c.

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GENERAL DESCRIPTION

CQM763D

Introduction

The Stornophone 763D radiotelephone is a mobile transmitter for the UHF duplex operated public radiotelephone systems in Denmark and Sweden.

The only difference between the Danish equipment and the Swedish equipment is the option for 19 private channels (81 - 99) in the Swedish equipment.

From the frequency allocation table, the channel numbers, channel frequencies and the relationship to the synthesizer signal appear. As the channel selector is in the BCD code and the programable divider requires the 9-complement of the BCD code, a converter is inserted.

	Transmitter frequency range	Receiver frequency range	Duplex spacing
CQM763D x 80 DK	453.0 MHz - 455.0 MHz	463.0 MHz - 465.0 MHz	10 MHz
CQM763D x 80 S[x]	452.5 MHz - 455.0 MHz	462.5 MHz - 465.0 MHz	10 MHz

[x] 19 private channels included

There are 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.

The upper circuit panel, designated RF763, 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 funtional module units for ease in servicing.

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

Reading the type plate:

CQM763D spec XX X XXXX

- XX: C4 — Remote control (CP703); C5 — Local control (CP705)
- XXXX: 80DK — Denmark 80 channels; 80S — Sweden 80 channels

Control Equipment

The locally controlled model will have the following front panel:

CP705 Front panel with controls, built-in loud speaker and channel selector.

The CQM763D 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.

CB706 Automatic control unit housed in a cast aluminium cabinet and containing operating controls for the radiotelephone.

Accessories

Accessories available for the CQM763D 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.

HS602 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.

Channel Indicator

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

Antenna

AN63-3 1/4 wave length whip antenna for the 420-470Mhz frequency band and the impedance matches 50 Ω. Base design permits mounting from the outside without damaging the car upholstery.

Installation Kits

The installation of a CQM763D 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 and accessories.

CC701 Battery Cable.

MK701 Mounting kit containing connectors for connecting battery, antenna and accessories to the radio cabinet plus fuse box and fuses for installation series with the 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.

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.

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CIRCUIT DESCRIPTION
CQM763D

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 incomming 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 SR700 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 receiver is derived from the microphone (MC) or the microtelephone (MT) via the tone generator TT780.

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

The receiver comprizes the following subunits:

BF762	Antenna branching filter
BP762	Preselector filter
RC762	Receiver converter with 1st mixer, local oscillator and synthesis mixer
IC703	Intermediate frequency Converter with 10.7MHz crystal filter, 2nd mixer, 2nd local oscillator and 455KHz ceramic filter
CF702	455KHz intermediate frequency amplifier, squelch circuit, AF amplifier and voltage regulator

60.296-E1

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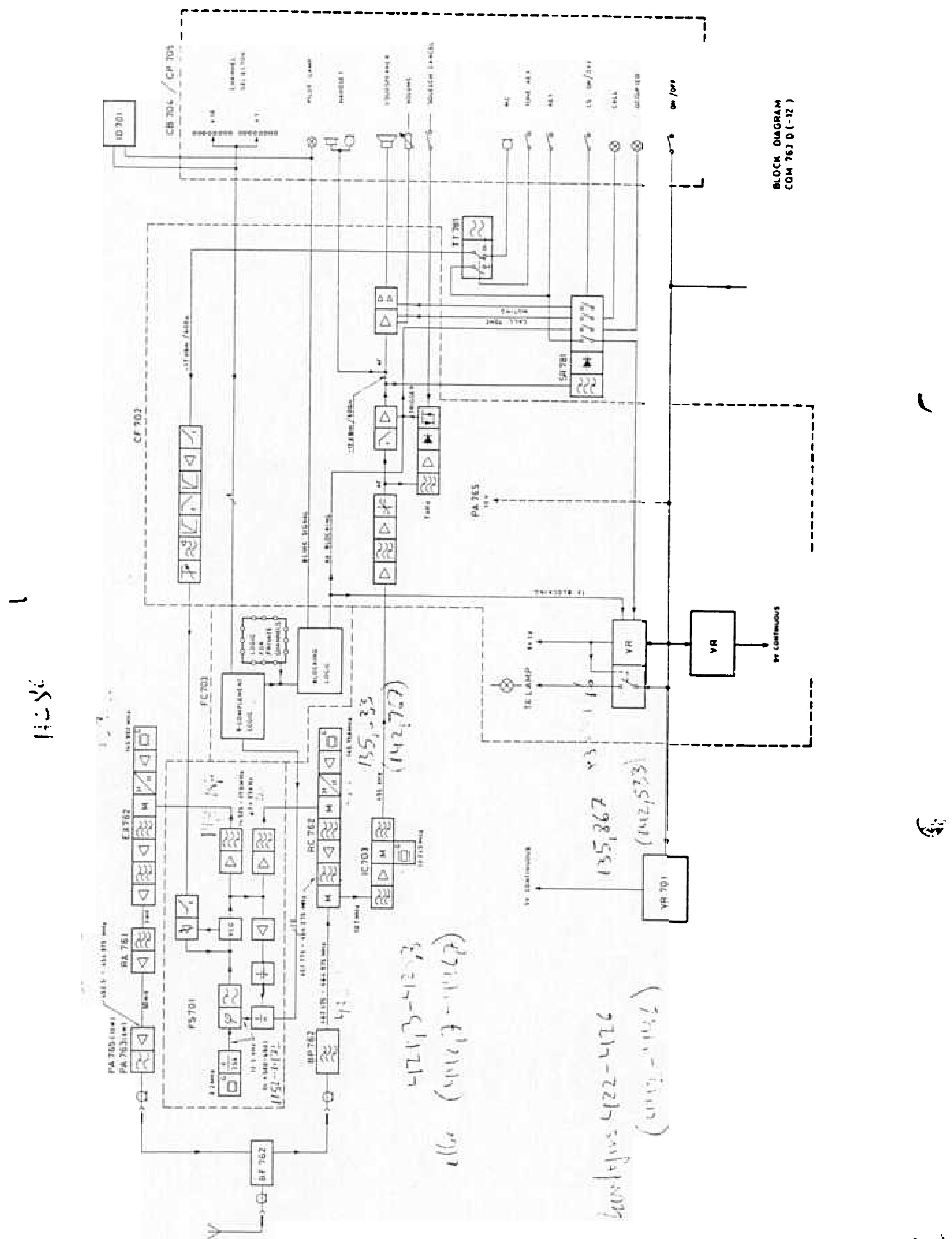

BLOCK DIAGRAM
CQM 763 D(-12)
CB 704 / CP 705
ID 701
CF 702
FC 703
EX 762
RA 761
PA 765
FS 701
RC 762
IC 703
BP 762
BF 762
VR 701
VR
TT 781
SR 781

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RECEIVER

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 ampli fier stage.

This approach has resulted in superior blocking, selectivity, and intermodulation characteristics of the receiver. The BP762 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 synthe sis 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 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. To compensate for oscilla tor drift at low temperatures the unit incorporates a partial crystal oven.

The conversions can be expressed as follows

$$f_{RX} = f_{XRX} + f_S + IF$$

= Antenna frequency

f_{XRX} Crystal oscillator frequency

= Synthesizer signal frequency

$IF_1 = 10.7MHz$

Intermediate Frequency Circuits

From the mixer in RC762 the 10.7MHz signal passes to the intermediate frequency converter, type IC703, which provides the channel selectivity of the receiver. The first IF signal passes through the 10.7MHz 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 conver ted to the second IF signal of 455KHz.

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

$$10.7MHz - 0.455MHz = 10.245MHz$$

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

The 455KHz 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 demo- dulated 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 field-effect transistor, operating as an electronic on/off switch, has been placed between the second and third stages. This switch is controlled

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›y squelch circuit. The amplifier has nominal output level of -17dBm (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 push-pull.

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 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	EX762
RF amplifier	RA761
RF power amplifier	PA763 or PA765
Antenna Branching filter	BF762
Modulation amplifier, transmitter switch and voltage regulator (these circuits constitute part of CF702)	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.

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.

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Before being applied to the modulator, the modulating signal is filtered in a splatter 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 RA761.

In order to suppress spurious signals, especially the oscillator frequency, 3 circuit helix filters are used. To compensate oscillator drift at low temperatures the unit incorporates a partial crystal oven.

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 (RA761) operating at the final frequency of the transmitter. Tuned input and output band pass filters of the amplifier provide aditional selectivity and thus also attenuation of undesired signals. The amplifier raises the signal to the level required by the final RF power amplifier PA763 or PA765. The nominal RF output power of RA761 is 100 mW into 50 Ω load.

RF Power Amplifier

The power amplifier PA763 contains three transistor amplifier stages, power amplifier PA765 one transistor stage and a power module. 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 ADC (Automatic Drive Control) 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. Additionally, the ADC circuit reduces 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 safe 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 7-pole Chebishev filter. The antenna filter having low insertion loss and ripple attenuates signals at undesired frequencies to an acceptable low level, e.g. harmonies of the transmitter frequency.

The antenna filter is not adjustable.

The transmitter signal at the output connector is fed through the antenna branching filter BF761 to the antenna.

Synthesizer Circuits

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

The signal is generated in a voltage controlled oscillator (VCO) whose output is amplified, and fed to the exciter and to the receiver converter. The VCO is part of a phase locked loop consisting of a buffer amplifier, a programable frequency divider, a phase detector, a prescaler and a low pass filter.

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.

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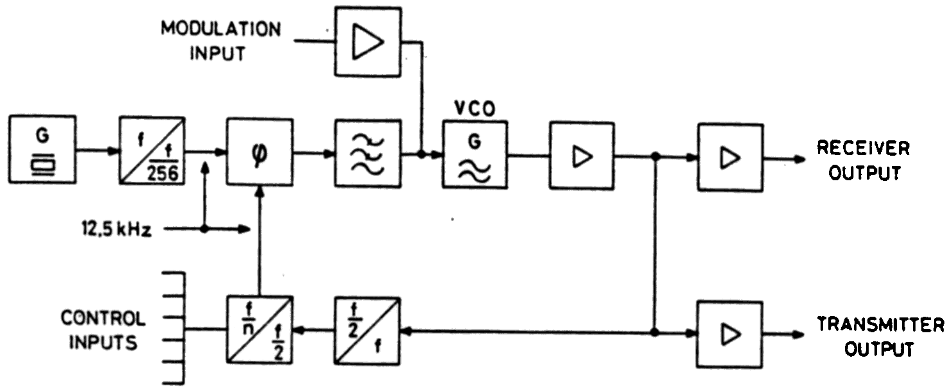

SYNTHESIZER BLOCK DIAGRAM

The 12.5 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 programable divider. The three decades in the counter are controlled by the 9-complement of the divisor expressed in the BCD code.

The third decade counter is fixed programmed to divide by 6.

Frequency Control

The conversion of the channel selector BCD code to its 9-complement code takes place in the frequency control unit FC703.

The circuits allow conversion of maximum 99 channels of which 19 channels are blocked by additional logic circuits. When the channel selector is set to a blocked channel, the frequency control unit produce blocking voltages to blocking gates in the transmitter and receiver circuits, and an astable multivibrator flashes the channel display and the ON/OFF lamp.

In Swedish units one or some of the remaining 19 channels may be opened and used as private channels.

Power Supply and Switching Circuits

CQM763D 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 CQM763D contains two almost identical voltage regulator circuits which deliver 9V 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

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the CQM763D 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 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.

ADJUSTMENT PROCEDURE
CQM763D

RECEIVER ALIGNMENT

Before switching on the CQM763D 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 sypply voltage until a current of 100mA is reached.

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

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: 9V ± 0.1V.

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: 5V ± 0.1V.

If necessary, adjust the 5V by means of potentiometer R1 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 (455 kHz)

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

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 an AVO-meter 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 decreasing meter reading.

Coarse Adjustment of L1 in CF702

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 (AF-RX) may be turned up. This potentiometer can be reached from the rear of the module tray BA702, and turns up counter- clockwise.

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, both in operation at the same time by pressing both 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 ± 20 Hz.

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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 channel 40 corresponding to an output frequency of 16.000 MHz.

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

Adjust C1 in FS 701 for 16.000.000 ± 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 channels not used.

Alignment of Mixer Injection Signal to RC762

Connect a DC voltmeter to testpoint (1) and testpoint (2) in RC762.

Adjust L3 in RC762 for maximum meter reading. Distance between the tuning slug and the top of the coil form should be approx. 2 mm.

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

Connect the voltmeter to testpoint (1) and testpoint (3) in RC762.

Adjust L5, RC762 for maximum meter reading.

The voltage with the oscillator stopped will be approx. 0.05V.

Start the oscillator.

Requirement:
Minimum voltage increase $\leq$ 0.45V

Typical: 0.8V

Adjustment of Tripler Circuit, RC762

The following procedure must be followed carefully as capacitor C13 can be adjusted to the third harmonic of the input frequency and to the second harmonic as well. Four settings of C13 will normally produce a resonance peak as it can be turned 360°.

Connect a DC voltmeter to testpoint (1) and testpoint (3) in RC762.

Adjust C13 for minimum voltage.

As mentioned above there will be four dips, of which the smaller is chosen.

Connect the DC voltmeter to testpoint (5) in RC762.

Connect a frequency counter to testpoint [4].

Read the frequency, approx. 437.0 MHz, to make certain that Q3 is working as a tripler. If necessary choose an other setting of C13.

Remove the frequency counter and adjust capacitor C15 for maximum reading on the voltmeter. Due to interaction the adjustment of C13 and C15 should be repeated until no further increase in voltage at testpoint (5) is obtained.

The voltage at testpoint (5) with the oscillator stopped will be approx. 0.6V. Minimum voltage increase with the oscillator working $\geq$ 0.3V; Typical: 0.6V.

Adjustment of Crystal Oscillator Frequency, RC762

Connect a frequency counter to testpoint [4] in RC762. Adjust L1, RC762, for correct frequency.

Requirement: f = 437.275 MHz ± 200 Hz.

If the frequency cannot be pulled to the correct reading the strap in the oscillator circuit must be altered. Refer to RC762 ciagram.

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 and volt meter to test point [4] RC

Set the channel selector to channel 30.

Stop the RC crystal oscillator and measure the RF level.

Requirement: 0.82 - 1.04 V

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

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

Alignment of Filters and RF Amplifier, RC762

Connect a voltmeter to testpoint (6) in RC762.

Stop the crystal oscillator in RC762 (short the crystal to chassis).

Course tuning

Connect an RF generator to the input of BP-filter I, and set the generator for 452.3 MHz. Adjust L9, L10, L11, L12 L15, L17 and C50 for maximum reading on the voltmeter.

Fine tuning

Remove the RF generator and start the crystal oscillator.

Select channel 01.

Turn the tuning slug of L5 in BP762 flush with the outside of the chassis.

L9, L10, L11, L12, L15, L16, L17, and C50 is adjusted for maximum meter reading in testpoint (6).

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 3.5% below the desired frequency, care must be taken not to resonate the filter circuits at the wrong frequency.

The voltage at testpoint (6) with the oscillator stopped will be approx. 3V.

Start the oscillator.

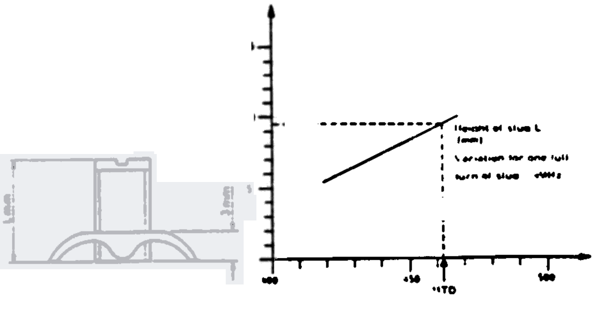
Requirement:
Minimum increase at testpoint (6)
RC762 = 0.5V

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

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

Coarse Adjustment of BP762

The trimming slugs, L1, L2, L3, and L4 of the filter BP762 are set to the approximate positions according to the graph. The graph and the picture indicate the mechanical position of the slugs as a function of the receiver antenna frequency. L5 is to remain in its position as set during the fine tuning of the filters.



Storno

Further Alignment of RC762
Fine Tuning of BP762, and
Fine Tuning of IC703

Connect a DC EVM with an RF probe to testpoint [1] in CF702. An AVO-meter 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 channel 30

Set the generator to the receiver frequency (463,725MHz) Fine tuning of the generator frequency may be done by loosely coupling a 455 KHz signal to the IF input of CF702. (First connect CQM700 chassis 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 testpoint [1], CF702.

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

C50	RC762
L 5,	BP762
L 4,	BP762
L 3,	BP762
L 2,	BP762
L 1,	BP762
L18,	RC762
L 1,	IC703
L 2	IC703
L 3	IC703

Due to interaction, especially between C50 in RC, and L5 in BP, the procedure should be repeated until no further increase in meter reading can be obtained.

By adjusting C50, RC762, the oscillator drive signal to the RF mixer will have decreased. L17, RC762, must be fine tuned for maximum reading on a DC voltmeter connected to test point (6), RC762

Now, when stopping the oscillator, the voltage testpoint (6) should fall at least 0.3V. 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 CQM763D, approx. 1 mV EMF from the gen

Modulate the generator with 1 KHz to a frequency swing of ± 3.5 KHz.

Connect an audio voltmeter to testpoint [2] in CF702 This testpoint 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 x Δ f max.: 3.5 KHz

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

If the CQM763D 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 mean of R16 in CF702.

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

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Connect an audio voltmeter and a distortion meter across the loudspeaker terminals. Set the volume control for 2.25V 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 nosignal 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-clock-wise (viewed from the component side of CF702).

Set the supply voltage to 16V.

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: $k \leq 7\%$

Checking Receiver Sensitivity

Modulate the RF generator with 1 KHz, and a frequency deviation of 3.0 x max. Δ f.

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 1V across the load.

Reduce the calibrated RF voltage from the RF generator.

Requirement:
for 12 dB SINAD $\leq$ 1.0 µV EMF. (channels 01-80)
for 12 dB SINAD $\leq$ 1.1 µV EMF. (channels 81-99)

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:
CQM763D with tone equipment, TT781, SR781, and channel indicator ID701.
$\leq$ 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 13.6V, and the current limiter to 4A.

Storno

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

Requirement: 9V TX = 9V ± 0.1V.

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 EX762

Connect a DC voltmeter to testpoints (1) and (2) in EX762.

Adjust L3 in EX762 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. 0.25V. Minimum increase with the oscillator working will be approx. 30 mV.

Connect the voltmeter to testpoints (1) and (3) in EX762.

Adjust L5 EX762, for maximum meter reading.

The voltage at test point (1) and (3) with the oscillator stopped will be approx. 0.05V.

Start the oscillator.

Requirement:
Minimum increase at testpoints (1) - (3), EX762 = 0.45V.

Adjustment of Tripler Circuit EX762

The following procedure is to be followed carefully as capacitor C13 can be adjusted to the third harmonic of the input frequency and to the second harmonic as well. As C13 has no stop there will normally be four points of resonance.

Connect a DC voltmeter to testpoint (1) and testpoint (3) in EX762.

Adjust capacitor C13 for minimum voltage.

As mentioned above there will be four dips of which the smaller is chosen.

Connect the DC voltmeter to testpoint (5) in EX762.

Adjust capacitor C15 for maximum reading.

Connect a frequency counter to testpoint [4].

Read the frequency, approx. 438 MHz, to make certain that Q3 is working as a tripler.

Remove the frequency counter and adjust C13 for maximum voltmeter reading.

Due to interaction the adjustment of C13 and C15 should be repeated until no further increase in voltage at testpoint (5) is obtainable. The voltage at testpoint (5) with the oscillator stopped will be approx. 0.6V.

Minimum increase at testpoint (5) ≥ 0.3V.

Adjustment of Crystal Oscillator Frequency, EX762

Connect a frequency counter to testpoint [4].

Adjust L1, EX762, for correct frequency.

Requirement:
437.975 MHz ± 200 Hz.

If the frequency cannot be pulled to the correct reading the strap in the oscillator circuit must be altered. Refer to EX762 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 and voltmeter to testpoint [4], EX762
Set the channel selector to channel 30.

Stop the EX crystal oscillator and measure the RF level.

Requirement: 0.82 - 1.04 V.

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

the level is low in one position, L7 in RF-amplifier II adjusted for best symetry.

Alignment of Filters and RF Amplifier EX762

Connect an RF probe and voltmeter to testpoint [9] in EX762 (output terminal).

Stop the crystal oscillator in EX762 (short the crystal to chassis).

<u>Course tuning</u>

Connect an RF generator to the input of BP-filter I, and set the generator for 453.00 MHz. Adjust L9, L10, L11, L12, L15, L16, and L17 for maximum reading on the voltmeter.

<u>Fine tuning</u>

Remove the RF generator and start the crystal oscillator.

Select channel 30

Adjust L9, L10, L11, L12, L15, L16, and L17 for maximum meter reading.

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 3.5% below the desired frequency, care must be taken not to resonate the filter circuits at the wrong frequency

Alignment of RF Amplifier RA761

Connect a voltmeter to testpoint (11) in RA761

Select channel 01

Adjust L17 in EX762 for minimum meter reading. Adjust L1, L2, L3, L4, L5, and C5 in RA761 for minimum meter reading, approx. 4.5V.

Remove the RF signal lead between RA 761 and PA763.

Connect an RF Watt meter to the RA761 output

Adjust L6, RA761 for maximum output. Adjust L1, L2, L3, L4, L5, L6, and C5 for maximum output.

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

Requirement: $P_{OUT} \geq 60$ mW.

Measure the voltage at testpoint (11) in RA761

Requirement $\leq 6V$

These requirements 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 PA763

Reestablish the connection between RA761 and PA763.

Connect a wattmeter to the antenna output

Select channel 30

PA763 should be aligned at a supply voltage of 12.5V

Turn the ADC potentiometer, R2 in PA763 up (clockwise), but back the potentiometer off if necessary during the alignment. The total current consumption while aligning must be limited with the ADC potentiometer to 3A (with tone equipment).

Adjust C3, C7, C11, C16, C21 and C22 in PA763, in this order, for maximum current consumption from the power supply.

Repeat until the Wattmeter shows RF output and proceed to adjust the above capacitors for maximum RF output.

2. During the following alignment, keep the ADC potentiometer set for a maximum output of 6W.

   Adjust C3 for minimum DC voltage on the collector (the transistor housing) of Q1, PA763.

   Adjust C7, C11, C15, C16, C21, and C22 for maximum RF output.

3. Repeat step 2

Increase the supply voltage to 16V and set the ADC potentiometer for an RF output of 6W.

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utomatic Drive Control Circuit (ADC)

When the ADC circuit is operating properly, the following figures must be obtainable on all channels

Requirements

Supply Voltage	Current Drain	Power Outpu
16.0 V	≤ 2.8 A	≥ 5.5 W
13.6 V	≤ 2.9 A	≥ 5.0 W
10.5 V	< 2.8 A	> 3.0 W

The power deviation between channels selected at random should not be greater than 0.1 dB.

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

Requirement $_{total} \leq 2.9$ A

Adjustment of Modulation and Frequency Deviation

Connect the deviation meter to the transmitter via an attenuation network (10W capacity).

Connect a distortion meter and an audio voltmeter to the audio output of the deviation meter.

Set the power 63D 13.6 V.

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

Select channel 80

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 modulatic 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 V~26 dB = 110 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.

Requirement $\Delta f = \pm 5$ KHz.

Select channel 40

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

Adjust R133 in CF702 for nominal frequency deviation

CQM763D x 80 DK: $\Delta f_{nom} = 3.3$ KHz
CQM763D x 80 S : $\Delta f_{nom} = 3.0$ KHz

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

Requirement: $V_{mod} = 220$ mV ± 1 dB

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

Requirement k ≤ 7% (without deemphasis)

Checking the Transmitter Stability

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

The existence of parasitic 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.

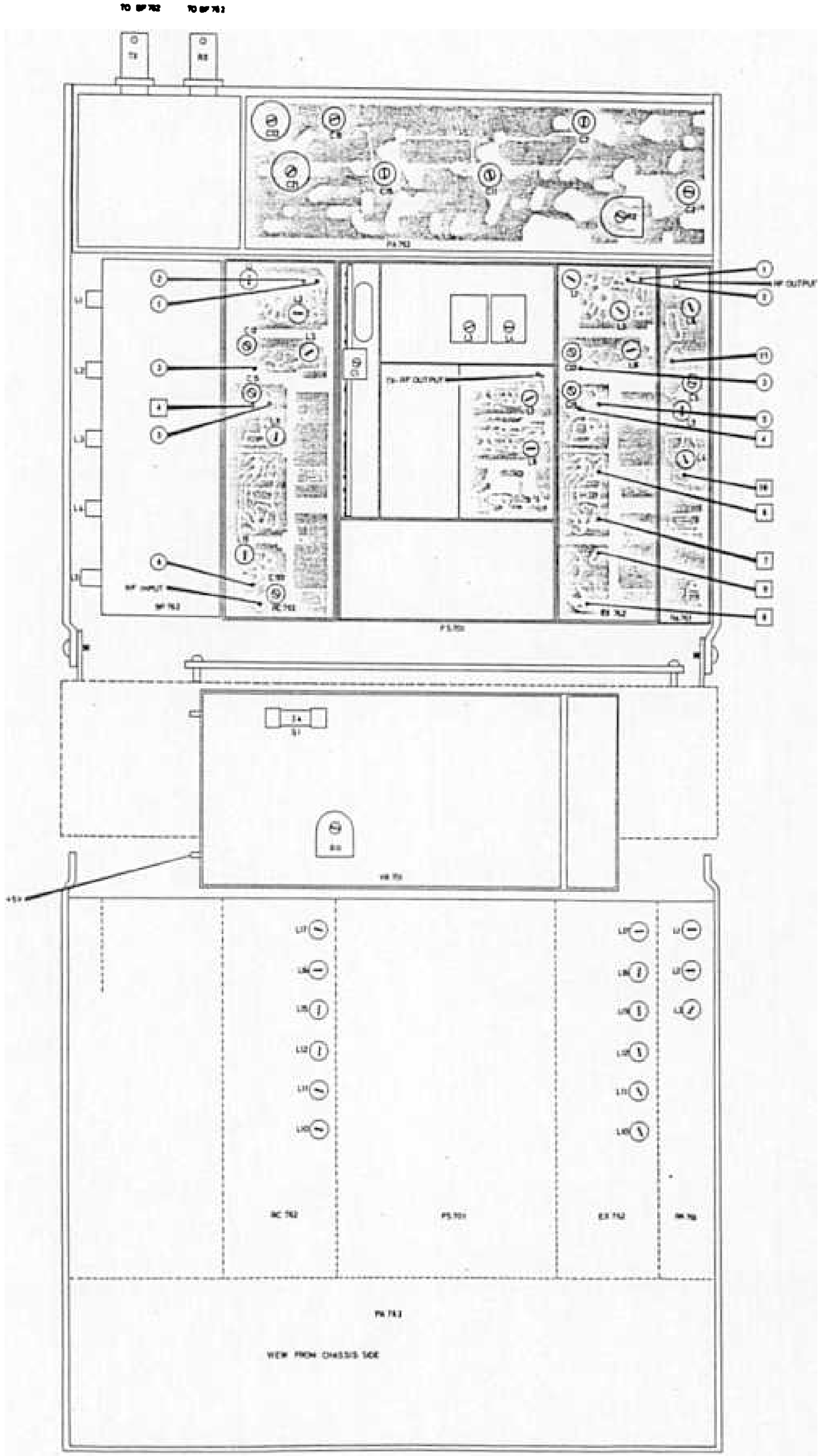
While varying the phase angle with W52C, check that no deflection appears on the AM indicator at any supply voltage between 10.5V and 16V.

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

Antenna Branching Filter BF763

The filter is factory aligned and should never be touched.

Storno



RADIO ASSEMBLY RF763 (CQM763D)

Location of Test Points and Adjustable Components

D402.231

FREQUENCY ALLOCATIQN TABLE

CQM763D

(Without private channels)

Relationship between transmitter frequency, receiver frequency synthesizer fre quency, programable divisor, and BCD control code for FS701.

3. fosc RX = 3 x 145.758 = 437.275MHz

3. fosc TX = 3 x 145.992 = 437.975MHz

					BCD Control Code for FS70								
					x100	x10				x1			
Channel	f_{TX} [MHz]	f_{RX} [MHz]	f_{synt} [MHz]	d.f.	K J	D	C	B	A	D	C	B	A
0		Blocked	15.000	600	0011	1	0	0	1	1	0	0	1
1	453.000	463.000	15.025	601	0011	1	0	0	1	1	0	0	0
2	453.025	463.025	15.050	602	0011	1	0	0	1	0	1	1	1
3	453.050	463.050	15.075	603	0011	1	0	0	1	0	1	1	0
4	453.075	463.075	15.100	604	0011	1	0	0	1	0	1	0	1
5	453.100	463.100	15.125	605	0011	1	0	0	1	0	1	0	0
6	453.125	463.125	15.150	606	0011	1	0	0	1	0	0	1	1
7	453.150	463.150	15.175	607	0011	1	0	0	1	0	0	1	0
8	453.175	463.175	15.200	608	0011	1	0	0	1	0	0	0	1
9	453.200	463.200	15.225	609	0011	1	0	0	1	0	0	0	0
10	453.225	463.225	15.250	610	0011	1	0	0	0	1	0	0	1
11	453.250	463.250	15.275	611	0011	1	0	0	0	1	0	0	0
12	453.275	463.275	15.300	612	0011	1	0	0	0	0	1	1	1
13	453.300	463.300	15.325	613	0011	1	0	0	0	0	1	1	0
14	453.325	463.325	15.350	614	0011	1	0	0	0	0	1	0	1
15	453.350	463.350	15.375	615	0011	1	0	0	0	0	1	0	0
16	453.375	463.375	15.400	616	0011	1	0	0	0	0	0	1	1
17	453.400	463.400	15.425	617	0011	1	0	0	0	0	0	1	0
18	453.425	463.425	15.450	618	0011	1	0	0	0	0	0	0	1
19	453.450	463.450	15.475	619	0011	1	0	0	0	0	0	0	0
20	453.475	463.475	15.500	620	0011	0	1	1	1	1	0	0	1
21	453.500	463.500	15.525	621	0011	0	1	1	1	1	0	0	0
22	453.525	463.525	15.550	622	0011	0	1	1	1	0	1	1	1
23	453.550	463.550	15.575	623	0011	0	1	1	1	0	1	1	0
24	453.575	463.575	15.600	624	0011	0	1	1	1	0	1	0	1
25	453.600	463.600	15.625	625	0011	0	1	1	1	0	1	0	0
26	453.625	463.625	15.650	626	0011	0	1	1	1	0	0	1	1
27	453.650	463.650	15.675	627	0011	0	1	1	1	0	0	1	0
28	453.675	463.675	15.700	628	0011	0	1	1	1	0	0	0	1
29	453.700	463.700	15.725	629	0011	0	1	1	1	0	0	0	0
30	453.725	463.725	15.750	630	0011	0	1	1	0	1	0	0	1
31	453.750	463.750	15.775	631	0011	0	1	1	0	1	0	0	0
32	453.775	463.775	15.800	632	0011	0	1	1	0	0	1	1	1
33	453.800	463.800	15.825	633	0011	0	1	1	0	0	1	1	0
34	453.825	463.825	15.850	634	0011	0	1	1	0	0	1	0	1
35	453.850	463.850	15.875	635	0011	0	1	1	0	0	1	0	0
36	453.875	463.875	15.900	636	0011	0	1	1	0	0	0	1	1
37	453.900	463.900	15.925	637	0011	0	1	1	0	0	0	1	0
38	453.925	463.925	15.950	638	0011	0	1	1	0	0	0	0	1
39	453.950	463.950	15.975	639	0011	0	1	1	0	0	0	0	0
40	453.975	463.975	16.000	640	0011	0	1	0	1	1	0	0	1
41	454.000	464.000	16.025	641	0011	0	1	0	1	1	0	0	0
42	454.025	464.025	16.050	642	0011	0	1	0	1	0	1	1	1
43	454.050	464.050	16.075	643	0011	0	1	0	1	[illegible]	1	1	

FREQUENCY ALLOCATION TABLE

CQM763D

Channel	f_{TX} [MHz]	f_{RX} [MHz]	f_{synt} [MHz]	d.f.	x100 K J	x10 D	C	B	A	x1 D	C	B	A
44	454.075	464.075	16.100	644	0011	0	1	0	1	0	1	0	1
45	454.100	464.100	16.125	645	0011	0	1	0	1	0	1	0	0
46	454.125	464.125	16.150	646	0011	0	1	0	1	0	0	1	1
47	454.150	464.150	16.175	647	0011	0	1	0	1	0	0	1	0
48	454.175	464.175	16.200	648	0011	0	1	0	1	0	0	0	1
49	454.200	464.200	16.225	649	0011	0	1	0	1	0	0	0	0
50	454.225	464.225	16.250	650	0011	0	1	0	0	1	0	0	1
51	454.250	464.250	16.275	651	0011	0	1	0	0	1	0	0	0
52	454.275	464.275	16.300	652	0011	0	1	0	0	0	1	1	1
53	454.300	464.300	16.325	653	0011	0	1	0	0	0	1	1	0
54	454.325	464.325	16.350	654	0011	0	1	0	0	0	1	0	1
55	454.350	464.350	16.375	655	0011	0	1	0	0	0	1	0	0
56	454.375	464.375	16.400	656	0011	0	1	0	0	0	0	1	1
57	454.400	464.400	16.425	657	0011	0	1	0	0	0	0	1	0
58	454.425	464.425	16.450	658	0011	0	1	0	0	0	0	0	1
59	454.450	464.450	16.475	659	0011	0	1	0	0	0	0	0	0
60	454.475	464.475	16.500	660	0011	0	0	1	1	1	0	0	1
61	454.500	464.500	16.525	661	0011	0	0	1	1	1	0	0	0
62	454.525	464.525	16.550	662	0011	0	0	1	1	0	1	1	1
63	454.550	464.550	16.575	663	0011	0	0	1	1	0	1	1	0
64	454.575	464.575	16.600	664	0011	0	0	1	1	0	1	0	1
65	454.600	464.600	16.625	665	0011	0	0	1	1	0	1	0	0
66	454.625	464.625	16.650	666	0011	0	0	1	1	0	0	1	1
67	454.650	464.650	16.675	667	0011	0	0	1	1	0	0	1	0
68	454.675	464.675	16.700	668	0011	0	0	1	1	0	0	0	1
69	454.700	464.700	16.725	669	0011	0	0	1	1	0	0	0	0
70	454.725	464.725	16.750	670	0011	0	0	1	0	1	0	0	1
71	454.750	464.750	16.775	671	0011	0	0	1	0	1	0	0	0
72	454.775	464.775	16.800	672	0011	0	0	1	0	0	1	1	1
73	454.800	464.800	16.825	673	0011	0	0	1	0	0	1	1	0
74	454.825	464.825	16.850	674	0011	0	0	1	0	0	1	0	1
75	454.850	464.850	16.875	675	0011	0	0	1	0	0	1	0	0
76	454.875	464.875	16.900	676	0011	0	0	1	0	0	0	1	1
77	454.900	464.900	16.925	677	0011	0	0	1	0	0	0	1	0
78	454.925	464.925	16.950	678	0011	0	0	1	0	0	0	0	1
79	454.950	464.950	16.975	679	0011	0	0	1	0	0	0	0	0
80	454.975	464.975	17.000	680	0011	0	0	0	1	1	0	0	1
81		Blocked	17.025	681	0011	0	0	0	1	1	0	0	0
82		"	17.050	682	0011	0	0	0	1	0	1	1	1
83		"	17.075	683	0011	0	0	0	1	0	1	1	0
84		"	17.100	684	0011	0	0	0	1	0	1	0	1
85		"	17.125	685	0011	0	0	0	1	0	1	0	0
86		"	17.150	686	0011	0	0	0	1	0	0	1	1
87		"	17.175	687	0011	0	0	0	1	0	0	1	0
88		"	17.200	688	0011	0	0	0	1	0	0	0	1
89		"	17.225	689	0011	0	0	0	1	0	0	0	0
90		"	17.250	690	0011	0	0	0	0	1	0	0	1
91		"	17.275	691	0011	0	0	0	0	1	0	0	0
92		"	17.300	692	0011	0	0	0	0	0	1	1	1
93		"	17.325	693	0011	0	0	0	0	0	1	1	0
94		"	17.350	694	0011	0	0	0	0	0	1	0	1
95		"	17.375	695	0011	0	0	0	0	0	1	0	0
96		"	17.400	696	0011	0	0	0	0	0	0	1	1
97		"	17.425	697	0011	0	0	0	0	0	0	1	0
98		"	17.450	698	0011	0	0	0	0	0	0	0	1
99		"	17.475	699	0011	0	0	0	0	0	0	0	0
00		"	15.000	600	0011	1	0	0	1	1	0	0	1

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FREQUENCY ALLOCATION TABLE

CQM763D

Private channels 81 - 99

					x100	x10	x1
Channel	f_{TX} [MHz]	f_{RX} [MHz]	f_{synt} [MHz]	d.f.	K J	D C B A	D C B A
81	452.500	462.500	14.525	581	0100	0 0 0 1	1 0 0 0
82	452.525	462.525	14.550	582	0100	0 0 0 1	0 1 1 1
83	452.550	462.550	14.575	583	0100	0 0 0 1	0 1 1 0
84	452.575	462.575	14.600	584	0100	0 0 0 1	0 1 0 1
85	452.600	462.600	14.625	585	0100	0 0 0 1	0 1 0 0
86	452.625	462.625	14.650	586	0100	0 0 0 1	0 0 1 1
87	452.650	462.650	14.675	587	0100	0 0 0 1	0 0 1 0
88	452.675	462.675	14.700	588	0100	0 0 0 1	0 0 0 1
89	452.700	462.700	14.725	589	0100	0 0 0 1	0 0 0 0
90	452.725	462.725	14.750	590	0100	0 0 0 0	1 0 0 1
91	452.750	462.750	14.775	591	0100	0 0 0 0	1 0 0 0
92	452.775	462.775	14.800	592	0100	0 0 0 0	0 1 1 1
93	452.800	462.800	14.825	593	0100	0 0 0 0	0 1 1 0
94	452.825	462.825	14.850	594	0100	0 0 0 0	0 1 0 1
95	452.850	462.850	14.875	595	0100	0 0 0 0	0 1 0 0
96	452.875	462.875	14.900	596	0100	0 0 0 0	0 0 1 1
97	452.900	462.900	14.925	597	0100	0 0 0 0	0 0 1 0
98	452.925	462.925	14.950	598	0100	0 0 0 0	0 0 0 1
99	452.950	462.950	14.975	599	0100	0 0 0 0	0 0 0 0
00		Blocked	15.000	600	0011	1 0 0 1	1 0 0 1

NOTE:
Equipment with private channels will have the blocking function suspended for one or more channels in the range 81 - 99. This requires the programable divisor to be changed from 6xx (K = 0 and J = 1) to 5xx (K = 1 and J = 0). The two controlled decades will still be expressed as the 9-complement of the channel number.

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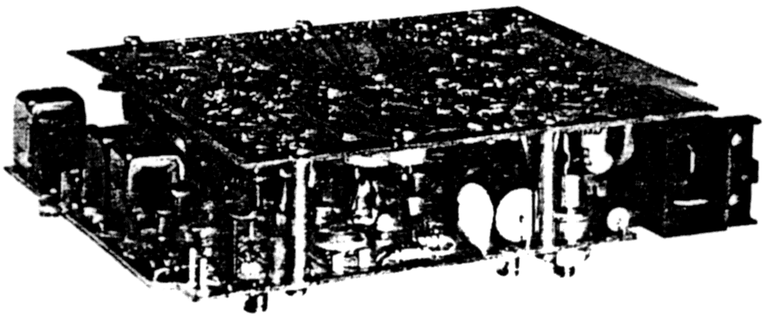
COMMON FUNCTIONS UNIT

CF701 & CF702



Description

The CF unit module contains all the circuitry for the CQM700 series radiotelephones that is not dependent upon frequency or channel separation. CF701 is designed for simplex operation and CF702 for duplex. The unit includes the following functions:

a 455 kHz intermediate frequency amplifier and discriminator
a de-emphasis network and an audio frequency preamplifier, including an electronic squelching switch
a squelch circuit
two 9 V voltage regulators and keying circuitry
an audio output amplifier
a modulation amplifier
a keying circuit for the power amplifier stage

The CF unit is constructed on two printed circuit boards mounted in a sandwich assembly. The two p-c boards are held in place with spacers, a small sewn cable taking care of internal connections. The conductive sides of the printed wiring boards face outwards, with the board containing the IF, the AF preamp, the squelch and the voltage regulators fastened to the chassis. External connections to the CF unit are all solder connections with the exception of the battery connection, which is through a plug.

Operating Principle

To aid heat dissipation, the AF amplifier output transistors and the drive resistor for Q29 in the TX switch, all on the upper p-c board, as well as the series regulator transistors in the voltage regulators on the lower board all have good thermal contact to the chassis.

The 455 kHz signal from IC700 passes through the IF stages to the integrated circuit diserimінator, IC-1. From there the audio signal divides between the squelch circuit input and the de-emphasis filter at the input to the audio preamplifier.

The squelch circuit opens and closes the signal path through the preamp according to the noise content in the demodulated signal. Also, control voltages for use with tone equipment are obtained from the squelch circuit.

The audio signal is taken from the 600 Ω output of the preamplifier to the AF amplifier. When transmitting in the simplex mode (CF701), the signal path through the output amplifier becomes automatically blocked. The tone equipment can also block the signal path here.

The signal from the microphone is amplified and limited in the modulation amplifier, which is designed around a dual, integrated operation-

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al amplifier. Both amplifiers, IC2a and IC2b are co tained in the same housing.

T adjacent channel interference, the hi uency component of the modulating signal is filtered out and the signal is also amplitude limited in order to keep the carrier frequency swing within the established maximum excursions for whichever channel separation is employed.

As mentioned previously, the CF unit also contains two voltage regulators; one supplies the receiver section and the other, the transmitter. The AF output amplifier and the PA stage are supplied through a filter choke directly from the battery and are therefore unregulated.

Switching between transmit and receive is accomplished without relays. In CF701 the transmitter key electronically switches one or the other of the voltage regulators on so that both do not function at the same time. Terminal 10 is grounded during transmission and otherwise floats when the key is not activated.

Likewise, in the case of CF702, switching between the duplex and the receive conditions is accomplished without relays. Whenever the equipment is turned on the 9 V RX voltage regulator will always be on.

The PA stage is controlled by the 9 V TX regulator which turns on when terminal 10 is grounded (via the transmit key). Thus when transmitting, both the 9 V TX and the 9 V RX regulators are on.

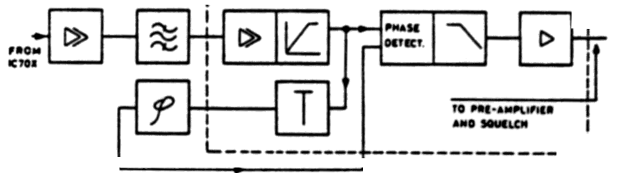
12 V TX is taken off before the on/off switch in order to avoid any voltage drop in the start cable when employing extended local control. 12 V TX is applied to the PA stage through a transistor switching arrangement, the TX switch, which is driven by 9 V TX regulator.

The 12 V supply voltage to the AF output amplifier is always on whenever the on/off switch is turned on. Therefore, in simplex equipment (CF701), the TX switch is designed to block the audio preamplifier when the transmitter is keyed. This is a precaution against any transients in the squelch circuit that might be able to open the receiver output during transmission.

As just explained, the receiver section in duplex equipment (CF702) is always on whenever power is applied to the set.

The 455 kHz IF Amplifier and Discriminator

This circuit amplifies, selects, limits and detects the receiver's second IF signal of 455 kHz allowing a deviation of up to ± 15 kHz from centre frequency.



The amplifier has five stages; the first two, Q1 and Q2, are made up of discrete components while the last three are a part of the integrated circuit, IC1, along with the phase detector.

The only resonant circuits employed in the 2nd IF stage are those between the collector of Q2 and the input to IC1. Resistors R9 and R12 loac T1 and T2 enough to achieve sufficiently broad bandwidth.

Inductive coupling between circuits is less than critical, R11 in the coupling link determining the coupling factor. Q2 operates with its collector-emitter voltage held low to prevent overdriving IC1.

The three amplifier stages in IC1 are differential amplifiers, which configuration approaches ideal symmetrical limiting. The stages are DC coupled and stability is assured through strong negative feedback. Capacitor C12 eliminates the feedback as far as AC voltages are concerned.

Via an emitter follower within the IC housing, the signal is fed to the phase detector. The IF signal, with its amplitude peaks clipped, is applied directly to one of the phase detector inputs.

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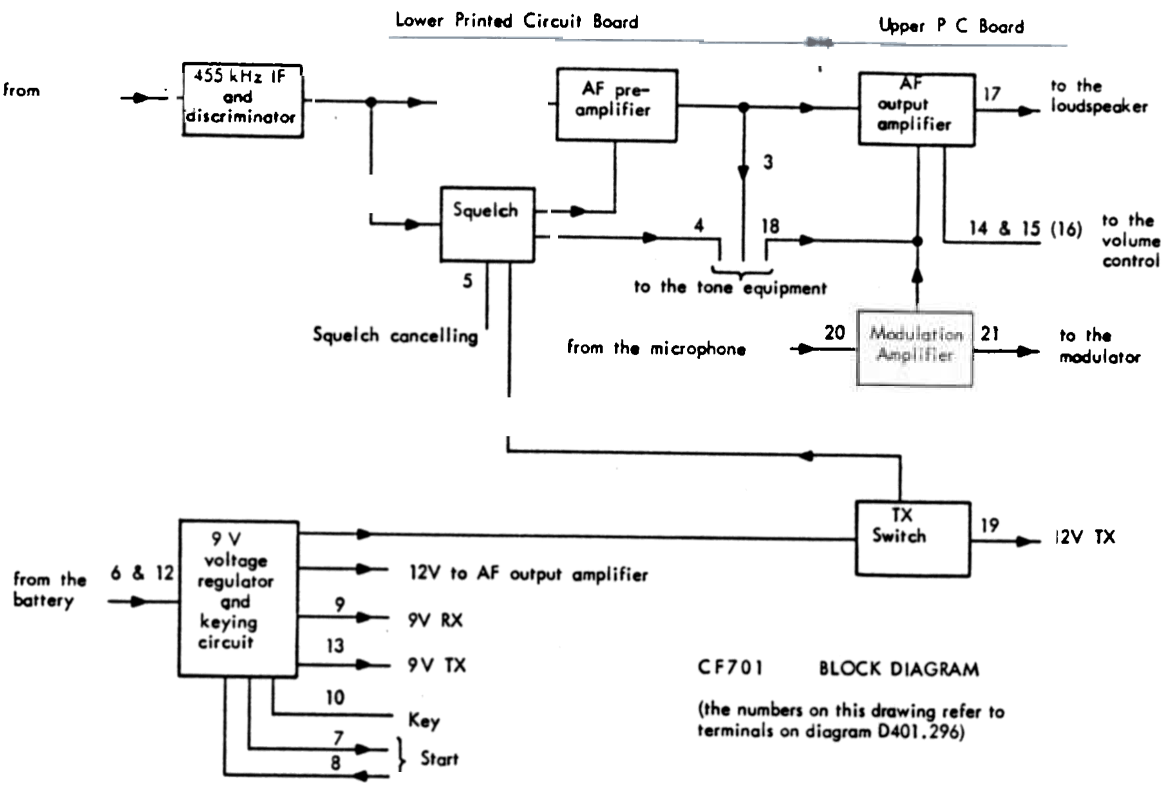
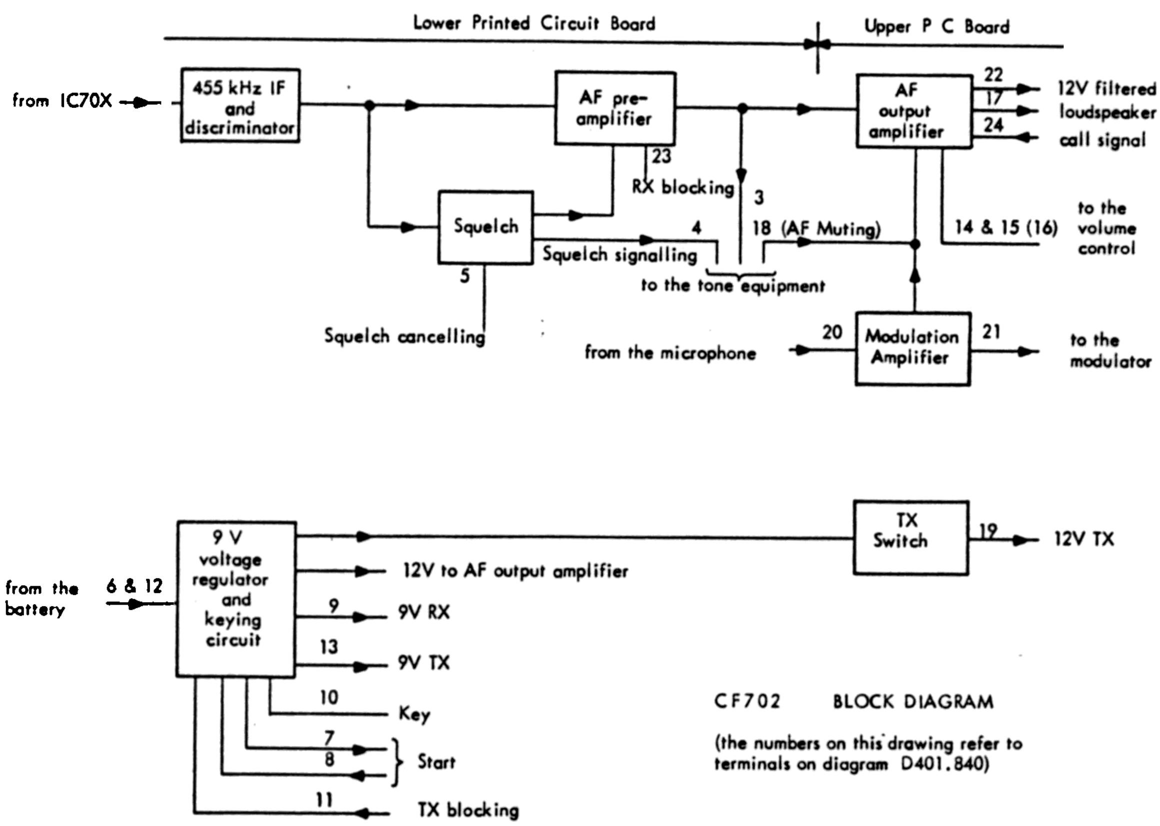


CF701 BLOCK DIAGRAM

(the numbers on this drawing refer to terminals on diagram D401.296)



CF702 BLOCK DIAGRAM

(the numbers on this drawing refer to terminals on diagram D401.840)

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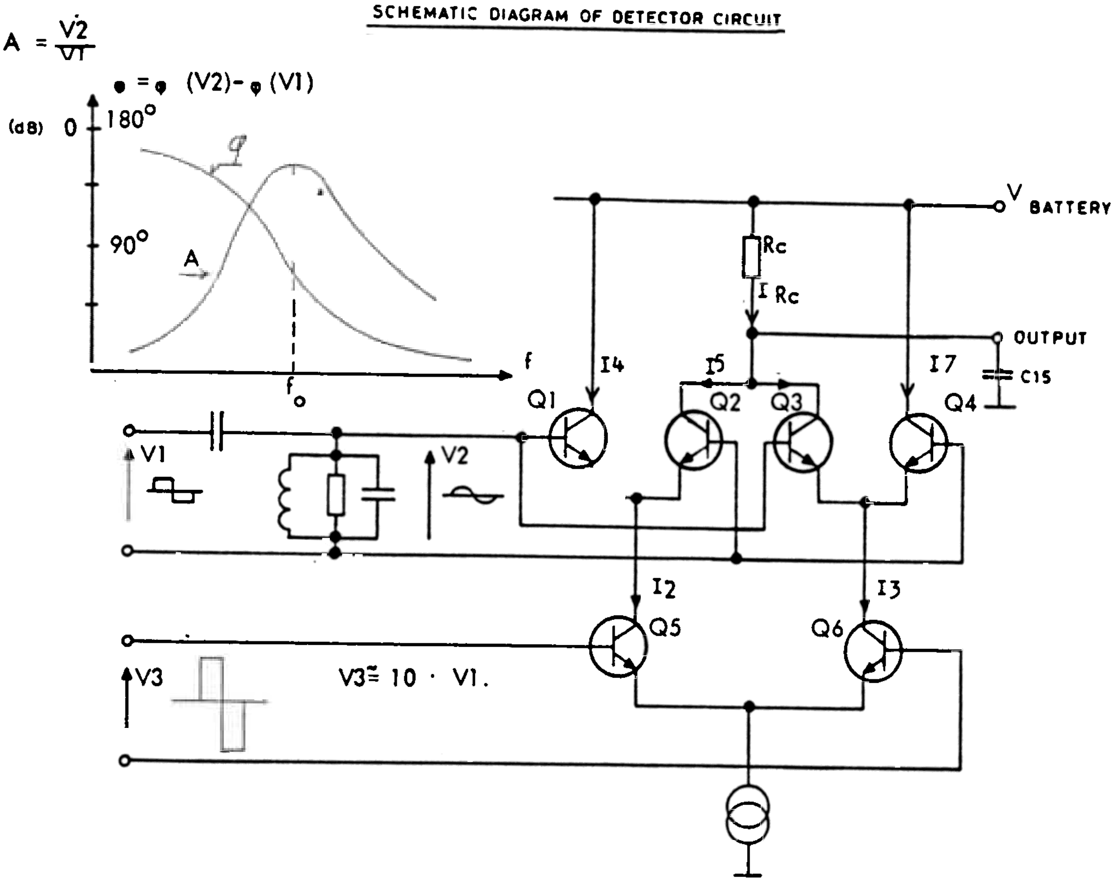
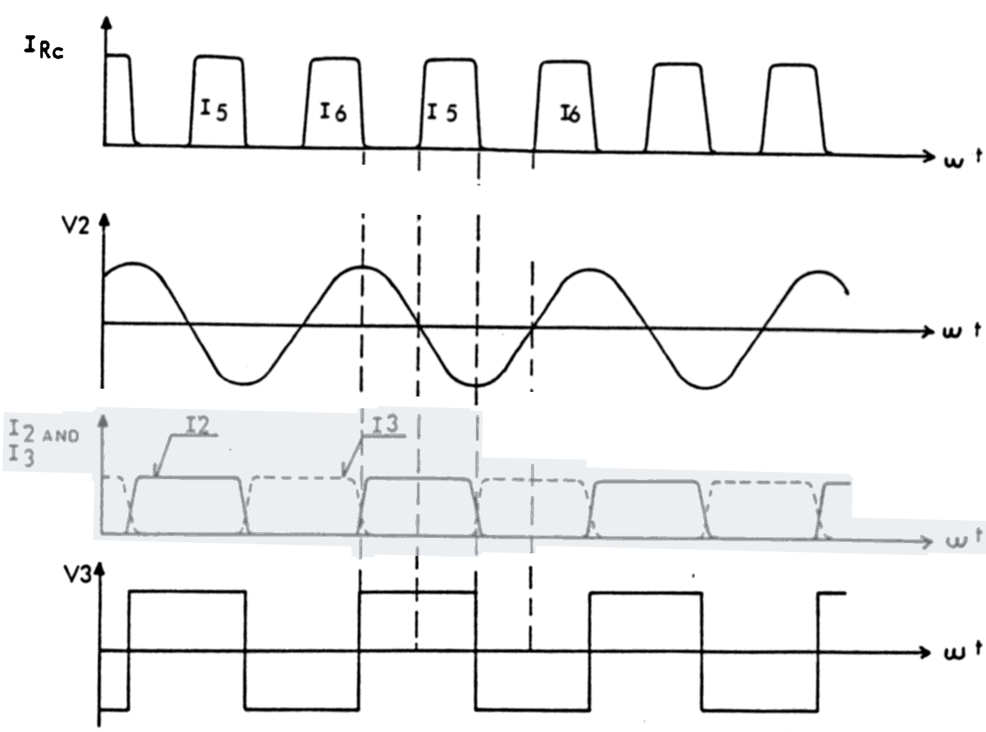
SCHEMATIC DIAGRAM OF DETECTOR CIRCUIT



GRAPH OF VOLTAGE AND CURRENT RELATIONSHIPS IN THE PHASE DETECTOR WHEN $f = f_0$



The other input is fed the same signal, attenuated and aproximately 90° out of phase (at f_0). Phase shift is accomplished with discrete components: C13, C14, L1 and R14. The following diagram shows the detector circuit schematic and the amplitude and phase characteristics of the phase shifting network. A graph of the detector current and voltage relationships is also included here.

The phase detector is designed around three differential amplifiers, all supplied through a constant-current source. In addition to the components shown in the detector schematic, IC1 also contains an emitter follower after the detector output, another emitter follower between the phase shifing network and one of the detector inputs, and various biasing networks.

As long as voltage V 2 is high enough to drive the two differential stages - Q1 + Q2, and Q3 + Q4 - as switches, the collector current pulses, I5 and I6, will appear as a constant amplitude value and the average value of current through R_C remains independent of the amplitude of the input voltage.

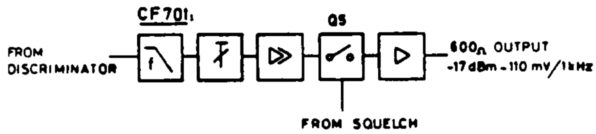
As seen on the schematic, current pulses through R_C only appear when V2 and V3 are of opposite polarities and I 5 appears only when V3 is positive while I 6 appears when V3 is negative. Supposing that $f > f_0$, then the difference in phase (V2 - V1) is reduced (the V2 pulse a little to the right in relation to V3), causing the width of current pulses I5 and I6 to decrease. In other words, the average current through R_C will decrease. When $f < f_0$, the opposite will occur.

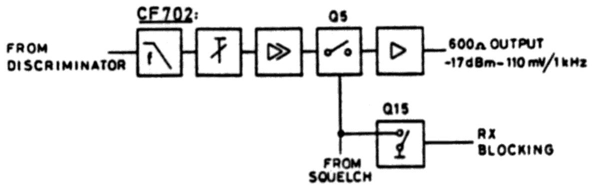
The width of I5 and I6 is therefore seen to be a measurement of the phase difference between V2 and V3. By integrating the output voltage (via R_C and C15) a voltage that is directly proportional to the phase shift is obtained.

Making use of both the negative and positive excursions of the signals, as in the detector configuration employed here, gives excellent suppression of noise and other undesired effects of inherent nonsymmetry in the clipped IF signal. For example, if the positive going half of V3 is wider than the negative half, I6 will be narrower and I5 wider with the result that the average current through R_C will remain unchanged.

An "S" curve similar to those known from conventional FM detectors will be present at the output (directly on pin 1 of IC1). However, the midpoint of this "S" curve will be around 3.5 V instead of 0 V. Circuit Q is designed low enough to enable the detector to handle frequency deviations of up to ± 15 kHz.

The De-emphasis Filter, AF Preamplifier and Electronic Squelching Switch





Network R15 and C19 take care of de-emphasising the demodulated signal at the rate of -6 dB pr. octave.

The three stages of the preamplifier, Q3, Q4 and Q6, must then amplify the AF signal and match it to the nominal 600 Ω load. In addition, Q5 is inserted between Q4 and Q6. Q5, which is a field-effect transistor, operates as an electronic switch, interrupting the signal path on command from the squelch circuit.

CF702 includes an additional transistor, Q15. With a DC potential of ≥ 3 V at terminal 23 (RX Blocking) Q15 will be driven on, turning the AF switch, Q5, off. With the gate of Q5 held at ground by Q15, the condition of the squelch circuit will have no effect on the preamplifier.

The nominal output voltage of the preamplifier is -17 dBm into the 600 Ω output line. R16 is the adjustment used for setting the correct output level.

The collector of Q3 is directly coupled to the base of Q4; resistors R21, R22 and R23 provide the feedback necessary to stabilize the two stages.

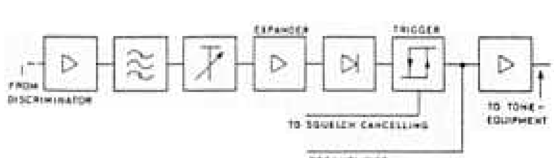
The signal path between the second and third amplifier stages is through the FET transistor, which acts like a relay contact, or switch. A gate-to-source potential of 4 V, at most, will "break" the path between source and drain. Since the collector of Q4 is at approx. 4.7 V, a gate voltage at Q5 under 0.7 V "breaks" the connection and " makes" the connection between Q4 and Q6 again when gate voltage rises above 4.7 V.

The Squelch

The squelch circuit opens or closes the audio signal path through the AF preamplifier according to the noise content of the incoming signal. The squelch circuit also provides a signal voltage for use in tone signalling.

An internal adjustment, potentiometer R38, is provided for setting the squelch level. The squelch function can be cancelled altogether by grounding terminal 5 via the squelch cancelling button on the control panel.

By altering only a few passive component values, the squelch section can operate on any of the three channel bandwidths normally employed.



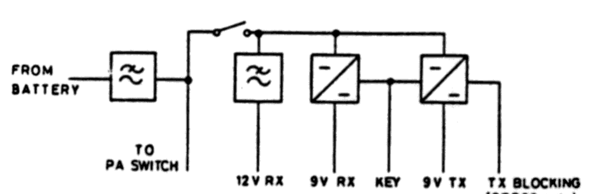
The squelch section includes a frequency selective noise amplifier, Q7, an expander stage, Q8, a noise detector, A Schmitt trigger, Q9 and Q10, and an emitter follower amplifier, Q11.

The operating principle is as follows

Some of the AF signal from the discriminator is fed to the noise amplifier whose collector load is made up of a parallel resonant circuit tuned to some frequency well above the voice range, and depending upon the channel bandwidth employed. The selected noise is then fed to Q8 which is biased in such a way that only positive going pulses of a certain minimum amplitude cause the transistor to conduct. Since only pulses of a certain amplitude can become amplified, the result is that a given relative change in noise amplitude at the base of Q8 appears as a larger relative change at the collector. The noise pulses are then rectified and filtered to a DC potential that, in turn, controls the Schmitt trigger, Q9 and Q10. The collector voltage on Q10 is used partly to drive the emitter follower, Q11, and partly, through an R-C network, to switch the FET transistor in the AF preamplifier.

Where CF701 is used, keying the transmitter also interrupts the power to the receiver. At the same time, diodes E2 and E6 in the squelch are grounded through Q30 to prevent any false signals that might appear in the squelch circuitry from affecting the AF amplifier or Q11 during this condition. This does not apply to CF702.

The 9 V Voltage Regulators and Keying Circuits



The two 9 V voltage regulators supply the receiver and the transmitter sections, respectively. They are intended for use with a 12 volt auto battery.

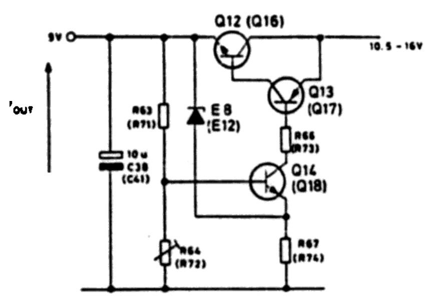
The battery connects to the regulators through the transient and ripple filter, L3a and C39, and through the vehicle's start switch via terminals 7 and 8. The AF output amplifier is supplied with unregulated, filtered battery power via the other filter winding, L3b, and C56 in the AF amplifier circuit.

To protect the equipment against incorrect battery polarity or excess voltage, a properly dimensioned zener diode is placed across the supply. If the power supply is connected wrong the zener diode will act as a short circuit at the input, blowing the fuses in the battery leads In case of excess supply voltage, the zener diode will not allow more than about 20 volts to be present at the input to the regulators.

The voltage regulators are protected against short circuits, with shorted output the current through Q12 will be < 0.5 A and through Q16, < 0.1 A. The power transistors are mechanically mounted so as to be in good thermal contact with the chassis.

The two regulators are principally identical as shown on the simplified diagram as follows:

> Q12 is driven by Q13, which is controlled by amplifier Q14. Transistor Q14 compares the zener reference voltage across E8 with a portion of the output voltage through dividing resistors R63 and R64. R64 sets the output voltage.



The operating principle is as follows

If V_{OUT} drops (due to a decrease in input voltage or an increase in load current), V_{BE} for Q14 will increase, also increasing base current for Q13 and Q12. When base current to Q12 increases, more current flows through the output load, cancelling the original drop in output voltage.

If the load current increases to a certain value, Q14 goes into saturation. If the load current increases still more, the zener diode will act as an open circuit and V_{BE} for Q14 decreases whereby base current for Q14, Q13 and Q12 decreases, too. Finally, Q14 will be cut off and base current in Q12 and Q13 will be zero. Thus is Q12 protected against destruction by short circuits at its output. Resistors R66 - and R67 - determine the saturation current through Q14 and, of course, the short circuit current.

A regulator built exactly like the simplified diagram would not be self-starting, however. Therefore, the regulators in the CF701 are provided with starting circuits:

9 V RX employs R61, R62 and E9 in its starting circuit and 9 V TX employs R70 and E11. Since 9 V RX and 9 V TX must not operate simultaneously, the regulators are also mutually coupled through a keying circuit that blocks, or cuts off, one regulator while allowing the other to operate. This function is controlled via terminal 10.

CF702 is arranged in a slightly different manner since 9 V RX must always operate when the equipment is turned on. While the 9 V RX and 9 V TX regulators employ the same starting circuits as just explained for CF701, the difference here is that keying the transmitter (which grounds terminal 10) does not turn the CF702 9 V RX regulator off.

<u>Operation of Keying and Starting Circuits</u>

For CF701:

When terminal 10 is floating and the power is turned on, 9 V RX will build up voltage since Q12 gets base current through R58, E9, R61 and R62. When 9 V RX reaches its final value the starting circuit will have no effect on the regulator because diode E9 will then be nonconducting (the unloaded voltage at terminal 10 is approx. 8.2 V at nominal battery voltage).

Transistors Q15 and Q19 are both heavily saturated, so the 9 V RX regulator will operate un-

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disturbed while 9 V TX will be blocked because Q18 is completely cut off by Q19.

Grounding terminal 10 immediately cuts off Q15 and Q19. 9 V RX falls towards 0 V as there is now no base current to Q13. 9 V RX falls off at a rate determined by the time constant of C38 and the load on terminal 9. Under all operating conditions within factory specifications for the radiotelephone, the time constant will easily be long enough that the current through starting circuit R70 and E11 can turn on Q18, whereby a voltage builds up on 9 V TX that finally reaches a level where diode E11 becomes nonconducting.

Diode E10 and resistor R68 ensure that keying the transmitter cuts off base current to Q13 effectively, even at high temperatures. Diode E7 ensures effective keying even if terminal 10 is not brought all the way down to 0 V potential.

Note that 9 V TX cannot begin to build up a voltage by itself after a short circuit. Since - as just explained - it is 9 V RX that starts 9 V TX, it is necessary to activate the transmitter key again. Even with 9 V RX shorted, Q12 still gets its base current through the starting circuit where one of the resistors, R62, is a PTC resistor that will limit base current to the transistor at high ambient temperatures or when Q12 heats up.

For CF702

When terminal 10 is floating and the power is turned on, 9 V RX will build up voltage since Q12 gets base current through R58, E9, R61 and R62. When 9 V RX reaches its final value the starting circuit will have no effect on the regulator because diode E9 will then be nonconducting (the unloaded voltage at terminal 10 is approx. 8.2 V at nominal battery voltage).

Transistor Q19 is heavily saturated, completely cutting off Q18 and thus blocking the 9 V TX voltage regulator.

When the transmit key grounds terminal 10, two things happen:

1.) Q19 loses its forward bias and immediately cuts off. Now, instead of acting as a short circuit between the base of Q18 and ground, Q19 can now be considered a large resistance.

2.) C45, which has been charging through diode E10, has accumulated a charge of about 6.6 V. With terminal 10 grounded the charge on C45 reverse biases E10. Now C45 will discharge.

There are two discharge paths available to C45 one through the bleeder resistor, R59, and one through R70 and E11 to the base of Q18. Remember that the base of Q18 is no longer grounded by Q19.

The discharge current to the base of Q18 drives this transistor on. Once Q18 turns on its base assumes a potential of approx. 5 V. By now C45 has discharged so much that E11 becomes reverse biased by the 5 V on the base of Q18, and C45 continues to discharge through its other path (R59).

As long as terminal 10 is kept at chassis potential by the transmit key the 9 V TX regulator continues to operate.

When the key is released and terminal 10 resumes its unloaded potential of approx. 7.3 V, Q19 is driven on and short circuits the base of Q18 again. The 9 V TX regulator then turns off.

C45 charges again through E10

Diode E7 ensures effective keying even if terminal 10 is not brought all the way down to 0 V potential.

Note that 9 V TX cannot begin to build up a voltage by itself after a short circuit but must be started again by keying the transmitter.

Even with 9 V RX shorted, Q12 still gets its base current through the starting circuit where one of the resistors, R62, is a PTC resistor

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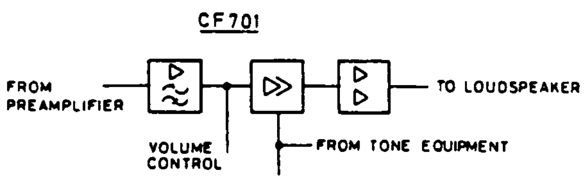
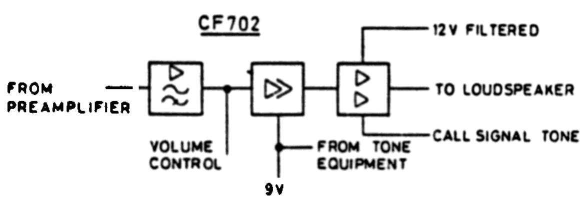
that will limit base current to the transistor at high ambient temperatures or when Q12 heats up.

The AF Output Amplifier

The output amplifier amplifies the audio signal from the preamplifier and powers the loudspeaker.





Frequencies below 250 Hz are very sharply cut off in the first amplifier stage, transistor Q20. Included in the collector of Q20 is a variable resistor which allows for adjustment of the amplifier gain above the nominal amount in order to compensate for weak modulation of the incoming signal.

The signal passes from the 1st stage to the volume control whose arm connects to terminal 15 in the case of local control or to terminal 16 in case of extended local control. An isolation resistor is placed between the two terminals, allowing for extended local control without necessitating the removal of the local control connections.

The 2nd amplifier stage, Q21, is an emitter follower whose base voltage is the essential factor in determining the symmetry of the drive signal to the loudspeaker output.

From Q21, the signal is fed via two R-C lowpass filter networks to the 3rd amplifier stage, Q22. The primary purpose of the two low-pass networks is to stabilize the amplifier in regard to AC when employing extended local control.

In Q22, which in principle is coupled in the grounded emitter configuration, the signal is amplified and passes directly to the next amplifier stage which, in turn, is coupled directly to the driver transistors, Q25 and Q26. Transistor Q23 and resistors R98, R99 and R100 provide temperature compensated biasing for the driver transistors. As far as AC is concerned, the circuit appears as a short circuit between the bases of the two driver transistors. The complementary output transistors operate in class AB push-pull. Strong negative DC feedback is introduced in order to stabilize the operating point for the output stages. The feedback network is from the output, over R106 to the emitter of Q22. The AC feedback network is formed by R106 in conjunction with R96.

The power transistors employ aluminium heat sinks fastened to the radio chassis for good thermal contact.

During transmission a "muting signal" grounds the base of Q24 via terminal 18 and an R-C network, blocking the output amplifier. This network also functions as the blocking gate for the tone equipment.

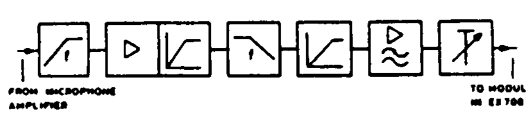
The Modulation Amplifier

General

The modulation amplifier differentiates, amplifies, limits and integrates the microphone signal. It also suppresses undesired high frequencies with an active filter designed for either 20, 25 or 50 kHz channel separation or, with a few resistor values changed, 12.5 kHz channel spacing.

Both amplifiers are contained in a single integrated circuit made up of dual operational amplifiers. The modulation amplifier contains additional passive differentiating and integrating circuits as well as diode clippers to prevent overmodulation.

The following block diagram shows the operating principle for the amplifier:



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TECHNICAL SPECIFICATIONS

Nominal Supply Voltage

13.6 V

Current Drain for CF701 (at nominal supply

Transmit 220 mA
Receive 65 mA

Current Drain for CF702 (at nominal supply voltage)

Transmit 285 mA
Receive 65 mA

12 dB SINAD Sensitivity (where 1.75 kHz deviation of the 455 kHz IF results in a 1 kHz audio signal)

2 μV input signal at antenna termination

AF Line Out (terminal 3)

-17 dBm/ 600 Ω

Regulated Voltages

Receiver (terminal 9) : 9 V
Transmitter (terminal 13): 9 V

Unregulated, Filtered Voltages

AF output amplifier : 13.6 V
PA stage (terminal 19) : 13.6 V

AF Output Power (terminal 17

2 W

Modulation Amplifier Sensitivity (for normal frequency swing of 1 kHz)

110 mV +[illegible] -0 dB

The following, more detailed specifications for the several CF701 and CF702 functions are all typical values measured at 25° C ambient temperature, unless otherwise stated.

455 kHz IF AMPLIFIER and DISCRIMINATOR

Current Drain (at nominal 9 V supply)

18 mA

Maximum Frequency Deviation

± 15 kHz

IF Bandwidth (3 dB attenuation)

± 17 kHz

Input Impedance

1 kΩ // 15 pF

Gain

from input (terminal 1) to pin 4 of IC1: 55 dB
from IC1 input (pin 4) to IC1 amplifier high output, pin 10: 55 dB

Discriminator Conversion Efficiency

50 mV / kHz

AF Output Voltage (f_m 1 kHz, Δf = 3.5 kHz)

110 mV

Measured at test point [2], terminated with 2.2 kΩ load.

Discriminator Linearity (relative to 1000 Hz

Pass-Band 100 - 3500 Hz: +0/ -1 dB
Measured at test point [2], terminated with 2.2 kΩ load.

Discriminator Output Resistance

200 Ω

Input

The input circuit, which is also the collector return for the microphone amplifier output stage through resistor R112, is asymmetric.

The Differentiating Circu

The differentiation network is made up of C64 and R113 (the input impedance of the op amp is negligible due to the feedback through R116). It differentiates at the rate of +6 dB pr. octave over the entire audio range of 300 to 3000 Hz.

The Amplifier - Clipper

The gain of the first amplifier stage, IC2a, is determined by the amount of feedback introduced. Circuit gain can be varied by about 10 dB by adjusting potentiometer R133.

Clipping action begins as soon as the amplifier is driven to where the collector excursions approximate the battery voltage. This level will be about 6.8 V peak-to peak. The amplifier can be driven up to 25 dB above its nominal input level. Symmetry of the clipping is determined by bias network R114 and R115 and therefore is fixed.

The Integration Circuit

Integrating takes place from 230 Hz at 6 dB pr. octave. The passive integrating network consists of R118 and C67. The lower limit for integration is determined solely by these two components as the previous amplifier's feedback makes its output impedance negligible, and because the loading of the network by the filter that follows is very light as long as the signal remains below the frequency limit of that filter.

The 2nd Clipper (or Phase Clipper)

This extra clipper is inserted to prevent strong input signals at low frequencies from overdriving the modulator stage. For signal levels corresponding to the nominal frequency swing, the clipper has no effect. Two 1.5 V diodes and

capacitor C69 make up this circuit. These diodes are connected to the junction of voltage divider R131 and R132 in order to have the same potential on both sides of C69, thus a ing the time constant R118 x C69 when key the transmitter. The clipping level is only approx. 1.2 V at maximum due to the com paratively large impedance of R118.

The Splatter Filter

The purpose of this filter is to cut off frequencies that lie above the voice range in order to avoid undesirable sideband noise. It is an active filter consisting of the second operational amplifier and its associated components. Its response approaches that of a Chebishev filter. The circuit arrangement is the so-called voltage follower, where the voltage gain is very near unity (1). The significant passive filter components are resistors R119, R120 and R121 and capacitors C70, C71, C72, C75, C76 and C77. The filter cannot be overdriven because the input signal level is subject to limiting by the diode clipper.

Adjusting the Frequency Swing

The amount of signal to the modulator input, and thus the frequency swing, is set by potentiometer R124, R133 sets the modulation sensi tivity.

The TX Switch.

The PA keying circuit operates an electronic switch in the path of the 12 V TX supply voltage to the PA unit. The circuit consists of Q29 and Q30 along with the associated resistor networks at their bases. The transistors operate in saturation when transmitting and are cut-off during standby, or receive. The circuit is controlled from 9 V TX.

For CF701, Q30 has the additional function of grounding out any spurious squelch signals whenever the transmitter is activated.

Minimum Load Resistance

.. kΩ

Harmonic Distortion

Δf = 15 kHz 4.5%
Δf = 3.5 kHz 1.0%

AF PREAMPLIFIER and SQUELCH-CONTROLLED SWITCH

Current Drain (at nominal 9 V supply)

8 mA

Input Impedance (at 1 kHz)

2.2 kΩ

Output Impedance

R_{OUT} = 680 Ω

Gain (gain control at highest setting)

R_L = 560 Ω, f = 1 kHz: 12.5 dB

Harmonic Distortion (R_L = 560 Ω, f = 1 kHz)

V_{OUT} = 110 mV (nominal) : 0.2 %
V_{OUT} = 500 mV : 0.5 %

Required Turn-on Potential for CF701
(at gate of Q5)

To ensure normal signal path: ≥ 4.7 V

Required Turn-off Potential for CF701
(at gate of Q5)

To ensure 70 dB attenuation of signal: ≤ 0.7 V
Measured with 110 mV, 1 kHz signal applied to circuit input, test point [2], and gain control set at max., V_{OUT} (terminal 3) = approx. 500 mV.

Required Turn-on Potential for CF702

a. at gate of Q5, to ensure normal signal path: ≥ 4.7 V

b. at terminal 23 (RX Blocking), to allow normal operation of squelch command : ≤ 0.8 V

Required Turn-off Potential for CF702

a. at gate of Q5, to ensure 70 dB attenuation of signal: ≤ 0.7 V

b. at terminal 23 (RX Blocking), for same result : ≥ 3 V

Measured with 110 mV, 1 kHz signal applied to circuit input, test point [2], and gain control set at max., V_{OUT} (at terminal 3) = approx. 500 mV.

De-emphasis Cut-off Frequency

90 Hz

Frequency Response (relative to -6 dB/ octave characteristic)

Pass-Band linearity (300 - 3000 Hz): +0/-1 dB
50 - 100 Hz : +15 dB

SQUELCH CIRCUIT

Current Drain (at nominal 9 V supply)

12 mA
Measured with unloaded Squelch Signalling (terminal 4).

Input Impedance (at 1 kHz)

20 kΩ

Noise Filter Resonant Frequency

12.5 kHz channel spacing : 7.1 kHz
20/25 kHz channel spacing : 7.1 kHz
50 kHz channel spacing : 10 kHz

Output Voltage

Squelched condition : ≤ 100 mV
Un-squelched condition: > 5.7 V
Measured at test point (1). DC.

Squelch Signalling (terminal 4)

R_{LOAD} minimum: 680Ω
V_{OUT}(with R_L = 680Ω)

Squelched condition ≤ 100 mV
Un-squelched condition ≥ 4.0 V

Storno

Transition Time (gain control set for nominal V_{OUT})

Delay measured from the time that the voltage at test point (1) switches state until the AF signal at terminal 3 increases from 10% to 90% of its nominal amplitude.

Turn-off delay (signal decrease from 90% to 10%) is also 6 ms.

Overall Receiver Squelch Response

Turn-on delay: 30 ms
Turn-off delay: 25 ms
Measured with receiver adjusted for 12 B SINAD.

AF OUTPUT AMI .IFIER

'oltage

6 V

Operating Range

10.5 to 16.0 V

Current Drain (at no al 'oltage)

no-signal condition	20 mA
at 2 W outpu	300 mA
blocked	20 mA

Output Power (at nominal suppl voltage)

maximum 2 W

Loudspeaker Impedance

Nominal / minimum: 5 Ω

Input Impedance (at 1 kHz)

560 Ω

Nominal Gain

Input signal (1 kHz) required for 2 W output: 110 mV
Measured with volume control (5 kΩ potenti meter) connected to terminals 14, 15 and chassis ground, and turned fully up.

Where the connections are to terminals 14, 16 and chassis, as with extended local control, the gain increases by 2 dB.

Adjustment of R83 can increase sensitivit 12 dB.

Gain vs. $\Delta V_{BATT.}$

13.6 V +2.4 / -3.1 V: 0.2 dB

Harmonic Distortion

P_{OUT} = 2 W	1%
P_{OUT} = 0.2 W	0.5%

Frequency Response (relative to 1 kHz

100 Hz	-22 dB
300 Hz	0 dB
2700 Hz	-0.5 dB
6 Hz	-2 dB

Measured at 0.2 W output power.

AF Muting

Required DC at terminal 18 to attenuate the output signal by 60 dB: 8.0 V

MODULATION AMPLIFIER

rrent Drain, CF701 (at nominal 9 V supply)

2 mA

Current Drain, CF70: .t nominal 9 V supply

5 mA

Input Impedance (at 1 kHz)

560 Ω

Limiting

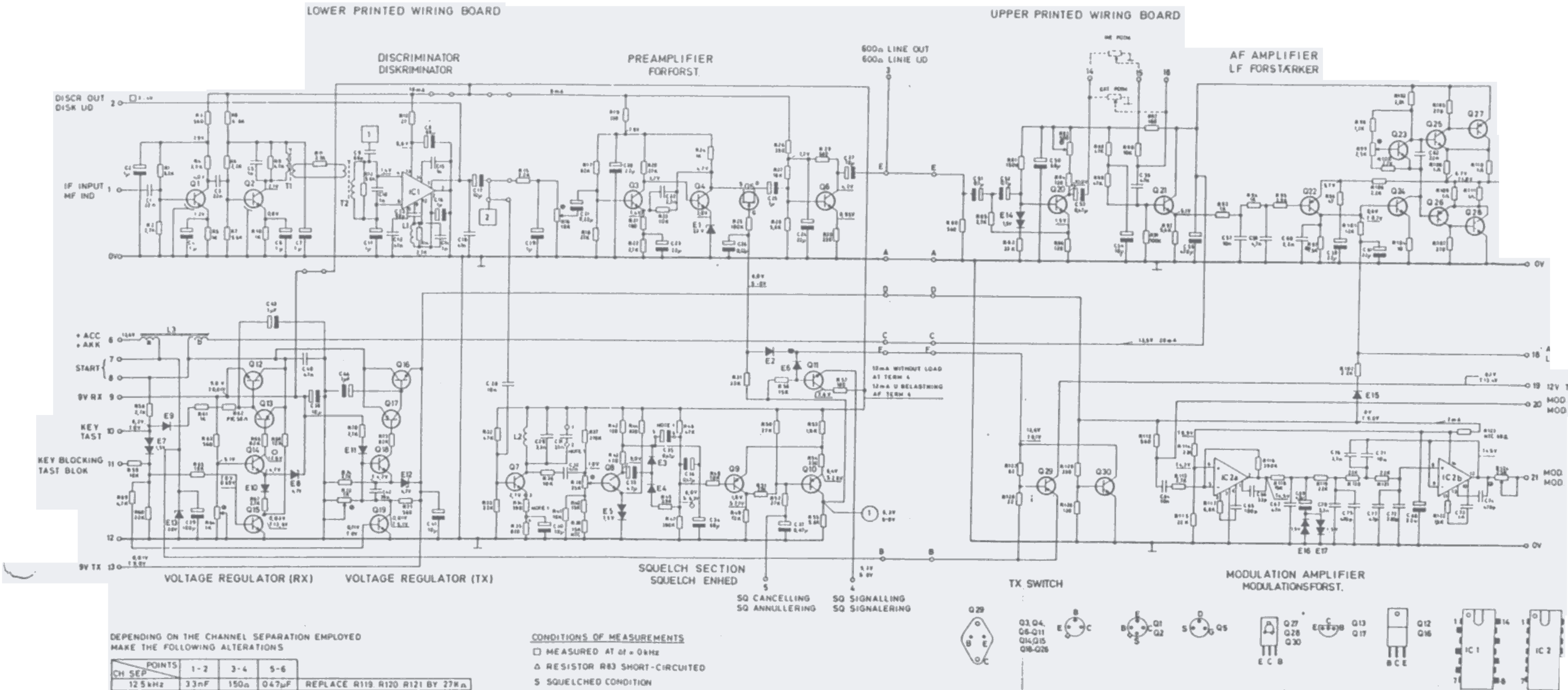
Signal clipping begins to occur with an input signal (1000 Hz) of: 110 mV

Output signal level observed at pin 2 of IC2 when clipping occurs: 7.0 V p.p.

Phase Limiting, CF701

Phase clipping level (at 300 Hz): 2.1 V p.p.

Measured immediately after the integration network, with an input signal of 1.1 V (nominal 110 mV + 20 dB).



DEPENDING ON THE CHANNEL SEPARATION EMPLOYED
MAKE THE FOLLOWING ALTERATIONS

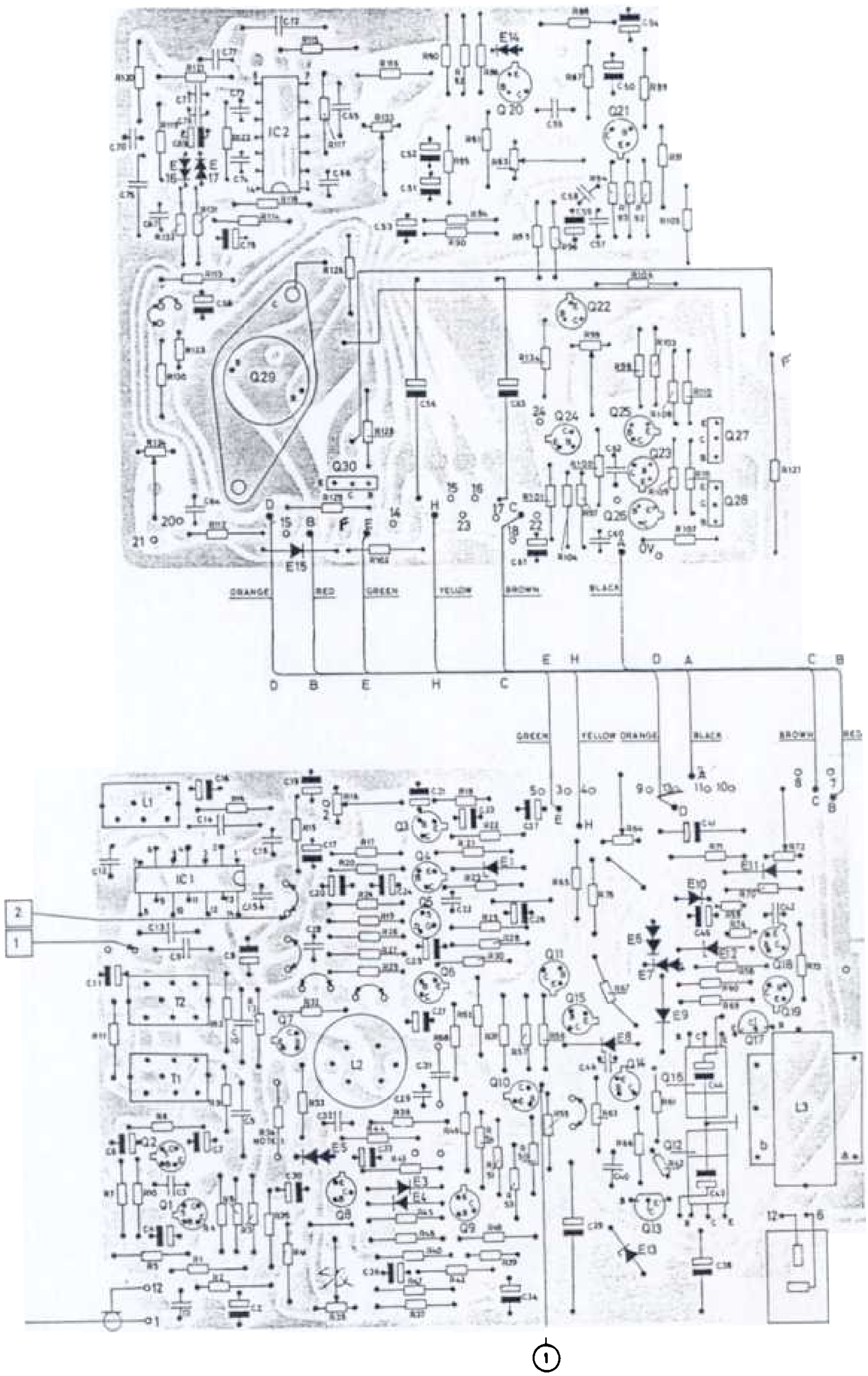
CH SEP / POINTS	1-2	3-4	5-6	
12.5kHz	3.3nF	150Ω	0.47µF	REPLACE R119 R120 R121 BY 27kΩ
20/25kHz	3.3nF	390Ω	0.47µF	
50kHz	OPEN	820Ω	OPEN	

CONDITIONS OF MEASUREMENTS
- □ MEASURED AT Δf = 0kHz
- Δ RESISTOR R83 SHORT-CIRCUITED
- S SQUELCHED CONDITION
- T TRANSMITTER KEYED CONDITION
- ○ USE A HIGH-RESISTANCE VOLTMETER (2MΩ)

COMMON FUNCTION UNIT
FÆLLESENHED

CF7

D401.2



COMMON FUNCTIONS UNIT CF702

D401.975

Stor...

TYPE	NO.	CODE	DATA	
	R107	80.5212	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 KΩ 5% "	1/8W
	R114	89.5062	22 KΩ 1% metal film	1/8W
	R115	89.5062	22 KΩ 1% metal film	1/8W
	R116	80.5277	0,22 MΩ 5% carbon film	1/8W
	R117	80.5259	6,8 KΩ 5% "	1/8W
	R118	80.5263	15 KΩ 5% "	1/8W
	R119	89.5062	22 KΩ 1% metal film	1/8W
	R120	89.5062	22 KΩ 1% metal film	1/8W
	R121	89.5062	22 KΩ 1% metal film	1/8W
	R122	80.5251	1,5 KΩ 5% carbon film	1/8W
	R123	89.5061	68 Ω 20% NTC	0,5W
	R124	86.5053	10 KΩ 20% potentiometer	0,1W
	R126	80.5229	22 Ω 5% carbon film	1/8W
	R127	81.5224	82 Ω 5% wire wound	1 W
	R128	80.5238	120 Ω 5% carbon film	1/8W
	R129	80.5143	330 Ω 5% "	1/4W
	R130	80.5238	120 Ω 5% "	1/8W
	R131	80.5251	1,5 KΩ 5% "	1/8W
	R132	80.5251	1,5 KΩ 5% "	1/8W
	R133	86.5038	500 KΩ 20% potentiometer	0,05W
	R134	80.5273	100 KΩ 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	

S. no

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
			BC108 Transistor
			BC108 Transistor
			BC108 Transistor
			BC179 Transistor
			BC179 Transistor
			BC108 Transistor
			TIP 31 Transistor
			BC214L Transistor
			BC108 Transistor
	Q15	99.5243	BC108 Transistor
	Q16	99.5246	TIP 31 Transistor
	Q17	99.5144-0	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

Stor...

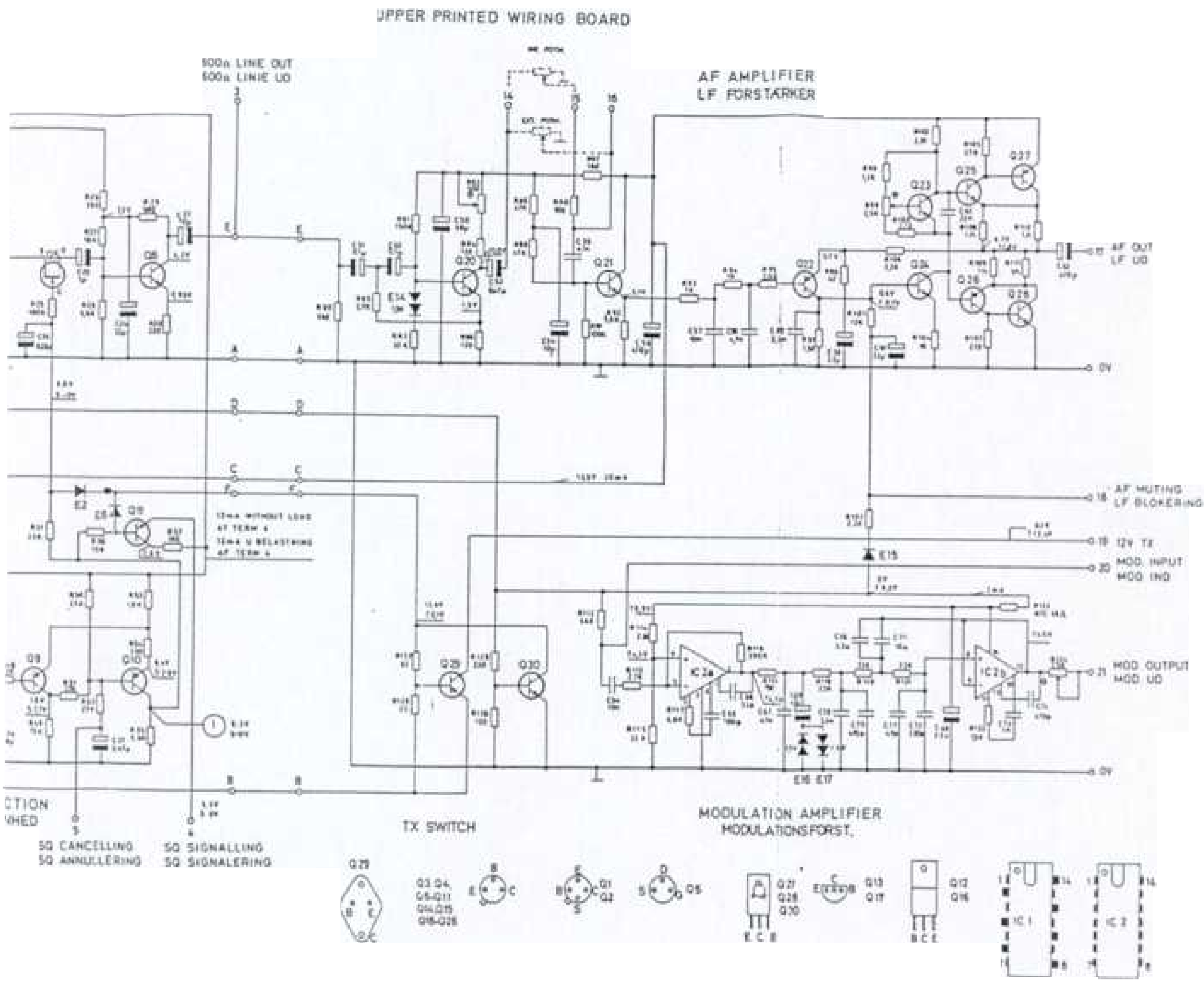
TYPE	NO.	CODE	DATA	
		10.2433	Common Functions Unit	
	C1	76.5071	22 nF 10% polyest. FL	50 V
	C2	73.5114	1 µF 20% tantal	35 V
	C3	76.5071	22 nF 10% polyest. FL	50 V
	C4	73.5114	1 µF 20% tantal	35 V
	C5	76.5067	1 nF 5% polystyr TB	160 V
	C6	73.5114	1 µF 20% tantal	35 V
	C7	73.5114	1 µF 20% tantal	35 V
	C8	73.5106	68 µF 20% tantal	16 V
	C9	74.5144	68 pF 5% ceram TB	160 V
	C10	76.5067	1 nF 5% polystyr TB	160 V
	C11	73.5114	1 µF 20% tantal	35 V
	C12	76.5072	47 nF 10% polyest. FL	50 V
	C13	74.5144	68 pF 5% ceram TB	160 V
	C14	76.5067	1 nF 5% polystyr TB	160 V
	C15	76.5069	1 nF 10% polyest. FL	50 V
	C16	73.5114	1 µF 20% tantal	35 V
	C17	73.5109	10 µF 20% tantal	16 V
	C18	76.5072	47 nF 10% polyest. FL	50 V
	C19	73.5114	1 µF 20% tantal	35 V
	C20	73.5127	22 µF 20% tantal	16 V
	C21	73.5118	0,22 µF 20% tantal	35 V
	C22	76.5059	2,2 nF 10% polyest. FL	50 V
	C23	73.5109	10 µF 20% tantal	16 V
	C24	73.5127	22 µF 20% tantal	16 V
	C25	73.5114	1 µF 20% tantal	35 V
	C26	73.5118	0,22 µF 20% tantal	35 V
	C27	73.5109	10 µF 20% tantal	16 V
	C28	76.5070	10 nF 10% polyest. FL	50 V
	C29	76.5060	3,3 nF 10% polyest. FL	50 V
	C30	73.5109	10 µF 20% tantal	16 V
	C31	76.5060	3,3 nF 10% polyest. FL	50 V
	C32	76.5072	47 nF 10% polyest. FL	50 V
	C33	73.5126	4,7 µF 20% tantal	35 V
	C34	73.5106	68 µF 20% tantal	16 V
	C35	73.5125	0,47 µF 20% tantal	35 V
	C36	73.5125	0,47 µF 20% tantal	35 V
	C37	73.5125	0,47 µF 20% tantal	35 V
	C38	73.5011	10 µF -10/+100% elco	16 V
	C39	73.5071	100 µF -10/+100 elco	35 V
	C40	76.5072	47 nF 10% polyest. FL	50 V
	C41	73.5011	10 µF -10/+100% elco	16 V
	C42	74.5187	39 pF 10% ceram N750 PL	25 V
	C43	73.5114	1 µF 20% tantal	35 V
	C44	73.5114	1 µF 20% tantal	35 V
	C45	73.5114	1 µF 20% tantal	35 V
	C46	74.5187	39 pF 10% ceram PL	25 V

S. no

TYPE	NO.	CODE	DATA	
	C50	73.5106	68 µF 20% tanta	16 V
	C51	73.5089	0,1 µF 20% tanta	35 V
	C52	73.5089	0,1 µF 20% tanta	35 V
	C53	73.5102	2,2 µF 20% tantal	35 V
	C54	73.5109	10 µF 20% tantal	16 V
	C55	76.5072	47 nF 10% polyest. FL	50 V
	C56	73.5138	470 µF -10/+50% elco	25 V
	C57	76.5070	10 nF 10% polyest. FL	50 V
	C58	76.5061	4,7 nF 10% polyest. FL	50 V
	C59	73.5127	22 µF 20% tantal	16 V
	C60	76.5059	2,2 nF 10% polyest. FL	50 V
	C61	73.5127	22 µF 20% tantal	16 V
	C62	76.5071	22 nF 10% polyest. FL	50 V
	C63	73.5137	470 µF -10/+50% elco	16 V
	C64	76.5070	10 nF 10% polyest. FL	50 V
	C65	74.5165	100 pF 10% ceram PL	63 V
	C66	74.5116	33 pF 5% ceram TB	160 V
	C67	76.5072	47 nF 10% polyest. FL	50 V
	C68	73.5127	22 µF 20% tantal	16 V
	C69	73.5126	4,7 µF 20% tantal	35 V
	C70	76.6050	3,3 nF 10% polyest. FL	50 V
	C71	76.5070	10 nF 10% polyest. FL	50 V
	C72	76.5063	22 pF 5% polystyr TB	160 V
	C73	76.5069	1 nF 10% polyest. FL	50 V
	C74	74.5161	470 pF -20/+80% ceram PL	63 V
	C75	76.5065	470 pF 5% polystyr TB	160 V
	C76	76.5060	3,3 nF 10% polyest. FL	50 V
	C77	74.5118	47 pF 5% ceram TB	160 V
	C78	73.5127	22 µF 10% tantal	16 V
	R1	80.5260	8,2 KΩ 5% carbon film	1/8W
	R2	80.5254	2,7 KΩ " "	1/8W
	R3	80.5246	560 Ω 5% " "	1/8W
	R4	80.5255	3,3 KΩ 5% " "	1/8W
	R5	80.5249	1KΩ 5% " "	1/8W
	R6	80.5253	2,2 KΩ 5% " "	1/8W
	R7	80.5258	5,6 KΩ 5% " "	1/8W
	R8	80.5259	6,8 KΩ 5% " "	1/8W
	R9	80.5257	4,7 KΩ 5% " "	1/8W
	R10	80.5249	1 KΩ 5% " "	1/8W
	R11	80.5218	2,7 Ω 5% " "	1/8W
	R12	80.5258	5,6 KΩ 5% " "	1/8W

COMMON FUNCTIONS UNIT CF702

X401.868

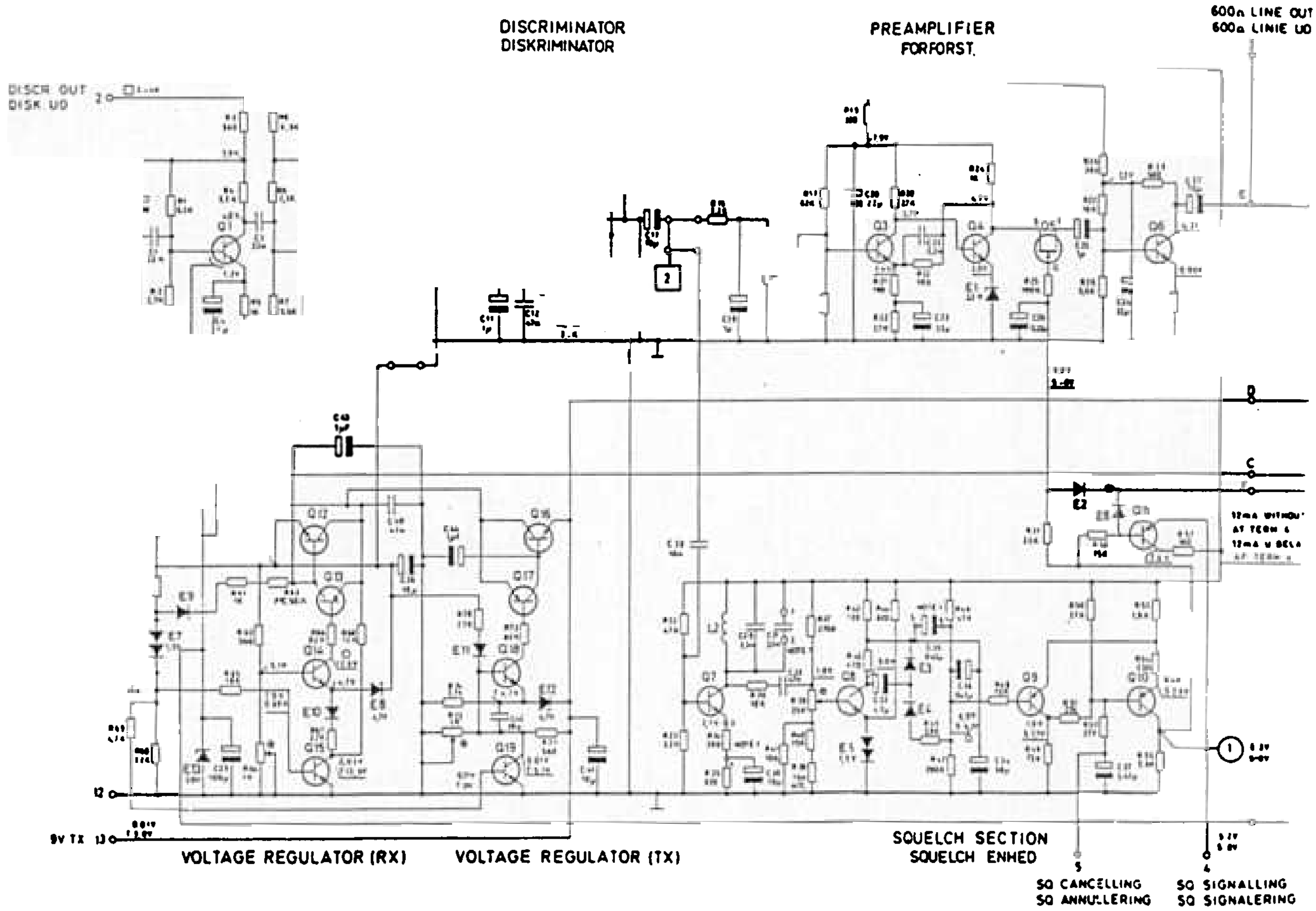


ER (2MΩ)

COMMON FUNCTION UNIT CF701
FÆLLESENHED

D401. 296/2

LOWER PRINTED WIRING BOARD



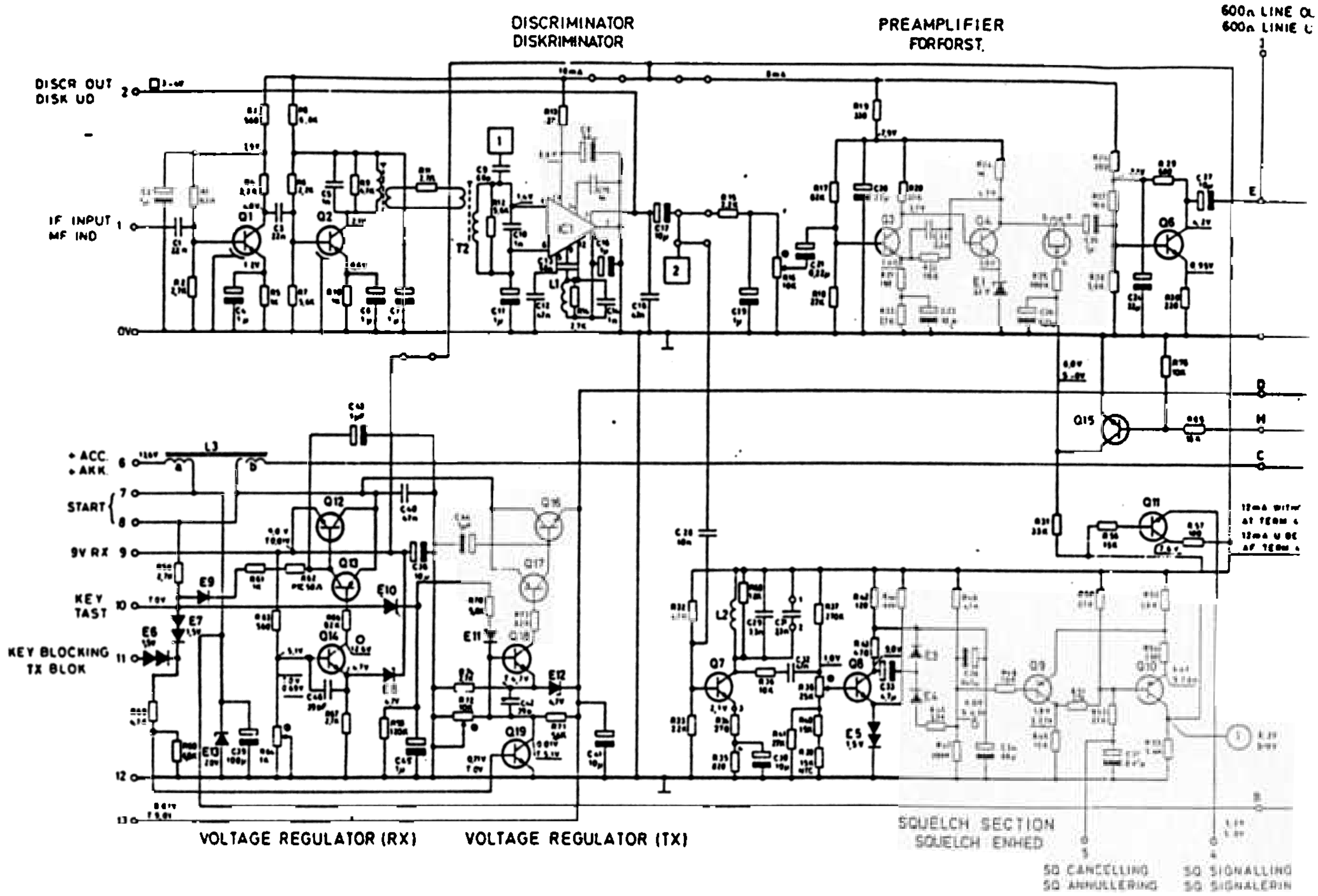
DEPENDING ON THE CHANNEL SEPARATION EMPLOYED
MAKE THE FOLLOWING ALTERATIONS

CH SEP \ POINTS	1-2	3-4	5-6	
12.5kHz	3.3nF	150Ω	0.47µF	REPLACE R119, R120, R121 BY 27KΩ
20/25kHz	3.3nF	390Ω	0.47µF	
50kHz	OPEN	820Ω	OPEN	

CONDITIONS OF MEASUREMENTS

- □ MEASURED AT Δf = 0kHz
- Δ RESISTOR R83 SHORT-CIRCUITED
- S SQUELCHED CONDITION
- T TRANSMITTER KEYED CONDITION
- O USE A HIGH-RESISTANCE VOLTMETER (2MΩ)

LOWER PRINTED WIRING BOARD



CONDITIONS OF MEASUREMENTS

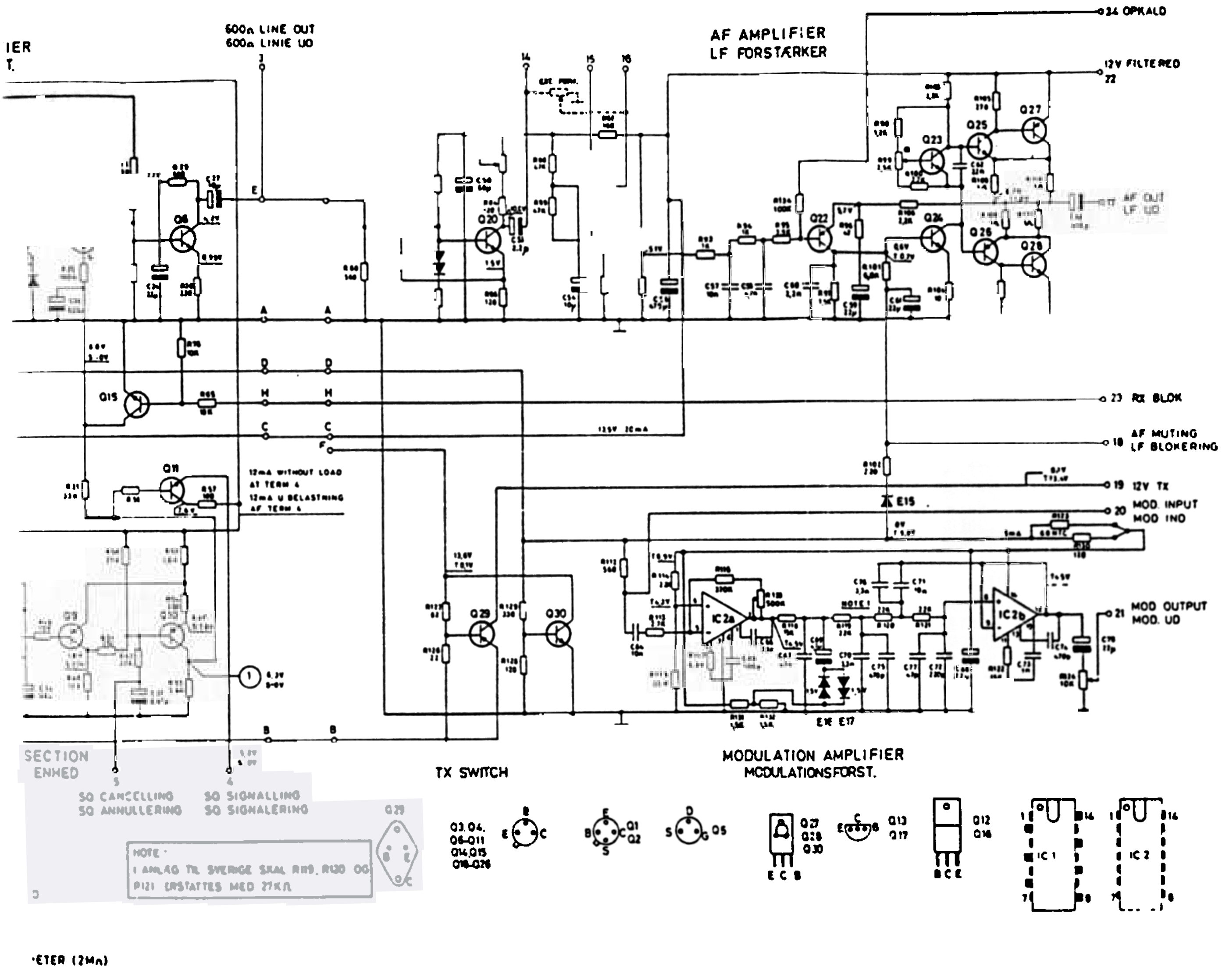
- ☐ MEASURED AT Δf = 0kHz
- Δ RESISTOR R83 SHORT-CIRCUITED
- S SQUELCHED CONDITION
- T TRANSMITTER KEYED CONDITION
- O USE A HIGH-RESISTANCE VOLTMETER (2MΩ)

NOTE:
I ANLÆG TIL SVERIGE SKAL R
R121 ERSTATTES MED 27KΩ.

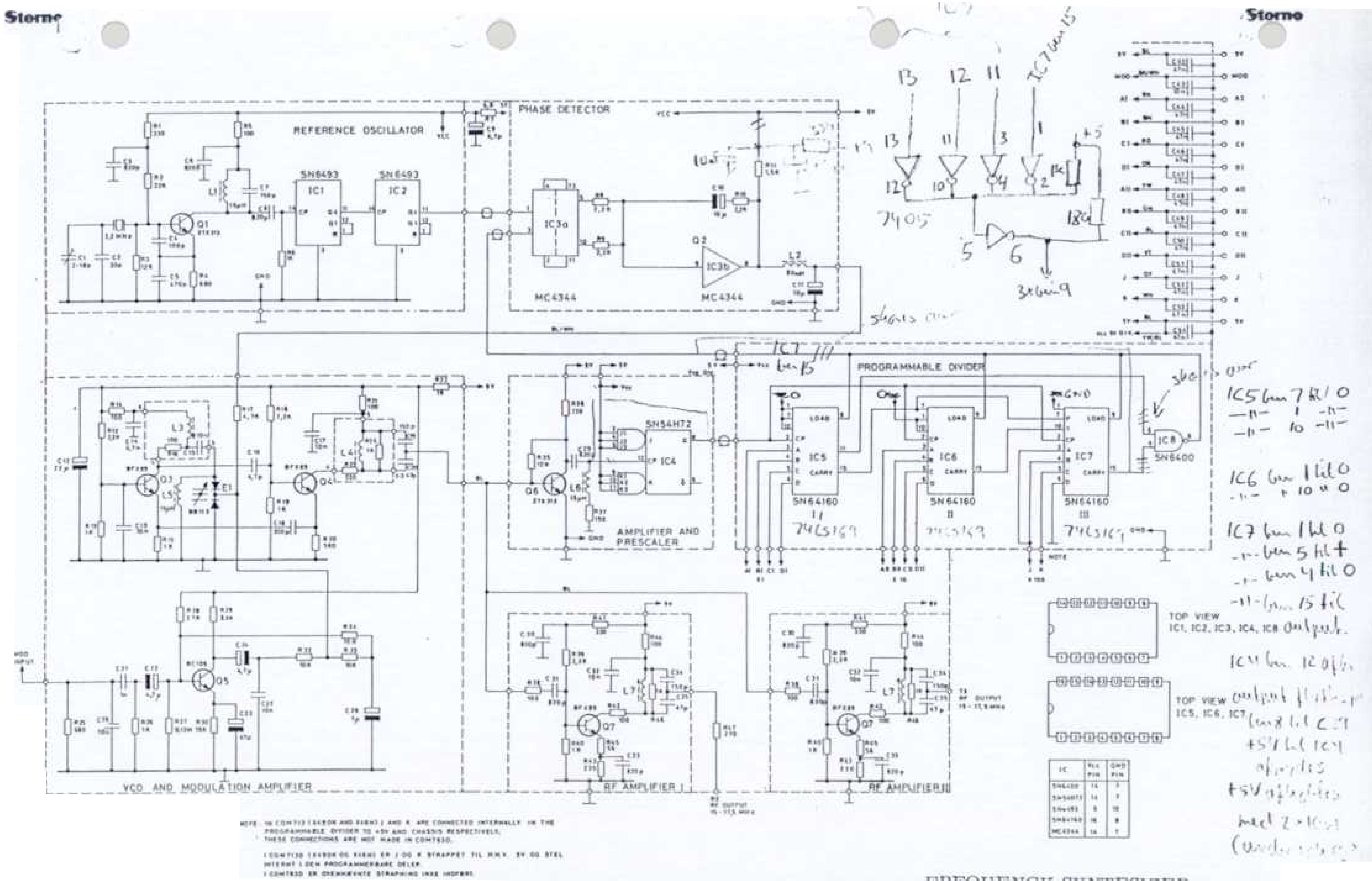
-E10

R71 ?

R72 ?

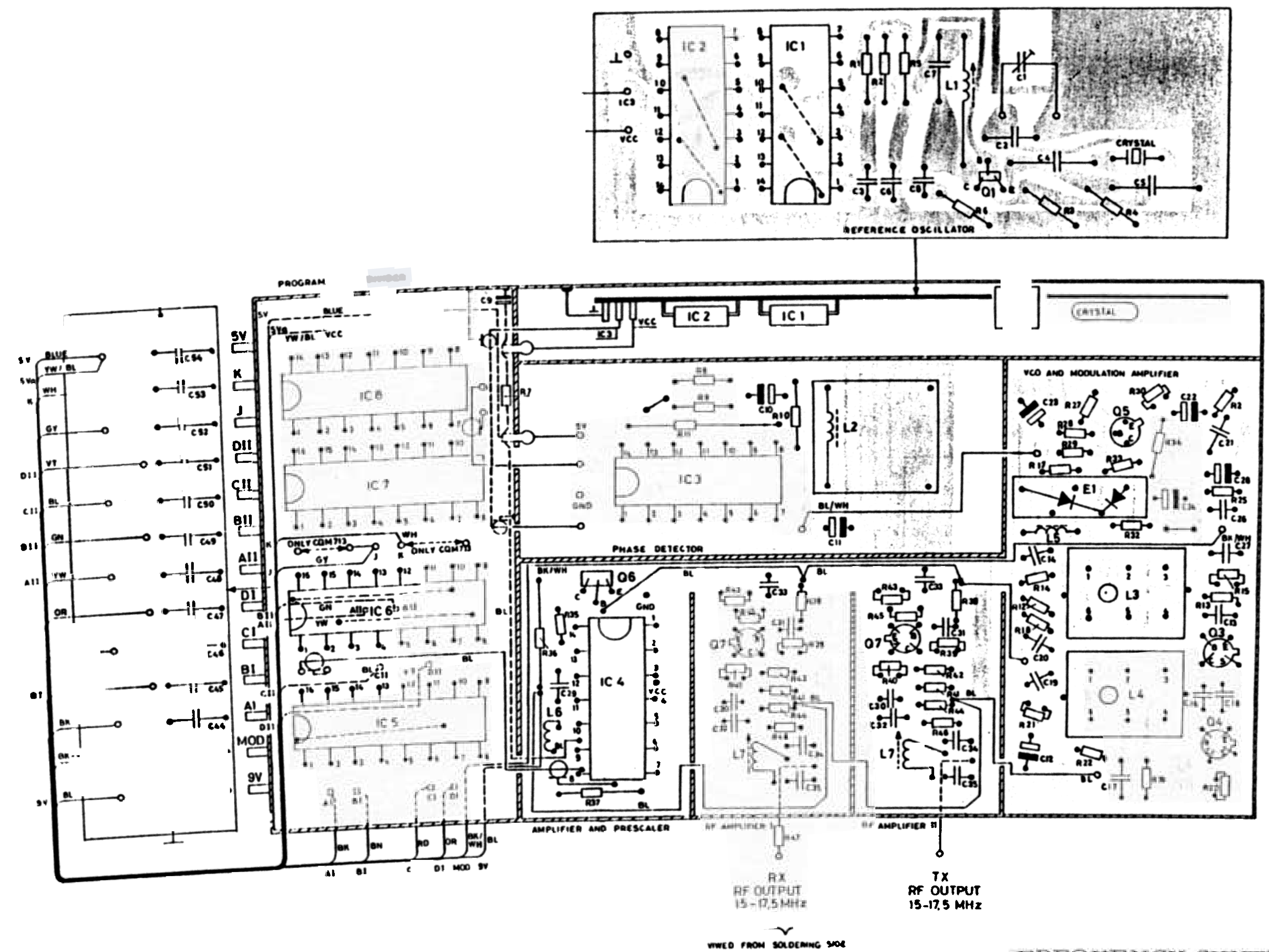


COMMON FUNCTION UNIT CF702
FÆLLESENHED
D401.840



FREQUENCY SYNTESIZER
FREKVENSSYNTESEENHED
FS701

D401.714/3



FREQUENCY SYNTESIZER
FREKVENSSYNTESEENHED

FS701

D/ ˙˙ 891/3

Storno

TYPE	NO.	CODE	DATA	
	R26	8).5049		1/10W
	R27	80.5074	120 KΩ 5% -	1/10W
	R28	80.5066	27 KΩ 5% -	1/10W
	R29	80.5055	3,3 KΩ 5% -	1/10W
	R30	80.5063		1/10W
	R32	80.5061	10 KΩ 5% carbon film	1/10W
	R33	80.5061	10 KΩ 5%	1/10W
	R34	80.5061	10 KΩ 5%	1/10W
	L3	61.1220		
	L4	61.1221		
	L5	63.5007	15 μH 20% choke	200 mA
	E1	99.5292	Triple cap. diode BB113	
	Q3	99.5240		
	Q4	99.5240		
	Q5	99.5201		
	C29		820 pF -20+80% ceram PL	63 V
	R35	80.5062	12 KΩ 5% carbon film	1/10W
	R36	80.5241	220Ω 5% -	1/8W
	R37	80.5039	150Ω 5% -	1/10W
	L6	63.5007	15 μH 20% choke	200mA
	Q6	99.5293	Tr[illegible]istor ZTX313	
	IC4	14.5062	SN54H72 Gated J-K flip-flop	
	IC5	14.5061		
	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		
	C31	74.5314		
	C32	76.5070		

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

FREQUENCY SYNTHESIZER
FREKVENSSYNTESEE

X401.863/2

Stor

NO.	C
	1
C9	7
R7	8
R47	8
C42	7
C43	7
C44 - - C54	7
C1	7
C2	7
C3	7
C4	7
C5	7
C6	7
C7	7
C8	7
R1	8
R2	8
R3	8
R4	8
R5	8
R6	8
L1	6
Q1	9
IC1	1
IC2	1
C10	7
C11	7
R8	8
R9	8
R10	8

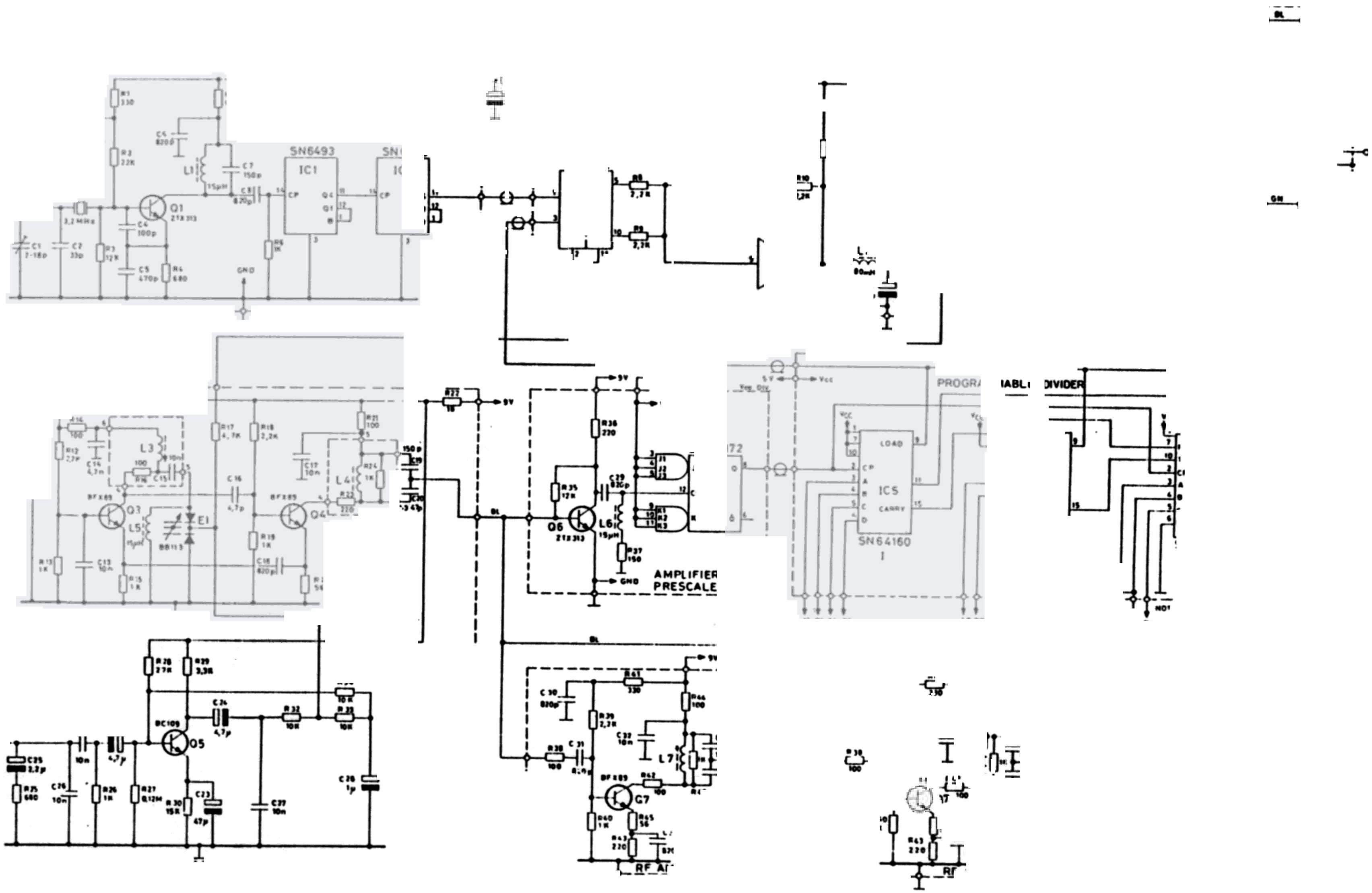
DA

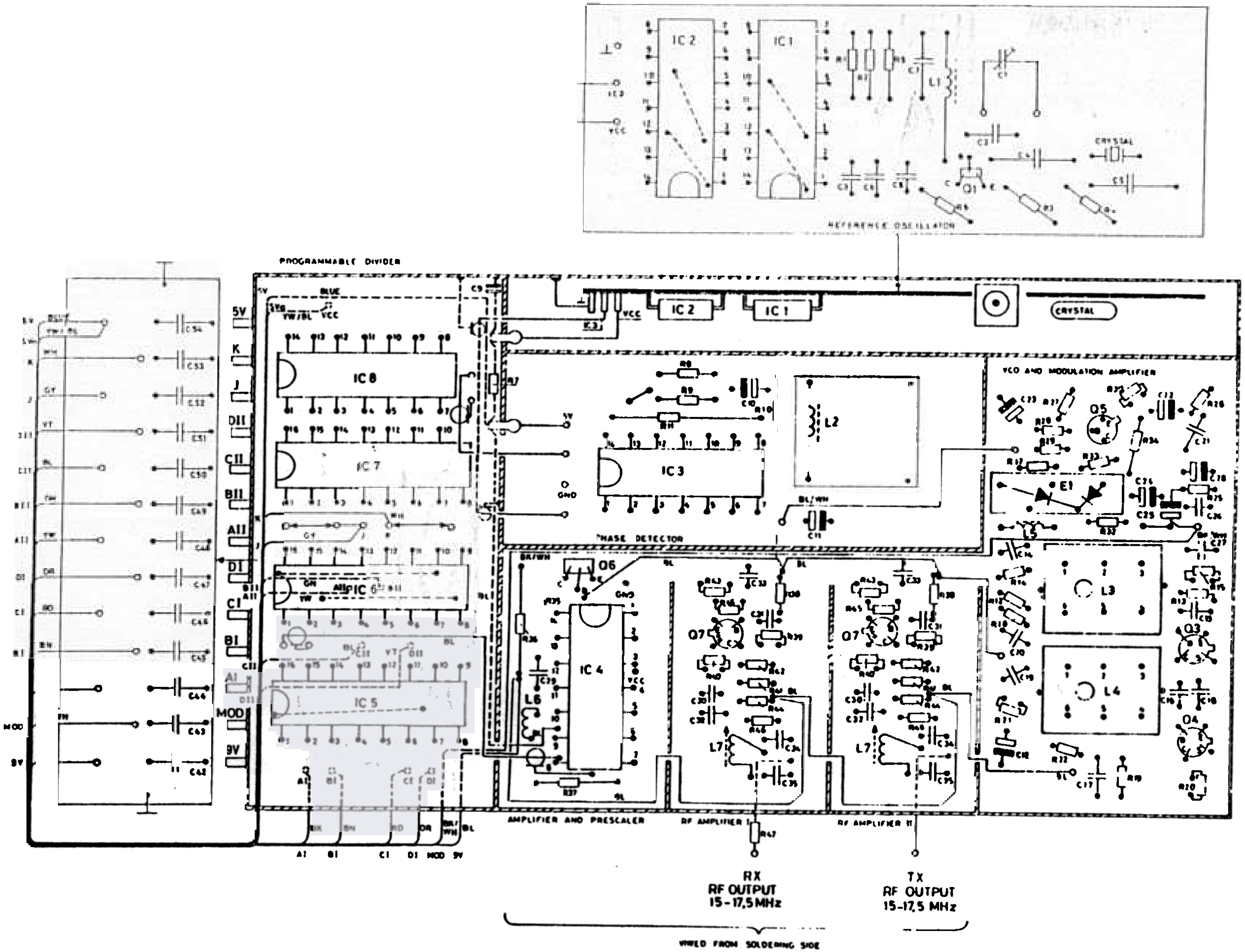
TYPE	NO.	CODE	A
	R11	80.5051	/10W
	L2	61.1222	
	IC3	14.5060	ER
	C12	73.5127	16 V
	C13	76.5070	50 V
	C14	76.5061	50 V
	C15	76.5070	50 V
	C16	74.5318	00 V
	C17	76.5070	50 V
	C18	74.5314	63 V
	C19	76.5103	25 V
	C20	74.5319	00 V
	C21	76.5069	50 V
	C22	73.5126	35 V
	C23	73.5128	3 V
	C24	73.5126	35 V
	C25	73.5135	6 V
	C26	76.5070	50 V
	C27	76.5070	50 V
	C28	73.5135	6 V
	R12	80.5053	10W
	R13	80.5049	10W
	R14	80.5037	10W
	R15	80.5049	10W
	R16	80.5037	10W
	R17	80.5057	10W
	R18	80.5053	10W
	R19	80.5049	10W
	R20	80.5046	0W
	R21	80.5037	0W
	R22	80.5028	0W
	R23	80.5041	0W
	R24	80.5049	0W
	R25	80.5047	[illegible] 5% 0W

FREQUENCY SYNTHESIZER
FREKVENS YNT LEEN E

S701

X401.863/2


SN6493
IC1
Q1
21X313
3,2 MHz
GND
Q3
BFX89
Q4
BFX89
E1
BB113
L3
L4
L5
Q5
BC109
Q6
21X313
L6
15μH
AMPLIFIER
PRESCALE
G7
BF X89
L7
RF AI
PROGRA
IABL
DIVIDER
IC5
SN64160
LOAD
CARRY
9V
GND



FREQUENCY SYNTESIZER
FREKVENSSYNTESEENHED

FS702

D402 550

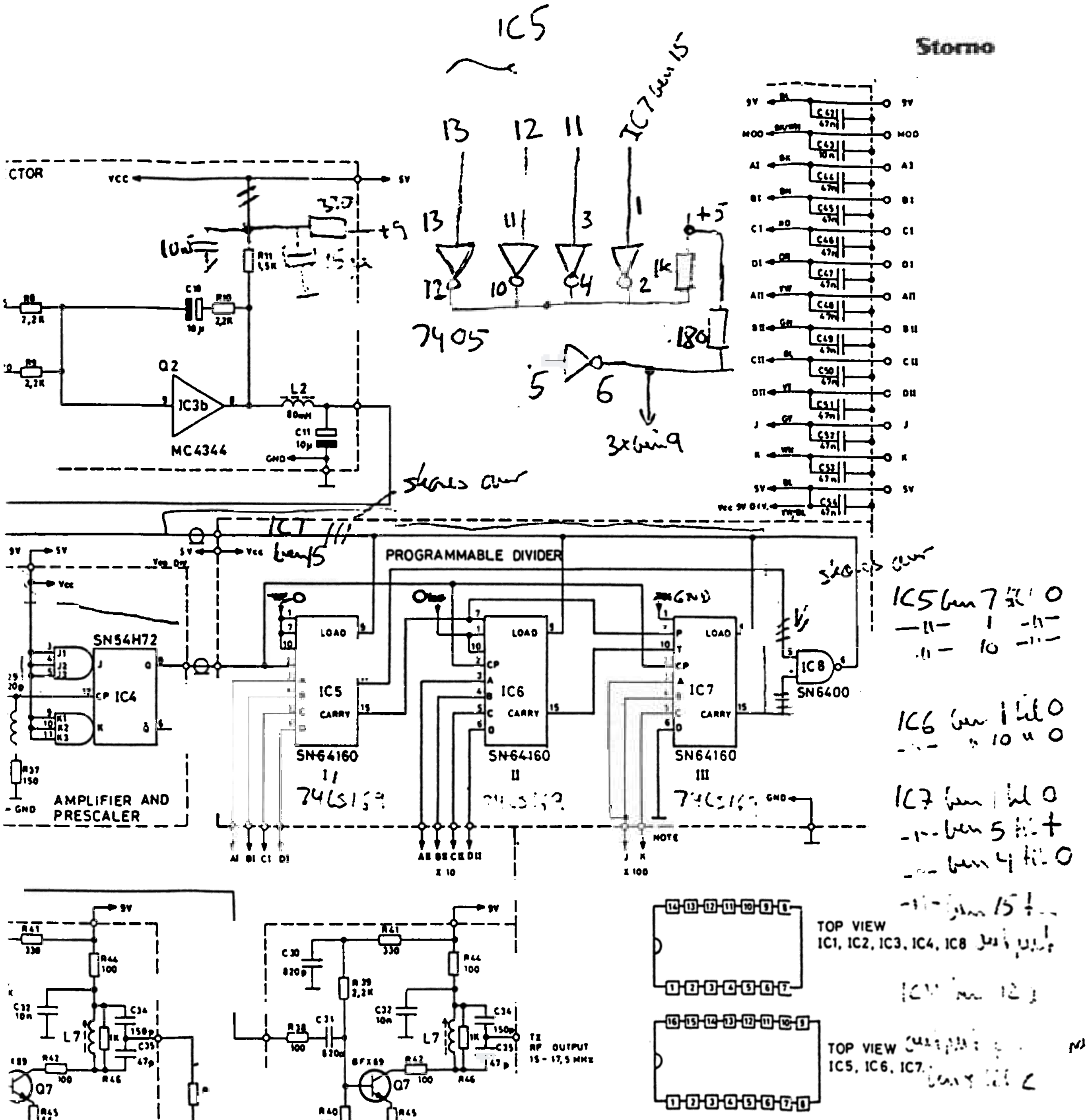
Storno

TYPE	Nº	CODE	DATA			
FS702		10.3503-00	Frequency Synthesizer			
	C1	78.5044	2/18 pF		teflon N350 norm.	300 V
	C2	74.5116	33 pF	5%	ceram NO 75 TB	160 V
	C3	74.5314	820 pF	-20/+80%	" II PL	63 V
	C4	76.5102	100 pF	2.5%	polystyr TB	25 V
	C5	76.5065	470 pF	5%	" TB	160 V
	C6	74.5314	820 pF	-20/+80%	ceram II PL	63 V
	C7	76.5103	150 pF	2.5%	polystyr TB	25 V
	C8	74.5314	820 pF	-20/+80%	ceram II PL	63 V
	C9	73.5126	4.7 µF	20%	tantal	35 V
	C10	73.5109	10 µF	20%	"	16 V
	C11	73.5109	10 µF	20%	"	16 V
	C12	73.5127	22 µF	20%	"	16 V
	C13	76.5070	10 nF	10%	polyest FL	50 V
	C14	76.5061	4.7 nF	10%	" FL	
	C15	76.5070	10 nF	10%	" FL	50 V
	C16	74.5318	4.7 pF	0.25 pF	ceram NPO PL	100 V
	C17	76.5070	10 nF	10%	polyest FL	50 V
	C18	74.5314	820 pF	-20/+80%	ceram II PL	63 V
	C19	76.5103	150 pF	2.5%	polystyr TB	25 V
	C20	74.5319	47 pF	2%	ceram N 750 PL	100 V
	C21	76.5070	10 nF	10%	polyest FL	50 V
	C22	73.5126	4.7 µF	20%	tantal	35 V
	C23	73.5124	47 µF	20%	"	6 V
	C24	73.5126	4.7 µF	20%	"	35 V
	C25	73.5102	2.2 µF	20%	"	35 V
	C26	76.5070	10 nF	10%	polyest FL	50 V
	C27	76.5070	10 nF	10%	" FL	50 V
	C28	73.5135	1 µF	-20/+50%	tantal	16 V
	C29	74.5314	820 pF	-20/+80%	ceram II PL	63 V
	C30	74.5314	820 pF	-20/+80%	" II PL	63 V
	C31	74.5314	820 pF	-20/+80%	" II PL	63 V
	C32	76.5070	10 nF	10%	polyest FL	50 V
	C33	74.5314	820 pF	-20/+80%	ceram II PL	63 V
	C34	76.5103	150 pF	2.5%	polystyren TB	25 V
	C35	74.5319	47 pF	2%	ceram N 750 PL	100 V
	C42	74.5283	47 nF	20%	" 2C1 CP	50 V
	C43	74.5281	10 nF	20%	" 2C1 CP	50 V
	C44-C54	74.5283	47 nF	20%	" 2C1 CP	50 V
	C55	74.5320	1 nF	-20/+80%	" FT	400 V
	C56	74.5320	1 nF	-20/+80%	" FT	400 V
	R1	80.5043	330 Ω	5%	carbon film	1/10W
	R2	65	22 kΩ	5%	" "	1/10W
	R3	62	12 kΩ	5%	" "	1/10W
	R4	47	680 Ω	5%	" "	1/10W
	R5		100 Ω	5%	" "	1/10W

TYPE	Nº	C		DATA			
	R6			1 kΩ	5%	carbon film	
	R7			6.8 Ω	5%	" "	
	R8-R10			2.2 kΩ	5%	" "	
	R11			1.5 kΩ	5%	" "	
	R12			2.2 kΩ	5%	" "	
	R13			1 kΩ	5%	" "	
	R14			100 Ω	5%	" "	
	R15			1 kΩ	5%	" "	
	R16			100 Ω	5%	" "	
	R17			4.7 kΩ	5%	" "	
	R18			2.2 kΩ	5%	" "	
	R19			1 kΩ	5%	" "	
	R20			560 Ω	5%	" "	
	R21			100 Ω	5%	" "	
	R22			18 Ω	5%	" "	
	R23			220 Ω	5%	" "	
	R24			1 kΩ	5%	" "	
	R25			680 Ω	5%	" "	
	R26			1 kΩ	5%	" "	
	R27			120 kΩ	5%	" "	
	R28			27 kΩ	5%	" "	
	R29			3.3 kΩ	5%	" "	
	R30			15 kΩ	5%	" "	
	R32-R34			10 kΩ	5%	" "	
	R35			12 kΩ	5%	" "	
	R36			220 Ω	5%	" "	
	R37			150 Ω	5%	" "	
	R38			100 Ω	5%	" "	
	R39			2.2 kΩ	5%	" "	
	R40			1 kΩ	5%	" "	
	R41			330 Ω	5%	" "	
	R42			100 Ω	5%	" "	
	R43			220 Ω	5%	" "	
	R44			100 Ω	5%	" "	
	R45			56 Ω	5%	" "	
	R46			1 kΩ	5%	" "	
	R47			270 Ω	5%	" "	
	L1			15 µH	20%	choke	200mA
	L2	61.1222				coil	
	L3	61.1220					
	L4	61.1221		RF coil			
	L5	63.5007		1. µH	[illegible]	choke	2(

X402.467

SB



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

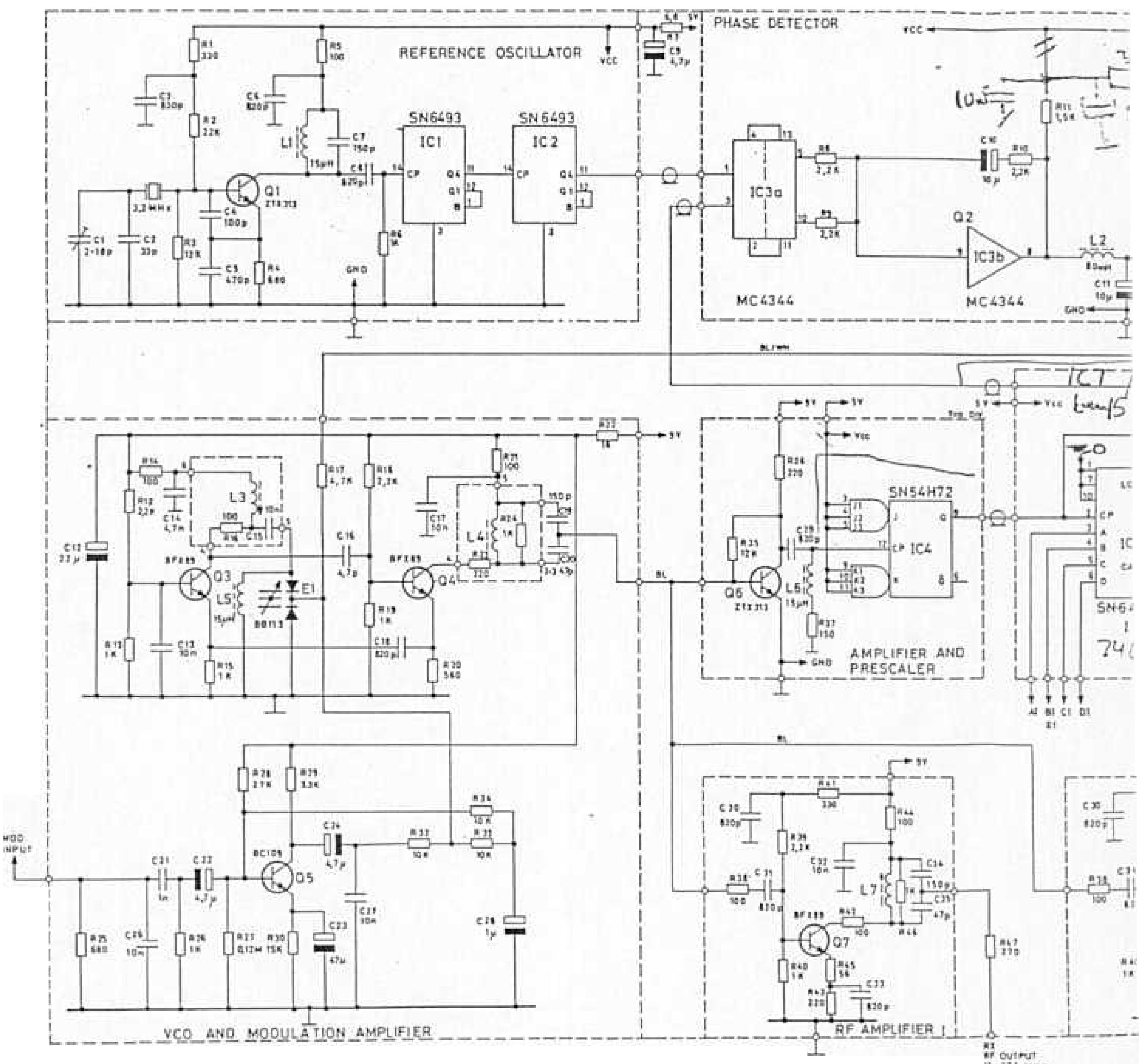
FREQUENCY SYNTESIZER
FREKVENSSYNTESEENHED

FS701

D401.714/3

SB

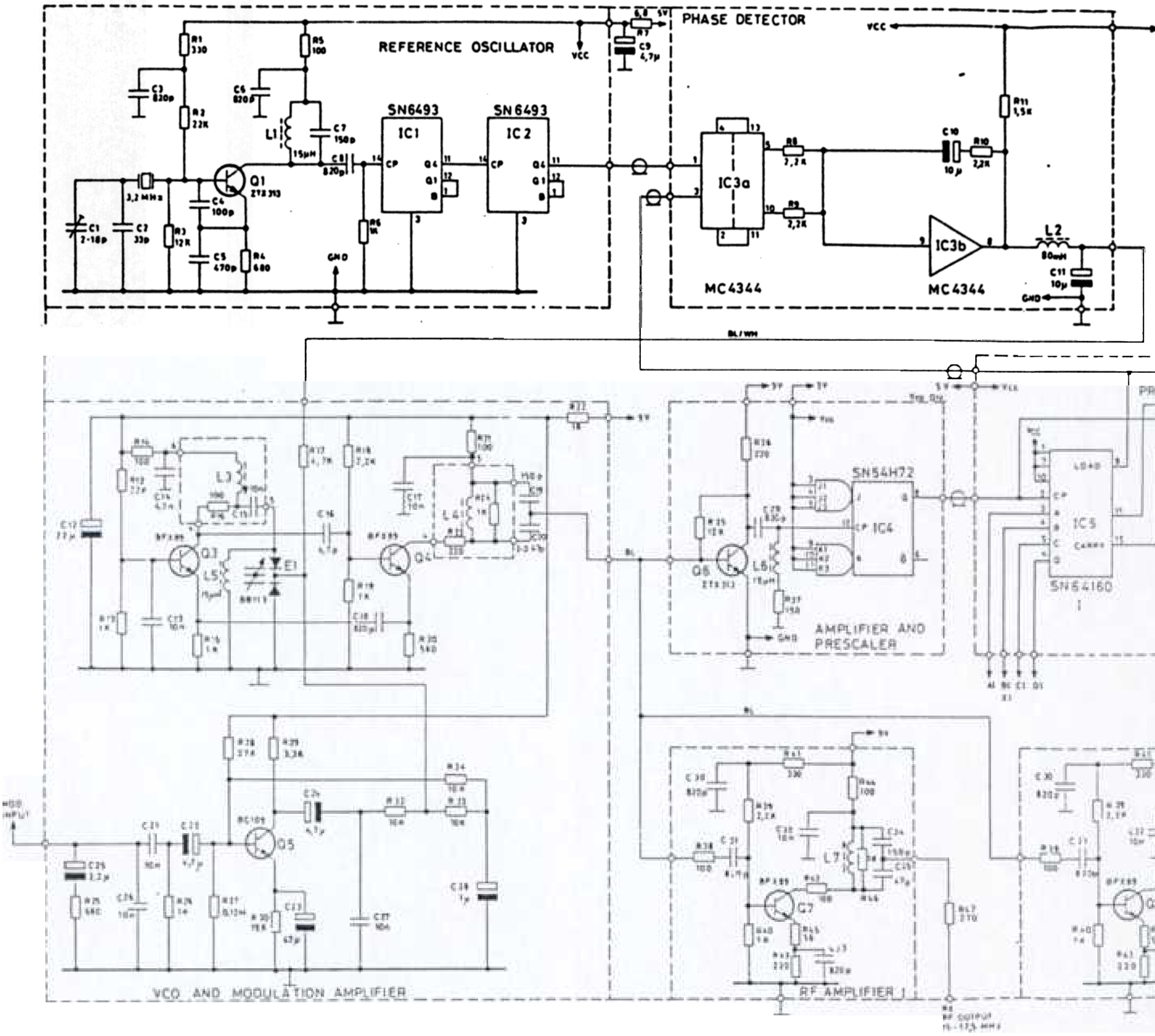
Storno

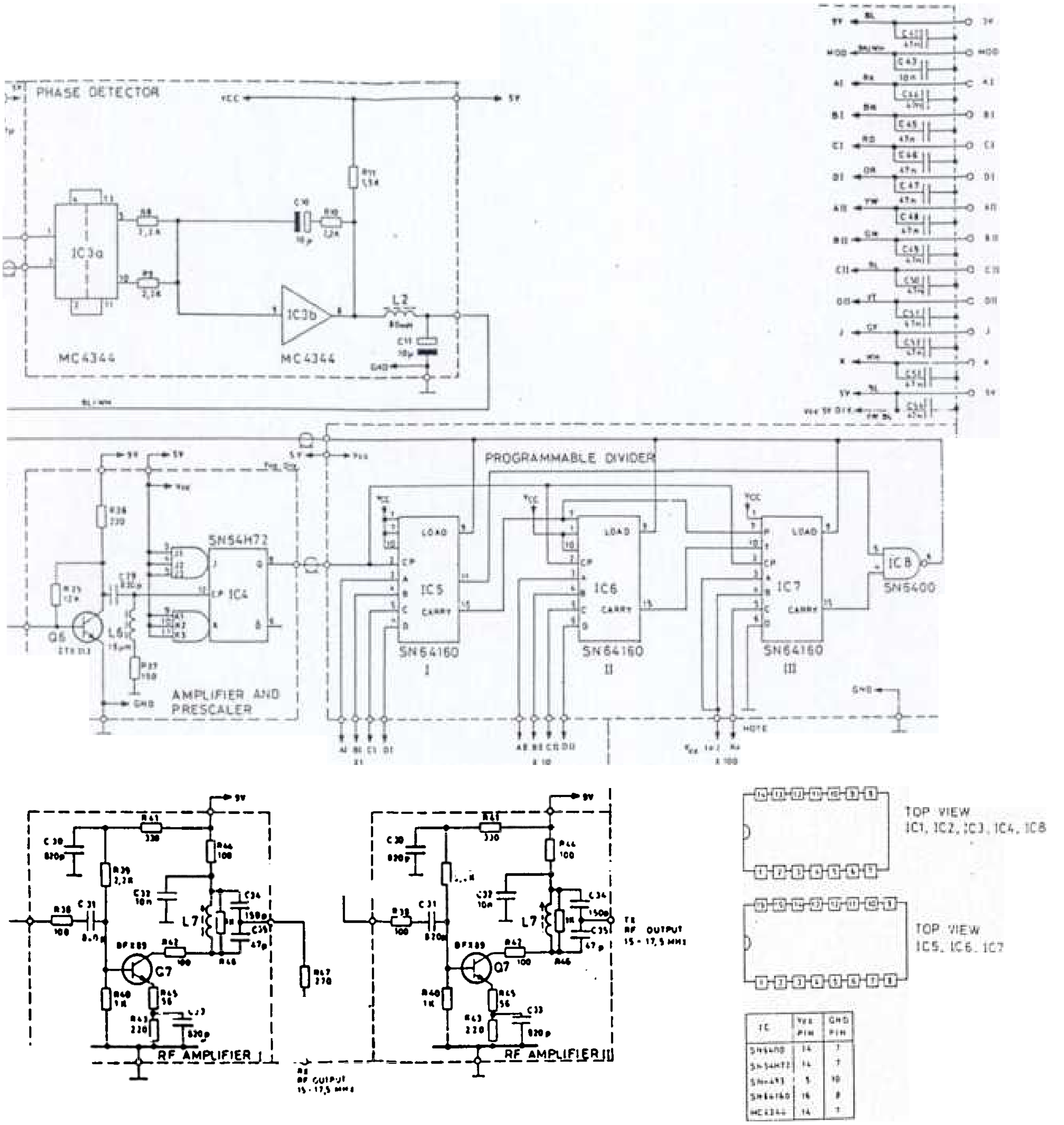


NOTE · IN CQM713 (X490K AND X46N) J AND K ARE CONNECTED INTERNALLY IN THE PROGRAMMABLE DIVIDER TO +5V AND CHASSIS RESPECTIVELY.
THESE CONNECTIONS ARE NOT MADE IN CQM7630.

I CQM7130 (X490K OG X46N) ER J OG K STRAPPET TIL H.H.V 5V OG STEL INTERNT I DEN PROGRAMMERBARE DELER.
I CQM7630 ER OVENNÆVNTE STRAPNING IKKE INDFØRT.

Storno

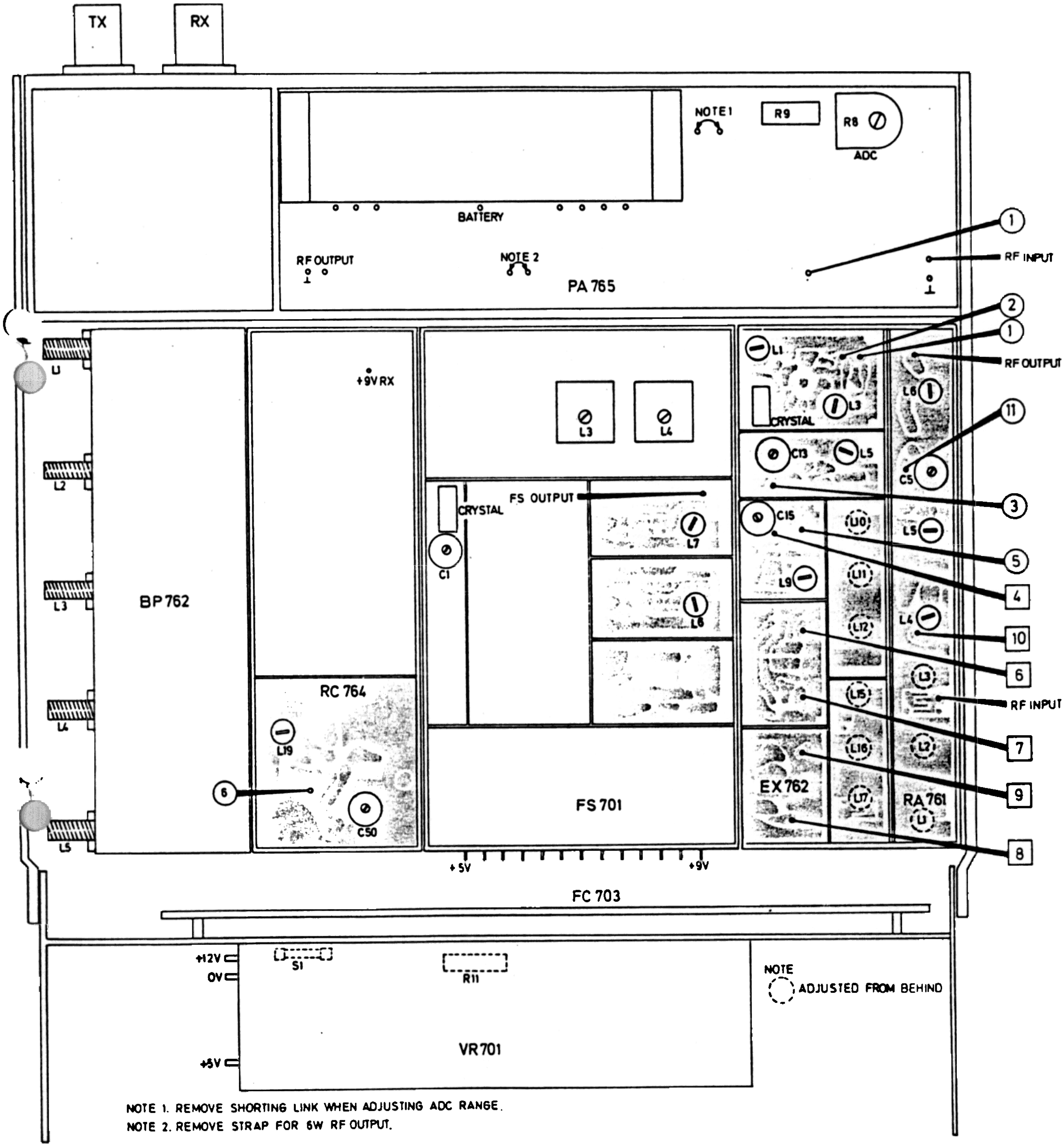

REFERENCE OSCILLATOR
PHASE DETECTOR
SN6493
IC1
SN6493
IC2
IC3a
IC3b
MC4344
MC4344
VCO AND MODULATION AMPLIFIER
SN54H72
IC4
AMPLIFIER AND PRESCALER
IC5
SN64160
RF AMPLIFIER



FREQUENCY SYNTESIZER
FREKVENSSYNTESEENHED

FS702

D 402 406



NOTE 1. REMOVE SHORTING LINK WHEN ADJUSTING ADC RANGE.
NOTE 2. REMOVE STRAP FOR 6W RF OUTPUT.

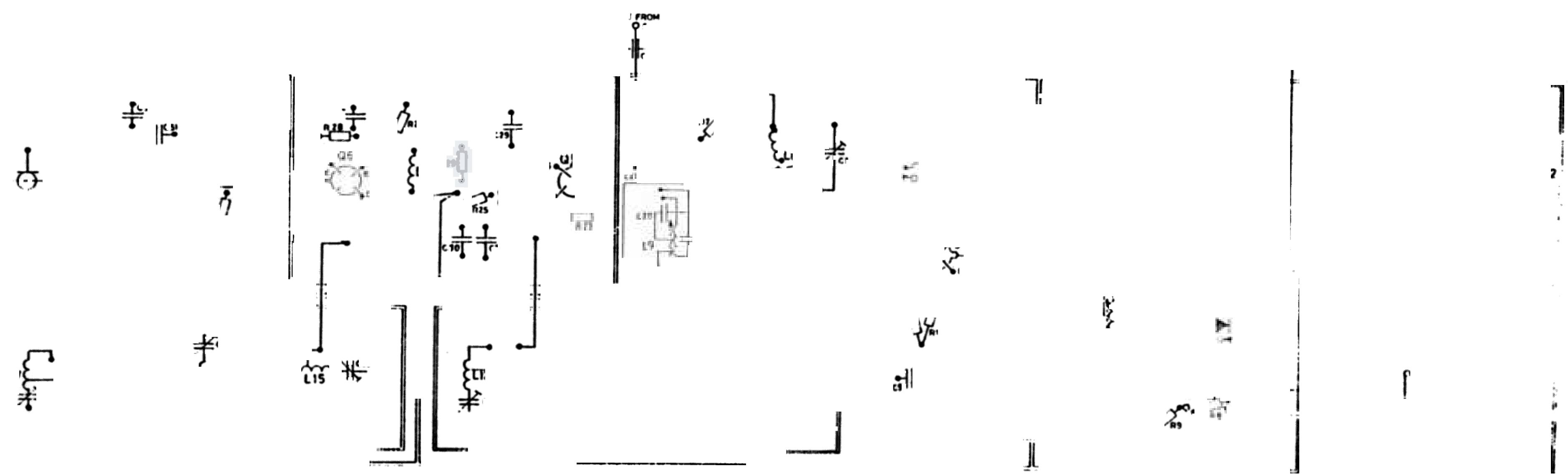
RADIO ASSEMBLY RF765 (CQM763D-12)

Location of Test Points and Adjustable Components

D402.562

Storno

Storno



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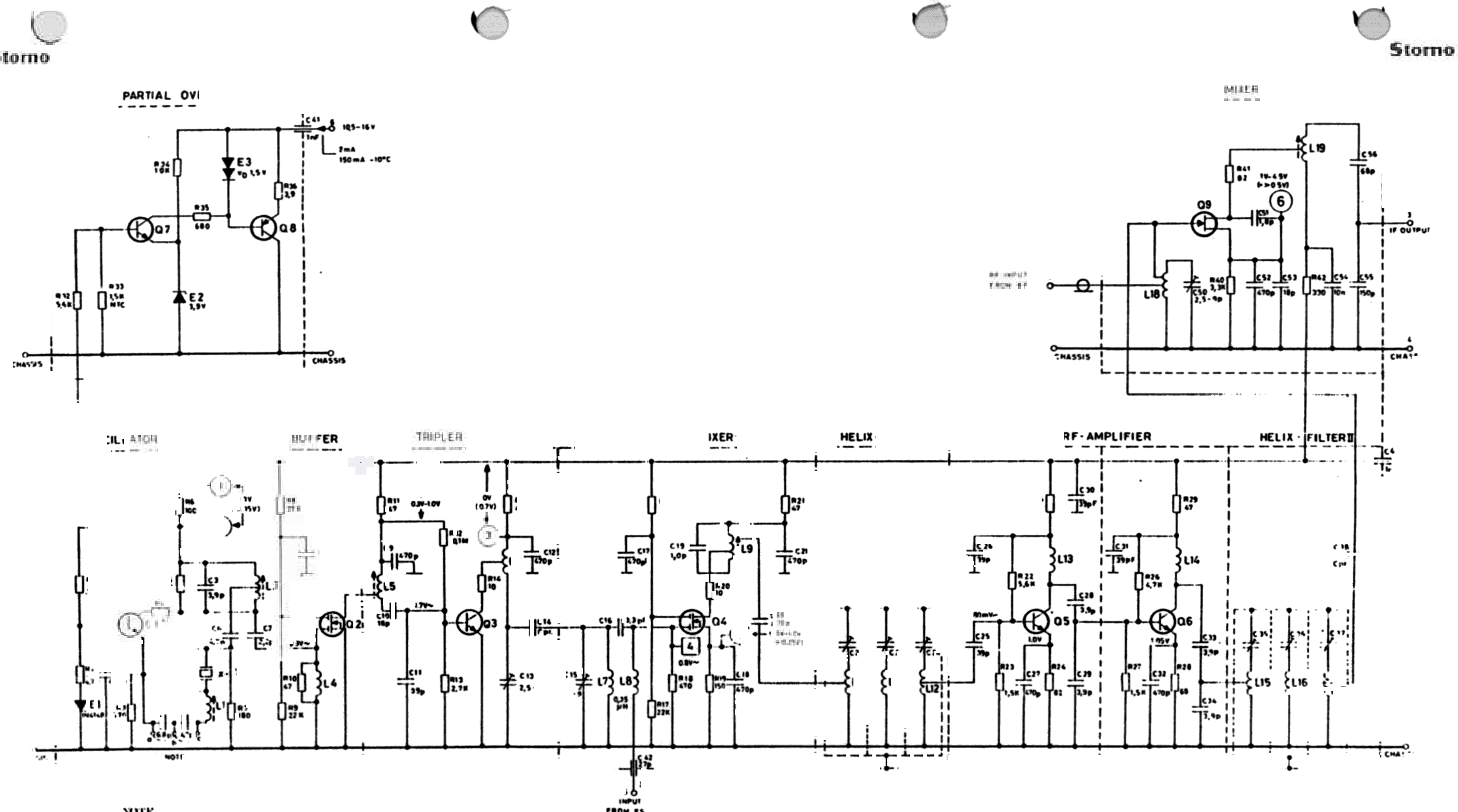
OD GE ON

D401896



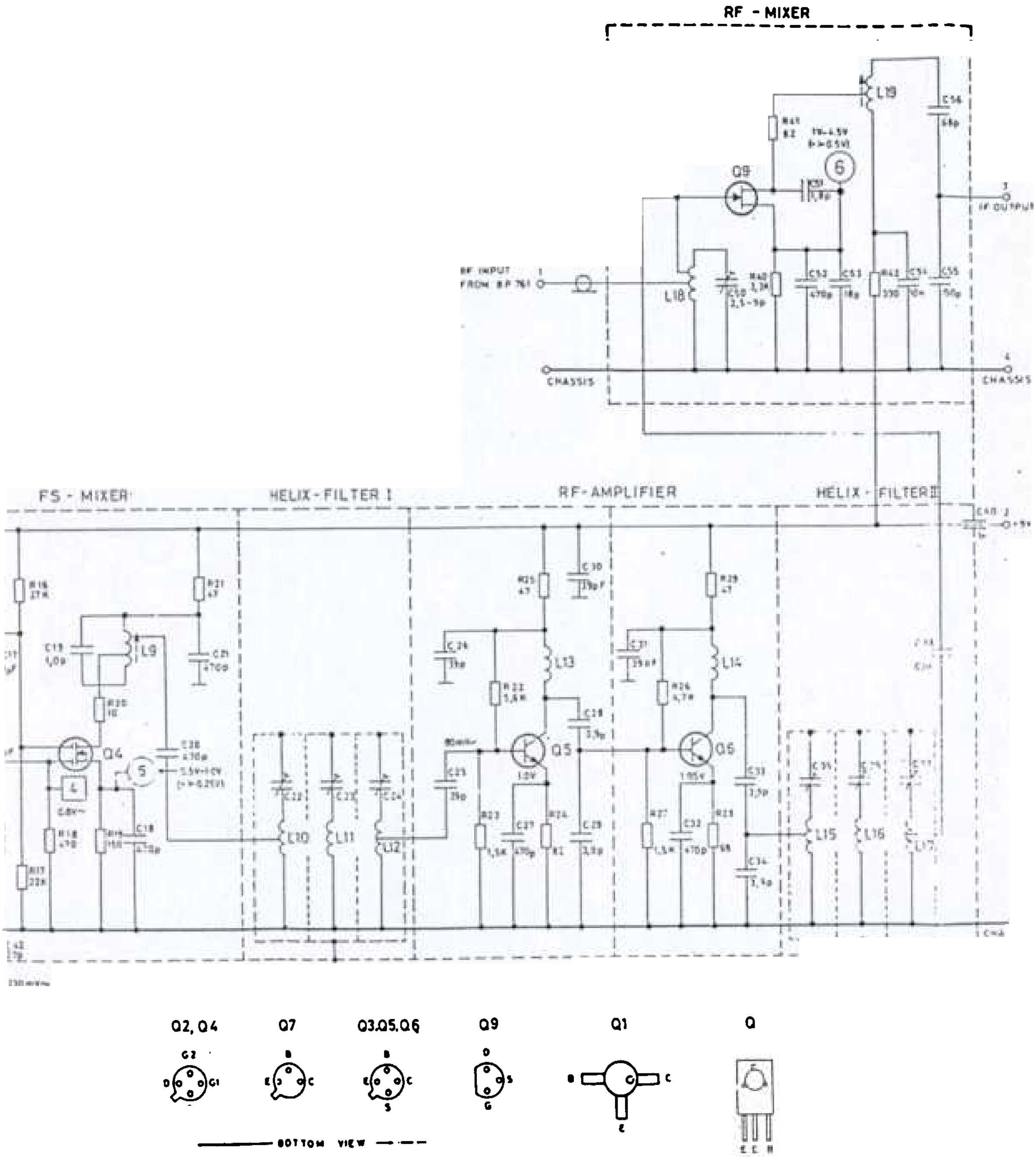
NOTE

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

ꞁECEIVER CONVE E
MODTAGE KONVE E

D 01 785

Storno

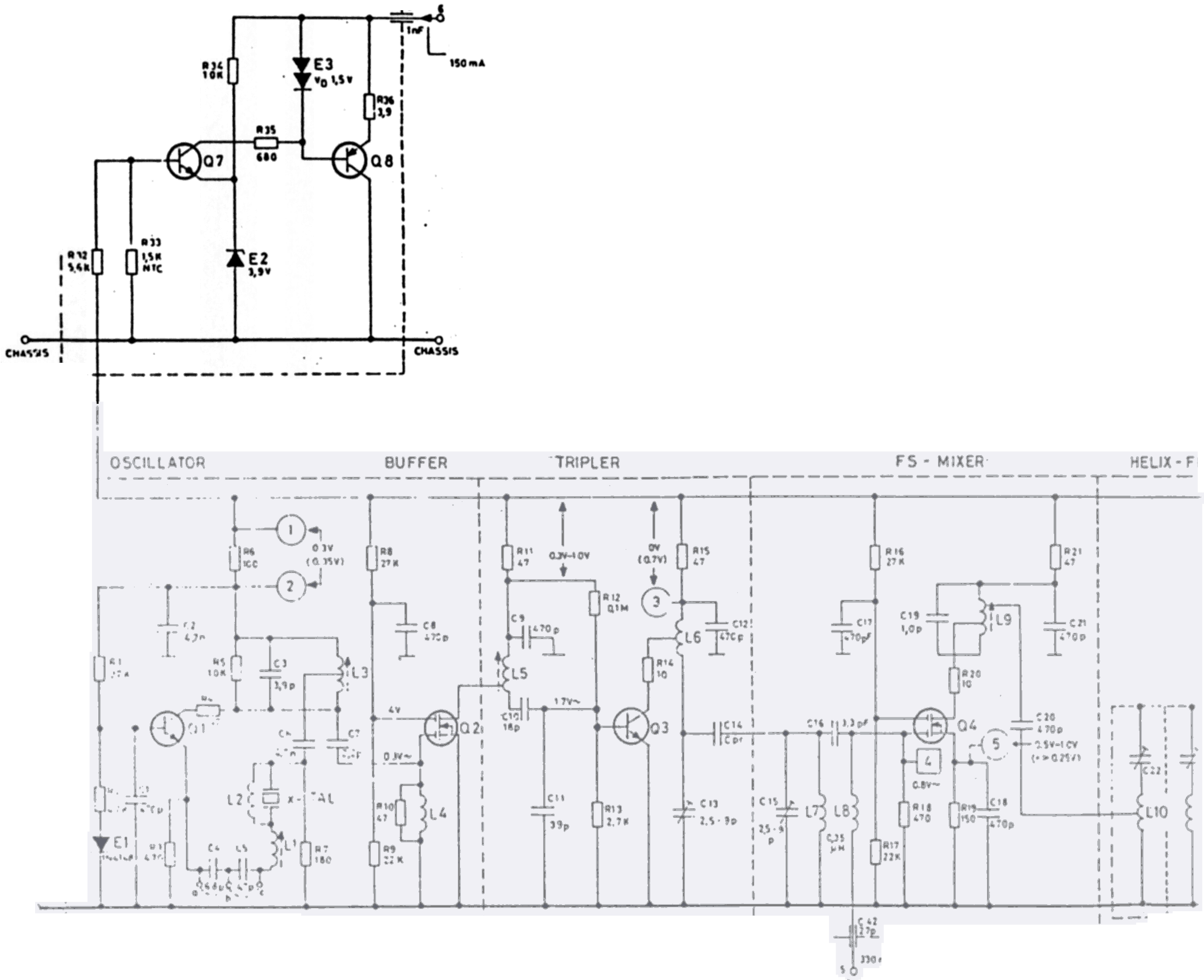


RECEIVER CONVERTER
MODTAGERKONVERTER

RC762

D401.785

Storno



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

Storno

TYPE	NO.	CODE	DATA	
RC762		10.2922	Receiver Converter	
	C1	74.5162	470 pF -20+50% ceram DI	400 V
	C2	74.5108	4.7 nF -20+80% ceram PL	20 V
	C3	74.5302	3.9 pF ± 0.25 pF ceram PL	63 V
	C4	74.5321	6.8 pF ± 0.25 pF ceram PL	100 V
	C5	74.5318	4.7 pF ± 0.25 pF ceram PL	100 V
	C6	74.5108	4.7 nF -20+80% ceram PL	20 V
	C7	74.5299	2.2 pF ± 0.25 pF ceram PL	63 V
	C8	74.5161	470 pF -20+80% ceram PL	63 V
	C9	74.5162	470 pF -20 +50% ceram DI	400 V
	C10	74.5310	18 pF 5% ceram PL	63 V
	C11	74.5316	39 pF 5% ceram PL	63 V
	C12	74.5162	470 pF -20+50% ceram DI	400 V
	C13	78.5055	2.5 - 9 pF trimmer DI	100 V
	C14		Printed capacitor	
	C15		2.5 - 9 pF trimmer DI	100 V
	C16	74.5301	3.3 pF ± 0.25 pF ceram PL	63 V
	C17	74.5162	470 pF -20+50% ceram DI	400 V
	C18	74.5162	470 pF -20+50% ceram DI	400 V
	C19	74.5123	1.6 pF ± 0.25 pF ceram DI	250 V
	C20	74.5161	470 pF -20+80% ceram PL	63 V
	C21	74.5162	470 pF -20+50% ceram DI	400 V
	C22		Helix Coil Adjustor	
	C23		Helix Coil Adjustor	
	C24	Heli	Helic Coil Adjustor	
	C25	74.5316	39 pF 5% ceram PL	63 V
	C26	74.5316	39 pF 5% ceram PL	63 V
	C27	74.5162	470 pF -20+50% ceram DI	400 V
	C28	74.5302	30 pF ± 0.25 pF ceram PL	63 V
	C29	74.5302	3.9 pF ± 0.25 pF ceram PL	63 V
	C30	74.5316	39 pF 5% ceram PL	63 V
	C31	74.5316	39 pF 5% ceram PL	63 V
	C32	74.5162	470 pF -20+50% ceram DI	400 V
	C33	74.5302	3.9 pF ± 0.25 pF ceram PL	63 V
	C34	74.5302	3.9 pF ± 0.25 pF ceram PL	63 V
	C35		Helix Coil Adjustor	
	C36		Helix Coil Adjustor	
	C37		Helix Coil Adjustor	
	C38		Printed Capacitor	
	C40	74.5198	1nF -20+50% ceram FT	30 V
	C41	74.5198	1 nF -20+50% ceram FT	30 V
	C42	74.5322	27 pF 20% ceram FT	400 V
	C50	78.5055	2.5 - 9 pF trimmer DI	100 V
	C51	74.5126	1.8 pF ± 0.25 pF ceram BD	250 V
	C52	74.5162	470 pF -20+50% ceram DI	400 V
	C53	74.5138	18 pF 5% ceram DI	125 V
	C54	74.5109	10 nF -20+80% ceram PL	20 V

Storno

TYPE	NO.	CODE	DATA		
	C55	76.5103	150 pF 2.5 % polystyr. TB		25 V
	C56	76.5101	68 pF 2.5 % polystyr. TB		25 V
	R1	80.5066	27 KΩ 5% carbon film		1/10W
	R2	80.5057	4.7 KΩ 5%	-	1/10W
	R3	80.5045	470 Ω 5%	-	1/10W
	R4	80.5033	47 Ω 5%	-	1/10W
	R5	80.5061	10 KΩ 5%	-	1/10W
	R6	80.5237	100 Ω 5%	-	1/8 W
	R7	80.5040	180 Ω 5%	-	1/10W
	R8	80.5066	27 KΩ 5%	-	1/10W
	R9	80.5065	22 KΩ 5%	-	1/10W
	R10	80.5033	47 Ω 5%	-	1/10W
	R11	80.5033	47 Ω 5%	-	1/10W
	R12	80.5073	100 KΩ 5%	-	1/10W
	R13	80.5054	2.7 KΩ 5%	-	1/10W
	R14	80.5025	10 Ω 5%	-	1/10W
	R15	80.5033	47 Ω 5%	-	1/10W
	R16	80.5066	27 KΩ 5%	-	1/10W
	R17	80.5065	22 KΩ 5%	-	1/10W
	R18	80.5045	470 Ω 5%	-	1/10W
	R19	80.5239	150Ω 5%	-	1/10W
	R20	80.5025	10 Ω 5%	-	1/10W
	R21	80.5033	47Ω 5%	-	1/10W
	R22	80.5058	5.8 KΩ 5%	-	1/10W
	R23	80.5051	1.5 KΩ 5%	-	1/10W
	R24	80.5036	82 Ω 5%	-	1/10W
	R25	80.5033	47 Ω 5%	-	1/10W
	R26	80.5057	4.7 KΩ 5%	-	1/10W
	R27	80.5051	1.5 KΩ 5%	-	1/10W
	R28	80.5035	68Ω 5%	-	1/10W
	R29	80.5033	47Ω 5%	-	1/10W
	R32	80.5058	5.6 KΩ 5%	-	1/10W
	R33	89.5069	1.5 KΩ 5% NTC		1/2 W
	R34	80.5061	10 KΩ 5% carbon film		1/10W
	R35	80.5047	680 Ω 5%	-	1/10W
	R40	80.5255	3.3 KΩ 5%	-	1/8 W
	R41	80.5036	82 Ω 5%	-	1/10W
	R42	80.5243	330 Ω 5%	-	1/8 W
	L1	61.1234	RF Coil		
	L2	61.1230	RF Coil		

RECEIVER CONVERTER
MODTAGERKONVERTER **RC762**

X 401.865

TYPE	NO.	CODE	DATA
	L3	61.1229	RC Coil 119-159 MHz
	L4	61.1221	RF Choke, R10 incl.
	L5	61.1227	RF Coil
	L6	62.0876	RF Coil
	L7	62.0877	RF Coil
	L8	62.0659/01	RF Choke 0.35 µH
	L9	61.1228	RF Coil
	L10	61.	Helix Coil 409.3-459.3 MHz
	L11	61.	Helix Coil 409.3-459.3 MHz
	L12	61.	Helix Coil 409.3-459.3 MHz
	L13	62.0875	RF Coil
	L14	62.0875	RF Coil
	L15	61.	Helix Coil 409.3-459.3 MHz
	L16	61.	Helix Coil 409.3-459.3 MHz
	L17	61.	Helix Coil 409.3-459.3 MHz
	L18	61.1117	IF Coil 10.7 MHz
	E1	99.5237	1N4148 Diode
	E2	99.5225	3.9 V Zenerdiode
	E3	99.5209	1.5 V Stab. diode
	Q1	99.5290	BFR90 Transistor
	Q2	99.5291	3N205 Transistor FET
	Q3	99.5240	BFX89 Transistor
	Q4	99.5291	3N205 Transistor FET
	Q5	99.5240	BFX89 Transistor
	Q6	99.5240	BFX89 Transistor
	Q7	99.5143	BC108 Transistor
	Q8	99.5236	BD136 Transistor
	Q9	99.5245	2N5245 Transistor J-FET

Storno

TYPE	NO.	CODE	DATA

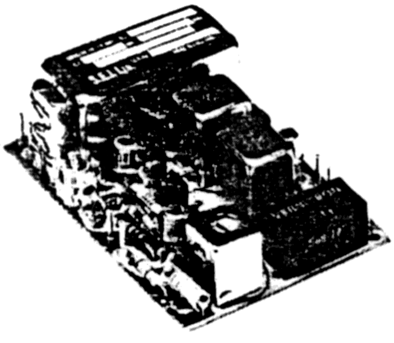
RECEIVER CONVERTER
MODTAGERKONVERTER

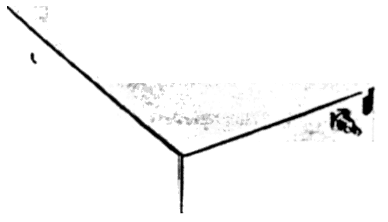
RC762

X401.865/2

Storno

IF CONVERTER IC701/IC703/IC704





Description

General

The IF converter converts the receiver section's 1st intermediate frequency of 10.7 MHz to 455 kHz which is the 2nd intermediate frequency

IC701 is employed in equipment fo 50 kH: channel separation.
IC703 is employed in equipment for 25 kHz and for 20 kHz separation.
IC704 is employed in equipment fo kHz channel separation.

All IC700 units contain the following stages:
a 10.7 MHz crystal filter
a high intermediate frequency amplifier
a local oscillator
a mixer
a 455 kHz ceramic filter

Crystal Filters

The requirements for selectivity are partly met through use of the crystal filter and partly through the 455 kHz ceramic filter in the output of the unit.

There are 3 different crystal filters employed, according to channel separation. One is for IC701, one is for IC703 and the last is for IC704. In IC701 and IC703 there are 4 crystals in the filter and in IC704 there are 6. The matching impedances for all three types are identical.

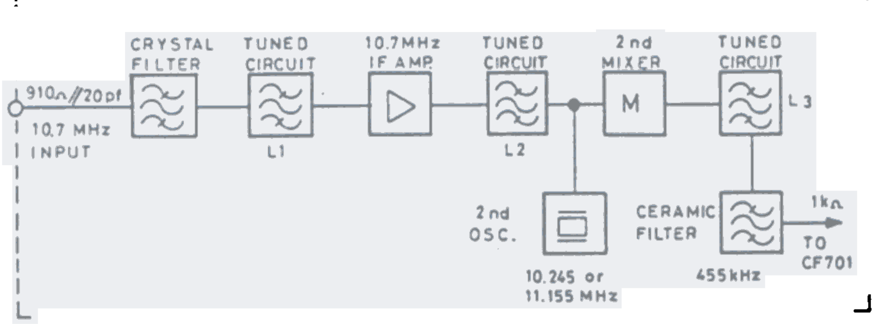
The crystal filter is coupled to the high intermediate frequency stage, Q1, through a parallel resonant circuit.

High IF Amplifie

A transistor having a low noise figure and minimum internal feedback is chosen for this circuit so that variations in the collector impedance will have negligible influence on the crystal matching impedance.

Oscillator

The oscillator is a crystal driven Colpitts oscillator in a grounded collector configuration. The crystal frequency is normally 10.245 MHz but in cases where



60.185-E1

Storno

Converter IC703

Input Frequency

10.7 MHz

Output Frequency

455 kHz

Input Impedance

910 Ω// 20 pF

Output Impedance

1 kΩ

Maximum Frequency Deviation

At 20 kHz bandwidth: ± 4 kHz

At 25 kHz bandwidth: ± 5 kHz

Bandwidth

At 3 dB attenuation relative to 10.7 MHz:

>± 5 kHz

<± 8.5 kHz

At 75 dB attenuation relative to 10.7 MHz:

± 17 kHz

Band-pass Ripple (typ. 1 dB)

gar. < 3 dB

Oscillator Frequency

Crystal specification S-98-12 in temp. range –25° to +65°C: 10.245 MHz or 11.155 MHz

Oscillator Frequency Adjustable by

$> \pm 30 \times 10^{-6}$

Voltage Gain (typ. 26 dB)

gar. > 23 dB

Current Consumption typ. 8 mA

Temperature Range

operating range: –25 to +65°C

functioning range: –30 to +75°C

Converter IC704

Input Frequency

10.7 MHz

Output Frequency

455 kHz

Input Impedance

910 Ω//20 pF

Output Impedance

1 kΩ

Maximum Frequency Deviation

± 2.5 kHz

Bandwidth

at 3 dB attenuation relative to 10.7 MHz:

> ± 2.7 kHz

at 6 dB attenuation relative to 10.7 MHz:

< ± 3.8 kHz

at 80 dB attenuation relative to 10.7 MHz:

< ± 10 kHz

Band-Pass Ripple, typ. 1 dB: gar. < 3 dB

Oscillator Frequency

Crystal spec. S-98-12 in temperature range –25° to +65°C: 10.245 or 11.155 MHz

Oscillator Frequency Adjustable by

$> \pm 30 \times 10^{-6}$

Voltage Gain (typ. 23 dB)

gar. > 20 dB

Current Consumption

8 mA

Temperature Range

operating range: –25° to +65°C

functioning range: –30° to +75°C

Storno

a harmonic of the local oscillator coincides with the receiver antenna frequency, interference can occur. Therefore, a crystal frequency of 11.155 MHz would be em - ployed instead.

The crystal operates in a parallel resonant circuit; fine-tuning adjustment of the oscillator frequency is performed with trimmer capacitor C12. The capacitive load for the crystal is made up of C14, C15 and C16, which also forms the necessary feedback loop. Variations in the IF amplifier have negligible influence on the oscillator frequency.

Mixer

The local oscillator signal and the 10.7 MHz IF signal are applied to the base of Q2. To achieve greater amplification, a bipolar transistor is employed here. In order that the bipolar mixer, however, does not deteriorate the excellent blocking and intermodulation characteristics achieved with the FET mixer in the receiver converter module, the crystal filter has been inserted.

Ceramic Filter

From the collector of the 2nd mixer the signal is passed via matching network L3 to a ceramic 455 kHz filter.

There are 3 different types of ceramic filters, one for each IC700 unit.

Strong signals can alter the output impedance of the 2nd mixer as well as the input impedance in the CF701 unit. Attenuating resistors are therefore inserted before and after the ceramic filter in order to ensure the least possible variation in filter matching impedance.
From the output of the ceramic filter the 455 kHz IF signal is coupled to the IF circuitry in CF701.

Technical Specifications

Converter IC701

Input Frequency
10.7 MHz

Output Frequency
455 kHz

Input Impedance
910 Ω // 20 pF

Output Impedance
1 kΩ

Maximum Frequency Diviation
± 15 kHz

Bandwidth
At 3 dB attenuation relative to 10.7 MHz:
> ± 12 kHz
< ± 20 kHz
At 70 dB attenuation relative to 10.7 MHz
< ± 35 kHz

Bandpass Ripple (typ. 1 dB)
gar. < 3 dB

Oscillator Frequency
Crystal spec. S-98-12 in temp. range
-25° to $+65^{\circ}$C: 10.245 MHz or 11.155 MHz

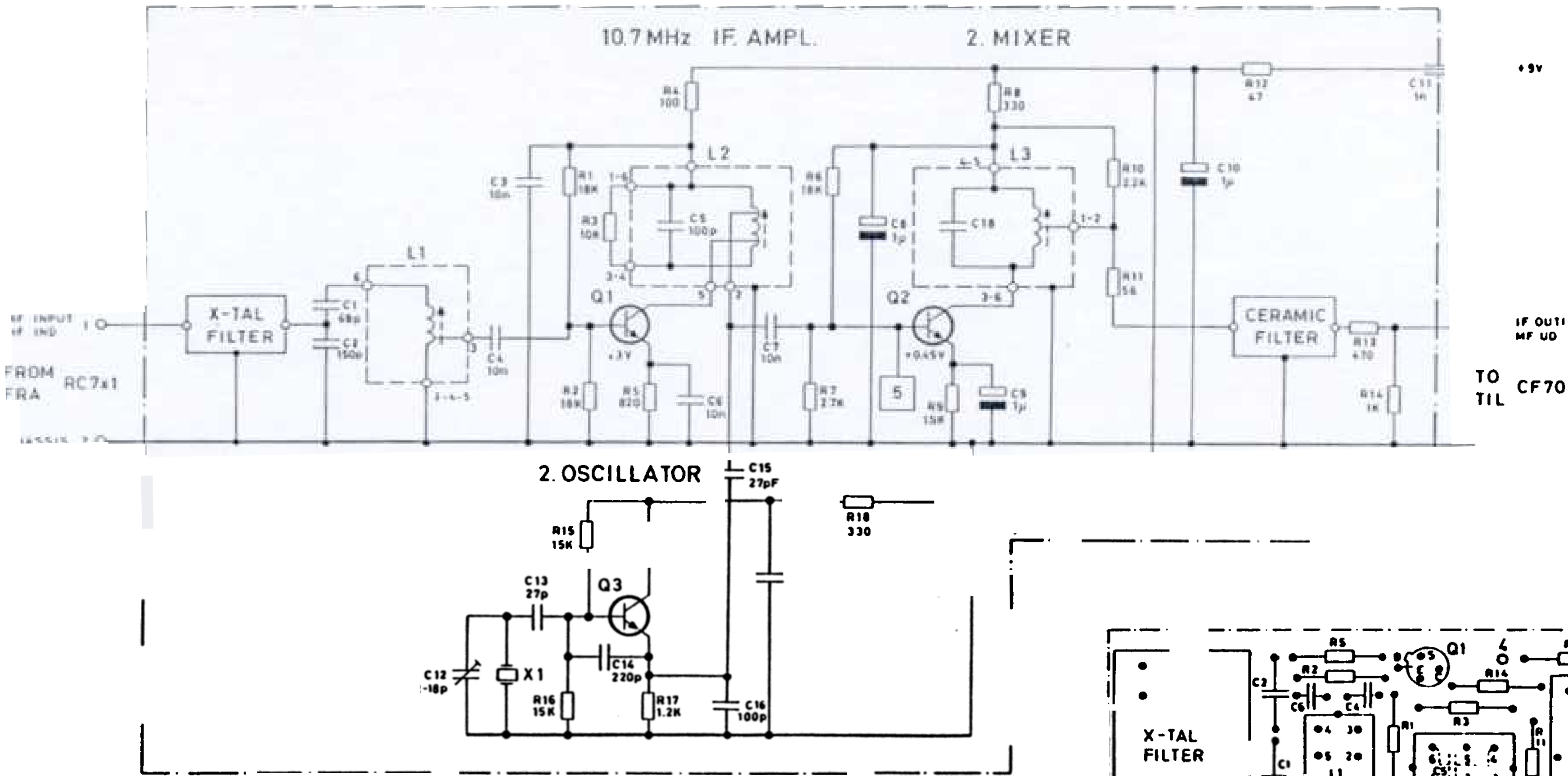
Oscillator Frequency adjustable by
$> \pm 30 \times 10^{-6}$

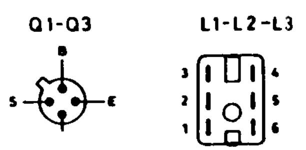
Voltage Gain (typ. 23 dB)
gar. > 20 dB

Current Consumption typ. 8 mA

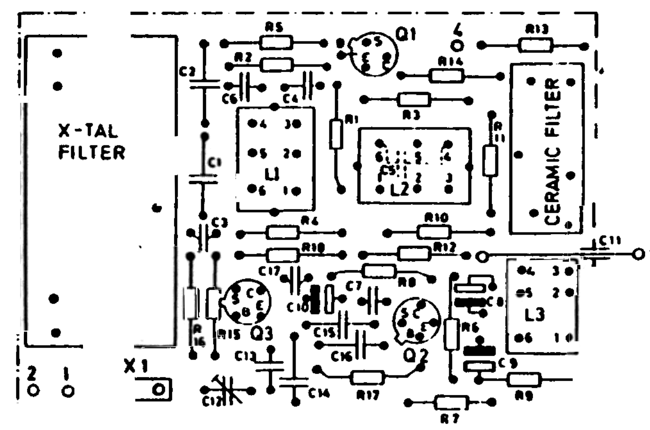
Temperature Range
operating range: -25° to $+65^{\circ}$C
functioning range: -30° to $+75^{\circ}$C

Storno





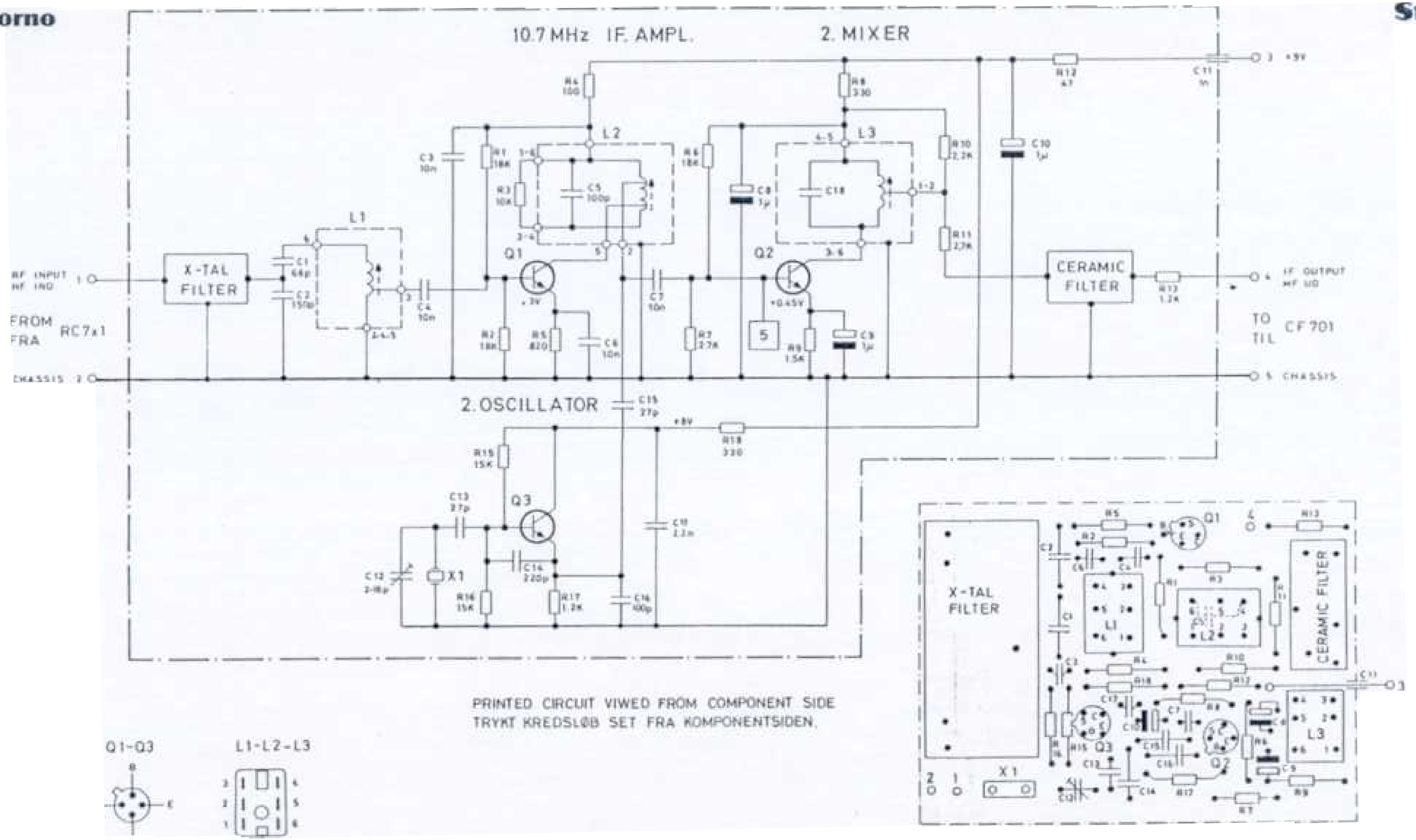
PRINTED CIRCUIT VIEWED FROM COMPONENT SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN



F CONVERTER IC701

D 401.326/3

Storno



BOTTOM VIEW
SET FRA BUNDEN

IF CONVERTER
MF KONVERTER

IC703

D401.327/2

TYPE	NO.	CODE	DATA	
IC701		10.2435	IF Converter	
	C1	76.5101	68 pF 2.5% polystyr TB	25V
	C2	76.5103	150 pF 2.5% polystyr TB	25V
	C3	76.5070	10 nF 10% polyest. FL	50V
	C4	76.5070	10 nF 10% polyest. FL	50V
	C5	76.5102	100 pF 2.5% polystyr TB	25V
	C6	76.5070	10 nF 10% polyest. FL	50V
	C7	76.5070	10 nF 10% polyest. FL	50V
	C8	73.5114	1 µF 20% tantal	35V
	C9	73.5114	1 µF 20% tantal	35V
	C10	73.5114	1 µF 20% tantal	35V
	C11	74.5167	1 nF -20 +80% ceram FT	300V
	C12	78.5044	2-18 pF trimmer	300V
	C13	74.5192	27 pF 5% ceram TB	160V
	C14	76.5104	220 pF 2.5% polystyr TB	25V
	C15	74.5107	27 pF 5% ceram	160V
	C16	76.5102	100 pF 2.5% polystyr TB	25V
	C17	76.5059	2.2 nF 10% polyest. FL	50V
	C18	76.5106	470 pF 2.5% polystyr	25V
	R1	80.5264	18 kΩ 5% carbon film	1/8W
	R2	80.5264	18 kΩ 5% " "	1/8W
	R3	80.5261	10 kΩ 5% " "	1/8W
	R4	80.5237	100 Ω 5% " "	1/8W
	R5	80.5248	820 Ω 5% " "	1/8W
	R6	80.5264	18 kΩ 5% " "	1/8W
	R7	80.5254	2.7 kΩ 5% " "	1/8W
	R8	80.5243	330 Ω 5% " "	1/8W
	R9	80.5251	1.5 kΩ 5% " "	1/8W
	R10	80.5253	2.2KΩ 5% " "	1/8W
	R11	80.5234	56 Ω 5% " "	1/8W
	R12	80.5233	47 Ω 5% " "	1/8W
	R13	80.5245	470 Ω 5% " "	1/8W
	R14	80.5249	1 kΩ 5% " "	1/8W
	R15	80.5263	15 kΩ 5% " "	1/8W
	R16	80.5263	15 kΩ 5% " "	1/8W
	R17	80.5250	1.2 kΩ 5% " "	1/8W
	R18	80.5243	330 Ω 5% " "	1/8W
	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	
		69.5015	Crystal Filter 10.7 MHz 50 KHz 50dB	

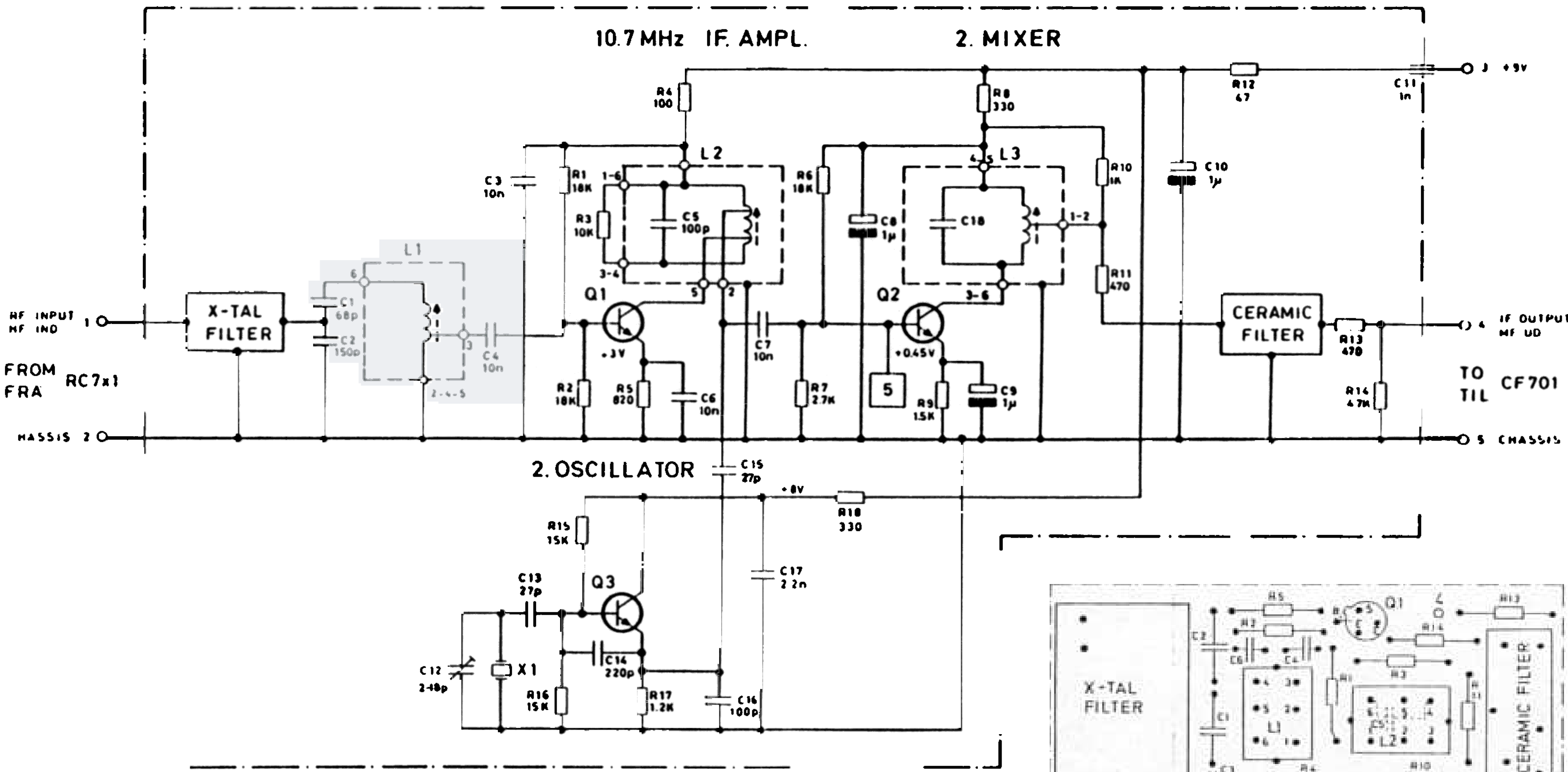
TYPE	NO.	CODE	DATA
		69.5013-00	Ceramic Filter 455 kHz
	Q1	99.5168	BF173 Transistor
	Q2	99.5166	BF167 Transistor
	Q3	99.5168	BF173 Transistor

TYPE	NO.	CODE	DATA	
IC703		10.2432	IF Converter	
	C1	76.5101	68 pF 2.5% polystyr TB	25V
	C2	76.5103	150 pF 2.5% polystyr TB	25V
	C3	76.5070	10 nF 10% polyest. FL	50V
	C4	76.5070	10 nF 10% polyest. FL	50V
	C5	76.5102	100 pF 2.5% polystyr TB	25V
	C6	76.5070	10 nF 10% polyest. FL	50V
	C7	76.5070	10 nF 10% polyest. FL	50V
	C8	73.5114	1µF 20% tantal	35V
	C9	73.5114	1 µF 20% tantal 0,6	35V
	C10	73.5114	1 µF 20% tantal	35V
	C11	74.5167	1 nF -20 +80% ceram FT	300V
	C12	78.5044	2-18 pF trimmer	300V
	C13	74.5192	27 pF 5% ceram TB	160V
	C14	76.5104	220 pF 2.5% polystyr TB	25V
	C15	74.5107	27 pF 5% ceram TB	160V
	C16	76.5102	100 pF 2.5% polystyr TB	25V
	C17	76.5059	2.2 nF 10% polyest. FL	50V
	C18	76.5106	470 pF 2.5% polystyr	25V
	R1	80.5264	18 kΩ 5% carbon film	1/8W
	R2	80.5264	18 kΩ 5% " "	1/8W
	R3	80.5261	10 kΩ 5% " "	1/8W
	R4	80.5237	100 Ω 5% " "	1/8W
	R5	80.5248	820 Ω 5% " "	1/8W
	R6	80.5264	18 kΩ 5% " "	1/8W
	R7	80.5254	2.7 kΩ 5% " "	1/8W
	R8	80.5243	330 Ω 5% " "	1/8W
	R9	80.5254	2.7 kΩ 5% " "	1/8W
	R10	80.5234	56 Ω 5% " "	1/8W
	R11	80.5254	2.7KΩ 5% " "	1/8W
	R12	80.5233	47 Ω 5% " "	1/8W
	R13	80.5250	1.2 kΩ 5% " "	1/8W
	R15	80.5263	15 kΩ 5% " "	1/8W
	R16	80.5263	15 kΩ 5% " "	1/8W
	R17	80.5250	1.2 kΩ 5% " "	1/8W
	R18	80.5243	330 Ω 5% " "	1/8W
	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	
		69.5031	Ceramic Filter 455 kHz	

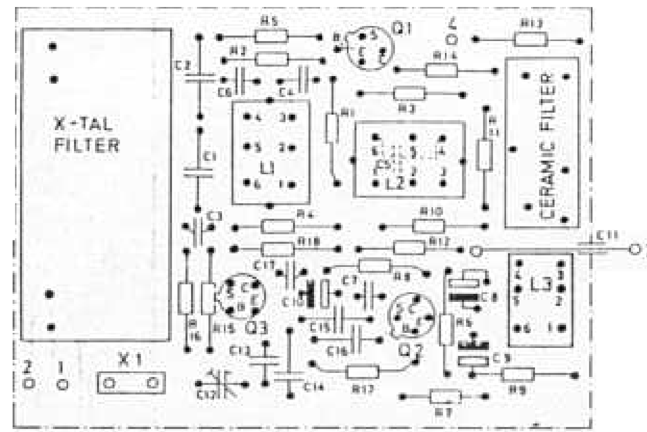
TYPE	NO.	CODE	DATA
	Q1	99.5168	BF173 Transistor
	Q2	99.5166	BF167 Transistor
	Q3	99.5168	BF173 Transistor

IF CONVERTER IC703

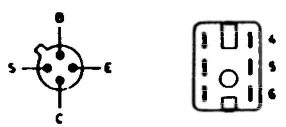
Storno



PRINTED CIRCUIT VIEWED FROM COMPONENT SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN



Q1-Q3 L1-L2-L3



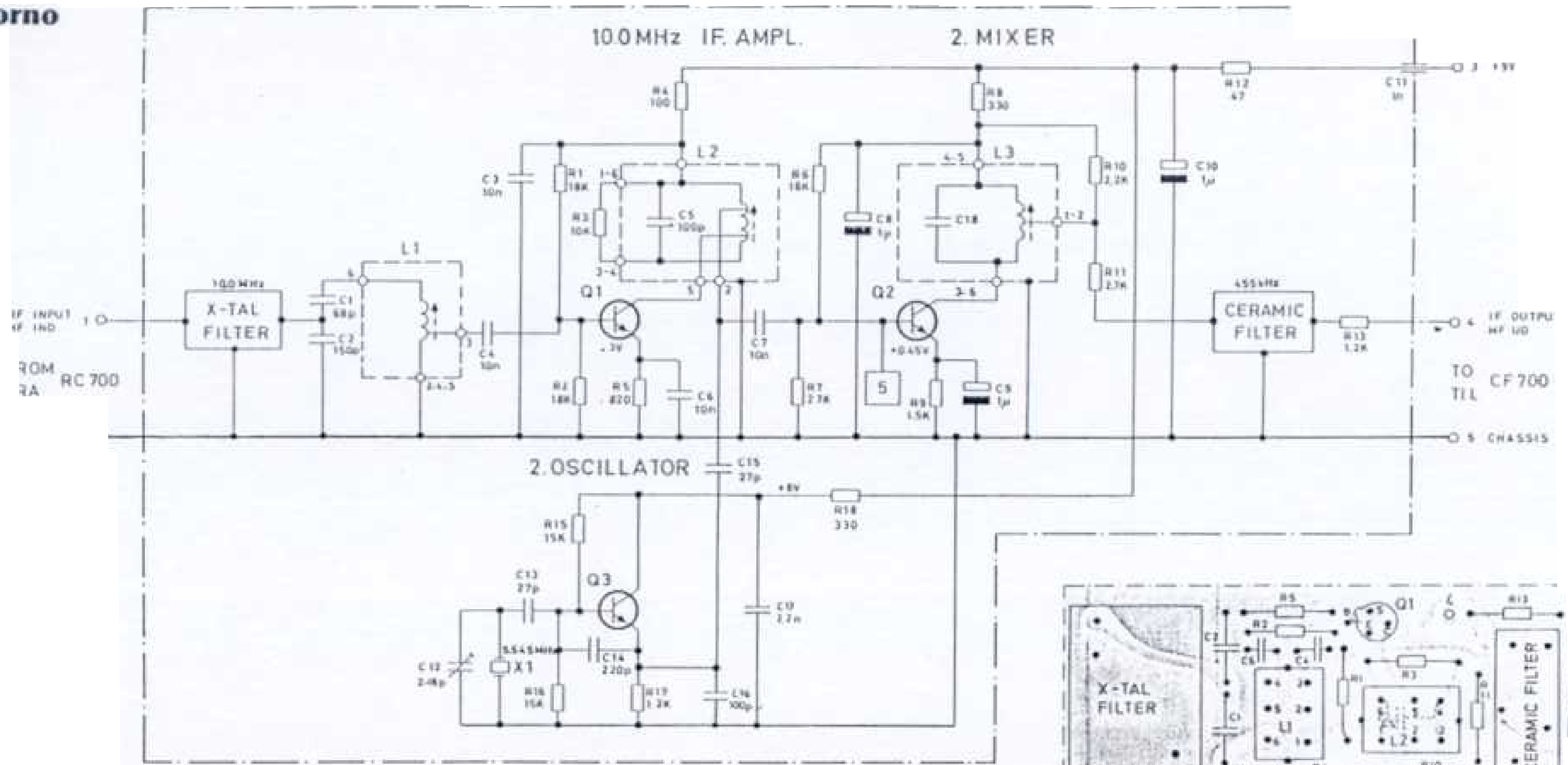
BOTTOM VIEW
SET FRA BUNDEN

IF CONVERTER
MF KONVERTER

IC704

D401.365/3

Storno



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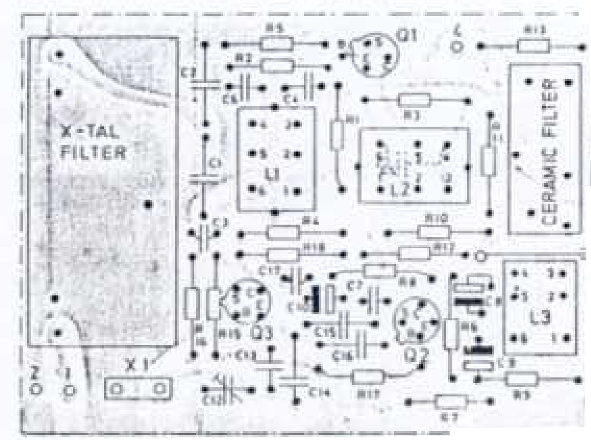
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN.



BOTTOM VIEW
SET FRA BUNDEN

IF CONVERTER
MF KONVERTER

IC705

D402.373

TYPE	NO.	CODE	DATA	
IC704		10.2517	IF Converter	
	C1	76.5101	68 pF 2.5% polystyr TB	25V
	C2	76.5103	150 pF 2.5% polystyr TB	25V
	C3	76.5070	10 nF 10% polyest. FL	50V
	C4	76.5070	10 nF 10% polyest. FL	50V
	C5	76.5102	100 pF 2.5% polystyr TB	25V
	C6	76.5070	10 nF 10% polyest. FL	50V
	C7	76.5070	10 nF 10% polyest. FL	50V
	C8	73.5114	1 µF 20% tantal	35V
	C9	73.5114	1 µF 20% tantal	35V
	C10	73.5114	1 µF 20% tantal	35V
	C11	74.5167	1 nF -20 +80% ceram FT	300V
	C12	78.5044	2-18 pF trimmer	300V
	C13	74.5192	27 pF 5% ceram TB	160V
	C14	76.5104	220 pF 2.5% polystyr TB	25V
	C15	74.5107	27 pF 5% ceram TB	160V
	C16	76.5102	100 pF 2.5% polystyr TB	25V
	C17	76.5059	2.2 nF 10% polyest. FL	50V
	C18	76.5106	470 pF 2.5% polystyr	25V
	R1	80.5264	18 kΩ 5% carbon film	1/8W
	R2	80.5264	18 kΩ 5% " "	1/8W
	R3	80.5261	10 kΩ 5% " "	1/8W
	R4	80.5237	100 Ω 5% " "	1/8W
	R5	80.5248	820 Ω 5% " "	1/8W
	R6	80.5264	18 kΩ 5% " "	1/8W
	R7	80.5254	2.7 kΩ 5% " "	1/8W
	R8	80.5243	330 Ω 5% " "	1/8W
	R9	80.5251	1.5 kΩ 5% " "	1/8W
	R10	80.5249	1 kΩ 5% " "	1/8W
	R11	80.5245	470 Ω 5% " "	1/8W
	R12	80.5233	47 Ω 5% " "	1/8W
	R13	80.5245	470 Ω 5% " "	1/8W
	R14	80.5257	4.7 kΩ 5% " "	1/8W
	R15	80.5263	15 kΩ 5% " "	1/8W
	R16	80.5263	15 kΩ 5% " "	1/8W
	R17	80.5250	1.2 kΩ 5% " "	1/8W
	R18	80.5243	330 Ω 5% " "	1/8W
	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	

TYPE	NO.	CODE	
		69.5018	Crys
		69.5014-00	Cera
	Q1	99.5168	BF1
	Q2	99.5166	BF1
	Q3	99.5168	BF1

IF CON ERTEI
MF KONV E RTER

IC 04

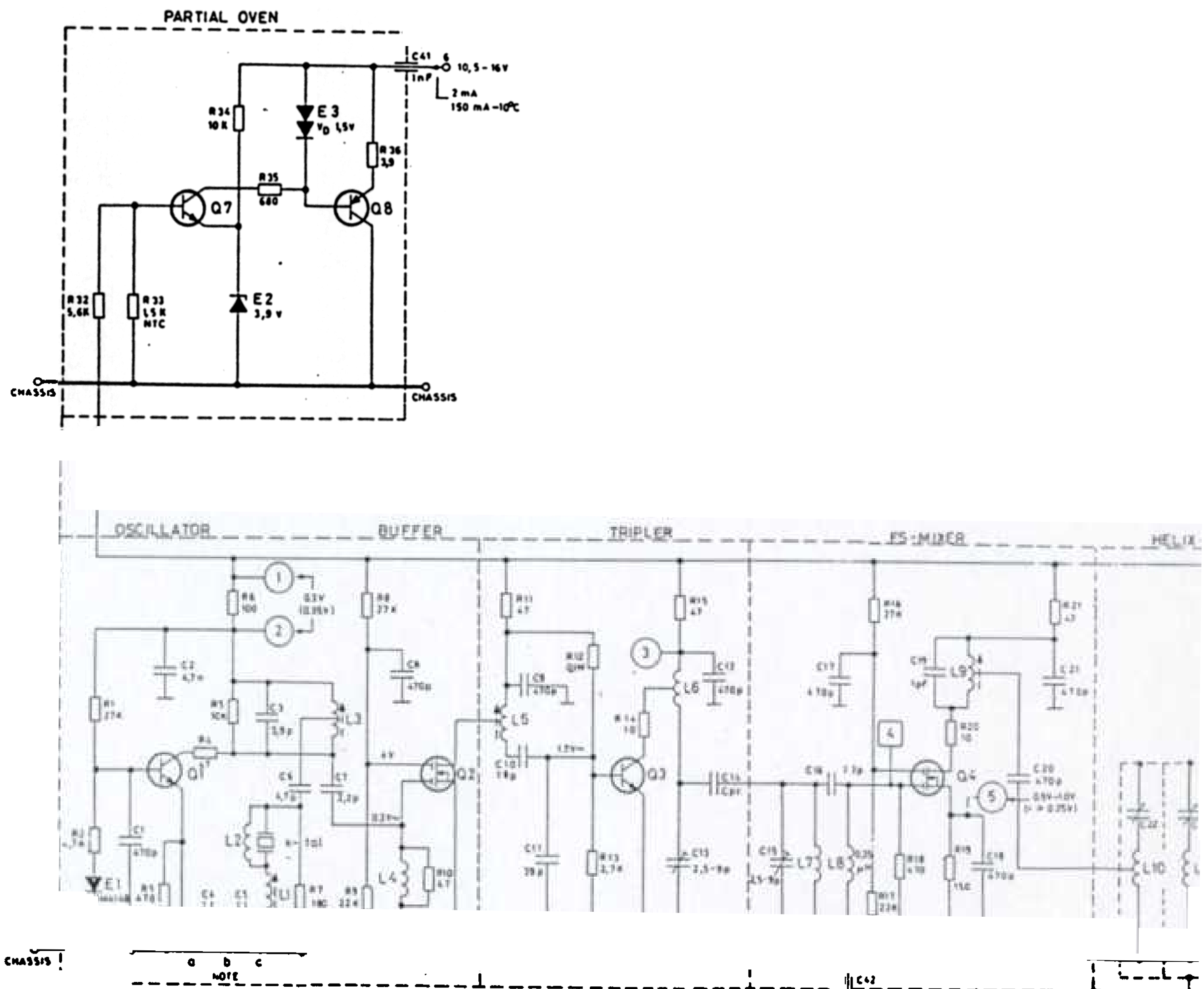
X10 795/2

TYPE	Nº	CODE	DATA	
		10.3498	IC 705 IF Converter	
	C1	76.5101	68pF 2.5% polystyr. TB	25V
	C2	76.5103	150pF 2.5% polystyr. TB	25V
	C3	76.5070	10nF 10% polyest. FL	50V
	C4	76.5070	10nF 10% polyest. FL	50V
	C5	76.5102	100pF 2.5% polyest. FL	50V
	C6	76.5070	10nF 10% polyest. FL	50V
	C7	76.5070	10nF 10% polyest. FL	50V
	C8	73.5114	1uF 20% tantal.	35V
	C9	73.5114	1uF 20% tantal.	35V
	C10	73.5114	1uF 20% tantal.	35V
	C11	74.5167	1nF- 20/+80% ceram FT	300V
	C12	78.5044	2-18pF teflon	300V
	C13	74.5192	27pF 5% ceram TB	160V
	C14	76.5104	220pF 2.5% polystyr. TB	25V
	C15	74.5107	27pF 5% ceram. TB	160V
	C16	76.5102	100pF 2.5% polystyr. TB	25V
	C17	76.5059	2.2nF 10% polyest. FL	50V
	R1	80.5264	18 Kohm 5% carbon film	0.125W
	R2	80.5264	18 Kohm 5% " "	0.125W
	R3	80.5261	10 Kohm 5% " "	0.125W
	R4	80.5237	100 ohm 5% " "	0.125W
	R5	80.5248	820 ohm 5% " "	0.125W
	R6	80.5264	18 Kohm 5% " "	0.125W
	R7	80.5254	2.7 Kohm 5% " "	0.125W
	R8	80.5243	330 ohm 5% " "	0.125W
	R9	80.5251	1.5 Kohm 5% " "	0.125W
	R10	80.5253	2.2 Kohm 5% " "	0.125W
	R11	80.5254	2.7 Kohm 5% " "	0.125W
	R12	80.5233	47 ohm 5% " "	0.125W
	R13	80.5250	1.2 Kohm 5% " "	0.125W
	R14		Not used	
	R15	80.5263	15 Kohm 5% " "	0.125W
	R16	80.5263	15 Kohm 5% " "	0.125W
	R17	80.5250	1.2 Kohm 5% " "	0.125W
	R18	80.5243	330 ohm 5% " "	0.125W
	L1	61.1122	10.0 MHz IF coil	
	L2	61.5023	10.0 MHz IF coil	
	L3	61.5021	455 kHz IF coil	
	X1	98.5014	9.545 MHz Crystal	
		69.5032	10.0 MHz Crystal Filter	
		69.5031	455 kHz Ceramic Filter 20/25 kHz	

TYPE	Nº	CODE	DATA
	Q1	99.5168	BF 173 Transistor
	Q2	99.5166	BF 167 Transistor
	Q3	99.5168	BF 173 Transistor

IF CONVERTER IC705

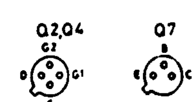
Storno



NOTE

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

( ) MEASURED WITH DRIVE
MÅLT MED UDSTYRING



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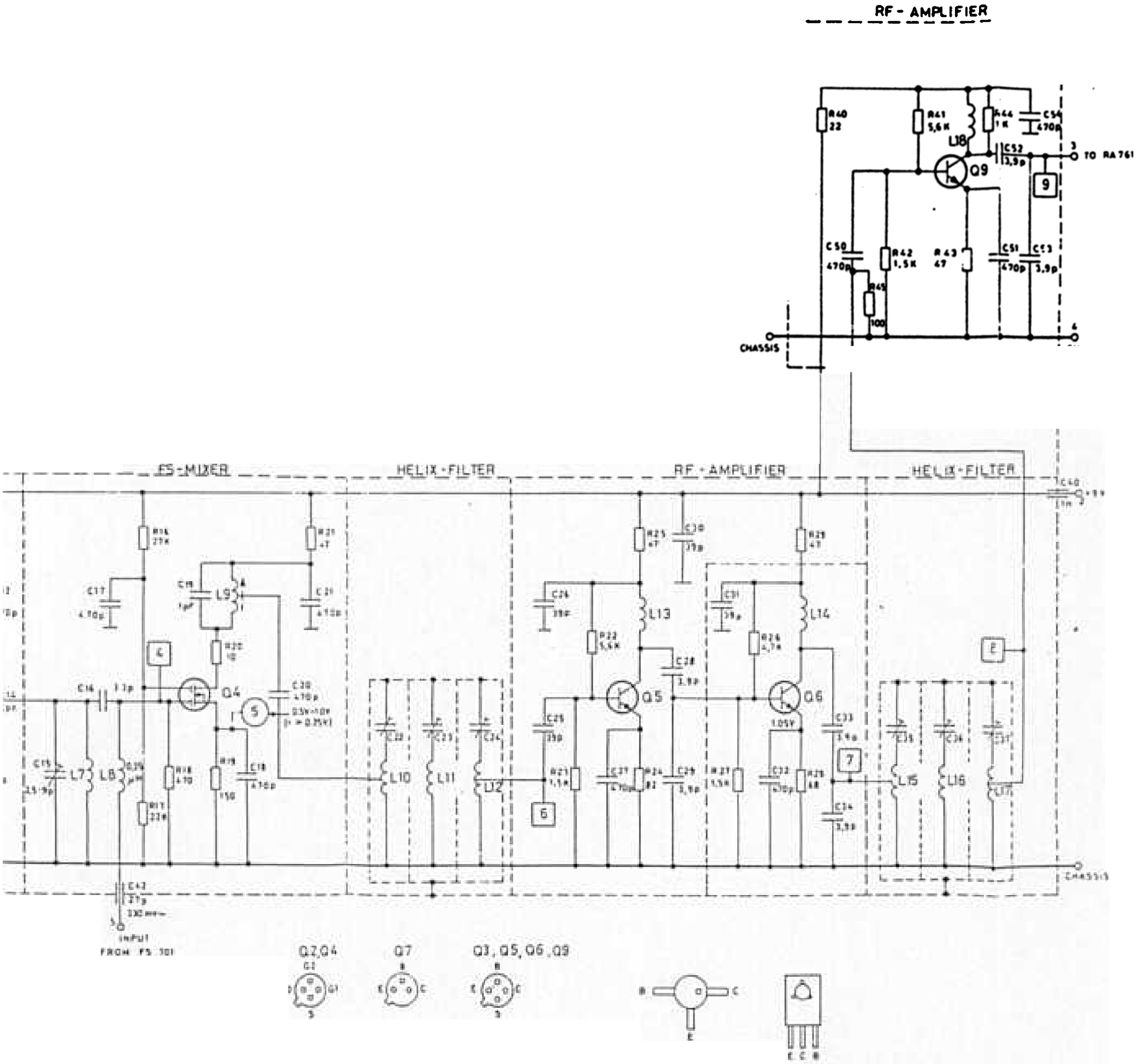
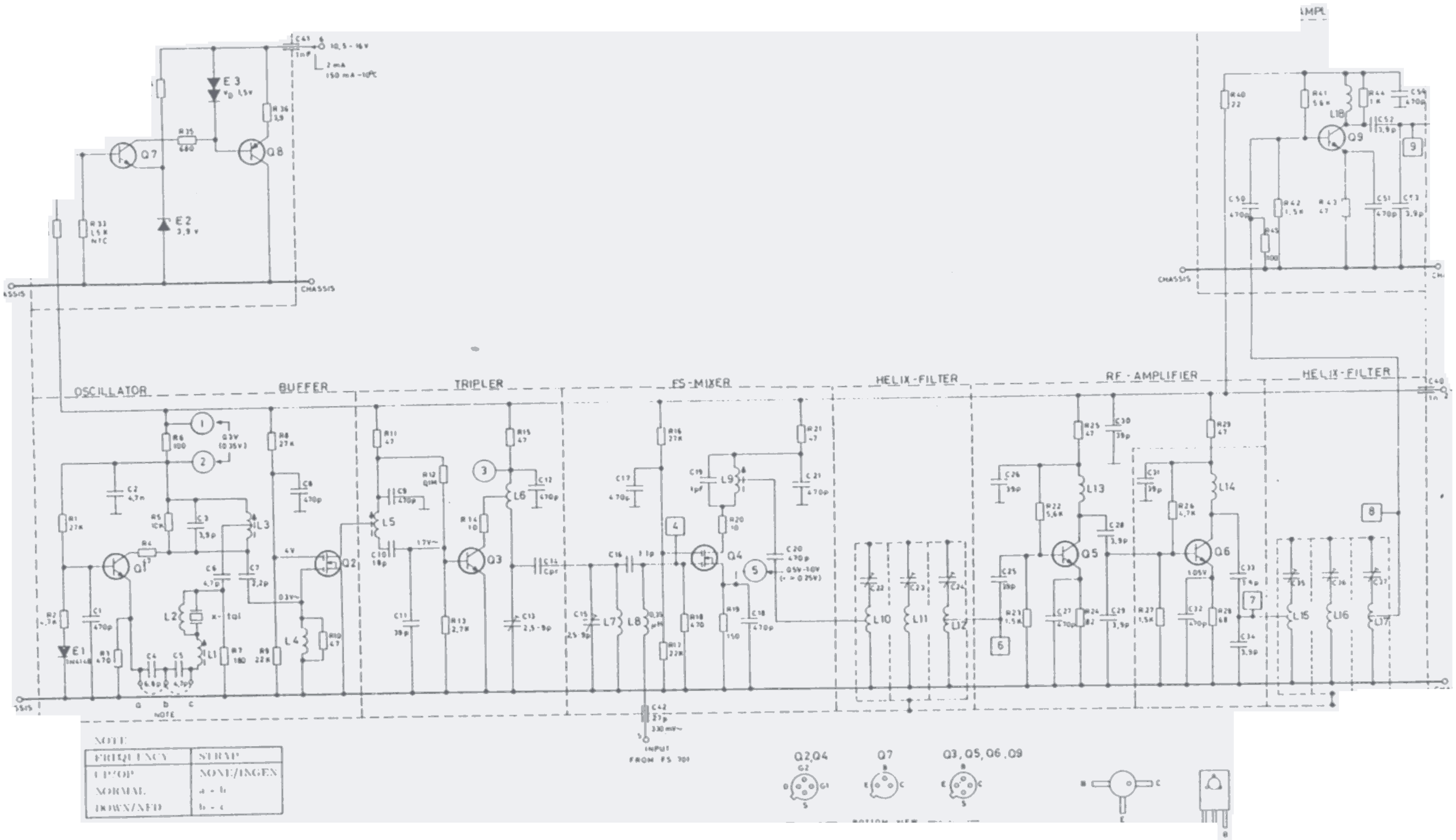


EXCITER
STYRESENDER

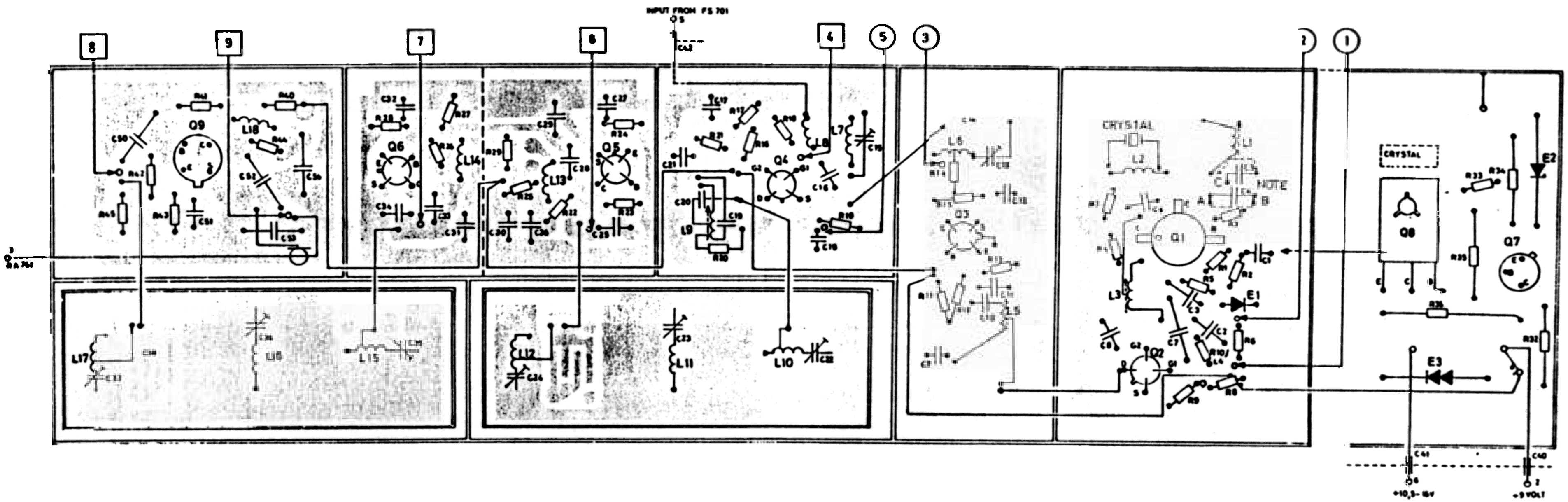
EX762

D 401.805

Storno



OSCILLATOR
BUFFER
TRIPLER
FS-MIXER
HELIX-FILTER
RF-AMPLIFIER
HELIX-FILTER
CHASSIS
10,5 - 16 V
2 mA
150 mA -10°C
INPUT
FROM FS 701
Q2,Q4
Q7
Q3, Q5, Q6, Q9
NOTE
FREQUENCY
STRAP
UP/OP
NONE/INGEN
NORMAL
a - b
DOWN/NED
b - c



EXCITER
STYRESENDER

EX762

D401.892

Storno

TYPE	NO.	CODE	DATA	
EX762		10.2924		
	C1	74.5162	470 pF -20+50% ceram DI	400 V
	C2	74.5108	4.7 nF -20+80% ceram PL	20 V
	C3	74.5302	3.9 pF ±0.25 pF ceram PL	63 V
	C4	74.5321	6.8 pF ± 0.25 pF ceram PL	100 V
	C5	74.5318	4.7 pF ± 0.25 pF ceram PL	100 V
	C6	74.5108	4.7 nF -20+80% ceram PL	20 V
	C7	74.5299	2.2 pF ± 0.25 pF ceram PL	63 V
	C8	74.5161	470 pF -20+80% ceram PL	63 V
	C9	74.5162	470 pF -20+80% ceram DI	400 V
	C10	74.5310	18 pF 5% ceram PL	63 V
	C11	74.5316	39 pF 5% ceram PL	63 V
	C12	74.5162	470 pF -20+50% ceram DI	100 V
	C13	78.5055	2.5-9 pF trimmer DI	100 V
	C14		Printed Capacitor	
	C15	78.5055	2.5-9 pF trimmer DI	100 V
	C16	74.5301	3.3 pF± 0.25 pF ceram PL	63 V
	C17	74.5162	470 pF -20+50% ceram DI	400 V
	C18	74.5162	470 pF -20+50% ceram DI	400 V
	C19	74.5123	1.0 pF ±0.25 pF ceram DI	250 V
	C20	74.5161	480 pF -20+80% ceram PL	63 V
	C21	74.5162	470 pF -20+50% ceram DI	400 V
	C22		Helix Coil Adjustor	
	C23		Helix Coil Adjustor	
	C24		Helix Coil Adjustor	
	C25	74.5316	39pF 5% ceram PL	63 V
	C26	74.5316	39 pF 5% ceram PL	63 V
	C27	74.5162	470 pF -20+50% ceram DI	400 V
	C28	74.5302	3.9 pF ± 0.25 pF ceram PL	63 V
	C29	74.5302	3.9 pF ± 0.25 pF ceram PL	63 V
	C30	74.5316	39 pF 5% ceram PL	63 V
	C31	74.5316	39 pF 5% ceram PL	63 V
	C32	74.5162	470 pF -20+50% ceram DI	400 V
	C33	74.5302	3.9 pF ± 0.25 pF ceram PL	63 V
	C34	74.5302	3.9 pF ± 0.25 pF ceram PL	63 V
	C35		Helix Coil Adjustor	
	C36		Helix Coil Adjustor	
	C37		Helix Coil Adjustor	
	C40	74.5198	1 nF -20+50% ceram FT	30 V
	C41	74.5198	1 nF -20+50% ceram FT	30 V
	C42	74.5322	27 pF 20% ceram FT	400 V
	C50	74.5161	470 pF -20+80% ceram PL	63 V
	C51	74.5162	470 pF -20+50% ceram DI	400 V
	C52	74.5130	3.9 pF ± 0.25 pF ceram DI	250 V
	C53	74.5130	3.9 pF ±0.25 pF ceram DI	250 V
	C54	74.5161	470 pF -20+80% ceram PL	63 V

Storno

TYPE	NO.	CODE	DATA		
	R1	80.5066	27 KΩ 5% carbon film		1/10W
	R2	80.5057	4.7 KΩ 5%	-	1/10W
	R3	80.5045	470 Ω 5%	-	1/10W
	R4	80.5033	47 Ω 5%	-	1/10W
	R5	80.5061	10 KΩ 5%	-	1/10W
	R6	80.5237	100 Ω 5%	-	1/8W
	R7	80.5040	180 Ω 5%	-	1/10W
	R8	80.5066	27 KΩ 5%	-	1/10W
	R9	80.5065	22 KΩ 5%	-	1/10W
	R10	80.5033	47 Ω 5%	-	1/10W
	R11	80.5033	47 Ω 5%		1/10W
	R12	80.5073	100 KΩ 5%		1/10W
	R13	80.5054	2.7 KΩ 5%		1/10W
	R14	80.5025	10 Ω 5%		1/10W
	R15	80.5033	47 Ω 5%		1/10W
	R16	80.5066	27 KΩ 5%		1/10W
	R17	80.5065	22 KΩ 5%		1/10W
	R18	80.5045	470 Ω 5%		1/10W
	R19	80.5239	150 Ω 5%	-	1/8 W
	R20	80.5025	10 Ω 5%	-	1/10W
	R21	80.5033	47 Ω 5%	-	1/10W
	R22	80.5058	5.6 KΩ 5%	-	1/10W
	R23	80.5051	1.5 KΩ 5%	-	1/10W
	R24	80.5036	82Ω 5%	-	1/10W
	R25	80.5033	47 Ω 5%	-	1/10W
	R26	80.5057	4.7 KΩ 5%	-	1/10W
	R27	80.5051	1.5 KΩ 5%	-	1/10W
	R28	80.5035	68 Ω 5%-	-	1/10W
	R29	80.5033	47 Ω 5%	1/10W	1/10W
	R32	80.5058	5.6 KΩ 5%	-	1/10W
	R33	89.5060	1.5 KΩ 5% NTC		1/2 W
	R34	80.5061	10 KΩ 5% carbon film		1/10W
	R35	80.5047	680Ω 5%	-	1/10W
	R40	80.5029	22 Ω 5%	-	1/10W
	R41	80.5058	5.6 KΩ 5%	-	1/10W
	R42	80.5051	1.5 KΩ 5%	-	1/10W
	R43	80.5033	47 Ω 5%	-	1/10W
	R44	80.5049	1 KΩ 5%	-	1/10W
	R45	80.5037	100 Ω 5%	-	1/10W
	L1	61.1234	RF Coil		
	L2	61.1230	RF Coil		

EXCITER
STYRESENDER

EX762

X 401.867

TYPE	NO.	CODE	DATA
	L3	61.1229	RF Coil 119-159 MHz
	L4	61.1231	RF Choke, R10 incl.
	L5	61.1227	RF Coil
	L6	62.0876	RF Coil
	L7	62.0877	RF Coil
	L8	62.0659-01	RF Choke 0.35 μH
	L9	61.1228	RF Coil
	L10	61.	Helix Coil 409.3-459.3 MHz
	L11	61.	Helix Coil 409.3-459.3 MHz
	L12	61.	Helix Coil 409.3-459.3 MHz
	L13	62.0875	RF Coil
	L14	62.0875	RF Coil
	L15	61.	Helix Coil 409.3-459.3 MHz
	L16	61.	Helix Coil 409.3-459.3 MHz
	L17	61.	Helix Coil 409.3-459.3 MHz
	L18	62.0875	RF Coil 420-470 MHz
	E1	99.5237	1N4148 Diode
	E2	99.5225	3.9 V Zenerdiode
	E3	99.5209	1.5 V Stab. diode
	Q1	99.5290	BFR90 Transistor
	Q2	99.5291	3N205 Transistor FET
	Q3	99.5240	BFX80 Transistor
	Q4	99.5291	3N205 Transistor FET
	Q5	99.5240	BFX89 Transistor
	Q6	99.5240	BFX89 Transistor
	Q7	99.5143	BC108 Transistor
	Q8	99.5236	BD136 Transistor
	Q9	99.5240	BFX89 Transistor

Storno

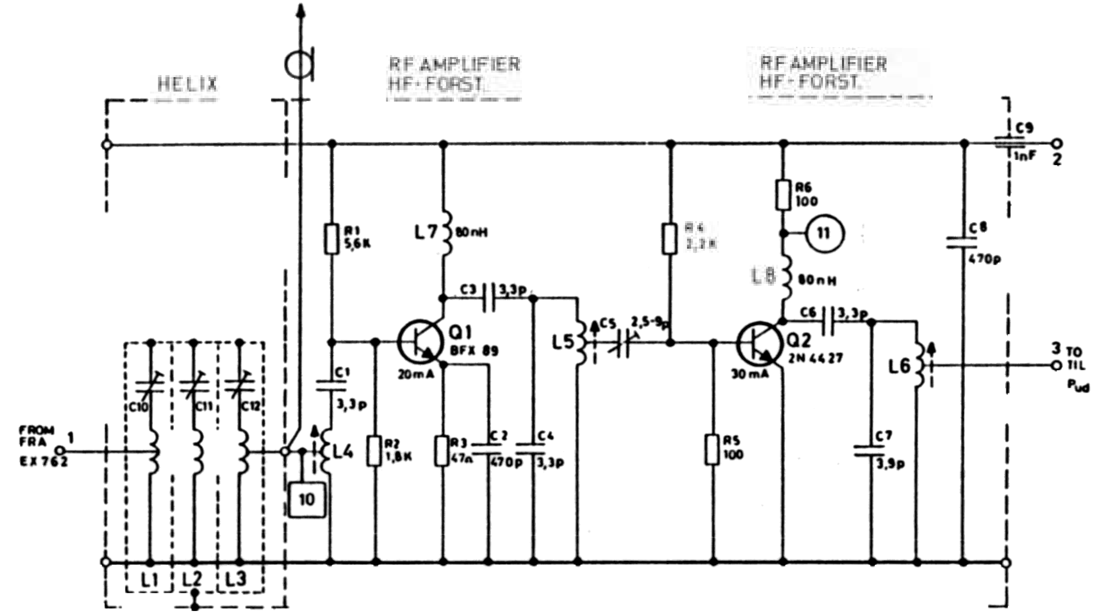
TYPE	NO.	CODE	DATA

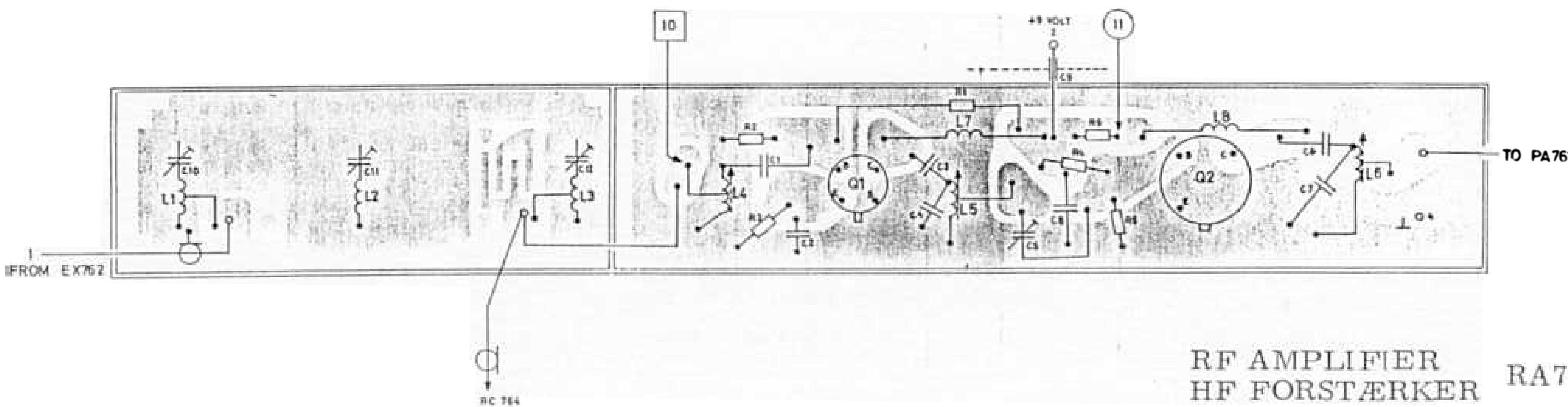
EXCITER
STYRESENDER

EX762

X401.867

Storno





RF AMPLIFIER
HF FORSTÆRKER

RA76

D 401.778

Storno

TYPE	NO.	CODE	DATA	
RA761		10.2925	RF Amplifi	
	C1	74.5129	3.3 pF ± 0.25 pF ceram DI	250 V
	C2	74.5162	470 pF-20+50% ceram DI	400 V
	C3	74.5129	3.3 pF ± 0.25 pF ceram DI	250 V
	C4	74.5129	3.3 pF ± 0.25 pF ceram DI	250 V
	C5	78.5055	2.5 - 9 pF trimmer	100 V
	C6	74.5129	3.3 pF ± 0.25 pF ceram DI	250 V
	C7	74.5130	3.9 pF ± 0.25 pF ceram DI	250 V
	C8	74.5161	470 pF-20 +80% ceram PL	63 V
	C9	74.5198	1 nF -20+50% ceram FT	30 V
	R1	80.5058	5.6 KΩ 5% carbon film	0.1 W
	R2	80.5052	1.8 KΩ 5% -	0.1 W
	R3	80.5033	47 Ω 5% -	0.1 W
	R4	80.5053	2.2 KΩ 5% -	0.1 W
	R5	80.5037	100Ω 5% -	0.1 W
	R6	80.5237	100 Ω 5% -	1/8 W
	L1	61.	Helix coil 420-470 MHz	
	L2	61.	Helix Coil 420-470 MHz	
	L3	61.	Helix Coil 420-470 MHz	
	L4	61.1223	RF-Coil 420-470 MHz	
	L5	61.1224	RF Coil 420-470 MHz	
	L6	61.1224	RF Coil 420-470 MHz	
	L7	62.0651	0.08 µH RF choke	
	L8	62.0651	0.08 µH RF choke	
	Q1	99.5240	BFX89 Transistor	
	Q2	99.5229	2N4427 Transistor	

Storno

TYPE	NO.	CODE	DATA

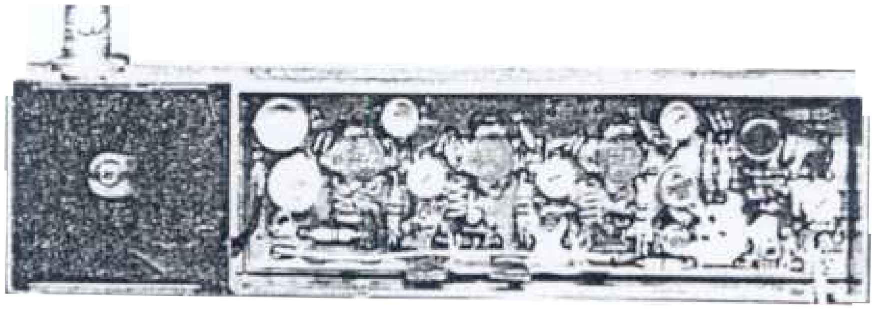
RF AMPLIFIER
HF FORSTÆRKER

RA761

X 401.860

Storno

RF POWER AMPLIFIER PA761

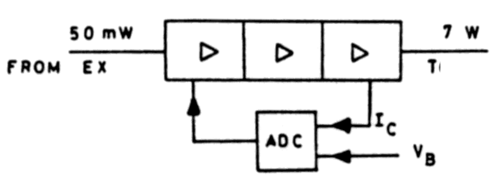


Description

General

PA761 contains 4 power amplifier stages and a current regulating circuit. It is built on a double-sided printed circuit board and includes transistors packaged in capstan-type housings. The unit is completely shielded, being built into a combination heat sink and shield which also contains the antenna switching unit.

The current regulating circuit monitors both the supply voltage and the output transistor collector current, preventing overloading of the transistors due to either too high a voltage or too great a standing wave ratio in the output load. This circuit also allows the output power to be more independent of the power supply or of variations in power output from the exciter.



RF Power Amplifier

The first driver, Q3, gets its collector voltage via the ADC circuit regulating transistor, Q2. Increasing or decreasing the collector voltage to Q3 regulates the drive power applied to the following stages.

π -network C3, L1 and C4 matches the exciter output impedance to the input impedance of Q3. Due to this impedance matching it is also possible to drive the PA stage from a 50 Ω generator. Q3 amplifies the exciter signal of about 50 mW to approx. 100 mW, which is necessary to drive Q4 properly.

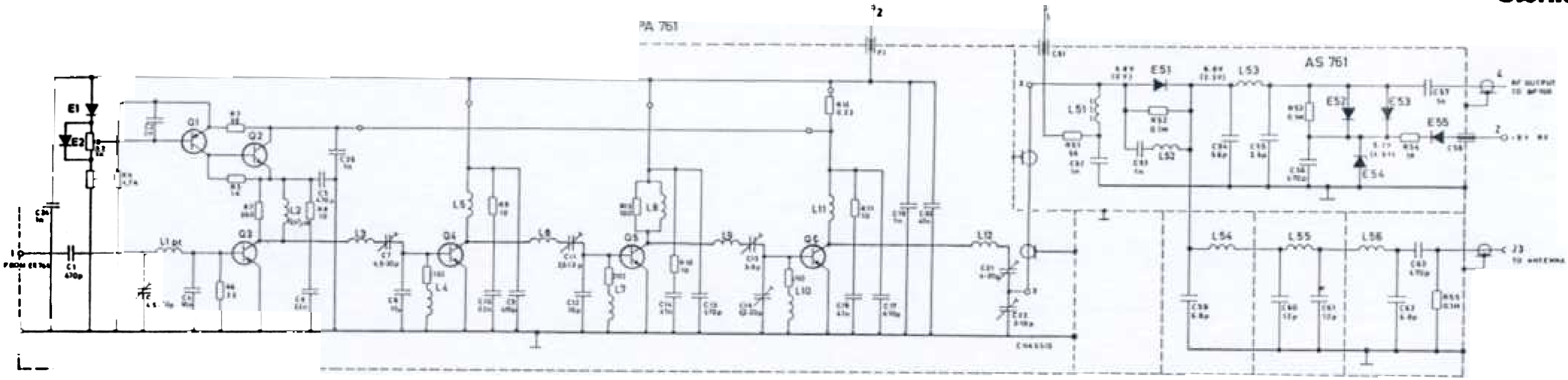
Transistors Q4 and Q5 further amplify the power to approx. 2W in order to drive the final power amplifier, Q6.

Output transistor Q6 amplifies the RF power signal to approximately 7 W and the following matching network of L12, C21 and C22 suppresses harmonics of the fundamental VHF frequency while transforming the collector impedance of Q6 to the antenna impedance of 50 Ω. Resistor R12 in the output transistor collector path is the current monitoring resistor for the ADC circuit.

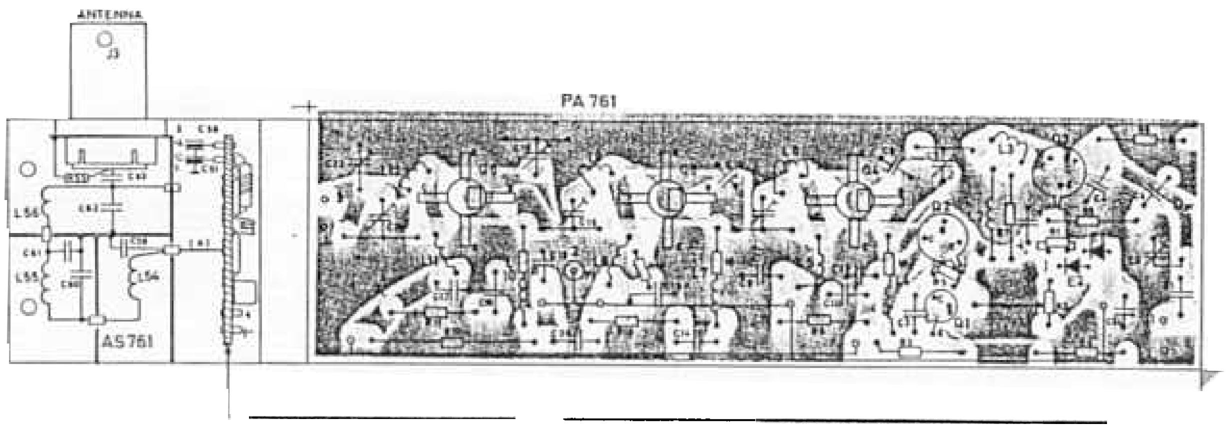
Current Regulating Circuit (ADC)

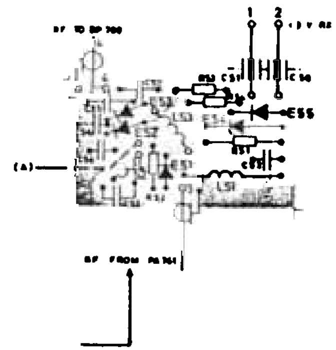
The purpose of the regulating circuit is to protect the transistors against overloads caused by too high a supply voltage and to limit current through the output transistor in case of mismatching. To accomplish this, the regulating circuit must monitor the supply voltage as well as the collector current through the transistor and from such results regulate the collector voltage to the first RF driver transistor, Q3, and thus the drive power to the following stages.

Storno



DC VOLTAGE WITHOUT ( ) DURING TRANSMITTING
DC VOLTAGE WITH ( ) DURING RECEIVING





PRINTED CIRCUIT VIEWED FROM COMPONENT SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN

POWER AMPLIFIER PA761

D401.324/5

The circuit consists of two DC coupled transistor stages, Q1 and Q2. Base to Q1 is tied to a reference voltage that can be determined by setting the trimming potentiometer, R2. Reference voltage is developed across diodes E1 and E2, which are biased into forward conduction. This introduces a temperature dependency in the rerence voltage that compensates for the temperature characteristics of the transistors.

For easier understanding of the circuit principle, first ignore its voltage dependent features; therefore, imagine that resistor R4 is removed from the circuit.

The DC return path for the emitter of Q1 is through R12 to the positive voltage terminal. R12 carries the collector current from the output amplifier, Q6. A rise in this collector current will mean an increase in the voltage drop across R12, causing the emitter of Q1 to become less positive and the collector voltage will likewise become less positive. This decreases bias to Q2, decreasing the current through this transistor. Since Q2 is in series with the DC collector path of Q3, the effect will be that of placing a larger resistor in series with the collector supply, thus reducing collector voltage to Q3. The RF drive to the output stage will fall, thereby counteracting the original increase in collector current.

If the supply voltage increases, the current through the output transistors will be kept constant as already explained, but the power dissipation in the transistor will increase along with the voltage. To counteract this effect, a voltage regulating loop is included.

Imagine R4 connected back into the circuit again so that a voltage divider consisting of R3 and R4 will develop a voltage across R3 in proportion to the supply voltage.

When the supply voltage increases so will the voltage drop across R3 and the base-emitter bias for Q1 will fall, again resulting in a reduction of collector voltage to Q3 and a reduction in the drive to the output stage.

The reduction of drive power decreases the current through Q6 and R12 just enough to counteract the original increase of voltage across R3. By selecting a suitable ratio between resistors R3, R4 and R12 the desired amount of regulation can be achieved.

Technical Specification

Frequency Range

400 to 470 MHz

Supply Voltage

Nominal	13.6 V (12.5 V)
Operating range	10 - 16 V

Output Power at 13.6 V : 6.5 W

With output power set for 6 W at 16 V, as measured through AS761

Output power at 16 V	6 W
Output power at 12.5 V	6 W
Output power at 10 V	4 W

Current Consumption

at nominal voltage 13.6 V	1.2 A
at 16 V :	1.0 A
at 10 V :	1.1 A

Input Power

50 mW

Input Impedance

50 Ω

Output Impedance

50 Ω

Gain

22 dB

Temperature Range

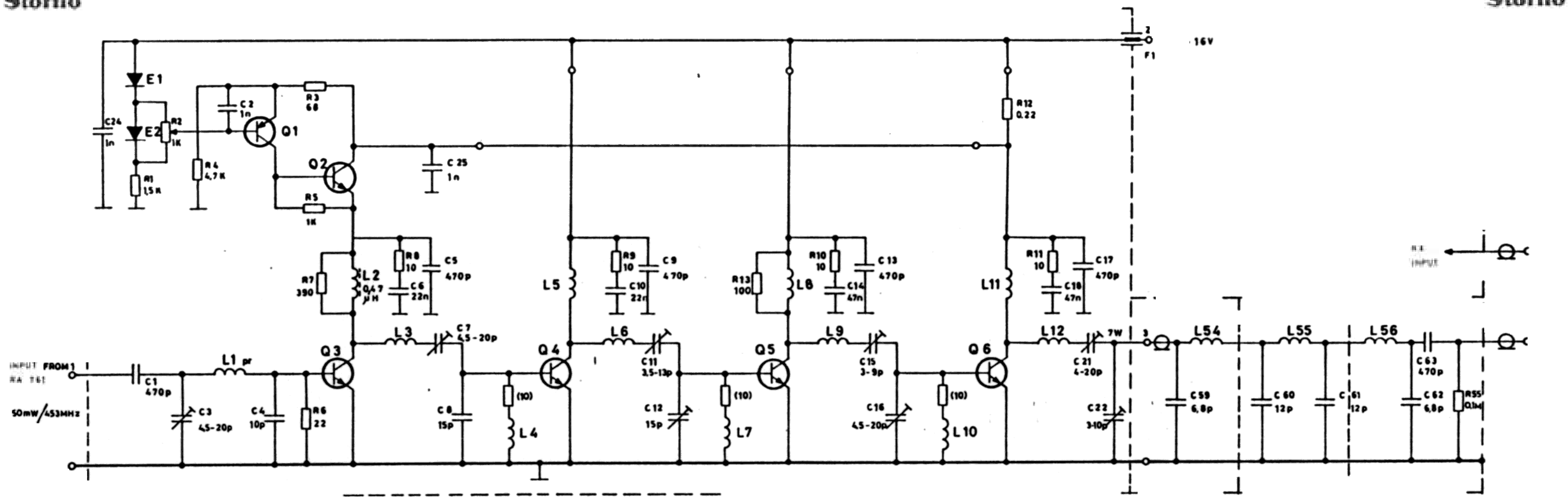
Operating range :	-25^{o} to $+70^{o}$ C
Functioning range :	-30^{o} to $+80^{o}$ C

Mechanical Dimensions

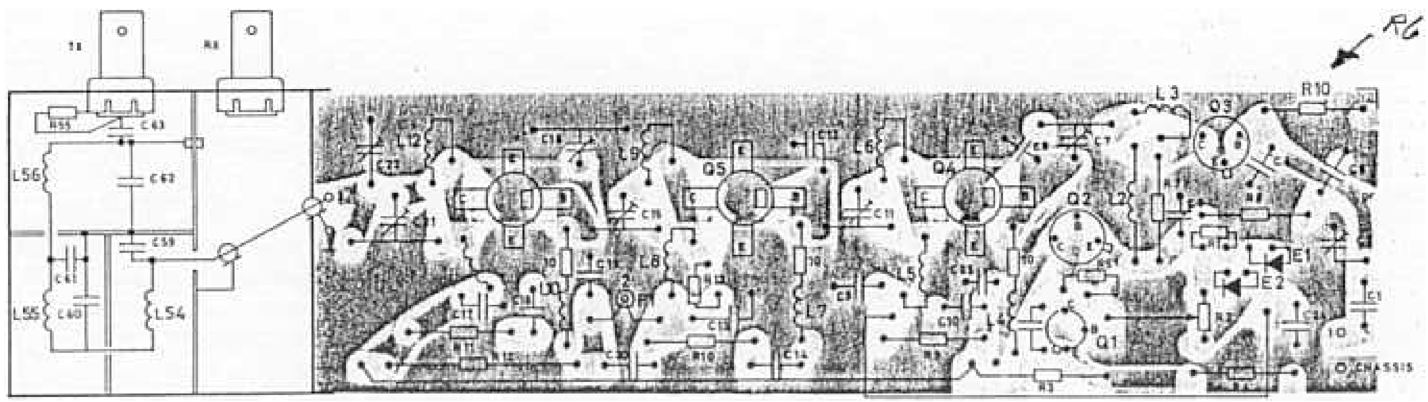
25 x 42 x 168 mm

(PC board : 35.6 x 119.4 mm)

Storno



COMPONENT SIDE VIEW
SET FRA KOMPONENTSIDE



Storno

POWER AMPLIFI R
FFEKTFOR TÆRK R

PA

D401.872

Storno

TYPE	NO	CODE	DATA	
PA763		10.2926	Power Amplifier	
	C1	74.5161	470 pF -20 +80% ceram PL	63 V
	C2	74.5155	1 nF -20+80% ceram PL	63 V
	C3	78.5026	4.5—20 pF trimmer	
	C4	74.5006	10 pF 5% ceram DI	400 V
	C5	74.5161	470 pF -20+80% ceram PL	63 V
	C6	76.5071	22 nF 10% polyest FL	50 V
	C7	78.5026	4.5—20 pF trimmer	
	C8	74.5046	15 pF 5% ceram DI	400 V
	C9	74.5161	470 pF -20+80% ceram PL	63 V
	C10	76.5071	22 nF 10% polyest FL	50 V
	C11	78.5025	3.5 —13 pF trimmer	
	C12	74.5046	15 pF 5% ceram DI	400 V
	C13	74.5161	470 pF -20+80% ceram PL	63 V
	C14	76.5072	47 nF 10% polyest FL	50 V
	C15	78.5050	3-9 pF trimmer	
	C16	78.5026	4.5—20 pF trimmer	
	C17	74.5161	470 pF -10+80% ceram PL	63 V
	C18	76.5072	47 nF 10% polyest FL	50 V
	C19	74.5155	1 nF -20+80% ceram PL	63 V
	C20	76.5072	47 nF 10% polyest FL	50 V
	C21	78.5031	4 —20pF trimmer	
	C22	78.5051	3 —10 pF trimmer	
	C24	74.5155	1 nF -20+80% ceram PL	63 V
	C25	74.5155	1 nF -20+80% ceram PL	63 V
	R1	80.5251	1.5 KΩ 5% carbon film	1/8 W
	R2	86.5058	1 KΩ 20% potentiometer	0.1 W
	R3	80.5235	68 Ω 5% carbon film	1/8 W
	R4	80.5257	4.7 KΩ 5% carbon film	1/8 W
	R5	80.5270	56 KΩ 5% -	1/8 W
	R6	80.5229	22 Ω 5% -	1/8 W
	R7	80.5244	390 Ω 5% -	1/8 W
	R8	80.5225	10 Ω 5% -	1/8 W
	R9	80.5225	10 Ω 5% -	1/8 W
	R10	80.5225	10 Ω 5% -	1/8 W
	R11	80.5225	10 Ω 5% -	1/8 W
	R12	82.5205	0.22 Ω 10% wire wound	1 W
	R13	80.5237	100 Ω 5% carbon film	1/8 W
	L2	63.5008	0.47 μH 20% RF choke	2.2 A
	L3	62.0794	RF Coil 420-470 MHz	
	L4	62.0795	RF Coil 420-470 MHz (made with 10 Ω resistor 80.5225)	
	L5	62.0796	RF Coil 420-470 MHz	
	L6	62.0797	RF Coil 420-470 MHz	

Storno

TYPE	NO.	CODE	DATA
	L7	62.0795	RF Coil 420-470 MHz (made with 10 Ω resistor 80.5225)
	L8	62.0798	RF Coil 420-470 MHz
	L9	62.0797	RF Coil 420-470 MHz
	L10	62.0795	RF Coil 420-470 MHz (made with 10 Ω resistor 80.5225)
	L11	62.0799	RF Coil 420-470 MHz
	L12	62.0797	RF Coil 420-470 MHz
	E1	99.5028	Diode 1N914
	E2	99.5028	Diode 1N914
	Q1	99.5230	Transistor BC178
	Q2	99.5128	Transistor 2N3053
	Q3	99.5229	Transistor 2N4427
	Q4	99.5242	Transistor BLX67
	Q5	99.5242	Transistor BLX67
	Q6	99.5243	Transistor BLX68

POWER AMPLIFIER
EFFEKTFORSTÆRKER

PA763

X 401.861

Storno

TYPE	NO.	CODE	DATA	
PA761		10.2428	Power Amplifier (incl. AS761)	
	C1	74.5161	470pF-20/+80% ceram PL	63V
	C2	74.5155	1nF-20/+80% ceram PL	63V
	C3	78.5026	4,5-20pF trimmer	160V
	C4	74.5006	10pF 5% ceram DI	400V
	C5	74.5161	470pF-20-80% ceram PL	63V
	C6	76.5071	22nF 10% polyest. FL	50V
	C7	78.5026	4,5-20pF trimmer	160V
	C8	74.5046	15pF 5% ceram DI	400V
	C9	74.5161	470pF-20/+80% ceram PL	63V
	C10	76.5071	22nF 10% polyest. FL	50V
	C11	78.5025	3,5-13pF trimmer	160V
	C12	74.5046	15pF 5% ceram DI	400V
	C13	74.5161	470pF-20+80% ceram	63V
	C14	76.5072	47nF 10% polyest. FL	50V
	C15	78.5050	3-9pF trimmer	160V
	C16	78.5026	4,5-20pF trimmer	160V
	C17	74.5161	470pF-20/+80% ceram PL	63V
	C18	76.5072	47nF 10% polyest. FL	50V
	C19	74.5155	1nF-20/+80% ceram PL	63V
	C20	76.5072	47nF 10% polyest. FL	50V
	C21	78.5031	4-20pF trimmer	250V
	C22	78.5051	3-10pF trimmer	250V
	C23			
	C24	74.5155	1nF-20/+80% ceram PL	63V
	C25	74.5155	1nF-20/+80% ceram PL	63V
	R1	80.5251	1,5k Ω 5% carbon film	1/8W
	R2	86.5058	1 k Ω 20% trim.pot.	0.1W
	R3	80.5235	68 Ω 5% carbon film	1/8W
	R4	80.5257	4.7k Ω 5% carbon film	1/8W
	R5	80.5270	56k Ω 5% carbon film	1/8W
	R6	80.5229	22 Ω 5% carbon film	1/8W
	R7	80.5244	390 Ω 5% carbon film	1/8W
	R8	80.5225	10 Ω 5% carbon film	1/8W
	R9	80.5225	10 Ω 5% carbon film	1/8W
	R10	80.5225	10 Ω 5% carbon film	1/8W
	R11	80.5225	10 Ω 5% carbon film	1/8W
	R12	82.5205	0,22 Ω 10% wire wound	1W
	R13	80.5237	100 Ω 5% carbon film	1/8W
	L1		Printed coil	
	L2	63.5008	0.47μH 20% RF choke 2.2A	
	L3	62.0794	RF coil 420-470 MHz	
	L4	62.0795	RF coil 420-470MHz (10 Ω 1/8W)	
	L5	62.0796	RF coil 420-470MHz	
	L6	62.0797	RF coil 420-470MHz	

Storno

TYPE	NO.	CODE	DATA	
	L7	62.0795	RF coil 420-470MHz (10 Ω 1/8W)	
	L8	62.0798	RF coil 420-470MHz	
	L9	62.0797	RF coil 420-470MHz	
	L10	62.0795	RF coil 420-470MHz (10 Ω 1/8W)	
	L11	62.0799	RF coil 420-470MHz	
	L12	62.0797	RF coil 420-470 MHz	
	F1	69.5023	Feed-through filter	
	E1	99.5028	1N914 Diode	
	E2	99.5028	1N914 Diode	
	Q1	99.5230	BC178 Transistor	
	Q2	99.5128	2N3053 Transistor	
	Q3	99.5229	2N4427 Transistor	
	Q4	99.5242	BLX67 Transistor	
	Q5	99.5242	BLX67 Transistor	
	Q6	99.5243	BLX68 Transistor	
AS761		10.2427	Antenna Switching Unit	
	C51	69.5007	VHF Filter FT	
	C52	74.5155	1 nF -20 +80% ceram PL	63V
	C53	74.5155	1 nF -20 +80% ceram PL	63V
	C54	74.5004	5.6 pF ±0.25 pF ceram DI	400V
	C55	74.5130	3.9 pF ±0.25 pF ceram DI	250V
	C56	74.5162	470 pF -20 +50% ceram DI	400V
	C57	74.5155	1 nF -20 +80% ceram PL	63V
	C58	69.5007	VHF Filter FT	
	C59	74.5021	6.8 pF ±0.25 pF ceram DI	400V
	C60	74.5194	12 pF 5% ceram DI	400V
	C61	74.5194	12 pF 5% ceram DI	400V
	C62	74.5021	6.8 pF ±0.25 pF ceram DI	400V
	C63	74.5094	470 pF 20% ceram DI	400V
	R51	80.5234	56 Ω 5% carbon film	1/8W
	R52	80.5273	0.1 MΩ 5% " "	1/8W
	R53	80.5273	0.1 MΩ 5% " "	1/8W
	R54	80.5049	1 kΩ 5% " "	1/8W
	R55	80.5073	0.1 MΩ 5% " "	1/8W

POWER AMPLIFIER
EFFEKTFORSTÆRKER

PA761

X401.619

Storno

TYPE	NO.	CODE	DATA	
	L51	63.5008	0.47 μH 20% RF choke	2.2A
	L52	62.0809	RF coil	
	L53	62.0810	RF coil	
	L54	62.0811	RF coil	
	L55	62.0811	RF coil	
	L56	62.0811	RF coil	
	E51	99.5244	BA182 Diode	
	E52	99.5244	BA182 Diode	
	E53	99.5244	BA182 Diode	
	E54	99.5224	Zenerdiode 4.7V 5%	0.25W
	E55	99.5237	1N4148 Diode	

Storno

TYPE	NO.	CODE	DATA

POWER AMPLIFIER
EFFEKTFORSTÆRKER

PA761

X401.619

Storno

ANTENNA SWITCH AS761

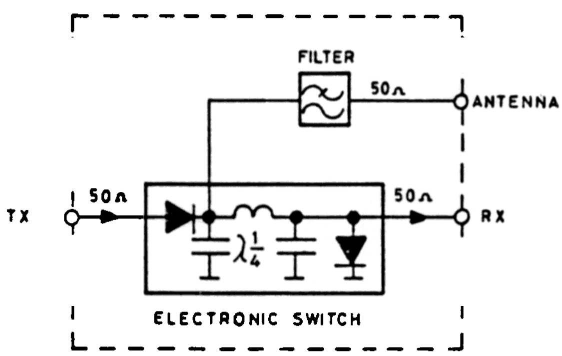
Description

General

The antenna switch AS761 contains a circuit for electronically switching the antenna between the transmitter and the receiver sections, and a low-pass filter that attenuates undesired frequencies, such as harmonics of the signal frequency, thus preventing their being radiated from the antenna.

AS761 mounts directly into the combination heat sink and shield for PA761.

The following simplified diagram shows the operating principle for the AS subunit.



The Electronic Switch

Refer to the complete schematic diagram

By switching a +9 V potential between terminals 1 and 2, the antenna is electronically switched between transmit and receive.

When transmitting, diodes E51 and E52/E53 conduct and the receiver terminal will see a short circuit.

The 1/4 wave impedance circuit consisting of C54, L53 and C55 transforms the short to an open circuit at the antenna, thus the transmit signal reaches the antenna with minimum loss.

When receiving, the diodes are effectively blocked due to the bias across zener diode E54. Now the diodes only represent a small capacity that includes itself in the 1/4 wave impedance circuit, as far as the receiver terminal is concerned.

The transmitter terminal, however, looks into a parallel resonant circuit made up of L52 and the capacity of E51, and is thereby isolated from the antenna.

The received signal is now free to pass from the antenna to the receiver input with minimum loss.

The Low-pass Filter

The low-pass filter is a 7-pole Chebishev filter exhibiting neligible band-pass ripple and minimum insertion loss.

The filter is built on a metal plate chassis having three closed compartments. It requires no alignment.

Technical Specifications

Frequency Range
420 - 470 MHz

Input and Output Impedance
50 Ω

Insertion Loss (transmitter to antenna)
0.5 dB

Insertion Loss (antenna to receiver)
0.6 dB

Separation between Transmitter and Receiver
25 dB

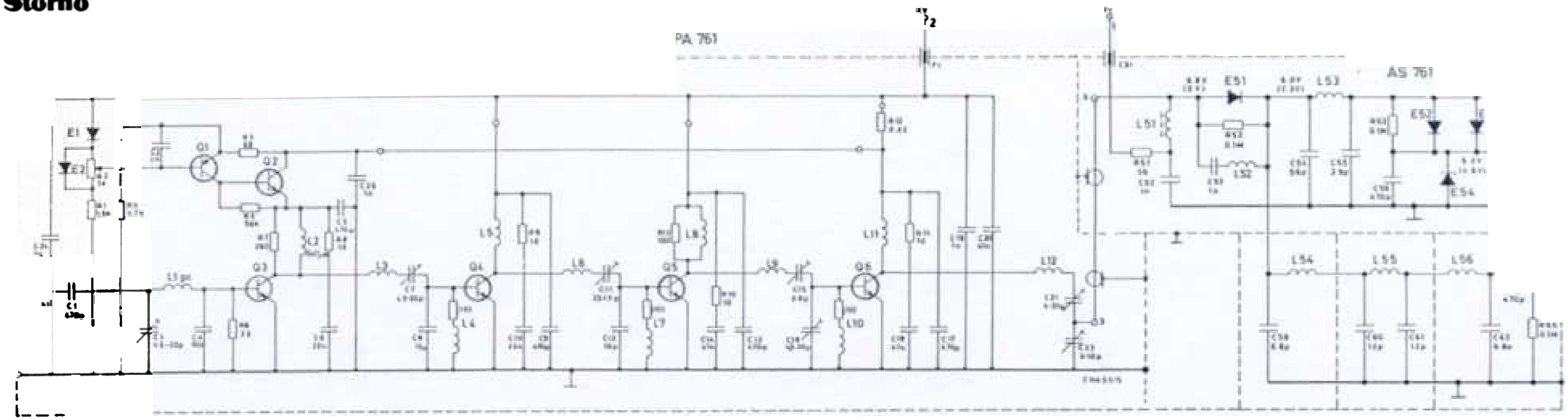
Second Harmonic (840 MHz) Attenuation
70 dB

Current Drain, transmit
38 mA

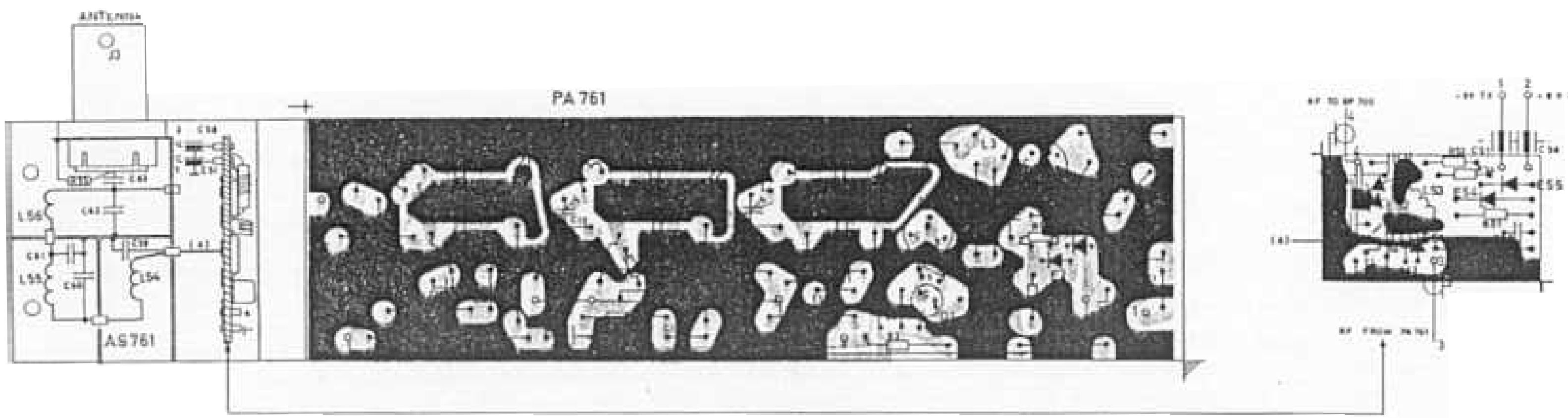
Current Drain, receive
4 mA

Temperature Range
operating range -25° to $+70^{\circ}$C
functioning range -30° to $+80^{\circ}$C

Dimensions
40 x 38 x 22 mm



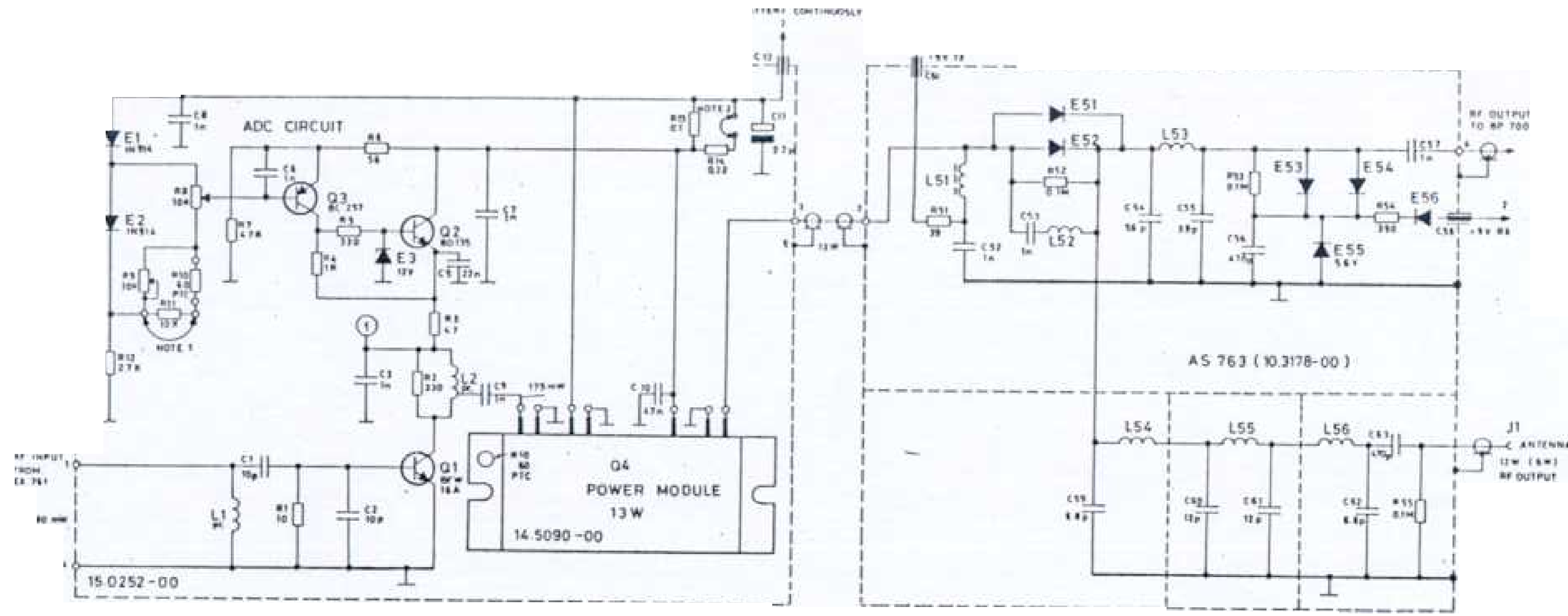
DC VOLTAGE WITHOUT ( ) DURING TRANSMITTING
DC VOLTAGE WITH ( ) DURING RECEIVING

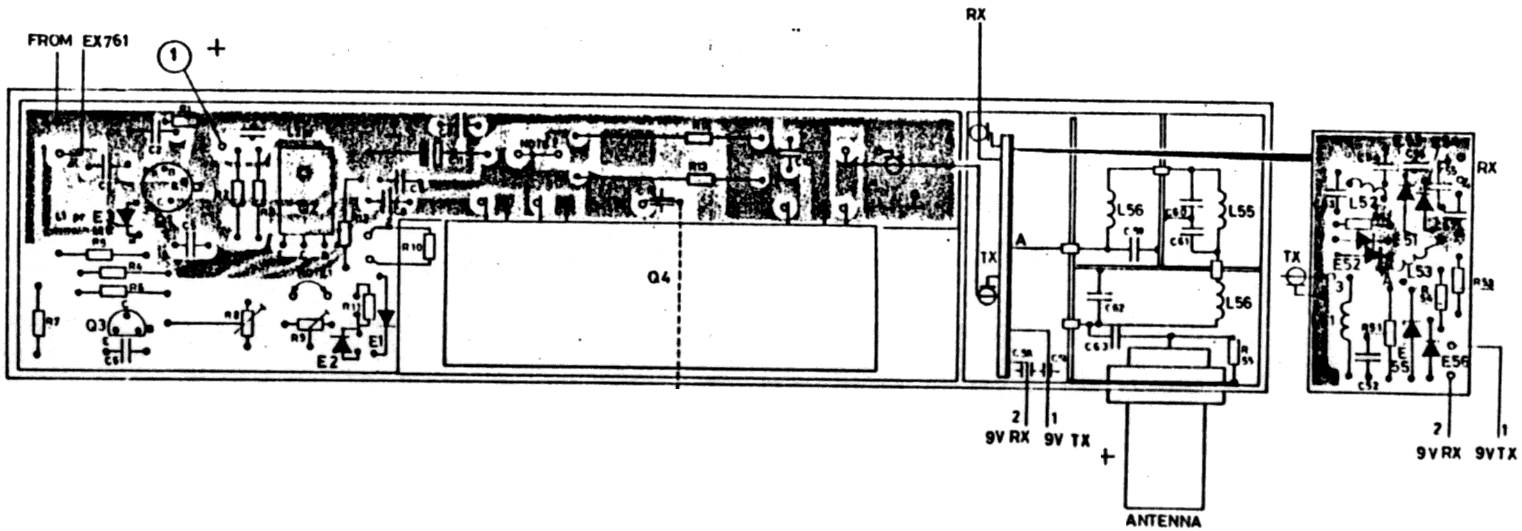


POWER AMPLIFIER PA761

D401.324/4

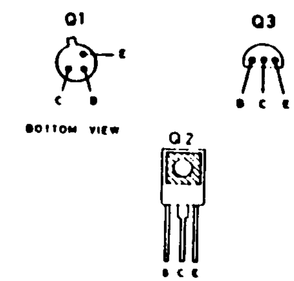
Storno





NOTE 1.
REMOVE SHORTING LINK WHEN ADJUSTING ADC RANGE

NOTE 2.
REMOVE STRAP FOR 6W RF OUTPUT



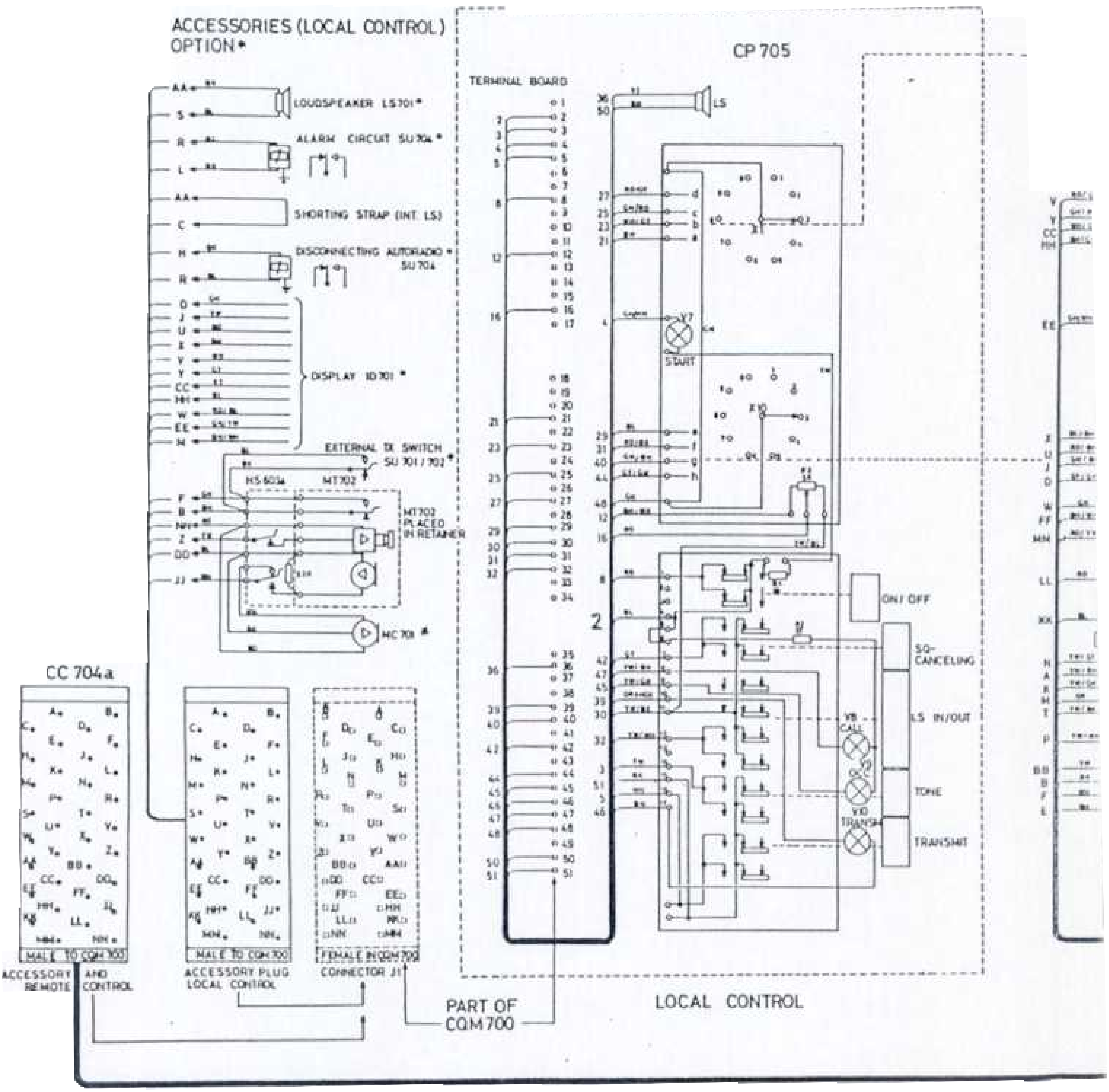
POWER AMPLIFIER
EFFEKTFORSTÆRKER
PA764

D 402.080

TYPE	NO.	CODE	DATA
PA764		10.3177-00	UHF Power Amplifier
	C1	74.5006	10 pF 5% ceram DI 400V
	C2	74.5006	10 pF 5% ceram DI 400V
	C3	74.5325	1 nF -20% + 80% ceram no lead 400V
	C4		not used
	C5	76.5071	22 nF 10% polyest FL 50V
	C6	74.5155	1 nF - 20% +80% ceram PL 63V
	C7	74.5155	1 nF - 20% +80% ceram PL 63V
	C8	74.5155	1 nF - 20% +80% ceram PL 63V
	C9	74.5155	1 nF - 20% +80% ceram PL 63V
	C10	76.5072	47 nF 10% polyest FL 50V
	C11	73.5064	2.2 µF - 10% +100% elco 63V
	C12	69.5023	VHF feed through filter
	R1	80.5225	10 Ω 5% carbon filter 1/8W
	R2	80.5243	330 Ω 5% " " 1/8W
	R3	80.5233	47 Ω 5% " " 1/8W
	R4	80.5249	1KΩ 5% " " 1/8W
	R5	80.5243	330 Ω 5% " " 1/8W
	R6	80.5234	56 Ω 5% " " 1/8W
	R7	80.5257	4.7KΩ 5% " " 1/8W
	R8	86.5039	10KΩ 20% potentiometer 0.1W
	R9	86.5037	10KΩ 20% " 0.05W
	R10	89.5071	60 Ω - 50KΩ PTC 30V
	R11	80.5261	10KΩ 5% carbon film 1/8W
	R12	80.5254	2.7KΩ 5% " " 1/8W
	R13	82.5208	0.1 Ω 10% wirewound 1W
	R14	82.5205	0.22 Ω 10% wirewound 1W
	E1	99.5028	IN914 Diode
	E2	99.5028	IN914 Diode
	E3	99.5223	12V 5% Zenerdiode 1/4W
	Q1	99.5298	BFW16A Transistor
	Q2	99.5235	BD135 Transistor
	Q3	99.5144	BC214L Transistor
	Q4	14.5090	UHF Power Module 13W
		10.3178	AS763 Antenna Switch
	C51	69.5007	VHF feed through filter
	C52	74.5155	1 nF - 20% +80% ceram PL 50V
	C53	74.5155	1 nF - 20% +80% ceram PL 50V
	C54	74.5004	5.6 pF ± 0.25 pF ceram DI 400V
	C55	74.5130	3.9 pF ± 0.25 pF ceram DI 250V
	C56	74.5162	470 pF - 20% +50% ceram DI 250V
	C57	74.5155	1 nF - 20% +80% ceram PL 50V

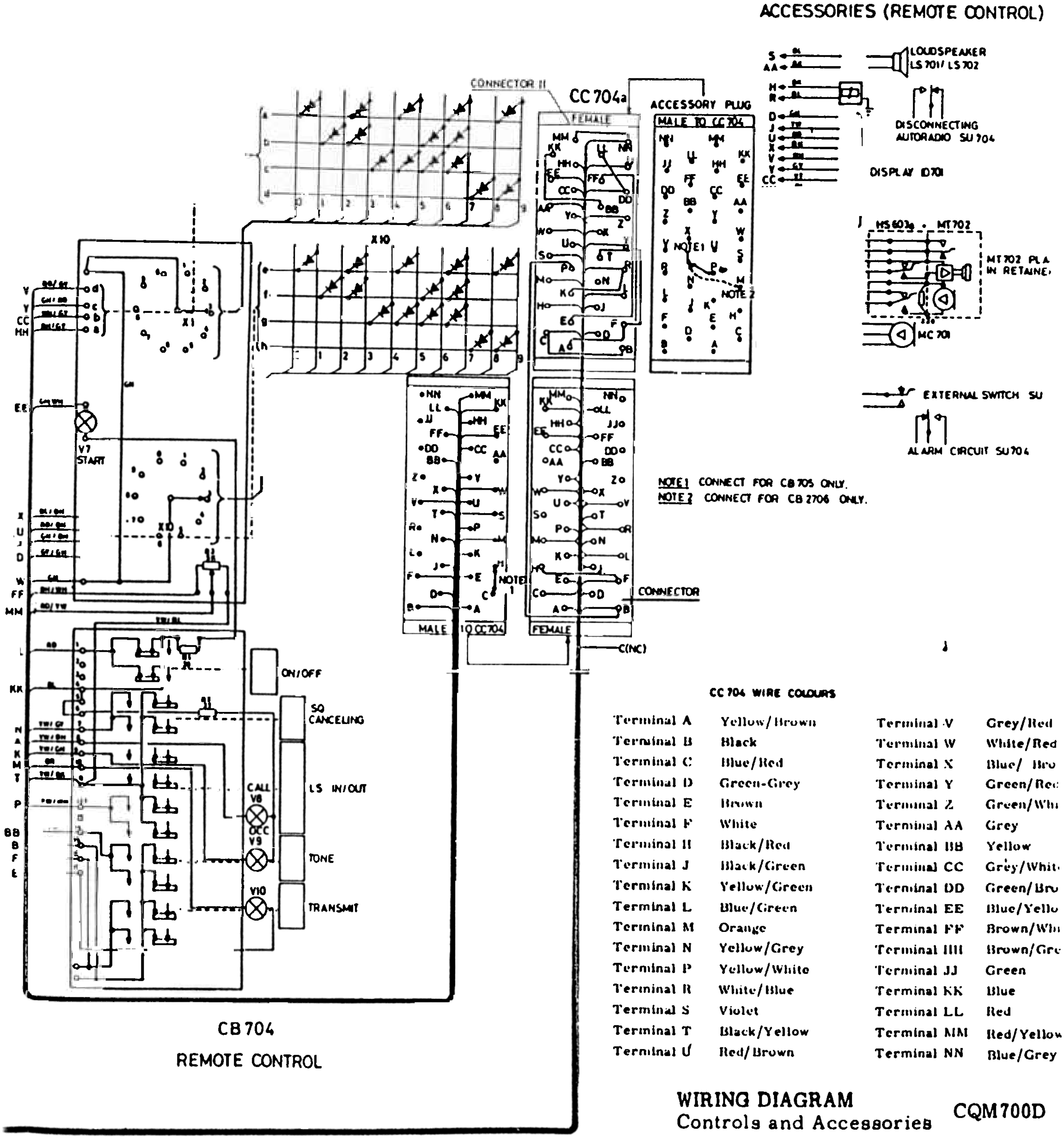
TYPE	NO.	CODE	DATA
	C58	69.5007	VHF feed through filter
	C59	74.5021	6.8 pF ± 0.25 ceram DI 400V
	C60	74.5194	12 pF 5% ceram DI 400V
	C61	74.5194	12 pF 5% ceram DI 400V
	C62	74.5021	6.8 pF ± 0.25 pF ceram DI 400V
	C63	74.5094	470 pF 20% ceram DI 400V
	R51	80.5232	39 Ω 5% carbon film 1/8W
	R52	80.5073	100KΩ 5% " " 1/8W
	R53	80.5073	100KΩ 5% " " 1/8W
	R54	80.5044	390KΩ 5% " " 1/8W
	R55	80.5273	100KΩ 5% " " 1/8W
	L51	63.5008	0.47 µH 20% RF choke 2.2A
	L52	62.0923	RF coil
	L53	62.0810	RF coil
	L54	62.0811	RF coil
	L55	62.0811	RF coil
	L56	62.0811	RF coil
	E51	99.5244	BA182 Diode
	E52	99.5244	BA182 Diode
	E53	99.5244	BA182 Diode
	E54	99.5244	BA182 Diode
	E55	99.5282	5.6V 5% Zenerdiode 1/8W
	E56	99.5237	IN4148 Diode

Storno



ACCESSORIES (LOCAL CONTROL) OPTION*
LOUDSPEAKER LS701*
ALARM CIRCUIT SU704*
SHORTING STRAP (INT. LS)
DISCONNECTING AUTORADIO* SU704
DISPLAY ID701*
EXTERNAL TX SWITCH SU701/702*
HS 603A
MT702
MT702 PLACED IN RETAINER
MC701*
CC 704a
MALE TO CQM700
ACCESSORY AND REMOTE CONTROL
ACCESSORY PLUG LOCAL CONTROL
FEMALE IN CQM700 CONNECTOR J1
PART OF CQM700
TERMINAL BOARD
CP 705
LS
START
ON/OFF
SQ-CANCELING
LS IN/OUT
CALL
TONE
TRANSMIT
LOCAL CONTROL

Storn



CC 704 WIRE COLOURS

Terminal A	Yellow/Brown	Terminal V	Grey/Red
Terminal B	Black	Terminal W	White/Red
Terminal C	Blue/Red	Terminal X	Blue/ Bro
Terminal D	Green-Grey	Terminal Y	Green/Re
Terminal E	Brown	Terminal Z	Green/Whi
Terminal F	White	Terminal AA	Grey
Terminal H	Black/Red	Terminal BB	Yellow
Terminal J	Black/Green	Terminal CC	Grey/Whit
Terminal K	Yellow/Green	Terminal DD	Green/Bro
Terminal L	Blue/Green	Terminal EE	Blue/Yello
Terminal M	Orange	Terminal FF	Brown/Whi
Terminal N	Yellow/Grey	Terminal HH	Brown/Gre
Terminal P	Yellow/White	Terminal JJ	Green
Terminal R	White/Blue	Terminal KK	Blue
Terminal S	Violet	Terminal LL	Red
Terminal T	Black/Yellow	Terminal MM	Red/Yellow
Terminal U	Red/Brown	Terminal NN	Blue/Grey

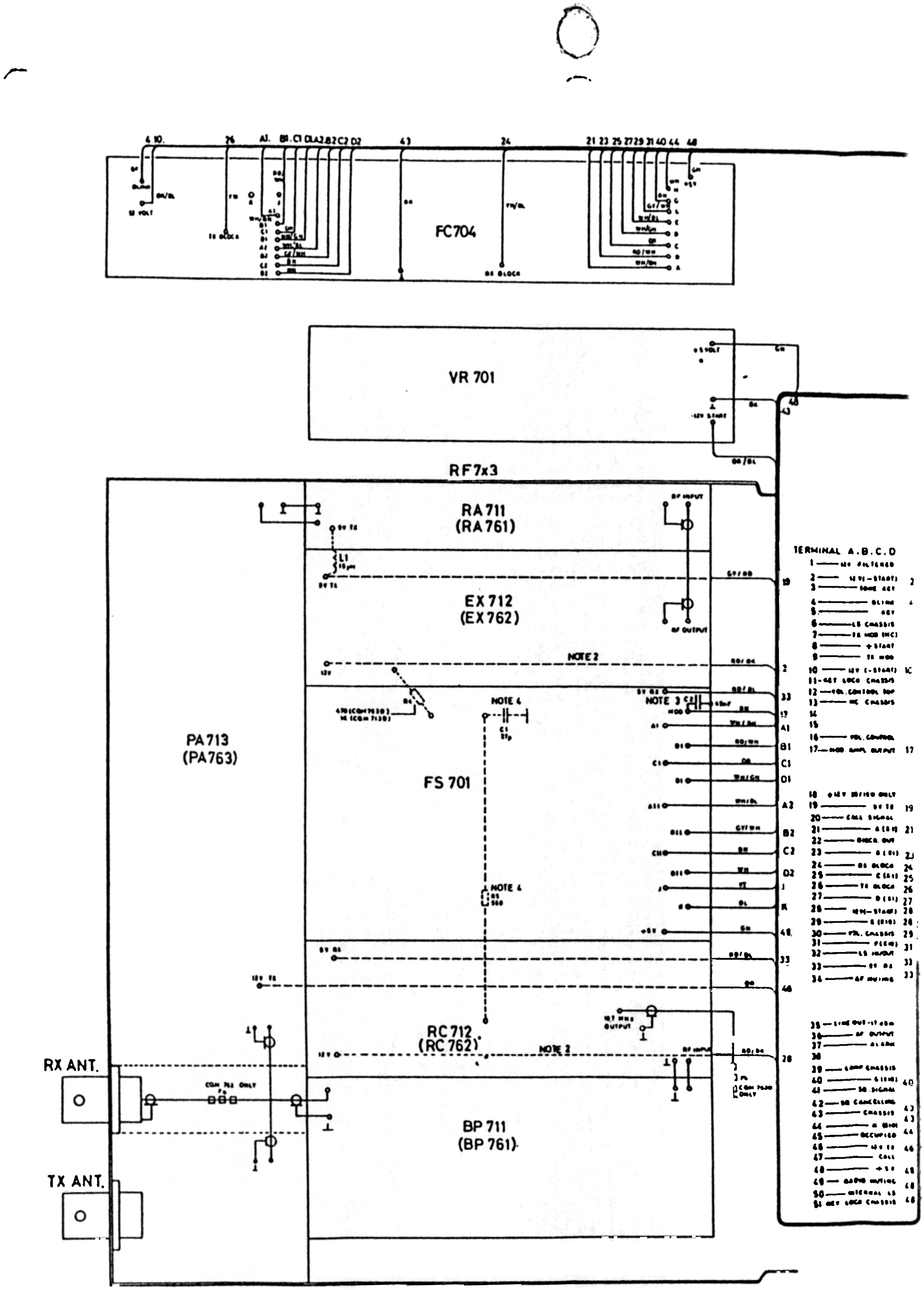
WIRING DIAGRAM
Controls and Accessories

CQM700D

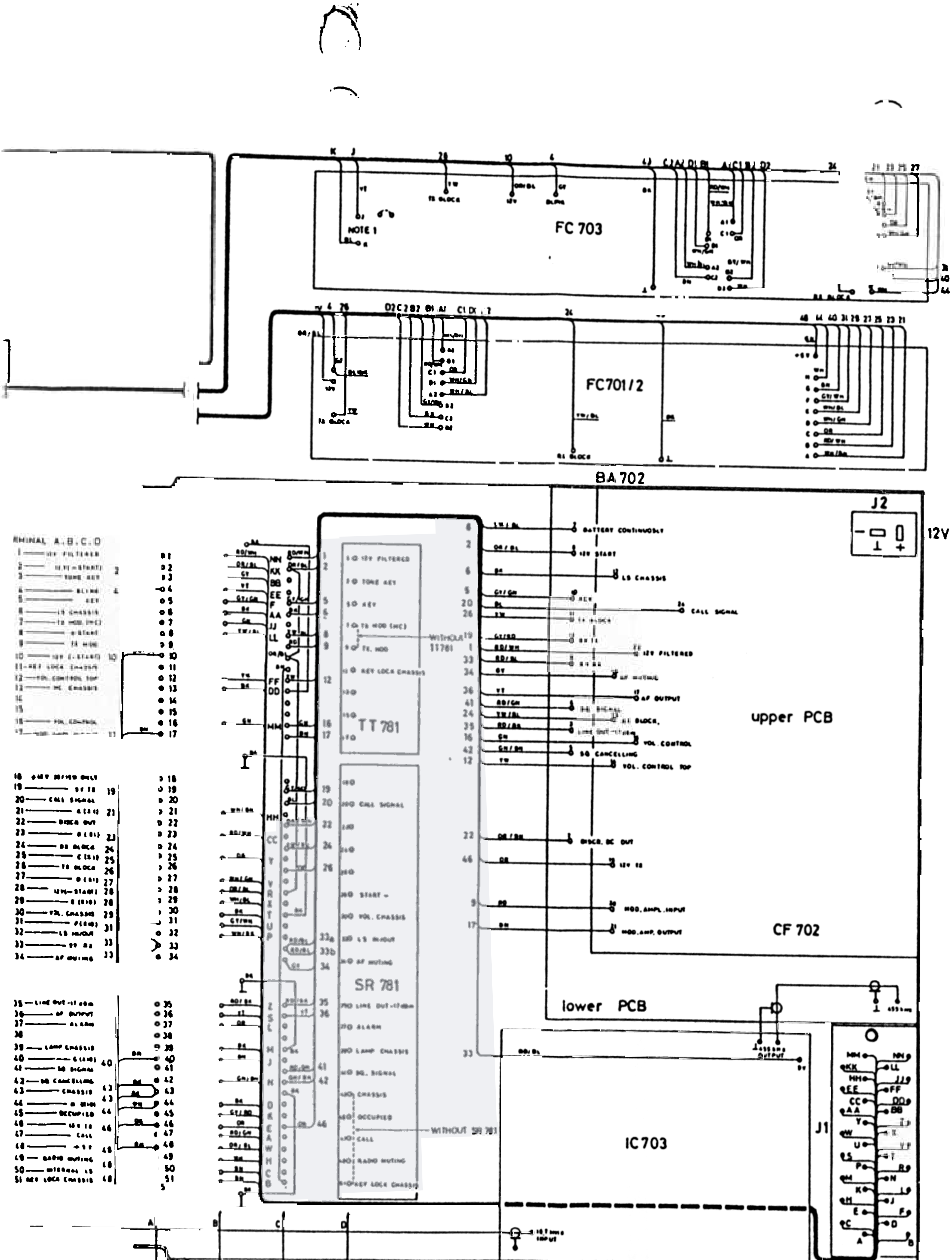
D 402.017/6

WIRING DIAGRAM CQM700D

D401.877/3

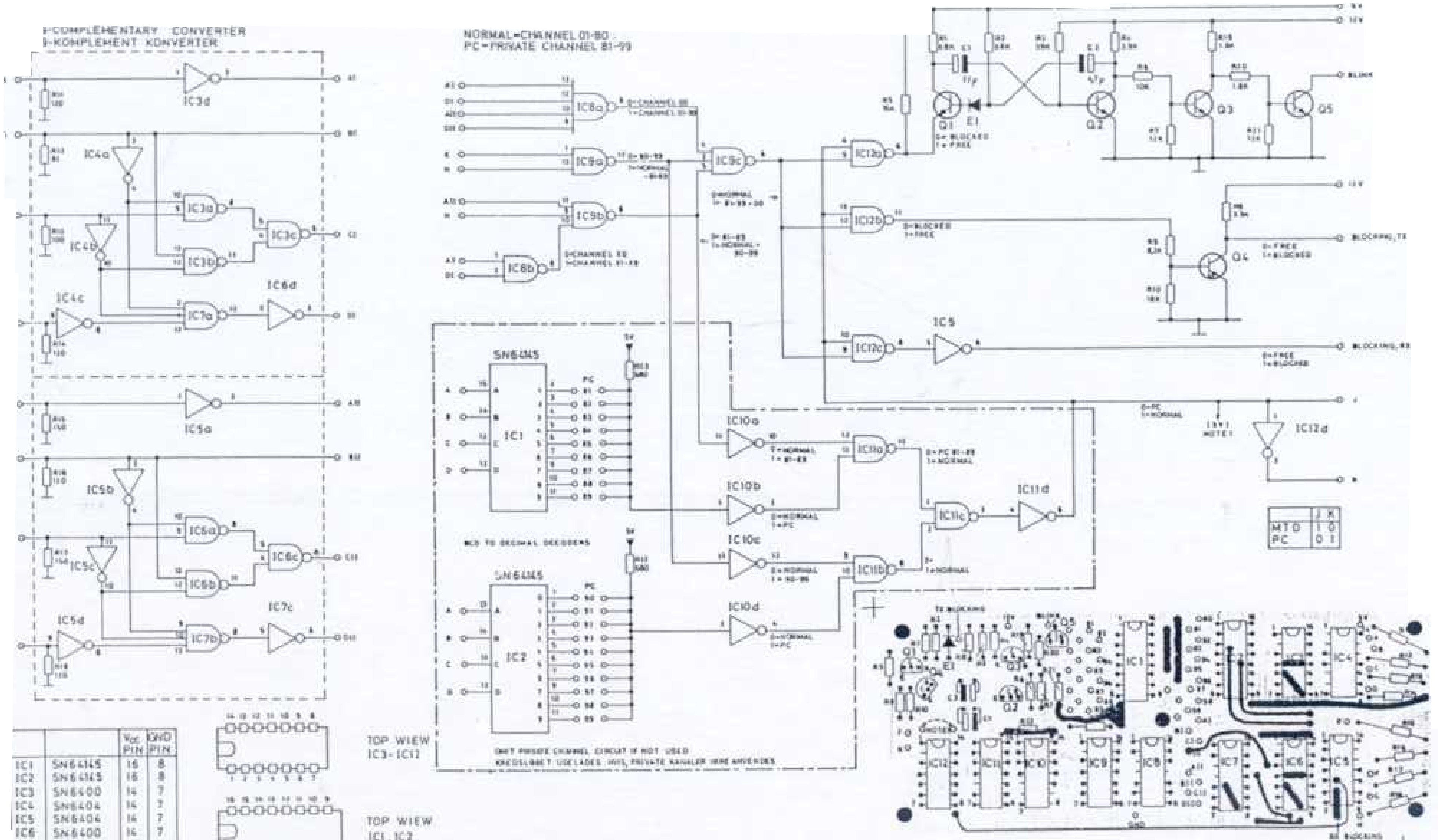


NOTE 1. J AND K WIRED IN CQM 763D ONLY.
NOTE 2. 12V IS SUPLIED TO EX AND RC IN CQM 763D ONLY.
NOTE 3. ONLY IN EQUIPMENT FOR SWEDEN
NOTE 4. IN CQM 713D ONLY
NOTE 5. IN LOCAL CONTROLLED UNITS: REMOVE CONNECTING WIRE



THE FOUR STRIPS OF TERMINALS DIAGRAM REPRESENT ONE AND TERMINAL STRIP ON TERMINAL

NUMBERS USED IN CABLING REFER TO NUMBERS ON THE TERMINALBOARD TERMINAL NUMBERS OF UNITS CONFORM TO TERMINAL NUMBERS USED ON THE DIAGRAMS OF THE VARIOUS UNITS.



		Vcc PIN	GND PIN
IC1	SN64145	16	8
IC2	SN64145	16	8
IC3	SN6400	14	7
IC4	SN6404	14	7
IC5	SN6404	14	7
IC6	SN6400	14	7
IC7	SN6410	14	7
IC8	SN6420	14	7
IC9	SN6410	14	7
IC10	SN6404	14	7
IC11	SN6400	14	7
IC12	SN6400	14	7

	J	K
MTD	1	0
PC	0	1

FREQUENCY CONTROL UNIT FC703
FREKVENSKONTROLENHED

D401.832

TYPE	NO.	CODE	DATA	
FC703		10.2927	Frequency Control Unit	
	C1	73.5127	22 µF 20% tantal	16 V
	C2	73.5103	4.7 µF 20% tantal	35 V
	R1	80.5059	6.8 KΩ 5% carbon film	1/10W
	R2	80.5071	68 KΩ 5% -	1/10W
	R3	80.5068	39 KΩ 5% -	1/10W
	R4	80.5056	3.9 KΩ 5% -	1/10W
	R5	80.5063	15 KΩ 5% -	1/10W
	R6	80.5061	10 KΩ 5% -	1/10W
	R7	80.5062	12 KΩ 5% -	1/10W
	R8	80.5056	3.9 KΩ 5% -	1/10W
	R9	80.5060	8.2 KΩ 5% -	1/10W
	R10	80.5064	18 KΩ 5% -	1/10W
	R11	80.5438	120 Ω 5% -	1/4 W
	R12	80.5436	82 Ω 5% -	1/4 W
	R13	80.5437	100 Ω 5% -	1/4 W
	R14	80.5438	120 Ω 5% -	1/4 W
	R15	80.5439	150 Ω 5% -	1/4 W
	R16	80.5438	120 Ω 5% -	1/4 W
	R17	80.5439	150 Ω 5% -	1/4 W
	R18	80.5438	120 Ω 5% -	1/4 W
	R19	80.5052	1.8 KΩ 5% -	1/10W
	R20	80.5052	1.8 KΩ 5% -	1/10W
	R21	80.5062	12 KΩ 5% -	1/10W
	R22	80.5247	680 Ω 5% -	1/8 W
	R23	80.5247	680 Ω 5% -	1/8 W
	E1	99.5237	Diode 1N4148	
	Q1	99.5117	Transistor BC167	
	Q2	99.5117	Transistor BC167	
	Q3	99.5117	Transistor BC167	
	Q4	99.5117	Transistor BC167	
	Q5	99.5117	Transistor BC167	
	IC3	14.5024	SN6400 Quadr. 2-input NAND gate	
	IC4	14.5034	SN6404 Hex Inverter	
	IC5	14.5034	SN6404 Hex Inverter	
	IC6	14.5024	SN6400 Quadr. 2-input NAND gate	
	IC7	14.5004	SN6410 Triple 3-input NAND gate	
	IC8	14.5031	SN6420 Dual 4-input NAND gate	
	IC9	14.5004	SN6410 Triple 3-input NAND gate	
	IC12	14.5024	SN6400 Quadr. 2-input NAND gate	

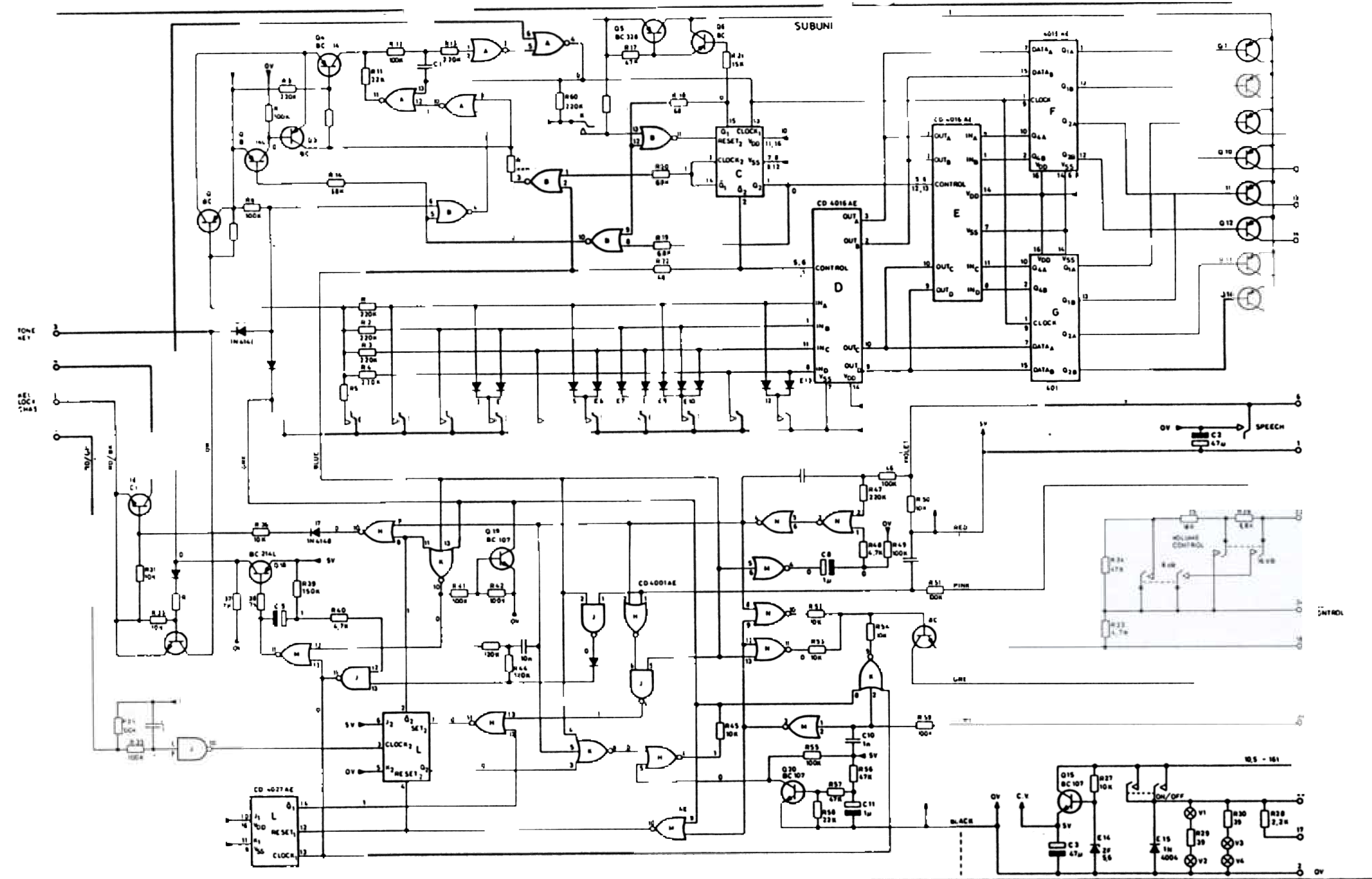
Storno

TYPE	NO.	CODE	DATA
			<u>Kit for Increasing Channels</u>
	IC1	14.5071	SN64145 BCD to decimal decoder
	IC2	14.5071	SN64145 BCD to decimal decoder
	IC10	14.5034	SN6404 Hex Inverter
	IC11	14.5024	SN6400 Quadr. 2-input NAND gate

FREQUENCY CONTROL UNIT
FREKVENSKONTROLENHED

FC703

X401.864



REV	DESIGN DRAWN APPR	COMP LIST
26.9.75	LeT/BSO	5A402 029
07.10.75		5A402 036

Storno
RADIO COMMUNICATION SYSTEMS

CONTROL BOX FOR 700 AUTOMATIC
CB 2706

DATE 21 11 74
A3 DRWG NO D402.028/1

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 1/8 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

Storno

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	CD4015AE 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
	O4	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

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

Storno

TYPE	NO.	CODE	DATA

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	

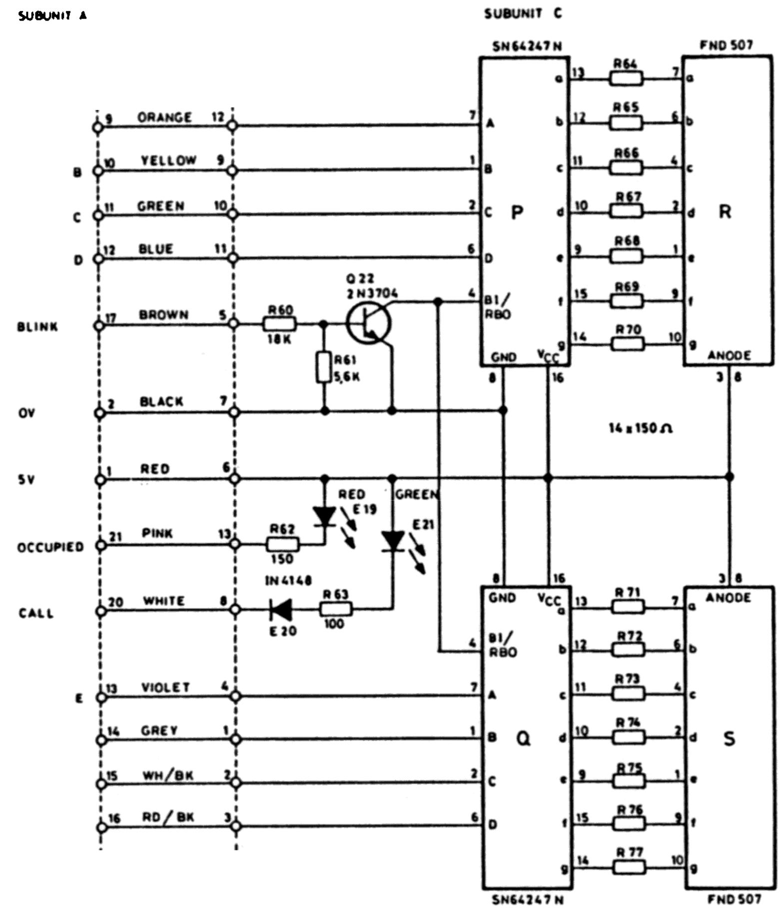
Storno

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

X402.036

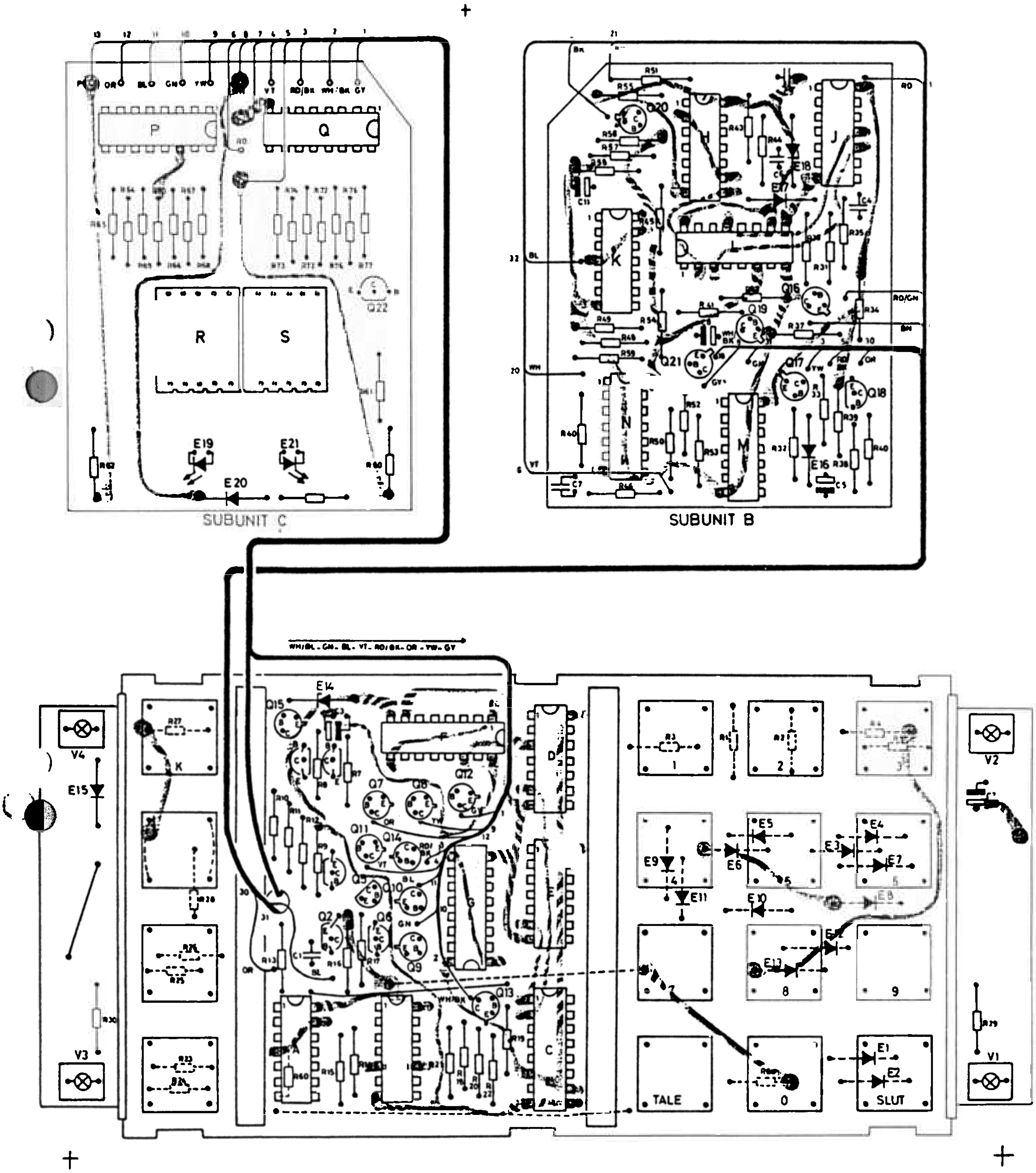
CONTROL UNIT CB2706
Subunit B

Storno



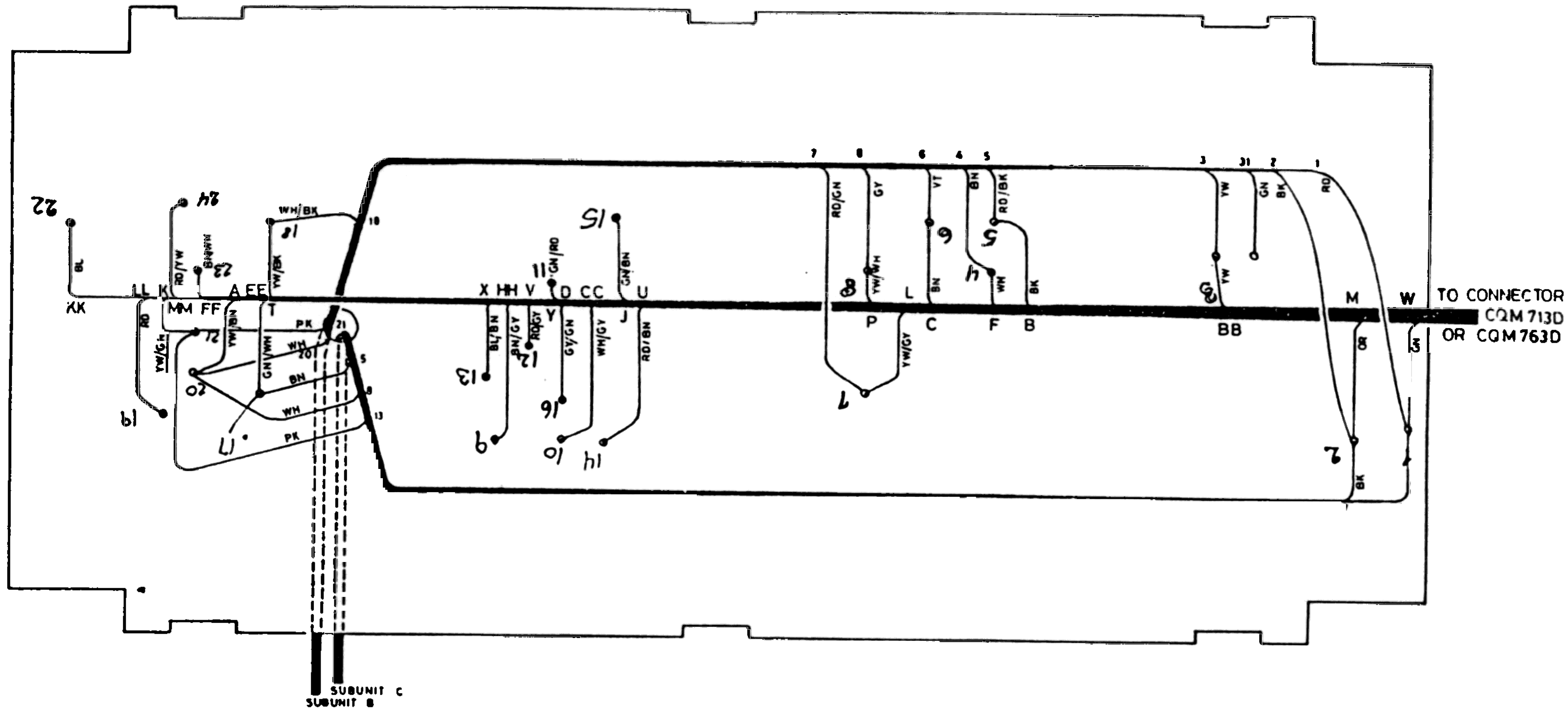
CONTROL UNIT CB2706
Subunit C

D402.033/2



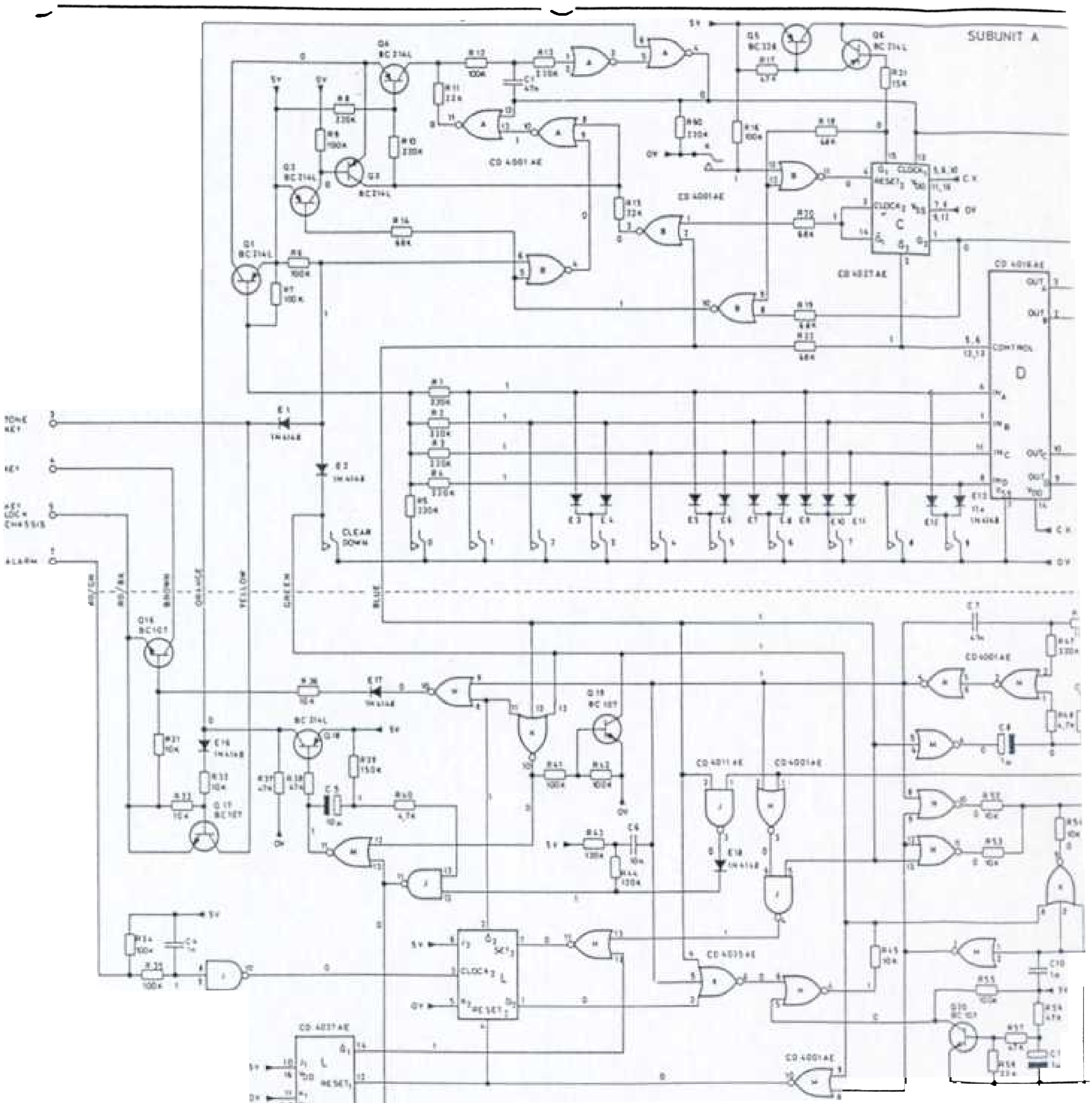
CONTROL UNIT CB2706

D402.167

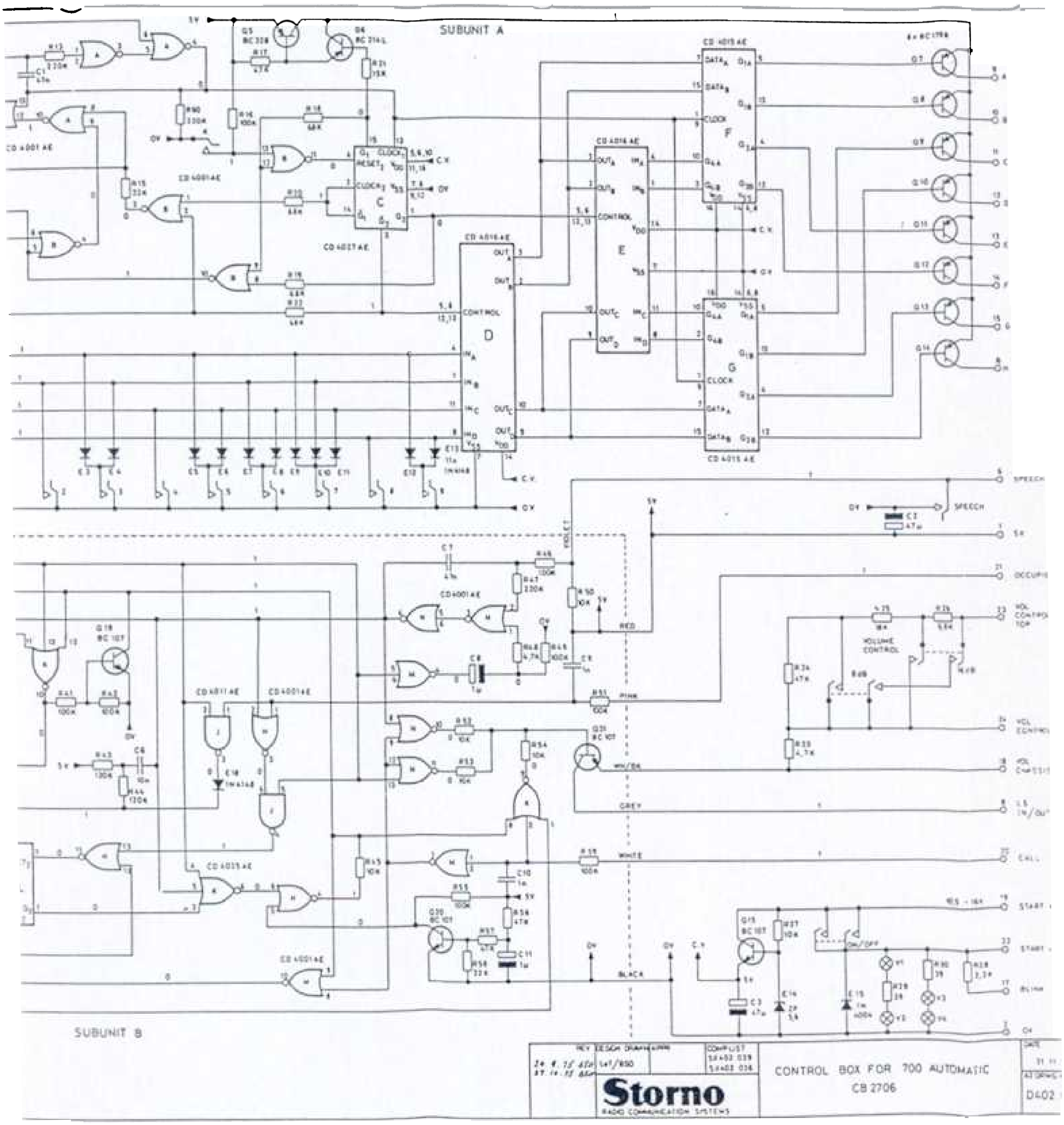


CONTROL UNIT CB2706
Wiring

D402.031/2


SUBUNIT A
CD 4001 AE
CD 4027 AE
CD 4016 AE
CLEAR DOWN
CONTROL
TONE KEY
KEY
ALARM
BROWN
ORANGE
YELLOW
GREEN
BLUE
CD 4011 AE
CD 4001 AE
CD 4035 AE
CD 4027 AE
1N4148

SUBUNIT B



SUBUNIT A
SUBUNIT B
CD 4001 AE
CD 4027 AE
CD 4016 AE
CD 4015 AE
CD 4011 AE
CD 4025 AE
8 x BC 179 B
SPEECH
OCCUPIED
VOL CONTROL TOP
VOLUME CONTROL
VOL CONTROL
VOL CHASSIS
LS IN/OUT
CALL
START
BLINK
ON/OFF
VIOLET
RED
PINK
GREY
WHITE
BLACK
CONTROL BOX FOR 700 AUTOMATIC
CB 2706
Storno
RADIO COMMUNICATION SYSTEMS
D402

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

Storno

TYPE	NO.	CODE	DATA

CONTROL UNIT CB2706
Subunit A

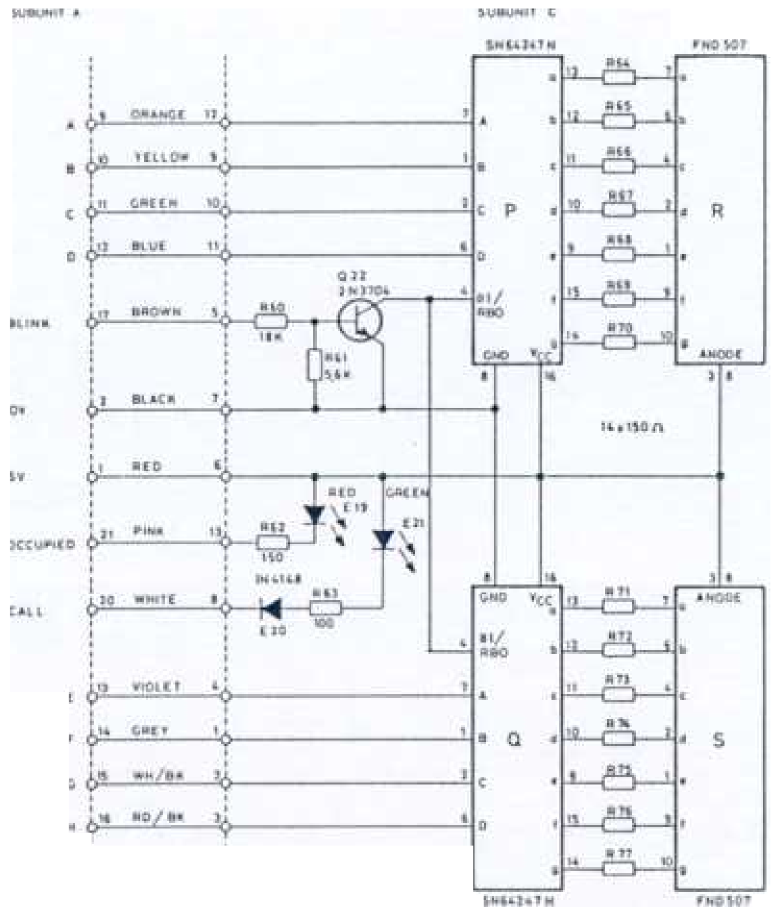
TYP	NO.	CODE	DATA
		15.0233-00	Subunit B. Part of CB2706
	C4	76.5069-00	1 nF 10% Polyester FL 50 V
	C5	73.5109-00	10 µF 20% Tantalum 16 V
	C6	76.5070-00	10 nF 10% Polyester FL 50 V
	C7	76.5072-00	47 nF 10% Polyester FL 50 V
	C8	73.5114-00	1 µF 20% Tantalum 35 V
	C9	76.5069-00	1 nF 10% Polyester FL 50 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

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

X402.036

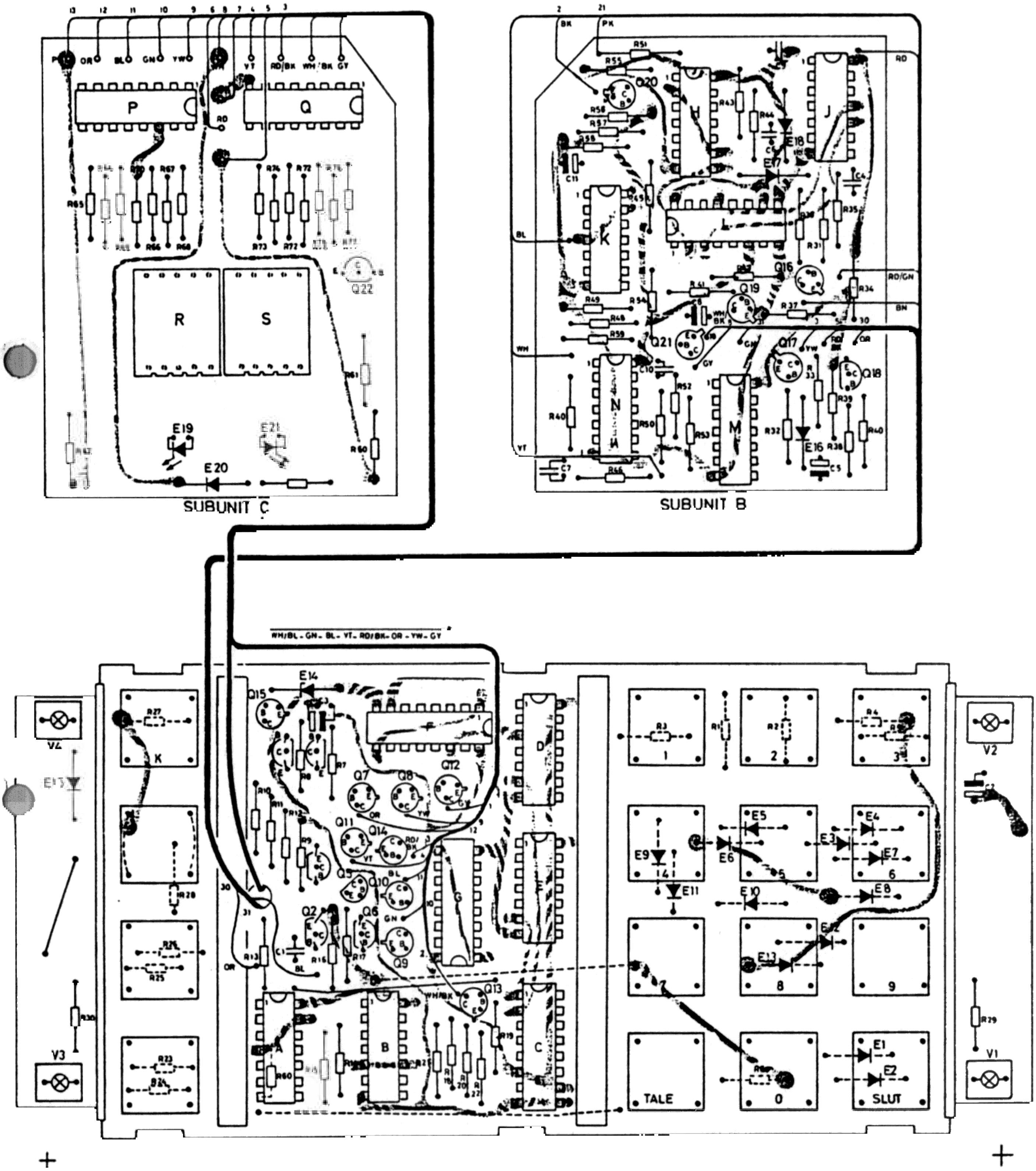
CONTROL UNIT CB2706
Subunit B

Storno



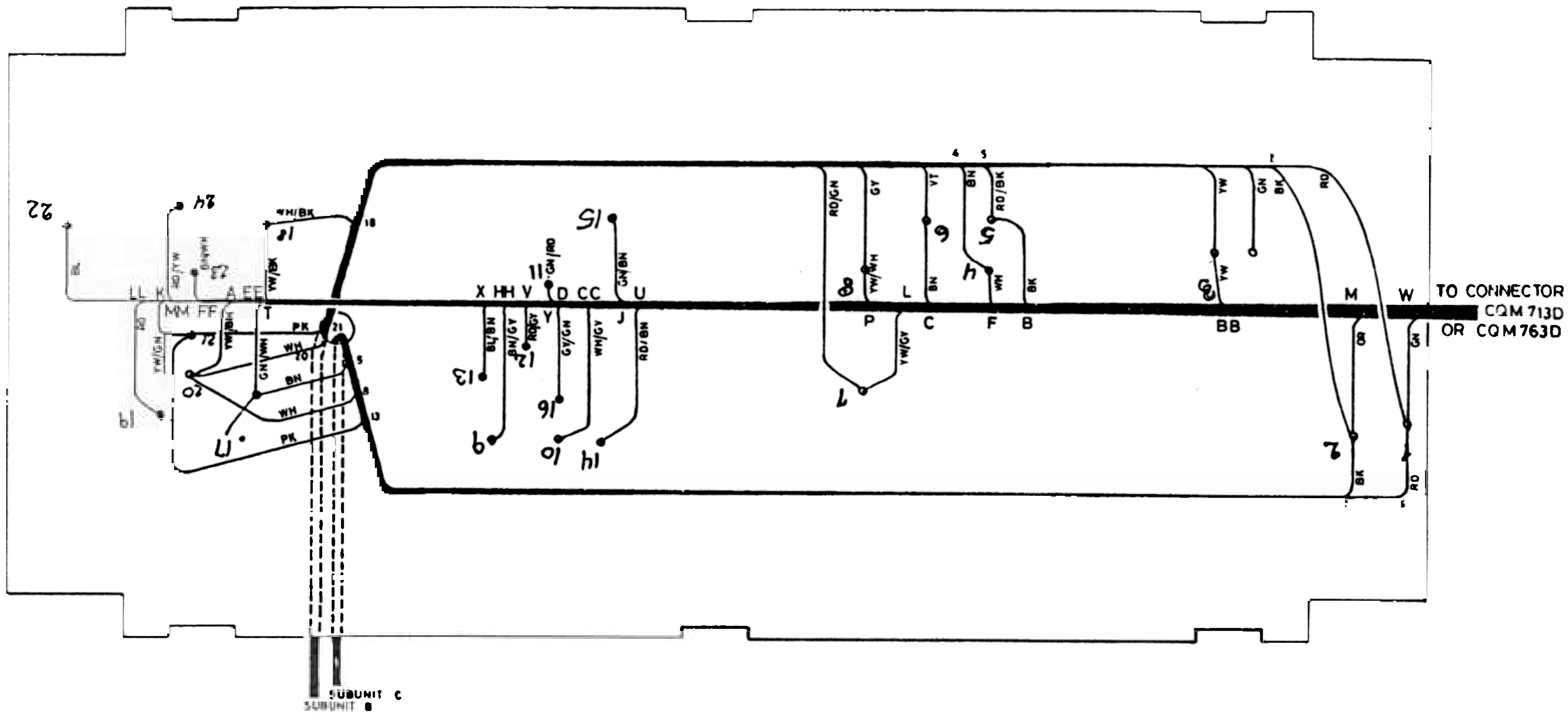
CONTROL UNIT CB2706
Subunit C

D402.033/2



CONTROL UNIT CB2706

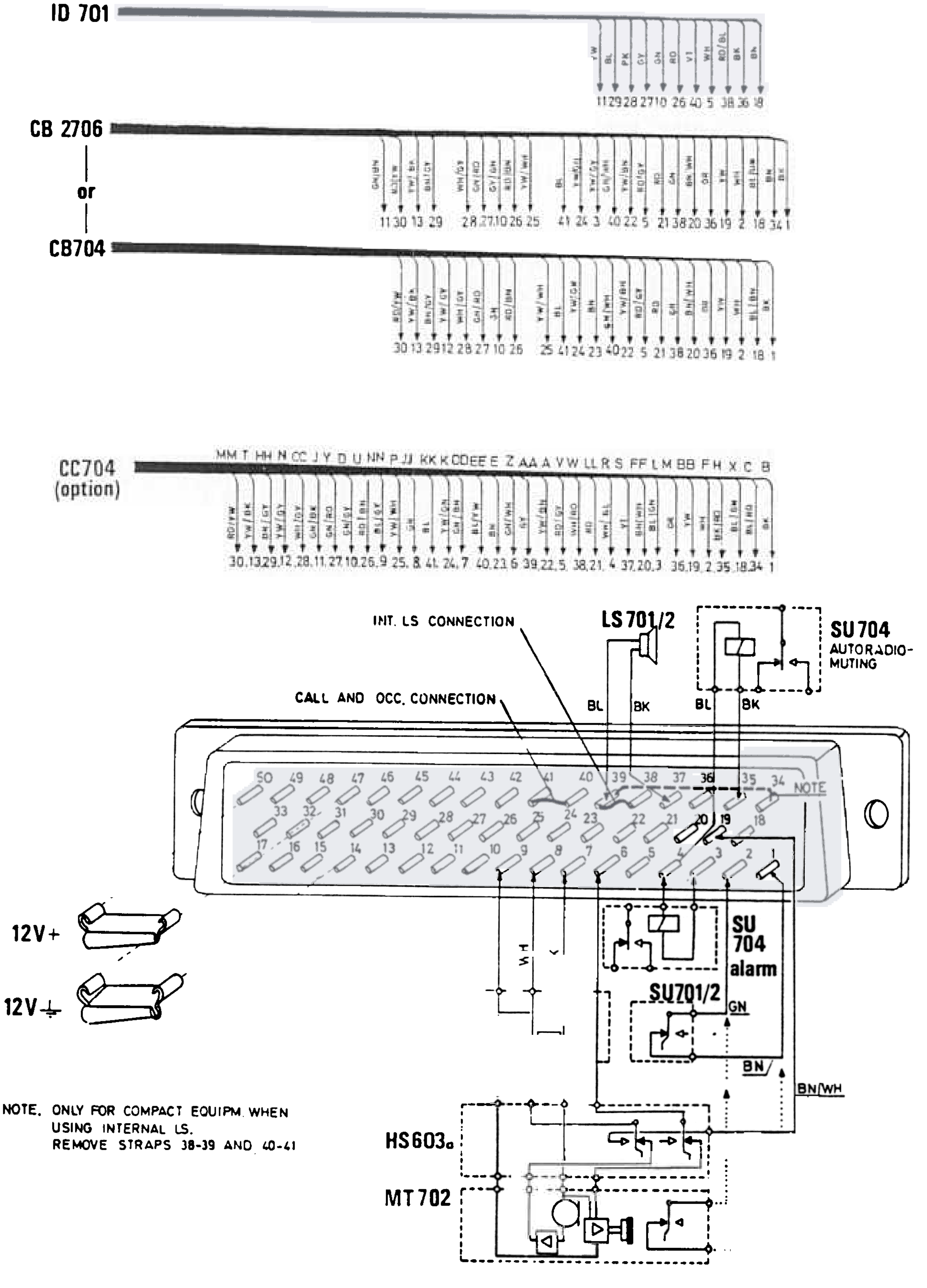
D402.167



CONTROL UNIT CB2706
Wiring

D402.031/2

Storno

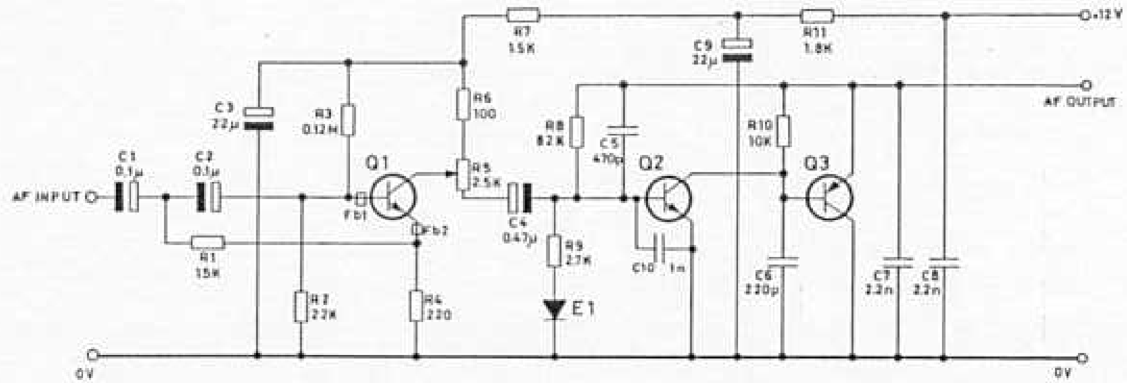


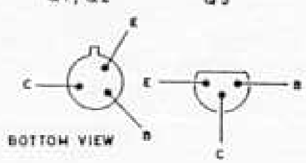
NOTE. ONLY FOR COMPACT EQUIPM. WHEN USING INTERNAL LS. REMOVE STRAPS 38-39 AND 40-41

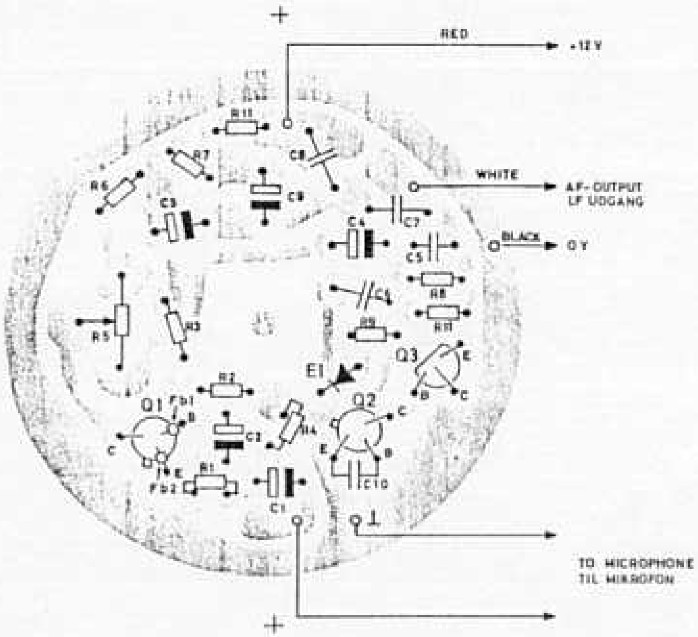
RADIOTELEPHONE CASETTE RETAINER FOR CQM 700 D

CABLE CONNECTIONS

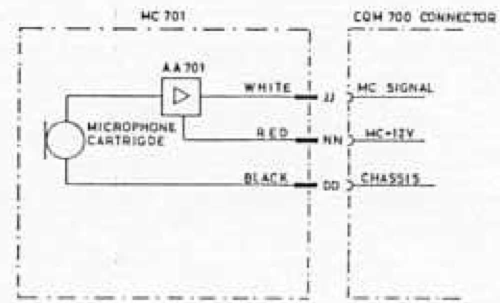
D402.417/2







PRINTED CIRCUIT VIEWED FROM COMPONENT SIDE.



AF AMPLIFIER AA701
LF FORSTÆRKER

D 401.216/3

Storno

TYPE	NO.	CODE	DATA	
AA701		10.2488	Microphone Amplifier	
	C1	73.5130	0.1 μF -20 +60% tantal	20 V
	C2	73.5130	0.1 μF -20 +60% tantal	20 V
	C3	73.5127	22 μF 20% tantal	16 V
	C4	73.5134	0.47 μF -20 +60% tantal	20 V
	C5	76.5106	470 pF 5% polystyr TB	25 V
	C6	76.5104	220 pF 5% polystyr TB	25 V
	C7	76.5059	2.2 nF 10% polyest. FL	50 V
	C8	76.5059	2.2 nF 10% polyest. FL	50 V
	C9	73.5127	22 μF 20% tantal	16 V
	C10	74.5155	1 nF -20 +80% ceram PL	63 V
	R1	80.5251	1.5 KΩ 5% carbon film	1/8W
	R2	80.5265	22 KΩ 5% carbon film	1/8W
	R3	80.5274	0.12 MΩ 5% carbon film	1/8W
	R4	89.5241	220 Ω 5% carbon film	1/8W
	R5	86.5067	2.5 KΩ 20% potentiometer	0.1W
	R6	80.5237	100 Ω 5% carbon film	1/8W
	R7	80.5251	1.5 KΩ 5% carbon film	1/8W
	R8	80.5272	82 KΩ 5% carbon film	1/8W
	R9	80.5254	2.7 KΩ carbon film	1/8W
	R10	80.5261	10 KΩ 5% carbon film	1/8W
	R11	80.5252	1.8 KΩ carbon film	1/8W
	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	

Storno

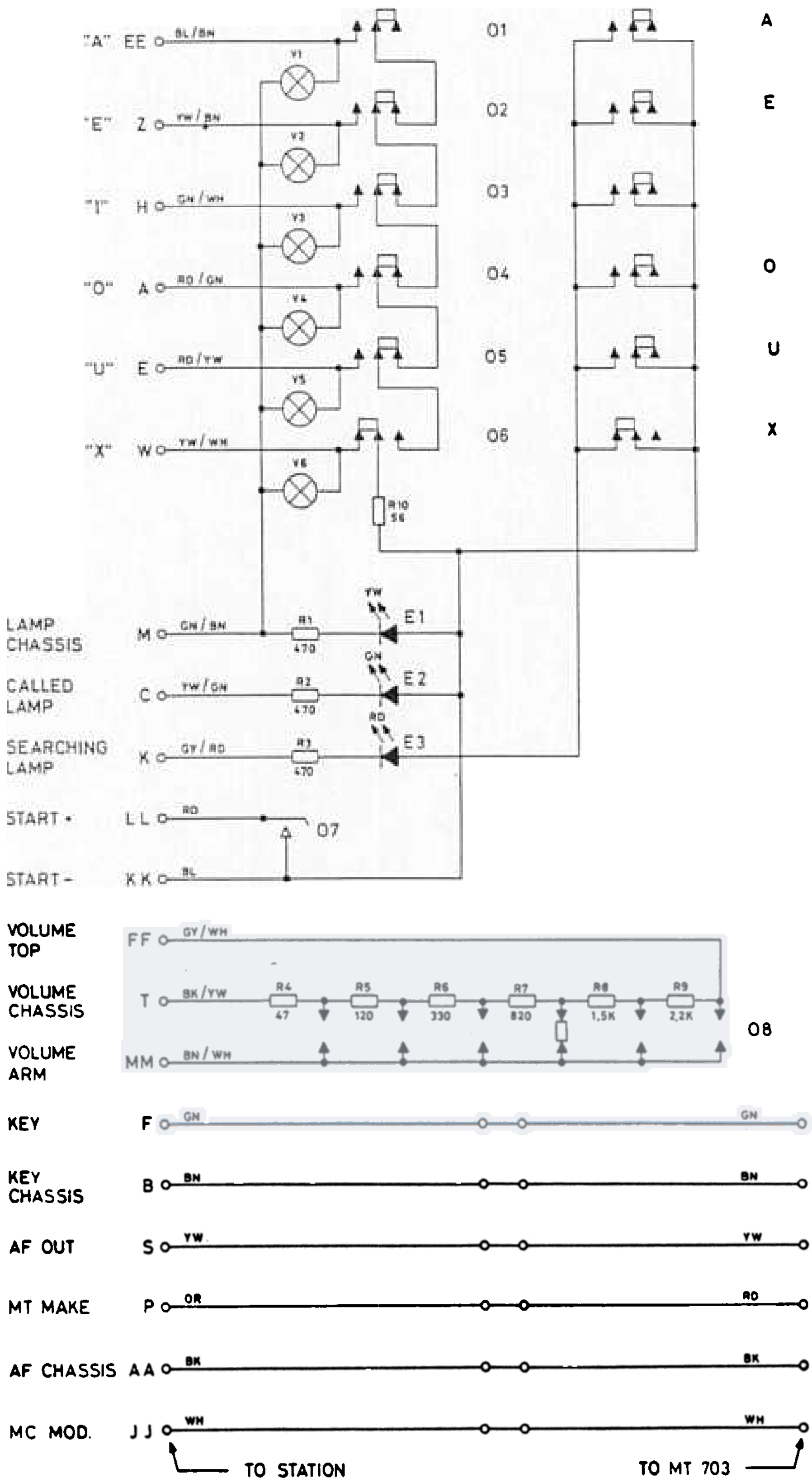
TYPE	NO.	CODE	DATA

MICROPHONE AMPLIFIER
MIKROFONFORSTÆRKER

AA701

X401.318/3

Storno



CONTROL UNIT CB705

D402.386

Storno

TYPE	Nº	CODE	DATA
CB704		10.2445	Control Unit
	R1	80.5432	39 ohm 5% carbon film 1/4W
	R2	80.5430	27 ohm 5% carbon film 1/4W
	R3	86.5069	5K ohm 20% potentiometer log 0.8W
	E1- E30	99.5237	IN 4148 Diode
	V7	92.5098	Lamp 12V/60mA
	V8	92.5098	Lamp 12V/60mA
	V9	92.5098	Lamp 12V/60mA
	V10	92.5098	Lamp 12V/60mA
	01	47.5074	Channel Selector x 10
	02	47.5074	Channel Selector x 1
	03	49.0214	Puch button, Squelch
	04	49.0207	Push button, LS in/out
	05	49.0211	Push button, On/Off
	06	49.0220	Push button, Tone Key
	07	49.0219	Push button, Key

torno

TYPE	Nº	CODE	DATA

CONTROL UNIT CB704

X402.560

Storno

TYPE	Nº	CODE	DATA
		10.3427	Control Unit CB705
	R1	80.5445	470 Ω 5% carbon film 1/4 W
	R2	80.5445	470 Ω 5% " " 1/4 W
	R3	80.5445	470 Ω 5% " " 1/4 W
	R4	80.5233	47 Ω 5% " " 1/8 W
	R5	80.5238	120 Ω 5% " " 1/8 W
	R6	80.5243	330 Ω 5% " " 1/8 W
	R7	80.5248	820 Ω 5% " " 1/8 W
	R8	80.5251	1.5 kΩ 5% " " 1/8 W
	R9	80.5253	2.2 kΩ 5% " " 1/8 W
	R10	80.5434	56 Ω 5% " " 1/4 W
	E1	99.5325	Yellow LED
	E2	99.5304	Green LED
	E3	99.5303	Red LED
	V1	92.5098	Lamp 12 V 60 mA
	V2	92.5098	Lamp 12 V 60 mA
	V3	92.5098	Lamp 12 V 60 mA
	V4	92.5098	Lamp 12 V 60 mA
	V5	92.5098	Lamp 12 V 60 mA
	V6	92.5098	Lamp 12 V 60 mA
	O1	49.0252	"A" Push button
	O2	49.0253	"O" Push button
	O3	49.0254	"E" Push button
	O4	49.0255	"U" Push button
	O5	49.0256	"I" Push button
	O6	49.0257	"X" Push button
	O7	47.5084	ON/OFF switch
	O8	47.0622	Volume switch

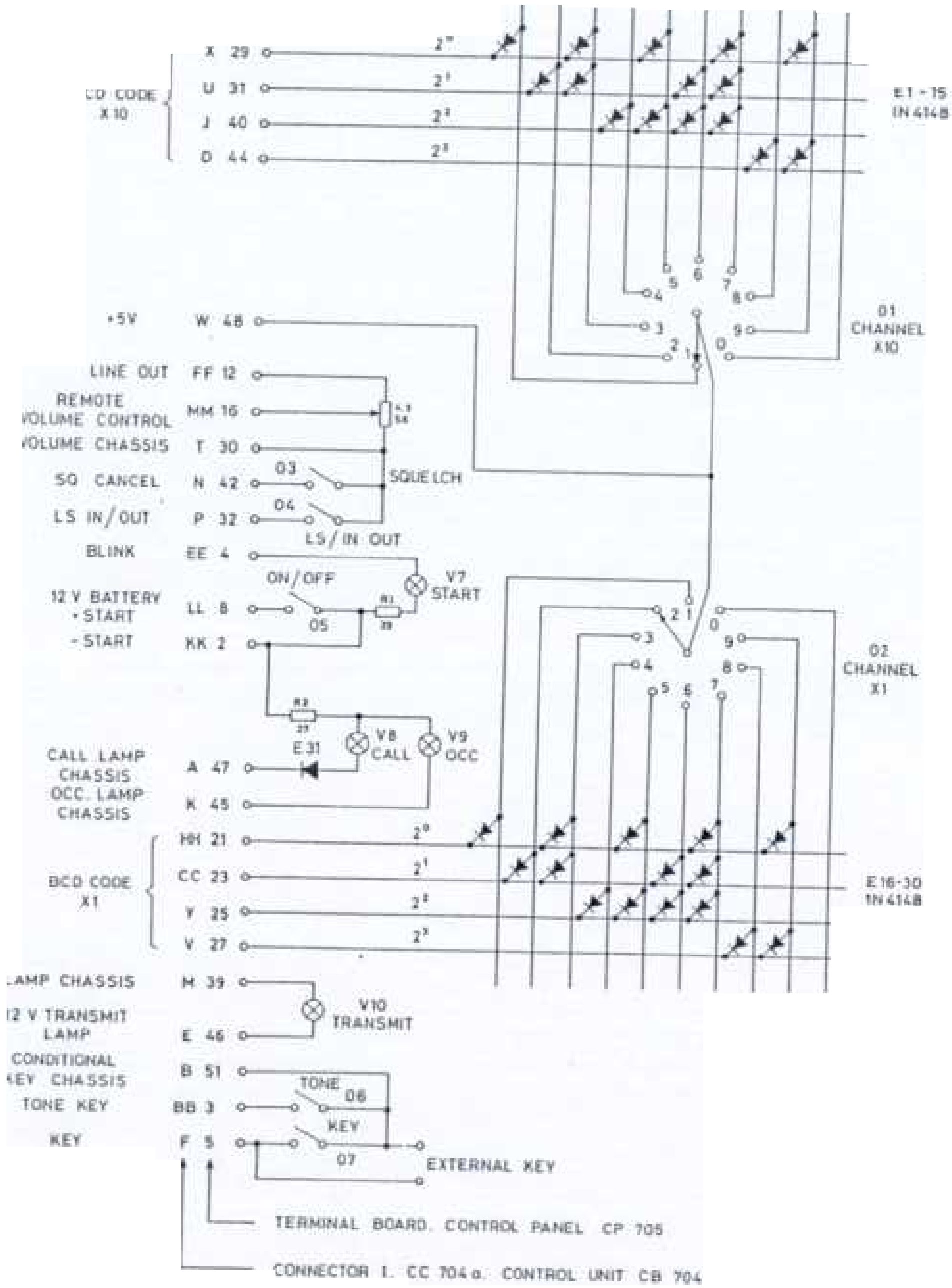
orno

TYPE	Nº	CODE	DATA

CONTROL UNIT CB705

X402.542

Storno



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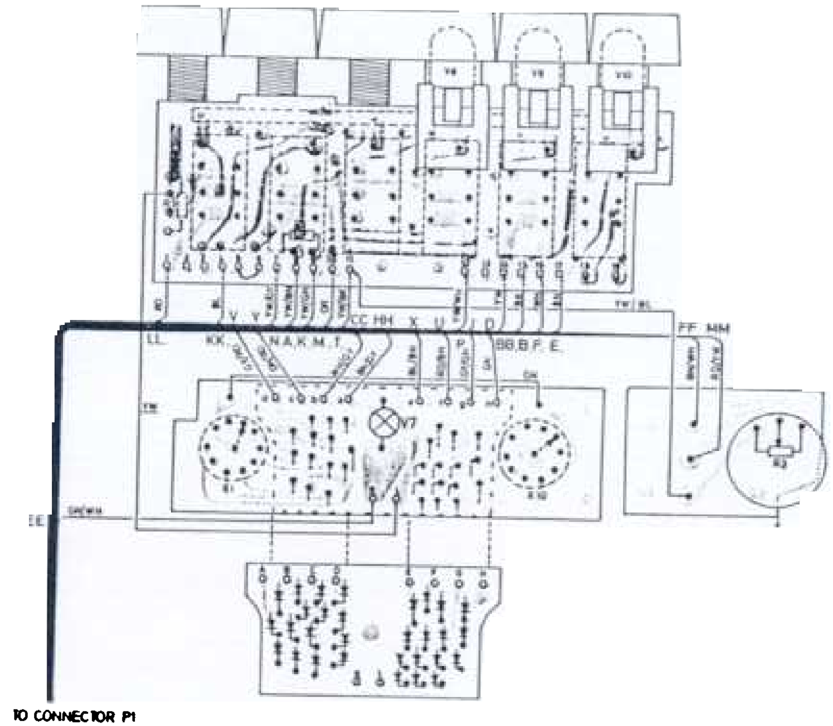
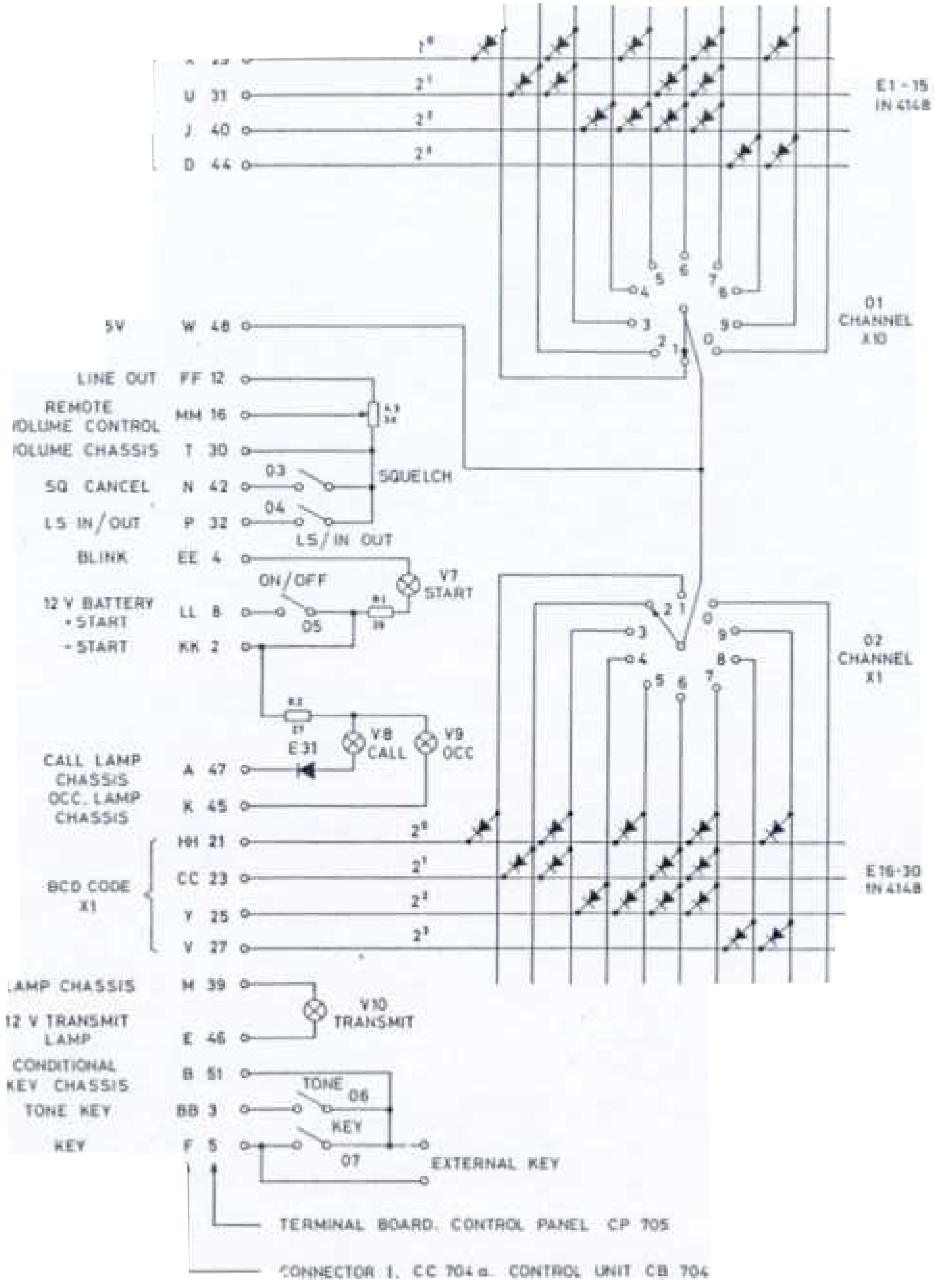
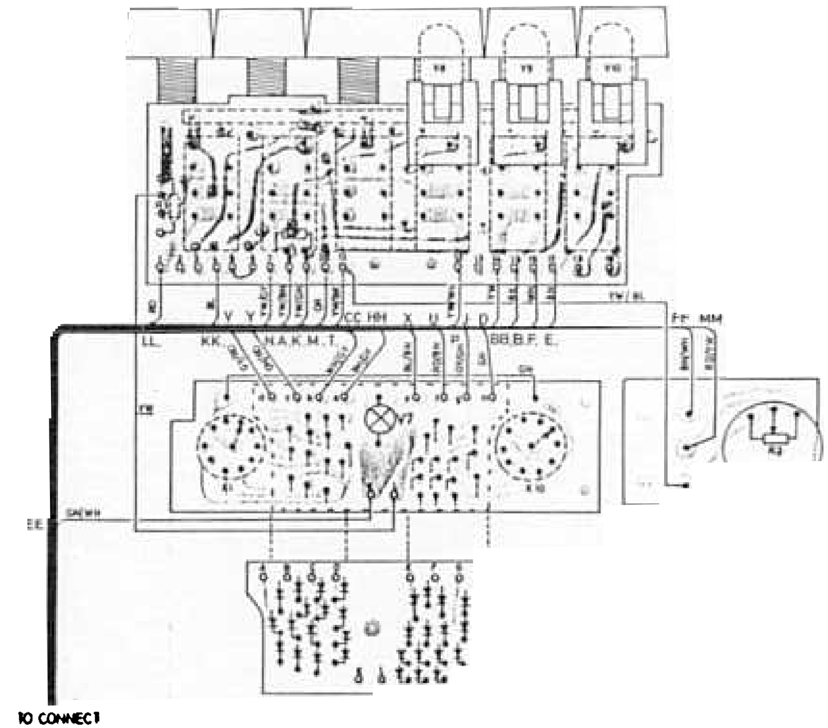


CONTROL PANEL CP 705
CONTROL UNIT CB 704

D 402.570

Storno

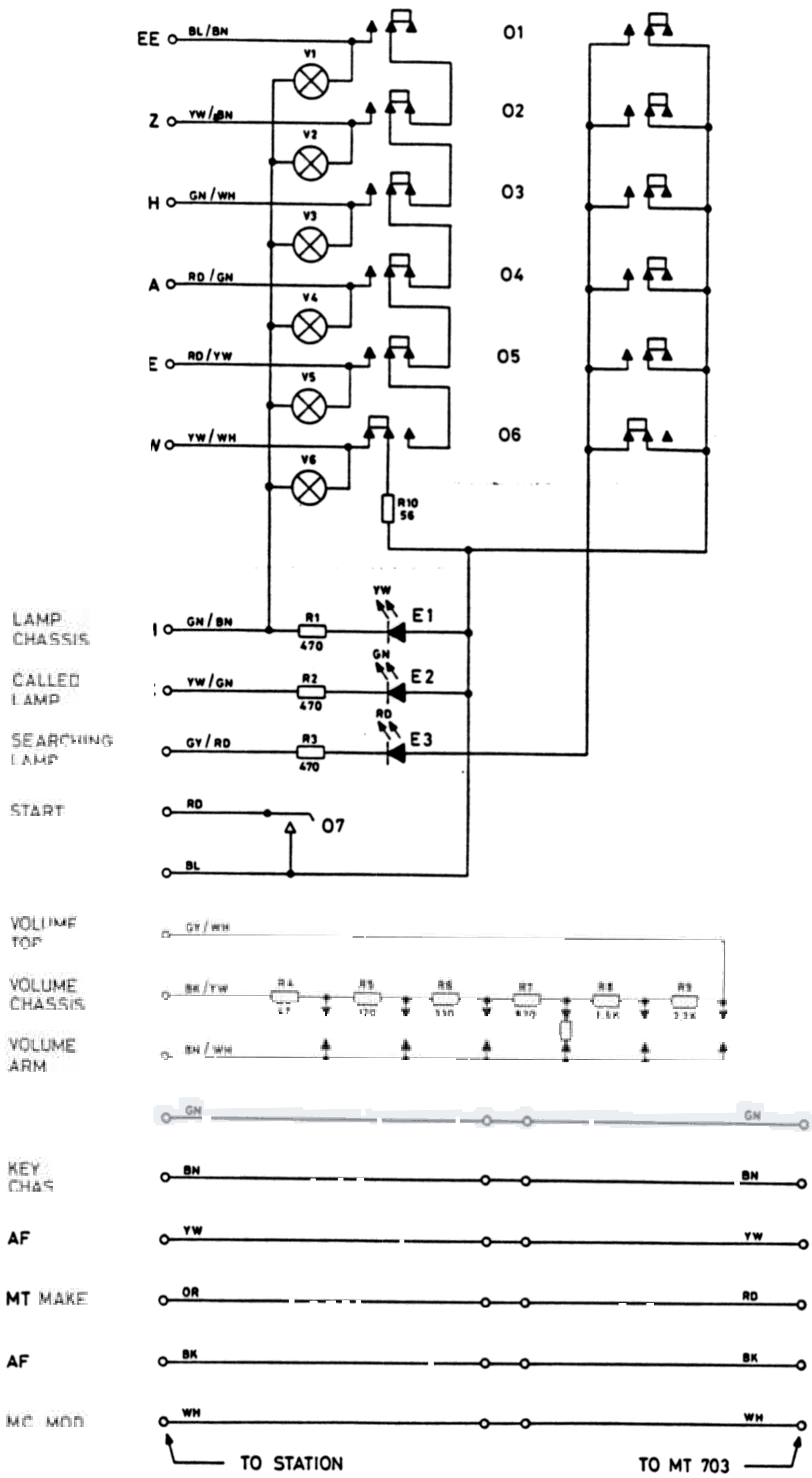




CONTROL PANEL CP 705
CONTROL UNIT CB 704

D402.570

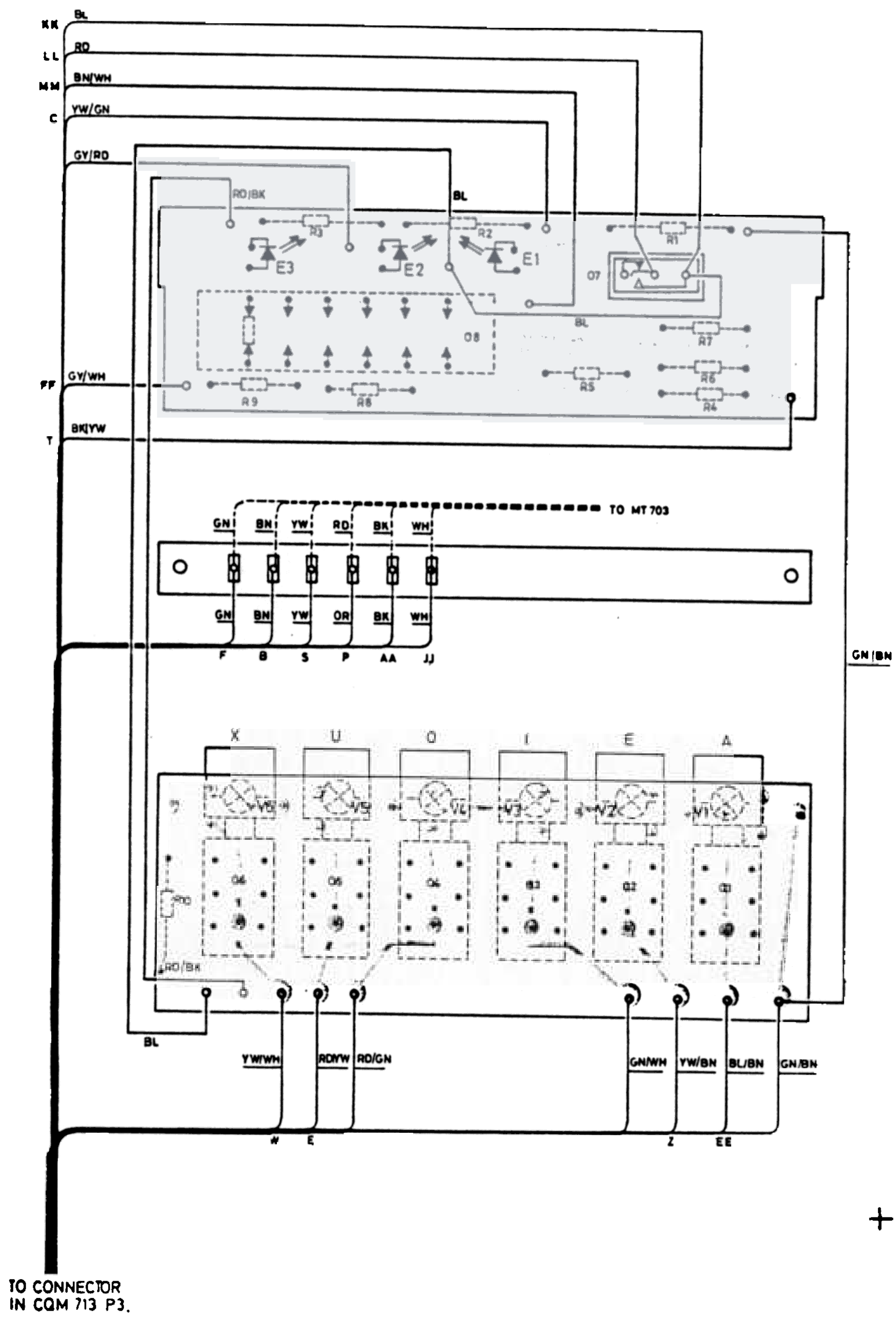
Storno



CONTROL UNIT CB7

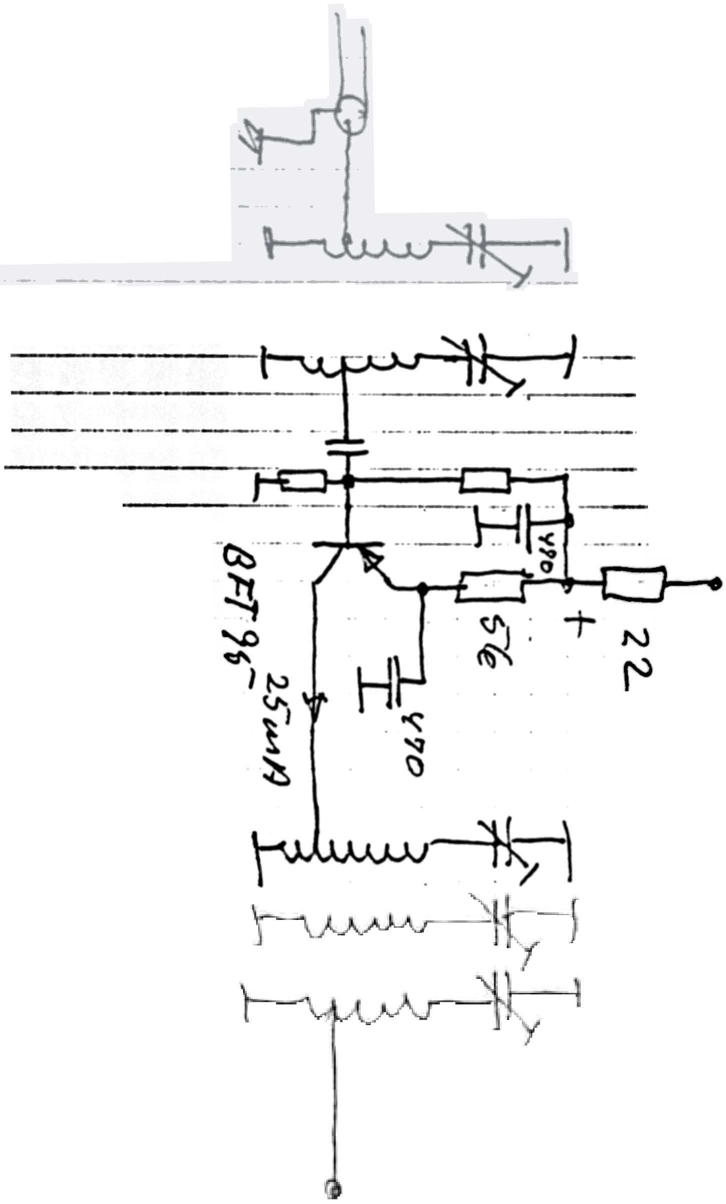
D402.386

Storno



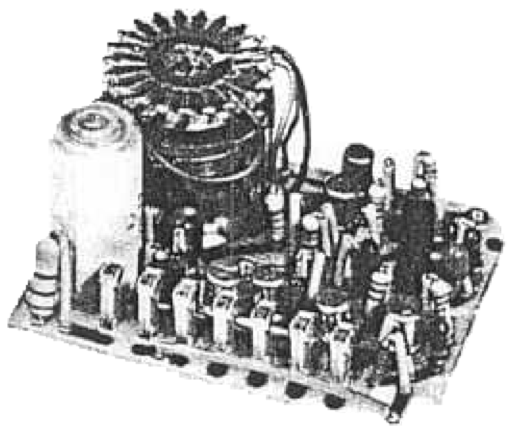
CONTROL UNIT CB705

D402.589


BFT 96
25mA
470
470
56
+
22

Storno

TONE TRANSMITTER
TT781 TT783



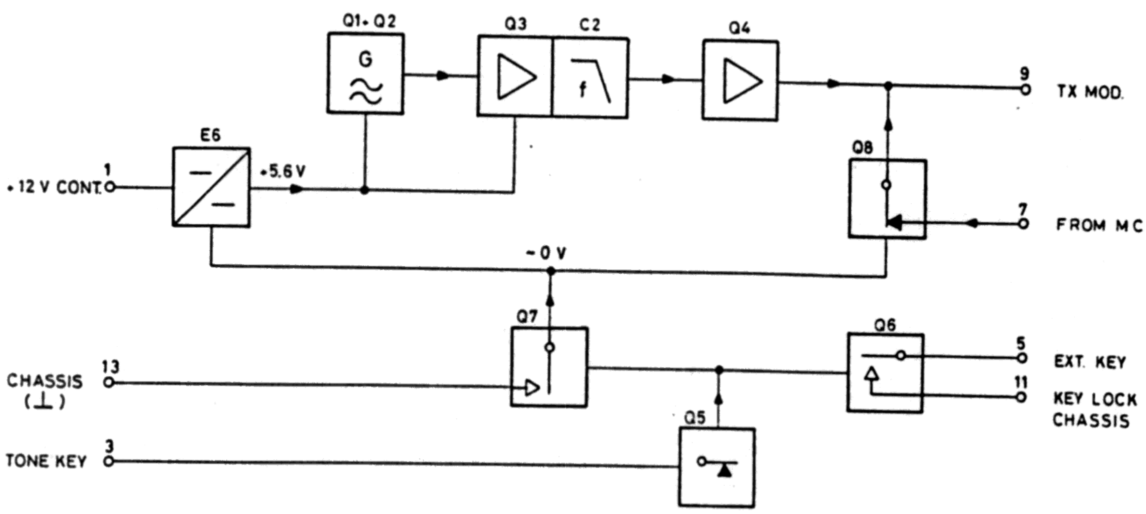
Description

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%

Frequency Response
6 dB pr. octave de-emphasis
f_o = 1000 Hz

Distortion (voice modulation)
≤ 5%

AF Gate Attenuation
≥ 50 dB

Distortion (tone modulation)
≤ 3%

TONE TRANSMITTER TT781

Tone Frequencies

Frequency Accuracy
≤ 0.3%

Frequency Stabilit
≤ 0.6%

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

TONE TRANSMITTER TT783

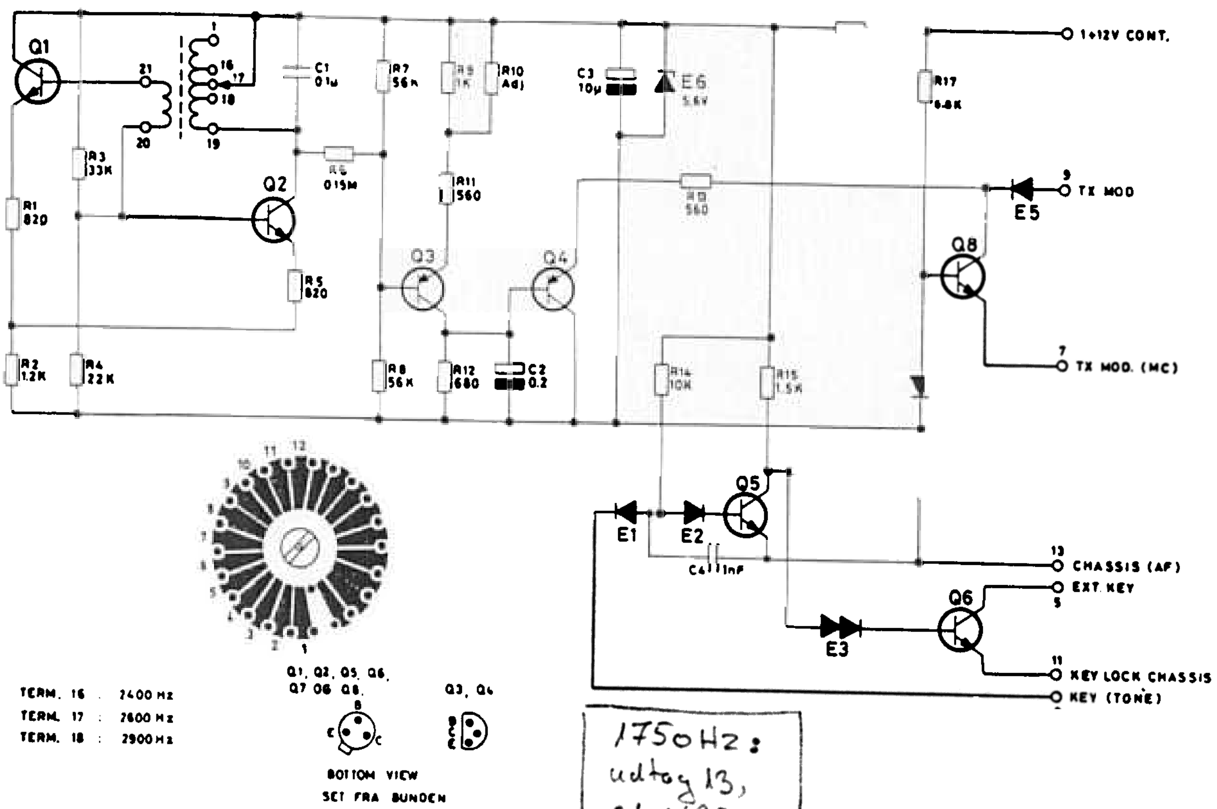
Tone Frequencies
825, 1010, 1240, 1435, 1520, 1750, 1860, 1980, 2000, 2135, 2280, 2450 Hz

Frequency Accuracy
≤ 0.5%

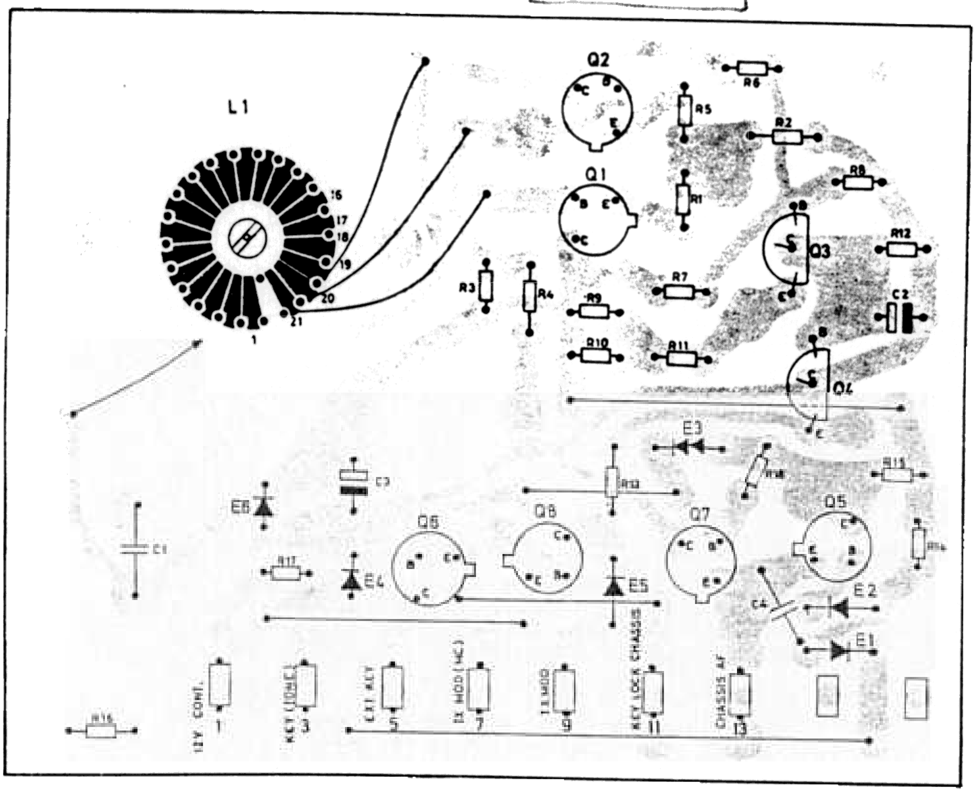
Frequency Stability
≤ 1%

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

Storno



1750Hz:
udtag 13,
C1 // 8,5 nF.



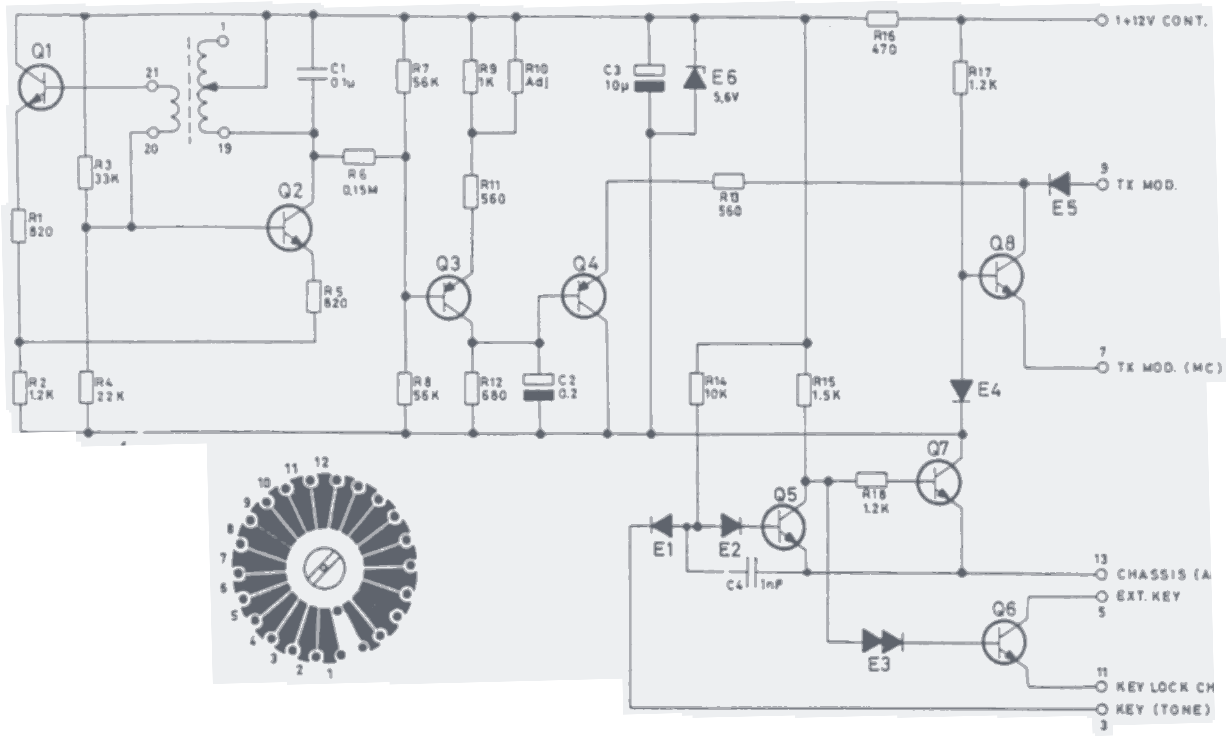
TONE TRANSMITTER
TONESENDER

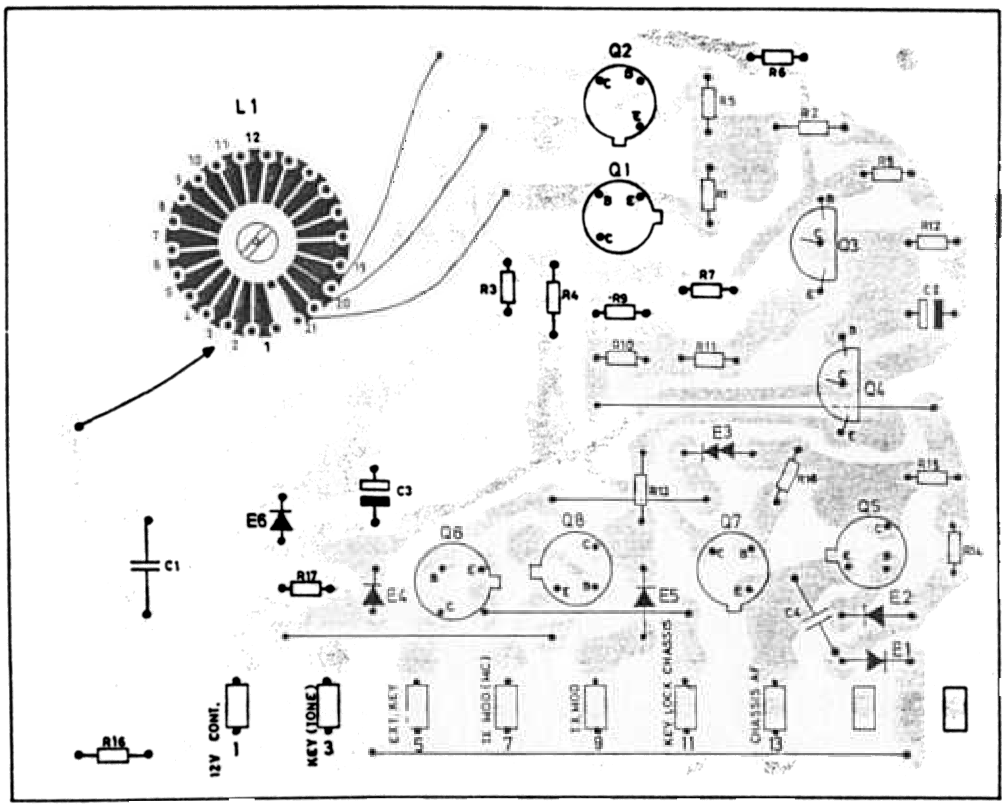
TT781

D 402.161

TYPE	NO.	CODE	DATA
TT781		10.3042-00	Tone Transmitter
	C1	76.5068	0.1 µF 1% polystyr TB 63V
	C2	73.5118	0.22µF 20% tantal 35V
	C3	73.5109	10 µF 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	1.2KΩ 5% " " 1/8W
	R3	80.5267	33KΩ 5% " " 1/8W
	R4	80.5265	22KΩ 5% " " 1/8W
	R5	80.5248	820 Ω 5% " " 1/8W
	R6	80.5275	0.15MΩ 5% " " 1/8W
	R7	80.5270	56KΩ 5% " " 1/8W
	R8	80.5270	56KΩ 5% " " 1/8W
	R9	80.5249	1KΩ 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	10KΩ 5% " " 1/8W
	R15	80.5251	1.5KΩ 5% " " 1/8W
	R16	80.5445	470 Ω 5% " " 1/8W
	R17	80.5250	1.2KΩ 5% " " 1/8W
	R18	80.5250	1.2KΩ 5% " " 1/8W
	L1	61.1133	Tone coil
	E1	99.5028	1N914 Diode
	E2	99.5028	1N914 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
	Q8	99.5143	BC108 Transistor
	Q7	99.5143	BC108 Transistor
	Q8	99.5143	BC108 Transistor

TYPE	NO.	CODE	DATA





TONE TRANSMITTER
TONESENDER

TT783

D401.557/3

Storno

TYPE	NO.	CODE	DATA			
TT783		10.2454	Tone Transmitter			
	C1	76.5068	0,1μF	1% polystyr. TB		63V
	C2	73.5118	0,22μF	20% tantal		35V
	C3	73.5109	10μF	20% tantal		16V
	C4	74.5155	1 nF	-20 +80% ceram	PL	63V
	R1	80.5248	820Ω	5% carbonfilm		1/8W
	R2	80.5250	1,2KΩ	5% carbonfilm		1/8W
	R3	80.5267	33KΩ	5% carbonfilm		1/8W
	R4	80.5265	22KΩ	5% carbonfilm		1/8W
	R5	80.5248	820Ω	5% carbonfilm		1/8W
	R6	80.5275	0,15MΩ	5% carbonfilm		1/8W
	R7	80.5270	56KΩ	5% carbonfilm		1/8W
	R8	80.5270	56KΩ	5% carbonfilm		1/8W
	R9	80.5249	1KΩ	5% carbonfilm		1/8W
	R10	80.52XX	Adj.	5% carbonfilm		1/8W
	R11	80.5246	560Ω	5% carbonfilm		1/8W
	R12	80.5247	680Ω	5% carbonfilm		1/8W
	R13	80.5246	560Ω	5% carbonfilm		1/8W
	R14	80.5261	10KΩ	5% carbonfilm		1/8W
	R15	80.5251	1,5KΩ	5% carbonfilm		1/8W
	R16	80.5445	470Ω	5% carbonfilm		1/4W
	R17	80.5259	6.8KΩ	5% carbonfilm		1/8W
	R18	80.5250	1,2KΩ	5% carbonfilm		1/8W
	L1	61.1158	Tone coil			
	E1	99.5028	1N914 Diode			
	E2	99.5028	1N914 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		

Storno

TYPE	NO.	CODE	DATA

TONE TRANSMITTER
TONESENDER

TT783

X401.687/2