STORNOPHONE 800

VHF PERSONAL RADIOTELEPHONE

TYPE CQP814

Spec. 1/3 C9x4TQ

146-174MHz

CONTENTS

Service Coordination

6 - 79

STORNOPHONE 800

VHF PERSONAL RADIOTELEPHONE

TYPE CQP814 S

Spec. 1/3 C914TQ

146-174MHz

MET

CONTENTS

Service Coordination

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TECHNICAL SPECIFICATIONS

GENERAL					
Type CQP	813	814	833	834	863
Frequency band in MHz	146 to 174		68 to 88		420 to 470
Channel separation in kHz	20 or 25	12.5	20 or 25	12.5	20 or 25
Maximum RF bandwidth	1.5 MHz		1.5 MHz		2.0 MHz
Number of RF channels	2, 4, 8, or 12 channels				
Antenna impedance	50 Ω				
Ambient temperature range	Operating range -25°C to +55°C Functioning range -30°C to +60°C				

TRANSMITTER					
Type CQP	813	814	833	834	863
RF output (adjustable)	0.1 to 1.5W		0.1 to 1.5W		0.1 to 1.0W
Modulation	Phase (PM)				
AF response	+6 dB pr. octave preemphasis				
300 to 3000 Hz	X		X		X
300 to 2400 Hz		X		X	
Maximum frequency swing in kHz	± 4 or 5	± 2.5	± 4 or 5	± 2.5	± 4 or 5
Spurious and harmonic radiation	Attenuated to meet government specifications				

RECEIVER					
Type CQP	813	814	833	834	863
Sensitivity e.m.f. for: 12 dB SINAD (EIA) 20 dB S/N (FTZ)	 0.5 μV 0.6 μV		 0.5 μV 0.6 μV		 0.7 μV 0.8 μV
Intermodulation attenuation (EIA)	75 dB		75 dB		70 dB
Adjacent channel selectivity	85 dB				
Spurious attenuation	85 dB				
AF output power	0.2 W				
AF response	-6 dB pr. octave deemphasis				
300 to 3000 Hz	X		X		X
300 to 2400 Hz		X		X	

Battery Data for CQP800				
Type	Min. Voltage	Nom. Voltage	Max. Voltage	Max. RF Output Power
BU801	9.6V	12V	14.4V	0.5W
BU802	9.9V	10.8V	13.5V	1.0W
BU803	10V	12V	15V	1.5W

60.164-E2

GENERAL DESCRIPTION
CQP814 1(3) C9 X4 TQ

The CQP814 1 (3) C9x4TQ portable radiotelephone is a combination transmitter and receiver for FM radio communication service on fixed, crystal controlled frequencies.

The CQP814 is remote controlled and fitted with 4 channels plus pilot tone signalling equipment.

A complete radiotelephone unit consists of six sections, begining from the bottom these are:

1) the battery
2) the transmitter
3) the receiver
4) the oscillator
5) the pilot tone unit
6) the control head

Remote control

A control unit CB811 containing the transmitter key, the speaker/microphone, antenna AN814, and 3-step volume control is connected to the set by means of a cable.

For easy indentification, each set has a type label showing the type and specification.

Batteries

To power the equipment the following battery types are available:

BU802/BU808	nickel-cadmium (NiCd) battery 10.8V, 225mAh.
BU807	nickel-cadmium (NiCd) battery 10.8V, 450mAh.

The batteries are encased in a high-impact cast plastic casette with snap action locks, automatically securing the battery when slid into place.

Battery Chargers

Available battery chargers:

CU801	Charging unit with two outlets for BU802, automatic type.
CU802	Charging unit with ten outlets for BU802, automatic type.
CU804	Charging unit with one outlet. A switch selects high or low charging currint as to charge the different battery types.
CU805	Charging unit with six outlets and built-in timer; for all types of batteries.

The battery chargers can be operated from either a 110V or a 220V AC mains.

Pilot Tone Equipment

The radio set is fitted with pilot tone unit (receiver/transmitter) TQ801a which is contained in a separate panel placed between the control head and the oscillator section.

Carrying Devices

The following devices are available for carrying the CQP800U:

CK801a	carrying harness for all types of equipment, mounting hardware, short and long straps, belt and clamps.
CK802	screw mounted pocket clip.
CK803a	shoulder strap with retainer for remote control unit.

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OPERATING INSTRUCTIONS CQP814 1(3) C9 x 4TQ

The remote controlled radiotelephone is fitted with control head CP809 and control unit CB811. The following control functions are incorporated:

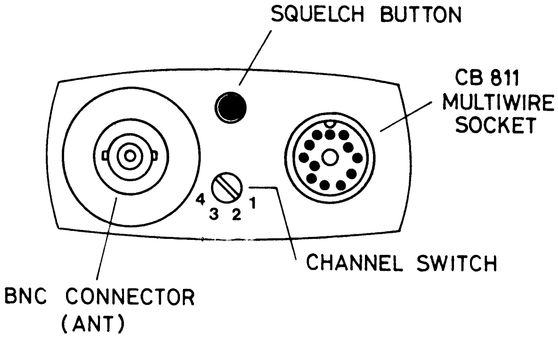
CP809
4-position channel selector with screw-driver setting. Push button for squelch cancelling.
Multiwire socket for CB811.
Auxillary BNC antenna connector.

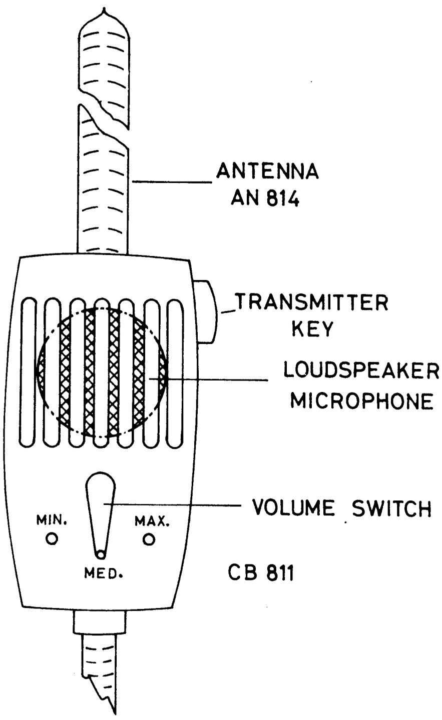
CB811
3-position volume control.
Push button for keying the transmitter.
Loudspeaker/microphone.

Receiving
Set the channel selector to the channel to be used. Any communication on that channel will now be heard from the loudspeaker.
If no signal can be heard, the volume control can be set by pressing the SQ cancelling button while adjusting the volume control for the desired sound level using the background noise for sound.

Transmitting
When the channel is clear, press the transmitter key button and speak with a normal voice into the loudspeaker
Release the transmitter key to listen.

On/Off
The radiotelephone has no on/off switch. When no longer in use switch off by removing the battery.





CQP810
CIRCUIT DESCRIPTION

Transmitter Circuit (see block diagram)

The transmitter is built up of several modules, each of which is completely enclosed (shielded) and has connector pins protruding from the bottom of the module. All the modules are then mounted onto a mother board that is common to both transmitter and receiver circuits. The transmitter section consists of the following modules:

XO812 or XO815	Crystal Oscillator
AA802	Modulation Amplifier
FN803	Modulation Filter for 20/25 kHz channel separation
or	
FN804	Modulation Filter for 12.5 kHz channel separation
PM811	Phase Modulator
FD811	1st Frequency Doubler
FD812	2nd Frequency Doubler
FD813	3rd Frequency Doubler
BP811	Band Pass Filter
PA811	1st Power Amplifier
PA812	2nd Power Amplifier and Antenna Switch
FN811	Antenna Filter
AD801	ADC Circuit
VR801	Voltage Regulator

Modulation Amplifier AA802 and FN803/FN804

The modulation amplifier function is carried out by the Modulation Amplifier, AA802 in conjunction with a Modulation Filter, FN803 or FN804. The microphone signal is applied to an operational amplifier: the degree of negative feedback, and thus the amplifier gain, can be adjusted by means of an external resistor. Microphone sensitivity can then be adjusted to suit individual requirements. In radio sets with built-in tone transmitters or sequential tone transmitters, the microphone amplifier is disabled by the tone key.

The amplified AF signal is applied to a limiter via a differentiating network. The limiter is likewise an operational amplifier utilising negative feedback. Following the limiter is an integration network and an active lowpass filter where the active element is another operational amplifier. The active filter removes any harmonics of the original input signal that arise during limiting action, and it also keeps the frequency excursions within the tolerances required for the channel spacing used in the particular equipment. An extra limiter is inserted between the integration network and the active low-pass filter to prevent strong input signals of low frequencies from overloading the filter.

Transmitter Oscillator XO812

The transmitter exciter signal is generated by a crystal, Colpitts-type oscillator operating on the crystal's fundamental frequency, which will be in the range of 17 to 22 MHz. The oscillator starts when the channel selector completes the circuit path to chassis ground. The collector circuit is tuned by a variable capacitance diode which also detunes the resonant circuit whenever the channel switch breaks the ground connection. Thus several oscillators can be tied in parallel without mutual loading effects. The output signal is capacitively taken off the tank circuit. The maximum number of channels is 12, with all oscillators placed in an oscillator panel.

Crystal Oscillator XO815

In radiotelephones with pilot tone facilities, a special oscillator very similar to the XO812 is used. This oscillator, however, includes an extra variable capacitance diode in the crystal circuit which, when driven by the subaudio pilot tone signal, frequency modulates the exciter oscillator.

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Phase Modulator PM811

The Phase Modulator consists of an input- and an output buffer plus a phase modulator stage. The exciter signal from the oscillator is fed to the input buffer stage. This amplier, with following π network, ensures a constant sine wave signal to the phase modulator. The modulator is a transistor amplifier stage where the modulating audio signal is applied to the emitter, which is RF decoupled. The modulation signal varies the transconductance (gm) of the amplifier and thus the phase angle (φ) of the RF signal at its output. To function properly, the modulator must work into a constant load and is therefore followed by a buffer stage whose output signal is sufficient in amplitude to drive the following stage, a frequency doubler.

Multiplier Chain FD811, FD812, FD813

The multiplier chain consists of three very similar frequency doubler stages. Each frequency doubler operates as a grounded emitter transistor amplifier followed by two inductively coupled LC circuits that are tuned to the second harmonic of the input frequency.

Band Pass Filter BP811

To ensure suppression of the undesired harmonics that arise in the frequency multiplying process, the multiplier chain is terminated by a double tuned band pass filter, the BP811.

Power Amplifier PA811 and PA812

The output power from the Multiplier chain (approx. 10mW) is amplified to the required antenna power (0.1 to 1.5W) in a three-stage amplifier composed of the PA811 and the PA812 modules.

PA811 contains two amplifier stages. The collector voltage to the first transistor is supplied via the ADC Circuit, and is variable. If more gain is required to drive the following PA812 stage, the collector supply (ADC) voltage will rise. On the other hand, if the drive signal is more than enough, the ADC voltage will drop.

PA812 contains the transmitter final amplifier plus a circuit for electronically switching the antenna between the transmitter and the receiver. Collector current for the second transistor in PA811 passes through the switching diodes, whereby they can be considered to be virtual short circuits. This connects the Power Amplifier output to the antenna while short circuiting the receiver input. When receiving, the diodes become reverse biased, effectively isolating the transmitter from the antenna while connecting the antenna to the receiver input.

ADC Circuit AD801

The transmitter output current is kept very nearly constant by means of the ADC Circuit. The voltage drop across a small resistor (1.2 ohms) in the output transistor's collector return is monitored by the ADC stage, which then regulates the collector voltage to the first transistor amplifier in the PA811 stage with the net effect of cancelling any variations and thus keeping the RF output at a constant value. The amount of current through the output stage, and thus the output power, can be set by means of a resistor mounted on the mother board.

Antenna Filter FN811

A nine-pole, low-pass filter having a cutoff frequency of 180 MHz is inserted between the transmitter output and the antenna. The filter suppresses any harmonics created in PA812.

Receiver Circuit (see block diagram)

The receiver is a double conversion superheterodyne using intermediate frequencies of 21,4 MHz and 103,5 kHz. Channel selectivity is achieved by means of a crystal filter in the first IF circuit. The radiotelephone can be fitted with up to 12 channels, one oscillator per channel. All the oscillators are arranged in parallel on a special oscillator panel which also contains the transmitter oscillators. The receiver employs an electronic squelch circuit whose threshold can be set with a resistor on the mother board. There is a pushbutton on the control panel for cancelling the squelch.

The receiver consists of the following modules:

RC811	Receiver Converter
XO811	Crystal Oscillator
XF803	Crystal Filter for 20/25 kHz channel separation
or XF804	Crystal Filter for 12,5 kHz channel separation
IC801	IF Converter
IA801	1st IF Amplifier
IA802	2nd IF Amplifier and Discriminator
SQ801a	Squelch Circuit
AA801	AF Amplifier
VR801	Voltage Regulator

Receiver Converter RC811

The RC811 converts the frequency of the antenna signal to the 1st IF frequency of 21,4 MHz. The incoming signal path from the antenna is through the Antenna Filter, FN811, and then via the antenna switching circuit in PA812 to the input of the RC811. The signal then passes through a two-element bandpass filter to a field effect transistor (J-FET) operating as a grounded gate amplifier. After amplification, the signal passes through a three-element VHF filter consisting of L3, L4 and L5. This filter is what mainly determines the selectivity of the converter. The signal is taken off at a 50-ohm tap and fed to the mixer via L6, a transformer that serves as an adjustment for achieving optimal sensitivity/gain. The local oscillator signal from the XO module(s), after passing through a two-element bandpass filter, is applied to the mixer gate. The bandpass filter ensures sufficient attenuation of any harmonics present. The mixer transistor is also a J-FET, this time in a grounded source configuration.

The IF signal is taken off via a combination autotransformer/L network to match the impedance of the following crystal filter.

Oscillator XO811

The local oscillator signal of 124 to 153 MHz is generated in the Hartley type crystal oscillator where the transistor operates as a grounded base amplifier, the oscillator starts when the channel selector switch completes the emitter circuit path to chassis ground. The collector circuit is tuned by a variable capacitance diode which also detunes the resonant circuit whenever the channel switch breaks the ground connection. Thus several oscillators can all be tied in parallel without mutual loading effects. The output signal is capacitively taken off the tank circuit.

The local oscillator signal frequency lies 21,4 MHz under the antenna frequency and the formula for calculating the crystal frequency is therefore:

$$f_x = f_a - 21{,}4\ \text{MHz}$$

(where f_x = crystal frequency
and f_a = antenna frequency)

Crystal Filter XF803 and XF804

The Crystal Filter unit comprises an eight-pole monolithic crystal filter and an impedance matching transformer for matching the output to the impedance of the following IF converter. Practically all of the receiver selectivity is achieved in the crystal filter.

XF803 is employed in equipment with 20/25 kHz channel spacing.
XF804 is employed in equipment with 12,5 kHz channel spacing.

IF Converter IC801

The first IF frequency (21,4 MHz) is converted to the second IF frequency (103,5 kHz) in this module, which contains an amplifier, a mixer and an oscillator. The output signal is taken off from a center tap on the coil in the mixer transistor's collector circuit and applied to an intermediate frequency amplifier, IA801.

IF Amplifier and Discriminator IA801 and IA802

The first Intermediate Frequency Amplifier, IA801, consists of two differential amplifiers in cascade. The output signal is applied to the second Intermediate Frequency Amplifier, IA802, which contains a 103,5 kHz bandpass filter, a quadrature detector, a lowpass filter and an audio frequency amplifier.

The IF amplifier, detector and AF amplifier are all included in one integrated circuit.

The balanced quadrature detector has excellent AM suppression and contains only one tuned circuit. Inserted between the detector and the AF amplifier is an active lowpass filter which removes any superimposed IF signal. The detector bandwidth and the audio amplifier output voltage can be regulated by means of two external resistors on the mother board (AF output at 1000 Hz = 110 mV).

LF Amplifier AA801

The audio frequency signal from IA802 is fed to the AA801 AF Amplifier where it becomes amplified to the desired audio power level. First the signal passes through an active highpass filter that suppresses any pilot tones or low noise frequencies. Next comes an integration network which gives the required de-emphasis. An integrated circuit containing two separate amplifiers makes up the amplifier and output stages. The volume control is inserted between these two amplifiers. The upper frequency limit of the output amplifier can be set for either 12,5 kHz or 20/25 kHz channel spacing by means of an external connection between two of the module pins.

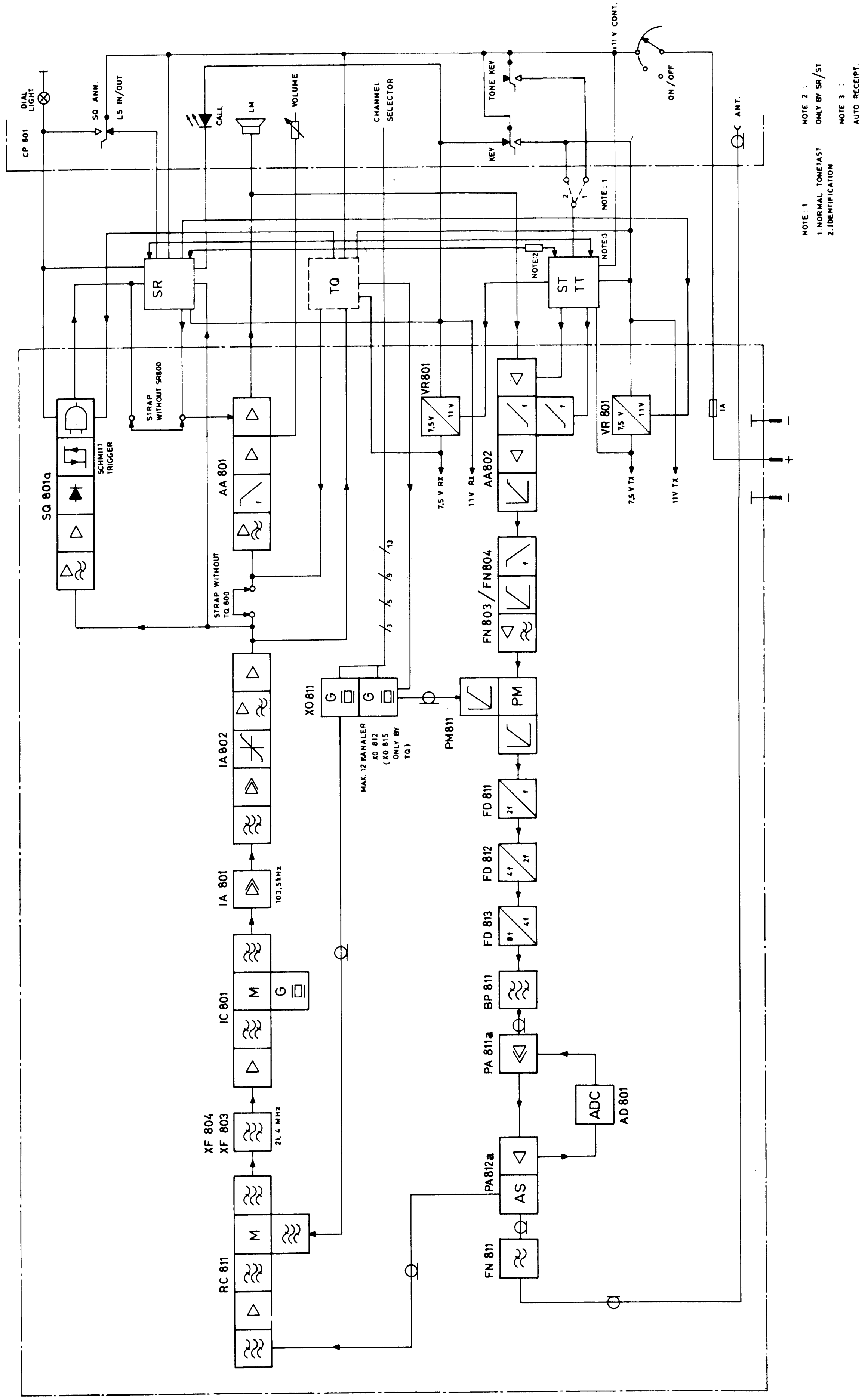
The Squelch Circuit can block the AF signal path by grounding the squelch terminal (5). When the squelch output goes positive again, the audio amplifier will operate normally.

Squelch Circuit SQ801a

The receiver Squelch Circuit operates automatically, according to the noise content of the antenna signal. Weak signals contain greater noise than acceptable signal levels. The output AF signal from IA802 is also present at the input to SQ801a, where it must first pass through an active highpass filter that suppresses frequencies under 7 kHz. Higher frequencies become amplified, then detected and whenever the signal-to-noise ratio is objectionable, the detected noise signal will be sufficient to turn off the audio amplifiers by depriving them of their collector voltage. With an acceptable signal strength at the antenna, the noise content will be too low to trigger the squelch, and the positive collector supply (+ V_{cc}) will be available to the audio amplifiers, allowing them to operate normally. An external resistor sets the squelch to open the path for a signal-to-noise ratio of ≥ 12dB SINAD. A pushbutton on the control head allows manual cancelling of the squelch function.

Power Supply and Voltage Regulator VR801

Because of variations in the battery voltage as the battery discharges, two VR801 type Voltage Regulators are employed to supply many of the transmitter and receiver circuits in the CQP800 with a constant 7,5 V potential. The regulators are short circuit protected.



BLOCK DIAGRAM CQP810

STORNOPHONE 800 ANTENNAS
Technical Specifications

	Frequency range MHz	Nominal impedance Ω	Bandwidth (VSWR ≤ 2) MHz	Max. difference between TX - RX freq. MHz	Typical gain performance rel. to λ/4 whip dB	Length mm	Weight g	Remarks
AN831 * Compact	68- 88	50	0.7	6	-11.5	36	38	Contains solid state aut. tuning device TXpos; I_{DC}= 10 mA
AN832 * Shortened λ/8 whip	68- 88	50	6	6	-7	320	44	
AN833 ** Shortened λ/4 whip	68- 88	50	>20	>20	-2.5	730	62	
AN811 * Compact	146-174	50	2.5	10	-5	36	38	Contains solid state aut. tuning device TXpos; I_{DC}= 10 mA
AN812 * Shortened λ/8 whip	146-174	50	9	9	-3	206	40	
AN813 ** λ/4 whip	146-174	50	>30	>30	0	510	50	
AN814 *	146-160	50	14	14	1) -6 hand held	105	20	1) -14 dB TXpos. -19 dB RXpos. Clipped to revers.
AN861 * Compact	420-470	50	10	10	-2	36	38	
AN862 ** λ/4 whip	420-470	50	>50	>50	0	160	35	
AN863 ** Heliflex	420-470	50	50	50	-2	65	47	
AN841 * Heliflex	TX: 105-108 RX: 136-148	50	TX: 2,8 RX: 11,5	50		160	60	Contains solid state aut. tuning device TX pos: 1 DC=10mA

* Adjustable to working frequencies.

** Factory adjusted.

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Pilot Tone Unit TQ801

The pilot tone unit contains a combined tone transmitter and tone receiver for the Stornophone 800 radiotelephone.

The unit consists of a chassis with a motherboard for four subassemblies.

When used as a pilot tone transmitter, the unit generates a low frequency signal for modulation of the transmitter.

Used as a pilot tone receiver the unit, when receiving a pilot tone modulated RF carrier, provide a logic control signal for the squelch circuit.

A 5-position switch on the motherboard is set to one of the 5 frequencies to which the unit has been adjusted. The 5 frequencies are to be selected from a series of 8 in the frequency range 71.9 Hz to 136 Hz. The receiving frequency and the generated frequency are identical.

Circuit Description

Pilot tone receiving mode.

A third order active filter suppresses the speech modulation contents of the input signal. The pilot tone modulation is applied to a limiter stage ensuring a constant drive for the band pass selection circuit. This circuit, which is a second order active filter of the state variable type, determines the tone to which the receiver responds. The selected signal is applied to a detector followed by a DC amplifier. The TQ signal output will assume a low state output (∿ 0V), when a tone of the correct frequency is received.

A third order high pass filter suppresses the tone modulation before the speech modulation is applied to the terminal connecting to the AF output amplifier.

Pilot tone transmitting mode.

When keying the transmitter, battery voltage is applied to the transmitter key terminal (24) on the TQ801. The voltage turns diode E7 on thereby opening a renerative feed-back loop. The charging of C13 injects a pulse into the circuit ensuring a rapid start of oscillations. The generated signal is applied to the pilot tone terminal (39).

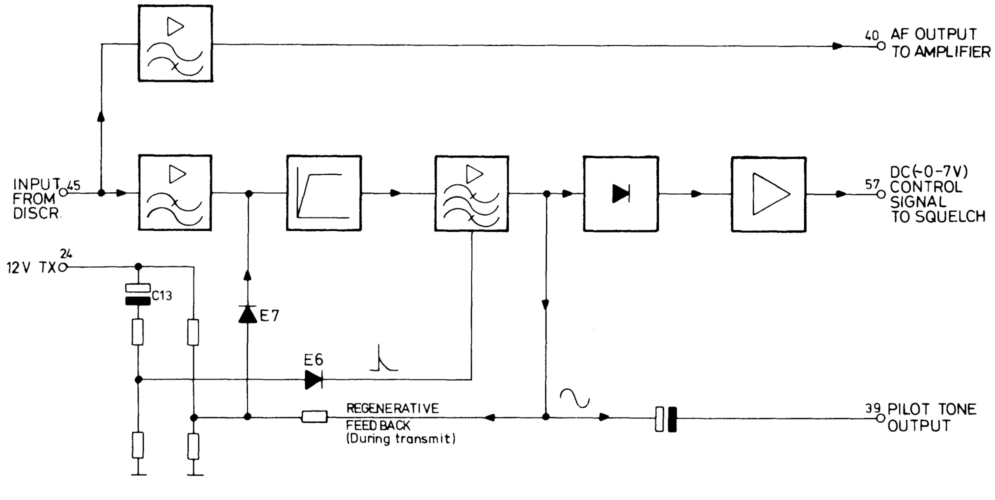
Regarding the mechanical construction the unit is divided into three thick film circuits and one printed circuit, all with plug-in pins for a common motherboard. Thick film circuit 14.0043 contains the low pass and the high pass filters, the limiter and the detector.

Thick film circuit 14.0047 and 14.0049 together with the printed circuit 15.0139 composes the band pass filter.

In order to achieve a frequency tolerance of 0.05% the series resistors R34 - R38 placed on thick film 14.0049 is adjusted during an operational test.

The frequency determining part of TQ801 is subassembly 15.0139 consisting of an epoxy glass fibre printed circuit on which six metal film resistors, 2 polystyrene capacitors and ten pins are mounted.

The five frequencies are to be selected from the series below and the corresponding resistor values are given.



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Frequency Hz	period µ sec.	Code no	Description
71.9	13908.2	89.5044-00	191 kΩ 1% metalfilm 0.25 W
82.5	12121.2	89.5041-00	143 kΩ 1% metalfilm 0.25 W
94.8	10548.5	89.5040-00	105 kΩ 1% metalfilm 0.25 W
103.5	9661.8	89.5039-00	93.1 kΩ 1% metalfilm 0.25 W
110.9	9017.1	89.5038-00	80.6 kΩ 1% metalfilm 0.25 W
118.8	8417.5	89.5037-00	71.5 kΩ 1% metalfilm 0.25 W
127.3	7855.4	89.5049-00	61.9 kΩ 1% metalfilm 0.25 W
136.5	7326.0	89.5067-00	53.6 kΩ 1% metalfilm 0.25 W

Normally R27 will have the higher value and the following resistors decreasing values to R31 as the lower.

Technical Specifications

General

Tone frequencies (EIA - RS220)

71.9Hz. 82,5Hz, 94,8Hz, 103,5Hz, 110,9Hz, 118,8Hz, 127,3Hz, and 136,5Hz.

Adjustment tolerance

$\frac{\Delta 8}{fo} = 0.05\%$

Frequency stability

0.5%

Temperature range

$-25^{o}C - +60^{o}C$.

Polarity

Negative chassis

Dimensions

56.4mm x 14.3mm x 25.8mm

Tone transmitter

Supply voltage

9,6V - 15V

Current drain

2 mA

Activating signal

Positive

Output impedance

600 Ω; AC or DC coupling

Load

$\geq$ 1 kΩ

Output level

2.2V ± 1 dB (R_L = 10 kΩ)

Distortion

0.1%

Response time

5 ms.

Tone Receiver

Supply voltage

a: 9.6V - 15V

b: 7.5V stabilized

Current drain

0.6 mA

Activating signal

Continuous tone input

Selectivity

The tone receiver will react with certainty within a bandwidth of ± 1%, but not to the adjacent tone.

Signal to noise sensitivity

2 dB

Response time

100 ms

Activating input level

15.7 mV ± 6 dB

Generator impedance of input signal

$\leq$ 3 kΩ

Input impedance

30 kΩ

Input frequency response

Flat; linear

Output level

Not activated: 7 V; Internal resistance 10 kΩ

Activated: Disconnection; Internal resistance $\geq$ 10 kΩ

 60.265-E1

ADJUSTMENT PROCEDURE
CQP814 1(3) C9 X4 TQ

The radiotelephone is adjusted as described for CQP814 except for the points below. During adjustment of the RF circuits the TQ801a Pilot Tone unit is disabled, refer to diagram.

Transmitter

The pilot tone modulation is adjusted by means of a resistor, DEV.ADJ, in the modulator circuit. This resistor is located between the TQ801a output, C8, and terminal 4 on X0815.

The maximum frequency deviation for the speech frequency is adjusted to a value ±300Hz below the standard value:
$\Delta f = \pm 2,2 KHz$; $f_{mod} = 1000Hz$

Adjustment of Transmitter Frequency

Connect a frequency counter to the antenna connector through an attenuator network.

Install the oscillator, XO815 or XO812.

Key the transmitter

Adjust the frequency, XO-C9, to be within tolerance.

Repeat the procedure for all channels.

Adjustment of Pilot Tone modulation

Connect a deviation meter through an attenuation network to the antenna connector.

Block the microphone amplifier by shorting terminal 5 on the AA802 to chassis.

Connect a resistor decade box between the output of TQ801a and the modulator input on the oscillator.

Key the transmitter.

Adjust the resistor decade to a value, which will produce a frequency deviation of ±300Hz.

Solder a standard value resistor, as read off the resistor decade setting, into the circuit.

(Repeat the procedure for all channels using pilot tone modulation).

Connect an audio frequency counter to the Deviation Meter AF output.

Measure the pilot tone frequencies at the deviation meter output.

Requirement: f_{nom} ±0,5%

Connect a distortion Meter to the Deviation Meter AF output.

Measure the pilot tone distortion at the deviation meter output.

Requirement: ≤10%

Receiver

The receiver is adjusted as described in the adjustment procedure for the equipment.

The squelch sensitivity is adjusted (R4) to open the receiver for 0,5μV e.m.f. at $0,7 \times \Delta f_{max}$.

Checking the Pilot Tone Receiver

Connect a signal generator to the antenna connector.

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Modulate the signal generator by the pilot tone to produce a frequency deviation of ±300Hz.

Adjust the signal generator output to 1 μV e.m.f.

Check that the receiver squelch opens for the correct pilot tone frequency by measuring the period time for the tone frequency.

Frequency	Period time	Tolerance
71.0 Hz	13908.2μ sec	±6.9 μ sec
82.5 Hz	12121.2μ sec	±6.0 μ sec
94.8 Hz	10548.5μ sec	±5.0 μ sec
103.5 Hz	9661.8μ sec	±4.8 μ sec
110.9 Hz	9017.1μ sec	±4.5 μ sec
118.8 Hz	8417.5μ sec	±4.2 μ sec
127.3 Hz	7855.4μ sec	±3.9 μ sec
136.8 Hz	7326.0μ sec	±3.6 μ sec

Reduce the pilot tone modulation to the signal generator until the squelch closes the receiver.

Check that the pilot tone modulation can be reduced at least 12dB without closing the squelch.

ADJUSTMENT PROCEDURE
CQP810

The following measuring instruments are required for tracing faults in and making adjustments to the transmitter/receiver circuits:

Control unit C35	code 95Bo363, including
Test cable	code 19B0027
Test cable adaptor	code 41.0206
Antenna connector adaptor	code 41.0201
RF Test probe	code 95.0059
DC ampere meter	10mA/100mA/1A
DC Voltmeter	Z_{in} = >0,5 M ohm
AC Voltmeter	Z_{in} = >2M ohm//50pF
FM signal generator	146 - 174 MHz
AF generator	Z_{out} = 600 ohm
RF Wattmeter	0-2 W
Deviation meter	
Distortion meter	
Oscilloscope	
Power supply	0 - 20 V/1A Preset current limiter 0-0,5 A
Frequency counter	

OPERATING CONTROL UNIT C35

The control unit and test cable C35 are designed for testing and adjusting STORNOPHONE 800. The instruments connect to the unit and remain connected during the procedure.

The front panel of the unit is divided into three parts.

1. The **TEST CONTROLS** are used to control the radio circuits.
2. The **BFO** is a 21,4 MHz crystal controlled oscillator.
3. The **INSTRUMENT TERMINAL** is used for measuring instrument connections.

Connection on the rear panel.

TEST PLUG	34-way connector for the test cable.
POWER SUPPLY	Jacks for power supply.
CURRENT MONITOR	Jacks for current monitor.

Connections on the front panel.

RF PROBE	Jacks for RF probe.
DCVM	Jacks for DC voltmeter.
AF PROBE	BNC connector for AF probe. Probe consist of shielded leads to be connected whenever measuring of audio is desired.
DEVM(AF)	BNC connector for the AF output of the deviation meter.
ACVM	BNC connector for the AF voltmeter, distortion meter and oscilloscope.
MOD INPUT	BNC connector for the AF generator.

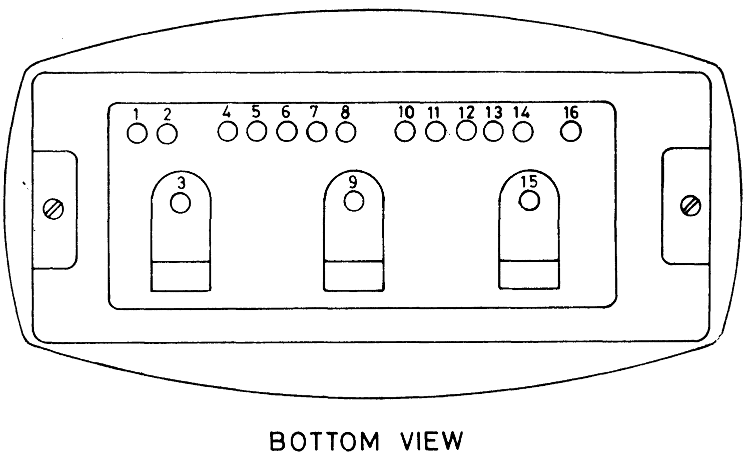
Toggle switches

SQ OFF	Disables the squelch circuit of the receiver (loudspeaker continously open).
KEY	Switches the transmitter on, the receiver off, and connects the AF generator input jack to the **LS/MICR** switch.
TONE KEY	Transmitter key for radio sets with tone transmitter.
RX GATE	Switches the receiver´s +7,5 V on/off.
TX GATE	Switches the transmitter´s + 7,5 V on/off.
ON-OFF	21,4 MHz crystal controlled **BFO** on/off.

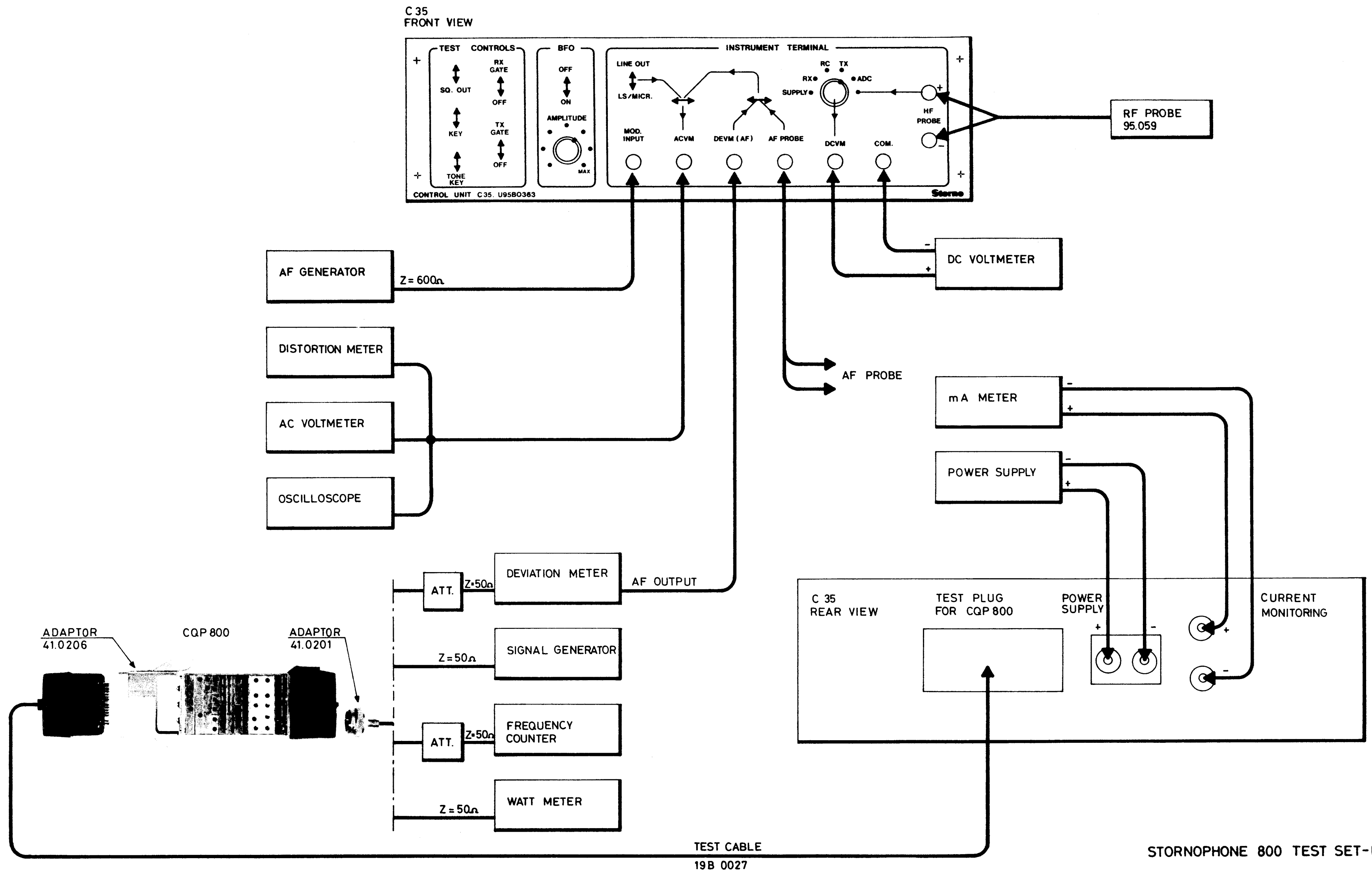
Storno

LINE OUT	Switches the AC voltmeter between the **LINE OUT** and the **LS/MICR**.
ACVM	Switches the AC voltmeter between the **LINE OUT** - **LS/MICR** switch and **DEVM (AF)** - **AF PROBE** switch.
DEVM (AF)	Switches the AC voltmeter input between the **DEVM (AF)** and the **AF PROBE** (AC Voltmeter).
DCVM switch	6-position DC voltmeter switch. 1. **SUPPLY** Voltage 2. **RX** +7, 5 V stabilized RX voltage 3. **RC** Receiver converter test point 4. **TX** +7, 5 V stabilized TX voltage 5. **ADC** voltage 6. **RF PROBE**
AMPLITUDE	**BFO** output attenuator

Test Point	Function
1	+7, 5 V TX stabilized
2	+7, 5 V RX regulator gate
3	DC ground (connected to point 15)
4	ADC voltage
5	Audio output - microphone input
6	Tone Key
7	+7, 5 V TX regulator gate
8	+ V_B Battery voltage measured after the fuse.
9	+11 V Battery
10	+11 V TX
11	+7, 5 V RX stabilized
12	Squelch disable
13	Receiver converter test point
14	21, 4 MHz signal input
15	DC ground (connected to point 3)
16	Discriminator and receiver line output



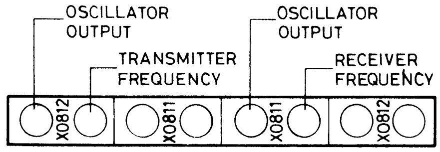
CQP800 Test Point Location
Bottom View



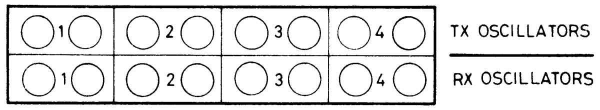
STORNOPHONE 800 TEST SET-UP

D402.093

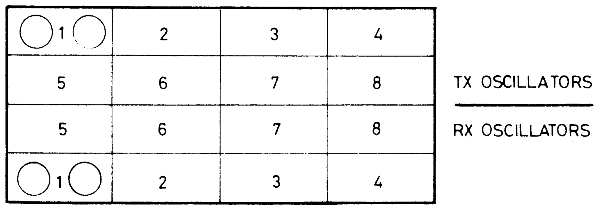
LOCATION OF OSCILLATORS



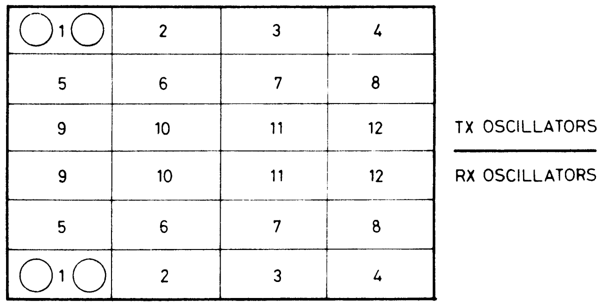
2 CHANNELS (CH803)



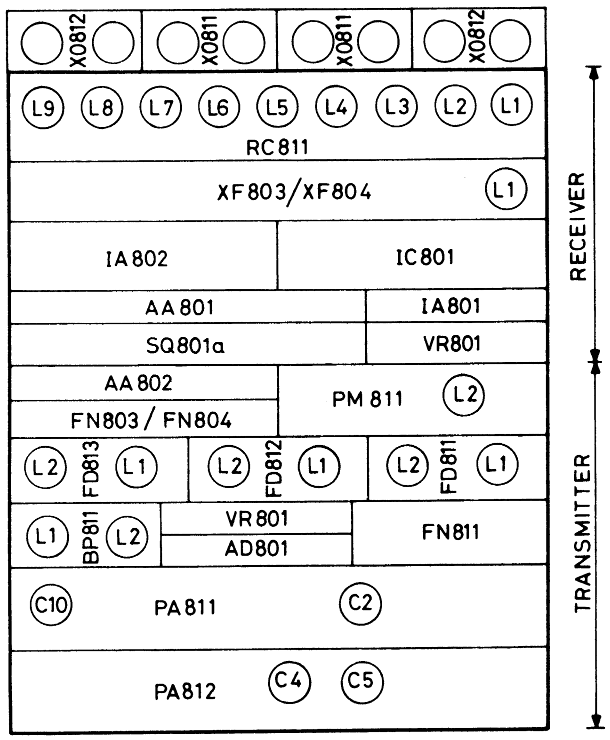
4 CHANNELS (CH804)

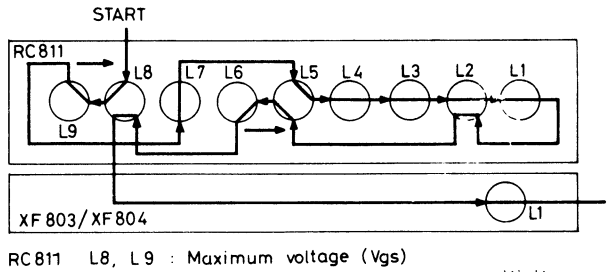


8 CHANNELS (CH 805)



12 CHANNELS (CH806)





RC811 L8, L9 : Maximum voltage (Vgs)
L1, L2, L3, L4, L5, L6 : Maximum sensitivity
L7 : Minimum distortion
XF800 L1 : Minimum distortion

 Storno

TRANSMITTER ADJUSTMENT

For location of components see page 10.

Before starting adjustment of the transmitter, check the resistor (R6) located between pin 4 and 6 of AD801.

6.8 k ohm for 0,1 to 0,5 W output power
4,7 k ohm for 1,0 W output power
3,3 k ohm for 1,5 W output power

A second resistor R7 is paralleled with R6 for fine adjustment of the output power.

Checking Supply Voltage and Current Drain

1. Select the channel closest to the center frequency, if more than one.
   Set the **DCVM** switch to **SUPPLY**.
   Connect a wattmeter to the antenna connector.
   Adjust the power supply to 11 V (12 V for 1,5 W transmitter).
   Set the current limiter to 0,5 A.
2. **KEY** the transmitter.
   Read the current drain on the mA meter.
   Current drain without output: approx. 70mA.
   Current drain with output: <400 mA
3. Unplug the oscillator and read the current drain.
   Requirement: <70 mA
4. Set the **DCVM** switch to **TX**.
   Read the TX stabilized voltage.
   Requirement: 7,5 V ±0,15 V

Crystal Oscillator Output Adjustment

5. Set the **DCVM** switch to **RF PROBE**
   KEY the transmitter
   Connect the RF probe to pin 2 on PM811 and hold the probe's metal housing against chassis.
   Adjust L1 in XO812 for maximum DC voltage, approx. 0,8 V.
   Repeat the adjustment on all channels.

Adjustment of Frequency Multipliers and Power Amplifiers.

Select channel closest to the center frequency, if more than one.

Set the tuning slugs in PM811, FD811, FD812, FD813, and BP811 to the approximate position:

High frequency (>160 MHz) = outer position

Low frequency (<160 MHz) = inner position

Medium frequency (~160 MHz) = middle position

KEY the transmitter.

6. Adjust the following coils and capacitors for maximum current drain as seen on the mA meter using an insulated trimming tool:

   L1 and L2 in FD811
   L1 and L2 in BP811
   C2 and C10 in PA811

   Adjust C4 and C5 in PA812 for maximum power output.

7. Set **DCVM** switch to **ADC**.
   Detune L1 and L2 in FD812 if ADC voltage is less than 10 V.
   Adjust L1 and L2 in FD811 for minimum ADC voltage.
   Adjust L1 and L2 in FD812 for minimum ADC voltage.
   Adjust L1 and L2 in FD813 for minimum ADC voltage.
   Adjust L1 and L2 in BP811 for minimum ADC voltage.
   Adjust C2 and C10 in PA811 for minimum ADC voltage.
   Adjust C4 and C5 in PA812 for maximum power output.
   Repeat the adjustments under 6 for minimum ADC voltage and maximum power output until no further improvement is obtainable.

Check the power output on all channels.

To increase the power output a resistor (R7) may be connected in parallel with R6 (see page 10).

Read the ADC voltage.
Requirement: 4 V to 10 V.
Typical ADC voltage at 1 W: 5 V.
Typical ADC voltage at 1,5 W: 8 V.

8. Read the total current drain.
Requirements:

0,5 W power output: approx. 220 mA.
1,0 W power output: approx. 350 mA.
1,5 W power output: approx. 500 mA.

Transmitter Frequency Adjustment

9. Connect a frequency counter through an attenuator to the antenna connector.
KEY the transmitter.
Adjust C9 in XO812 to the channel frequency.
Repeat the adjustment on all channels.
Requirement at 25°C: $\pm 0,5 \times 10^{-6}$.

Checking and Adjustment of Modulator.

10. Connect the deviation meter through an attenuator to the antenna connector.
Set the **DEVM (AF) - AF PROBE** switch to **DEVM (AF)**.
Set the **ACVM** switch to **DEVM (AF)**.
Short circuit resistor combination R10/R11 (see page 10).
KEY the transmitter.
Set the AF generator to 1000 Hz and adjust the output to give a transmitter frequency deviation of approx. ±3 KHz.
The output should be below clipping level as seen at the AF output at the deviation meter.
Adjust L2 in PM811 for minimum distortion.
Remove the short circuit across R10/R11.

11. Set the tone generator output to 30 mV.
Check that Δf max. is not exceeded at frequencies between 300 Hz and 3000 Hz.
If necessary adjust R11/R10.
Set the tone generator output to 0,7 x Δf max. at 1000 Hz.

12,5 kHz: 0,7 x Δf max. = ± 1,75 kHz
20 kHz: 0,7 x Δf max. = ±2.8kHz.
25 kHz: 0,7 x Δf max. = ±3,5 kHz.

Check the total harmonic distortion at the output of the deviation meter.

Requirement: THD < 7% (without de-emphasis)

RECEIVER ADJUSTMENT

For location of components see page 10.

Supply voltage and current drain

Before making adjustments to the receiver circuits check the discriminator bandwidth resistor between pin 1 and pin 3 of IA802.

CQP813 - R3 = 5,6 k ohm
CQP814 - R3 = 27 k ohm

1. Set the **DCVM** switch to **SUPPLY**.
Adjust the power supply to 11 V.
Set the current limiter to 0,1 A.

2. Read the current drain.

I_{total}: <100 mA

3. Set the **DCVM** switch to **RX**.
Read the stabilized RX voltage.
Requirement: 7,5 V ±0,15 V.

Adjustment of Receiver Converter

4. Set the trimming slugs in L1, L2, L3, and L4 in RC811 to the outer position for frequencies below 160 MHz.
Set the slugs to the inner position for frequencies above 160 MHz.
Set slugs in L5, L6, L7, L8, and L9 to the middle position.
Set the **DCVM** switch to **RC**.
Adjust L1 in all receiver oscillators for maximum DC voltage.
Set the channel selector to the channel closest to the center frequency, if more than one.
Adjust L8 in RC811 for maximum DC voltage.
Adjust L9 in RC811 for maximim DC voltage.
Adjust L8 in RC811 for maximum DC voltage.

When removing the oscillator the DC voltage should fall at least 0,1 V.

5. Set the signal generator to the receiver frequency.
Modulate the generator with 1 kHz to a frequency deviation of 0,7 x Δf max:

± 3,5 kHz for 25 kHz channel spacing
± 2,8 kHz for 20 kHz channel spacing
± 1,75 kHz for 12,5 kHz channel spacing.

Set **SQ OUT** switch down.
Set **LINE OUT - LS/MICR** down.
Set **ACVM** switch to **LS/MICR**.

Adjust the signal generator output to 12 dB SINAD.
Turn the volume switch to the 3rd position.
(approx. 0,5 V on the ACVM, no clipping).

As the receiver sensitivity increases during the adjustment, the signal generator output must be reduced to maintain 12 dB SINAD.

Adjust L7 in RC811 for best signal to noise ratio at approx. 12 dB SINAD.
Detune L5.
Adjust L4 in RC811 for best signal to noise ratio.
This is the ONLY adjustment of L4.
The following coils are adjusted for best signal to noise ratio in this order:

L3, RC811
L2, RC811
L1, RC811
L2, RC811
L5, RC811
L6, RC811

Repeat the adjustment of L5 and L6 until no further improvement is obtained.
Readjust L8 in RC811 for maximum voltage on DCVM (approx. 1,7 V).
Readjust L3 in RC811 for best signal to noise ratio.

6. Set the signal generator output to approx. 100 μV e.m.f.
Adjust L7 in RC811 and L1 in XF800 for minimum distortion.

Receiver sensitivity measurement.

EIA (Electronic Industrie's Association) Standard, definition:
The SINAD sensitivity of a receiver is the minimum input signal that will provide at least 50% of the receivers's rated audio output power with 12dB signal +noise +distortion to noise + distortion.

Method of measurement.

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

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

The second condition is the one where the signal (modulation) is removed with a notch filter and the RF-signal is lowered in amplitude until the remaining noise and distortion increases to 12 dB below the first condition, as read on the distortion meter scale. This corresponds to a reading of 25%, 25 being 12 dB below 100, which was our reference condition.
(100-6dB=50, 50-6dB=25).

In practice our first condition is achieved by feeding a minimum of 1000μV of RF-signal modulated with 1000Hz at 0.7 x Δf max. to the receiver.
The audio output (which must be at least 50% of the receiver's audio rating) is measured with the distortion meter in position CAL and adjusted with potentiometer ADJ. FSD. to a reading of 100.

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

By backing off the attenuator of the RF-generator, thereby lowering the RF-input to the receiver, the noise will eventually increase; the attenuator being adjusted for a reading on the distortion meter scale of 25%.

At this stage it must be ensured that the increased noise and the signal (with the notch filter switched out while checking) still equals 100 on the meter scale.

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

7. The sensitivity must be minimum 1,0 μV e.m.f.
   Typical value: 0,5 μV e.m.f.
   Changing the supply voltage from 9,6 V to 15 V should not influence the sensitivity obtained at 11 volt.
   If more than one channel is provided, the sensitivity check should be repeated on all channels.

Oscillator Frequency Adjustment

8. Set the generator to the receiver frequency using the frequency counter.
   Remove the signal generator modulation and set the output to 100 μV e.m.f.
   Turn the **BFO** on.
   Adjust **BFO AMPLITUDE** to produce a clear beat tone.
   Set **ACVM** switch to **LINE OUT**.
   Adjust L2 in XO811 for zero beat as seen on the oscilloscope.

   If more than one channel is provided the adjustment should be repeated on all channels.
   When adjustments are completed, turn the **BFO OFF**.

Checking Receiver Audio Line Output

Modulate the signal generator with 1 kHz and 0,7 x Δ f max.

± 3,5 kHz for 25 kHz channel spacing.
± 2,8 kHz for 20 kHz channel spacing.
± 1,75 kHz for 12,5 kHz channel spacing.

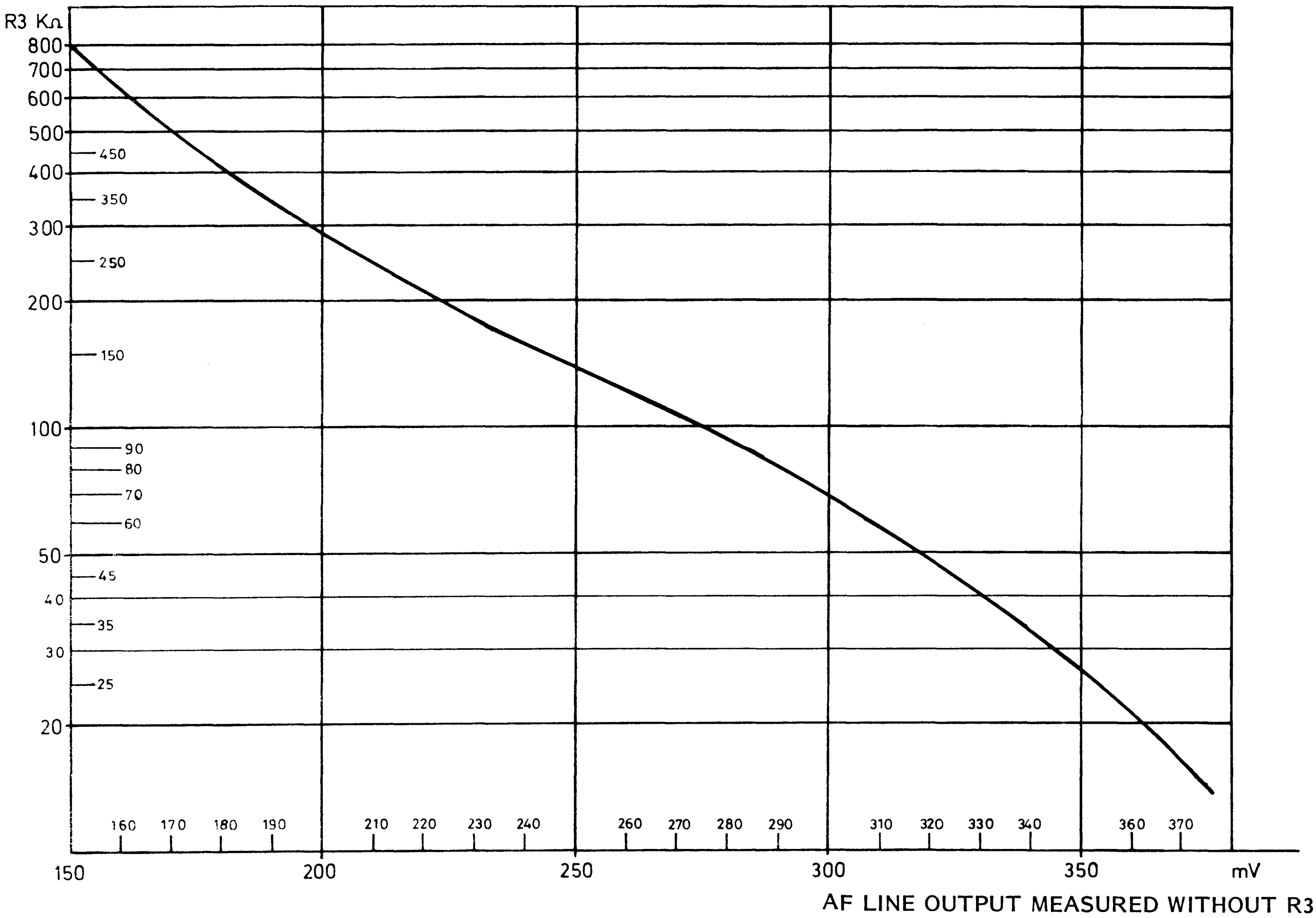
9. Set the signal generator output to 100 μV e.m.f.
   Switch the **ACVM** to **LINE OUT**.
   Read the AF Line voltage.
   Requirement: 110 mV ± 3 dB.
   If necessary connect a resistor (R3) in parallel with R2 (IA802, pin 5-6) until 110 mV is obtained.
   The graph page 9 indicates the value of the resistor, which should be the closest higher standard value.

Checking the AF Frequency Response and Distortion.

10. Set the signal generator output to approx. 100 μV e.m.f.
    Set **LINE OUT - LS/MICR** switch down.
    Turn the volume switch to the 4th position.
    Read the AF voltage on the **ACVM** (reference).
    Set the modulation frequency to 300 Hz.

    AF voltage: -10 dB ± 2 dB rel. to 1000 Hz.
    Set the modulation frequency to 3000 Hz.
    AF voltage: +10 dB ± 2 dB rel to 1000 Hz.

11. Turn the volume switch to the 5th position.
    Check the total harmonic distortion at 1000 Hz.
    Requirement: CQP813, THD = <7%
    CQP814, THD = <8%



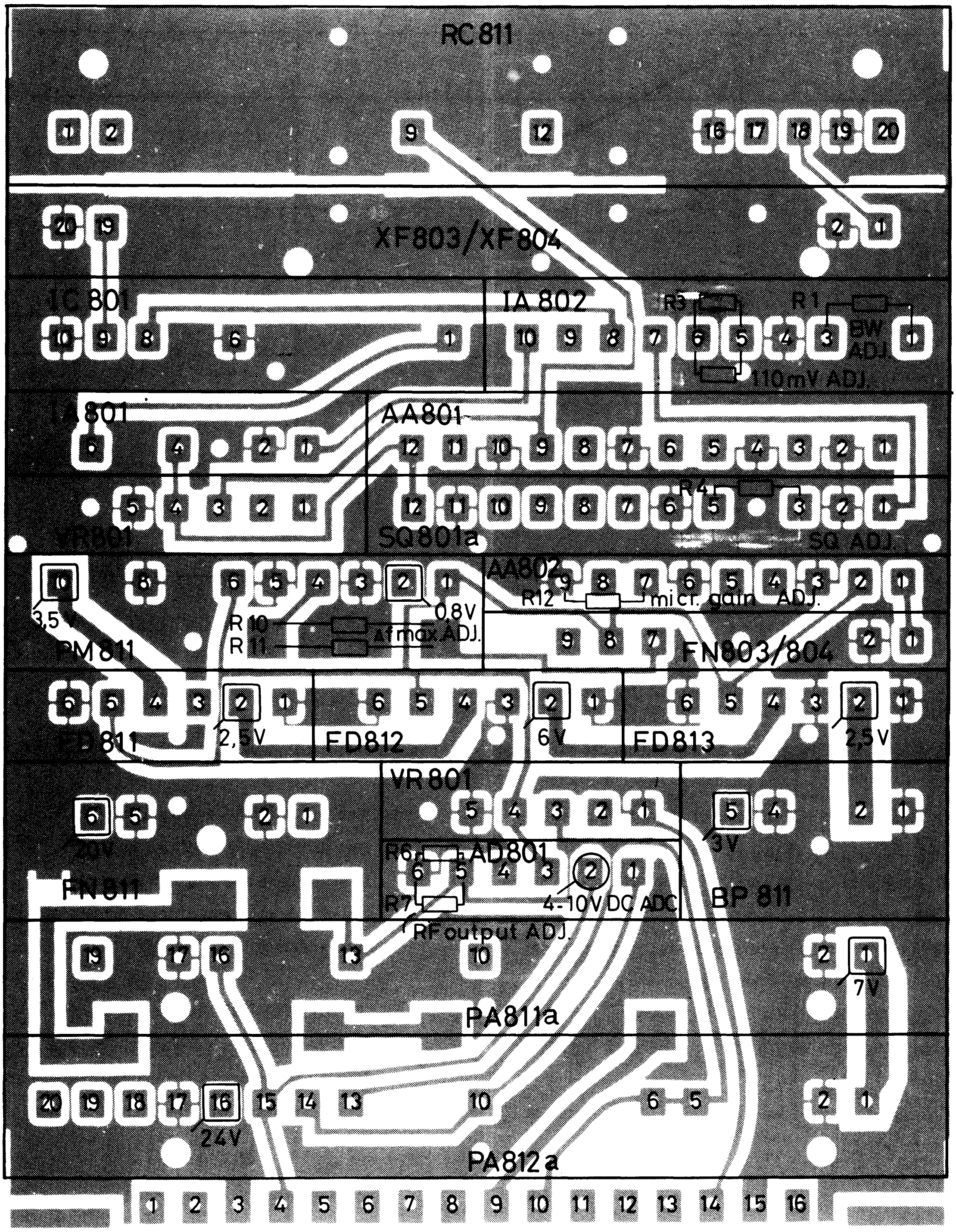
Adjustment and Checking of the Squelch Function.

12. Modulate the signal generator with 1 kHz and 0,7 x Δ f max.
    Set the volume to the 5th position.
    Set the **SQ OUT** switch up.
    Increase the RF-generator output until the signal opens the squelch.
    Requirement: 10 to 12 dB SINAD
    Decrease the volue of R4 if SINAD is less than 10 dB.
    Decrease the value of R4 if SINAD is more than 12 dB.

Checking the Overall Receiver Current Drain.

13. Set the **DCVM** switch to **SUPPLY**.
    Set the supply voltage to 11 V.
    Disconnect the signal generator.
    Read the current drain on the mA meter.
    Requirement: < 7,5 mA.

    Set the **SQ OUT** switch down.
    Set the volume switch to the 5th position.
    Read the current drain on the mA meter.
    Requirement: < 70 mA.



MEASURED WITH RF PROBE AND DCVM AT 1W RF OUTPUT. APROXIMATE VALUES.

SUMMARY
TRANSMITTER ADJUSTMENT
CQP810

	TEST	ADJUST	INSTRUMENT	READING
1	Supply voltage	Power supply	Voltmeter	11 V (12 V - 1, 5 W)
2	Current drain		mA meter	70 - 400 mA
3	Current drain without oscillator		mA meter	< 70 mA
4	+ 7, 5 V TX		Voltmeter	+ 7, 5 V ± 2%
5	Oscillator output	XO812 - L1	95.059 + VM	maximum
6	Current drain	FD811 - L1, L2 FD812 - L1, L2 FD813 - L1, L2 BP811 - L1, L2 PA811 - C2, C10	mA meter	maximum
7	Power output ADC voltage	FD811 - L1, L2 FD812 - L1, L2 FD813 - L1, L2 BP811 - L1, L2 PA811 - C2, C10 PA812 - C4, C5	Wattmeter Voltmeter	maximum power output 0, 5 - 1, 5 W minimum ADC voltage 4 - 10 V
8	Current drain		mA meter	0, 5 W - < 220 mA 1, 0 W - < 350 mA 1, 5 W - < 500 mA
9	Frequency	Xo812 - C9	Frequency counter	$f_{ant} \pm 0,5 \times 10^{-6}$
10	Modulator	PM811 - L2	AF Generator Deviation meter Distortion meter	minimum distortion
11	30 mV AF input Modulation distortion	R11 - R10	AF Generator Deviation meter Distortion meter	0, 7 x Δ f max, f mod=1kHz. THD = < 7%

SUMMARY
RECEIVER ADJUSTMENT
CQP810

	TEST	ADJUST	INSTRUMENT	READING
1	Supply voltage	Power supply	DC voltmeter	11 V
2	Current drain	Check	mA meter	< 100 mA
3	+ 7,5 V RX	Check	Voltmeter	+ 7,5 V ± 2%
4	RC test point without oscillator	XO811 - L1 RC811 - L8, L9	DC voltmeter	maximum (1,7 V) - 0,1 V
5	Receiver sensitivity	RC811 L7, L4, L3, L2, L1 L2, L5, L6	RF Generator Distortion meter	minimum distortion
		L8 L3	DC voltmeter Distortion meter	maximum minimum
6		XF800 - L1 RC811 - C7	RF Generator (high output)	minimum distortion
7	Sensitivity	Check		< 1,0 µV e.m.f.
8	Frequency	XO811 - L2	RF Generator 21,4 MHz BFO oscilloscope	zero beat
9	AF Line output	IA802 (R3)	RF Generator (high output) AC voltmeter	110 mV AF
10	AF response	Check	RF Generator (high output) AC voltmeter	300 Hz: -10 ± 2 dB 1000 Hz: 0 dB 3000 Hz: + 10 ± 2 dB
11	Distortion	Check	Distortion meter	CQP813: < 7% CQP814: < 8%
12	Squelch	R4	RF generator	opens at 10-12 dB SINAD
13	Current drain	Volume to pos. 5.	mA meter	no signal, Sq. off < 7 mA no signal, Sq. on < 70 mA

ADJUSTMENT PROCEDURE
AN814

The adjustment of the antenna matching net-work can be accomplished by using two methods depending on the instruments available.

1. Adjusting for maximum radiated power

Instruments:

Multimeter; measuring ranges 0-50 µA, 0-250 µA; ≥ 20 KΩ / V

RF-probe; Storno code no. 95.0059.
Adjustment cover for CB811 with clip and adjustment holes, Storno code no. U95B0503.
Coil adjustment tool; Storno code 17.0053.
Capacitor adjustment tool; Storno code 17.5012.

Test set-up

Connect 48 cm of 1mm equipment wire to the RF-probe to act as pick-up antenna.

Connect the RF-probe to the multimeter.

Unsolder the chassis connection inside the CB811 and install the adjustment cover.

Connect the control unit to the radio set.

Carry the radio set in a shoulder sling at your left hip.

Hold the control unit with your right hand and approximately 10 cm (4") from your face.

Key the transmitter.

The distance from the antenna to the RF-probe should be 1 to 2 metres, your right hand should touch the clip on the back of the control unit and the control cable should be held against the body.

Adjust coil L1 in CB811 for maximum deflection on the multimeter.

Adjust capacitor C2 for maximum deflection on the multimeter.

When the adjustments have been accomplished the cover and the chassis connection to the clip should be reinstalled.

2. Adjusting for minimum VSWR

Instruments:

CQP800 Rho-Detector type TS-D36;
Storno code U95B0476.
RF-generator with Amplitude Modulation.
AF-voltmeter; $Z_{in} \geq 1M\Omega$; f.s.d. ≥ 30 mV.

Adjustment cover for CB811 with clip and adjustment holes; Storno code no. U95B0503.
Coil adjustment tool; Storno code 17.0053.
Capacitor adjustment tool; Storno code 17.5012.

Test set-up

The CQP800 Rho-Detector is attached to a shoulder sling and carried at your left hip. CB811 is connected to the Rho-Detector via a test connector. The cables from the Rho-Detector is connected to the RF-generator and to the AF-voltmeter.

AM modulate the RF-generator and set the frequency to 153 MHz.

Adjust the RF-generator output for a suitable deflection on the AF-voltmeter.

Unsolder chassis connection and install adjustment cover.

With the CB811 held in your right hand approximately 10 cm from your face adjust coil L1 for minimum deflection on the AF-voltmeter.

Adjust capacitor C2 for minimum deflection on the AF-voltmeter.

During the adjustments your hand should touch the clip on the control unit and the control cable be held against the body.

The VSWR must not exceed 2:1, as measured with reference to a calibrated load mismatch.

When the adjustments have been accomplished the cover and chassis connection should be reinstalled.

Note.

The Rho-Detector can be used in conjunction with sweep equipment, e.g. Rhode & Swarz Poly-scopes.
This will illustrate the symmetry and the bandwidth of the antenna.

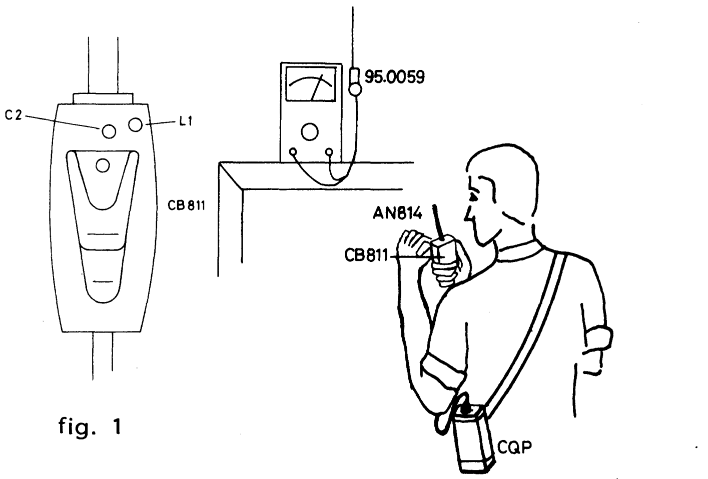


fig. 1

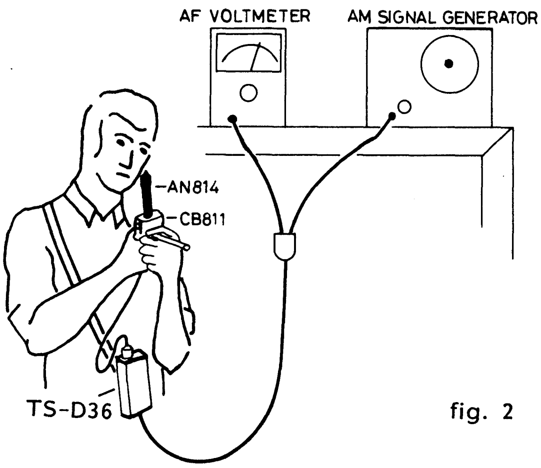


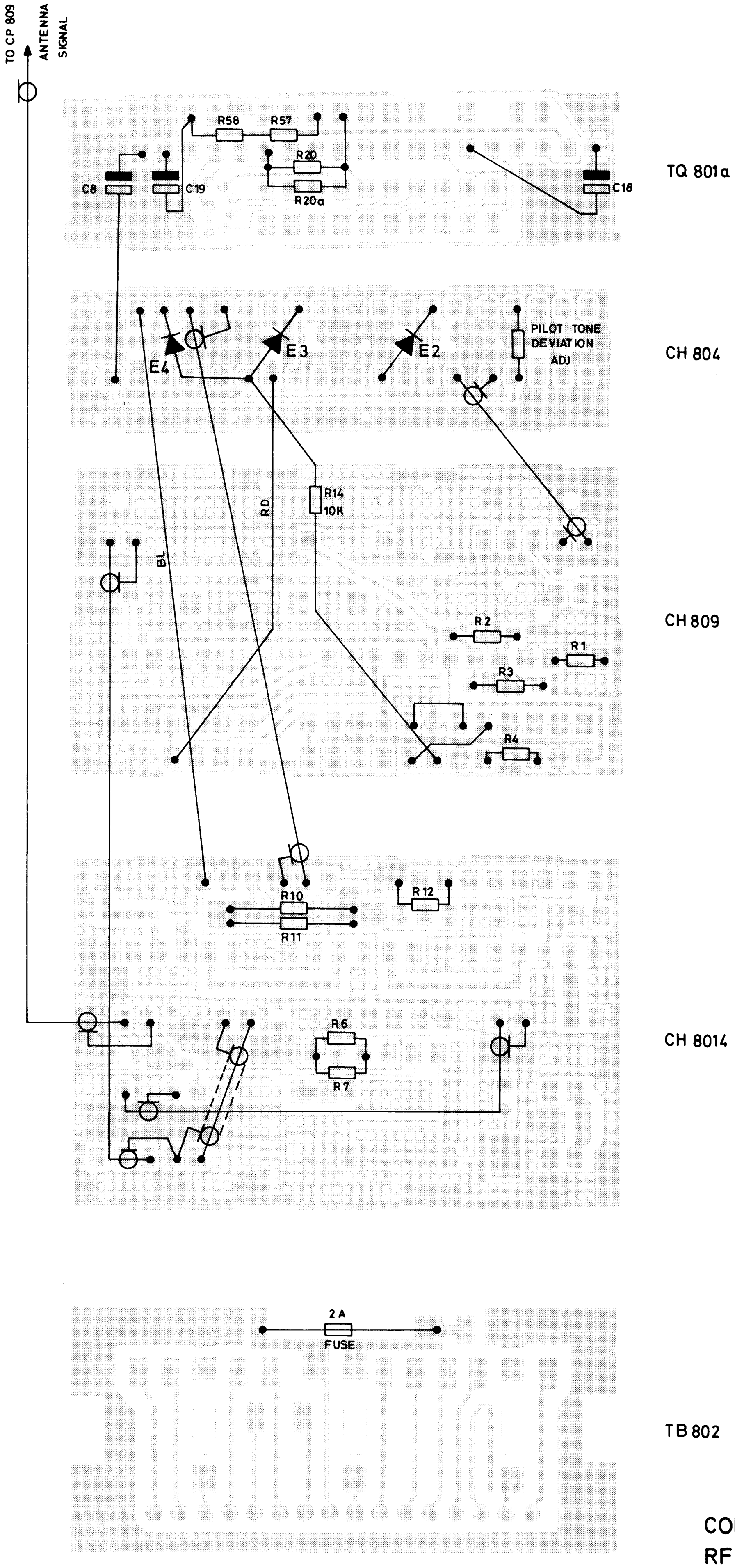
fig. 2

TYPE	Nº	CODE	DATA	
		10.3590	TX814-1W	Transmitter
		10.3591	TX814-3W	Transmitter
		10.3434	RX814	Receiver
		10.2711	CH804	Oscillator Chassis
		10.3729	CP809	Control Head
		10.2882-01	TQ801a	Pilot Tone Unit
		10.3587	TB802	Terminal Board
		10.3730	CA800 S6	Cabinet
		10.3245	CB811	Control Unit
		10.2708	XO811	Receiver Oscillator
		10.2883	XO815	Transmitter Oscillator
			Transmitter Modules	
		10.2688	AA802	Modulation amplifier
		10.2691	AD801	ADC circuit
		10.2680	BP811	Bandpass filter
		10.3505	CH8014	Chassis
		10.2677	FD811	Frequency doubler
		10.2678	FD812	Frequency doubler
		10.2679	FD813	Frequency doubler
		10.2695	FN804	Modulation filter
		10.2681	FN811	Antenna filter
1W		10.2682	PA811a	Power amplifier
1W		10.2683-01	PA812a	Power amplifier
3W		10.3413	PA813	Power amplifier
3W		10.3414	PA814	Power amplifier
		10.2676	PM811	Phase modulator
		10.2690	VR801	Voltage regulator
			Receiver Modules	
		10.2687-01	AA801a	Audio amplifier
		10.3228	CH809	Chassis
		10.2685	IA801	IF amplifier
		10.2808	IA802	IF amplifier/detector
		10.2686	IC801	IF converter
		10.2676	RC811	Receiver converter
		10.2689-01	SQ801a	Squelch circuit
		10.2690	VR801	Voltage regulator
		10.2693	XF804	Crystal filter
	R1	80.5066	27Kohm 5%	Carbon film 0.1W
	R2	80.5081	470Kohm 5%	Carbon film 0.1W
	R3	80.50xx	ADJ (BW) 5%	Carbon film 0.1W

TYPE	Nº	CODE	DATA		
	R4	80.50xx	ADJ (SQ) 5%	Carbon film	0.1W
1W	R6	80.5057	4.7Kohm 5%	Carbon film	0.1W
3W	R6	80.5056	3.9Kohm 5%	Carbon film	0.1W
	R12	80.5063	15Kohm 5%	Carbon film	0.1W
	R14	80.5061	10Kohm 5%	Carbon film	0.1W
	C8	73.5134	0.4uF 20%	Tantal	16V
	E2	99.5237	1N4148	Diode	
	E3	99.5237	1N4148	Diode	
	E4	99.5237	1N4148	Diode	

CQP814 1(3) C9 x 4TQ

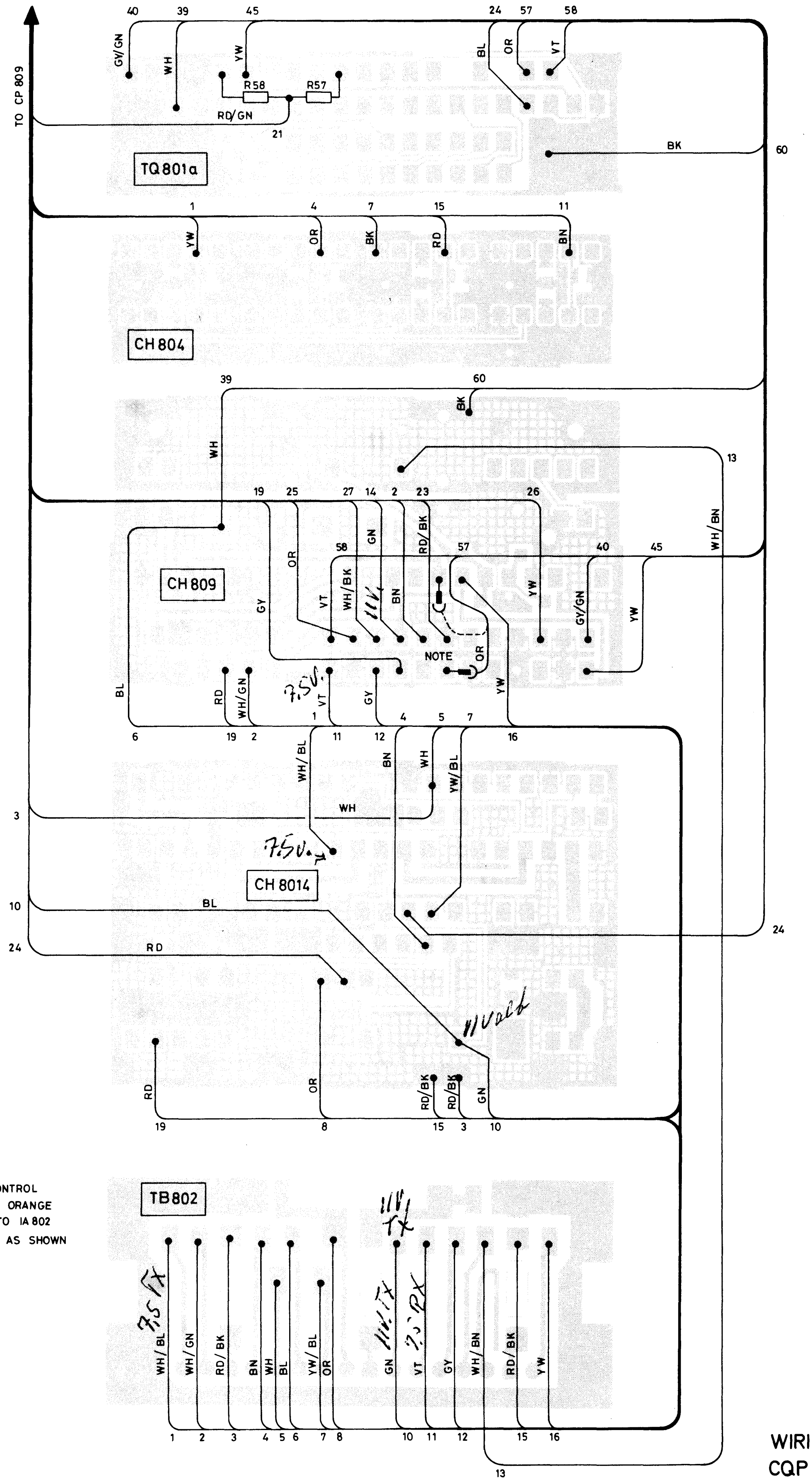
X402.706



COMPONENT LAY-OUT
RF COAX CABLING
CQP 814 1 C9 x 4TQ
CQP 814 3 C9 x 4TQ

D402.700

Storno



NOTE 1

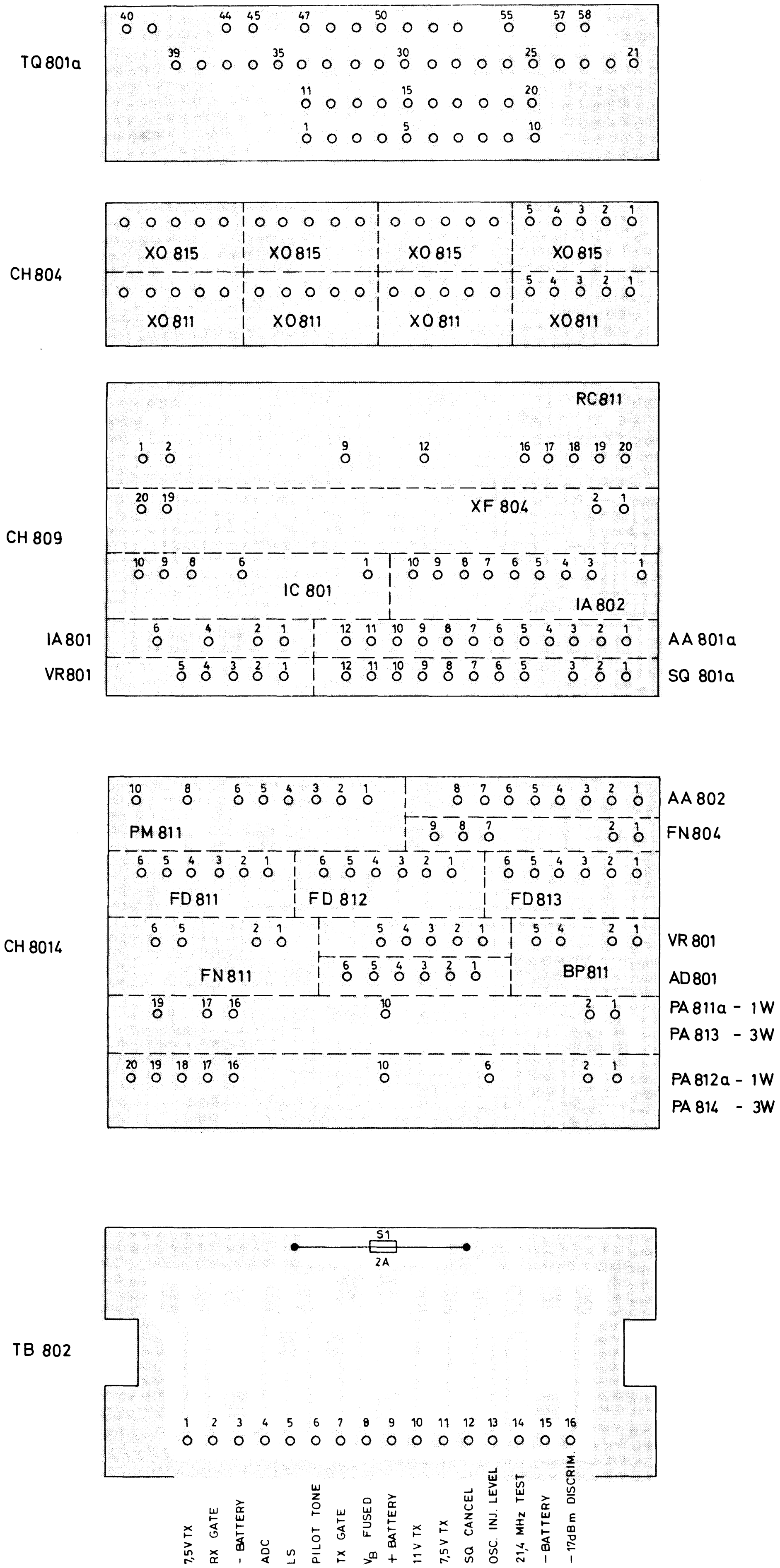
IF PILOT TONE CONTROL IS NOT USED THE ORANGE WIRE IS MOVED TO IA 802 TERM. 8 (7,5 V RX), AS SHOWN IN DOTTED LINE

WIRING LOCATION

CQP 814 1 C9 x 4 TQ

CQP 814 3 C9 x 4 TQ

D402.699



PIN LOCATION
CQP 1C9 x 4TQ
CQP 3C9 x 4TQ

D402.698

PORTABLE RADIOTELEPHONE TYPE CQP814(1)3C9x4TQ
MODULE TERMINALS AND FUNCTIONS

Module	Terminal	Function
TQ801a	1 - 10	5V
	11 - 20	5V
	21	Chassis
	22	5V
	23	3.3V
	24	Chassis (0V)
	25	5V
	26	10.5V
	27	5V
	28	5V
	29	Chassis (0V)
	30	5V
	31	10.5V
	32	Chassis (0V)
	33	5V
	34	10.5V
	35	5V
	36	5V
	37	5V
	38	Chassis (0V)
	39	Pilot tone out
	40	5V
	41	Chassis (0V)
	44	10.5V
	45	0V
	47	Chassis (0V)
	48	5V
	49	10.5V
	50	5V
	51	5V
	52	3.3V
	53	5V
	55	Chassis (0V)
	57	7V
	58	7.5V
XO811	1	RF out
	2	Channel switch
	3	7.5V RX
	4	-

Module	Terminal	Function
XO815	1	RF out
	2	Channel switch
	3	7.5V TX
	4	Pilot tone input
	5	Chassis
RC811	1	RF input
	2	Chassis
	9	+ 11V RX
	12	Testpoint
	16	Chassis
	17	(IF out)
	18	IF out
	19	Chassis
	20	Oscillator input
XF804	1	IF input
	2	Chassis
	19	IF output
	20	Chassis
IC801	1	2nd IF out
	6	Chassis
	8	7.5V RX
	9	IF input
	10	Chassis
IA801	1	2nd IF out
	2	Chassis
	4	7.5V RX
	6	2nd IF input
IA802	1	BW Adj.
	3	BW Adj.
	4	Chassis
	5	110mV Adj.
	6	110mV Adj.
	7	AF output
	8	7.5V RX
	9	Chassis
	10	2nd IF input

Storno

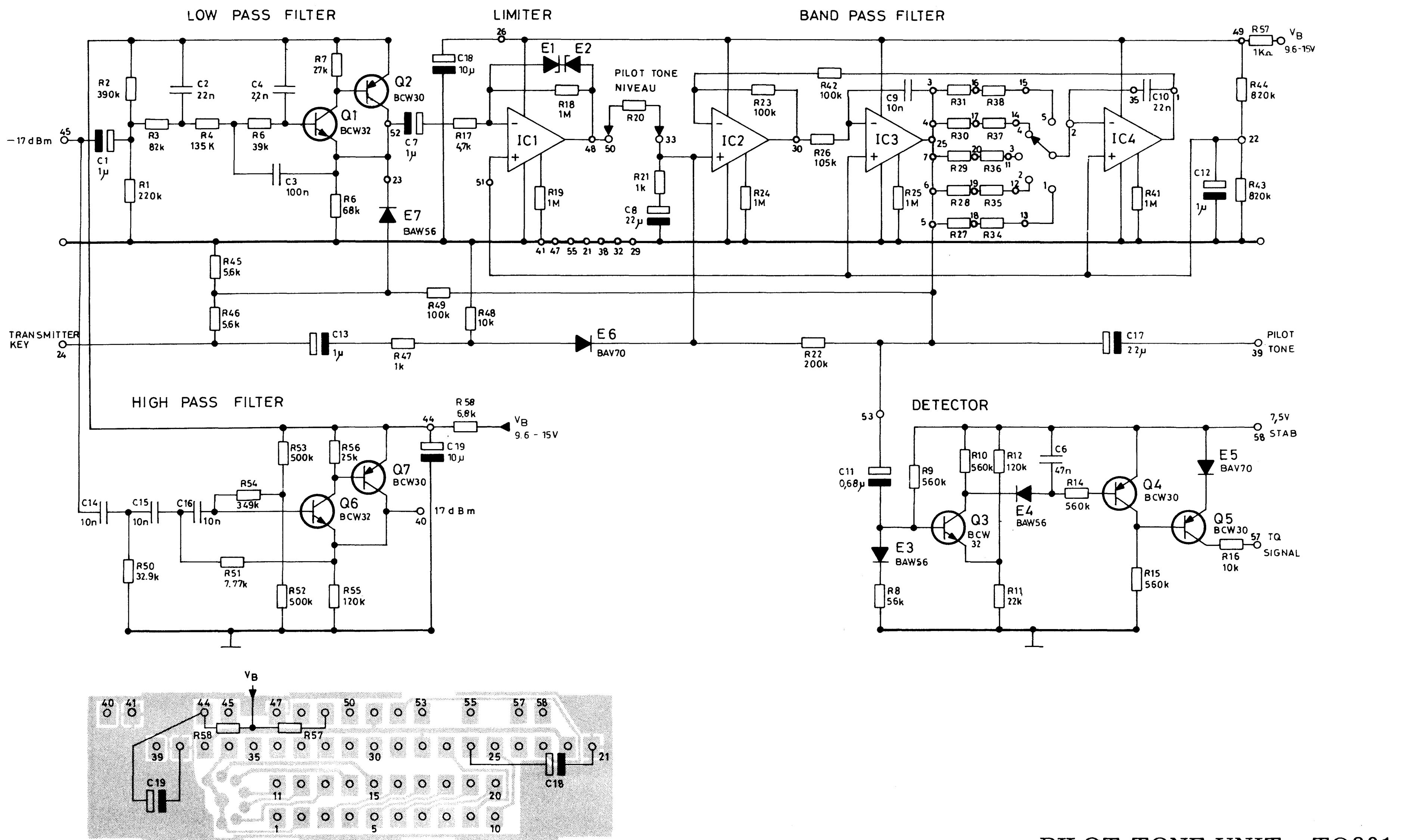
Module	Terminal	Function
AA801a	1	AF Input
	2	Chassis
	3	Volume Top
	4	Chassis
	5	AF Mute
	6	-
	7	Chassis
	8	AF output
	9	+ 11V RX
	10	Volume chassis
	11	Volume arm
	12	7.5V RX
SQ801a	1	Signal input
	2	Chassis
	3	SQ Adj.
	5	SQ Adj.
	6	Chassis
	7	TQ signal
	8	Mute signal
	9	SQ cancel
	10	+ Battery
	11	Chassis
	12	7.5V RX
VR801	1	Chassis
	2	RX Gate
	3	+ 11V RX
	4	7.5V RX
	5	Chassis
AA802	1	AF out
	2	+ 7.5V TX
	3	Chassis
	4	Tone input
	5	MC Blocking
	6	Chassis
	7	MC gain adj.
	8	MC input

Module	Terminal	Function
FN804	1	AF input
	2	Chassis
	7	Mod. out
	8	+ 7.5V TX
	9	Chassis
PM811	1	+ 7.5V TX
	2	RF input
	4	Mod. input
	5	Chassis
	6	+ 7.5V TX
	8	Chassis
	10	RF output
FD811	1	Chassis
	2	Rf output
	3	Chassis
	4	RF input
	5	+ 7.5V TX
	6	Chassis
FD812	1	Chassis
	2	RF output
	3	Chassis
	4	RF input
	5	+ 7.5V TX
	6	Chassis
FD813	1	Chassis
	2	RF output
	3	Chassis
	4	RF input
	5	+ 7.5V TX
	6	Chassis
BP811	1	Chassis
	2	RF input
	4	Chassis
	5	Rf output
PA811a/813	1	RF output
	2	Chassis
	10	+ 11V TX
	16	ADC voltage
	17	Chassis
	19	Rf input

Storno

Module	Terminal	Function
PA812a/814	1	RF input
	2	Chassis
	6	11V TX
	10	11V TX
	16	RF output
	17	Chassis
	18	RF to RC811
	19	+ 11V RX
	20	+ 10V TX
AD801	1	+ 10V TX
	2	ADC voltage
	3	7.5V TX
	4	ADC adj.
	5	+ 11V TX
	6	Chassis
VR801	1	Chassis
	2	TX Gate
	3	+ 11V TX
	4	7,5V TX
	5	Chassis

Module	Terminal	Function
TB802	1	7.5V TX
	2	RX Gate
	3	- Battery
	4	ADC Voltage
	5	Loudspeaker
	6	Pilot tone
	7	TX Gate
	8	Vbatt. Fused
	9	+ Battery
	10	+ 11V TX
	11	+ 7.5V Tx
	12	SQ Cancel
	13	RC Test point
	14	21.4MHz Test input
	15	- Battery
	16	- 17dBm Discrim.



PILOT TONE UNIT TQ801a

D401.804/2

Storno

TYPE	Nº	CODE	DATA
TQ801a		10.2882-01	Pilot tone receiver/transmitter
		10.2971-01	CH808a Chassis
		14.0043-01	Subassembly; Filters, Limiter, Detector
		14.0047-01	Subassembly } Bandpass filter
		14.0049-01	Subassembly } Bandpass filter
		15.0039-01	Subassembly } Bandpass filter

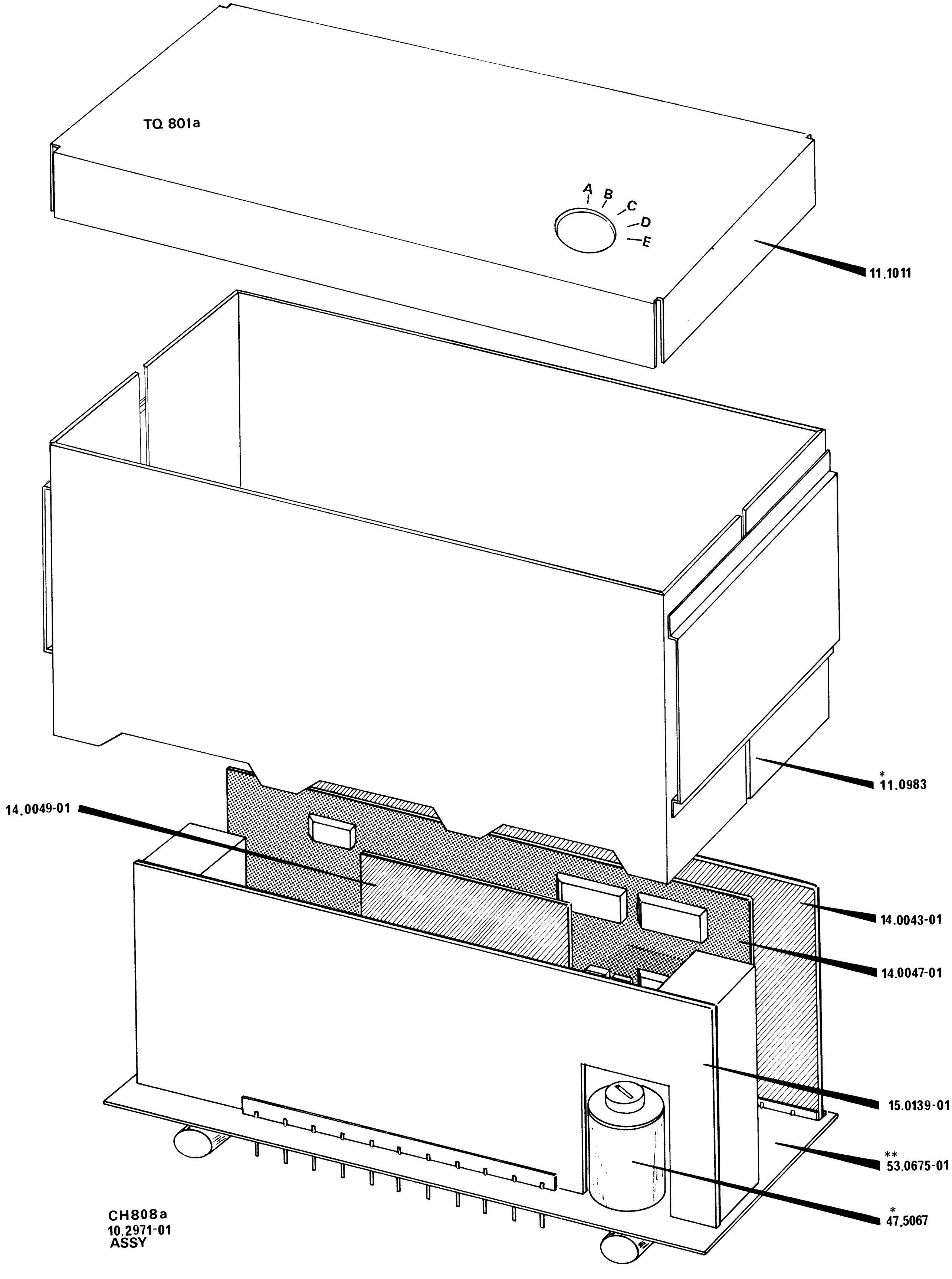
Storno

TYPE	Nº	CODE	DATA

PILOT TONE UNIT TQ801

X402.262

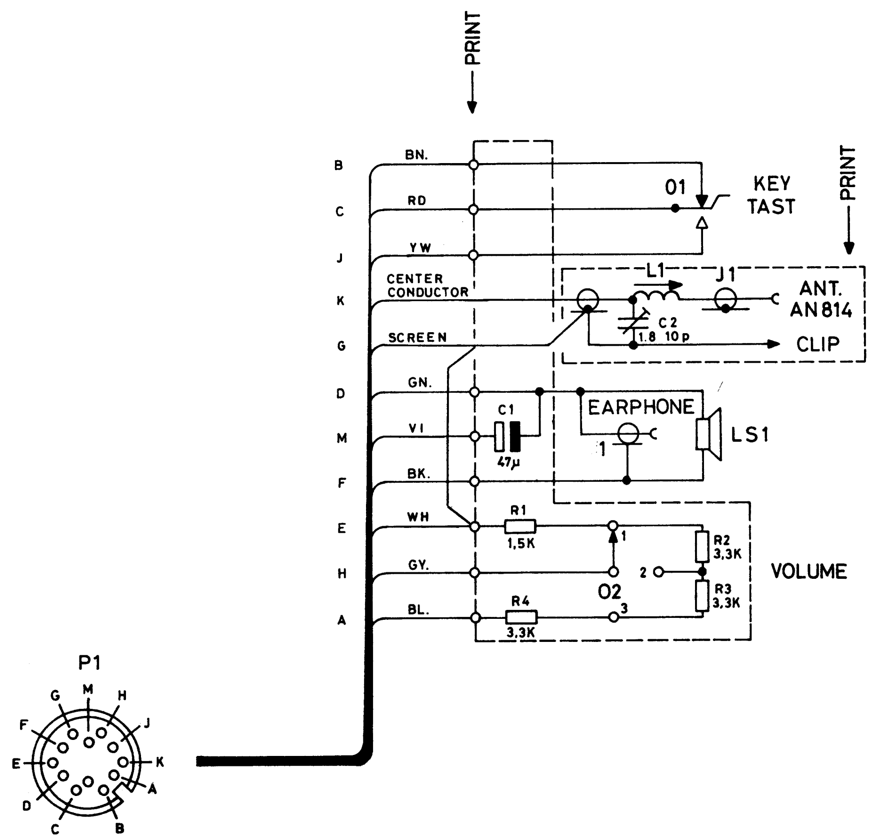
Storno

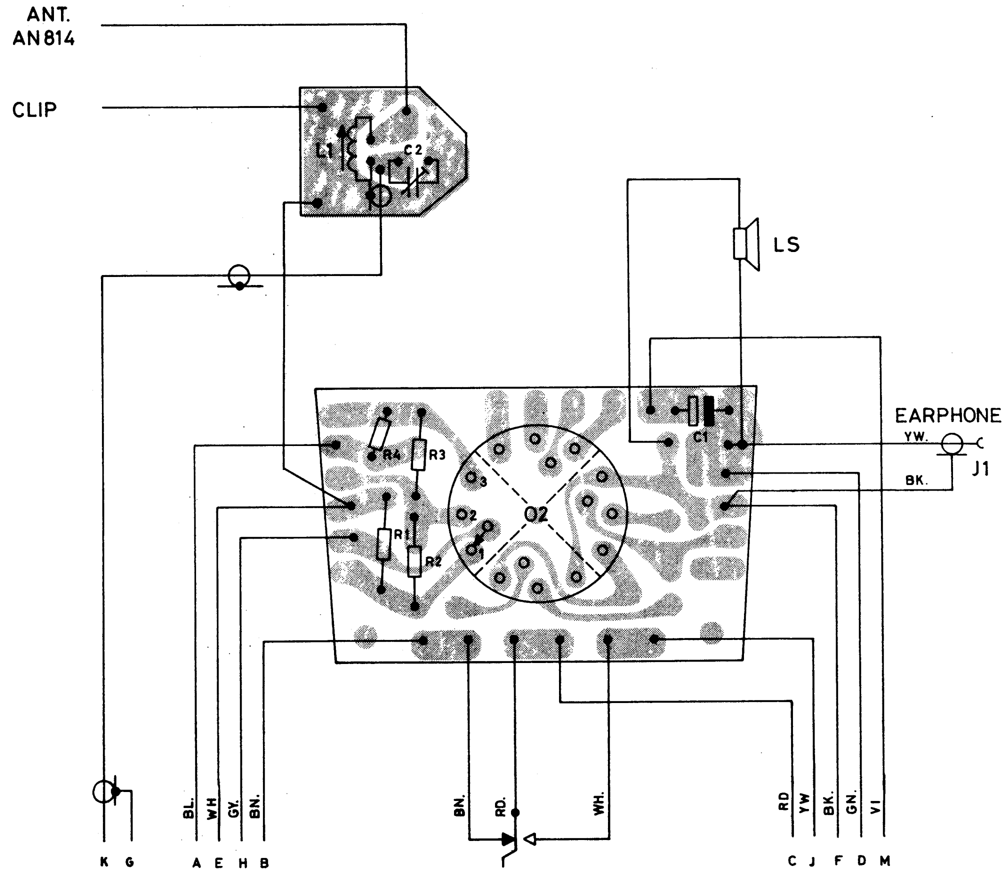


PILOT TONE UNIT TQ801a

Mechanical Lay-out

Storno





CONTROL UNIT CB 811

D.402.169/5

Storno

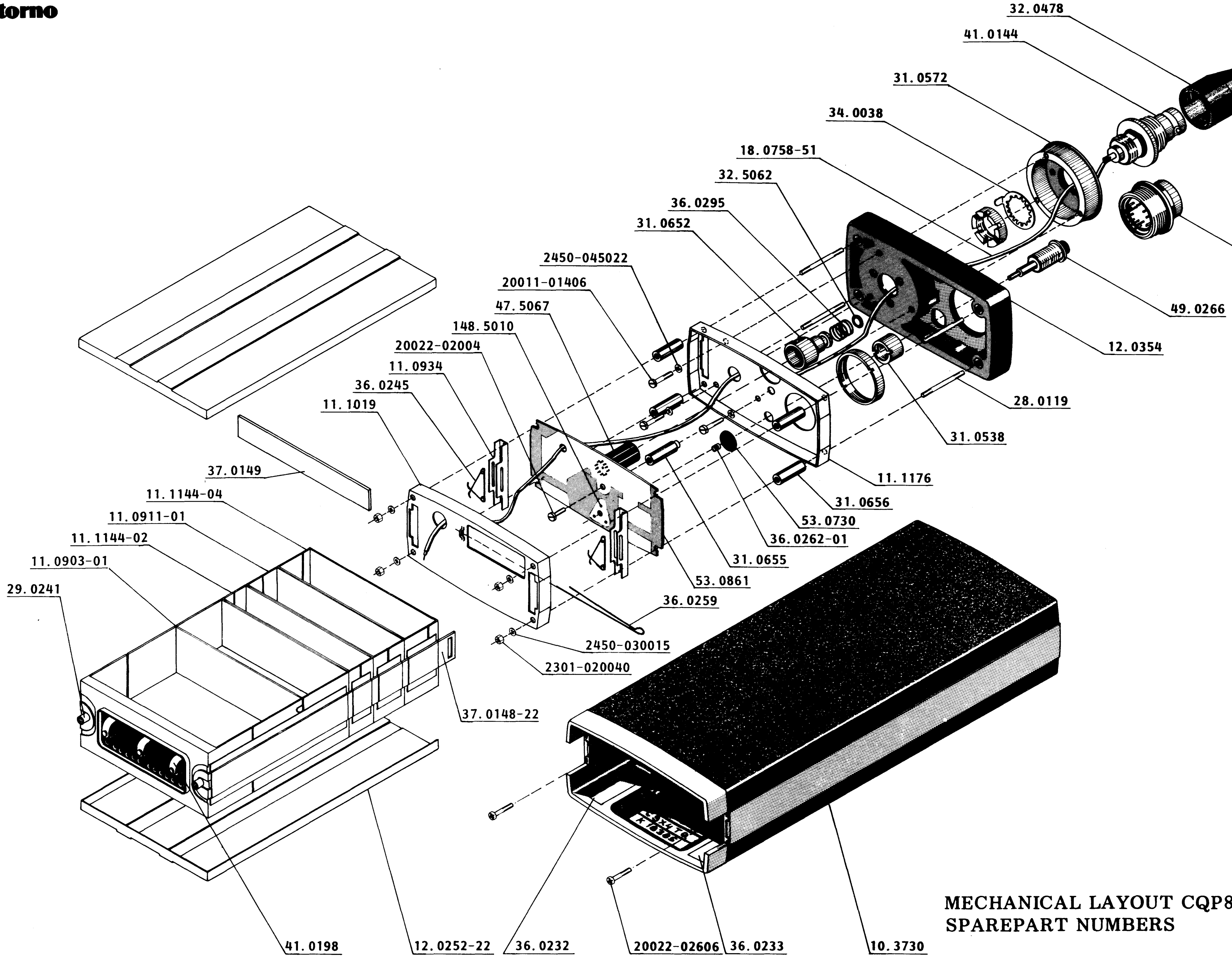
TYPE	Nº	CODE	DATA
CB811		10.3245-00	Control Unit
	C1	73.5149	47 µF 20% tantal 16V
	C2	78.5048	1.8 - 10 pF trimmer 300V
	R1	80.5051	1.5 KΩ 5% carbon film 0.1W
	R2	80.5052	1.8 KΩ 5% " " 0.1W
	R3	80.5055	3.3 KΩ 5% " " 0.1W
	R4	80.5059	6.8 KΩ 5% " " 0.1W
	L1	61.1314	Coil
	O1	47.0621	Switch; key
	O2	47.5072	Switch; volume
	J1	41.5160	Connector
	P1	41.0157	Connector
	LS	96.5086	Microphone

Storno

TYPE	Nº	CODE	DATA

CONTROL UNIT CB811

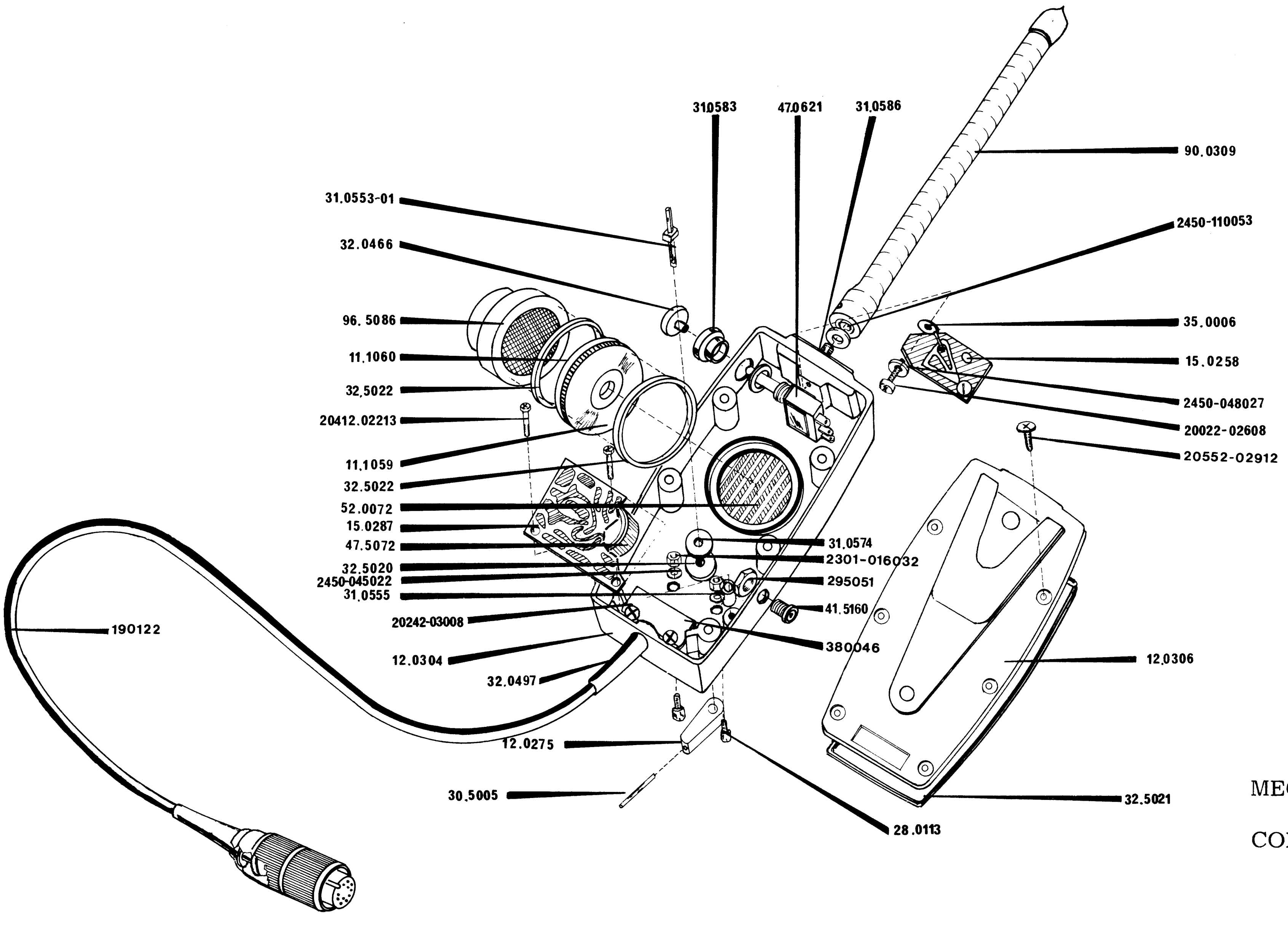
X402.260/2



MECHANICAL LAYOUT CQP814 1C9x4TQ
SPAREPART NUMBERS

M405.095

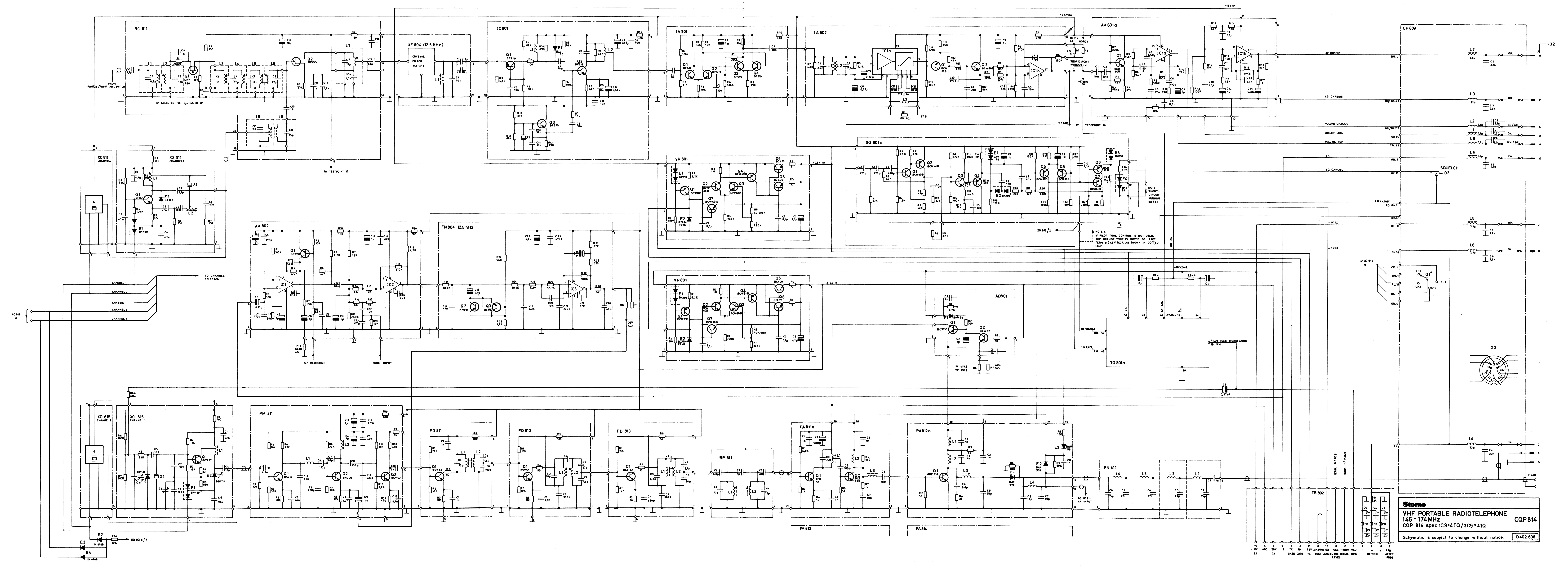
Storno



MECHANICAL LAY-OUT

CONTROL UNIT CB811

M405.066/4


Storno
VHF PORTABLE RADIOTELEPHONE
146 - 174 MHz
CQP 814 spec 1C9×4TQ/3C9×4TQ
CQP814
Schematic is subject to change without notice.
D402.606