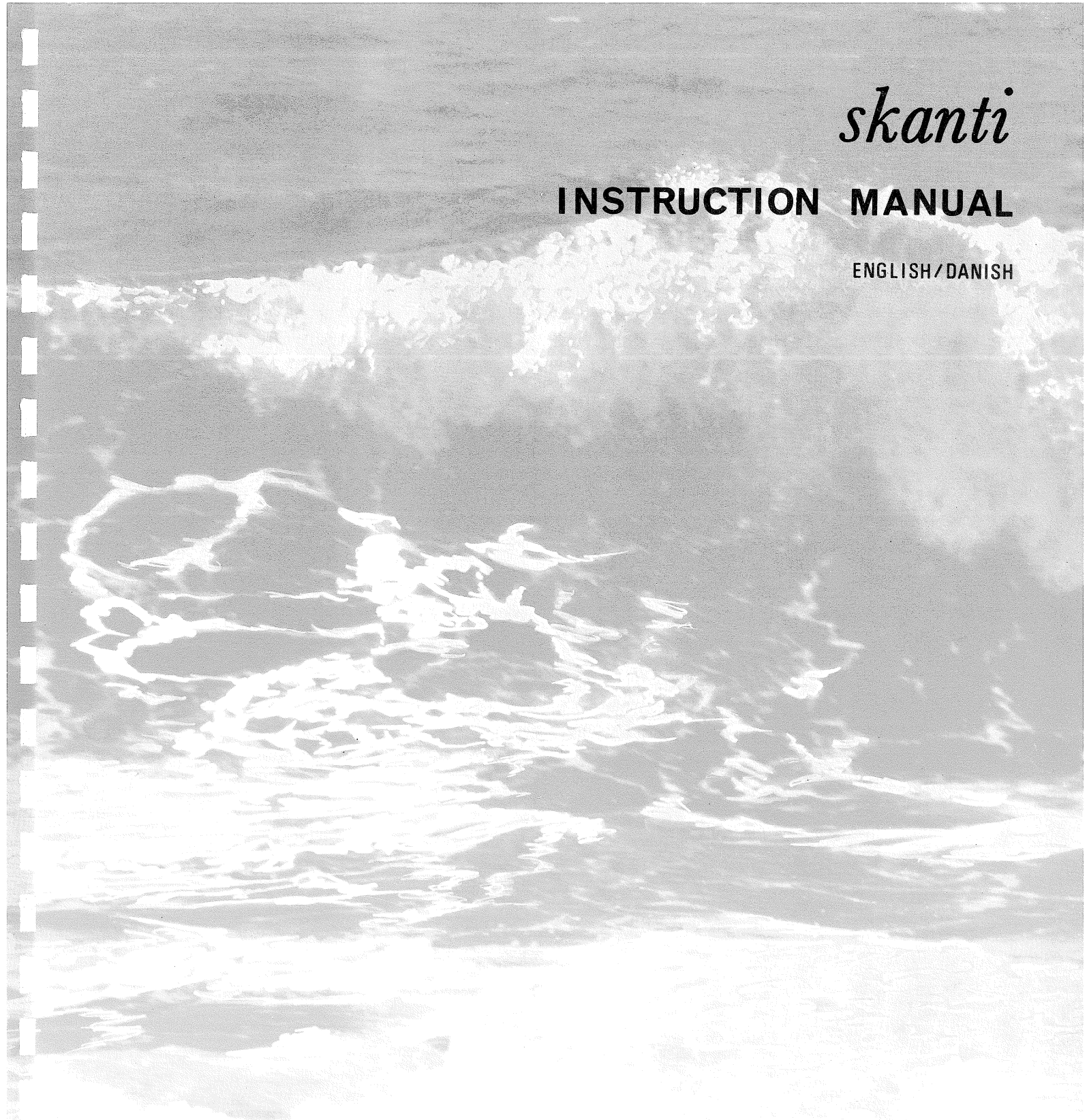

skanti

INSTRUCTION MANUAL

ENGLISH/DANISH

Type E16

50 WATT IF
TRANSMITTER

skanti

INSTRUCTION MANUAL E16

INSTRUKTIONSBOG E16

SKANDINAVISK TELEINDUSTRI SKANTI A/S
ADDRESS: 34 KIRKE VAERLOESEVEJ, DK 3500 VAERLOESE, DENMARK . PHONE: (01) 48 25 44
CABLES: SKANTIRADIO, COPENHAGEN . TELEX: 6600 FOTEX, DK ATT. SKANTIRADIO COPENHAGEN

Gorm Helt-Hansen

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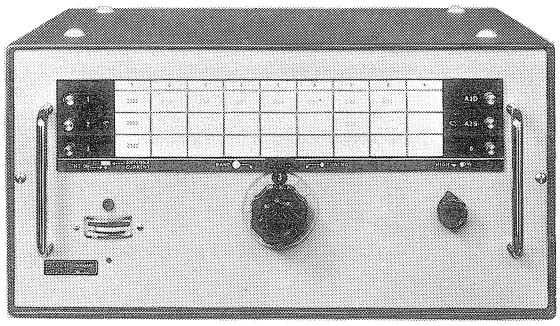
skanti

Marine Radio Equipment **Data Sheet E16**



Type E16

50 WATT IF TRANSMITTER

APPLICATION

The E16 transmitter is designed for ship-to-shore and ship-to-ship radio communication in the Coastal Telephony (IF) band.

TECHNICAL DATA

Frequency Range

1605 - 3800 kHz

Fixed Frequencies

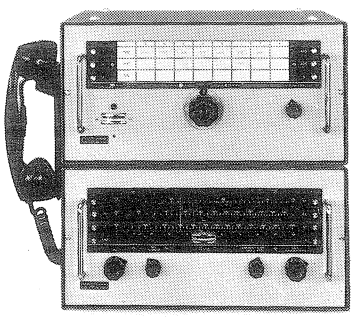
Provision for a total of 25 crystal-controlled frequencies distributed on 9 channels. One channel accomodates 2182 kHz. Each of the remaining eight channels accomodates 3 frequencies with a maximum spacing of approx. 2%.

Crystals

Crystal Frequency = transmitting frequency
Holder: type HC6/U
Tolerance: 0.003%
Temperature range: -20° to +70° C.
Drive: 10 mW
Circuit: parallel resonance, 30 pF
Activity: DEF. 5271
SKANTI designation: A-0205

Antenna

Capacitance: preferably greater than 130 pF
Resistance: approx. 5-120 ohms
Effective antenna length: approx. 12-20 metres (36-60 ft.)



The E16 shown in Combination with a Type D56 Receiver

Gorm Helt-Hansen

Power Output

Approx. 50 watts into antenna circuit at any frequency. A carrier power of approx. 40 watts is obtained in an antenna of 200 pF, 10 ohms, at 2182 kHz.

Types of Operation

A3, duplex or simplex telephony

Modulation

AM, average modulation depth 90%.
Dynamic compression approx. 10 dB at 1000 Hz.
Frequencies 300-2700 Hz are within ±3 dB.
3500 Hz is attenuated more than 20 dB,
5000 Hz is attenuated more than 40 dB.
Noise and hum modulation is suppressed more than 40 dB.

Harmonic and Spurious Emission

Suppression is better than 40 dB below full carrier power.

Power Supply

24 volts DC ±10%
Max. permissible voltage: 30 volts.
Current drain: 0.8 - 9.0 amps.
An external converter is required for other supply voltages.

Valves (total of 2)

PL83, 6159B

Transistors (total of 12)

6 x BC109C, 2 x 40389, 4 x 2N3055.

Diodes (total of 17)

3 x 1N757A, 5 x ESK 1/12, 4 x OA85
2 x 1S923, 3 x 10D2

Lamps (total of 2)

PFE455, CM2180

Fuses, 6.3 dia. x 32, slow (total of 2)

1.0 amp., 10.0 amps.

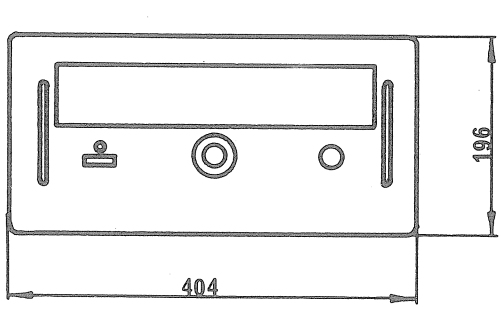
Weight

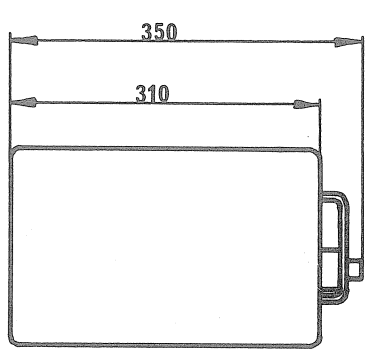
Approx. 11 kgs.

Dimensions

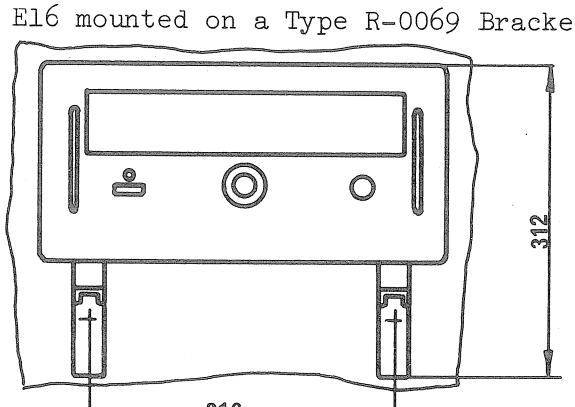
Height: 196 mm (7 3/4 ins.)
Width: 404 mm (15 29/32 ins.)
Depth: 350 mm (13 3/4 ins.)
(incl. of controls and handles).

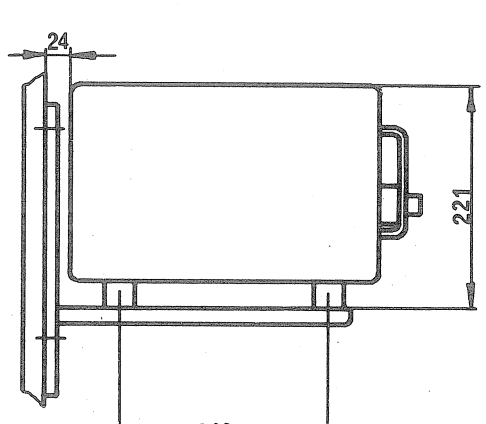
DIMENSIONAL OUTLINE
(Dimensions in mm)





The E16 mounted on a Type R-0069 Bracket:





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ADDRESS: 34 KIRKE VAERLOESEVEJ, DK 3500 VAERLOESE, DENMARK . PHONE: (01) 48 25 44
CABLES: SKANTIRADIO, COPENHAGEN . TELEX: 6600 FOTEX, DK ATT. SKANTIRADIO COPENHAGEN

1. INTRODUCTION

1.1 Application:

The E16 telephony transmitter is designed for ship-to-shore and ship-to-ship telephony communication.

1.2 Frequencies:

The E16 has provision for a total of 25 crystal controlled transmitting frequencies in the range 1605 - 3800 kHz. One channel accomodates the 2182 kHz frequency while the other eight channels can be placed anywhere within the frequency range. Three frequencies with a maximum frequency spacing of approx. 2% may be placed in each of the eight channels.

1.3 Output Power:

The E16 delivers approx. 50 watts to the antenna circuit which is designed to transfer power at maximum efficiency to antennas of lengths between approx. 12 and 20 metres.

1.4 Modulation:

The E16 has an automatic modulation control which provides an average modulation depth of 90 - 95% and prevents overmodulation.

1.5 Power Supply:

The power supply voltage is 24 volts DC. Due to extensive use of transistors the current drain is low, only 5 - 8 amps. during normal speech. An external converter is required for supply voltages other than 24 volts DC.

1.6 Operation:

Operation of the equipment is simple. An easy-to-read frequency chart on the front panel facilitates rapid selection of the transmitting frequency. A meter is provided for fine tuning to the antenna. An electronic circuit protects the equipment against overloading in case of incorrect use.

1.7 Installation:

To secure maximum radiation the utmost care should be shown in installing the E16. The antenna and earth connections should be carried out as described in section 3, and - after the rigging of the ship is in operational condition - the technician must carefully perform the specified adjustment of the transmitter circuits on all frequency channels to be used.

2. TECHNICAL DESCRIPTION

2.1 Circuit Diagram:

For block diagram see drwg. No. E-0295. Also refer to complete diagram drwg. No. E-0292.

2.2 RF Section:

The transmitter's RF section comprises a crystal controlled transistor oscillator (TR1) followed by a driver stage with valve V1. The gain of the driver stage is controlled automatically. The anode load consists of a broad band tuned filter with a diode switch for two bands. The driver stage always supplies the correct amount of excitation to the PA valve (V2).

The PA valve works into a pi-section circuit. Relay RL1, controlled by channel switch S1d, matches the circuit to the two frequency bands corresponding to the driver circuit, while taps on coil L6 tune the circuit to the oscillator frequency. Transformer T4 matches the PA tank circuit to the antenna resistance, while the antenna circuit tunes the antenna to the transmitting frequency.

2.3 AF Section:

The audio-frequency section is fully transistorised. The audio signal coming from the microphone is amplified by transistor TR3 and fed to diode clipper D5/D6. Transistor TR4 further amplifies the signal and filter L11/L12 removes distortion products introduced by the clipping process. Transistors TR5/TR6 amplify the filtered signal and deliver two 180°-out-of-phase signals to the output amplifier, TR7/TR8/TR9/TR10. The quiescent current of the output amplifier is stabilized. The stabilizing voltage is supplied from the RF section and matched by diodes D7/D8 and temperature compensating resistors. The output amplifier is loaded, through transformer T1, by the anode and screen-grid currents of the PA valve, thereby amplitude modulating the latter.

2.4 Power Supply:

The power supply voltage is 24 volts DC. This voltage is fed through fuse FS2 and diode D15 (to safeguard against wrong polarization) to the valve heaters and to the phase splitter and microphone circuits of the AF section.

When the handset key is depressed, relay RL2 in the AF section is energized, causing 24 volts to be fed from the relay contacts to oscillator TR1 and through safety switch S5 to the coil of RL3. Hence RL3 is energized only if safety switch S5 is closed.

From the contacts of relay RL3 the 24-volt supply voltage is fed direct through fuse FS1 to the anode voltage converter (DC converter) which is a self-excited chopper using output transformer T2. Transformer T2 works into a rectifier delivering output voltages of 290 and 580 volts DC. All connections to and from the converter are filtered.

From relay RL3, 24 volts is also supplied to the speech amplifier.

During duplex operation (A3D) 24 volts is supplied from switch S3a direct to relay RL3, for which reason the transmitter will operate even if the handset key is not depressed.

3. INSTALLATION

3.1 Possible Combinations:

a) E16 transmitter and D56/D59 receiver with K41 two-tone alarm generator, DUPLEX operation (see drwg. D-0220)

b) E16 transmitter and D56/D59 receiver with K41 two-tone alarm generator, SEMI-DUPLEX/SIMPLEX operation (see drwg. D-0218)

c) E16 transmitter with K41 two-tone alarm generator,DUPLEX operation, no SKANTI receiver (see drwg. E-0296)

3.2 Mounting:

The cabinet can be mounted on a tabletop or on a type R-0069 bracket (see drwg. D-0216), in combination with a type D56/D59 receiver if desired.

3.3 Disassembling the Transmitter:

Release the two snap fasteners (marked A in Fig. 1) by turning them 90 degrees counter-clockwise, using a broad screwdriver. Pull out the chassis drawer from the cabinet and unplug the multiwire connector located in the lower right-hand corner. To avoid the risk of accidental contact with high-tension voltage when the chassis drawer is pulled out, the chassis is provided with a safety switch to disconnect the power supply from the starting relay. The safety switch is a toggle switch which can be switched on manually when the chassis is pulled out.

CAUTION: With the chassis drawer pulled out the safety switch should be switched on only by a technician and with very great care since dangerous high voltage is now present. If the safety switch has been switched on while the chassis drawer has been pulled out, it is necessary to switch it off again in order to be able to push the chassis back into place.

3.4 Connecting the Cables:

Installation should be carried out as shown in the drawings specified in section 3.1. Please also note the installation tips for the antenna and earth connections in section 3.6.

3.5 Earth Connection of the Battery:

The transmitter does not cause earthing of the battery. If desired - such a connection should be carried out at the battery, to either the positive or the negative terminal. If the battery is charged from a balanced ship's mains (110/220 V DC) - during operation of the radio station - the battery must not be earthed.

3.6 Installation Guidance for Antenna and Earth Connections:
(For duplex installation of transmitter/receiver)

Earth Connections

In order to avoid duplex noise it is necessary to insulate the receiver cabinet from the transmitter cabinet with type R-0071 coupling parts. This requires that the receiver be earthed through a separate earth wire.

a) Wooden Cutters

Connect the transmitter to a copper plate of at least 1 m^2 (3 1/4 sq.ft.) which should be mounted outside on the hull below the waterline and as close to the transmitter as possible. The earth plate should be provided with a $\frac{1}{2}$" brass bolt which must be fastened and hardsoldered to the plate in such a way that it is possible, inside the vessel, to fasten with a nut a 50 x 0.5 mm (2 x 1/64 ins.) copper strip. Connect this strip to the transmitter, using the most direct route and avoiding bends.

Connect the receiver to the same bolt as used for the transmitter with 2.5 mm^2 (3/32 sq.ins.) insulated wire. Mount the wire as far as possible from the transmitter copper strip (not closer than 0.5 m ($1\frac{1}{2}$ ft.)).

b) Steel Cutters

Connect the transmitter to the hull by means of a 50 x 0.5 mm (2 x 1/64 ins.) copper strip as short and direct as possible. To avoid corrosion the copper strip must not be connected directly to an aluminium wheelhouse, though it may be connected through a piece of cadmium-plated steel.

Connect the receiver in the same manner to the hull using 2.5 mm^2 (3/32 sq.ins.) insulated wire. This wire must be connected to a separate earth screw to which no other equipment is connected. Protection against corrosion must be used if the vessel has an aluminium wheelhouse.

Mount the wire as far as possible from the transmitter copper strip.

c) Cables

Connect (unless otherwise specified) all lead covers, screens and earth wires effectively to the earth terminal on the transmitter.

Mount cables as far as possible from the transmitter and receiver earth wires. NOTE: Under no circumstances mount wires parallel to the transmitter copper strip within a distance of 0.7 m (2 3/4 ins.)- 0.2 meter (3/4 ins.) as far as the receiver earth wire is concerned.

Antennas

Suspend antennas as high and free as possible. The antenna wire should be of good quality, and have high ultimate strength. Good large-surface insulators and springs should be inserted in the antenna wire.

Coaxial cables, if used, must be as short as possible. Use a low-capacity type cable. Connect the transmitting antenna to the transmitter through a coaxial cable having a high working voltage rating (e.g. PT29M). The cable length must be as short as possible and should not exceed 1.5 m (5 ft.)

See also drwg. No. E-0287.

Radio Noise

To avoid duplex-noise the greatest possible distance between transmitting and receiving antennas should be provided. Stays, wires, steel masts etc. should be either earthed or insulated effectively.

For the same reason any other electrical installation, such as cable screens and electrical devices, should be earthed effectively and such devices should also be equipped with radio noise filters.

3.7 Connecting the Type K41 Two-tone Alarm Generator:

Feed the cable from K41 through the rear right opening in the cabinet and connect it as shown in drawings Nos. D-0218, D-0220 and E-0296.

3.8 Checking the Alignment:

If the transmitter is supplied less crystals and unaligned, it will be necessary to perform alignment according to the instruction in section 5. For crystal data see Data Sheet E16.

Matching to the ship's antenna should be made by the technician when the installation has been carried out correctly and the ship's rigging is in operational condition. In case frequencies are specified when ordering, the transmitter is factory pre-matched for a normal antenna, so that only correction of selected taps for coupling and antenna stage will be necessary. Perform this adjustment on each channel as follows:

Connect the transmitter chassis to the installation through the multiwire connector and place it in the cabinet. Operate the transmitter as described in sections 4.2, 4.3, 4.4 and note down the reading obtained on ANTENNA CURRENT ME1.

a) Checking the selected antenna tap

Should maximum reading be obtained with ANTENNA TUNING L7 turned to an extreme position, power should be switched off and the transmitter chassis pulled out. Select a new antenna tap for the particular frequency channel (NOTE: the number on the wire corresponds to the channel number). Antenna tap selection is carried out on the terminals behind the crystals in the top of the transmitter chassis.

b) Checking the selected coupling tap

Switch off power and pull out the transmitter chassis. On the particular frequency channel select the next lower tap on the coupling coil placed in the top center of the chassis (NOTE: wire numbers correspond to channel number).

Push the chassis back into place and switch on power. Note the max. reading on ANTENNA CURRENT ME1 after re-adjustment of ANTENNA TUNING L7 . If the reading is lower, the procedure should be repeated at a higher coupling tap. If the reading is higher, an even lower tap should be tried etc.

It is important to select the coupling tap giving the highest reading on ANTENNA CURRENT ME1 on each channel. Should two taps provide almost the same reading, the lower tap should be preferred.

c) Checking Meter Sensitivity

The sensitivity of ANTENNA CURRENT ME1 is factory pre-adjusted. In certain cases it may be necessary to correct this adjustment. The sensitivity is adjusted with potentiometer R29 which is placed below the meter just behind the front panel in such a way that adjustment can be performed with a screwdriver through a hole in the front panel. The sensitivity should be adjusted to obtain a reading on ANTENNA CURRENT ME1 of approx. 7 on the lowest operating frequency when full carrier is transmitted.

4. OPERATING INSTRUCTIONS

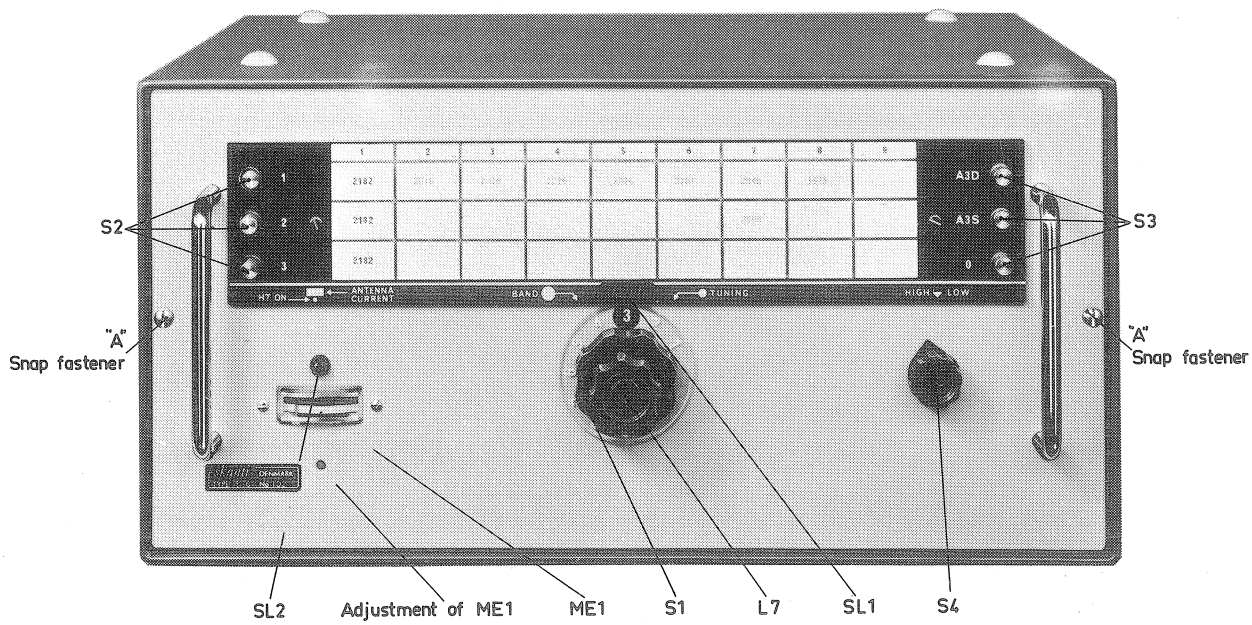


Fig. 1. Transmitter front panel and controls.

4.1 The Controls:

S3: SERVICE SWITCH

a) Press "A3D" for DUPLEX operation. Transmitting and receiving are done simultaneously.

b) Press "A3S" for SIMPLEX and SEMI-DUPLEX operation (ready after a 30 sec. warm-up period). To transmit, press the handset key; to receive, release the key. In other words: "push-to-talk" operation.

c) "0" is the power off switch.

S1: CHANNEL SELECTOR, a 9-position switch indicating the number of the selected channel . The frequency chart placed above S1 indicates the frequencies available.

S2: FREQUENCY SELECTOR: 3 push-buttons by means of which the desired frequency (indicated on the frequency chart) is selected.

S4: POWER REDUCTION. HIGH: 1/1 output power. LOW: 1/4 output power.

L7: ANTENNA TUNING for fine tuning of the antenna.

SL1: LT INDICATOR, a lamp indicating presence of filament voltage.

SL2: HT INDICATOR, a lamp indicating presence of anode voltage.

ME1: ANTENNA CURRENT, a meter showing relative antenna current.

4.2 Starting the Transmitter:

Press the A3S push-button (SERVICE SWITCH S3). LT INDICATOR SL1 glows if power supply is connected. Allow the transmitter to warm up for about 30 seconds.

4.3 Selection of Frequency:

Turn CHANNEL SELECTOR S1 to the desired channel. Select frequency with FREQUENCY SELECTOR S2 (push-buttons 1, 2 and 3)

NOTE: Selection of frequency must be performed only at A3S and without pressing the handset key.

4.4 Simplex and Semi-duplex Telephony:

To transmit, press the handset key, thus muting the connected receiver. HT INDICATOR SL2 lights up, indicating the presence of anode voltage.

Set POWER REDUCTION S4 to HIGH.

Carefully adjust ANTENNA TUNING L7 (placed in the centre of CHANNEL SELECTOR S1) for maximum reading on ANTENNA CURRENT ME1.

The transmitter is now ready for operation. The POWER REDUCTION switch S4 may be set to LOW if reduced power output is desired. This may be preferable in communication over very short distances.

NOTE: When switching POWER REDUCTION S4 from HIGH to LOW do not readjust ANTENNA TUNING L7.

Speak directly into the microphone at normal speech level. Check that the ANTENNA CURRENT ME1 needle kicks upwards in time with the speech, indicating that speech is being transmitted with the carrier.

To receive, release the handset key. HT INDICATOR SL2 stops glowing, the needle of ANTENNA CURRENT ME1 returns to its starting point and the receiver is now ready for reception.

4.5 Duplex Telephony:

Set up the transmitter for simplex telephony (see section 4.4). Press push-button "A3D" (SERVICE SWITCH S3). HT INDICATOR SL2 lights up and ANTENNA CURRENT ME1 shows a reading as before but without the handset key being depressed. The receiver loudspeaker is automatically switched off and reception is now done through the handset earpiece.

To transmit speech, press the handset key.

NOTE: Switching to a new frequency must only be done when using the "A3S" mode and with the handset key released.

4.6 Electronic Protective Circuit:

This circuit will operate if the transmitter is set to a frequency channel not in use - or if two operating frequencies are selected at the same time. It may also operate if frequency switching is carried out during carrier transmission.

In all cases, operation of the electronic protective circuit is indicated by the fact that the HT INDICATOR SL2 stops glowing. To put the transmitter back in operation - after having corrected the wrong setting - release handset key and, if the transmitter is set for duplex "A3D", press push-button "A3S", and the transmitter may be operated again after approximately five seconds.

4.7 Checking the Operation of the Transmitter:

a) ANTENNA CURRENT ME1 shows the relative current delivered by the transmitter. The reading is frequency dependent and therefore it is no indication of incorrect operation if different readings are obtained on different channels.

b) When carrying out the installation (see section 3) the technician should check that the transmitter delivers its full output power on all channels in use. If readings are noted for all channels it will be possible to check output power deviations whenever desired. NOTE: the value of the power supply voltage affects the output power and hence also the reading on ANTENNA CURRENT ME1.

c) Check the modulation efficiency by whistling into the microphone. This should cause the reading on ANTENNA CURRENT ME1 to increase by 10-20%.

d) The LT INDICATOR SL1 indicates the presence of filament voltage (24 V) while the HT INDICATOR SL2 indicates the presence of anode voltage (a faint 4 kHz note is occasionally audible).

5. ALIGNMENT TO NEW FREQUENCIES

Should it be desired to use the transmitter on other frequencies than those supplied a technician must perform the following procedure (see diagram E-0292):

a) Pull out the transmitter chassis and insert a crystal of the desired frequency in the holder selected. For crystal data refer to Data Sheet E16. Write the frequency in the corresponding place on the FREQUENCY CHART on the transmitter front panel.

b) Wire the terminal strip connected to switch wafer S1d in such a way that the terminal corresponding to the selected channel connects to terminal "10" on the terminal strip if the crystal frequency is higher than 2500 kHz. In case the crystal frequency is lower than 2500 kHz no connection should be made to the terminal.

c) Select, according to TABLE 1, a coil tap on PA coil L6. Solder the wire from switch wafer S1e directly to the coil turn (Wire numbers correspond to channel numbers). Disconnect the wire (carrying the same number as the channel) from switch wafer S1f to transformer T4, and connect a general-purpose instrument (range 2.5 volts) to test point TP21.

TABLE 1	L6 tap (number of turns from the free end of the coil)									
kHz	1650	1800	2000	2200	2500	2600	2900	3200	3500	3800
No.	6	13	19	24	29	17	23	27	30	33

d) Start the transmitter and read the voltage at test point TP21. Switch off the transmitter and solder the wire from switch wafer S1e to a turn adjacent to the first one selected. Start the transmitter and again read the voltage at test point TP21. Continue in this manner until a turn is found at which minimum voltage occurs (normally less than 0.5 volt).

e) Connect the wire from S1f to T4 to, for example, terminal 5 on T4. Solder the corresponding wire from S1g to antenna tap B. Push the transmitter chassis back into place and continue as described in section 3.8.

6. MAINTENANCE AND SERVICE

6.1 Battery:

The condition of the battery should be checked often. The battery must be kept fully charged and distilled water filled up to about 5 - 10 mm (13/64 - 25/64 ins.) above the plates.

6.2 Fuses:

The two fuses in the 24-volt primary connections to filament and anode supplies, respectively, are placed inside the transmitter (top right).

The LT INDICATOR SL1 indicates the presence of filament voltage, while the HT INDICATOR SL2 indicates the presence of anode voltage. If one of the lamps does not glow, the reason may be a blown fuse.

Only replace a blown fuse once. If it blows a second time, a technician should be called. Always use fuses of the correct rating. Use of fuses of higher rating than specified may cause damage to the equipment.

The fuses are accessible when the transmitter chassis is pulled halfway out (see also section 3.3).

6.3 Antenna Tuning:

Check antenna tuning by comparing the reading on ANTENNA CURRENT ME1 with the reading obtained after installation (see section 4.7b).

If substantial deviations in readings are found, the following checks should be made:

a) Is the supply voltage correct?

b) Has any change in antenna or earth connections been made since the transmitter was installed?

c) Has the ship's rigging been changed?

d) Is there a leakage path between the antenna or shielded cable and earth, possibly due to dirt or moisture on antenna insulators?

When the cause has been found, the trouble should be corrected. It may be necessary to change the matching to the antenna (see section 3.8).

6.4 Test Points:

Inside the transmitter are test points for typical voltages and currents in the individual circuits. Test points are indicated on component placement drawings and are marked on the copper-plated side of the printed circuit boards.

A technician can therefore quite easily locate the test points and perform measurements for comparison with values according to drawing E-0298.

1. INDLEDNING

1.1 Anvendelse:

Telefonisender E16 er beregnet til telefonkorrespondance mellem skibe og kyststationer og mellem skibe indbyrdes.

1.2 Arbejdsfrekvenser:

Senderen er krystalstyret på indtil 25 arbejdsfrekvenser i området 1605 - 3800 kHz. 1 kanal er reserveret for frekvensen 2182 kHz, medens 8 frekvenskanaler kan vælges frit indenfor området. I hver af de 8 kanaler kan anbringes indtil 3 frekvenser med en maximal frekvensafstand på ca. 2%.

1.3 Afgiven effekt:

Senderen afgiver ca. 50 watt til antennekredsen, der er konstrueret til, med størst mulig virkningsgrad, at tilpasse alle antenner med en effektiv længde mellem ca. 12 og 20 m.

1.4 Modulation:

Senderen har automatisk modulationskontrol, der giver en gennemsnitlig modulationsgrad på 90-95% og tillige hindrer overmodulation.

1.5 Strømforsyning:

Strømforsyningen sker direkte fra 24 volt jævnstrøm. Da anlægget udnytter transistorer så langt som muligt, er forbruget ringe, 5-8 Amp. under normal tale. Ved strømforsyning fra andre spændingsarter tilsluttes senderen gennem en udvendig omformer.

1.6 Betjening:

Anlæggets betjening er enkel. Frekvensindstillingen sker efter et overskueligt skema og efterfølges af en finafstemning af antennen til maximalt udslag på et viserinstrument. Der er indbygget beskyttelsesforanstaltninger mod overbelastning.

1.7 Installation:

Det er af stor betydning for opnåelse af den størst mulige rækkevidde, at installationen af senderen sker med stor omhu. Antenne og jordledning må være udført, som angivet i kap. 3, og installatøren må på alle benyttede frekvenskanaler udføre den beskrevne justering af senderens kredse korrekt, når skibets rigning er i sejlklar stand.

2. TEKNISK BESKRIVELSE

2.1 Senderens principdiagram:

Se blok-diagram, tegn. nr. E-0295.
Se iøvrigt komplet diagram, tegn. nr. E-0292.

2.2 HF-del:

Senderens HF-del består af krystalstyret transistor-oscillator (TR1) efterfulgt af driver-trin med rør V1. Driver-trinnets forstærkning er automatisk reguleret. Anodebelastningen består af et bredbånds-afstemt filter med diodeomskiftning for to bånd. Driver-trinnet afgiver altid korrekt styrespænding til PA-røret (V2).

PA-røret er belastet med en pi-kreds. Relæ RL1, styret af kanalomskifteren S1d, tilpasser kredsen til de to frekvensbånd svarende til driverkredsen, medens udtag på spolen L6 afstemmer kredsen til oscillatorfrekvensen.

En transformator T4 tilpasser PA-kredsen til antennens modstand, medens antennekredsen afstemmer antennen til sendefrekvensen.

2.3 LF-del:

Senderens lavfrekvensdel er fuld transistoriseret. Talespændingen fra mikrofonen forstærkes i TR3, og begrænses i diodeklipperen D5/D6. Trin TR4 forstærker atter signalet, og filter L11/L12 fjerner generende forvrængning dannet i diodeklipperen. Trin TR5/TR6 forstærker det filtrerede signal og leverer to faseforskudte signaler til udgangsforstærkeren TR7/TR8/TR9/TR10. Udgangsforstærkerens hvilestrøm er stabiliseret, idet en stabiliseret spænding tilføres fra HF-delen og tilpasses med D7/D8 samt temperaturafhængige modstande. Udgangsforstærkeren belastes gennem transformator T1 med PA-rørets anode- og skærmgitterstrøm, hvorved senderen amplitudemoduleres.

2.4 Strømforsyningen:

Senderen strømforsynes altid fra 24 volt DC. Denne spænding føres over sikring FS2 og diode D15 (som beskytter mod forkert polaritet) til rørenes glødetråde samt LF-delens fasevender og mikrofonkredsløb.

Når mikrotelefonens tangent trykkes vil RL2 i LF-delen trække, og dets kontakt fører da 24 V til oscillatoren TR1 og gennem sikkerhedsafbryderen S5 til spolen i startrelæet RL3. RL3 kan derfor kun trække hvis S5 er sluttet.

Kontakten på relæ RL3 fører 24 V direkte over sikring FS1 til anodespændingsomformeren (DC-converter), der består af en selvsvingende chopper med transformator T2 i udgangen. T2 er belastet med en ensretter for udgangsspændingerne 290 og 580 V DC. Alle forbindelser til og fra converteren er forsynet med filtre.

RL3 tilfører samtidigt 24 V til modulationsforstærkeren.

Ved duplex-drift (A3D) tilfører omskifter S3a 24 V direkte til RL3, hvorfor senderen arbejder uden at mikrotelefonens tangent trykkes.

3. INSTALLATION

3.1 Installationsmuligheder:

a) Sender E16 og modtager D56/D59 med to-tonet tegngiver K41 DUPLEX drift (se tegn. D-0220)

b) Sender E16 og modtager D56/D59 med to-tonet tegngiver K41 SEMI-DUPLEX/ SIMPLEX drift (se tegn. D-0218)

c) Sender E16 med to-tonet tegngiver K41, DUPLEX drift, uden SKANTI modtager (se tegn. E-0296)

3.2 Opspændingsmåder:

Kabinettet kan monteres på bord eller på konsol type R-0069, evt. sammenbygget med modtager type D56/D59 (tegn. D-0216).

3.3 Demontering af sender:

Snaplåsene, mærket A på fig. 1, løsnes med en bred skruetrækker ved at dreje mod uret. Senderchassiet udtrækkes af kabinettet, og multistikket nederst i højre side aftages. Chassiet er forsynet med en sikkerhedsafbryder, der afbryder strømmen til strømforsyningens startrelæ. Herved undgår man, at der er højspænding på senderen, når denne åbnes. Sikkerhedskontakten er en vippekontakt, der kan sluttes manuelt, når chassiet er ude.

Bemærk: Sikkerhedskontakten bør kun sluttes af en tekniker og under største agtpågivenhed, da der er livsfarlig højspænding i senderen. Hvis sikkerhedskontakten har været sluttet, medens chassiet var trukket ud af kabinettet, må man huske at afbryde den igen, idet chassiet kun kan skubbes på plads i kabinettet, hvis afbryderen er afbrudt.

3.4 Tilslutning af kabler:

Installationen udføres som vist på tegningerne nævnt under pkt. 3.1. Se desuden installationsvejledning for antenne og jordledninger pkt. 3.6.

3.5 Jordforbindelse af batteri:

Senderen forårsager ingen jordforbindelse af batteriet. Om ønsket bør en sådan forbindelse udføres ved batteriet til enten den positive eller negative pol. Hvor batteriet oplades fra et balanceret skibsnet (110/220 V DC) - under drift af radioanlægget - må der ikke tilsluttes jordforbindelse til batteriet.

3.6 INSTALLATIONSVEJLEDNING FOR ANTENNER OG JORDLEDNINGER (Ved duplex-installation af sender/modtager)

Jordforbindelser

Af hensyn til duplex-støj er det nødvendigt at isolere modtagerens kabinet fra senderens kabinet med sammenspændingsdele type R-0071. Følgelig skal modtageren forsynes med særskilt jordforbindelse.

a) Trækuttere

Senderen forbindes til en kobberplade mindst 1 m^2, som anbringes udvendig på skibssiden under vandlinien og så nær senderen som muligt. Jordpladen forsynes med en $\frac{1}{2}$" messingbolt, som skal fastspændes og slagloddes på pladen, således at man indvendig i skibet kan fastskrue et 50 x 0,5 mm kobberbånd, som så føres ad den absolut korteste vej og med så få knæk som muligt til senderen.

Modtageren forbindes til samme bolt som senderen med 2,5 mm^2 isoleret ledning. Ledningen føres i så stor afstand som praktisk muligt fra senderens jorbånd og ikke nærmere end 0,5 m før tilslutningen på jordpladen.

b) Stålkuttere

Senderen forbindes til skibsskroget med et 50 x 0,5 mm kobberbånd, som bør være så kort og lige som muligt. Ved aluminiumsstyrehus må kobberbåndet ikke forbindes direkte på dette, men eventuelt med kadmieret jern imellem, af hensyn til korrosion.

Modtageren forbindes ligeledes til skibsskroget med 2,5 mm^2 isoleret ledning. Denne ledning skal have en særskilt jordskrue, som ikke må være fælles for andre apparater. Ved aluminiumsstyrehuse skal den sikres mod korrosion.

Ledningen føres i så stor afstand fra senderens kobberbånd som praktisk muligt.

c) Kabler

Alle blykapper, skærme og jordtråde forbindes (hvor intet andet er anført) effektivt til jordforbindelsen på senderen.

Kabler anbringes såvidt muligt langt fra senderens og modtagerens jordledning og under ingen omstændigheder parallelt med senderens kobberbånd nærmere end 0,7 m; for modtagerjordledningens vedkommende ikke nærmere end 0,2 m.

Antenner

Disse oprigges så frit og højt som muligt. Antennematerialet skal være af god kvalitet med stor brudstyrke og gode isolatorer med stor overflade, og fjedre skal indsættes i antennetråden.

Eventuelle coaxial-kabler skal være så korte som muligt, og af en type med lav kapacitet. Senderantennen tilsluttes senderen gennem et coaxial kabel med høj driftsspænding (f.eks. PT29M). Kabellængden skal være så kort som mulig og maximalt 1,5 m.

Se iøvrigt tegning nr. E-0287.

Radiostøj

Af hensyn til duplex-støj (modtalestøj) bør der tilstræbes størst mulig afstand mellem sender- og modtagerantenne, og stag, wirer, stålmaster og lignende skal enten jordes eller isoleres effektivt.

Ligeledes af hensyn til modtalestøj og radiostøj iøvrigt skal enhver anden el-installation såsom kabelkapper (skærme) og apparater jordes effektivt, og disse apparater skal være radiostøjdæmpede.

3.7 Tilslutning af to-tonet tegngiver, type K41:

Kablet fra K41 føres ind gennem højre kabelåbning og tilsluttes som vist på tegning nr. D-0218, D-0220, E-0296.

3.8 Kontrol af trimning:

Hvor senderen er leveret uden krystaller og utrimmet, må indtrimning først udføres i henhold til vejledningen i afsnit 5. For krystaldata se Data Sheet E16.

Tilpasning til skibets antenne foretages af installatøren, når installationen er korrekt udført og skibets rigning er i sejlklar stand. Tilpasning til en indstillet frekvens vil fra fabrikken være klargjort for en normal antenne, og der vil da kun blive tale om korrektion af de valgte udtag for kobling og antennetrin. Denne justering foretages for hver kanal således:

Senderchassiset tilsluttes installationen gennem multistikket og anbringes på plads i kabinettet. Senderen betjenes som beskrevet i pkt. 4.2, 4.3, 4.4 og udslaget på ANTENNESTRØM ME1 noteres.

a) Kontrol af valgt antennetrin: Hvis maximum udslag forekommer med ANTENNE-AFSTEMNING L7 drejet i en yderstilling, afbrydes strømtilførslen. Senderen åbnes, og der vælges et nyt antennetrin for den pågældende frekvenskanal. (Bemærk: Ledningernes nummer svarer til kanalnummeret). Valg af antennetrin sker foroven i senderen på terminalerne bag krystallerne.

b) Kontrol af valgt koblingstrin: Strømtilførslen afbrydes, senderen åbnes og der vælges for den indstillede frekvenskanal eet trin lavere på senderens koblingsspole anbragt foroven i senderens midte. (Bemærk: Ledningernes nummer svarer til kanalnummeret).

   Senderen lukkes og startes pånyt, og det maximale udslag på ANTENNESTRØM ME1 efter ny afstemning af ANTENNEAFSTEMNING L7 noteres. Er udslaget blevet mindre, gentages prøven ved et højere koblingstrin; er udslaget blevet større, prøves ved et endnu lavere trin o.s.v.

   Det er vigtigt, at der for hver kanal vælges det koblingstrin, der giver størst udslag på ANTENNESTRØM ME1. Hvis to trin giver omtrent ens udslag, vælges det laveste trin.

c) Kontrol af instrument følsomhed: Følsomheden af ANTENNESTRØM ME1 er justeret fra fabrikken. I visse tilfælde kan det dog være nødvendigt at korrigere justeringen. Følsomheden indstilles med potentiometret R29, der er anbragt umiddelbart bag forpladen, således at justering kan foretages med en skruetrækker gennem et hul i forpladen. Følsomheden bør justeres således, at man på den laveste arbejdsfrekvens får et udslag på ANTENNESTRØM ME1 på ca. 7, når senderen udsender fuld bærebølge.

4. BETJENINGSFORSKRIFT

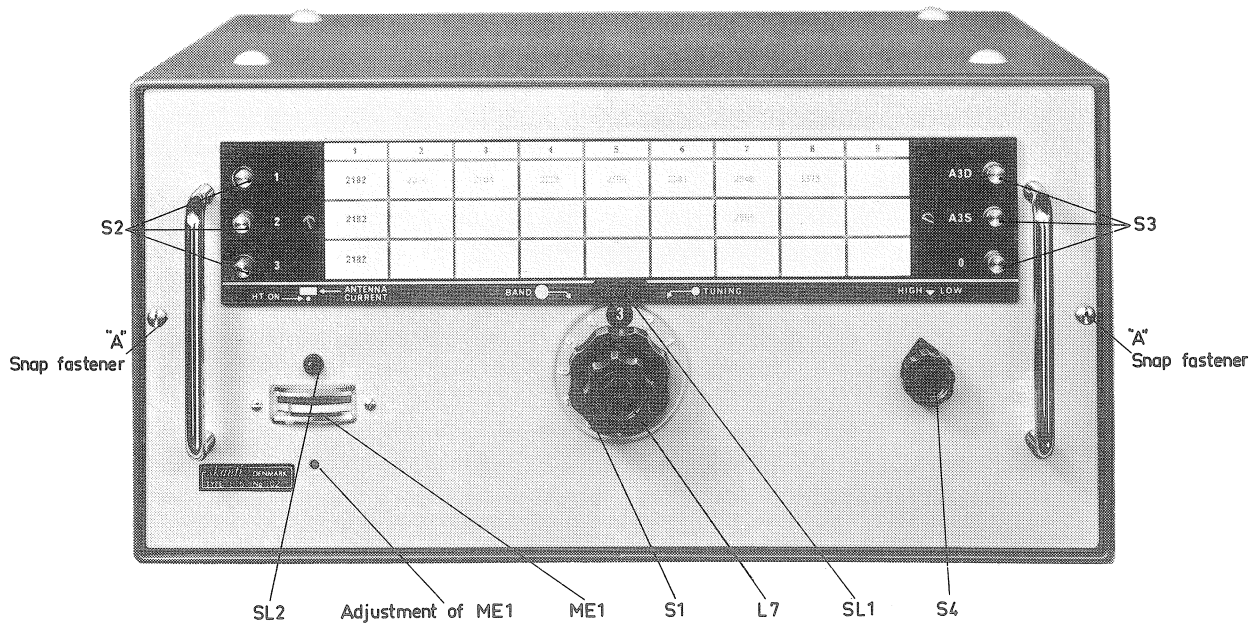


Fig. 1. Senderens forplade og betjeningsknapper.

4.1 Betjeningsknappernes funktioner:

S3: FUNKTIONSOMSKIFTER

a) Med "A3D" indtrykket er senderen indstillet til DUPLEX-telefoni, (hvor der sendes og lyttes samtidigt).

b) Med "A3S" indtrykket er senderen (efter ca. 30 sek. opvarmningstid) klar til SIMPLEX og SEMI-DUPLEX anvendelse (d.v.s. skiftetale, hvor der sendes, mens mikrotelefonens tangent er indtrykket og lyttes, mens tangenten er upåvirket).

c) Med "0" indtrykket er senderen afbrudt.

S1: KANALVÆLGER, omskifter med 9 stillinger. Nummeret over den sorte mærkat angiver den valgte kanal. Frekvenstabellen angiver kanalens frekvensmuligheder.

S2: FREKVENSVÆLGER, hvor den ønskede frekvens i den på S1 indstillede kanal, udvælges i henhold til tabellen ved indtrykning af den tilhørende knap.

S4: EFFEKTOMSKIFTER. HIGH: 1/1 effekt. LOW: ca. 1/4 effekt.

L7: ANTENNEAFSTEMNING for finafstemning af antenne.

SL1: LT-INDIKATOR, indikatorlampe for glødespænding.

SL2: HT-INDIKATOR, indikatorlampe for anodespænding.

ME1: ANTENNESTRØM, måleinstrument for relativ antennestrøm.

4.2 Start af senderen:

Indtryk "A3S" knappen (FUNKTIONSOMSKIFTER S3). LT-INDIKATOR SL1 lyser, hvis anlægget er tilsluttet strømforsyningen. Lad senderen varme op i ca. 30 sekunder.

4.3 Valg af frekvens:

Indstil KANALVÆLGER S1 til den ønskede frekvenskanal og vælg arbejdsfrekvens med FREKVENSVÆLGER S2 (trykknap 1 - 2 eller 3).

Bemærk: Indstilling af frekvensen må kun foretages ved "A3S" og med upåvirket mikrofontangent.

4.4 Simplex og semiduplex-telefoni:

Tryk mikrotelefonens tangent ind. Den tilsluttede modtager blokeres. HT-INDIKATOR SL2 lyser og indikerer, at anodespændingsforsyningen arbejder.

Stil EFFEKTOMSKIFTEREN S4 i stilling HIGH.

Foretag finjustering af ANTENNEAFSTEMNING L7 (anbragt i midten af KANALVÆLGEREN S1) indtil ANTENNESTRØM ME1 viser maximalt udslag.

Senderen er nu klar til drift. EFFEKTOMSKIFTEREN S4 kan stilles i LOW, hvis man ønsker at arbejde med reduceret effekt. Dette kan især have betydning ved korrespondance mellem to stationer, der ligger tæt ved hinanden.

BEMÆRK: ANTENNEAFSTEMNING L7 må ikke efterjusteres, når EFFEKTOMSKIFTEREN S4 skiftes fra HIGH til LOW.

Tal direkte ned i mikrofonen med normal talestyrke og bemærk, at ANTENNESTRØM ME1 giver udslag i takt med talen, hvilket er indikation på at talen udsendes med bærebølgen.

Ved lytning frigøres mikrotelefonens tangent. HT-INDIKATOR SL2 ophører at lyse, viseren i ANTENNESTRØM ME1 går tilbage til udgangspunktet, og modtageren bliver automatisk åbnet.

4.5 Duplex-telefoni:

Senderen indstilles ved simplex-telefoni, se 4.4. Indtryk derefter "A3D" (FUNKTIONSOMSKIFTER S3). HT-INDIKATOR SL2 lyser og ANTENNESTRØM ME1 giver udslag som før, men uden at mikrotelefonens tangent trykkes. Modtagerens højttaler afbrydes automatisk, men stationerne kan aflyttes normalt i mikrotelefonens ørestykke.

Indtryk mikrotelefonens tangent, når tale ønskes udsendt.

BEMÆRK: Frekvensskift må kun foretages ved "A3S" og med upåvirket mikrotelefontangent.

4.6 Automatisk sikring:

Denne træder i funktion, hvis senderen indstilles på en ubenyttet frekvenskanal - eller hvis der indtrykkes to arbejdsfrekvenser samtidigt. Den kan også træde i funktion, hvis der foretages frekvensskift under udsendelse af bærebølge.

I alle tilfælde markeres det ved, at HT-INDIKATOR SL2 går ud, og genindkobling sker - efter at den forkerte indstilling er rettet - ved at slippe mikrotelefonens tangent og, hvis senderen er indstillet til duplex "A3D", da at indtrykke knappen "A3S", hvorefter senderen kan betjenes normalt efter ca. 5 sekunders forløb.

4.7 Kontrol af senderens funktion:

a) ANTENNESTRØM ME1 giver et relativt mål for den af senderen afleverede antennestrøm. Udslagets størrelse er frekvensafhængigt, hvorfor det ikke er tegn på fejl, hvis der er forskellige udslag på de forskellige kanaler.

b) Installatøren kontrollerer under installationen (se afsnit 3) at senderen afgiver fuld effekt på alle benyttede kanaler. Noteres udslagene ned for hver kanal, kan man senere kontrollere afvigelser i den afgivne effekt.

Bemærk: Størrelsen af den tilførte forsyningsspænding påvirker udgangseffekten og dermed udslaget på ANTENNESTRØM ME1.

c) Ved fløjt i mikrofonen kontrolleres modulationens effektivitet, idet udslaget på ANTENNESTRØM ME1 skal øge 10-20% ved fløjt i mikrofonen.

d) LT-INDIKATOR SL1 angiver om senderen får tilført glødespænding (24 V), mens HT-INDIKATOR SL2 angiver, om anodespændingsforsyningen arbejder (hvilket også vil kunne høres svagt).

5. INDTRIMNING TIL NYE FREKVENSER

Når senderen ønskes anvendt på andre frekvenser end de, den er udrustet med ved leveringen, må en tekniker udføre følgende (se diagram E-0292):

a) Åbne senderen og indsætte et krystal med samme frekvens som den ønskede sendefrekvens på den valgte plads. For krystallets data se iøvrigt Data Sheet E16. Frekvensen noteres i det tilsvarende felt på frekvenstabellen på senderens forplade.

b) Montere loddelisten forbundet til omskifterdæk S1d således, at den loddeterminal, der svarer til den valgte kanal, er forbundet til terminal "10" på loddelisten, hvis krystalfrekvensen er større end 2500 kHz. Er krystalfrekvensen mindre end 2500 kHz skal loddeterminalen være uforbundet.

c) Ud fra tabel 1 forvælge et spole udtag på PA-spolen L6. Ved lodning direkte på den valgte vinding forbindes spolen til kanalomskifteren Sle.

BEMÆRK: Ledningernes nummer svarer til kanalnummeret.

Ledningen med samme kanalnummer fra omskifterdæk Slf til koblingstransformatoren T4 brydes, og et universalinstrument (måleområde 2.5 V) tilsluttes målepunkt TP21.

TABEL 1	L6 udtag (antal vindinger fra spolens fri ende)									
kHz	1650	1800	2000	2200	2500	2600	2900	3200	3500	3800
Nr.	6	13	19	24	29	17	23	27	30	33

d) Senderen startes og spændingen i målepunkt TP21 aflæses. Senderen afbrydes og ledningen fra omskifterdæk Sle tilloddes en vinding ved siden af den først valgte. Senderen startes og spænding i TP21 aflæses igen. Man fortsætter på denne måde, indtil den vinding er fundet, hvor spændingen er mindst mulig (normalt mindre end 0,5 volt).

e) Ledning fra Slf til T4 forbindes f.eks. til terminal 5 på T4 og den tilsvarende ledning fra Slg tilloddes antennetrin B, hvorefter senderen lukkes, og der fortsættes som beskrevet i pkt. 3.8.

6. VEDLIGEHOLDELSE OG SERVICE

6.1 Batteri:

Batteriets tilstand bør hyppigt kontrolleres. Det er nødvendigt, at batteriet altid er i en god ladetilstand, og der bør jævnligt efterfyldes med destilleret vand. Vædsken skal stå 5 - 10 mm over pladerne.

6.2 Sikringer:

Indvendigt i senderen (foroven til højre) er anbragt to smeltesikringer i 24 volt primærledningerne til henholdsvis glød- og anodespændingsforsyning.

LT-INDIKATOR SL1 angiver om senderen får tilført glødespænding, medens HT-INDIKATOR SL2 angiver, om anodespændingsforsyningen arbejder. Manglende lys i en af indikatorerne kan derfor måske skyldes en smeltet sikring.

Sikringer udskiftes kun en gang. Ved gentagne sikringsbrud må en tekniker tilkaldes. Brug aldrig sikringer påstemplet en større strømstyrke end specificeret, da dette kan medføre ødelæggelser i anlægget.

Sikringerne er tilgængelige, når senderchassiet er trukket halvt ud af kabinettet (se også pkt. 3.3).

6.3 Antenneafstemning:

Antenneafstemningen kontrollerer man jævnligt ved at undersøge, om man opnår samme udslag på ANTENNESTRØM ME1, som der blev opnået ved installationen (se pkt. 4.7b).

Finder man væsentlige afvigelser i aflæsningerne på ANTENNESTRØM ME1, må følgende undersøges:

a) Er senderens fødespænding korrekt?

b) Er der, siden installationen blev foretaget, sket ændringer i antenne- eller jordforbindelser?

c) Er der foretaget ændringer i skibets rigning?

d) Er der afledning på antennen eller skærmkablet, eventuelt forårsaget af snavs eller fugt på antenne-isolatorerne.

Findes årsagen et af de nævnte steder, må fejlen søges afhjulpet. Eventuelt må senderens tilpasning til antennen ændres (pkt. 3.8).

6.4 Målepunkter:

Senderen er indvendigt forsynet med målepunkter for karakteristiske spændinger eller strømme i de enkelte kredsløb. Målepunkterne er angivet på komponentplaceringstegningerne, og på de trykte kredsløbsplader er punkterne markeret på den kobberbelagte side.

En tekniker vil derfor kunne finde målepunkterne og foretage kontrolmålinger til sammenligning med de i tegning nr. E-0298 opgivne værdier.

Supply voltage 24 volt DC.

x) These voltages are measured relative to terminal 5 on the AF printed circuit board E-0234.

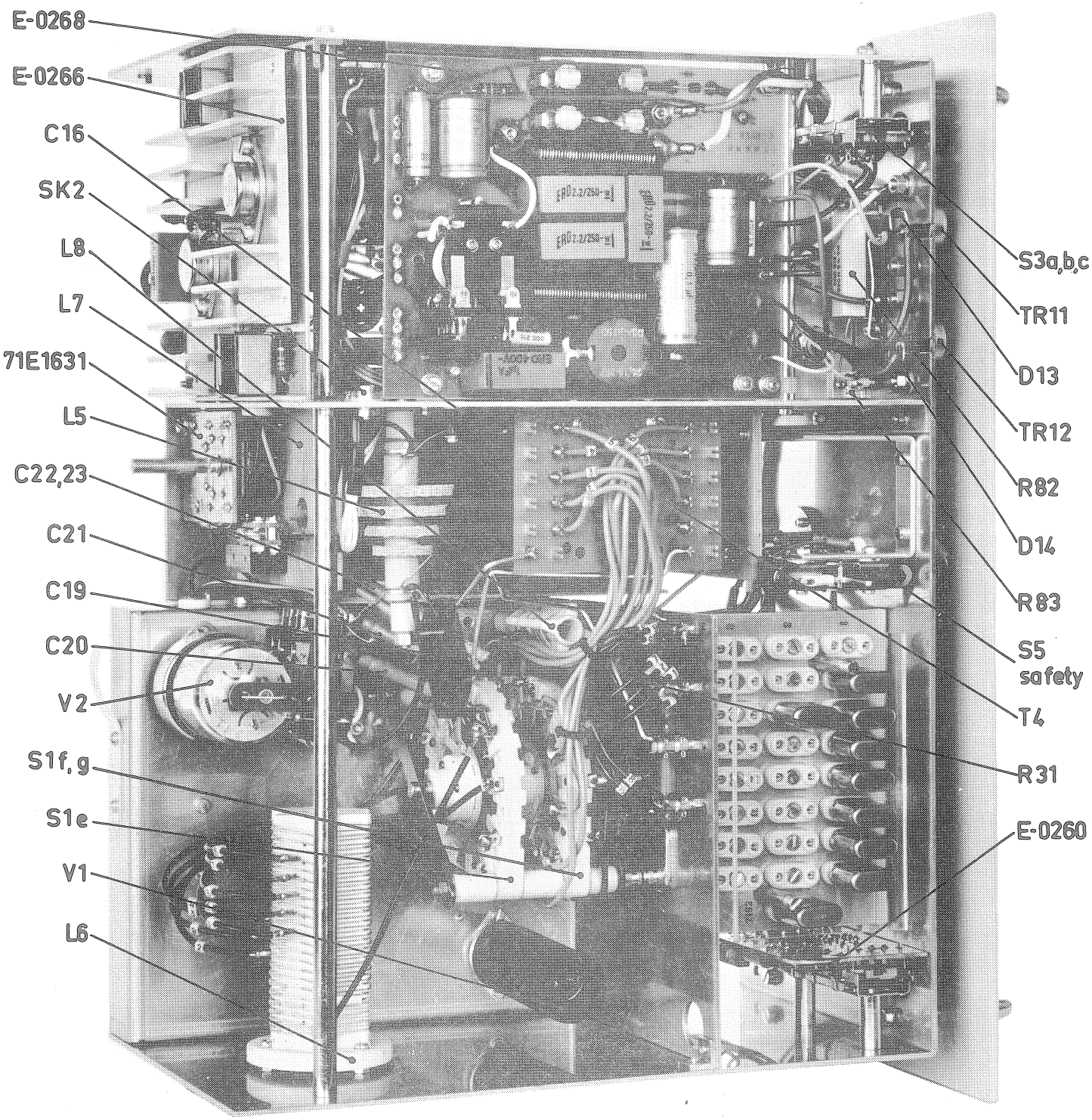
Other voltages are relative to chassis

DC measurements are made with a 25 KΩ/V meter

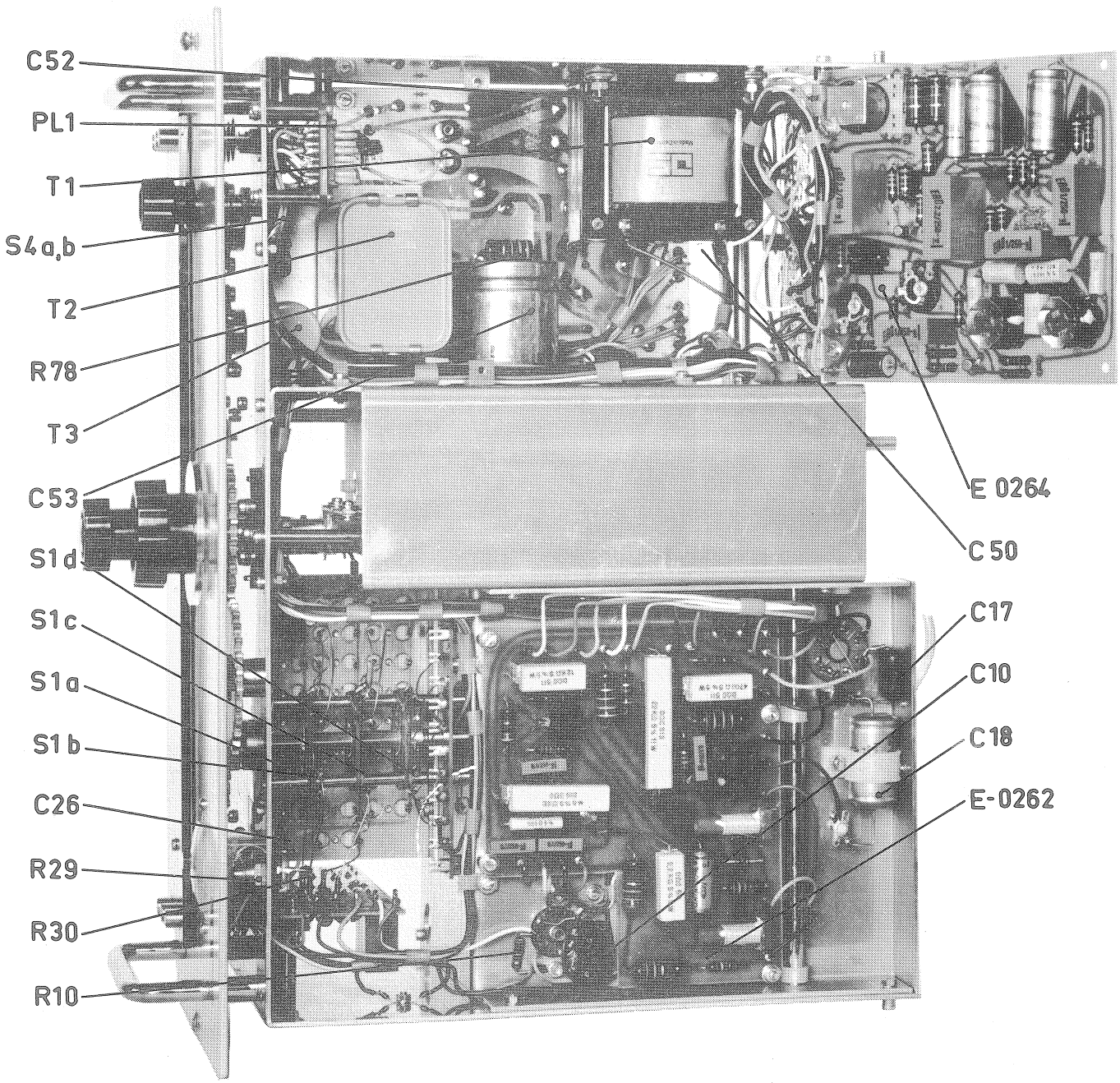
and AC measurements with a VTVM (RMS).

PRINTED CIRCUIT BOARD	TP	SERVICE A3D, HIGH	REMARKS
E-0234	1	23 V DC x)	
"	2	2.2 V DC x)	
"	3	0.7 V DC x)	
"	4	1.4 V DC x)	
"	5	19 V DC x)	
"	6	0.5 V DC x)	
"	7	14 V DC x)	
E-0238	8	0.5 V DC x)	
E-0234	9	90mV AC x)	Approx. 2KHz is applied from a AF generator
"	10	0.9-1.0V AC x)	50Ω. Press key on microtelephone.
E-0228	11	9 V DC	
"	12	11 V DC	
E-0222	13	2.8-3.3V DC	
"	14	6-14 V DC	
"	15	9 V DC	
"	16	0.5-0.8V DC	
"	17	-2 V DC	
"	18	ca 210V DC ca 480V DC	At f> 2.5MHz. Relay RL1 is activated At f< 2.5MHz. Relay RL1 is not activated
"	19	200-270V DC	Depending on the crystal
"	20	180-220V DC	Depending on antenna coupling. Low power: App. 70V
Chassis	21	0.2-0.7V DC 1.2-1.6V DC	No antenna load With antenna load } NOTE: HIGH TENSION VOLTAGE
E-0234	22	ca $10V_{eff}$ AC x)	Approx. 2KHz at correct adjusted modulation

E-0274-1
TOP VIEW OF CHASSIS



E-0273-1
BOTTOM VIEW OF CHASSIS



PARTS LIST
FOR
TYPE E16
DRAWING E-0292

ABBREVIATIONS

A	= ampere	NTC	= neg. temp. coefficient
Car.	= carbon	p	= pico or 10^{-12}
Cer.	= ceramic	Polyes.	= polyester
n	= nano or 10^{-9}	Polyst.	= polystyrene
F	= farad	S.alum.	= solid aluminium electrolytic
H	= henry	u	= micro or 10^{-6}
k	= kilo or 10^{3}	V	= working volts dc
lin.	= linear	Vac.	= working volts ac
log.	= logaritmic	Var.	= variable
m	= milli or 10^{-3}	ww	= wire wound
M	= meg or 10^{6}	W	= watt
MP	= metalized paper	W.alum.	= wet aluminium electrolytic

CAPACITORS

C1	31 pF	2%	400 V	Cer.NP0	C21	220 pF	5%	1600 V	Cer.N750
C2	29 pF	5%	400 V	Cer.NP0	C22	470 pF	5%	1000 V	Cer.N750
C3	31 pF	2%	400 V	Cer.NP0	C23	470 pF	5%	1000 V	Cer.N750
C4	31 pF	2%	400 V	Cer.NP0	C24	470 pF	5%	1000 V	Cer.N750
C5	270 pF	2.5%	160 V	Polyst.	C25	470 pF	5%	1000 V	Cer.N750
C6	39 pF	5%	400 V	Cer.NP0	C26	4.7 nF		400 V	Cer.
C7	0.1 uF	10%	250 V	Polyes.	C27	180 pF	5%	1000 V	Cer.N750
C8	270 pF	2.5%	160 V	Polyst.	C28	100 uF		400 V	W.alum.
C9	2.2 uF	10%	250 V	Polyes.	C29	0.1 uF	10%	250 V	Polyes.
C10	0.1 uF	10%	250 V	Polyes.	C30	100 uF		40 V	W.alum.
C11	0.1 uF	10%	250 V	Polyes.	C31	2.2 uF	10%	250 V	Polyes.
C12	0.1 uF	10%	250 V	Polyes.	C32	33 nF	10%	250 V	Polyes.
C13	0.47 uF	10%	400 V	Polyes.	C33	250 uF		40 V	W.alum.
C14	3 nF	10%	500 V	Mica	C34	2.2 uF	10%	250 V	Polyes.
C15	0.1 uF	10%	250 V	Polyes.	C35	1 uF	10%	250 V	Polyes.
C16	5 nF	20%	1500 V	Mica	C36	1 uF	10%	250 V	Polyes.
C17	1 nF	10%	500 V	Mica	C37	12 nF	1%	63 V	Polyst.
C18	0.1 uF		1000 V	MP	C38	5.6 nF	1%	63 V	Polyst.
C19	1 nF	20%	1500 V	Mica	C39	22 nF	1%	63 V	Polyst.
C20	220 pF	5%	1600 V	Cer.N750	C40	1.8 nF	1%	125 V	Polyst.

C41	15 nF	1%	63 V	Polyst.	C60	0.1 uF		1000 V	MP
C42	1 uF	10%	250 V	Polyes.	C61	1 nF		1600 V	Cer.
C43	320 uF		6.4 V	W.alum.	C62	1 uF	10%	400 V	Polyes.
C44	250 uF		40 V	W.alum.	C63	1 nF		1600 V	Cer.
C45	10 uF		64 V	W.alum.	C64	1 nF		1600 V	Cer.
C46	10 uF		64 V	W.alum.	C66	400 uF		40 V	W.alum.
C47	0.1 uF		12 V	Cer.	C67	2.2 uF	10%	250 V	Polyes.
C48	0.1 uF		12 V	Cer.	C68	2.2 uF	10%	250 V	Polyes.
C49	1 uF	10%	250 V	Polyes.	C69	2.2 uF	10%	250 V	Polyes.
C50	4.7 nF		400 V	Cer.	C70	400 uF		40 V	W.alum.
C51	33 nF	10%	250 V	Polyes.	C71	47 nF	10%	250 V	Polyes.
C52	0.47 uF	10%	400 V	Polyes.	C72	4.7 nF	10%	400 V	Polyes.
C53	2 uF		850 V	MP					

DIODES

D1	1N757A	Zener		D10	ESK 1/12	Silicon	
D2	1N757A	Zener		D11	ESK 1/12	Silicon	
D3	1N757A	Zener		D12	ESK 1/12	Silicon	
D4	ESK 1/12	Silicon		D13	10D2	Silicon	IR
D5	OA85	Germanium		D14	10D2	Silicon	IR
D6	OA85	Germanium		D15	10D2	Silicon	IR
D7	1S923	Silicon	TI	D16	OA85	Germanium	
D8	1S923	Silicon	TI	D17	OA85	Germanium	
D9	ESK 1/12	Silicon					

FUSES

FS1	24 V DC	10 A slow	$6.3^{\varnothing}$ x 32 mm ($1/4"^{\varnothing}$ x 1 1/4")
FS2	24 V DC	1 A slow	$6.3^{\varnothing}$ x 32 mm ($1/4"^{\varnothing}$ x 1 1/4")

COILS

					SKANTI CODE
L1	10 mH	RF-CHOKE		PRAHN 1580/12	
L2	220 uH	RF-CHOKE		PRAHN 1583/41	
L3	95 uH	DRIVER			E-0255
L4	95 uH	DRIVER			E-0255
L5	700 uH	RF-CHOKE		PRAHN 1591/2	
L6	35 uH	PA-COIL			E-0243
L7	6-30 uH	VARIOMETER			71C02
L8	20 uH	ANTENNA-COIL			E-0241
L11	270 mH	AF-COIL	brown/brown		E-0233
L12	340 mH	AF-COIL	brown/red		E-0297
L13	250 mH	HT-CHOKE			E-0124
L14	46 uH	LT-CHOKE			E-0126
L15	46 uH	LT-CHOKE			E-0126
L16		CURRENT-COIL			E-0069

METERS

ME1	Moving coil meter	100 uA	1200 ohm	Bertram

PLUGS

PL1	12 pole plug	XP12	McMurdo

RESISTORS

R1	10 kohm	5%	1/3 W	Car.
R2	5.6 kohm	5%	1/3 W	Car.
R3	270 ohm	5%	1/3 W	Car.
R4	1.5 kohm	5%	1/3 W	Car.
R5	1.2 kohm	5%	1/2 W	Car.
R6	220 ohm	5%	1/3 W	Car.
R7	270 ohm	5%	3 W	ww
R8	150 ohm	5%	1/3 W	Car.
R10	22 kohm	5%	1/3 W	Car.
R11	33 ohm	5%	9 W	ww
R12	560 ohm	5%	3 W	ww
R13	82 ohm	5%	1/2 W	Car.
R14	6.8 kohm	5%	1/2 W	Car.
R15	820 ohm	5%	1/3 W	Car.
R16	2.7 kohm	5%	1/3 W	Car.
R17	18 kohm	5%	1 W	Car.
R18	18 kohm	5%	1 W	Car.
R19	27 kohm	5%	1 W	Car.
R20	5.6 kohm	5%	1/3 W	Car.
R21	4.7 kohm	5%	5 W	ww
R22	100 ohm	5%	1/3 W	Car.
R23	2.2 kohm	5%	5 W	ww
R24	330 kohm	5%	1 W	Car.
R25	22 kohm	5%	11 W	ww
R26	1 Mohm	5%	1/2 W	Car.
R27	560 kohm	5%	1/3 W	Car.
R28	12 kohm	5%	5 W	ww
R29	0.5 Mohm	lin.	0.25 W	Var.Car.
R30	390 kohm	5%	1/3 W	Car.
R31	470 kohm	5%	2 W	Car.
R40	220 ohm	5%	1 W	Car.
R41	220 ohm	5%	1 W	Car.
R42	330 ohm	5%	1/3 W	Car.
R43	33 kohm	5%	1/3 W	Car.
R44	4.7 kohm	5%	1/3 W	Car.
R45	4.7 kohm	5%	1/3 W	Car.
R46	680 ohm	5%	1/3 W	Car.
R47	4.7 kohm	5%	1/3 W	Car.
R48	4.7 kohm	5%	1/3 W	Car.
R49	68 kohm	5%	1/3 W	Car.
R50	4.7 kohm	5%	1/3 W	Car.
R51	47 kohm	5%	1/3 W	Car.
R52	4.7 kohm	5%	1/3 W	Car.
R53	560 ohm	5%	1/3 W	Car.
R54	220 ohm	5%	1/2 W	Car.
R55	4.7 kohm	lin.	0.25 W	Var.Car.
R56	1 kohm	5%	1/3 W	Car.
R57	4.7 kohm	lin.	0.25 W	Var.Car.
R58	2.2 kohm	5%	1/3 W	Car.
R59	2.2 kohm	5%	1/3 W	Car.
R60	6.8 kohm	5%	1/3 W	Car.
R61	2.2 kohm	5%	1/3 W	Car.
R62	220 ohm	5%	1/2 W	Car.
R63	100 ohm	5%	1/3 W	Car.
R64	2.7 kohm	5%	1/3 W	Car.
R65	270 ohm	5%	1/3 W	Car.
R66	270 ohm	5%	1/3 W	Car.
R70	2.7 kohm	5%	1/3 W	Car.
R71	4.7 kohm	lin.	0.25 W	Var.Car.
R72	330 ohm	5%	1/3 W	Car.
R73	390 ohm	5%	1/3 W	Car.
R74	390 ohm	5%	1/3 W	Car.
R75	390 ohm	5%	1/3 W	Car.
R76	0.27 ohm	10%	3 W	ww
R77	0.27 ohm	10%	3 W	ww
R78	330 kohm	5%	1 W	Car.
R80	10 ohm	10%	1 W	ww
R81	22 ohm	5%	1/2 W	Car.
R82	220 ohm	5%	9 W	ww
R83	Value selected at production			
R84	470 ohm	5%	3 W	ww
R85	470 ohm	5%	1/3 W	Car.
R86	10 kohm	5%	1/3 W	Car.
R87	1 kohm	5%	1/3 W	Car.

RELAYS

RL1	KMK2	24 V DC		KEYSWITCH
RL2	DL321.322	24 V DC		ITT
RL3	KMK2	24 V DC		KEYSWITCH
RL4	SU2081	24 V DC	See drawing D-0218	ITT

SWITCHES

			SKANTI CODE
S1a,b,c,d	Osc.channel	rotary switch	E-0256
S1e,f,g	PA.channel	rotary switch	E-0115
S2	Frequency	push-button switch	E-0257
S3	Service	push-button switch	E-0109
S4	High/Low power	rotary switch	D-0050
S5		safety switch	

SOCKETS

SK1	12 pole socket	XS12	McMurdo

LAMPS

SL1	minilamp	6 V 40 mA CM2180 Chicago Miniature Lamp Works
SL2	neonlamp	110/220 V PFE455 - 110/220 V Schurter

TRANSFORMERS

			SKANTI CODE
T1	Mod.transformer	J.S. 31.5 - 12336/5	
T2	Output transformer	J.S. KX - 12355/6	
T3	Driver transformer	J.S. KX - 12458/2	
T4	Coupling transformer		E-0291

THERMISTORS

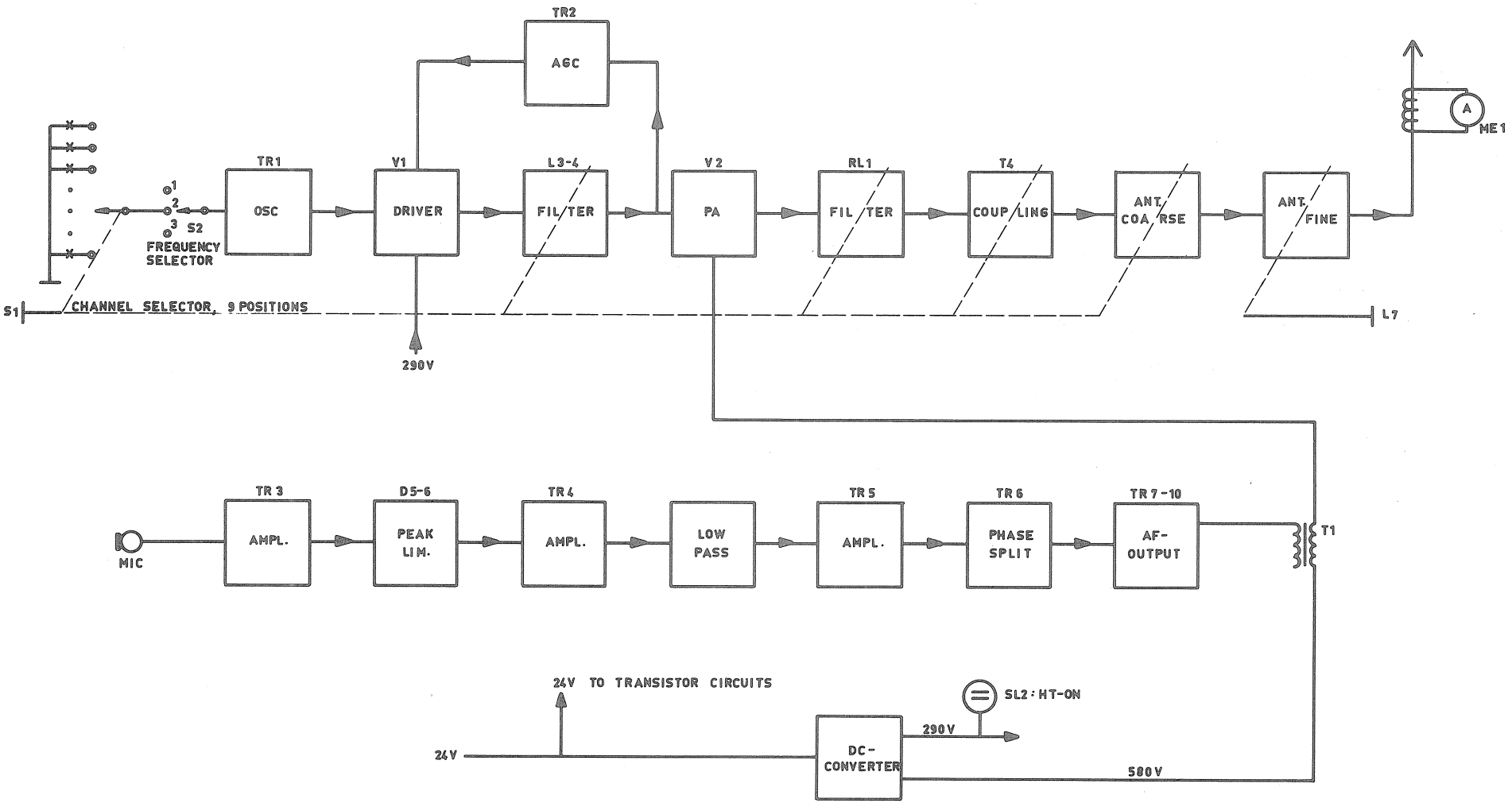
TH1	470 ohm 1 W NTC Resistor	TH2	470 ohm 1 W NTC Resistor

TRANSISTORS

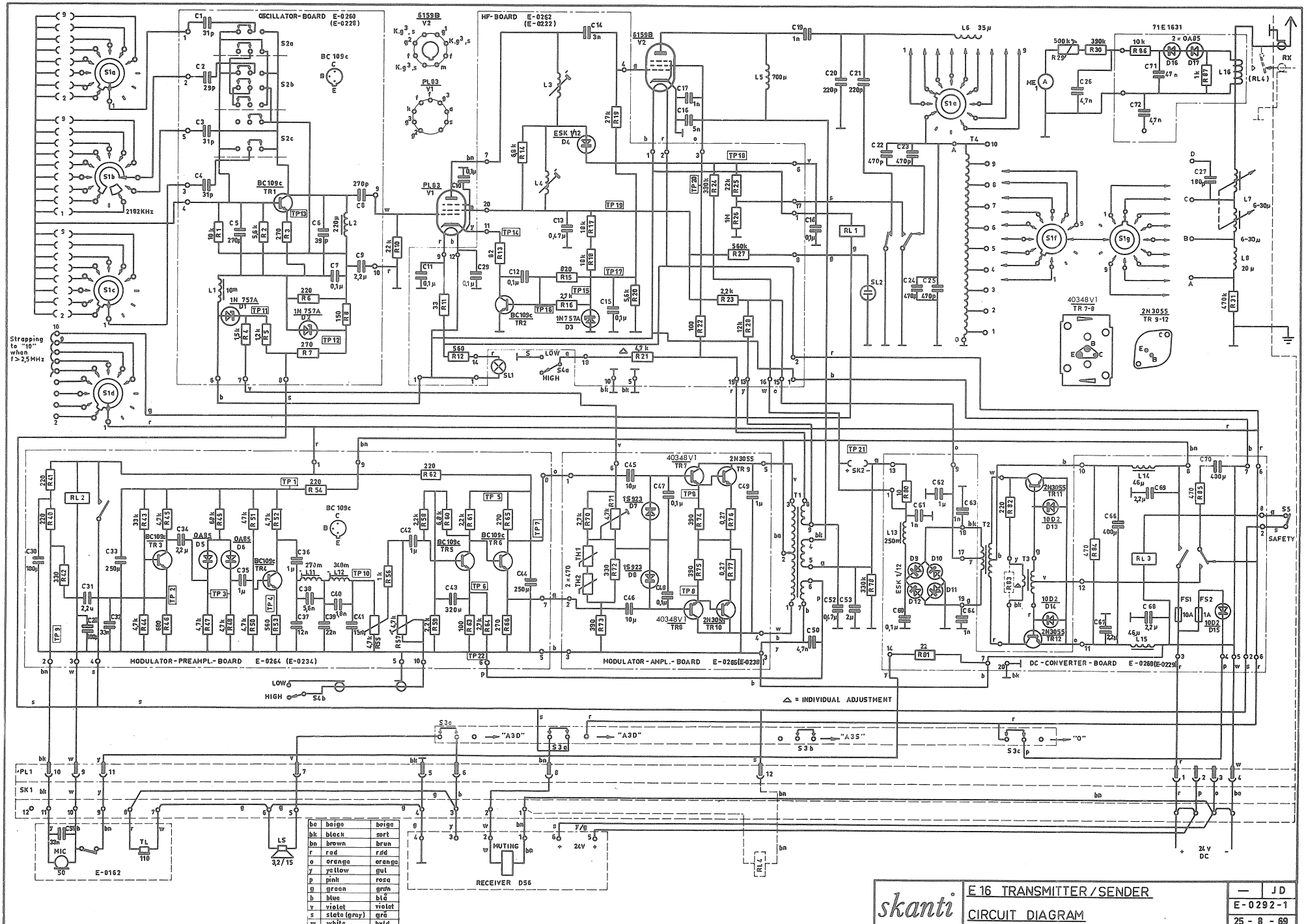
TR1	BC109c	Silicon	TR7	40389	Silicon
TR2	BC109c	Silicon	TR8	40389	Silicon
TR3	BC109c	Silicon	TR9	2N3055	Silicon
TR4	BC109c	Silicon	TR10	2N3055	Silicon
TR5	BC109c	Silicon	TR11	2N3055	Silicon
TR6	BC109c	Silicon	TR12	2N3055	Silicon

TUBES

V1	PL83 - 15A6	V2	YL1372 - 6159B



skanti	E16 BLOCK-DIAGRAM	- JD E-0295-1 25-9-69

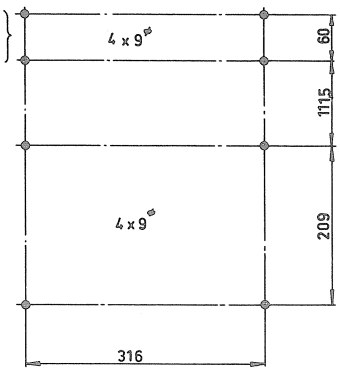


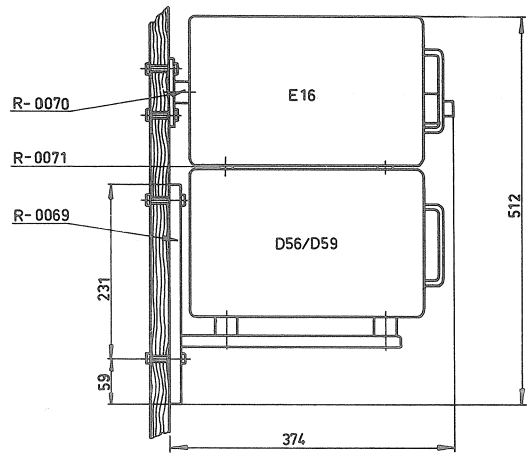
be	beige	beige
bk	black	sort
bn	brown	brun
r	red	rød
o	orange	orange
y	yellow	gul
p	pink	rosa
g	green	grøn
b	blue	blå
v	violet	violet
s	slate (gray)	grå
w	white	hvid

R-0069, R-0070, R-0072 fastspændes med 5/16" WG
R-0069, R-0070, R-0072 to be fastened by 5/16 WG

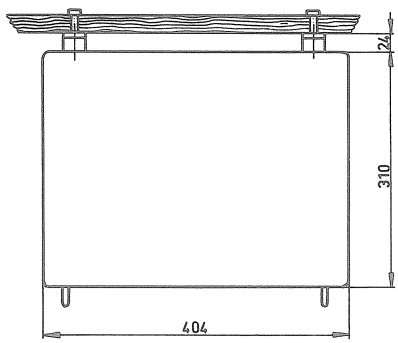
Enhed: Unit:	Vægt: Weight:
E16	11,0 kg
D56	7,1 kg
D59	7,3 kg

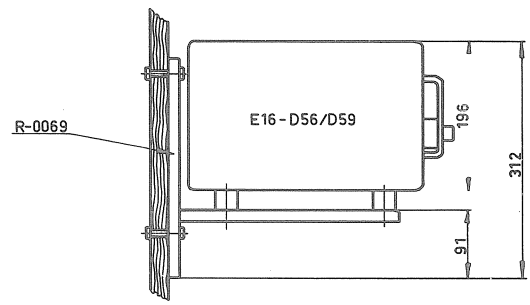
Bores kun for R-0070
To be drilled for
R-0070 only



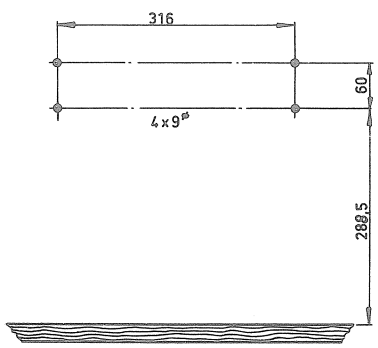


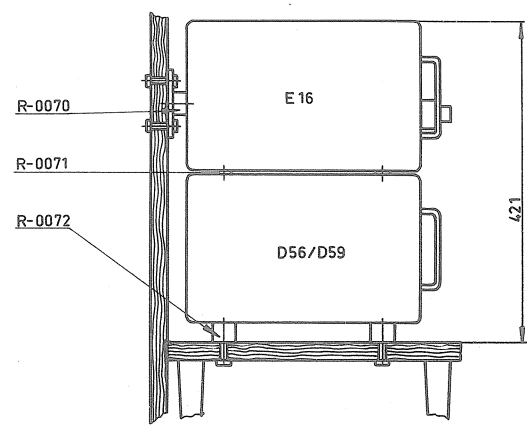
To enheder monteret på skot
Two units fitted on bulkhead



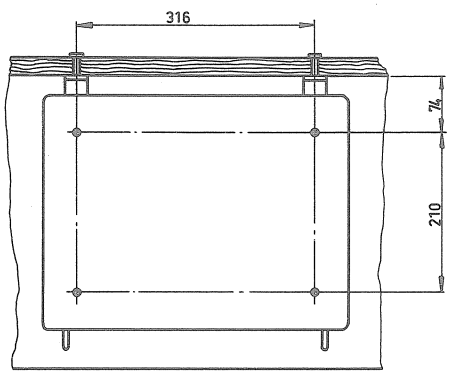


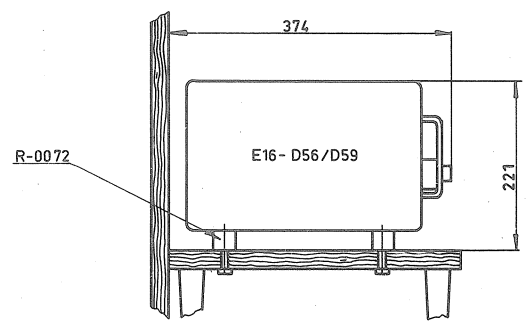
En enhed monteret på skot
One unit fitted on bulkhead





To enheder monteret på bord
Two units fitted on tabletop





En enhed monteret på bord
One unit fitted on tabletop

	Monterings tilbehør	Fitting accessories:
R-0069:	Konsol med svingningsdæmpere	Bracket with shock absorbers
R 0070:	Vægbeslag	Wall fitting
R-0071:	Sammenspændingsdele med mellemkabel	Coupling parts with connecting cable
R-0072:	Svingningsdæmpere for bordmontage	Shock absorbers for tabletop mounting

Tolerancer: ± 0,5 mm
Dimensions are in mm
Tolerances: ± 0.5 mm

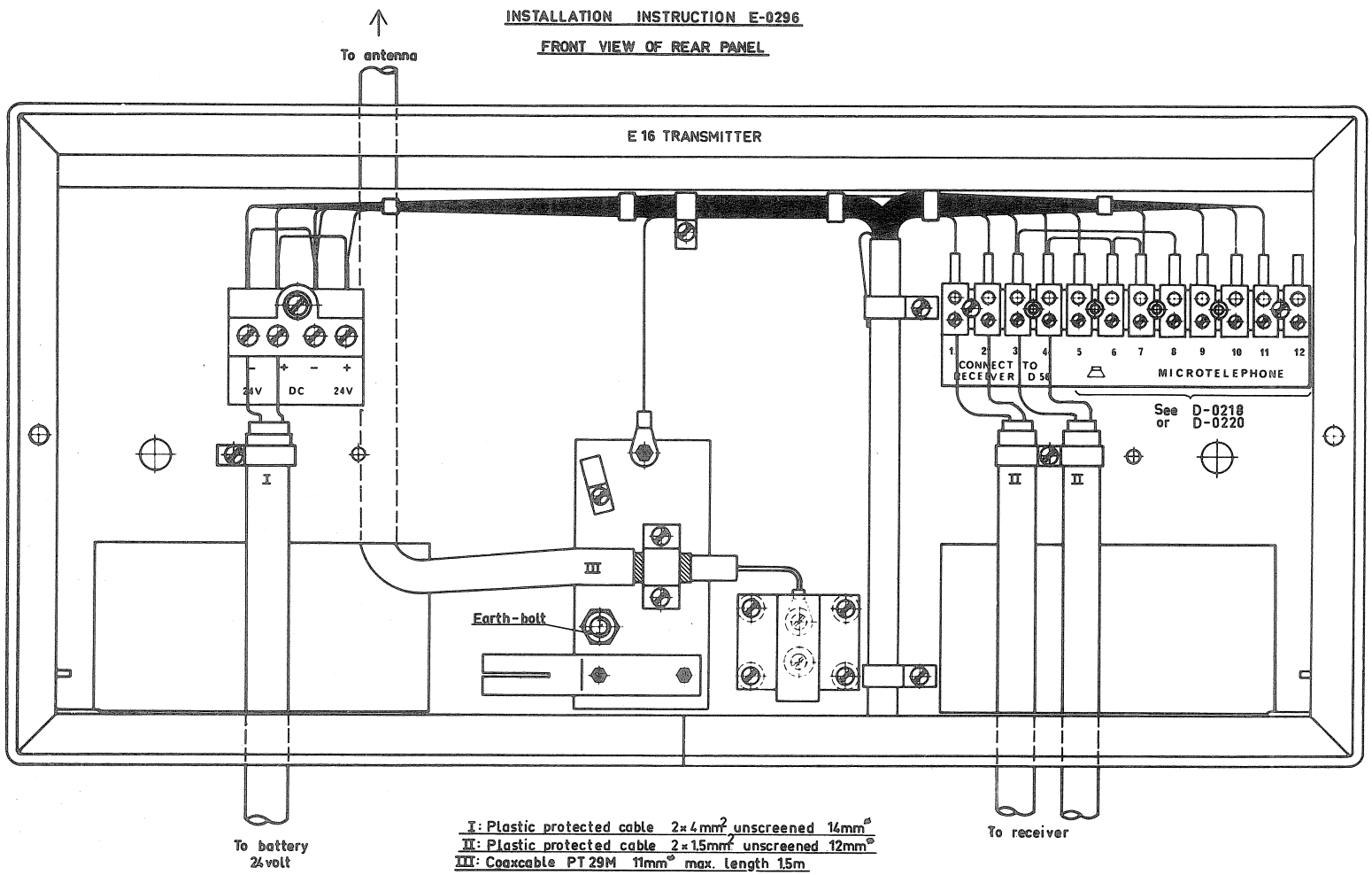
skanti

Montering af E16-D56/D59 på skot eller bord
Fitting of E16-D56/D59 on bulkhead or tabletop

-	JD
D-0216-1	
23-9-69	

INSTALLATION INSTRUCTION E-0296

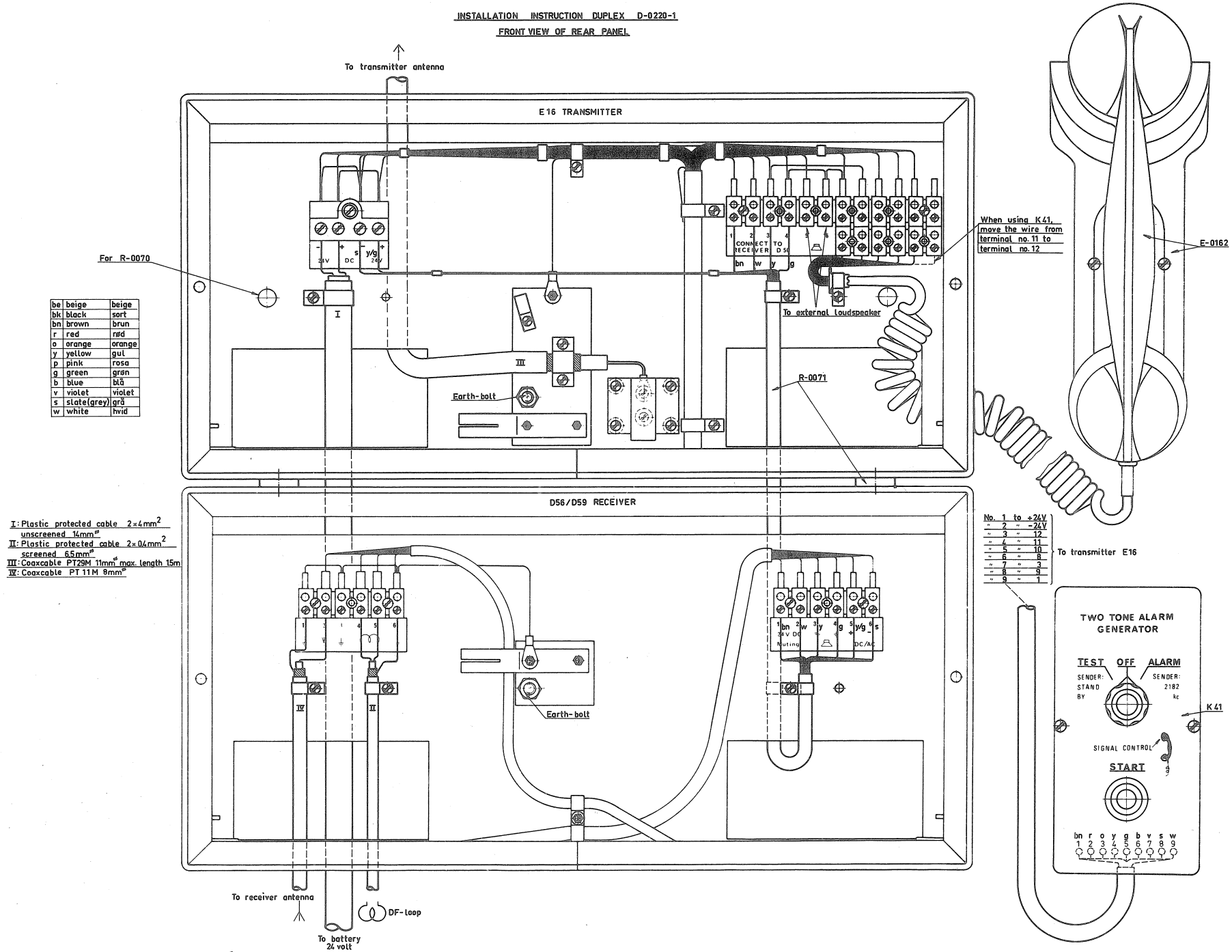
FRONT VIEW OF REAR PANEL



I: Plastic protected cable 2 × 4 mm² unscreened 14mm⌀
II: Plastic protected cable 2 × 1.5mm² unscreened 12mm⌀
III: Coaxcable PT 29M 11mm⌀ max. length 1.5m

INSTALLATION INSTRUCTION DUPLEX D-0220-1

FRONT VIEW OF REAR PANEL

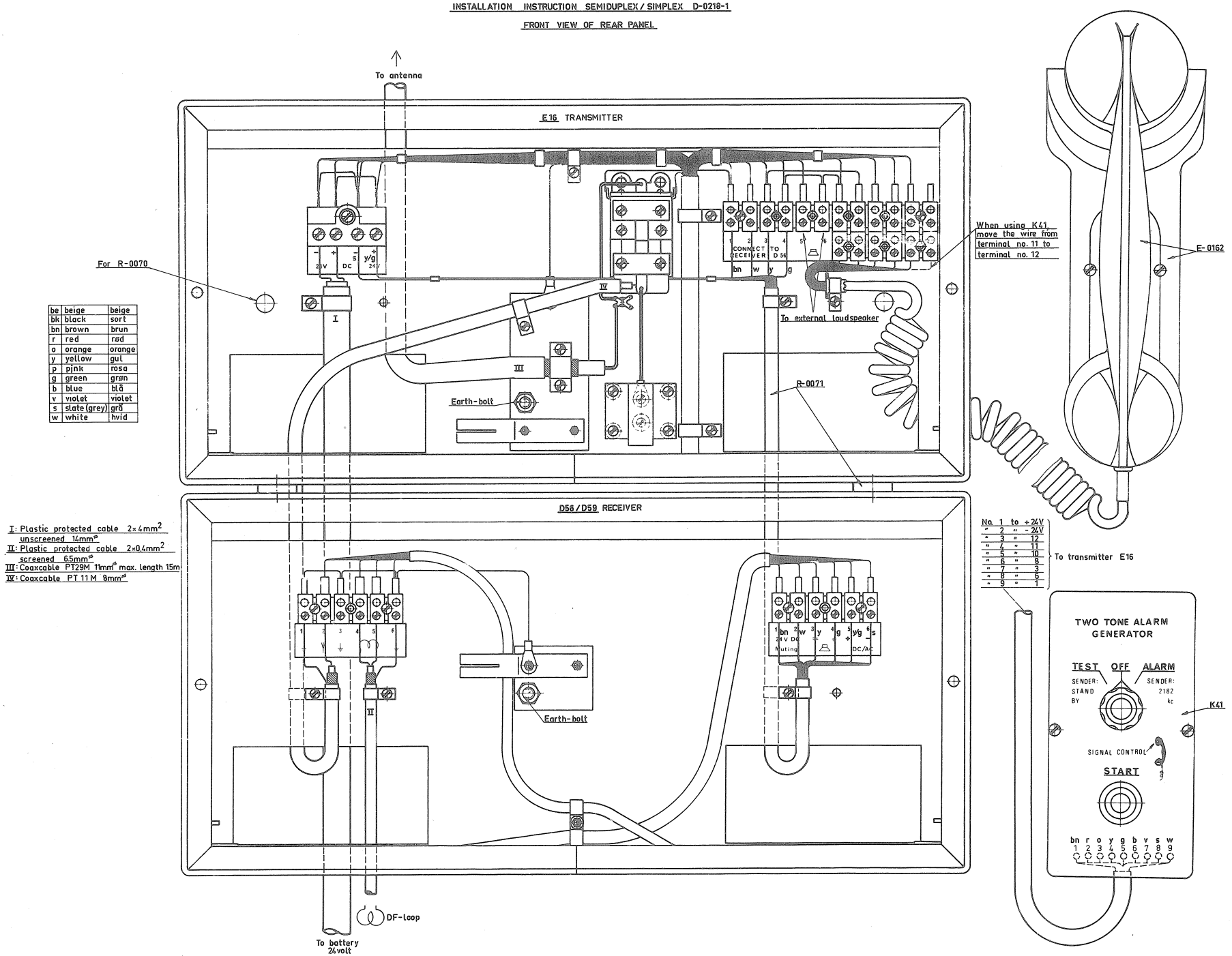


be	beige	beige
bk	black	sort
bn	brown	brun
r	red	rød
o	orange	orange
y	yellow	gul
p	pink	rosa
g	green	grøn
b	blue	blå
v	violet	violet
s	slate(grey)	grå
w	white	hvid

I: Plastic protected cable 2×4mm² unscreened 14mm⌀
II: Plastic protected cable 2×0.4mm² screened 6.5mm⌀
III: Coaxcable PT29M 11mm⌀ max. length 15m
IV: Coaxcable PT 11M 8mm⌀

INSTALLATION INSTRUCTION SEMIDUPLEX / SIMPLEX D-0218-1

FRONT VIEW OF REAR PANEL

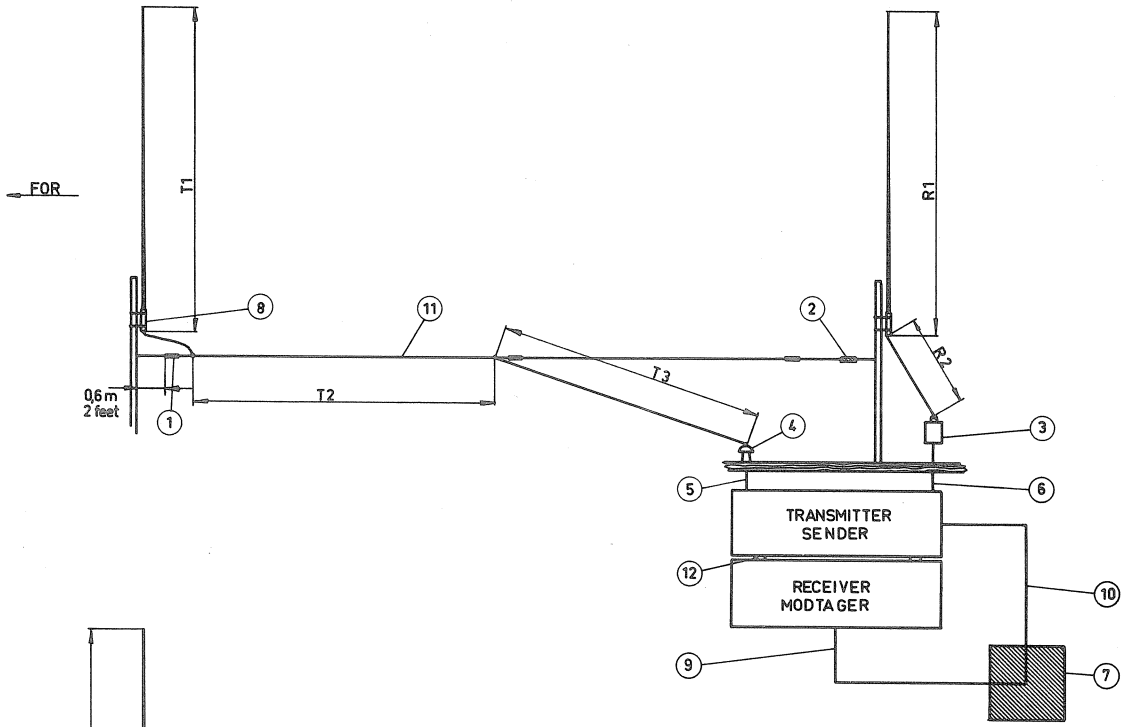


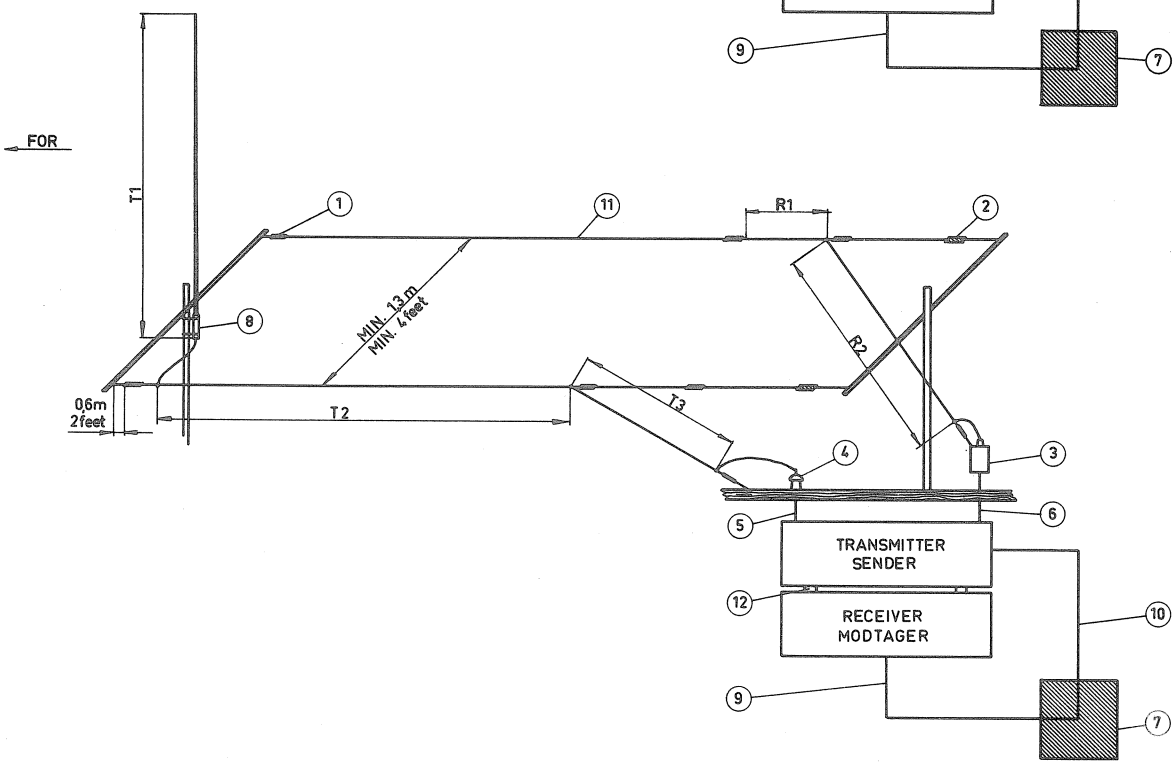
be	beige	beige
bk	black	sort
bn	brown	brun
r	red	rød
o	orange	orange
y	yellow	gul
p	pink	rosa
g	green	grøn
b	blue	blå
v	violet	violet
s	slate (grey)	grå
w	white	hvid

I: Plastic protected cable 2×4mm² unscreened 14mm⌀
II: Plastic protected cable 2×0.4mm² screened 6.5mm⌀
III: Coaxcable PT29M 11mm⌀ max. length 15m
IV: Coaxcable PT 11 M 8mm⌀

No.	1	to	+24V
"	2	"	-24V
"	3	"	12
"	4	"	11
"	5	"	10
"	6	"	8
"	7	"	3
"	8	"	5
"	9	"	1

To transmitter E16





Length of antenna (TRANSMITTER)
Max. 20 metres (22 yards), min. 12 metres (13 yards).
Proposal as shown in drawing. The length comprises T1+T2+T3+Coaxialcable

Antennelængde (SENDER)
Max. 20m, min 12m. Forslag som vist på tegning.
Længden består af T1+T2+T3+Coaxkabel

Length of antenna (RECEIVER)
Max. 30 metres (33 yards), min. 6 metres (6 1/2 yards).
Proposal as shown in drawing. The length comprises R1+R2

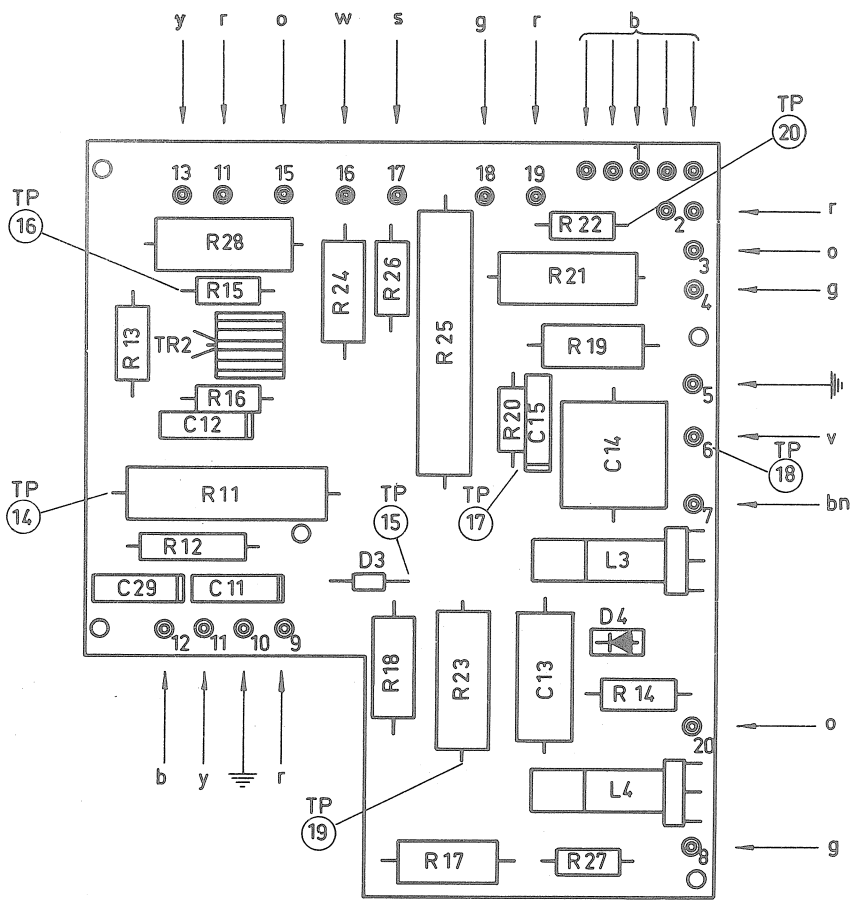
Antennelængde (MODTAGER)
Max. 30m, min 6m. Forslag som vist på tegning.
Længden består af R1+R2

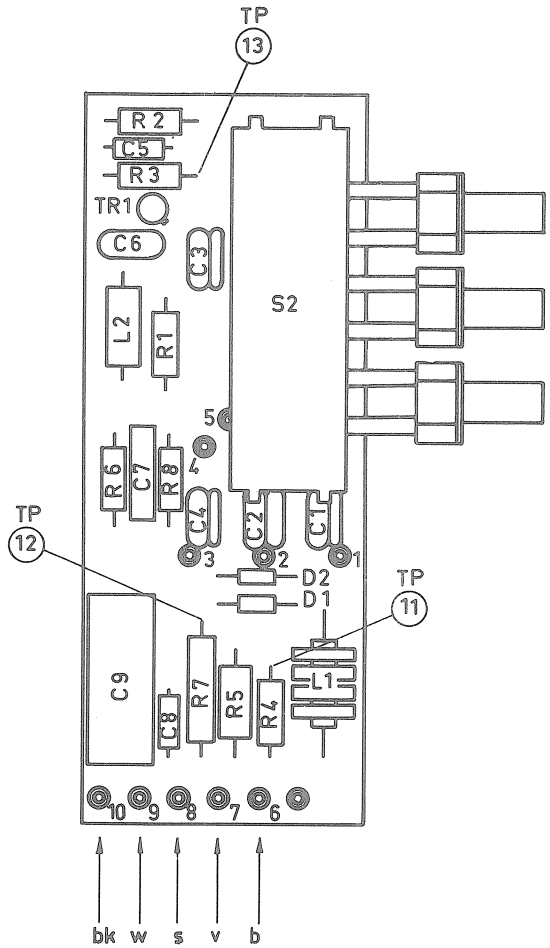
	MATERIAL PROPOSAL		MATERIALEFORSLAG	
Pos	Description		Benævnelse	
1	Insulator	(f. inst. Type 762)	Isolator	(f. eks. Type 762)
2	Spring	(f. inst. Type F1)	Fjeder	(f. eks. Type F1)
3	Antenna junction box	(f. inst. Type G7)	Antennedåse	(f. eks. Type G7)
4	Stand off	(f. inst. Type G8)	Gennemføringsisolator	(f. eks. Type G8)
5	Coaxialcable	(f. inst. Type PT29M max. length 1.5m (5ft)	Coaxkabel	(f. eks. Type PT29M max. 1.5m)
6	Coaxialcable	(f. inst. Type PT11M)	Coaxkabel	(f. eks. Type PT11M)
7	Earth plate	(min 1m² (3 1/4 sq.f.) copper)	Jordplade	(min 1m² kobber)
8	Whip antenna	(Type A22)	Stavantenne	(Type A22)
9	Plastic cable	(2.5mm² - 3/32 sq.i.)	Plastkabel	(2,5 mm²)
10	Copper strip	(50×0.5mm - 2"×1/64")	Kobberbånd	(50×0,5mm)
11	Antenna wire	(f. inst. 6×8×0.35mm - 15/64"×5/16"×1/64")	Antennetråd	(f. eks. 6×8×0,35mm)
12	Coupling part	(1 set Type R-0071)	Sammenspændingsdele	(1 sæt Type R-0071)

skanti

INSTALLATION GUIDANCE FOR ANTENNA AND EARTH CONNECTION (TRANSMITTER-RECEIVER).
INSTALLATIONSVEJLEDNING FOR ANTENNER OG JORDLEDNINGER (SENDER-MODTAGER).

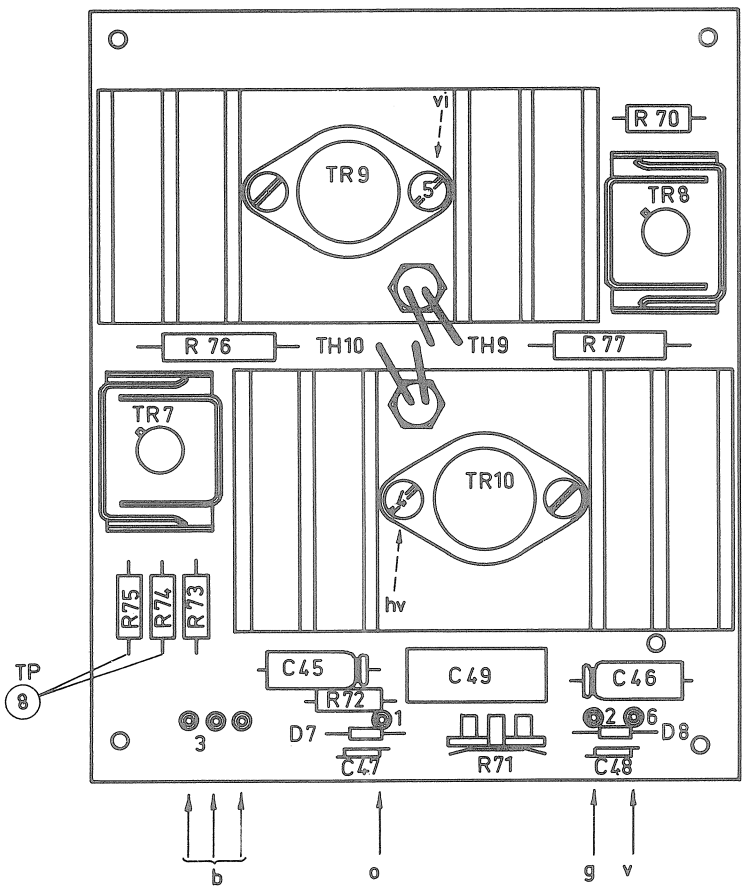
JD
E-0287-1
7 - 10 - 69



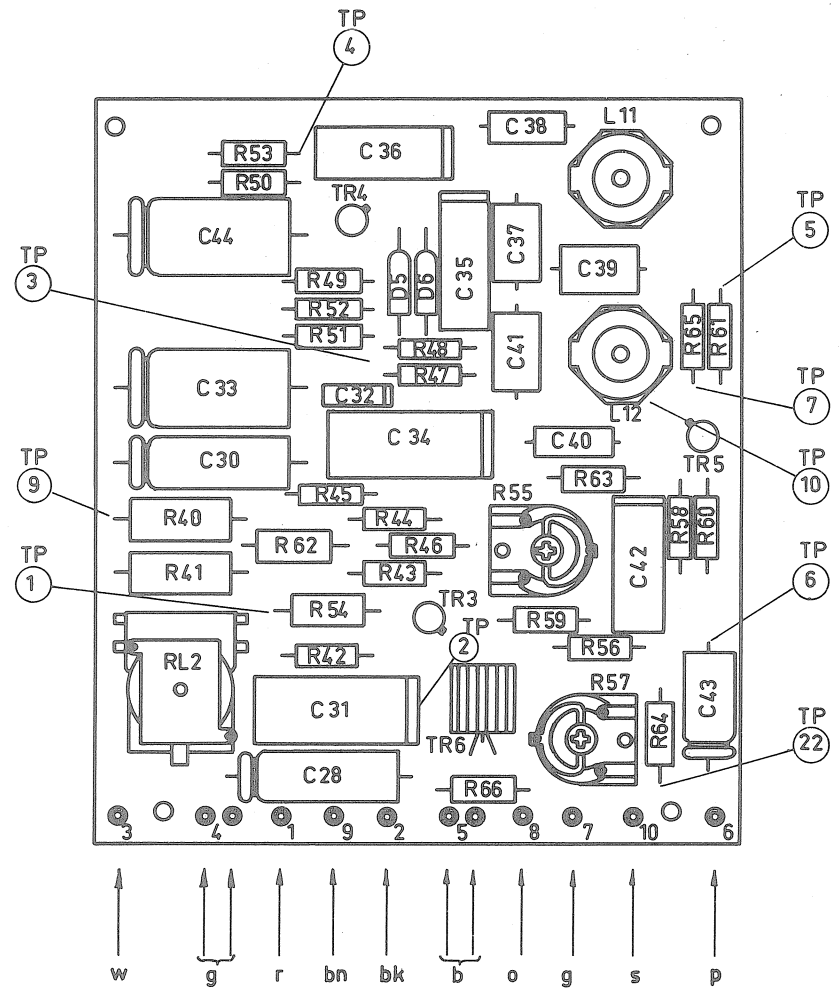


skanti	E 16 HF - BOARD E-0222	J D E - 0262 - 1 28 - 8 - 69	

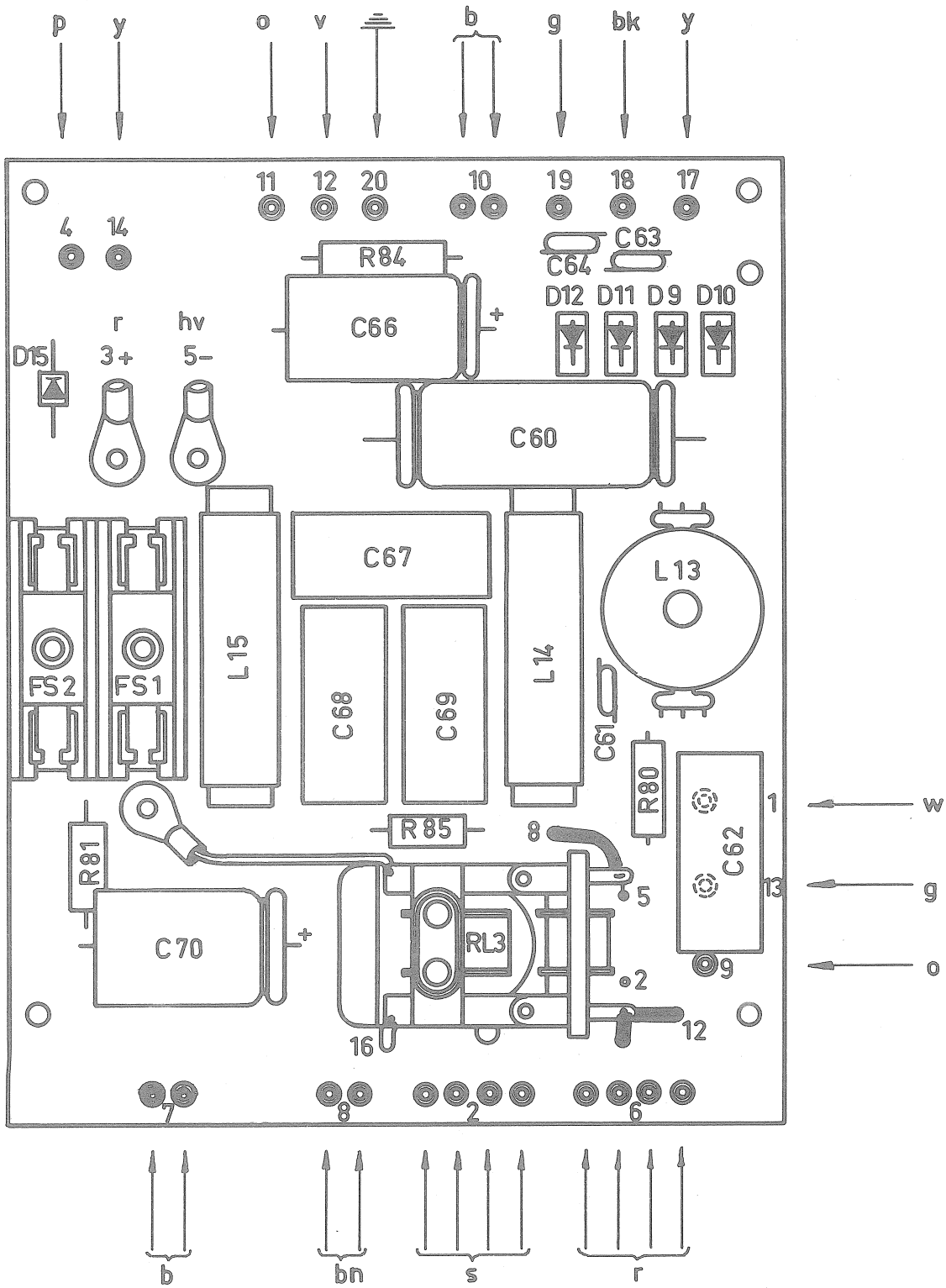
skanti	E16 OSCILLATOR-BOARD E - 0228	J D E - 0260 - 1 27 - 8 - 69	



skanti	E16 MODULATOR-AMPL:BOARD E-0238	JD E-0266-1 26-8-69	



skanti	E16 MODULATOR-PREAMPL.-BOARD E-0234	JD E-0264-1 29-8-69	



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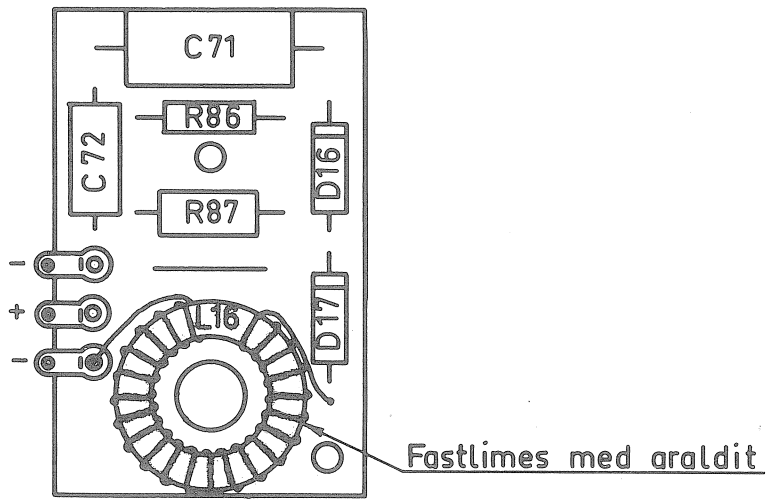

skanti	ANTENNA CURRENT INDICATOR UNIT E-0253	JD 71 E 163 1 9 - 10 - 69