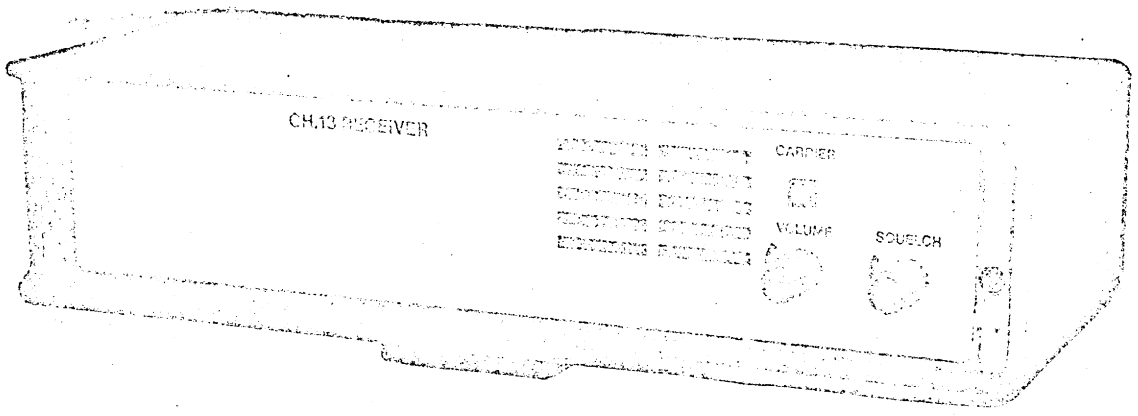
SR 24



INSTRUCTION MANUAL

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5-12-77

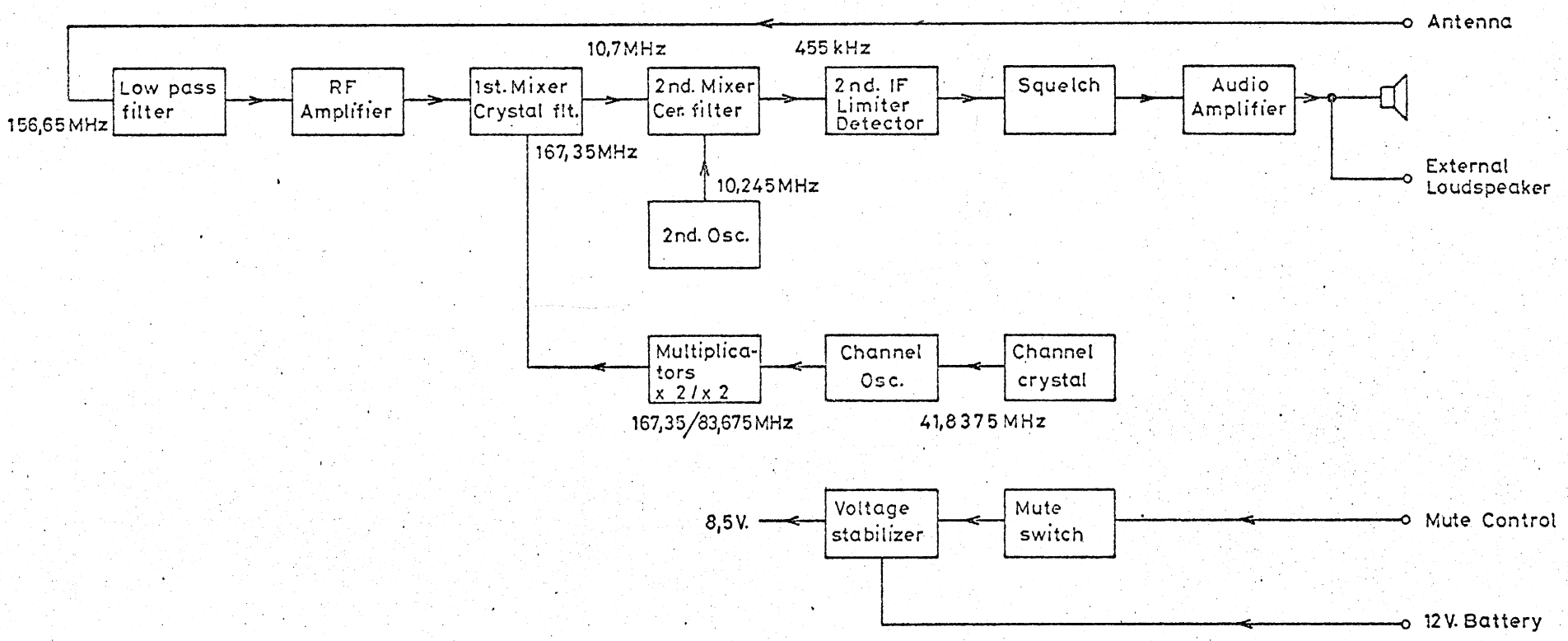
SR24 VHF RECEIVER SPECIFICATION (CHANNEL 13)

GENERAL

FREQUENCY RANGE	156,0 - 157,4 MHz
CHANNELS	1 (13)
CHANNELS SPACING	25 KHz
CRYSTALS	1 CRYSTAL PER CHANNEL
TEMP. RANGE	$-20^{o}C$ TO $+50^{o}C$
FREQUENCY STABILITY	$\pm$10 PPM
SUPPLY VOLTAGE	$\pm$12V BATTERY (TESTVOLTAGE 13,6V)
RF IMPEDANCE	50Ω
OPERATING CONTROLS:	VOLUME AND ON/OFF
	SQUELCH (ADJUSTABLE)
	CARRIER LAMP

RECEIVER

SENSITIVITY	$\leqslant$0,5 μV $\frac{1}{2}$ EMF 12 dB SINAD
-	$\leqslant$0,7 μV $\frac{1}{2}$ EMF 20 dBQ
SQUELCH TRESHOLD SENSITIVITY	$\leqslant$SENSITIVITY MEASSURED
- LIMIT -	$\leqslant$2 μV $\frac{1}{2}$ EMF
ACCEPTANCE BANDWIDTH	$\geqslant$ $\pm$7,5KHz
SELECTIVITY	$\geqslant$ $\pm$70 dB
SPURIOUS RESPONSE	$\geqslant$ 70 dB
INTERMODULATION I AND II	$\geqslant$ 66 dB
AUDIO OUTPUT POWER	$\geqslant$ 2,5W (1W IN INTERNAL LOUDSPEAKER
DISTORTION	$\leqslant$ 10% AT 2,5W
AUDIO FREQUENCY RESPONSE	+2 TO -8dB FROM 6dB/OCT
HUM AND NOISE	$\geqslant$ 50dB SQUELCHED
- - - -	$\geqslant$ 35dB UNSQUELCHED



					MALFORHOLD —	MATERIALE	FINISH
						DIMENSION	LAGER NR.
					TITEL BLOCK DIAGRAM CHANNEL 13 RECEIVER SR24		UDSTÅTTER
							TEGN. NR. SL. AF 721 – 0035
/	11.3.75	GBC			STANDARD ELECTRIC A/S GLOSTRUP		GODKENDT AF
UDG.	DATO	TEG.	KTR.	GODK.			

FUNCTIONAL DESCRIPTION

RF BOARD UNIT 3

Refer to circuit diagram and assembly drawing

The rf amplifier V- 01 is a field-effect transistor with double-tuned circuits at the input and at the output. The tuned circuits are provided with trimmers for alignment. Tuning between the simplex channel and duplex channel bands is achieved through varicaps D- 01 to D- 04, which are matched as a quartet.

The varicaps are biased + 8 V on duplex channels via resistor R- 08 and trimmer potentiometer R- 01. On simplex terminal Pin 7 is closed to ground from the si/du switch (transistor V- 04 on the AF-OSC. board), reducing the bias to a value set by potentiometer R- 01. Bias reduction is associated with an increase of capacitance, and the combination C- 08 + D- 01, therefore, tunes L- 01 to a lower frequency (the differential variation is 4.6 MHz). The operation is similar on all four tuned circuits.

Field effect transistor V-. 02 operates as 1st mixer with signal input to the gate terminal and the 1st oscillator signal injected across the source resistor R- 10. The tuned circuit at the drain terminal consists of coil L- 05 and capacitors C- 18/C-.19. Capacitor C- 19 matches to the 10.7 MHz crystal filter input.

The 1st amplifier employs cascade amplifier V- 03/V- 04 in the first stage. The collector circuit consists of coil L- 07 and capacitors C- 30 - C- 31 to match the output to integrated circuit IC- 01.

IC- 01 operates as IF amplifier, 2nd oscillator and 2nd mixer. As an oscillator, the injection frequency is controlled by quartz crystal Y- 01 with frequency adjusting trimmer capacitor C- 05. 2nd IF frequency is 455 KHz and is taken from terminal 6 to L- 14 which is a matching inductance to the 455 KHz ceramic filter.

The ceramic filter adds to the selectivity of the receiver and drives the 2nd IF amplifier, integrated circuit IC 02. This block simultaneously performs the task of a limiter and a frequency discriminator. The discriminator function requires external tuned circuit L- 15/C- 38, tuned to 455 KHz.

Audio output is taken from terminal 1 to Pin 9 via R- 23. The IC circuit is actually an emmitter follower at the output, and because of this the dc potential is about + 3 V - this is of importance for the squelch function.

Refer to circuit diagram and assembly drawing

The oscillator V- 11 operates with grounded collector and a series resonant quantz crystal in a network from base to ground. Feedback from emitter to base is obtained via C-43
The frequency of the quartz crystal in the base-to-ground path can be pulled by trimmer capacitor adjustment, and an inductance coil (L-07) in series, in series
provides compensation for the frequency offset, which is associated with the series capacitor. Oscillator output is taken from the emitter resistor R-49 to 1st doubler V- 01, The oscillator output is multiplied by two in the 1st multiplier V- 01 and once more doubled in the 2nd multiplier V- 02. This stage is tuned to the center of two bands, separated by 4.6 MHz, through matched varicaps D- 01 and D- 02. The frequency of the duplex channel band is higher, and therefore a large bias is applied to the varicaps on duplex from V- 04.
Trimmer potentiometer R- 15 adjusts the increase of capacitance on simplex, by setting the lower voltage level associated with higher varicap capacitance.

SQUELCH CIRCUIT

Capacitor C- 21 essentially passes noise signal to amplifier V- 09 which is provided with a tuned circuit L- 06/C- 23 in the collector. The voltage across the tuned circuit is rectified in D- 14 and a positive voltage appears at the output, charging capacitor C- 25.

Transistor V- 10 is a pnp transistor whose base-emitter voltage - in the absence of noise - is determined by the voltage drop across trimmer potentiometer R- 36. The voltage drop is caused by the current which always flows through transistor V- 09. Because of this V- 10 conducts under normal conditions, i.e. when a signal is received and its noise content is minute. Consequently the voltage across collector resistor R- 37 is high (1-state), and forward-biasing switch diode D- 16, the cathode of which is at approximately + 3 V from the emitter follower output of IC- 02. Audio signals are thus passed to the audio amplifier.

When the amount of noise increases, due to a weak transmission or no signal being received, the positive output voltage from D- 14 counteracts the negative base-emitter voltage of V- 10, and finally affects a complete cut-off. This implies a low voltage across R- 37 and D- 16 becomes reserve-biased - no audio signals are passed to the audio amplifier. The squelch trip point is set by R- 36 to a convenient level.

AUDIO POWER AMPLIFIER

The audio signals from the detector are brought to Pin 12 and pass the squelch diode switch D- 16 (now assumed to be conducting to blocking capacitor C- 31. The RC-filter after the preset gain potentiometer R- 40, capacitor C- 40 and R- 41 privides the 6dB/octave de-emphasize response.
The power amplifier is an integrated circuit type with W output into 4 ohms. The amplifier is boot strapped to allow ground reference for the loudspeaker.

MOTHER BOARD UNIT 57

Refer to assembly drawing

The mother board provides the interconnections between the plug-in PC boards.

CONTROL BOARD UNIT 58

Refer to circuit diagram and assembly drawing

The control board mainly houses all external controls. The built-in loudspeaker and the optional external loudspeaker audio level is controlled by volume control R-

The voltage stabilizer consists of a series regulator IC-01 and reference zener diode D-05 . The output voltage is nominally +8,5 V

The transistor V02 operates as s switch controlled from the mute input control via transistor V01.

The transistor V01 is normally biased from the divider R01 and R02,i.e. the base is at 1-state. However, when receive is to be prevented (during transmission from related transmitters), the mute input is set to ground causing 0-state to appear on basic of V01 , switching off V02.

The battery supply line filter L01, L02, C04, and C05 together with diode D01 provides protection from transients.

TROUBLESHOOTING

GENERAL

The first step in troubleshooting a defective radio set is to isolate the fault to a particular section or assembley. The second step is to localize the fault or defective part responsible for the trouble. Some faults, such as burned-out resistors, arcing and short circuits may be found through visual inspection. However, the majority of problems will have to be located by logical troubleshooting procedures, including checking stage output and DC voltages.

D.C. voltages and significant signal levels are given in this chapter along with necessary set up procedures. Tests are arranged in logical sequence to facilitate effective troubleshooting. Both DC and AC levels may deviate to some extent from the nominal values given, expecially if the power source has a voltage different from the nominal rated input voltage of the set. Some voltages are affected by control settings, and all voltages may vary by as much as the tolerance of the components in the circuit. These variations are to be expected and are of no major consequence.

Paragraph 6.3 provides a generalized troubleshooting procedure to help in locating the faulty functional section and in solving some simple problems.

PRECAUTIONS

Following are some general rules to observe in troubleshooting the set. Due to the wide use of

transistors and printed circuit boards, it is suggested that these rules be observed closely to prevent damage and to aid in troubleshooting.

1. In solid state circuits, the resistances and impedances are generally of much lower values than in the tube type circuits. A discrepancy of a few ohms can affect performance. Also, transistors can be damaged by high current or high voltage ohmmeter circuits. Therefore, use only the low resistance ranges of the ohmmeter and use a meter with a sensitivity rating of 20Kohm/volt or greater to make accurate measurements and to avoid damaging transistors or integrated circuits.

2. Transistors are best checked in the circuit, using AC and DC voltage indications for the troubleshooting. AC signal levels are given in the remaining paragraphs of this chapter together with test setup information. Be sure to check the emitter resistor voltage drop and the base bias. Change in transistor bias may be causing a problem if a resistor has been overheated gone open circuit, changed value, shorted.

3. A transistor can be checked out of the circuit with a sensitive ohmmeter as follows:

   To check a PNP transistor, connect the positive lead of the ohmmeter to the base of the transistor, connect the negative lead to the emitter and then to the collector. Generally a resistance reading of 50 kohm or more should be obtained in each case. Reconnect the meter with the negative lead to the base and the positive lead to the emitter. A resistance of 500 ohm or less should be obtained. When the positive lead is connected to the collector,

a value of 500 ohms or less should likewise be obtained. With the positive lead on the collector and the negative lead on the emitter, the resistance should be high.

Similar tests are made on an NPN transistor, and in that case should produce similar results with opposite polarity. With the negative lead on the emitter or collector, the resistance should be high. With the positive lead on the base and the negative lead on the emitter or collector, the resistance should be low. With the negative lead on the collector and the positive lead on the emitter, the resistance should be high.

NOTE

If a transistor is found defective, make certain that the circuit is in operating order before installing a replacement transistor. If the malfunction is not corrected, putting in another transistor will most likely result in burning out the new component. Do not depend upon fuses to protect transistors. Never remove or replace a semiconductor device with the voltage applied. Transients thus produced can damage them.

4. Do not use grounded test instruments with sets operated from positive ground systems, since a ground connection to a line can short the power source. If necessary, completely isolate the set from the ground before connecting test equipment.
5. Care must be exercised, when checking transistor circuits, not to short the leads to the case or surrounding circuits. It is usually convenient to use the lead of a resistor connected to a transistor element as a test point.

This is preferable to trying to get at the transistor lead itself.

6. The radio was accurately aligned at the factory. Many of the adjustments are critical, and are not necessarily adjusted for maximum output indication. Some require special test equipment and test set-ups. Random adjustment of controls in "optimizing performance" should be avoided. Alignment should be performed only when necessary after repair or accidential disturbance

7. The preferred power source for a DC power supply unit is a fully charged battery capable of the current drain required. Observe polarity when making the connection. If a battery eliminator is used in place of a battery, it must have no ripple, since the transistor circuits of the set operate directly from the source of power. Good voltage regulation is necessary. The power switch on the set should be turned off before the battery eliminator is turned on or off to prevent transient voltages from damaging transistors or capacitors which are sensitive to excess voltage.

TROUBLESHOOTING PROCEDURE TO LOCATE FAULTY CIRCUIT BOARD

RECEIVER FAILS TO OPERATE

Set squelch control in off position. (Volume control fully clockvise). When no noise is heard in the loudspeaker or telephone, check the DC voltages and the audio amplifier.

On test point 3 on the AF- and multiplier board, the DC voltage is normally 8,3 V and on Pin 12 the reading should be 12,5 V. Connect a VTVM across the loudspeaker and inject a 1kHz 120 mV signal from an audio generator via 0,1 µFcapacitor to Pin 12 on the AF- and multiplier board.The reading on the VTVM should be 2,8 V.

Check the oscillator injection on test point 2 on the RF board, normal reading is 350 mV. Inject a 10 mV RF signal modulated with 1kHz, 3,3kHz deviation, to the antenna connector and measure the audio signal after the discriminator on Pin 9. Normal reading is 120 mV. Reduce the signal level and check the sensitivity, for 20 dB S/N ratio measured across the loudspeaker. This should be around 1uV EMF.

TROUBLESHOOTING PROCEDURE TO LOCATE FAULTY COMPONENT

MULTIPLIER CIRCUIT:
Check the following DC voltages(AVO-meter):

Pin 1 supply voltage	8,5 V
- 3	7,8 V
V 201 base	1,4 V
V 201 emitter	0,7 V
V 201 collector	8,5 V

V 202 base	0,7 V
V 202 emitter	1,1 V
V 202 collector	8,5 V
V 203 base	4,1 V
V 203 emitter	3,4 V
V 203 collector	8,5 V
Pin 2	0,1 V

Check the RF levels are:

Pin 17	350 mV
- 15	180 mV

SQUELCH CIRCUIT:

Check the following DC voltages:

V 209 base	2,3 V
V 209 emitter	1,7 V
V 209 collector	7,1 V
V 210 base	7,9 V
V 210 emitter	8,4 V
V 210 collector	0,45 V

Check the noise levels with an oscilloscope:

Pin 12	1,0 Vpp
Test point 5	2,5 Vpp

Set squelch switch in off position and check that the DC voltage on test point 4 is 8,4 V.

AUDIO AMPLIFIER

Check the following DC voltages:

IC 201 Pin 1	7,55 V
- - - 2	0,0 V
- - - 3	0,0 V
- - - 4	0,0 V
- - - 5	0,0 V
- - - 6	0,7 V
- - - 7	0,02 V
- - - 8	1,4 V
- - - 9	0,0 V
- - - 10	6,0 V
- - - 11	0,0 V
- - - 12	13,5 V
- - - 13	0,0 V
- - - 14	13,6 V

RF BOARD

Connect the board to the set via an extension board,

Check the following DC voltages:

V 301 gate	0,0 V
V 301 source	0,4 V
V 301 drain	8,4 V
V 302 gate	0,0 V
V 302 source	1,6 V
V 302 drain	8,4 V
V 303 base	5,7 V
V 303 emitter	4,5 V
V 303 collector	8,4 V
V 304 base	2,1 V
V 304 emitter	1,4 V
V 304 collector	4,5 V
IC 301 Pin 1	5,4 V
- - - 2	2,7 V
- - - 3	0,0 V
- - - 4	2,2 V
- - - 5	5,3 V
- - - 6	8,4 V
- - - 7	8,4 V
- - - 8	8,4 V
IC 302 Pin 1	4,2 V
- - - 2	3,3 V
- - - 3	0,0 V
- - - 4	1,3 V
- - - 5	1,3 V
- - - 6	1,3 V
- - - 7	0,0 V
- - - 8	0,0 V
- - - 9	0,2 V
- - - 10	1,4 V
- - - 11	2,7 V
- - - 12	3,3 V
- - - 13	8,3 V
- - - 14	4,9 V

- 7 - 0,1 - simplex -

Check that the second oscillator output and frequency is:

Test point 3	10,245MHz±100Hz
- - -	≥ 700 mV

Connect a signal generator modulated with 1KHz, 3,5KHz devation to the antenna connector and tune to the selected channel. Set input RF level to 10mV and check the audio output:

Pin 9	≥ 120 mV

Reduce input level to 2o uV ½EMF and check the amplification.

Test point 4	≥ 80 mV

GENERAL

This chapter contains information on repair after the fault has been located. The first section contains some general information on repairing solid state equipment, and the remaining sections describe methods for removing, dismantling and replacing a particular assembly in the equipment.

Special handling of printed circuit boards and semiconductors is necessary to avoid damaging these parts. Use only a low-heat soldering iron when installing or removing soldered-in parts. When removing a part from a printed circuit board, first unbend the crimped leads. Use only the necessary amount of heat to unsolder the part. Clear excess solder from mounting eyelets, making sure that mounting holes are clear before installing the new part. When removing a transformer or other part having a several leads, straighten all leads first and then heat leads one at a time, working around the part, until the part can be gently rocked out. A solder sucker type of desoldering iron will greatly simplify removal of multiple lead components.

Note e.g. that a toothpick can be used to clear molten solder from holes.

When installing or removing a soldered-in semiconductor, grasp the lead, to which heat is being applied, between the solder joint and the semiconductor with long-nose pliers. This will dissipate some of the heat that would otherwise conduct into the semiconductor device from the soldering iron. Make certain that all wires soldered to semiconductor terminals have first been properly tinned so that the necessary connection can be made quickly. Excessive heat will permanently damage a semiconductor.

If the copper of the PC board is damaged, a piece of small buss wire can be used to bridge the gap. It is seldom necessary to replace a board because of a break in the copper.

Capacitors, resistors, and other two lead components can be replaced without removing the old leads, using the following procedure. This method is not as good as when removing old leads, but it can sometimes be used to advantage if access to the printed side of the boards is difficult.

a. Cut the component in half with diagonal cutter.

b. Crush the remains of the component, and break the pieces away from the leads. This will leave the maximum lead length remaining.

c. Bend the leads close to the board to form a terminal loop.

d. Connect the leads of the new component to the terminals formed by the old leads, and solder the connections. Be careful to trim the leads so they do not contact nearby leads.

ACCESS TO ASSEMBLY

All small signal units are placed on plug-in PC boards. Only four screws on the front panel have to be removed, and the cover can be lifted clear.

REMOVAL OF CONTROL BOARD

The control board is a plug-in PC board, and to get access to the board the front plate must be removed. Unscrew the knobs and the two screws securing the front plate to the mainframe, then the frontplate can be removed. To remove the control board, further 3 screws securing the board must be unscrewed.

ALIGNMENT

NOTE

Alignment should be done only when necessary, only for circuits necessary and only according to instructions. There are circuits which are adjusted for critical parameters and not merely maximum output.

When connecting grounded test equipment to the set, never operate a dc power system with a positive ground.

Alignment is possible only when an extension board is available.

CHANNEL OSCILLATOR FREQUENCY ALIGNMENTS

The frequency must be checked and adjusted, if required, after repairs which have affected the oscillator and 1st doubler circuits.

Connect a frequency counter to testpoint 2 on the RF board and read the multiplied frequency of the channel crystal selected (operate on receive).

NOTE

The frequency read on the counter is 10.700 MHz above the frequency of the assigned channel.

Align the frequency to the assigned frequency of the channel - with 10.700 MHz added - to better than ± 100 Hz with the trimmer capacitor of the crystal connected.

Connect a RF vtvm to the output from the doublers, using pins 15/16.

align for maximum signal, on L-202, C-208, and C-213.

CAUTION

The coupling between coils L-204 and L-205 has been adjusted at the factory using swept frequency technique. A displacement will affect the flatness and cause objectionable output variations.

RECEIVER ALIGNMENTS

AUDIO AMPLIFIER ALIGNMENT

Remove the AF- OSC. board and connect it to the set via the extension board.

Connect an audio generator via 0,1 uF to the top or R- 40, and an audio vtvm across the loudspeaker. Set the frequency to 1000 Hz.

Turn gain potentiometer R- 40 fully clockwise.

Switch on the receiver.

Increase the input signal to obtain 2,8 V rms output. The input signal should then be about 120 mv.

Check that clipping starts at about 3.0 V ac (with an oscilloscope connected across the loudspeaker when the input is increased.

Final adjustment of R- 40 is made when the RF unit is aligned.

SQUELCH ALIGNMENT,

Remove the AF-scanner board and connect it to the set via the extension board.

Connect an audio generator via 0,1 F to pin 12 and set the frequency to about 6.5 KHz.

Set potentiometer R- 36 midway.

Switch on the receiver with the squelch in operation.

Connect an oscilloscope to test point 5 and inject 50 mV from the generator. Vary the frequency to find resonance (6-7 KHz).

Reduce input signal to zero and measure the testpoint 5 voltage - correct value is + 8 V.

Increase the signal injected till the test-point 5 voltage drops to 0 V. The level should be 50 to 80 mV.

Final adjustment of R- 36 is made when the rf circuits have been aligned.

Remove the connections to pin 12, after the power has been switched off.

RECEIVER IF ALIGNMENTS, RF UNIT

Remove the RF board and connect it to the set via the extension board.

Connect a counter to test point 3 via a resistor of 1K ohm and a blocking capacitor of 10 nF.

Switch on the receiver and adjust the frequency to 10.245 MHz ± 100 Hz with trimmer capacity C-305.

Connect a VTCM to test point 3 and measure the signal level, which should be minimum 700 mV.

Switch off the receiver and remove the counter from test point 3.

Connect an oscilloscope to test point 4 to check the second IF to 455 KHz.

Switch on again and inject an unmodulated signal on the channel to the antenna. Set the signal level to obivate clipping of the amplifiers.

Aligh L 07 for max. response on the oscilliscope.

Switch off the receiver and remove the oscilloscope form test point 4. Connect the oscilliscope to pin 9 and switch on again.

Modulate the signal (with 1 KHz) to a deviation of ± 3,5 KHz and view the result at the oscilloscope.

Align L 15 for max. response. The peak to peak value should be more than 280 mV. During this measurement the input signal frequency must be tuned to the nominal frequency ± 100 Hz.

Connect a distortionmeter across the loudspeaker and reduce the input signal until 12 dB SINAD is obtained, Align L 05, L 06 and L 14 for maximum sensitivity.

NOTE

This concludes alignments of the I.F. and discriminator circuits.

RECEIVER RF CIRCUIT ALIGNMENTS

Remove the RP board and connect it to the set via the extension board.

Connect a distortion meter over the loudspeaker for SINAD tests.

Switch on the receiver. Modulate the generator with 1000 Hz, deviation ± 3.5 KHz.

Align C- 01, C- 02, C- 03, and C- 04 for maximum sensitivity.

Check the sensitivity figure, which should be 0,7 emf for 12 dB SINAD.

Decrease the input to about 0,6 uV emf and adjust squelch control R-236 just enough to allow the squelch to operate.

Increase the input signal to 100 nV and adjust R-240 on the AF-scanner board for 2,8 V rms across the loudspeaker.

Diagram no.	Description	Specification	Mfg. type no.	Mfg.	Part no.
AF-	Multiplier Unit 52				710-0463
C 01	Capacitor ceramic	2,2nF±10% High-k 100 V	2222/63003222	Philips	210-1513
C 02	Not assigned				
C 03	" "				
C 04	Capacitor ceramic	1nF±10% High-k 100 V	2222/63003102	"	210-1509
C 05	" "	22pF±2% N150 63 V	2222/63834229	"	210-1564
C 06	Capacitor ceramic	1nF±10% High-k 100 V	2222/63003102	Philips	210-1509
C 07	" "	2,7pF±0,25pF N150 250 V	9/0116,9	Ferropern	210-1053
C 08	" trimmer	2-6pF 250 V	10S-tvilo 06	Stetner	213-0000
C 09	" ceramic	3,9pF±0,25pF N150 63 V	2222/63833398	Philips	210-1555
C 10	" "	1nF±10% High-k 100 V	2222/63003102	"	210-1509
C 11	Capacitor ceramic	1nF±10% High-k 100 V	2222/63003102	"	210-1509
C 12	" "	3,9pF±0,25pF N150 63 V	2222/6383398	"	210-1555
C 13	" trimmer	2-6pF 250 V	10S-triko 06	Stetner	213-0000
C 14	" ceramic	1,5pF±o,25pF N150 250 V	9/0116,4	Ferroperm	210-1052
C 15	" "	22pF±2% N150 63 V	2222/63834229	Philips	210-1564
C 16	Capacitor ceramic	10pF±2% N150 63 V	2222/6383410	Philips	210-1406
C 17	" "	1nF±10% High-k 100 V	2222/63003102	"	210-1509

Diagram no.	Description	Specification	Mfg. type no.	Mfg.	Part no.
C 21	Capacitor polystyr.	2,2nF±5% 30 V	HS 7/C	Sutlex	211-0730
C 22	" "	0,22uF±10% 250 V	2222/34245333	Philips	211-1116
C 23	" "	68nF±20% 250 V	2222/54244638	"	211-1110
C 24	" ceramic	1nF±10% High-k 100 V	2222/63003102	"	210-1509
C 25	" tantalaan	3,3uF+50-20% 16 V	1 AG	ITT	214-0166
C 26	Capacitor ellyt	22uF+50-20% 25 V	EN 12,35	ITT	212-1202
C 27	" polyester	0,1uF±20% 250 V	2222/34244104	Philips	211-1105
C 28	" ceramic	1nF±10% High-k 100 V	2222/63003102	"	210-1509
C 29	" "	1nF±10% High-k 100 V	2222/63003102	"	210-1509
C 30	" tantalaan	3,3uF+50-20% 16 V	IAG	ITT	214-0166
C 31	Capacitor polyester	0,1uF±20% 250 V	2222/34244104	Philips	211-1105
C 32	" ellyt	100 uF+100-10% 16 V	EN 12,35	ITT	212-1201
C 33	" "	100uF+100-10% 16 V	EN 12,35	"	212-1201
C 34	" "	470uF+50-10% 16 V	KE	Frako	212-0611
C 35	" polyester	10uF±20% 250 V	2222/34244103	Philips	211-1100
C 36	Capacitor polystyr.	300pF±5% 30 V	HS 7/A	Suflex	211-0715
C 37	" polyester	0,33uF±20% 250 V	2222/34245334	Philips	211-1109
C 38	" ellyt	100uF+100-10% 16 V	EN 12,35	ITT	212-1201
C 39	" "	1000uF+50-10% 16 V	KE	Frako	212-0612
C 40	" polyester	0,1uF±20% 250 V	2222/34244104	Philips	211-1105

Diagram no.	Description	specification	Mfg. type no.	Mfg.	Part no.
C 41	Capacitor elly	100uF+100-10% 16 V	EN 12,35	ITT	212-1201
C 42	" ceramic	10nF+100-20% 40 V	2222/62902103	Philips	210-1323
L 01	Choke	3,3uH±10%	1587	Ferroperm	222-3050
L 02	Coil				710-0451
L 03	Choke	3,3uH±10%	1587	Ferroperm	
L 07	Coil				710-0450
L 04	Coil	710-0436			710-0436
L 05	Coil				763-1101
L 06	Coil pot.care				710-0452
R 01	Resistor carbon	22k ±5% 0,2 W	SBB 0207	Beyschlag	201-8572
R 02	" "	4,7k ±5% 0,2 W	"	"	201-8447
R 03	Resistor carbon	390 ±5% 0,2 W	SBB 0207	Beyschlag	201-8339
R 04	" "	47k ±5% o,2 W	"	"	201-8547
R 05	" "	4,7k ±5% 0,2 W	SBB 0207	"	201-8447
R 06	" "	180 ±5% 0,2 W	"	"	201-8318
R 07	" "	56k ±5% 0,2 W	"	"	201-8556
R 08	Resistor carbon	56k ±5% 0,2 W	SBB 0207	Beyschlag	201-8556
R 09	" "	15k ±5% 0,2 W	"	"	201-8515
R 10	" "	15k ±5% 0,2 W	"	"	201-8515
R 11	" "	1,5k ±5% 0,2 W	"	"	201-8415
R 12	" "	47k ±5% 0,2 W	"	"	201-8547

Diagram no.	Description	Specification	Mfg. type no.	Mfg.	Part no.
R 33	Resistor carbon	18k ±5% 0,2 W	SBB 0207	Beyschlag	201-8518
R 34	" "	1,2k ±5% 0,2 W	"	"	201-8412
R 35	" "	12k ±5% 0,2 W	"	"	201-8512
R 36	" trimmer	1k ±§% 0,2 W	1-9833 FN-Plahe	Preh	209-3302
R 37	" carbon	10k ±5% 0,2 W	SBB 0207	Beyschlag	201-8510
R 38	Resistor carbon	22k ±5% 0,2 W	"	"	201-8522
R 39	Not assigned				
R 40	Resistor trimmer	5k ±5% 0,1 W	60150-001	Preh	209-3347
R 41	" "	10k ±5% 0,2 W	SBB 0207	Beyschlag	201-8510
R 42	Not assigned				
R 43	Resistor carbon	33 ±5% 0,2 W	SBB 0207	Beyschlag	201-8233
R 44	" "	47 ±5% 0,2 W	"	"	201-8247
R 45	" "	220 ±5% 0,2 W	"	"	201-8322
R 46	" "	4,7k ±5% 0,2 W	SBB 0207	"	201-8447
V 01	Transistor silicon	BF 197		Philips	240-0537
V 02	Transistor silicon	BF 197		Philips	240-0537
V 03	" "	BF 197		"	240-0537
V 04	" "	BC 1476		"	240-0536

Diagram	Description	Specification	Mfg. type no.	Mfg.	Part no.
	Transistor			Philips	
	" "			"	
V 09	" "	BC 147b		"	240-536
V 10	" "	BC 327		"	240-0543
I 01	Integrated circuit	TBA641B11		SGS/Inotec	262-0016
D 01- 02	Diode variocap	12-BB105G		Motorola	232-5016
D 03- 04	" silicon	AA 143		ITT	232-2020
D 05- 08	" "	1N4148		Sesco	232-2005
D 09- 10	" "	AA 143		ITT	232-2020
D 11- 13	" "	14148		Sesco	232-2005
D 14	Diode silicon	AA 143		ITT	232-2020
D 15- 16	" "	1N4148		Sesco	232-2005
	Bead			Philips	220-4077
Z 02	Connector		617D21AHDEBL-704	Cannon	151-7704

Diagram no.	Description	Specification	Mfg. type no.	Mfg.	Part no.
					710-427
	RF print board unit 3				
C 01-. 04	Capacitor trimmer	2-6pF N033 250 V	10S-triko 06	Stettner	213-0000
C 05.	" "	4,5-20pF N750 160 V	CADsB	"	213-0014
C 06	" ceramic	2,2pF ±0,25pF N150 250 V	9/0116,9	Ferroperm	210-1054
C 07	" "	15pF±2% N150 63 V	2222/63834159	Philips	210-1562
C 08- 11	" "	3,9pF±0,25pF N150 63 V	2222/63833398	"	210-1555
C 12- 14	Capacitor ceramic	1nF±10% High-k 100 V	2222/63003102	Philips	210-1509
C. 15	" "	3,3pF±0,25pF N150 400 V	9/0116,9	Ferroperm	210-1005
C 16- 17	" "	3,3pF±10% High-k 100 V	2222/63003332	Philips	210-1515
C 18	" "	68pF±2% N150 63 V	2222/63834689	"	210-1570
C 19	" "	56pF±2% N150 63 V	2222/63834569	"	210-1569
C 20- 25	Capacitor polyester	0,1uF±20% 250 V	2222/34249104	Philips	211-1105
C 26- 28	" ceramic	10nF±100-20% High-k 46 V	2222/62903103	"	210-1523
C 29	" "	27pF±2% N150 63 V	2222/63834279	"	210-1574
C 30- 32	" "	150pF±2%N150 63 V	2222/63834151	"	210-1574
C 33	" polystyr.	470pF±5% 30 V	HS 7/A	Suflex	211-0739
C 34	Capacitor ceramic	4,7pF±0,25pF N150 63 V	2222/63833398	Philips	210-1556
C 35	" "	2,2pF±0,25pF N150 250 V	910116,9	Ferroperm	210-1054
C 36	" "	10pF±2% N150 63 V	2222/6383410	Philips	210-1406
C 37	" "	18pF±2% N150 63 V	2222/63834189	"	210-1563
C 38- 39	" polyst.	560pF±5% 30 V	HS7/A	Suflex	211-0740

Diagram no.	Description	Specification	Mfg. type no.	Mfg.	Part no.
C 40	Capacitor polyst.	2,2nF±5% 30 V	HS 7/A	Suflex	211-0739
C 41	" polyester	0,1uF±20% 250 V	2222/34244104	Philips	211-1105
C 42	" ellyt	100uF+100-10% 16 V	EN 12,35	ITT	212-1201
C 43	" tantalum	1,0uF+50-20% 35 V	TAG SEL	ITT	214-0167
C 44- 45	" ceramic	3,3nF±10% High-k 100 V	2222/63003332	Philips	210-1515
L 01- 03	Coil				763-1101
L 04	"				710-0436
L 05	"				710-0437
L 06	Not assigned				
L 07	Coil				710-438
L 08- 09	Coil	10uH±10%	1587	Ferroperm	722-3046
L 10- 11	Choke	3,3uH±10%	1587	"	222-3050
L 12	"	10uH±10%	1587	"	222-3046
L 13	"	100uH±10%	1587	"	222-5016
L 14	Not assigned				
L 15	Coil				710-0439
L 16	Choke	15uH±10%	1587	Ferroperm	220-3047
R 01	Resistor trimmer	10k 0,1 W lin.	60150-001	Preh	209-3348
R 02- 05	" carbon	56k ±5% 0,2 W	SBB 0207	Beyschlag	201-8556
R 06	" "	100 ±5% 0,2 W	"	"	201-8310

Diagram no.	Description	Specification	Mfg. type no.	Mfg.	Part no.
R 07- 09	Resistor carbon	10k ±5% 0,2 W	SBB 0207	Beyschlag	201-8510
R 10	" "	56k ±5% 0,2 W	"	"	201-8256
R 11	" "	5,6k ±5% 0,2 W	"	"	201-8456
R 12- 13	" "	3,9k ±5% 0,2 W	"	"	201-8439
R 14	" "	2,7k ±5% 0,2 W	"	"	201-8427
R 15	Resistor carbon	820 ±5% 0,2 W	SBB 0207	Beyschlag	201-8382
R 16	" "	18 ±5% 0,2 W	"	"	201-8218
R 17	" "	8,2k ±5% 0,2 W	"	"	201-8482
R 18	" "	1,2k ±5% 0,2 W	"	"	201-8412
R 19	" "	18k ±5% 0,2 W	"	"	201-8518
R 20	Resistor carbon	27k ±5% 0,2 W	SBB 0207	Beyschlag	201-8527
R 21	" "	3,3k ±5% 0,2 W	"	"	201-8433
R 22	" "	27k ±5% 0,2 W	"	"	201-8527
R 23	" "	560 ±5% 0,2 W	"	"	201-8356
V 01	Transistor FET	U1837E		Teledyne	240-1300
V 02	Transistor silicon	BF256L/A		Texas Instr.	240-0924
V 03- 04	" "	BF 196		Philips	240-0527
IC 01	Integrated circuit	LM 3028A		National	262-0014
IC 02	" "	LM 2111N		"	262-0015
D 01- 04	Diode variocap	12-BB105G		Motorola	232-5016

Diagram no.	Description	Specification	Mfg. type no.	Mfg.	Part no.
Q 01-L 06	Crystal filter/coil		HMC-10 M-3 B+10B10	Toyo	250-0008
Q 02-L 14	Ceramic filter/coil		TBF4 - 25A	Vernitron	255-0000
Y 01	Crystal	10,245 MHz		Croven	251-0002
Z 03	Connector		G17D21A4DEBL-704	Cannon	151-7704
	Bead			Philips	220-4077
	Coax cabel	50 18 cm & 5 cm			156-3006

Diagram	Description	Specification	Mfg. Type No.	MFG	Part No.
Control Print Board Unit 58.					
C01	Capacitor ellyt	470uF+50-10% 16 V	K E	FRAKO	212-0611
C02-C03	" polyester	0.33uF±10% 250 V	2222/34245334	PHILIPS	211-1109
C04	" ceramic	33pF ±2% N150 63 V	2222/63834339	"	210-1566
C05	" "	10nF +100-20% High-k 40 V	2222/62903103	"	210-1523
L01-L02	Choke	2,5 Wdg 4B1	4312/02036700	"	222-3053
R01-R02	Resistor carbon	47k±5% 0,3 W	SBB 0207	BEYSCHLAG	201-8547
R03	" "	100±5% 0,3 W	"	"	201-8310
R04	" "	1k±5% 0,3 W	"	"	201-8410
R05	Not assigned				
R06	Potentiometer + switch	10k 0,08 W log	63470-000	PREH	209-3360
R 7	Potentiometer + switch	2,5M 0,08 W log	63406-000	PREH	209-3361
R 8	Resistor carbon	100 ±5% 0,3 W	SBB 0207	BEYSCHLAG	201-8310
V01	Transistor silicon	BC147B		PHILIPS	240-0536
V 2	" "	BC327		"	240-0543
IC01	Integrated circuit	uA78L05AC, 5 V regulator		FAIRCHILD	262-0023

D 01	Diode zener	BZX70-C18 18 V 2,5 W		PHILIPS	232-1073
D02-D04	" silicon	1N4148		SESCO	232-2005
D05	" zener	ZPD 3,9 V 400 mW		I T T	232-1033
Z01	Plug	13 poles		CANNON	151-7701
LA01	Lamp	12 V 30 mA W2x4,6 d	2322	OSRAM	152-1070
	Lens	Yellow	3500206	ALWEGA	152-2344
	Lamp socket	standing W2x4,6d	4080021	"	152-2050
	Loudspeaker	8 ohm 2 W	E230 MT	PEERLESS	153-9020

Mother Print Board Unit 57.

C01-C02	Capacitor ceramic	10nF+100-20% High-k 40 V	2222/62403103	PHILIPS	210-1523
R01	Resistor carbon	100k ±5% 0,3 W	SBB 0207	BEYSCHLAG	201-3610
Z01	Socket	13 poles		AMPHENOL	151-7700
Z02-Z03	"	21 poles		"	151-7703
	Coax cable	50 ohm 6 cm			151-3006

Low Pass Filter Unit 59.

C01-C04	Capacitor ceramic	10pF ±2% N150 63 V	2222/63234109	PHILIPS	210-1360
C05-C06	" "	1nF +80-20% D 9000	SBFK5	STETTNER	210-0502
L01	Choke	0,1uH ±10%	1587	FERROPERM	222-3057

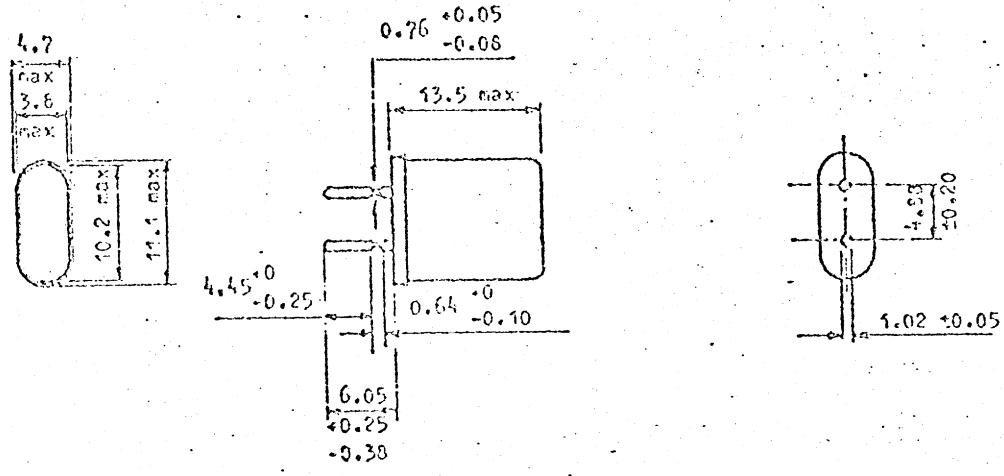
QUARTS CRYSTAL SPECIFICATION

1. General specification

The crystal holder shall meet the requirements of D.E.F. 5271 style K (USA type HC-25/U), unless otherwise specified.

2. Mechanical data

All dimensions in mm.



2.1 Environmental data

Applicable to E.S.R., level of drive, shock, vibration and climatic tests	MIL-C-3098C

3. Maximum ratings

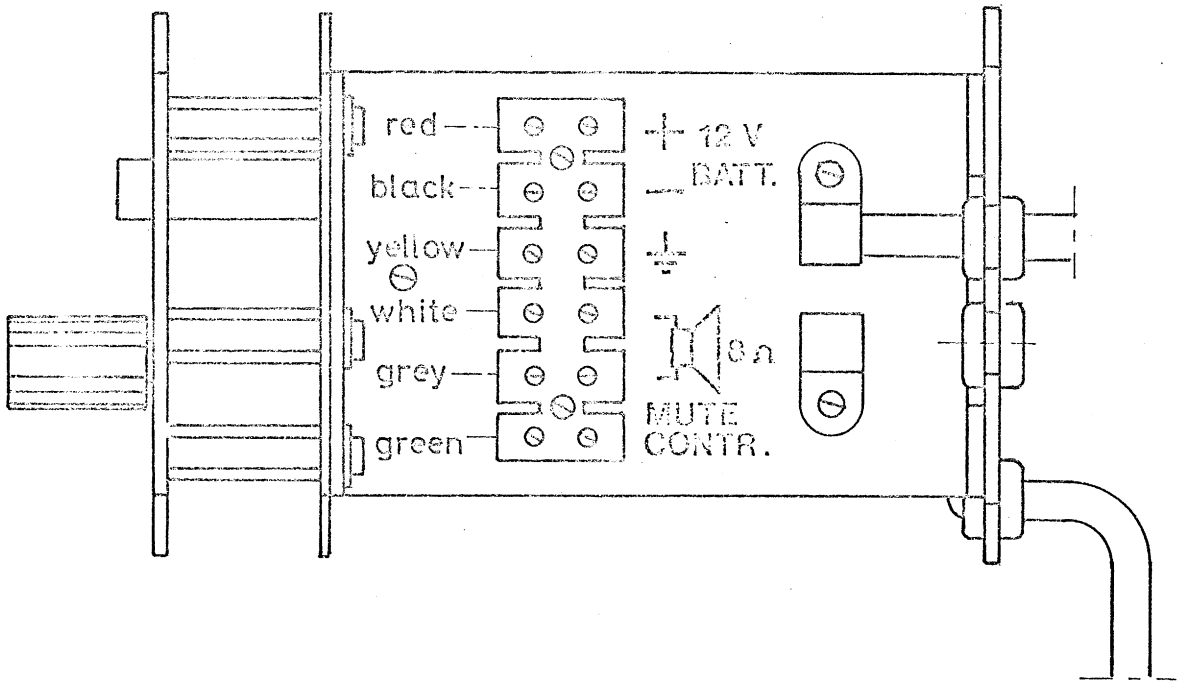
	Variant 1.	Variant 2.
Operating temperature range	-10 ... +60°C	-20 ... +60°C

4. Characteristics

Frequency range	41.750 - 43.494 KHz
Mode of operating	3rd overtone, AT-cut
Frequency tolerance at +25°C	0 ... + 20 ppm
Frequency tolerance within temp. ranges according to above	± 10 ppm rel. to freq. at +25°C
Series resonance	Series resistance <40 Ω
Power dissipation	<1 mV
Parallel capacitance C_o	<6 pF
Dynamic capacitance C_1	>1,4 mPF
Spurious response	<6 dB

5. Marking

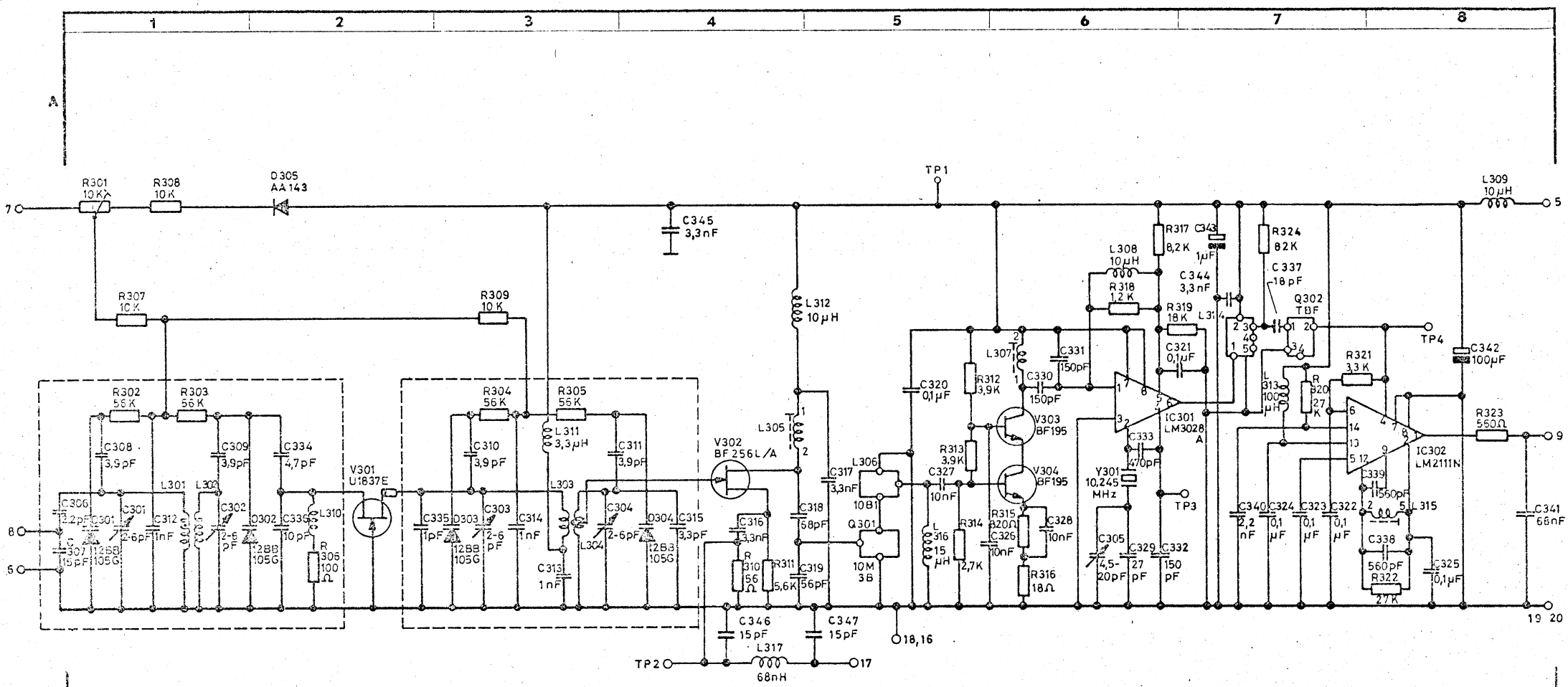
One side	701-0011
Other side	Manufacturer and crystal oscillating frequency
Top	Channel designator



SIDE VIEW OF SR 24
WITH COVER REMOVED

STANDARD ELECTRIC A/S
COPENHAGEN

769 -0007



1	27.9.74	G.B.C.					
DUG	DATO	SIGN	KONF	MTP	STA		

MALFORHOLD —	MATERIALE		FINISH
	DIMENSION		LAGER NR

TITEL Diagram f. RF board
Unit 3 STR 24 S.

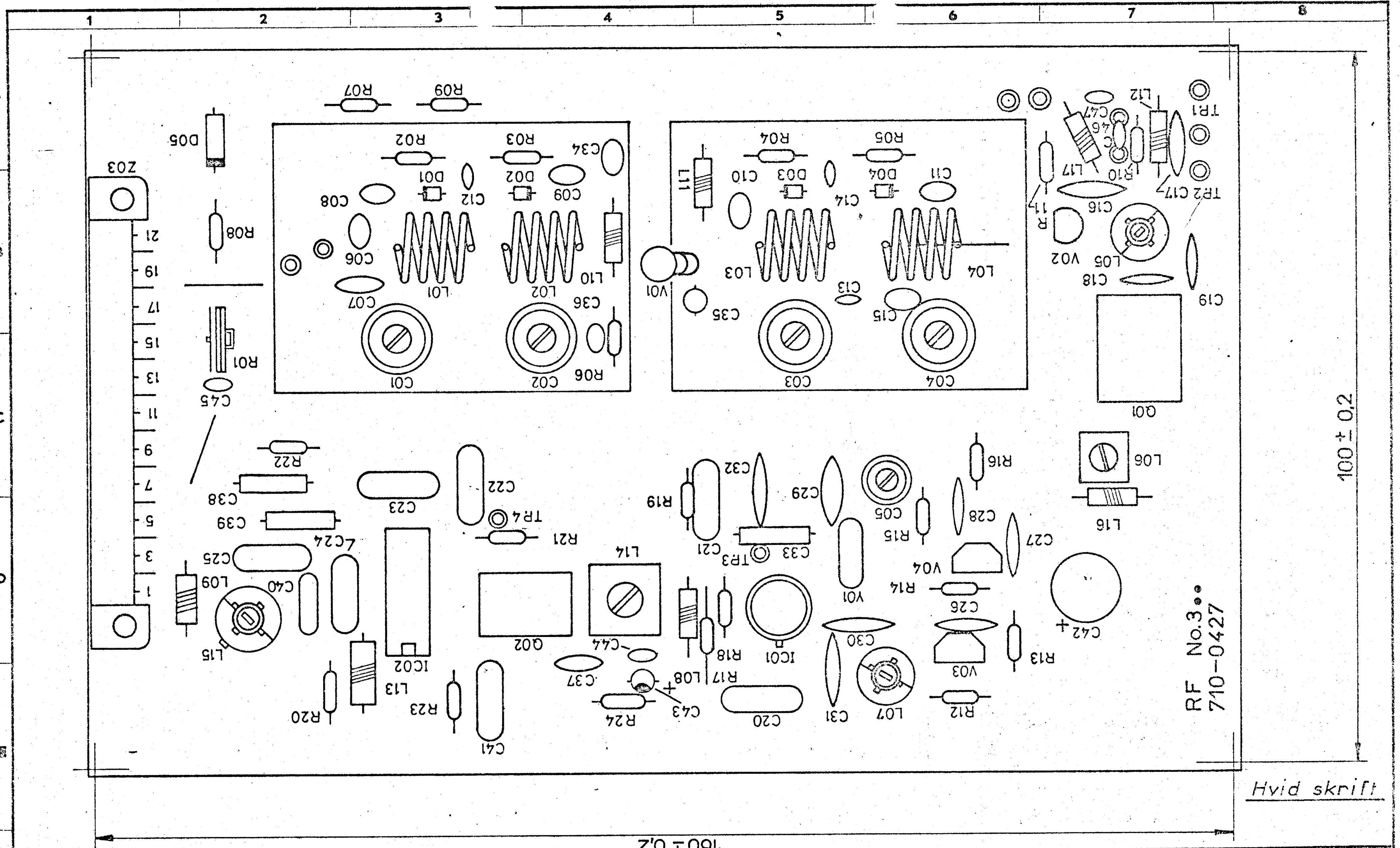
STANDARD ELECTRIC A/S
GLOSTRUP

ITT

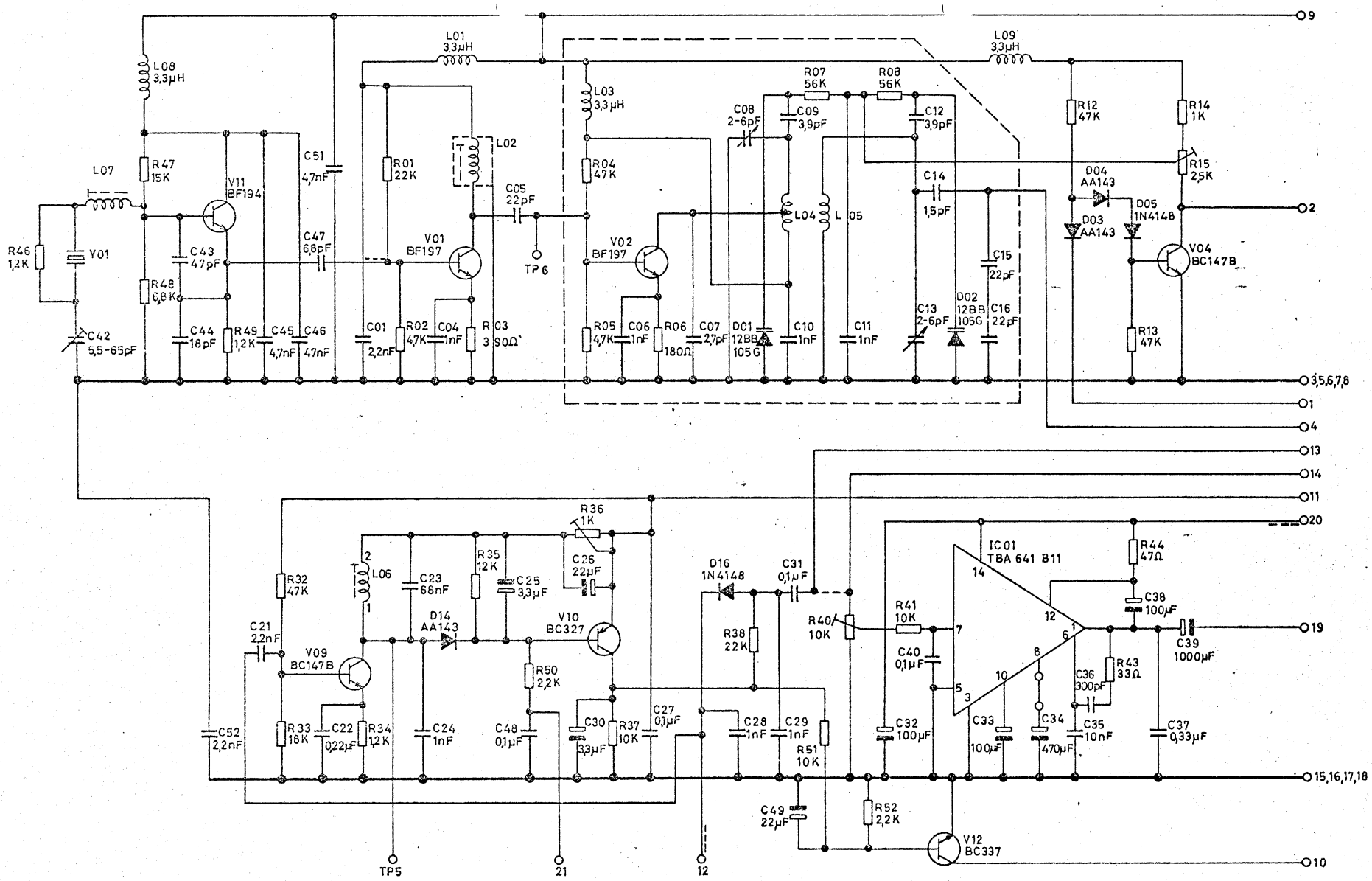
ERSTATTER

TEGN NR 720-0245 BL AF

ERSTATTET AF

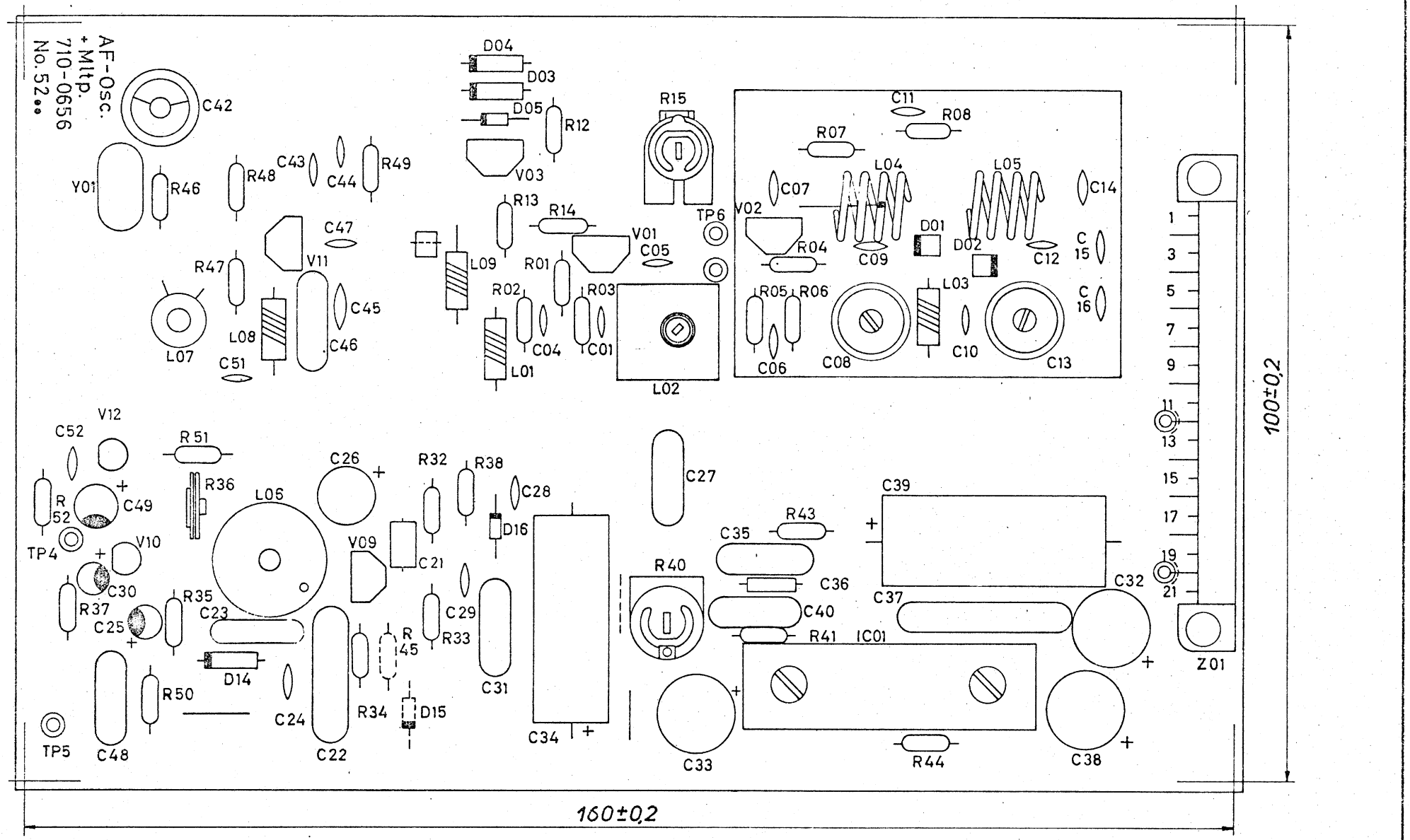


MÅLFORHOLD 2:1	MATERIALE 765-0210-11			FINISH	
	DIMENSION			LAGER NR	
5	14.11.74	GBC	TITEL Silketryk f. RF STR 24	ERSTATTER	
4	25.9.74	GBC		TEGN. NR 760-0232	
3	23.1.74	GBC			
2	26.10.73	GBC	STANDARD ELECTRIC A/S GLOSTRUP	ERSTATTET AF	
1	21.8.73	PM			
UDG	DATO	SIGN.	KONF	MTP	STA



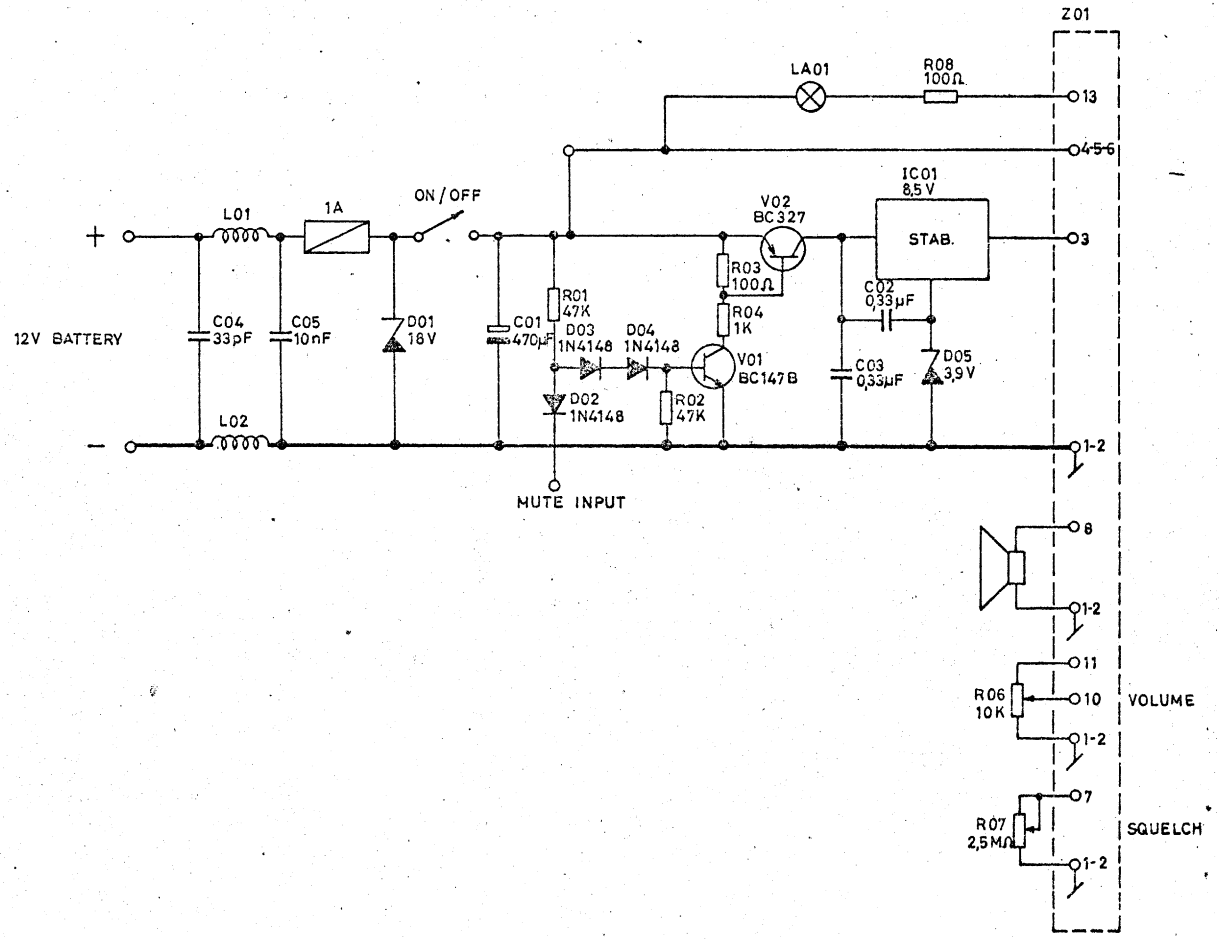
						MÅLFORHOLD	MATERIALE STYKLISTE 710-0656	FINISH
							DIMENSION	LAGER NR.
						TITEL Diagram for AF-Osc.+Multip-lier SR24/25		ERSTATTER
								TEGN. NR. 720-0250 BL. AF
1	18.3.75	JMP				STANDARD ELECTRIC A/S GLOSTRUP		ERSTATTET AF
UDG.	DATO	TEG.	ING.	GODK.				

SEK 900



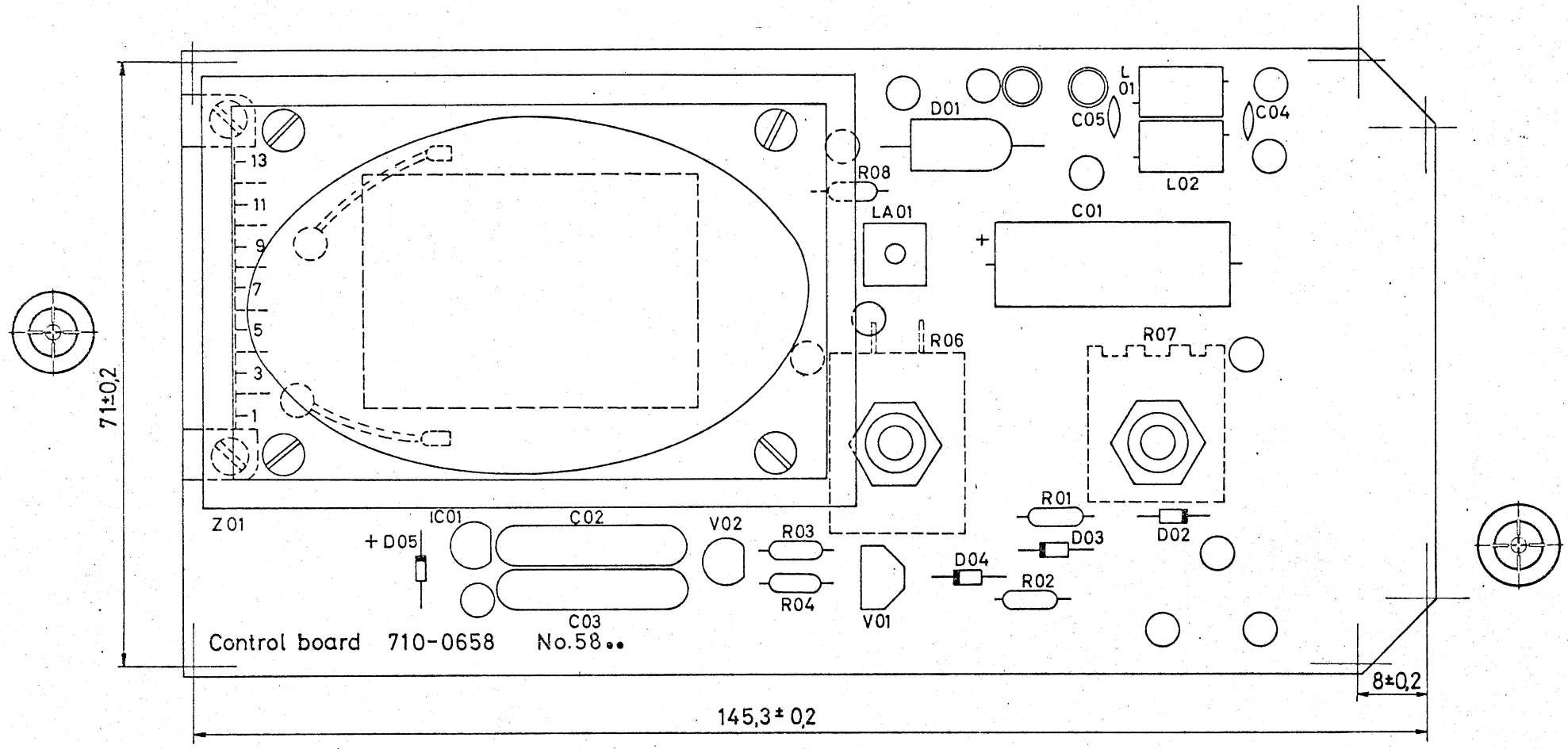
Hvid skrift

						MÅLFORHOLD 2:1	MATERIALE 765-0358-59	FINISH
							DIMENSION	LAGER NR
						TITEL Silketryk for AF-Osc.+Multiplier SR 24/25		ERSTATTER
								TEGN NR 760-0286 BL. 1 AF 1
1	28.2.75	PHP.				ITT STANDARD ELECTRIC A/S GLOSTRUP		ERSTATTET AF
UDG.	DATO	TEG.	ING.	GODK				



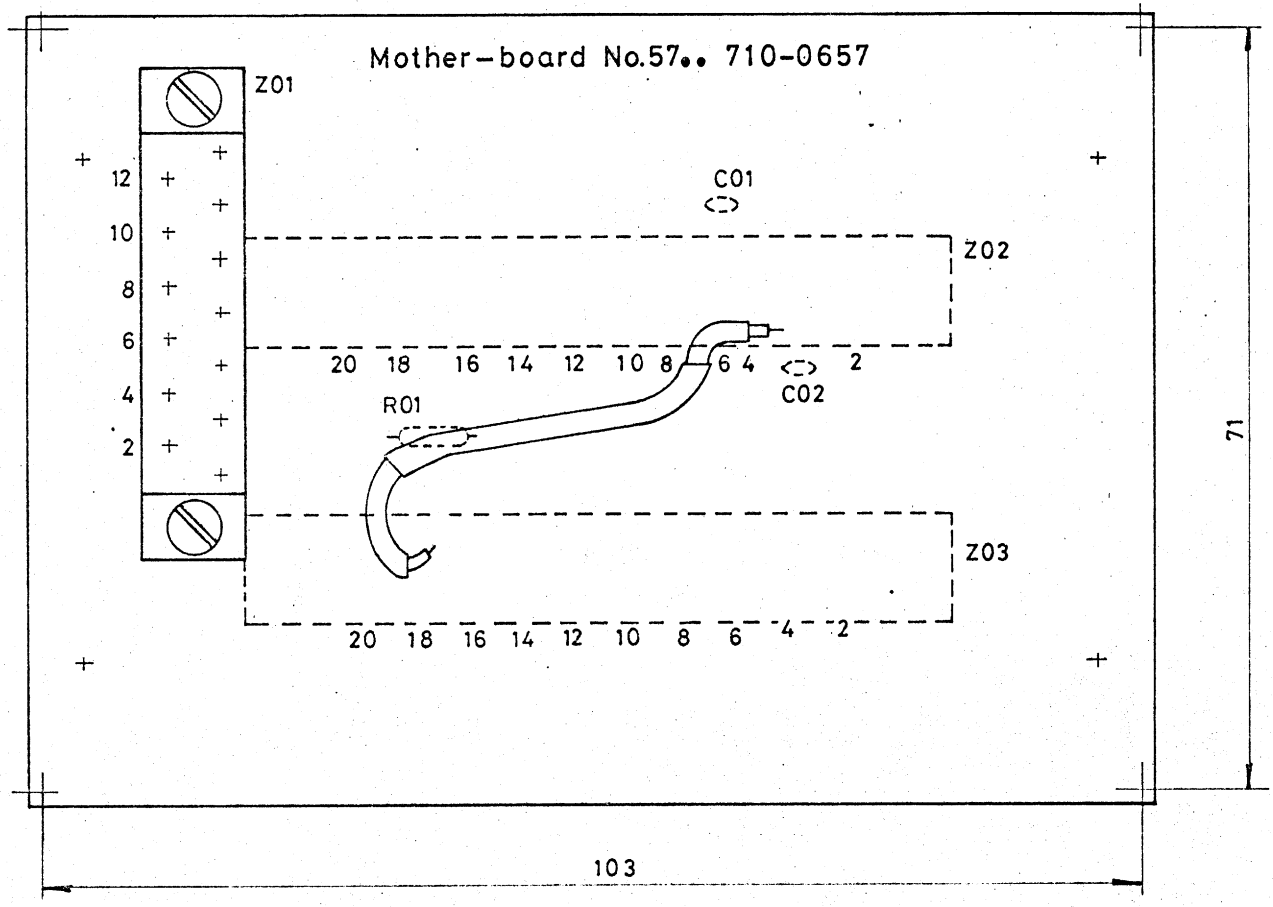
						MÅLFORHOLD	MATERIALE 710-0658	FINISH
							DIMENSION	LASER NR.
						TITEL	Diagram for Control Unit SR24	ERSTATTER
								TEGN. NR. 720-0252
1	19.3.75	JMP				STANDARD ELECTRIC A/S GLOSTRUP		ERSTATTET AF
UDG.	DATO	TEG.	ING.	GODK.				

SEK 900



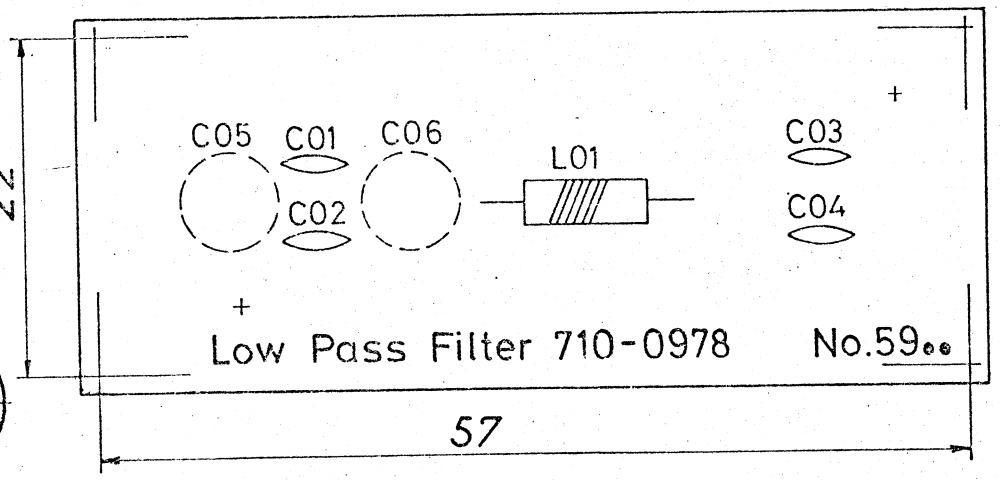
Hvid skrift

						MÅLFORHOLD 2:1	MATERIALE 765-0356-57 DIMENSION	FINISH LAGER NR
						TITEL SILKETRYKSTEGNING FOR CONTROL PRINT SR24		ERSTATTER
						STANDARD ELECTRIC A/S GLOSTRUP		TEGN NR. 760-0285 BL. AF
1	4.3.75	JMP						ERSTATTET AF
UDG.	DATO	TEG.	ING.	GODK.				



Hvid skrift

					MÅLFORHOLD 2:1	MATERIALE 765-0354-55	FINISH
						DIMENSION	LAGER NR
					TITEL Silketryk for Mother board side 1. SR 24		ERSTATTER
							TEGN NR. 760-0284
1	6.3.75	GBC			ITT STANDARD ELECTRIC A/S GLOSTRUP		ERSTATTET AF
UDG.	DATO	TEG.	ING.	GODK			



Hvid skrift

MÅLFORHOLD 2:1	MATERIALE 765-0372-73		FINISH
	DIMENSION		LAGER NR
TITEL Silketrykstegning for Low Pass filter SR24/25			ERSTATTER
			TEGN NR 760-0302 BL 1 AF 1
STANDARD ELECTRIC A/S GLOSTRUP			ERSTATTET AF

1 12.3.75 JMP.
UDG DATO SIGN KONF MTP STA