MOBILE RADIOTELEPHONE
MODEL STORNOPHONE 600L
TYPE CQL631
TYPE CQL632
TYPE CQL633
TYPE CQL634
68...88 MHz

CONTENTS

GENERAL SPECIFICATIONS

CHAPTER I. GENERAL DESCRIPTION
- A. Design Details
- B. Control Equipment and Accessories

CHAPTER II. THEORETICAL CIRCUIT DESCRIPTION
- A. General Description
- Description of Subunits

CHAPTER III. ACCESSORIES
- Microphones, Microtelephones, etc.

CHAPTER IV. INSTALLATION

CHAPTER V. SERVICE
- A. Maintenance
- B. Fault-finding and Repairs
- C. Adjustment Procedure

CHAPTER VI. DIAGRAMS AND PARTS LISTS

Storno

GENERAL SPECIFICATIONS

Type	CQL631	CQL632	CQL633	CQL634
Frequency Range	68-88 MHz	68-88 MHz	68-88 MHz	68-88 MHz
Min. Channel Separation	50 kHz	25 kHz	20 kHz	12.5 kHz
Max. Frequency Swing	± 15 kHz	± 5 kHz	± 4 kHz	± 2.5 kHz
Frequency Stability	Meets government specifications			
Max. Bandwidth	1000 kHz			
Antenna Impedance	50 ohms nominal			
Number of RF Channels	Max. 6 channels			
Dimensions	230 x 230 x 70 mm			
Weight	4.7 kilos			

TRANSMITTER SPECIFICATIONS

RF Power Output	10 watts, provision for reduced power
Modulation	Phase modulation 300-3000 Hz (for CQL631, 632, and 633) 300-2500 Hz (for CQL634)
FM Noise	CQL631: 50 dB below standard test modulation CQL632: 44 dB below standard test modulation CQL633: 42 dB below standard test modulation CQL634: 40 dB below standard test modulation
Spurious Outputs	Less than 2×10^{-7} watts

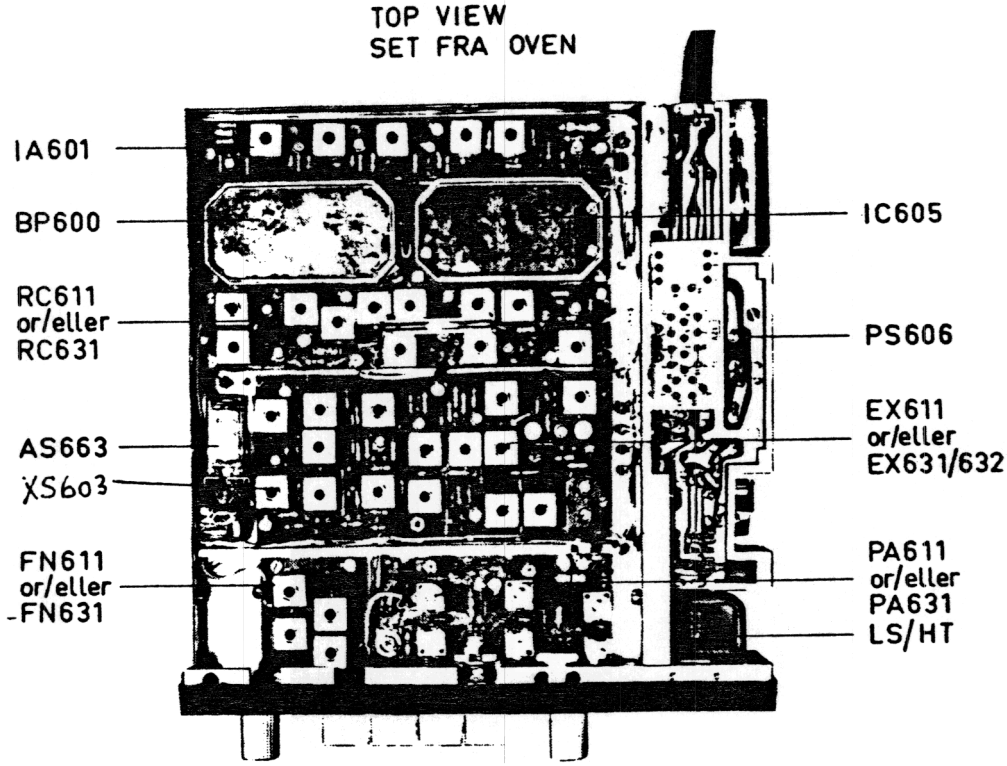
RECEIVER SPECIFICATIONS

Stensitivity	0.35 μV for 20 dB signal-to-noise ratio
Squelch	Electronic, adjustable
Adjacent Channel Selectivity	Better than 80 dB (EIA two-signal method)
Undesired Radiation	Less than 2×10^{-9} watts
Intermodulation	Better than 70 dB (EIA method)
Spurious Response Attenuation	Better than 80 dB
Audio Output	2 watts; only 1 watt with built-in speaker

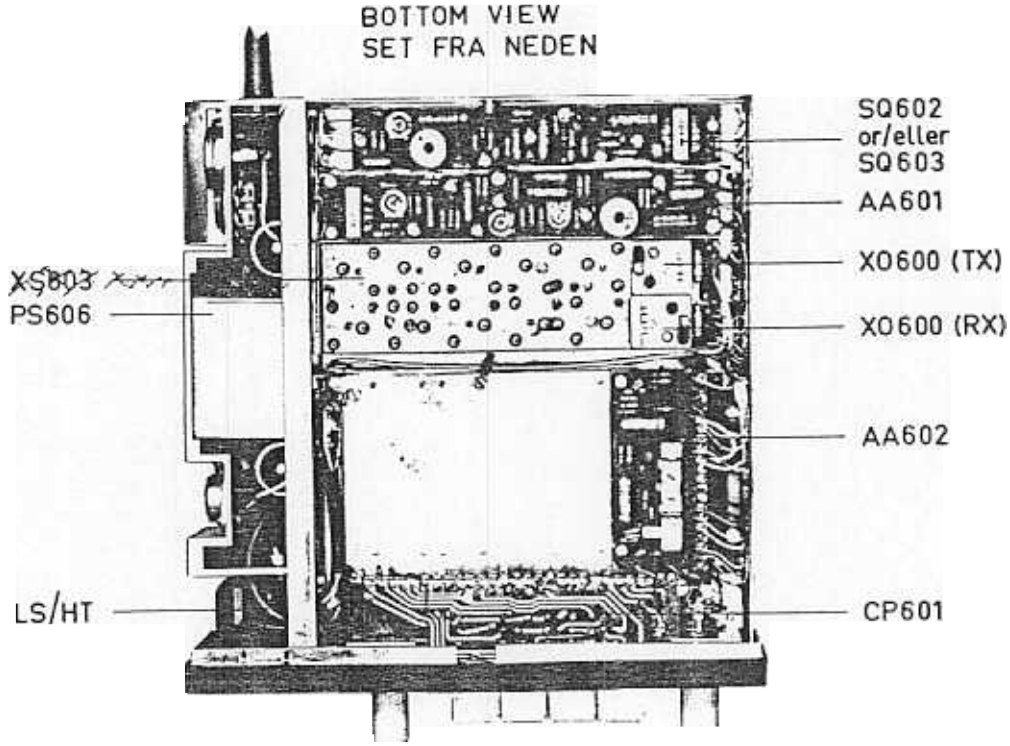
POWER SUPPLY SPECIFICATIONS

Battery Voltage	6.3 V	12.6 V	25.2 V
Battery Drain:			
Stand-by (ready to transmit)	0.55A	0.25A	0.12A
Transmission	8.0A	3.0A	1.4A

TOP VIEW
SET FRA OVEN



BOTTOM VIEW
SET FRA NEDEN



MOBILE RADIOTELEPHONE TYPE CQL 610, CQL 630
MOBILT RADIOTELEFONANLÆG

41.016-D1/E1

Storno

CHAPTER I. GENERAL DESCRIPTION

A. Design Details

Introduction

The STORNOPHONE 600L is a locally operated transmitter/receiver combination for VHF/UHF FM radio communication in one of the frequency ranges 68-88 MHz, 146-174 MHz, and 420-470 MHz. The complete radiotelephone comprises a cabinet which houses the transmitter, receiver, and control panel; a microphone or handset; and an antenna and installation materials.

This manual contains a detailed description of the STORNOPHONE 600L and the standard accessories which are available. Because we at Storno are constantly processing the experience we gain during the production, testing, and operation of our radiotelephones, minor modifications and corrections will be made at regular intervals. These will be listed on a separate sheet, which will be placed first in this manual.

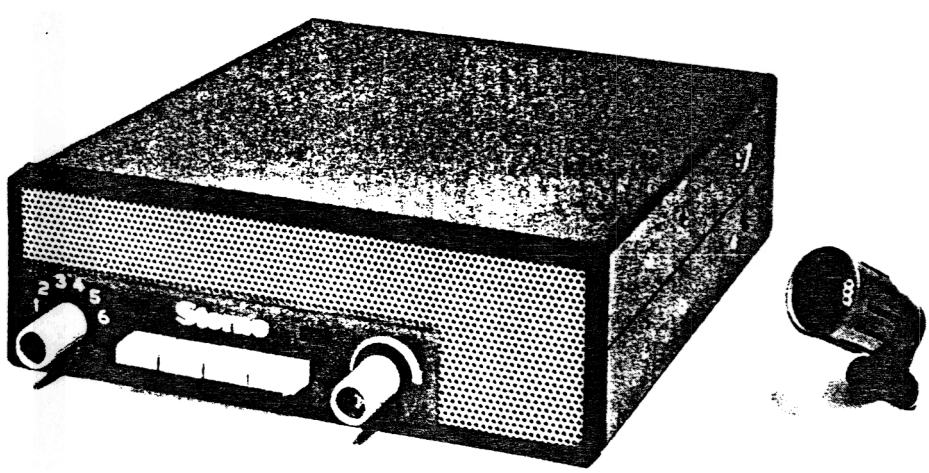
If your STORNOPHONE 600L is a special version, descriptions of the necessary modifications will be condensed into an appendix which is placed first in the standard description whilst the associated circuit diagrams are placed last in the book.

Standard Versions

The STORNOPHONE 600L is available in the following versions:

Type	Frequency Range	Channel Separation
CQL611	146-174 MHz	50 kHz
CQL612	146-174 MHz	25 kHz
CQL613	146-174 MHz	20 kHz
CQL614	146-174 MHz	12, 5 kHz
CQL631	68-88 MHz	50 kHz
CQL632	68-88 MHz	25 kHz
CQL633	68-88 MHz	20 kHz
CQL634	68-88 MHz	12, 5 kHz
CQL661	420-470 MHz	50 kHz
CQL662	420-470 MHz	25 kHz
CQL663	420-470 MHz	20 kHz

Where it is not necessary to distinguish between radiotelephones with different channel separations, the following description will employ common designations for radiotelephones inside the same frequency band. Thus, the CQL611, CQL612, CQL613, and CQL614 2-metre radiotelephones will be covered under the common designation of CQL610.



The STORNOPHONE 600L is intended for simplex operation. The standard version is for local operation. It can be operated from 6-, 12-, and 24-volt DC power supplies. Switching from one voltage to another requires a rewiring job in the power supply section.

A maximum of six RF channels can be provided.

Transmitter power output for 2- and 4-metre stations (CQL610 and CQL630) is 10 watts with provision for operation at reduced power. For 0.7-metre stations (CQL660), power output is 6 watts, likewise with provision for operation at reduced power.

Construction

The radiotelephone is housed in a drawer-type cabinet consisting of an outer section designed as a housing, and an inner section that is similar to a drawer. The two sections are held together by a number of screws on the right-hand and rear sides of the cabinet.

The outer section is a box made of 2-mm aluminium sheet.

The drawer section, of cadmium-plated steel sheet, carries all radio circuits. Besides serving as a chassis for the units of the radiotelephone, the drawer divides the interior of the cabinet into three mutually screened compartments. Thus, a vertical wall in the right-hand side of the cabinet separates the power supply section and the loudspeaker from the other radio sections. A horizontal wall through the middle divides the cabinet into two sections the upper one of which contains all RF and IF modules except for the oscillators; these are located in the lower section together with the audio modules and the control panel.

The front panel of the drawer section carries the controls etc. and the loudspeaker.

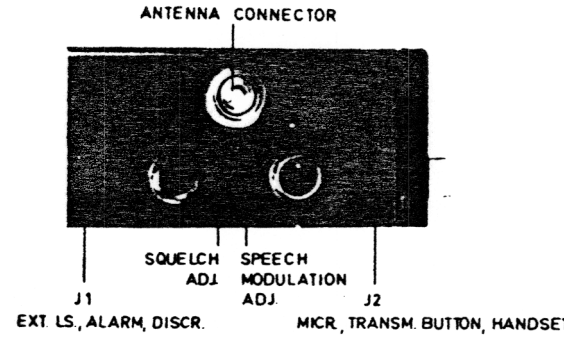
The rear wall carries the battery terminals.

There are three connectors on the left-hand side of the cabinet, for:

Microphone, transmit button or microphone.

Antenna cable (BNC connector).

External loudspeaker and test point for discriminator measurement.



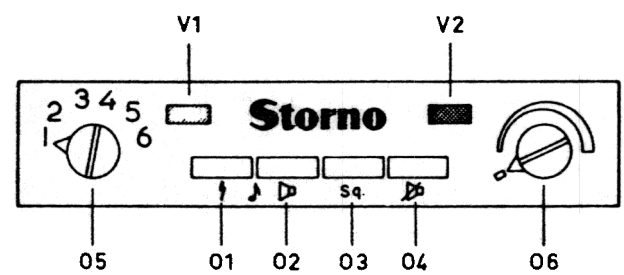
The cabinet also has two holes through which it is possible to adjust:

Squelch function

Speech modulation.

Operation

The controls etc. provided on the Type CP601 Control Panel are accessible on the front panel of the cabinet, on which they are located as shown in the sketch. Number and letter designations, identical with those used in the circuit diagrams, cover the following functions:



01	Self-releasing push-button	Transmit/tone button(+)
02	Self-releasing push-button	"Speaker In". This button, in conjunction with a built-in tone receiver, cuts in the loud speaker. In some versions, this button functions as a tone button (++).
03	Self-locking double-push releasing push-button	Cuts out the squelch function.
04	Self-releasing push-button	"Speaker Out". This button, in conjunction with a built-in tone receiver, cuts out the loudspeaker.

05	Control knob	Channel selector for max. 6 channels.
06	Control knob	Combined on/off switch and volume control.
V1	Red lamp	Transmit pilot lamp.
V2	Green lamp	Indicates reception of selective call.

(+)
If a tone generator is used, a tone call can be transmitted only by pressing the button 01, causing both the tone generator and the station transmitter to be operated. If tone calls are not desired in subsequent traffic, the radiotelephone must be operated from an external transmit button such as a steering-wheel switch or microphone switch.

(++)
If a tone generator is used in a station not equipped with an external transmit button, a restrapping operation in the control panel is required, which calls for tone calls to be transmitted by pressing the buttons 01 and 02 simultaneously. Subsequent traffic in which the use of tone calls is not desired is handled by means of transmit button 01 only.

The circuits of the various control functions are covered in detail by the description of CP601 in Chapter II.

Besides, a detailed instruction manual is supplied with each STORNOPHONE 600L.

Voltage Switching

The STORNOPHONE 600L is designed for operation from 6, 12, and 24 volts DC.

Switching between the various supply voltages is performed on a strap board, located on top of the power supply section. The switching operation consists in unsoldering and rewiring a few straps in accordance with directions given on a diagram provided inside the cabinet, on which connections for the respective voltages are clearly indicated.

When performing the switching operation the external voltage indicator on the rear wall of the cabinet should be rotated so that the voltage indicated on it answers to the voltage for which the equipment has been strapped.

Remote Control

The STORNOPHONE 600L is supplied for local control only. However, it can be converted for remotely controlled operation by means of a Type MK601 remote control kit, which is separately available from STORNO. Detailed instructions for performing the conversion are given in a subsequent section of this manual.

Tone Equipment

Tone equipment to permit operation in selective calling systems can easily be installed in the STORNOPHONE 600L, in which space has been left for the tone transmitter, tone receiver, and alarm circuit. If the STORNOPHONE 600L is supplied with built-in tone equipment, descriptions, circuit diagrams etc. of such equipment will be contained in a separate technical manual.

B. Control Equipment and Accessories

The list below covers the types of control equipment and accessories that are available for the STORNOPHONE 600L. Some of them, such as installation materials, antenna, and microphone, are necessary for installing and operating the equipment.

Control Equipment

LS601	High-efficiency loudspeaker. Supplied with mounting hardware but less connector.
MC601	Fixed microphone with built-in amplifier. Hardware for fixed mounting is supplied.
MC602	Fixed microphone with built-in amplifier and 10-cm gooseneck.
MC603	Fixed microphone with built-in amplifier and 20-cm gooseneck.
MC604	Fixed microphone with built-in amplifier and 40-cm gooseneck.

MC605 Fixed microphone for mounting on steering column. A steering-wheel switch for use with a fixed microphone is available.

MC606 Fist microphone with built-in amplifier, transmit button, and hang-up bracket. Mounting hardware is supplied.

MK601 Conversion kit. For modifying a locally controlled station for remote control Consists of control box, remote control panel, and connectors and control cable.

MK602 Conversion kit. For mounting a multiwire connector on the control box of a remotely controlled station.

MT601 Handset with built-in amplifier and transmit button. Hang-up bracket and mounting hardware are supplied.

Antennas

The STORNOPHONE 600L is designed for operation with a 50-ohm antenna. STORNO can supply the following standard types, all of which have bases designed to permit mounting from the outside without damaging the car upholstery.

AN39-5 1/4 wavelength whip antenna for the frequency range 68-88 MHz.

AN19-5 1/4 wavelength whip antenna for the frequency range 146-174 MHz.

AN69-3 1/4 wavelength whip antenna for the frequency range 420-470 MHz.

AN69-4 5/8 wavelength whip antenna for the frequency range 420-470 MHz.

Other types, such as a 5/8-wavelength rear-mounting antenna, tilt-over antenna or magnetic antenna may be used if desired.

Installation Kit

In addition to the accessories listed above, the installation of a STORNOPHONE 600L radiotelephone requires a kit of parts. These are specified below:

17.030 Standard kit of accessories consisting of antenna connector, fuse holder and fuses, dummy fuse holder, and a set of cable shoes.

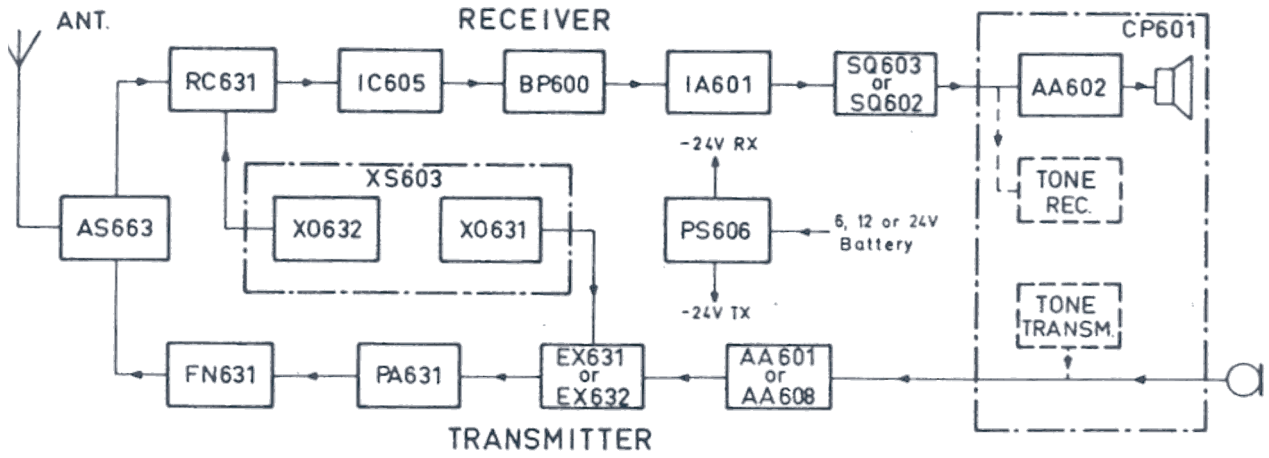
19.088 Standard installation kit consisting of 8 metres of battery cable and 6 metres of antenna cable. These lengths are sufficient for installing a radiotelephone, even in large vehicles.

Installation Instructions

Brief installation instructions are supplied with each individual accessory. However, Chapter IV of this manual contains a complete description of how to install both the radiotelephone and the accessories.

CHAPTER II. THEORETICAL CIRCUIT ANALYSIS

A. General Description, 68-88 MHz Equipment



Both the receiver and the transmitter are divided into a number of subunits each of which is built on printed wiring boards. This division has been made in order to make the equipment easily accessible for adjustments and repairs, and follows strictly logical lines.

The receiver and transmitter use silicon transistors throughout, resulting in less dependence on ambient temperature and in greater reliability.

Receiver Section

The receiver is a double-conversion superheterodyne using intermediate frequencies of 10.7 MHz and 455 kHz. The necessary selectivity is obtained by means of two bandpass filters.

The receiver is composed of these five modules:

Receiver converter with RF amplifier and 1st mixer	RC631
Crystal oscillator (1-6 pcs.	XO632
Intermediate-frequency converter with 10.7 MHz band-pass filter and 2nd mixer	IC605
455 kHz intermediate-frequency filter for 50 kHz, 25 kHz, or 20 kHz channel separation	BP608(50kHz) BP609(25kHz) BP6010(20kHz) BP6012(12.5kHz)
455 kHz intermediate-frequency amplifier and discriminator	IA601
Squelch and audio amplifier unit	
In CQL611, 612, and 613:	SQ603
In CQL614:	SQ602

The receiver moreover comprises an audio output amplifier, Type AA602. However, this unit is located in control panel CP601 and will be described in connection with the latter.

The RF and IF modules of the receiver are located in the top section of the cabinet except for the oscillators. These are located in the bottom section together with the audio units.

Transmitter Section

The transmitter is phase modulated. Its output frequency is six times the oscillator frequency. Phase modulation is performed at the fundamental frequency.

A maximum of six crystal oscillators - one for each frequency channel - can be provided.

The transmitter is composed of the following subunits:

Audio amplifier. In CQL611, 612, and 613:	AA601
In CQL614:	AA608
Crystal oscillator (1-6 pcs.)	XO631
Exciter and modulator for 50 kHz and 25/20 kHz channel separation	EX631 (50kHz)
	EX632 (25, 20, and 12.5kHz)
RF power amplifier	PA631
Antenna filter	FN631

The following subunits are common to the receiver and transmitter sections:

Antenna shift unit	AS663
Crystal oscillator panel with space for six receiver oscillators and six transmitter oscillators	XS603

Control Panel

Control panel CP601 contains all controls and circuits required for operating the radiotelephone and checking its performance. It also accomodates the following subunits:

Audio output amplifier	AA602
Tone transmitter (if provided)	
Tone receiver (if provided)	
Alarm circuit (if provided)	AC683

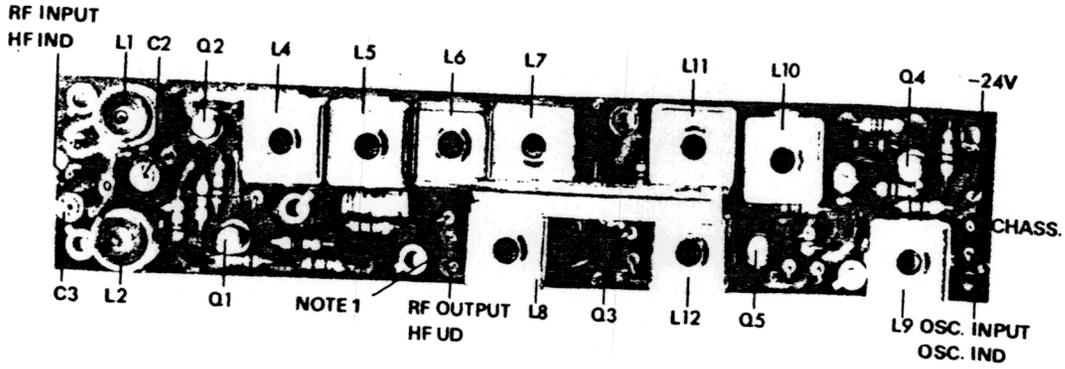
Power Supply Section

Power supply section PS606 converts 6, 12, or 24 volts DC from, say, a car battery into 24 volts stabilized DC for the transmitter and receiver sections.

The following pages of this chapter contain a complete description of the circuits of the individual subunits and their specifications.

Storno

Receiver Converter RC631



The receiver converter is built on a wiring board. It consists of the following stages:

Signal Frequency Amplifier
Mixer
Oscillator-Signal Amplifier
Oscillator-Signal Doubler.

The receiver converter amplifies the incoming signal and converts it to a first intermediate frequency of 10.7 Mc/s, for which purpose an oscillator signal, amplified and multiplied, is injected into the mixer.
All transistors used in this unit are silicon type n-p-n transistors.

Mode of Operation

Signal Frequency Amplifier

The incoming signal is applied - via a bandpass filter (L1, L2) - to the signal-frequency amplifier. Good separation between the input and output circuits of this amplifier ensures good stability. - The amplified signal is fed through a four-circuit filter to the emitter of the mixer transistor.

Mixer

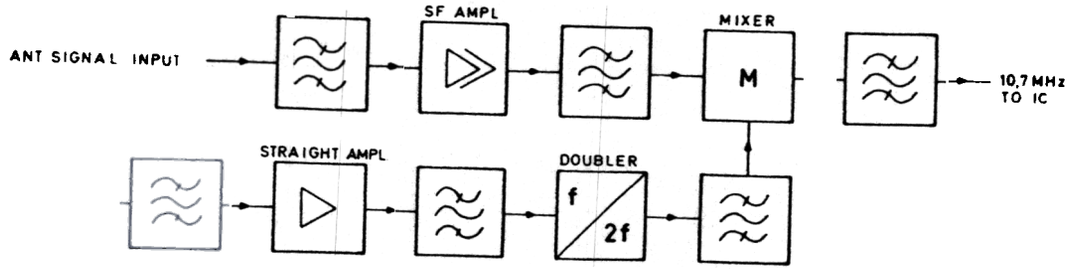
Whilst the amplified and filtered signal from the antenna is applied to the emitter of the mixer, the output signal of the tripler is applied to the base. In other words, additive mixing is used. The mixer works into a 10.7 Mc/s filter (L8) which can be matched to the following IF converter unit by means of a simple strapping operation.

The strap marked NOTE 1 in the photograph is used in equipments with 20 or 25 kc/s channel separation.

In equipments with 50 kc/s channel separation, the strap marked NOTE 1 should be removed (see also the circuit diagram at the back of this manual).

Amplifier and Tripler

The output of the crystal oscillator is amplified by a straight amplifier stage. This is followed



37.384-E1

by a doubler the collector circuit of which consists of a double bandpass filter tuned to the second harmonic of the oscillator frequency. From there, the signal is fed to the base of the mixer transistor.

Technical Specifications

Frequency Range

68 - 88 Mc/s.

Gain

Voltage gain from antenna to input of mixer: 12 dB.

Input Impedance

Nominal: 50 ohms.

Crystal Frequency Calculation

For 68 - 88 Mc/s range:

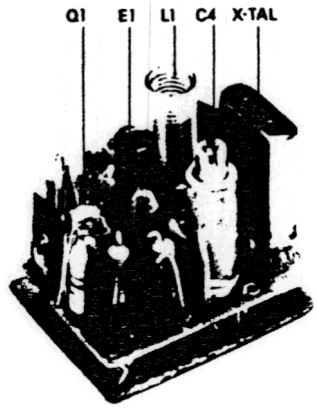
$$fx = \frac{fsig + 10.7}{2} \text{ Mc/s}$$

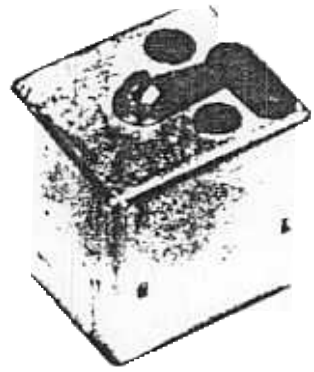
where fx is the crystal frequency in Mc/s, and fsig is the signal frequency in Mc/s.

Dimensions

160 x 32 mm.

Receiver Oscillator Unit XO632





The receiver oscillator unit is a crystal-controlled oscillator. It is built on a double wiring board, and is a totally enclosed plug-in unit.
The oscillator unit plugs into a crystal oscillator panel which has pins mating with sockets on the oscillator unit.

Mode of Operation

The oscillator is a third overtone series resonant Colpitts oscillator with the crystal connected at low-impedance points to ensure good frequency stability.
Undesired frequency pulling of the oscillator frequency is minimized through damping of the collector circuit.
The oscillator is started up by connecting the CHANNEL SHIFT terminal to chassis through the channel selector in the control box. A diode in series with the -24V supply lead prevents any flow of undesired current in the unit.
The oscillator signal is fed to the receiver converter via the crystal oscillator panel.
The operating frequency can be adjusted by means of a trimmer capacitor located close to the crystal.

Technical Specifications

Crystal Frequency Range

39.35 - 51.04 Mc/s.

Frequency Pulling

$\frac{\Delta f}{f}$: $\pm 30 \times 10^{-6}$.

Frequency Stability

For voltage variations within 24V ±2.5 %:
Better than $\pm 0.2 \times 10^{-6}$.

In temperature range -30°C to +80°C:
Better than $\pm 2 \times 10^{-6}$.

Load Impedance

50 ohms.

Power Output

Approx. 200 μW.

Receiver Oscillator Unit XO662

The receiver oscillator unit is a crystal-controlled oscillator. It is built on a double wiring board, and is a totally enclosed plug-in unit. The oscillator unit plugs into a crystal oscillator panel which has pins mating with sockets on the oscillator unit.

Mode of Operation

The oscillator uses a parallel-resonant Colpitts circuit. It is followed by a multiplier stage which quadruples the crystal frequency. The oscillator is started up by connecting the CHANNEL SHIFT terminal to chassis through the channel selector. A diode in series with the -24V supply prevents any flow of undesired current in the unit.

A capacitance diode E, biased by a temperature-dependent voltage, compensates for frequency variations at high and low temperatures. The degree of compensation is adjusted with potentiometer R10. Frequency adjustment is performed with trimmer capacitors C10 and C11. The RF output of the oscillator is fed via the crystal oscillator panel to the receiver converter.

Technical Specifications

Coverage

For crystal: 11.37 - 14.23 MHz.
For output voltage: 45.5 - 56.9 MHz.

Frequency Pulling

$\frac{\Delta f}{f_o} \geq \pm 30 \times 10^{-6}$

Frequency Stability

Against voltage variations of -24V ± 2.5%: Better than $\pm 1.5 \times 10^{-6}$.
In temperature range -25°C to +80°C: Better than $\pm 5 \times 10^{-6}$.

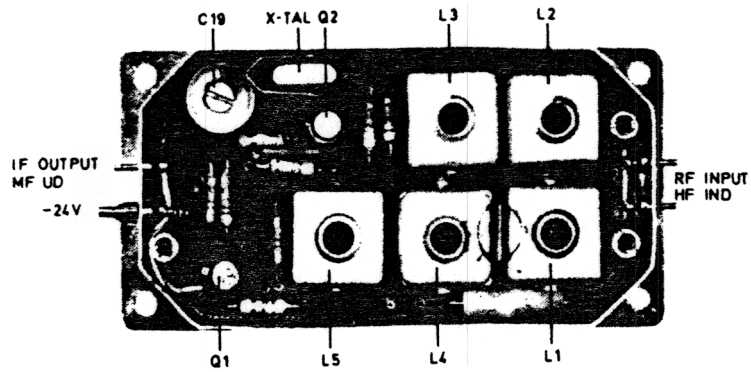
Load Impedance

50 ohms.

Output Voltage

170 mV/50 ohms.

IF Converter IC 605



The IF converter unit is built on a wiring board, and is housed in a metal box with a screw-on lid.
The unit consists of the following stages:

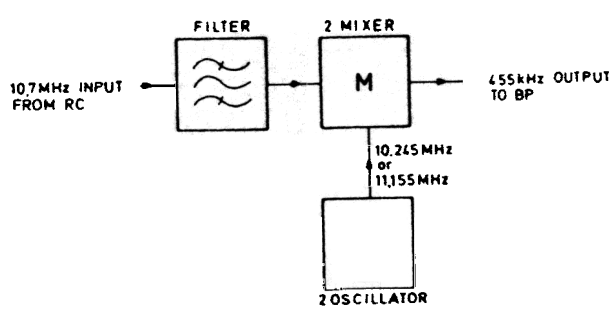
Coil filter
Oscillator
Mixer.

The IF converter filters the high intermediate-frequency signal at 10.7 MHz and converts it to a low intermediate-frequency signal at 455 kHz.

Mode of Operation

Coil Filter

From the receiver converter unit RC, the high intermediate-frequency signal at 10.7 MHz is fed to the coil filter, which consists of five tuned circuits. The output of the filter is applied to the mixer.



Oscillator

The oscillator is a crystal-controlled Colpitts oscillator. The crystal frequency is normally 10.245 MHz, but in cases where one of the harmonics of the local oscillator coincides with the frequency of the incoming signal, which might cause interference, a crystal frequency of 11.155 MHz is chosen instead. The crystal oscillates in a parallel resonant circuit, and frequency adjustment is performed with a trimmer capacitor.

Mixer

Both the 10.7 MHz signal and the oscillator signal are applied to the base of the mixer transistor. The low intermediate frequency signal at 455 kHz is taken off at the collector.

Technical Specifications

Input Frequency

10.7 MHz.

Output Frequency

455 kHz.

Input Impedance

910 ohms // 20 pF.

Output Impedance

3.8 k ohms // 480 pF.

Bandwidth

At 6 dB relative to 10.7 MHz: 230 kHz.
At 55 dB attenuation relative to 10.7 MHz: 1820 kHz.

Bandpass Ripple

0 dB.

Oscillator Frequency

Calculating the crystal frequency (fx):
fx = 10.7 MHz - 0.455 MHz = 10.245 MHz.
At certain signal frequencies, however, this crystal frequency cannot be used owing to harmonic radiation. In such cases a crystal frequency of 11.155 MHz is used which is calculated as follows:

fx = 10.7 MHz + 0.455 MHz = 1.155 MHz.

Below follow lists of IC crystal frequencies for a number of signal frequencies.

A = 10.245 MHz crystal frequency
B = 11.155 MHz crystal frequency

68-88 MHz

Receiver Frequency Range	fx
68.0 - 70.5 MHz	A
70.5 - 72.9 MHz	B
72.9 - 80.8 MHz	A
80.8 - 83.2 MHz	B
83.2 - 88.0 MHz	A

146 - 174 MHz

Receiver Frequency Range	fx
146.0 - 152.5 MHz	A
152.5 - 154.9 MHz	B
154.9 - 162.7 MHz	A
162.7 - 165.1 MHz	B
165.1 - 174.0 MHz	A

420 - 470 MHz

Receiver Frequency Range	fx
420 - 421.5 MHz	B
421.5 - 428.8 MHz	A
428.8 - 431.7 MHz	B
431.7 - 439.1 MHz	A
439.1 - 442.0 MHz	B
442.0 - 449.3 MHz	A
449.3 - 452.2 MHz	B
452.2 - 459.6 MHz	A
459.6 - 462.5 MHz	B
462.5 - 470.0 MHz	A

Crystal Specification

In temperature range -15°C to +60°C: S-98-8.
In temperature range -25°C to +65°C: S-98-12.

Oscillator Frequency Pulling Range

Greater than $\pm 40 \times 10^{-6}$

Available Power Gain

With 10.245 MHz crystal: Greater than 3 dB.
With 11.155 MHz crystal: Greater than 2 dB.

Centre Frequency Variation

At 3 dB attenuation relative to 455 kHz: Less than ± 700 Hz.

Dimensions

80 x 40 x 29 mm

37.558-E1

IF Filters BP608, BP609, BP6010, and BP6012

The IF filter is built on a wiring board, and is housed in a hermetically sealed metal box. The filter is a selective bandpass filter consisting of eight resonant circuits capacitively coupled to each other at their high-impedance ends. Its input and output are inductively coupled to the first and last resonant circuits, respectively, and are consequently galvanically separated.
The filter is artificially aged after wiring and insertion in the box.

IF filter BP608 is used in equipments with 50 kHz channel separation.
IF filter BP609 is used in equipments with 25 kHz channel separation.
IF filter BP610 is used in equipments with 20 kHz channel separation.
IF filter BP6012 is used in equipments with 12.5 kHz channel separation.

Technical Specifications

Input Frequency

~~10.7 MHz.~~ 455 kHz

Output Frequency

455 kHz.

Generator Impedance

3.9 k ohms // 480 pF.

Load Impedance

1 k ohm // 480 pF.

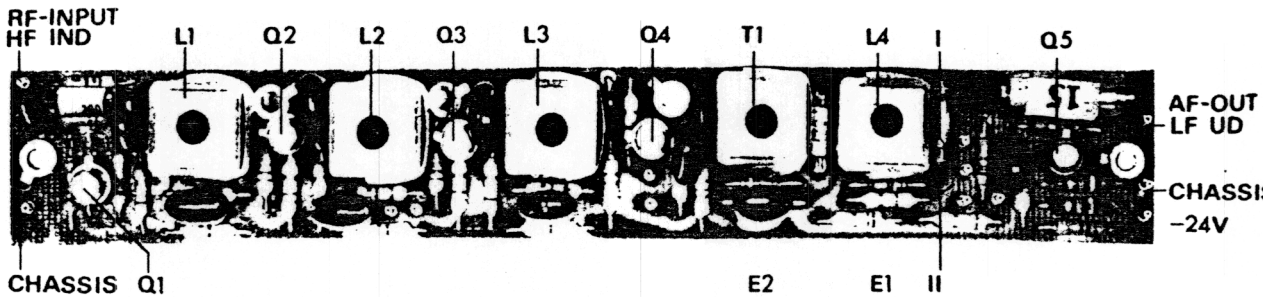
Bandwidth

BP608	At 6 dB attenuation relative to 455 kHz: Greater than ± 15 kHz. At 80 dB attenuation relative to 455 kHz: Less than ± 28 kHz.
BP609	At 6 dB attenuation relative to 455 kHz: Greater than ± 6.5 kHz. At 80 dB attenuation relative to 455 kHz: Less than ± 18.5 kHz.
BP6010	At 6 dB attenuation relative to 455 kHz: Greater than ± 5.7 kHz. At 80 dB attenuation relative to 455 kHz: Less than ± 16 kHz.
BP6012	At 6 dB attenuation relative to 455 kHz: Greater than ± 3.5 kHz. At 65 dB attenuation relative to 455 kHz: Less than ± 8.0 kHz.

Insertion Loss

BP608	Less than 3 dB
BP609	Less than 7 dB
BP6010	Less than 8 dB
BP6012	Less than 9 dB

IF Amplifier IA601



The IF amplifier is built on a wiring board. It consists of the following stages:

Four IF Amplifier Stages
Discriminator
Output Amplifier

The IF amplifier serves the purpose of amplifying and rectifying the low intermediate-frequency signal at 455 kc/s. It also amplifies the audio output delivered by the discriminator.

Mode of Operation

IF Amplifier Stages

From the filter (BP), the low intermediate-frequency signal at 455 kc/s is applied to the IF amplifier unit.
Interstage coupling consists of a single tuned collector circuit capacitively tapped for the base of the transistor of the following stage. The last IF amplifier stage works into the discriminator. The last two amplifier stages operate as voltage limiters.

Discriminator and Output Amplifier

The discriminator is an inductively coupled Foster Seeley discriminator the output circuit of which comprises a voltage divider consisting of resistors R29, R30, and R31. By shifting a strap back and forth between two taps on the voltage divider, the audio output voltage may be altered so that the IF amplifier unit can be used for different channel separations.

The strap marked I in the photograph is used in equipments with 20 or 25 kc/s channel separation.
The strap marked II in the photograph is used in equipments with 50 kc/s channel separation (see also circuit diagram of the IA601 IF amplifier at the back of this manual).

In order to ensure that the discriminator will be loaded lightly, the following audio amplifier stage is an emitter follower using a high-resistance base biasing network.

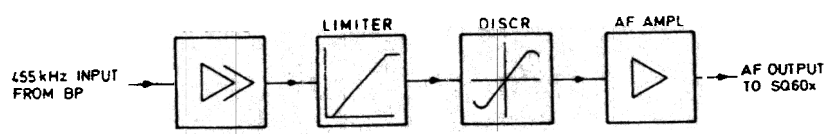
Technical Specifications

Intermediate Frequency

455 kc/s.

Max. Frequency Swing

±15 kc/s or ±5 kc/s/±4 kc/s, depending on strap used.



IF Bandwidth

±20 kc/s at 3 dB attenuation.

Generator Impedance

1 k ohm/0.25 mH.

Input Impedance

1 k ohm // 480 pF.

Output Impedance

340 ohms.

Discriminator Bandwidth

Linear to ±20 kc/s.

Discriminator Slope

Measured with instrument with Ri = 1000 ohms: 2.2 μA/kc/s.

Discriminator Centre Frequency Stability

±1 kc/s.

Gain

The gain is determined as the input voltage at which the audio output voltage has dropped 1 dB below max. audio output voltage. Δf = ±10.5 kc/s and fmod = 1000 c/s: 1.6 μV.

Audio Output Level

At fmod = 1000 c/s.

For ΔF = ±2.8 kc/s, strapped for ΔFmax. = ±5 kc/s: 0.9 V.

For ΔF = ±3.5 kc/s, strapped for ΔFmax. = ±5 kc/s: 1.1 V.

For ΔF = ±10.5 kc/s, strapped for ΔFmax. ±15 kc/s: 1.1 V.

Demodulation Characteristic

Flat: +0/-1 dB.

Deviation relative to 1000 c/s in the range 300 - 3000 c/s. ΔFmax. = 0.2 x ΔFmax. at 1000 c/s.

Distortion

In the range 3000 - 3000 c/s:

For ΔF = ±15 kc/s, strapped for ΔFmax. = ±15 kc/s: 1.4 %.

For ΔF = ±5 kc/s, strapped for ΔFmax. = ±5 kc/s: 1.2 %.

Min. Load Impedance

In the range 300 - 3000 c/s: approx. 2 k ohms.

Current Drain

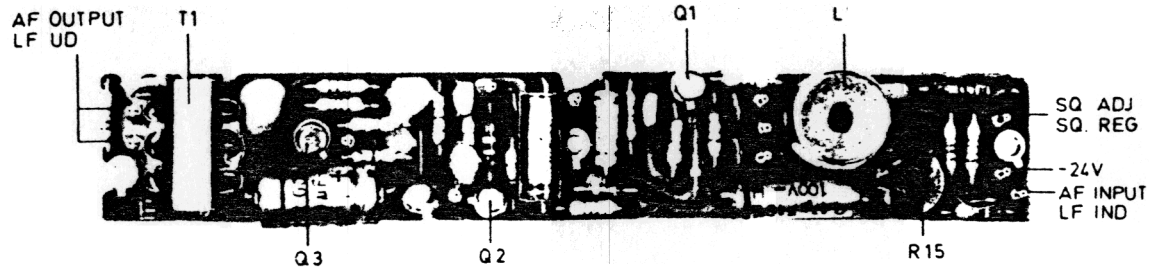
10 mA.

Dimensions

160 x 24 mm.

Storno

Squelch and Audio Amplifiers SQ602 and SQ603



The squelch and audio amplifier unit is built on a wiring board. It consists of the following stages:

Noise Amplifier
Noise Rectifier
Audio Amplifier

The audio amplifier stage serves the purpose of amplifying the demodulated signal delivered by the discriminator whilst the squelch circuit - in the absence of an incoming signal - amplifies and rectifies the discriminator noise, permitting use of the rectified noise voltage for muting the audio amplifier stage.

Mode of Operation

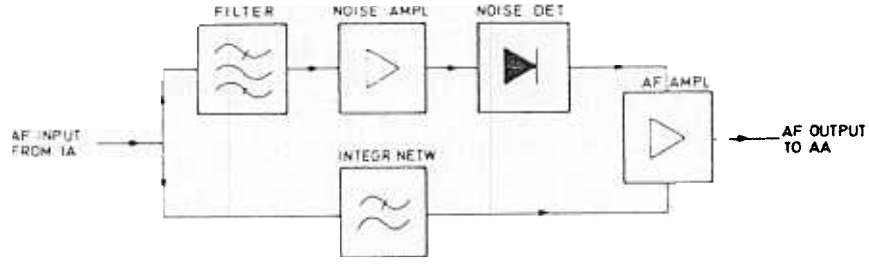
Audio Amplifier

The audio signal from the discriminator in the preceding intermediate frequency amplifier unit, IA, is applied to the audio amplifier stage via an integrating network and a potentiometer.

The integrating network, which in the case of phase modulation consists of resistor R16 and capacitor C12, produces a -6dB/octave frequency characteristic. For frequency modulation, C12 is replaced by a resistor, R18, resulting in a flat frequency characteristic. The following potentiometer, R15, makes it possible to adjust the gain for nominal power output (3dBm). The audio amplifier has transformer output with an output impedance of 600 ohms.

Squelch Circuit

A portion of the noise from the discriminator is filtered in the bandpass filter (L1, C2) and fed to the noise amplifier stage. The transistor of this stage is biased in such a manner that only noise peaks of a certain magnitude can make the transistor conductive. The noise voltage consequently generated in the collector circuit is rectified by a diode and applied to transistor Q2, which operates as a DC amplifier.



37.568-E1

When a sufficiently high noise voltage is applied to the noise rectifier, the collector-emitter impedance of the DC amplifier will be so low that the base bias for the audio amplifier disappears, thereby muting the latter.

The bias for the noise amplifier, and consequently the squelch sensitivity, can be adjusted with a squelch potentiometer located in the control box.

The resonant frequency of the bandpass filter in the input circuit of the squelch unit can be altered by strapping, permitting use of the filter at channel separations of 12, 5, 20, 25, and 50 kc/s.

(see notes on diagram).

Technical Specifications

Input Impedance

In the range 300 - 3000 c/s:
Greater than 3 k ohms.

Output Impedance

At 1000 c/s: 600 ohms.

Nominal Load Impedance

600 ohms.

Audio Output Level

At 1000 c/s and input voltage of 0.6V and R15 in the fully clockwise position: 1.3V.

Frequency Characteristic (PM)

In the range 300 - 3000 c/s relative to 1000 c/s:
-6dB/octave +0/-1dB.

Frequency Characteristic (FM)

In the range 300 - 3000 c/s relative to 1000 c/s:
Flat ±0 dB.

Distortion

At 3dBm power output and 1000 c/s: 2%.

Output Noise Attenuation

Unsquelched: better than 50 dB
Squelched: better than 70 dB.

Squelch Sensitivity

For $\Delta F = 0.7 \times \Delta F_{max}$. and fmod = 1000 c/s, full unsquelching occurs at:
Min. signal-to-noise ratio in speech channel: 3 dB.
Max. signal-to-noise ratio in speech channel: Adjusted to max. 20 dB S/N.

Squelch Hang

At max. squelch sensitivity: approx. 0.5 sec.
At min. squelch sensitivity: approx. 0.1 sec.

Channel Separation

50 kc/s or 25/20 kc/s depending on strap.

Delay

Approx. 50 msec.

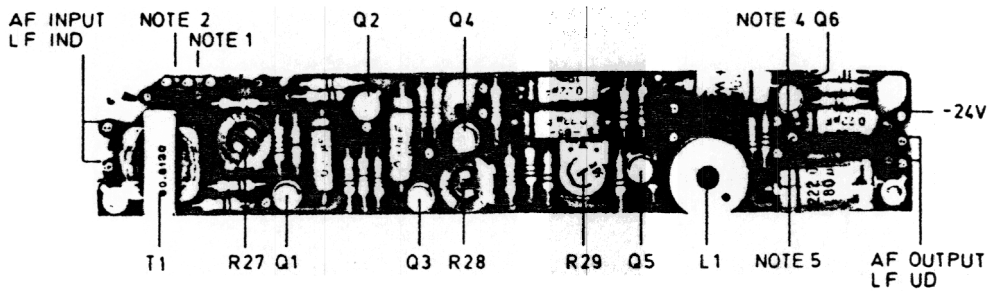
Current Drain

For unsquelched operation (audio output): 12 mA.
For squelched operation (no audio output): 8.5 mA.

Dimensions

148 x 24 mm.

Audio Amplifiers AA601 and AA608



Audio amplifiers AA601 and AA608 are built on wiring boards. They consist of the following stages:

Differentiating network
1st amplifier
Limiter
Integrating network
2nd amplifier
Splatter filter
Output amplifier.

The audio amplifier performs two important functions: it amplifies the signal from the microphone to a level suitable for the modulator, and it limits the amplitude of the said signal so that the maximum permissible frequency swing will not be exceeded.
Besides, the AA601 attenuates frequencies above 3000 Hz and the AA608 frequencies above 2500 Hz, thus preventing adjacent-channel interference.

Mode of Operation

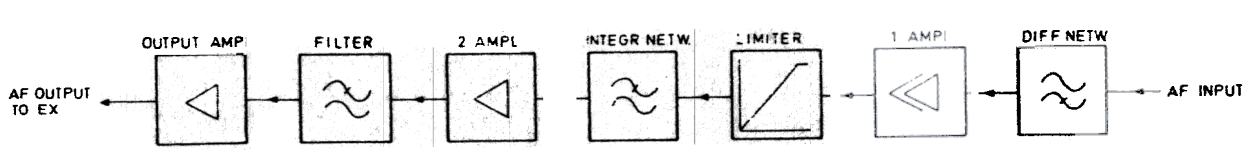
Differentiating Network

Each audio amplifier has 600-ohm balanced transformer input followed by a potentiometer, R27, for sensitivity adjustment. The following differentiating network (pre-emphasis network) is switchable between two different time constants: the strap designated NOTE 1 cuts in the differentiating network R2, C3, which provides straight phase modulation, whilst the strap designated NOTE 2 cuts in the network composed of (R1 + R2) and C1, which provides mixed phase and frequency modulation, a phase modulation characteristic being obtained for modulating frequencies below 1000 Hz and frequency modulation for modulating frequencies above 1000 Hz. From the differentiating network, the signal is fed to the 1st amplifier stage.

1st Amplifier and Limiter

The 1st amplifier consists of two transistor stages in a conventional emitter circuit. The use of un-bypassed emitter resistors results in a high degree of negative feedback. The following limiter consists of two transistors with a common emitter resistor. Limiting is accomplished in the following manner:

When the input voltage of transistor Q3 becomes positive with respect to the emitter voltage, Q3 will attempt to draw more current, and the emitter/base voltage of transistor Q4 will consequently decrease, causing the latter transistor to draw less current. A further increase in input voltage will cause Q3 to draw so much cur-



rent that Q4 will cut off, thus limiting the signal amplitude. If the input signal of Q3 becomes negative with respect to the emitter voltage, the full current will flow through Q4. In this case, Q3 will cut off, again causing limiting. The symmetry of the limiting is adjustable with potentiometer R28.

Integrating Network

The integrating network consists of the output impedance of transistor Q4 in conjunction with capacitor C6. This capacitor is connected via a strap; by removing the strap, the capacitor can be left out while making measurements on the limiter, thereby avoiding integration.

The following potentiometer, R29, controls the output voltage of the audio amplifier and hence also the maximum frequency swing of the transmitter with the limiter operative.

2nd Amplifier and Splatter Filter

The 2nd amplifier consists of a single transistor stage with an un-by-passed emitter resistor, resulting in a high degree of negative feedback. The amplifier stage is followed by a splatter filter. This is a pi-network whose cutoff frequency is 3000 Hz in the AA601 and 2500 Hz in the AA608 It serves the purpose of attenuating higher frequencies such as harmonics generated by the clipper and amplifier stage.

Output Amplifier

The output amplifier consists of a single transistor stage with an un-bypassed emitter resistor. The collector resistor is a voltage divider (R25 and R17), making it possible to alter the output voltage - and hence the frequency swing - by a restrapping operation.

Depending on the frequency band in use and the desired frequency swing (channel separation), the units should be strapped in accordance with the notes on the associated diagrams.

Technical Specifications

Current Drain

13 mA.

Clipping Level (1000 Hz)

Peak value of clipped voltage at test point 24 with strap designated NOTE 3 removed: 2.9 V peak.

Minimum Input Voltage for Clipping (1000 Hz)

The input voltage at which clipping occurs with potentiometer R27 turned full on (and with strap designated NOTE 3 removed): 34 mV.

Maximum Output Voltage (1000 Hz)

Maximum output voltage across 10 k ohm load resistor, at full clipping and with potentiometer R29 turned full on (with straps designated NOTE 3 and NOTE 4 inserted): In AA601: 3.5V peak. In AA608: 1.9 V peak.

Harmonic Distortion (1000 Hz)

Distortion is measured at output voltage of 0.8V, corresponding to 0.7 ΔF max. Potentiometer R29 is adjusted so that the output voltage across 10 k ohms is 1.5 V peak for an input voltage of 20 dB above clipping level. The input voltage is reduced to 110 mV, and potentiometer R27 is adjusted for an output voltage of 0.8 V across 10 k ohms: 0.5%.

Frequency Response:

The unit is adjusted as for measurement of harmonic distortion. The input voltage is reduced by 20 dB to 11 mV.

Frequency response, AA601:
flat between 300 and 3000 Hz +0.2/0.8 dB; at 5 kHz the voltage has dropped 12 dB below 0 dB at 1000 Hz.
Frequency response, AA608:
flat between 300 and 2500 Hz +0.2/0.8 dB; at 5 kHz the voltage has dropped 12 dB below 0 dB at 1000 Hz.

Input Impedance

600 ohms. Input impedance is floating.

Output Impedance

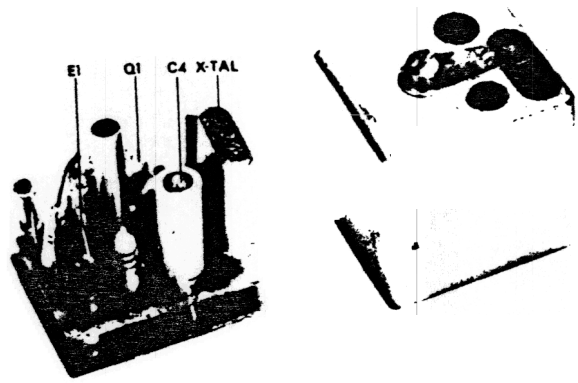
3.9 k ohms or 1.2 k ohms, depending on strapping.

Dimensions

160 x 28 mm

Storno
24

Transmitter Oscillator Unit X0631



The transmitter oscillator unit is a crystal-controlled oscillator and is built on a double wiring board. It is a totally enclosed plug-in unit.
The oscillator units plugs into a crystal oscillator panel which has pins mating with sockets on the oscillator unit.

Mode of Operation

The oscillator uses a parallel-resonant Colpitts circuit with the crystal loosely coupled to the transistor. The oscillator is started up by connecting the CHANNEL SHIFT terminal to chassis through the channel selector in the control box. A diode in series with the -24 V supply lead prevents any flow of undesired current in the unit.
The oscillator signal is fed via the crystal oscillator panel to the RF input of the exciter.
The operating frequency can be adjusted by means of a trimmer capacitor located close to the crystal.

Technical Specifications

Crystal Frequency Range

11.3 - 14.66 Mc/s.

Frequency Pulling

$\frac{\Delta f}{f}$: $\pm 30 \times 10^{-6}$.

Frequency Stability

For voltage variations within 24V ±2.5%: Better than $\pm 1 \times 10^{-6}$.

Load Impedance

25 ohms.

Power Output

Approx. 80 μW.

37.376-E1

Transmitter Oscillator Unit X0661

The transmitter oscillator unit is a crystal-controlled oscillator and is built on a double wiring board. It is a totally enclosed plug-in unit.

The oscillator plugs into a crystal oscillator panel which has pins mating with sockets on the oscillator unit.

Mode of Operation

The oscillator uses a parallel-resonant Colpitts circuit with the crystal loosely coupled to the transistor. The oscillator is started up by connecting the CHANNEL SHIFT terminal to chassis through the channel selector. A diode in series with the -24 V supply lead prevents any flow of undesired current in the unit. The oscillator signal is fed via the crystal oscillator panel to the RF input of the exciter.

The operating frequency can be adjusted by means of a trimmer capacitor located close to the crystal.

Technical Specifications

Crystal Frequency Range

11.3 - 14.66 MHz.

Frequency Pulling

$\frac{\Delta f}{f} \geq \pm 30 \times 10^{-6}$.

Frequency Stability

For voltage variations within 24V ± 5%:
Better than $\pm 0.1 \times 10^{-6}$.

In temperature range -30°C to +80°C:
Better than $\pm 5 \times 10^{-6}$.

Load Impedance

25 ohms.

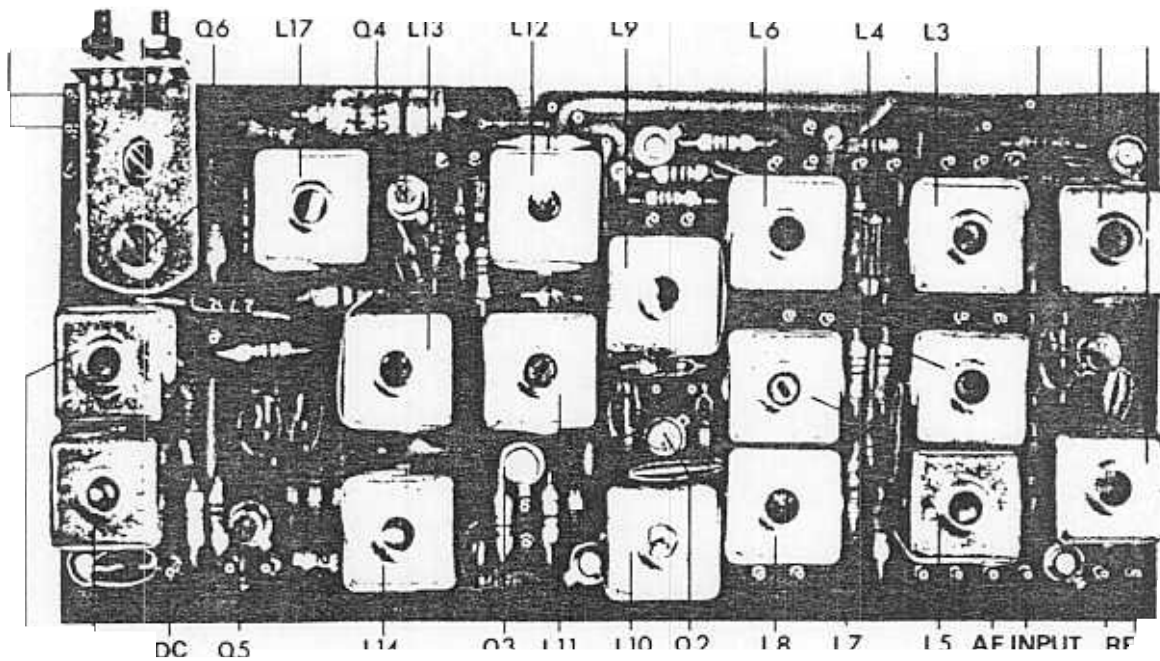
Power Output

Approx. 25 microwatts.

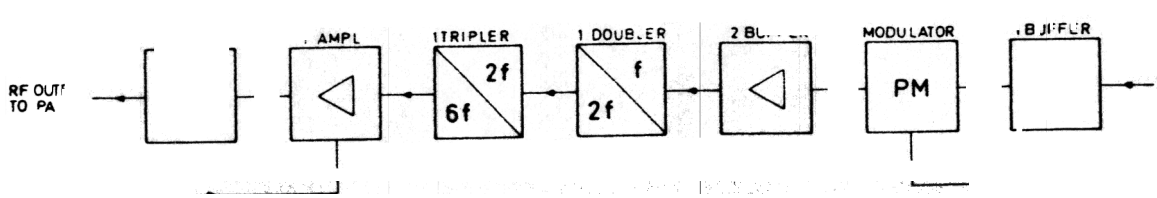
Crystal

Type 98-16.

xc er X6 nd X6 2



M p

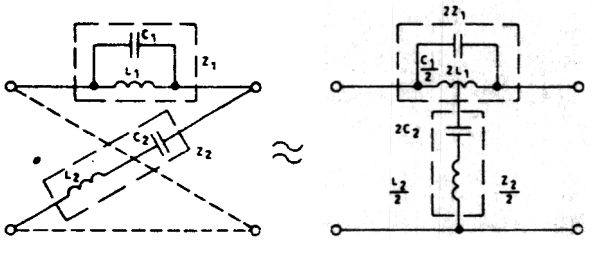


sistor. This stage amplifies the input signal to a level suitable for the modulator. The base circuit serves as an impedance transformer, providing an input impedance of approx. 50 ohms.

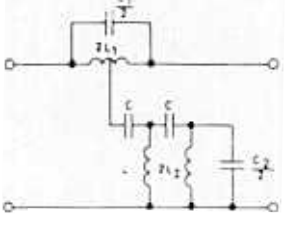
Phase Modulator

The phase modulator is a modified bridged T network composed of reactances. This circuit has low insertion loss, constant four-terminal impedances, and produces a relatively large linear phase swing. A number of modulator circuits can be cascaded if a larger phase swing is desired. For example, exciter EX631, producing a phase swing of ±15 kc/s, has two modulator circuits whilst the EX632, whose phase swing is either ±5 kc/s or ±4 kc/s, contains only one modulator circuit.

The bridged T network is derived from a lattice section as shown below.



In these networks, the insertion loss is zero (no-loss reactance) and the four-terminal impedance is constant if the value of $Z_1 \times Z_2$ is constant. The phase shift introduced by the network can be varied by varying the impedances; however, this must be done in such a way that $Z_1 \times Z_2$ remains constant. In order to make the circuit practically applicable as a phase modulator, the series resonant circuit is replaced by a quarter-wave transformer and a parallel-resonant circuit.



The advantage of this arrangement is that the phase shift can be varied by varying the two circuit capacitances in the same manner. This also meets the requirement that $Z_1 \times Z_2$ must be constant. The circuit capacitances are capacitance diodes on whose bias the modulating voltage is superimposed.

Attenuating networks inserted on either side of the modulator reduce interaction between the modulator and the buffer stage during alignment.

2nd Buffer

This stage is largely identical with the 1st buffer. It, too, has tuned LC circuits in its base and collector leads. Both circuits are damped by parallel resistances to keep the stage stable. Similarly, the damping of the circuits of the first and second buffer stages cause the operation of the modulator to become less dependent on the tuning of the buffer stages.

Frequency Multipliers

The doubler and tripler use conventional circuitry in a common-emitter circuit. These two stages are not neutralized, the tuned circuits being damped by resistors in the interests of good stability. The circuits between the doubler and the tripler and between the tripler and the 1st power amplifier are double-tuned bandpass filters (L11 - L2 and L3 - L14, respectively) with close-to-critical coupling between circuits. These bandpass filters set a limit to the bandwidth of the exciter by attenuating undesired harmonics generated in the frequency multiplication process.

Power Amplifiers

The 1st and 2nd power amplifiers raise the signal level to approx. 500 mW in a 50-ohm load. Impedance matching between stages is accomplished by means of a tapped parallel resonant circuit (L5). The tap connects - via a series resonant circuit consisting of C39 and L16 - to the base of transistor Q6 of the 2nd power amplifier. Battery voltage for the first power amplifier is taken from the drive control circuit of the following RF amplifier unit, PA. The power output delivered by the exciter is adjusted by varying this voltage. The emitter resistor of the 2nd power amplifier is un-bypassed in the interests of better stability; another advantage of omitting bypassing is that wide transistor tolerances are then without importance.

A pi-network provides impedance matching to the 50-ohm load imposed by the following RF power amplifier.

Technical Specifications

Frequency Range

68 - 88 Mc/s.

Frequency Multiplication Factor

6.

Crystal Frequency Band

11.33 - 14.66 Mc/s.

Power Output

600 mW.

Power Input

40 μW.

Generator Impedance

50 ohms.

Load Impedance

50 ohms.

Audio Input Impedance

At 1000 c/s: 10 k ohms.

Modulation

Phase modulation, +6 dB/octave ±1 dB within 300 - 3000 c/s.

Modulation Sensitivity

Modulating voltage (for $\Delta F = 0.7 \times \Delta F_{max.}$ at 1000 c/s):
EX631: 0.85 V
EX632: 0.6 V.

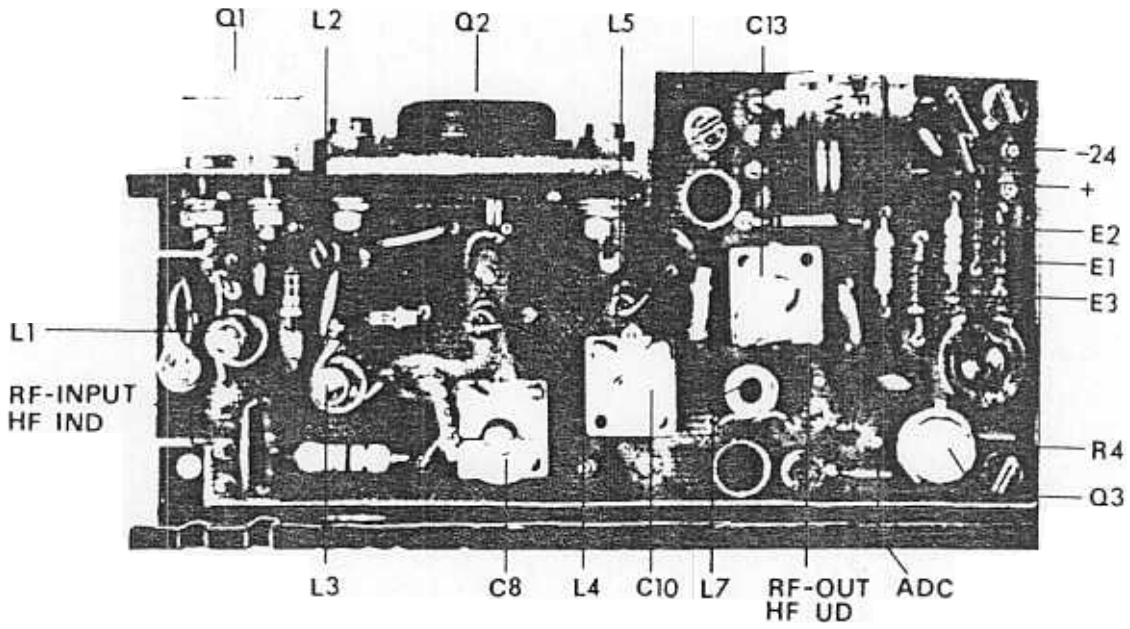
Modulation Distortion

Measured without de-emphasis:
EX631: 6%
EX632: 5%.

Dimensions

68 x 140 x 25 mm.

RF Power Amplifier PA631



The RF power amplifier is built on a wiring board. It consists of the following stages:

1st Power Amplifier (Driver)
2nd Power Amplifier (Output)
ADC Circuit (Automatic Drive Control Circuit).

The RF power amplifier is a Class C amplifier. It raises the RF signal level to approx. 10 watts in a 50-ohm load. An ADC circuit ensures constant current through the output transistor and so prevents it from being overloaded. This circuit also causes the output of the RF power amplifier to be less dependent on variations in supply voltage and ambient temperature.
Note that the earth potential of this unit connects to the -24-volt terminal of the supply voltage.

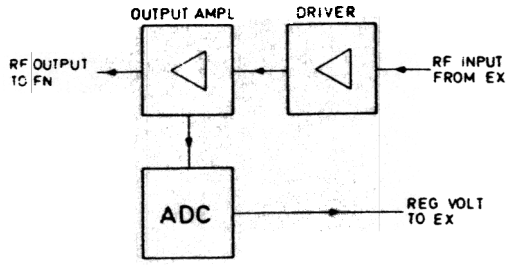
Mode of Operation

Driver Stage and Output Stage

The driver amplifies the signal from the EX exciter to a level (3 - 4 watts) suitable for driving the following output stage. Pi-networks are used for matching the output stage to the driver and to the load impedance into which it works. Since proper impedance matching over the entire 68 - 88 Mc/s band cannot be accomplished with one set of component values only, some of the capacitance values of these pi-networks may have to be altered, depending on what portion of the band is to be used. Full information about this is given in the circuit diagram and parts list of the PA631 RF power amplifier unit.

ADC Circuit (Automatic Drive Control Circuit)

This circuit consists of one transistor stage operating as a DC amplifier. The transistor base receives, via a potentiometer, a reference voltage which is produced by a zener diode.



37 380-E1

There is a DC path from the emitter of this transistor to the collector of the output stage of the power amplifier unit, where a 1-ohm resistor provides operating voltage for the drive control circuit.
Lastly, the collector of the control transistor connects to the 1st power amplifier stage of the EX exciter.

An increase in the current through the output stage will result in an increase in voltage across the collector resistor and hence produce a decrease in the base-emitter voltage of the control transistor. Consequently, the supply voltage applied to the 1st power amplifier of the exciter will decrease, and so will the drive applied to the output stage. This will reduce the current through the output stage.

Technical Specifications

Frequency Range

68 - 88 Mc/s.

Power Output

10 W. Adjustable by means of the ADC circuit.

Current Drain

950 mA at 10 watts power output.

Input Impedance

50 ohms.

Output Impedance

50 ohms.

Gain

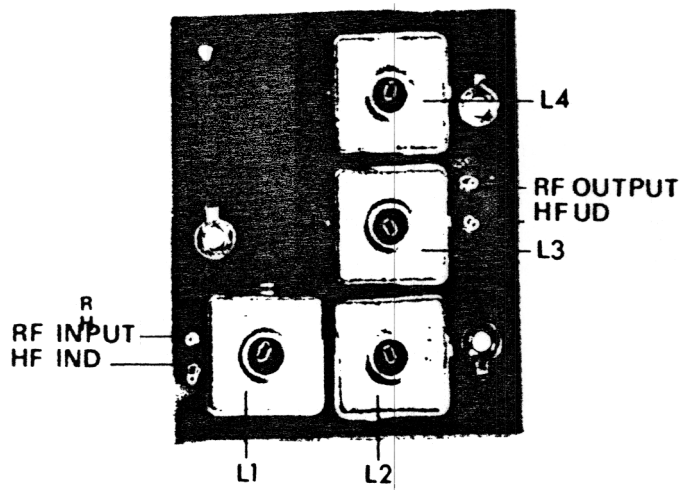
15 dB at 78 Mc/s.
The gain varies over the frequency range.

Dimensions

56 x 160 x 29 mm.

37. 380-E1

Antenna Filter FN631



The antenna filter is built on a wiring board. It consists of a bandpass filter having low insertion loss.

This bandpass filter, composed of four LC circuits (two series-resonant circuits and two parallel-resonant circuits), serves the purpose of preventing the transmitter from radiating signals at undesired frequencies, such as harmonics of the signal frequency.

Technical Specifications

Frequency Range

68 - 88 Mc/s.

Input Impedance

50 ohms.

Output Impedance

50 ohms.

Bandwidth (3 dB)

40 Mc/s.

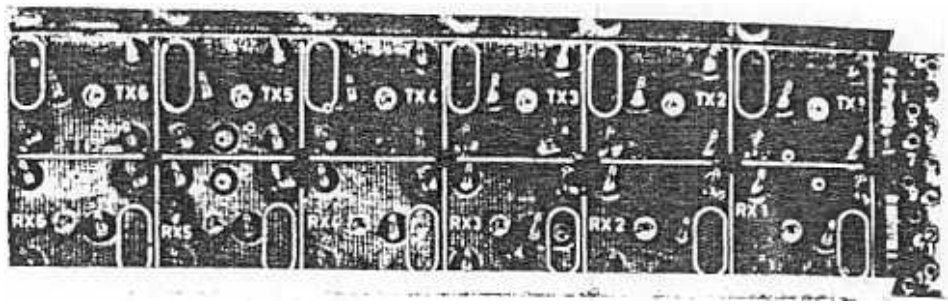
Insertion Loss

68 - 88 Mc/s: 0.4 dB.

Dimensions

52 x 44 mm.

Crystal Oscillator Panel XS603



The crystal oscillator panel consists of a wiring board with conductors on both sides, and a screen.

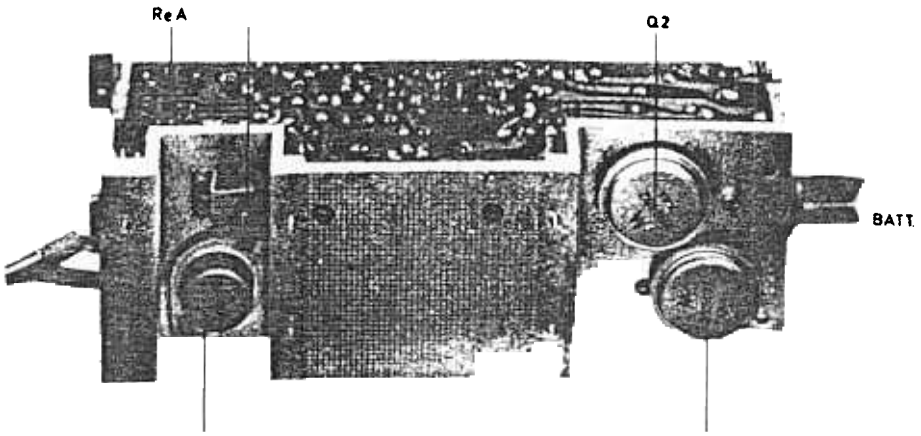
The wiring board has plug pins for up to six receiver-oscillator units and six transmitter-oscillator units.

In order to ensure that the proper oscillators - and hence also the proper frequencies - are provided for the channels, the pin sets of the wiring board are marked with channel numbers 1-6 for the oscillators of the receiver and transmitter, respectively.

Mode of Operation

Crystal switching is performed with the channel selector. It is done electronically by closing or opening the supply voltage leads for the individual transmitter and receiver oscillators.

Power Supply Unit PS606



Power supply unit PS606 is built on a drawn aluminium chassis and a wiring board. It consists of these units:

DC converter with polarity protection diode and a strap board.
Series regulator.
Transmit relay.

The power supply converts 6, 12, or 24 volts from a battery into 24 volts stabilized DC for operating the transmitter and receiver sections of the equipment.

Mode of Operation

DC Converter

The DC converter is a conventional push-pull oscillator with two transistors in a common-emitter circuit and a transformer inserted in the collector circuit whilst the feedback windings connect to the bases. The converter frequency is between 1 and 4 kHz.
The transformer primary is composed of four identical centre-tapped windings which are connected in series and/or in parallel depending on the battery voltage. They are in parallel for 6 volts; for 12 volts they are partly in series and partly in parallel; for 24 volts they are in series.

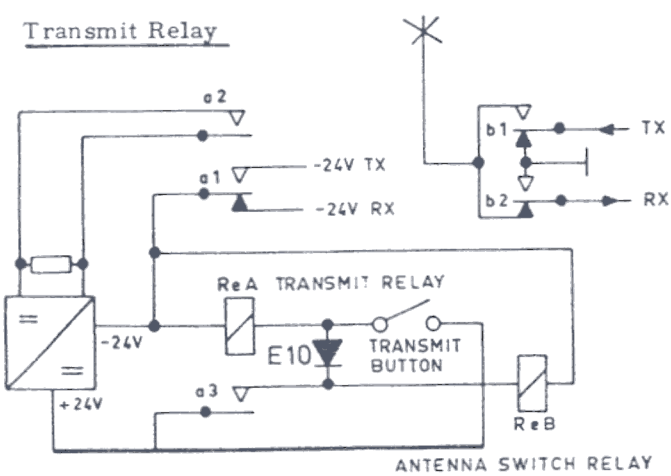
An inductance, L1, between the bases of the two transistors is so dimensioned that its core will saturate before that of the transformer, thus avoiding excessive peak currents through the transistors. Two resistors inserted in the positive feedback loop ensure optimum efficiency under the two different types of loading existing during reception (max. 300 mA) and transmission (max. 1.4 A). Their values are altered both when the strap board is rewired to switch from one battery voltage to another and when the contact pair a2 of the transmit relay are switched between the transmit and receive positions.
A polarity protection diode E_1 is connected in its back direction across the battery cable input of the power supply unit in order to protect the converter transistors against the consequences of incorrect battery-voltage polarity. Incorrect polarity will cause the diode to become conductive, thus blowing the battery-cable fuse. The diode should always be checked when the cable has been incorrectly polarized and replaced if necessary.
The transformer secondary has a main winding with taps for matching, and an auxiliary winding. The main winding connects to a bridge rectifier, E3 - E6. Normally the connection providing the full number of turns is used, but in cases where most operation occurs at high battery voltages the number of turns must be reduced, in which case the matching tap is used (see circuit diagram). This results in improved efficiency. The

secondary auxiliary winding furnishes a positive auxiliary voltage for the following series regulator.

Series Regulator

The series regulator consists of a series transistor Q3, a control transistor Q4, and an amplifier transistor Q5.
The base of the amplifier transistor receives, via an alignment potentiometer, a portion of the stabilized output voltage. In the emitter circuit there is a reference diode, E8, and DC voltage at this point is compared with the base voltage. The collector of the amplifier transistor connects to the base of the control transistor. If the output voltage begins to increase, so will the collector current of the amplifier transistor, and the base voltage for the control transistor will decrease. This will cause the base voltage for the series transistor to decrease and the voltage drop across the latter to increase, thereby causing the output voltage to decrease. The output voltage is adjusted for -24 volts by means of alignment potentiometer R18.
In order to protect the transmitter-receiver sections against over-voltage in the case of defects in the series regulator, a zener diode across the output of the regulator circuit prevents the voltage from exceeding a certain potential (approx. 30 volts).

Transmit Relay



The transmit relay (ReA) is powered by the stabilized 24-volt supply. It serves the triple purpose of switching the supply voltage back and forth between the receiver and transmitter sections shorting a feedback resistor in the DC converter on transmit, and securing that the transmit relay will release before the antenna shift relay on completion of a transmission. When the transmit relay is operated, the antenna shift relay (located outside the power supply unit) is energized via the DC path through diode E10 and the transmit button to earth. This occurs simultaneously with the operation of the transmit relay, but since the operating time of the antenna shift relay is shorter than that of the transmit relay, the antenna will be connected to the transmitter before the latter begins to operate and can deliver any power. On switching to receive, the transmit relay will be de-energized before the antenna relay due to the fact the latter relay remains operated via contact set a3 of the transmit relay.

Technical Specifications

Supply Voltages

Measured at the fuse holders.

Operating Voltage	Minimum	Nominal	Maximum
6 V	5 V	6.3 V	7.5 V
12 V	10 V	12.6 V	16.5 V
24 V	20 V	25.2 V	33.0 V

Output Voltage

Regulated, -24V

Output Voltage Variation

For temperature and load variations.
Less than ± 0.6 V.

Output Load

Receive, max. 0.3 A
Transmit, max. 1.4 A.

Output Voltage Ripple

Less than 20 mV p-p.

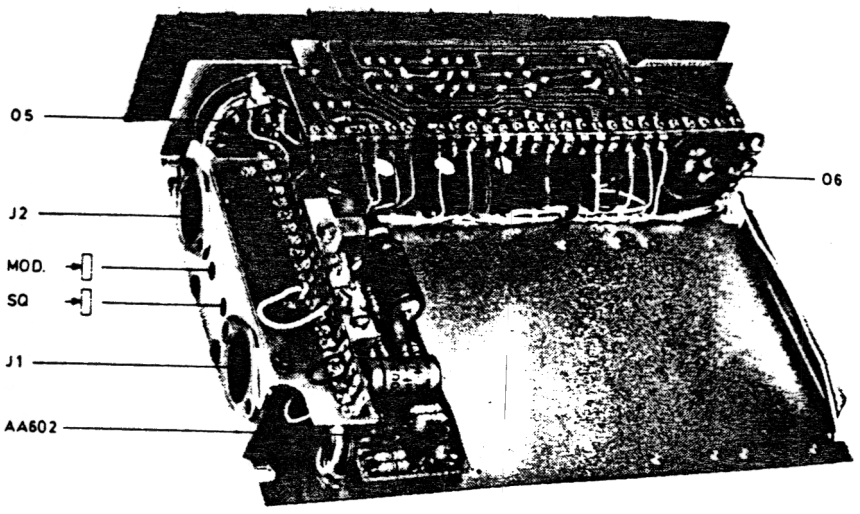
Battery Drain (typical values)

Voltage	No-load	Receive 0.3 A	Transmit 1.4 A
6.3V	0.25A	2.3A	10.5A
12.4V	0.10A	1.2A	4.6A
25.2V	0.06A	0.6A	2.1A

Converter Frequency

- 4 kHz.

Control Panel CP601



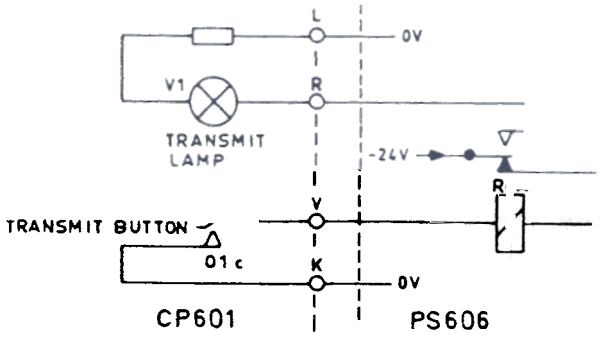
General

Control panel CP601 consists of a metal chassis on which all controls are mounted, a wiring board, and a terminal board.

The panel is intended for use with Type CQL600 radiotelephones. In locally controlled equipment it will always be mounted in the transmitter/receiver cabinet. For remote control it will be mounted in a separate cabinet, Type CA605.

The control panel contains all circuits required for operation of the radiotelephone.

Functions



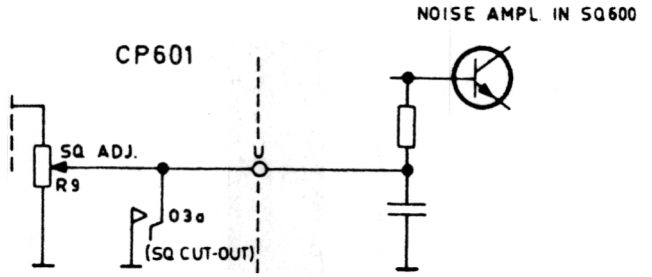
01. Transmit Button

The transmit button is a self-releasing push-button. When it is pressed, the transmit relay is operated, causing voltage to be applied to the transmitter section and to the transmit lamp V1 on the control panel.

However, if the control panel incorporates a tone transmitter, the button will also function as a tone transmit button as it will simultaneously switch on the tone transmitter and the station transmitter. In this event an external switch is required for turning on the transmitter when the use of tone calls is not desired.

03. Squelch Cut-out

This self-locking double-pressure-releasing push-button permits cutting out the squelch function as sketched below.



04. "Loudspeaker Out"

This is a self-releasing push-button. It is used only in conjunction with a tone receiver, for cutting out the loudspeaker.

05. Channel Selector

The channel selector is a rotary switch. It has six positions, one for each channel that can be provided. Switching between channels is performed by connecting the desired transmitter oscillator and receiver oscillator to earth, thereby applying operating voltage to them. If less than six channels are provided, the unused positions of the channel selector will be connected to the preceding one of the channels in use, so that this channel will be cut-in even if the channel selector happens to be set at a channel for which crystals are not provided.

06. Combined On/Off Switch and Volume Control

This knob is a combined on/off switch and volume control. To switch off the radiotelephone, turn the knob fully left. Volume adjustment is continuous. A dial indication is provided.

V1. Red Transmit Indicator Lamp

This lamp turns on when transmit button 01 is pressed.

V2. Green Lamp for Selective Calling

This lamp indicates that a selective call is being received. It is provided in the control panel only if a tone receiver is used.

In addition to the above-mentioned control functions, the control panel carries a 1-watt 50-ohm loudspeaker.

Besides, the panel carries the connector sockets specified below:

J1. Socket for connection of an external 15 - 20 ohm loudspeaker, providing 2 watts of audio output, and for connection of an alarm circuit. Also for discriminator check measurement.

J2. Socket for connection of microphone, switch, or handset.

Two holes in the chassis between sockets J1 and J2 permit adjustment of:

The squelch potentiometer. To tighten the squelch, turn clockwise.

Potentiometer for speech modulation control. To increase the gain, turn anti-clockwise.

Selective Functions

Cutting the Loudspeaker In and Out

When using selective calling the loudspeaker will be open during incoming calls. On completion of a call, the loudspeaker can be cut out by depressing the button 04, so that only calls intended for the station operator can cut in the loudspeaker. To monitor the channel for traffic, the operator will cut in the loudspeaker by pressing the button 02. This should always be done before switching on the transmitter, for which reason the tone receiver unit incorporates a circuit to prevent the transmitter from being switched on before the button 02 has been depressed and the loudspeaker cut in.

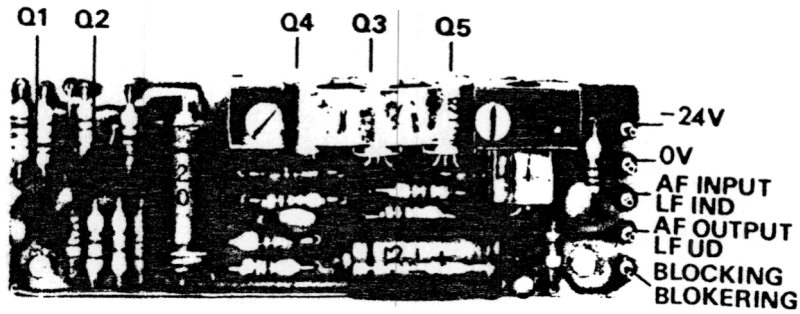
For other selective functions see the Tone Equipment Manual.

Built-in Units

The control panel houses the receiver audio output amplifier, AA602, which is described separately in this Chapter.

The control panel will also accomodate a tone transmitter and tone receiver, also an alarm circuit. Diagram D400.842 shows how these units are installed in the control panel, whilst descriptions and diagrams of the tone equipment are contained in a separate manual covering tone equipment for the STORNOPHONE 600.

Audio Output Amplifier AA602



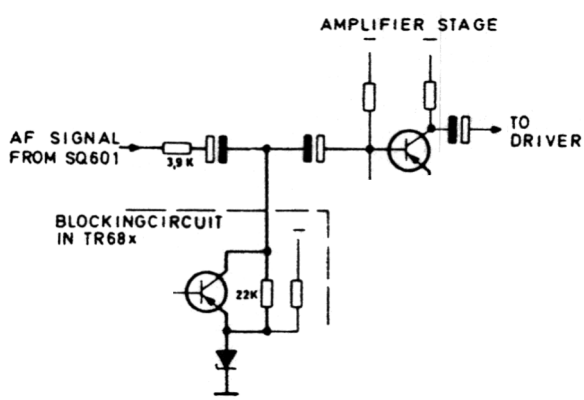
The audio output amplifier is built on a wiring board. It consists of these stages:

Blocking attenuation circuit
Pre-amplifier stage
Driver
Complementary output stage with temperature compensator.

The audio output amplifier is a transformerless push-pull amplifier which is capable of delivering 2 watts of power output. This unit is located in the control box.

Mode of Operation

The blocking attenuation network in the input circuit of the audio output amplifier is used only if a selective tone receiver is provided, in which case the attenuation network (a T-network) is made up of the pre-amplifier input impedance, a series resistor, and the output impedance of the tone-receiver blocking circuit; the latter impedance should be less than 1.5 ohms if the desired blocking attenuation is to be achieved (see sketch below).



The signal if fed to the output stage via the pre-amplifier stage and the driver stage, both of which receive negative feedback voltage from the output stage. Temperature compensation of the output stage is accomplished by biasing a transistor connected between the bases of the output transistors. The type of compensation employed is base-emitter voltage compensation. The output stage operates in Class B push-pull in a common-collector circuit. It is transformerless, with a loudspeaker load of approx. 15 ohms.

Warning Never short-circuit the loudspeaker output (terminals 2 and 4) as this will cause permanent damage to transistors.

Reducing the Input Sensitivity

If a reduction in the output amplifier sensitivity is desired, a 1/8-watt resistor (see table below for resistance value) may be inserted between terminal 3 of the unit and the wiring board in CB60x.

INPUT SENSITIVITY FOR 2 WATTS OUTPUT	RESISTANCE VALUE
+3 dBm	22 k ohms
0 dBm	12 k ohms
-3 dBm	6.8 k ohms
-6 dBm	2.7 k ohms
-9 dBm	0 ohms

Technical Specifications

Supply Voltage
24 V ±5%.

Resistance in Power Supply Cable
R_{cable}: max. 14 ohms.

Current Drain
At 24V: without signal 20 mA
at 2 watts output 175 mA
blocked 20 mA

Power Output
Max. 2 watts.

Loudspeaker Impedance
15 ohms.

Input Impedance
6.5 k ohms.

Input Sensitivity
For 2 watts into 15 ohms and R_{cable} = 0 ohms. Better than -9 dBm.

Frequency Response
Measuring level 1W (ref. 1000 c/s): 300 - 3000 c/s +0.5 dB -1.5 dB.

Distortion
Less than 5%.

Hum and Noise
Attenuated 60 dB.

Blocking
Earthing the blocking lead through tone receiver TR68x or 1.5-ohm resistor: 50 dB.

Dimensions
28 x 80 mm.

CHAPTER III. ACCESSORIES

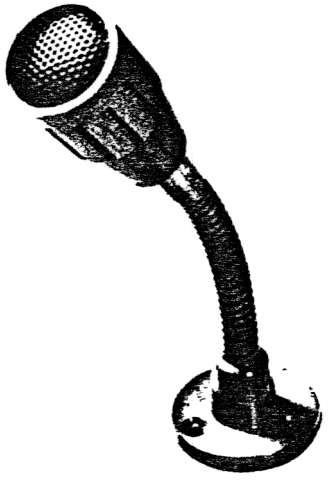
Fixed Microphone MC601



Microphone MC601a

The MC601a microphone is designed for fixed mounting and a speaking distance of approx. 30 - 40 cm. The microphone housing contains a 600-ohm microphone cartridge and a Type AA604 50-dB amplifier with integrated circuits. This microphone may be used with the CB601 control box.

Fixed Microphones MC602, MC603, MC604

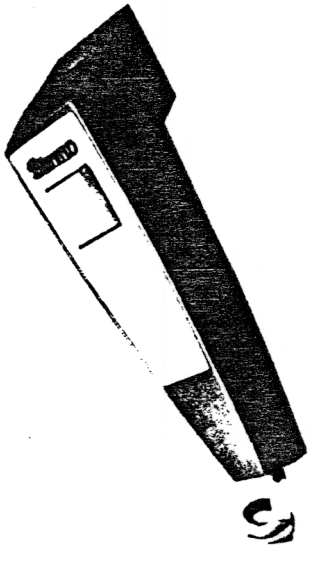


Microphones MC602a, MC603a, and MC604a

These microphones are identical with the Type MC601a in regard to technical details and operation; however, they have goosenecks of different lengths.

MC602a	11-cm gooseneck
MC603a	21-cm gooseneck
MC604a	41-cm gooseneck

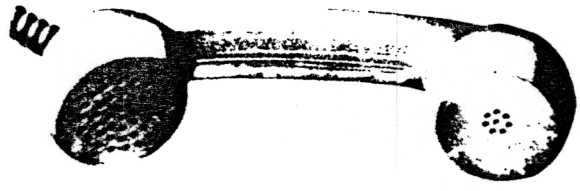
Fist Microphone MC606



Microphone MC606a

The MC606a microphone is a fist microphone. A transmit button is provided on the housing. The MC606 microphone contains a 600-ohm dynamic microphone cartridge and a Type AA606 50-dB integrated amplifier.
The fist microphone is used with the CB601 control box.

Handset MT601



Handset MT601

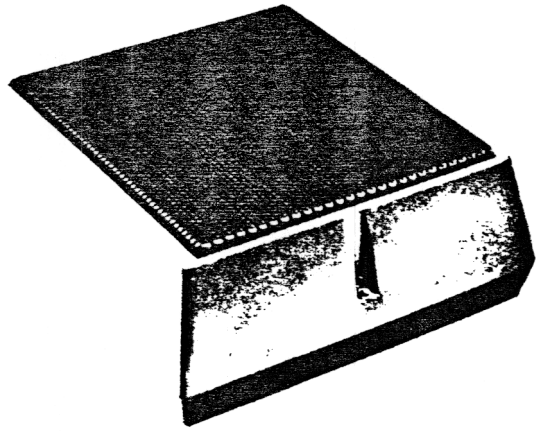
The MT601 handset is a conventional handset with transmit key. It contains a telephone cartridge and a microphone cartridge with a built-in amplifier.
The MT601 handset may be used with the CB601 control box.

Handset MT602

Handset MT602

The MT602 handset is a watertight handset with transmit button. It contains a telephone cartridge and a microphone cartridge with a Type AA605 one-stage transistor amplifier which provides approx. 20 dB gain. The MT601 handset may be used with either the CB601 or the CB602 control box.

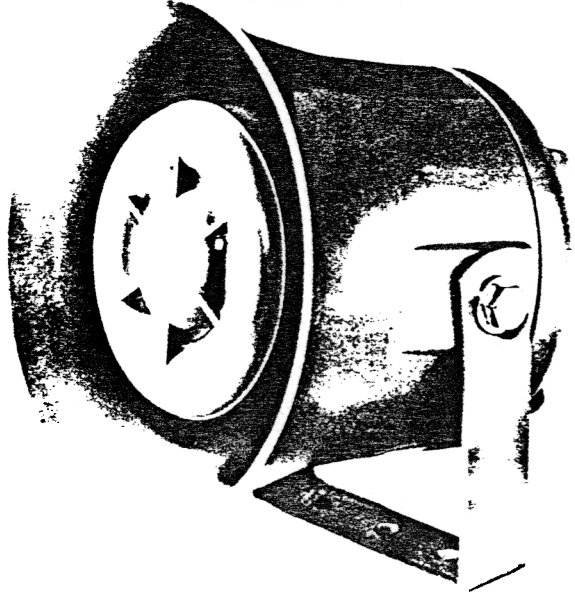
Loudspeaker LS601



Loudspeaker LS601a

The Type LS601a loudspeaker is a 2-watt 15-ohm loudspeaker mounted in a plastic housing. It may be mounted wherever convenient (mounting hardware is supplied). It can also be mounted on the CB601 control box.

Folded-Horn Loudspeaker LS602



Folded-Horn Loudspeaker LS602

The Type LS602 folded-horn Loudspeaker is a watertight high-efficiency loudspeaker with pronounced directional properties. For this reason it is excellently suited for outdoor mounting, for instance in conjunction with motorcycle installations.

Technical Data

Impedance: 20 ohms
Power capacity: 10 watts
Lower limiting frequency: 560 c/s
Dimensions: 150-mm dia. x 140 mm.

CHAPTER IV. INSTALLATION

A. General

Introduction

It is of great importance that installation is carried out carefully and in accordance with the enclosed instructions. Careless or incorrect installation may disastrously impair the performance of the equipment and will substantially increase the risk of breakdowns.

It is therefore recommended that the installation personnel study and follow the instructions given in this chapter.

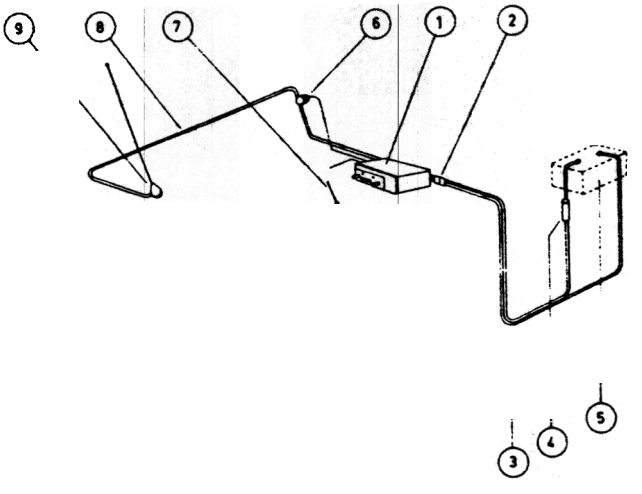
Unfortunately it is not possible to draw up a set of universally valid installation instructions for the STORNOPHONE 600L; the number of models and types of vehicles is too large and requirements for individual installation jobs are too diversified to permit that.

In many cases, moreover, customers have special wishes in regard to placement of the individual units of which the equipment is composed - especially where equipment is to be installed in ships, locomotives, etc.

If an installation job involves problems that can not be solved through a study of this manual, please contact STORNO.

Unpacking

On receipt of any consignment from STORNO, all items should be unpacked and checked against the packing list and (if possible) the invoice. Also check for possible damage during transport. STORNO should immediately be notified if goods are damaged or not as ordered.



1. Station Cabinet with Mounting Plate.
2. Battery connector.
3. Battery cable.
4. Fuse holder.
5. Vehicle battery.
6. Microphone.
7. Steering wheel switch
8. Antenna cable
9. Whip antenna.

When dispatching equipment to STORNO in case of complaints, repairs, etc. the original packing should be used whenever possible.

Main Units

A standard radiotelephone station consists of these main units: A CA605 station cabinet containing transmitter section, receiver section, power supply unit, control panel, and loudspeaker.

A Type 17.030 kit of installation parts comprising: Mounting plate, connectors, fuse holder, and cable shoes.

The following additional items are required for installing the radiotelephone and making it ready for operation:

Kit of installation cables (battery cable and antenna cable). Storno type 19.088.

Microphone. Several types are available.
Antenna. Several types are available.

Also available are various types of accessories such as: External loudspeaker, handset, steering-wheel transmit button, modification kit for converting the radiotelephone for remote control, etc.

An instruction sheet or folder is supplied with each accessory and each large installation component.

Standard Directions

Before starting work, the siting of the radiotelephone and its cabling should be selected on a basis of the following factors:

Operation should be straightforward and easy. In vehicles, radiotelephones should be sited with a view to maximum safety for the driver.

The radiotelephone should be easily accessible for service, and its cabling should be placed so as to provide room for connectors and the snap fasteners of the mounting plate.

Cabling should be as short as practicable.

Cables should be placed well away from movable, moist, and hot components. In vehicles, cables should be run through existing conduits or between the upholstery and the car body. Cables should not be mounted below the bottom of the car where this can be avoided.

In marine installations, cables should be secured by an adequate number of clamps.

For 6-volt operation, the battery cable must not exceed 4 metres in length if 2 x 4 mm^2 PVC cable is used. If a longer cable is required, its cross section should be proportionately heavier.

Cables should be adequately relieved of stress - especially at critical points such as entries and sharp bends.

Soldering

When soldering cables in the units of the station, for example when converting the station for remotely controlled operation, the use of a soldering iron of 20- to 25-watt rating is recommended whereas soldering to connector terminals requires a soldering iron of a somewhat higher rating, though not more than 65 watts. When installing the antenna connector, the antenna cable screeen braid should be soldered securely into place. Moreover, when fitting connectors to coaxial cables, the soldering job should be done as quickly as possible, followed by cooling in alcohol, in order to prevent the cable dielectric from melting.

Temperature

The equipment should be installed in a place that will permit the heat given off through the cabinet surface to be drained away by the ambient air, whose temperature should be inside the range -15°C to +50°C for continuous operation, although the equipment will operate inside the range -30°C to +60°C over limited time intervals such as hot summer days or cold winter nights.

B. Installing the Station Cabinet

Siting

The STORNOPHONE 600L is built for local operation and is consequently intended for installation near the operating position. In vehicles, the most convenient place will therefore be under the dashboard.

However, the equipment may - depending on the type of service for which it is to be used and on local conditions - be sited in different ways and in different places if this is deemed desirable seeing that the installation kit permits mounting it in any desired position.

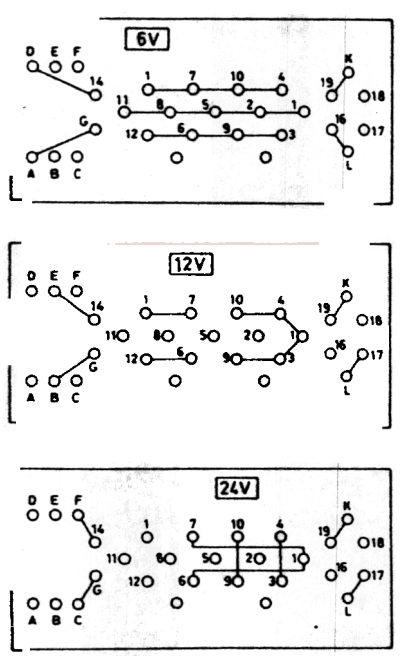
In choosing the proper place in which to mount the cabinet, the various factors discussed in the preceding section should be taken into account where at all possible.

Strapping for the Battery Voltage in Use

As supplied from the factory, the radio cabinet carries on its rear wall a voltage plate stating which one of the above-mentioned supply voltages the equipment is strapped for. If you subsequently switch the equipment for a different voltage you should replace the plate accordingly.

Switching to a different supply voltage consists in changing a number of straps on the top side of the power supply unit PS606, which carries a strap card showing strapping arrangements for the respective voltages.

Strap Card in PS606



Installing the Mounting Plate

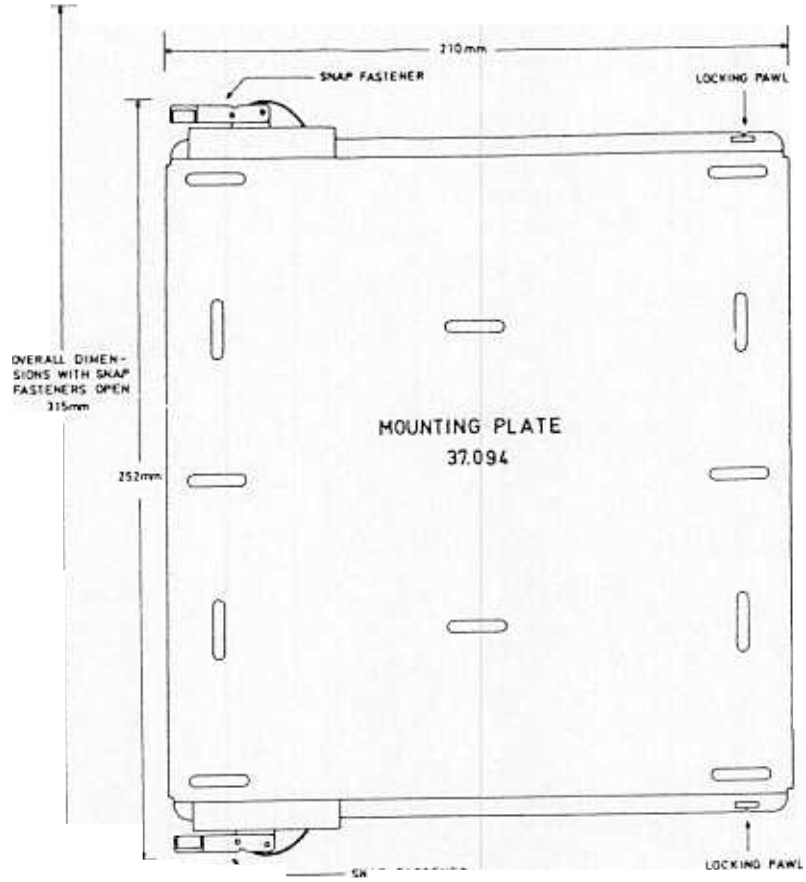
The cabinet is installed by means of the installation kit (37.094), which comprises these parts:

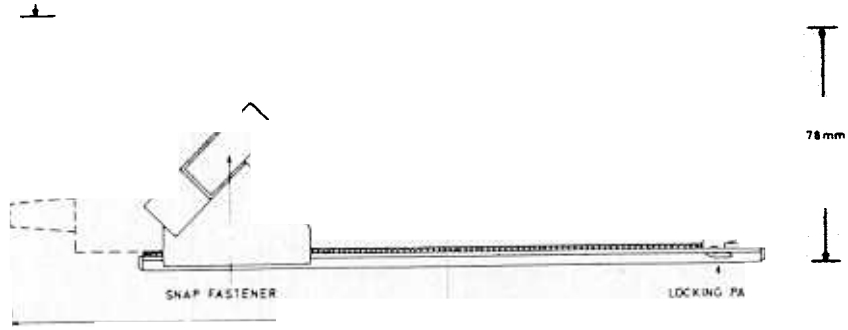
Mounting plate with snap fasteners and locking pawls.
6 self-cutting screws, 3.9 x 6.5 BZ.
Mounting hardware.

The mounting plate, to which the station cabinet is held by two snap fasteners at the front and two locking pawls at the back, may be secured both on top of the cabinet and below it. This makes it possible to mount the equipment either suspended - under the dashboard, under the ceiling or on a wall - or standing, on a desk or shelf etc.
The mounting plate has a large number of screw holes in it that make it possible to secure it with screws at all or any points that may be deemed expedient, depending on the nature of the material to which it is to be secured. The installation kit contains the screws required.

The exact number of screws to be used depends on the nature of the material to which the mounting plate is to be secured and on the location of the screws on the mounting plate, but a minimum of four screws should be used, spaced as far apart and placed as near the corners of the mounting surface as possible. If the equipment is to be mounted in a sloping position, the mounting hardware should be cut into suitable lengths, which should thereafter be bent to the desired angle.

To secure the cabinet to the mounting plate, bring the two locking pawls of the plate into the cutouts on the top or bottom of the cabinet and thereafter bring the two snap fasteners into engagement with the cutouts in the sides of the cabinet and snap them shut.





C. Installing Cables and Connectors

Installation Kit

A kit of installation hardware is supplied with the equipment. In addition to mounting hardware, this kit comprises the following parts:

Antenna connector UG88/U, BNC (STORNO type 41.5120).

6-contact connector for microphone and (if used) steering-wheel transmit button (STORNO type 41.5093).

2-contact connector housing (STORNO type 41.5508) with two male connectors (STORNO type 41.5509).

Fuse holder (STORNO type 46.5010).

1 fuse for 24-volt operation, 3 amps. 6.0 x 25 mm (STORNO type 92.5065).
1 fuse for 12-volt operation, 6 amps, 6.0 x 25 mm (STORNO type 92.5066).
1 fuse for 6-volt operation, 15 amps, 6.3 x 26 mm (STORNO type 92.5072^{A}).

An adhesive plate listing fuse ratings for different supply voltages.

2 tubular rivets to relieve cable strain in multi-wire connectors (STORNO type 30.021).

2 cable shoes (STORNO type 35.5005).

$^{\Delta}$NOTE: Only fuse type 92.5072, which is a quick-blow fuse, may be used for 6-volt operation. Most other commercially available motor-car fuses are too sluggish to provide adequate protection in case of short circuits.

In addition to the installation kit described above, STORNO can supply the necessary cables in the form of an installation kit (STORNO type 19.088) comprising:

8 metres of battery cable, 2 x 4 mm^2 PVC (STORNO type 73.5022).

6 metres of antenna cable (50-ohm coaxial cable, RG58C/U - STORNO type 75.5013).

These lengths of cable will suffice for most vehicle installations.

However, these types of cables can also be supplied in lengths according to customers' requirements.

Battery Cable

Fit the cable to the 2-contact connector housing (41.5508) with associated male connector contacts (41.5509).

Install the fuse holder (46.5010) in the positive conductor of the battery cable (the marked portion of the cable) as close to the battery as possible.

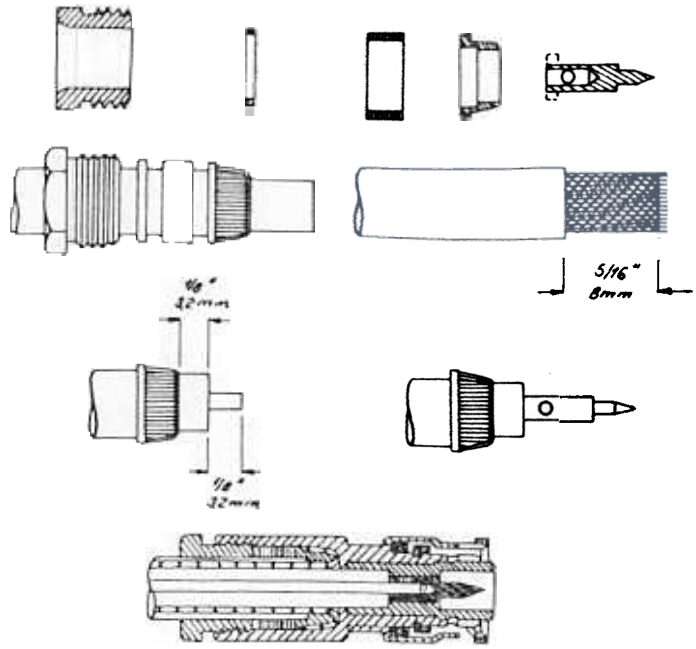
The plate indicating fuse ratings for different supply voltages should thereafter be placed on the fuse holder. Insert the correct fuse in the holder.

Connect the cable, with the cable shoes supplied, direct to the battery terminals - the marked portion of the cable should go to plus.

Plug the battery-cable connector into the radiotelephone's battery connector. The marked cable portion referred to above should go to the lead coming from the radiotelephone cabinet.

Antenna Connector and Antenna Cable

Fit the UG88/U antenna connector to the antenna cable as described.



Cut end of cable even. Remove 8 mm of PVC jacket. Do not use tools that may nick the strands of the braid.

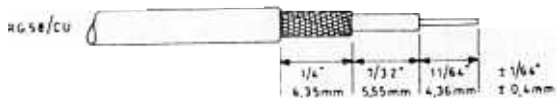
Comb out braid. Pull wires out across cable end. Slide components of connector on to cable in sequence indicated.

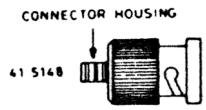
Comb braid back over cone, taking care that wires do not cross each other. Cut braid wires off as shown. Remove 3.2 mm of insulation without nicking centre conductor. Do not use wire stripper.

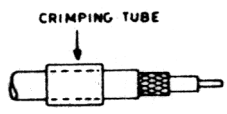
Tin centre conductor of cable and the contact. Solder carefully. Do not use soldering paste. Cool with alcohol. Remove resin and excess tin, using sharp knife. Make sure that contact is straight and located in centre.

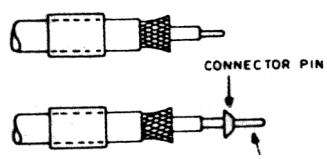
Push connector body on to cable end. Screw coupling ring on and tighten, using adjustable spanner.

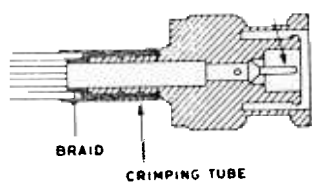
If a "crimp"-type antenna conductor is used (STORNO type 41.5148), the fitting operation requires a crimping tool (Erma 29010) and associated accessories.

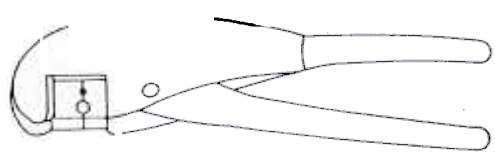












"ERMA" CRIMPING TOOL
NR 29010/29271

Procedure

Strip cable as shown in sketch. Avoid nicking strands of braid and centre conductor.

Slide crimping tube and connector housing on to cable in sequence shown.

Slide connector pin in over the centre conductor and secure it, using crimping tool.

Slide connector housing into place over the pin as shown.

Bring bared cable braid out over connector housing sleeve. Slide crimping tube up to connector housing and crimp it on to the sleeve and braid, using crimping tool.

The procedure for connecting the antenna cable to the antenna is described in the section "Standard Antennas".

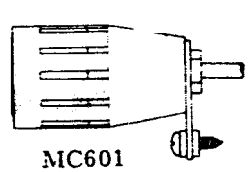
6-contact Connector 41.5093

This connector is to be fitted on the cable coming from the microphone or handset and (if used) an external transmit button. The exact procedure depends on the type of control equipment to be used and is therefore described in connection with the latter.

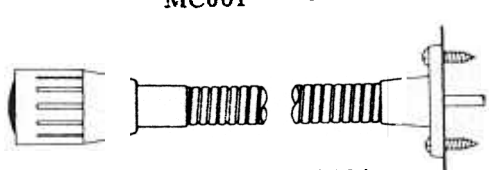
D. Installing Control Equipment

Fixed Microphones MC601, MC602, MC603, and MC604

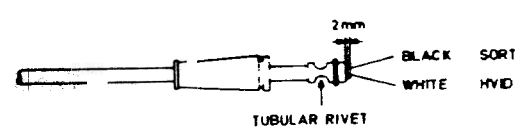
Mount the microphone in a suitable place so that normal speaking distance will be 30 - 40 cm. In motor vehicles, the corner post will usually be found a good place for mounting the microphone. The microphone-cable conductors should be soldered to the 6-contact connector as shown in the sketches below.

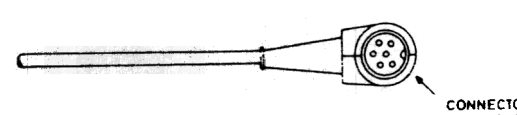


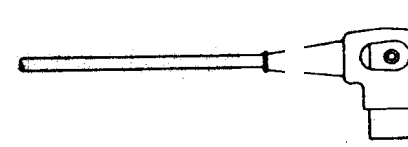
MC601

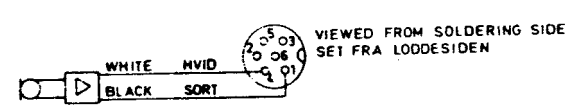


MC602, MC603, MC604



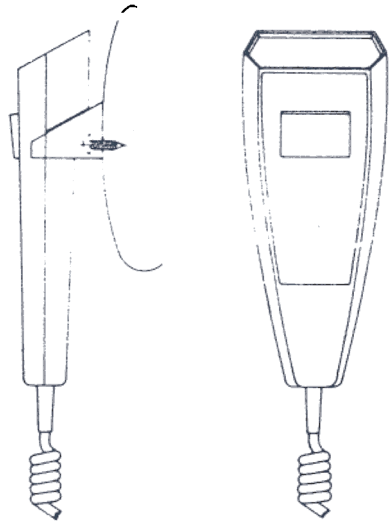


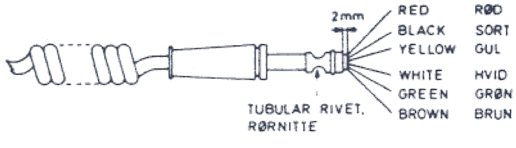


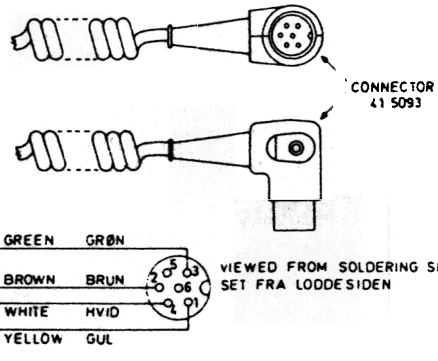


Fist Microphone with Transmit Button MC606

Mount the microphone and its holder in some convenient place near the operating position. Use the holder for marking the holes to be drilled. Screw the holder into place by means of the screws supplied. Solder the microphone-cable conductors to the 6-contact connector as shown in the sketches below.

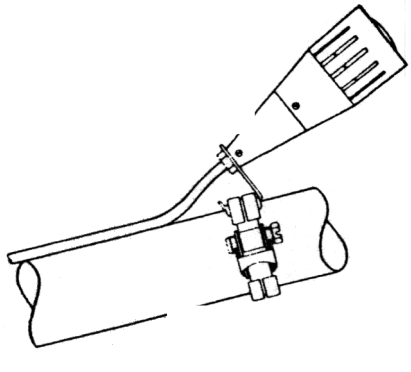


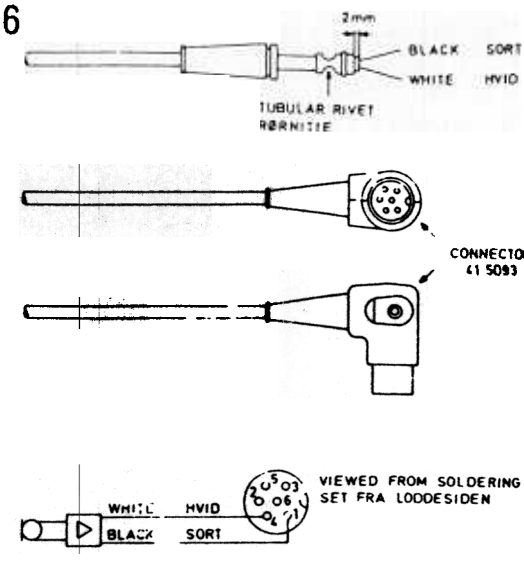




Steering-wheel Microphone MC607

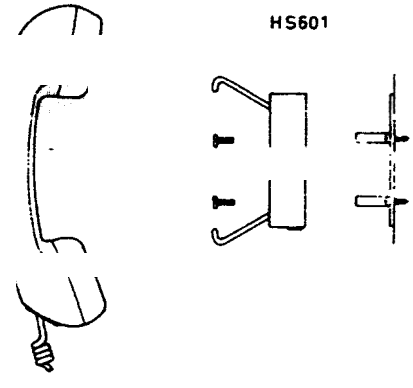
The steering-wheel microphone should be mounted and wired as shown in the sketches below.

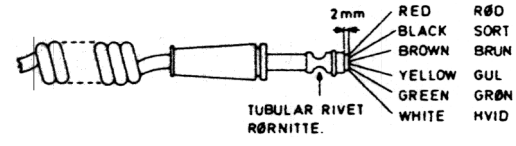


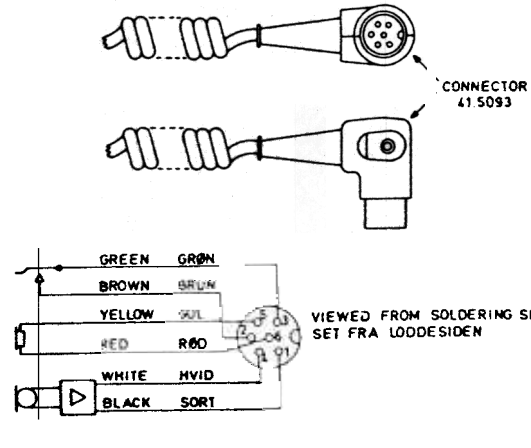


Handset with Hang-up Bracket MT601

The handset and its holder (37.106) should be mounted in some convenient place near the operating position. The handset cable should be soldered to the 6-contact connector as shown in the sketches below.

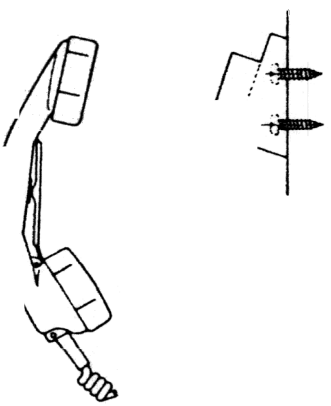


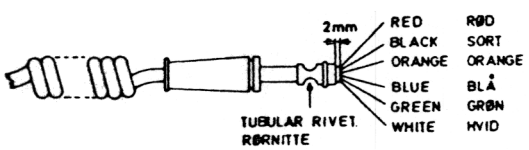


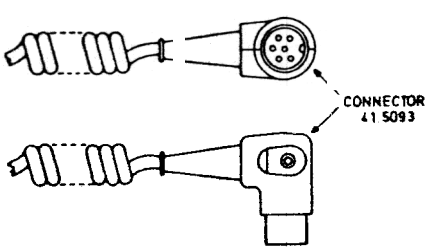


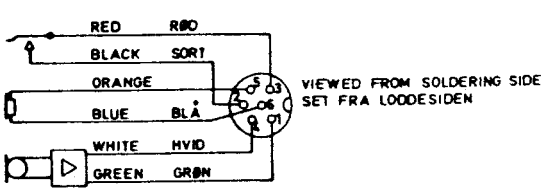
Handset with Hang-up Bracket MT602

The handset and its holder should be mounted in some convenient place near the operating position. The handset cable should be soldered to the 6-contact connector as shown in the sketches below.





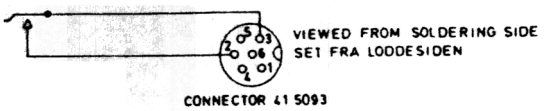




Steering-wheel Transmit Button

The steering-wheel transmit button may be used with fixed microphones MC601, MC602, MC603, and MC604. The transmit button should be mounted on the steering wheel and the wire ends soldered to the 6-contact connector as shown in the sketch below.





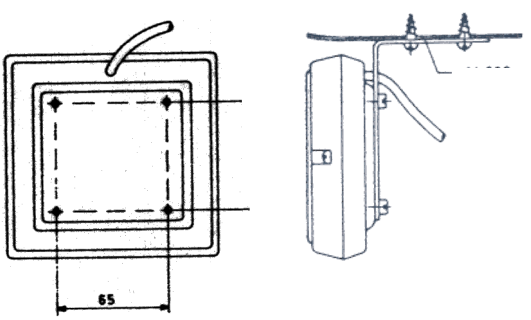
Loudspeaker LS601

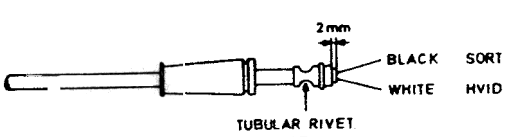
The loudspeaker should be mounted by means of the hardware and screws supplied.

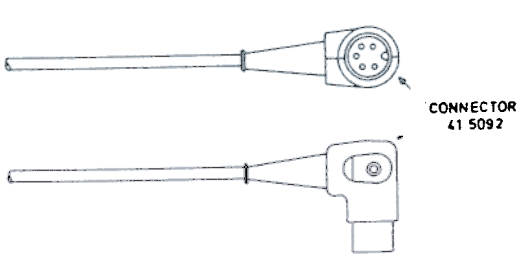
A 5-contact connector (STORNO type 41.5092) should be mounted on the loudspeaker cable. This connector is part of the standard installation kit supplied when the STORNOPHONE 660L is supplied with an external loudspeaker.

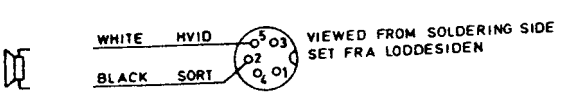
The cable conductors should be soldered to the connector as shown in the sketches below.

NOTE: When connecting an external loudspeaker it is necessary to unsolder and insulate the leads of the built-in loudspeaker.









E. Standard Antennas

The antenna should be placed as high as possible and well out in the clear as this will make it easier to obtain optimum matching and maximum radiation. On a vehicle, the roof must be considered the best place for the antenna. If the roof is not a metal one, one square metre of aluminium foil should be glued to it immediately below the antenna (it may be placed on the inside of the roof). In the case of passenger cars, the antenna may also be mounted on the lid of the luggage compartment. However, this will impair the efficiency of the antenna and produce undesirable directivity effects, for which reason this solution should be resorted to only where these factors are of minor importance - that is, in cases where maximum range is not an important requirement.

All of the standard antennas described here can be installed from outside; it is not necessary to make a hole in the car upholstery.

Antenna Mount

The antenna cable may be connected to the antenna in two different ways, either by means of a crimping tool (Erma 29010) and associated accessories (29271) or by means of conventional tin soldering.

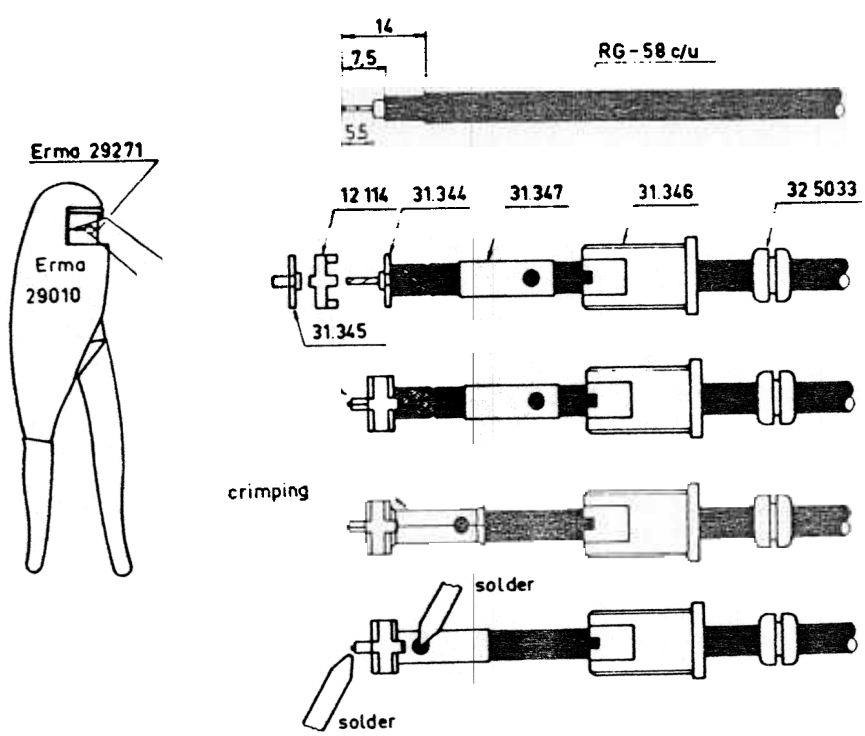
Procedure

Strip the jacket and dielectric from the end of the coaxial cable as shown, avoiding to nick the strands of the braid and centre conductor.

Slide the grommet (32.5033), threaded sleeve (31.346) and crimping tube (31.347) in on the cable in the sequence shown. Thereafter insert the sleeve (31.344) between the cable dieelectric and the braid and lastly place the insulating washer (12.114) and sleeve (31.345) as shown.

Thereafter secure the antenna mount to the cable, either using a crimping tool to make the crimping tube fit tightly around the cable braid and the sleeve (31.345) fit tightly around the centre conductor, or by soldering. Both procedures are illustrated in the sketches below.

At the place selected for mounting the antenna, drill a 13.5 - 14.0 mm dia. hole. Pull the free cable end below the upholstery (if any) to the transmitter/receiver cabinet. Then lower the

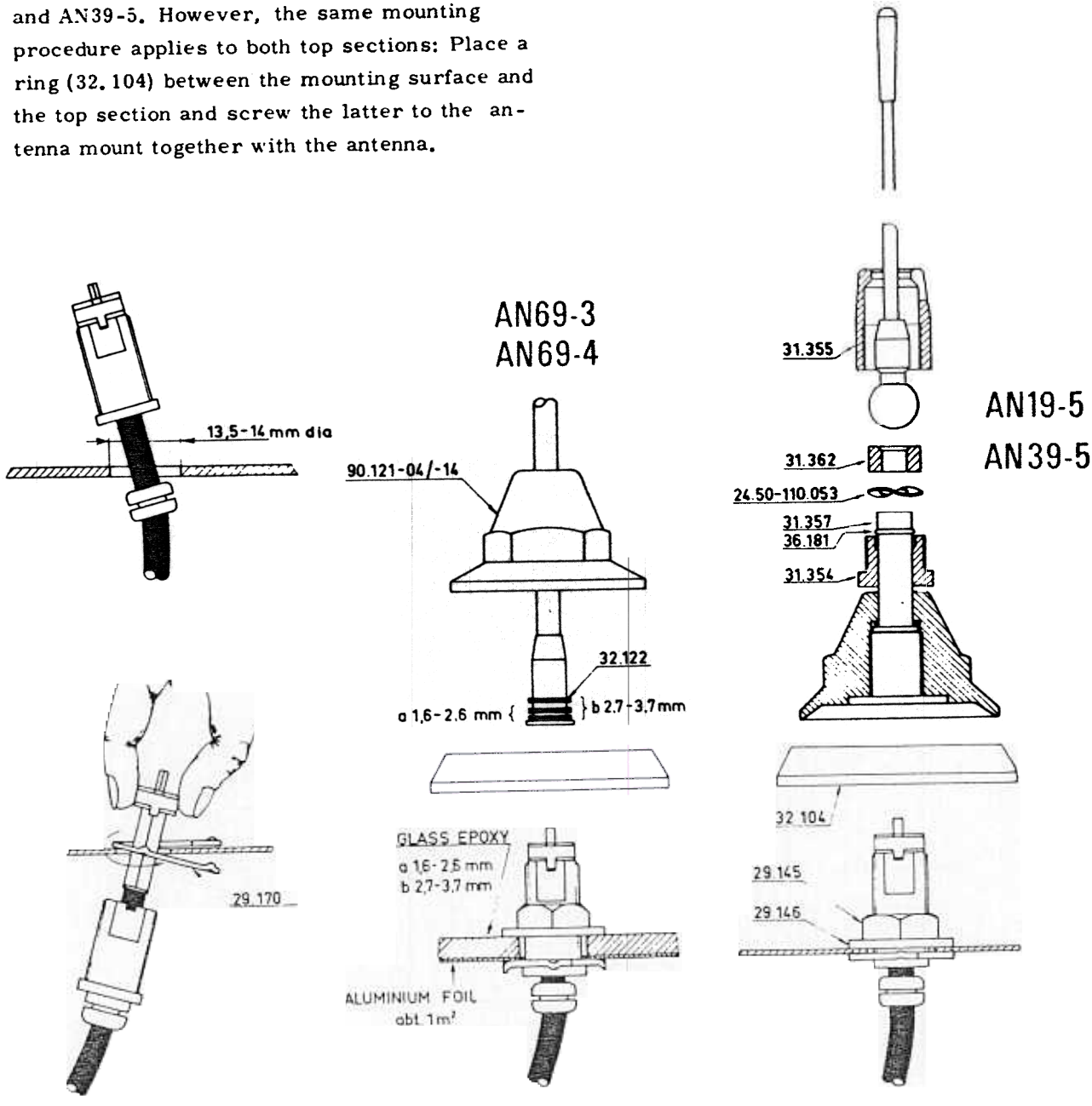


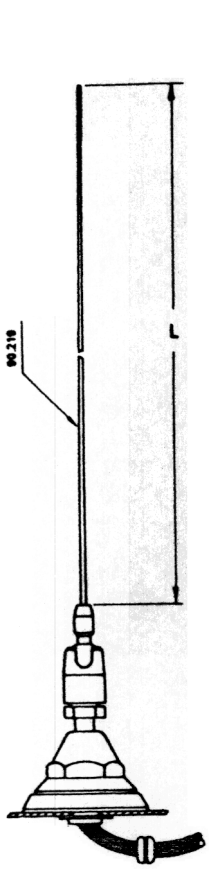
antenna mount halfway into the hole previously drilled, so that the grommet and threaded sleeve are located below the mounting surface. Screw the spiral disk through the hole.

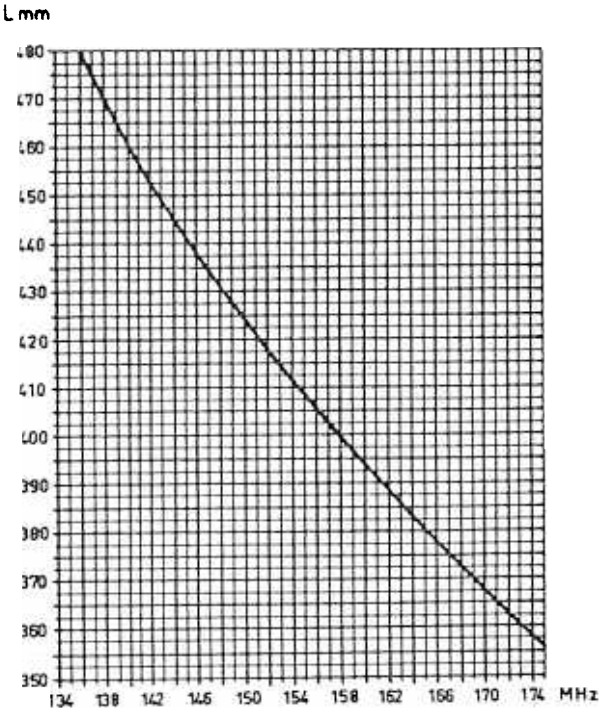
Lift the antenna mount into position; fit a washer (29.146) on the outside and secure with a nut (29.145).

The top section of the antenna mount is available in two versions, one of them for use with antennas AN69-3 and AN69-4, the other one, which has a ball joint, for use with antennas AN19-5 and AN39-5. However, the same mounting procedure applies to both top sections: Place a ring (32.104) between the mounting surface and the top section and screw the latter to the antenna mount together with the antenna.

Antennas AN69-3 and AN69-4 have a number of gaskets (32.122) between the antenna mount and the top section. The exact number of gaskets to be used depends on the thickness of the material on which the antenna is to be mounted. If the material is between 1.6 and 2.6 mm thick, two gaskets should be used; if it is between 2.7 and 3.7 mm thick (glass-fibre roofs etc.), use three gaskets.

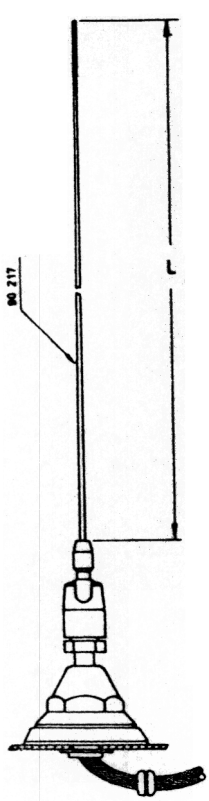


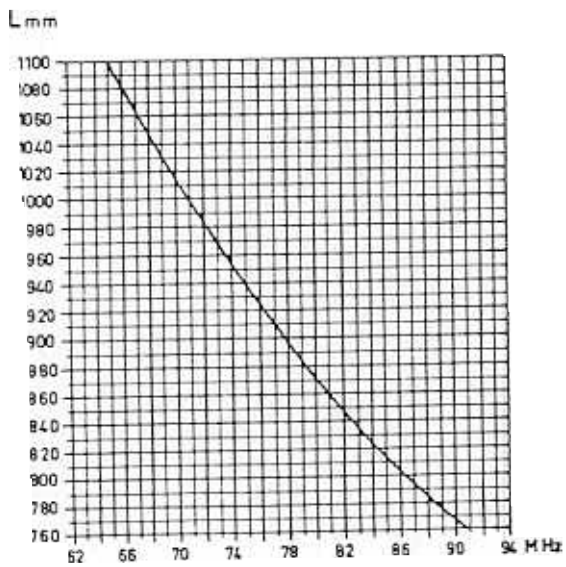




AN19-5

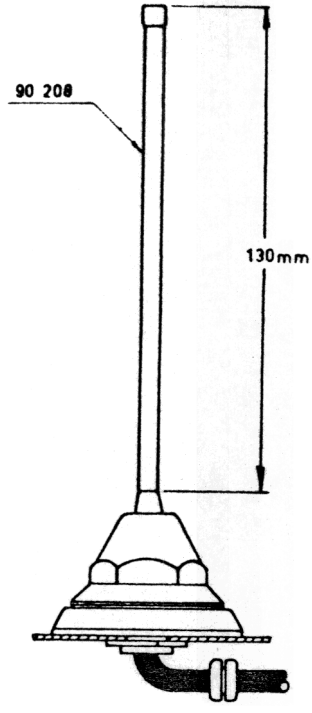
Whip antenna AN19-5 should be shortened to 1/4 λ of the operating frequency. This should be calculated as the average of the transmitter and receiver frequencies of the station. The exact antenna length can be read from the curve.





AN39-5

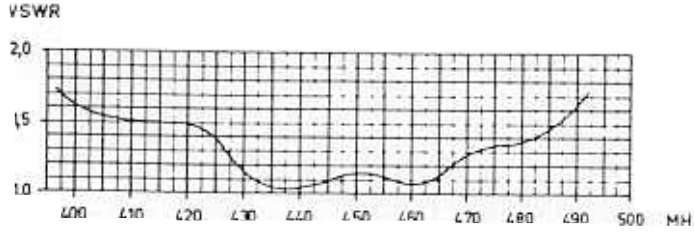
Whip antenna AN39-5 should be shortened to 1/4 λ of the operating frequency. This should be calculated as the average of the transmitter and receiver frequencies of the station. The exact antenna length can be read from the curve.

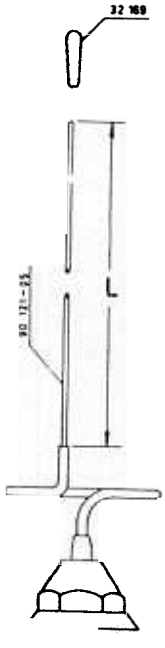


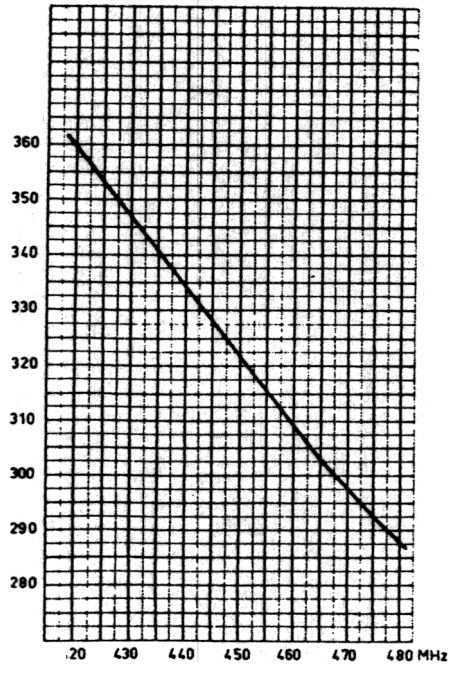


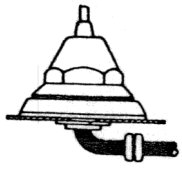
AN69-3

Whip antenna AN69-3 is a pre-cut 1/4 λ antenna. The curve shows the standing-wave ratio inside the 450 MHz band.













AN69-4

Whip antenna AN69-4 should be shortened to 5/8 λ of the operating frequency. This should be calculated as the average of the transmitter and receiver frequencies of the station. The exact antenna length can be read from the curve.

F. Conversion to Remote Control

Connector Kit MK601

The locally controlled radiotelephone can be converted for remote control if desired. The components required for this purpose are contained in a modification kit, MK601, comprising:

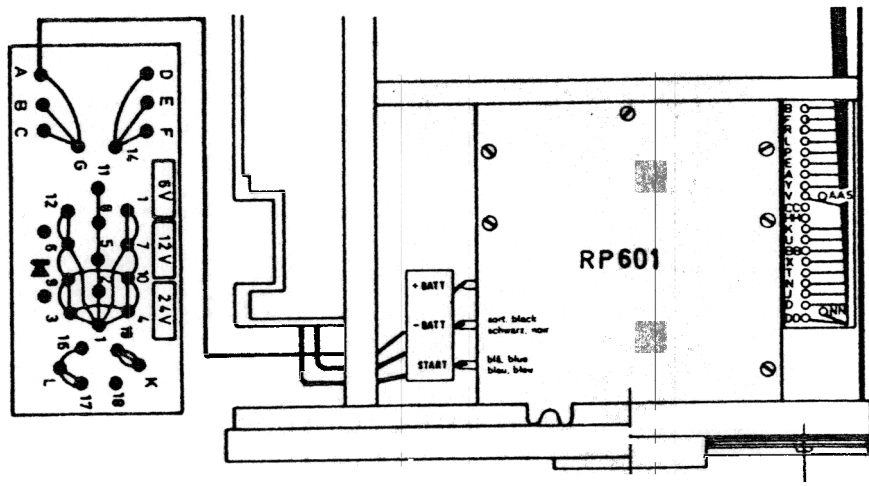
Relay Panel RP601 (STORNO type 10.1452).
Cabinet CA606 (STORNO type 10.1476).
Multiwire Connector, female (STORNO No. 41.161).
6 metres of control cable, PVC 4 x 0.25 mm^2 + 22 x 0.125 mm^2 (STORNO type 74.5014).

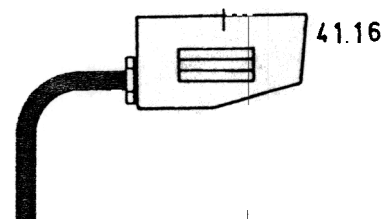
Procedure

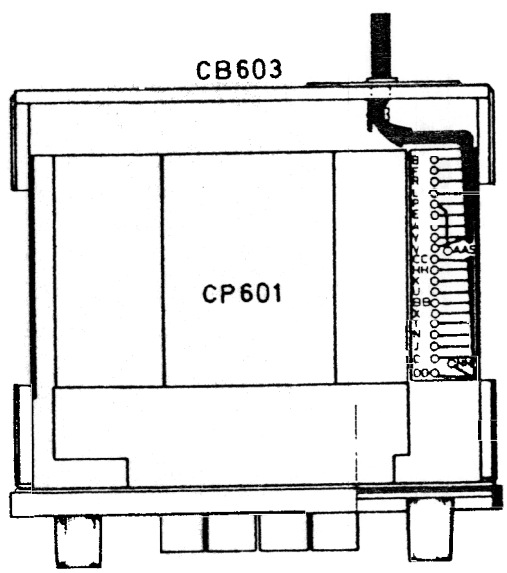
Remove CP601 control panel from the station cabinet

Unsolder the loudspeaker leads and insulate the ends.

Next, the "-BATT." and "START" leads (black and blue) from the power supply unit should be unsoldered from the station switch in the control panel.







Unsolder the station cabling from the control-panel terminal board.

Take off the channel selector knob and the On/off and volume-control knob.

Remove the control panel from the station chassis (4 screws) and take out the panel.

Mount Relay Panel RP601 in the Station Cabinet

Mount the relay panel in the space previously occupied by the control panel. Secure with 4 screws.

Solder the station cabling to the relay-panel terminal board.

Cable Connections in RP601

Terminal	Colour	Terminal	Colour
B	brown-green	BB	grey-white
F	green	X	white-blue
R	blue	T	white-green
L	black	N	red-green
P	red-blue	J	white-red
E	grey-green	D	white-brown
A	grey	DD	black
Y	yellow-blue	NN	orange
V	yellow		
K	black		
U	red-black		

Connect the "-BATT." and "START" leads (black and blue) to the relay panel as shown in the sketch.

Connect a lead between strap terminal A (+BATT) of the power supply unit to the terminal marked "+BATT" on the relay panel.

Secure the front panel of the relay panel to the station cabinet, using two screws.

Mount Control Panel CP601 in Cabinet CA606

Insert the control panel in cabinet CA606 and secure it with 4 screws.

Mount the front panel of the control panel and the control knobs.

Strip the end of the 26-conductor control cable over a suitable length. Pull the stripped length of cable through the inlet on the back of the cabinet and solder the cable conductors to the control panel terminal board.

Cable Connections in Control Panel CP601 and Connector 41.161.

Terminal	Colour	Terminal	Colour
B	green-white	X	brown-white
F	green-grey	BB	brown-grey
L	red-yellow	A	green
R	black-yellow	E	green-brown
V	violet	K	red
DD	grey	P	blue
NN	yellow	U	brown
D	yellow-white	Y	black
J	yellow-green	CC	red-brown
N	yellow-brown	HH	blue-brown
T	yellow-grey		

The cable should be relieved of stress where it enters the cabinet.

Cabinet CA606 with control panel CP601 installed in it constitutes control box CB603, which is the control box to be used with this radiotelephone.

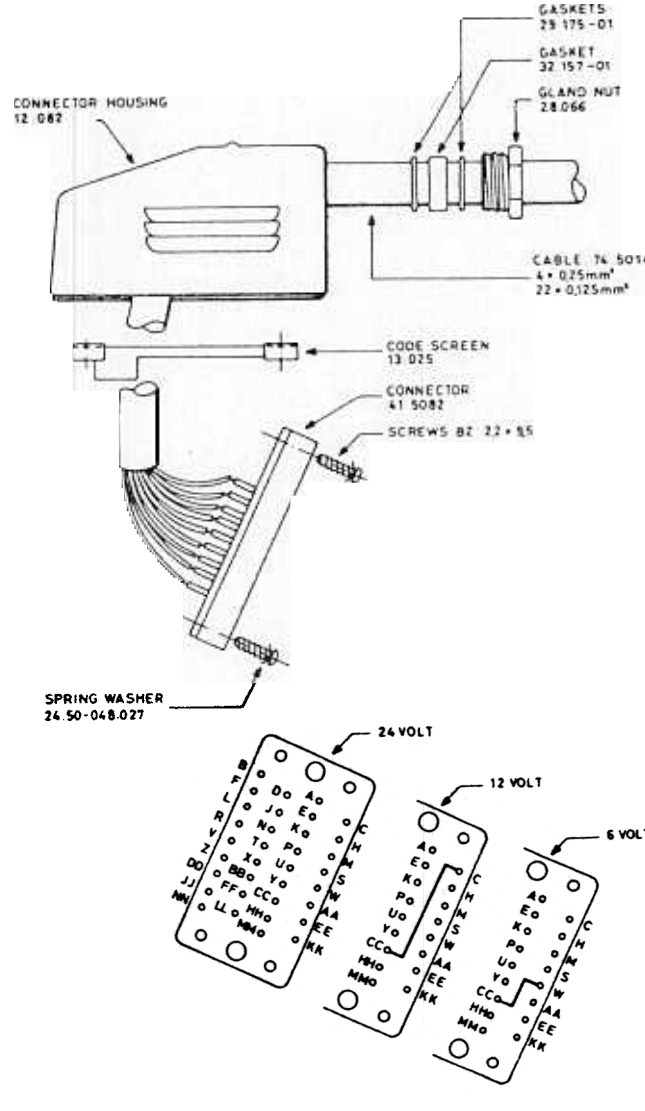
Fit the Multiwire Connector to the Control Cable

Solder the control-cable conductors to connector 41.161 in accordance with the terminal/colour code above.

Depending on the battery voltage, the following straps should be made in the connector:

For 6 volts: Strap terminals CC and W together.
For 12 volts: Strap terminals CC and C together.
For 24 volts: No straps.

NOTE: The built-in speaker cannot be used when the radiotelephone is remotely-controlled, for which reason it is necessary to connect an external loudspeaker to the control box.

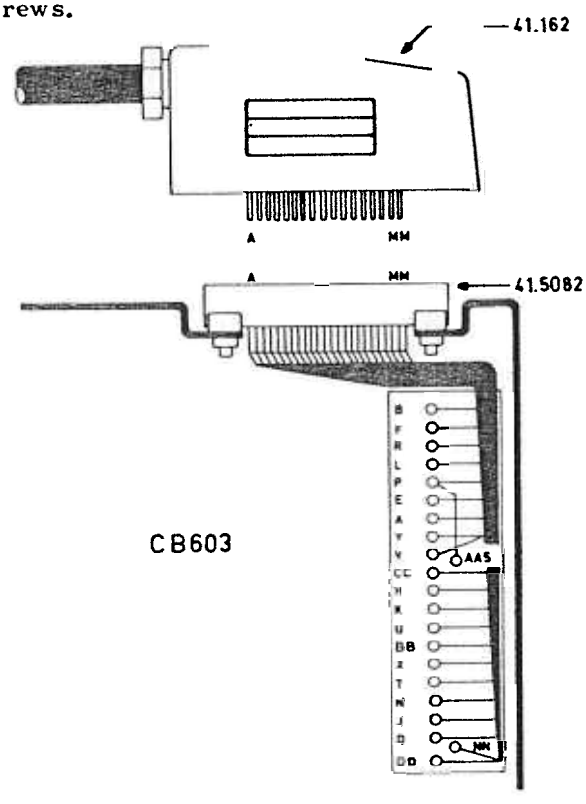


Connector Kit MK602

In connection with the conversion for remote control, control box CB603 may be equipped with a connector terminal for the control cable.

The components required for this purpose are contained in a modification kit, MK602, comprising:

Multiwire connector, male (STORNO type 41.162).
Multiwire connector, female (STORNO type 41.5082).
Code plate (STORNO type 13.025).
Spring with sleeve.
Screws.



Installation

Cut a short length off the 26-conductor cable and solder it to multiwire connector 41.5082 in accordance with the terminal/colour code in the chart below.

Remove the blank wall on the back plate of the control box and instead insert multiwire connector 41.5082 with the cabling which has been soldered to it.

Solder the cabling from the connector to the terminal board in the control panel in accordance with the terminal/colour code in the chart below.

Fit multiwire connector 41.162 to the control cable from the station cabinet in accordance with the terminal/colour code below.

Cable Connections When Using MK602

Terminal	Colour	Terminal	Colour
B	green-white	X	brown-white
F	green-grey	BB	brown-grey
L	red-yellow	A	green
R	black-yellow	E	green-brown
V	violet	K	red
DD	grey	P	blue
NN	yellow	U	brown
D	yellow-white	Y	black
J	yellow-green	CC	red-brown
N	yellow-brown	HH	blue-brown
T	yellow-grey		

G. Noise Suppression

Introduction

Noise interference in mobile radiotelephones may either be generated by the vehicle's or ship's own electrical system or originate from outside sources such as other vehicles, electric motors, overhead lines etc.

Obviously, nothing can be done about outside sources of noise, but the STORNOPHONE 600L incorporates carefully designed circuits to reduce such noise interference. Incidentally, if the vehicle or ship is moving, noise interference will usually be encountered only intermittently and for brief periods at a time.

On the other hand, electrical noise generated by the vehicle's or ship's own electrical system can often be adequately suppressed by relatively simple means. It should be kept in mind, however, that as long as the radiotelephone is operating close to the base station, noise will not normally be objectionable. It is only when the two

stations are separated by a considerable distance so that only a relatively weak signal is reaching the receiver, that noise will be audible in the loudspeaker during reception.

Really efficient noise suppression of a complete electrical system can be quite a problem, but satisfactory results can usually be obtained by following the simple hints given below. Moreover, it is suggested that the user provide the special noise-suppression manuals published by manufacturers of electrical equipment (such as Bosch, Beru, Lucas, Duvieller, etc.).

Ignition Noise

The most common source of noise is ignition noise, which is a steady popping sound following the speed of the engine. If the manufacturer has not provided the ignition system with noise-suppression devices, suppressor resistors should be inserted in series with each spark plug, or spark plugs with built-in resistors may be used. Suppressor resistors should preferably be wire-wound resistors (approx. 5 k ohms), which will suppress noise more effectively than carbon resistors (approx. 10 - 15 k ohms). Suppressor resistors in the spark plug cables should be placed as close as possible to the spark plugs, and the sparkgaps should be increased by 0.1mm.

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

Should the procedure outlined above fail to produce a satisfactory result, a 0.1 μF coaxial capacitor may be inserted between the ignition coil primary terminals and chassis. The capacitor should be installed close to the ignition coil, keeping the chassis wire as short as possible.

Lastly, it may be mentioned that dirty or burned distributor contacts may be the cause of a type of noise interference that shows up as ignition noise.

Generator Noise

Generator noise is a whine whose pitch and strength vary with the speed of the engine. In most cases, this noise is due to arcing between dirty or worn brushes and the commutator. It can usually be eliminated by cleaning (or replacing) the brushes.

In certain cases, however, it may be necessary to insert a filter in the generator circuit. A noise suppressor capacitor may be inserted in the lead from the ignition coil terminal (the lead going to the ignition switch) and the outgoing battery cable, close to the generator relay terminal. Do not strip the cable of more insulation than strictly necessary as bare wires will increase the risk of short circuits.

Other Sources of Noise

Noise from the voltage regulator is heard in the loudspeaker as a grating sound. It can usually be removed by installing a coaxial capacitor in the lead to the generator, as close to the regulator as possible, taking care to provide an efficient connection to chassis.

All electric instruments and motors are potential sources of noise interference. Noise from the windscreen wiper motor, for instance, can be eliminated by means of a conventional suppressor capacitor. The easiest way to identify the source of noise is to switch off the suspected sources one by one. The electric clock, the petrol gauge, and the oil-pressure-gauge lamp are examples of potential sources of noise.

In all cases, noise interference can be adequately suppressed by judicious use of capacitors.

Static electricity, such as may be caused by the vehicle wheels, is sometimes a problem. The cure consists in installing copper-braid static collectors or special shorting springs.

H. Testing Installed Equipment

Checking the Equipment Before Starting Up

When the STORNOPHONE 600L has been installed in accordance with the directions given above, check:

that the power supply unit has been strapped for the battery voltage to be used;

that the straps in the multiwire connector of the control cable have been placed in accordance with the battery voltage to be used (this applies only to remotely controlled equipments);

that the fuse holder carries the correct fuse (15 amps. for 6 volts, 6 amps. for 12 volts, and 3 amps. for 24 volts);

that the battery plus terminal connects, via the battery connector, to the red battery lead on the station cabinet;

that both the antenna and the antenna connector have been correctly connected to the equipment; and

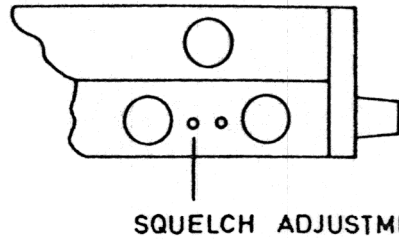
that the channel selector has been set to the desired channel.

The STORNOPHONE 600L is factory pre-adjusted and tested. The only adjustment to be made on completion of the installation consists in setting the sensitivity of the transmitter modulator. This is done with potentiometer R1 in control panel CP601. This potentiometer is accessible through a hole in the left side of the station cabinet.

Starting the Equipment

To start the equipment, advance the volume control to its mid-scale position. It will then be ready to receive.

Depress the "SQUELCH" button. A strong hiss should now be heard in the loudspeaker unless the base station is transmitting.
Release the "SQUELCH" button. This should cause the hiss to stop. If it does not, the squelch circuit should be tightened by turning the squelch adjustment potentiometer, accessible through a hole in the left side of the station cabinet, in a clockwise direction until the hiss stops.



Equipment with Built-in Tone Receiver

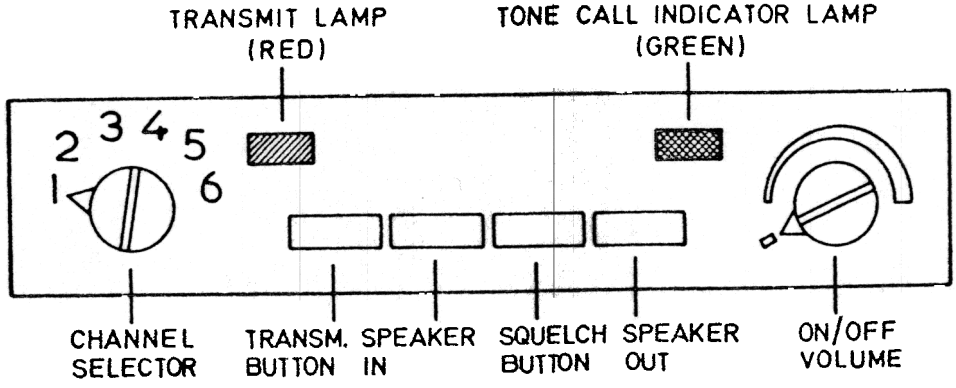
If a tone receiver is provided in the equipment, the "SPEAKER IN" button must be depressed before the hiss can be heard, and the green lamp should show light.

Depressing the "SPEAKER OUT" button should cause the hiss to stop.
Releasing the "SQUELCH" button should also cause the hiss to stop.

The "SPEAKER IN" button must be depressed before the transmitter can be turned on.

Operating the Transmitter

The transmitter can be controlled either from the built-in transmit button or from an external transmit button such as a steering-wheel or



microphone button. The red transmitter lamp should glow while the transmit button is kept depressed.

Equipment with Built-in Tone Transmitter

Tone calls are transmitted by depressing the built-in transmit button, which will switch on both the VHF transmitter and the tone transmitter. In subsequent transmissions, where no tone calls are required, the station is controlled from an external transmit button (steering-wheel or microphone button).

If the tone transmitter is employed for identification, a tone code is transmitted each time the carrier is switched on, whether this is done with an external transmit button or with the built-in one.

If a tone transmitter is employed in a radiotelephone not equipped an external transmit button, it is necessary to restrap control panel CP601 (see circuit diagrams for installation of tone equipment in CP601). Tone calls will then be made by simultaneously depressing the station's "TRANSMIT" and "SPEAKER IN" buttons. For subsequent calls, where tone calls are not to be transmitted, only the transmit button should be depressed.

Checking with the Base Station

Call the base station. If the CQP600L radiotelephone has both a tone transmitter and a tone receiver, these should be tested as follows:

Depress the "SPEAKER IN" button. Monitor the channel for traffic.

Depress the tone button on the control box, causing a tone call to be transmitted. If the base station answers the call, the tone transmitter is functioning satisfactorily.

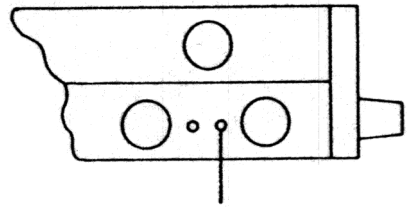
Ask the base station to transmit a tone call. Then release the tone button and depress the "SPEAKER OUT" button.

When the call from the base station is received, the green call lamp will show light; the horn or bell of the alarm circuit (if one is provided) will sound; and the tone call will be heard in the loudspeaker.

Answer the base station by switching on the transmitter by means of the external transmit button (steering-wheel or microphone button).

Adjusting Modulation Sensitivity

The modulation sensitivity should be adjusted to match the operator's voice. This is done by altering the setting of the sensitivity control, potentiometer R1, accessible through a hole in the left side of the station cabinet. Use an insulated alignment tool.



ADJUSTING MODULATION SENSITIVITY

If the operator is speaking into the microphone from a large distance or if his voice level is too low, and also under conditions of high ambient noise, there is a risk that the transmitter's signal-to-noise ratio will be too poor. The best cure is to reduce the speaking distance.

Microphone sensitivity should not be increased beyond the point where the frequency swing caused by the car's own noise (that is, without speech) is 0.05 x ΔF_{max}. To increase the modulation sensitivity, turn R1 in an anti-clockwise direction.

Storno

CHAPTER V. SERVICE

A. Maintenance

Preventive Service Inspections

When a STORNOPHONE 600L has been properly installed and checked for satisfactory operation it should not thereafter be left to itself until breakdowns begin to occur. Every equipment should be inspected at regular intervals and readjusted if necessary. The frequency of such routine inspections will depend on the conditions under which the equipment is operated and on the total number of operating hours, but twelve months is the maximum time that should be permitted to elapse from one preventive service inspection to the next.

Thanks to the application of conservative design principles, the STORNOPHONE 600L may be expected to have long life. Easy service and fault finding were two other important design considerations. All significant currents and voltages are specified in the circuit diagrams. On each circuit diagram is printed a screen picture of the wiring board, showing the diagram symbols of the individual components.

Moreover, all modules have easily accessible test points to permit rapid checking of the operational condition of the equipment. When a module is to be serviced on the bench it is usually a good plan to illuminate the board strongly from behind, which will cause the printed wiring to stand out clearly.

Test Report

Each STORNOPHONE 600L dispatched from the factory is accompanied by a Test Report listing all test-point values for that particular equipment, as measured by the Final Testing Department. These readings vary somewhat from one equipment to the next, so the metering chart will provide a useful standard of comparison during future checks. It is suggested that a sort of "log" be kept of all check measurements made on each individual equipment because a comparison between individual test-point readings over a certain period will make it possible for the service technician to form a clear idea of the general condition of the equipment and will distinctly show when readjustments etc. should be made.

Readings at Test Points

The list below specifies all test points in the equipment and the respective readings. Readings are intended only as a guide.

CQL 611, CQL 612, CQL 613, and CQL 614

Point	Unit	Instr.	Measurement
1	RC611	Probe A	10-30 mV ●
2	RC611	Probe A	30-80 mV ●◆
3	RC611	Probe B	0.6-1.2V
4	RC611	Probe B	0.3-0.8V
7	IC605	Probe B	0.2-0.8V
8	IA601	Probe A	0.3-2.0 μV □
10	IA601	AF-voltm.	12.5kHz: 0.45-0.6V ■ 20 kHz: 0.8-1.0V 25 kHz: 0.9-1.1V 50 kHz: 1.3-1.4V
14	SQ600	AF-voltm.	V ■
27	AA601/608	AF-voltm.	0.25-1.0V ▲
30	EX611	Probe B	0.5-1.4V
32	EX611	Probe B	0-1.6V
33	EX611	Probe C	3.0-5.0V
34	EX611	Probe C	2.0-6.5V
35	EX611	Probe B	1.5-5.0V
36	PA611	Probe D	15-20V ○
(37)	PA611	mA-instr.	10W: 150-300 mA * 6W: 50-150 mA
(38)	PA611	mA-instr.	10W: 500-800 mA * 6W: 300-500 mA

CQL 631, CQL 632, CQL 633, and CQL 634

Point	Unit	Instr.	Measurement
[1]	RC631	Probe A	5-20 mV ●
[2]	RC631	Probe A	10-40 mV●◆
[3]	RC631	Probe B	0.4-1.0V
[4]	RC631	Probe B	0.4-1.0V
[7]	IC605	Probe B	0.2-0.8V
[8]	IA601	Probe A	0.3-2.0 μV □
[10]	IA601	AF-voltm.	12.5 kHz: 0.45-0.6V ■ 20 kHz: 0.8-0.9V 25 kHz: 0.9-1.1V 50 kHz: 1.3-1.4V
[14]	SQ600	AF-voltm.	1.1V ■
[27]	AA601/608	AF-voltm.	0.5-1.0V ▲
[30]	EX63x	Probe B	0.5-0.9V
[32]	EX63x	Probe B	1.4-1.8V
[33]	EX63x	Probe C	2.6-5.0V
[35]	EX63x	Probe B	0.3-0.8V
[36]	PA631	Probe D	14-16V ○
(37)	PA631	DC-voltm.	10W: 0.2-0.45V *
(38)	PA631	DC-voltm.	10W: 0.6-0.85V *

● Antenna signal-EMF for 10 μA
◆ Without oscillatorsignal
□ Antenna signal-EMF for 40 μA
■ Antenna signal 1 μV EMF, 0.7 x ΔF and 1000 Hz
▲ Frequency deviation 0.7 x ΔFmax and 1000 Hz
○ Measured across a 47 Ω resistor
* Measured at nominal output power

Probe A: Probe + 0-50 μA instrument (Ri=1kΩ)
Probe B: Probe + 0-2.5V instrument (20kΩ/V)
Probe C: Probe + 0-10V instrument (20kΩ/V)
Probe D: Probe + 0-25V instrument (20kΩ/V)

Test Points

Most modules have two kinds of test points - DC test points, which are designated by numbers in circles (1); and signal test points, designated by numbers in squares, [2]. Measurements at DC test points should be made with a multimeter having an internal resistance of at least 20kΩ/V. RF signal measurements may be made with a multimeter in conjunction with a STORNO Type 95,089 RF probe. Audio-frequency signal measurements require the use of a vacuum-tube voltmeter.

Routine Inspections

A normal routine inspection should cover checks of all test points in the equipment, and the readings taken should thereafter be checked against readings obtained in previous routine inspections. However, each routine inspection should also comprise the operations specified below:

1) Inspect (visually) transistors, diodes etc. Fasten any components that may have worked loose.
2) Check the supply voltage. It should not be outside these values: 6.3V ± 20%, 12.6V ± 20%, a 25.2V ± 20%.
3) Check cable connections, fuse box, battery (look for corroded joints; top up with distilled water if necessary). Also check the current drain.
4) Measure the carrier power delivered by the transmitter. Readjust the ADC-circuit if necessary.
5) Measure the receiver sensitivity and readjust the receiver input circuits if necessary.
6) Call the base station and perform speech test.
7) Check the antenna mounting, especially for rust.

Replacement of Modules

In certain situations time can be saved by replacing a probably defective module with a new module of the same type.
Even if it is known to be fully aligned, such a newly inserted module may require a few minor readjustments.

B. Fault-finding and Repairs

Fault-finding

Fault-finding should be performed only by skilled personnel who have the necessary measuring instruments etc. at their disposal and have previously studied the operating principles of the STORNOPHONE 600L.

Before starting work, find out whether the fault is located in the accessories, in the outside power source, in the installation cabling, or in the transmitter/receiver equipment itself.

Keep in mind when making check measurements and adjustments that the STORNOPHONE 600L has a number of adjustments that should not be touched unless the necessary measuring instruments are available. In any case it is important that the directions given in Sec. C (Adjustment Procedure) be followed closely in each individual case if a satisfactory result is to be obtained.

Resistance Measurement

Two precautionary measures are necessary when making resistance measurements on transistor circuits. Firstly, it is necessary to make sure that the ohmmeter current does not exceed one milliampere, which may very well be the case with certain types of vacuum-tube voltmeters. Secondly, the ohmmeter voltage may cause the transistors to become conductive, with incorrect readings as the obvious result. Since most faults are either short circuits or open circuits, accurate measurements of resistance are not normally required.

Soldering on Semiconductors

Never forget, when soldering on semiconductors, that the soldering operation should be performed quickly and as a general rule it is not advisable to solder closer to semiconductors than approx. 5 mm - germanium transistors, for instance, will not stand temperatures above 85-90°C.

However, a transistor should not be replaced until it has been determined with reasonable certainty that it is defective. Even transistors of the same type and make may show fairly wide variations in their data. For this reason it is usually necessary, in the case of replacements, to check the transistor circuits and readjust them if necessary.

Wiring Boards

The wiring boards used in the STORNOPHONE 600L are very rugged, but in unfortunate cases it is possible for the printed wiring to break or detach itself from the board. This usually happens when excessive heat is applied when soldering or when a soldering operation lasts longer than it should. Fine cracks in the wiring or in the wiring board itself are mostly difficult to spot with the naked eye, in which cases a magnifying glass will be a good help. This type of fault can also be the cause of trouble of an intermittent nature.

Such faults are easily corrected by soldering a short end of wire across the broken place on the board. The wiring boards also carry some fixed capacitances. Here, repairs must be made with some caution in order to avoid changes in capacitance.

Replacement of components

Replacement of resistors, capacitors and similar components on printed wiring boards require the use of a small pencil-type soldering iron of 30- to 75-watt rating so as to permit rapid soldering. The use of a tin sucker to drain away melted solder is also advisable. Do not attempt to pull any component off the wiring board until the solder flows smoothly as there is otherwise a risk of pulling some of the printed wiring off the board. As a general rule the soldering iron should not be applied to the board for a longer time than strictly necessary. Care should be taken, when soldering a new component to the wiring board, that no short circuits are caused by excess solder. Do not use more solder than strictly necessary. Large blobs of solder can reduce the spacing between the printed wires, which can produce undesirable effects in RF circuits even if no actual short circuit exists.

C. Adjustment Procedure

General

The directions given in this section are intended as an aid in aligning a STORNOPHONE 600L and consequently must not be considered the only correct adjustment procedure. However, departures from the directions given here should be made only in cases where the technician can foresee with certainty that modified alignment methods will neither degrade the specifications stipulated nor complicate subsequent alignment procedures.

Only such skilled radio technicians as have already acquainted themselves with the operation of the STORNOPHONE 600L should perform adjustments and repairs. Each individual radiotelephone is checked and tested before being dispatched from the factory. In the absence of any special agreements. The Testing Department has:

1) Inserted oscillator units with quartz crystals for the channels ordered.
2) Aligned the complete radiotelephone so that the accuracy of the transmitting and receiving frequencies is better than 1×10^{-6}.
3) Adjusted the receiver audio output and the speech limiter clipping level according to specifications.
4) Adjusted and tested the built-in tone equipment (if provided).

When the installation has been completed and its proper execution checked, the transmitter modulation sensitivity should be adjusted so that it is suitable for the voice of the operator. This adjustment is performed through a hole in the side of the cabinet. In case that the microphone is placed some distance away from the operator, the voice is low, and the ambient noise level is high, there is a risk that the signal-to-noise ratio of the transmitter modulation may be too poor.

Caution: The greatest care should be shown when measuring currents, voltages etc. in the circuits of the STORNOPHONE 600L as even brief short circuits, such as may be caused by the test prods of a measuring instrument, may in certain cases cause permanent damage to a transistor.

STORNOPHONE 600L

This adjustment procedure applies to the following radiotelephones:

CQL611 (146-174 MHz), 50 kHz channel separation
CQL612 (146-174 MHz), 25 kHz channel separation
CQL613 (146-174 MHz), 20 kHz channel separation
CQL614 (146-174 MHz), 12.5kHz channel separation
CQL631 (68-88 MHz), 50 kHz channel separation
CQL632 (68-88 MHz), 25 kHz channel separation
CQL633 (68-88 MHz), 20 kHz channel separation
CQL634 (68-88 MHz), 12.5kHz channel separation

Directions for the adjustment of the TR68x tone receiver and the TT68x tone transmitter are also given.

Measuring Equipment

While adjustments are being performed, the STORNOPHONE 600L should be connected to a power supply via a standard installation cable, fuseholders, and fuse.
The power supply should be adjusted to deliver the voltage for which the voltage straps of the equipment have been set.

For 6-volt operation: 6.3 volts (as measured at the fuseholders located outside the station cabinet in the battery lead.
For 12-volt operation: 12.6 volts (as measured at the fuseholders located outside the station cabinet in the battery lead.
For 24-volt operation: 25.2 volts (as measured at the fuseholders located outside the station cabinet in the battery lead.

The following instruments are required:

A power supply rated at 5.0-33 V/15 A.

A signal generator, for 146-174 MHz (CQL610) or 68-88 MHz (CQL630).

A crystal controlled signal generator for 455 kHz (e.g. STORNO-sweepgenerator type L20).

An audio voltmeter.

A distortion meter.

A standard receiver with calibrated discriminator.

A wattmeter, 0-10 watts/0-25 watts.

A dummy load.

A tone generator.

An RF probe (STORNO Type 95.089).

A multimeter, 20 k ohms per volt.

A microammeter, 50-0-50 μA, Ri = 1000 ohms.

A milliammeter, 0 - 500 milliamps.

An ammeter, 0 - 1 amp.

With these instruments available, the STORNOPHONE 600 can always be restored to operating condition.

RECEIVER ALIGNMENT

In case of divergence between the test-point readings of the Test report and the check measurements made on the units, the equipment can be checked on the lines laid down in the following alignment procedure

Before starting the alignment of the receiver, first check the internal supply voltage, -24 volts. If necessary, adjust it for the correct value, using potentiometer R18 in power supply unit PS606 (the potentiometer is accessible through a hole in the wiring board of the PS606).

Also check that the straps in receiver converter RC6x1, intermediate-frequency amplifier IA601 and squelch and audio amplifier SQ600 are in accordance with the channel separation in use (see circuit diagrams of the respective units).

Alignment of Low IF Channel and Discriminator, IC 605, and IA 601

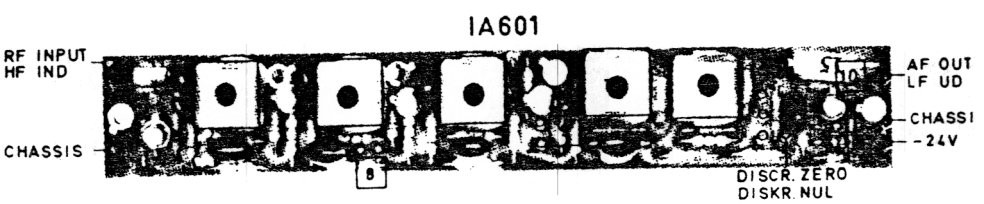


Fig. 1

Apply a 455 kHz signal (approx. 10 μV) to the input of BP60x without cutting off the connection between IC605 and BP60x.

Connect RF probe and multimeter at testpoint [9].

Adjust coils L1, L2, and L3 in IA601 for maximum meter reading, approx. 20 μA.

Apply a 455 kHz signal (approx. 1 mV) to the input of IA601 without cutting off the connection between BP60x and IA601.

Connect 50-0-50 microammeter to tap marked "Discriminator Zero".

Adjust coil L4 (discriminator secondary) for zero on 50-0-50 microammeter.

Adjust transformer coil T1 (discriminator primary) for best symmetry at 455 kHz ± 15 kHz.

Since these two circuits interact, the discriminator zero must be constantly checked and readjusted.

Reading for ± 15 kHz at 1 mV input signal: 37.5 μA ± 2 μA.

Linearity at ± 15 kHz: 2.5 μA per kHz.

Low-IF block filter BP60x is aligned and artificially aged at the factory, making subsequent realignment unnecessary.

Alignment of Signal Frequency Amplifier and High IF Channel, RC6x1 and XO6xx

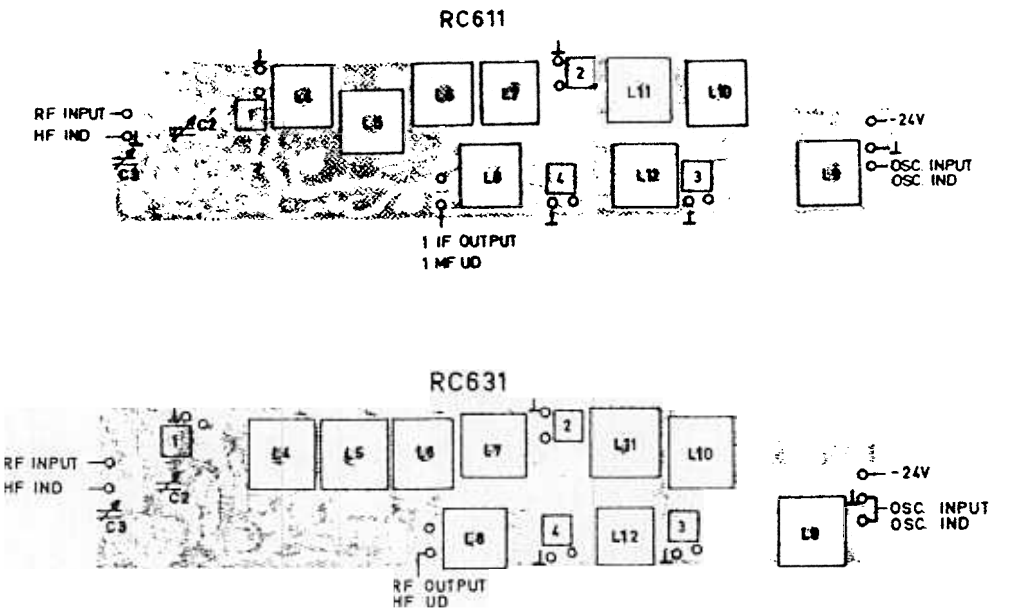


Fig. 2

Calculation of the crystal frequency (fx) for a given signal frequency (fsig):

CQL63x: $fx = \frac{fsig + 10.7}{2}$ MHz

CQL61x: 40 48000 = 70.260

46-160 MHz: $fx = \frac{fsig + 10.7}{3}$ MHz

156-174 MHz: $fx = \frac{fsig - 10.7}{3}$ MHz

Connect RF probe and multimeter at testpoint [3].

Adjust coil L1 in the used oscillator unit XO6xx for maximum meter reading.

Adjust coils L9 and L10 in RC6x1 for maximum meter reading (see values on the Test report).

Connect RF probe with multimeter at test point [4].

Adjust coils L11 and L12 in RC6x1 for maximum meter reading (see values on the Test report).

Connect the signal generator to the antenna input and set it to the signal frequency.

Connect RF probe and multimeter at test point [1].

Adjust trimmer capacitor C2 and C3 and coil L4 in RX6x1 for maximum meter reading.

Adjust coil L5 in RC6x1 for minimum meter reading.

Adjust coil L6 in RCx1 for maximum meter reading.

Adjust coil L7 in RCx1 for minimum meter reading.

NOTE: In RC611 there is only a small difference between maximum and minimum readings.

Connect RF probe and multimeter at test point [8] in IA601.

Readjust coils L4, L5, L6, L7, and L8 in RC6x1 for maximum meter reading. The level should be so low that limiting does not occur (below 200μA)

Adjustment of High IF Oscillator, X06xx

The oscillator unit is adjusted before leaving the factory. However, if a frequency counter is available, the oscillator can be adjusted by means of a trimmer capacitor C4 in the unit, with the frequency counter connected at test point [3] in RC6x1 via a capacitor. The oscillator must be adjusted to frequency with an accuracy better than 1×10^{-6}.

Checking the Oscillator in IC 605

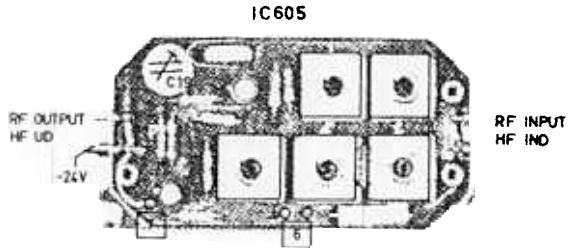


Fig. 3

To adjust the oscillator frequency, connect a frequency counter at test point [7] and, using trimmer capacitor C9, adjust the oscillator to exact frequency (10.245 MHz or 11.155 MHz).

Filter Matching, Sensitivity, and Audio Level Adjustment, IC 605, IA 601, and SQ 603/602

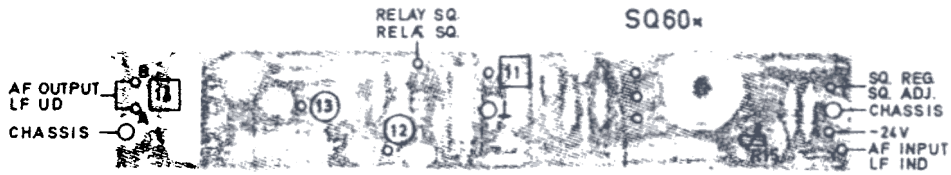


Fig. 4

Connect the signal generator to the antenna input of RC6x1 and set it to the signal frequency. Set the frequency swing to 70% of the maximum permissible limit:

± 1.75 kHz for 12.5 kHz channel separation
± 2.8 kHz for 20 kHz channel separation
± 3.5 kHz for 25 kHz channel separation
± 10.5 kHz for 50 kHz channel separation

The modulation frequency should be 1000 Hz. The RF level should be 100-1000 μV.

Connect RF probe and multimeter at test point [8] in IA601.

Adjust Coil L8 in RC6x1 and coils L1, L2, L3, L4, and L5 in IC605 for maximum meter reading. The RF level should be so low that limiting does not occur (below 200 μA).

Connect the distortion meter and the audio voltmeter at test point [10] in IA601.

Audio level at test point [10] should be approx.

0.5V for 12.5 kHz channel separation.
1.0V for 25/20 kHz channel separation.
1.35V for 50 kHz channel separation.

Switch to the receiving channel using the highest frequency.

Set the signal generator to the signal frequency selected, still keeping the frequency swing at 70% of the maximum permissible limit and the modulating frequency at 1000 Hz.

Adjust the signal generator output for 1 mV.

Calibrate the distortion meter so that the sum of signal, noise, and distortion corresponds to 100% when the filter is not inserted.

Insert the filter to remove the modulating frequency.

Carefully adjust the input filter in RC6x1 for best possible signal-to-noise ratio. It should be possible to obtain a 12-dB signal-to-noise ratio for an electromotive force of 0.8 μV.

Connect the audio voltmeter and the distortion meter at test point [14] in SQ600 (at output terminals) or the terminals A and E in Control Panel CP601.

Reduce the output of the signal generator until the distortion meter reading increases to 25%, corresponding to a 12-dB ratio between signal+noise+distortion. (12 dB SINAD).

Adjust, by means of potentiometer R15 in SQ600, the output level for 3 dBm, corresponding to 1.1V across a 600Ω load.
Distortion less than 3.5%.

NOTE: The 600Ω load is located in CP601, it serves as level control.

Squelch Sensitivity

Keep the signal generator connected to the antenna input of RC6x1 and keep it set at the signal frequency. Set the frequency swing to 70% of the maximum permissible limit. The modulating frequency should be 1000 Hz.

The squelch function is activated by depressing button 03 on CP601.

Check that the squelch control is working, that is, it must be capable of cutting in the receiver output and turning it off again in the absence of an incoming RF-signal.
The squelch control is located on the control panel CP601 (potentiometer R9).

Set the squelch control to the treshold value (in the absence of an incoming RF signal). Again apply an RF signal and increase it until the squelch circuit opens the signal path through the receiver.

Minimum signal-to-noise ratio in the speech channel: 4 dB, typical.

"Tighten up" the squelch control and increase the RF signal level until the squelch circuit opens the signal path.

Maximum signal-to-noise ratio in the speech channel: 20 dB, typical.

TRANSMITTER ALIGNMENT

Check that the straps in units EX6xx, PA6x1 and AA601/608 are in accordance with the channel separation in use and the frequency band in use (see circuit diagrams).

Transfer the signal lead connecting exciter EX6xx to power amplifier PA6x1 to the 47-ohm load resistor in PA6x1, test point [36] which loads the exciter during adjustments.

The transmitter must be operated under carrier-on conditions during the subsequent adjustments. This is accomplished by depressing the transmit button or by connecting terminals J2/3 and J2/5 together in control panel CP601.

Set the ADC control potentiometer (R4 in PA631 and R5 in PA611) at mid-scale.

Alignment of Exciter EX6xx

Alignment of the exciter should be performed <u>without</u> modulating signal from AA601/608.

EX611 (in CQL611, CQL612, CQL613, and CQL614)

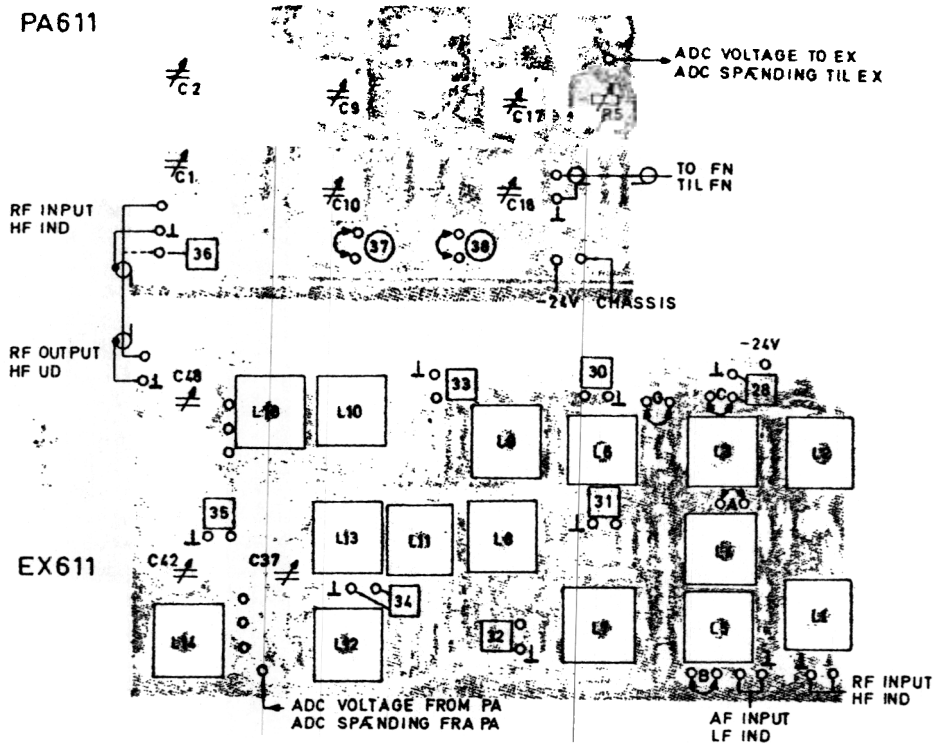


Fig. 5

Check that the exciter is strapped for the frequency band in use.

Connect RF probe and multimeter at test point [30].

Adjust coils L1, L2, and L6 for maximum meter reading, approx. 0.5V.

Insert straps marked G and A.

Adjust coil L3 for maximum meter reading, approx. 0.5V.

Insert straps marked G and B instead.

Adjust coil L4 for minimum reading, approx. 0.05V.

Insert straps marked G and C instead.

Adjust coil L5 for minimum meter reading, approx. 0.05V.

Repeat alignment of coils L3, L4, and L5 (this is necessary because of interaction between the circuits) until minima and maxima are obtained.

Remove straps.

Repeat alignment of coils L2 and L6 for maximum reading approx. 0.5V.

Connect RF probe and multimeter at test point [32].

Adjust coil L7 for maximum meter reading, approx. 1.0V.

Connect RF probe and multimeter at test point [33].

Adjust coils L8 and L9 for maximum meter reading. Repeat the adjustment of these coils several times. Reading: approx. 4.0V.

Connect RF probe and multimeter at test point [34].

Adjust coils L10 and L11 for maximum meter reading, approx. 4.0V.

Connect RF probe and multimeter at test point [35].

Adjust coils L12 and L13 as well as trimmer capacitor C37 for maximum meter reading, approx. 2.0V.

Connect RF probe and multimeter at test point [36] in PA611 (across 47-ohm load resistor R8).

Adjust coils L14 and L16 as well as trimmer capacitors C42 and C48 for maximum meter reading, approx. 15V.

EX631, and EX632 (in CQL631, CQL632, CQL633, and CQL634)

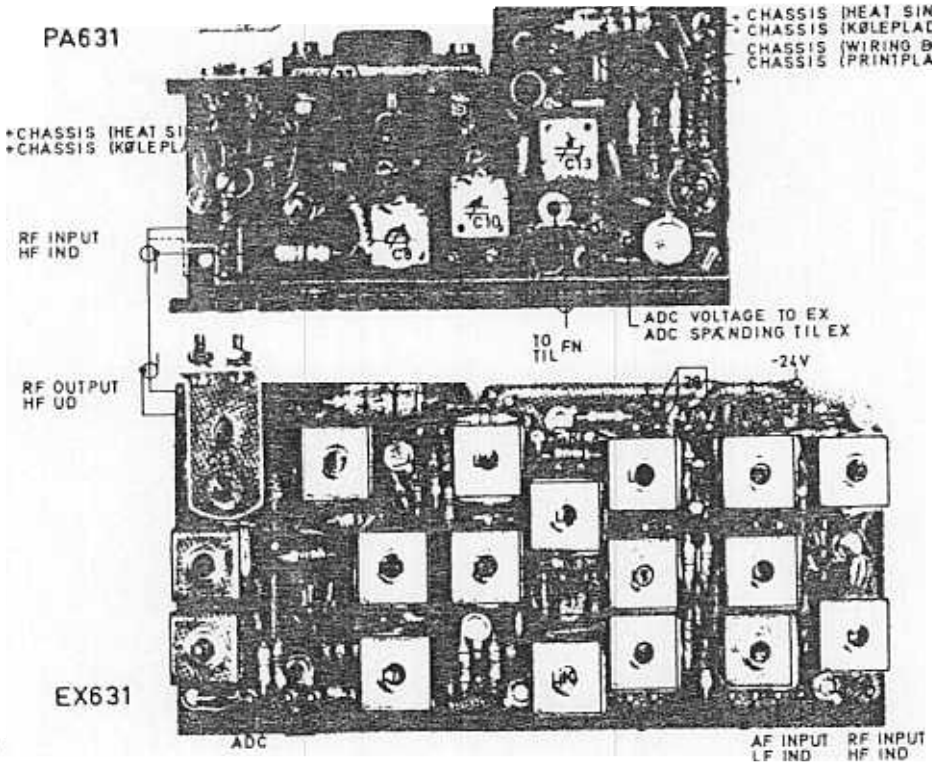


Fig. 6

Connect RF probe and multimeter at test point [30].

Adjust coils L1, L2, and L9 for maximum meter reading, approx. 0.5V.

Insert straps marked G and A.

Adjust coil L3 for maximum meter reading, approx. 0.5V.

Insert straps marked G and B instead.

Adjust coil L4 for minimum meter reading, approx. 0.05V.

Insert straps marked G and C instead.

Adjust coil L5 for minimum meter reading, approx. 0.05V.

Repeat alignment of coils L3, L4, and L5 (this is necessary because of interaction between the circuits) until minima and maxima are obtained.

Remove straps.

Again adjust coils L1, L2, and L9 for maximum meter reading, approx. 0.5V.

Adjustment of 2nd Modulator in EX631

Connect RF probe and multimeter at test point [30].

Insert straps marked G and D.

Adjust coil L6 for maximum meter reading, approx. 0.5V.

Insert straps marked G and E.

Adjust coil L7 for minimum meter reading, approx. 0.05V.

Insert straps marked G and F.

Adjust coil L8 for minimum meter reading, approx. 0.05V.

Repeat alignment of coils L6, L7, and L8 (this is necessary because of interaction between the circuits) until minima and maxima are obtained.

Remove straps.

NOTE: This completes the alignment of the modulator. Henceforth the modulator must not be adjusted for minimum distortion.

EX631, and EX632 (in CQL631, CQL632, CQL633, and CQL634)

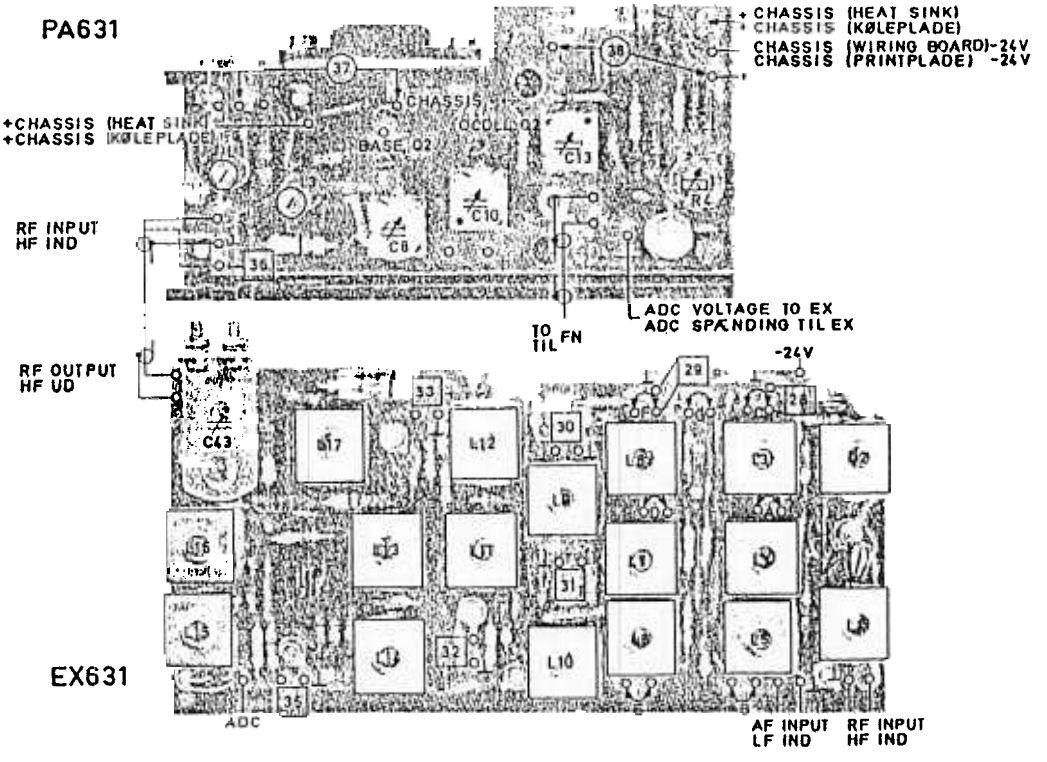


Fig. 6

Connect RF probe and multimeter at test point 30.

Adjust coils L1, L2, and L9 for maximum meter reading, approx. 0.5V.

Insert straps marked G and A.

Adjust coil L3 for maximum meter reading, approx. 0.5V.

Insert straps marked G and B instead.

Adjust coil L4 for minimum meter reading, approx. 0.05V.

Insert straps marked G and C instead.

Adjust coil L5 for minimum meter reading, approx. 0.05V.

Repeat alignment of coils L3, L4, and L5 (this is necessary because of interaction between the circuits) until minima and maxima are obtained.

Remove straps.

Again adjust coils L1, L2, and L9 for maximum meter reading, approx. 0.5V.

Adjustment of 2nd Modulator in EX631

Connect RF probe and multimeter at test point 30.

Insert straps marked G and D.

Adjust coil L6 for maximum meter reading, approx. 0.5V.

Insert straps marked G and E.

Adjust coil L7 for minimum meter reading, approx. 0.05V.

Insert straps marked G and F.

Adjust coil L8 for minimum meter reading, approx. 0.05V.

Repeat alignment of coils L6, L7, and L8 (this is necessary because of interaction between the circuits) until minima and maxima are obtained.

Remove straps.

NOTE: This completes the alignment of the modulator. Henceforth the modulator must not be adjusted for minimum distortion.

Connect RF probe and multimeter at test point [32].

Adjust coil L10 for maximum meter reading, approx. 1.0V.

Connect RF probe and multimeter at test point [33].

Alternately adjust coils L11 and L12 for maximum meter reading, approx. 3.0V.

Connect RF probe and multimeter at test point [35].

Alternately adjust coils L13 and L14 for maximum meter reading, approx. 0.4V.

Connect RF probe and multimeter at test point [36] in PA631 (across the 47-ohm load resistor, R7).

Adjust coils L15, L16, and L17 and trimmer capacitor C43 for maximum meter reading, approx. 15V.

Release the transmit button or remove strap between terminals J2/3 and J2/5.

Adjustment of Power Amplifier Stage, PA6x1

First, the signal lead from the exciter should be transferred from the load resistor to the input of PA6x1.

Connect a dummy load across the output of powe amplifier PA6x1.

PA611 (in CQL611, CQL612, CQL613, and CQL614)

Remove strap designated (37) and replace it with a 500-mA meter.

Remove strap designated (38) and replace it with a 1-amp. meter.

Back off the ADC potentiometer, R5, (anti-clockwise).

Depress the transmit button

Carefully advance the ADC potentiometer, adjusting trimmer capacitors C1, C2, C9, C10, C17, and C18 for maximum power output.

When maximum power output has been obtained with the ADC potentiometer at maximum and the entire stage completely adjusted, reduce the power output to 10 watts, using the ADC potentiometer.

Readjust trimmer capacitors C17 and C18 for maximum power output.

Again adjust the ADC potentiometer for 10 watts power output.

At full power output, the current at test point (37), as measured with the milliammeter, should be less than 300 mA, and the current at test point (38), as measured with the 1-amp. meter, should be less than 800 mA.

CAUTION: Sometimes, in the low end of the frequency band, the transmitter may deliver more than 15 watts of power output. Since the resulting current drain will cause permanent damage to the PS606 power supply unit, care should be taken that the power output will at no time while aligning the transmitter exceed 15 watts (or 1 amp.) as measured at (38).

PA631 (in CQL631, CQL632, CQL633, and CQL634)

Back off the ADC potentiometer, R4, (anti-clockwise).

Depress the transmit button

Carefully advance the ADC potentiometer, adjusting coils L1 and L3 and trimmer capacitors C8, C10 and C13 for maximum power output.

When maximum power output has been obtained with the ADC potentiometer at maximum and the entire stage is completely adjusted, reduce the power output to 10 watts, using the ADC potentiometer.

Readjust trimmer capacitors C10 and C13 for maximum power output.

Again adjust the ADC potentiometer for 10 watts power output.

At full power output, the voltage at test point (37) should be less than 0.48V, corresponding to a maximum driver emitter current of 320 mA. The voltage at test point (38) should be less than 0.8V, corresponding to a maximum power-amplifier collector current of 800 mA.

Adjusting the Power Amplifier for 6 Watts Power output, PA6x1

Adjust the unit for maximum obtainable power output as described above.

Using the ADC potentiometer, reduce the power output to 7-8 watts.

In PA611: Readjust trimmer capacitors C17 and C18 for maximum power output.

In PA631: Readjust trimmer capacitors C10 and C13 for maximum power output.

Adjust the ADC potentiometer for 5 watts power output.

Again readjust the trimmer capacitors for maximum power output.

Lastly, using the ADC potentiometer, adjust the power output level for 6 watts.

Currents and voltages at the test points should be as follows:

PA611: (37) less than 180 mA.

(38) less than 500 mA.

PA631: (37) less than 180 mA, corresponding to 0.27 V.

(38) less than 500 mA, corresponding to 0.5V.

Antenna Filter FN6x1

The antenna filter is adjusted before leaving the factory and subsequent adjustment is unnecessary.

Crystal Oscillator XO631

Crystal oscillators are as a general rule adjusted before leaving the factory, for which reason frequency adjustment is necessary only when a new crystal has been inserted.
A frequency counter is required for making the exact adjustment.

In this case the transmitter should be aligned first, because the frequency is most easily measured at the transmitter output. The frequency accuracy should be better than 1×10^{-6}.

Modulation Adjustment, AA601/AA608



Fig. 7

Make sure that the unit is strapped for phase modulation (see circuit diagram).

Set potentiometer R28 at mid-scale.

Connect standard receiver and distortion meter to the transmitter output through attenuating networks.

Connect audio voltmeter and tone generator to terminals B and F in control panel CP601 modulation input of the transmitter).

Adjust the input signal from the tone generator for modulation level, 110 mV + 20 dB, corresponding to 1.1 V.

Vary the frequency between 300 and 3000 Hz while adjusting for maximum frequency swing.

CQL611 and CQL631: ΔF max. = ± 15 kHz
CQL612 and CQL632: ΔF max. = ± 5 kHz
CQL613 and CQL633: ΔF max. = ± 4 kHz
CQL614 and CQL634: ΔF max. = ± 2.5 kHz

Adjust, by means of potentiometer R29 in AA601/608 the frequency swing so that it will not exceed the maximum value (ΔF max.) anywhere inside the frequency range 300 - 3000 Hz. This should be checked at both negative and positive modulation peaks.

Using potentiometer R27, adjust the modulation sensitivity so that a 110 mV input voltage at 1000 Hz from the tone generator produces a frequency swing that is 70% of the maximum permissible swing.

Repeat the adjustment of potentiometers R29 and R27.

Adjust, at the 110 mV (1000 Hz) input voltage, the symmetry of the limiter for minimum distortion, using potentiometer R28.

Recheck the modulation sensitivity and readjust it if it has changed.
Read the distortion meter. Distortion should be less than 8%.

NOTICE! Distortion should be measured with de-emphasis.

UNITS IN CONTROL PANEL CP601

Checking the AA602 Audio Output Amplifier

Connect the signal generator to the antenna input of the receiver and set it to the signal frequency at a frequency swing that is 70% of the maximum permissible swing at 1000 Hz.

Connect a 15-ohm 3-watt load resistor across the output terminals of the AA602 output amplifier. Also connect an audio voltmeter across the same terminals.

Turn the volume control of the control panel fully open. The voltage across the load should be at least 6.3 V.

Tone Receiver TR68x

This unit is adjusted before leaving the factory and requires no subsequent readjustment.

Tone Transmitter TT68x

Connect an audio voltmeter to the output of the tone transmitter and connect a standard receiver to the antenna output of the transmitter section.

Adjust the coil of the tone transmitter for a tone frequency of 1060 c/s.

Apply power to the tone transmitter.

Adjust, by means of the alignment potentiometer of the tone transmitter unit, the tone transmitter output level for 110 mV, corresponding to a measuring level of -17 dBm.

If a two-tone transmitter is used, each transmitter section should deliver only half the voltage specified above. This is performed by short-circuiting one of the tone-coils and thus cut out one of the oscillators. Then adjust the output level for 55 mV.

Check the frequency swing at 1060 c/s.

Adjust the tone transmitter coil for the desired tone frequency. Recheck the frequency swing.

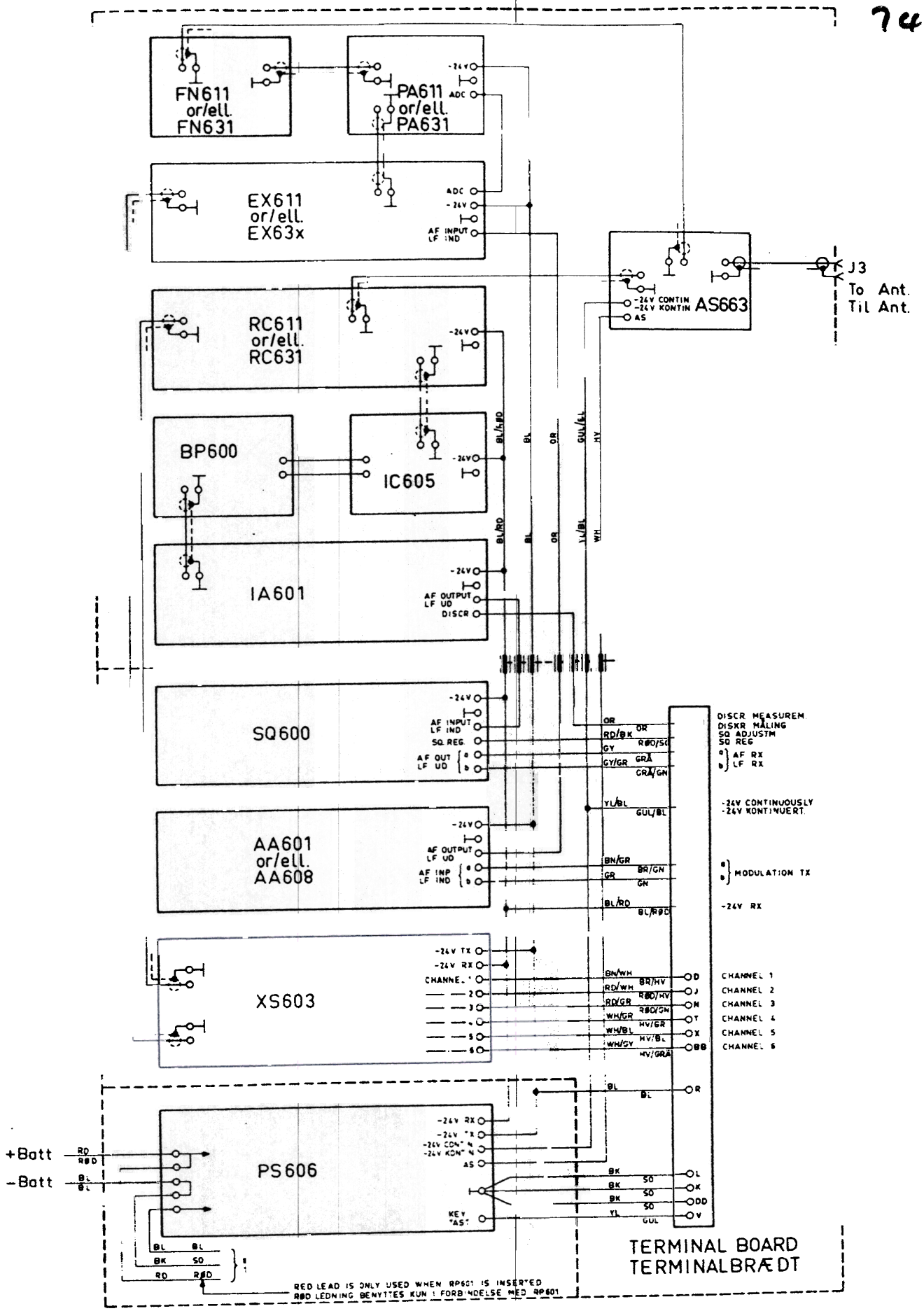
Frequency swing for single-tone transmitter: 70% +1, -2 dB of maximum frequency swing.

Frequency swing for two-tone transmitter: 35% for each tone.

CHAPTER VI. DIAGRAMS AND PARTS LISTS

The diagrams and schematics of the radiotelephone station STORNOPHONE 600 are to be found on the pages following. The component designation in each modular unit starts at R1, C1, L1 etc., for what reason special care should be devoted in filling out the spare part order form. All information concerning each component in question can be found in the parts lists and should be stated together with the type designation of the modular unit.

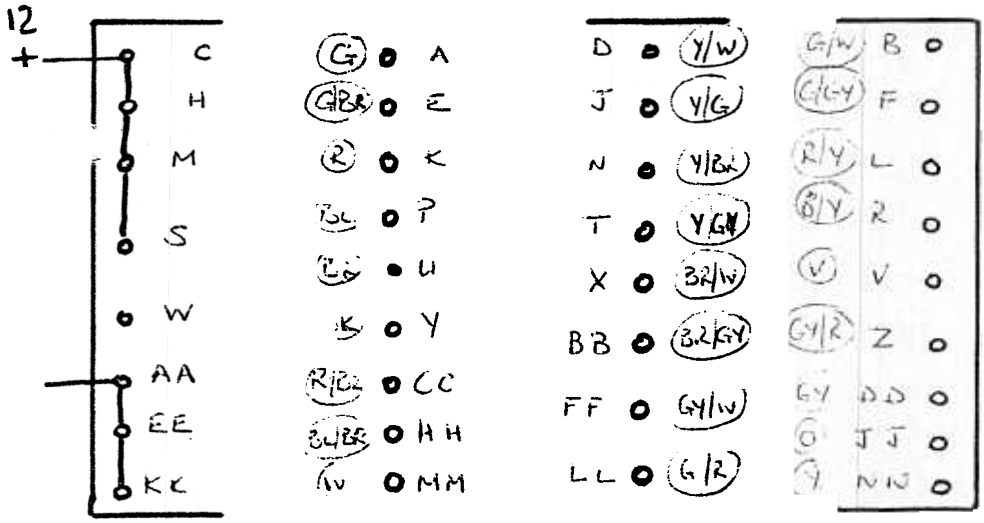
Furthermore - specification of equipment type and possible production number will ease the handling of the order at Storno and minimize the risk of erroneous delivery. The last page in this manual contains alterations and modifications of the equipment.



CABLE FORM
KABLINGSDIAGRAM

CQL610 CQL630

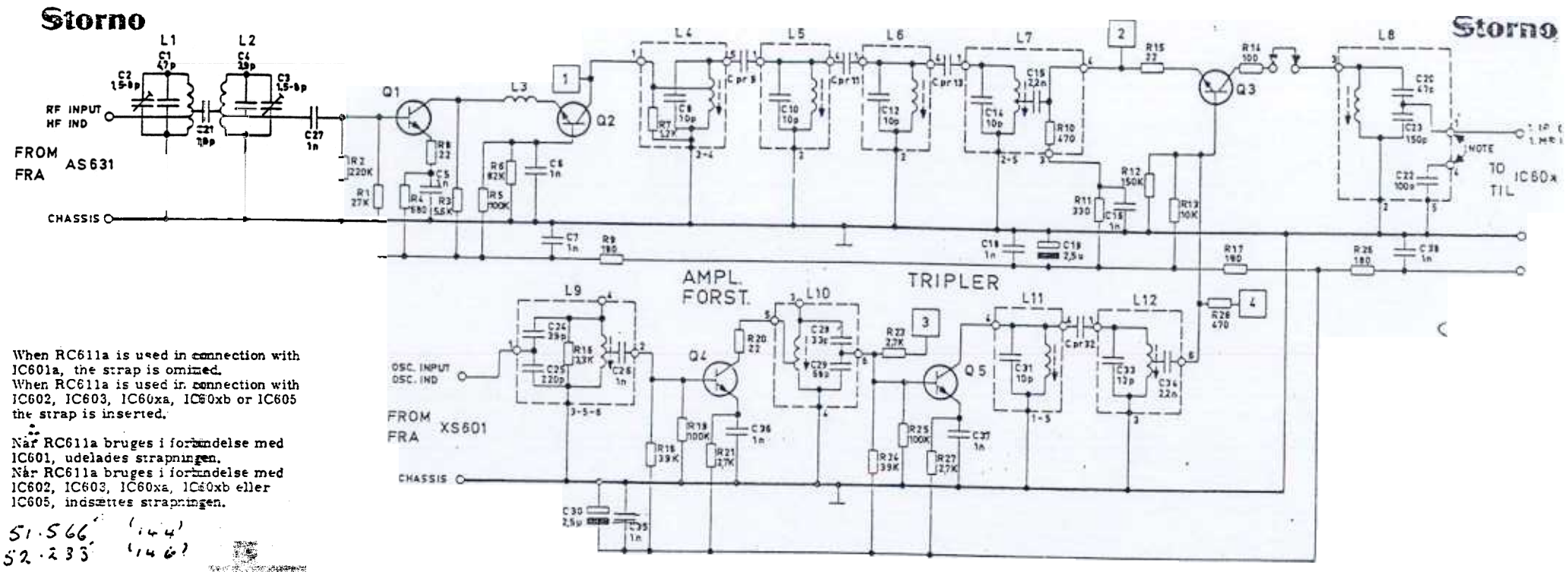
STORNO 634 B.MOUNT PLUG CONNECTIONS.



G – GREEN
GY – GREY
BR – BROWN
BL – BLUE
BK – BLACK
W – WHITE
Y – YELLOW
O – ORANGE
V – VIOLET
R – RED

Nos IN CONTROL BOX ARE THE SAME AS PLUG. WIRE UP NUMBER TO NUMBER AND COLOUR TO COLOUR.

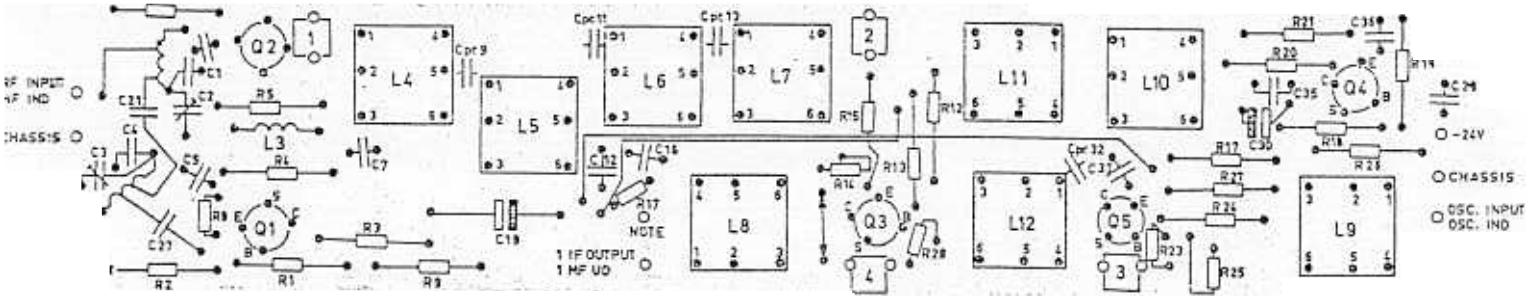
+Batt
-Batt



When RC611a is used in connection with IC601a, the strap is omitted.
When RC611a is used in connection with IC602, IC603, IC60xa, IC60xb or IC605 the strap is inserted.

Når RC611a bruges i forbindelse med IC601, udelades strapningen.
Når RC611a bruges i forbindelse med IC602, IC603, IC60xa, IC60xb eller IC605, indsættes strapningen.

51.566 (144)
52.233 (146)
osc 1/1.



7/5-A

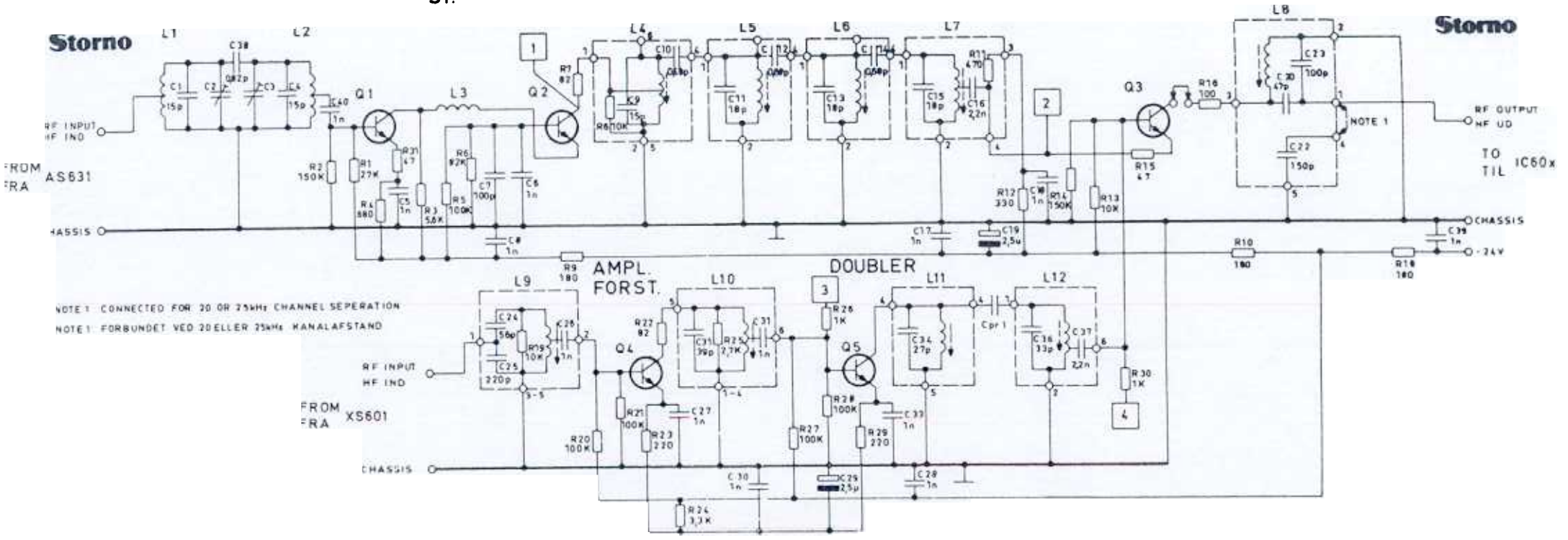
RECEIVER CONVERTER
MODTAGER KONVERTER

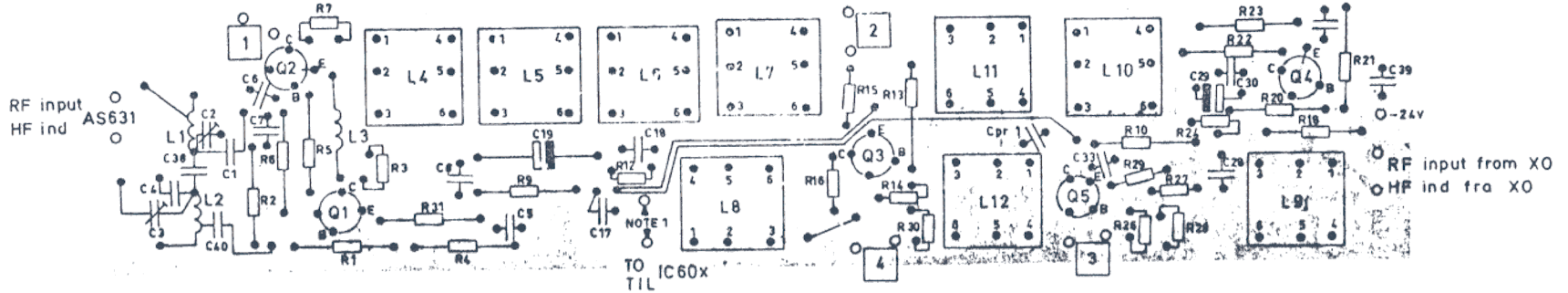
RC611a

D400.833

SF.

MX.





RECEIVER CONVERTER
MODTAGER KONVERTER

RC631a

D400.693/2

	NO.	CODE	DATA		
	C1	74.5105	15 pF 5%	NO75	250V
	C2	78.5033	3,5-21pF ceram	NPO	125V
	C3	78.5033	3,5-21pF	NPO TB	125V
	C4	74.5105	15pF 5%	NO75	250V
	C5	74.5155	1 nF -20/+50% ceram	PL	63V
	C6	74.5155	1 nF -20/+50% "	PL	63V
	C7	74.5013	100pF 20% "	DI	500V
	C8	74.5155	1nF -20/+50% "	PL	63V
	C9	74.5142	18pF ±0,5pF "	NO75 TB	250V
	C10	74.5121	0,68pF ±0,1pF "	P100 BD	250V
	C11	74.5142	18pF ±0,5pF "	NO75 TB	250V
	C12	74.5121	0,68pF ±0,1pF "	P100 BD	250V
	C13	74.5142	18pF ±0,5pF "	NO75 TB	250V
	C14	74.5121	0,68pF ±0,1pF "	P100 BD	250V
	C15	74.5142	18pF ±0,5pF "	NO75 TB	250V
	C16	76.5059	2,2pF 10% polyest.	FL	50V
	C17	74.5155	1nF -20/+50% ceram	PL	63V
	C18	74.5155	1nF -20/+50% "	PL	63V
	C19	73.5064	2,5µF -10/+50% elco		70V
	C20	74.5118	47pF 2% ceram	NO75 TB	250V
	C22	76.5079	100pF 5% polystyr.	TB	125V
	C23	76.5062	150pF 5% "	TB	125V
	C24	74.5118	47pF 2% ceram	NO75 TB	250V
	C25	76.5063	220pF 5% polystyr.	TB	125V
	C26	76.5069	1nF 10% polyest.	FL	50V
	C27	74.5155	1nF -20/+50% ceram	PL	63V
	C28	74.5155	1nF -20/+50% "	PL	63V
	C29	73.5064	2,5µF -10/+50% elco		70V
	C30	74.5155	1nF -20/+50% ceram	PL	63V
	C31	74.5117	39pF 2% ceram	NO75 TB	250V
	C32	76.5069	1nF 10% polyest.	FL	50V
	C33	74.5155	1nF -20/+50% ceram	PL	63V
	C34	74.5107	27pF 2% ceram	NO75 TB	250V
	C36	74.5107	27pF 2% "	NO75 TB	250V
	C37	76.5059	2,2nF 10% polyest.	FL	50V
	C38	74.5122	0,82pF ±0,1pF ceram	P100	500V
	C39	74.5155	1nF -20/+50% "	PL	63V
	C40	74.5155	1nF -20/+50% "	PL	63V
		80.5266	27kΩ 5% carbon film		1/8W
	R2	80.5275	0,15MΩ 5% " "		1/8W
	R3	80.5258	5,6kΩ 5% " "		1/8W
	R4	80.5247	680Ω 5% " "		1/8W
	R5	80.5273	0,1MΩ 5% " "		1/8W
	R6	80.5273	82 kΩ 5% " "		1/8W
	R7	80.5236	82 Ω 5% " "		1/8W
	R8	80.5061	10 kΩ 5% " "		1/10W
	R9	80.5240	180 Ω 5% " "		1/8W

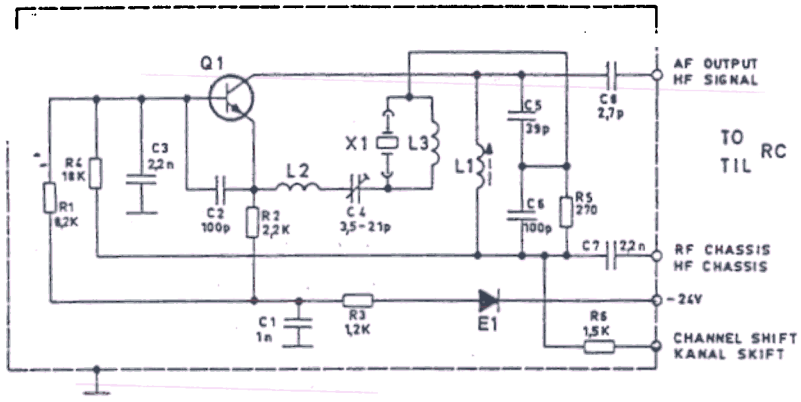
TYPE	NO.	CODE	DATA	
	R10	80.5240	180 Ω 5% carbon film	1/8W
	R11	80.5245	470Ω 5% " "	1/8W
	R12	80.5243	330Ω 5% " "	1/8W
	R13	80.5261	10 kΩ 5% " "	1/8W
	R14	80.5275	0,15MΩ 5% " "	1/8W
	R15	80.5233	47 Ω 5% " "	1/8W
	R16	80.5237	100Ω 5% " "	1/8W
	R18	80.5240	180Ω 5% " "	1/8W
	R19	80.5061	10kΩ 5% " "	1/10W
	R20	80.5273	0,1MΩ 5% " "	1/8W
	R21	80.5273	0,1MΩ 5% " "	1/8W
	R22	80.5236	82 Ω 5% " "	1/8W
	R23	80.5241	220Ω 5% " "	1/8W
	R24	80.5255	3,3kΩ 5% " "	1/8W
	R25	80.5054	2,7kΩ 5% " "	1/10W
	R26	80.5249	1 kΩ 5% " "	1/8W
	R27	80.5273	0,1MΩ 5% " "	1/8W
	R28	80.5273	0,1MΩ 5% " "	1/8W
	R29	80.5241	220Ω 5% " "	1/8W
	R30	80.5249	1 kΩ 5% " "	1/8W
	R31	80.5233	47 Ω 5% " "	1/8W
	L1	62.730	Coil/spole 68-88 MHz	
	L2	62.731	Coil/spole 68-88 MHz	
	L3	62.659	Filtercoil/Drosselspole	
	L4	61.793	Coil/spole 68-88 MHz (C9, C10, R8)	
	L5	61.794	Coil/spole 68-88 MHz (C11, C12)	
	L6	61.795	Coil/spole 68-88 MHz (C13, C14)	
	L7	61.796	Coil/spole 68-88 MHz (C15, C16, R11)	
	L8	61.871	Coil/spole 10,7MHz (C20, C22, C23)	
	L9	61.798	Coil/spole 39,35-49,35MHz(C24, C25, C26 R19)	
	L10	61.799	Coil/spole 39,35-49,35MHz(C31, C32, R25)	
	L11	61.800	Coil/spole 78,7-98,7MHz (C34)	
	L12	61.801	Coil/spole 78,7-98,7MHz (C36, C37)	
	Q1	99.5168	Transistor BF173	
	Q2	99.5118	Transistor BF115	
	Q3	99.5118	Transistor BF115	
	Q4	99.5118	Transistor BF115	
	Q5	99.5118	Transistor BF115	

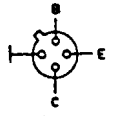
RECEIVER CONVERTER
MODTAGER KONVERTER

RC631a

X400.695/2

Storno





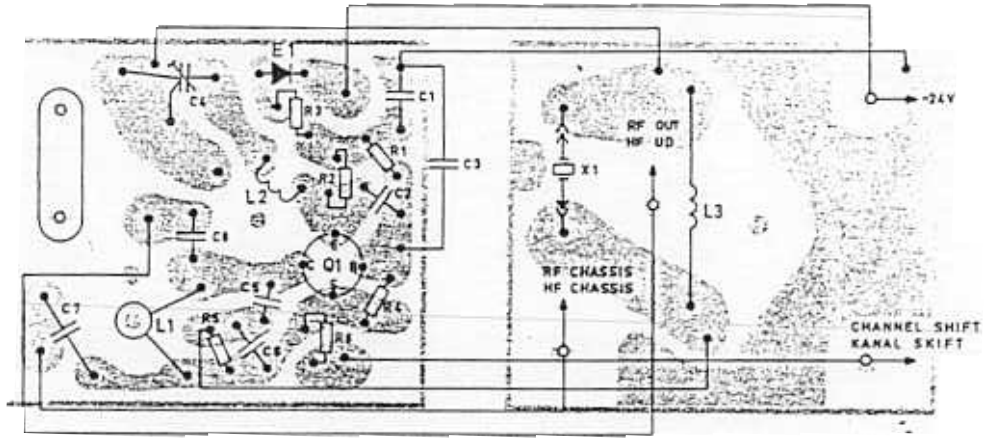
BOTTOM VIEW
SET FRA BUNDEN

UPPER PRINTED WIRING BOARD VIEWED FROM COMPONENT SIDE

ØVERSTE TRYKTE KREDSLØB SET FRA KOMPONENTSIDEN

LOWEST PRINTED WIRING BOARD VIEWED FROM COMPONENT SIDE

NEDERSTE TRYKTE KREDSLØB SET FRA KOMPONENTSIDEN

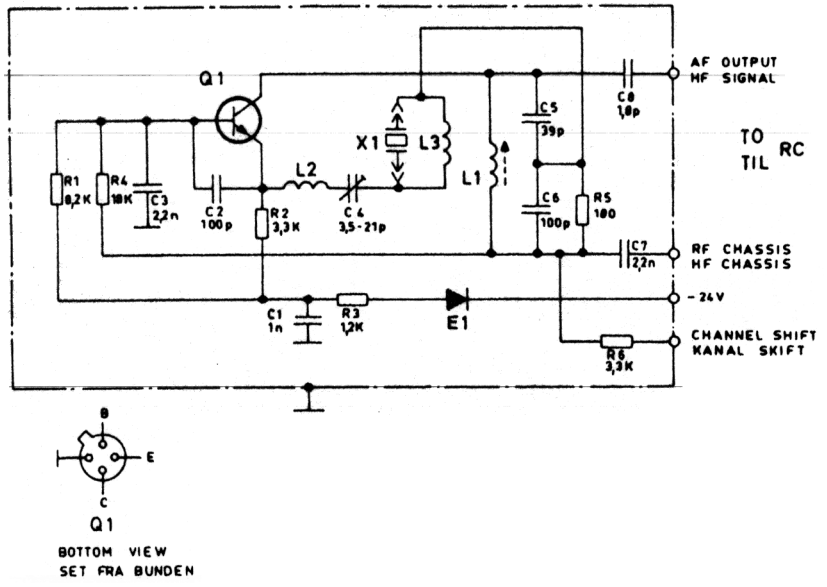


CRYSTALOSCILLATOR FOR RX.

XO611

D400.667/3

Storno



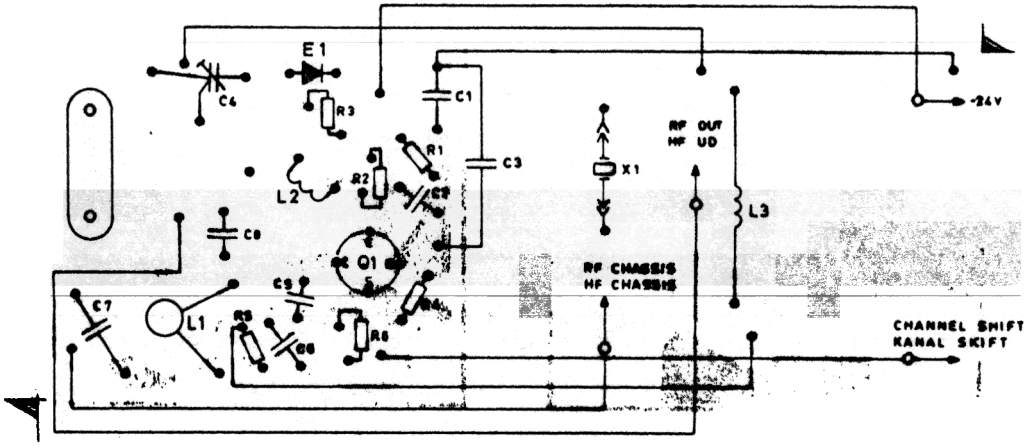
BOTTOM VIEW
SET FRA BUNDEN

UPPER PRINTED WIRING BOARD VIEWED FROM COMPONENT SIDE

ØVERSTE TRYKTE KREDSLØB SET FRA KOMPONENTSIDEN

LOWEST PRINTED WIRING BOARD VIEWED FROM COMPONENT SIDE

NEDERSTE TRYKTE KREDSLØB SET FRA KOMPONENTSIDEN



CRYSTALOSCILLATOR FOR RX.

XO632

D400.674/3

Storno

TYPE	NO.	CODE	DATA	
	C1	76.5069	1nF 10% polyester FL	50V
	C2	76.5102	100pF 2,5% polystyr.	30V
	C3	76.5059	2,2nF 10% polyester FL	50V
	C4	78.5033	3,5-21pF trimmer ceram NPO	125V
	C5	74.5117	3,9pF ±2% ceram NO75TB	250V
	C6	76.5102	100pF 2,5% polystyr.	30V
	C7	76.5059	2,2nF 10% polyest. FL	50V
	C8	74.5126	1,8pF ±0,25pF ceram N150BD	500V
	R1	80.5260	8,2kΩ 5% carbon film	1/8W
	R2	80.5255	3,3kΩ 5% " "	1/8W
	R3	80.5250	1,2kΩ 5% " "	1/8W
	R4	80.5264	18kΩ 5% " "	1/8W
	R5	80.5240	180Ω 5% " "	1/8W
	R6	80.5255	3,3kΩ 5% " "	1/8W
	L1	61.802	Coil/Spole 39,35 - 49,35 MHz	
	L2	62.660	Filtercoil/Drosselspole	
	L3	62.729	Coil/Spole 39,3 - 51,1 MHz	
	D1	99.5028	Diode OA200	
	X1	98.	Crystal	
	Q1	99.5166	Transistor BF167	

Storno

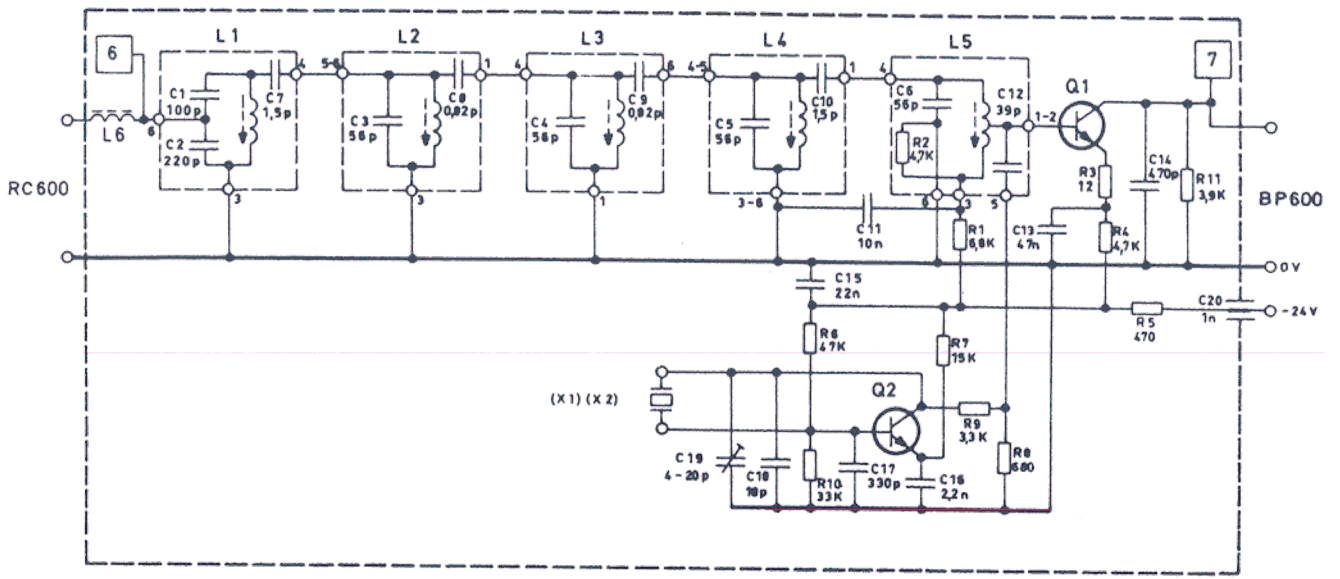
TYPE	NO.	CODE	DATA

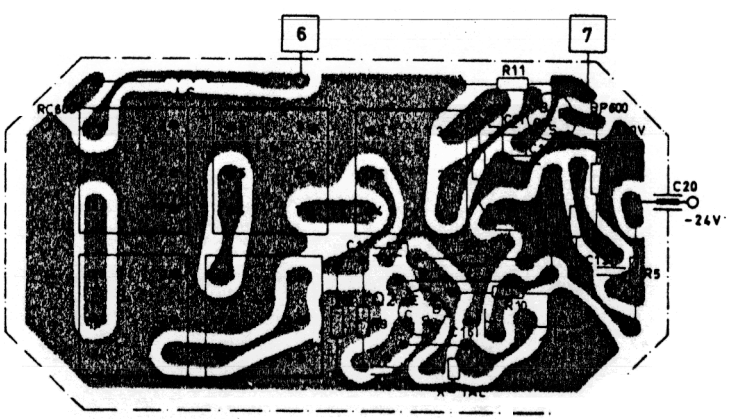
CRYSTALOSCILLATOR FOR RX.

XO632

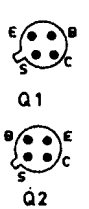
N400.694/2

Storno





VIEWED FROM COMPONENT SIDE
SET FRA KOMPONENTSIDEN



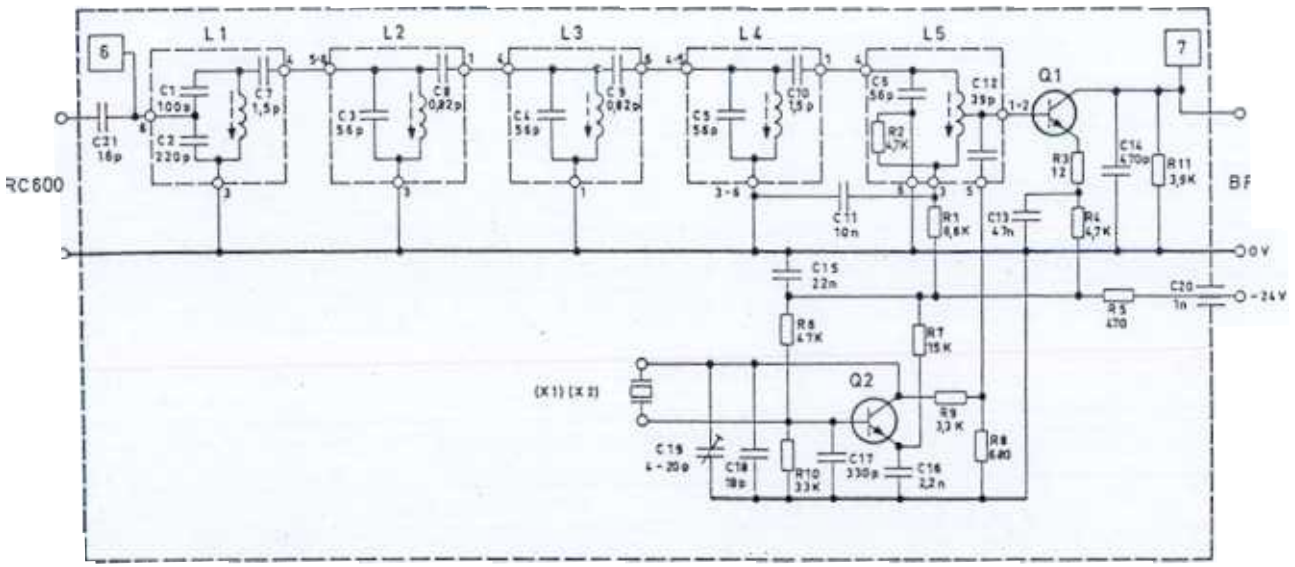
BOTTOM VIEW
SET FRA BUNDEN

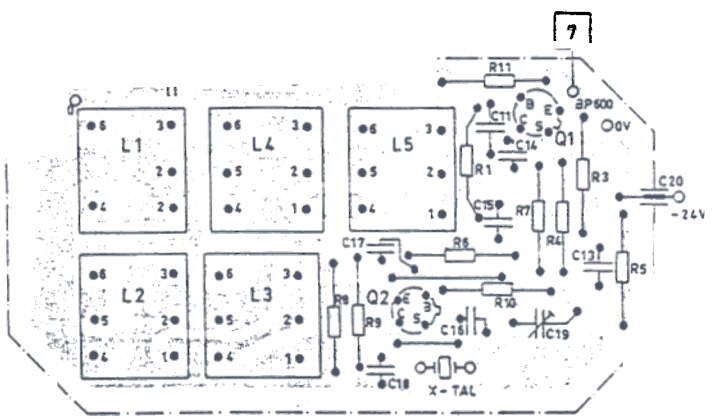
IF-CONVERTER
MF-KONVERTER

IC605

D400.775

Storno





VIEWED FROM COMPONENT SIDE
SET FRA KOMPONENTSIDEN

BOTTOM VIEW
SET FRA BUNDEN

IF-CONVERTER
MF-KONVERTER

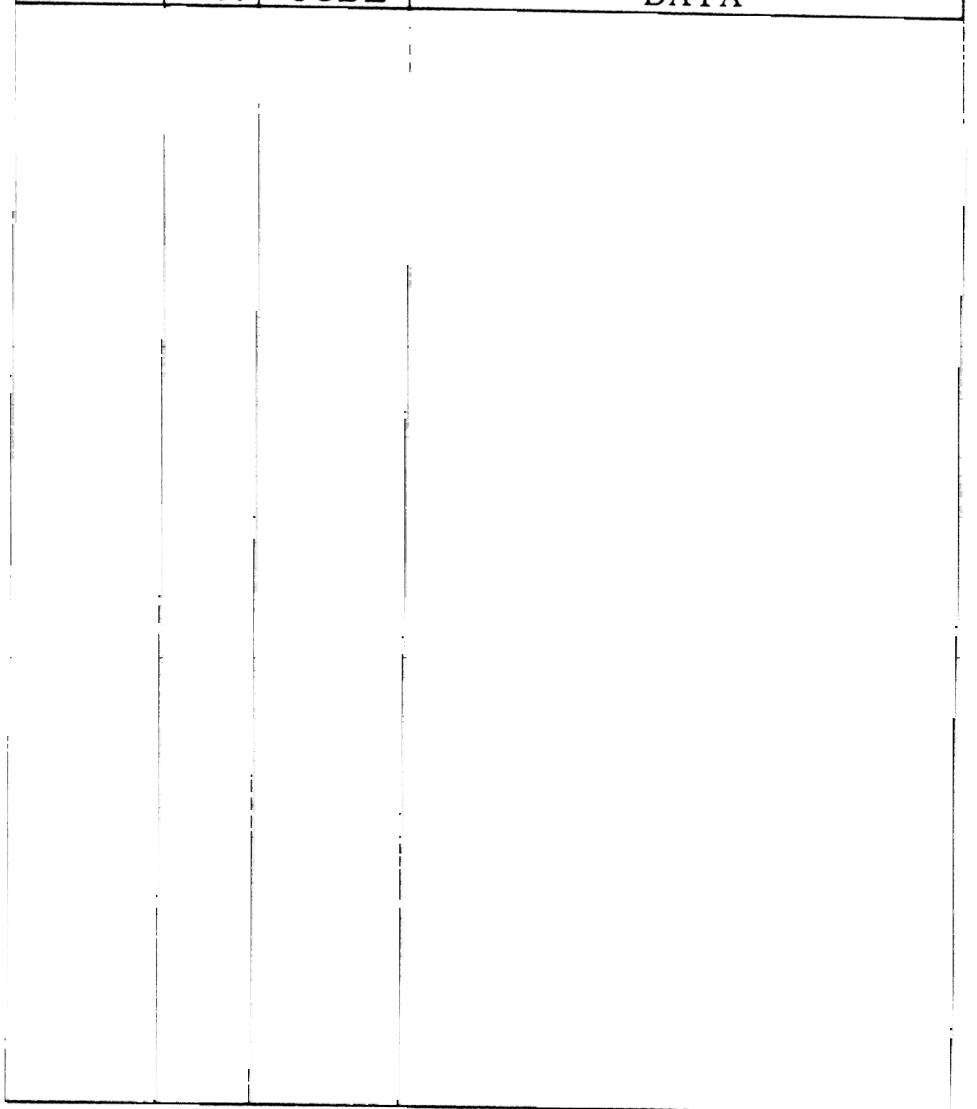
IC605

D400.775/2

TYPE	NO.	CODE	DATA	
	C1	76.5079	100 pF 5% polystyr. TB	125V
	C2	76.5063	220 pF 5% polystyr. TB	125V
	C3	74.5177	56 pF 2% ceram N150 TB	250V
	C4	74.5177	56 pF 2% ceram N150 TB	250V
	C5	74.5177	56 pF 2% ceram N150 TB	250V
	C6	74.5177	56 pF 2% ceram N150 TB	250V
	C7	74.5125	1.5pF ± 0,25 pF ceram N150 BD	250V
	C8	74.5122	0,82pF ± 0,1pF ceram P100 BD	250V
	C9	74.5122	0,82pF ± 0,1pF ceram P100 BD	250V
	C10	74.5125	1,5 pF ± 0,25 pF ceram N150 BD	250V
	C11	76.5070	10 nF 10% polyest. FL	50V
	C12	74.5117	39 pF 2% ceram NO75 TB	250V
	C13	76.5072	47 nF 10% polyest. FL	50V
	C14	76.5065	470 pF 5% polystyr. TB	125V
	C15	76.5171	22 nF 10% polyest. FL	50V
	C16	76.5059	2,2 nF 10% polyest. FL	50V
	C17	76.5064	330 pF 5% polystyr. TB	125V
	C18	74.5138	18 pF 5% ceram N150 DI	125V
	C19	78.5131	4/20 pF ceram trimmer N470 DI	100V
	C20	74.5167	1 nF -20+80% ceram II FT	300V
	R1	80.5259	6,8 kΩ 5% carbon film	1/8W
	R2	80.5257	4,7 kΩ 5% carbon film	1/8W
	R3	80.5226	12 Ω 5% carbon film	1/8W
	R4	80.5257	4,7 kΩ 5% carbon film	1/8W
	R5	80.5245	470 Ω 5% carbon film	1/8W
	R6	80.5269	47 kΩ 5% carbon film	1/8W
	R7	80.5263	15 kΩ 5% carbon film	1/8W
	R8	80.5247	680 Ω 5% carbon film	1/8W
	R9	80.5255	3,3 kΩ 5% carbon film	1/8W
	R10	80.5267	33 kΩ 5% carbon film	1/8W
	R11	80.5256	3,9 kΩ 5% carbon film	1/8W
	L1	61.998	Coil/spole 10,7 MHz (C1-C2-C7)	
	L2	61.999	Coil/spole 10,7 MHz (C3-C8)	
	L3	61.1000	Coil/spole 10,7 MHz (C4-C9)	
	L4	61.1001	Coil/spole 10,7 MHz (C5-C10)	
	L5	61.1002	Coil/spole 10,7 MHz (C6-C12-R2)	
	L6	61.5007	15 µH 20% filter coil/drossel 200 mA	
	X1	98.5004	Crystal/Krystal 98-8 10,2450 MHz	
	X2	98.5005	Crystal/Krystal 98-8 11,1550 MHz	
	Q1	99.5177	Transistor BF166	
	Q2	99.5166	Transistor BF167	

Storno

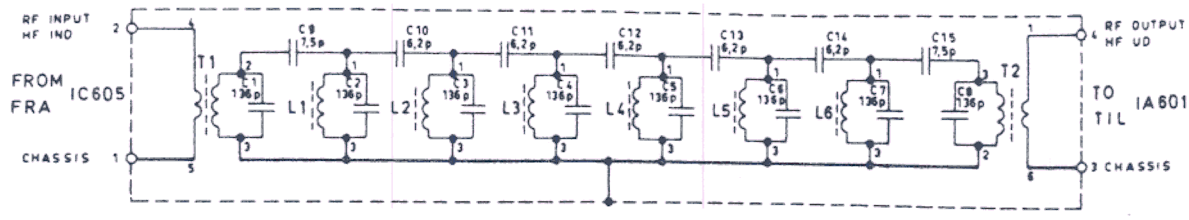
TYPE	NO.	CODE	DATA



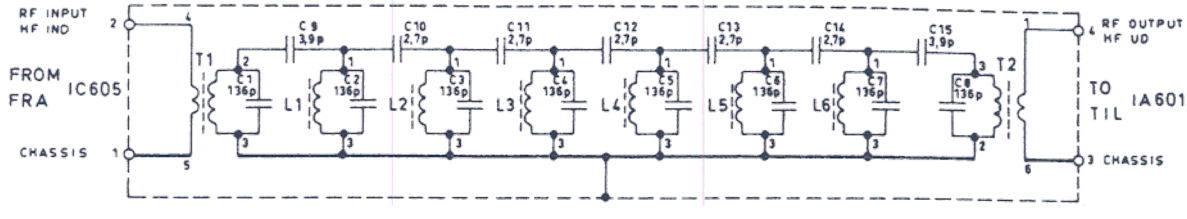
IF CONVERTER
MF KONVERTER

IC605

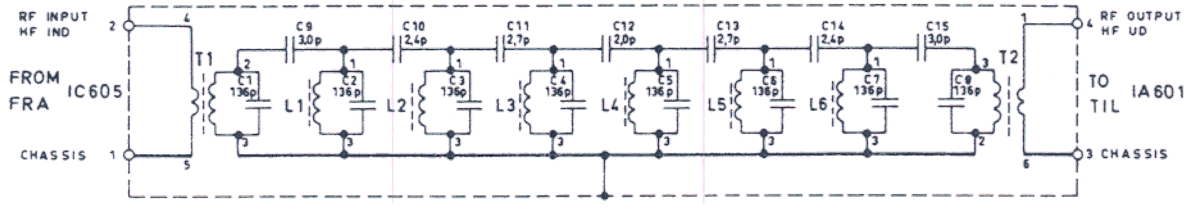
X400.815



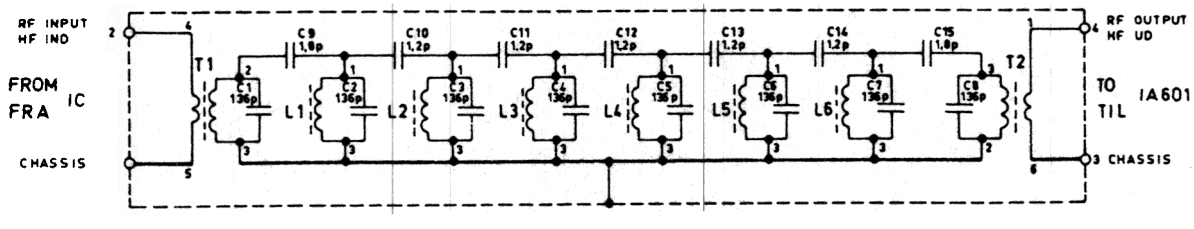
BP608 D400.806



BP609 D400.807



BP6010 D400.808



BP6012 D400.860

BAND-PASS FILTER BP608, BP609,
BÅNDPASFILTER BP6010, BP6012

Storno

TYPE	NO.	CODE		
	C1-8	74.5144		
	C9	74.5179		) DI
	C10	74.5170		DI
	C11	74.5170		DI
	C12	74.5170		DI
	C13	74.5170		DI
	C14	74.5170		DI
	C15	74.5179		DI
	L1	61.885-01	Coil/spole 455 kHz	
	L2	61.885-01	Coil/spole 455 kHz	
	L3	61.885-01	Coil/spole 455 kHz	
	L4	61.885-01	Coil/spole 455 kHz	
	L5	61.885-01	Coil/spole 455 kHz	
	L6	61.885-01	Coil/spole 455 kHz	
	T1	61.1009		
	T2	61.1010	Coil/spole 455 kHz	

BP609

C1-8	74.5144	68 pF 2% ceram NO75 TB	250V
C9	74.5130	3, 9 pF 0, 25pF ceram N150 DI	250V
C10	74.5128	2, 7 pF 0, 25pF ceram N150 DI	250V
C11	74.5128	2, 7 pF 0, 25pF ceram N150 DI	250V
C12	74.5128	2, 7 pF 0, 25pF ceram N150 DI	250V
	74.5128	2, 7 pF 0, 25pF ceram N150 DI	250V
	74.5128	2, 7 pF 0, 25pF ceram N150 DI	250V
	74.5130	3, 9 pF 0, 25pF ceram N150 DI	250V
L1	61.819-01	Coil/spole 455 kHz	
L2	61.819-01	Coil/spole 455 kHz	
L3	61.819-01	Coil/spole 455 kHz	
L4	61.819-01	Coil/spole 455 kHz	
L5	61.819-01	Coil/spole 455 kHz	
L6	61.819-01	Coil/spole 455 kHz	
T1	61.979-01	Coil/spole 455 kHz	
T2	61.979-01	Coil/spole 455 kHz	

BP6010

C1-8	74.5144	68 pF 2% ceram NO75 TB	250V
C9	74.5172	3 pF 0, 25 pF ceram N150 DI	250V
C10	74.5178	2, 4 pF 0, 25 pF ceram N150 DI	250V
C11	74.5128	2, 7 pF 0, 25 pF ceram N150 DI	250V
C12	74.5174	2 pF 0, 25 pF ceram N150 DI	250V
C13	74.5128	2, 7 pF 0, 25 pF ceram N150 DI	250V

Storno

TYPE	NO	CODE	DATA	
	C14	74.5178	2, 4 pF 0, 25 pF ceram N150 DI	250V
	C15	74.5172	3 pF 0, 25 pF ceram N150 DI	250V
		61.819-01	Coil/spole 455 kHz	
		61.819-01	Coil/spole 455 kHz	
		61.819-01	Coil/spole 455 kHz	
		61.819-01	Coil/spole 455 kHz	
		61.819-01	Coil/spole 455 kHz	
		61.819-01	Coil/spole 455 kHz	
	T1	61.979-01		
	T2	61.980-01		

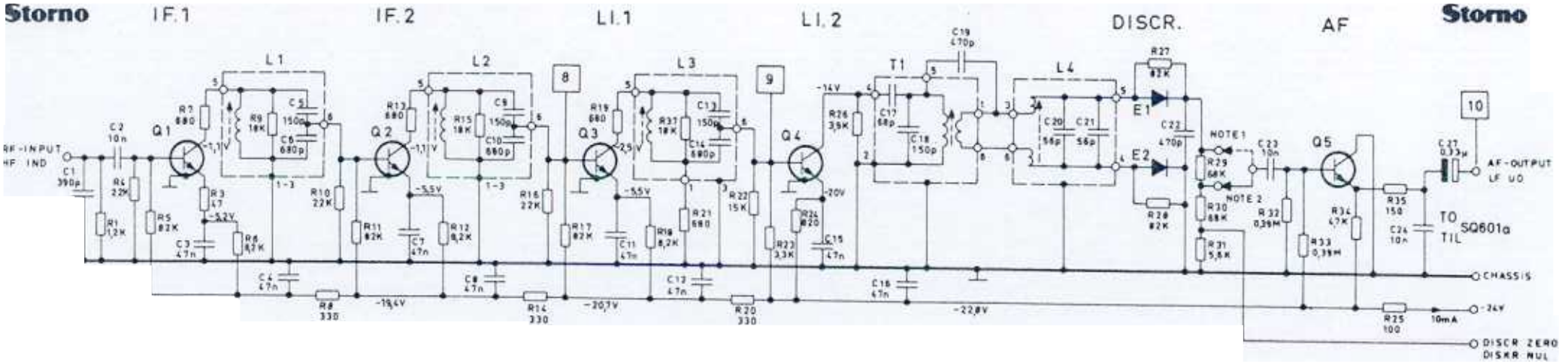
BP6012

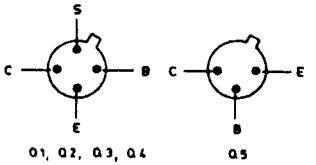
	74.5144	68 pF 2% ceram NO75 TB	250V
	74.5126	1, 8 pF 0, 25 pF ceram N150 DI	250V
	74.5124	1, 2 pF 0, 25 pF ceram N150 DI	250V
	74.5124	1, 2 pF 0, 25 pF ceram N150 DI	250V
	74.5124	1, 2 pF 0, 25 pF ceram N150 DI	250V
	74.5124	1, 2 pF 0, 25 pF ceram N150 DI	250V
	74.5124	1, 2 pF 0, 25 pF ceram N150 DI	250V
	74.5126	1, 8 pF 0, 25 pF ceram N150 DI	250V
L1	61.819-01	Coil/spole 455 kHz	
L2	61.819-01	Coil/spole 455 kHz	
L3	61.819-01	Coil/spole 455 kHz	
L4	61.819-01	Coil/spole 455 kHz	
L5	61.819-01	Coil/spole 455 kHz	
L6	61.819-01	Coil/spole 455 kHz	
T1		Coil/spole 455 kHz	
T2		Coil/spole 455 kHz	

BAND-PASS FILTER
ANDPASFILTER

X400.879

BP608, BP609, BP6010, BP6012

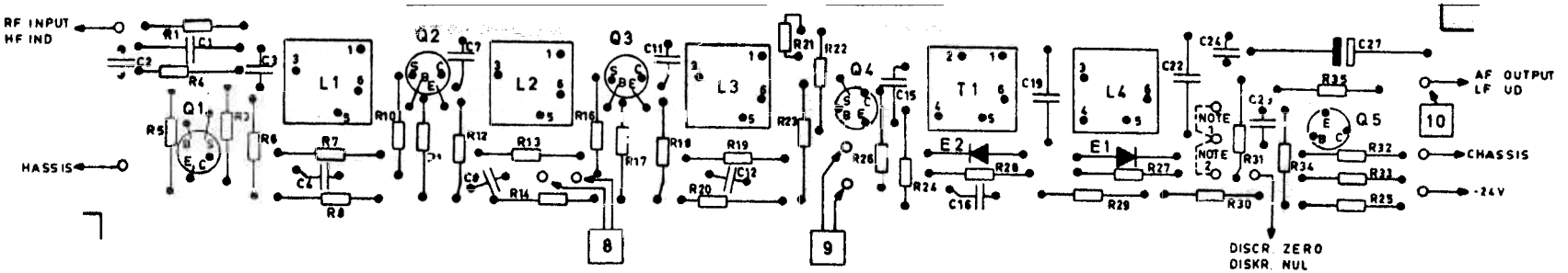




NOTE 1. CONNECTION FOR ±4kHz OR ±5kHz FREQ. DEVIATION
NOTE 2. CONNECTION FOR ±15kHz FREQ. DEVIATION

NOTE 1. FORBINDELSE VED ±4kHz ELLER ±5kHz FREKVENSSVING
NOTE 2. FORBINDELSE VED ±15kHz FREKVENSSVING.

PRINTED CIRCUIT SEEN FROM COMPONENT SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN



IF-AMPLIFIER
MF-FORSTÆRKER

IA601b

D400.796

TYPE	NO.	CODE	DATA	
	C1	76.5017	390 pF 5% polyest. TB	125V
	C2	76.5070	10 nF 10% polyest. FL	50V
	C3	76.5072	47 nF 10% polyest.	50V
	C4	76.5072	47 nF 10% polyest.	50V
	C5	76.5103	150 pF 2,5% polystyr. TB	30V
	C6	76.5107	680 pF 2,5% polystyr. TB	30V
	C7	76.5072	47 nF 10% polyest.	50V
	C8	76.5072	47 nF 10% polyest.	50V
	C9	76.5103	150 pF 2,5% polystyr. TB	30V
	C10	76.5107	680 pF 2,5% polystyr. TB	30V
	C11	76.5072	47 nF 10% polyest.	50V
	C12	76.5072	47 nF 10% polyest.	50V
	C13	76.5103	150 pF 2,5% polystyr. TB	30V
	C14	76.5107	680 pF 2,5% polystyr. TB	30V
	C15	76.5072	47 nF 10% polyest.	50V
	C16	76.5072	47 nF 10% polyest.	50V
	C17	76.5101	68 pF 2,5% polystyr. TB	30V
	C18	76.5103	150 pF 2,5% polystyr. TB	30V
	C19	76.5065	470 pF 5% polystyr. TB	125V
	C20	74.5111	56 pF 2% ceram. NO75 TB	250V
	C21	74.5111	56 pF 2% ceram. NO75 TB	250V
	C22	76.5065	470 pF 5% polystyr TB	125V
	C23	76.5070	10 nF 10% polyest. FL	50V
	C24	76.5070	10 nF 10% polyest. FL	50V
	C27	76.5075	0,33µF 10% polyest. TB	100V
	R1	80.5250	1,2k 5% carbon film	1/8W
	R3	80.5233	47 Ω 5% carbon film	1/8W
	R4	80.5265	22k 5% carbon film	1/8W
	R5	80.5272	82k 5% carbon film	1/8W
	R6	80.5260	8,2kΩ 5% carbon film	1/8W
	R7	80.5247	680 Ω 5% carbon film	1/8W
	R8	80.5243	330 Ω 5% carbon film	1/8W
	R9	80.5010	18k 5% carbon film	1/10W
	R10	80.5265	22k 5% carbon film	1/8W
	R11	80.5272	82k 5% carbon film	1/8W
	R12	80.5260	8,2 kΩ 5% carbon film	1/8W
	R13	80.5247	680 Ω 5% carbon film	1/8W
	R14	80.5243	330 Ω 5% carbon film	1/8W
	R15	80.5010	18k 5% carbon film	1/10W
	R16	80.5265	22k 5% carbon film	1/8W
	R17	80.5272	82k 5% carbon film	1/8W
	R18	80.5260	8,2 kΩ 5% carbon film	1/8W
	R19	80.5247	680 Ω 5% carbon film	1/8W
	R20	80.5243	330 Ω 5% carbon film	1/8W
	R21	80.5247	680 Ω 5% carbon film	1/8W
	R22	80.5263	15k 5% carbon film	1/8W
	R23	80.5255	3,3k 5% carbon film	1/8W

Storno

TYPE	NO.	CODE	DATA	
	R24	80.5248	820 Ω 5% carbon film	1/8W
	R25	80.5237	100 Ω 5% carbon film	1/8W
	R26	80.5256	3,9k 5% carbon film	1/8W
	R27	80.5272	82k 5% carbon film	1/8W
	R28	80.5272	82k 5% carbon film	1/8W
	R29	80.5271	68k 5% carbon film	1/8W
	R30	80.5271	68k 5% carbon film	1/8W
	R31	80.5258	5,6k 5% carbon film	1/8W
	R32	80.5280	390k 5% carbon film	1/8W
	R33	80.5280	390k 5% carbon film	1/8W
	R34	80.5257	4,7k 5% carbon film	1/8W
	R35	80.5239	150Ω 5% carbon film	1/8W
	R37	80.5010	18k 5% carbon film	1/10W
	E1	99.5133	Diode IS45 planar	
	E2	99.5133	Diode IS45 planar	
	L1	61.811-01	Coil/spole 455 kHz (C5-C6-R9)	
	L2	61.811-01	Coil/spole 455 kHz (C9-C10-R15)	
	L3	61.811-01	Coil/spole 455 kHz (C13-C14-R37)	
	L4	61.813-01	Coil/spole 455 kHz discr. (C20-C21)	
	T1	61.812-01	Trafo 455 kHz (C17-C18)	
	Q1	99.5175	Transistor BF 185	
	Q2	99.5175	Transistor BF 185	
	Q3	99.5175	Transistor BF 185	
	Q4	99.5175	Transistor BF 185	
	Q5	99.5143	Transistor BC 108	

IF-AMPLIFIER
MF-FORSTÆRKER

IA601b

X400.797

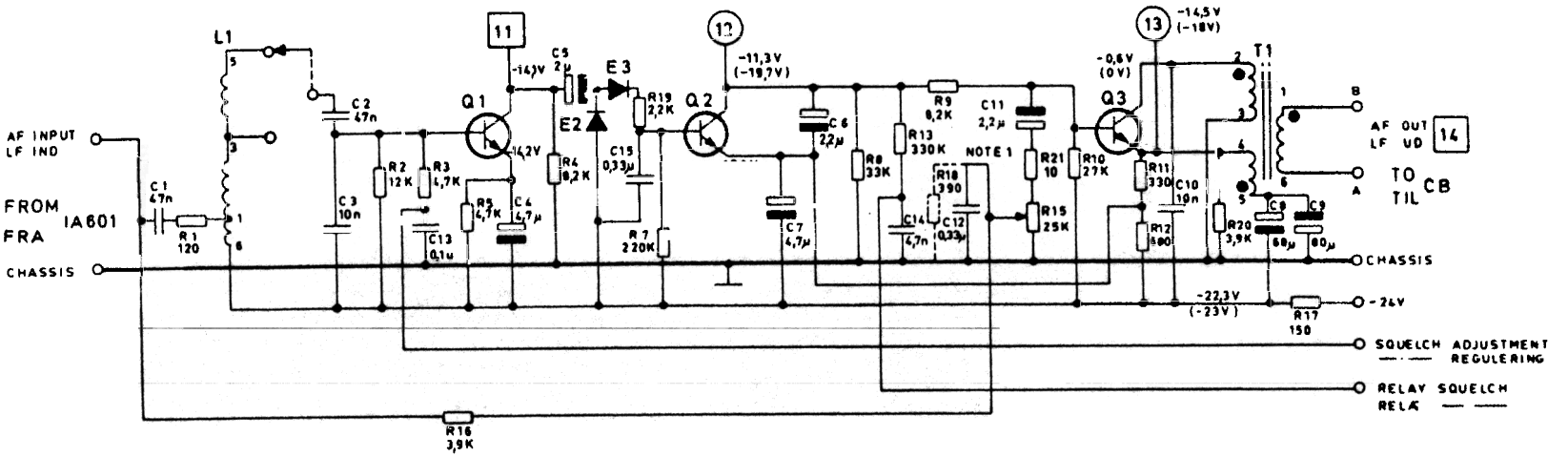
Storno

NOISE AMP
STØJFORST.

NOISE DETECTOR
STØJDETEKTOR

AF AMP
LF FORST

Storno

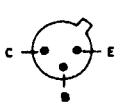


NOTE 1. IF FM IS USED INSTEAD OF PM, C12 IS REPLACED BY R18(390Ω)

NOTE 1 VED FM UDBYTTES C12 MED R18(390Ω)

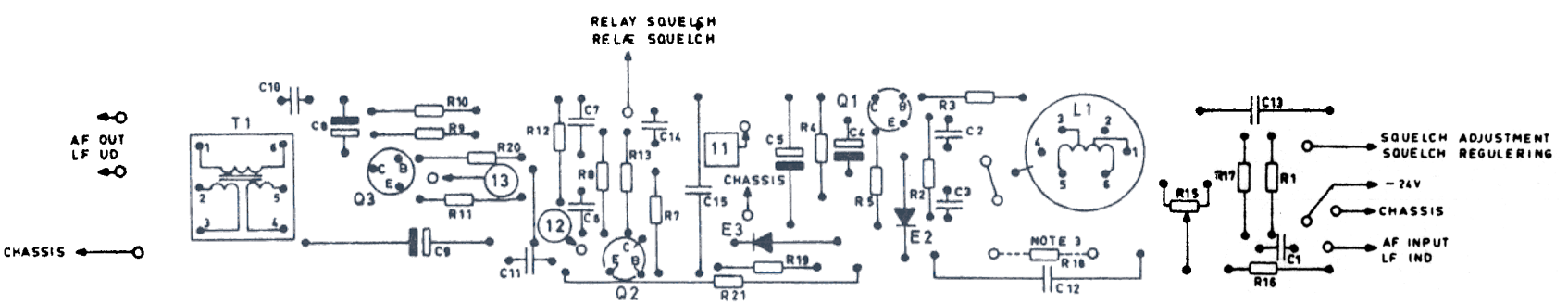
DC VOLTAGES WITHOUT PARENTHESES ARE MEASURED WITH SQUELCH OFF (AF-SIGNAL OUT)
DC VOLTAGES IN PARENTHESES ARE MEASURED WITH SQUELCH ON (NO AF-SIGNAL OUT).
SQUELCH REGULATOR ADJUSTED TO 10KΩ.

DC SPÆNDINGER UDEN PARENTES MÅLT VED SQUELCH OFF (LF-SIGNAL UD).
DC SPÆNDINGER I PARENTES MÅLT VED SQUELCH ON (INTET LF-SIGNAL UD).
SQUELCH REG. INDSTILLET TIL 10KΩ.



Q1, Q2 Q3
BOTTOM VIEW
SET FRA BUNDEN

PRINTED CIRCUIT VIEWED FROM COMPONENT SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN



AF-AMPLIFIER AND SQUELCH
LF-FORSTÆRKER OG SQUELCH

SQ 602

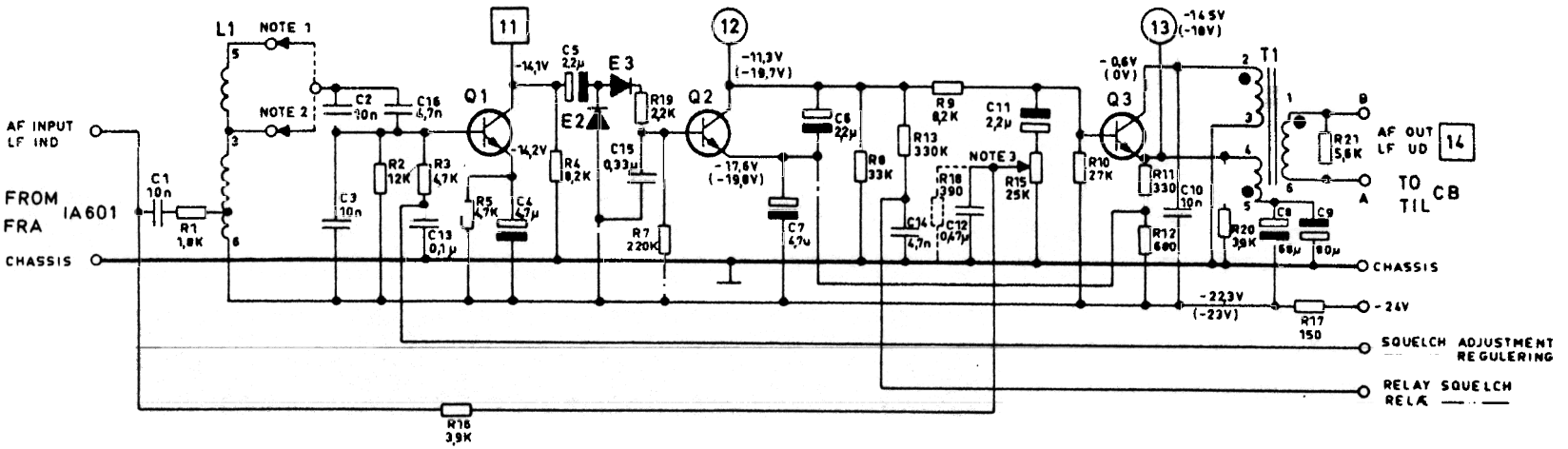
D400.844

NOISE AMP
STØJFORST.

NOISE DETECTOR
STØJDETEKTOR

AF AMP
LF FORST

Storno

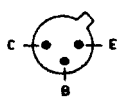


NOTE 1. CONNECTED IF 20 OR 25KHz CHANNEL SEPARATION IS USED.
NOTE 2. CONNECTED IF 50KHz CHANNEL SEPARATION IS USED.
NOTE 3. IF FM IS USED INSTEAD OF PM, C12 IS REPLACED BY R18 (390Ω)

NOTE 1. STRAPPES VED 20 25KHz KANALAFSTAND.
NOTE 2. STRAPPES VED 50KHz KANALAFSTAND.
NOTE 3. VED FM UDBYTTES C12 MED R18 (390Ω)

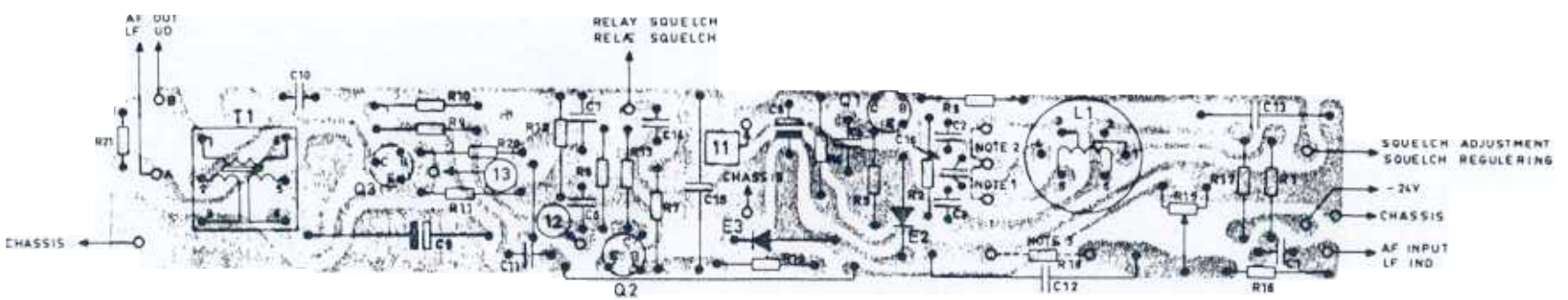
DC VOLTAGES WITHOUT PARENTHESES ARE MEASURED WITH SQUELCH OFF (AF-SIGNAL OUT)
DC VOLTAGES IN PARENTHESES ARE MEASURED WITH SQUELCH ON (NO AF-SIGNAL OUT).
SQUELCH REGULATOR ADJUSTED TO 15KΩ.

DC SPÆNDINGER UDEN PARENTES MÅLT VED SQUELCH OFF (LF-SIGNAL UD)
DC SPÆNDINGER I PARENTES MÅLT VED SQUELCH ON (INTET LF-SIGNAL UD)
SQUELCH REG. INDSTILLET TIL 15KΩ.



Q1, Q2, Q3
BOTTOM VIEW
SET FRA BUNDEN

PRINTED CIRCUIT SEEN FROM COMPONENT SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN



AF AMPLIFIER AND SQUELCH
LF FORSTÆRKER OG SQUELCH

SQ603

TYPE	NO.	CODE	DATA	
	C1	76.5070	10nF 10% polyest. FL.	50V
	C2	76.5070	10nF 10% polyest. FL.	50V
	C3	76.5070	10nF 10% polyest. FL.	50V
	C4	73.5103	4,7 µF 20% tantal	15V
	C5	73.5102	2,2 µF 20% tantal	35V
	C6	73.5102	2,2µF 20% tantal	35V
	C7	73.5103	4,7µF 20% tantal	15V
	C8	73.5106	68µF 20% tantal	15V
	C9	73.5110	80µF -10/+50% elco	25V
	C10	76.5070	10nF 10% polyest. FL	50V
	C11	73.5102	22µF 20% tantal	35V
	C12	76.5076	0,47uF 20% polyest. TB	100V
	C13	76.5073	0,1µF 10% polyest. TB	100V
	C14	76.5061	4,7nF 10% polyest. FL	50V
	C15	76.5075	0,33µF 10% polyest. TB	100V
	C16	76.5061	4,7µF 10% polyest. FL	50V
	R1	80.5252	1,8k 5% carbon film	1/8W
	R2	80.5262	12k 5% carbon film	1/8W
	R3	80.5257	4,7k 5% carbon film	1/8W
	R4	80.5260	8,2k 5% carbon film	1/8W
	R5	80.5257	4,7k 5% carbon film	1/8W
	R7	80.5277	220k 5% carbon film	1/8W
	R8	80.5267	33k 5% carbon film	1/8W
	R9	80.5260	8,2k 5% carbon film	1/8W
	R10	80.5266	27k 5% carbon film	1/8W
	R11	80.5243	330Ω 5% carbon film	1/8W
	R12	80.5247	680Ω 5% carbon film	1/8W
	R13	80.5279	330k 5% carbon film	1/8W
	R15	86.5044	25k 20% potm. lin.	0,1W
	R16	80.5256	3,9k 5% carbon film	1/8W
	R17	80.5239	150Ω 5% carbon film	1/8W
	R19	80.5253	2,2k 5% carbon film	1/8W
	R20	80.5256	3,9k 5% carbon film	1/8W
	R21	80.5258	5,6k 5% carbon film	1/8W
	L1	61.816-01	coil/spole	
	T1	60.5134	Trafo 2400Ω/600Ω	
	E2	99.5028	Diode 1N914	
	E3	99.5028	Diode 1N914	
	Q1	99.5143	Transistor BC108	
	Q2	99.5121	Transistor BC107	
	Q3	99.5121	Transistor BC107	

Storno

TYPE	NO.	CODE	DATA

AF AMPLIFIER AND SQUELCH
LF FORSTÆRKER OG SQUELCH

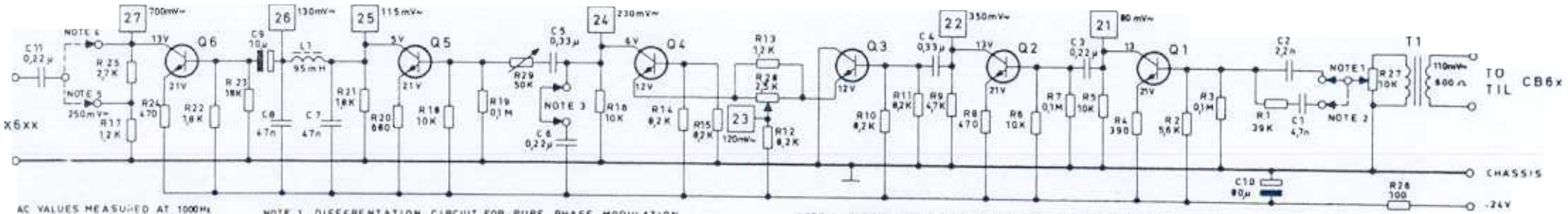
SQ603

X400.804/2

Storno

Storno

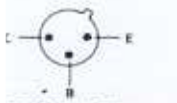
3. AMPLIFIER	2. AMPLIFIER	INTEGRAT. CIRCUIT	LIMITER	1. AMPLIFIER	DIFFERENTIATOR
3. FORSTÆRKER	2. FORSTÆRKER	INTEGRAT. LED	BEGRÆNSER	1. FORSTÆRKER	DIFFERENTIATIONSLED



AC VALUES MEASURED AT 1000Hz
AC VÆRDIER MÅLT VED 1000Hz

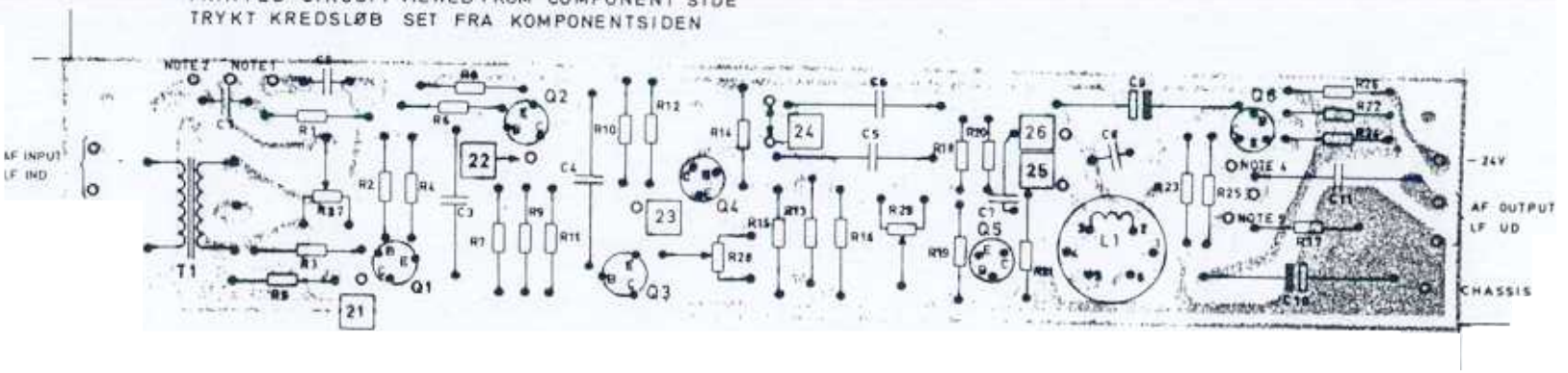
NOTE 1. DIFFERENTATION CIRCUIT FOR PURE PHASE MODULATION
NOTE 2. DIFFERENTATION CIRCUIT FOR MIXED PHASE AND FREQUENCY MODULATION.
NOTE 3. THE SHORTING LINK IS REMOVED AT MEASUREMENTS WHERE INTEGRATION IS UNWANTED.
NOTE 4. CONNECTION FOR 50kHz AND 25kHz IN 4 METER AND 50kHz CHANNEL SEPARATION IN 2 METER EQUIPMENT.
NOTE 5. CONNECTION FOR 25kHz AND 20kHz CHANNEL SEPARATION IN 2 METER EQUIPMENT.

NOTE 1. DIFFERENTIATIONSLED FOR REN FASEMODULATION
NOTE 2. DIFFERENTIATIONSLED FOR BLANDET FASE- OG FREKVENS-MODULATION.
NOTE 3. VED MÅLINGER HVOR INTEGRATION ER UØNSKET FJERNES STRAPNINGEN.
NOTE 4. TILSLUTNING FOR 50kHz OG 25kHz I 4 METER OG 50kHz KANALAFSTAND I 2 METER ANLÆG.
NOTE 5. TILSLUTNING FOR 25kHz OG 20kHz KANALAFSTAND I 2 METER ANLÆG.



BOTTOM VIEW
SET FRA BUNDEN

PRINTED CIRCUIT VIEWED FROM COMPONENT SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN



AF-AMPLIFIER
LF-FORSTÆRKER

AA601

D 400.671/3

Storno

TYPE	NO.	CODE	DATA	
	C1	76.5061	4,7nF 10% polyest. FL	50V
	C2	76.5059	2,2nF 10% polyest. FL	50V
	C3	76.5074	0,22uF 10% polyest. TB	100V
	C4	76.5075	0,3uF 10% polyest. TB	100V
	C5	76.5075	0,3uF 10% polyest. TB	100V
	C6	76.5074	0,22uF 10% polyest. TB	100V
	C7	76.5072	47nF 10% polyest. FL	50V
	C8	76.5072	47nF 10% polyest. FL	50V
	C9	73.5001	10uF -10 +50% elco	25V
	C10	73.5110	80uF -10 +50% elco	25V
	C11	76.5074	0,22uF 10% polyest. TB	100V
	R1	80.5268	39kΩ 5% carbon film	1/8W
	R2	80.5258	5,6kΩ 5% carbon film	1/8W
	R3	80.5273	100kΩ 5% carbon film	1/8W
	R4	80.5244	390Ω 5% carbon film	1/8W
	R5	80.5261	10kΩ 5% carbon film	1/8W
	R6	80.5261	10kΩ 5% carbon film	1/8W
	R7	80.5273	100kΩ 5% carbon film	1/8W
	R8	80.5245	470Ω 5% carbon film	1/8W
	R9	80.5257	4,7kΩ 5% carbon film	1/8W
	R10	80.5260	8,2kΩ 5% carbon film	1/8W
	R11	80.5260	8,2kΩ 5% carbon film	1/8W
	R12	80.5260	8,2kΩ 5% carbon film	1/8W
	R13	80.5250	1,2kΩ 5% carbon film	1/8W
	R14	80.5260	8,2kΩ 5% carbon film	1/8W
	R15	80.5260	8,2kΩ 5% carbon film	1/8W
	R16	80.5261	10kΩ 5% carbon film	1/8W
	R17	80.5250	1,2kΩ 5% carbon film	1/8W
	R18	80.5261	10kΩ 5% carbon film	1/8W
	R19	80.5273	100kΩ 5% carbon film	1/8W
	R20	80.5247	680Ω 5% carbon film	1/8W
	R21	80.5252	1,8kΩ 5% carbon film	1/8W
	R22	80.5252	1,8kΩ 5% carbon film	1/8W
	R23	80.5264	18 kΩ 5% carbon film	1/8W
	R24	80.5245	470Ω 5% carbon film	1/8W
	R25	80.5254	2,7kΩ 5% carbon film	1/8W
	R26	80.5237	100Ω 5% carbon film	1/8W
	R27	86.5039	10kΩ 20% trim lin	0,1W
	R28	86.5043	2,5kΩ 20% trim lin	0,1W
	R29	86.5040	50 kΩ 20% trim lin	0,1W
	L1	61.824	Filter coil/Filterspole	95 mH
	T1	60.5130	Transformator LF600/1000Ω	
	Q1	99.5143	Transistor BC108	
	Q2	99.5143	Transistor BC108	
	Q3	99.5143	Transistor BC108	

Storno

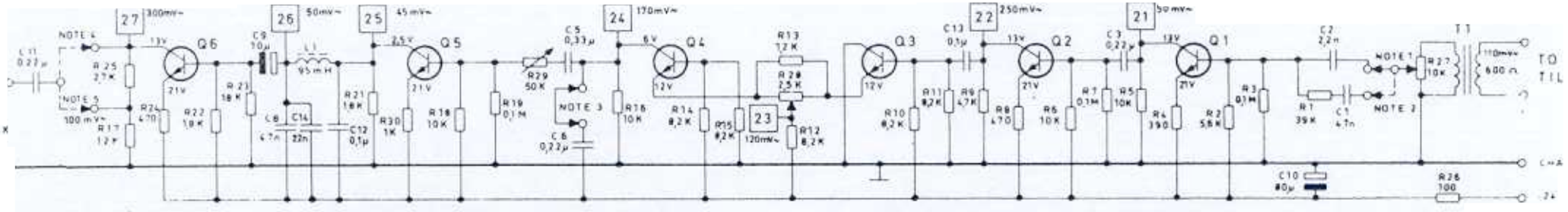
TYPE	NO.	CODE	DATA
	Q4	99.5143	Transi or BC108
	Q5	99.5143	Transi or BC108
	Q6	99.5143	Transi or BC108

AF-AMPLIFIER
LF-FORSTÆRKER

AA601

X400.683/3

3. AMPLIFIER	2. AMPLIFIER	INTEGRAT. CIRCUIT	LIMITER	1. AMPLIFIER	DIFFERENTIATOR
3. FORSTÆRKER	2. FORSTÆRKER	INTEGRAT. LED	BEGRÆNSER	1. FORSTÆRKER	DIFFERENTIATIONSLED



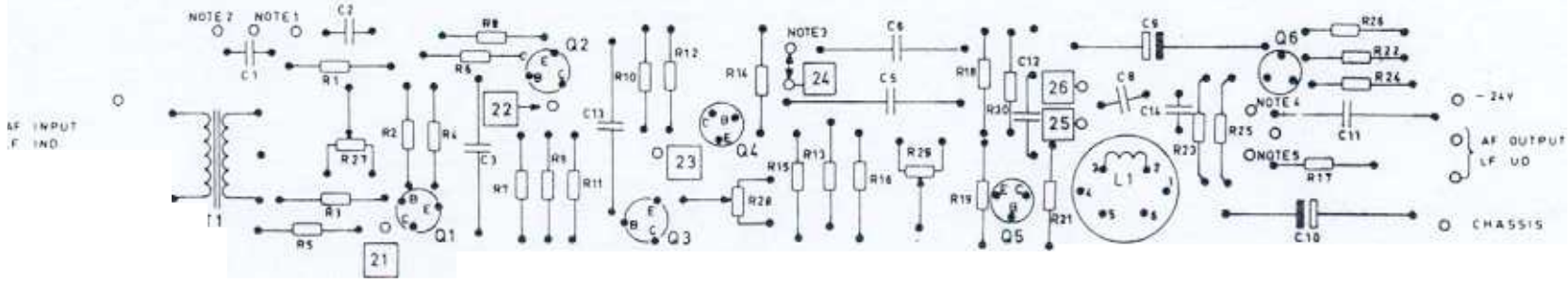
NOTE 1 DIFFERENTIATION CIRCUIT FOR PURE PHASE MODULATION
NOTE 2 DIFFERENTATION CIRCUIT FOR MIXED PHASE AND FREQUENCY MODULATION
NOTE 3 THE SHORTING LINK IS REMOVED AT MEASUREMENTS WHERE INTEGRATION IS UNWANTED
NOTE 4 CONNECTION FOR 12,5kHz CHANNEL SEPARATION IN 4 METER EQUIPMENT
NOTE 5 CONNECTION FOR 12,5kHz CHANNEL SEPARATION IN 2 METER EQUIPMENT

NOTE 1 DIFFERENTIATIONSLED FOR REN FASEMODULATION
NOTE 2 DIFFERENTIATIONSLED FOR BLANDET FASE-OG FREKVENS-MODULATION
NOTE 3 VED MÅLINGER HVOR INTEGRATION ER UØNSKET FJERNES STRAPNINGEN
NOTE 4 TILSLUTNING FOR 12,5kHz KANALAFSTAND I 4 METER ANLÆG
NOTE 5 TILSLUTNING FOR 12,5kHz KANALAFSTAND I 2 METER ANLÆG



BOTTOM VIEW
SET FRA BUNDEN

PRINTED CIRCUIT VIEWED FROM COMPONENT SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN



AF-AMPLIFIER
LF-FORSTÆRKER

AA608

D400.838

NO.	CODE	DATA	
C1	76.5061	4,7nF 10% polyest. FL	50V
C2	76.5059	2,2nF 10% " FL	50V
C3	76.5074	0,22µF 10% " TB	100V
C5	76.5075	0,33µF 10% " TB	100V
C6	76.5074	0,22µF 10% " TB	100V
C8	76.5072	47 nF 10% " FL	50V
C9	73.5001	10 µF -10/+50% elco	25V
C10	73.5110	80 µF -10/+50% "	25V
C11	76.5074	0,22 µF 10% polyest. TB	100V
C12	76.5073	0,1µF 10% " FL	50V
C13	76.5073	0,1µF 10% " FL	50V
C14	76.5071	22nF 10% " FL	50V
R1	80.5268	39 kΩ 5% carbon film	1/8W
R2	80.5258	5,6kΩ 5% " "	1/8W
R3	80.5273	0,1MΩ 5% " "	1/8W
R4	80.5244	390 Ω 5% " "	1/8W
R5	80.5261	10 kΩ 5% " "	1/8W
R6	80.5261	10 kΩ 5% " "	1/8W
R7	80.5273	0,1MΩ 5% " "	1/8W
R8	80.5245	470 Ω 5% " "	1/8W
R9	80.5257	4,7kΩ 5% " "	1/8W
R10	80.5260	8,2kΩ 5% " "	1/8W
R11	80.5260	8,2kΩ 5% " "	1/8W
R12	80.5260	8,2kΩ 5% " "	1/8W
R13	80.5250	1,2kΩ 5% " "	1/8W
R14	80.5260	8,2kΩ 5% " "	1/8W
R15	80.5260	8,2kΩ 5% " "	1/8W
R16	80.5261	10 kΩ 5% " "	1/8W
R17	80.5250	1,2kΩ 5% " "	1/8W
R18	80.5261	10 kΩ 5% " "	1/8W
R19	80.5273	0,1MΩ 5% " "	1/8W
R21	80.5252	1,8kΩ 5% " "	1/8W
R22	80.5252	1,8kΩ 5% " "	1/8W
R23	80.5264	18 kΩ 5% " "	1/8W
R24	80.5245	470 Ω 5% " "	1/8W
R25	80.5254	2,7kΩ 5% " "	1/8W
R26	80.5237	100 Ω 5% " "	1/8W
R27	86.5039	10 kΩ 20% potentiometer lin.	0,1W
R28	86.5043	2,5 kΩ 20% " "	0,1W
R29	86.5040	50 kΩ 20% " "	0,1W
L1	61.824-01	Filter coil/Filterspole	95 mH
T1	60.5130	Transformer 600/1000 Ω	

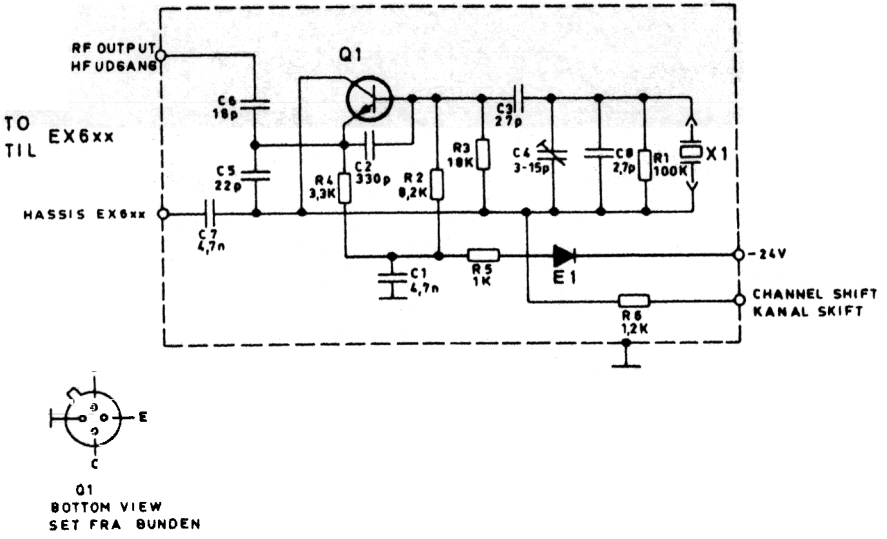
TYPE	NO.	CODE	DATA
	Q1	99.5143	BC108 Transistor
	Q2	99.5143	BC108 Transistor
	Q3	99.5143	BC108 Transistor
	Q4	99.5143	BC108 Transistor
	Q5	99.5143	BC108 Transistor
	Q6	99.5143	BC108 Transistor

AF-AMPLIFIER
LF-FORSTÆRKER

AA608

X400.850

Storno

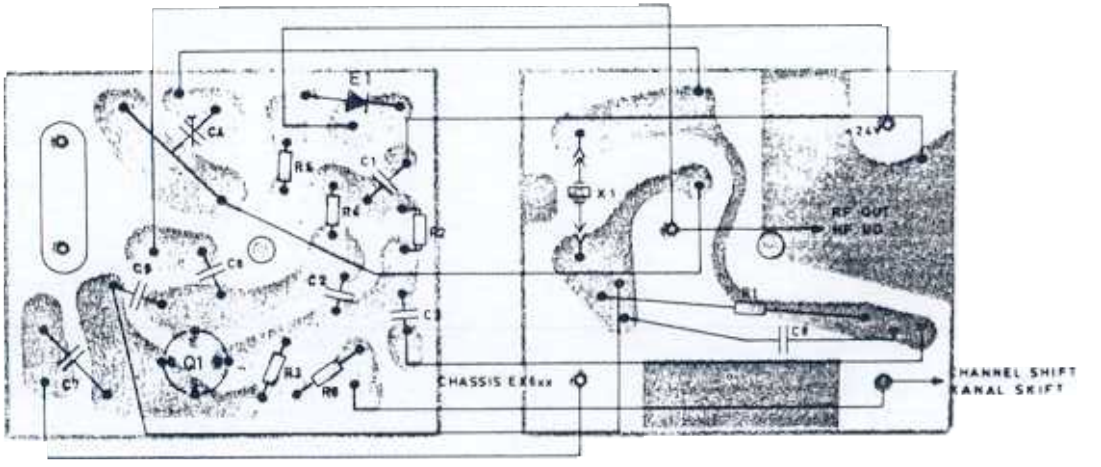


UPPER PRINTED WIRING BOARD VIEWED FROM COMPONENT SIDE

ØVERSTE TRYKTE KREDSLØB SET FRA KOMPONENTSIDEN

LOWEST PRINTED WIRING BOARD VIEWED FROM COMPONENT SIDE

NEDERSTE TRYKTE KREDSLØB SET FRA KOMPONENTSIDEN



CRYSTALOSCILLATOR FOR TX.

XO631

D400.666/2

TYPE	NO.	CODE	DATA	
	C1	76.5061	4,7nF ± 10% polyester FL	50V
	C2	76.5105	330pF 2,5% polystyren	30V
	C3	74.5107	27pF ± 0,5pF ceram NO75TB	250V
	C4	78.5032	3-15pF trimmer ceram NPOTB	500V
	C5	74.5106	22 pF ± 0,5pF ceram NO75TB	250V
	C6	74.5142	18 pF ± 0,5pF " NO75TB	250V
	C7	76.5061	4,7nF ± 10% polyester	50V
	C8	74.5128	2,7pF ± 0,25pF ceram N150DI	250V
	R1	80.5273	100 kΩ 5% carbon film	1/8W
	R2	80.5260	8,2 kΩ 5% " "	1/8W
	R3	80.5264	18 kΩ 5% " "	1/8W
	R4	80.5255	3,3kΩ 5% " "	1/8W
	R5	80.5249	1 kΩ 5% " "	1/8W
	R6	80.5250	1,2 kΩ 5% " "	1/8W
	E1	99.5028	Diode OA200	
	Q1	99.5118	Transistor BF115	
	X1	98.	Crystal	

TYPE	NO.	CODE	DATA

QUARZOSZILLATOR FÜR SENDER

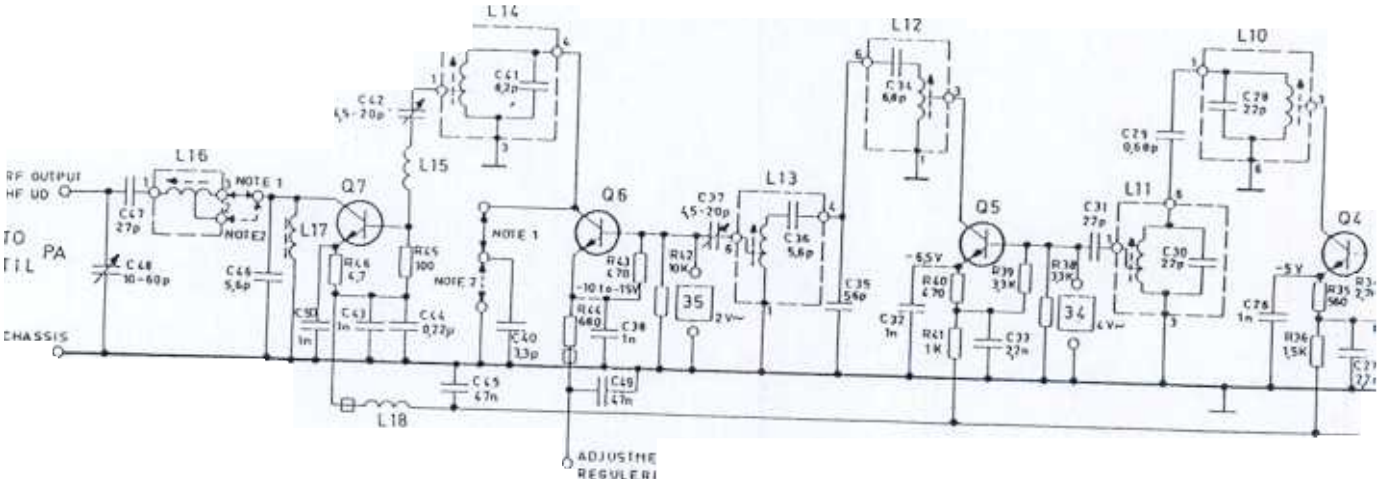
XO631

X400.680/2 T

94B

Storno

2. PA 1. PA 2. DOUBLER 2. DOBLER TRIPLE

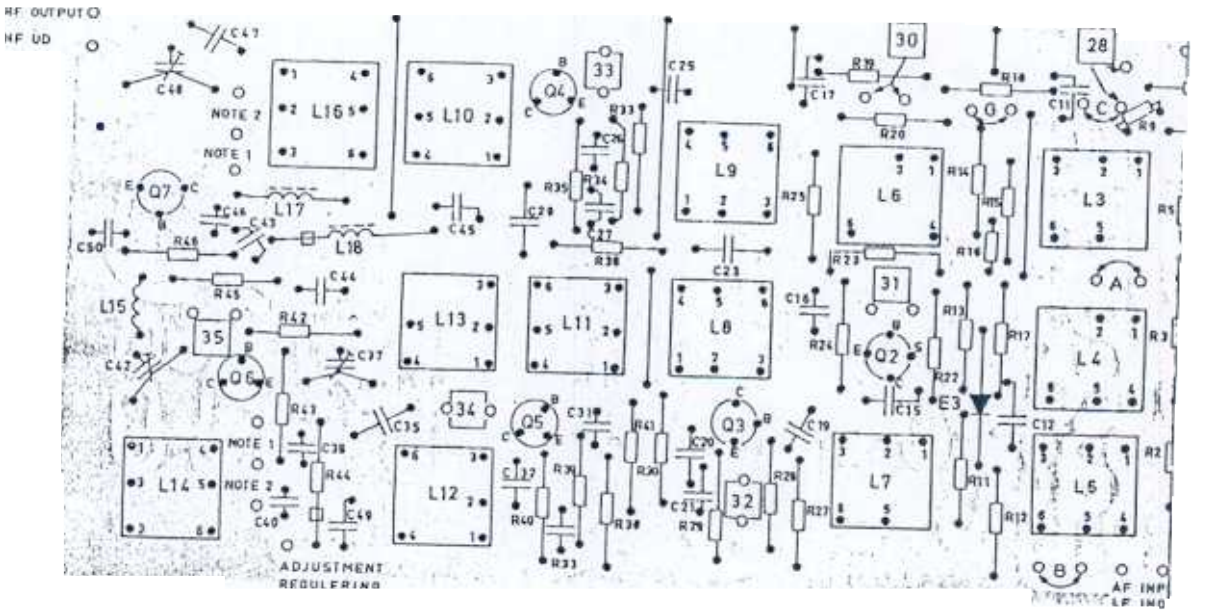


NOTE 1. CONNECTION FOR 146-160MHz
FORBINDELSE FOR 146-160MHz

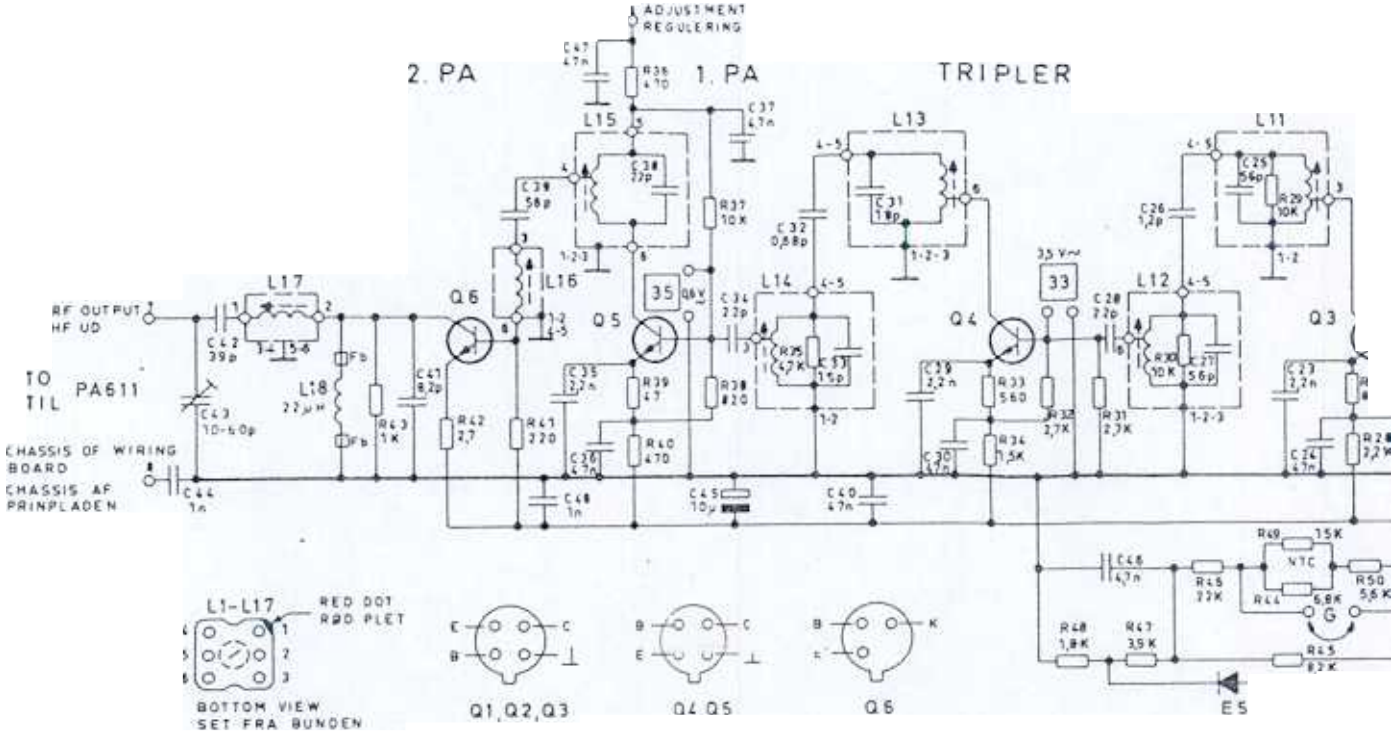
NOTE 2. CONNECTION FOR 160-174MHz
FORBINDELSE FOR 160-174MHz

RF VALUES MEASURED WITH RF-PROBE STORNO NR 95,089
DC VOLTAGES MEASURED WITH REFERENCE TO CHASSIS
HF VÆRDIER MÅLT MED HF-PROBE STORNO NR 95,089
DC SPÆNDINGER MÅLT I FORHOLD TIL CHASSIS

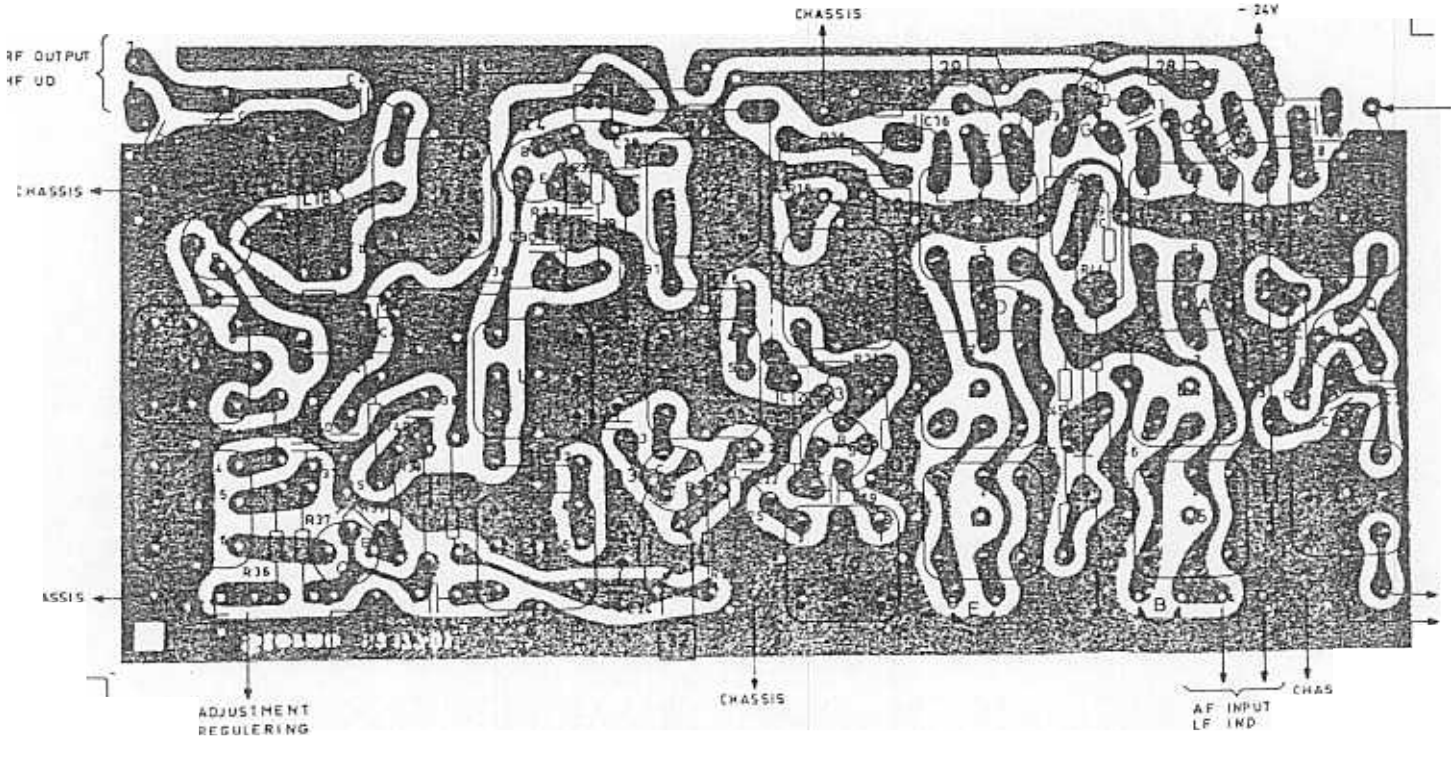
PRINTED CIRCUIT VIEWED FROM COMPONENT SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN



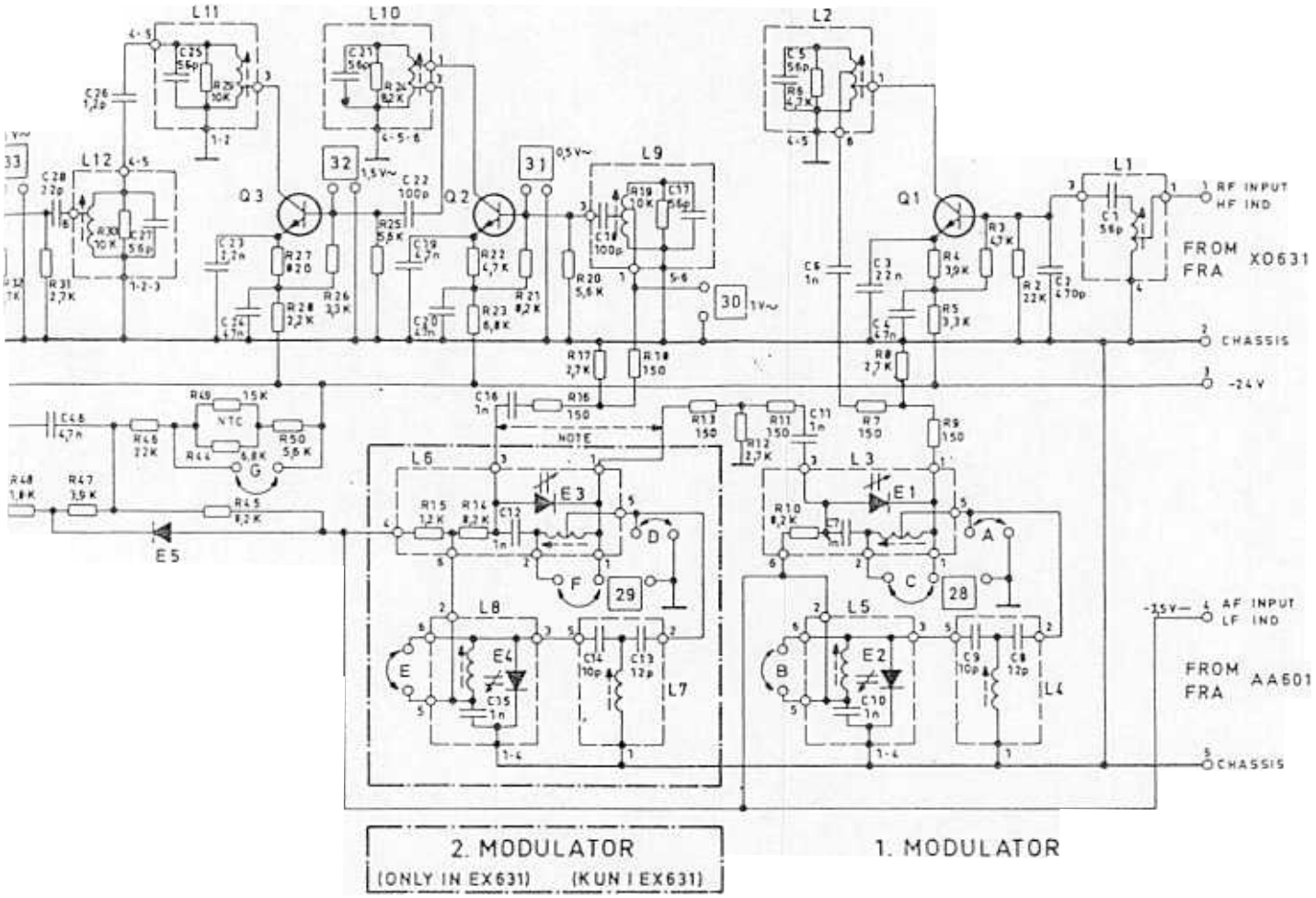
Storno

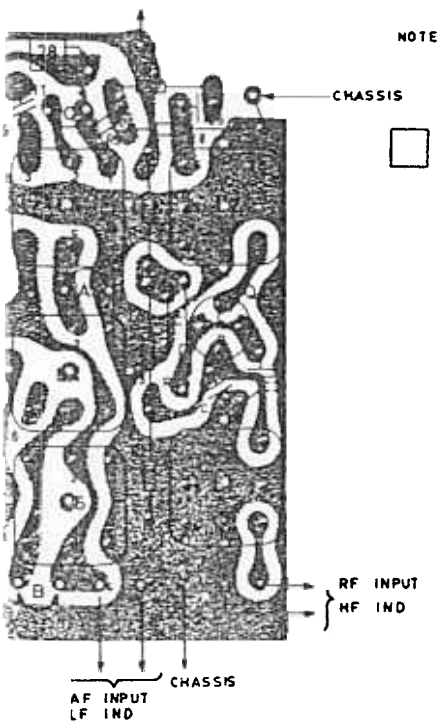


PRINTET CIRCUIT SEEN FROM COMPONENT SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN



R DOUBLER 2. BUFFER BUFFER





NOTE. 2 MODULATOR UNIT IS OMITTED IN EX632 AND R13 IS CONNECTED TO C16 BY MEANS OF A STAP

NOTE. 2 MODULATOR ER UDELADT EX632 OG R13 ER FORBUNDET I C16 VIA EN STRAPNING.

RF VALUES MEASURED WITH RF PROBE STORNO NR 95.089
DC VOLTAGES MEASURED WITH REFERENSE TO CHASSIS

HF VÆRDIER MÅLT MED HF-PROBE STORNO NR 95 089
DC SPÆNDINGER MÅLT I FORHOLD TIL CHASSIS

EXCITER
STYRESENDER

EX631, EX632

D400.692/3

94 c

TYPE	NO.	CODE	DATA				
		74.5111	56pF	2%	ceram.	TB	250V
		74.5161	470pF	-20/+50%	"	PL	63V
		76.5071	22nF	10%	polyest.	FL	50V
		76.5072	47nF	10%	"	FL	50V
		74.5111	56pF	2%	ceram.	TB	250V
		74.5155	1nF	-20/+50%	"	PL	63V
		74.5155	1nF	-20/+50%	"	PL	63V
		74.5136	12pF	5%	"	DI	125V
		74.5135	10pF	5%	"	DI	125V
		74.5155	1nF	-20/+50%	"	PL	63V
		74.5155	1nF	-20/+50%	"	PL	63V
EX631		74.5155	1nF	-20/+50%	"	PL	63V
EX631		74.5136	12pF	5%	"	DI	125V
EX631		74.5135	10pF	5%	"	DI	125V
EX631		74.5155	1nF	-20/+50%	"	PL	63V
		74.5155	1nF	-20/+50%	"	PL	63V
		74.5111	56pF	2%	"	TB	250V
		74.5013	100pF	20%	"	DI	500V
		74.5164	4,7nF	-20/+50%	"	PL	63V
		76.5072	47nF	10%	polyest.	FL	50V
		74.5111	56pF	2%	ceram.	TB	250V
		74.5013	100pF	20%	"	DI	500V
		74.5163	2,2nF	-20/+50%	"	PL	63V
		76.5072	47nF	10%	polyest.	FL	50V
		74.5111	56pF	2%	ceram.	TB	250V
		74.5124	1,2pF	±0,25pF	"	BD	250V
		74.5111	56pF	2%	"	TB	250V
		74.5106	22pF	±0,5pF	"	TB	250V
		74.5163	2,2nF	-20/+50%	"	PL	63V
		76.5072	47nF	10%	polyest.	FL	50V
		74.5142	18pF	±0,5pF	ceram.	TB	250V
		74.5121	0,68pF	±0,1pF	"	BD	250V
		74.5105	15pF	±0.5pF	"	TB	250V
		74.5106	22pF	±0,5pF	"	TB	250V
		74.5163	2,2nF	-20/+50%	"	PL	63V
		76.5072	47nF	10%	polyest.	FL	50V
		74.5164	4,7nF	-20/+50%	ceram.	PL	63V
		74.5106	22pF	±0,5pF	"	TB	250V
		74.5111	56pF	2%	"	TB	250V
		76.5072	47nF	10%	polyest.	FL	50V
		74.5134	8.2pF	±0.25pF	ceram.	DI	250V
		74.5117	39pF	2%	ceram.	TB	250V
		78.5030	10-60pF	trimm.	"	DI	250V
		74.5155	1nF	-20/+50%	"	PL	63V
		73.5100	10uF	-10/+50%	elco		35V
		74.5164	4,7nF	-20/+50%	ceram.	PL	63V

TYPE	NO.	CODE	DATA			
	R2	80.5253	2,2kΩ	5%	carbon	1/8W
	R3	80.5257	4,7kΩ	5%	"	1/8W
	R4	80.5256	3,9kΩ	5%	"	1/8W
	R5	80.5255	3,3kΩ	5%	"	1/8W
	R6	80.5057	4,7kΩ	5%	"	1/10W
	R7	80.5239	150Ω	5%	"	1/8W
	R8	80.5254	2,7kΩ	5%	"	1/8W
	R9	80.5239	150Ω	5%	"	1/8W
	R10	80.5060	8,2kΩ	5%	"	1/10W
	R11	80.5239	150Ω	5%	"	1/8W
	R12	80.5254	2,7kΩ	5%	"	1/8W
	R13	80.5239	150Ω	5%	"	1/8W
EX631	R14	80.5060	8,2kΩ	5%	"	1/10W
EX631	R15	80.5050	1,2kΩ	5%	"	1/10W
	R16	80.5239	150Ω	5%	"	1/8W
	R17	80.5254	2,7kΩ	5%	"	1/8W
	R18	80.5239	150Ω	5%	"	1/8W
	R19	80.5061	10kΩ	5%	"	1/10W
	R20	80.5258	5,6kΩ	5%	"	1/8W
	R21	80.5260	8,2kΩ	5%	"	1/8W
	R22	80.5257	4,7kΩ	5%	"	1/8W
	R23	80.5259	6,8kΩ	5%	"	1/8W
	R24	80.5060	8,2kΩ	5%	"	1/10W
	R25	80.5258	5,6kΩ	5%	"	1/8W
	R26	80.5255	3,3kΩ	5%	"	1/8W
	R27	80.5248	820kΩ	5%	"	1/8W
	R28	80.5253	2,2kΩ	5%	"	1/8W
	R29	80.5061	10kΩ	5%	"	1/10W
	R30	80.5061	10kΩ	5%	"	1/10W
	R31	80.5054	2,7kΩ	5%	"	1/8W
	R32	80.5254	2,7kΩ	5%	"	1/8W
	R33	80.5246	560Ω	5%	"	1/8W
	R34	80.5451	1,5kΩ	5%	"	1/4W
	R35	80.5057	4,7kΩ	5%	"	1/10W
	R36	80.5245	470Ω	5%	"	1/8W
	R37	80.5261	10kΩ	5%	"	1/8W
	R38	80.5248	820Ω	5%	"	1/8W
	R39	80.5233	47Ω	5%	"	1/8W
	R40	80.5245	470Ω	5%	"	1/8W
	R41	80.5241	220Ω	5%	"	1/8W
	R42	89.5021	2,7Ω	5%	metal	1/16W
	R43	80.5449	1 kΩ	5%	carbon	1/4W

EXITER EX63X

X400.698

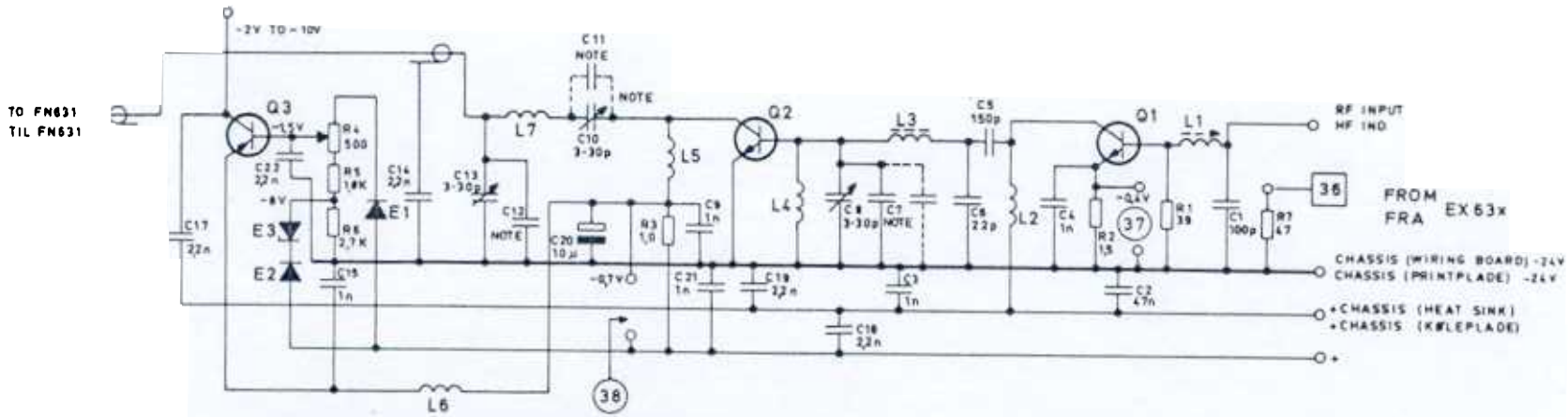
	NO.	CODE	DATA			
	R44	80.5259	6.8kΩ	5%	carbon	1/8W
	R45	80.5260	8.2kΩ	5%	"	1/8W
	R46	80.5265	22 kΩ	5%	"	1/8W
	R47	80.5256	3.9kΩ	5%	"	1/8W
	R48	80.5252	1.8kΩ	5%	"	1/8W
	R49	89.5010	15kΩ	5%	NTC	0,6W
	R50	80.5258	5.6kΩ	5%	carbon	1/8W
	L1	61.825	RF coil/HF-spole 11.3-14.7MHz (C1)			
	L2	61.826	RF coil/HF-spole 11.3-14.7MHz(C5, R6)			
	L3	61.827	RF coil/HF-spole 11,3-14,7MHz(C7, R10, E1)			
	L4	61.828	RF coil/HF-spole 11.3-14.7MHz(C8, C9)			
	L5	61.829	RF coil/HF-spole 11.3-14.7MHz(C10, E2)			
EX631	L6	61.830	RF coil/HF-spole 11.3-14.7MHz(C12, R14 R15, E3			
EX631	L7	61.828	RF coil/HF-spole 11.3-14.7MHz(C13, C14)			
EX631	L8	61.829	RF coil/HF-spole 11.3-14.7MHz(C15, E4)			
	L9	61.831	RF coil/HF-spole 11.3-14.7MHz(C17, C18 R19)			
	L10	61.832	RF coil/HF-spole 11.3-14.7MHz(C21, R24)			
	L11	61.833	RF coil/HF-spole 22.7-29.3MHz(C25, R29)			
	L12	61.834	RF coil/HF-spole 22.7-29.3MHz(C27, R30)			
	L13	61.835	RF coil/HF-spole 68-88MHz (C31)			
	L14	61.836	RF coil/HF-spole 68-88MHz (C33, R35)			
	L15	61.837	RF coil/HF-spole 68-88MHz (C38)			
	L16	61.838	RF coil/HF-spole 68-88 MHz			
	L17	61.839	RF coil/HF-spole 68-88 MHz			
	L18	63.5006	2.2uH Filter coil/Drosselspole 20% 600mA			
	E1	99.5140	Capacitance diode/kapacitetsdiode BA101C			
	E2	99.5140	Capacitance diode/kapacitetsdiode BA101C			
EX631	E3	99.5140	Capacitance diode/kapacitetsdiode BA101C			
EX631	E4	99.5140	Capacitance diode/kapacitetsdiode BA101C			
	E5	99.5136	Diode AA119			
	Q1	99.5118	Transistor BF115			
	Q2	99.5118	Transistor BF115			
	Q3	99.5118	Transistor BF115			
	Q4	99.5139	Transistor BSX19			
	Q5	99.5139	Transistor BSX19			
	Q6	99.5138	Transistor 2N3866			

TYPE	NO.	CODE	DATA

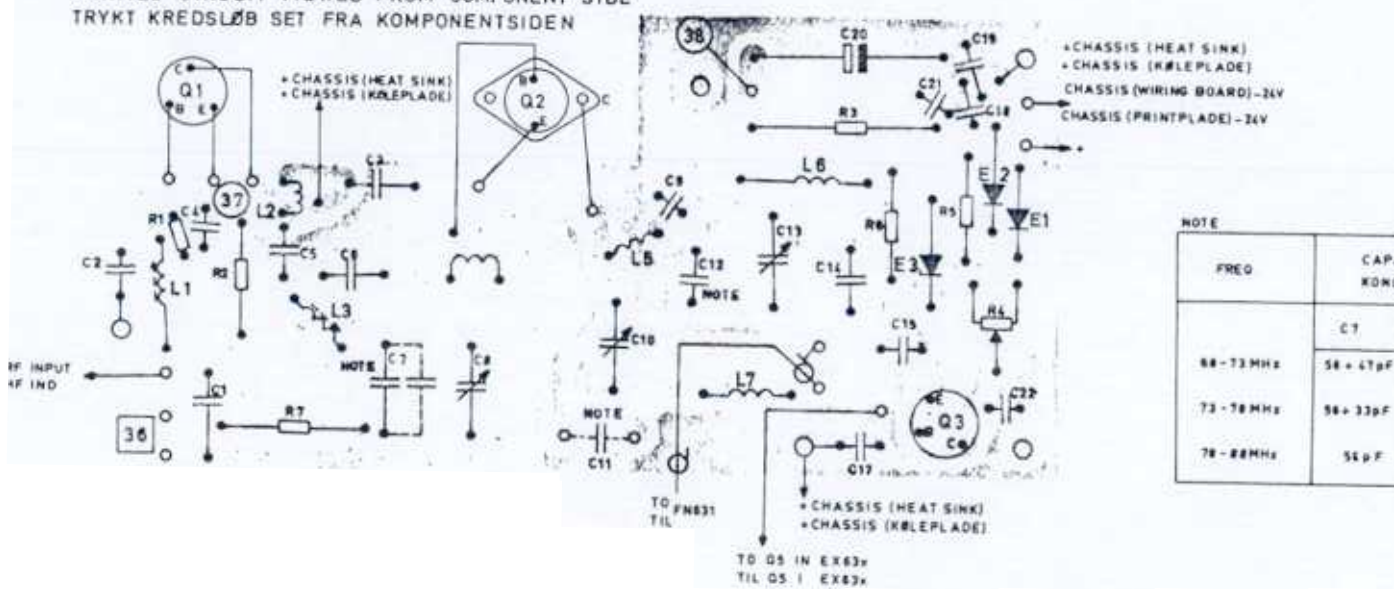
EXITER

X400.698

AMPLIFICATION ADJUSTMENT (TO Q5 IN EX63x)
FORSTÆRKNINGSREGULERING (TIL Q5 I EX63x)



PRINTED CIRCUIT VIEWED FROM COMPONENT SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN



NOTE

FREQ	CAPACITOR VALUES KONDENSATORVÆRDIER		
	C7	C11	C12
68-73MHz	56+47pF	18pF	47pF
73-78MHz	56+33pF	18pF	47pF
78-88MHz	56pF	—	—

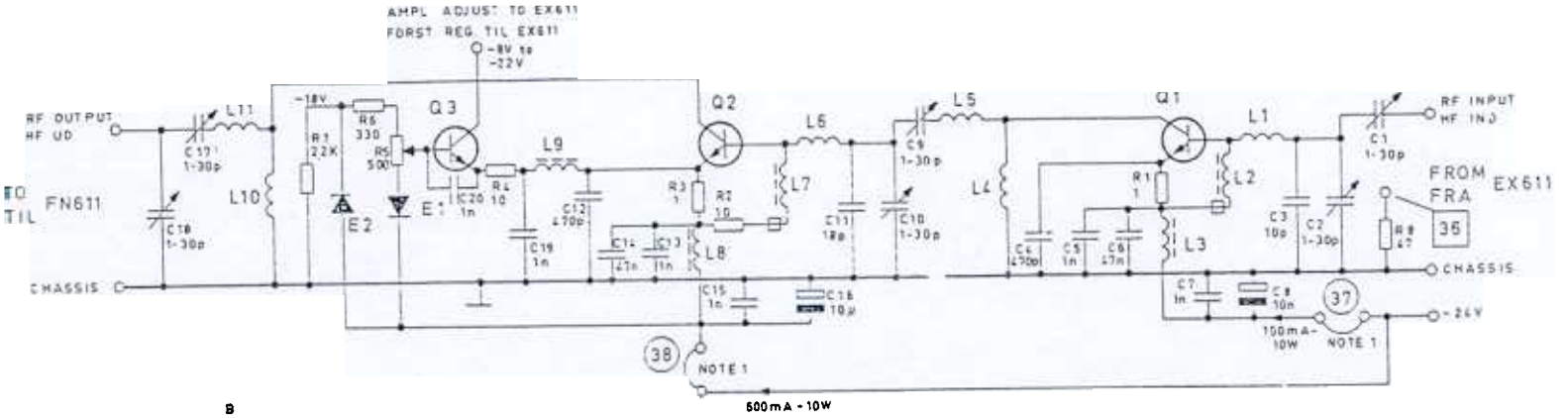
RF-POWER AMPLIFIER
HF-EFFEKTFORSTÆRKER

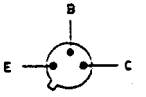
PA631

D400.691/2

Storno

ADC PA DRIVER



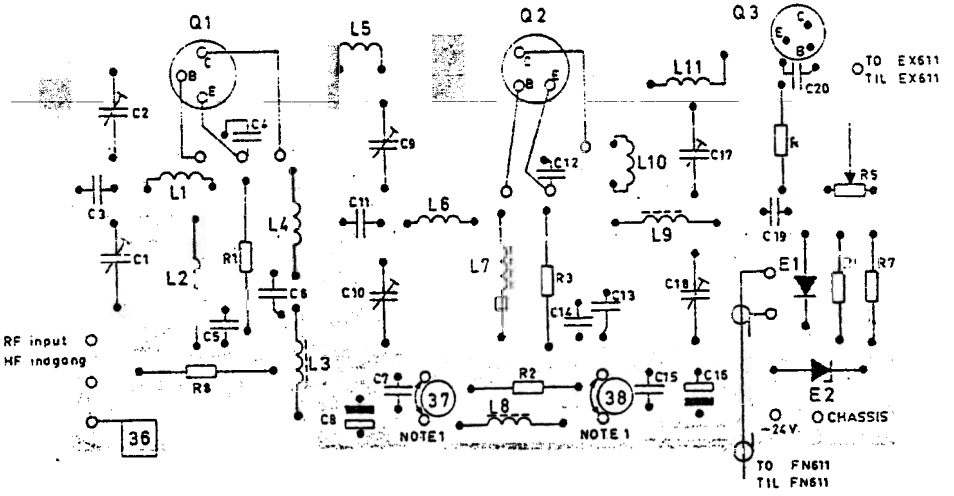


Q1 Q2 Q3
BOTTOM VIEW
SET FRA BUNDEN

NOTE THE SHORT CIRCUITS ARE REPLACED BY mA-INSTRUMENTS DURING ADJUSTMENT.

NOTE KORTSLUTNINGERNE ERSTATTES AF mA INSTRUMENTER UNDER JUSTERING.

PRINTED CIRCUIT SEEN FROM COMPONENT SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN



RF-POWER AMPLIFIER
HF-EFFEKTFORSTÆRKER

PA611

D400.669/2

TYPE	NO.	CODE	DATA	
	C1	74.5165	100pF 10% ceram. N150 PL	63V
	C2	76.5072	47nF 10% polyester FL	50V
	C3	74.5015	1nF -20 +50% ceram. II DI	500V
	C4	74.5155	1nF -20 +50% ceram. II PL	63V
	C5	74.5166	150pF 10% ceram. N750 PL	63V
	C6	74.5106	22pF 0,5% ceram. NO75 TB	250V
	C7	74.5111	56pF 2% ceram. NO75 TB	250V
68-73MHz	C7a	74.5118	47pF 2% ceram. NO75 TB	250V
73-78MHz	C7b	74.5116	33pF 2% ceram. NO75 TB	250V
	C8	78.5029	3-30 pF air trimmer P40	300V
	C9	74.5155	1nF -20 +50% ceram. IIPL	63V
	C10	78.5029	3-30pF air trimmer P40	300V
68-78MHz	C11	74.5142	18pF ±0,5pF ceram. NO75 TB	250V
68-78MHz	C12	74.5116	33pF 2% ceram. NO75 TB	250V
	C13	78.5029	3-30pF air trimmer P40	300V
	C14	74.5093	2,2nF -20 +50% ceram. II DI	500V
	C15	74.5155	1nF -20 +50% ceram. II PL	63V
	C16	74.5163	2,2nF -20 +50% ceram. II PL	63V
	C17	74.5163	2,2nF -20 +50% ceram. II PL	63V
	C18	74.5163	2,2nF -20 +50% ceram. II PL	63V
	C19	74.5163	2,2nF -20 +50% ceram. II PL	63V
	C20	73.5100	10uF -10 +100% elco TB	35V
	C21	74.5155	1 nF -20 +50% ceram. II PL	63V
	R1	80.5232	39 Ω 5% carbon film	1/8W
	R2	89.5025	1,5Ω 10% oxid.	1/4W
	R3	89.5024	1Ω 10% oxid.	1W
	R4	86.5042	500Ω 20% trimmer carbon film	0,1W
	R5	80.5252	1,8K 5% carbon film	1/8W
	R6	80.5254	2,7K 5% carbon film	1/8W
	R7	80.5433	47Ω 5% carbon film	1/8W
	E1	99.5028	Diode OA200	
	E2	99.5028	Diode OA200	
	E3	99.5114	Zenerdiode BZY 57	
	L1	61.804	RF-coil/HF-spole 68-88 MHz	
	L2	63.5008	Filter coil/Drosselspole 0,47uH 20% 2A	
	L3	61.805	RF-coil/HF-spole 68-88 MHz	
	L4	63.5008	Filter coil/Drosselspole 0,47uH 20% 2A	
	L5	63.5008	Filter coil/Drosselspole 0,47uH 20% 2A	
	L6	63.5007	Filter coil/Drosselspole 15 uH 20% 700 mA	
	L7	61.806	RF-coil/HF-spole 68-88 MHz	
	Q1	99.5129	Transistor 2N3553	
	Q2	99.5127	Transistor 2N2947	
	Q3	99.5125	Transistor BCY33	

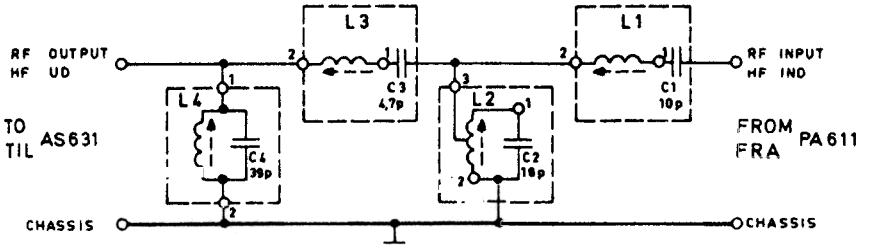
Storno

TYPE	NO.	CODE	DATA

RF-POWER AMPLIFIER
HF-EFFEKTFORSTÆRKER

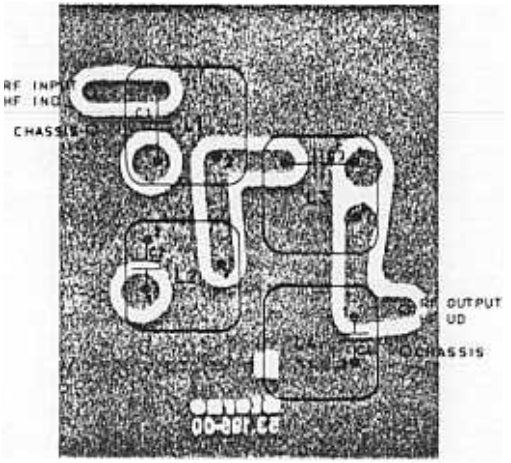
PA631

X400.697/2



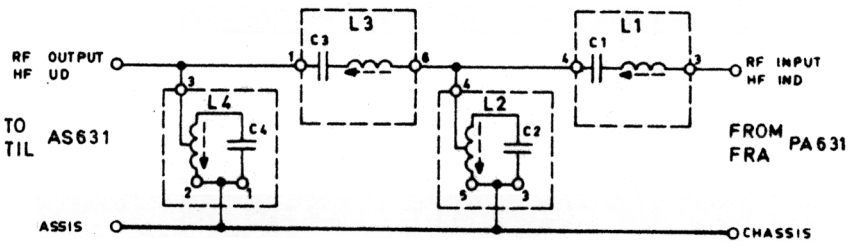
FN611

PRINTED CIRCUIT VIEWED FROM COMPONENT-SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN



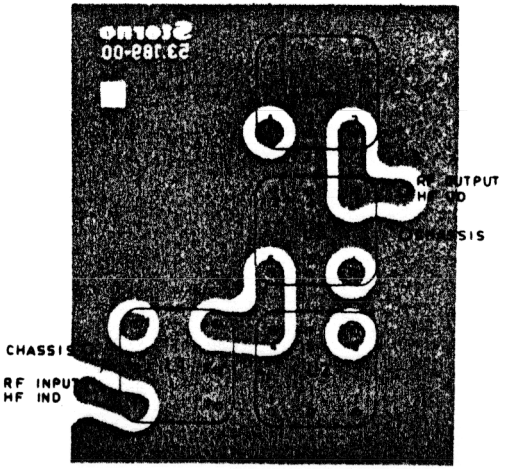
FN611

Storno



FN631

PRINTED CIRCUIT VIEWED FROM COMPONENT SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN



FN631

ANTENNA FILTER
ANTENNE FILTER

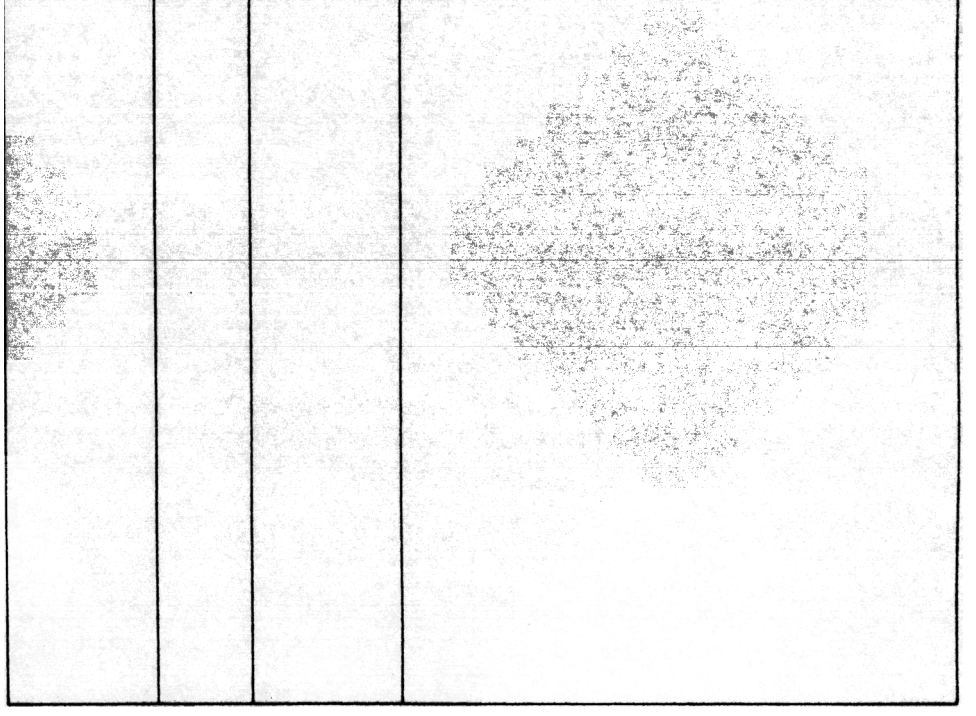
FN611 FN631

D 400.668/2

TYPE	NO.	CODE	DATA
611	C1	74.5135	10pF 5% ceram. N15 DI 125V
631	C1	74.5106	22pF ±0,5pF " NO75 TB 250V
611	C2	74.5138	18pF 5% " N150 DI 250V
631	C2	74.5117	39pF ±2% " NO75 TB 250V
611	C3	74.5131	4,7pF ±0,25pF " N150 DI 250V
631	C3	74.5141	12pF ±0,5pF " NO75 TB 250V
611	C4	74.5117	39pF ±2% " NO75 TB 250V
631	C4	74.5106	22pF ±0,5pF " NO75 TB 250V
611	L1	61.861	Coil/Spole 146-174 MHz (C1)
631	L1	61.807	Coil/Spole 68-88 MHz (C1)
611	L2	61.862	Coil/Spole 146-174 MHz (C2)
631	L2	61.808	Coil/Spole 68-88 MHz (C2)
611	L3	61.863	Coil/Spole 146-174 MHz (C3)
631	L3	61.809	Coil/Spole 68-88 MHz (C3)
611	L4	61.864	Coil/Spole 146-174 MHz (C4)
631	L4	61.810	Coil/Spole 68-88 MHz (C4)

Storno

TYPE	NO.	CODE	DATA

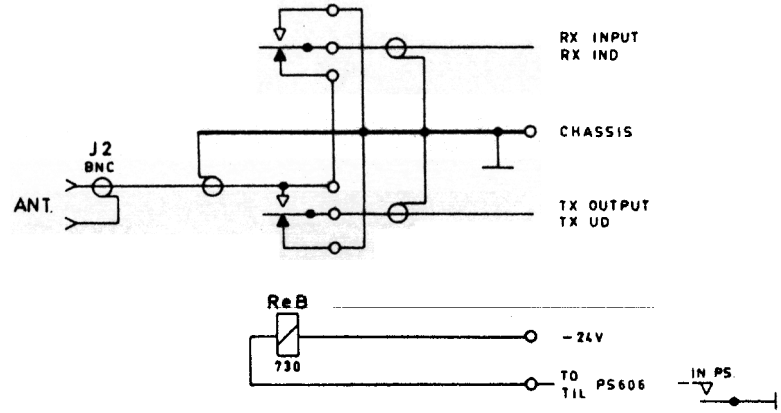


ANTENNA FILTER
ANTENNE FILTER

X400.689

FN611, FN631

Storno



ReB: 58.5063 RELAY/RELÆ 24V 730Ω

ANTENNA SHIFT UNIT
ANTENNE SKIFTEENHED

AS663

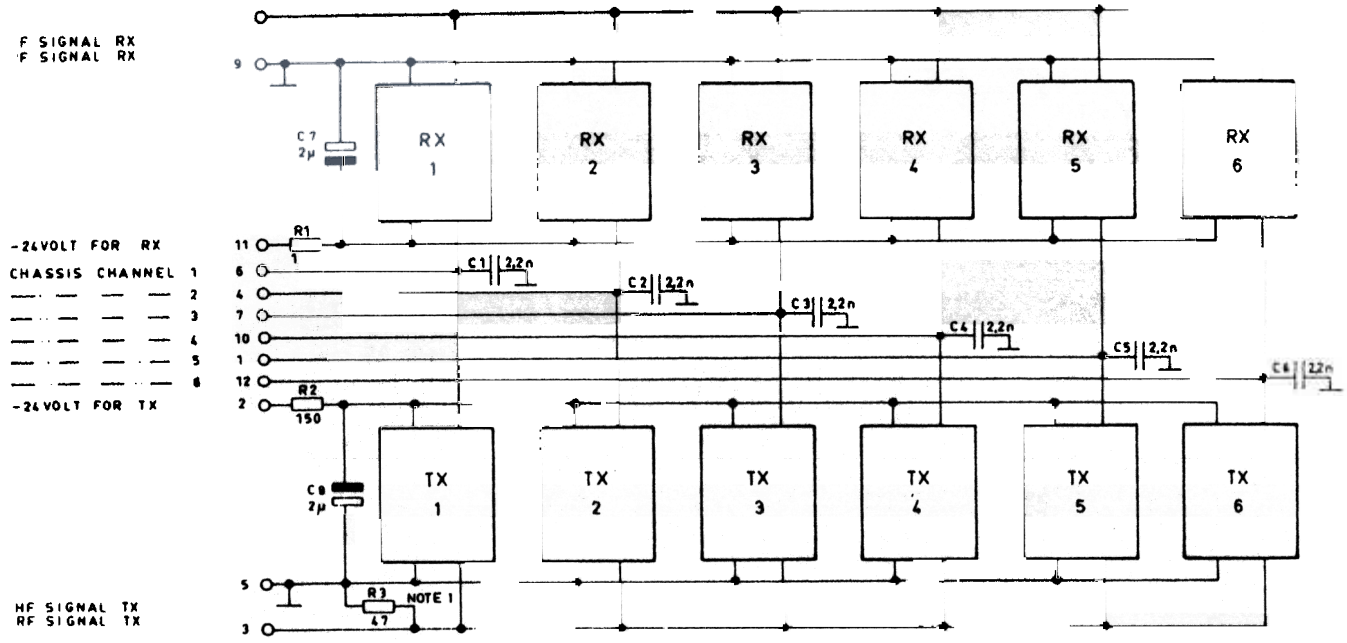
D400.802

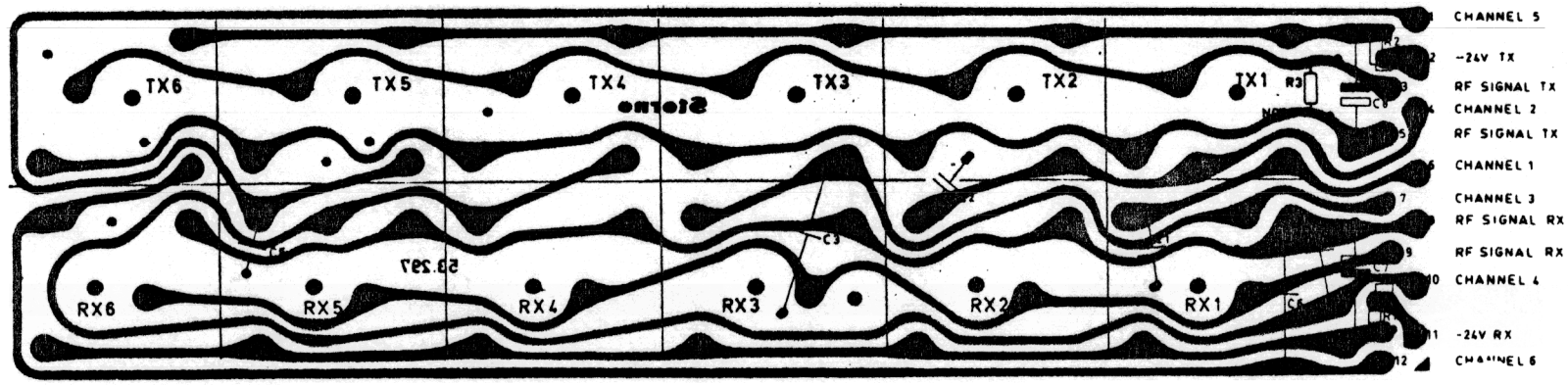
Storno

Storno

NOTE 1 : R3(47Ω) IS ONLY PROVIDED IN CONNECTION WITH TRANSMITTER OSCILLATORS.

R3(47Ω) MONTERES KUN I FORBINDELSE MED SENDEROSCILLATORER.





CRYSTAL SHIFT PANEL
KRYSTALSKIFTEPANEL

XS603

D400.817

TYPE	NO.	CODE	DATA	
	C1	76.5059	2.2 nF 10% polyest. FL	50V
	C2	76.5059	2.2 nF 10% " FL	50V
	C3	76.5059	2.2 nF 10% " FL	50V
	C4	76.5059	2.2 nF 10% " FL	50V
	C5	76.5059	2.2 nF 10% " FL	50V
	C6	76.5059	2.2 nF 10% " FL	50V
	C7	73.5064	2 μF -10/+50% elco TB	70V
	C8	73.5064	2 μF -10/+50% elco TB	70V
	R1	80.5239	150Ω 5% carbon film	1/8W
	R2	80.5239	150Ω 5% " "	1/8W
CQL	R3	80.5033	47 Ω 5% " "	1/10W

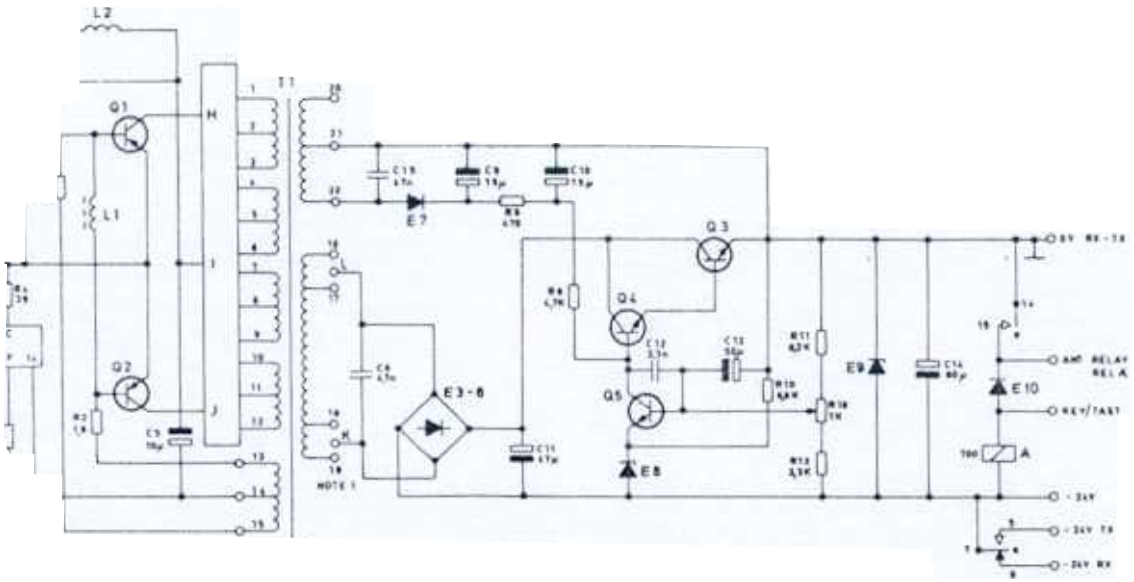
Storno

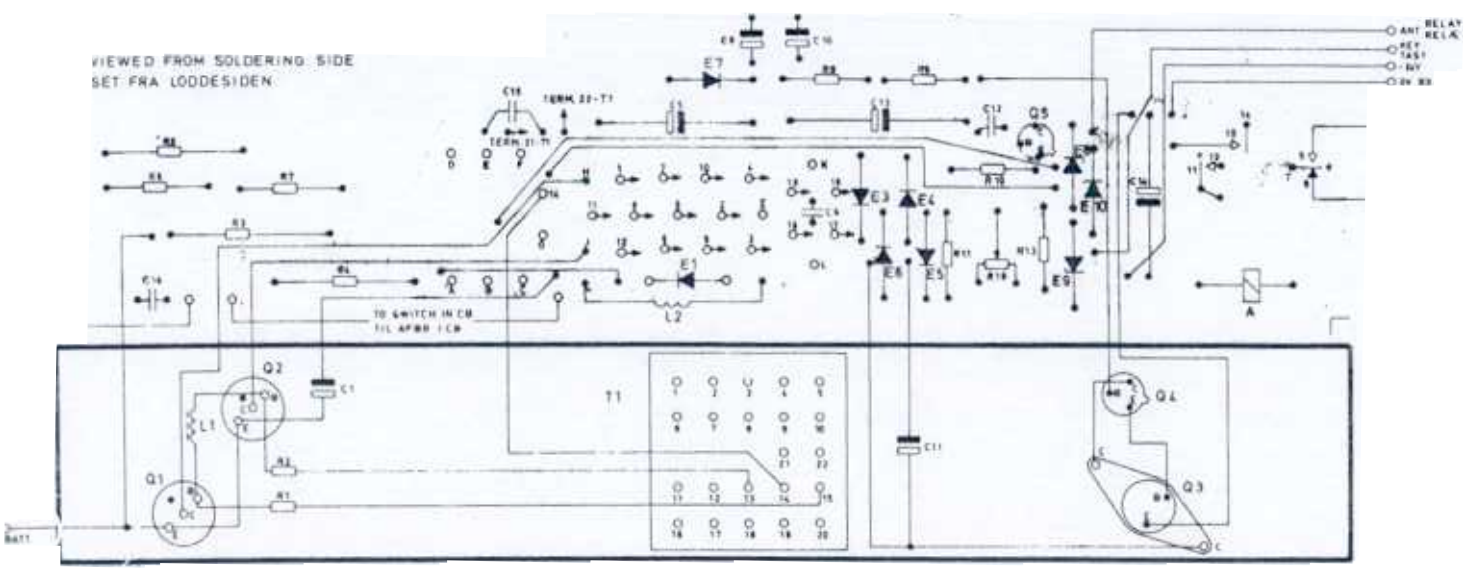
TYPE	NO.	CODE	DATA

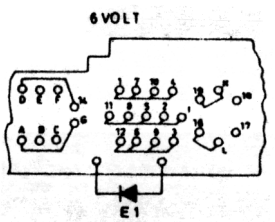
CRYSTAL OSCILLATOR PANEL XS603

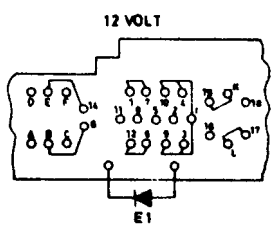
X400.876

Storno











PS 606

D400805

TYPE	NO.	CODE	DATA	
	C1	73.5101	47 µF -10 +100% elco	75/90V
	C5	73.5100	10 µF -10 +100% elco	35V
	C6	76.5061	4.7 nF 10% polyest. FL	50V
	C9	73.5105	15 µF 20% tantal	15V
	C10	73.5105	15 µF 20% tantal	15V
	C11	73.5101	47 µF -10 +100% elco	75/90V
	C12	73.5063	3,3 nF 10% polyest. FL	50V
	C13	73.5030	50 µF -10 +100% elco	25V
	C14	73.5110	80 µF -10 +50% elco	25V
	C15	76.5072	47 nF 10% polyest. FL	50V
	C16	74.5013	100 pF 20% ceram II DI	400V
	R1	84.5022	1,8 Ω 10% wirewound/trådviklet	5W
	R2	84.5022	1,8 Ω 10% wirewound/trådviklet	5W
	R3	84.5019	10 Ω 10% wirewound/trådviklet	5,5W
	R4	81.5032	39 Ω 5% carbon film	1/2W
	R5	81.5031	33 Ω 5% carbon film	1/8W
	R6	80.5437	100 Ω 5% carbon film	1/4W
	R7	80.5441	220 Ω 5% carbon film	1/4W
	R8	80.5257	4,7 kΩ 5% carbon film	1/8W
	R9	80.5245	470 Ω 5% carbon film	1/8W
	R10	80.5259	6,8 kΩ 5% carbon film	1/8W
	R11	80.5260	8,2 kΩ 5% carbon film	1/8W
	R12	86.5058	1 kΩ 20% potm. carb. film lin.	0,1W
	R13	80.5255	3,3 kΩ 5% carbon film	1/8W
	L1	61.803-01	Coil/spole	
	L2	62.750	Coil/spole	
	T1	60.5133	Transformer 6-12-24V/24V	
	ReA	58.5052	Relay/relæ 24V 700 Ω	
	E1	99.5020	Diode 1N4004	
	E3	99.5020	Diode 1N4004	
	E4	99.5020	Diode 1N4004	
	E5	99.5020	Diode 1N4004	
	E6	99.5020	Diode 1N4004	
	E7	99.5020	Diode 1N4004	
	E8	99.5146	Zenerdiode 6,9V 5%	0,275W
	E9	99.5132	Zenerdiode 30V 5%	0,2W
	E10	99.5020	Diode 1N4004	
	Q1	99.5126	Transistor 2N2492	
	Q2	99.5126	Transistor 2N2492	
	Q3	99.5130	Transistor 40251	
	Q4	99.5128	Transistor 2N3053	
	Q5	99.5121	Transistor BC107	

Storno

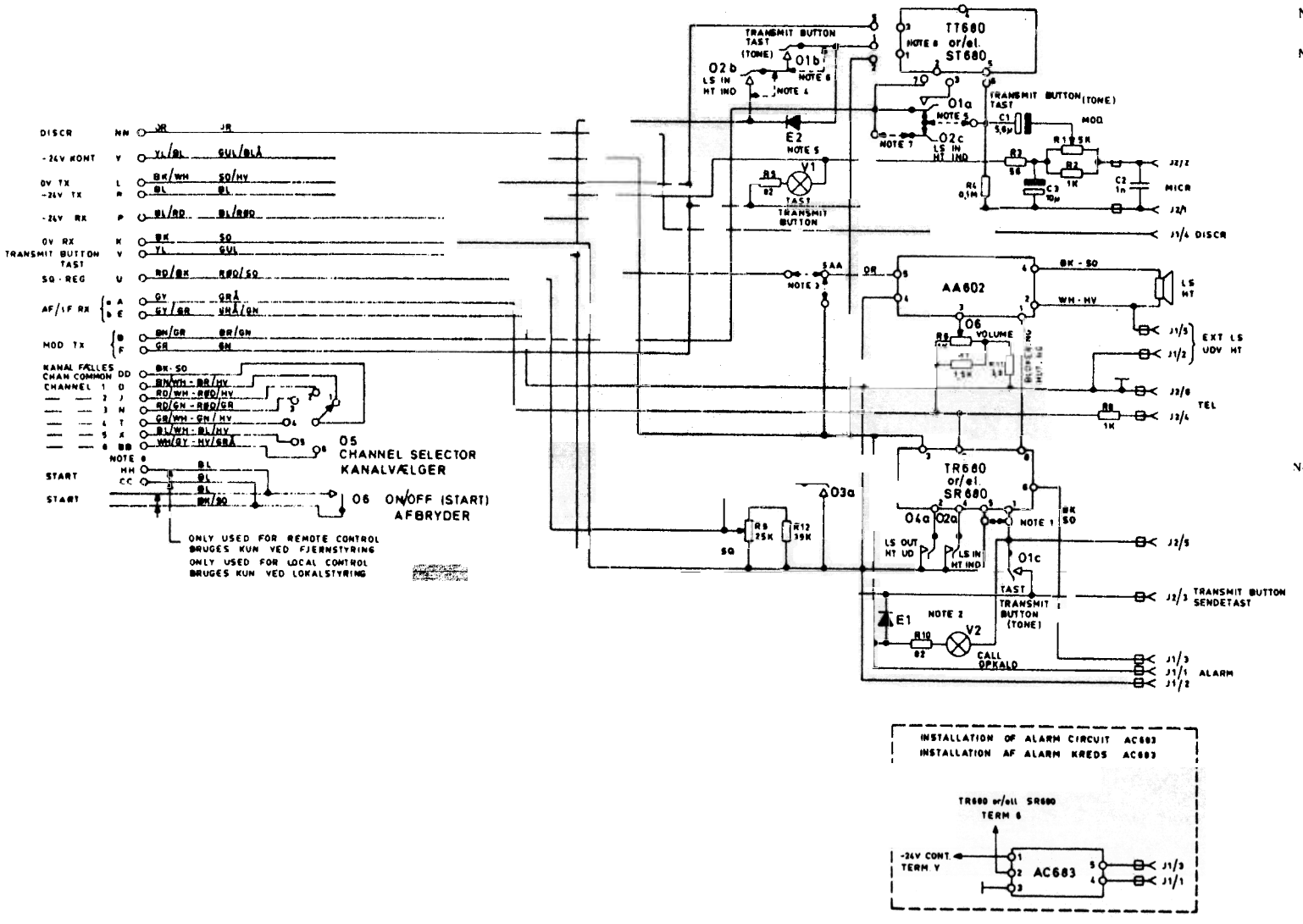
TYPE	NO.	CODE	DATA

POWER SUPPLY UNIT
STRØMFORSYNINGSENHED

PS 606

N400.814

Storno



Note When TR680 or SR680 is installed: Remove strap.
Når TR680 eller SR680 indmonteres, fjernes strapningen.

Note 2. When TR680 or SR680 is installed: Insert lamp V2 and diode E1.
Når TR680 eller SR680 indmonteres, indsættes lampe V2 og diode E1.

When no TR680 or SR680 is installed: Connect term. 5 to term. P.
When TR680 or SR680 is installed: Connect term. 5 to term. Y.
Når TR680 eller SR680 ikke er indmonteret, forbindes term. 5. til term. P.
Når TR680 eller SR680 er indmonteret, forbindes term. 5 til term. Y.

a) When TT680 is used for selective calling and no external transmit button is used (for instance microphone switch or handset key): Remove strap.
When external transmit button is used: Insert strap.
b) When ST680 is used for identification: Insert strap.

a) Når TT680 eller ST680 benyttes til selektive opkald, og der ikke forefindes udvendig sendetast - mikrofontast eller rørtast - fjernes strapningen.
Når udvendig tast benyttes, indføres strapningen.
b) Hvis ST680 benyttes til identifikation, indføres strapningen.

When ST680 is installed: Remove strap and insert diode E2.
Når ST680 indmonteres, fjernes strapningen og diode E2 indsættes.

Note 6. When TT680 is installed:
Connect term. 1 (TT680) to term. 2 (CP601).
Connect term. 2 (TT680) to term. 3 (CP601).
Connect term. 3 (TT680) to term. 1 (CP601).
When ST680 is installed:
Connect term. 1 (ST680) to term. 2 (CP601).
Connect term. 2 (ST680) to term. 7 (CP601).
Connect term. 3 (ST680) to term. 5 (CP601).
Connect term. 4 (ST680) to term. 1 (CP601).
Connect term. 5 (ST680) to term. 6 (CP601).
If ST680 is used for identification: Insert strap across button O1b.

Når TT680 indmonteres:
Forbind term. 1 (TT680) til term. 2 (CP601).
Forbind term. 2 (TT680) til term. 3 (CP601).
Forbind term. 3 (TT680) til term. 1 (CP601).
Når ST680 indmonteres:
Forbind term. 1 (ST680) til term. 2 (CP601).
Forbind term. 2 (ST680) til term. 7 (CP601).
Forbind term. 3 (ST680) til term. 5 (CP601).
Forbind term. 4 (ST680) til term. 1 (CP601).
Forbind term. 5 (ST680) til term. 6 (CP601).
Hvis ST680 benyttes til identifikation indføres strapningen over O1b.

When TT680 is installed and external transmit button is used: Remove strap.
If no external transmit button is used: Insert strap.
Når TT680 indmonteres, og der benyttes udvendig sendetast, fjernes strapningen.
Hvis der ikke benyttes udvendig sendetast, indføres strapningen.

CONTROL PANEL CP601

KONTROL PANEL CP601

D400.82/2

TYPE	NO.	CODE	DATA
	C1	73.5113	5.6µF 20% Tantal 35V
	C2	76.5069	1 nF 10% polystyr FL. 50V
	C3	73.5100	10µF -10/+100% elco 35/40V
	R1	86.5050	5 kΩ 20% potentiometer lin. 0.1W
	R2	80.5249	1 kΩ 5% carbon film 1/8W
	R3	80.5234	56Ω 5% " " 1/8W
	R4	80.5273	0.1MΩ 5% " " 1/8W
	R5	80.5236	82 Ω 5% " " 1/8W
	R6	86.5057	1 kΩ 20% potentiometer log. m. afbryder/with switch 0.25W
	R7	80.5251	1.5 kΩ 5% carbon film 1/8W
	R8	80.5249	1 kΩ 5% " " 1/8W
	R9	86.5044	25 kΩ 20% potentiometer lin. 0.1W
	R10	80.5236	82 Ω 5% carbon film 1/8W
	R11	80.5220	3.9 Ω 5% " " 1/8W
	R12	80.5268	39 kΩ 5% " " 1/8W
	O1, O2 O3, O4	47.448	Push-button section Trykknapprække
	O5	47.5042	Switch (channel) omskifter (kanal)
	V1	92.5003	Lamp/Lampe 24V 25mA BA7
*	V2	92.5003	Lamp/Lampe 24V 25mA BA7
	J1	41.5090	Socket/stikdåse
	J2	41.5091	Socket/stikdåse
*	E1	99.5136	AA119 Diode
* *	E2	99.5020	1N4004 Diode
*	Only installed in connection with tone receiver		
*	Kun installeret i forbindelse med tonemodtager		
* *	Only installed in connection with tone transmitter ST680		
* *	Kun installeret i forbindelse med tonesender ST680		

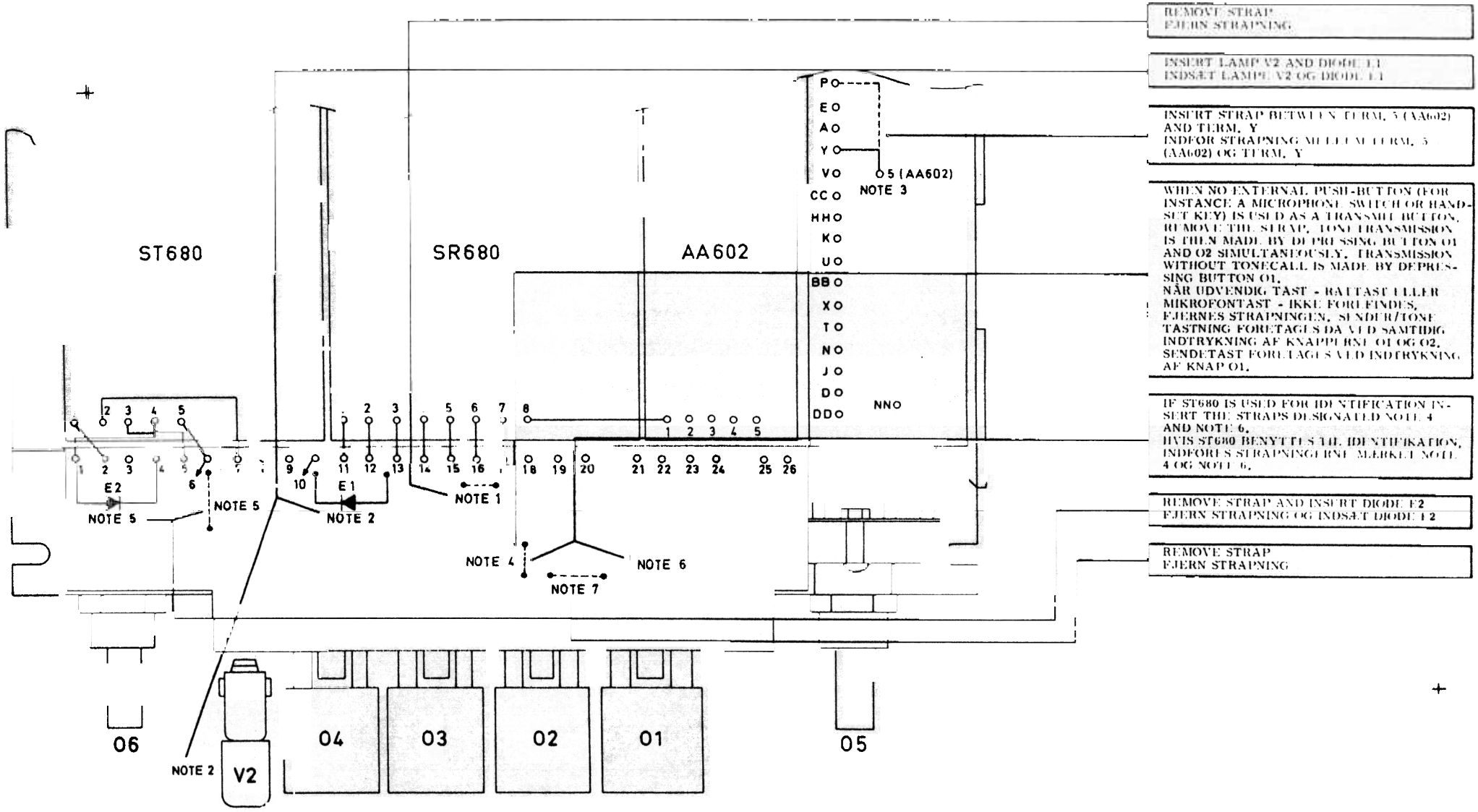
Storno

TYPE	NO.	CODE	DATA

CONTROL PANEL
BETJENINGSPANEL

CP601

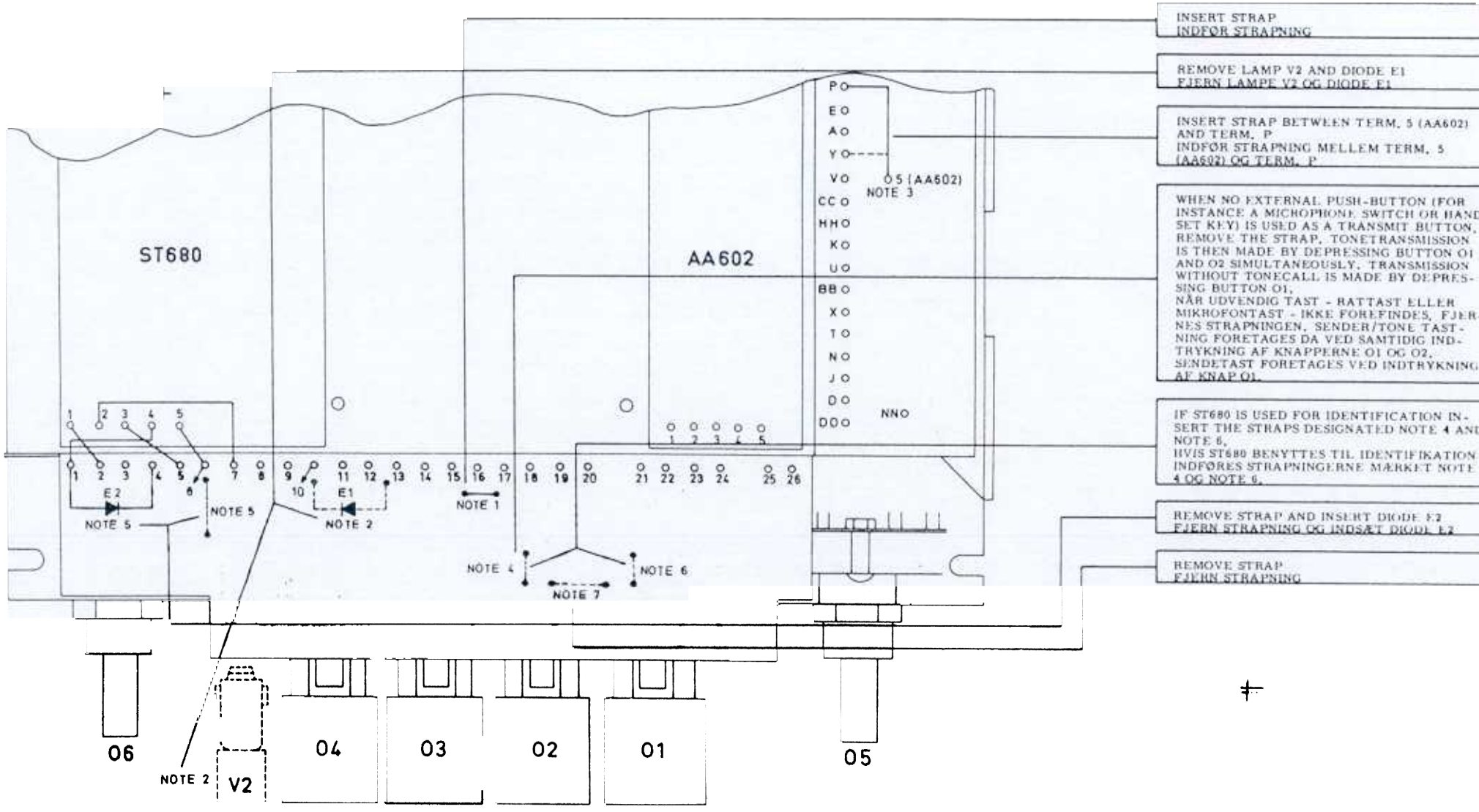
X400.859



INSTALLATION OF SR680 AND ST680 IN CP601.

INDBYGNING AF SR680 OG ST680 i CP601.

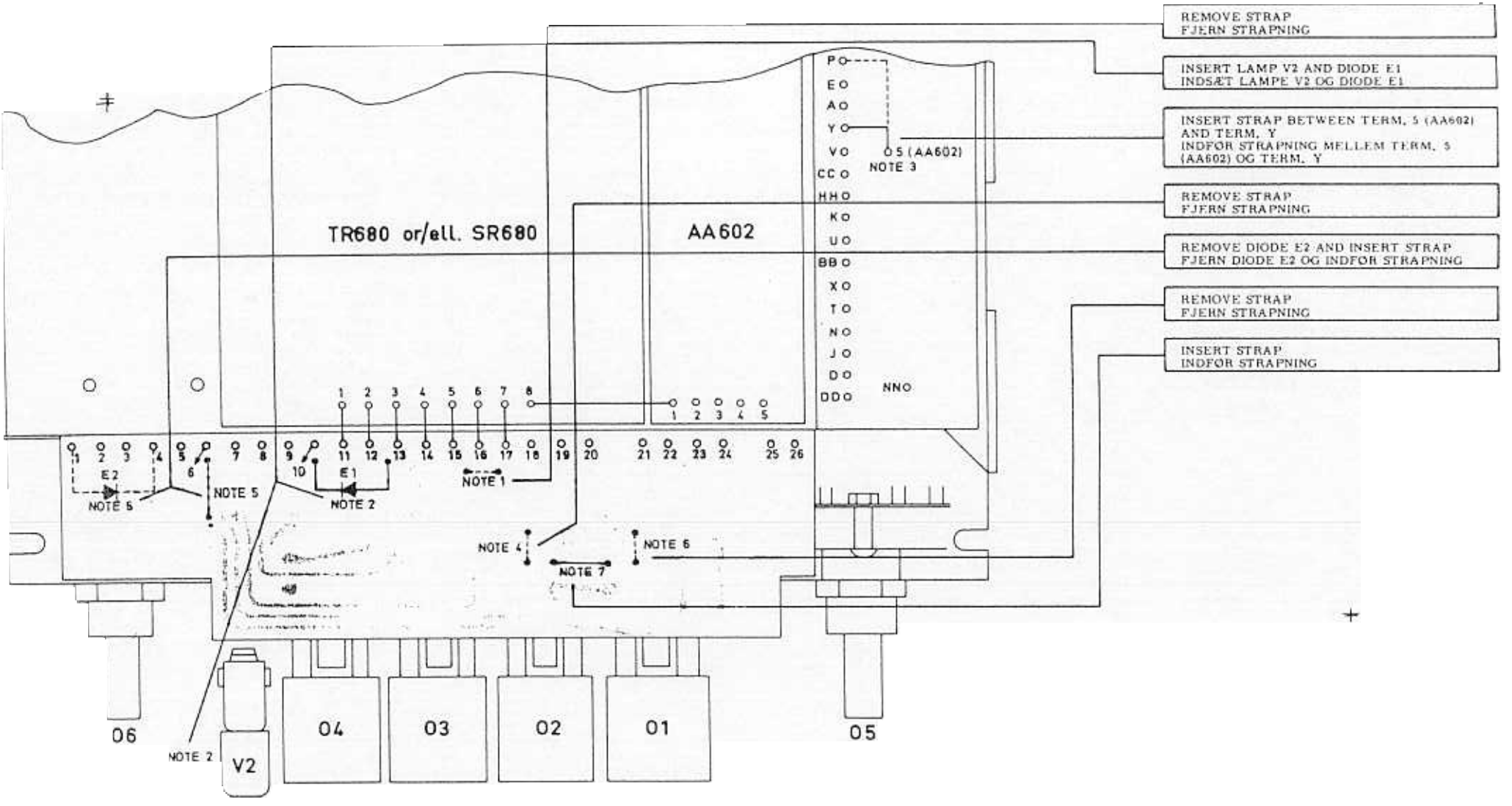
D400.934



INSTALLATION OF ST680 IN CP601.

INDBYGNING AF ST680 i CP601.

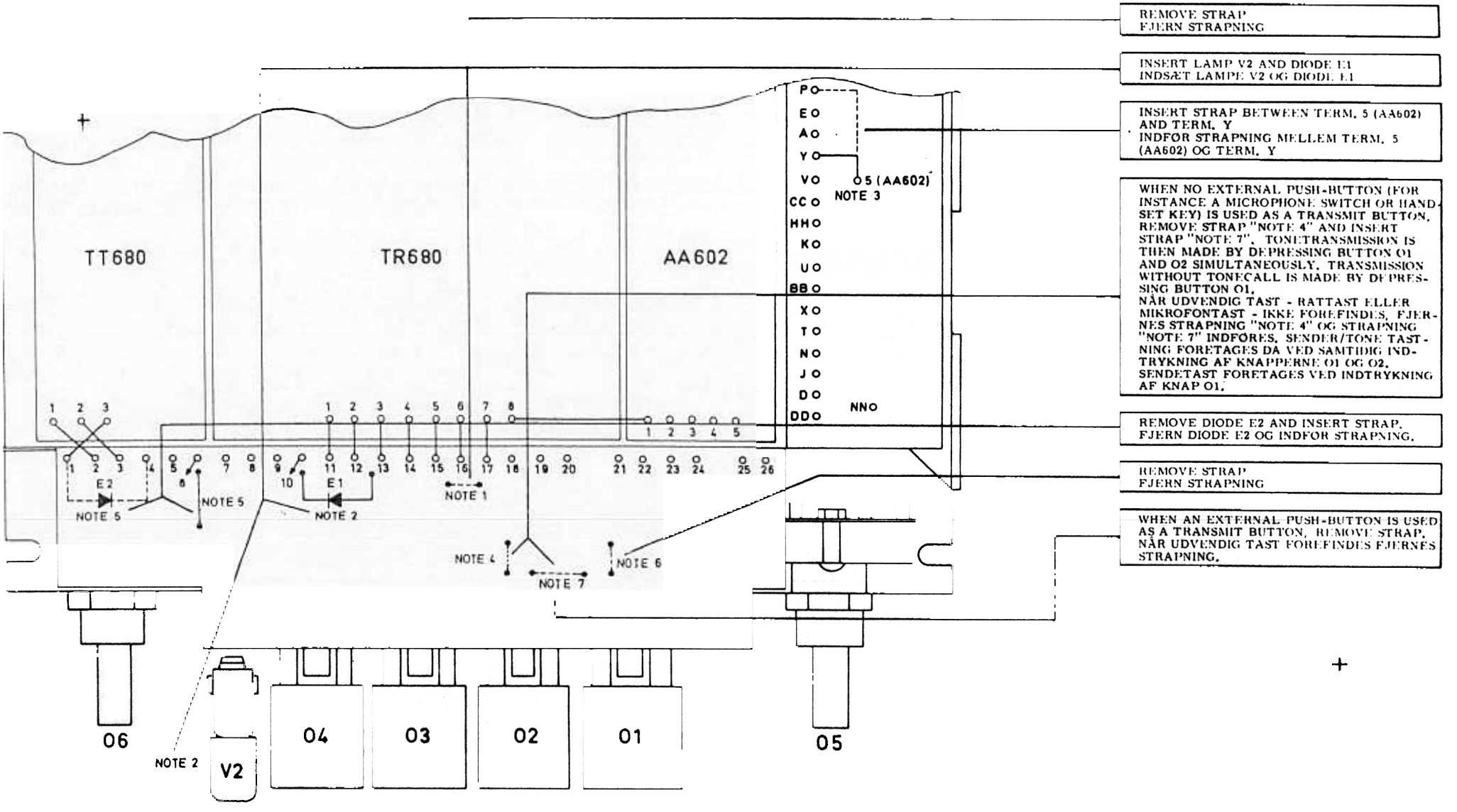
D400.935



INSTALLATION OF TR680 OR SR680 IN CP601.

INDBYGNING AF TR680 ELLER SR680 i CP601.

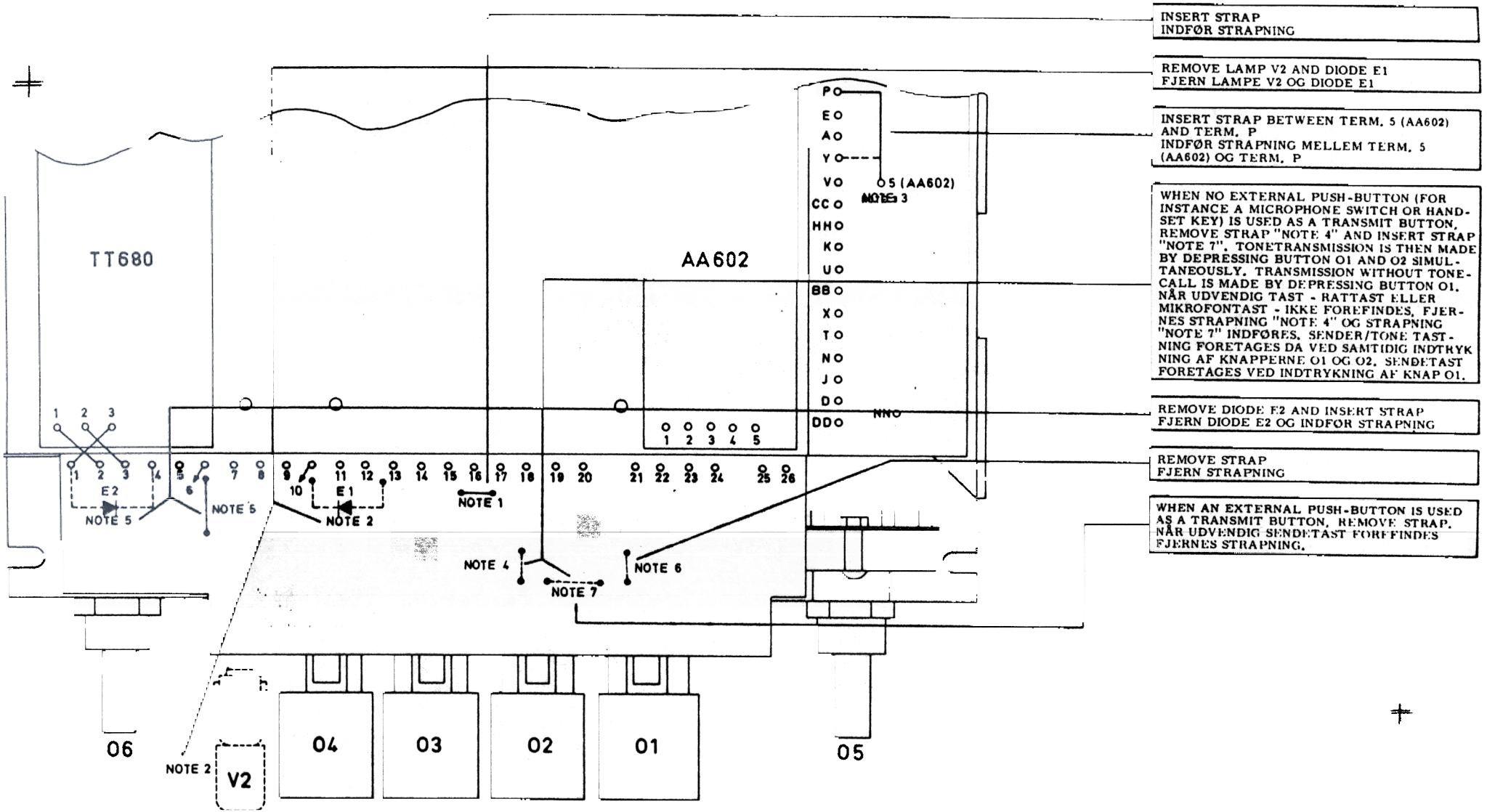
D400.936



INSTALLATION OF TR680 AND TT680 IN CP601.

INDBYGNING AF TR680 OG TT680 i CP601.

D400.937



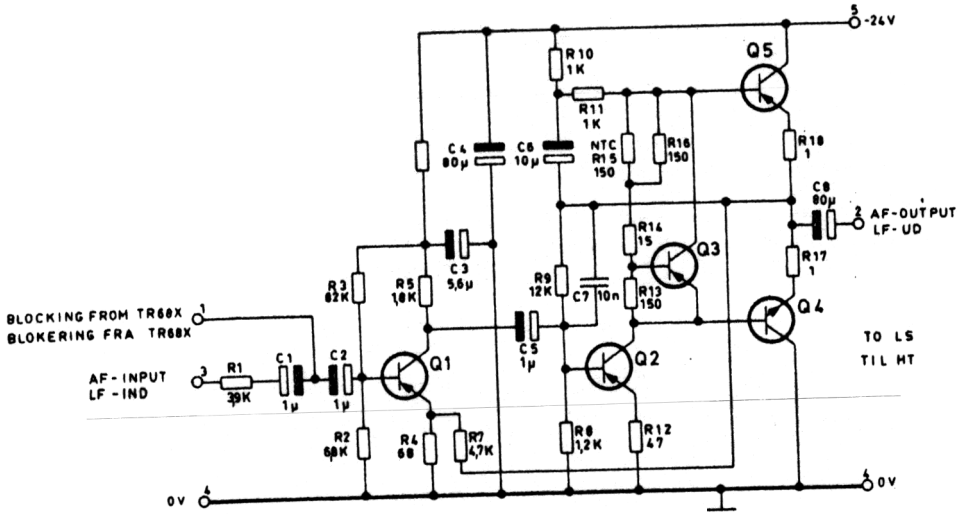
INSTALLATION OF TT680 IN CP601.

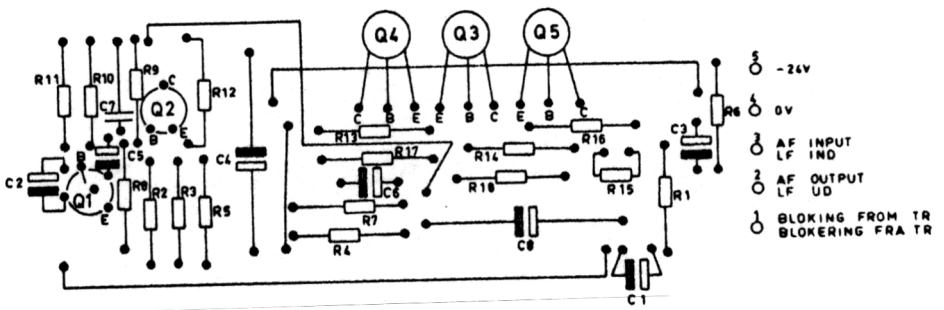
INDBYGNING AF TT680 i CP601.

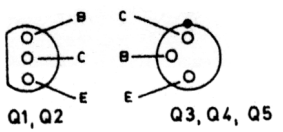
D400.938

12

Storno







BOTTOM VIEW
SET FRA BUNDEN

AF-AMPLIFIER
LF-FORSTÆRKER

AA602a

D400.836

Storno

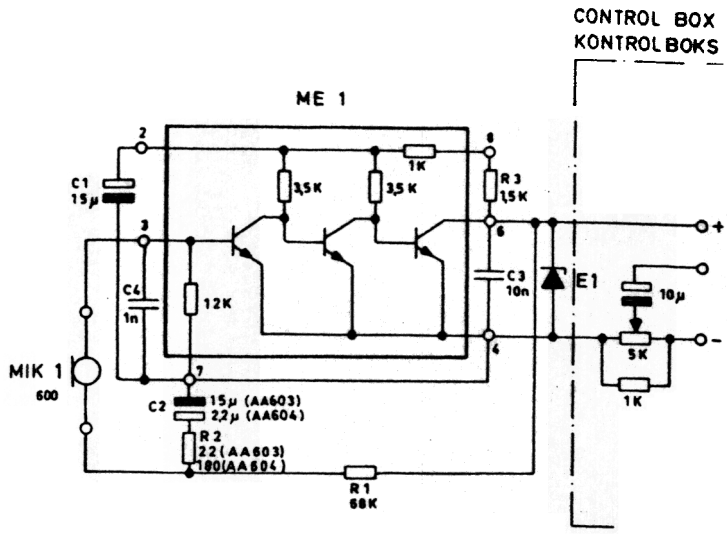
TYPE	NO.	CODE	DATA	
	C1	73.5114	1uF 20% tantal	30V
	C2	73.5114	1uF 20% tantal	30V
	C3	73.5113	5,6uF 20% tantal	35V
	C4	73.5110	80uF -10/+50% elco	25V
	C5	73.5114	1uF 20% tantal	30V
	C6	73.5109	10uF 20% tantal	15V
	C7	76.5052	10nF 10% polyest. FL	50V
	C8	73.5110	80uF -10/+50% elco	25V
	R1	80.5256	3,9k 5% carbon film	1/8W
	R2	80.5259	6,8k 5% carbon film	1/8W
	R3	80.5272	82k 5% carbon film	1/8W
	R4	80.5235	68Ω 5% carbon film	1/8W
	R5	80.5252	1,8k 5% carbon film	1/8W
	R6	80.5252	1,8k 5% carbon film	1/8W
	R7	80.5257	4,7k 5% carbon film	1/8W
	R8	80.5250	1,2k 5% carbon film	1/8W
	R9	80.5262	12k 5% carbon film	1/8W
	R10	80.5249	1k 5% carbon film	1/8W
	R11	80.5249	1k 5% carbon film	1/8W
	R12	80.5233	47Ω carbon film	1/8W
	R13	80.5239	150Ω 5% carbon film	1/8W
	R14	80.5227	15Ω 5% carbon film	1/8W
	R15	89.5029	150Ω 10% NTC	0,6W
	R16	80.5239	150Ω 5% carbon film	1/8W
	R17	80.5213	1Ω 5% carbon film	1/8W
	R18	80.5213	1Ω 5% carbon film	1/8W
	Q1	99.5144	Transistor 2N3702	
	Q2	99.5144	Transistor 2N3702	
	Q3	99.5106	Transistor AC125	
	Q4, Q5	99.5165	Transistor AC176/128	

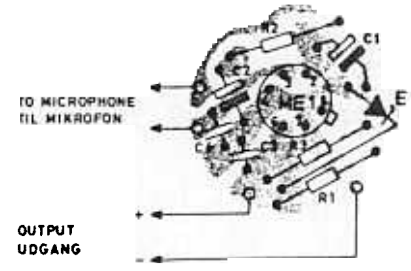
TYPE	NO.	CODE	DATA

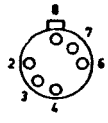
AF OUTPUT AMPLIFIER
LF UDGANGSFORSTÆRKER

AA602a

X400.677/3



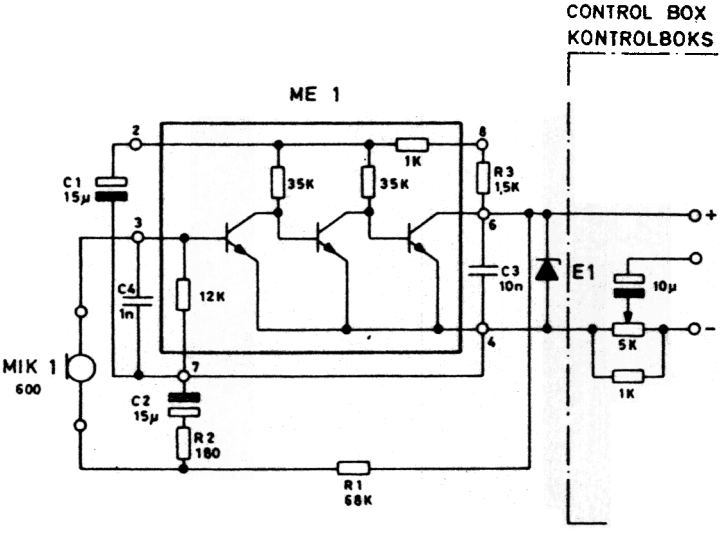


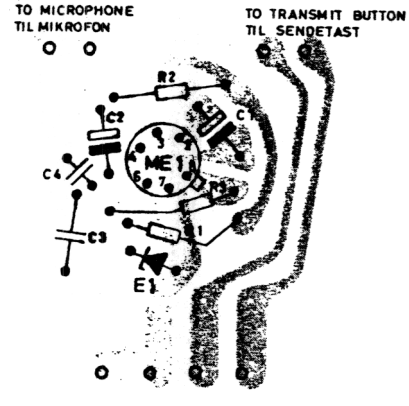


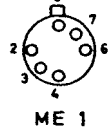
TOP VIEW
SET FRA TOPPEN

ME 1

AA603, AA604







TOP VIEW
SET FRA TOPPEN

ME 1

AA606

AF-AMPLIFIER
LF-FORSTÆRKER

AA603, AA604, AA606

Storno

TYPE	NO.	CODE	DATA	
	C1	73.5105	15 µF 20% tantal	15V
AA603	C2	73.5105	15 µF 20% tantal	15V
AA604	C2	73.5102	2.2 µF 20% tantal	35V
AA606	C2	73.5105	15 µF 20% tantal	15V
	C3	76.5070	1 nF 10% polyest FL	50V
	R1	80.5271	68 kΩ 5% carbon film	1/8W
AA603	R2	80.5229	22 Ω 5% " "	1/8W
AA604	R2	80.5240	180 Ω 5% " "	1/8W
AA606	R2	80.5240	180 Ω 5% " "	1/8W
	R3	80.5251	1.5 kΩ 5% " "	1/8W
	E1	99.5042	Zenerdiode 9,1V 5%	
	ME1	14.5001	LF-forstærker 65 dB 40 mW AF-Amplifier	

Storno

TYPE	NO.	CODE	DATA

AF-AMPLIFIER
LF-FORSTÆRKER

AA603, AA604, AA60

X400.909