FAST RADIOSTATION

MODEL STORNOPHONE 600

TYPE CQF611
TYPE CQF612
TYPE CQF613
TYPE CQF614

} - 6455/1

med

PS680-6551

146 . . . 174 MHz

Storno

FAST RADIOSTATION
MODEL STORNOPHONE 600

TYPE CQF611
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} **-6455/1** med

med

PS680-6551

146 ... 174 MHz

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TECHNICAL SPECIFICATIONS

A. General

Frequency Range

146-174 MHz.

Channel Spacing and Frequency Swing

TYPE	CQF611	CQF612	CQF613	CQF614
Min. channel spacing	50 kHz	25 kHz	20 kHz	12.5 kHz
Max. frequency swing	±15 kHz	±5 kHz	±4 kHz	±2.5 kHz

Type of Operation

Simplex or duplex.

Modulation

CQF611, CQF612, CQF613: Phase-modulated telephony in the range 300 to 3000 Hz.
CQF614: Phase-modulated telephony in the range 300 to 2600 Hz.

Frequency Stability

Meets government specifications.

Total Channel Bandwidth

Simplex: 1 MHz.
Duplex: 0.5 MHz.

Antenna Impedance

50 ohms nominal.

Number of RF Channels

Maximum 2 or 12.

Operation

Control equipment type CAF600 or control box CB601.

Supply Voltage

220/240V AC, 50 Hz, or 12/24 DC, depending on the power supply unit employed.

Power Consumption

Depends on the power supply unit and control equipment employed. See under power supply data.

Supply Voltage for Radio Units

-24V ±2.5%.

Ambient Temperature

Working range: -25°C to +50°C.
Function range: -30°C to +60°C.

Dimensions

Station cabinet CA602: 550mm x 365mm x 135mm.

Weight

Depends on whether the station is for simplex or duplex operation and on the type of power supply unit employed.
A simplex station less control panel and power supply unit weighs 19.2 kilos.
A duplex station less control panel and power supply unit weighs 21.2 kilos.
To this must be added the weight of the power supply unit:

220V power supply for 25W station, type PS602: 6.2 kilos.
220V power supply for 10W station, type PS603: 4.8 kilos.
12/24V power supply for 10W station, type PS604: 1.3 kilos.
24V voltage regulator for 10/25W station, type PS605: 0.5 kilos.

B. Transmitter

RF Output
10 watts or 25 watts.

Crystal Frequency Calculation

$$\text{Crystal frequency} = \frac{\text{signal frequency}}{12}$$

ADC Circuit
Automatic drive control circuit which protects the transmitter against damage due to short circuits or absence of antenna loading.

Spurious and Harmonic Radiation
Less than 2 x 10^{-7} watts.

Adjacent-channel Interference
Attenuated to meet government specifications.

AF Input Impedance
600 ohms.

Modulation Sensitivity
Nominal 110mV for 70% of maximum permissible frequency swing at 1000 Hz.

Modulation Response
CQF611, CQF612, CQF613: 6 dB/octave pre-emphasis characteristic from 300 to 3000 Hz, +0.5dB/2.0dB relative to 1000 Hz.

CQF614: 6dB/octave preemphasis characteristic from 300 to 2500 Hz, +0.5dB/-2.0dB relative to 1000 Hz.

By performing a restrapping operation the modulation response can be altered to 6dB/octave from 300 to 1000 Hz and flat in the range 1000-3000 Hz for CQF611, CQF612, and CQF613, and from 1000 to 2500 Hz for CQF614.

Modulation Distortion
Max. 7% at 70% of maximum permissible frequency swing and 1000 Hz (measured without 750 μsec network in the standard receiver used for making the measurement).

Modulation Limiting
The modulation signal can be increased from -17 dBm to +3 dBm without exceeding the permissible frequency swing.

FM Hum and Noise
CQF611: Min. 45 dB
CQF612: Min. 40 dB
CQF613: Min. 40 dB
CQF614: Min. 38 dB
(measured without 750 μsec network in the standard receiver used for making the measurement).

Current Consumption
At 10 watts: 1.0A.
At 25 watts: 2.9A.

Dimensions
275mm x 180mm x 38mm.

Weight
1.8 kilos.

C. Receiver

Maximum input signal for 12 dB SINAD:

TYPE	CQF611	CQF612	CQF613	CQF614
μV e.m.f.	0.6	0.5	0.5	0.5

Input signal for obtaining 20 dB signal-to-noise ratio:

TYPE	CQF611	CQF612	CQF613	CQF614
μV e.m.f.	0.8	0.7	0.7	0.8

Squelch Sensitivity
CQF611, CQF612, CQF613: 0.4μV e.m.f.
CQF614: 0.3μV e.m.f.

Intermediate Frequency
1st intermediate frequency: 10.7 MHz.
2nd intermediate frequency: 455 kHz.

Technical Specifications

Crystal Frequency Calculation

	CQF611, CQF612, CQF613, CQF614 with oscillator XO611		CQF612 with oscillator XO662	
Band, MHz	146-160	156-174	146-160	156-174
Crystal freq., MHz	$\frac{fs + 10.7}{3}$	$\frac{fs - 10.7}{3}$	$\frac{fs + 10.7}{12}$	$\frac{fs - 10.7}{12}$

fs = signal frequency.

Modulation Acceptance Bandwidth

EQUIPMENT	CQF611	CQF612	CQF613	CQF614
Max. frequency swing	± 15 kHz	± 5 kHz	± 4 kHz	± 2.5 kHz
Min. 6dB bandwidth	± 16 kHz	± 8 kHz	± 6 kHz	± 3.8 kHz

Adjacent Channel Selectivity

CQF611, CQF612: 85dB (EIA measuring method).

CQF613: 75dB (FTZ measuring method)

CQF614: ± 10.2 kHz (GPO measuring method)

Spurious Response Attenuation

CQF611, CQF612, CQF613: Min. 85 dB.
CQF614: Min. 75 dB.

Intermodulation Attenuation

CQF611, CQF612, CQF613: Min. 70 dB (EIA measuring method).
CQF614: 58 dB (GPO measuring method).

Blocking

Conforms to government specifications.

Spurious and Harmonic Emissions

Less than 0.5nW (0.5×10^{-9}W). FTZ measuring method.

AF Output Impedance

600 ohms ± 20% measured at frequencies in the range 300-3000 Hz).

AF Load Impedance

Nominal 600 ohms.

AF Power Output

2 mW.

AF Distortion

CQF611, CQF612, CQF613: 3%.
CQF614: 4%.

AF Response

CQF611, CQF612, CQF613: 6dB/octave from 300 to 3000 Hz +0/-2 dB relative to 1000 Hz.
CQF614: 6dB/octave from 300 to 3000 Hz +0/-2.5dB relative to 1000 Hz.

Hum and Noise

Measured in unsquelched condition according to EIA measuring method.
CQF611: 45 dB.
CQF612, CQF613, CQF614: 40 dB.

Current Consumption

In unsquelched condition: Max. 40 mA.

Dimensions

275mm x 180mm x 38mm.

Weight

1.8 kilos.

Data for power supply units are listed in Chapter II (description of power supply units).

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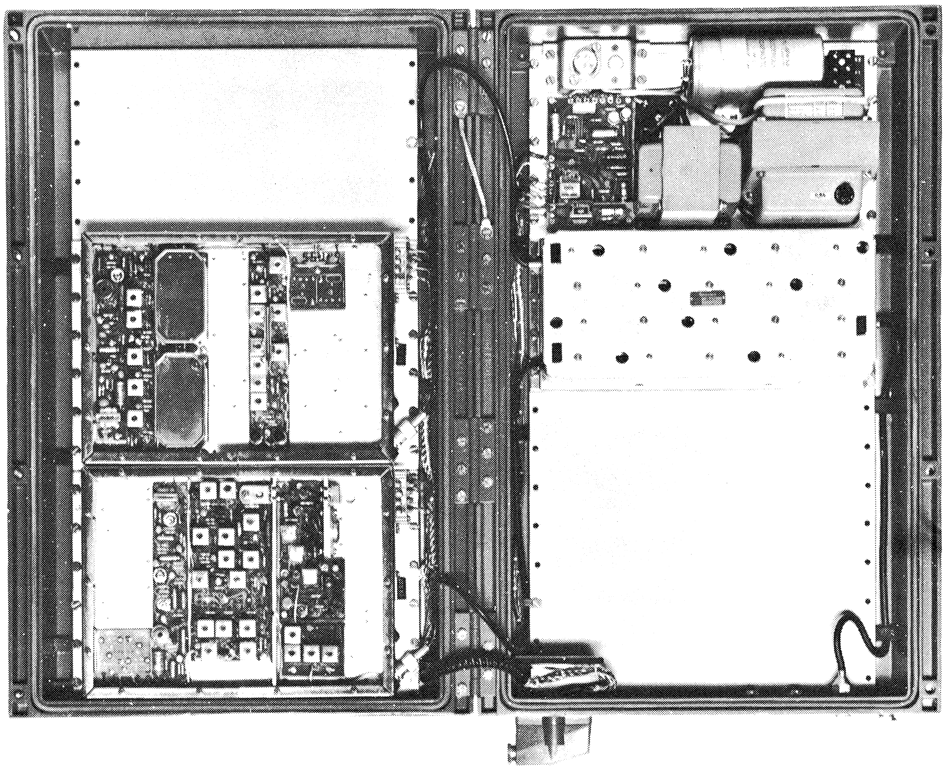
CHAPTER I. GENERAL DESCRIPTION

A. Construction



Introduction

The fixed VHF-FM radio station, Type CQF600, is a transmitter/receiver combination. It employs a type of modular construction that has enabled STORNO to offer a wide range of station types. These can be supplied, inside the frequency bands available, with 50, 25, 20, and 12.5 kHz channel spacing, for either simplex or duplex operation, or as a repeater station, and with either 10 or 25 watts of RF output. The equipments can be supplied for operation from either 220 volts AC or 12/24 volts DC supply voltage.

Various types of control systems a available for controlling the radio station, with facilities for repeater function, selective calling, etc.

Control equipment (if any) supplied with the station is covered by a separate manual.

The radio station fully meets the specifications of the authorities of a number of countries, hence also the requirements of the British GPO standard and the American EIA standard for land-mobile radio communication.

This manual is intended as a guide to the installation, maintenance, and adjustment of the radio station, and every effort has been made to provide, through text and circuit diagrams, an adequate description of its circuitry, construction, and mode of operation.

However, because we at STORNO are constantly processing the experience we acquire during the production, testing, and operation of our radiotelephones, minor modifications and corrections will be made continually. These will be listed on a supplement and amendment sheet, inserted as the first page of this manual.

If your radiotelephone is a special version, the necessary descriptions of modifications are compiled in a supplement which is placed first in the standard description whilst the associated circuit diagrams and parts lists are placed last in the manual.

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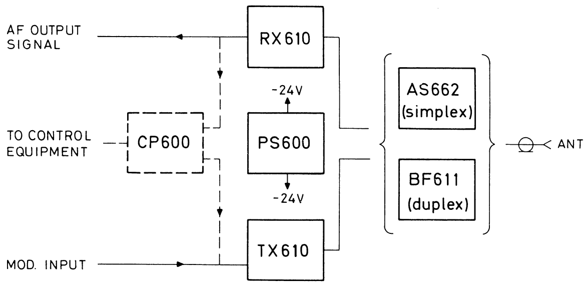
Chapter I. General Description

Standard Versions



This manual covers the following types of equipment:

CQF611: 146-174 MHz, 50 kHz channel spacing
CQF612: 146-174 MHz, 25 kHz channel spacing
CQF613: 146-174 MHz, 20 kHz channel spacing
CQF614: 146-174 MHz, 12.5 kHz channel spacing.

These equipments are composed of the following units:

TYPE OF STATION	CQF611	CQF612	CQF613	CQF614
RECEIVER	RX611	RX612	RX613	RX614
TRANSMITTER:				
10 watts	TX611			TX614
25 watts	TX615			TX618
POWER SUPPLY				
220V AC	PS602, used in stations with 25-watt transmitter			
220V AC	PS603, used in stations with 10-watt transmitter			
12/24V DC	PS604, used in stations with 10-watt transmitter			
Voltage Regulator Δ) 20-28V DC	PS605, used in stations with 10- or 25-watt transmitter			
ANTENNA SWITCHING UNIT	AS662, used in simplex stations			
DUPLEX FILTER	BF611, used in duplex stations			

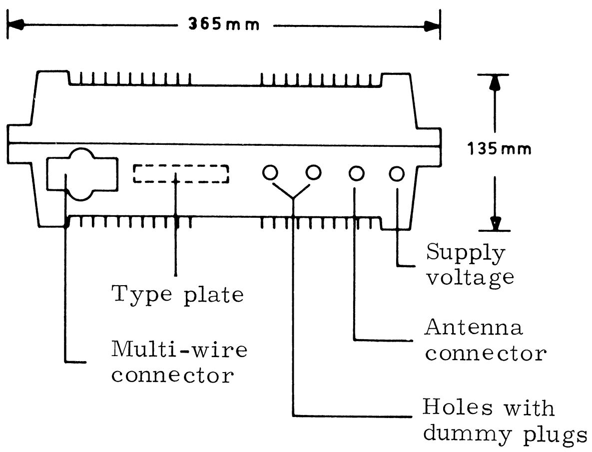
(Δ Voltage regulator PS605 is used in conjunction with an emergency power supply in which the operating voltage is supplied from a charger and buffer batteries.

Construction

The units of the radio station are contained in a pressure diecast cabinet, type CA602. This consists of two sections - a front section and a rear section which are held together by four hinges in the left side of the cabinet and locked with four screws in the opposite side. A rubber packing between the two cabinet sections prevents any ingress of moisture into the equipment.

The outside surface of the cabinet is ribbed in order to drain away heat from the equipment.

At the bottom of the rear wall are a multi-wire connector which accepts a control cable, and an antenna connector and a supply-cable feedthrough.



Also provided are two holes with dummy plugs. These holes are to accomodate additional antenna connectors in cases where more than one antenna is to be used with the station.

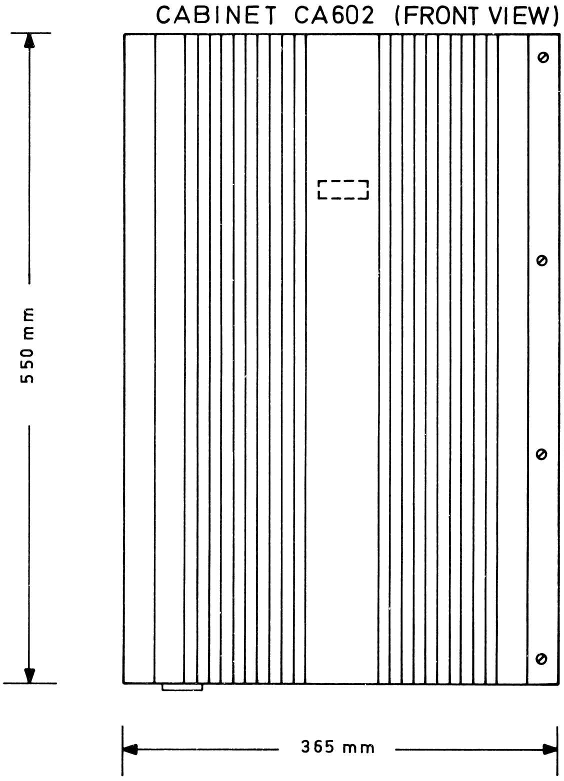
The interior of the cabinet provide space for all units of the station. The transmitter unit and receiver unit, both housed in screen boxes, are bolted to the inner side of the front section, which also houses a group switching relay in equipment employing between 8 and 12 channels.

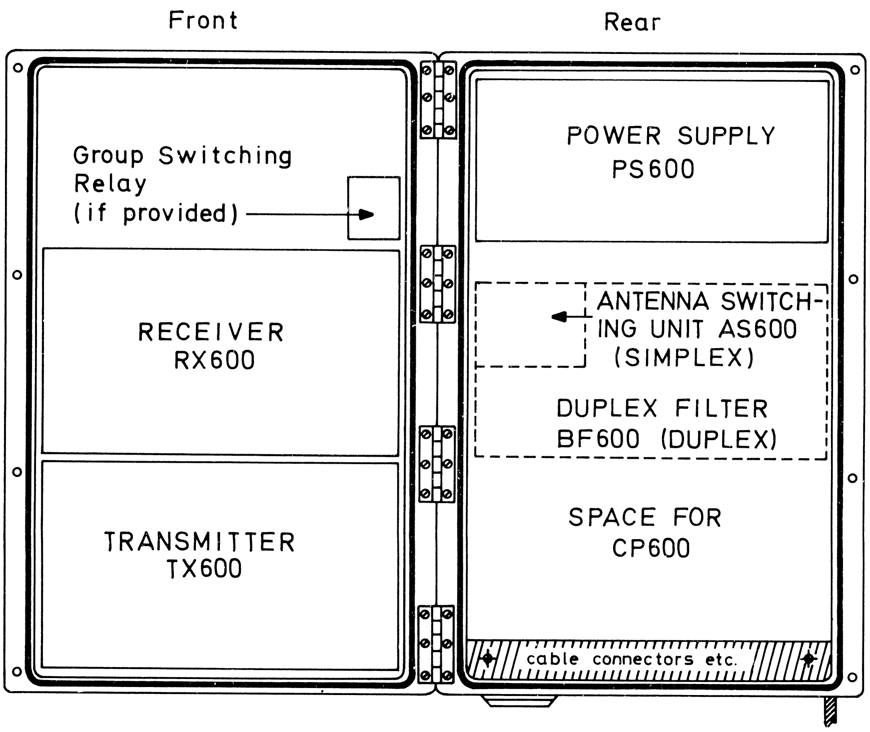
The rear section contains the power supply unit and the antenna switching unit or duplex filter, depending on whether the station is for simplex or duplex operation. Space is also provided for installation of a control panel, type CP600.

Both the transmitter and receiver sections are composed of a number of modular units which are built on printed wiring boards and bolted into position side by side in their respective screen boxes.

Some of the components of the power supply unit are placed on a printed wiring board. This board and the large components of the power supply are mounted on a metal chassis which is bolted to the cabinet.

All RF connectors in the radio station are type BNC connectors except for the antenna connector which is a type N connector.



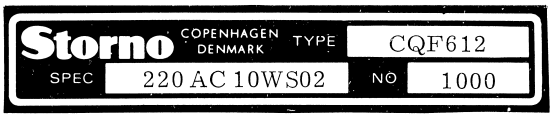


Type Designations and Specifications

A type plate at the bottom of the cabinet rear wall carries the type designation, chief specifications, and serial number of the station. The type designation states the frequency band and channel spacing of the station, as mentioned above.

The specification lists the following data:

Supply voltage (220 AC, 24 DC, or 12 DC)
Maximum RF power output (10W or 25W)
Type of operation (S = simplex, D = duplex).
The maximum number of channels that can be provided in the station (2 or 12).



Where no distinction between radiotelephones with different channel spacings is necessary, the following description will employ a common designation for the different types of equipment.

For example, equipments CQF611, CQF612, CQF613, and CQF614 will be included under the common designation of CQF610. Similarly, the common designation TX610 will be used for all transmitters, and RX610 will be used for all receivers.

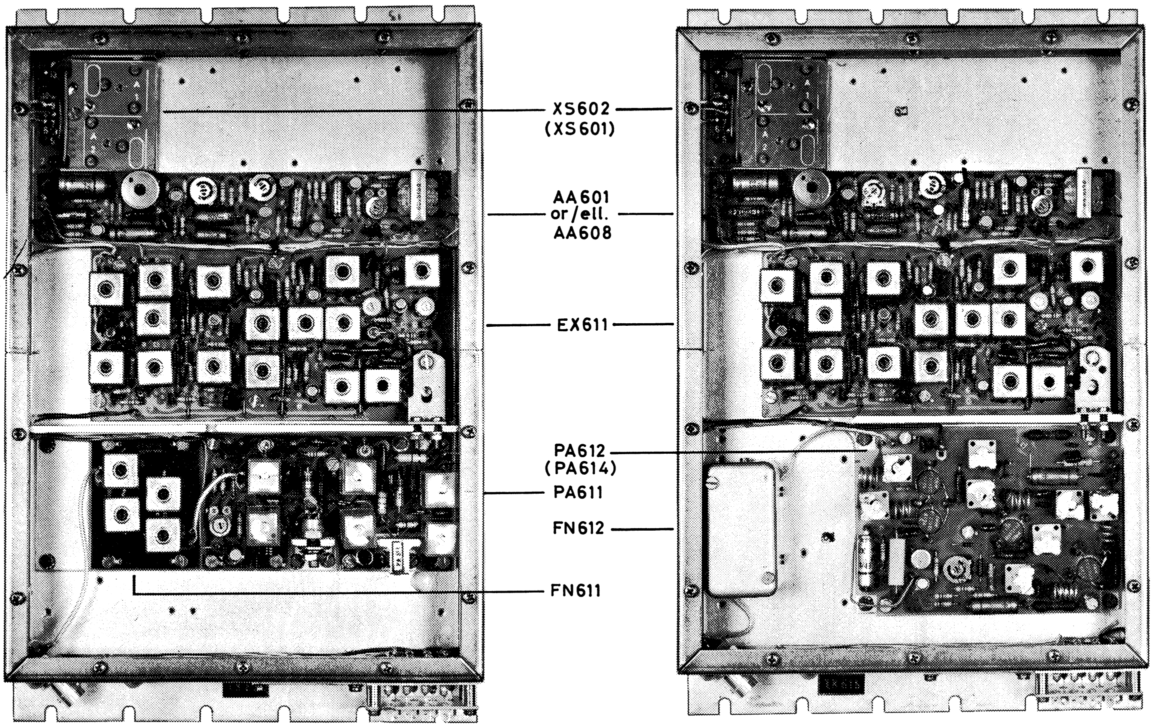
Placement

The radio station is intended for wall mounting, and various types of brackets for this purpose are available. However, other methods of mounting may be used if care is taken to provide adequate cooling and sufficient room to permit opening the cabinet cover so that the units of the station will become accessible.

The chapter "INSTALLATION" contains additional information about mounting of the radio station and the accessories required for this purpose.

CHAPTER II. THEORETICAL CIRCUIT ANALYSIS

A. Transmitters



TX611, TX614 TX615, TX618

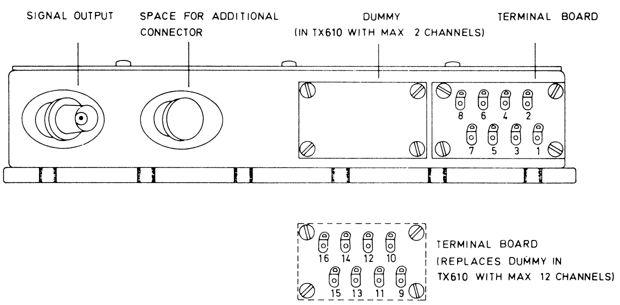
General

The transmitter model TX610 is the designation of a group of transmitters comprising types TX611, TX614, TX615, and TX618 for use in the frequency band 146-174 MHz with different channel spacings and with either 10 or 25 watts of RF power output.

The transmitters are phase modulated on the fundamental frequency. The maximum number of crystal oscillators is usually two - one for each frequency channel - but provision can be made for installing additional crystal oscillators, with 12 as the maximum possible number of channels.

The transmitter is housed in a closed metal box carrying on its outside a coaxial connector, from which the output signal is taken off, and terminals for the transmitter cabling which connects, via feedthrough filters, to the respective circuits inside the screen box.

The top of the screen box can be removed on loosening a number of screws in it, providing access to the transmitter circuits.

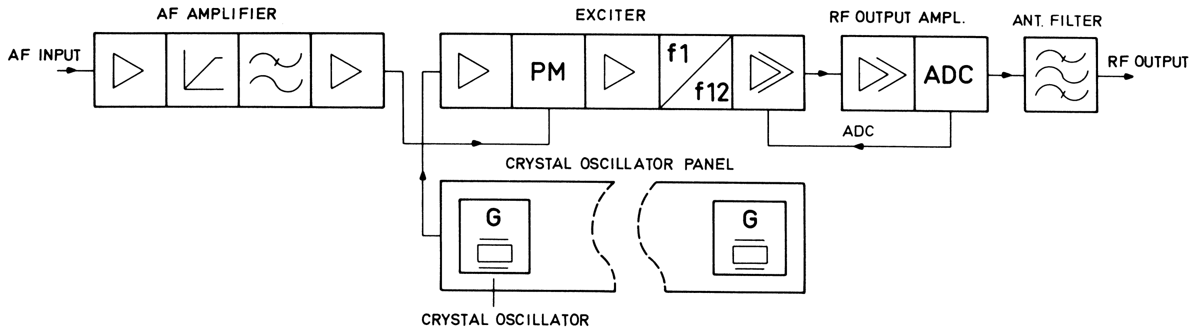


The transmitter is divided into a number of sub-units each of which is built on printed wiring boards. The division follows practical and logical lines, the aim being to make the transmitter easily accessible for adjustment and repairs.

The chart on next page lists the various types of transmitters and their sub-units.

TRANSMITTER TYPE	TX611	TX614	TX615	TX618
Channel Spacing	50, 25, 20 kHz	12.5 kHz	50, 25, 20 kHz	12.5 kHz
RF Output	10 W	10 W	25 W	25 W
SUB-UNITS				
AF Amplifier	AA601	AA608	AA601	AA608
Crystal Oscillator(s)	XO631/XO665	XO631	XO631/XO665	XO631
Crystal Oscillator Panel	XS601/XS602	XS601/XS602	XS601/XS602	XS601/XS602
Exciter	EX611	EX611	EX611	EX611
RF Power Amplifier	PA611	PA611	PA614/PA612	PA614/PA612
Antenna Filter	FN611	FN611	FN612	FN612

Sub-units



AF Amplifiers AA601 and AA608

This unit is the transmitter AF section. It serves the purpose of differentiating, clipping, integrating, and filtering and amplifying the modulation signal before it is applied to the phase modulator in the exciter which follows it.

AA601 is used in transmitters with 20, 25, and 50 kHz channel spacing. AA608 is used in transmitters with 12.5 kHz channel spacing.

Crystal Oscillator Units XO631 and XO665

The crystal oscillator is housed in a screen box. It is a plug-in unit for placement on the transmitter crystal-oscillator panel. The transmitter is provided with an oscillator unit for each frequency channel.

The two types of crystal oscillators are used as specified below:

In transmitters with 50 kHz channel spacing: XO631

In transmitters with 25 kHz channel spacing: XO631 or XO665 depending on government specifications

In transmitters with 20 kHz spacing: XO631

In transmitters with 12.5 kHz channel spacing: XO631.

Crystal Oscillator Panels XS601 and XS602

The crystal oscillator panel is intended for connection of the crystal oscillator units.
Oscillator panel XS601 accomodates a maximum of 12 crystal oscillator units.
Oscillator panel XS602 accomodates a maximum of 2 crystal oscillator units.

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Chapter II. Theoretical Circuit Analysis

Exciter EX611

In the exciter, the oscillator signal is amplified and phase modulated and thereafter undergoes twelve times frequency multiplication and power amplification.

RF Power Amplifiers PA611 and PA614/PA612

The RF power amplifier steps up the output of the exciter to the desired power output level - 10 watts for PA611 and 25 watts for PA612.

The RF power amplifier also incorporates an ADC circuit (automatic drive control circuit).

Antenna Filters FN611 and FN612

The antenna filter serves the purpose of attenuating spurious and harmonic emissions.

Type FN611 is used in 10-watt transmitters.
Type FN612 is used in 25-watt transmitters.

The following pages contain a detailed description of the circuits of the individual sub-units and their specifications.

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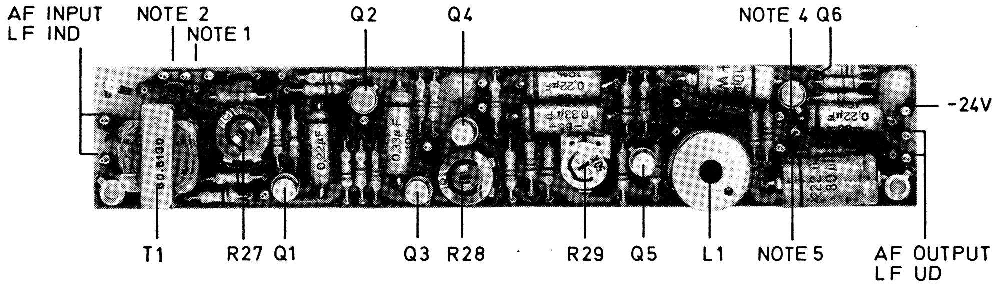
Audio Amplifiers AA601 and AA608



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

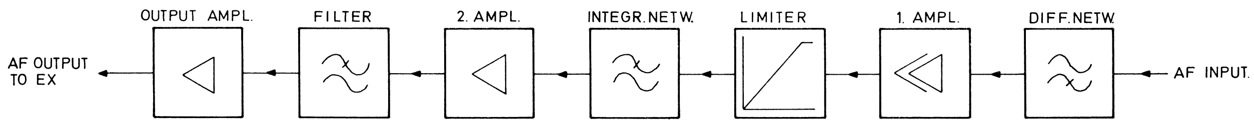
Differentiating Network

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-



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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.

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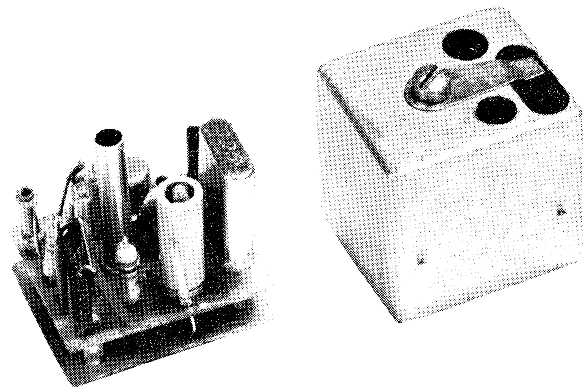
Transmitter Oscillator Unit X0631



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 μV.

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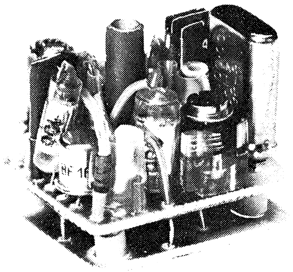
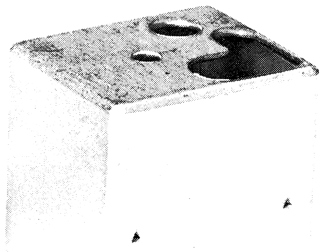
Transmitter Oscillator Unit XO665





Transmitter oscillator unit XO665 is a crystal-controlled parallel-resonant oscillator for use in the frequency range 11.33 MHz to 14.66 MHz. It is built on a double wiring board and is a totally enclosed plug-in unit.

The XO665 plugs into a crystal oscillator panel which has pins mating with sockets on the oscillator unit.

Mode of Operation

The oscillator is of the Colpitts type. It is started up by connecting the CHANNEL SHIFT terminal to chassis through the channel selector. A diode in series with the -24V supply lead prevents any flow of undesired current in the unit during receive periods. The oscillator signal is fed via the crystal oscillator panel to the RF input terminal of the exciter. A capacitance diode E2, biased by a temperature-dependent voltage, compensates for frequency variations at high and low temperatures. The temperature compensation is provided by applying two independent voltages to capacitance diode E2, one of these voltages which is varying within the entire temperature range is applied to E2 through R8 from the voltage divider R3, R4.

The other voltage which is only varying at high and low temperatures is applied to the capacitance circuit via R7 from voltage divider R1, R2.

Technical Specifications

Crystal Frequency Range

11.33 - 14.66 MHz

Frequency Pulling

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

Frequency Stability

Against voltage variations of -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

50 ohms

Power Output

Approx. 25 microwatts

Type of Crystal

98-16.

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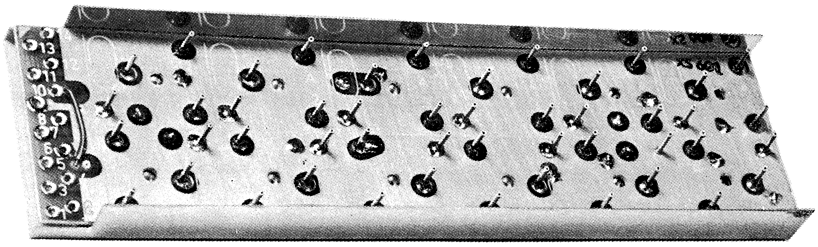
Storno

Crystal Oscillator Panel XS601



The crystal oscillator panel consists of a wiring board with conductors on both sides, and a screen. The station uses two panels of this type, one for the transmitter-oscillator units and one for the receiver-oscillator units.

The front of the wiring board has plug pins for connection of up to 12 oscillator units, a crystal oscillator unit being required for each frequency channel provided in the station.
In order to ensure that the channels are equipped with the correct oscillators - and hence the correct frequencies - the plug pins of the wiring board are marked with the channel numbers 1-12.

Mode of Operation

Channel Switching

Channel switching is performed with the channel selector in the control desk or control box of the station. The switch contacts connect the transmitter and receiver oscillator units of the selected channel to chassis, thereby applying power to them since all transmitter and receiver oscillators connect to the -24V potential during transmit and receive, respectively.
If the station is equipped with more than 8 channels, a group switching system is used which incorporates a group switching relay, located outside the crystal oscillator panel. This system serves the purpose of limiting the number of conductors in the control cable.

When the group switching feature is provided, the oscillators are divided into two groups - A and B. Group A covers channels 1-8, group B comprising channels 9-12. Each group has a common minus lead which - via the contacts of the switch relay - is always open for one group when it is closed for the other one. The group switching relay is not operated when channels 1-8 are in use.

For channels 9-12, the relay is operated, being energized via an extra contact pair on the channel switch. This will cause the relay contacts in the minus lead of group A to break, instead causing those of group B to make.

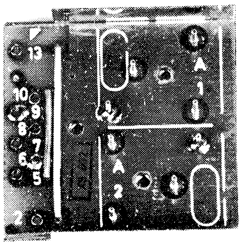
The crystal oscillator units for the first four and the last four channels have pairwise common chassis leads, in this sequence: 1+9, 2+10, 3+11, and 4+12. On the channel switch, the same pairwise positions are shorted. But because the group switching relay has opened the minus lead of the unused group of channels, only one transmitter oscillator and one receiver oscillator will be in operation at any time.

If the radio station is equipped with a type PS601 or PS604 power supply unit, the group switching relay (Re C) is inserted in that unit when the group switching function is installed; besides, two straps in the power supply unit are removed (see circuit diagram of PS in question).

37. 391-E2

Storno

Crystal Oscillator Panel XS602



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

Two panels of this type are used, one for the transmitter-oscillator units and one for the receiver-oscillator units.

The front of the wiring board has pins for connection of 2 plug-in oscillator units, each of the frequency channels of the station using a crystal-oscillator unit of each own.

In order to secure 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 the channel numbers 1 and 2.

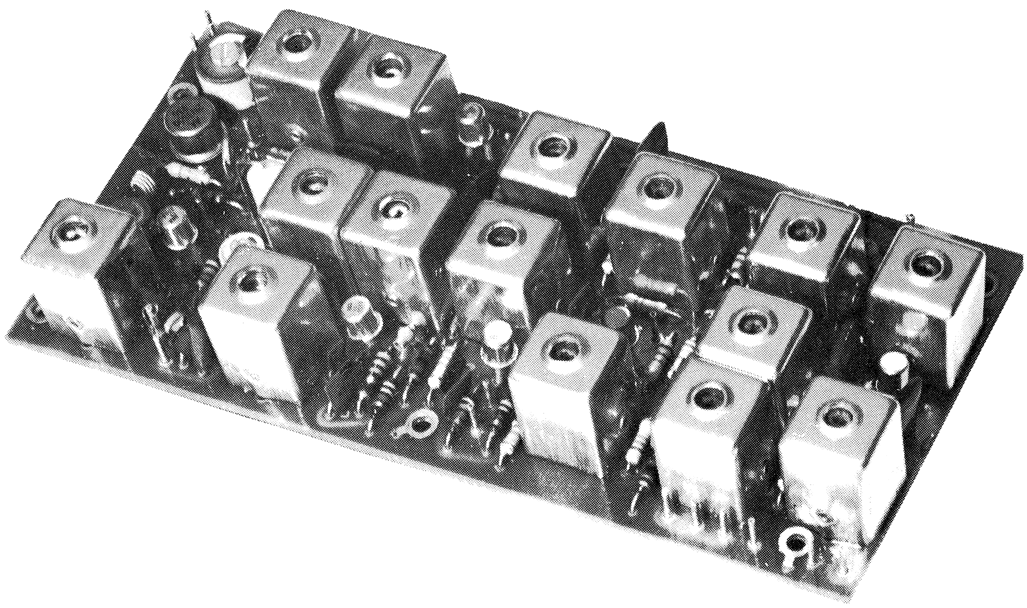
Mode of Operation

Channel switching is performed from the control desk or control box of the radio station, whose channel selector connects the selected transmitter and receiver oscillator units to chassis and thereby puts them into operation seing that both receiver oscillators and transmitter oscillators connect to the -24V potential on receive and transmit, respectively.

37.643-E1

Storno

Exciter EX611



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

1st Buffer
Modulator
2nd Buffer
1st Frequency Doubler
Frequency Tripler
2nd Frequency Doubler
1st Power Amplifier
2nd Power Amplifier

The exciter performs two main functions: it modulates the RF oscillator signal and converts it to a frequency and a level suitable for the following power amplifier unit, PA.

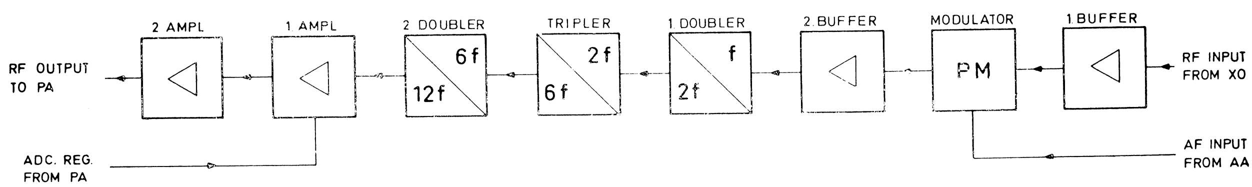
Mode of Operation

1st Buffer

The RF signal from the oscillator is applied to the 1st buffer (transistor Q1), which has tuned LC circuits in its base and collector leads. The stage is not neutralized; stability is accomplished by damping the collector circuit, L2, with a resistor. 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

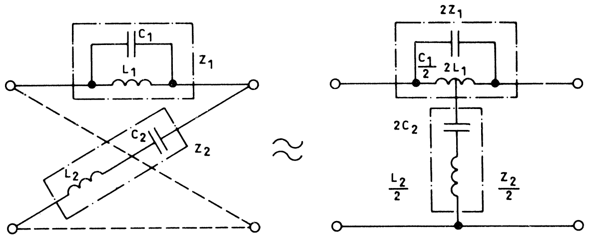
The phase modulator is a modified bridged T network composed of reactances. This circuit has



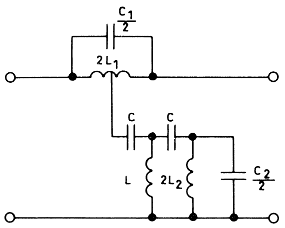
37.377-E1

Storno

low insertion loss, constant four-terminal impedances, and produces a relatively large linear phase swing. The bridged T network is derived from a lattice section as shown below.



In these networks, the insertion loss is zero (no-loss reactances) 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 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 resistors 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 frequency multiplier chain comprises a doubler, a tripler, and another doubler, with a total frequency multiplication factor of twelve. These stages are not neutralized, the tuned circuit being damped by resistors in the interests of good stability. The circuits between the multipliers and between the last doubler and the 1st power amplifier are double-tuned bandpass filters 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 (L14). The tap connects - via a series resonant circuit consisting of C42 and L15 - to the base of transistor Q7 of the 2nd power amplifier. Battery voltage for the 1st 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 transistor tolerances are then without importance. In order to be able to tune the power amplifier stages over the entire 2-metre band it was found necessary to divide it into two frequency bands, 146-168 Mc/s and 168-174 Mc/s. Switching between these subbands is performed by means of straps in the collector circuits of the amplifier stages.

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

Technical Specifications

Frequency Range

146-174 Mc/s.

Frequency Multiplication Factor

12.

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Storno

Crystal Frequency Bands

12.16 - 14.50 Mc/s.

Power Output

700 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): 0.85V.

Modulation Distortion

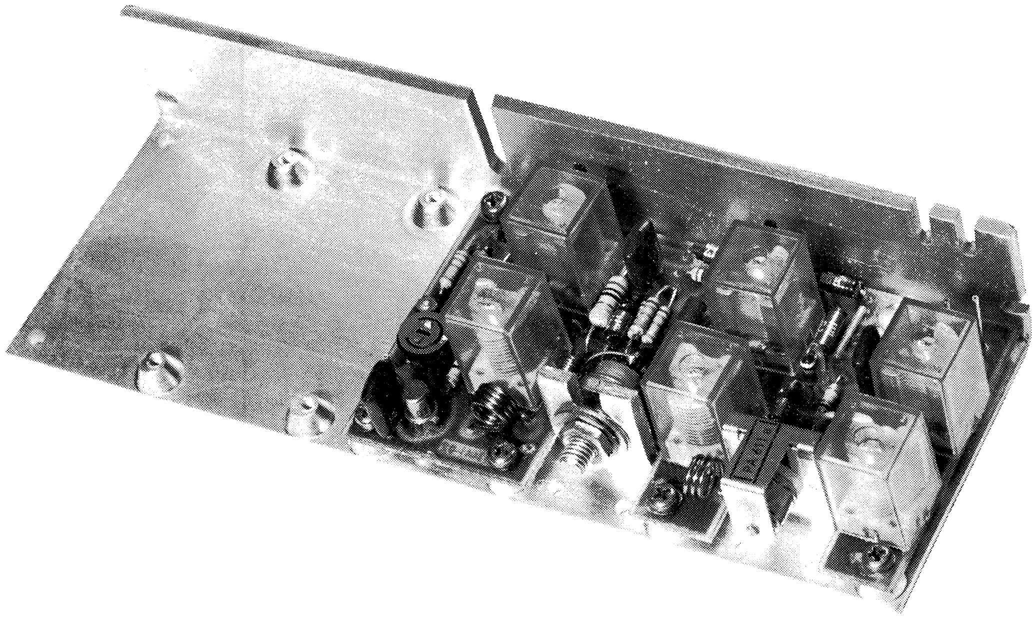
Measured without de-emphasis: 5%.

Dimensions

68 x 140 x 25 mm.

37.377-E1

RF Power Amplifier PA611



The 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.

Mode of Operation

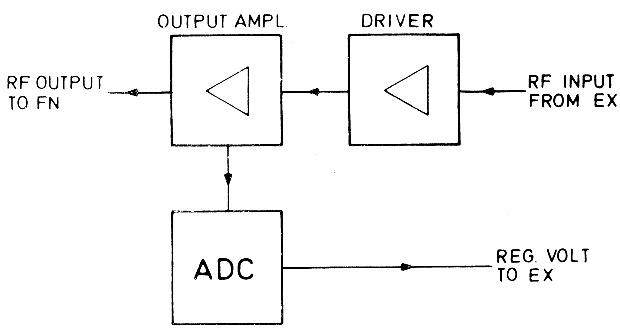
Driver Stage and Output Stage

The driver amplifies the signal from the EX exciter to a level (approx. 3 - 4 watts) suitable for driving the following output amplifier.

Pi-networks are used for matching the output stage to the driver and to the load impedance into which it works.

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. There is a DC path from the emitter of this transistor to the emitter 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.



Storno

An increase in the current through the output stage will result in a voltage drop across the emitter resistor and hence also in a decrease in the base-emitter voltage of the control transistor. Consequently, the supply voltage applied to the 1st power amplifier stage 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

146 - 174 Mc/s.

Power Output

10 W. Adjustable by means of the ADC circuit.

Current Drain

750 mA at 10 watts power output.

Input Impedance

50 ohms.

Output Impedance

50 ohms.

Gain

15 dB at 156 Mc/s.
The gain varies over the frequency range.

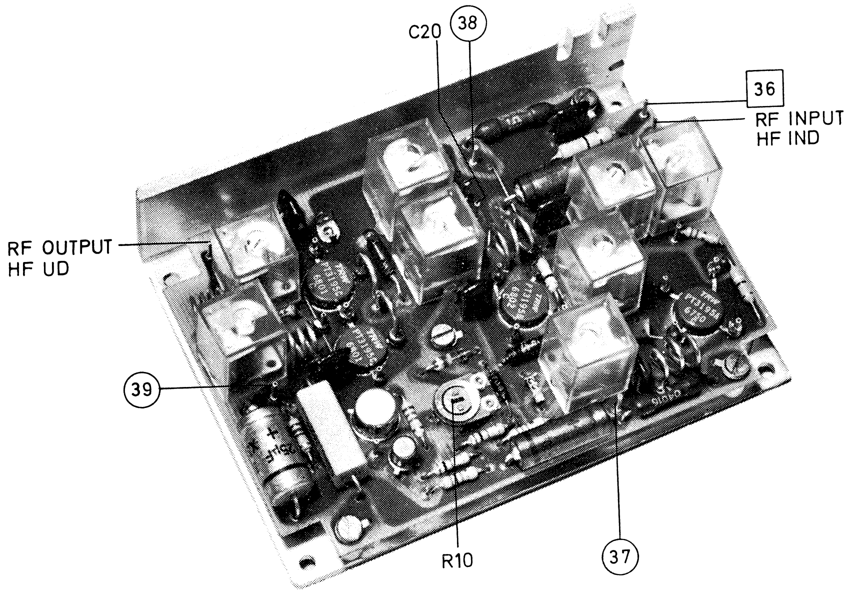
Dimensions

56 x 160 x 29 mm.

37.379-E1

 Storno

RF Power Amplifier PA612



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

1st power amplifier stage (driver stage)
2nd power amplifier stage (driver stage)
Output amplifier stage
ADC circuit (automatic drive control circuit).

The RF power amplifier operates in Class C. It increases the RF input signal level to 25 watts in a 50-ohm load. The unit incorporates an automatic drive control circuit which ensures constant current through the output transistors and so prevents them from being overloaded.

This circuit also causes the RF power output to be less dependent on variations in supply oltage and ambient temperature.

The earth potential of this unit connects to the -24-volt terminal of the supply voltage. Consequently there is no DC path between the earth potential and chassis.

Mode of Operation

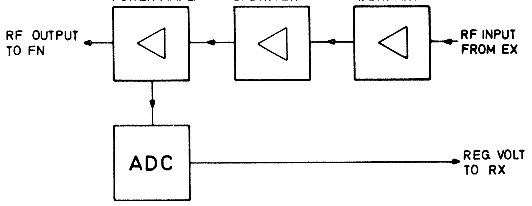
Driver Stage and Output Stage

The first driver amplifies the signal from the exciter to a level of approx. 2 watts. Two trimmer capacitors permit adjustment of the input impedance of the stage to 50 ohms.

The second driver increases the power level from approx. 2 watts to 9 watts, which is the power required to drive the output amplifier to full output. The second driver consists of a matched pair of transistors, connected in parallel. The output stage is designed to deliver 25 watts into a 50-ohm load.

ADC Circuit (Automatic Drive Control Circuit)

This circuit consists of two transistors operating as DC amplifiers. The first transistor (Q5) registers the current through the output stage by means of a 0.33-ohm resistor, R4, in series with



 37.663-E1

Storno

the collector circuit of the output stage. The other transistor (Q6) operates as a phase inverter and also provides some gain. The base of the first transistor receives, via a potentiometer, a reference voltage which is produced by a zener diode. The emitter of this transistor connects, via a resistor, to the collector of the output transistor, and the collector of Q5 connects to chassis (-24 volts) via a voltage divider. The base of the other transistor, Q6, connects to a tap on the voltage divider constituting the collector circuit of Q5, whilst the emitter of Q6 connects to chassis (-24 volts) through a resistor. The collector of Q5 connects to the 1st driver stage of the exciter.

An increase in the current through the output stage will result in an increase in voltage across collector resistor R4 and hence produce a decrease in the base-emitter voltage of control transistor Q5. Consequently, the current through the voltage divider will decrease and hence produce a decrease in the base-emitter voltage of Q6, thus reducing the current through that transistor. The lower current through Q6 produces a lower collector-emitter voltage for the 1st driver stage of the exciter, so that less drive is applied to the transmitter output stage.

Conversely, in the event of a decrease in current through the output stage the control circuit would have caused more power to be applied to the exciter. The output power level can be adjusted by altering the value of the reference voltage applied to the base of the first DC amplifier.

Technical Specifications

Frequency Range

146-174 MHz

Input Impedance

50 ohms

Input Signal Level

Max. 0.5 watt

Load Impedance

50 ohms

Power Output

25 watts, adjustable by means of the ADC circuit.

Bandwidth

Greater than 1 MHz at variations within 0-0.1dB

Current Consumption

2.4 amps.

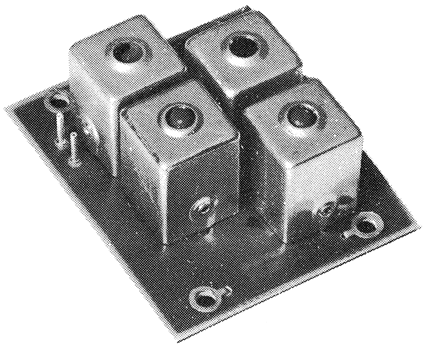
Dimensions

104 x 76 x 29 mm.

37.663-E1

Storno

Antenna Filter FN611



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

146 - 174 Mc/s.

Input Impedance

50 ohms.

Output Impedance

50 ohms.

Bandwidth (3 dB)

72 Mc/s.

Insertion Loss

146 - 174 Mc/s: 0.4 dB.

Dimensions

52 x 44 mm.

37.381-E1

Storno

Antenna Filter FN612

The antenna filter is a lowpass filter having low insertion loss. It serves the purpose of attenuating harmonics from the transmitter.

Construction

The antenna filter is a 9-pole lowpass filter. It is composed of air-wound coils which are coupled capacitively, by means of feed-through capacitors, to the bottom plate of the filter unit.
The filter requires no alignment.

Technical Specifications

Frequency Band

146 - 174 MHz

Input Impedance

50 ohms

Output Impedance

50 ohms

Insertion Loss

Inside the frequency band 146-174 MHz: Less than 0.5 dB.

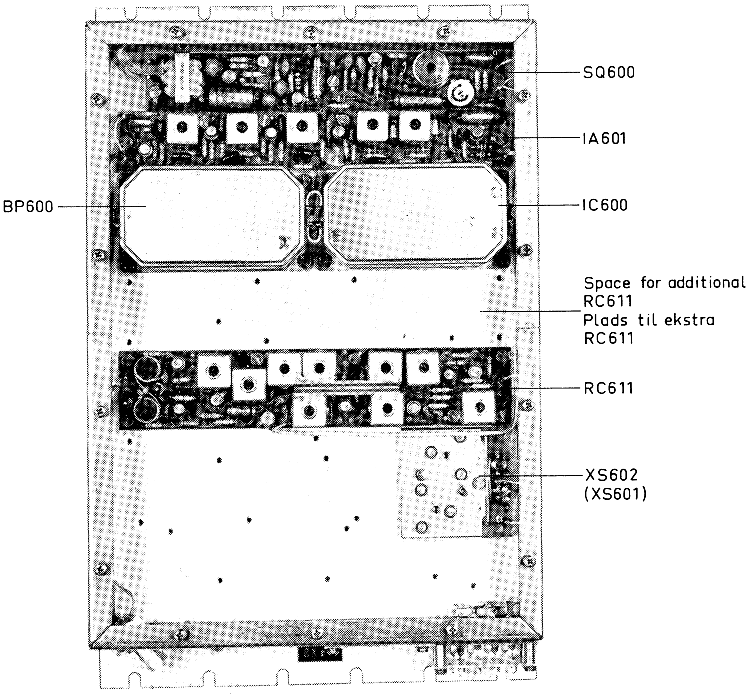
Dimensions

54 x 30 x 29 mm.

37.664-E1

Storno

B. Receivers



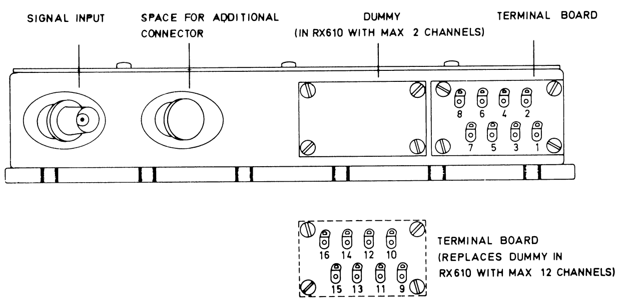
General

Receiver model RX610 is the designation of a group of FM receivers comprising types RX611, RX612, RX613, and RX614 for communication in the frequency band 146-174 MHz with channel spacings of 50 kHz, 25 kHz, 20 kHz, and 12.5 kHz.

The receivers are double-conversion super-heterodyne receivers employing intermediate frequencies of 10.7 MHz and 455 kHz. The requisite amount of adjacent-channel selectivity is obtained by means of two block filters.

The receiver uses electronic squelch. The maximum number of crystal oscillators is usually two - one for each channel - but provision can be made for installing additional crystal oscillators, with 12 as the maximum possible number of channels.

The receiver is housed in a closed metal box carrying on its outside a coaxial connector for incoming signals, and terminals for the receiver cabling which connects, via feedthrough filters, to the respective circuits inside the screen box.



The top of the screen box can be removed by loosening a number of screws in it, providing access to the receiver circuits.

The receiver is divided into a number of sub-units each of which is built on printed wiring boards. This division follows practical and logical lines, the aim being to make the receiver easily accessible for adjustment and repairs.

32.039-E1

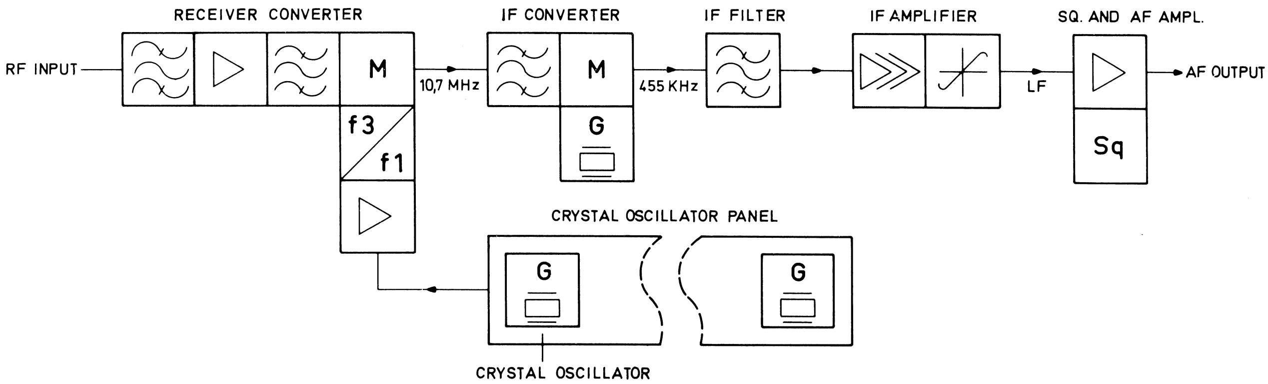
Chapter II. Theoretical Circuit Analysis

The different receiver types and their sub-units are tabulated below.

RECEIVER TYPE	RX611	RX612	RX613	RX614
Channel Spacing	50 kHz	25 kHz	20 kHz	12.5 kHz
SUB-UNITS				
Receiver Converter	RC611 Δ)	RC611 Δ)	RC611 Δ)	RC611 Δ)
Crystal Oscillator	XO611	XO611/XO662	XO611	XO611
Crystal Oscillator Panel	XS601/XS602	XS601/XS602	XS601/XS602	XS601/XS602
IF Converter	IC601	IC602	IC603	IC605
IF Filter	BP601	BP602	BP602	BP6012
IF Amplifier	IA601	IA601	IA601	IA601
Squelch and AF Amplifier	SQ601	SQ601	SQ601	SQ602

(Δ Space has been left in the receiver screen box for installation of an additional receiver converter for use where additional receiver input bandwidth is necessary.

Sub-units



Receiver Converter RC611

The receiver converter amplifies the incoming signal and provides adequate image rejection. It also multiplies the oscillator signal frequency to the injection signal frequency required by the mixer, which converts the incoming signal frequency to 10.7 MHz.

Crystal Oscillator Units XO611 and XO662

The crystal oscillator is housed in a screen box. It is a plug-in unit for placement on the receiver crystal oscillator panel. The receiver is provided with an oscillator unit for each frequency channel.

The two types of crystal oscillators are employed as specified below:

In receiver with 50 kHz channel spacing (RX611): XO611.

In receiver with 25 kHz channel spacing (RX612): XO611 or XO662, depending on government specifications.

In receiver with 20 kHz channel spacing (RX613): XO611.

In receiver with 12.5 kHz channel spacing(RX614): XO611.

Storno

Crystal Oscillator Panels XS601 and XS602

The crystal oscillator panel is intended for connection of the crystal oscillator units.
Oscillator panel XS601 accomodates a maximum of 12 crystal oscillator units.
Oscillator panel XS602 accomodates a maximum of 2 crystal oscillator units.

IF Converters IC601, IC602, IC603, and IC605

The intermediate-frequency converter filters the 10.7 MHz signal from the receiver converter and converts it to 455 kHz.

IF Filters BP601, BP602, and BP6012

455 kHz bandpass filter.

IF Amplifier IA601

455 kHz intermediate-frequency amplifier with limiter and FM signal demodulator.

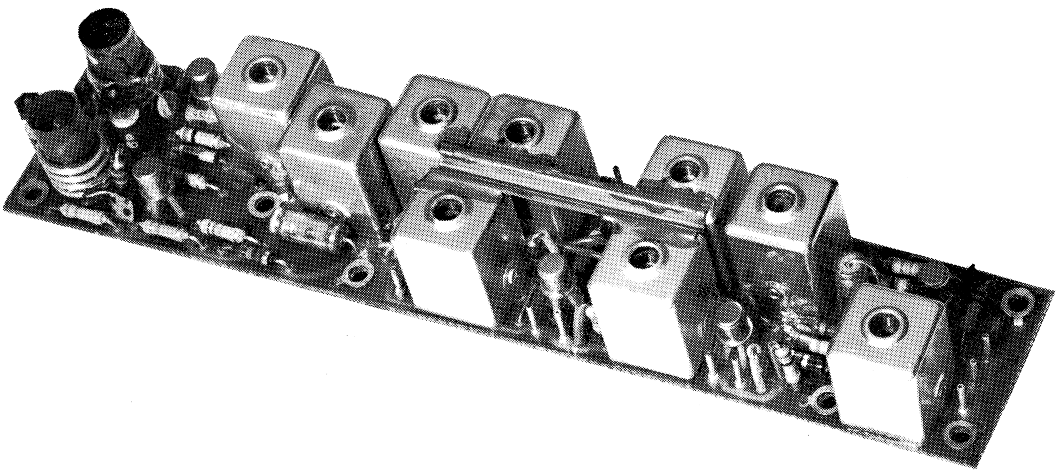
Squelch and AF Amplifiers SQ601 and SQ602

AF amplifier with electronic squelch.

The following pages contain a detailed description of the circuits of the individual sub-units and their specifications.

32.039-E1

Receiver Converter RC611



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

Signal Frequency Amplifier
Mixer
Oscillator-Signal Amplifier
Oscillator-Signal Tripler.

The converter amplifies the incoming signal and converts it to a high 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

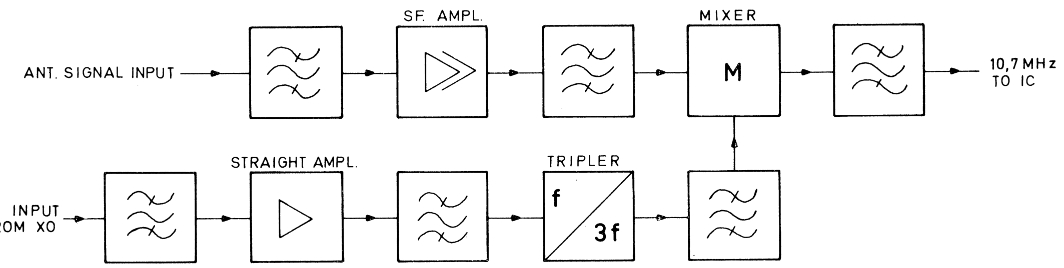
The incoming signal is applied - via a bandpass filter (L1, L2) - to the signal frequency amplifier. Good separation between the input and output circuits of this amplifier ensures good stability. - The amplified signal is fed through a four-circuit filter to the emitter of the mixer transistor.

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.
(See circuit diagram of the RC611 receiver converter 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



Storno

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

Technical Specifications

Frequency Range

146 - 174 Mc/s.

Gain

Voltage gain from antenna to input of mixer: 10-12 dB.

Input Impedance

Nominal: 50 ohms.

Crystal Frequency Calculation

For 146 - 160 Mc/s range:

$$fx = \frac{fsig + 10.7}{3} \text{ Mc/s.}$$

For 156 - 174 Mc/s range:

$$fx = \frac{fsig - 10.7}{3} \text{ Mc/s.}$$

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

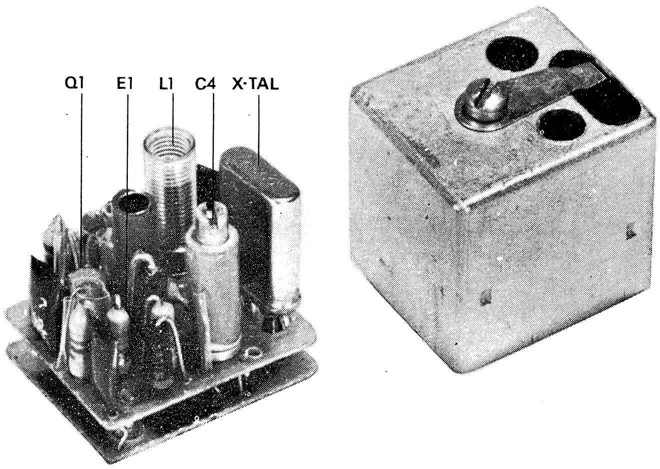
Dimensions

160 x 32 mm.

37. 383-E2

 Storno

Receiver Oscillator Unit XO611



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 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

48.4 - 56.9 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.

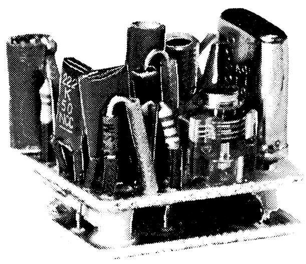
Power Output

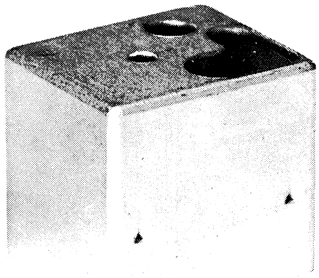
Approx. 1 mW.

 37.385-E1

Storno

Receiver Oscillator Unit XO666





Receiver oscillator unit XO666 is a crystal-controlled, third-overtone 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 series-resonant Colpitts circuit followed by a temperature compensating network.

The oscillator is started by connecting the CHANNEL SHIFT terminal to chassis through the channel selector.

Adjustment of the oscillator frequency is performed by means of trimmer capacitor C5 inserted in series with the crystal.

A capacitance diode E3, biased by a temperature-dependent voltage, compensates for frequency variations at high and low temperatures.

The temperature compensation is provided by applying two independent voltages to capacitance diode E3.

One of these voltages which is varying within the entire temperature range is applied to E3 from the voltage dividers R4, R5 and R1, R2. The other voltage which is varying at high and low temperatures only, is applied to E3 via R8 and E1 from the voltage divider R1 and R2.

Technical Specifications

Crystal Frequency Range

45.5 - 56.9 MHz

Frequency Pulling

$\frac{\Delta f}{f_o} \geq \pm 25 \times 10^{-6}$

Frequency Stability

Against voltage variations of -24V ± 2.5%:
Better than $\pm 1.5 \times 10^{-6}$.
In temperature range -30°C to +80°C:
Better than 2.5×10^{-6}

Load Impedance

50 Ω

Output Voltage

200mV/50Ω ± 3dB

Current Drain

At 25°C: 3.5mA ± 0.5mA

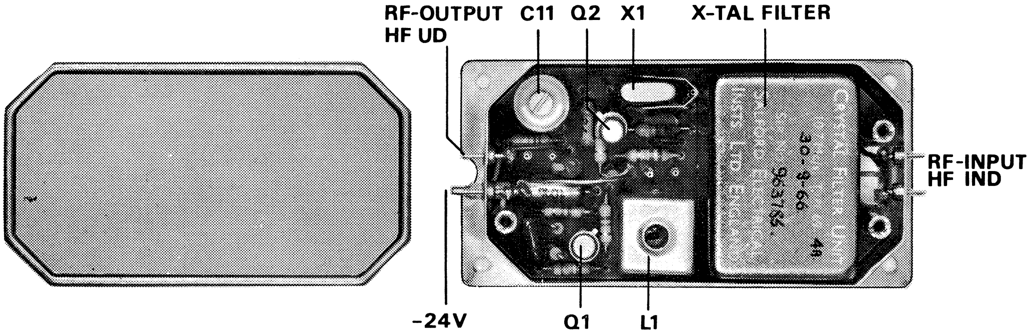
Type of Crystal

98-21.

60.070-E1

Storno

IF Converters IC601, IC602, IC603



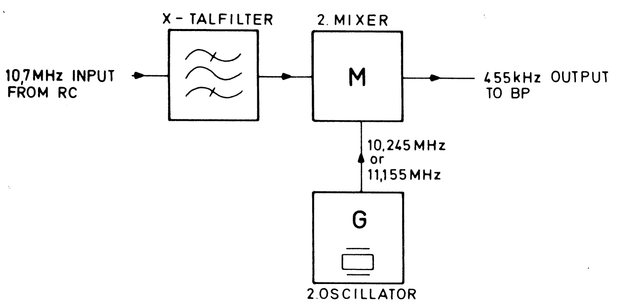
The IF converter unit is built on a wiring board, and is housed in a metal box with screw-on lid. The unit consists of the following stages:

Crystal Filter
Oscillator
Mixer

The IF converter filters the high intermediate frequency signal at 10.7 Mc/s and converts it to a low intermediate frequency signal at 455 kc/s.

IF converter IC601 is used in equipments with 50 kc/s channel separation.
IF converter IC602 is used in equipments with 25 kc/s channel separation.
IF converter IC603 is used in equipments with 20 kc/s channel separation.

The three converters use different crystal filters but are otherwise quite identical.



Mode of Operation

Crystal Filter

From the receiver converter unit, RC, the high intermediate frequency signal at 10,7 Mc/s is fed to the crystal filter. The filter connects to the mixer via a parallel resonant circuit, which ensures a perfect impedance match.

Oscillator

The oscillator is a crystal-controlled Colpitts oscillator. The crystal frequency is normally 10.245 Mc/s, 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 Mc/s 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 Mc/s signal and the oscillator signal are applied to the base of the mixer transistor. The low intermediate frequency signal at 455 kc/s is taken off at the collector.

37.387-E2

Storno

Technical Specifications

Input Frequency

10.7 Mc/s.

Output Frequency

455 kc/s.

Input Impedance

910 ohms // 20 pF.

Output Impedance

3.9 k ohms // 480 pF.

Maximum Frequency Swing

IC601: ±15 kc/s
IC602: ±5 kc/s
IC603: ±4 kc/s

Bandwidth

IC601 At 3 dB attenuation relative to 10.7 Mc/s: Greater than ±15 kc/s.
At 50 dB attenuation relative to 10.7 Mc/s: Less than ±50 kc/s.

IC602 At 3 dB attenuation relative to 10.7 Mc/s: Greater than ±7.5 kc/s.
At 50 dB attenuation relative to 10.7 Mc/s: Less than ±25 kc/s.

IC603 At 3 dB attenuation relative to 10.7 Mc/s: Greater than ±6 kc/s.
At 50 dB attenuation relative to 10.7 Mc/s: Less than ±20 kc/s.

Bandpass Ripple

IC601 Less than 2 dB
IC602 Less than 1.5 dB
IC603 Less than 1.5 dB

Oscillator Frequency

Calculation of crystal frequency (fx):
fx = 10.7 Mc/s - 0.455 Mc/s - 10.245 Mc/s.

However, at certain incoming frequencies the low crystal frequency must not be used owing to the risk of harmonic radiation. In this cases the high crystal frequency is used.
The calculation of the high crystal frequency is as follows:

fx = 10.7 Mc/s + 0.455 Mc/s = 11.155 Mc/s.

The lists below specifies what type of crystal which is to be used within the various frequency ranges.

A = 10.245 Mc/s
B = 11.155 Mc/s

146-174 Mc/s

Receiver frequency range	fx.
146.0 - 152.5 Mc/s	A
152.5 - 154.9 Mc/s	B
154.9 - 162.7 Mc/s	A
162.7 - 165.1 Mc/s	B
165.1 - 174.0 Mc/s	A

68-88 Mc/s

Receiver frequency range	fx.
68.0 - 70.5 Mc/s	A
70.5 - 72.9 Mc/s	B
72.9 - 80.8 Mc/s	A
80.8 - 83.2 Mc/s	B
83.2 - 88.0 Mc/s	A

420-470 Mc/s

Receiver frequency range	fx.
420.0 - 421.5 Mc/s	B
421,5 - 428.8 Mc/s	A
428.8 - 431.7 Mc/s	B
431.7 - 439.1 Mc/s	A
439.1 - 442.0 Mc/s	B
422.0 - 449.3 Mc/s	A
449.3 - 452.2 Mc/s	B
452.2 - 459.6 Mc/s	A
459.6 - 462.5 Mc/s	B
462.5 - 470.0 Mc/s	A

Crystal Specification

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

Frequency Pulling Range for Osc.

Greater than ±50 x 10^{-6}.

Available Power Gain

With 10.245 Mc/s crystal: Greater than 15dB.
With 11.155 Mc/s crystal: Greater than 14dB.

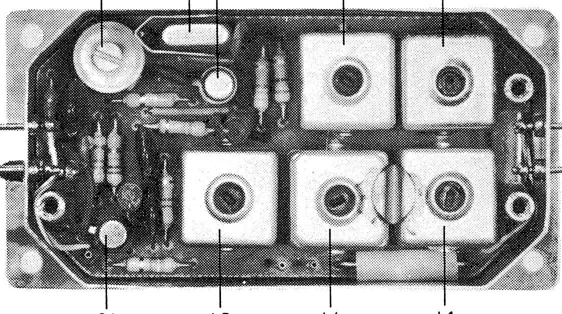
Dimensions

80 x 40 x 29 mm.

37.387-E2

Storno

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:

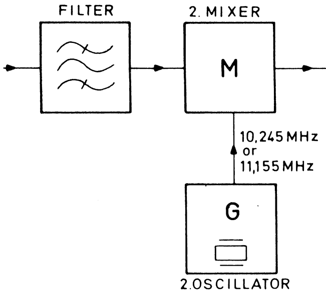
Coil filter
Oscillator
Mixer.

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.

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Storno

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 = 11.155 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 ± 40 x 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.

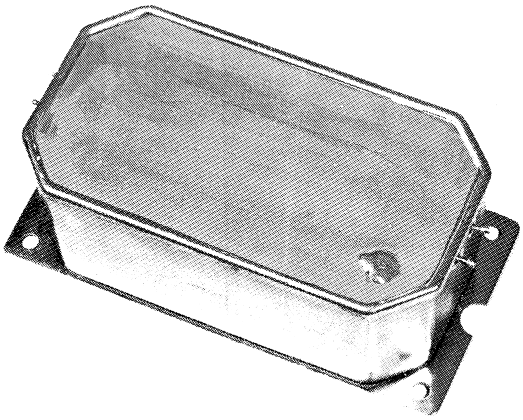
Dimensions

80 x 40 x 29 mm.

37.558-E1

Storno

IF Filters BP601 and BP602



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 six 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 BP601 is used in equipments with 50 kc/s channel separation.
IF filter BP602 is used in equipments with 20 or 25 kc/s channel separation.

Technical Specifications

Centre Frequency

455 kc/s.

Generator Impedance

3.9 k ohms // 480 pF.

Load Impedance

1 k ohm // 480 pF.

Bandwidth

BP601: At 3dB attenuation relative to 455 kc/s: Greater than ±15 kc/s.
At 45 dB attenuation relative to 455 kc/s: Greater than ±35 kc/s.

BP602: At 3dB attenuation relative to 455 kc/s: Greater than ±8 kc/s.
At 45dB attenuation relative to 455 kc/s: Less than ±20 kc/s.

Insertion Loss

BP601: 2 dB
BP602: 3 dB.

Centre Frequency Variation

At 3 dB attenuation relative to 455 kc/s: Less than ±700 c/s.

Dimensions

80 x 40 x 29 mm.

37.388-E1

Storno

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.

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

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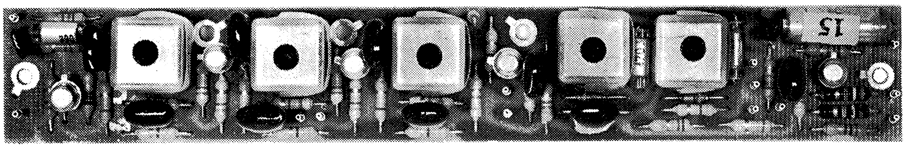
IF Amplifier IA601



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.

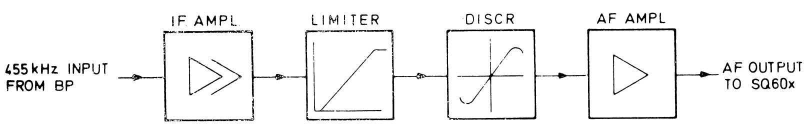
Technical Specifications

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

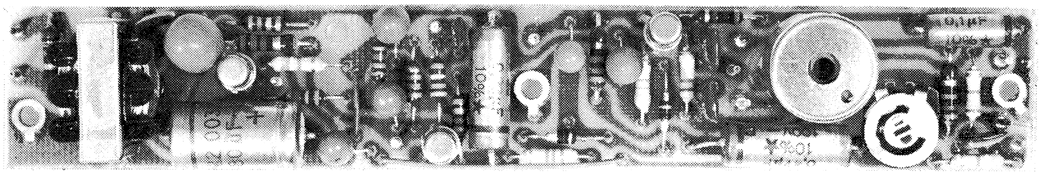
10 mA.

Dimensions

160 x 24 mm.

Storno

Squelch and Audio Amplifier SQ601



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

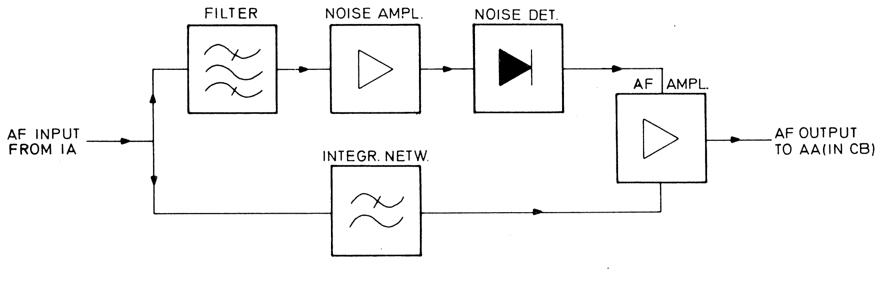
Audio Amplifier

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.



37.390-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 20, 25, and 50 kc/s.

NOTE 1 in the photograph of the unit shows the strap for 20 and 25 kc/s.

NOTE 2 in the photograph of the unit shows the strap for 50 kc/s.

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.

Storno

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: 23 dB.

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

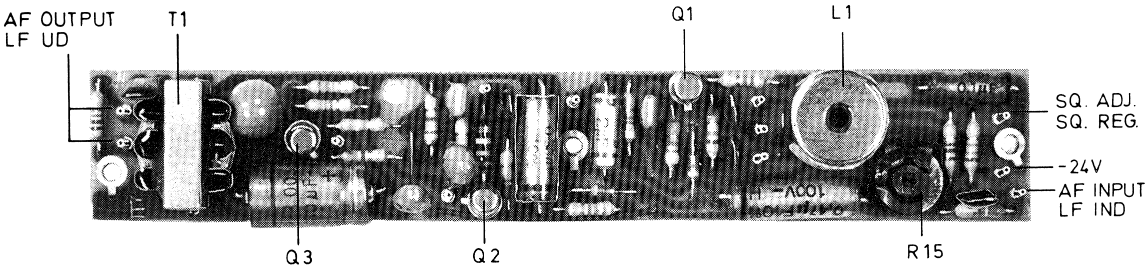
For unsquelched operation (audio output): 12 mA.
For squelched operation (no audio output): 8.5 mA.

Dimensions

148 x 24 mm.

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

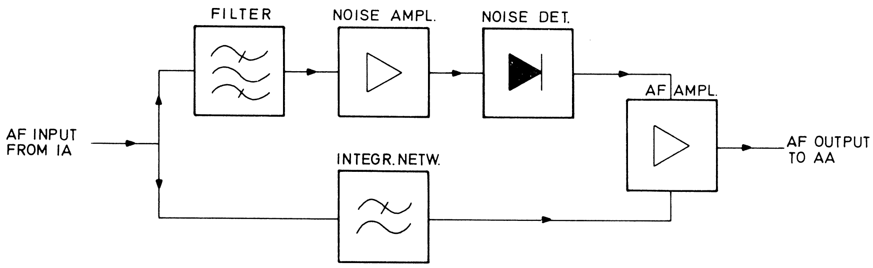
Audio Amplifier

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

Storno

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 ΔF = 0.7 x ΔFmax. 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.

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Storno

C. Power Supply Units

General

Depending on supply voltage and transmitter RF output, radio station CQF600 can be supplied with several different types of power supply units to provide the -24 volts of stabilized DC required for powering its transmitter and receiver.

For example, the CQF600 can be supplied for operation from 12/24V DC, 220V AC, or with a voltage regulator for use with an external emergency power supply consisting of a charger buffer batteries.

The power supply unit of the CQF600 is built on a module chassis which is screw-mounted at the top of the rear wall of the station cabinet whilst the supply-voltage cable for the power supply unit is brought in through a hole in the bottom of the cabinet.

Types

PS602. Mains power supply for operation from 220V AC, 50 Hz. Used in stations with 25-watt transmitters.

PS603. Mains power supply for operation from 220V AC, 50 Hz. Used in stations with 10-watt transmitters.

PS604. Converter power supply for operation from 12V or 24V DC. Used in stations with 10-watt transmitters.

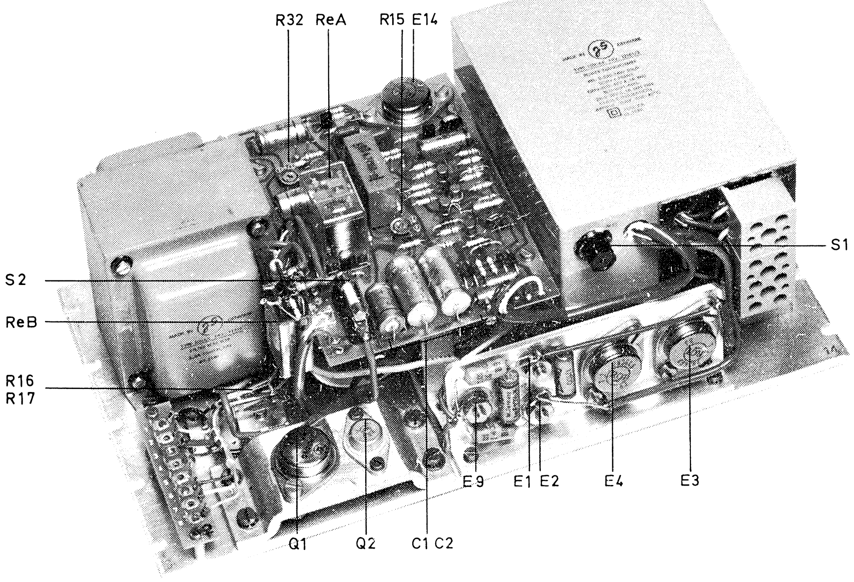
PS605. Voltage regulator for operation from 20-28V DC. Used in stations with 10-watt transmitters.

The following pages contain a detailed description of the circuits of the individual power-supply units and their specifications.

32.039-E1

Storno

Power Supply Unit PS602



Power supply unit PS602 is operated from the mains. It converts 220V or 240V AC to 24V stabilized DC.

The unit is built on a module chassis, and is intended for installation in a CQF600 station cabinet. It consists of the following main components:

Power transformer
Rectifier and preregulation circuit
Filter
Series regulator
Electronic protective circuit
Transmit relay.

Mode of Operation

Power Transformer

The transformer has three windings: a primary for 220V and 240V, and two secondaries, one for 48V and one for 28-0-28V. A fuse is inserted in the primary circuit.
The transformer meets CEE standard, class II (4 kV primary-to-secondary and primary-to-chassis).

Rectifier and Filter

Rectifiers E1, E2, E3, and E4 operate in a bridge circuit in which E1 and E2 are conventional silicon rectifiers whereas E3 and E4 are controlled rectifiers whose firing times can be altered by means of a preregulation circuit, permitting adjustment of the power delivered to filter L1 and electrolytic capacitors C1 and C2.

Series Regulator and Preregulator

The series regulator is composed of three transistors: a voltage amplifier Q3, a current amplifier Q2, and a series transistor Q1.
The base of amplifier transistor Q3 receives, via potentiometer R32, a portion of the output voltage, which it compares with the reference voltage across the zener diode E16 in the emitter circuit of the transistor.

The loop consisting of transistors Q3, Q2, and Q1 will oppose any change in output voltage by regulating the voltage across series transistor Q1 at a value that will keep the output constant. Moreover, the preregulation circuit ensures, by adjustment of the firing times of diodes E3 and E4, that the voltage across the series transistor is kept fairly constant regardless of mains-voltage and load fluctuations. This arrangement limits the collector losses in series transistor Q1 to max. 20 watts.

The firing pulse circuit consists of unijunction

37.644-E1

Storno

oscillator Q8, synchronization transistor Q9, and regulator transistor Q7, which receives constant voltage from Q6.

The factors determining the frequency of the unijunction oscillator include capacitors C6 and C11 and the emitter load of Q8, consisting of R10, R9, and transistor Q7.

Transistor Q7 registers the voltage across Q1, and any change in that voltage will alter the oscillator frequency.

When, during each cycle, the voltage across capacitors C6 and C11 reaches a certain value, Q8 will fire, sending a firing pulse to the controlled rectifiers, E3 and E4.

Synchronization transistor Q9 sees to it that C6 and C11 begin to charge at the same time relative to the mains frequency.

The loop formed by the preregulator circuit will endeavour to keep the voltage across Q1 constant by varying the firing time of E3 and E4. Phase shift capacitor C9 opposes the tendency to hunting at low frequencies.

Electronic Protective Circuit

The power supply unit incorporates circuits to protect against both overcurrent and overvoltage. If the current exceeds approx. 4.5A, the voltage across resistors R16 and R17 will cause transistor Q4 to pass current, resulting in a voltage drop across R24, which fires the controlled rectifier E13, which in its turn fires the large controlled rectifier E14. When the latter rectifier passes current it will blow the secondary fuse S2 within 50 msec and so cut off the current.

Similarly, overvoltage at the output of the power supply unit will activate transistor Q5, causing it to fire the controlled rectifier E15, which in its turn fires the controlled rectifier E14, which will thereafter blow the secondary fuse S2.

Transmit Relay

In addition to contacts for switching between the receiver and the transmitter, the transmit relay has a set of contacts which, in conjunction with diode E19, are used for switching the antenna in simplex operation of the radio station.

When the transmit relay is operated, terminal 7 is connected to chassis, resulting in the simultaneous operation of relay A in the power-supply unit and the antenna switching relay, which is placed outside the power supply unit.

The antenna switching relay is now held by relay-A contacts 14-15. On the transmit button being released, relay A will release before the antenna switching relay. This arrangement protects the transmitter from being powered without also being connected to the antenna connector.

NOTE: A strapping arrangement permits using the PS602 for either simplex operation or duplex operation of a radio station.
For simplex operation, a strap is placed between terminals 5 and 4.
For duplex operation, a strap is placed between terminals 5 and 6.

Technical Specifications

Supply Voltage

220V or 240V +10/-20%, 50 to 60 Hz.

Current Consumption

Approx. 1.1A at max. output load of 3.8A.

Output Voltage

24V ±2.5%.
Ripple less than 15mV p-p.

Output Current

Max. 3.8A.

Loss

Approx. 60W at 264V supply voltage (primary 240V tap) and at maximum output load (3.8A).

Type of Service

Continuous.

Temperature

PS602 is intended for mounting on a heat sink, which may assume the following temperatures:

Working range: -25°C to +65°C.
Function range: -30°C to +75°C.

Weight

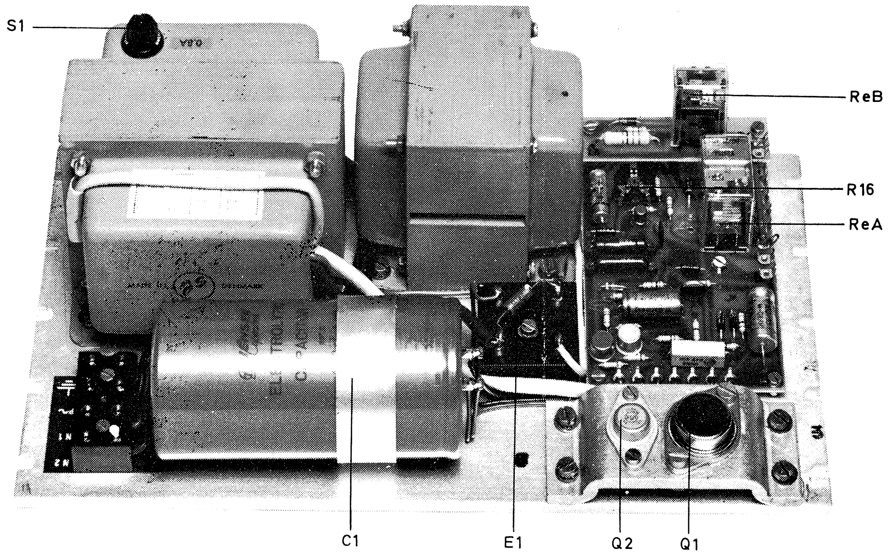
6.2 kilos.

Dimensions

275 mm x 150 mm x 88 mm.

Storno

Power Supply Unit PS603



Power supply unit PS603 is operated from the mains. It converts 220V or 240V AC to 24V stabilized DC.

The unit is built on a module chassis, and is intended for installation in a CQF600 station cabinet It consists of the following main components:

Power transformer
Rectifier
Filter
Series regulator
Electronic protective circuit
Transmit relay.

Mode of Operation

Power Transformer

The transformer has three windings. A primary for 220V and 240V, and two secondaries, one for 39/43V and one for 15-0-15V. The 39V tap is used if the mains voltage does not decrease by more than 10%. When using the 43V tap, mains-voltage drops of up to 20% are permissible. A fuse is inserted in the primary circuit.

The transformer meets CCE standard, class II (4 kV primary-to-secondary and primary-to-chassis).

Rectifier and Filter

Rectifier E1 is a bridge-type silicon rectifier. The filter consists of a swinging choke and an electrolytic capacitor C1, chosen in the interests of low ripple, low internal resistance, and reasonable physical dimensions.

Series Regulator

The series regulator is composed of three transistors, a voltage amplifier Q3, a current amplifier Q2, and a series transistor Q1. The base of amplifier transistor Q3 receives, via potentiometer R16, a portion of the output voltage, which it compares with the reference voltage across the zener diode E6 in the emitter circuit of the transistor. The loop consisting of transistors Q3, Q2, and Q1 will oppose any change in output voltage by regulating the voltage across series transistor Q1 at a value that will keep the output voltage constant.

Electronic Protective Circuit

This circuit cuts off the output current in the case of short-circuits or overloads. It operates on the principle of registering the voltage across a resistor R5, inserted in the collector circuit of

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Storno

series transistor Q1. If the voltage across R5 increases to a value corresponding to approx. 2.5A or more, transistor Q5 will saturate, causing transistors Q1 and Q2 to cut off.

This condition is stable even if the fault which caused the protective circuit to function disappears. The circuit is reset by removing the mains voltage and cutting it in again after approx. 15 seconds, when capacitor C1 will be sufficiently discharged.

The output voltage is protected against overvoltage by zener diode E7 which is connected directly across the output. If, for example, the series transistor short-circuits, the output voltage will become so high that E7 becomes conductive and melts, whereafter the fuse S1 in the transformer circuit blows. Both the fuse and the zener diode must be replaced in order to put the equipment back into operation.

Transmit Relay

In addition to contacts for switching between the receiver and transmitter, the transmit relay has a pair of contacts which, in conjunction with diode E4, are used for switching the antenna in simplex operation of the radio station.

When the transmit relay is operated, terminal 7 is connected to chassis, resulting in the simultaneous operation of relay A in the power supply unit and the antenna switching relay, which is placed outside the power supply unit.

The antenna switching relay is now held by relay-A contacts 14-15. On the transmit button being released, relay A will release before the antenna switching relay. This arrangement protects the transmitter from being powered without also being connected to the antenna connector.

NOTE: The power supply unit may be used for both simplex and duplex operation of a radio station. In the latter case a strap must be inserted between terminals 4 and 5.

Technical Specifications

Supply Voltage

220V or 240V +10, -20%, 50 to 60 Hz.

Current Consumption

Approx. 0.5A at max. output load of 1.9A.

Output Voltage

24V ±2.5%.
Ripple less than 10 mV p-p.

Output Current

Max. 1.9A.

Loss

Approx. 60 watts at 264V supply voltage (primary 240V tap) and at maximum output load (1.9A).

Type of Service

Continuous.

Temperature

PS603 is intended for mounting on a heat sink, which may assume the following temperatures:

Working range: $-25^{\circ}C$ to $+65^{\circ}C$
Function range: $-30^{\circ}C$ to $+75^{\circ}C$.

Weight

4.8 kilos.

Dimensions

275mm x 150mm x 88mm.

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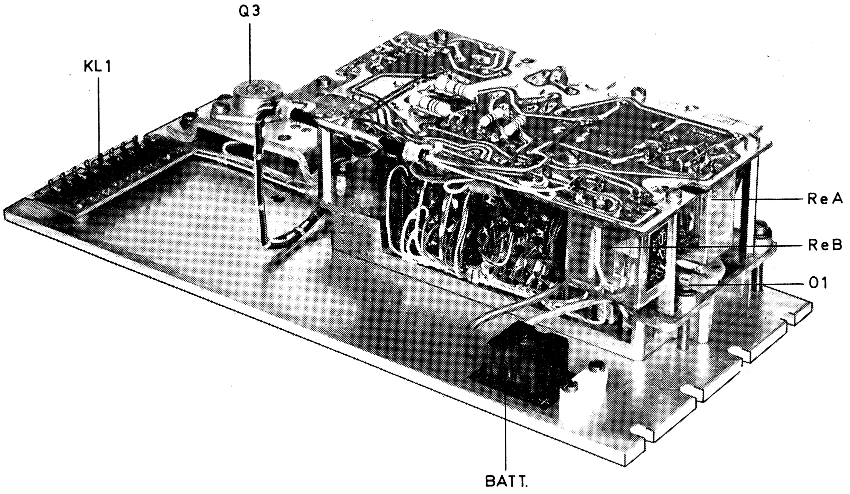
Storno

Power Supply Unit PS604



Power supply unit PS604 is a converter power supply which converts 12 or 24 volts of battery voltage into a 24-volt stabilized DC voltage.

The unit is built on a module chassis, and is intended for installation in a CQF600 station cabinet. It consists of the following main components:

DC converter with voltage switch
Series regulator
Starter and transmit relay

Voltage switching is performed by means of a rotary switch. Besides, when switching from 24V to 12V battery voltage a strap must be inserted between the C terminal of the power supply unit and the +Batt. terminal (see circuit diagram of PS604).

Mode of Operation

DC Converter

The DC converter is a conventional push-pull type with two transistors in a common-emitter circuit and the transformer inserted in the collector circuit, the feedback windings being connected to the bases.

The converter frequency is between 1 and 4 kHz.
The transformer primary consists of four identical centre-tapped windings which are connected either in series or in parallel depending on the battery supply voltage. For 12V, they are partly in series and partly in parallel; for 24V, they are in series.
An inductance between the bases of the two transistors is so dimensioned that its core will saturate before that of the transformer. This arrangement protects the transistors from excessive peak currents.

The transformer secondary has a main winding with taps for matching, and an auxilliary winding. The main winding connects to a bridge rectifier. The secondary auxiliary winding is used to furnish a positive auxiliary voltage for the following series regulator and also powers the starter lamp of the radio station.

Series Regulator

The series regulator consists of a series transistor, a control transistor, and an amplifier transistor.

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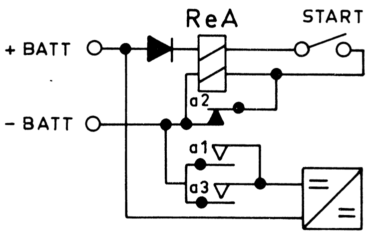
The base of the amplifier transistor receives, via an alignment potentiometer, a portion of the output voltage. A reference diode in the emitter circuit compares the voltage across it with the base voltage. The collector of the amplifier transistor connects to the base of the control begins to increase, 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 will increase, resulting in a drop in output voltage. The output voltage is adjusted for -24V by means of alignment potentiometer R14. A zener diode across the regulator output protects the transmitter-receiver modules against overvoltage in the case of defects in the series regulator since the voltage cannot exceed a certain potential (approx. 30V).

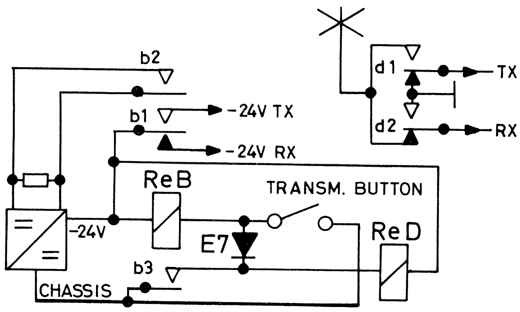
Starter Relay



The starter relay (Re. A) serves the purpose of turning the battery voltage for the power supply unit on and off; this is done via contact pairs a1 and a3. The relay has two coils, but only one of them is energized for starting, the other coil being short-circuited via one of the contact pairs of the relay (a2). After the station has been started, this latter contact pair will break, thereby connecting the two coils in series and reducing the holding current.
A diode in series with the relay protects the power supply unit against incorrect battery voltage polarity.

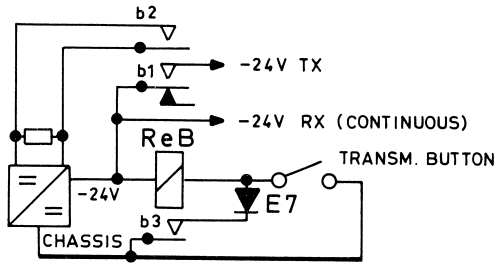
Transmit Relay (function in simplex operation)

Transmit relay (Re. B) is operated from the control box or control equipment. This relay switches the supply voltage back and forth be-



tween the receiver and transmitter sections (contact set b1) and short-circuits a feedback resistance in the DC converter during transmission (contact set b2); the latter operation is performed in order to obtain maximum efficiency at fluctuating converter loads. When the transmit relay is operated, the antenna switching relay - placed outside the power supply unit - is energized via the DC path through diode E7 and the transmit button to earth. This occurs simultaneously with the operation of the transmit relay, but since the operating time of the antenna switching 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 because the latter relay remains operated via contact set b3 of the transmit relay.

(function in duplex operation)



In duplex operation, the antenna switching function is not performed, and the power supply unit delivers -24V for the receiver section continuously.

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Storno

Technical Specifications

Supply Voltages

Measured at input terminals

Supply Voltage	Minimum	Nominal	Maximum
12V	10.0V	12.6V	16.5V
24V	20.0V	25.2V	33.0V

Output Voltage

Regulated, -24V.

Output Voltage Fluctuation

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

Current Consumption, typical

Voltage	Receiver Setting		Transmitter Setting	
	I_{out} = 0A	I_{out} = 0.5A	I_{out} = 0A	I_{out} = 1.6A
12.6V	0.2A	1.9A	0.5A	6.2A
25.2V	0.11A	0.88A	0.2A	2.7A

Output Load

Receive: max. 0.5A.
Transmit: max. 1.6A.

Output Voltage Ripple

Less than 10 mV p-p.

Converter Frequency

1-4 kHz.

Temperature Range

Ambient temperature:
Working range: -25°C to +70°C.
Function range: -30°C to +80°C.

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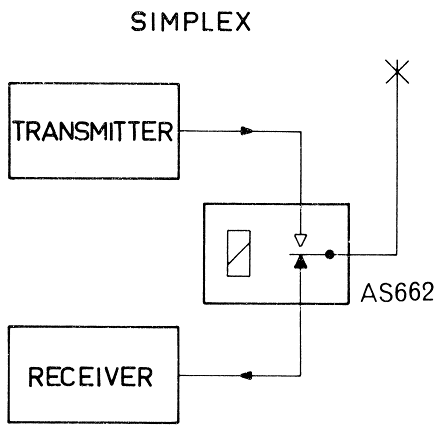
D. Antenna Switching Units and Antenna Branching Filters

Antenna Switching Unit

In radio stations using simplex operation - alternate transmission and reception - it must be possible to switch the antenna between the transmitter output and the receiver input. This function is performed by the antenna switching unit, which incorporates a coaxial relay.

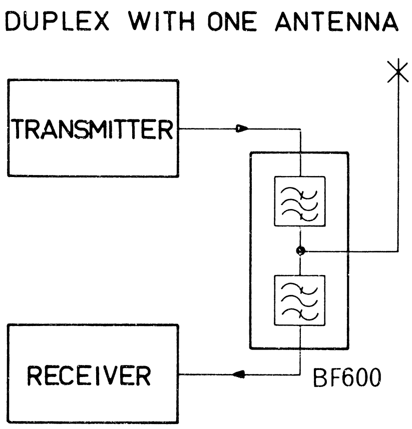


Types

AS662 Antenna switching unit for use in fixed radio stations for simplex operation.

Antenna Branching Filters

In radio stations using duplex operation - simultaneous transmission and reception - the transmitter and receiver sections are as a general rule connected to the same antenna. In such radio stations, an antenna branching network is inserted between the transmitter output, the receiver input, and the antenna. The chief function of the branching network is to prevent the transmitter power output from being applied to the receiver input.



Types

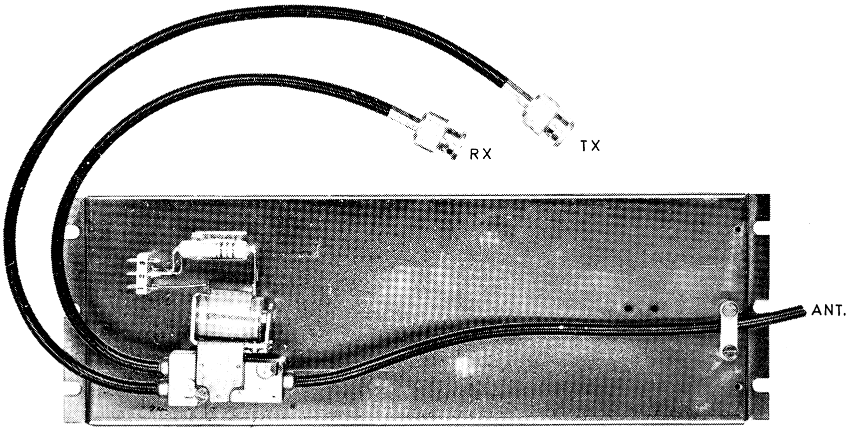
BF611 Antenna branching network for the frequency band 146 - 174 MHz.

BF631 Antenna branching network for the frequency band 63 - 88 MHz.

BF661 Antenna branching network for the frequency band 420 - 470 MHz.

Storno

Antenna Switching Unit AS662

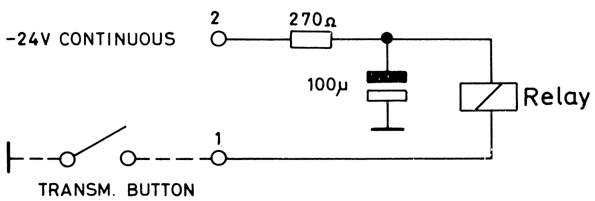


Antenna switching unit AS662 is a coaxial antenna switching unit for use at frequencies up to approx. 500 MHz. Its impedance is 50 ohms.

The antenna switching unit is mounted on a chassis which can be fastened inside the radiotelephone cabinet.

The antenna switching relay switches the antenna between the receiver and transmitter antenna terminals. The interconnections are performed by means of three coaxial cables fitted to the unit. Two of them, with BNC connectors, are connected to the transmitter RF output and receiver signal input, respectively; the third cable goes to the antenna connector provided on the radiotelephone.

Mode of Operation



A resistor and capacitor in the antenna switching unit provide a high value of operating voltage - and hence also a brief operating time - for the relay, in addition to ensuring a low value of locking voltage.

This is accomplished by applying -24 volts continuously to the capacitor when the relay is not operated.

When the relay is operated, the 24-volt potential across the capacitor discharges through the relay coil to chassis, whereupon the relay voltage drops to 12 volts, the continuous voltage being halved owing to the voltage drop across the resistor.

Technical Specifications

Impedance

50 ohms.

Contact Current

Max. 0.75 amp. in range 60-500 MHz.

Insertion Loss

0.1 dB.

Attenuation between Closed and Open Contacts

Max. 35 dB at 470 MHz.

Operating Voltage

24 volts ± 5%.

Operating Current

50 mA.

Operating Time

Max. 7 msec.

Drop-out Time

Max. 20 msec.

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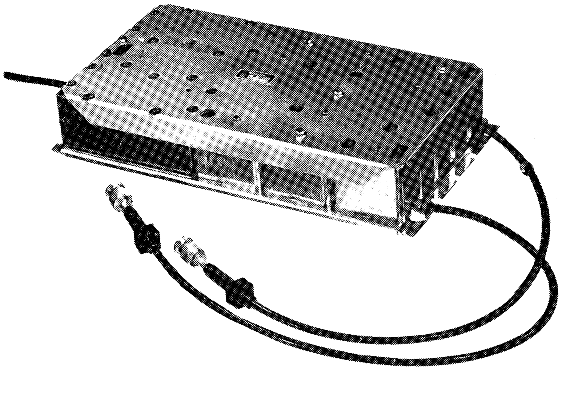
Storno

Branching Filters BF611 and BF612



Branching networks BF611 and BF612 are used with radio stations operating in duplex service with the transmitter and receiver connected to the same antenna inside the frequency range 146-174 MHz.

Branching network BF611 is used in the fixed radio station CQF610, where it is mounted in the station cabinet.

The unit is housed in a screen box, the interior of which is divided up into a number of mutually screened compartments containing the various filter circuits.
A number of holes on the top of the screen box provide access for adjustment of the filter.

Two cables fitted with connectors are used for connecting the filter to the transmitter signal output and the receiver signal input whilst a third cable is connected to the antenna connector of the station cabinet.

Branching network BF612 is used in conjunction with the mobile radiotelephone CQM610. BF612 consists of a type BF611 branching network housed in a cabinet which may either be installed separately or mounted to the cabinet of the radiotelephone.

Branching network BF612 is - just like BF611 - equipped with two cables with connectors for connection to the transmitter output and receiver input of the radio station whilst the antenna terminal of the network is a connector which is mounted on the cabinet.

Mode of Operation

The branching network is composed of two band-stop filters the transmitter section of which has four series-resonant traps and the receiver section five series-resonant traps.
These traps are identical except for L4, C4 and L5, C5, which are two identical series-resonant traps of considerably higher Q than the other circuits, to compensate for the insertion loss introduced by the filter.
In order to accomplish sufficiently high surge impedance in the individual series-resonant traps and consequently sufficiently narrow stop-bandwidth in the filter, all coils of the series-resonant traps have taps.

The series-resonant traps connect to each other through quarter-wave cables, except that compensating circuits L10, C10, and L11, C11 are inserted between series-resonant traps L1, C1, and L2, C2 and between L8, C8 and L9, C9.

The quarter-wave cables going to series-resonant traps L4, C4 and L5, C5 have an impedance of only 25 ohms because of the lower impedance of these traps. The 25-ohm impedance is accomplished by connecting two lengths of 50-ohm cable in parallel.

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In order to facilitate adjustment, short-circuiting holes are provided above traps L4, C4 and L5, C5 through which the short-circuit points shown in the circuit diagram can be connected to chassis.

Technical Specifications

Frequency Range

146-174 MHz.

Duplex Spacing (spacing between transmitting frequency and receiving frequency).

Greater than, or equal to, 4 MHz.

Insertion Loss, Transmitter Section

For 4 MHz duplex spacing: approx. 1.2 dB.
For 10 MHz duplex spacing: approx. 0.6 dB.

Insertion Loss, Receiver Section

For 4 MHz duplex spacing: approx. 1.3 dB.
For 10 MHz duplex spacing: approx. 0.8 dB.

Pass Band

0.6 MHz.

Isolation, Transmitter Section

Min. 45 dB.

Peak Isolation, Transmitter Section

Approx. 75 dB.

Isolation, Receiver Section

Min. 55 dB.

Peak Isolation, Receiver Section

Approx. 90 dB.

Nominal Impedance

50 ohms.

Standing-wave Ratio

Less than 2.

Maximum Power Input

25 watts.

Temperature Range

-30°C to +80°C.

Stable against shocks and vibrations in ordinary mobile service.

Overall Dimensions

BF611: 274mm x 149mm x 53mm
BF612: 307mm x 160mm x 72mm.

Weight

BF611: 2.2 kilos
BF612: 3.8 kilos.

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CHAPTER III. INSTALLATION

A. Installation of the Cabinet

General

The site for a fixed radio station should be chosen on a basis of the following factors:

a) The distance between the station and the antenna should be as short as possible so as to limit the length of the antenna feed cable and hence also the losses involved.

b) Maximum ambient temperature permitted for the equipment is 50°C, and the temperature in the station room should never exceed this limit. Since all the heat generated in the equipment must be drained away through the surface of the cabinet, it is important to avoid covering up the latter.

c) In order to secure easy access to all circuits in the event of service, sufficient room should be left around the cabinet so that it can be opened, thereby making the circuitry accessible.

Installation of the Cabinet

The Stornophone 600 fixed radio station is intended for wall mounting. STORNO can supply the following types of suspension:

Conventional suspension (code No. 37.091). For use where special requirements are not made concerning the mounting of the cabinet.

T-suspension (code No. 37.088). For use where the equipment may be exposed to vibrations, making particularly rugged mounting a necessity. In order to remove the cabinet from the suspension it is necessary to loosen a locking screw, using an Unbrako key (L-shaped hexagonal key).

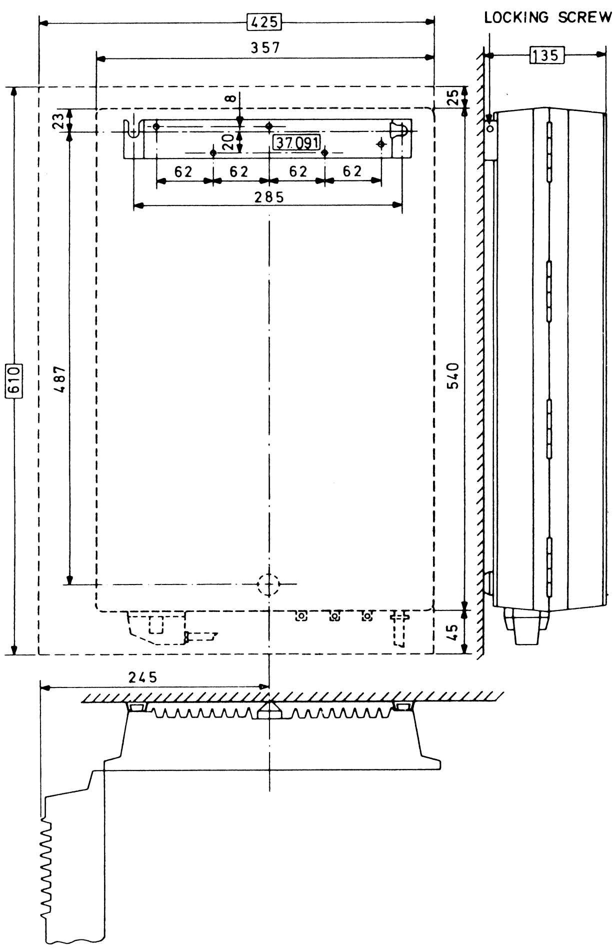
T-suspension (code No. 37.105). Identical with the T-suspension described above except that the locking screw is spring activated and can be loosened without using tools.

Conventional Suspension, 37.091

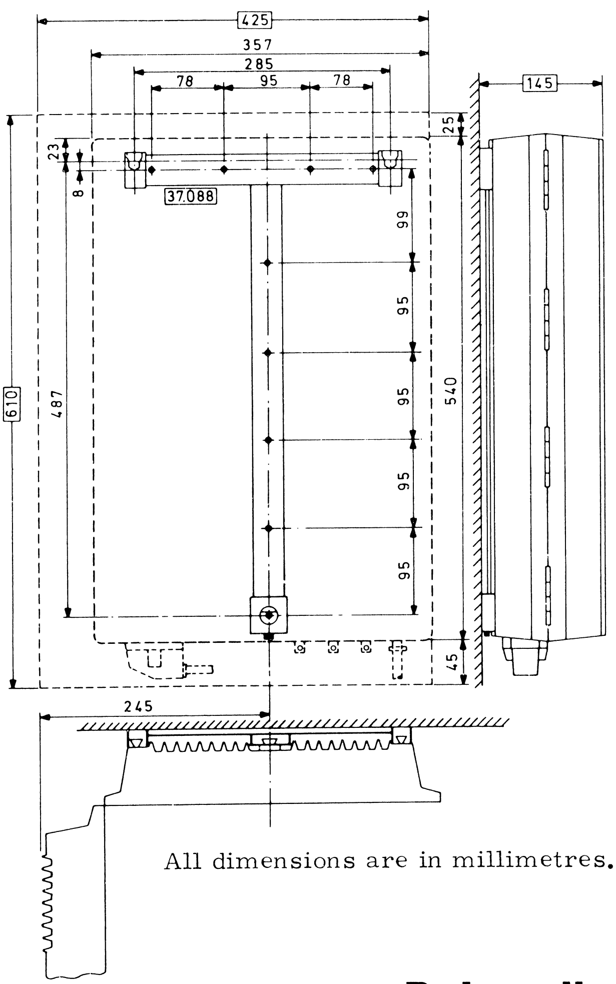
This is a kit comprising the following parts:

One suspension plate
One locking screw
Five wood screws

Fig. 1 shows how to mount the cabinet. All dimensions are listed.



All dimensions are in millimetres.



All dimensions are in millimetres.

T-Suspension (code No. 37.088 or 37.105)

A T-suspension is a kit comprising the following parts:

One suspension plate with locking pawl
Nine wood screws

Fig. 2 shows how to mount the cabinet. All dimensions are listed.

B. Installation of Cabling

The cabling required for operation of the Stornophone 600 fixed radio station comprises:

Power cable
Antenna cable
Control cable.

Power Cable

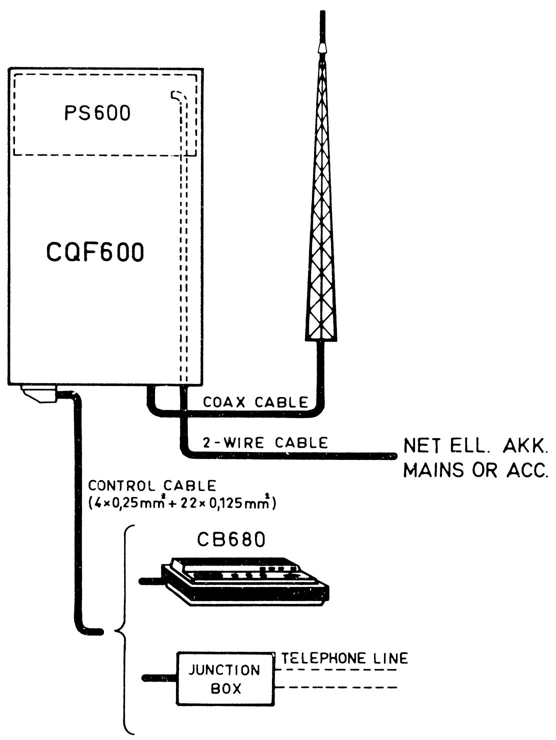
Bring the power cable from the mains or accumulator through the hole in the bottom of the cabinet and connect it to the power supply unit of the equipment.

Antenna Cable

Plug the antenna cable, with a connector mounted on it, into the station's antenna connector (UHF connector, Type N).

Control Cable with Multiwire Connector

The control cable connecting the control equipment to the radio station proper is a 26-con-

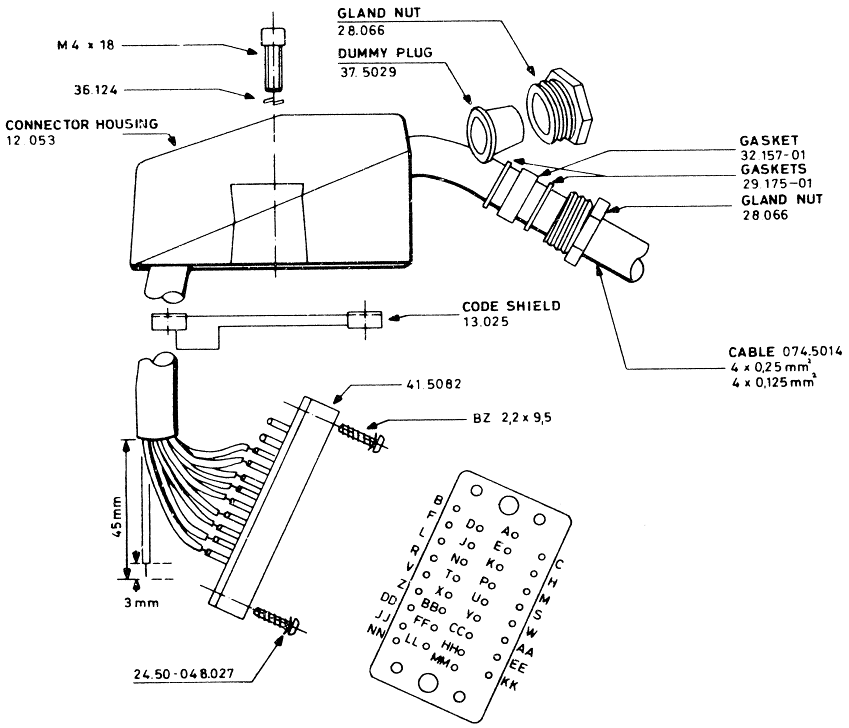


ductor cable, STORNO type 074.5014 (4 x 0.25 mm^2 + 22 x 0.125 mm^2). This cable should be connected to the station via a multiwire connector (41.159) one part of which (the male plug) is mounted on the radiotelephone cabinet. The other part (the female plug) should be mounted on the control cable.

To mount the connector on the control cable, first slide the gland nut and rubber gaskets in over the cable and bring the latter through the bushing provided in the connector housing. Then strip the control cable and its conductors of insulation as shown in the installation drawing and solder the conductors to the solder tags of the connector in accordance with the terminal/colour code.

Thereafter pull the connector into position in the connector housing with the code screen (13.025) inserted as shown and secure them, using the screws supplied. Lastly, slide the connector components into place and tighten the gland nut.

Terminal	Colour	Terminal	Colour
B	green-white	X	brown-white
F	green-grey	BB	brown-grey
L	red-yellow	FF	grey-white
R	black-yellow	LL	green-red
V	violet	A	green
Z	grey-red	E	green-brown
DD	grey	K	red
JJ	orange and yellow	P	none
NN	none	U	brown
D	yellow-white	Y	black and blue
J	yellow-green	CC	red-brown
N	yellow-brown	HH	blue-brown
T	yellow-grey	MM	white



CHAPTER IV. SERVICE

A. Maintenance

Preventive Service Inspections

When the radiostation 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 radiostation 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 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.

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.

CQF611, CQF612, CQF613, CQF614

POINT	UNIT	INSTR.	MEASUREMENT
[1]	RC611	Probe A	10-30 mV ●
[2]	RC611	Probe A	30-80 mV ●◆
[3]	RC611	Probe B	0,6-1,2 V
[4]	RC611	Probe B	0.3-0.8 V
[7]	IC600	Probe B	0.2-0.8 V
[8]	IA601	Probe A	0.3-2.0 µV □
[10]	IA601	AF-voltm.	12.5kHz: 0.4-0.5V ■ 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 AA608	AF-voltm.	0.2-1.0V ▲
[30]	EX611	Probe B	0.5-1.4V
[32]	EX611	Probe B	1.0-1.6V
[33]	EX611	Probe C	3.0-5.0V
[34]	EX611	Probe C	2.0-6.5V
[35]	EX611	Probe B	1.5-2.5V
[36]	PA611 PA612	Probe D	15-20V ○
(37)	PA611 (6/10W)	mA-instr.	10W: 150-300mA * 6W: 50-150mA
(38)	PA611 (6/10W)	mA-instr.	10W: 500-800mA * 6W: 300-400mA
(37)	PA612 (25W)	DC-voltm.	0.08-0.25V *
(38)	PA612 (25W)	DC-voltm.	0.3-0.7V *
(39)	PA612 (25W)	DC-voltm.	0.5-0.6V *

CQF631, CQF632, CQF633, CQF634

POINT	UNIT	INSTR.	MEASUREMENT
1	RC631	Probe A	5-20 mV ●
2	RC631	Probe A	10-40 mV ●◆
3	RC631	Probe B	0.4-1.0 V
4	RC631	Probe B	0.4-1.0V
7	IC600	Probe B	0.2-0.8V
8	IA601	Probe A	0.3-2.0 μV □
10	IA601	AF-voltm.	12.5kHz: 0.4-0.5V ■ 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 AA608	AF-voltm.	0.5-1.0V ▲
30	EX630	Probe B	0.5-0.9V
32	EX630	Probe B	1.4-1.8V
33	EX630	Probe C	2.6-5.0V
35	EX630	Probe B	0.3-0.8V
36	PA631 PA632	Probe D	14-16V O
(37)	PA631 (6/10 W)	DC-voltm.	10W: 0.2-0.45V * 6W: 0.1-0.3V
(38)	PA631 (6/10 W)	DC-voltm.	10W: 0.6-0.85V * 6W: 0.3-0.4V
(37)	PA632 (25W)	DC-voltm.	0.08-0.3V *
(38)	PA632 (25W)	DC-voltm.	0.4-0.7V *
(39)	PA632 (25W)	DC-voltm.	0.5-0.6V *

● Antenna signal - EMF for 10 μA
◆ Without oscillatorsignal
□ Antenna signal - EMF for 40 μA
■ Antenna signal 1 μV EMF, 0,7 x ΔF max. and 1000 Hz
O Measured across a 47 Ω resistor
* Measured at nominal output power
▲ Frequency deviation 0.7 x ΔF max. and 1000 Hz.

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)

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 (see specifications for the power supply unit used).
3) Check cable connections and connectors. 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 other stations 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 radiostation.
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 radiostation 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 vacuumtube 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^{o}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 radiostation 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.

Fault-finding in Power Supply Unit PS602

General

The compact construction and large number of components of power supply PS602 may make fault-finding in this unit difficult.

However, these fault-finding instructions enable the repairman to perform the measurements which are necessary in order to locate faults in the unit.

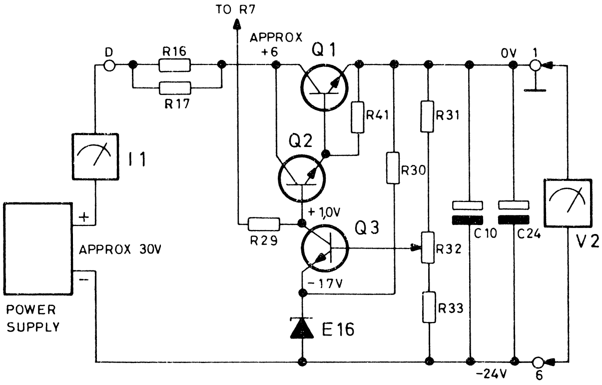
Measuring Equipment

The measuring instruments listed below are required for checking the power supply unit:

An adjustable autotransformer, 170-270V, 2A.
An adjustable power supply, 0-30V, with adjustable current limiting, such as the Radiometer type SE 11 a.
An oscillograph such as the Telequipment type S 32 A.
An AC voltmeter, 0-250V.
A DC voltmeter, 0-30V.
An ammeter, 0-5A DC.

Procedure

It is necessary to divide the power supply unit into a number of circuits and to test these separately since the correct functioning of each individual circuit depends on whether the other circuits of the power supply unit are functioning satisfactorily.



Conditions of Measurement

No mains power must be applied to the power supply unit.
Take out fuse S2.
Remove the load from the power supply unit (unsolder the cabling from its output terminals).
Remove straps marked NOTE 1 and NOTE 2 in the circuit diagram of the PS602 (D400. 813).
Connect a laboratory-type power supply having current limiting at approx. 60 mA to terminal 6 (minus) and terminal 1 (plus). Adjust its output voltage for approx. 30V.

Requirements

After the capacitors have become fully charged:
J1 = approx. 40 mA.
V2 = approx. 24 V.

It should be possible to adjust V2, by means of potentiometer R32, from approx. 20V to 26V.

With V2 set for 24V, check the DC voltages of the series regulator. Correct readings appear from the diagram above.

Checking the Turn-on Circuit

The turn-on circuit consists of transistors Q6, Q7, Q8, and Q9, and their associated components (see circuit diagram D400. 813).

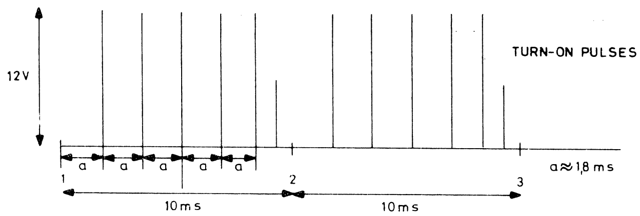
Conditions of Measurement

Unsolder from terminals E and F on the wiring board the two yellow leads coming from controlled rectifiers E4 and E3.

Connect resistors R3 and R2, in parallel, to terminal D (see sketch).

Connect an oscillograph across the two paralleled resistors.

Apply 220V mains voltage to the input of the power supply unit.



POINTS 1, 2, AND 3 REPRESENTS PASSAGE OF 50Hz MAINS VOLTAGE THROUGH ZERO

a= TURN-ON DELAY

Variation of Turn-on Time

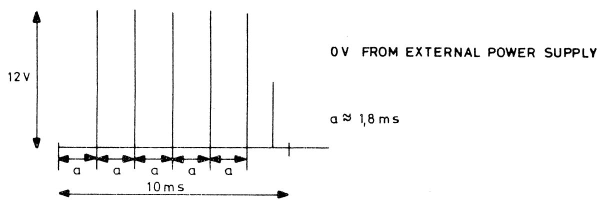
Conditions of measurement are the same as for checking the turn-on circuit (see preceding section), with one addition:

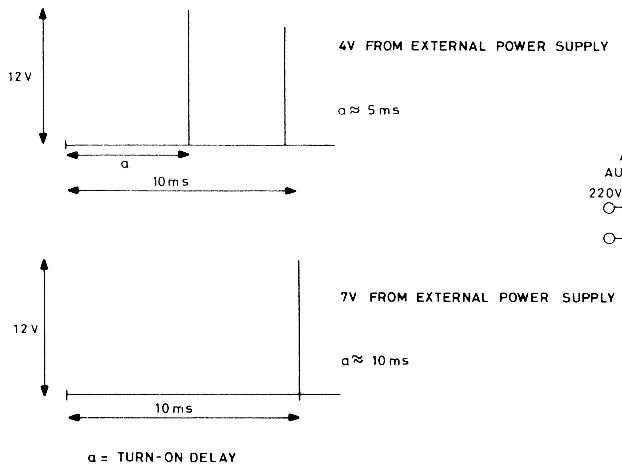
Unsolder from the wiring board the black lead coming from terminal 1 on the tag strip.

Connect an external adjustable power supply to the PS602 so that its plus potential goes to terminal 9 and its minus potential goes to that terminal on the wiring board from which you removed the black lead.

Checks

With the external power supply set to deliver 0, 4, and 7V, respectively, the oscillograph readings shown below should be obtained.





Some Possible Faults

If E7 or E8 is open, every second pulse train will be missing.

If both E7 and E8 are open, transistor Q9 will pass current and so short-circuit transistor Q8. This will disable the oscillator, and no turn-on pulses will appear.

A short-circuit in Q7 will cause the oscillator to operate at a low frequency. Turn-on delay a ≈ 10 ms.

If E11 is open, the oscillator will operate at a high value of turn-on delay, a ≈ 10 ms.

Resistance Measurements on Unijunction Transistor Q8 (2N2646)

B_1-B_2: approx. 2.8 k ohms and 4 k ohms
B_1-E: approx. 24 k ohms and 3 k ohms
B_2-E: approx. 25 k ohms and 14 k ohms

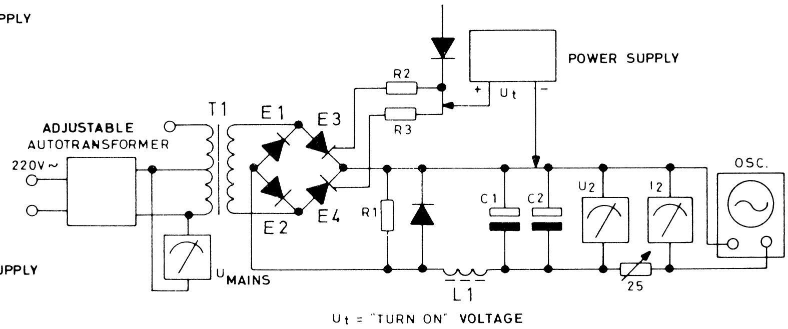
Measured with multimeter

Two values are listed for each measurement, for both polarities of the multimeter.

Measurement of Ripple on the Power Supply Section of the Turn-on Circuit

At 220V mains voltage applied to the PS602:
Ripple across capacitor C3: $1V_{p-p}$, f = 100 Hz.

Rectifier and Filter



Conditions of Measurement

Apply 175V AC to the input terminals of the power supply unit.
Remove fuse S2.

Connect the load directly across electrolytic capacitors C1 and C2 as shown in the circuit diagram.

Likewise as shown in the diagram, connect an external adjustable power supply to the turn-on electrodes of E3 and E4.

For U_t = 0, the output voltage U_2 should be 0.
For U_t = 6, the output voltage U_2 should be approx. 34V for I_2 = 2A.

U_2 ripple should not exceed approx. 300 mV_{p-p} (100 Hz).

If one of the controlled rectifiers is open, U_2 will be approx. 20V for I_2 = 2A, and U_2 ripple will be approx. 1200 mV_{p-p} (50 Hz).

NOTE: U_2 must not exceed 50 V.

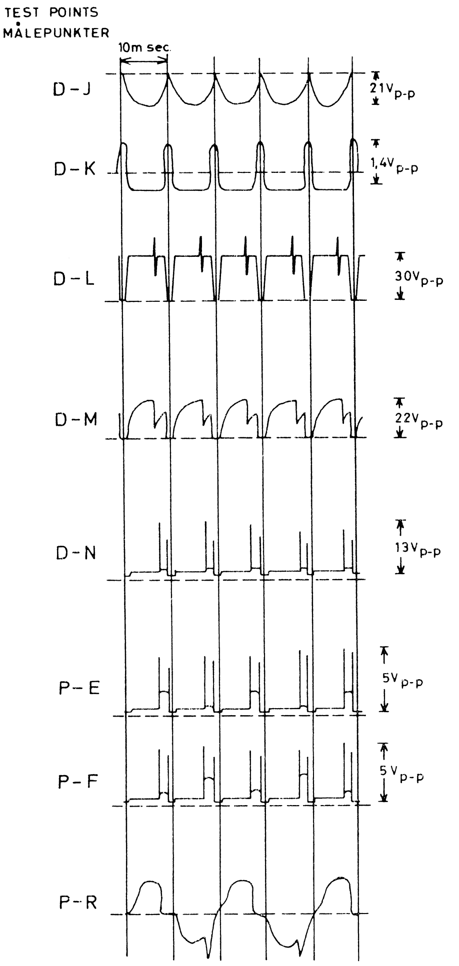
Overall Check of Power Supply Unit

Resolder all leads that were unsoldered during the preceding check measurements and make the power supply unit ready for normal operation.

Measurement of Curve-forms

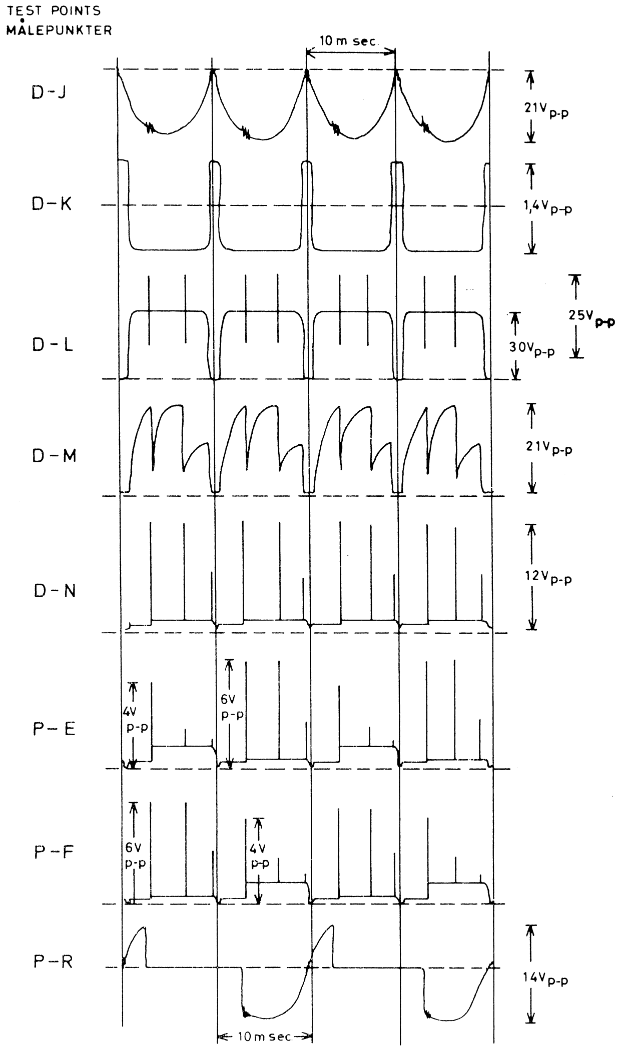
Conditions of Measurement:

U_{mains} = 220V, 50 Hz.
I_{load} = 0 A.
Measuring instrument: Telequipment S32A.



Conditions of Measurement:

U_{mains} = 220V, 50 Hz.
I_{load} = 3.8 A.
Measuring instrument: Telequipment S32A.



C. Adjustment Procedure

General

The directions given in this section are intended as an aid in aligning a STORNOPHONE 600 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 600 should perform adjustments and repairs.

Each individual radiotelephone is checked and tested before being dispatched from STORNO. In the absence of any special agreement, 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 radiostation in conjunction with control equipment (if provided).

Types of Radiostations

This adjustment procedure applies to the following radiostations:

TYPE	BAND (MHz)	CHANN. SEPARATION
CQF611	146-174	50 kHz
CQF612	146-174	25 kHz
CQF613	146-174	20 kHz
CQF614	146-174	12.5 kHz
CQF631	68-88	50 kHz
CQF632	68-88	25 kHz
CQF633	68-88	20 kHz
CQF634	68-88	12.5 kHz

Measuring Equipment

While adjustments are being performed, the radiostation should be connected to a control desk and a power source delivering a voltage as specified in the specifications for the power supply unit used.

The following instruments are required:

A signal generator, for 146-174 MHz (CQF610) or 68-88 MHz (CQF630).

A crystal-controlled signal generator for 455 kc/s. (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.

CAUTION: The greatest care should be shown when measuring currents, voltages etc. in the circuits of the STORNOPHONE 600 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.

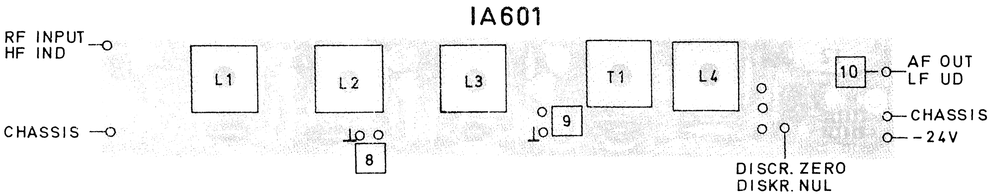
RECEIVER ALIGNMENT

Before starting alignment of the receiver, first check the internal supply voltage, -24 volts. If necessary, adjust it for the correct value, using a potentiometer located in the power supply unit.

In PS602: potentiometer R32
In PS603: potentiometer R16
In PS604: potentiometer R14
In PS605: potentiometer R19

Also check that the straps in receiver converter RC611 or RC631, intermediate-frequency amplifier IA601 and squelch and audio amplifier SQ601 or SQ602 are in accordance with the channel separation in use (see circuit diagrams of the respective units).

Alignment of Low IF Channel and Discriminator, IC60x and IA601



Apply a 455 kHz signal (approx. 0.1mV) to the input of BP60x without cutting off the connection between IC60x 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. 1mV) 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 reading 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: 37.5μA ± 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 X06xx

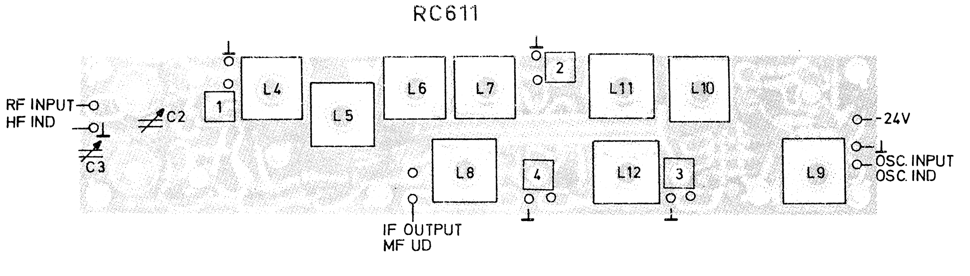


fig. 2

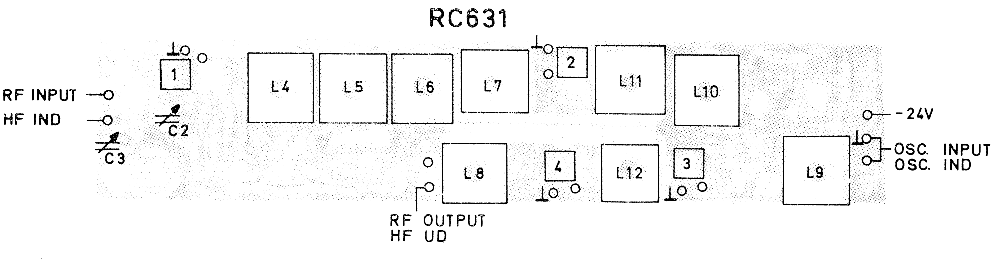


fig. 3

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

CQF630: $fx = \frac{fsig + 10.7}{2}$ MHz

CQF610:

146 - 160 Mc/s: $fx = \frac{fsig + 10.7}{3}$ MHz

156 - 174 Mc/s: $fx = \frac{fsig - 10.7}{3}$ 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 list of test point reading).

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

Adjust coils L11 and L12 in RC6x1 for maximum meter reading (see list of test point reading).

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 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.

<u>All stations except CQF614 and CQF634</u>

Readjust coils L4, L5, L6, L7, and L8 in RC6x1 and coil L1 in IC60x for maximum meter reading. The level should be so low that limiting does not occur (approx. 1-4 μV).

<u>CQF614 and CQF634</u>

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 200 μA).

Adjustment of Oscillator, XO6xx

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 IC60x

IC601, IC602, IC603

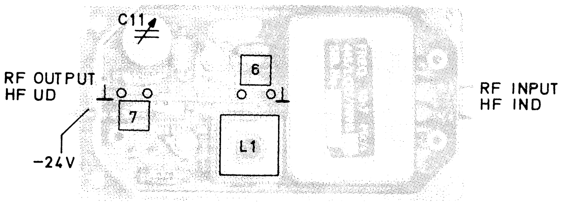
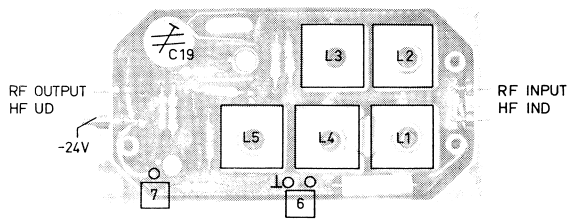


fig. 4

To adjust the oscillator frequency, connect a frequency counter at test point [7] and, using trimmer capacitor C11, adjust the oscillator to exact frequency (10.245 MHz or 11.155 MHz).

IC605 (In CQF614 and CQF634 only)



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, IC60x, IA601 and SQ60x

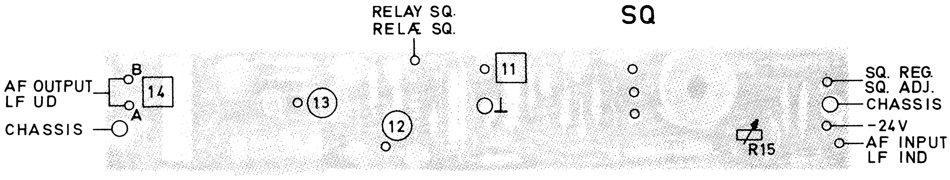


fig. 5

Connect the signal generator to the antenna input of RX6x1 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 modulating frequency should be 1000 Hz. The RF level should be 100 - 1000 μV.

In CQF614 and CQF634 only
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 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.

Check distortion, k $\leqslant$ 5%.

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 100-1000 μV.

Adjust, by means of potentiometer R15 in SQ60x, the output level for 3 dBm, corresponding to 1.1V across a 600-ohm load.

Connect the audio voltmeter and the distortion meter at test point 14 in SQ60x (at output terminals).

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

Insert filter to remove the modulating frequency.

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 and noise + distortion (12 dB SINAD).

Distortion: less than 3.5%.

Carefully adjust the input filter in RC611 or RC631 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.

Note: The 600-ohm load is located in the control box, where it serves as level control.

Squelch Sensitivity

Keep the signal generator connected to the antenna input of RCx1 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.

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 in the control desk or the control panel of the control equipment.

Set the squelch control to the threshold value (without RF signal applied). 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: 21 dB, typical.

TRANSMITTER ALIGNMENT

Check that the straps in units EX6xx, PA6xx, 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 PA6xx to the 47-ohm load reaistor in the power amplifier unit, testpoint [36] which loads the exciter during adjustments.

The transmitter must operate under carrier-on conditions during the subsequent adjustments.

This is accomplished by depressing the transmit button on the control desk or by connecting terminals V and K-L in the multi-wire connector together.

Set the ADC control potentiometer at mid-scale:
In PA611: potentiometer R5
In PA612: potentiometer R10
In PA614: potentiometer R9
In PA631: potentiometer R9
In PA632: potentiometer R8.

Alignment of Exciter EX6xx

Alignment of the exciter should be performed without modulating signal from AA601/AA608.

EX611 (in CQF611, CQF612, CQF613, and CQF614)

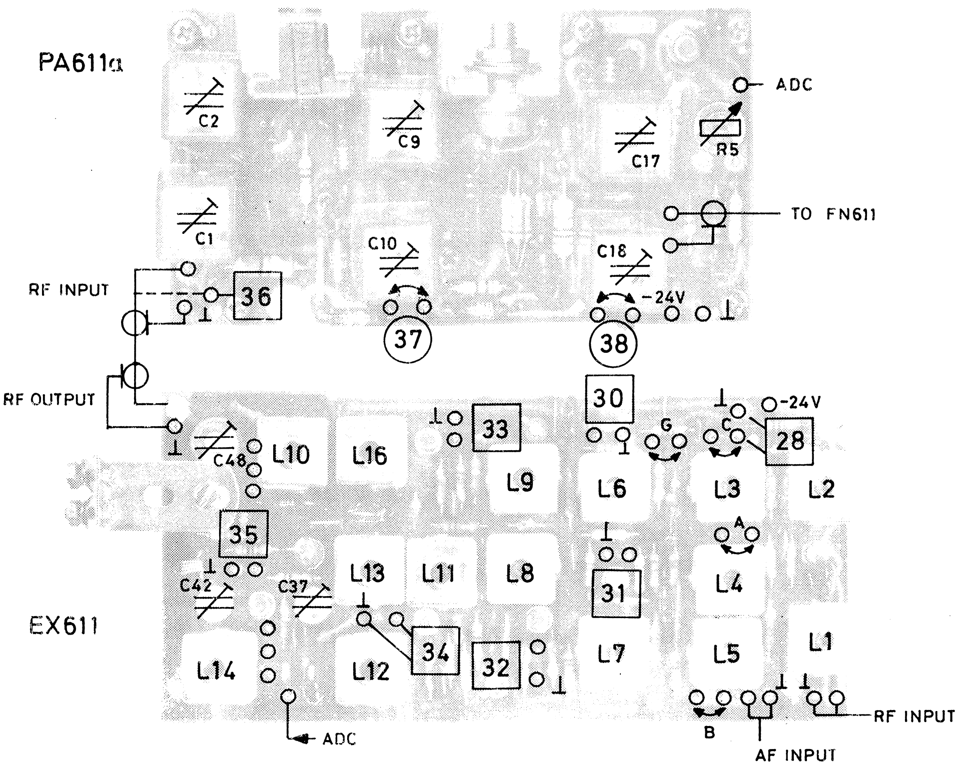


fig. 6

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

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

Adjust 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.

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 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 or PA612 (across 47-ohm load resistor).

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

EX631 and EX632 (in CQF631 and CQF632, CQF633, CQF634, respectively)

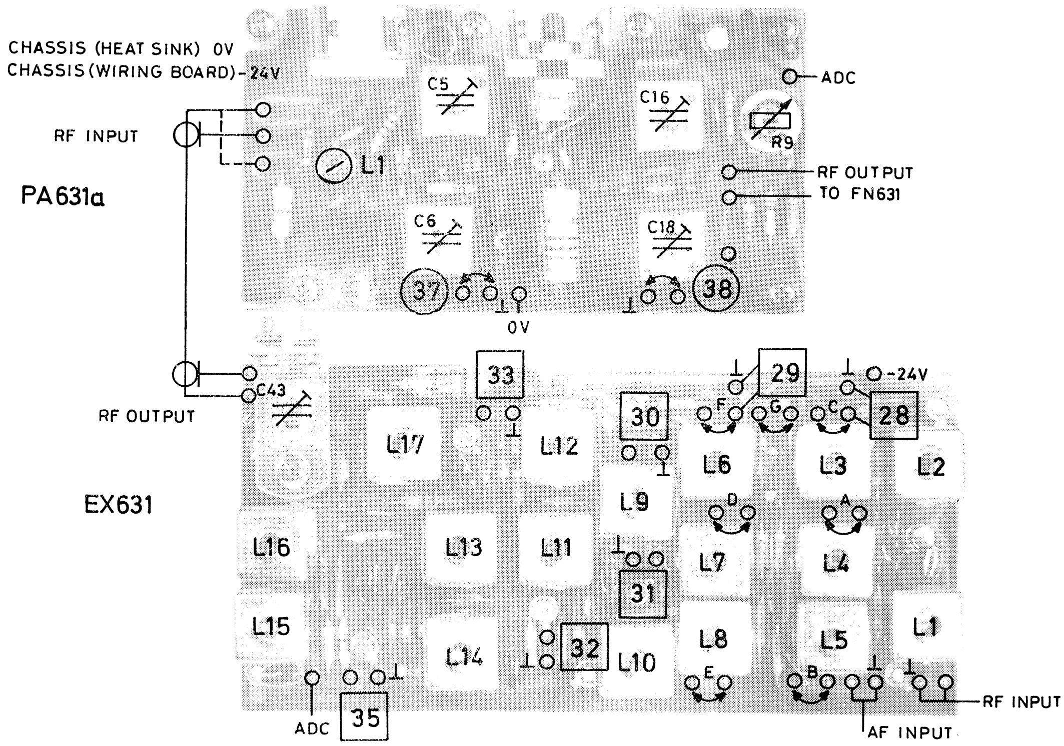


fig. 7

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 maxi mum 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. 1.6V.

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 or PA632 (across the 47-ohm load resistor).

Adjust coils L15, L16, and L17 and trimmer capacitor C43 for maximum meter reading, approx. 17V.

Release the transmit button (or remove strap between terminals V and K-L).

Adjustment of Power Amplifier Stage, PA600

First, the signal lead from the exciter should be transferred from the load resistor to the input of PA600.

Connect a wattmeter and a dummy load across the output of power amplifier PA600.

PA611 (10 Watts Power Amplifier Stage in CQF611, CQF612, CQF613, and CQF614)

See Fig. 6.

Set all trimmer capacitors of the power amplifier to half of their capacity.

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, (anticlockwise).

Depress the transmit button (or strap terminals V and K-L together).

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 not exceed 250mA, and the current at test point (38), as measured with the 1-amp. meter, should not exceed 700 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 power supply unit, care should be taken that the maximum currents stated above are not exceeded while aligning the transmitter.

PA631 (10 Watts Power Amplifier Stage in CQF631, CQF632, CQF633, and CQF634)

Back off the ADC potentiometer, R9 (anti-clockwise).

Depress the transmit button (or strap terminals V and K-L together).

Carefully advance the ADC potentiometer, adjusting coil L1 and trimmer capacitors C5, C6, C16, and C18 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 coil L1 and trimmer capacitors C16 and C18 for maximum power output.

Again adjust the ADC potentiometer for 10 watts power output.

Every adjustment of the ADC potentiometer should be followed by readjustment of coil L1 and trimmer capacitors C16 and C18.

Remove strap designated (37) and insert instead a milliammeter (0-500 mA).

Remove strap designated (38) and insert instead an ammeter (0-1.5A).

At maximum (10W) power output the current in test points (37) should not exceed 300 mA. The current in test points (38) should not exceed 800 mA.

Remove the meters and insert the straps.

Adjusting the Power Amplifier for 6 Watts Power Output, PA6x1

See Fig. 7.

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 coil L1 and trimmer capacitors C16 and C18 for maximum power output.

Adjust the ADC potentiometer for 5 watts power output.

Again readjust as described 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 0.5 V.

PA612 (25 Watts Power Amplifier Stage in CQF611, CQF612, CQF613, and CQF614)

Transfer the signal lead from the exciter from load resistor R1 to the input of the PA612.

Connect a wattmeter and a dummy load to the output of antenna filter unit FN612.

Connect a voltmeter (0-0.5V) to test points (37), across test resistor R2 (1 ohm).

Connect a voltmeter (0-1.0V) to test points (38), across test resistor R3 (1 ohm).

Connect a voltmeter (0-1.0V) to test points (39), across test resistor R4 (0.3 ohm).

Turn ADC potentiometer R10 all the way down (clockwise).

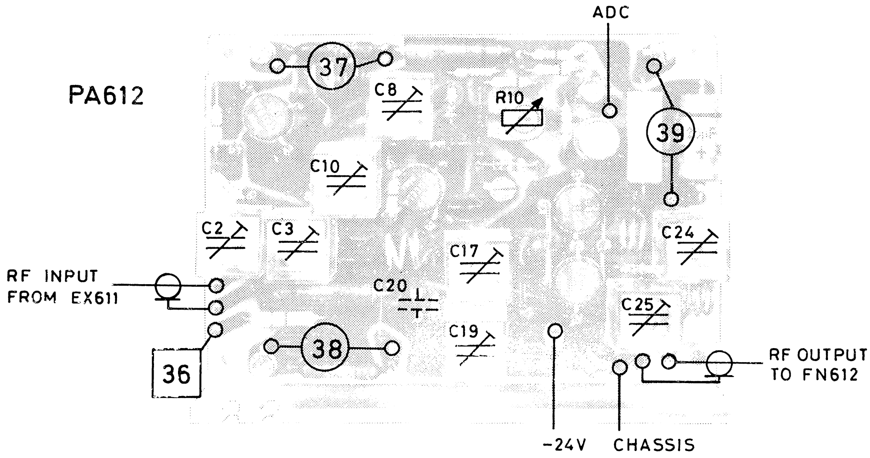


fig. 8

Set trimmer capacitors C2 and C3 at approx. one-fourth of full capacitance.

Set trimmer capacitors C8, C10, C17, C19, C24, and C25 at maximum capacitance.

NOTE: During the subsequent adjustments, the currents flowing through the various stages of the unit must not exceed these values:

1st driver stage (Q1): 0.25A, corresponding to 0.25V at (37)

2nd driver stage (Q2): 0.7A, corresponding to 0.7V at (38)

Output stage (Q3 and Q4): 1.75A, corresponding to 0.58V at (39).

Turn on the transmitter.

Check if the output stage draws current (test point (39)). If it does not, carefully advance the ADC potentiometer (anti-clockwise).

Adjust trimmer capacitors C2 and C3 for maximum reading at test point (37).

Adjust trimmer capacitors C8 and C10 for maximum reading at test point (38).

Adjust trimmer capacitors C17 and C19 for maximum reading at test point (39).

Adjust trimmer capacitors C24 and C25 for maximum power output.

With these adjustments completed, the current through each stage should be approx. two to three times higher than the current through the preceding stage.

Slowly increase, by means of the ADC potentiometer, the input signal from the exciter until the ratio of the currents changes appreciably.

Thereafter again adjust the PA612 for maximum power output, this time working from the output back towards the input (C25, C24, C19, C17, C10, C8, C3, C2). It is usually necessary to repeat the entire alignment procedure a few times. Make sure that the above-mentioned ratio of the currents through the various stages is restored.

Again increase the input voltage until the ratio of the currents changes. Thereafter again align the unit, working from its output back to its input.

When a power output level of 10 watts has been obtained, it will usually be sufficient to adjust trimmer capacitors C25, C24, C19, and C17.

When 25 watts of power output has been obtained, all trimmer capacitors should be adjusted for best efficiency and maximum power output.

If more than 25 watts of power output is obtained: Reduce the output to 25 watts by means of ADC potentiometer R10 and thereafter adjust trimmer capacitors C25 and C24 for best efficiency.

PA614 (25 Watts Power Amplifier Stage in CQF611, CQF612, CQF613, and CQF614)

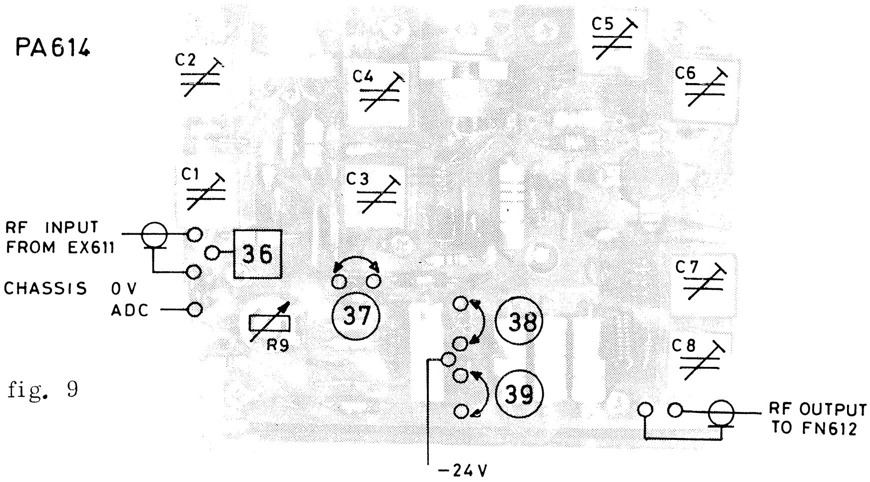


fig. 9

Transfer the signal lead from the exciter from load resistor R1 to the input of the PA614.

Connect a wattmeter and a dummy load to the output of antenna filter FN612.

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

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

Connect a voltmeter (0-1V) to testpoints (39), across test resistor R7 (0.33Ω).

Turn ADC-potentiometer R9 all the way down (counter-clockwise).

Set trimmer capacitors C1, C2, C3, C4, C6, and C8 at half of their capacity (their tuning slugs turned half-way in, whereas the tuning slugs of C5 and C7 should be fully turned out.

NOTE: During the subsequent adjustments, the currents flowing through the various stages of the unit must not exceed these values:

1st driver stage (Q1): 0.15A at test points (37).

2nd driver stage (Q2): 0.6A at test points (38).

Output stage (Q3): 1.85A corresponding to 0.61V at (39).

Turn on the transmitter.

Carefully open up the ADC-potentiometer to allow the cu rent at test points (38) to increase approx. 100-200 mA.

Adjust trimmer capacitors C5, C6, and C7 for maximum power output. Repeat the alignment procedure.

When a power output of 10 watts has been obtained trimmer capacitor C8 should be included in the alignment procedure. Continue by turns to advance the ADC-potentiometer and adjust capacitors C5, C6, C7, and C8 until a power output of 25 watts is obtained.

Adjust all trimmer capacitors (C1, C2, C3, C4, C5, C6, C7, and C8) for maximum power output. If more than 25 watts power output is obtained during this alignment, reduce the output to 25 watts by means of the ADC-potentiometer and continue the alignment. Repeat the alignment a couple of times.

NOTE: During the alignment of PA614 the tuning slug of trimmer capacitor C1 should never be turned more than half way out to avoid incorrect loading of the exciter.

When 25 watts of power output has been obtained the driver and output stages should be adjusted for best efficiency and maximum power output. Duri ~ the adjustment the output should be kept at r . 25 watts by means of the ADC-potentiometer.

Adjust capacitors C3 and C4 for maximum current consumption in 1st driver stage, measured at test points (37). Repeat the alignment a couple of times.

Adjust capacitors C5 and C6 for minimum current consumption in 2nd driver stage, measured at test points (38). Repeat the alignment a couple of times.

Adjust capacitors C7 and C8 for minimum current consumption in the output stage, measured at test point (39). Repeat the alignment a couple of times.

PA632 (25 Watts Power Amplifier Stage in CQF631, CQF632, CQF633, and CQF 634)

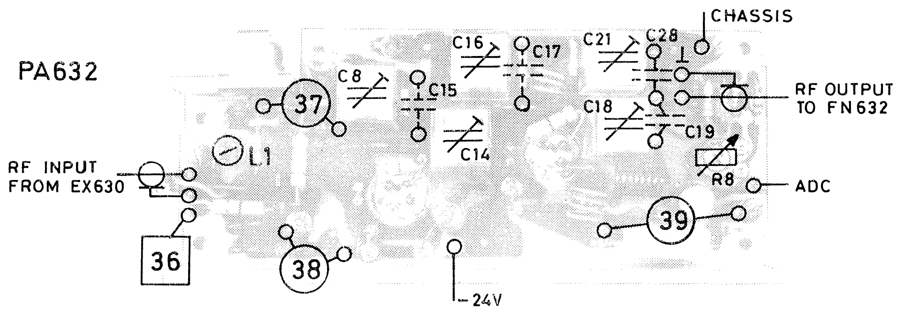


fig. 10

Transfer the signal load from the exciter from load resistor R1 to the input of the PA632.

Connect a wattmeter and a dummy load to the output of antenna filter unit FN632.

Connect a voltmeter 0-1V to test points (37)

Connect a voltmeter 0-1V to test points (38)

Connect a voltmeter 0-1V to test points (39)

Turn ADC potentiometer R8 all the way down (anti-clockwise).

Set trimmer capacitors C8, C14, C16, C18, and C21 at maximum capacitance.

Note: During the subsequent adjustments, the currents flowing through the various stages of the unit must not exceed these values:

1st driver stage (Q1): 0.2A, corresponding to 0.3V at (37)
2nd driver stage (Q2): 0.7A, corresponding to 0.7V at (38)
Output stage (Q3): 1.8A, corresponding to 0.6V at (39)

Turn on the transmitter.

Check if the output stage draws current (test point (39)).

If it does not, carefully advance the ADC potentiometer (clockwise).

Adjust trimmer capacitors C8, C14, C16, C18, and C21 for maximum power output into the dummy load. It is usually necessary to repeat the entire alignment procedure a few times.

When all the stages draw current (test points (37), (38), and (39)) and the wattmeter indicates a power output from the unit, increase the input power until a state of saturation occurs (that is when the power output ceases to increase concurrently with the clockwise opening of the ADC potentiometer).

When the state of saturation occurs, adjust trimmer capacitors C21, C18, C16, C14, and C8 besides coil L1 for maximum power output. Repeat the alignment procedure a few times.

Continue by turns to advance the ADC potentiometer and align the circuits until a power output of 25 watts is obtained, without exceeding the maximum permissible currents through the various stages.

If more than 25 watts power output is obtained: Reduce the output to 25 watts by means of ADC potentiometer R8, and thereafter adjust trimmer capacitors C18 and C21 for best efficiency.

Antenna Filter FN6x1 or FN6x2

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 or AA608

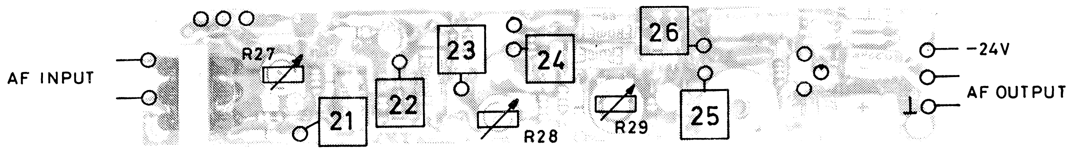


fig. 11

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 the modulation input of AA601/AA608.

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

<u>AA601 (in all stations except CQF614 and CQF634)</u>

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

CQM611 and CQM631: ΔF max. = ±15 kHz
CQM612 and CQM632: ΔF max. = ±5 kHz
CQM613 and CQM633: ΔF max. = ±4 kHz.

Adjust, by means of potentiometer R29 in AA601, 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.

<u>AA608 (in CQF614 and CQF634 only)</u>

Vary the frequency between 300 and 2500 Hz while adjusting for maximum frequency swing (ΔFmax. = ±2.5 kHz).

Adjust, by means of potentiometer R29 in AA608, the frequency swing so that it will not exceed the maximum value (ΔF max.) anywhere inside the frequency range 300-2500 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%.

<u>NOTICE!</u> Distortion should be measured with de-emphasis.

Adjustment of Antenna Branching Filter BF611

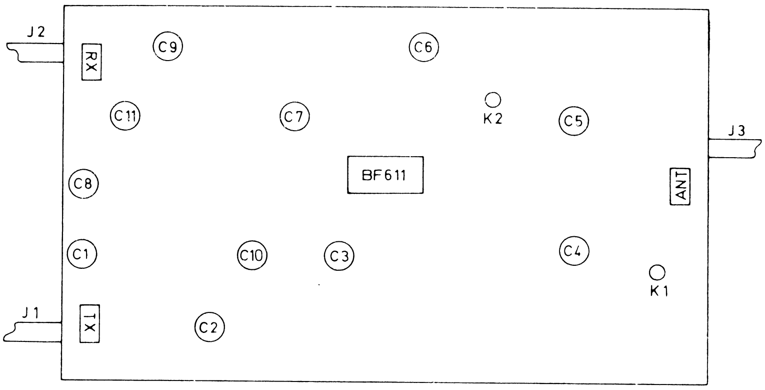


fig. 12

Switch the radiostation to a channel in the centre of its channel coverage range.

Detune all series traps of the filter by means of trimmer capacitors C1, C2, C3, C4, C5, C6, C7, C8, and C9. Take care not to screw the tubular trimmer capacitors too far down.

Set trimmer capacitors C10 and C11 at minimum capacitance.

Adjustment of the Transmitter Section for Isolation of the Receiving Frequency

Connect a signal generator, set to the receiving frequency (modulation 1000 Hz), to J1.

Connect a 50-ohm load to J2.

Connect the receiver to J3.

Strap short-circuit point K2 to chassis.

Adjust the transmitter section of the branching filter by successively tuning the series traps (C1, C2, C3, and C4) for minimum signal at the receiver input.

Adjustment of the Receiver Section for Isolation of the Transmitting Frequency

Connect a wattmeter to J1.

Connect a tapped 50-ohm load to J2. Connect the tap to an RF millivoltmeter.

Connect the transmitter to J3.

Strap short-circuit point K1 to chassis.

Turn on the transmitter.

Adjust the receiver section of the branching filter by successively tuning the series traps (C5, C6, C7, C8, and C9) for minimum signal reading on the RF millivoltmeter.

Adjustment of the Transmitter Section for Minimum Attenuation of the Transmitting Frequency

Connect the transmitter to J1.

Connect a 50-ohm load to J2.

Connect a wattmeter to J3.

Turn on the transmitter.

Adjust trimmer capacitor C10 for maximum wattmeter reading, choosing the larger of the two peaks.

Adjust the transmitter output stage for maximum wattmeter reading, taking care that the transmitter does not "squegg" (parametric oscillations).

Adjustment of the Receiver Section for Minimum Attenuation of the Receiving Frequency

Connect the transmitter to J1.

Connect the receiver to J2.

Connect a tapped 50-ohm load to J3. Connect the tap to a signal generator set to the receiving frequency (modulation: 1000 Hz).

Adjust trimmer capacitor C11 for maximum signal input to the receiver, choosing the larger of the two signal peaks.

Adjust the receiver input stage for maximum sensitivity.

Adjustment of Antenna Branching Filter BF631

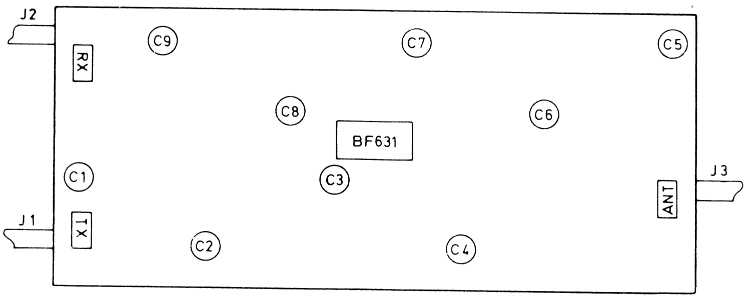


fig. 13

Switch the radiostation to a channel in the centre of its channel coverage range.

Detune all the series traps of the filter by means of trimmer capacitors C1, C2, C3, C4, C5, C6, C7, C8, and C9. Take care not to screw the tubular trimmer capacitors too far down.

Adjustment of the Transmitter Section for Isolation of the Receiving Frequency

Connect a signal generator, set to the receiving frequency (modulation 1000 Hz), to J1.

Connect the receiver to J2.

Connect a 50-ohm load to J3.

Adjust the transmitter section of the branching filter by successively tuning the series traps (C1, C2, C3, and C4) for minimum signal at the receiver input.

Adjustment of the Receiver Section for Isolation of the Transmitting Frequency

Connect the transmitter to J1.

Connect a tapped 50-ohm load to J2. Connect the tap to an RF millivoltmeter.

Connect a wattmeter to J3.

Turn on the transmitter.

Adjust the receiver section of the branching filter by successively tuning the series straps (C5, C6, C7, C8, and C9) for minimum signal reading on the RF millivoltmeter.

Repeat the adjustment of the transmitter section for isolation of the receiving frequency.

Adjustment of the Output Stages of the Transmitter for Maximum Power Output

Connect the transmitter to J1.

Connect the receiver to J2.

Connect a wattmeter to J3.

Turn on the transmitter.

Adjust the transmitter output stage (PA600) for maximum wattmeter reading, take care that the transmitter does not "squegg" (parametric oscillations).

Adjustment of the Input Stages of the Receiver for maximum sensitivity

Connect the transmitter to J1.

Connect the receiver to J2.

Connect a tapped 50-ohm load to J3. Connect the tap to a signal generator set to the receiving frequency (modulation 1000 Hz).

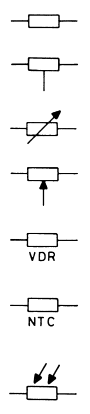
Adjust the receiver input stage (RC600) for maximum sensitivity.

Storno

CHAPTER V. DIAGRAMS AND ELECTRICAL PARTS LISTS

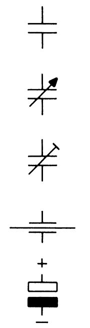
GRAPHICAL SYMBOLS USED IN STORNO CIRCUIT DIAGRAMS

Resistors (R)



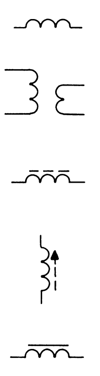
- Resistor
- Resistor with fixed tap
- Variable resistor
- Resistor with movable tap
- Varistor (voltage-dependent resistor)
- Temperature-dependent resistor with negative temperature coefficient
- Light-sensitive resistor (Photosensitive resistor)

Capacitors (C)



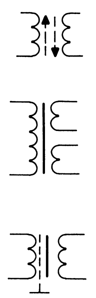
- Capacitor
- Variable capacitor
- Trimmer capacitor
- Feedthrough capacitor
- Electrolytic capacitor

Coils (L)



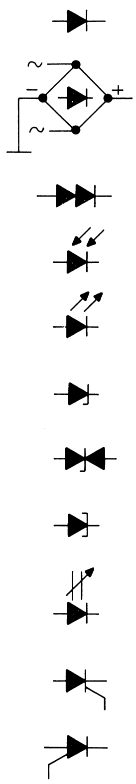
- RF coil, air core
- Coupled RF coils, air core
- RF coil with core
- RF coil with adjustable core
- AF choke

Transformers (T)



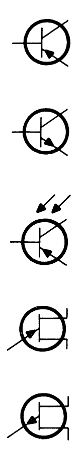
- Transformer with adjustable RF cores
- Transformer with iron core
- Transformer with screen connected to chassis

Diodes (E)



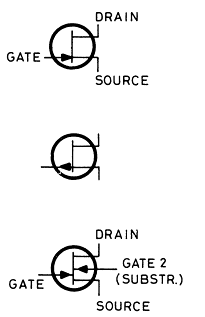
- Diode
- Bridge rectifier
- Series-connected stabilizer diodes within one case
- Light-sensitive diode (Photosensitive diode)
- Light-emitting diode
- Zener diode (unidirectional)
- Zener diode (bidirectional)
- Tunnel diode
- Varactor diode (capacitance diode)
- Controlled rectifier, PNPN (N-thyristor)
- Controlled rectifier, NPNP (P-thyristor)

Transistors (Q)

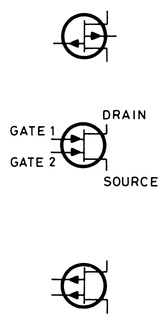


- Transistor, PNP
- Transistor, NPN
- Light-sensitive transistor
- Unipolar transistor with N-type base
- Unipolar transistor with P-type base

Junction Field Effect Transistors (JFET)

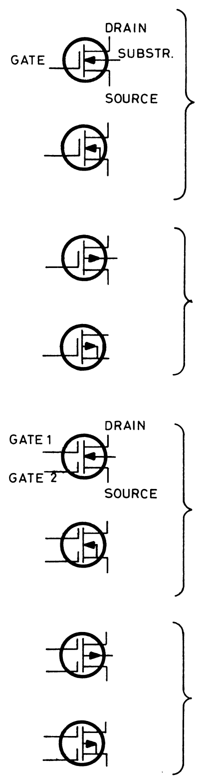


- N-channel JFET
- P-channel JFET
- N-channel dual gate JFET



- P-channel dual gate JFET
- N-channel JFET tetrode
- P-channel JFET tetrode

Insulated Gate Field Effect Transistors (IGFET or MOS)

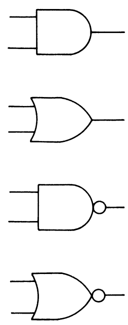


- N-channel IGFET (MOS)
- P-channel IGFET (MOS)
- N-channel dual gate IGFET (MOS)
- P-channel dual gate IGFET (MOS)

Integrated Circuits (IC)

Several integrated circuits contained within one case are designated by one common number followed by an identifying letter (a, b, c etc.). Thus, circuits IC1a, IC1b and IC1c are contained within one case.

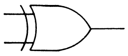
Gates

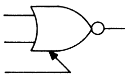


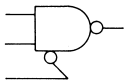
- AND gate
- OR gate
- NAND gate
- NOR gate

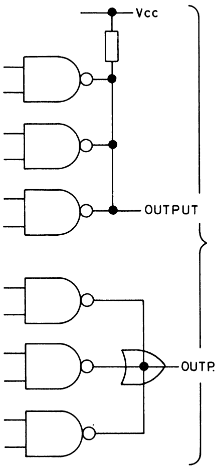
GRAPHICAL SYMBOLS USED IN STORNO CIRCUIT DIAGRAMS

Gates, continued


Exclusive OR gate


NOR gate with expander input (high)

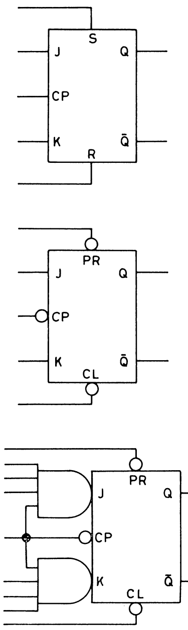

NAND gate with expander input (low)



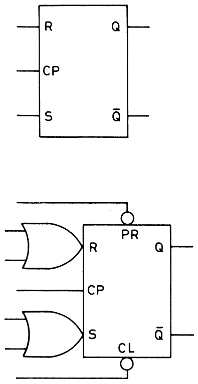
Wired OR (combined OR outputs) (presentation at top is used in detailed diagrams; presentation below is used in functional diagrams)

Flip-flops

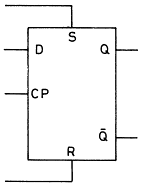
Abbreviations used:
S = Set
R = Reset
CP = Clock Pulse
PR = Preset
CL = Clear



J-K Flip-flops

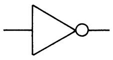


R-S Flip-flops

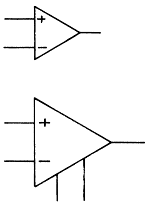


D Flip-flop

Inverters

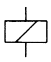

Inverter

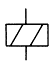
Operational Amplifiers

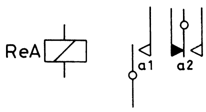


Operational amplifiers

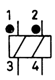
Relays (RE)


Single-coil relay

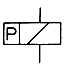

Dual-coil relay



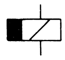
Relay with make contacts and change-over contacts

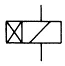


Relay with direction of winding indicated. Dot indicates two coils wound in the same direction



Polarized relay


Coil for slow-release relay


Coil for slow-acting relay

Contacts

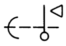
Contacts are always shown in their non-operated positions unless otherwise specified

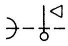

Make contacts

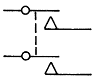

Break contacts


Change-over contacts

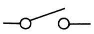

Change-over contacts, centre off

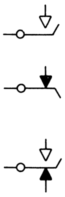

Make contacts, delayed operation

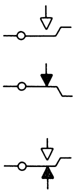

Make contacts, delayed release

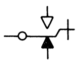

Mechanically coupled make contacts

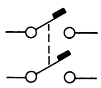
Switches and Keys (O)

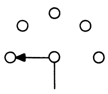

On/off switch


Locking keys or switches; push on, push off


Non-locking self-releasing keys or switches

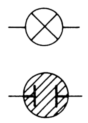

Locking mutually releasing keys or switches (in row of push-buttons etc.)


Self-releasing switch (overcurrent switch etc.)


Rotary switch

GRAPHICAL SYMBOLS USED IN STORNO CIRCUIT DIAGRAMS

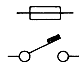
Lamps (V)



Indicator lamp

Neon lamp

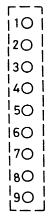
Fuses and Cut-outs (S)



Fuse

Circuit-breaker

Tag Strips (KL)

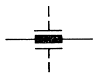


Tag strip - dashed frame may be wholly or partly omitted

Batteries (BT)

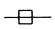
Battery

Feedthrough Filters (F)



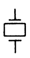
Feedthrough filter

Ferrite Beads (FB)



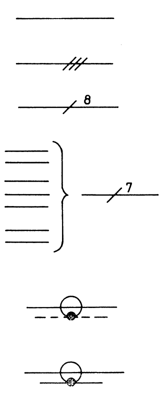
Ferrite bead

Crystals (X)



Crystal

Cables and Wires (W)



Usual conductor

Three conductors

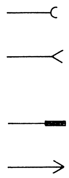
Eight conductors

Shift from multiple-line to single-line presentation

Screened wire

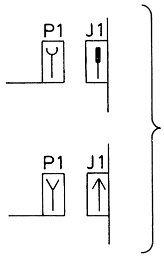
Coaxial cable

Connectors (J and P)

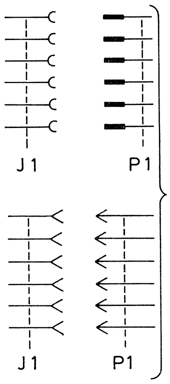


Female connector (socket). Lower symbol discontinued

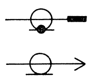
Male connector (plug). Lower symbol discontinued



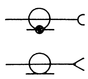
Schematic symbols for multi-wire connectors. (Upper symbol will gradually supersede lower symbol)
Multi-wire connectors are always designated "J" when permanently mounted on a cabinet or unit etc., "P" when fitted to cables



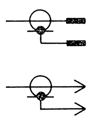
Detail symbols for multi-wire connectors. (Upper symbol will gradually supersede lower symbol)
Where both connectors are fitted to cables, male connector is designated "P" and female connector "J"



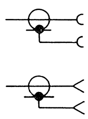
Coaxial plug



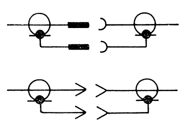
Coaxial socket



Coaxial plug for floating screen

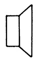


Coaxial socket for floating screen



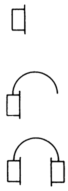
Coaxial plug with mating socket

Loudspeakers (LS)



Loudspeaker

Telephones (TEL)



Telephone

Single headphone (earphone)

Double headphone (headset)

Microphones (M)

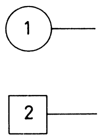
Meters etc.

Indicating instrument

Balancing instrument

Inkwriter, recording instrument

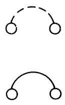
Test Points



DC test point

AC test point

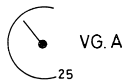
Replaceable Connections



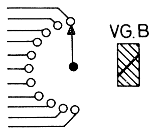
Cross-field connection (jumper)

Strap

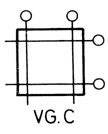
Selectors (VG)



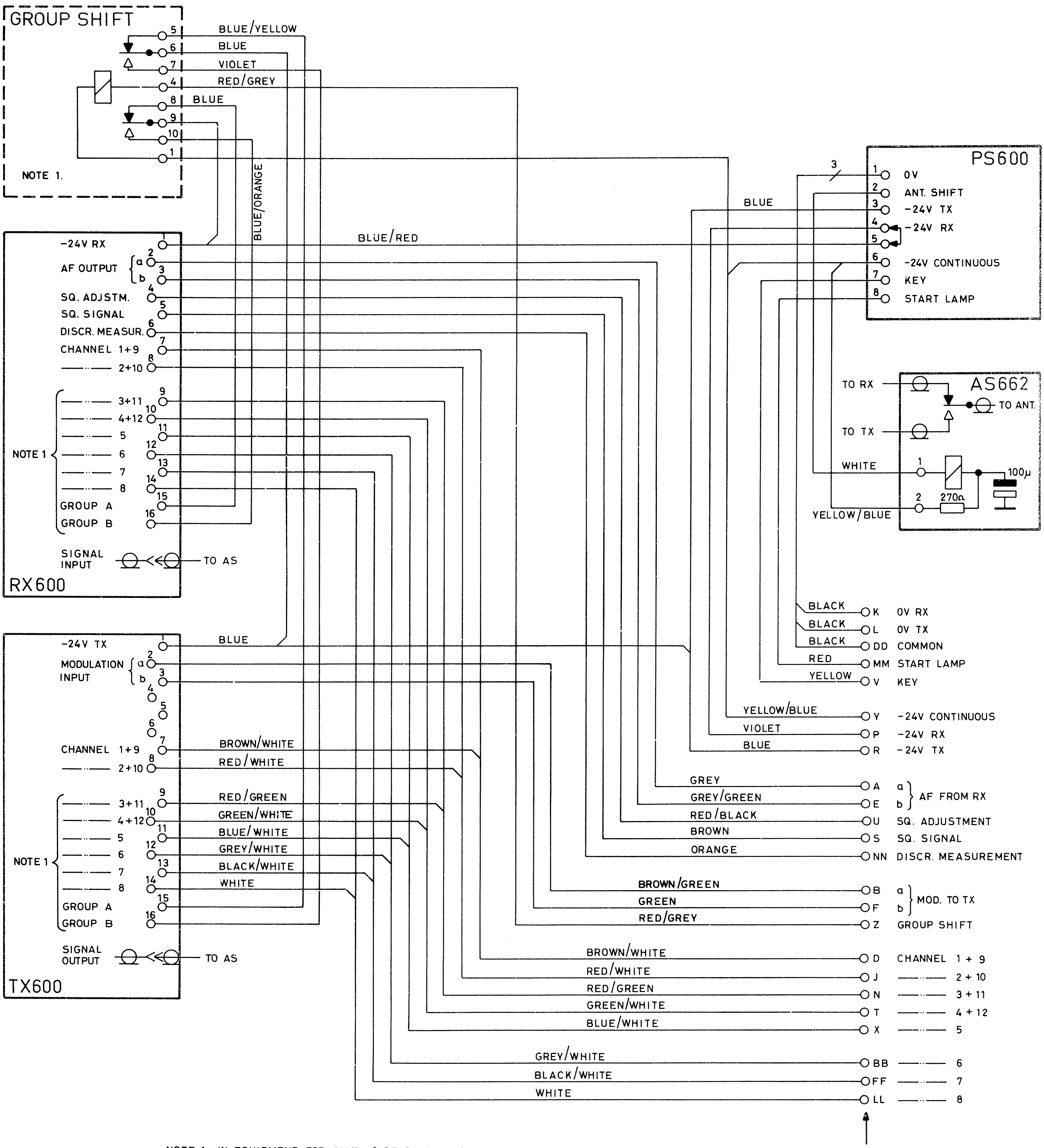
Schematic symbol for rotary selector with designation of number of contact points

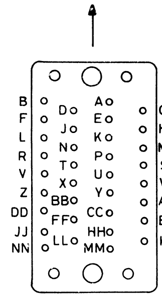


Detail symbol for rotary selector



Co-ordinate selector





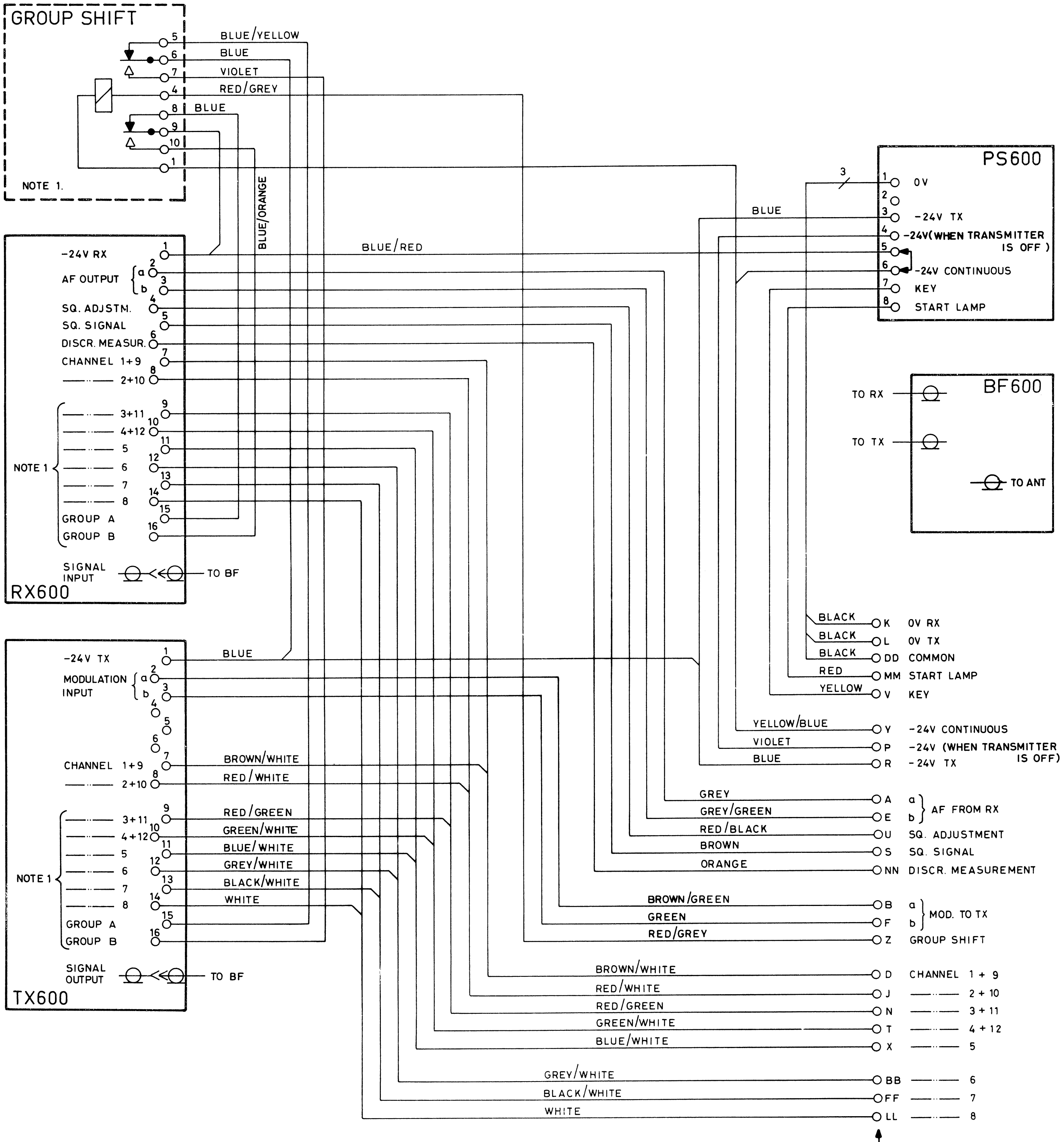
NOTE 1. IN EQUIPMENT FOR MAX. 2 RF CHANNELS THE GROUP SHIFT PANEL AND THE TERMINALS 9-16 IN RC600 AND TX600 ARE OMITTED.

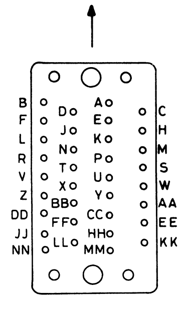
I UDSTYR FOR MAKSIMALT 2 HF-KANALER ER GRUPPESKIFT ENHEDEN OG TERMINALERNE 9-16 I RX600 OG TX600 UDELADT.

CABLE FORM
KABLINGSDIAGRAM

CQF610, CQF630, CQF661 SIMPLEX

D400.749/4





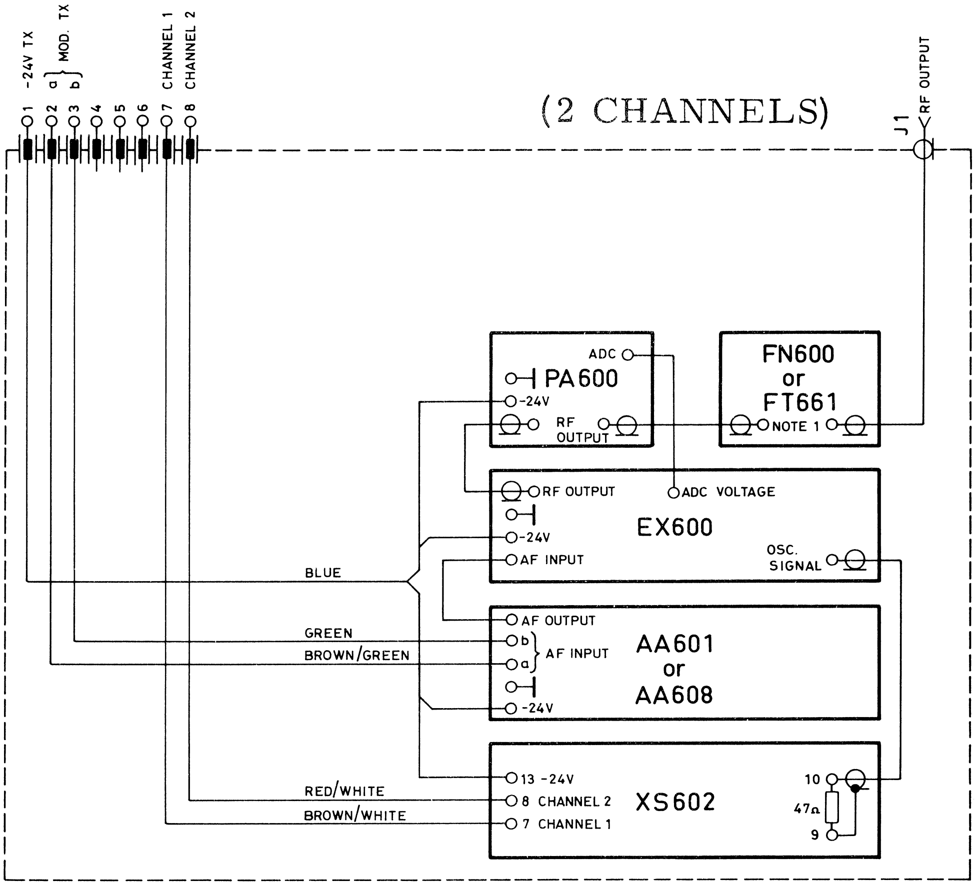
NOTE 1. IN EQUIPMENT FOR MAX. 2 RF CHANNELS THE GROUP SHIFT PANEL AND THE TERMINALS 9-16 IN RC600 AND TX600 ARE OMITTED.

I UDSTYR FOR MAKSIMALT 2 HF-KANALER ER GRUPPESKIFT ENHEDEN OG TERMINALERNE 9-16 I RX600 OG TX600 UDELADT.

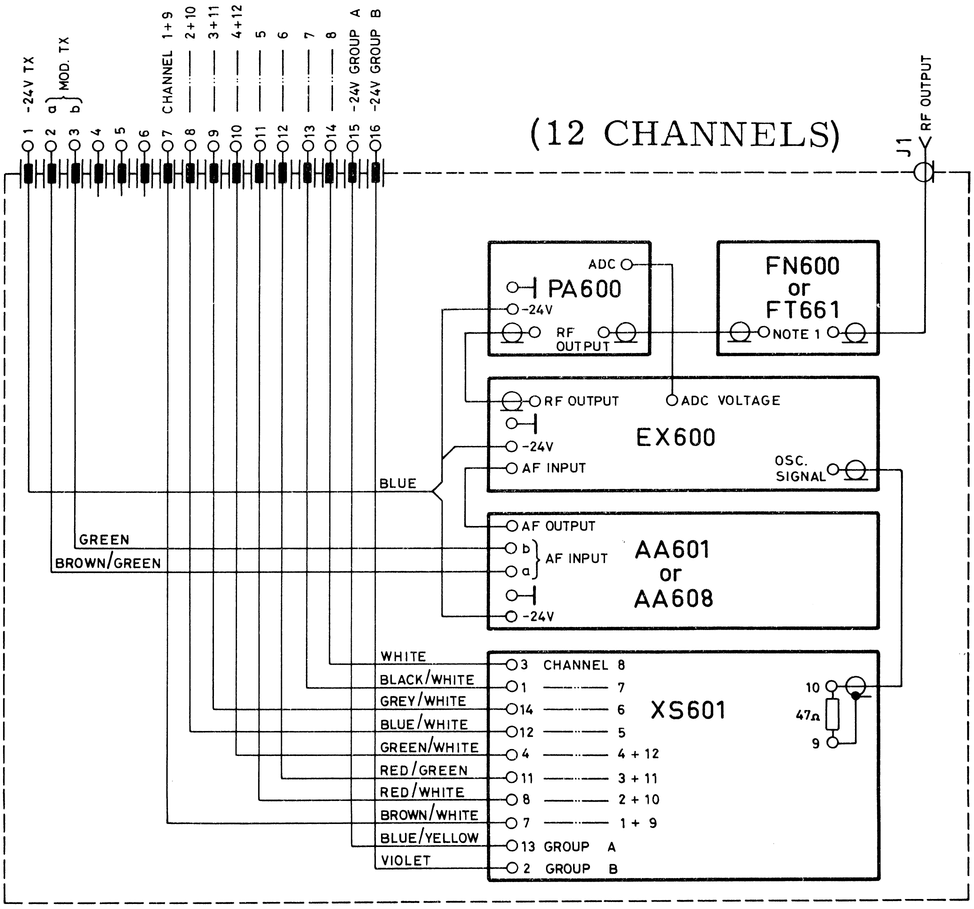
CABLE FORM
KABLINGSDIAGRAM

CQF610, CQF630, CQF661 DUPLEX

D400.748



D400.757/4



NOTE 1. FT661 IS USED IN TRANSMITTERS TX661 AND TX665 FOR THE 420-470MHz BAND.

FT661 BENYTTES I SENDER TX661 OG TX665 FOR FREKVENSBÅNDET 420-470 MHz.

D400.753/4

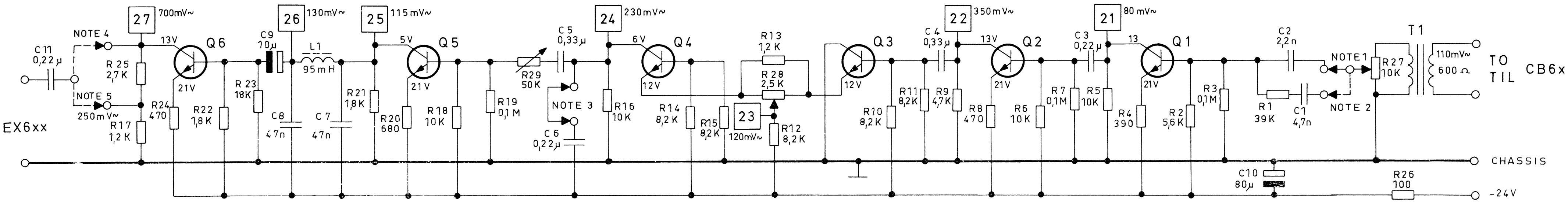
CABLE FORM
KABLINGSDIAGRAM

TX610, TX630, TX661, TX665

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.

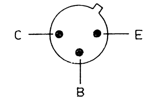
NOTE 1. DIFFERENTIATIONSLED FOR REN FASEMODULATION

NOTE 2. DIFFERENTIATIONSLED FOR BLANDET FASE-OG FREKVENS-MODULATION.

NOTE 3. VED MÅLINGER HVOR INTEGRATION ER UØNSKET FJERNES STRAPNINGEN.

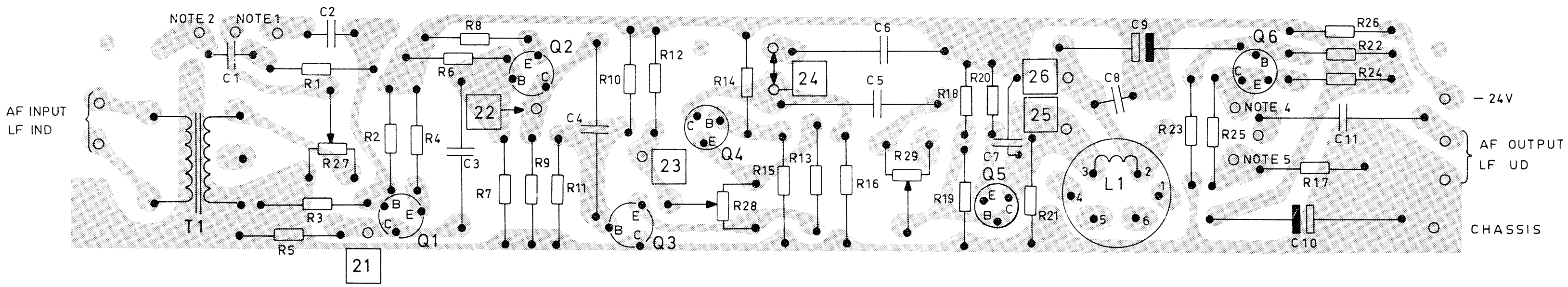
NOTE 4. TILSLUTNING FOR 50kHz OG 25kHz I 4 METER OG 50kHz KANALAFSTAND I 2 METER ANLÆG.

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

D400.671/3

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	Transistor BC108
	Q5	99.5143	Transistor BC108
	Q6	99.5143	Transistor BC108

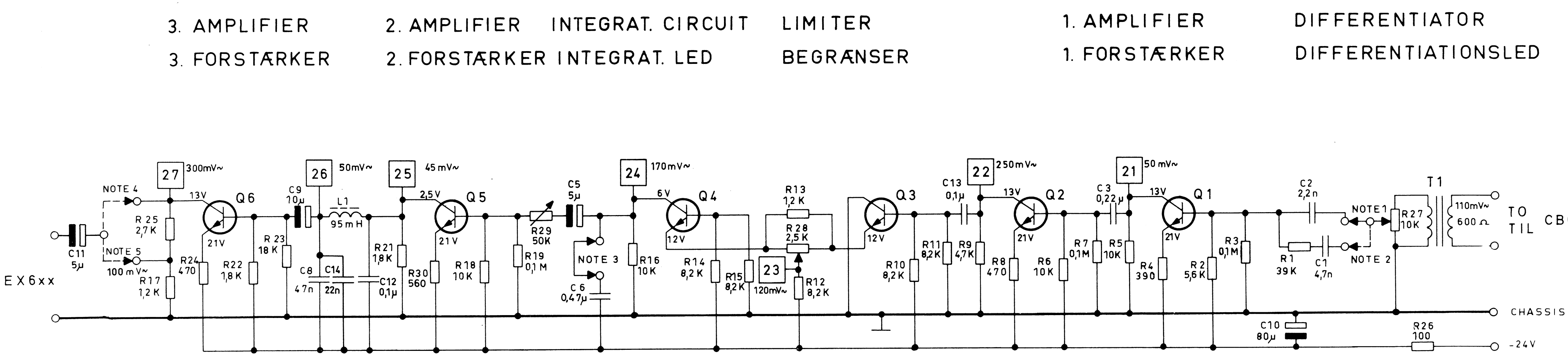
AF-AMPLIFIER
LF-FORSTÆRKER

AA601

X400.683/3

Storno

Storno



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 12,5kHz CHANNEL SEPARATION IN 4 METER EQUIPMENT.

NOTE 5 CONNECTION FOR 12,5kHz CHANNEL SEPARATION IN 2 METER EQUIPMENT.

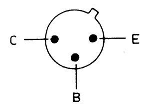
NOTE 1. DIFFERENTIATIONSLED FOR REN FASEMODULATION

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.

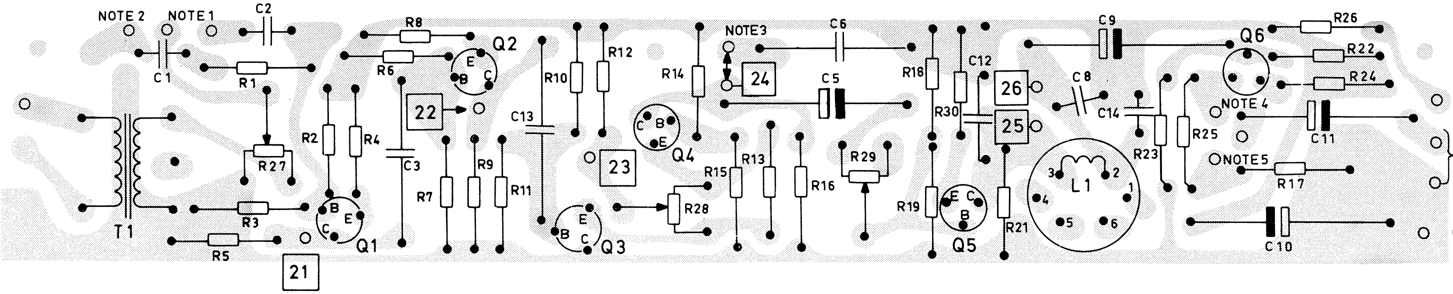
NOTE 5 TILSLUTNING FOR 12,5kHz KANALAFSTAND I 2 METER ANLÆG



BOTTOM VIEW
SET FRA BUNDEN

PRINTED CIRCUIT VIEWED FROM COMPONENT SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN

AF INPUT
LF IND



AF OUTPUT
LF UD

- 24V

CHASSIS

AF-AMPLIFIER
LF-FORSTÆRKER

AA608

D400.838/2

TYPE	NO.	CODE	DATA	
	C1	76.5061	4.7 nF 10% polyest. FL	50V
	C2	76.5059	2.2 nF 10% " FL	50V
	C3	76.5074	0.22 μF 10% " TB	100V
	C5	73.5104	5 μF 10/+100% elco	100V
	C6	76.5094	0.47 μF 20% polyest. FL	
	C8	76.5072	47 nF 10% polyest. FL	50V
	C9	73.5001	10 μF -10/+50% elco	25V
	C10	73.5110	80 μF -10/+50% elco	25V
	C11	73.5104	5 μF 10/+100% elco	100V
	C12	76.5073	0.1 μF 10% polyest. FL	50V
	C13	76.5073	0.1 μF 10% polyest. FL	50V
	C14	76.5071	22 nF 10% polyest. FL	50V
	R1	80.5268	39 kΩ 5% carbon film	1/8W
	R2	80.5258	5.6 kΩ 5% " "	1/8W
	R3	80.5273	0.1 MΩ 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	0.1 MΩ 5% " "	1/8W
	R8	80.5245	470 Ω 5% " "	1/8W
	R9	80.5257	4.7 kΩ 5% " "	1/8W
	R10	80.5260	8.2 kΩ 5% " "	1/8W
	R11	80.5260	8.2 kΩ 5% " "	1/8W
	R12	80.5260	8.2 kΩ 5% " "	1/8W
	R13	80.5250	1.2 kΩ 5% " "	1/8W
	R14	80.5260	8.2 kΩ 5% " "	1/8W
	R15	80.5260	8.2 kΩ 5% " "	1/8W
	R16	80.5261	10 kΩ 5% " "	1/8W
	R17	80.5250	1.2 kΩ 5% " "	1/8W
	R18	80.5261	10 kΩ 5% " "	1/8W
	R19	80.5273	0.1 MΩ 5% " "	1/8W
	R21	80.5252	1.8 kΩ 5% " "	1/8W
	R22	80.5252	1.8 kΩ 5% " "	1/8W
	R23	80.5264	18 kΩ 5% " "	1/8W
	R24	80.5245	470 Ω 5% " "	1/8W
	R25	80.5254	2.7 kΩ 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
	R30	80.5246	560 Ω 5% carbon film	1/8W
	L1	61.824-01	Filter coil/Filterspole	95 mH
	T1	60.5130	Transformer 600/1000 Ω	
	Q1	99.5143	BC108 Transistor	

Storno

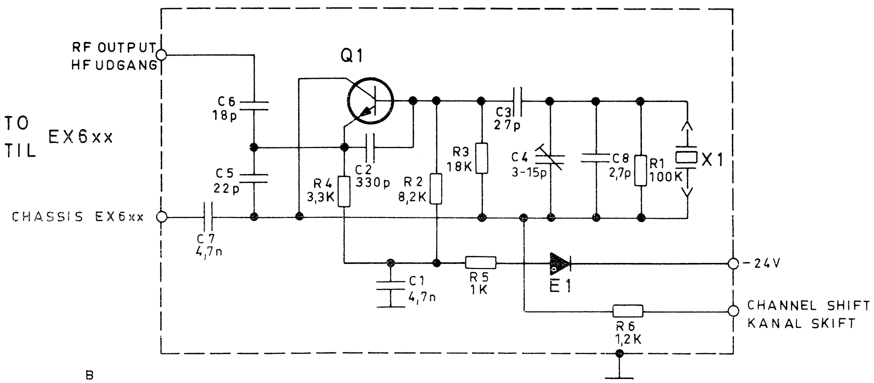
TYPE	NO.	CODE	DATA
	Q2	99.5143	BC108 Transistor
	Q3	99.5143	BC108 Transistor
	Q4	99.5143	BC108 Transistor
	Q5	99.5143	BC108 Transistor
	Q6	99.5143	BC108 Transistor

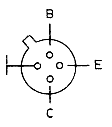
AF-AMPLIFIER
LF-FORSTÆRKER

AA608

X400.850/2

Storno





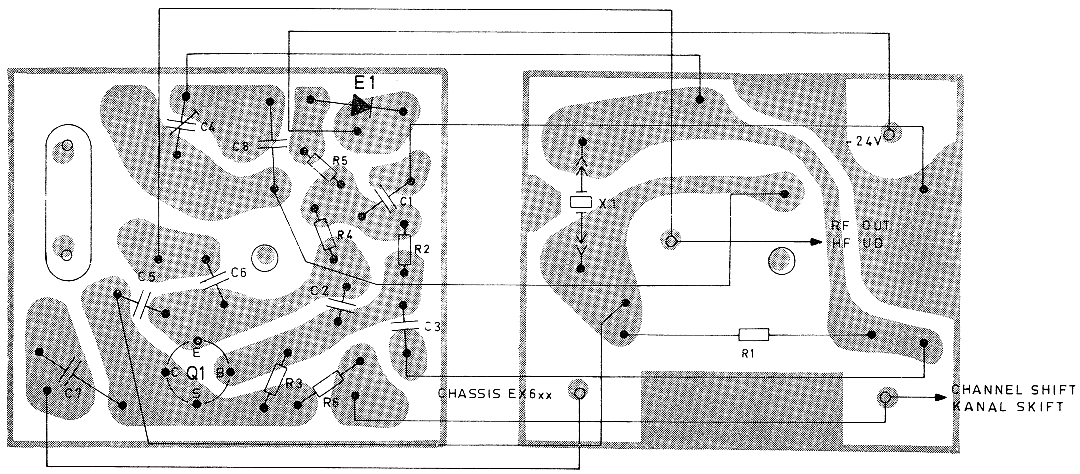
Q1
BOTTOM VIEW
SET FRA BUNDEN

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 TX.

XO631a

D400.666/3

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	

Storno

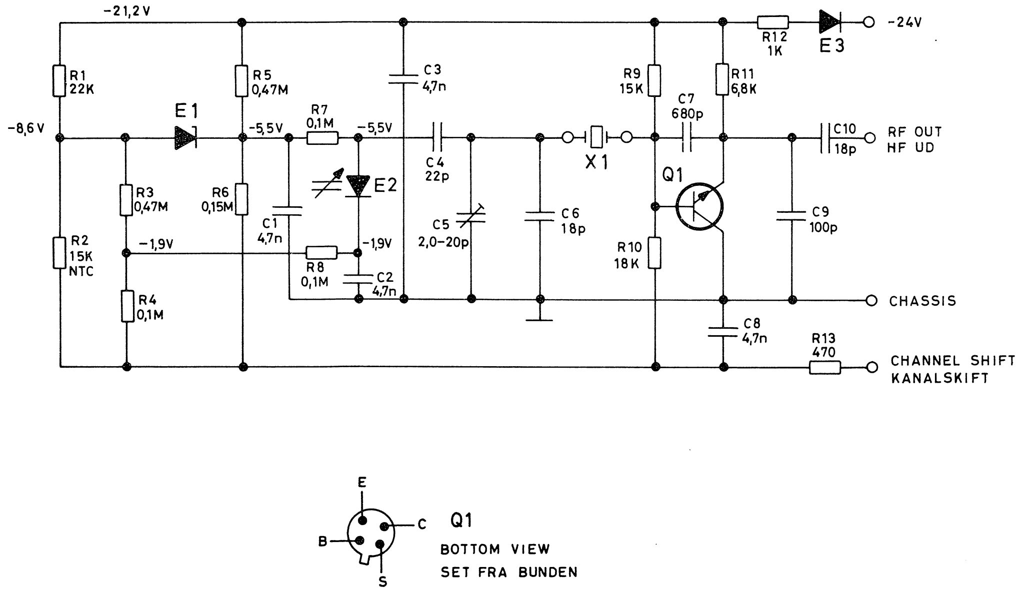
TYPE	NO.	CODE	DATA

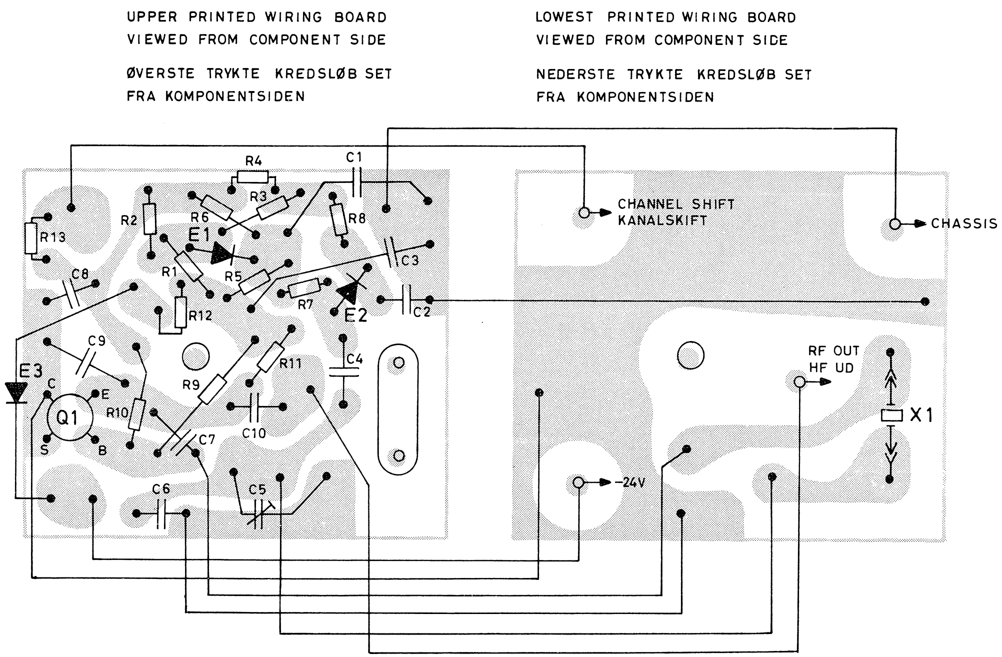
CRYSTALOSCILLATOR FOR TX. XO631

X400.680/2

Storno

Storno





CRYSTAL OSCILLATOR
KRYSTAL OSCILLATOR

XO665

D400 991/2

TYPE	NO.	CODE	DATA	
	C1	76.5061	4.7 nF 10% polyest. FL	50V
	C2	76.5061	4.7 nF 10% polyest. FL	50V
	C3	76.5061	4.7 nF 10% polyest. FL	50V
	C4	74.5106	22 pF ±0,5 pF ceram N075 TB	160V
	C5	78.5044	2-20 pF teflon N250 norm.	500V
	C6	74.5142	18 pF ±0,5 pF ceram N075 TB	160V
	C7	76.5018	680 pF 5% polystyr. TB	125V
	C8	76.5061	4.7 nF 10% polyest. FL	50V
	C9	76.5079	100 pF 5% polystyr. TB	125V
	C10	74.5138	18 pF 5% ceram N150 DI	125V
	R1	80.5065	22 kΩ 5% carbon film	1/10W
	R2	89.5010	15 kΩ 20% NTC	0,6W
	R3	80.5081	0,47 MΩ 5% carbon film	1/10W
	R4	80.5073	0,1 MΩ 5% carbon film	1/10W
	R5	80.5081	0,47 MΩ 5% carbon film	1/10W
	R6	80.5075	0,15 MΩ 5% carbon film	1/10W
	R7	80.5073	0,1 MΩ 5% carbon film	1/10W
	R8	80.5073	0,1 MΩ 5% carbon film	1/10W
	R9	80.5063	15 kΩ 5% carbon film	1/10W
	R10	80.5064	18 kΩ 5% carbon film	1/10W
	R11	80.5059	6,8 kΩ 5% carbon film	1/10W
	R12	80.5049	1 kΩ 5% carbon film	1/10W
	R13	80.5045	470 Ω 5% carbon film	1/10W
	E1	99.5042	Zenerdiode 9,1V 5%	0,25W
	E2	99.5140	Capacitance diode BA101C	
	E3	99.5028	Diode 1N914	
	Q1	99.5166	Transistor BF167	

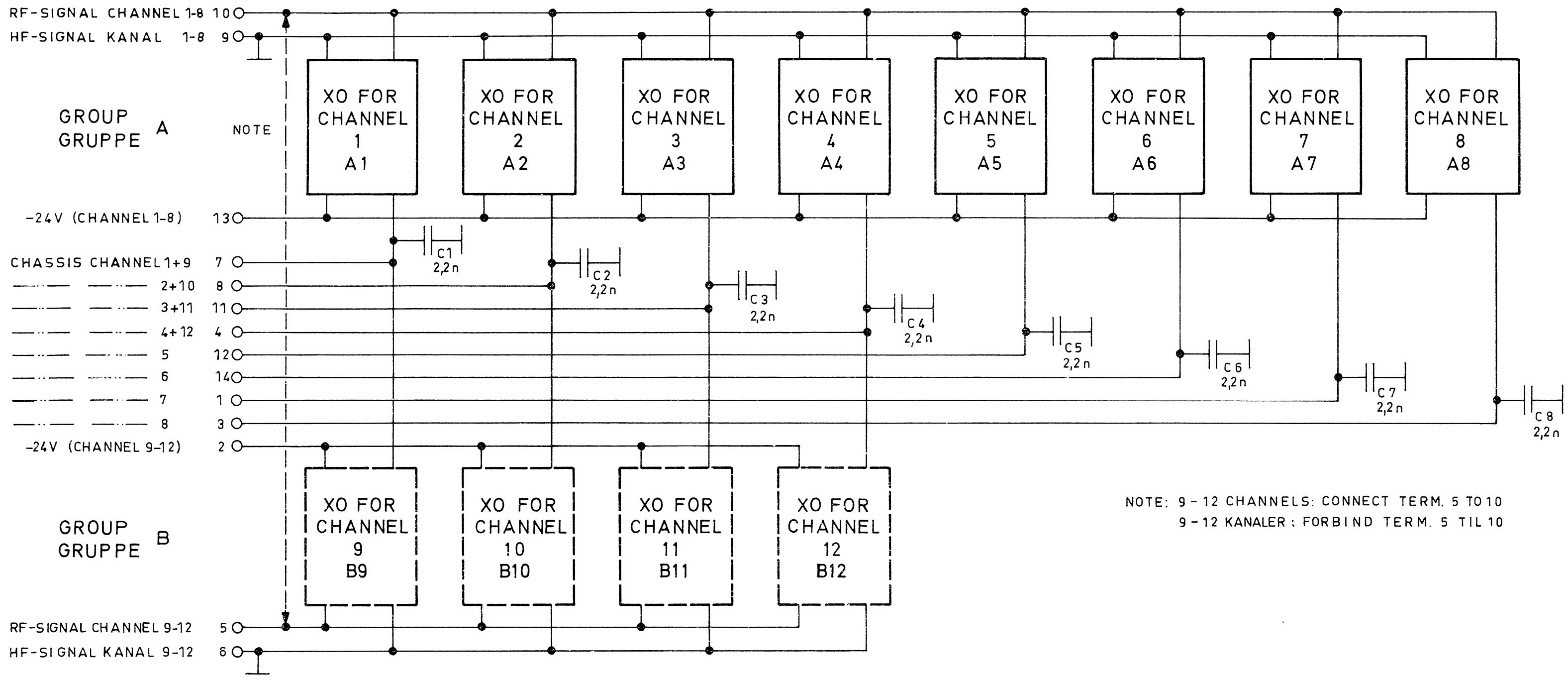
Storno

TYPE	NO.	CODE	DATA

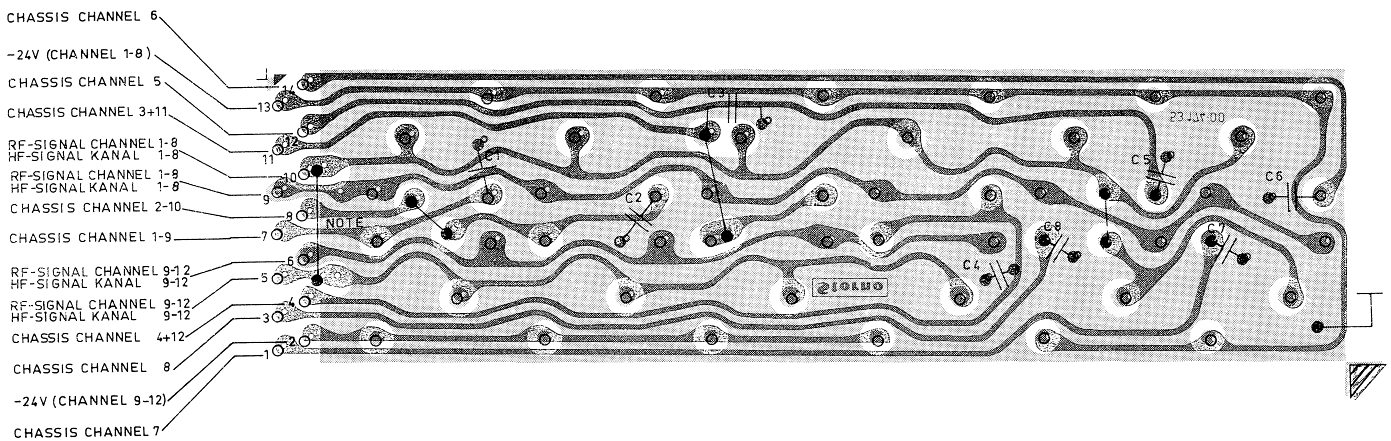
CRYSTAL OSCILLATOR
KRYSTALOSCILLATOR

XO665

X401.038



NOTE: 9 - 12 CHANNELS: CONNECT TERM. 5 TO 10
9 - 12 KANALER : FORBIND TERM. 5 TIL 10



CRYSTAL OSCILLATOR PANEL XS601

D400.722

Storno

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	76.5059	2.2 nF 10% " FL 50V
	C8	76.5059	2.2 nF 10% " FL 50V

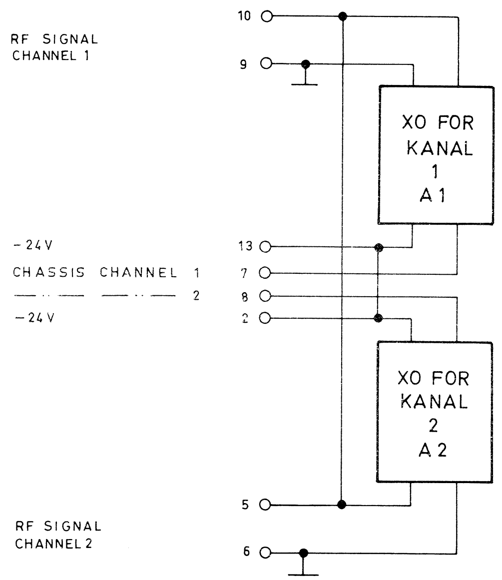
Storno

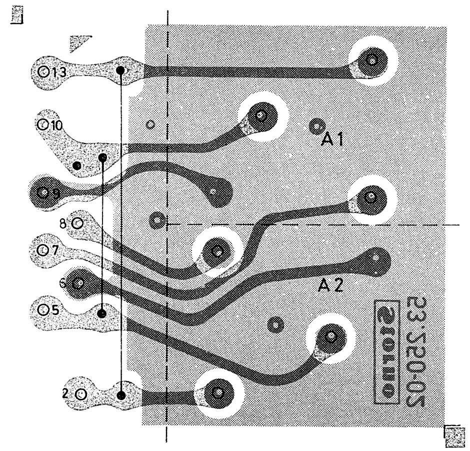
TYPE	NO.	CODE	DATA

CRYSTAL OSCILLATOR PANEL XS601

X400.875

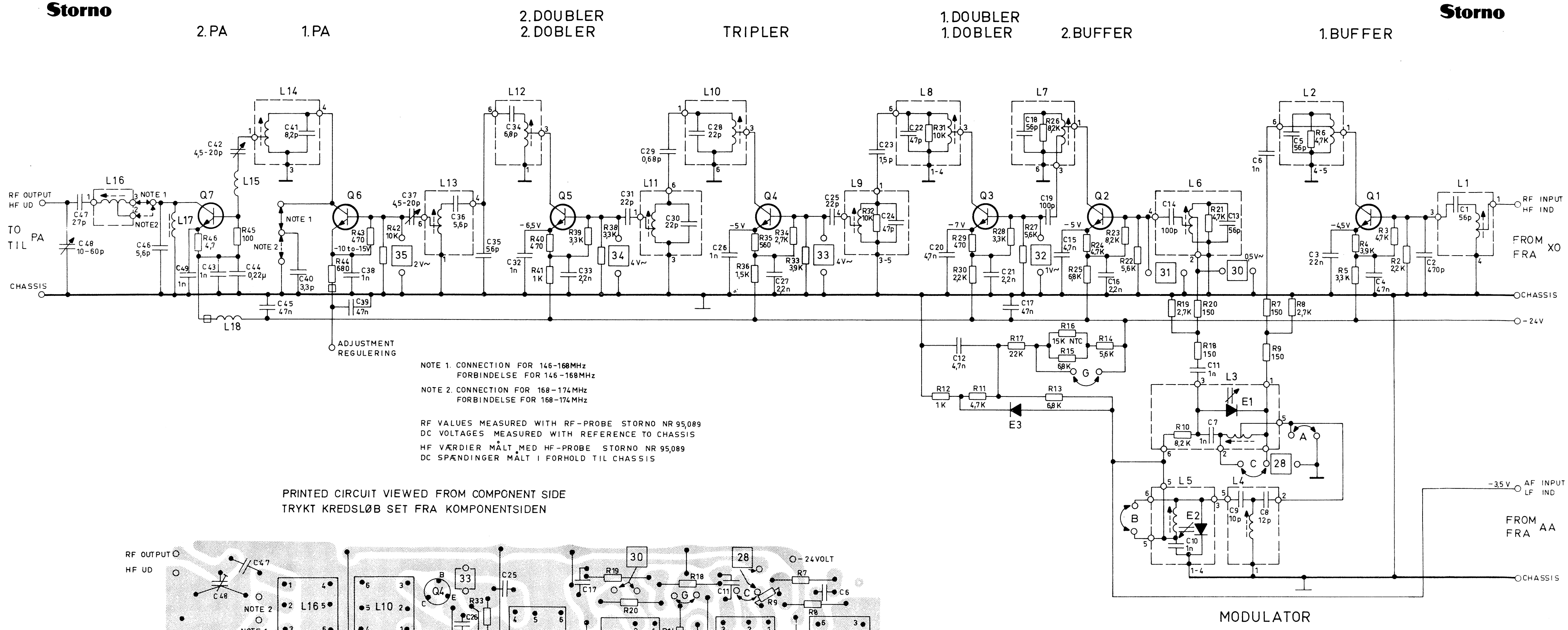
Storno





CRYSTAL OSCILLATOR PANEL XS602

D400.819/2



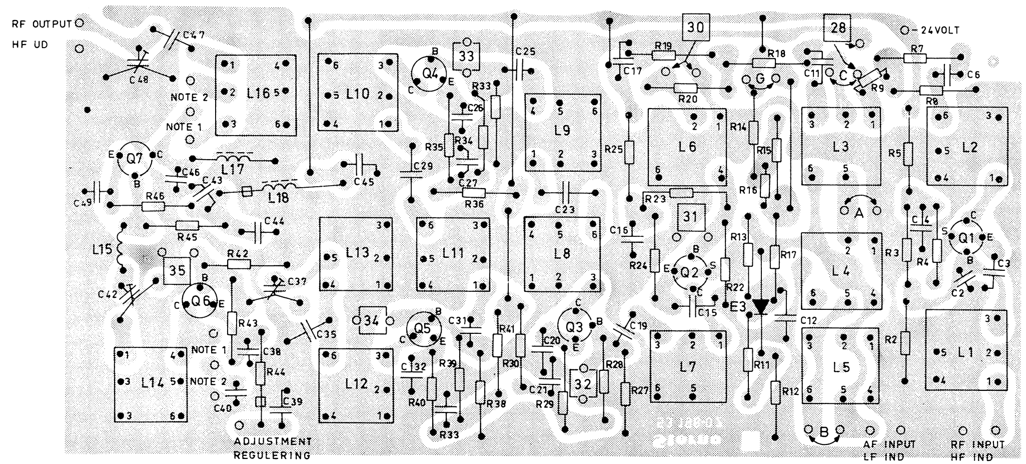
NOTE 1. CONNECTION FOR 146-168MHz
FORBINDELSE FOR 146-168MHz

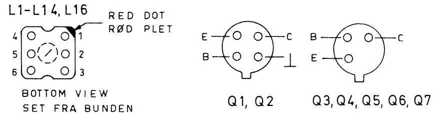
NOTE 2. CONNECTION FOR 168-174MHz
FORBINDELSE FOR 168-174MHz

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





EXCITER
STYRESENDER

EX611

D400.670/4

TYPE	NO.	CODE	DATA	
	C1	74.5111	56pF 2% ceram TB	250V
	C2	74.5161	470pF -20/+50% ceram PL	63V
	C3	76.5071	22nF 10% polyest. FL	50V
	C4	74.5163	2,2nF -20/+50% ceram PL	63V
	C5	74.5111	56pF 2% ceram TB	250V
	C6	74.5155	1 nF -20/+50% ceram PL	63V
	C7	74.5155	1 nF -20/+50% " PL	63V
	C8	74.5136	12pF 5% ceram DI	125V
	C9	74.5135	10pF 5% " DI	125V
	C10	74.5155	1 nF -20/+50% ceram PL	63V
	C11	74.5155	1 nF -20/+50% " PL	63V
	C12	74.5164	4,7nF -20/+50% " PL	63V
	C13	74.5111	56 pF 2% ceram TB	250V
	C14	74.5013	100pF 20% " DI	500V
	C15	74.5164	4.7nF -20/+50% ceram PL	63V
	C16	74.5163	2,2nF -20/+50% " PL	63V
	C17	76.5072	47nF 10% polyest. FL	50V
	C18	74.5111	56pF 2% ceram TB	250V
	C19	74.5013	100pF 20% ceram DI	500V
	C20	74.5164	4.7nF -20/+50% ceram PL	63V
	C21	74.5163	2.2nF -20/+50% " PL	63V
	C22	74.5118	47pF 2% ceram TB	250V
	C23	74.5125	1.5pF ±0.25pF ceram BO	250V
	C24	74.5118	47 pF 2% ceram TB	250V
	C25	74.5106	22 pF ±0,5pF ceram TB	250V
	C26	74.5155	1 nF -20/+50% " PL	63V
	C27	74.5163	2,2 nF -20/+50% " PL	63V
	C28	74.5106	22 pF ±0,5pF " TB	250V
	C29	74.5121	0,68pF ±0,1pF " BD	250V
	C30	74.5106	22pF ±0.5pF " TB	250V
	C31	74.5106	22pF ±0.5pF " TB	250V
	C32	74.5155	1 nF -20/+50% " PL	63V
	C33	74.5163	2.2nF -20/+50% " PL	63V
	C34	74.5133	6.8pF ±0.25pF " DI	250V
	C35	74.5111	56pF 2% ceram TB	250V
	C36	74.5132	5.6pF ±0,25pF ceram DI	250V
	C37	78.5026	4.5-20pF Trimmer ceram	100V
	C38	74.5155	1 nF -20/+50% ceram PL	63V
	C39	76.5072	47nF 10% polyest. FL	50V
	C40	74.5129	3.3pF ±0,25pF ceram DI	250V
	C41	74.5134	8,2pF ±0,25pF " DI	250V
	C42	78.5026	4.5-20pF Trimmer ceram	100V
	C43	74.5155	1 nF -20/+50% ceram PL	63V
	C44	76.5074	0.22 μF 10% polyest. TB	100V
	C45	76.5072	47nF 10% " FL	50V
	C46	74.5132	5.6pF ±0.25pF ceram DI	250V
	C47	74.5107	27pF 2% ceram TB	250V
	C48	78.5030	10-60pF Trimmer ceram	250V

Storno

TYPE	NO.	CODE	DATA	
	C49	76.5072	47nF 10% polyest. FL	50V
	C50	74.5155	1 nF -20/+50 ceram PL	63V
	R2	80.5253	2.2 kΩ 5% carbon film	1/8W
	R3	80.5257	4.7 kΩ 5% " "	1/8W
	R4	80.5256	3.9 kΩ 5% " "	1/8W
	R5	80.5255	3.3 kΩ 5% " "	1/8W
	R6	80.5057	4.7 kΩ 5% " "	1/8W
	R7	80.5239	150 Ω 5% " "	1/8W
	R8	80.5254	2,7 kΩ 5% " "	1/8W
	R9	80.5239	150 Ω 5% " "	1/8W
	R10	80.5060	8.2 kΩ 5% " "	1/10W
	R11	80.5257	4.7 kΩ 5% " "	1/8W
	R12	80.5249	1 kΩ 5% " "	1/8W
	R13	80.5259	6.8 kΩ 5% " "	1/8W
	R14	80.5258	5.6 kΩ 5% " "	1/8W
	R15	80.5259	6.8 kΩ 5% " "	1/8W
	R16	89.5010	15 kΩ 10% NTC	0.6W
	R17	80.5265	22 kΩ 5% carbon film	1/8W
	R18	80.5239	150 Ω 5% " "	1/8W
	R19	80.5254	2.7 kΩ 5% " "	1/8W
	R20	80.5239	150 Ω 5% " "	1/8W
	R21	80.5057	4.7 kΩ 5% " "	1/10W
	R22	80.5257	4.7 kΩ 5% " "	1/8W
	R23	80.5260	8.2 kΩ 5% " "	1/8W
	R24	80.5257	4.7 kΩ 5% " "	1/8W
	R25	80.5259	6.8 kΩ 5% " "	1/8W
	R26	80.5060	8.2 kΩ 5% " "	1/10W
	R27	80.5259	6.8 kΩ 5% " "	1/8W
	R28	80.5255	3.3 kΩ 5% " "	1/8W
	R29	80.5245	470 Ω 5% " "	1/8W
	R30	80.5253	2.2 kΩ 5% " "	1/8W
	R31	80.5061	10 kΩ 5% " "	1/10W
	R32	80.5061	10 kΩ 5% " "	1/10W
	R33	80.5256	3.9 kΩ 5% " "	1/8W
	R34	80.5254	2.7 kΩ 5% " "	1/8W
	R35	80.5246	560 Ω 5% " "	1/8W
	R36	80.5251	1.5 kΩ 5% " "	1/8W
	R38	80.5255	3.3 kΩ 5% " "	1/8W
	R39	80.5255	3.3 kΩ 5% " "	1/8W
	R40	80.5245	470 Ω 5% " "	1/8W
	R41	80.5249	1 kΩ 5% " "	1/8W
	R42	80.5261	10 kΩ 5% " "	1/8W

EXCITER
STYRESENDER

EX611

X400.690/4

TYPE	NO.	CODE	DATA
	R43	80.5245	470 Ω 5% carbon film 1/8W
	R44	80.5247	680 Ω 5% " " 1/8W
	R45	80.5237	100 Ω 5% " " 1/8W
	R46	80.5221	4.7 Ω 10% " " 1/8W
	L1	61.825	Coil/spole 12, 16-14, 5 MHz (C1,)
	L2	61.826	Coil/spole 12, 16-14, 5 MHz (C5, R6)
	L3	61.827	Coil/spole 12, 16-14, 5 MHz (C7, R10, E1)
	L4	61.828	Coil/spole 12, 16-14, 5 MHz (C8, C9)
	L5	61.829	Coil/spole 12, 16-14, 5 MHz (C10, E2)
	L6	61.846	Coil/spole 12, 16-14, 5 MHz (C13, C14, R21)
	L7	61.847	Coil/spole 12, 16-14, 5 MHz (C18, R26)
	L8	61.848	Coil/spole 24, 33-29 MHz (C22, R31)
	L9	61.849	Coil/spole 24, 33-29 MHz (C24, R32)
	L10	61.850	Coil/spole 73-87 MHz (C28)
	L11	61.851	Coil/spole 73. 87 MHz (C30)
	L12	61.852	Coil/spole 146-174 MHz (C34)
	L13	61.853	Coil/spole 146-174 MHz (C36)
	L14	61.854	Coil/spole 146-174 MHz (C41)
	L15	62.715	Coil/spole 146-174 MHz
	L16	61.856	Coil/spole 146-174 MHz
	L17	61.5007	Filter coil/Filterspole 15μH 20% 200mA
	L18	63.5008	Filter coil/Filterspole 0, 47μH 20% 2.2A
	E1	99.5140	Capacitance diode BA101C
	E2	99.5140	Capacitance diode BA101C
	E3	99.5136	Diode AA119
	Q1	99.5118	Transistor BF115
	Q2	99.5118	Transistor BF115
	Q3	99.5139	Transistor BSX19
	Q4	99.5139	Transistor BSX19
	Q5	99.5139	Transistor BSX19
	Q6	99.5139	Transistor BSX19
	Q7	99.5138	Transistor 2N3866

Storno

TYPE	NO.	CODE	DATA

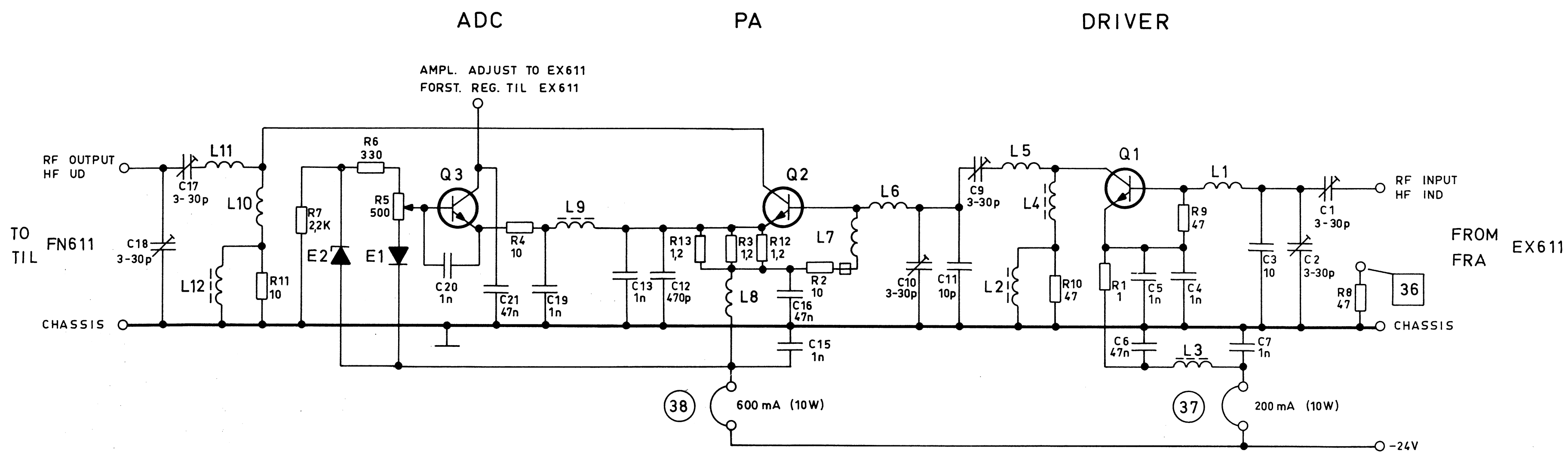
EXCITER STYRESENDER

EX611

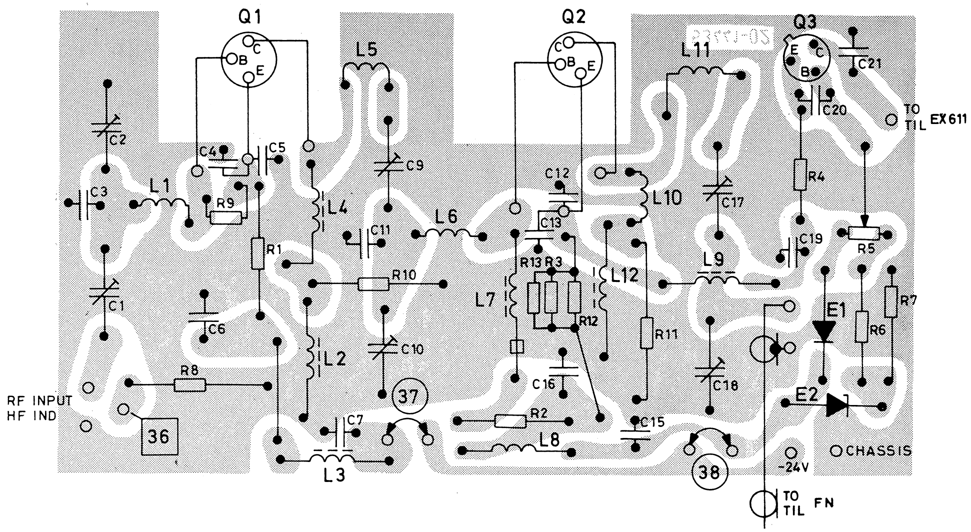
X400.690/4

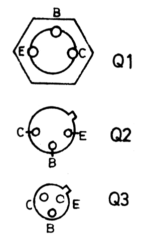
Storno

Storno



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





BOTTOM VIEW
SET FRA BUNDEN

NOTE 1: THE SHORT CIRCUITS ARE REPLACED BY mA-INSTRUMENTS DURING ADJUSTMENT.

NOTE 1: KORTSLUTNINGERNE ERSTATTES AF mA-METRE UNDER JUSTERING

RF POWER AMPLIFIER
HF-EFFEKTFORSTÆRKER

PA611a

D400.669/5

TYPE	NO.	CODE	DATA	
	C1	78.5029	3-30 pF trimmer	300V
	C2	78.5029	3-30 pF "	300V
	C3	74.5135	10 pF 5% ceram N150	125V
	C4	74.5155	1 nF -20 +50% ceram PL	63V
	C5	74.5155	1 nF -20 +50% " PL	63V
	C6	76.5072	47 nF 10% polyest. FL	500V
	C7	74.5155	1 nF -20 +50% ceram PL	63V
	C9	78.5029	3-30 pF trimmer	300V
	C10	78.5029	3-30 pF "	300V
	C11	74.5135	10 pF 5% ceram N150	125V
	C12	74.5161	470 pF -20 +50% ceram PL	63V
	C13	74.5155	1 nF -20 +50% ceram PL	63V
	C15	74.5155	1 nF -20 +50% " PL	63V
	C16	76.5072	47 nF 10% polyest. FL	500V
	C17	78.5029	3-30 pF trimmer	300V
	C18	78.5029	3-30 pF "	300V
	C19	74.5155	1 nF -20 +50% ceram PL	63V
	C20	74.5155	1 nF -20 +50% " PL	63V
	C21	76.5072	47 nF 10% polyest. FL	500V
	R1	80.5213	1 Ω 10% carbon film	1/8W
	R2	80.5225	10 Ω 5% " "	1/8W
	R3	80.5214	1.2 Ω 10% " "	1/8W
	R4	80.5225	10 Ω 5% " "	1/8W
	R5	86.5042	500 Ω 20% potentiometer	0.1W
	R6	80.5243	330 Ω 5% carbon film	1/8W
	R7	80.5253	2.2 kΩ 5% " "	1/8W
	R8	80.5433	47 Ω 5% " "	1/4W
	R9	80.5233	47 Ω 5% " "	1/8W
	R10	80.5233	47 Ω 5% " "	1/8W
	R11	81.5025	10 Ω 5% " "	1/2W
	R12	80.5214	1.2 Ω 10% " "	1/8W
	R13	80.5214	1.2 Ω 10% " "	1/8W
	L1	62.718	RF-coil/HF spole 146-174 MHz	
	L2	63.5007	15 µH 10% choke/drossel	0.5A
	L3	63.5006	2.2 µH 20% " "	0.6A
	L4	63.5008	0.47 µH 20% " "	2 A
	L5	62.719	RF-coil/HF spole 146-174 MHz	
	L6	62.718	RF-coil/HF spole 146-174 MHz	
	L7	63.5008	0.47 µH 20% choke/drossel	2 A
	L8	63.5008	0.47 µH 20% " "	2 A
	L9	63.5006	2.2 µH 20% " "	0.6A
	L10	62.717	RF-coil/HF-spole	
	L11	62.716	RF-coil/HF-spole 146-174 MHz	
	E1	99.5028	OA 200 Diode	
	E2	99.5114	BZY 57 Zenerdiode	

Storno

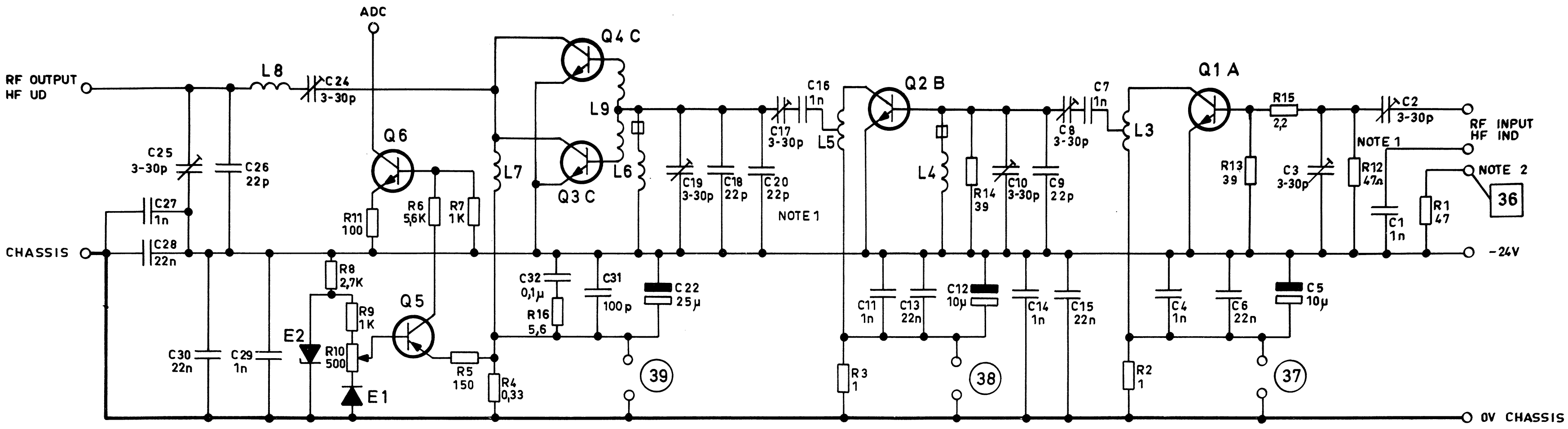
TYPE	NO.	CODE	DATA
	Q1	99.5129	2N3553 Transistor
	Q2	99.5137	2N3632 Transistor
	Q3	99.5121	BC107 Transistor

RF-POWER AMPLIFIER
HF-EFFEKTFORSTÆRKER

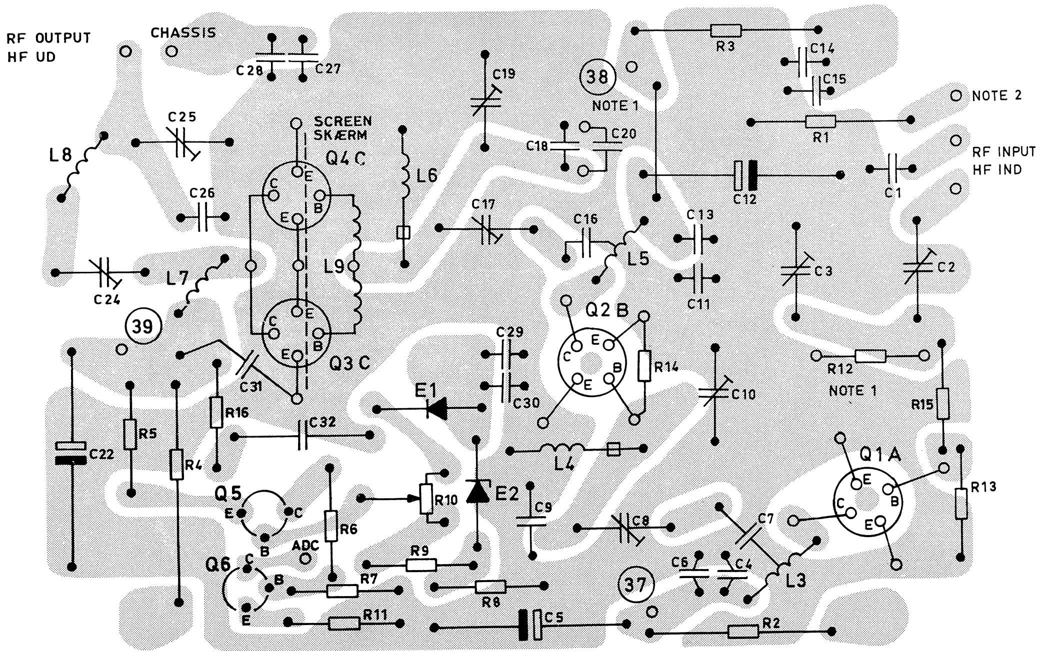
PA611a

X400.678/4

Storno Storno



PRINTED CIRCUIT VIEWED FROM COMPONENT SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN

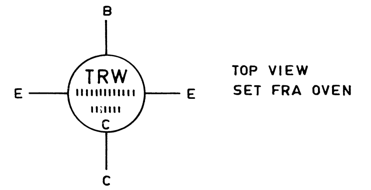


NOTE 1: C20 (22p) AND R12 (47Ω) ARE INSERTED IN THE FREQUENCY BAND 140-155 MHz.

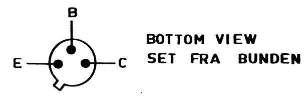
C20 (22p) OG R12 (47Ω) INDSÆTTES I FREKVENSOMRÅDET 140-155 MHz.

NOTE 2 R1 (47Ω) IS USED DURING ADJUSTMENT OF THE EXCITER.

R1 (47Ω) ANVENDES VED JUSTERING AF STYRESENDER.



Q1, Q2, Q3, Q4



Q5, Q6

RF POWER AMPLIFIER
HF-EFFEKTFORSTÆRKER

PA612

D400.794/4

Storno

TYPE	NO.	CODE	DATA	
	C1	74.5155	1nF -20 +80% ceram II PL	63V
	C2	78.5029	3-30pF trimmer P40 norm.	300V
	C3	78.5029	3-30pF trimmer P40 norm.	300V
	C4	74.5155	1nF -20 +80% ceram II PL	63V
	C5	73.5100	10 μF -10 +100% elco TB	40V
	C6	76.5071	22nF 10% polyest. FL	50V
	C7	74.5155	1nF -20 +80% ceram II PL	63V
	C8	78.5029	3-30pF trimmer P40 norm.	300V
	C9	74.5106	22pF ±0,5pF ceram NO75 TB	250V
	C10	78.5029	3-30pF trimmer P40 norm.	300V
	C11	74.5155	1nF -20 +80% ceram II PL	63V
	C12	73.5100	10 μF -10 +100% elco TB	40V
	C13	76.5071	22nF 10% polyest. FL	50V
	C14	74.5155	1nF -20 +80% ceram II PL	63V
	C15	76.5071	22 nF 10% polyest. FL	50V
	C16	74.5155	1nF -20 +80% ceram II PL	63V
	C17	78.5029	3-30pF trimmer P40 norm.	300V
	C18	74.5008	22pF 5% ceram N150 DI	500V
	C19	78.5029	3-30pF trimmer P40 norm.	300V
	C20	74.5008	22pF 5% ceram. N150 DI	500V
	C22	73.5107	25 μF -10 +100% elco TB	35V
	C24	78.5029	3-30pF trimmer P40 norm.	300V
	C25	78.5029	3-30pF trimmer P40 norm.	300V
	C26	74.5106	22pF ±0,5pF ceram NO75 TB	250V
	C27	74.5155	1nF -20 +80% ceram II PL	63V
	C28	76.5071	22nF 10% polyest. FL	50V
	C29	74.5155	1nF -20 +80% ceram II PL	63V
	C30	76.5071	22nF 10% polyest. FL	50V
	C31	74.5145	100pF 2% ceram N 075 7B	160V
	C32	76.5073	0,1 μF 10% polyest. TB	100V
	R1	80.5433	47 Ω 5% carbon film	1/4W
	R2	82.5201	1 Ω 10% wirewound/trådviklet	1 W
	R3	82.5201	1 Ω 10% wirewound/trådviklet	1 W
	R4	83.5502	0,33 Ω 10% wirewound/trådviklet	3 W
	R5	80.5239	150 Ω 5% carbon film	1/8W
	R6	80.5258	5,6 kΩ 5% carbon film	1/8W
	R7	80.5249	1 kΩ 5% carbon film	1/8W
	R8	80.5254	2,7 kΩ 5% carbon film	1/8W
	R9	80.5249	1 kΩ 5% carbon film	1/8W
	R10	86.5042	500 Ω 20% potm. lin. carbon film	0,1W
	R11	80.5237	100 Ω 5% carbon film	1/8W
	R12	80.5233	47 Ω 5% carbon film	1/8W
	R13	80.5232	39 Ω 5% carbon film	1/8W
	R14	80.5232	39 Ω 5% carbon film	1/8W
	R15	80.5217	2,2 Ω 5% carbon film	1/8W
	R16	80.5222	5,6 Ω 5% carbon film	1/8W

Storno

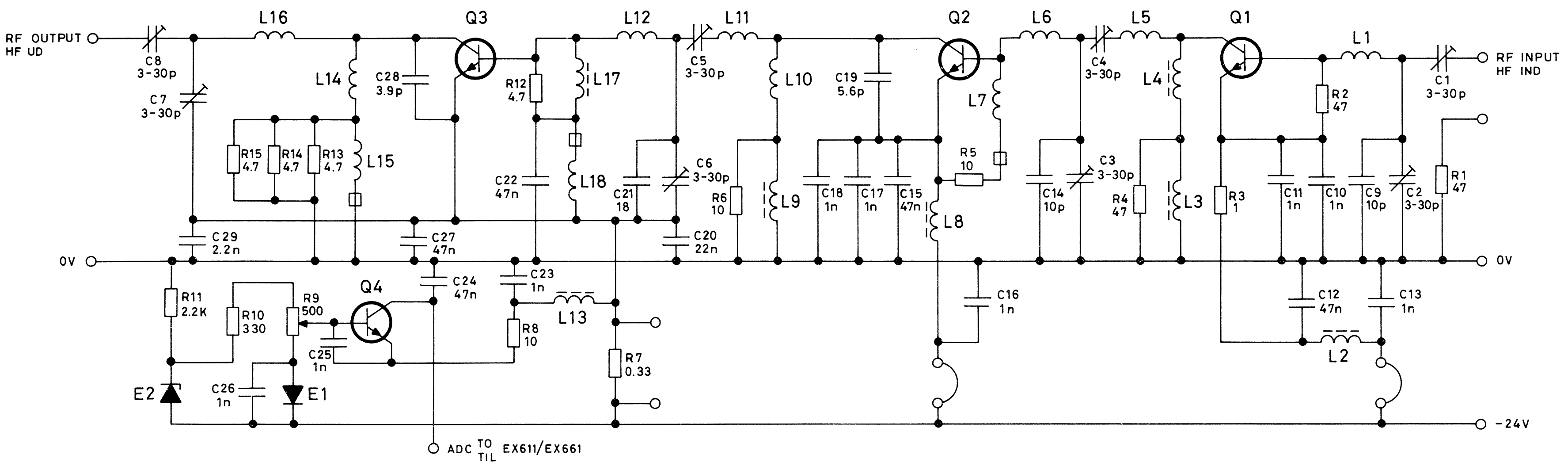
TYPE	NO.	CODE	DATA	
	L3	62.739-01	RF coil/HF spole 140-174 MHz	
	L4	63.5008	0,47 μH 20% choke/drossel	2 A
	L5	62.741	RF coil/HF spole 140-174 MHz	
	L6	63.5008	0,47 μF 20% choke/drossel	2 A
	L7	62.740	RF coil/HF spole 140-174 MHz	
	L8	62.738	RF coil/HF spole 140-174 MHz	
	L9	62.776	RF coil/HF spole 140-174 MHz	
	E1	99.5028	Diode OA200	
	E2	99.5114	Zenerdiode 5,6V 5%	1/4W
	Q1(A) Q2(B) Q3, Q4 (C)	99.5195	Transistor kit / Transistor sæt PKT 3195 150MHz/25W	
			When ordering the above transistors singly the following type numbers should be used.	
			Ved enkeltvis bestilling af ovennævnte transistorer benyttes følgende type-numre.	
	Q1(A)	99.5196	Transistor PT3195	
	Q2(B)	99.5197	Transistor PT3195	
	Q3, Q4 (C)	99.5198	Transistor PT3195	
	Q5	99.5125	Transistor BCY33	
	Q6	99.5121	Transistor BC107	
	FC	65.5061	Ferroxcube beads/ferritperler	

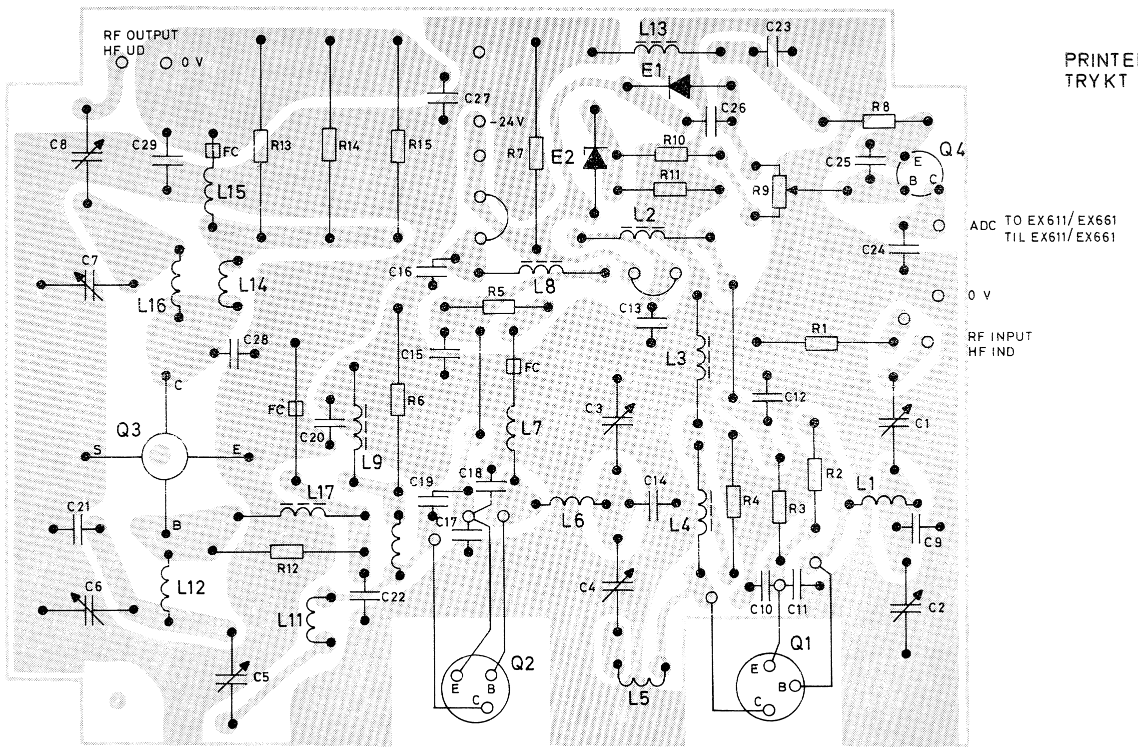
RF POWER AMPLIFIER
HF-EFFEKTFORSTÆRKER

PA612

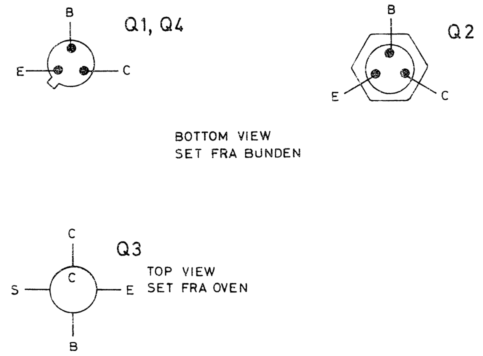
X400.840/5

Storno





PRINTED CIRCUIT VIEWED FROM COMPONENT SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN



RF POWER AMPLIFIER
HF EFFEKTFORSTÆRKER

PA614

D401.280

Storno

TYPE	NO.	CODE	DATA	
PA614		10.2520	RF Power Amplifier	
	C1	78.5029	3-30 pF air trimmer P40	300V
	C2	78.5029	3-30 pF air trimmer P40	300V
	C3	78.5029	3-30 pF air trimmer P40	300V
	C4	78.5029	3-30 pF air trimmer P40	300V
	C5	78.5029	3-30 pF air trimmer P40	300V
	C6	78.5029	3-30 pF air trimmer P40	300V
	C7	78.5029	3-30 pF air trimmer P40	300V
	C8	78.5029	3-30 pF air trimmer P40	300V
	C9	74.5135	10 pF 5% ceram. N150 DI	125V
	C10	74.5155	1 nF -20/+80% ceram. II PL	63V
	C11	74.5155	1 nF -20/+80% ceram. II PL	63V
	C12	76.5072	47 nF 10% polyest. FL	50V
	C13	74.5155	1 nF -20/+80% ceram. II PL	63V
	C14	74.5135	10 pF 5% ceram. N150 DI	125V
	C15	76.5072	47 nF 10% polyest. FL	50V
	C16	74.5155	1 nF -20/+80% ceram. II PL	63V
	C17	74.5155	1 nF -20/+80% ceram. II PL	63V
	C18	74.5155	1 nF -20/+80% ceram. II PL	63V
	C19	74.5132	5,6 pF ±0,25 pF ceram N150 DI	250V
	C20	76.5071	22 nF 10% polyest. FL	50V
	C21	74.5138	18 pF 5% ceram. N150 DI	125V
	C22	76.5072	47 nF 10% polyest. FL	50V
	C23	74.5155	1 nF -20/+80% ceram. II PL	63V
	C24	76.5072	47 nF 10% polyest. FL	50V
	C25	74.5155	1 nF -20/+80% ceram. II PL	63V
	C26	74.5155	1 nF -20/+80% ceram. II PL	63V
	C27	76.5072	47 nF 10% polyest. FL	50V
	C28	74.5130	3,9 pF ±0,25 pF ceram N150 DI	250V
	C29	74.5163	2,2 nF -20/+80% ceram II PL	63V
	R1	80.5433	47 Ω 5% carbon film	1/4W
	R2	80.5233	47 Ω 5% carbon film	1/8W
	R3	80.5213	1 Ω 5% carbon film	1/8W
	R4	80.5433	47 Ω 5% carbon film	1/4W
	R5	80.5225	10 Ω 5% carbon film	1/8W
	R6	81.5025	10 Ω 5% carbon film	1/2W
	R7	83.5502	0,33 Ω 10% wirewound/trådvikl.	3W
	R8	80.5225	10 Ω 5% carbon film	1/8W
	R9	86.5042	500 Ω 20% potm. carb. film lin.	0.1W
	R10	80.5243	330 Ω 5% carbon film	1/8W
	R11	80.5253	2.2 kΩ 5% carbon film	1/8W
	R12	80.5421	4.7 Ω 5% carbon film	1/4W
	R13	82.5021	4.7 Ω 5% carbon film	1W
	R14	82.5021	4.7 Ω 5% carbon film	1W
	R15	82.5021	4.7 Ω 5% carbon film	1W

Storno

TYPE	NO.	CODE	DATA	
	L1	62.0718	RF coil/HF spole 140-174 MHz	
	L2	63.5006	2.2 μH 20% RF choke/HF drossel	0.6A
	L3	63.5007	15 μH 10% RF choke/HF drossel	0.5A
	L4	61.5010	0.33 μH 20% RF choke/HF drossel	2A
	L5	62.0719	RF coil/HF spole 140-174 MHz	
	L6	62.0718	RF coil/HF spole 140-174 MHz	
	L7	62.0777	RF coil/HF spole 140-174 MHz	
	L8	63.5008	0.47 μF 20% RF choke/HF spole	2A
	L9	63.5008	0.47 μH 20% RF choke/HF crossel	2A
	L10	62.0717	RF coil/HF spole	
	L11	62.0804	RF coil/HF spole 140-174 MHz	
	L12	62.0718	RF coil/HF spole 140-174 MHz	
	L13	63.5006	2.2 μH 20% RF choke/HF drossel	0.6A
	L14	62.0806	RF coil/HF spole	
	L15	62.0808	RF coil/HF spole	
	L16	62.0805	RF coil/HF spole 140-174 MHz	
	L17	63.5008	0.47 μH 20% RF choke/HF drossel	2A
	L18	62.0807	RF coil/HF spole	
	E1	99.5028	Diode 1N914	
	E2	99.5114	Zenerdiode 5.6V 5%	0.25W
	Q1	99.5129	Transistor 2N3553	
	Q2	99.5137	Transistor 2N3632	
	Q3	99.5241	Transistor BLY93A24	
	Q4	99.5121	Transistor BC107	

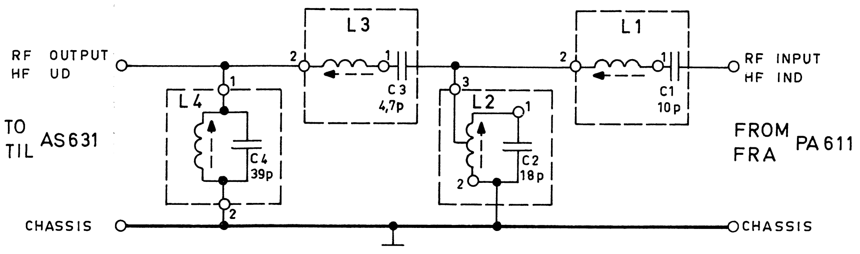
RF POWER AMPLIFIER
HF-EFFEKTFORSTÆRKER

PA614

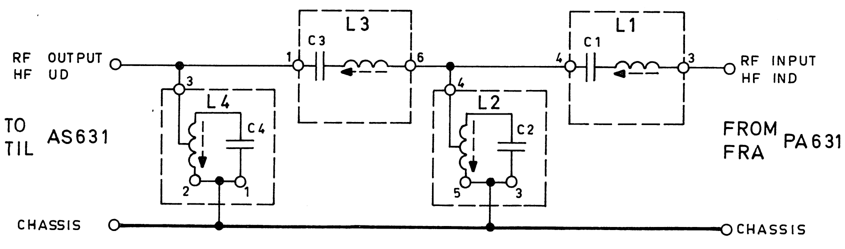
X401.279/2

Storno

Storno

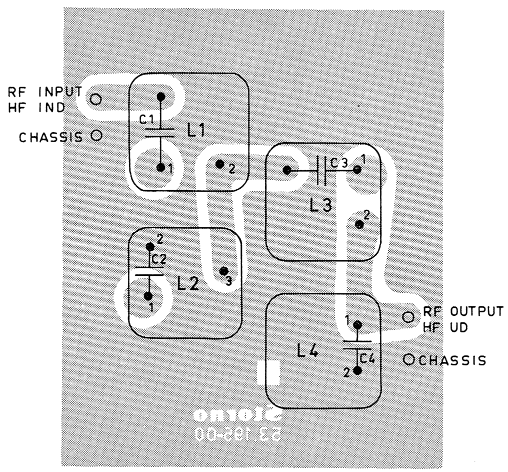


FN611



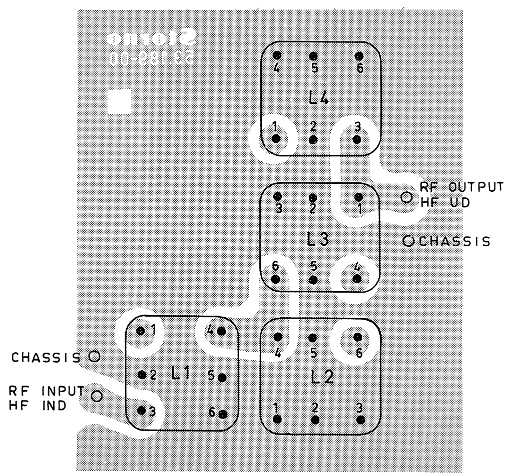
FN 631

PRINTED CIRCUIT VIEWED FROM COMPONENT SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN



FN611

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)

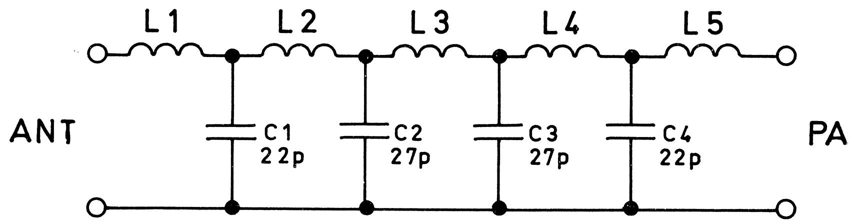
Storno

TYPE	NO.	CODE	DATA

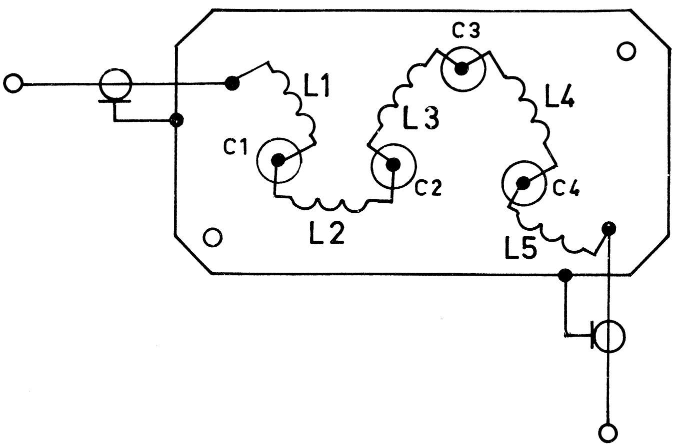
ANTENNA FILTER
ANTENNE FILTER

FN611, FN631

X400.689

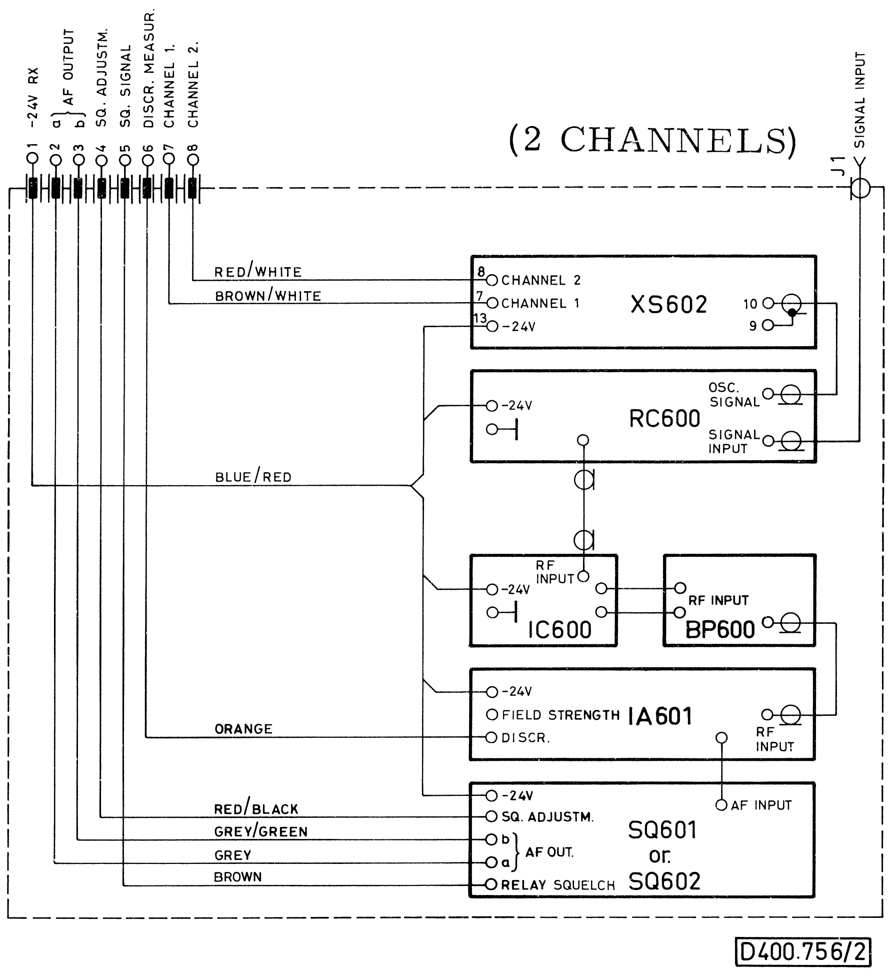


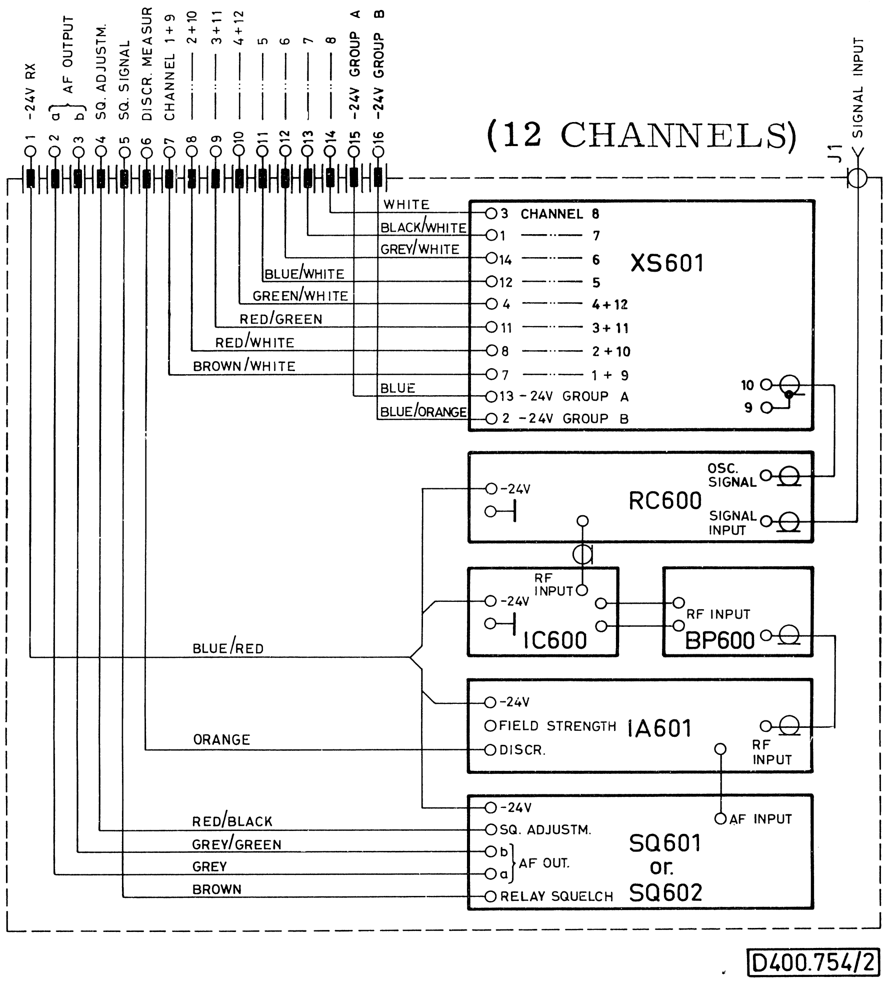
L1 HF spole nr. 62 751
L2 ——— ·· ——— 62 753
L3 ——— ·· ——— 62 752
L4 ——— ·· ——— 62 754
L5 ——— ·· ——— 62 755



Storno	konstr./tegn.	ANTENNEFILTER FN612	TEGN. NR. D400.830 A4
	godk.		
	komp.liste	KODE	

Storno

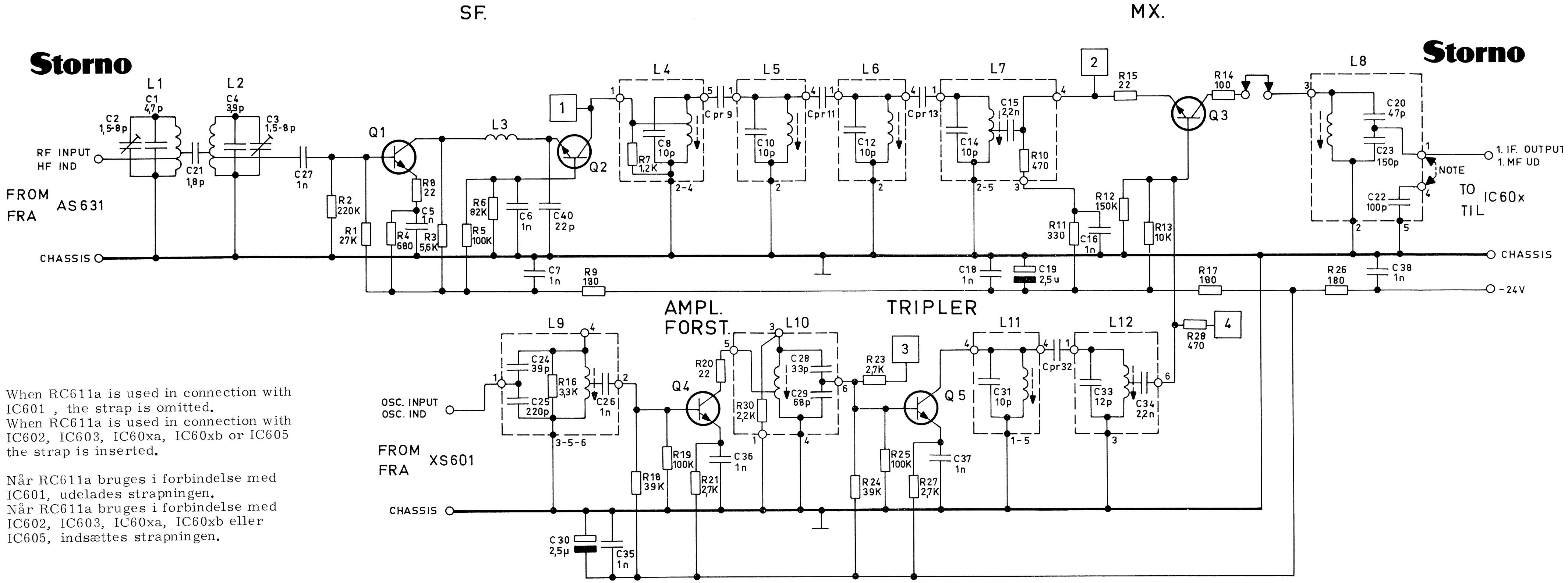




CABLE FORM

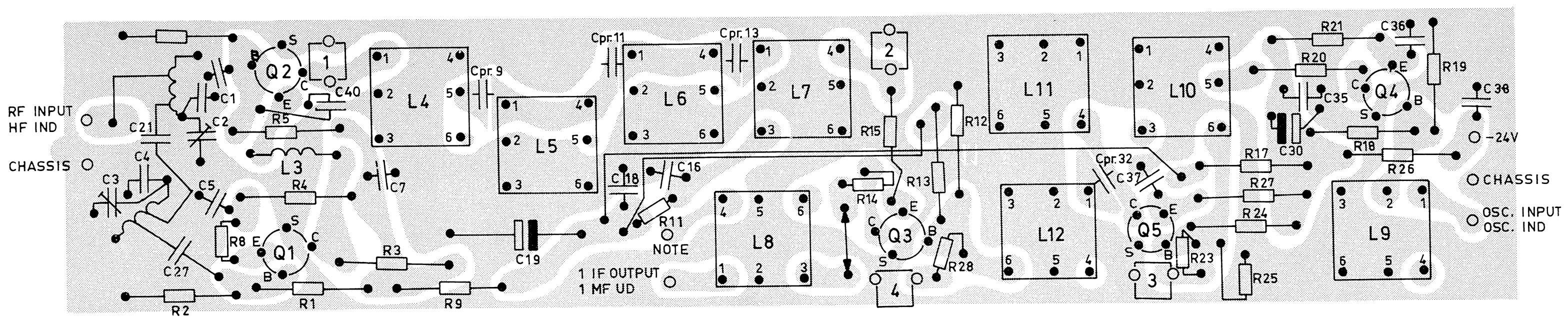
KABLINGSDIAGRAM

RX610, RX630, RX661



Note: When RC611a is used in connection with IC601 , 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.



RECEIVER CONVERTER
MODTAGER KONVERTER

RC611a

D400.833/2

TYPE	NO.	CODE	DATA	
	C1	74.5131	4,7pF ±0,25pF N150 DI	500V
	C2	78.5034	1,5-8pF trimmer NPO TB	125V
	C3	78.5034	1,5-8pF trimmer NPO TB	125V
	C4	74.5130	3,9pF ±0,25pF N150 DI	500V
	C5	74.5155	1nF -20 +50% ceram. PL	63V
	C6	74.5155	1nF -20 +50% ceram. PL	63V
	C7	74.5155	1nF -20 +50% ceram. PL	63V
	C8	74.5110	10pF ±0,5pF ceram. NO75 TB	250V
	C9		print capacitance/printkapacitet	
	C10	74.5110	10pF ±0,5pF ceram. NO75 TB	250V
	C11		print capacitance/printkapacitet	
	C12	74.5110	10pF ±0,5pF ceram. NO75 TB	250V
	C13		print capacitance/printkapacitet	
	C14	74.5110	10pF ±0,5pF ceram. NO75 TB	250V
	C15	76.5059	2,2nF 10% polyest. FL	50V
	C16	74.5155	1nF -20 +50% ceram. PL	63V
	C18	74.5155	1nF -20 +50% ceram. PL	63V
	C19	73.5064	2,5μF -10 +50% elco	70V
	C20	74.5118	47pF ±2% ceram. NO75 TB	250V
	C21	74.5126	1,8pF ±0,25pF N150 BD	250V
	C22	76.5079	100pF 5% polystyr. TB	125V
	C23	76.5062	150pF 5% polystyr. TB	125V
	C24	74.5117	39pF 2% ceram. TB	250V
	C25	76.5063	220pF 5% polystyr.	125V
	C26	74.5059	1nF 10% polyest. FL	50V
	C27	74.5155	1nF -20 +50% ceram. PL	63V
	C28	74.5116	33pF 2% ceram. NO75 TB	250V
	C29	74.5144	68pF 2% ceram. NO75 TB	250V
	C30	73.5064	2,5μF -10 +50% elco	70V
	C31	74.5110	10pF ±0,5pF ceram. NO75 TB	250V
	C32		print capacitance/printkapacitet	
	C33	74.5141	12pF ±0,5pF ceram. NO75 TB	250V
	C34	76.5059	2,2nF 10% polyest. FL	50V
	C35	74.5155	1nF -20 +50% ceram. PL	63V
	C36	74.5155	1nF -20 +50% ceram. PL	63V
	C37	74.5155	1nF -20 +50% ceram. PL	63V
	C38	74.5155	1nF -20 +50% ceram. PL	63V
	C40	74.5106	22 pF ±0,5 pF NO75 TB	160V
	R1	80.5266	27kΩ 5% carbon film	1/8W
	R2	80.5277	0,22MΩ 5% carbon film	1/8W
	R3	80.5258	5,6kΩ 5% carbon film	1/8W
	R4	80.5247	680kΩ 5% carbon film	1/8W
	R5	80.5273	0,1MΩ 5% carbon film	1/8W
	R6	80.5272	82kΩ 5% carbon film	1/8W
	R7	80.5250	1,2kΩ 5% carbon film	1/8W
	R8	80.5259	22Ω 5% carbon film	1/8W
	R9	80.5240	180Ω 5% carbon film	1/8W
	R10	80.5045	470Ω 5% carbon film	1/10W

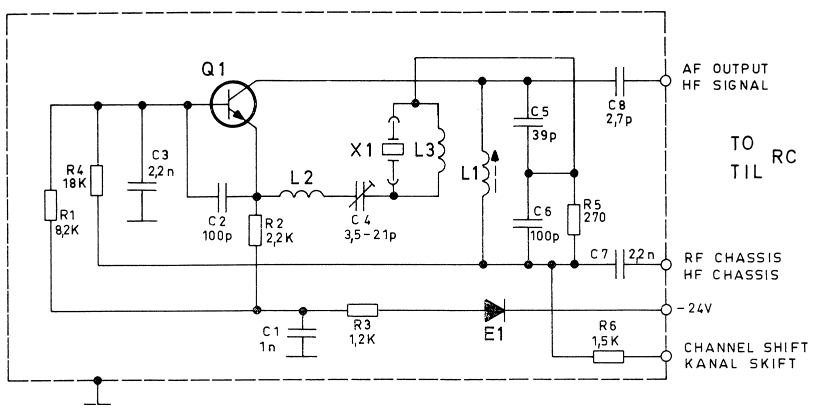
TYPE	NO.	CODE	DATA	
	R11	80.5243	330Ω 5% carbon film	1/8W
	R12	80.5275	0,15MΩ 5% carbon film	1/8W
	R13	80.5261	10kΩ 5% carbon film	1/8W
	R14	80.5237	100Ω 5% carbon film	1/8W
	R15	80.5229	22Ω 5% carbon film	1/8W
	R16	80.5055	3,3kΩ 5% carbon film	1/10W
	R17	80.5240	180Ω 5% carbon film	1/8W
	R18	80.5268	39kΩ 5% carbon film	1/8W
	R19	80.5273	0,1MΩ 5% carbon film	1/8W
	R20	80.5229	22Ω 5% carbon film	1/8W
	R21	80.5254	2,7kΩ 5% carbon film	1/8W
	R23	80.5254	2,7kΩ 5% carbon film	1/8W
	R24	80.5268	39kΩ 5% carbon film	1/8W
	R25	80.5273	0,1MΩ 5% carbon film	1/8W
	R26	80.5240	180Ω 5% carbon film	1/8W
	R27	80.5254	2,7kΩ 5% carbon film	1/8W
	R28	80.5245	470Ω 5% carbon film	1/8W
	R30	80.5253	2.2kΩ 5% carbon film	1/10W
	L1	62.759	RF coil/HF-spole 146-174MHz	
	L2	62.758	RF coil/HF-spole 146-174MHz	
	L3	62.659	RF choke/HF-drosselspole	
	L4	61.1034	RF coil/HF-spole (C8, R7)	
	L5	61.868-01	RF coil/HF-spole (C10)	
	L6	61.869-01	RF coil/HF-spole (C12)	
	L7	61.870-01	RF coil/HF-spole (C14, C15, R10)	
	L8	61.871-01	RF coil/HF-spole (C20, C21, C22, C23)	
	L9	61.872-01	RF coil/HF-spole (C24, C25, C26, R16)	
	L10	61.1033	RF coil/HF-spole (C28, C29, R30)	
	L11	61.874-02	RF coil/HF-spole (C31)	
	L12	61.875-02	RF coil/HF-spole (C33, C34)	
	Q1	99.5177	Transistor BF166	
	Q2	99.5118	Transistor BF115	
	Q3	99.5168	Transistor BF173	
	Q4	99.5166	Transistor BF167	
	Q5	99.5166	Transistor BF167	

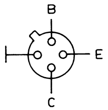
RECEIVER CONVERTER
MODTAGER KONVERTER

RC611a

X400.888/2

Storno





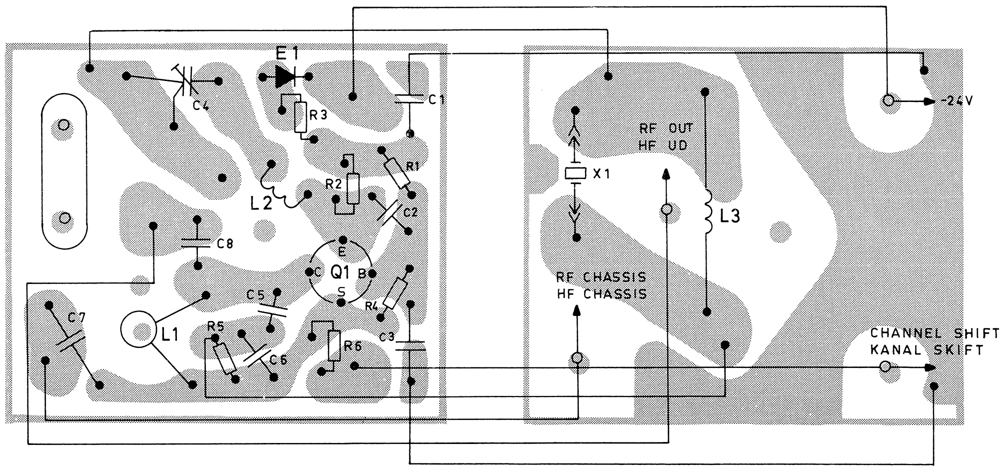
Q1
BOTTOM VIEW
SET FRA BUNDEN

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.

XO611a

D400.667/4

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% polystyr FL	50V
	C4	78.5044	2 - 18 pF trimmer	300V
	C5	74.5117	39 pF ±2% ceram NO75TB	250V
	C6	76.5102	100pF 2,5% polystyr	30V
	C7	76.5059	2,2nF 10% polyester FL	50V
	C8	74.5128	2,7pF ±0,25pF ceram N150BD	250V
	R1	80.5260	8,2kΩ 5% carbon film	1/8W
	R2	80.5253	2,2kΩ 5% " "	1/8W
	R3	80.5250	1,2kΩ 5% " "	1/8W
	R4	80.5264	18 kΩ 5% " "	1/8W
	R5	80.5242	270Ω 5% " "	1/8W
	R6	80.5251	1,5 kΩ 5% " "	1/8W
	E1	99.5028	Diode 1N914	
	L1	61.876	RF coil/HF-spole 48-57 MHz	
	L2	62.662	Filter coil/Drosselspole	
	L3	62.652-01	Filter coil/Drosselspole	
	Q1	99.5028	Transistor BF167	
	X1		Crystal	

Storno

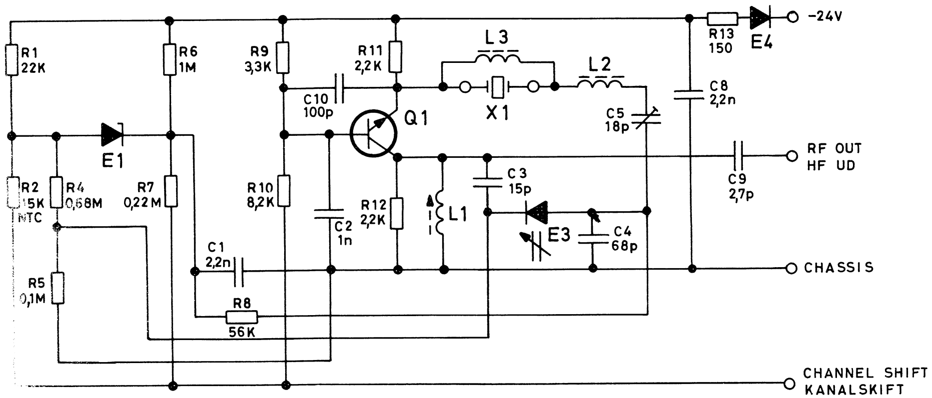
TYPE	NO.	CODE	DATA

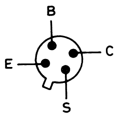
CRYSTALOSCILLATOR FOR RX.

X400.686/3

XO611a

Storno





Q1
BOTTOM VIEW
SET FRA BUNDEN

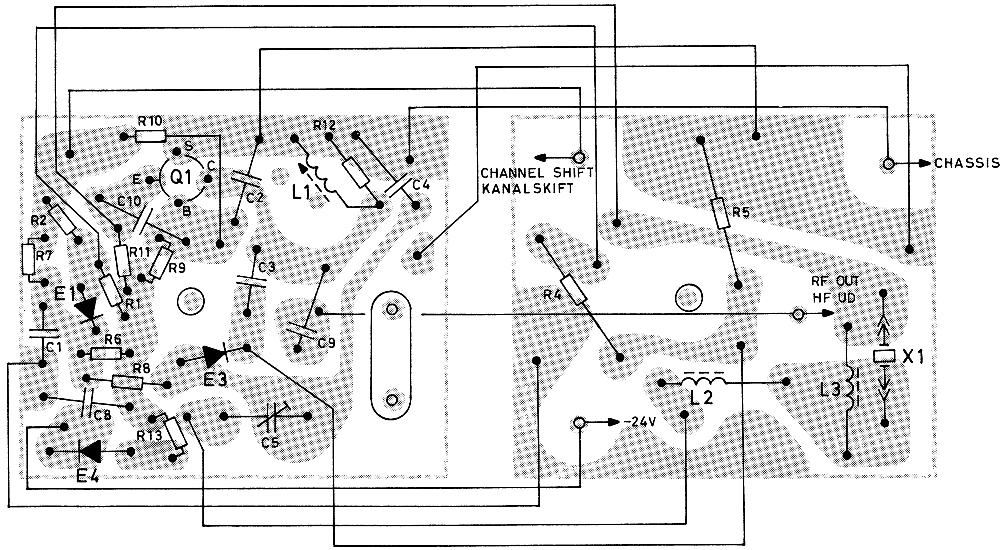
Storno

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



CRYSTAL OSCILLATOR
KRYSTAL OSCILLATOR

XO666

D401 018/3

Storno

TYPE	NO.	CODE	DATA	
	C1	76.5059	2,2 nF 10% polyest. FL	50V
	C2	74.5155	1 nF -20 +50% ceram II PL	63V
	C3	74.5173	15 pF 5% ceram N750 PI	125V
	C4	76.5101	68 pF 5% polystyr. TB	125V
	C5	78.5044	2-20 pF teflon N250 norm.	500V
	C8	76.5059	2,2 nF 10% polyest. FL	50V
	C9	74.5128	2,7 pF ±0,25 pF ceram N150	250V
	C10	76.5102	100 pF 5% polystyr. TB	30V
	R1	80.5065	22 kΩ 5% carbon film	1/10W
	R2	89.5010	15 kΩ 20% NTC	0,6W
	R4	80.5083	0,68 MΩ 10% carbon film	1/10W
	R5	80.5073	0,1 MΩ 5% carbon film	1/10W
	R6	80.5085	1 MΩ 10% carbon film	1/10W
	R7	80.5077	0,22 MΩ 5% carbon film	1/10W
	R8	80.5070	56 kΩ 5% carbon film	1/10W
	R9	80.5055	3,3 kΩ 5% carbon film	1/10W
	R10	80.5060	8,2 kΩ 5% carbon film	1/10W
	R11	80.5053	2,2 kΩ 5% carbon film	1/10W
	R12	80.5053	2,2 kΩ 5% carbon film	1/10W
	R13	80.5039	150 Ω 5% carbon film	1/10W
	L1	61.1077	RF coil/HF-spole	
	L2	61.1076	RF coil/HF-spole	
	L3	61.1076	RF coil/HF-spole	
	E1	99.5223	Zenerdiode 12V 5%	0,25W
	E3	99.5140	Capacitance diode BA101C	
	E4	99.5028	Diode 1N914	
	Q1	99.5217	Transistor 2N918	

Storno

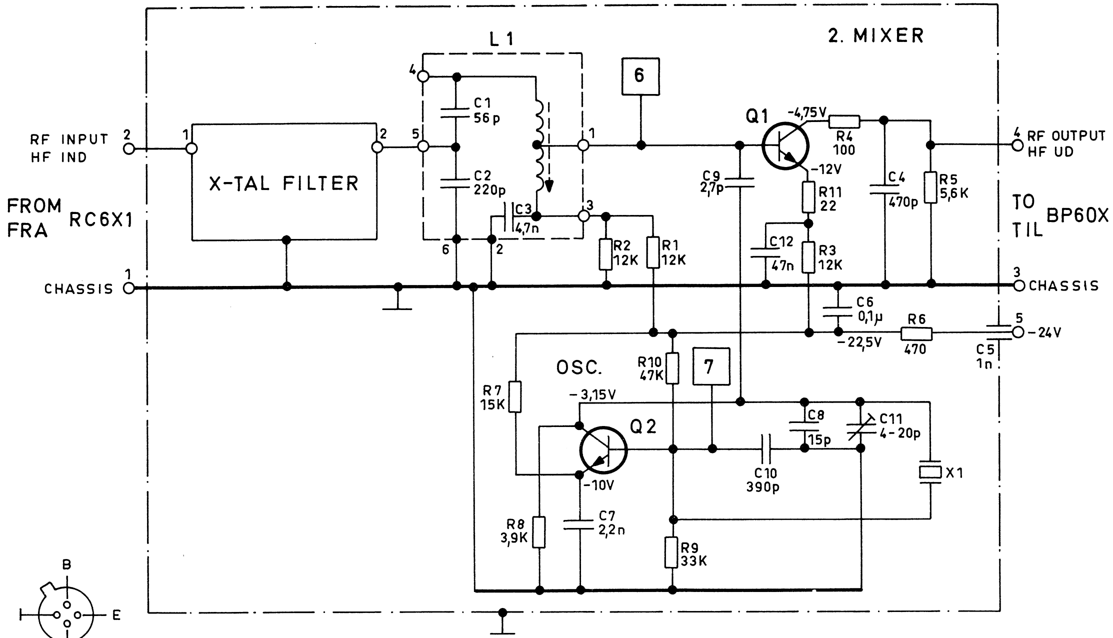
TYPE	NO.	CODE	DATA

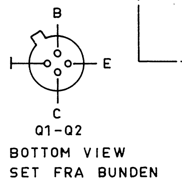
CRYSTAL OSCILLATOR
KRYSTALOSCILLATOR

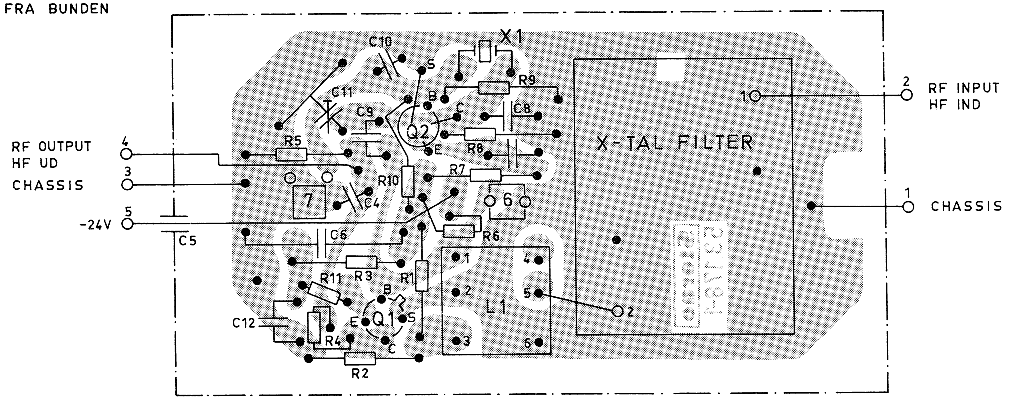
XO666

X401.039

Storno







PRINTED CIRCUIT VIEWED FROM COMPONENT SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN

IF-CONVERTER
MF-KONVERTER

IC601b, IC602b, IC603b

D400.664/3

TYPE	NO.	CODE	DATA
	C1	74.5111	56 pF 2% ceram NO75 TB 250V
	C2	76.5063	220 pF 5% polystyr. TB 125V
	C3	76.5061	4,7nF 10% polyest. FL 50V
	C4	76.5065	470 pF 5% polystyr. TB 125V
	C5	74.5167	1 nF -20/+50% ceram. FT 300V
	C6	76.5073	0,1μF 10% polyest. TB 100V
	C7	76.5059	2.2nF 10% " FL 50V
	C8	74.5142	18 pF ±0.5pF ceram. NO75 TB 250V
	C9	74.5107	2,7pF 2% " NO75 TB 250V
	C10	76.5017	390 pF 5% polystyr. TB 125V
	C11	78.5031	40/20pF ceram trimmer N470 DI 100V
	C12	76.5072	47 nF 10% polyest. 50V
	R1	80.5262	12 kΩ 5% carbon film 1/8W
	R2	80.5262	12 kΩ 5% " " 1/8W
	R3	80.5262	12 kΩ 5% " " 1/8W
	R4	80.5237	100 Ω 5% " " 1/8W
	R5	80.5258	5.6kΩ 5% " " 1/8W
	R6	80.5245	470Ω 5% " " 1/8W
	R7	80.5263	15 kΩ 5% " " 1/8W
	R8	80.5256	3.9kΩ 5% " " 1/8W
	R9	80.5267	33 kΩ 5% " " 1/8W
	R10	80.5269	47 kΩ 5% " " 1/8W
	R11	80.5229	22 Ω 5% " " 1/8W
	L1	61.977	Coil/spole 10.7 MHz (C1, C2, C3)
	Q1	99.5166	Transistor BF 167
	Q2	99.5166	Transistor BF 167
	X1	98.5004	10.2450 MHz crystal, Storno type 98-8 or/eller
		98.5005	11.1550 MHz crystal, Storno type 98-8
IC601b		69.5010	10.7 MHz X-tal filter/krystalfilter 50 kHz
IC602b		69.5009	10.7 MHz X-tal filter/krystalfilter 25 kHz
IC603b		69.5008	10.7 MHz X-tal filter/krystalfilter 20 kHz

Storno

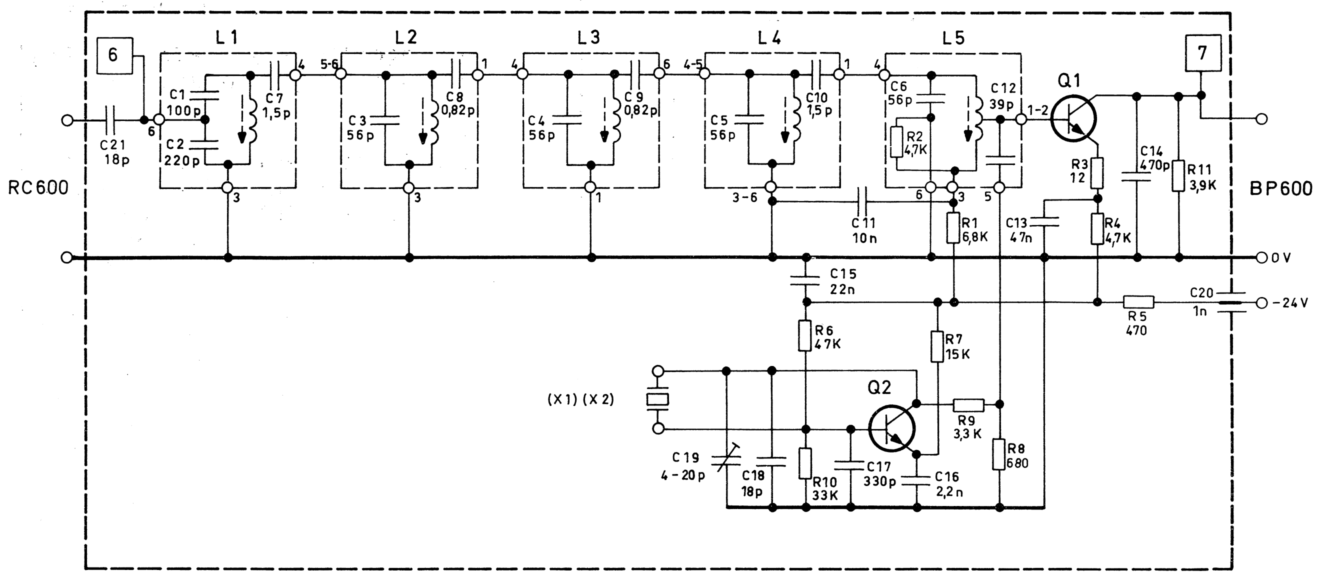
TYPE	NO.	CODE	DATA

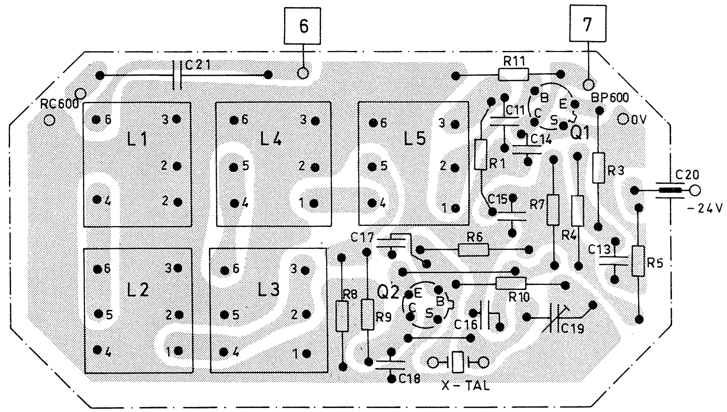
IF-CONVERTER MF-KONVERTER IC601b, IC602b, IC603b

X400.684/3

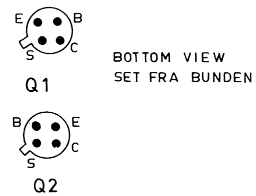
Storno

Storno





VIEWED FROM COMPONENT SIDE
SET FRA KOMPONENTSIDEN



IF-CONVERTER
MF-KONVERTER

IC605

D400.775/2

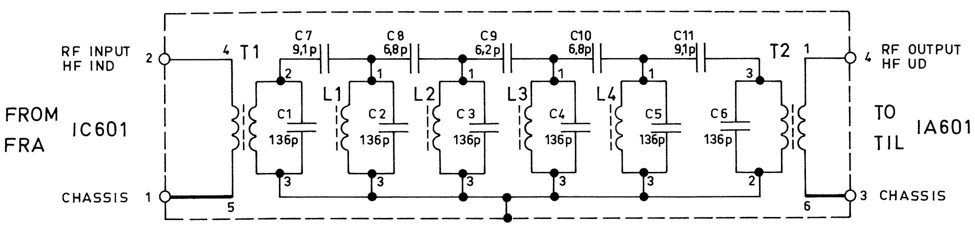
TYPE	NO.	CODE	DATA	
	C1	76.5079	100 pF 5% polystyr. TB	125V
	C2	76.5063	220 pF 5% polystyr. TB	125V
	C3	74.5177	56 pF 2% ceram N150 TB	250V
	C4	74.5177	56 pF 2% ceram N150 TB	250V
	C5	74.5177	56 pF 2% ceram N150 TB	250V
	C6	74.5177	56 pF 2% ceram N150 TB	250V
	C7	74.5125	1,5pF ± 0,25 pF ceram N150 BD	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
	C21	74.5138	18 pF 5% ceram N150 DI	125V
	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)	
	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	

TYPE	NO.	CODE	DATA

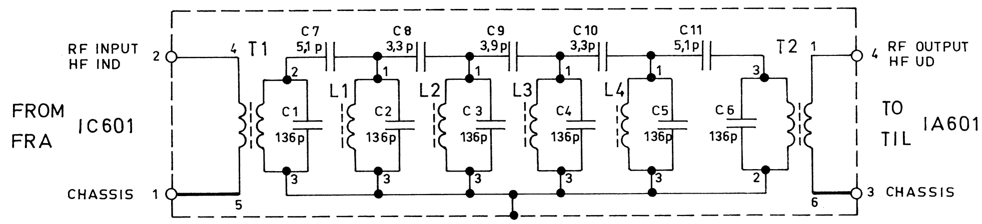
ZF-UMSETZER IC605

X400.815/3T

Storno



BP601



BP602

BAND-PASS FILTER
BÅNDPASFILTER

BP601, BP602

D400.663/3

Storno

TYPE	NO.	CODE	DATA
	C1	74.5144	2x68pF ±2% ceram. NO75 TB 250V
	C2	74.5144	2x68pF ±2% " NO75 TB 250V
	C3	74.5144	2x68pF ±2% " NO75 TB 250V
	C4	74.5144	2x68pF ±2% " NO75 TB 250V
	C5	74.5144	2x68pF ±2% " NO75 TB 250V
	C6	74.5144	2x68pF ±2% " NO75 TB 250V
BP601	C7	74.5169	9,1pF ±5% " N150 DI 250V
BP602	C7	74.5168	5,1pF ±0,25pF " N150 DI 250V
BP601	C8	74.5133	6,8pF ±0,25pF " N150 DI 250V
BP602	C8	74.5129	3,3pF ±0,25pF " N150 DI 250V
BP601	C9	74.5170	6,2pF ±0,25pF " N150 DI 250V
BP602	C9	74.5130	3,9pF ±0,25pF " N150 DI 250V
BP601	C10	74.5133	6,8pF ±0,25pF " N150 DI 250V
BP602	C10	74.5129	3,3pF ±0,25pF " N150 DI 250V
BP601	C11	74.5169	9,1pF ±5% " N150 DI 250V
BP602	C11	74.5168	5,1pF ±0,25pF " N150 DI 250V
BP601	L1	61.885	Coil/Spole 455 kHz
BP602	L1	61.819	Coil/Spole 455 kHz
BP601	L2	61.818	Coil/Spole 455 kHz
BP602	L2	61.822	Coil/Spole 455 kHz
BP601	L3	61.818	Coil/Spole 455 kHz
BP602	L3	61.822	Coil/Spole 455 kHz
BP601	L4	61.885	Coil/Spole 455 kHz
BP602	L4	61.819	Coil/Spole 455 kHz
BP601	T1	61.884	Transformer sec. coil/sek. spole 455 kHz
BP602	T1	61.821	Transformer " / " 455 kHz
BP601	T2	61.886	Transformer prim. coil/prim. spole 455kHz
BP602	T2	61.823	Transformer " / " 455kHz

Storno

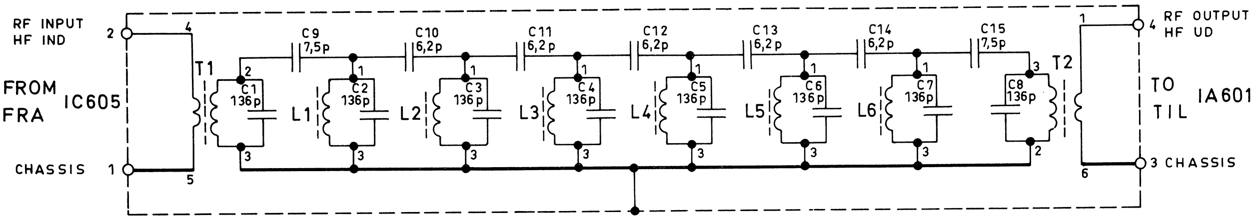
TYPE	NO.	CODE	DATA

BAND-PASS FILTER
BÅNDPASFILTER

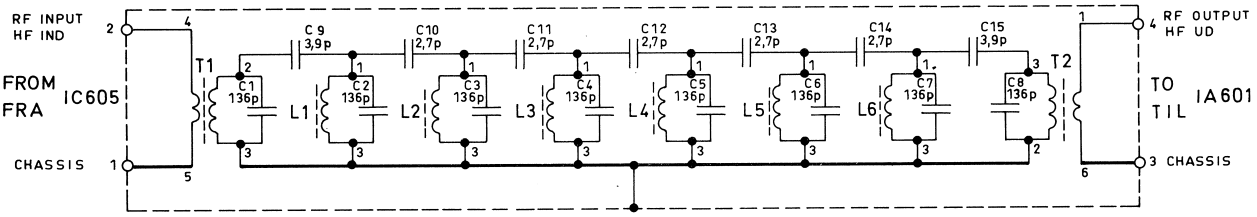
X400.687/2

BP601, BP602

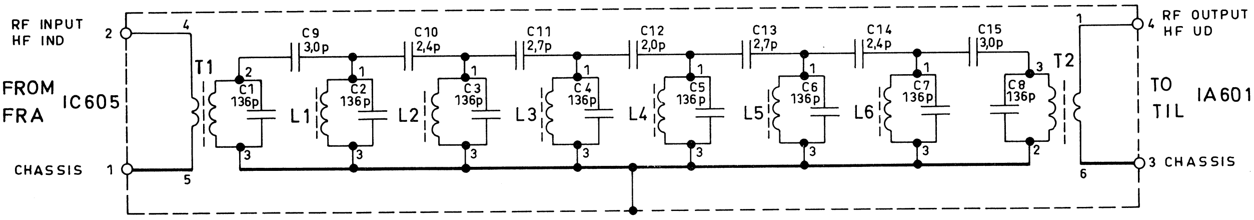
Storno



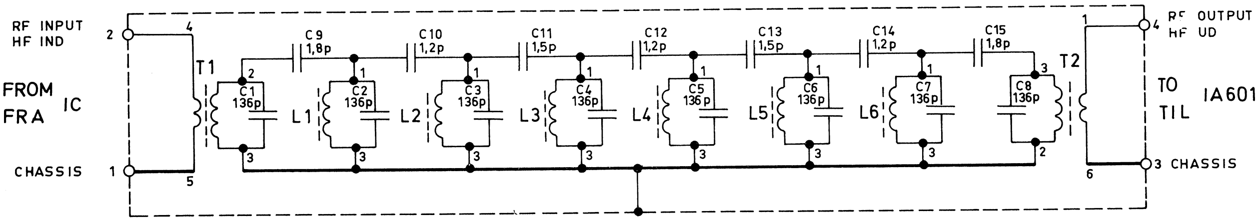
BP608 D400.806



BP609 D400.807



BP6010 D400.808



BP6012 D400.860/2

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

Storno

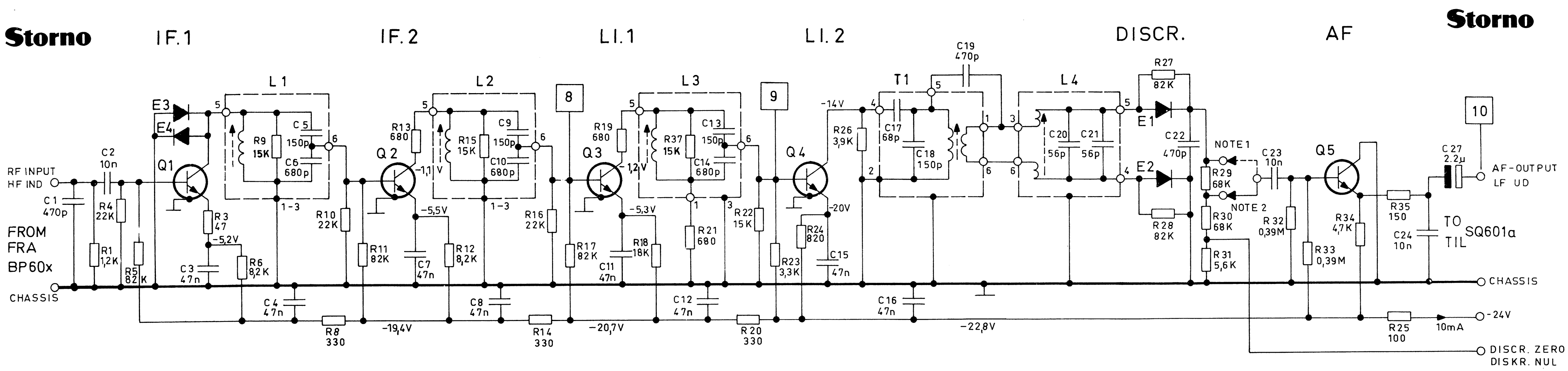
TYPE	NO.	CODE	DATA	
			BP608	
	C1-8	74.5144	68 pF 2% ceram NO75 TB	250V
	C9	74.5179	7,5 pF 0,25 pF ceram N150 DI	250V
	C10	74.5170	6,2 pF 0,25pF ceram N150 DI	250V
	C11	74.5170	6,2 pF 0,25pF ceram N150 DI	250V
	C12	74.5170	6,2 pF 0,25pF ceram N150 DI	250V
	C13	74.5170	6,2 pF 0,25pF ceram N150 DI	250V
	C14	74.5170	6,2 pF 0,25pF ceram N150 DI	250V
	C15	74.5179	7,5 pF 0,25pF ceram N150 DI	250V
	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	Coil/spole 455 kHz	
	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
	C13	74.5128	2,7 pF 0,25pF ceram N150 DI	250V
	C14	74.5128	2,7 pF 0,25pF ceram N150 DI	250V
	C15	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
	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	61.980-01	Coil/spole 455 kHz	
			BP6012	
	C1-8	74.5144	68 pF 2% ceram NO75 TB	250V
	C9	74.5126	1,8 pF 0,25 pF ceram N150 DI	250V
	C10	74.5124	1,2 pF 0,25 pF ceram N150 DI	250V
	C11	74.5125	1,5 pF 0,25 pF ceram N150 DI	250V
	C12	74.5124	1,2 pF 0,25 pF ceram N150 DI	250V
	C13	74.5125	1,5 pF 0,25 pF ceram N150 DI	250V
	C14	74.5124	1,2 pF 0,25 pF ceram N150 DI	250V
	C15	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	61.1048	Coil/spole 455 kHz	
	T2	61.1049	Coil/spole 455 kHz	

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

X400.879/2

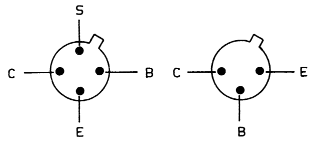


NOTE 1. CONNECTION FOR ±4kHz OR ±5kHz FREQ. DEVIATION

NOTE 2. CONNECTION FOR ±15kHz FREQ. DEVIATION

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

NOTE 2. FORBINDELSE VED ±15kHz FREKVENSSVING.

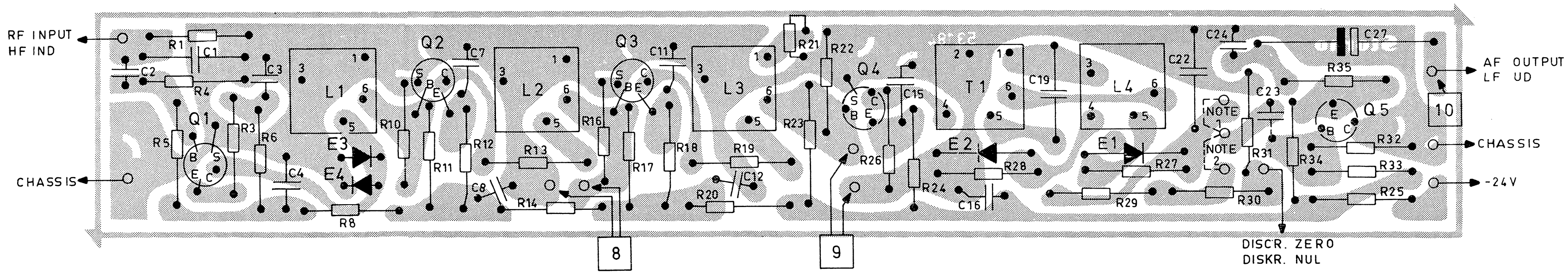


Q1, Q2, Q3, Q4
BOTTOM VIEW
SET FRA BUNDEN

Q5
BOTTOM VIEW
SET FRA BUNDEN

PRINTED CIRCUIT SEEN FROM COMPONENT SIDE

TRYKT KREDSLØB SET FRA KOMPONENTSIDEN



IF-AMPLIFIER
MF-FORSTÆRKER

IA601c

D401.042/3

Storno

TYPE	NO.	CODE	DATA
	C1	76.5065	470 pF 5% polystyr TB 125V
	C2	76.5070	10 nF 10% polyest. FL 50V
	C3	76.5072	47 nF 10% polyest. FL 50V
	C4	76.5072	47 nF 10% polystyr FL 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. FL 50V
	C8	76.5072	47 nF 10% polyest. FL 50V
	C9	76.5103	150 pF 2,5% polyest. TB 30V
	C10	76.5107	680 pF 2,5% polystyr. TB 30V
	C11	76.5072	47 nF 10% polyest. FL 50V
	C12	76.5072	47 nF 10% polyest. FL 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. FL 50V
	C16	76.5072	47 nF 10% polyest. FL 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	73.5064	2.2 μF -10+100% elco 63V
	R1	80.5250	1,2 kΩ 5% carbon film 1/8W
	R3	80.5233	47 Ω 5% carbon film 1/8W
	R4	80.5265	22 kΩ 5% carbon film 1/8W
	R5	80.5272	82 kΩ 5% carbon film 1/8W
	R6	80.5260	8,2 kΩ 5% carbon film 1/8W
	R8	80.5243	330 Ω 5% carbon film 1/8W
	R9	80.5064	18 kΩ 5% carbon film 1/10W
	R10	80.5265	22 kΩ 5% carbon film 1/8W
	R11	80.5272	82 kΩ 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	80.5064	18 kΩ 5% carbon film 1/10W
	R16	80.5265	22 kΩ 5% carbon film 1/8W
	R17	80.5272	82 kΩ 5% carbon film 1/8W
	R18	80.5264	18 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	15 kΩ 5% carbon film 1/8W
	R23	80.5255	3,3 kΩ 5% carbon film 1/8W
	R24	80.5248	820 Ω 5% carbon film 1/8W

Storno

TYPE	NO.	CODE	DATA
	R25	80.5237	100 Ω 5% carbon film 1/8W
	R26	80.5256	3,9 kΩ 5% carbon film 1/8W
	R27	80.5272	82 kΩ 5% carbon film 1/8W
	R28	80.5272	82 kΩ 5% carbon film 1/8W
	R29	80.5271	68 kΩ 5% carbon film 1/8W
	R20	80.5271	68 kΩ 5% carbon film 1/8W
	R31	80.5258	5,6 kΩ 5% carbon film 1/8W
	R32	80.5280	0,39 MΩ 5% carbon film 1/8W
	R33	80.5280	0,39 MΩ 5% carbon film 1/8W
	R34	80.5257	4,7 kΩ 5% carbon film 1/8W
	R35	80.5239	150 Ω 5% carbon film 1/8W
	R37	80.5064	18 kΩ 5% carbon film 1/10W
	L1	61.811-02	Coil/spole 455 kHz (C5-C6-R9)
	L2	61.811-02	Coil/spole 455 kHz (C9-C10-R15)
	L3	61.811-02	Coil/spole 455 kHz (C13-C14-R37)
	L4	61.813-01	Coil/spole 455 kHz discr. (C20-C21)
	T1	61.812-02	Trafo 455 kHz (C17-C18)
	E1	99.5028	Diode 1N914
	E2	99.5028	Diode 1N914
	E3	99.5028	Diode 1N914
	E4	99.5021	Diode 1N914
	Q1	99.5166	Transistor BF167
	Q2	99.5166	Transistor BF167
	Q3	99.5166	Transistor BF167
	Q4	99.5168	Transistor BF173
	Q5	99.5143	Transistor BC108

IF-AMPLIFIER
MF-FORSTÆRKER

IA601c

X400.797/5

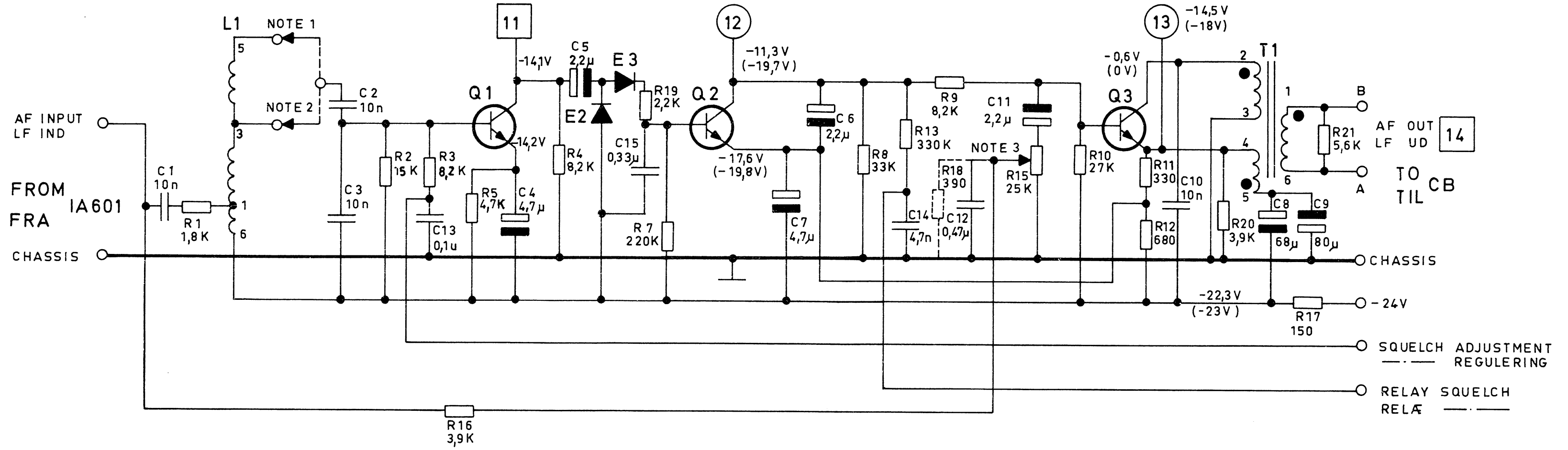
Storno

Storno

NOISE AMP
STØJFORST.

NOISE DETECTOR
STØJDETEKTOR

AF AMP
LF FORST

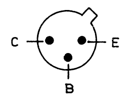


NOTE 1. CONNECTED IF 20 OR 25KHz CHANNEL SEPARATION IS USED.
NOTE 2. CONNECTED IF 50KHz CHANNEL SEPARATION IS USED.
NOTE 3. IF FM IS USED INSTEAD OF PM, C12 IS REPLACED BY R18(390Ω)

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

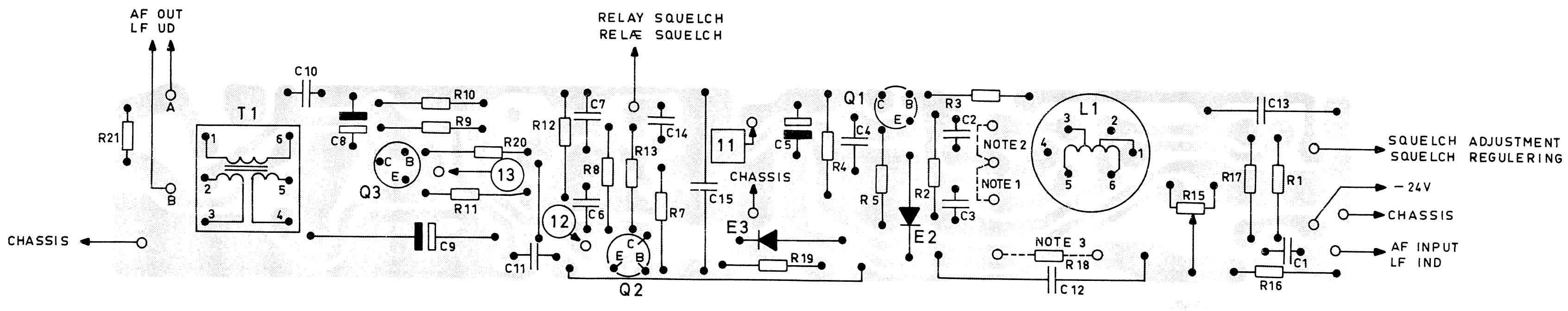
DC VOLTAGES WITHOUT PARENTHESES ARE MEASURED WITH SQUELCH OFF (AF-SIGNAL OUT).
DC VOLTAGES IN PARENTHESES ARE MEASURED WITH SQUELCH ON (NO AF-SIGNAL OUT).
SQUELCH REGULATOR ADJUSTED TO 10KΩ.

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 SEEN FROM COMPONENT SIDE
TRYKT KREDSLØB SET FRA KOMPONENTSIDEN



AF-AMPLIFIER AND SQUELCH
LF-FORSTÆRKER OG SQUELCH

SQ601a

D400.661/5

Storno

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	4,7uF 20% tantal 15V
	C5	73.5102	2,2μF 20% tantal 35V
	C6	73.5102	2,2uF 20% tantal 35V
	C7	73.5103	4,7uF 20% tantal 15V
	C8	73.5106	68uF 20% tantal 15V
	C9	73.5110	80uF -10/+50% elco 25V
	C10	76.5070	10nF 10% polyest. FL 50V
	C11	73.5102	2,2uF 20% tantal 35V
	C12	76.5076	0,47uF 20% polyest. TB 100V
	C13	76.5073	0,1uF 10% polyest. TB 100V
	C14	76.5061	4,7nF 10% polyest. FL 50V
	C15	76.5075	0,33uF 10% polyest. TB 100V
	R1	80.5252	1,8k 5% carbon film 1/8W
	R2	80.5263	15k 5% carbon film 1/8W
	R3	80.5260	8,2k 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

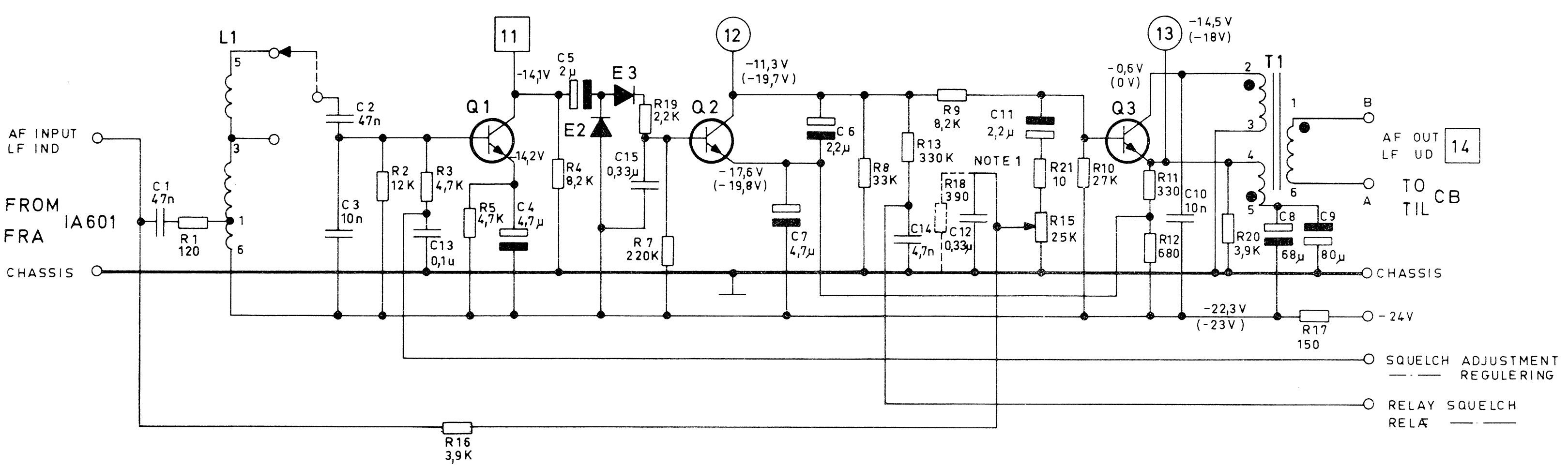
AF-AMPLIFIER AND SQUELCH
LF-FORSTÆRKER OG SQUELCH

SQ601a

X400.682/4

Storno

Storno

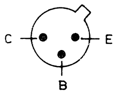


NOTE 1. IF FM IS USED INSTEAD OF PM, C12 IS REPLACED BY R18(390Ω)

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

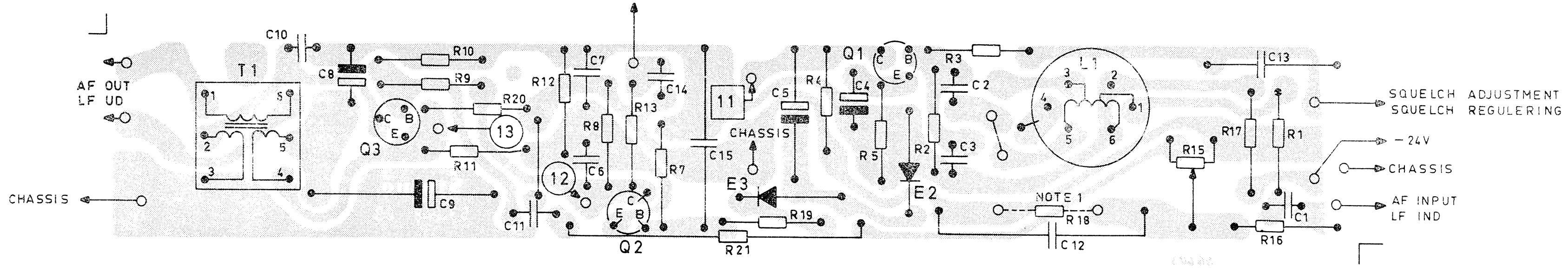
DC VOLTAGES WITHOUT PARENTHESES ARE MEASURED WITH SQUELCH OFF (AF-SIGNAL OUT).
DC VOLTAGES IN PARENTHESES ARE MEASURED WITH SQUELCH ON (NO AF-SIGNAL OUT).
SQUELCH REGULATOR ADJUSTED TO 10KΩ.

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

Storno

TYPE	NO.	CODE	DATA	
	C1	76.5072	47 nF 10% polyest.	50V
	C2	76.5072	47 nF 10% polyest.	50V
	C3	76.5070	10 nF 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	2,2 μF 20% tantal	35V
	C7	73.5103	4,7 μF 20% tantal	15V
	C8	73.5106	68 μF 20% tantal	15V
	C9	73.5110	80 μF -10 +50% elco	25V
	C10	76.5070	10 nF 10% polyest. FL	50V
	C11	73.5102	2.2 μF 20% tantal	35V
	C12	76.5075	0.33 μF 10% polyest. TB	100V
	C13	76.5073	0,1 μF 10% polyest. TB	100V
	C14	76.5061	4,7 nF 10% polyest. FL	50V
	C15	76.5075	0,33 μF 10% polyest. TB	100V
	R1	80.5238	120 Ω 5% carbon film	1/8W
	R2	80.5262	12 kΩ 5% carbon film	1/8W
	R3	80.5257	4,7 kΩ 5% carbon film	1/8W
	R4	80.5260	8,2 kΩ 5% carbon film	1/8W
	R5	80.5257	4,7 kΩ 5% carbon film	1/8W
	R7	80.5277	0,22 MΩ 5% carbon film	1/8W
	R8	80.5267	33 kΩ 5% carbon film	1/8W
	R9	80.5260	8,2 kΩ 5% carbon film	1/8W
	R10	80.5266	27 kΩ 5% carbon film	1/8W
	R11	80.5243	330 Ω 5% carbon film	1/8W
	R12	80.5247	680 Ω 5% carbon film	1/8W
	R13	80.5279	0,33 MΩ 5% carbon film	1/8W
	R15	86.5044	25 kΩ 20% potm. Lin.	0,1W
	R16	80.5256	3,9 kΩ 5% carbon film	1/8W
	R17	80.5239	150 Ω 5% carbon film	1/8W
	R19	80.5253	2.2 kΩ 5% carbon film	1/8W
	R20	80.5256	3,9 kΩ 5% carbon film	1/8W
	R21	80.5225	10 Ω 5% carbon film	1/8W
	L1	61.816	Coil/spole	
	T1	60.5134	Transformer 2400 Ω/600 Ω	
	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

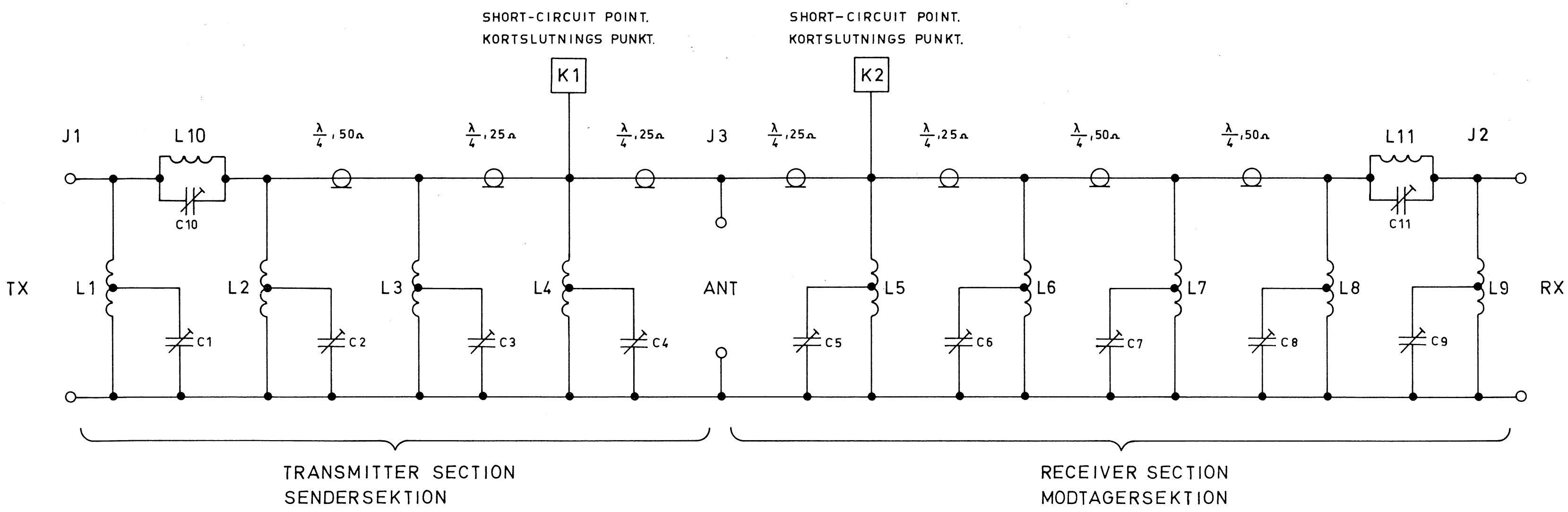
AF-AMPLIFIER AND SQUELCH
LF-FORSTÆRKER OG SQUELCH

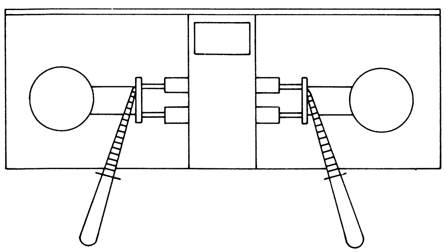
SQ602

X400.845/2

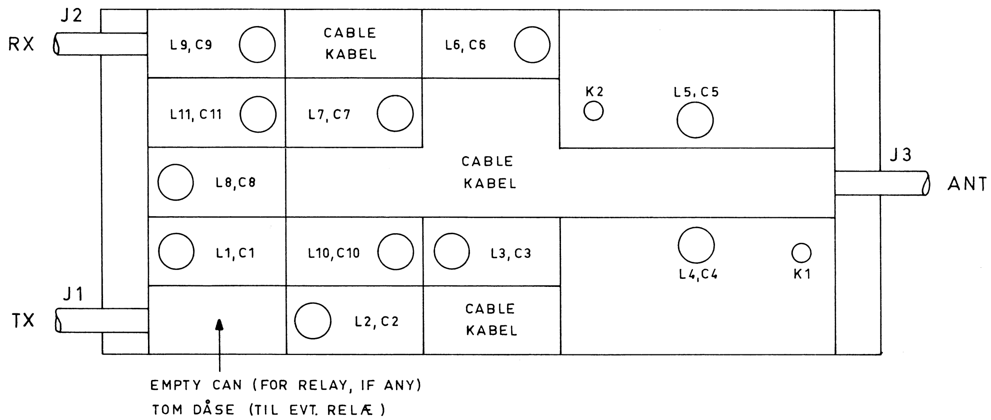
Storno

Storno





SHORT-CIRCUITING PINS FOR K1 AND K2.
KORTSLUTNINGSPINDE TIL K1 OG K2.



BRANCHING FILTER
DELEFILTER

BF611, BF612

D400.828/2

TYPE	NO.	CODE	DATA
	C1	78.5040	0.4 - 6.3 pF trimmer TB 500V
	C2	78.5040	0.4 - 6.3 pF trimmer TB 500V
	C3	78.5040	0.4 - 6.3 pF trimmer TB 500V
	C4	78.5040	0.4 - 6.3 pF trimmer TB 500V
	C5	78.5040	0.4 - 6.3 pF trimmer TB 500V
	C6	78.5040	0.4 - 6.3 pF trimmer TB 500V
	C7	78.5040	0.4 - 6.3 pF trimmer TB 500V
	C8	78.5040	0.4 - 6.3 pF trimmer TB 500V
	C9	78.5040	0.4 - 6.3 pF trimmer TB 500V
	C10	78.5041	4 - 60 pF " 500V
	C11	78.5041	4 - 60 pF " 500V
	L1	62.742	Coil/spole
	L2	62.742	"
	L3	62.742	"
	L4	62.748	"
	L5	62.748	"
	L6	62.742	"
	L7	62.742	"
	L8	62.742	"
	L9	62.742	"
	L10	62.749	"
	L11	62.749	"
	C10-L10	69.008	L-C circuit/kreds
	C11-L11	69.007	L-C circuit/kreds
BF612a		10.2042	CA6012 cabinet

Storno

TYPE	NO.	CODE	DATA

BRANCHING FILTER
DELEFILTER

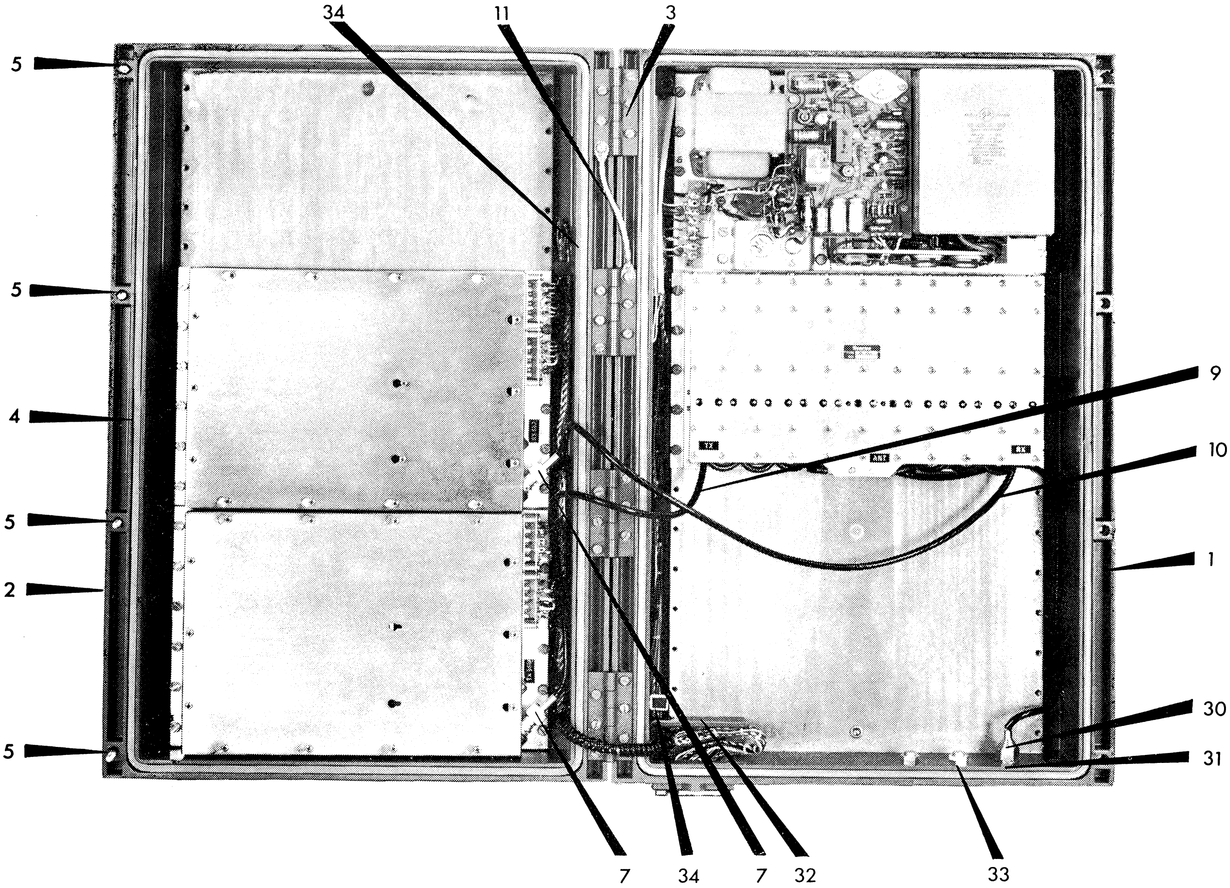
BF611, BF612a

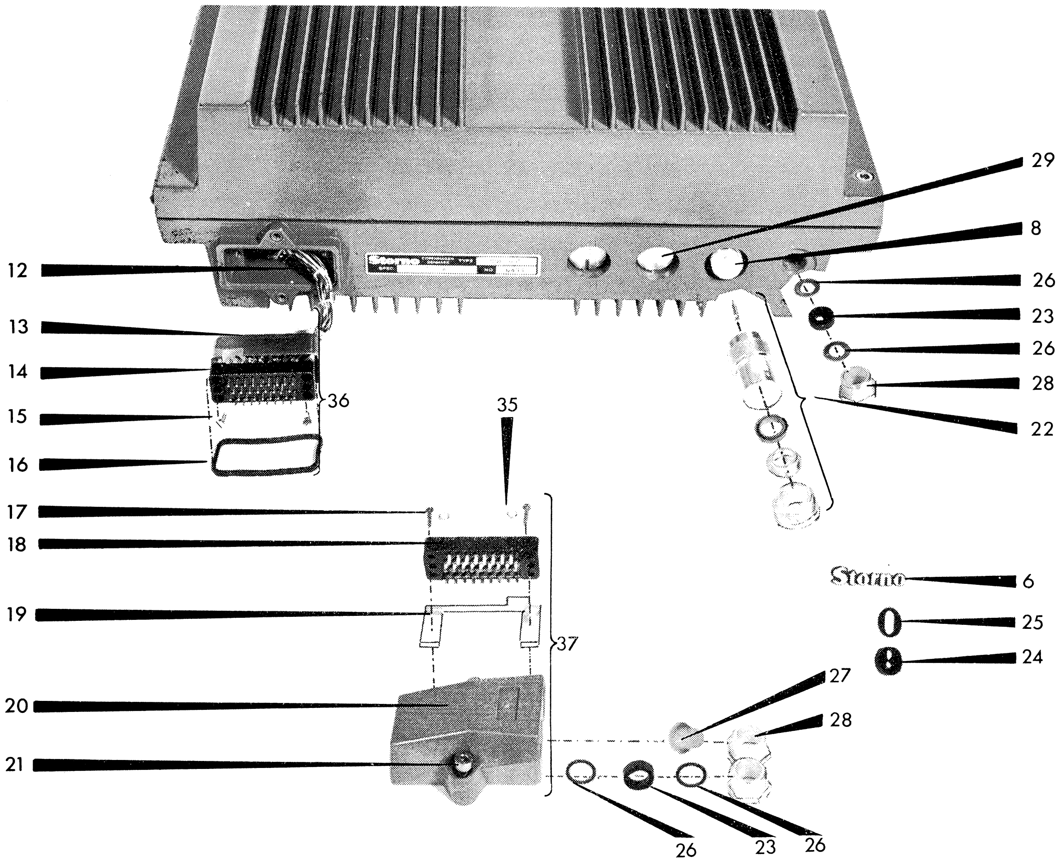
X401.094

CHAPTER VI. MECHANICAL PARTS LISTS

When ordering mechanical parts from Storno please state the code numbers and descriptions given in the parts lists.

Storno





RADIO CABINET

FUNKGERÄTESCHRANK

CA602

M405.002

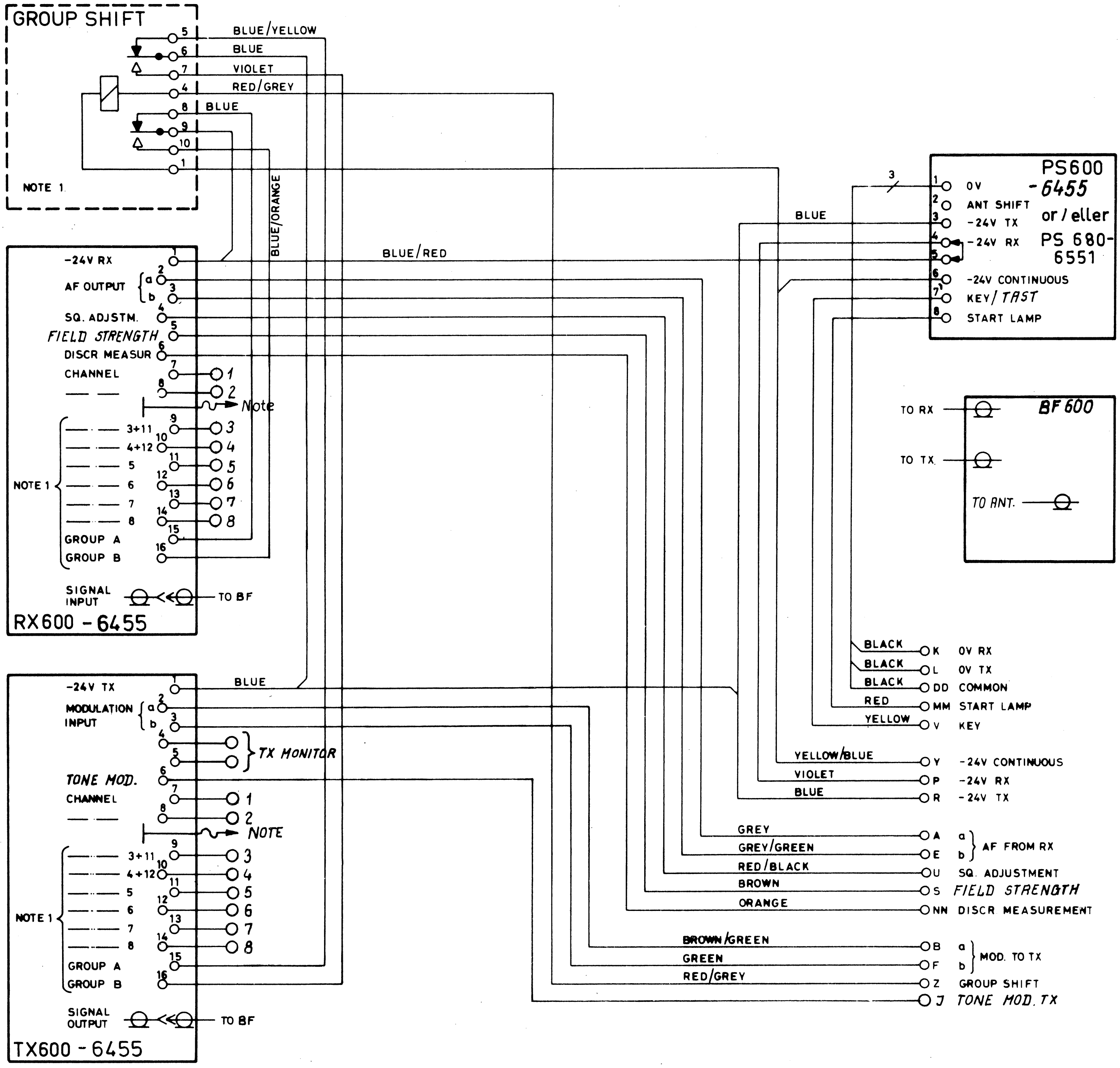
ITEM	CODE	DESCRIPTION
1	12.076	Cabinet, Rear part Kabinet bagstykke
2	12.099	Cabinet, Front part Kabinet forstykke
3	37.066	Hinge Hængsel
4	32.200-01	Gasket Gummipakning
5	20.033-050.30	Allen Screw M5x30 Skrue
6	51.171	Motif Firmaskilt
7	41.5148	Connector, Type BNC Konnektor, BNC
8	41.5153	Connector, Type N Konnektor, N
9	19.093	TX Coaxial Cable Assembly TX-kabel
10	19.092	RX Coaxial Cable Assembly RX-kabel
11	19.075	Earthing Strap Galvanisk ledningsforbindelse
12	18.485	Cableform Kabling
13	13.031	Code Screen, Female Metalskærm
14	41.5081	34 Way Connector, Male Multikonnektor, han
15	20.412-022.10	Screw BZ2.2x9.5 Skrue
16	32.160	Gasket Pakning
17	20.412-022.10	Screw BZ2.2x9.5 Skrue
18	41.5082	34 Way Connector, Female Multikonnektor, hun
19	13.025	Code Screen, Male Kodeskærm
20	12.053	Connector Housing Hus
21	20.033-040.18	Allen Screw M4x18 Skrue M4x18
22	41.5115	Connector, Type N Antennekonnektor (han) komplet
23	32.157-01	Sealing Ring (Control Cable) Gummiskive
24	32.158	Sealing Ring (Battery Cable) Gummiskive
25	29.174	Fibre Washer Skive
26	29.175-01	Washer Metalskive
27	37.5029	Blanking Piece Plasticprop
28	28.066	Threaded Nipple Gevindstykke

RADIO CABINET CA602

ITEM	CODE	DESCRIPTION
29	29.193	Blanking Screw Blindskrue
30	29.214	Screen Nut Skærmmøtrik
31	31.350	Bush for Item 30 Stag for skærmmøtrik
32	33.239	Bracket Vinkelstykke
33	29.180	Nut Møtrik
34	32.201	Cable Retainer Kabelholder
35	24.50-048.027	Washer Skive
36	41.163	34 Way Connector, Male Multikonnektor, komplet han
37	41.159	34 Way Connector, Female Multikonnektor, komplet hun

APPENDIX

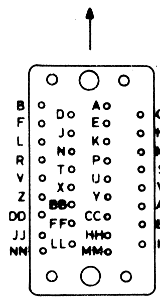
Storno



NOTE 1. IN EQUIPMENT FOR MAX. 2 RF CHANNELS THE GROUP SHIFT PANEL AND THE TERMINALS 9-16 IN RC600 AND TX600 ARE OMITTED.

I UDSTYR FOR MAKSIMALT 2 HF-KANALER ER GRUPPESKIFT ENHEDEN OG TERMINALERNE 9-16 I RX600 OG TX600 UDELADT

Note: Kanalvalg sker ved strappning på RX- og TX- enhedernes terminaler.

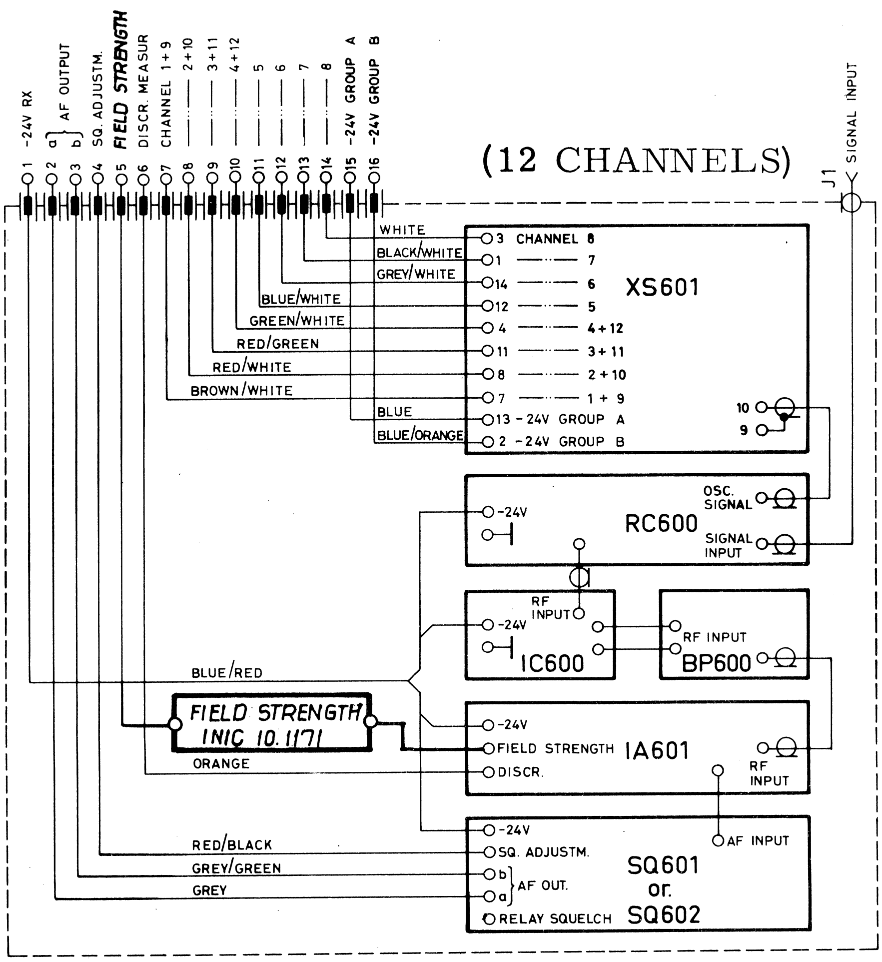


CABLE FORM
KABLINGSDIAGRAM

CQF610, CQF630, CQF661 Duplex
-2001/6455,-/1

NH/KG
21-4-72
N.H.

D119050



Ki/BO
24.5.71

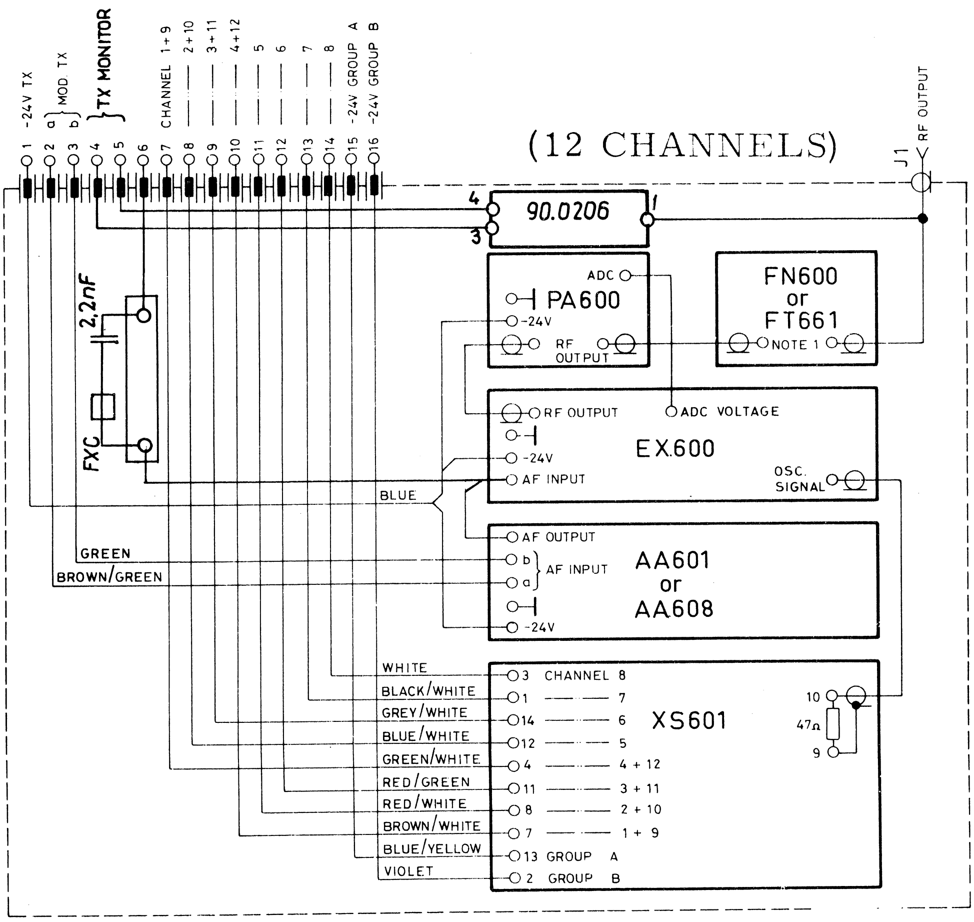
CABLE FORM

KABLINGSDIAGRAM

RX610, RX630, RX661

- 2001/6455

D 116673



NOTE 1. FT661 IS USED IN TRANSMITTERS TX661 AND TX665 FOR THE 420-470MHz BAND.

FT661 BENYTTES I SENDER TX661 OG TX665 FOR FREKVENSBÅNDET 420-470 MHz.

Kj / BO
17.5.71

CABLE FORM
KABLINGSDIAGRAM

TX610, TX630, TX661, TX665
-2001/6455

D 116672

Field Strength Indicator 10.1171.

A. Description.

The field strength indicator is intended for measurements on CQM/CQF600 stations.
The indicator is built in a printed circuit and consists of a rectifier designed as a voltage doubler and an AF filter. From the input terminal a short wire is connected to test point [8] or [9] in IA601.

Mounting of the field strength indicator in the CQM/CQF600 cabinet is performed by unscrewing the two middle clamping screws for SQ601 (the plastic spacers under the SQ unit are retained); the field strength indicator is then fastened by screws on its spacers in the holes and with the soldering side of the printed circuit turning up.

In case of field strength indications for receiver input signals between 0,3 μV and 1,5 μV (EMF) the indicator is connected to test point [9] in IA601/601b, and via available wire in the station cabling the output terminal is connected to a 500 μA instrument (R = 5 kΩ). At IA601b a resistor of 1 kΩ is connected in series with the instrument.

In the event of field strength indications for receiver input signals between 1,5 μV and 100 μV (EMF) the indicator is connected to the test point [8] in IA601. At IA601 a resistor of 1,8 kΩ is connected in series with the 500 μA instrument. At IA601b the series resistance must be 3,3 kΩ.

B. Data.

1. Input frequency — 455 kHz.
2. Voltage range — 0 to 10 volts RF.
3. Input impedance — Approx. 1/8 x DC load.
4. Deflection on 500 μA instr. — See the attached response curves.
5. Dimensions — Circular printed circuit with diameter equal to 23 mm.

C. Testing.

1. Instruments.

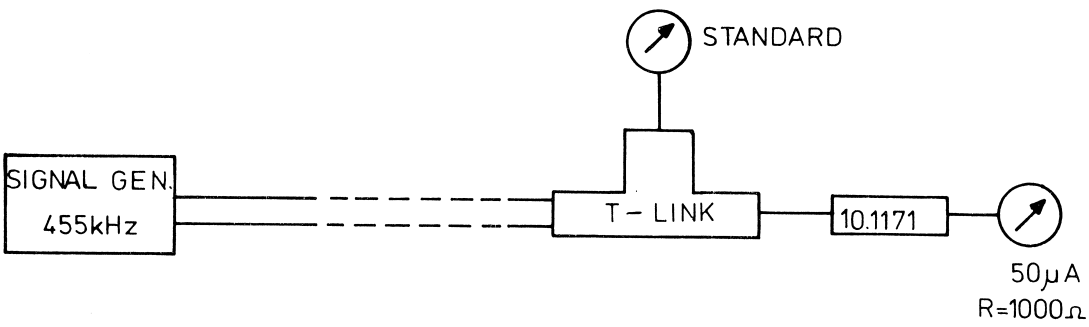
   1 signal generator 455 kHz.

   1 microammeter 50 μA (R_i = 1000Ω) or AVO-meter

   1 RF load, 51Ω (Mx - 554/u)

   1 T-link (UG - 274/u).

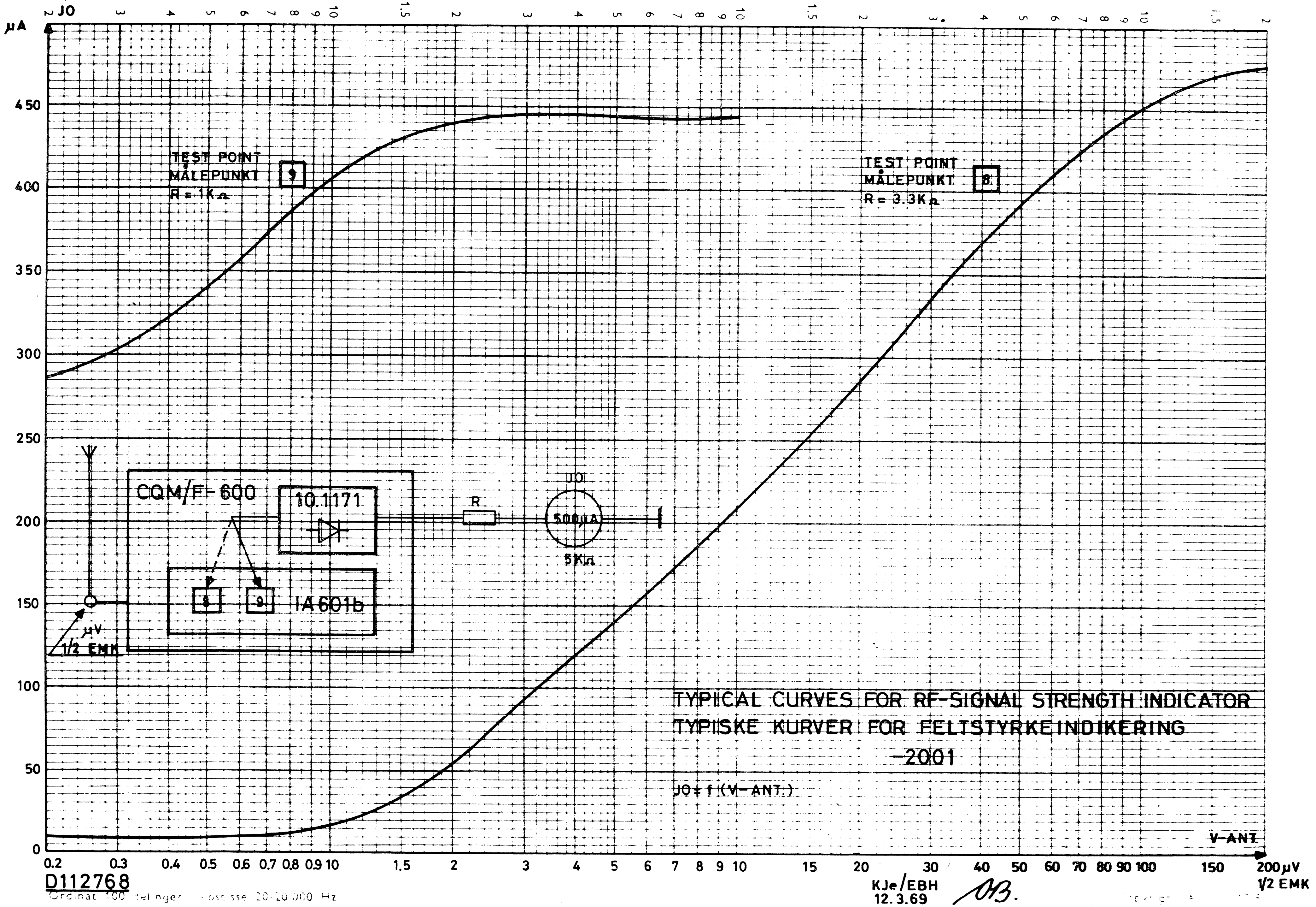
2. Set-up

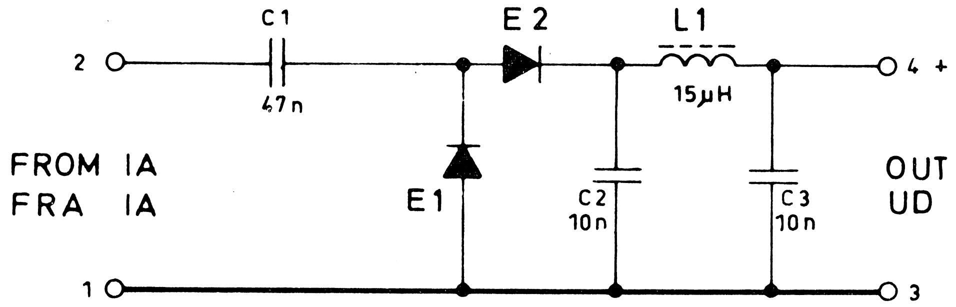


3. Measurements:

   The output voltage of the signal transmitter, at 455 kHz, is adjusted until the standard instrument indicates 100 mV, and the output from the field strength indicator is read on the 50 μA instrument.

   Requirements: Deflection on the 50 μA instr.: 7 μA ± 1 μA.


TYPICAL CURVES FOR RF-SIGNAL STRENGTH INDICATOR
TYPISKE KURVER FOR FELTSTYRKEINDIKERING
-2001
JO = f (V-ANT.)
TEST POINT
MÅLEPUNKT 9
R = 1KΩ
TEST POINT
MÅLEPUNKT 8
R = 3.3KΩ
CQM/F-600
10.1171
IA601b
R
JO
500μA
5KΩ
μV
1/2 EMK
μA
JO
V-ANT.
200μV
1/2 EMK
D112768
KJe/EBH
12.3.69



konstr./tegn. AHu/KKj 28.3.67
godk.
komp. liste

Storno

FIELD-STRENGTH INDICATOR
FELTSTYRKEINDIKATOR

10.1171

D400.719

no	code	data	no	code	data
C1	76.5072	47nF 10%polyestFL50V			
C2	76.5070	10nF 10%polyestFL50V			
C3	76.5070	10nF 10%polyestFL50V			
E1	99.5136	diode AA119			
E2	99.5136	diode AA119			
L1	61.5007	15µH 10% choke			

Storno

udarb af: KJe/IAa

kontrol af

tilh diagr

Parts list

Feltstyrkeindikator

Stykliste 101171

komp liste X112559

blad no af

ANTENNA MONITOR 90.206

(Ref. diagram D400.832)

Description

The antenna monitor consists of a rectifier to which an RF voltage is fed through a small coupling coil from the field around the antenna connector. By varying the coupling of the coil the output current from the monitor can be set for 30 μA (with a load of 1kohm) when used with all types of transmitters in the CQF600-programme. The rectifier is built on a printed wiring board which is attached by a single screw.

Data

Input Signal: Coupled inductively to the monitor from the antenna connector of a radio station containing one of the following types of transmitters: TX631, TX632, TX635, TX636, TX611, TX615, TX661, TX662, TX665, and TX666.

Output Signal: Should be adjusted to 30 μA DC into a 1kohm load by varying the coupling at the input.

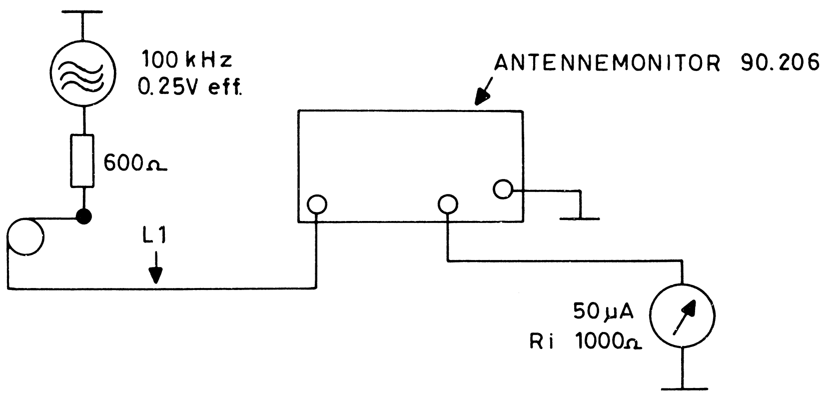
Dimensions: 30 x 9 x 10 cm excl. the coupling coil.

Test Procedure

1. Instruments

A microammeter 50 μA, R_i = 1000 ohm.
An AF tone generator 100 kHz, 0.25V R.M.S.

2. Set-up



3. Measurements

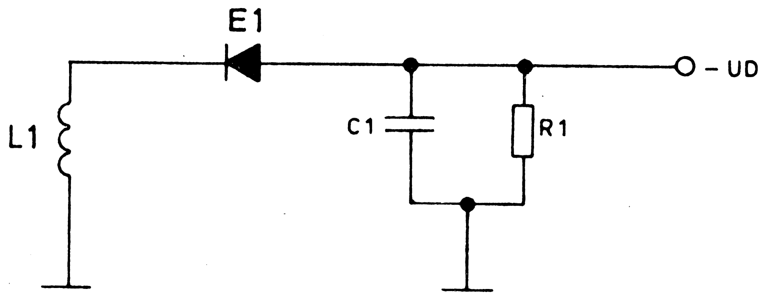
Supply an AF signal (100 kHz, 0.25V RMS.) between chassis and L1.

Requirement. Reading on 50 μA instrument: Above 15 μA.

4. Adjustment

After having installed the monitor adjust the coupling between the coil and the antenna connector by varying the position of the coupling coil until the desired meter reading is obtained.

Requirement. 30 μA into a 1kohm load.



NO.	CODE	DATA	
C1	74.5155	1nF -20 +80% ceram	63V
R1	80.5249	1kΩ 5% carbon	1/8W
L1	62.756	coil/spole	
E1	99.5136	AA119 Diode	

Storno	konstr./tegn.	ANTENNEMONITOR 90.206	TEGN. NR. D400.832 A4
	godk.		
	komp.liste		

Strømforsyning

PS68o-6551

Strømforsyning PS680-6551.

B. Data.

Ref. diagram D118777.

1. Forsyningsspænding V1 (målt på term. 11 og 12).
   ÷25,5 - ÷35 V DC ved J2 ≤ 1,6 A.

2. Udgangsspænding V2
   ÷24 V ±1,2 V indenfor de angivne områder af V1, J2 og T1.
   V2 rippel ≤ 15 mV ved J2 = 1,6 A og V1 rippel ≤ 1,0 V.
   V2 rippel ≤ 10 mV ved J2 = 0,25A og V1 rippel ≤ 1,0 V.

3. Udgangsstrøm J2
   ≤ 1,6 A.

4. Udgangsimpedans
   DC ≈ 0,2Ω.

5. Eget forbrug ved J2 = 0 A
   J1 ≤ 10 mA.

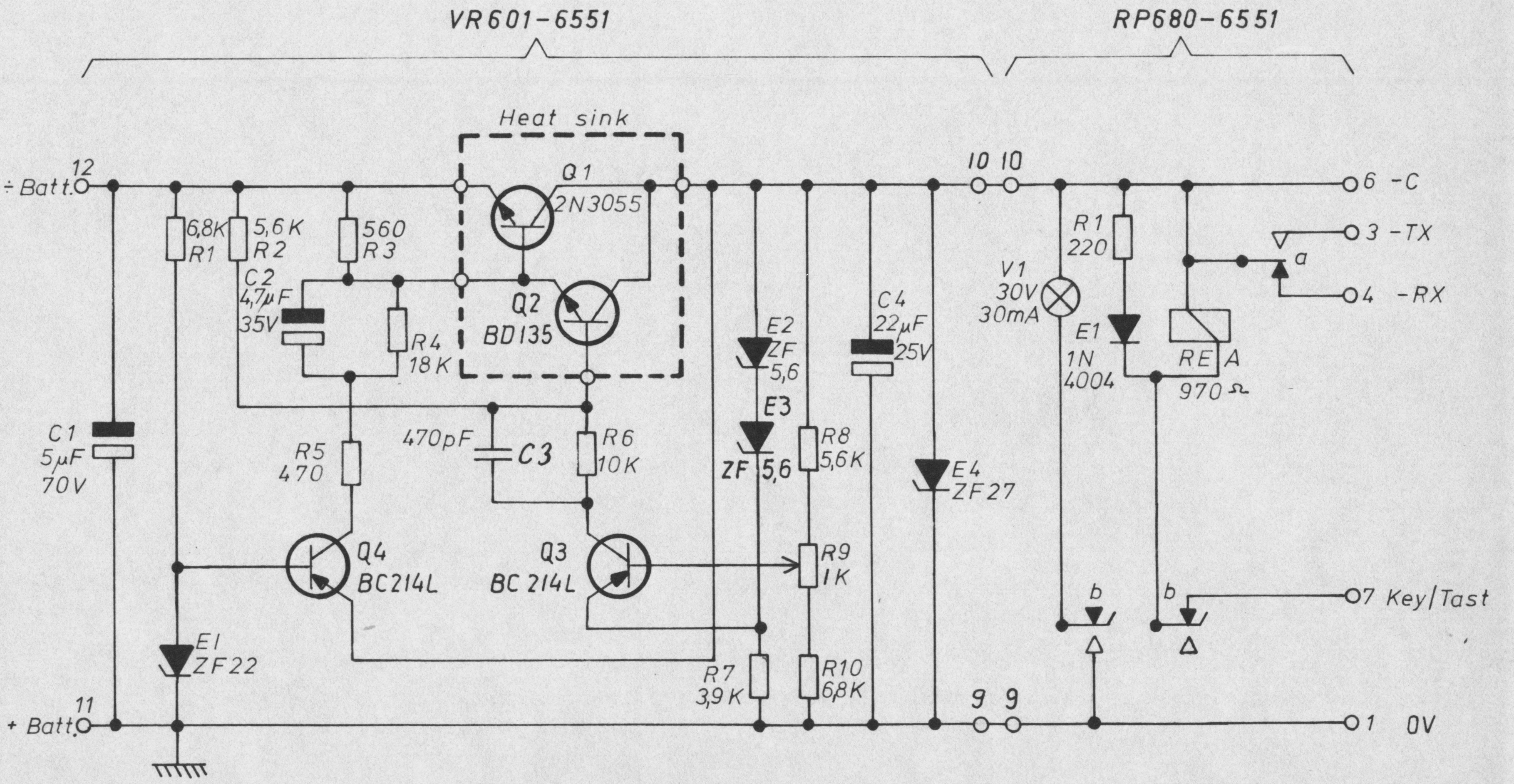
6. Kortslutningsstrøm ved V1 = ÷35 V.
   J1 ≤ 0,25 A.

7. Max. tilladelig temperaturområde på chassis
   ÷30 til +60° C.

8. Mekaniske dimensioner
   Modul chassis 89 x 274 mm.

9. Tilslutning
   Skal - uden ændringer - kunne isættes CQF600 hovedstation med standardkabling.

Ved montage af BD 135 anvendes 3 mm plastskrue 21181 - 03012. Efter montagen tilpasses skruelængden.



konstr./tegn. LT/NH/BiS 20.3.1972

godk. N.K

komp.liste X118778 X118779

VOLTAGE REGULATOR

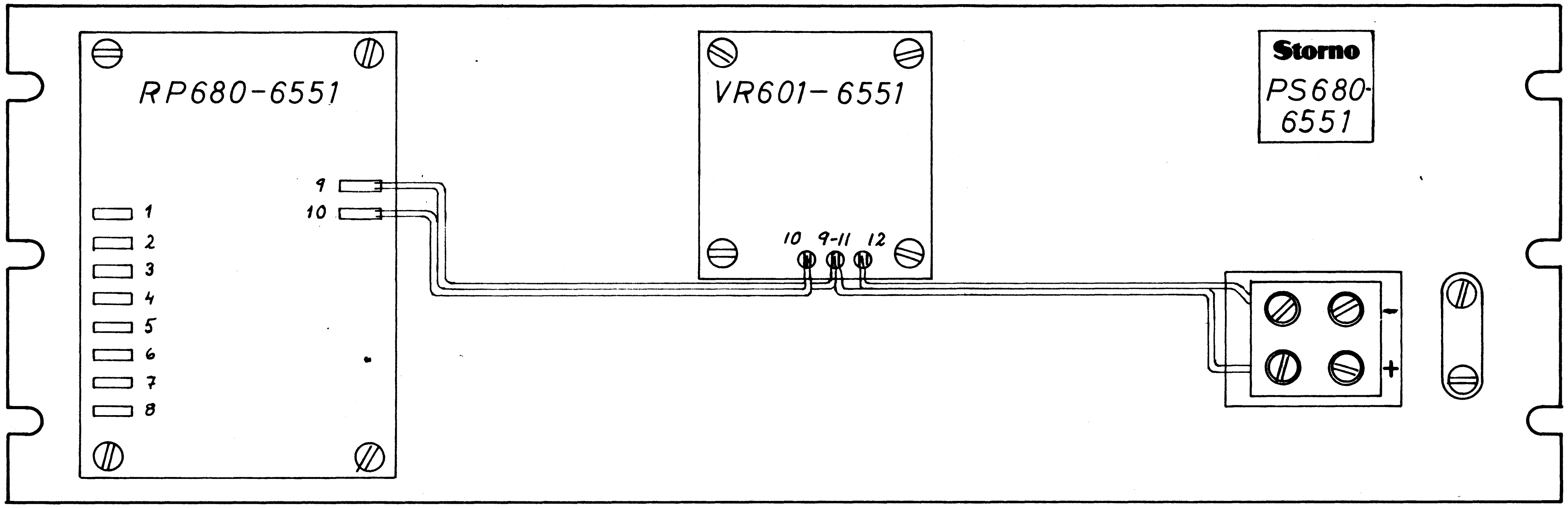
SPÆNDINGSREGULATOR

PS 680-6551

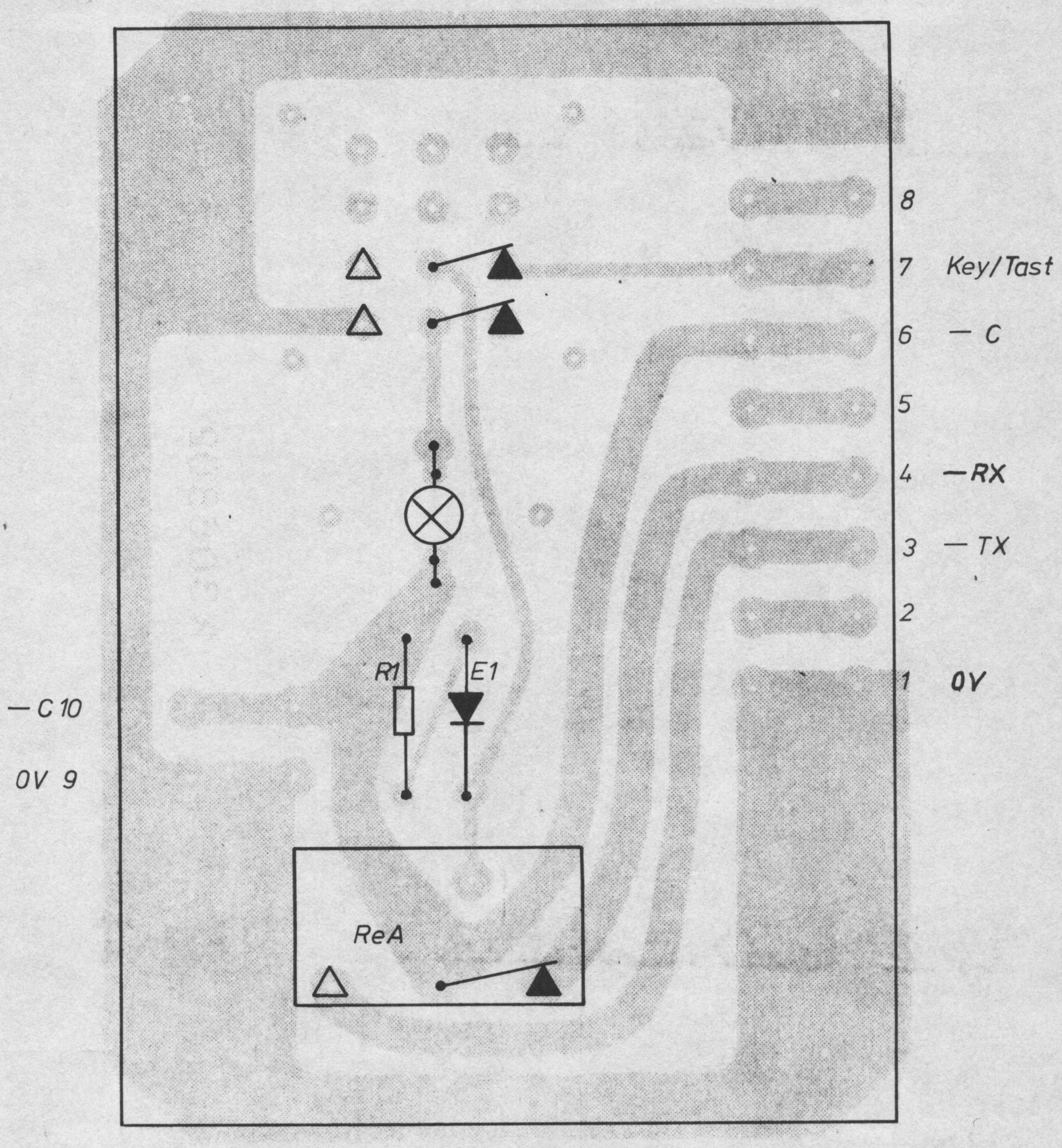
KODE

TEGN. NR. D118777

A 4



Storno	konstr./tegn. KDM 26.10.72	monteringsoversigt for PS680-6551	TEGN. NR. I 121 053 A3
	godk. N.H.		
	komp. liste	KODE	



VIEWED FROM COMPONENT SIDE
SET FRA KOMPONENTSIDEN

Storno	konstr./tegn. KDM/MBP 29.9.72	LAY OUT	TEGN NR I 119820 A4
	godk.	KOMPONENTPLACERING	
	komp.liste	RP 680-6551	
		KODE	

no	code	data	no	code	data
R1	80.5241-00	220Ω 5% carbon film 1/8W			
E1	99.5020-00	Diode 1N4004			
ReA	58.5068-00	Relæ 24 V/970Ω			
V1	92.5071-00	Lampe 30 V/30 mA			
Sb	47.5050-	4-polet omskifter MEC			
	48.5017-00	Lampefatning			

Storno

udarb af NH/HNi 20/3-72

kontrol af NH

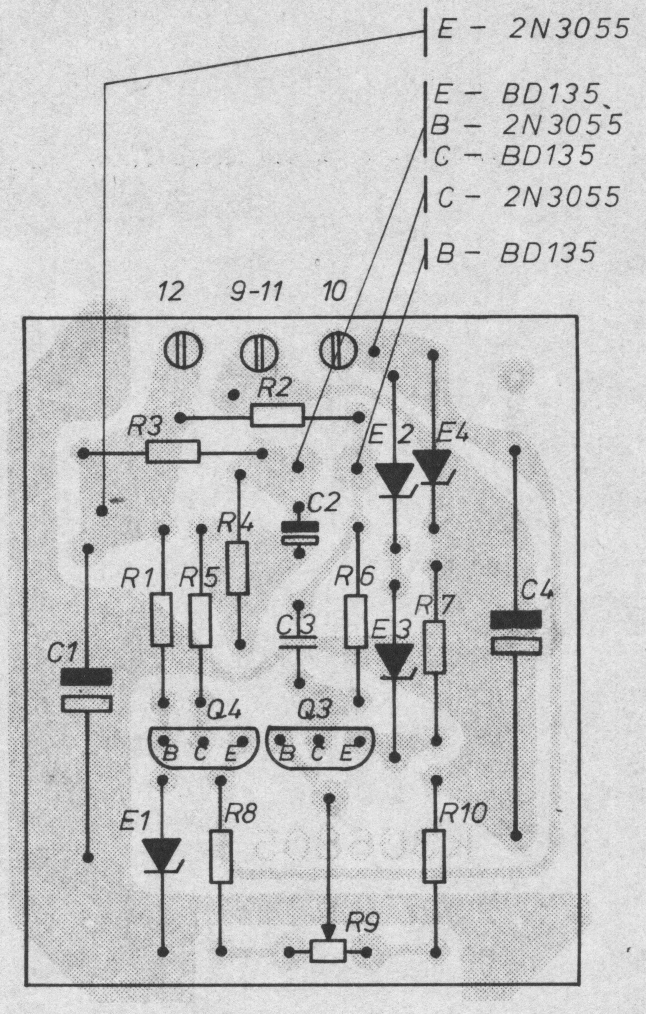
tilh diagr D118777

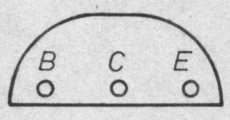
Parts list
Stykliste

RP680-6551

komp liste X118778

blad no 1 af 1





Bottom view
Set fra bunden

VIEWED FROM COMPONENT SIDE
SET FRA KOMPONENTSIDEN

Storno	konstr./tegn. KDM/MBP 29.9.72 godk. NH. komp.liste	LAY OUT KOMPONENTPLACERING VR601-6551 KODE	TEGN. NR. I 119819 A4

no	code	data	no	code	data
C1	73.5104-00	5 µF -10+100% elco 70V			
C2	73.5126-00	4,7 µF 20% tantal 35V			
C3	74.5161-00	470 pF -20+50% ceram. ll PL 63V			
C4	73.5120-00	22 µF 20% elco 25V			
R1	80.5259-00	6,8 kΩ 5% carbon film 1/8W			
R2	80.5258-00	5,6 kΩ 5% carbon film 1/8W			
R3	80.5246-00	560 Ω 5% carbon film 1/8W			
R4	80.5264-00	18 kΩ 5% carbon film 1/8W			
R5	80.5245-00	470 Ω 5% carbon film 1/8W			
R6	80.5261-00	10 kΩ 5% carbon film 1/8W			
R7	80.5256-00	3,9 kΩ 5% carbon film 1/8W			
R8	80.5258-00	5,6 kΩ 5% carbon film 1/8W			
R9	86.5058-00	1 kΩ 20% potm. lin. carbon film 0,1 W			
R10	80.5259-00	6,8 kΩ 5% carbon film 1/8W			
E1	99.5212-00	Zenerdiode 22 V 5% 1/4W			
E2	99.5114-00	Zenerdiode 5,6 V 5% 1/4W			
E3	99.5114-00	Zenerdiode 5,6 V 5% 1/4W			
E4	99.5222-00	Zeneriode 27 V 5% 1/4W			
Q1	99.5171-00	Transistor 2 N3055			
Q2	99.5235-00	Transistor BD135			
Q3	99.5144-00	Transistor BC214L			
Q4	99.5144-00	Transistor BC214L			
	59.0029	Køleklods boret			

Storno

udarb. af NH/HNi 20/3-72

kontrol af N.H.

tilh. diagr. D118777

Partslist
Stykliste

VR601-6551

komp. liste X118779

blad no 1 af 1