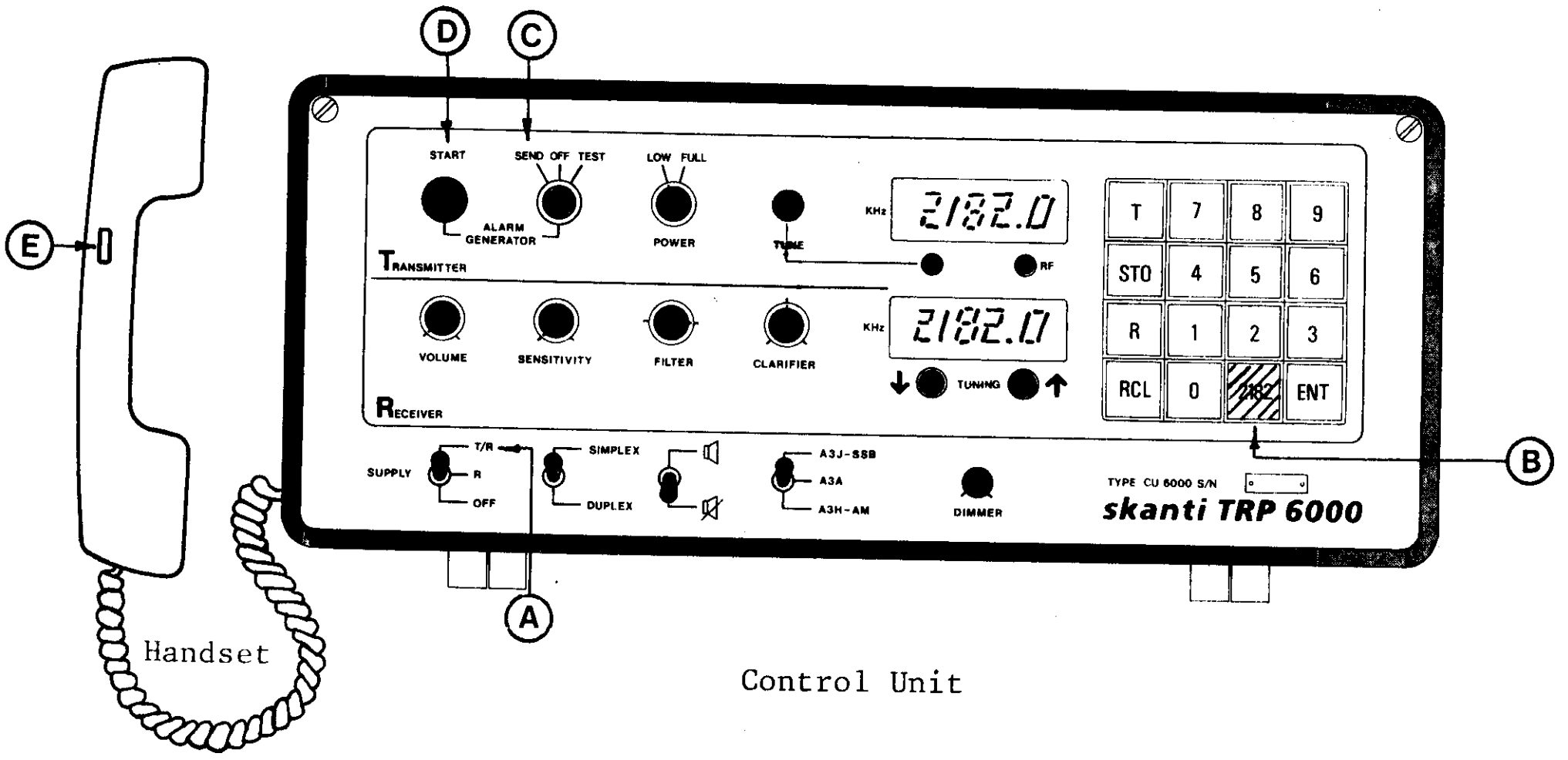
skanti

INSTRUCTION MANUAL

SSB RADIOTELEPHONE
TRP6000

DISTRESS OPERATION ON 2182 kHz



Transmission of two-tone alarm signal

1. Switch SUPPLY (A) to "T/R"

2. Press the "2182" key (B)

3. Switch ALARM GENERATOR to "SEND" (C)

4. Press ALARM GENERATOR "START" pushbutton (D)

Transmission starts immediately after the automatically initiated tuning sequence and the alarm signal is now transmitted for about 45 seconds.

To repeat the alarm signal transmission just press the "START" push-button (D) again.

The alarm signal can be monitored in the handset earpiece.

An alarm signal transmission may be interrupted at any time by turning the ALARM GENERATOR switch to "OFF".

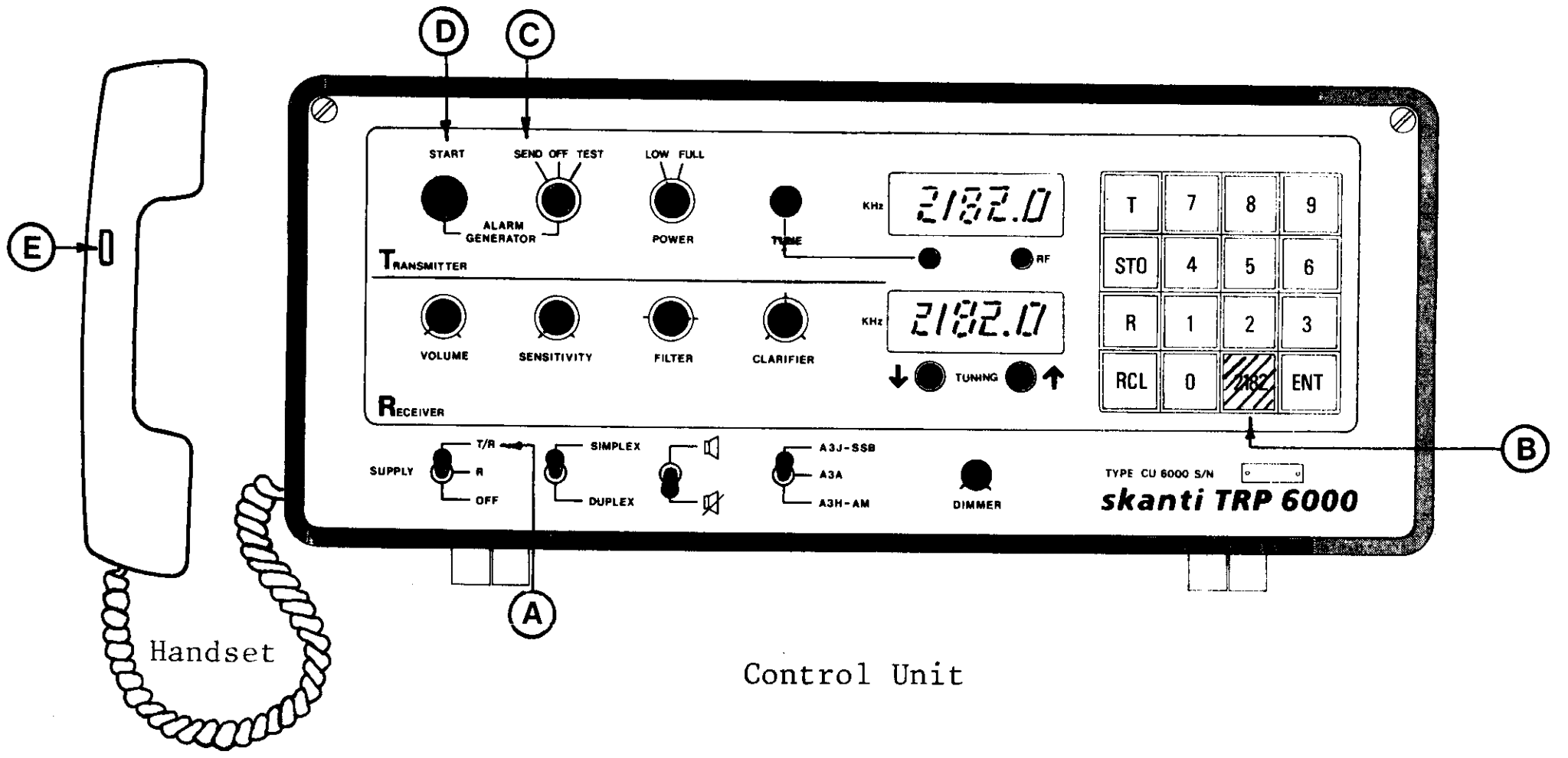
Transmission of distress message

When the alarm signal ceases press handset key (E), and transmit your distress message by speaking into the handset microphone with a clear and calm voice.

Release handset key (E) and wait for a reply.

Repeat the distress message at intervals until a reply is received.

DISTRESS OPERATION ON 2182 kHz



Control Unit

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TRP6000 INSTRUCTION MANUAL

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NOTICE

Due to the constant processing of the experience gained during production and operation of our equipment, minor modifications may occur relative to the information given in this manual. Whenever practicable corrections will be listed on a correction sheet inside the front cover of this manual.

TRP 6000 INSTRUCTION MANUAL

CONTENTS

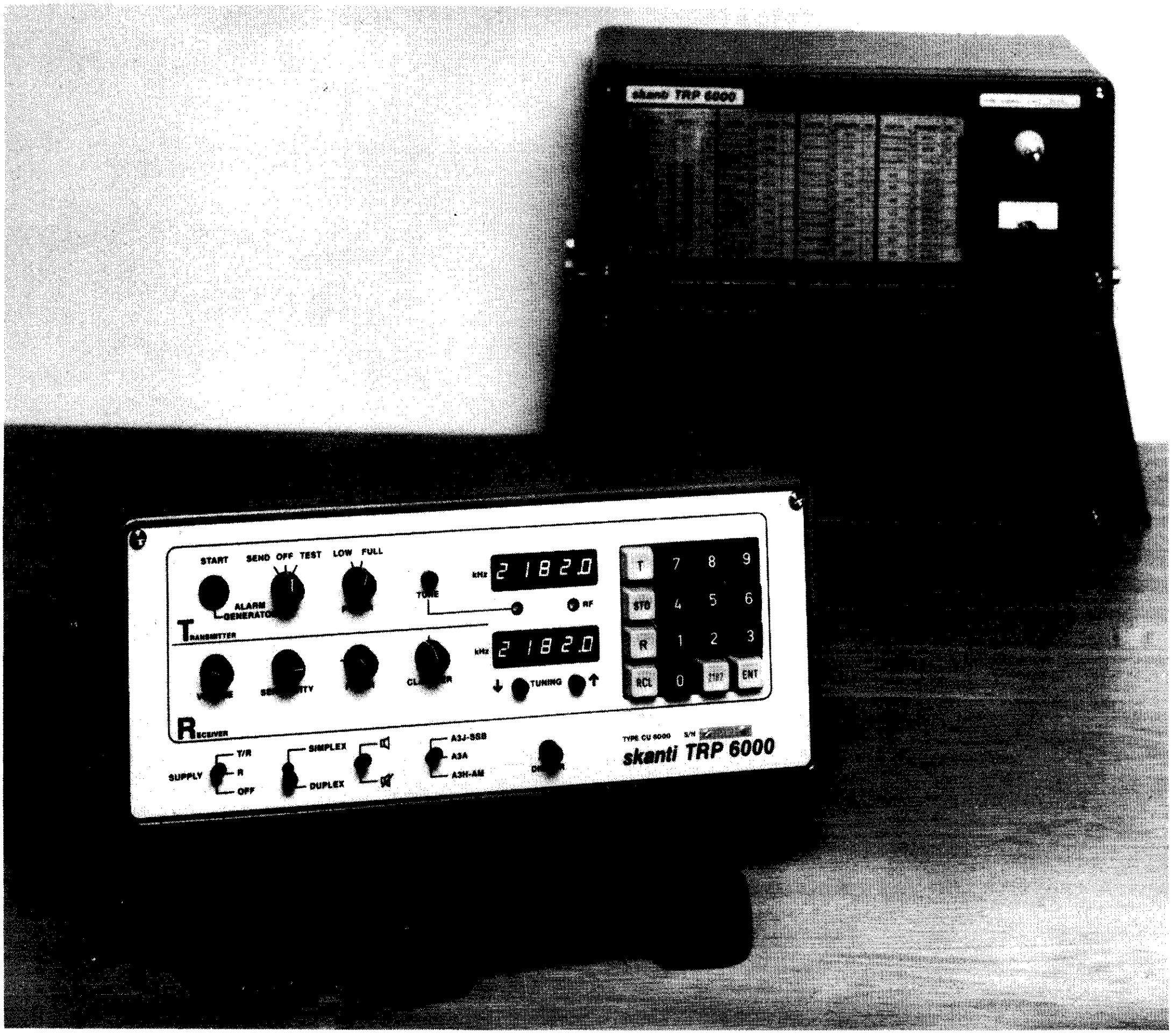

skanti TRP 6000
START
SEND OFF TEST LOW FULL
ALARM GENERATOR
TONE
kHz
2 1 8 2.0
RF
TRANSMITTER
RECEIVER
TUNING
T
STO
R
RCL
ENT
SUPPLY
T/R
R
OFF
SIMPLEX
DUPLEX
A3J-SSB
A3A
A3H-AM
TYPE CU 6000
S/N

Fig. 1.1

1. INTRODUCTION TO TRP 6000

The TRP 6000 is an SSB Radiotelephone equipment for duplex, semiduplex and simplex communications in the maritime mobile bands from 1.6 to 4.5 MHz.

The novel design of the SKANTI TRP 6000 breaks with the traditional SSB radiotelephone concept. The TRP 6000 is divided into two units, a handy CONTROL UNIT and a fully remote controlled TRANSMITTER UNIT (fig. 1.1).

The Control Unit (CU 6000) contains all receiver and transmitter operating controls and is housed in a non-metallic, non-magnetic cabinet. This combined with the small dimensions of the cabinet ensures maximum installation flexibility.

The transmitter Unit (TU 6400, 400 W or TU 6200, 200 W) is fully remote controlled and may be installed up to 50 metres from the Control Unit where most convenient with respect to antenna lead-in, grounding and the battery connections, thus reducing the well-known problems of power-loss and radio frequency interference caused by long antenna- and ground-wires.

The Transmitter Unit is housed in a rugged nylon-coated steel cabinet and contains the fully solid state linear power amplifier, the power supply and the automatic tuning system. Cooling is performed by temperature controlled fans switched on only under heavy duty operation.

The microprocessor equipped Control Unit contains two separate frequency synthesizers and two frequency displays for the receiver and transmitter functions. Frequency selection is carried out via a common keyboard. A single key operation instantly selects 2182 kHz operation.

The keyboard permits the operator to program up to 20 channels with his busiest receiving and transmitting frequency pairs, and to recall each channel with a few key operations. The TRP 6000 will store the programmed channels for several years, even when switched off. Where required by the authorities, the TRP 6000 will contain a transmitter-frequency PROM with a capacity of up to 80 frequencies. Transmitter keying can only then take place exclusively on the authorized frequencies programmed into the PROM. The keyboard permits recall and display of all the frequencies contained in the PROM.

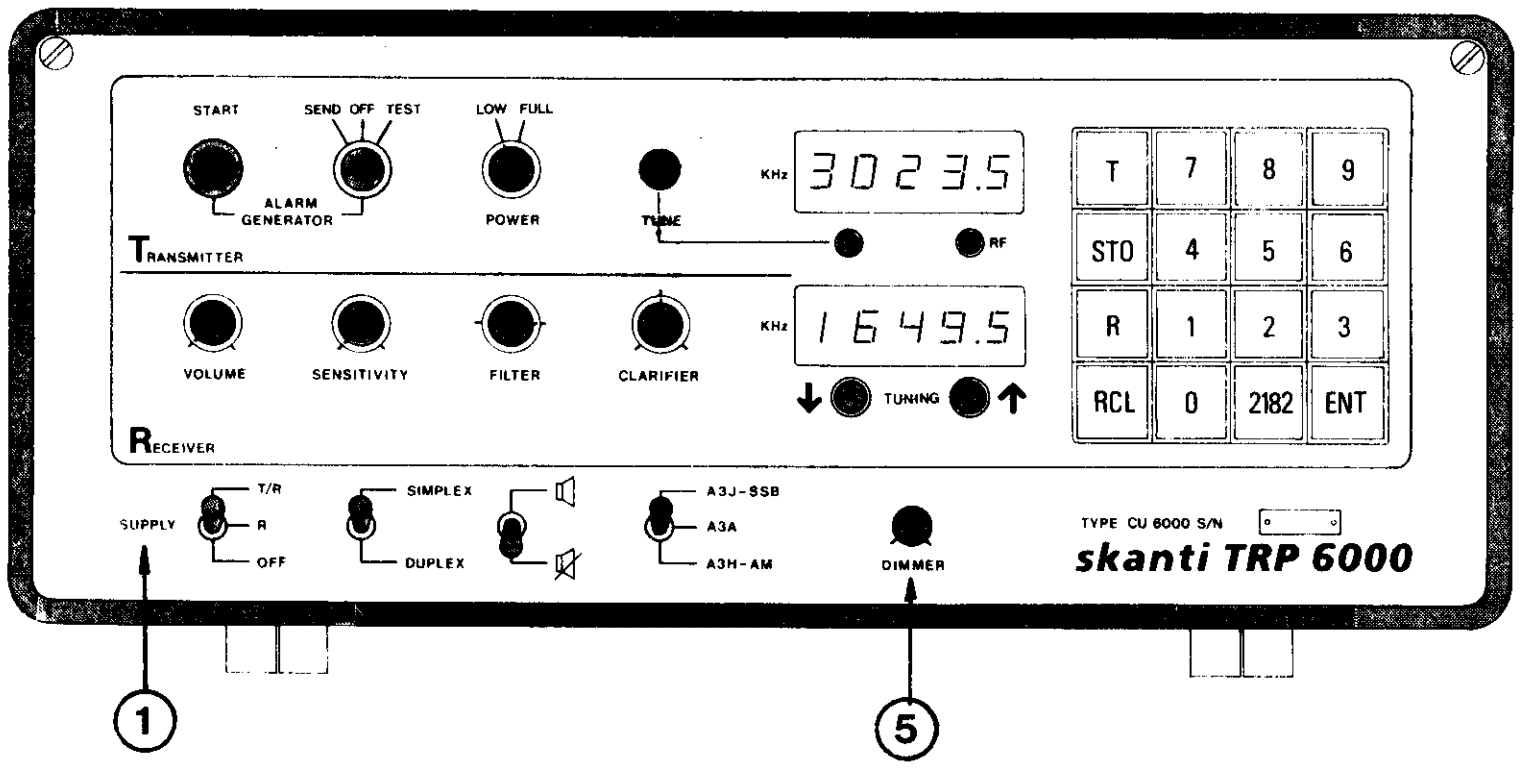
Due to the all solid state design the TRP 6000 is ready for operation within seconds after being switched on.

The automatic tuning system ensures optimum antenna matching under all conditions. This results in maximum RF output power for reliable short, medium and long range communications.

2. OPERATION

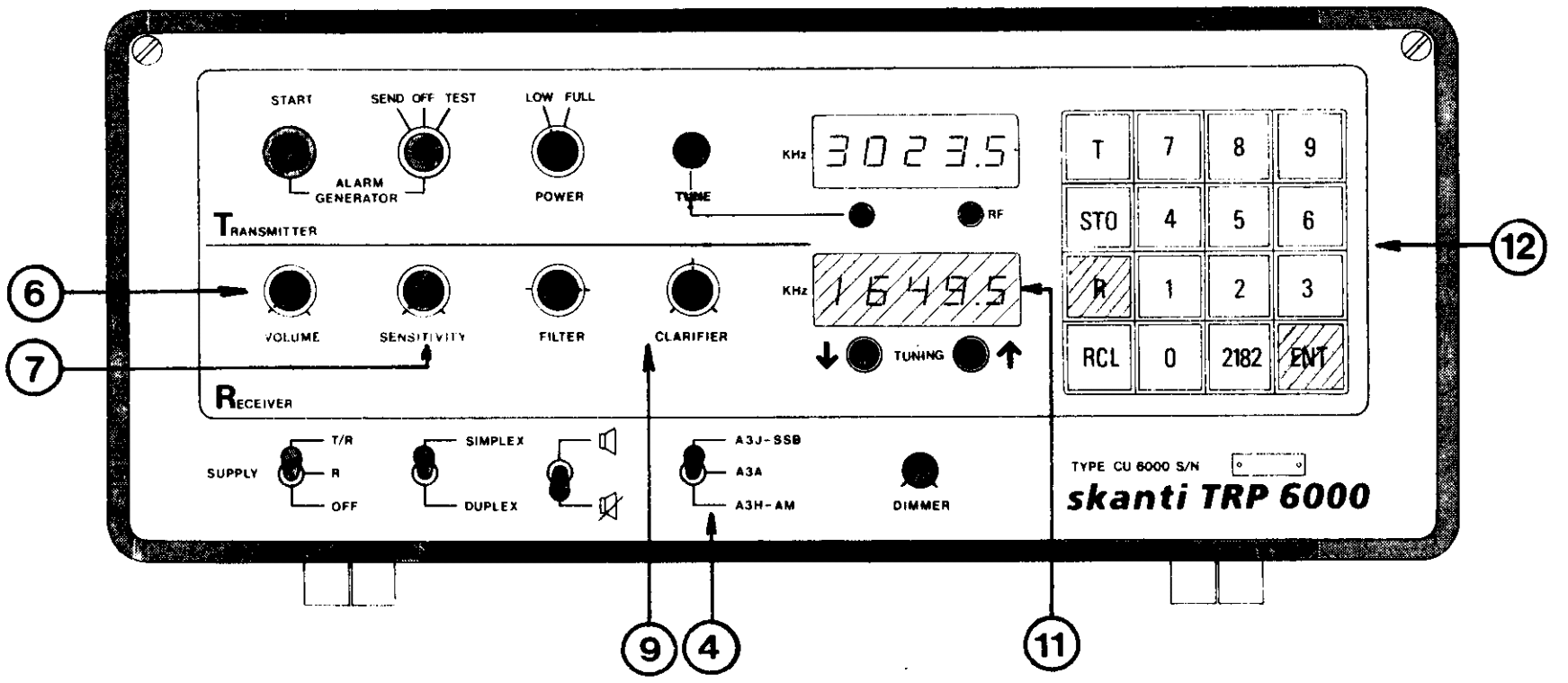
2.1. OPERATING INSTRUCTIONS - SHORT FORM

SWITCH ON



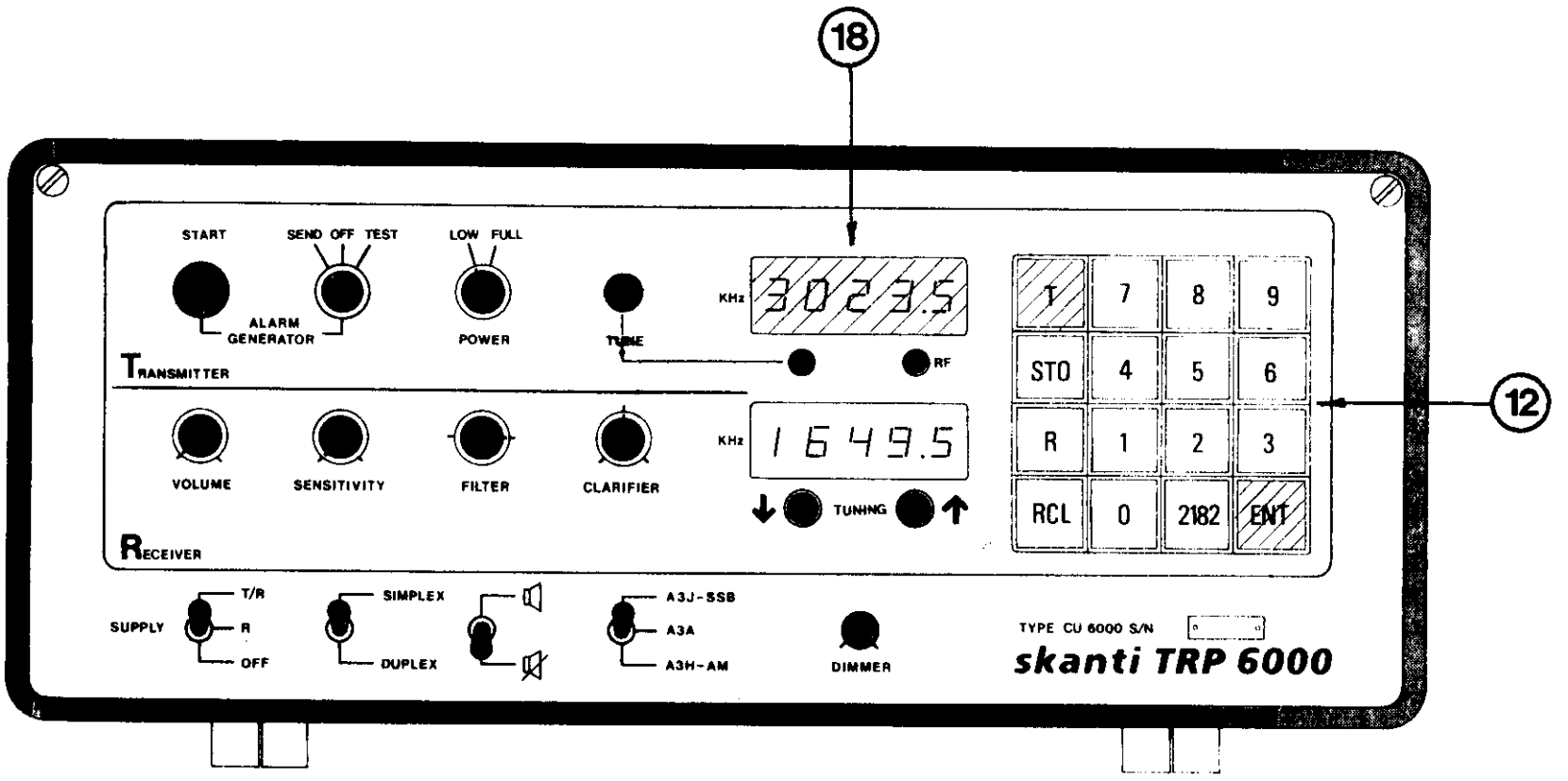
1. Switch SUPPLY (1) to "T/R".
2. Turn DIMMER (5) fully clockwise.

RECEIVE FREQUENCY SET-UP



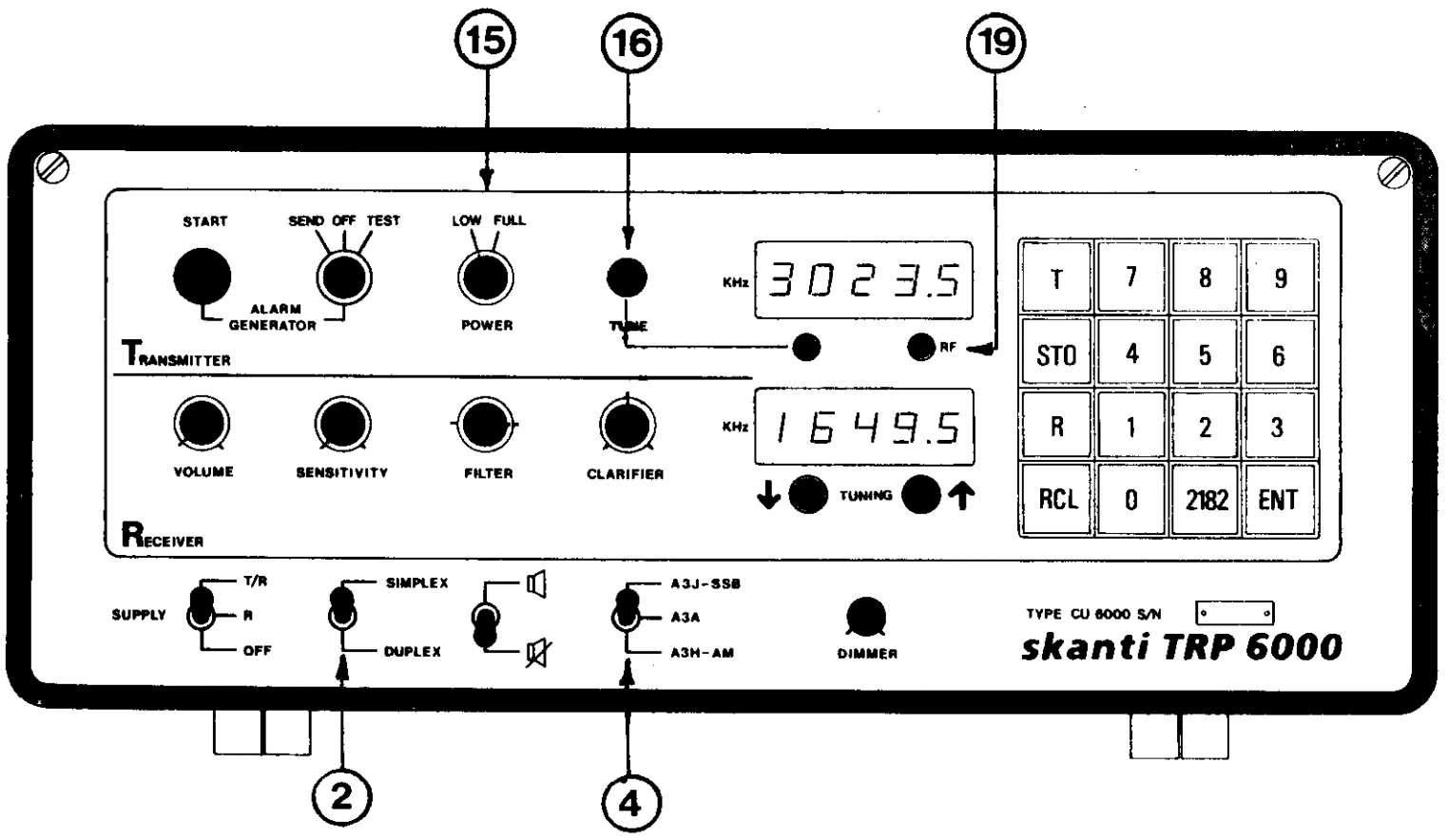
1. Press "R" key on keyboard (12).
2. Enter desired frequency in the receive frequency display (11) via keyboard (12) numeric keys.
3. Press "ENT" key on keyboard (12).
4. Turn SENSITIVITY (7) fully clockwise.
5. Adjust VOLUME (6) for a convenient sound level.
6. Set Mode-switch (4) to "SSB" or "AM" according to received signal.
7. Adjust CLARIFIER (9) for natural-sounding speech if mode is "SSB".

TRANSMIT FREQUENCY SET-UP



1. Press "T" key on keyboard (12)
2. Enter desired frequency in the transmit frequency display (18) via keyboard (12) numeric keys.
3. Press "ENT" key on keyboard (12).

TRANSMITTER TUNING

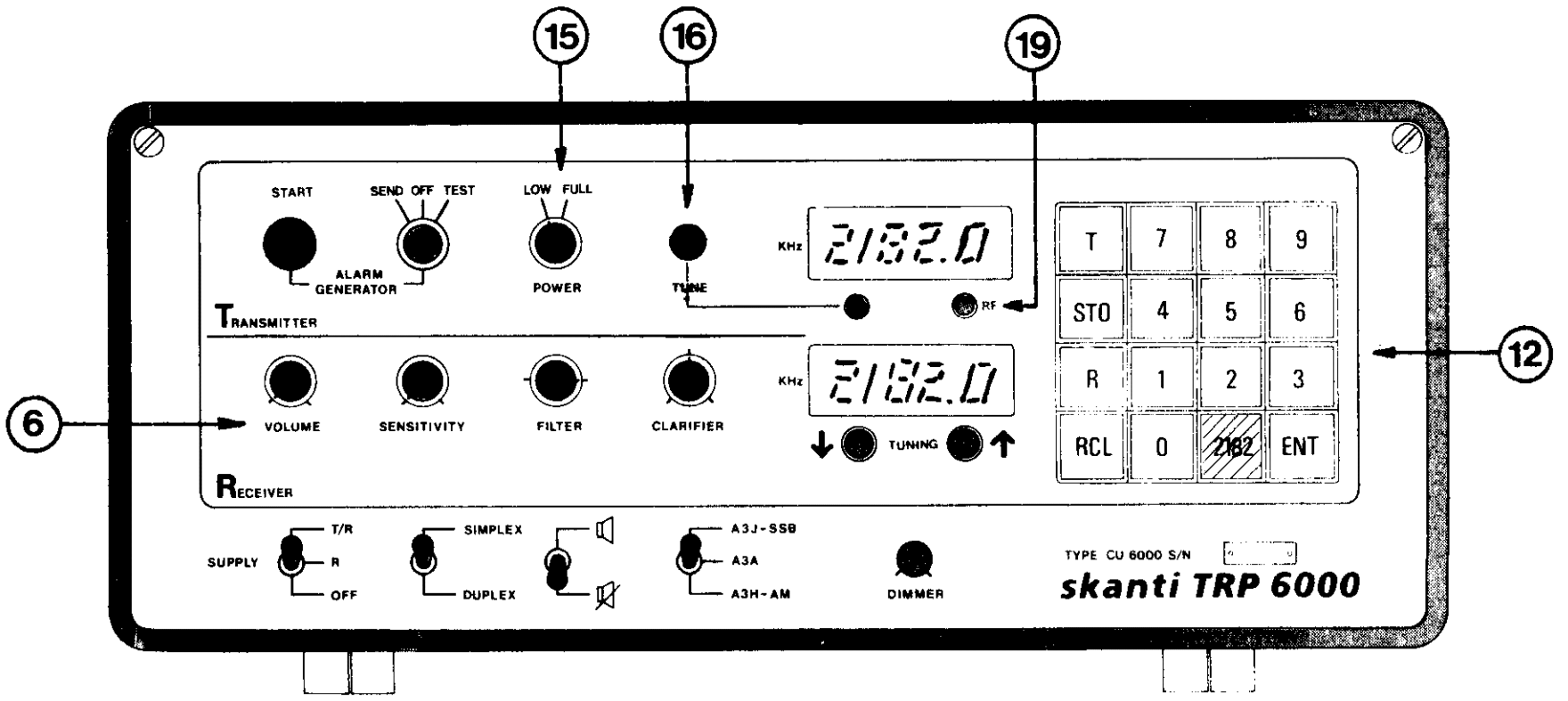


1. Press TUNE pushbutton (16).
   The RF output indicator (19) lights during the automatic tuning procedure. When this light goes off, tuning is completed.

TO TRANSMIT

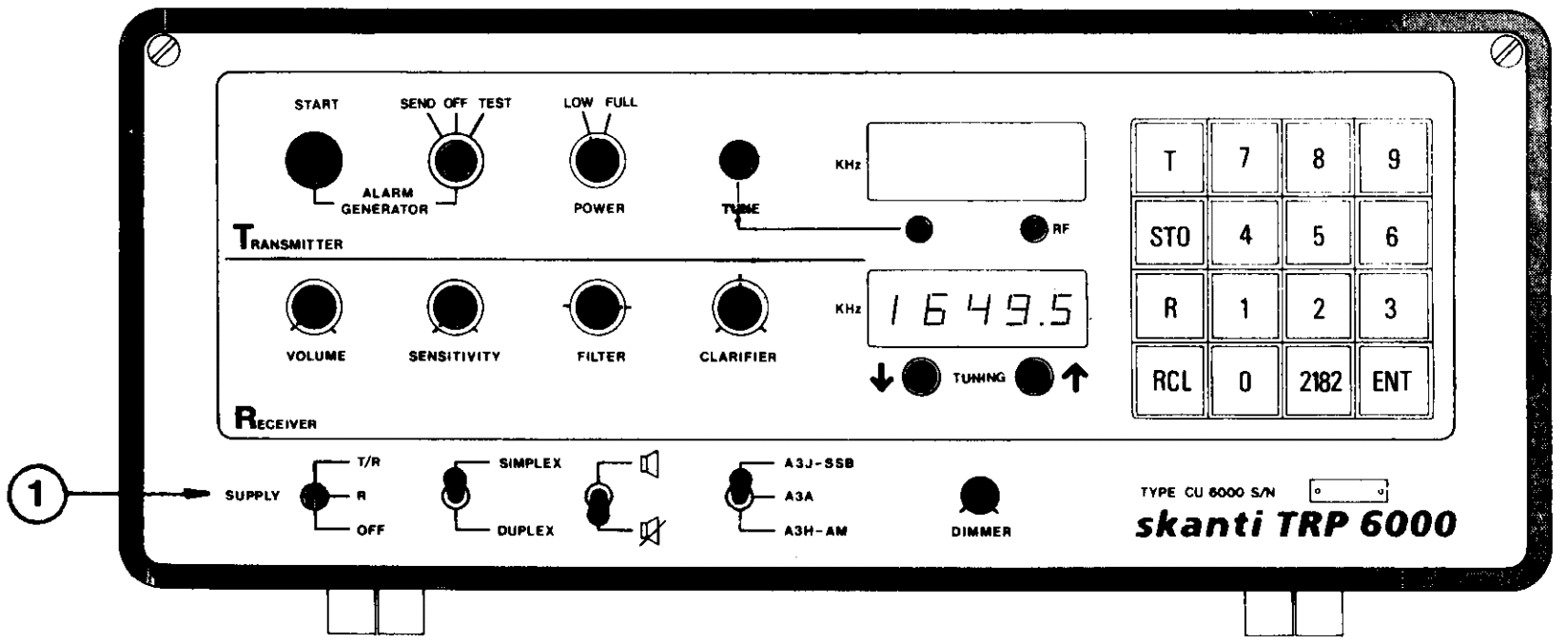
1. Set POWER-switch (15) to "LOW" or "FULL".
2. Choose SIMPLEX or DUPLEX (2) and SSB or AM (4).
3. Press the handset key - you are now on-the-air.

QUICK SET-UP FOR 2182 kHz



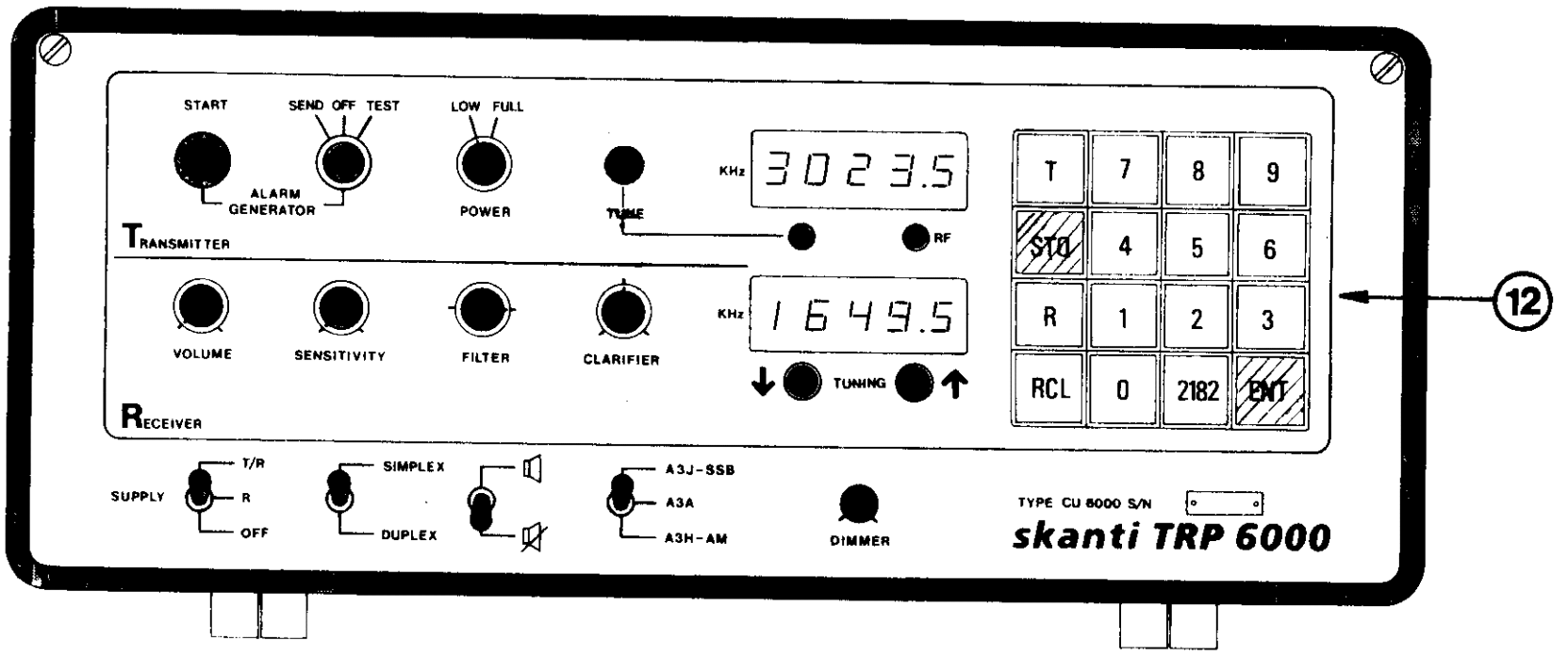
1. Press "2182" key on keyboard (12).
   This instantly changes receive and transmit frequency to 2182 kHz.
   Mode A3H-AM is automatically selected (mode switch is de-activated).
   Receiver sensitivity is automatically switched to maximum. (The SENSITIVITY control is de-activated).
2. Adjust VOLUME (6) for a convenient sound level.
3. Press the TUNE (16) pushbutton and wait until the light in the RF (19) output indicator goes out.
4. Set POWER-switch (15) to "LOW" or "FULL".
5. Press the handset key - you are now on-the-air.

RECEIVE ONLY



1. Switch SUPPLY (1) to "R".
   This will switch off all transmitter functions.

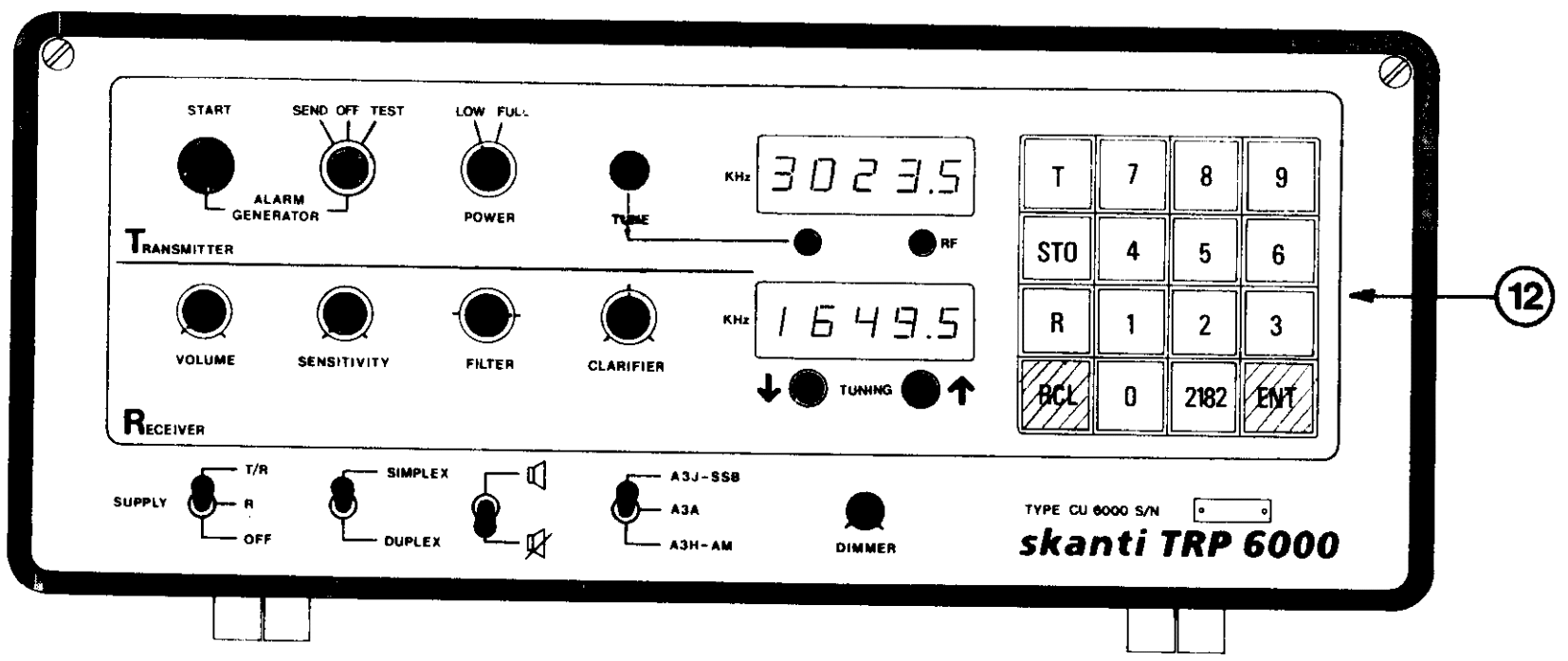
HOW TO STORE (STO) RECEIVE AND TRANSMIT FREQUENCY PAIRS



To programme a "channel" into the built-in frequency memory proceed as follows:

1. Set up the actual frequencies on the two displays.
2. Press the "STO" key on keyboard (12) and keep it pressed.
3. Enter your channel-number via the keyboard (12) numeric keys. You have 20 channels from 0-19.
4. Press and release "ENT" key, release "STO".

HOW TO RECALL (RCL) STORED RECEIVE AND TRANSMIT FREQUENCIES



To recall a "channel" in the frequency memory proceed as follows:

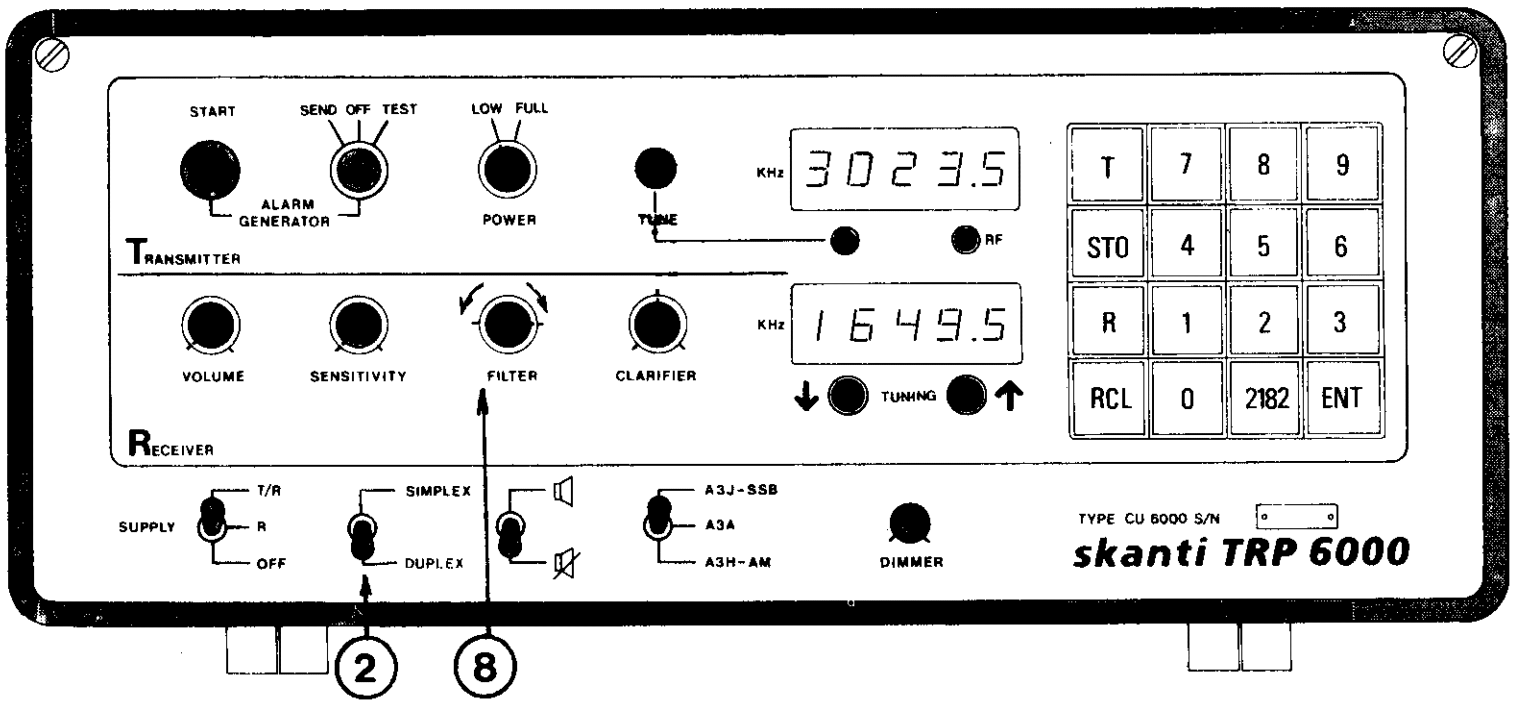
1. On keyboard (12) press

"RCL"

Channel no.

"ENT"

DUPLEX OPERATION



1. Set SIMPLEX/DUPLEX switch (2) to DUPLEX.

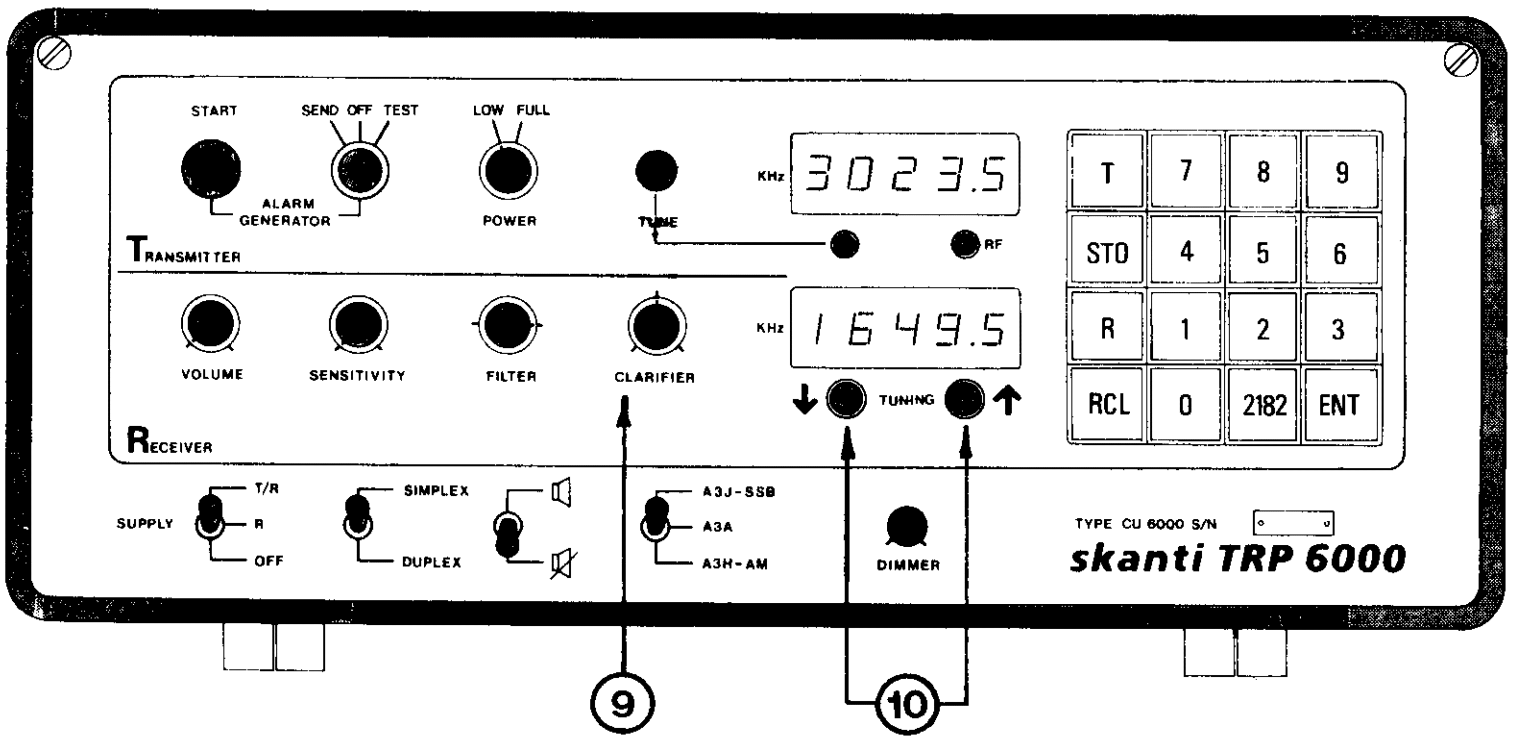
   To minimize noise and interference at the receiving frequency, activate the FILTER (8) as follows:

2. Turn the FILTER (8) knob to its extreme left or right position (right or left demarcation line); this will activate the filter.

3. Adjust FILTER (8) knob for max. receiver sensitivity or minimum transmitter noise/interference.

NOTE: The filter switches off automatically if the receiver frequency is changed either by TUNING or by a new key-board entry of receiver frequency.

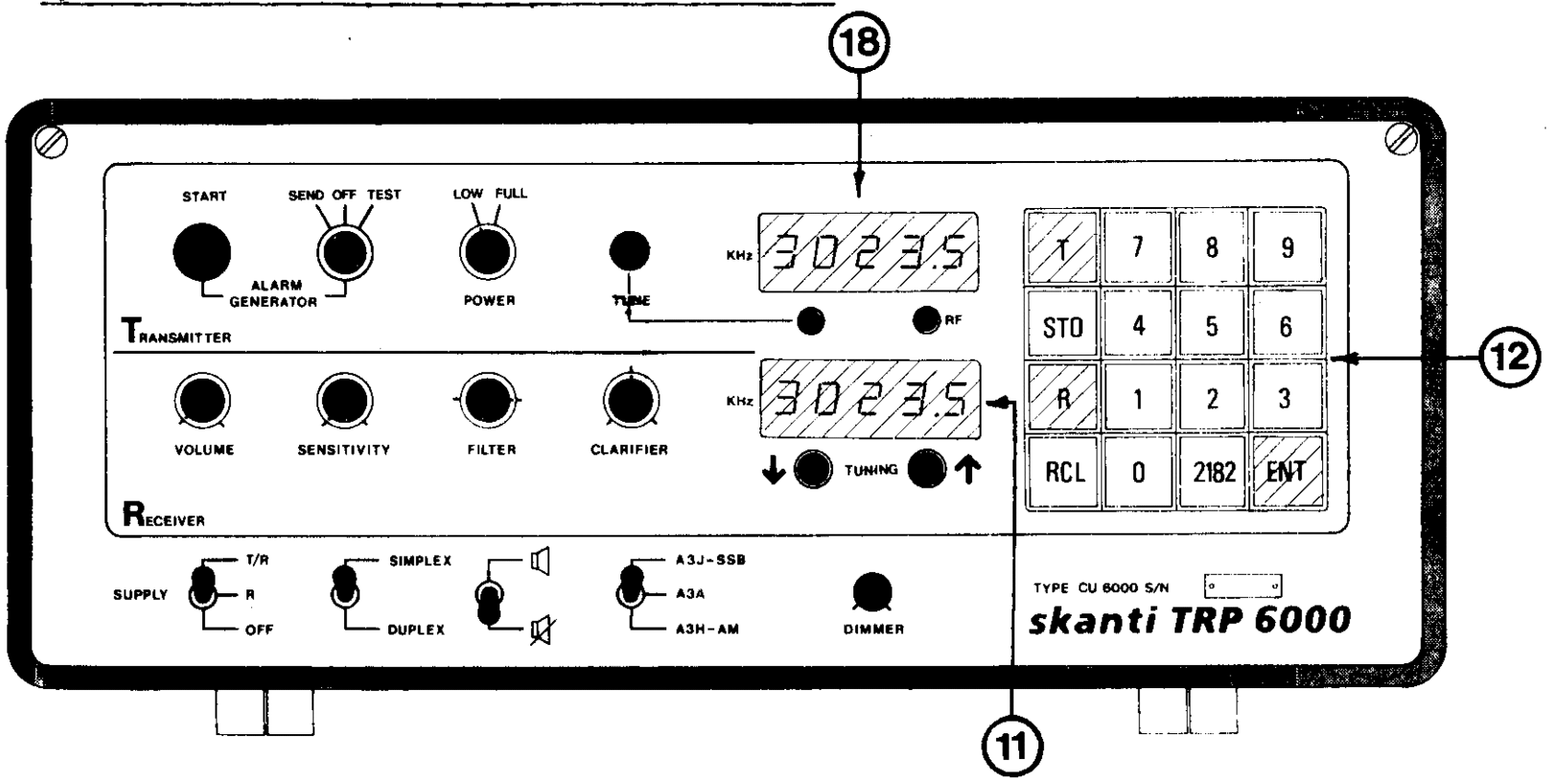
RECEIVER TUNING



1. TUNING pushbuttons (10) are used to change the receive frequency up/down. A short operation will change the frequency 1 kHz or 100 Hz in A3/A3H and A3J/A3A mode respectively. If a TUNING pushbutton is pressed and held pressed for more than 0.5 sec. the receiving frequency will change continuously with 10 kHz/sec. or 5 kHz/sec. in A3/A3H and A3J/A3A mode respectively. After 1 second the rate of change will be doubled. See also page 2-7.

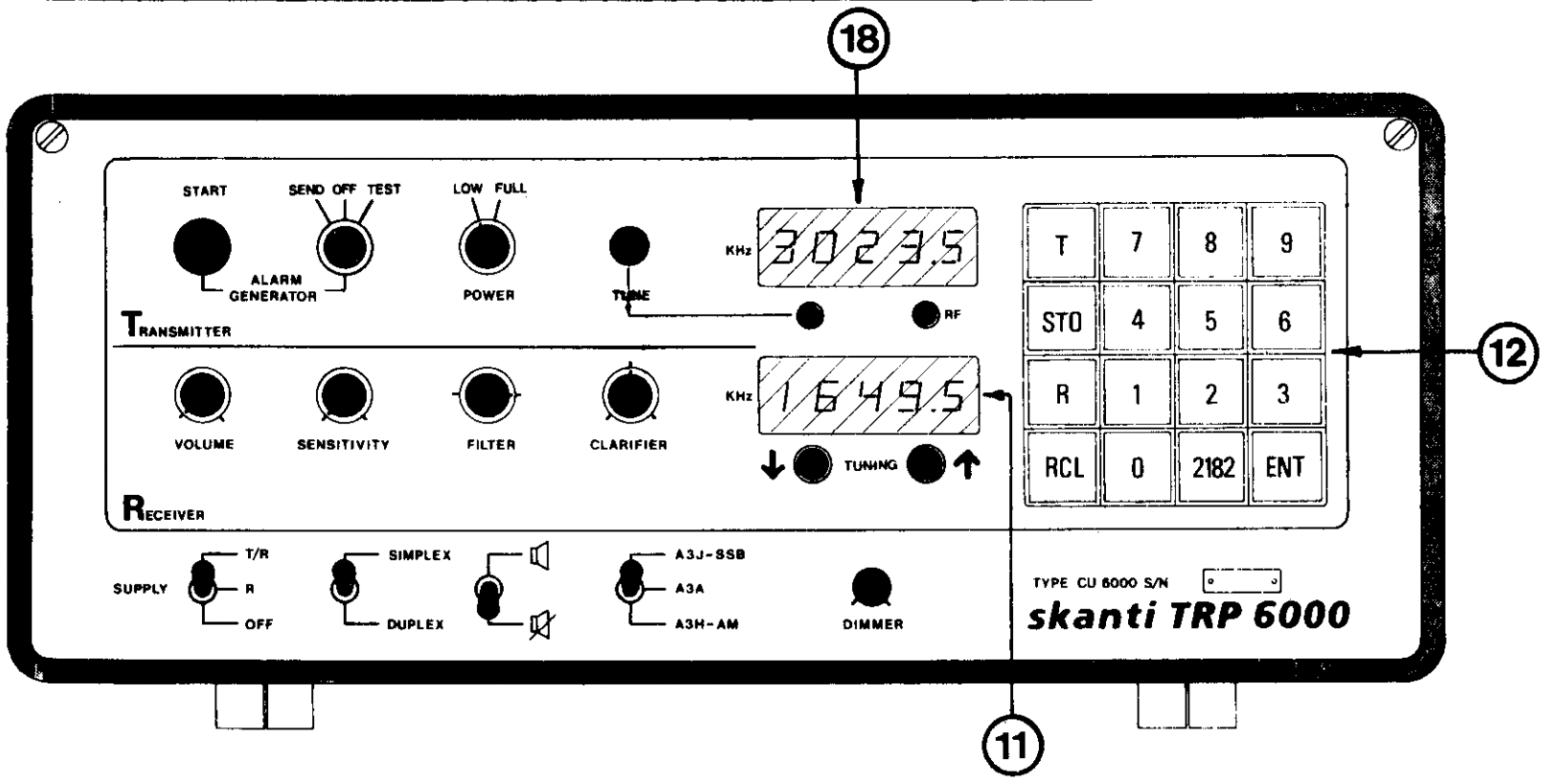
2. For fine tuning to an SSB station use the CLARIFIER control (9) and adjust for natual-sounding speech.

QUICK SET-UP FOR SIMPLEX OPERATION



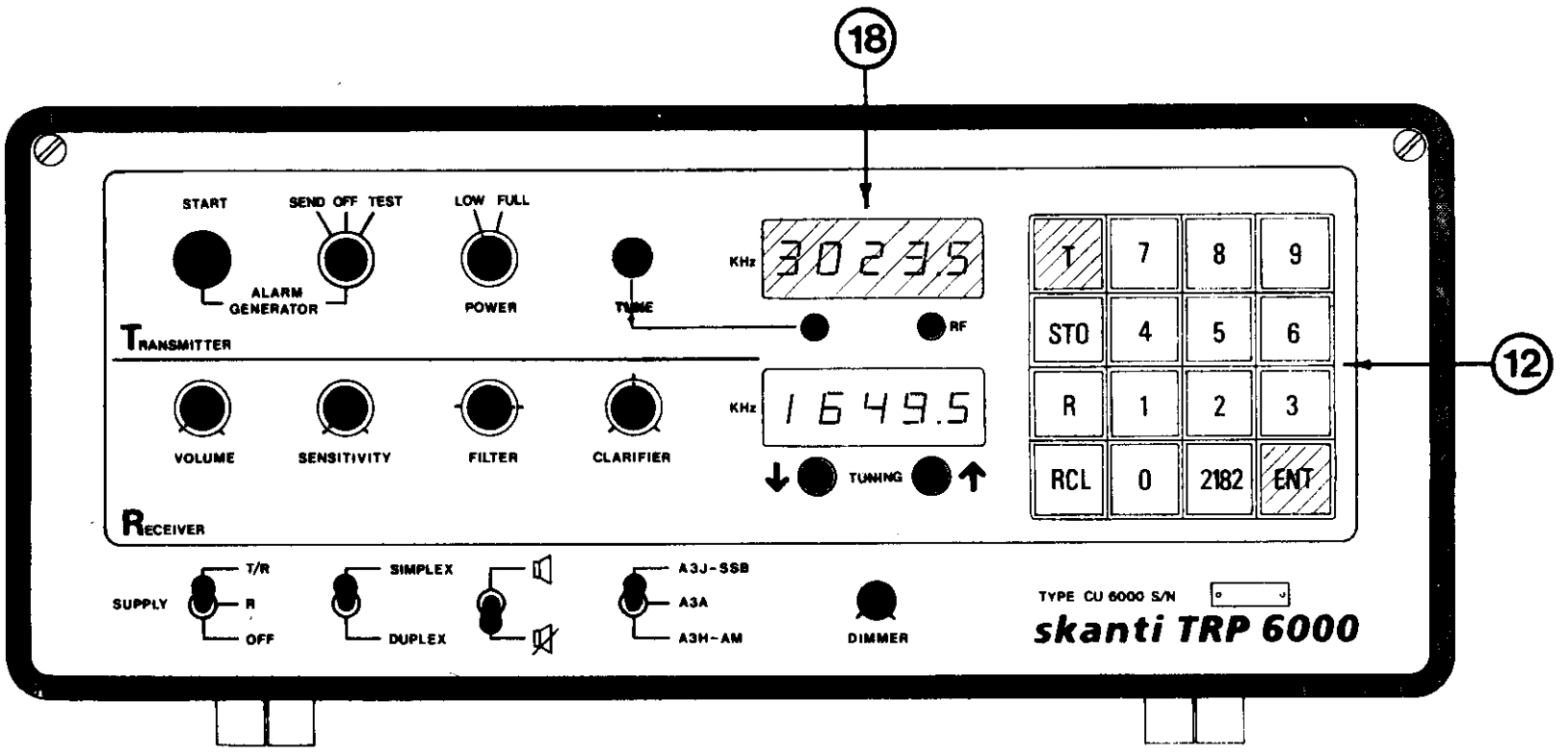
1. Press "T" key on keyboard (12)
2. Press "R" key on keyboard (12)
3. Enter desired frequency in the transmit and receive frequency displays (18) and (11) simultaneously via keyboard (12) numeric keys.
4. Press "ENT" key on keyboard (12)

QUICK WAY OF RECALLING STORED FREQUENCY PAIRS



1. Press "R" key on keyboard (12)
2. Press "ENT" key on keyboard (12)
3. The transmit and receive frequency displays (18) and (11) will now show the first stored frequency pair.
4. Repeat step 2 to see the next frequency pair.

VERIFICATION OF TRANSMITTER -FREQUENCY PROM



1. Press "T" key on keyboard (12)
2. Press "ENT" key on keyboard (12)
3. The transmit frequency display (18) will now show the first authorized frequency programmed into the PROM.
4. Repeat step 2 up to 80 times to see the next frequency.

9 kHz (10 kHz) SCANNING FACILITY IN THE BROADCAST BANDS

This facility eliminates the need for fine-tuning to broadcast stations when using the TUNING pushbuttons. The broadcast bands 155 kHz to 281 kHz and 531 kHz to 1602 kHz are scanned in steps of 9 kHz, corresponding to the channel spacing of broadcast stations in Regions 1 and 3. Alternatively the band 540 to 1600 may be scanned in steps of 10 kHz, corresponding to the channel spacing in Region 2.

To obtain 9 kHz (10 kHz9 scanning proceed as follows:

Press in sequence	"R"
	"9" ("10")
	"ENT"

"9.0" ("10.0") is flashing in the R-display. Store the information in channel No. 19:

Press	"STO" and keep it pressed
Press in sequence	"1"
	"9"
	"ENT"
Release	"STO"

Any other content in channel 19 than 9.0 or 10.0 causes 1 kHz scanning.

Note that when the 9 kHz (10 kHz) scanning facility is desired channel 19 cannot be used for storing a receiver frequency.

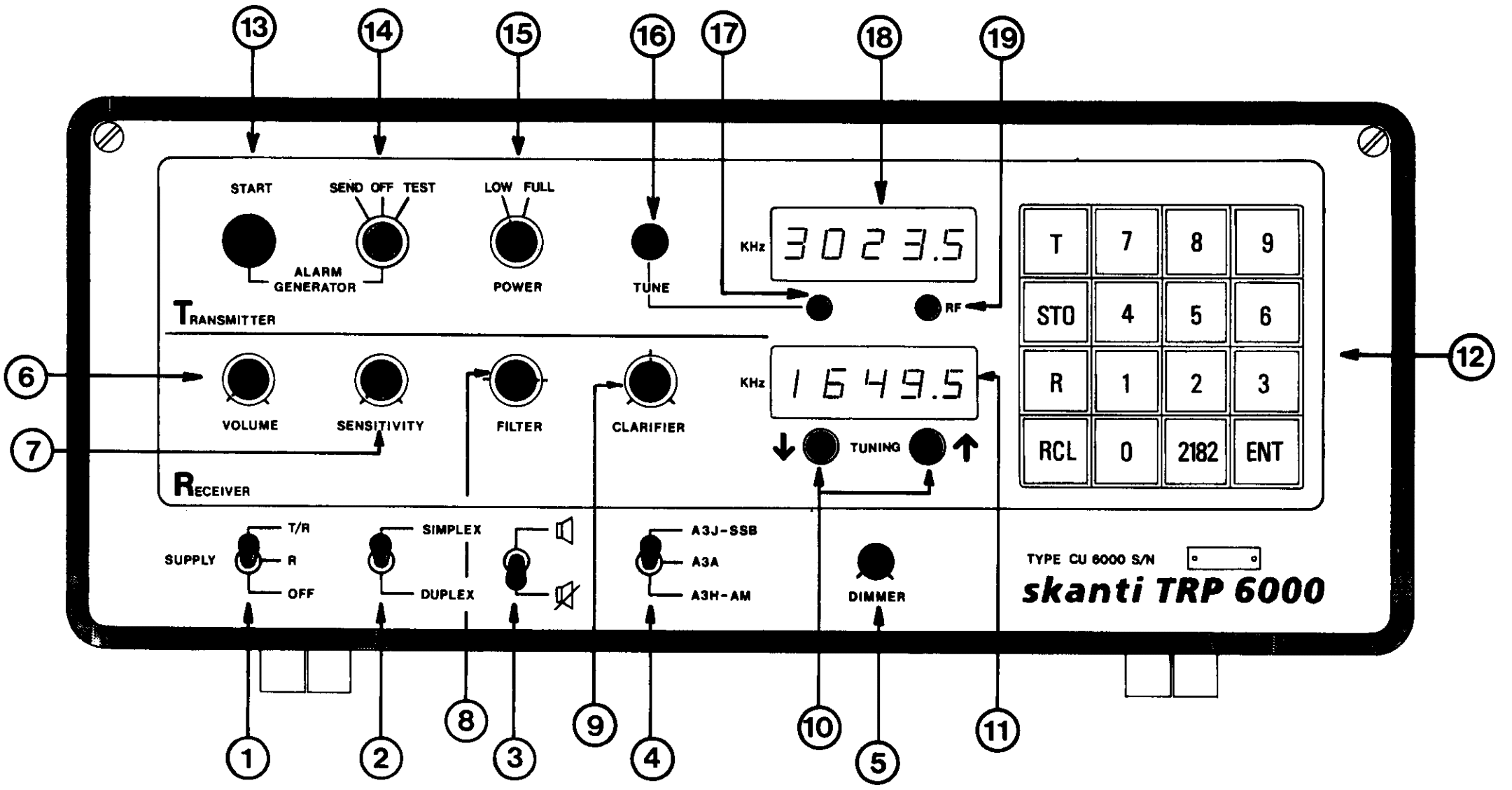

13
14
15
16
17
18
19
START
SEND OFF TEST
LOW FULL
ALARM GENERATOR
POWER
TUNE
KHz
3023.5
RF
TRANSMITTER
T
7
8
9
STO
4
5
6
R
1
2
3
RCL
0
2182
ENT
12
6
7
VOLUME
SENSITIVITY
FILTER
CLARIFIER
KHz
1649.5
TUNING
RECEIVER
SUPPLY
T/R
R
OFF
SIMPLEX
DUPLEX
A3J-SSB
A3A
A3H-AM
DIMMER
TYPE CU 6000 S/N
skanti TRP 6000
1
2
8
3
9
4
10
5
11

Fig. 2.2.1

2.2. DETAILED DESCRIPTION OF OPERATING CONTROLS

Refer to fig. 2.2.1.

① SUPPLY

T/R : Complete switch-on of TRP 6000

R : Receiver only is switched on

OFF : Complete switch-off of TRP 6000

② SIMPLEX / DUPLEX

DUPLEX : Transmitter is keyed from handset key.
Receiver is on, but speaker(s) is disconnected.

SIMPLEX : Transmitter is keyed from handset key.

③ Speaker on/off

: Speaker(s) on

: Speaker(s) off

④ Mode switch

A3J-SSB : Transmission of A3J
Reception of A3J and A3A

A3A : Transmission of A3A
Reception of A3A and A3J

A3H-AM : Transmission of A3H
Reception of A3H and A3
A3H-AM is automatically selected in the receiver for frequencies below 1606.5 kHz.

⑤ DIMMER : For adjustment of the light intensity in the frequency displays.
Turn fully clockwise, for full maximum intensity.

⑥ VOLUME : For adjustment of receiver AF gain.

⑦ SENSITIVITY: Adjusts receiver IF amplifier gain. Turning the control anticlockwise gradually reduces the gain. This can be advantageous during SSB reception as it prevents noise from coming up in speech pauses.

NOTE: The AGC (Automatic Gain Control) is impeded when the gain is manually reduced by means of the SENSITIVITY control. Always turn the control fully clockwise when selecting a new frequency.

The SENSITIVITY control is disabled at frequencies below 1606.5 kHz (broadcast bands) and 2182 kHz (if selected by 2182 key) where A3H-AM, AGC ON is automatically selected.

⑧ FILTER : For activation and adjustment of the narrow, tunable receiver input filter.
To activate the filter, turn the knob to its extreme left or right position (right or left horizontal markers).

Next, adjust the knob for maximum receiver sensitivity or minimum transmitter noise/interference.

NOTE: The filter is taken out of circuit automatically if the receiver frequency is changed, with either the TUNING pushbuttons (10) or with a new keyboard entry of receiver frequency.

⑨ CLARIFIER : Receiver frequency fine tuning in modes A3A and A3J.

⑩ TUNING

: Receiver frequency-decrease pushbutton

: Receiver frequency-increase pushbutton

NOTE: Rate of change is 10 kHz/second in A3/A3H mode and 5 kHz/second in A3A/A3J mode.
However, the rate of frequency change will double if a TUNING pushbutton is kept pressed for more than one second. See also page 2-7.
In A3J/A3A mode the frequency will step 100 Hz each time one of the pushbuttons is pressed.

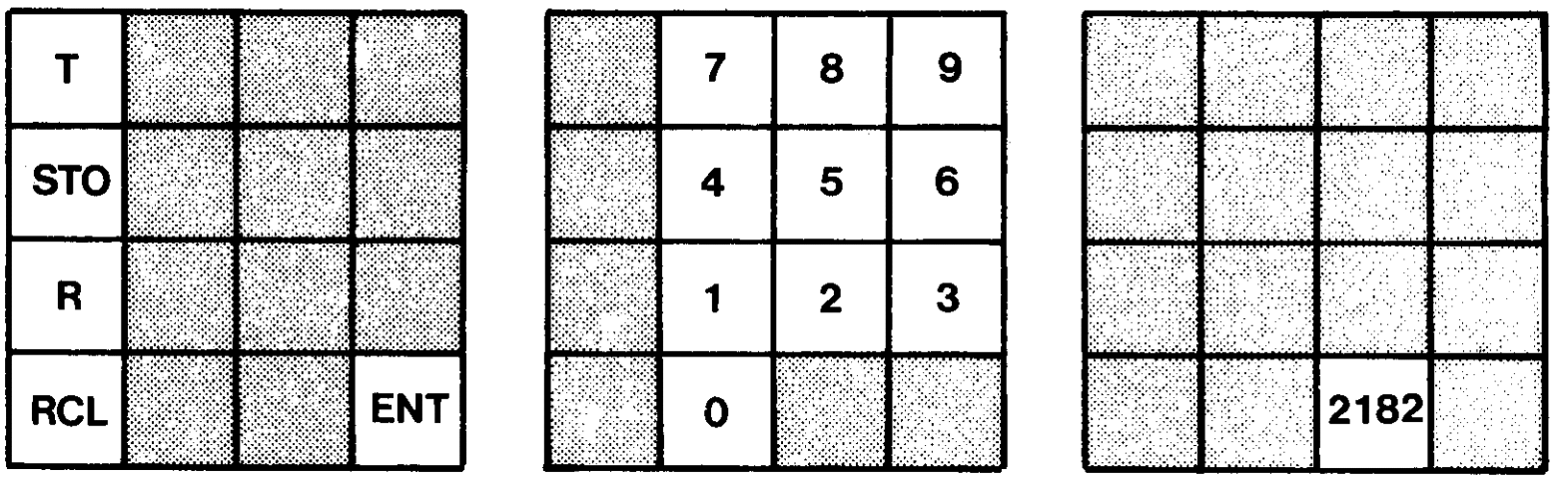
⑪ R-display : Receive frequency display.

A flashing decimal point indicates that an enter or recall of a new receive frequency is not finalized.

Flashing digits indicate that the frequency is outside the specified receiver frequency range.

(12) Keyboard

The keyboard consists of six control keys and ten numeric keys.



FUNCTION CONTROL KEYS NUMERIC KEYS 2182 CONTROL KEY

All keyboard operations (except use of the "2182" key) must begin with one of the four extreme left column keys T - STO - R - RCL to define the type of function and must end with ENT to indicate that the keyboard operation is finalized.

For this reason keyboard operations generally have the following 3-step structure:

Step 1 Press one of the four function control keys:
T for updating the T-display
STO for storing the frequencies in T- and R-display
R for updating the R-display
RCL for recalling stored frequencies (channels).

Step 2 Use the numeric keys, either for entering new frequencies or a channel number.

Step 3 Press ENT.

Details related to the six control keys are as follows:

T Transmitter frequency key.
Pressing this key will clear the T-display.
The decimal point flashes to indicate that a new transmit frequency must be entered with the numeric keys.

STO — Store key.
To be used for storing the current contents of the T- and R-displays in the user-programmable memory.

Pressing STO will not change the contents of the T- and R-displays.

STO must be pressed during the complete store sequence, see section 2.1.

R — Receiver frequency key.

Pressing this key will clear the R-display. The decimal point flashes to indicate that a new receive frequency must be entered with the numeric keys.

RCL — Recall key.
To be used for recalling a channel (a frequency pair) from the user-programmable memory.

Pressing this key will clear both T- and R-displays. The decimal point will flash, in both displays, to indicate the channel number must be entered with the numeric keys.

The entered channel number will now show in the R-display. Refer to section 2.2 for complete recall procedure.

ENT — Enter key.
Must be operated to terminate all keyboard operations initiated by the T-STO-R or RCL keys.

2182 — Quick set-up key for 2182 kHz.

Pressing this key will instantly select 2182 kHz as both transmit and receive frequency.

A3H simplex operation and full receiver sensitivity is automatically selected independent of the actual positions of the mode-switch, simplex/duplex switch or sensitivity control knob.

(13) START : Alarm generator start push-button.

Pressing this red pushbutton will initiate the 45 seconds two-tone alarm signal generation period if the ALARM GENERATOR SWITCH (14) is in position SEND or TEST. If in position SEND, the transmitter is automatically tuned when the START pushbutton is pressed.

(14) ALARM GENERATOR SWITCH

SEND : In this position the alarm generator is ready to to be started by the START pushbutton (13).

When START is pressed the transmitter is automatically tuned, then keyed and the two-tone alarm signal is transmitted for approx. 45 seconds at full output power.

The alarm signal can be monitored in the telephone handset and can be interrupted at any time, by switching (14) to OFF.

OFF : The alarm generator is switched off and cannot be activated by pressing START (13).

TEST : Transmitter cannot be keyed.

The alarm generator can be started by pressing the START pushbutton (13).

The alarm signal is generated for 45 seconds.

The alarm signal can be monitored in the telephone handset and can be interrupted at any time, by switching (14) to OFF.

(15) POWER

LOW : Transmitter is driven to approx. 1/8 of full rated output power.

NOTE: Full power is automatically selected when the ALARM GENERATOR switch (14) is in the SEND position.

FULL : Transmitter is driven to full rated output power.

⑯ TUNE : Pushbutton for initiating the automatic tuning procedure in the Transmitter Unit. A typical tuning takes about 7 seconds. During tuning the RF output indicator (19) will light to indicate that the transmitter is keyed and that power is delivered to the antenna during tuning.
When the light in (19) is switched off, tuning is completed.
During tuning the receiver is muted.

⑰ Tune indicator:

Light indicates that tuning is needed.
Press TUNE (16).

If the tune indicator lights even when tuning has been performed, an overload condition is present in the Transmitter Unit. Refer to page 4-5 for specific instructions.

⑱ T-display: Transmitting frequency display.

A flashing decimal point indicates that an enter or recall of a new transmitting frequency is not finalized.

Flashing digits indicates that the frequency is unauthorized, i.e. the frequency is outside the specified transmitter frequency range and/or not contained in the transmit frequency PROM.

The transmitter cannot be keyed if the T-display is flashing.

⑲ RF : RF output indicator.
A low light intensity indicates the transmitter is being keyed.
Light intensity increases in direct relation to increase in the actual antenna current.

3. PREVENTIVE MAINTENANCE

To ensure maximum performance and minimum repair trouble, we strongly recommend you to follow below stated headlines for preventive maintenance.

1. Always keep the battery fully charged.

2. Check antenna installation and the ground connection at regular intervals.

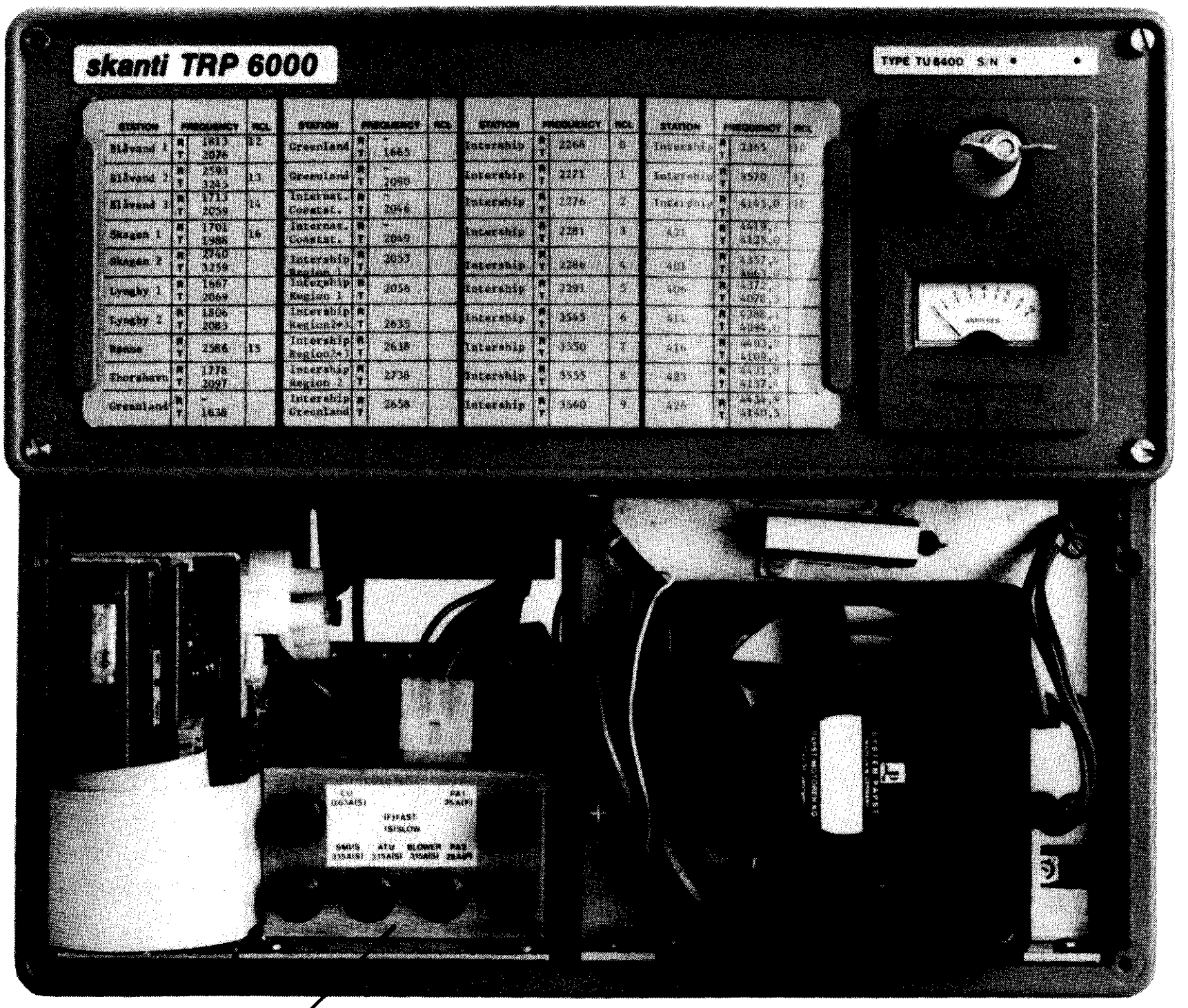
3. Keep antenna feed-through insulators clean and dry.

4. Keep your TRP 6000 clean and dry externally: this will ensure continued function of the front panel controls and will prevent flash-over from the antenna-horn.

5. If TRP 6000 has not been used for a long period of time combined with exposure to extreme environmental conditions, open both units and make a visual inspection. Remove salt, water or ice with a moist cloth before switching on the equipment. Check that the cooling fans and the two tuning coils are running freely.

6. For general maintenance and top performance, call an authorized service technician to give the equipment and the complete antenna / earth connection installation a general check every 12-18 months.

NOTE: Check at regular intervals that the Power Amplifier air intake located at the lower right front of the Transmitter Unit is free of dust. If dust is visible detach the front panel and remove the dust by means of a soft brush. Check intervals should be from one to six months dependent upon the environment.



Transmitter Unit - Lower front panel removed

Fig. 4.1

4. TROUBLE SHOOTING AND SERVICE

4.1. Malfunction

If the equipment is not functioning correctly, a check should be made that it is being operated properly; see chapter 2.

4.2. Battery

The condition of the battery should be checked at frequent intervals. The battery must always be fully charged and should be topped up frequently with distilled water (liquid should be 5 to 10 mm above the plates).

4.3. Replacement of Fuses

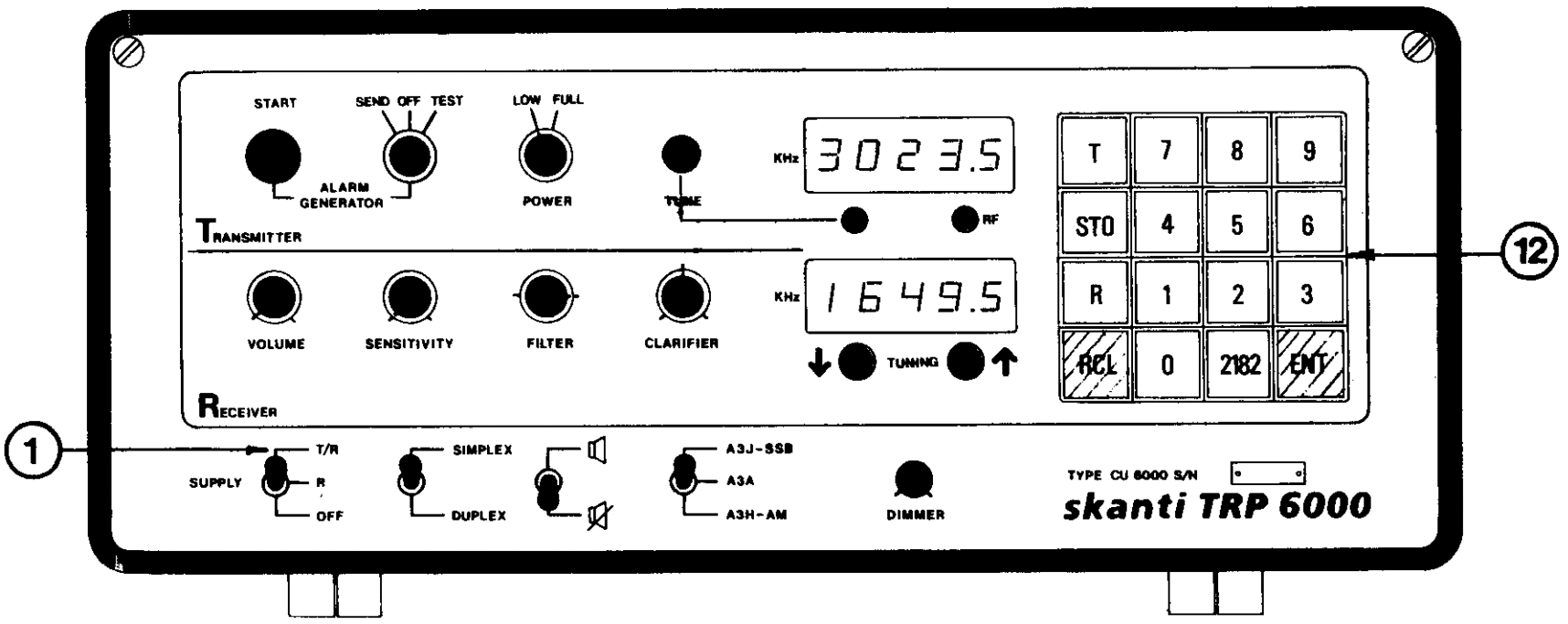
All fuses can be found behind the lower front panel of the Transmitter Unit.The fuses become accessible when the front panel is removed (4 screws). Spare fuses are placed on the inside of the lower front panel (see fig. 4.1.).

NOTE: Set SUPPLY switch to OFF and open external supply voltage switch before opening the equipment and replacing fuses.

Fuse ratings are given in the table below. Fuses with marked ratings within 5 per cent of the ratings given must be used. Note that slow or fast blowing fuses must be used as specified.

Fuse Rating	Fuse Marking	Function	Symptom if fuse is blown
0.63 A slow	CU	+24V to SUPPLY switch	Equipment totally dead. Main relay in Transmitter Unit does not operate when SUPPLY switch is activated.
3.15 A slow	SMPS	Generation of 7.5V and 15V	Control Unit off. Main relay in Transmitter Unit operates when SUPPLY switch is switched from OFF to R. Cooling fans in Transmitter Unit are off.
3.15 A slow	AAC	+24V for automatic antenna coupler	TUNE pushbutton no function.
3.15 A slow	Blower	+24V for blower converter	PA cooling fan does not rotate when SUPPLY switch is in position T/R.
25 A slow	PA 1	+24V to left-hand power amp.	Reduced antenna current and RF output indicator light.
25 A slow	PA 2 (TU6400 only)	+24V to right-hand power amp.	No antenna current and minimum RF output indicator light intensity if PA 1 and PA 2 are both blown.

4.4. HOW TO USE THE BUILT-IN SELFCHECK FUNCTION



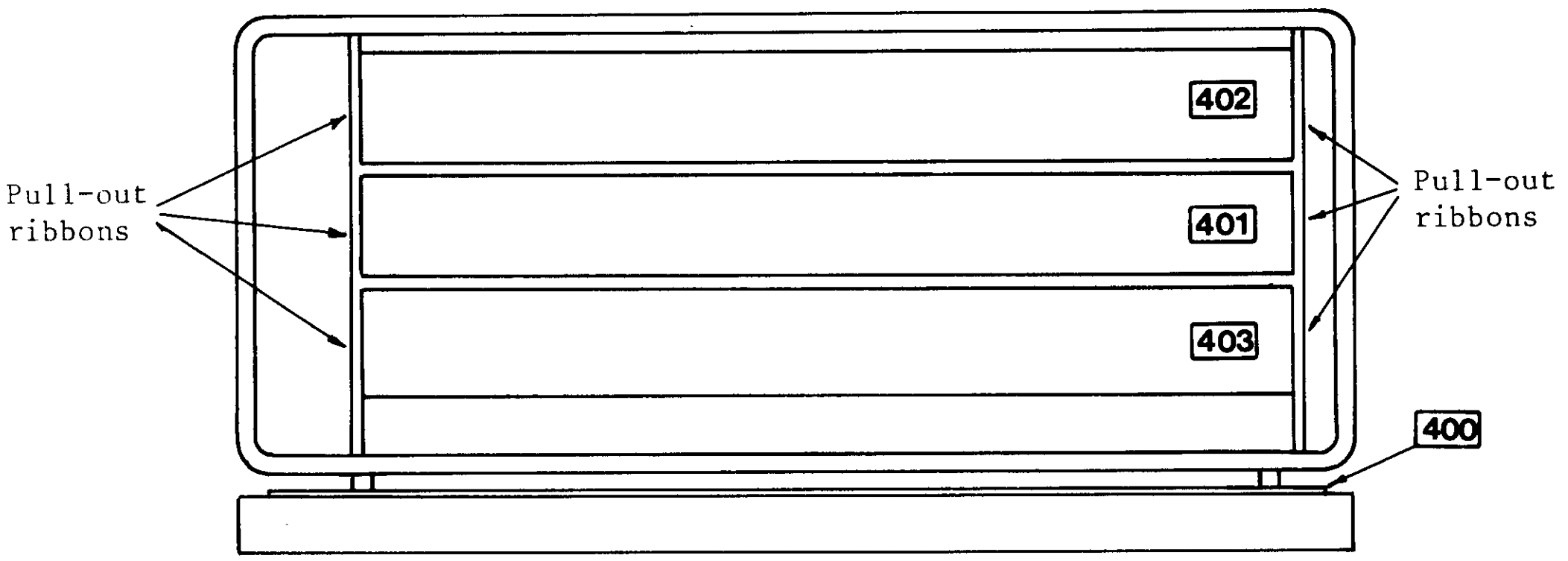
The built-in selfcheck function checks all major functions in the Control Unit.

Check procedure:

1. Set SUPPLY-switch (1) to "T/R" and switch off speaker.
2. Press "RCL" and keep it pressed, then press "ENT"
3. Release "RCL" and "ENT".

A check takes approx. 4 seconds. The result of the check is shown in the T-display.

Table 4.4.1 shows the possible error codes and the corresponding most probable faults.



Control Unit p.c.b. positions

To replace a faulty p.c.b. set SUPPLY switch to OFF, disconnect the coax- and flat-ribbon-cables and pull out the faulty p.c.b. box taking advantage of the pull-out ribbons placed on each side of the box.

NOTE: Make sure to state the exact part number (refer to the spare parts lists in section 4.7.) of the faulty p.c.b. when ordering a replacement

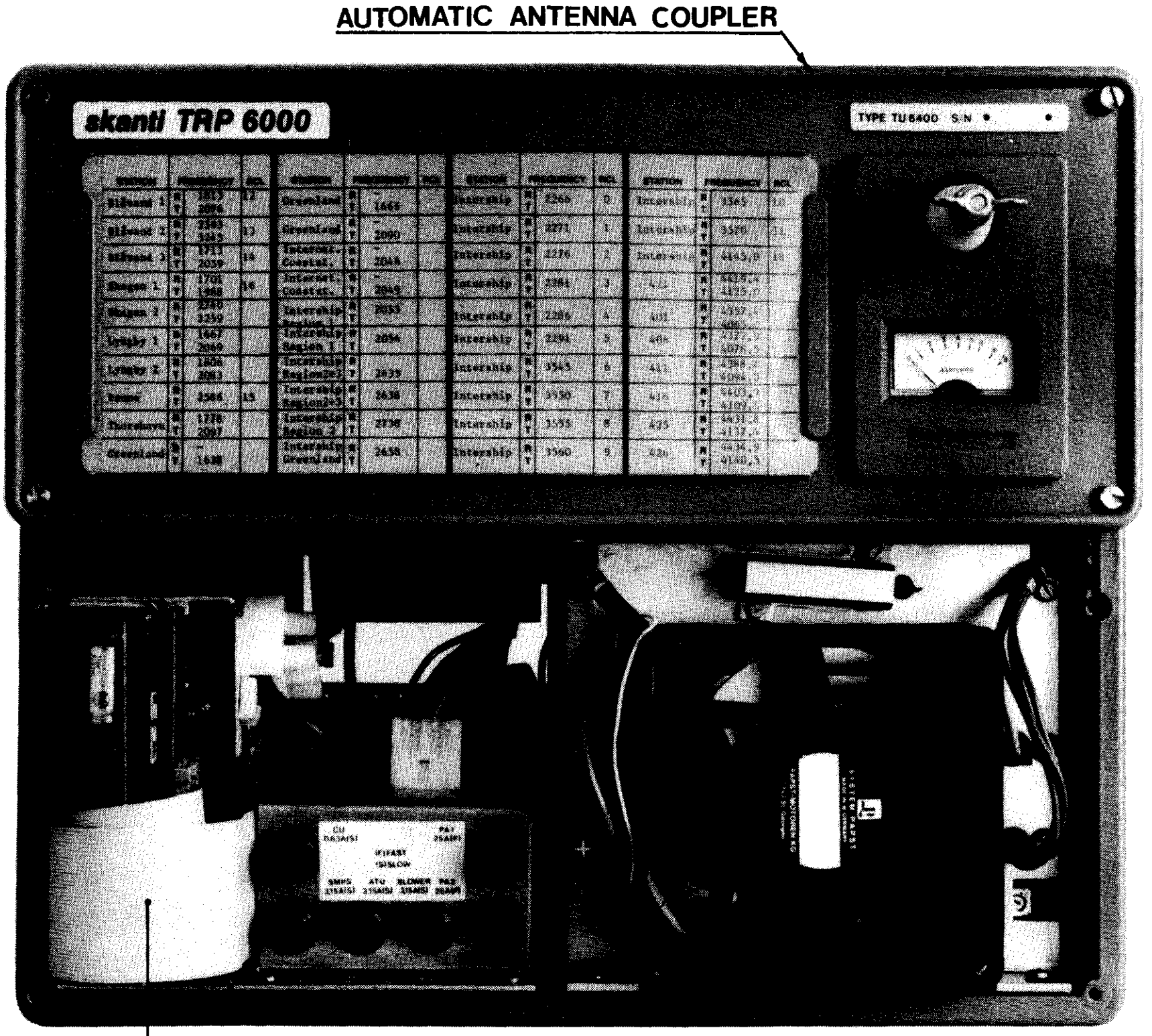
SELFCHECK ERROR MESSAGES			
ERROR CODE	PCB WITH FAILURE	TEST POINT FAILING	POSSIBLE FAILURE
C 000	no fault	-	-
101	401	6	a) AF-amplifier; BS- and LP-filters b) Mode switch circuit (SSB)
102		5	a) Signal detector; AGC detector b) 1.4 MHz BP-filter
103		4	a) RX signal path incl. 1.4 MHz x-tal LSB filter to signal detector.
104		6	a) Mode switch circuit (AM)
105		4	a) 1.4 MHz wide AM filter
201	402	3	a) 3.3 MHz VCXO; 9.3 MHz mixer b) 9.3 MHz BP-filter
202		1	a) VCO in RX-synthesizer
203		2	a) ÷ N divider; reference divider b) Phase comparator; LP-filter
301	403	9	a) 1.4 MHz level stabilizer
302		10	a) ÷ N divider; ÷ 14.000 divider b) Phase comparator; LP-filter
303		11	a) VCO in EX-synthesizer
304		12	a) EX signal path incl. 2.8 MHz LP-filter from 1.4 MHz mixer.
305		8	a) Compressor
306		12	a) 4.22 MHz LP-filter
399		-	a) SUPPLY-switch not in position "T/R"
400		7	a) 15 V power from supply missing

a) Most probable failure

b) Second most probable failure

Table 4.4.1.

15/6



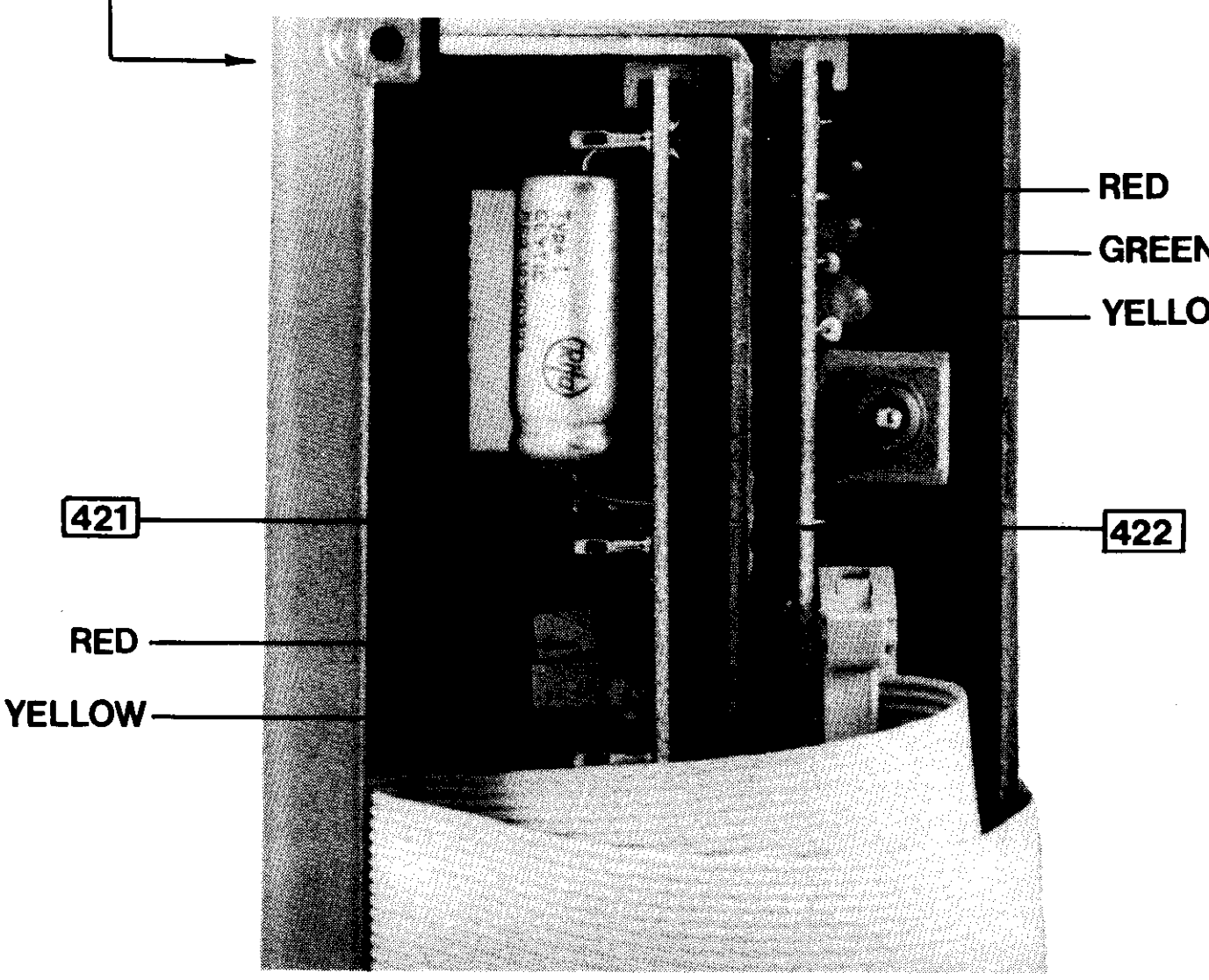


Fig. 4.5.1 Transmitter Unit

4.5. TRANSMITTER UNIT FAULT FINDING

Remove the lower front panel as illustrated on fig. 4.5.1.
Set SUPPLY switch (Control Unit front panel) to T/R.

As illustrated on fig. 4.5.1 you will find five LED status-indicators on the power supply module:

[421] Red light indicates 15V stabilized supply voltage OK.
Yellow light indicates 7.5V stabilized supply voltage OK.

If either red or yellow is off replace [421].

If both indicators are off check SMPS-fuse and CU-fuse. If both fuses OK replace [421].

[422] Red light indicates that +24V for [422] is OK.
Green light indicates that the transmitter is keyed.
Yellow light indicates that the cooling fans are switched to full speed.

If red is off check the BLOWER-fuse.
If yellow is on, but cooling fans are stopped, replace [422].

Control Unit TUNE INDICATOR lights continuously.

Press TUNE pushbutton and wait until light in the RF output indicator is switched off. If the tune indicator is still lit when the transmitter is keyed a transmitter overload condition exists due to one or more of the following abnormal conditions:

A - Load mismatch. Check the complete antenna installation and the earth connection carefully.

B - The Power Amplifier Module temperature is too high. Check cooling fans and ensure that transmitter unit ambient temperature and ventilation are within specified limits.

C - The Automatic Antenna Coupler is faulty. Remove the frequency table, change frequency, press TUNE and observe the two tuning coils through the openings behind the frequency table. If the coils do not rotate, replace [433] and/or [434]. If you do not have the necessary spares, refer to section 4.6. of this manual.

Antenna current too low, tuning normal.

If the antenna current is less than normal, but tuning is OK (no light in the tune indicator (17) when the transmitter is keyed), the output power from the Power Amplifier Module might be too low due to one of the two [441] Power Amplifiers failing. This can be checked as follows:

Remove the PA1 fuse and observe the antenna current. If antenna current is unchanged and the PA1 fuse is OK, the lefthand [441] (PA1) is faulty. If the antenna current is reduced to about zero, PA1 is OK. Reinsert the PA1 fuse. Repeat the test by removing the PA2 fuse.

4.6. HOW TO MANUALLY TUNE THE TRANSMITTER TO 2182 kHz IN CASE OF A FAILURE IN THE AUTOMATIC TUNING SYSTEM.

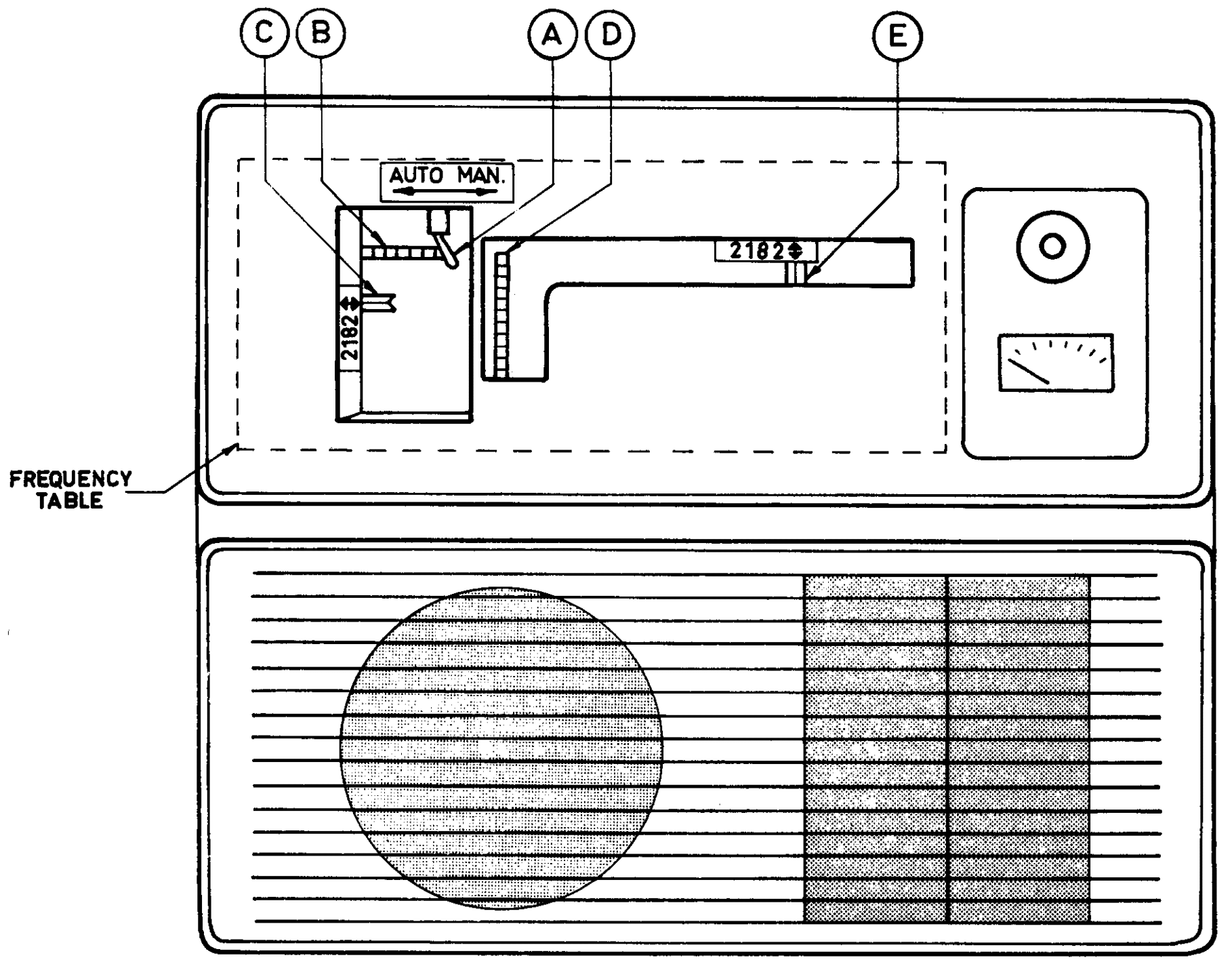


Fig. 4.6.1 Transmitter Unit

1. Switch SUPPLY to "OFF" on Control Unit
2. Remove Frequency Table from Transmitter Unit (Fig. 4.6.1)
3. Remove the self-adhesive plastic film behind the frequency table.
4. Switch AUTO/MAN switch (A) to position MAN.
5. Rotate with a finger, wheel (B) until the roller (C) is positioned exactly at the 2182-marker.
6. Rotate with a finger, wheel (D) until the roller (E) is positioned exactly at the 2182 marker.
7. Switch SUPPLY to "T/R" on Control Unit.
8. The radiotelephone is now ready for operation on 2182 kHz only.
9. Operate the radiotelephone as described in section 2.1.

NOTE: Call for immediate repair when you reach port.

4.7. SPARE PARTS LIST

Standard Shipborne Spares

					Part No.
2	fuse	0.63 A	slow	6.3 x 32 mm	720 263 00
2	fuse	3.15 A	slow	6.3 x 32 mm	720 331 50
2	fuse	25 A	slow	6.3 x 32 mm	720 425 01

Depot Spares for TRP 6000

Control Unit CU 6000

[400]	Front Panel Board	107 440 01
[401]	Receiver	107 440 11
[402]	Control and Rx Synthesizer	107 440 21
[403]	Exciter	107 440 31
	60 Lead Flat Ribbon Cable	106 400 10
	26 Lead Flat Ribbon Cable	106 400 30
	10 Lead Flat Ribbon Cable	106 400 20

Handset

[450]	Microphone Amplifier	107 445 01
	Earpiece	862 000 05
	Microphone	862 000 06

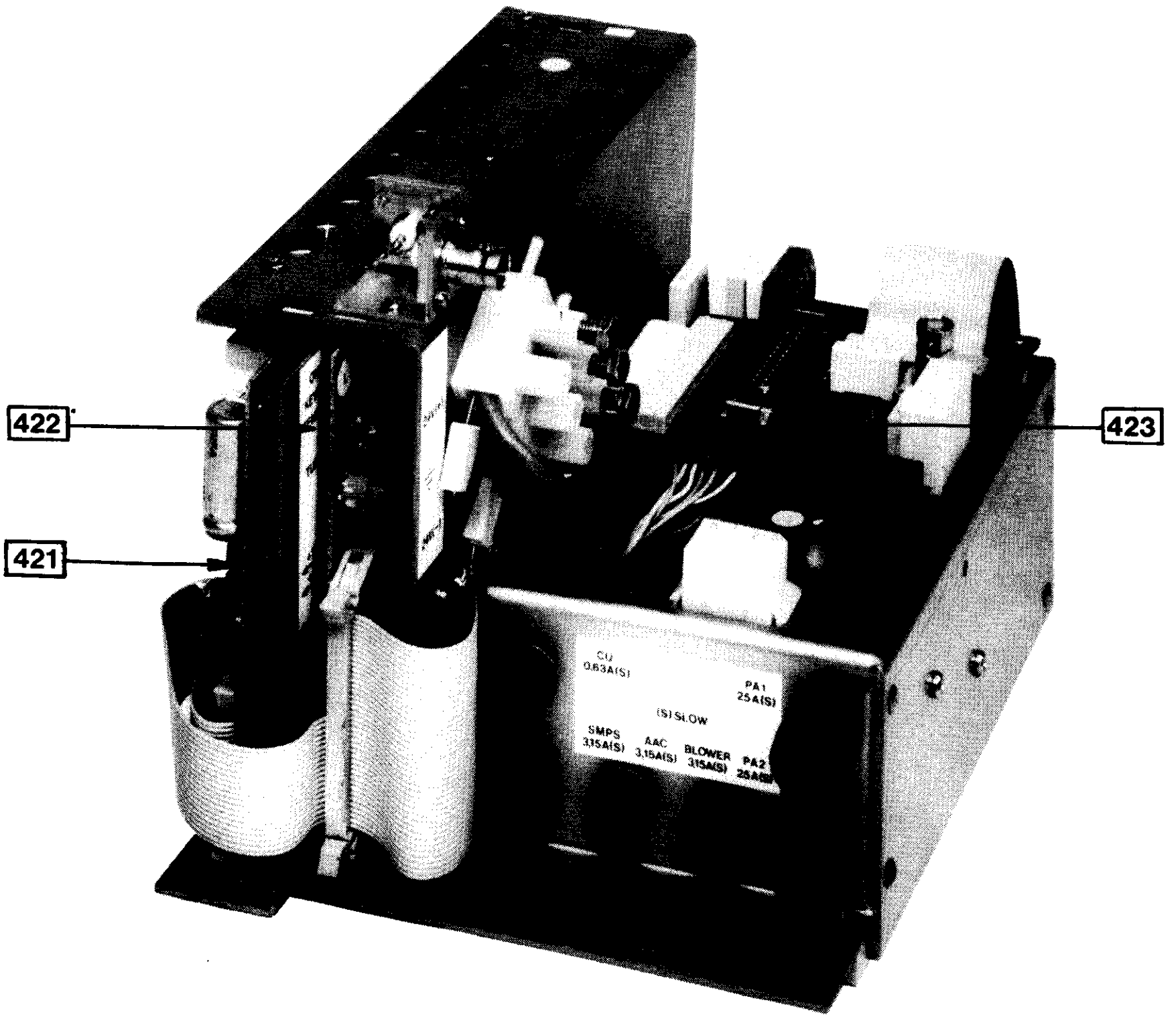
Transmitter Unit TU 6400

Power Supply Module:

[421]	Switch Mode Power Supply	107 442 11
[422]	Blower Converter	107 442 21
[423]	Interconnection Board	107 442 31
RL1	Relay, 24V	780 000 05
C1-2	4700 uF 40V	652 947 02
D1	BZY93 Zener	832 933 90

Power Amplifier Module:

[441]	Power Amplifier	107 444 11
[442]	Stabilizer and Combiner	107 444 21
B1	Blower 24V AC	872 000 06
R1	70 ohm 50 W	548 150 00



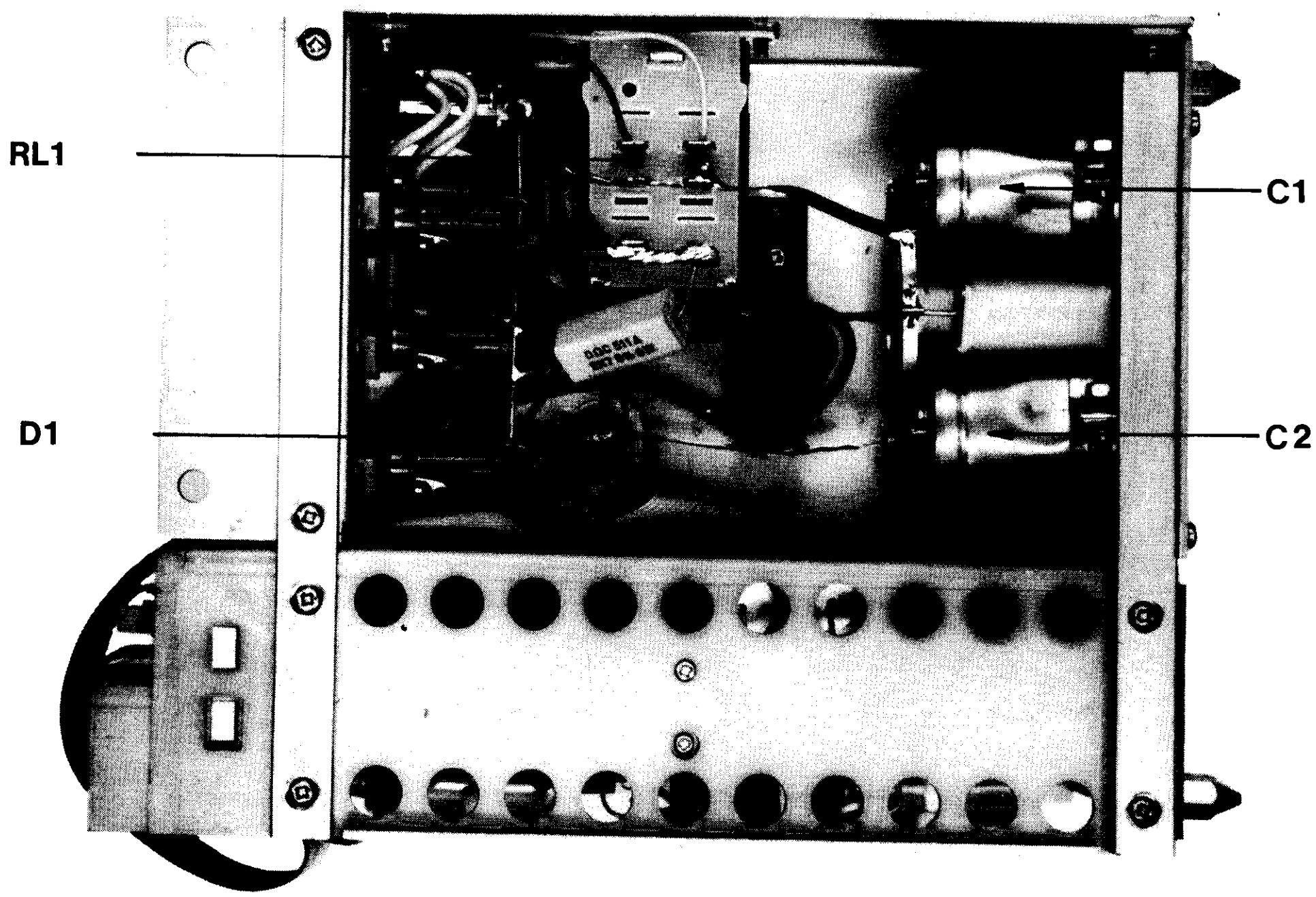


Fig. 4.7.1. Power Supply Module

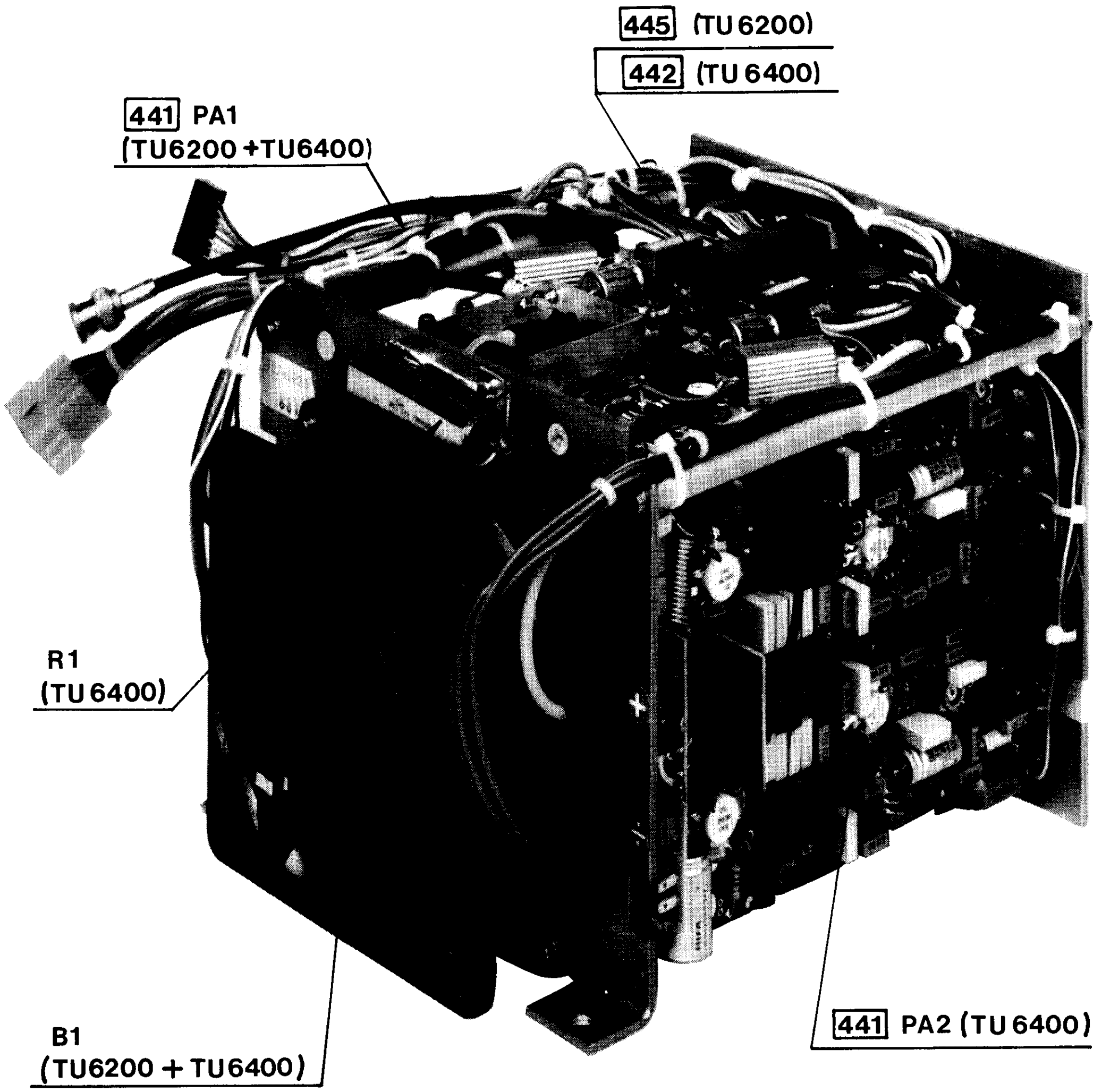


Fig. 4.7.2.

Power Amplifier Module

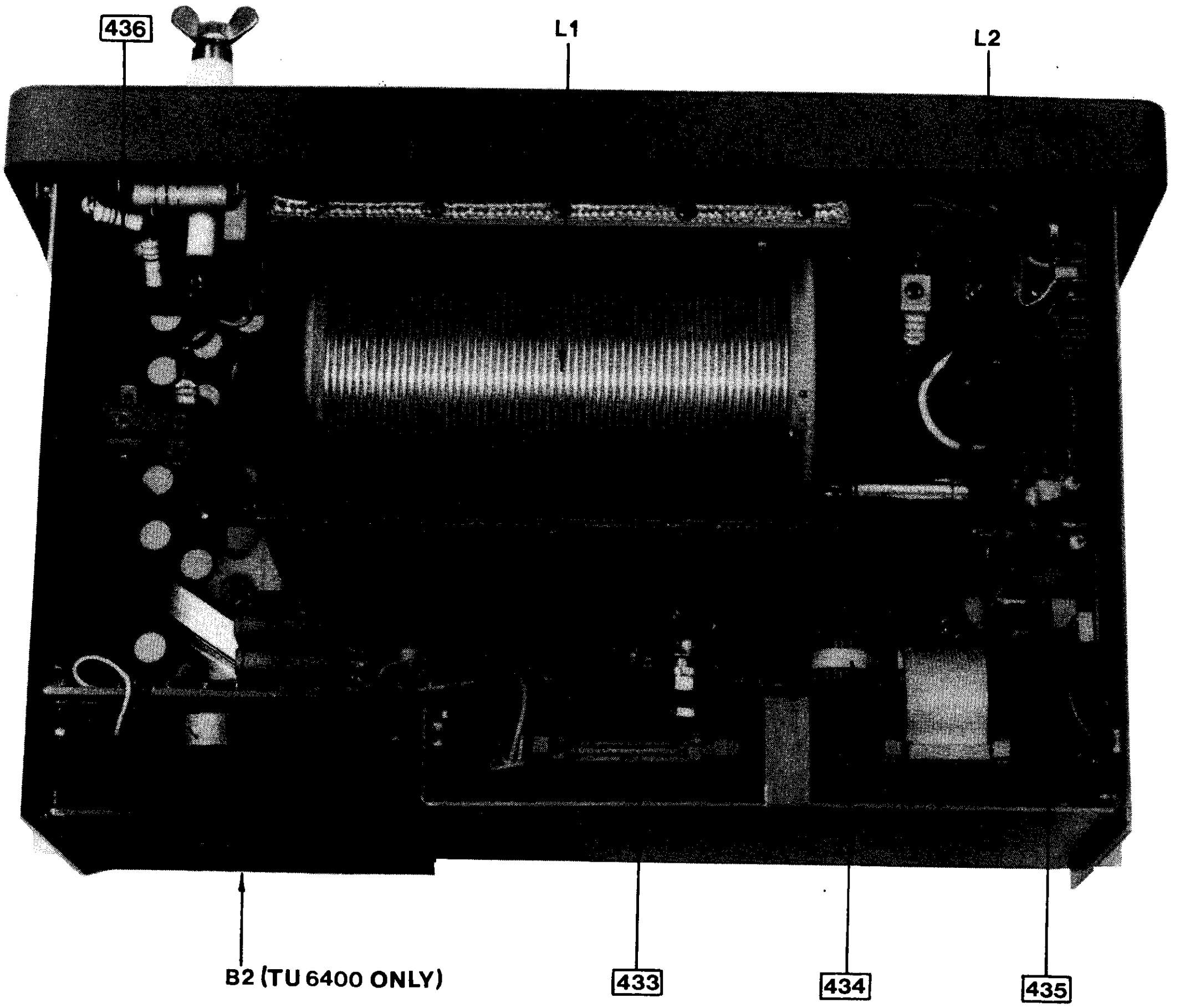


Fig. 4.7.3 Automatic Antenna Coupler

5. TECHNICAL DATA

The SKANTI TRP 6000 complies with the SOLAS 74 convention and the ITU Radio Regulations. It meets the CEPT specifications, the UK MPT specifications as well as the national requirements of most countries.

GENERAL

Frequency Generation:	True digital frequency synthesis with 100 Hz resolution.
Frequency Presentation:	Two 5-digit digital LED displays.
Frequency Accuracy:	Better than 40 Hz.
Operating modes:	Duplex, semiduplex and simplex A3A, A3H and A3J (upper side band).
Operating Temperature:	$-10^{o}C$ to $+55^{o}C$.
Frequency Selection:	By common keyboard. 2182 kHz is entered for both transmitter and receiver by a single key, also providing automatic selection of A3H and simplex mode.

RECEIVER

Frequency Range:	Broadcast bands: 100 - 1606.5 kHz Communication bands: 1606.5 - 4500 kHz
Frequency Selection	A search/scanning facility is provided with 1000 Hz resolution in A3/A3H mode. A 100 Hz step function is provided in A3J/A3A mode. A3/A3H mode is automatically selected below 1606.5. kHz.
Sensitivity:	Antenna input for 10 dB SINAD: 0.15 - 1.6 MHz AM: 20 uV 1.6 - 4.5 MHz AM: 6.3 uV SSB: 1 uV measured with high antenna impedance. With 50 ohms input the figures are improved by approx. 6 dB.
Clarifier Control:	Variation ± 100 Hz.
Duplex Filter:	The built-in preselector is automatically disabled by any frequency change. The circuit is re-established (when required) by turning the control knob to one of its extreme positions.
Audio Output:	5 W in 4 ohms to internal and/or external loudspeaker(s)

TRANSMITTER

Output Power:	200 W p.e.p. with TU 6200 400 W p.e.p. with TU 6400 Reduction to less than 60 W p.e.p.
Transmitter Frequencies:	Up to 80 PROM programmable channels, freely distributed in the range 1606.5 to 4220 kHz. Free frequency selection in 100 Hz steps is optionally available where permitted.
Antenna Requirements:	7-18 metres wire and/or whip.
Antenna Tuning	Fully automatic to above antennas and to any load with a resistive impedance from 1 to 75 ohms (minimum series capacitor 100 pF) from 1.6 to 4.2 MHz.
Alarm Generator:	A two-tone alarm generator is incorporated. Full power is automatically selected and the antenna tuning carried out when the alarm is activated.

POWER REQUIREMENTS

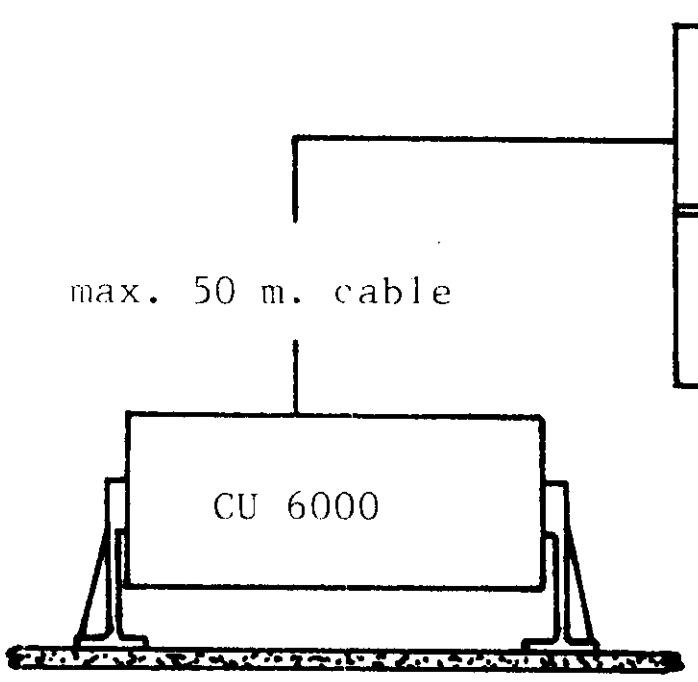
Supply Voltage: 24V DC (+30%, -10%)
Connection will not earth supply battery.
AC mains by optional external unit.

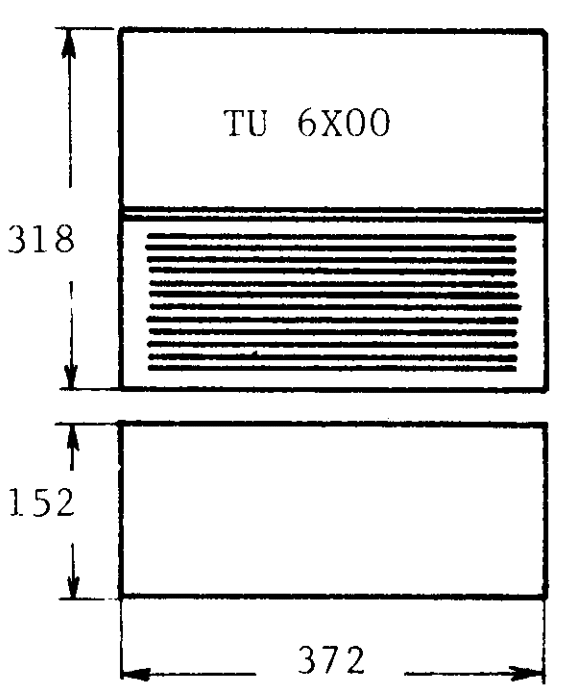
Consumption:

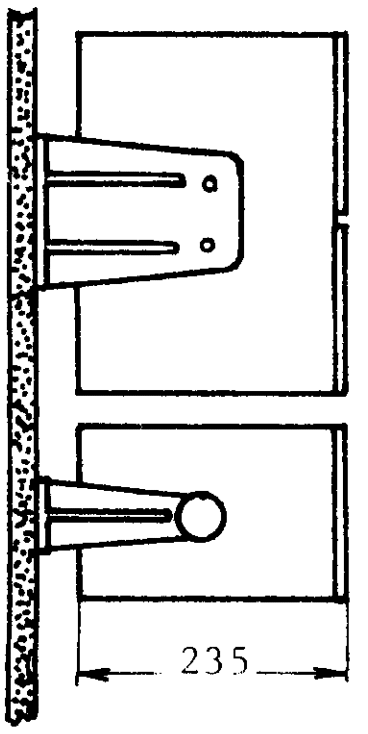
Operation	400 W p.e.p.	200 W p.e.p.
R	0,75A	0,75A
T/R Unkeyed	2,30A	2,30A
A3J Unmod.	4,00A	3,25A
A3H Unmod.	21,5A	13,0A
A3J Normal speech	11,0A	7,50A
A3H Normal speech	21,0A	13,0A
A3H Transmit alarm	27,5A	15,3A

DIMENSIONS AND WEIGHT

CU 6000:	7.3 kgs
TU 6200:	16.0 kgs
TU 6400:	18.0 kgs







All manual controls on the front panel, with exception of the FILTER control, are connected to this p.c.b. All control signals branch out from this board to the different Control Unit p.c.b.'s, by way of two ribbon cables.

The Keyboard is continuously scanned by the Microprocessor Circuit, located on p.c.b. 402 . Activation of a particular key will load the number corresponding to that key, into the Microprocessor Circuit. This scanning process will also detect whether one of the two frequency tuning pushbuttons has been activated.

A multiplex technique is utilized to present the information, requested by the user, on the R-and-T displays.

For each display element, a BCD-code is sent from the Microprocessor Circuit to the BCD-to-7 Segment Decoder which in turn directly controls a Segment Driver. Concurrently, a display element address is sent to the Scan Decoder where one of the ten Digit Drivers is selected. The display element selected is now permitted to display the data for a length of time. Subsequently, the Microprocessor Circuit will send new data to a new display element, and so forth.

All display elements are updated every second millisecond. The maximum time-on duration for a single display is 200 microseconds. Continuously variable reduction of time-on duration - to the point where no light is visible on the displays - is available with the DIMMER control.

6.1.2. RECEIVER 401

The antenna RF signal is led through 401-SK1 to a circuit designed to protect the receiver against excessive RF voltage and static electricity discharges, appearing on the antenna.

The RF signal from the protection circuit goes to one of the four input filters. Three of these filters are fixed-tuned and have respective passbands of 100 - 400 kHz, 400 - 1606.5 kHz and 1606.5 kHz - 4499.9 kHz. The fourth filter, used in duplex operation, has a passband with a variable center frequency, controlled by the FILTER knob on the front panel. Center frequency range is 1606.5 - 4499.9 kHz.

A change in receiving frequency will be followed by automatic selection from among the three fixed-tuned filters. The automatic selection is controlled from the Microprocessor via the Gate Circuit. If the duplex filter is to be used the FILTER knob must be turned to one of its extreme positions, where a switch is activated and sets a latch in the Gate Circuit which in turn selects the duplex filter.

During SELFCHECK the antenne input is disabled and a RF CHECK SIGNAL from the EXCITER, p.c.b. 403 , is fed to the Input Filters. The VOLUME/ SENSITIVITY GND Switch is also controlled via the Gate Circuit. This

switch ensures maximum volume and sensitivity during SELFCHECK, irrespective of the actual settings of the front panel controls. The RF signal from the input filters is mixed, in the 1st mixer, with a 10.8 - 15.2 MHz signal from the RX synthesizer, located on p.c.b. [402] . Mixer output is filtered in a 10.7 MHz double sideband crystal filter, where overall AM selectivity is determined.

The 10.7 MHz IF signal passes a PIN diode attenuator, controlled from the AGC circuit, before being fed to the 2nd Mixer. The other input signal to this mixer is a 9.3 MHx + 100/- 500 Hz signal from the Clarifier Circuit on p.c.b. [402] .

The 2nd IF filtering is selected from the Gate Circuit. In the SSB-mode the output from the 2nd Mixer is fed to a lower sideband crystal filter which determines overall SSB selectivity. In the AM-mode the output is fed to a 1.4 MHz LC-filter.

The filters are followed by the IF Amplifier, the gain of which is controlled by the AGC voltage. A check signal (CHECK 4) is produced by a Detector connected to the output of the IF Amplifier. This facilitates a check for the presence of a 1.4 MHz IF signal during SELFCHECK, provided that the AGC is at failure.

A 1.4 MHz Band-Pass Filter connects the IF Amplifier to the Signal Detector. The integrated circuit of the Signal Detector contains a balanced mixer and a high-gain limiting amplifier. The IF signal is applied balanced to the one input part of the mixer.

In the AM mode, the IF signal is also fed to the amplifier input. This signal is amplified and clipped to constant amplitude and internally connected to the other input part of the mixer where it is mixed with the modulated signal. The difference frequency contains the wanted AF signal.

In the SSB-mode a 1.4 MHz signal, derived from the Reference Divider on p.c.b. [402] , is applied to the amplifier input.

The AF signal is via the VOLUME potentiometer on p.c.b. [400] fed to the AF amplifier which contains a 3 kHz active low-pass filter. AF output excits p.c.b. [401] to enter the handset earpiece and the loudspeaker(s).

The Signal Detector output also contains the sum frequency of the two input signals. This signal is used for the Automatic Gain Control and is taken off across a 2.8 MHz tuned circuit. The signal is amplified before being brought to the AGC Detector. The AGC Detector output controls the overall IF gain of the receiver.

IF gain may also be manually controlled with the SENSITIVITY control on the front panel. However, at frequencies below 1606.5 kHz and when 2182 kHz, is selected by means of the 2182 key, the SENSITIVITY control is disabled so as to allow maximum IF gain irrespective of the actual setting of the control knob.

A check signal (CHECK 5) direived from the AGC Detector, is used to confirm correct AGC circuit operation during SELFCHECK.

6.1.3. CONTROL AND RX SYNTHESIZER [402]

6.1.3.1. Microprocessor Circuit

The Microprocessing Unit (MPU) is the central unit of the Microprocessor Circuit. It responds to inputs and produces outputs in a manner determined wholly by a sequency of instructions referred to as its program. The sequential operation of the MPU is clocked by a 2.8 MHz signal derived from the Reference Divider of the RX Synthesizer.

The program is held in the Read-Only Memory (ROM). The instructions are fetched into the MPU one at a time to be decoded and actioned. The program contains instructions for reading input from the Keyboard; how to display transmitting and receiving frequencies; carrying out of SELFCHECK analysis, to mention a few of the tasks.

The TX Frequency PROM can be programmed to store up to 80 transmitting frequencies. Stored information may be recalled by the user when required. The PROM can be programmed to allow free selection of transmitting frequencies where permitted by the authorities.

The Input/Output (I/O) circuits are utilized by the MPU to communicate with the keyboard, the Displays, the two synthesizers as well as the RAM and the check Multiplexer. The I/O Circuits also delivers a two tone alarm signal to the Exciter.

The Non Volatile Random Access Memory (RAM) is the user-programmable frequency memory. Memory content will not be lost when power is switched off, because a lithium battery will then supply current to the RAM.

The Multiplexer (MUX) is connected to 12 check signal lines from various circuits in the Control Unit. Call-up of the SELFCHECK routine causes the MPU to scan these check signals. Appearance of a check signal indicating a functional error will stop MPU scanning and an error message will be displayed.

MPU start-up procedure is controlled by the Restart Generator, when power is turned on.

The Power Down Detector detects if the 7.5 V supply voltage is decreasing below a certain limit - a warning sign that power will most likely disappear very soon. At this point an order is communicated to the MPU to conclude all current tasks and to await return of power.

6.1.3.2. RX Synthesizer

The reference oscillator of the synthesizer is a 12.6 MHz crystal controlled oscillator. The amplitude stabilized output signal is fed to the Clarifier Mixer and to the Reference Divider.

In the Reference Divider a 2.8 MHz source for the MPU is produced, a 1.4 MHz source for the Exciter and the Receiver, 5 kHz and 500 Hz sources for the I/O circuits as well as a 500 Hz reference frequency for the synthesizer loop.

The 500 Hz reference frequency and the Loop Divider output frequency are compared in the Phase/Frequency Comparator circuit. To obtain lock two conditions must be met: First, the frequency of the two output signals must be the same, i.e. 500 Hz. Second, a very small, but definite, phase difference must exist between the two signals. If this minute phase difference changes, the Phase/Frequency Comparator will immediately produce

a correction voltage that will correct the VCO frequency until the original phase difference is reestablished.

A check signal (CHECK 2) used to confirm proper lock of the Synthesizer Loop, is derived from the Phase/Frequency Comparator.

The Loop Filter is designed to stop unwanted noise from modulating the VCO, and to give the loop a proper dynamic response.

The Voltage Controlled Oscillator (VCO) covers a frequency range of 10.8 - 15.2 MHz. The amplitude stabilized output signal is split between two Buffer Amplifiers, one for the injection signal to the Receiver' s 1st Mixer, the other for the Loop Divider.

A check signal (CHECK 1) confirms that the VCO produces an output signal.

The division ratio of the Loop Divider is controlled by the contents of the Serial-to Parralel Shift Registers. Information to these registers is received from the Microprocessor Circuit in serial format. Loop Divider output frequency is 500 Hz, when the loop is locked.

The frequency of the 3.3 MHz Voltage Controlled Crystal Oscillator (VCXO) is determined both by the 100 Hz information, stored in the Shift Registers, and the Clarifier Control Voltage. The control voltages are added in a summing amplifier. VCXO frequency may be varied approximately ± 100 Hz with the CLARIFIER control whereas frequency may be varied 0, 100, 200, 300 or 400 Hz by the 100 Hz information-controlled voltage. The total frequency variation range is thus -100 Hz to + 500 Hz.

The 3.3 MHz signal is mixed with the 12.6 MHx XO frequency in the Clarifier Mixer. The output signal is filtered in a 9.3 MHz band-pass filter and applied to a Buffer Amplifier. The output is amplitude stabilized by means of a detector controlling the 3.3 MHz oscillator gain. A check signal (CHECK 3) used to confirm the presence of adequate output, is drawn from the same detector. The resulting 9.3 MHz +100/-500 Hz signal is led to the Receiver's 2nd Mixer.

6.1.4. EXCITER [403]

6.1.4.1. Signal Path

The AF input signal from the MICROPHONE AMPLIFIER [450] , located in the handset, or the two tone alarm signal generated on p.c.b. [402] is fed to the Compressor. The Compressor serves to maintain a constant AF modulation peak level. The regulating voltage, controlling the gain of the Compressor, is drived from the output of the Sideband Amplifier.

A check signal (CHECK 8) is derived from the compressor for checking correct compressor operation.

A 1.4 MHz signal, produced by the Reference Divider in the RX Synthesizer is fed, by way of a Buffer Amplifier, to the 1.4 MHz Level Stabilizer. The stabilized 1.4 MHz signal can be turned on or off by a control line from the Gate Circuit, corresponding to keyed or non-keyed state.

A check signal (CHECK 9) is derived from the Level Stabilizer to indicate if the 1.4 MHz signal is present.

The 1.4 MHz signal is fed to the 1st Mixer where the compressed AF signal is converted into a double sideband suppressed carrier signal at 1.4 MHz. The upper sideband is then removed by the lower sideband crystal filter at the mixer output. The filtered signal is now amplified in the sideband amplifier and fed to the Sideband Level Regulator. The amplification of both regulators are controlled by two control lines from the Gate Circuit in accordance with the mode selected. The amplification ratios are mutually related such that the peak to peak voltage of the combined signal appearing after the two regulators is the same independent of the operating mode.

The 2nd Mixer receives the combined 1.4 MHz A3J, A3A or A3H LSB signal and mixes it with the output signal from the Exciter Synthesizer. The output is passed through one of the two low-pass filters which pass only the difference frequency of the two input signals. Thus the 1.4 MHz LSB signal is converted to an upper sideband signal at the actual transmitting frequency.

If the transmitting frequency is below 2.8 MHz the Gate Circuit selects the 2.8 MHz low-pass filter, otherwise the 4.2 MHz low-pass filter is selected.

The RF signal from one of the two low-pass filters are then fed through an amplifier where RF signal-level control takes place. A trimming potentiometer permits adjustment of the Exciter RF signal output level to the correct value.

RF Power Control is operated from the front panel via the Gate Circuit. A DC voltage selects either low or full output power from the Exciter.

The Check Signal Switch, controlled by the Microprocessor, opens during SELFCHECK so as to deliver an RF CHECK SIGNAL to the Receiver.

6.1.4.2. Exciter Synthesizer

A 1.4 MHz signal, derived from the RX Synthesizer is fed to a Buffer Amplifier, which produces two output signals, one for the 1.4 MHz Level Stabilizer and one for the Reference Divider. In the Reference Divider the 1.4 MHz frequency is divided by 14000 and the resulting 100 Hz signal is applied to the Phase/Frequency Comparator as a reference frequency for the Exciter Synthesizer.

The Phase/Frequency Comparator compares the 100 Hz reference frequency with the output frequency of the Loop Divider. Two conditions must be met to ensure a correct VCO frequency: First, the frequency of the two input signals must be the same, i.e. 100 Hz. Second, the phase error must be within close limits. If the phase error exceeds a certain limit, the Phase/Frequency Comparator will close the Synthesizer Loop and produce a correction voltage which, via the Loop Filter, adjusts the VCO frequency until the original phase difference is reestablished. The comparator will then reopen the Synthesizer loop.

Another DC-signal is derived from the comparator to indicate if the VCO frequency is correct. This DC-signal enters the Gate Circuit, which then produces a check signal (CHECK 10).

The Loop Filter is designed to stop unwanted noise from modulating the VCO, and to give the loop a proper dynamic response.

The VCO covers a frequency range of 3-5.9 MHz. The amplitude stabilized output signal is split between two Buffer Amplifiers, one for the injection signal to the 2nd mixer in the Exciter's signal path, the other for the Loop Divider. A check signal (CHECK 11) indicates if the VCO produces an output signal.

The division ratio of the Loop Divider is controlled by the contents of the serial-to-Parallel Shift Registers. Information to these registers is received from the Microprocessor Circuit in serial format. Loop Divider output frequency is 100 Hz, when the VCO frequency is correct.

6.2.1. POWER SUPPLY MODULE

The DC-power, derived from the battery, have to pass at first a relay switch, controlled by the Overvoltage And Reverse Polarity Protection circuit, an input filter, and a transient protection circuit before it is allowed to flow on to the two converter boards [421] and [422] , via Interconnection Board [423] . Power for the AAC is also routed via [423] while power for the PA-module is fed to a 12-pole socket on the power supply module chassis.

6.2.1.1. Switch Mode Power Supply [421]

The input power is fed through an additional Noise Filter before it is supplied to the Converter Driver.

On the secondary side of the converter-transformer one of the rectified outputs is compared to a reference voltage and the result is transferred to the primary side via an optocoupler and is used to control the duty cycle of the flyback converter. This is done by regulating the duty cycles of the pulses, derived from a 20 kHz Oscillator, before they are forming the driving signal for the Converter Driver.

So a regulating loop has been designed in order to keep the output voltage from the converter fairly stable independent of battery voltage variations and different loading conditions on the outputs.

By means of optocouplers in the feedback path the secondary side of the converter is galvanic isolated from the primary side and thereby from the battery.

Two Rectifiers produce 17V and 9V respectively. Of these the 9 V output is regulated while the 17V output is tracking. Each Rectifier is equipped with a Current Sensor and an Overvoltage Protector. The two Sensors, and the Overvoltage Protector, attached to the 9V line, disables the regulating loop and forces the converter into a low-power mode if an abnormal loading condition exists on the outputs.

6.2.1.2. Blower Converter [422]

By means of the Power Switch on the CU-front panel the Overvoltage and Reverse Polarity Protection circuit is connected to the input lines from the battery except when the switch is in its OFF position.

In case a reverse polarity is applied the relay RL1 will not be activated thereby protecting the whole Power Supply. Also if input voltage exceeds limits RL1 will be deactivated.

If the Overvoltage And Reverse Polarity Protection circuit accepts voltage level and polarity, the RL1 is activated and simultaneously the 20 kHz Oscillator on p.c.b. [421] is powered from p.c.b. [422] .

The blower converter produces square wave signals for driving two blowers. Blower no. 1 (on the PA module) is always operating when "T/R" is selected on the power switch. Blower no. 2 (in the AAC-unit) is only in operation when extra cooling is required. The converter has two modes of operation:

a) Blower no. 1 only. Constant speed (slow and quiet).
b) Both blowers. Variable speed (tracks battery voltage, maximum cooling).

In mode a) both frequency and voltage inputs to the converter driver are stabilized.

In mode b) a relay switches in blower no. 2. At the same time the VCO (Voltage Controlled Oscillator) generating the square wave is made to track battery voltage thus generating a higher frequency when battery voltage is high. Also in this mode the voltage stabilizer is bypassed in order to supply maximum power to the blowers.

Mode b) is selected when the input TEMP 1 is taken low. This happens when the temperature sensors on the PA-module reaches a temperature of approx. 60^{o} C.

The keying relay produces a 24 V output signal when KEYLINE goes active. This can be used for external purposes (i.e. antenna relay) but is also used internally to key the PA-module. This is done by activating the stabilizers on this module via "PA PWR CTRL" derived from 24 V when keyed. A delay circuit compensates for the delay in the simplex relay if fitted. If a delay in the keying of the transmitter is unwanted the delay-circuit can be deactivated by removing a jumper.

A tune switch is located on this board to facilitate servicing the AAC.

6.2.2. POWER AMPLIFIER MODULE

6.2.2.1. STABILIZER [442]

The RF signal, produced by the Exciter in the Control Unit, enters via the INTERCONNECTION BOARD [423] .

First, the signal goes through the Protection Attenuator. This attenuator, controlled by the Protection Attenuator Control, protects the succeeding P.A. boards and is activated if one or more of the following three situations occur:

1. The peak value of the output voltage from one of the two P.A.-stages exceeds a certain limit.

2. The SWR measured in the Automatic Antenna Coupler exceeds 2.5

3. The temperature measured at one of the two P.A.-stages exceeds 92°C.

Output of the Protection Attenuator is split-up by the Input Power Splitter circuit. The two-6dB outputs go to their respective P.A. boards. The two boards, POWER AMPLIFIER [441] , are identical.

The output signals from the power amplifiers are combined in the Output Power Combiner, the output of which goes to the Automatic Antenna Coupler.

Two 25.4 Volt regulators deliver supply voltage to the P.A. boards. The base currents of the 25.4 V regulators also serve to provide current to the two Bias Stabilizers. The 4.5 V Regulators supply additional current. The 5.4 V Limiters limit the Bias Supply Voltages.

6.2.2.2. POWER AMPLIFIER [441]

The RF signal is brought through a Gain Adjustment Attenuator (adjustment range approx. 6 dB) before being amplified approx. 21 dB in Driver 1, a class A amplifier.

Subsequently, 18 dB gain is supplied in Driver 2 (class AB, push-pull) before the signal is given 10 dB of final amplification in the P.A. output stage (also, class AB, push-pull). Resulting output power is 225 Watts, PEP, into 35 ohms.

The Peak Detector that monitors the output voltage is connected to the Protection Attenuator Control on p.c.b. [442] .

The Bias Stabilizers supplies the bases of the class AB amplifiers with stabilized bias voltages.

A temperature sensor circuit monitors the temperature of the heat sink. If the temperature exceeds 60°C the BLOWER CONVERTER [422] is alerted and if the temperature exceeds 92°C, the monitor will alert the Protection Attenuator Control on p.c.b. [442] .

6.2.3. AUTOMATIC ANTENNA COUPLER

The RF signal from the Power Amplifier Module is connected to the LOW-PASS FILTER [434] , which removes the harmonics from the signal.

During the tuning sequence a 4.22 MHz Low-pass filter, loaded with 70 ohms at the output, is switched-in. A Directional Coupler extracts information about forward and reflected voltages on the RF signal line following the low-pass filter.

The impedance level is then changed by means of a 50 ohms to 112.5 ohms transformer.

The RF signal is now fed to the L-matching network, comprised of two variable inductors, L1 and L2. A shortening capacitor, C2, may be inserted in series with the antenna.

RF current is measured with the aid of a current transformer before the RF signal is taken from the Automatic Antenna Coupler. A detector rectifies the RF current and provides a signal to the RF lamp on the Control Unit's front panel as well as the Antenna Current Meter on the Transmitter Unit's front panel.

When a TUNE COMMAND is received from the Control Unit, a 20 sec. Timer is started, enabling the 2.5 Hz Clock Generator that makes the Sequential Network step through its tuning sequence.

The first steps are:

1. to inhibit keying
2. to reset Protection Atenuator
3. to switch-in the 4.22 Mhz low-pass tuning filter
4. to disconnect L2 from chassis

The next steps are

1. to cancel the keying inhibit
2. to send a TUNE POWER REQUEST to the Control Unit.
3. to start up Phase Comparator 1, Predriver 1 and Motor 1 Driver.

When Phase Comparator 1 detects a completed adjustment of L1, the Motor 1 Driver is cut off and the Motor 1 Stop Detector outputs a signal,which tells the Sequential Network to move to the next step sequence:

1. to inhibit keying while connecting L2 to chassis
2. to allow keying to resume
3. to start up Phase Comparator 2, Predriver 2 and Motor 2 Driver.
   Phase Comparator 1 fine-adjusts L1 at the same time L2 is adjusted.

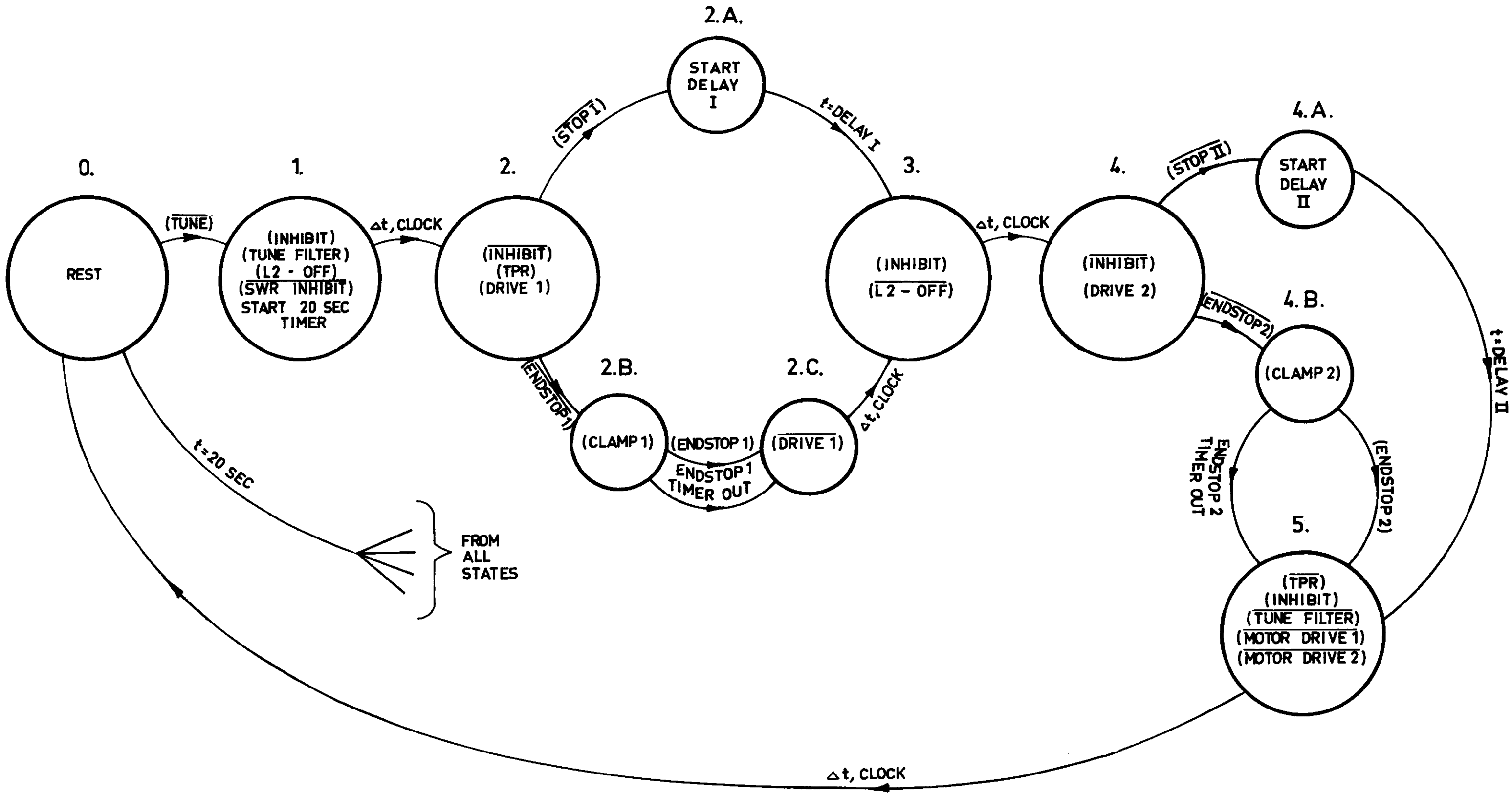
When Phase Comparator 2 detects a correct adjustment of L2, the Motor 2 Driver is cut off and the Motor 2 Stop Detector outputs a signal which causes the sequential Network to progress to the final steps, which are:

1. to cancel the TUNE POWER REQUEST
2. to inhibit keying
3. to disconnect the Tuning Filter
4. to disconnect the Phase Detectors,Predrivers and Motor Drivers
5. to permit keying

Two Endstop Detectors, one for each variable inductor, detect if one of the roller contacts reaches the end of a coil. A signal is then sent to the respective predrivers to force the motor to rotate in the correct direction, independent of the Phase Detector output.

If the tuning sequence has not been concluded within 20 seconds from the tune command the Automatic Antenna Coupler returns to its rest state and awaits the appearance of a new Tune Command, before starting up a new tuning sequence.

TUNING SEQUENCE



7. INSTALLATION

Correct installation of the equipment is important for maximum performance and reliability. Antennas and earth connections must be installed with the greatest care, especially where duplex telephony is desired.

7.1. Control Unit

The Control Unit is suspended in a pair of brackets supplied. The drawing on page 7-9 shows possible mounting positions, overall dimensions and a drilling plan for the necessary holes. The unit can be tilted in the brackets to a convenient angle and fixed in that position by tightening the bolts at the sides.

A frame for flush mounting is optionally available.

7.2. Transmitter Unit

The Transmitter Unit may be mounted up to 15 metres from the Control Unit using a RG-58C/U coaxial cable and a screened 24x0.15 sq.mm multiwire cable for interconnection and up to 50 metres away using heavier cables and junction boxes. In installations where the cable length between the units exceeds 15 metres, use RG-213/U (RG-8A/U) coaxial cable and a screened 24x0.75 sq.mm cable. The unit should be installed in a dry place near antenna lead-in and battery connection. Consideration should be given to accessibility for servicing. The brackets supplied allow for bulkhead or bench mounting. The drawing on page 7-9 shows mounting details. Observe minimum clearances.

7.3. Connection to the Permanent Installation

The TRP 6000 is to be powered from a 24V battery or a separate AC-to-24V DC converter unit. The supply leads are connected to the Transmitter Unit through the cable entry at the rear of the cabinet. Note that fuses must be provided in the supply leads. Maximum voltage drop in the supply leads should be 0.5 Volts. Table 7.1. shows the necessary cable cross sections and external fuse ratings.

Transmitter Unit	Max. cable length to battery	Conductor area	External fuses
TU 6200	6 m	2 x 6 mm^2	25A
	10 m	2 x 10 mm^2	
	16 m	2 x 16 mm^2	
	27 m	2 x 25 mm^2 *)	
TU 6400	5 m	2 x 10 mm^2	50A
	8 m	2 x 16 mm^2	
	13 m	2 x 25 mm^2 *)	

*) Use pin terminal adaptor 343 428 11.

Table 7.1.

7.4. Earth Connections

As the transmitter earth connection is a part of the total antenna system, it is of the utmost importance that the earth connection is constructed to have the smallest possible RF-impedance. Losses in the earth connection will result in a decrease in radiated power which means that the range of the transmitter will be reduced. A poor earth connection will further impede or even make duplex communication impossible.

7.4.1. Transmitter Earth Terminal:

The transmitter earth terminal is located at the rear of the Transmitter Unit.

7.4.2. Steel Ships:

From the transmitter earth terminal a 100 x 0.5 mm copper strap is run uninterrupted to two ½" or M12 bolts welded to the hull as close to the equipment as possible.

7.4.3. Wooden Ships:

From the transmitter earth terminal a 100 x 0.5 mm copper strap is run, preferably uninterrupted, to a copper earth bolt hard soldered to an earth plate having a minimum area of 1 m^2 mounted under the water line. Should it, however, be necessary to break the copper strap, for example to pass through a deck, two ½" or M12 bolts should be used for this feed through. The copper strap should then be continued below deck, after connection to the same two bolts.

The copper strap must not be passed through iron pipes and should be kept a minimum distance of 0.5 m from iron parts of some extent. If this minimum distance cannot be kept the copper strap must be effectively connected to these parts using a strap having the same dimensions.

On wooden ships having a superstructure of metal, this superstructure should also be effectively connected to the copper strap by using stainless steel bolts and preferably pieces of stainless steel strips between the metal parts.

7.4.4. Receiver Earth Terminal:

The receiver earth terminal is located in the receiver antenna connection box. To facilitate duplex operation the instructions given below should be followed.

7.4.5. Steel Ships:

A flexible 2.5 sq.mm earth wire is run from the antenna connection box to a separate ½" or M12 earth bolt welded to the hull as close to the antenna connection box as possible. As an alternative the receiver earth connection may be established at the antenna-end of the coaxial cable.

7.4.6. Wooden Ships:

A flexible 2.5 sq.mm earth wire is run from the receiver antenna connection box directly to the transmitter earth bolt on the earth plate. The earth wire should be run a minimum distance of 0.5 m from the transmitter copper strap. As an alternative the receiver earth connection may be established at the antenna-end of the coaxial cable.

7.4.7. Control Unit Earth Terminal:

The Control Unit earth terminal is located at the rear of the front panel. The Control Unit should be connected to earth if it is separated from the Transmitter Unit.

7.4.8. Steel Ships:

A flexibe 2.5 sq. mm earth wire is run to a separate ½" earth bolt welded to the hull as close to the Control Unit as possible.

7.4.9. Wooden Ships:

A flexible 2.5 sq. mm earth wire is run directly to the transmitter earth bolt on the earth plate. The wire should be run at a minimum distance of 0.5 m from the receiver earth wire.

7.4.10. Other Cables:

Other cables should be placed as far away as possible from the earth leads and under no circumstances parallel with the transmitter copper strap closer than 0.7 m and, for the receiver and Control Unit earth leads, closer than 0.2 m.

7.4.11. Earthing the Battery:

RF earth connections will cause neither battery nor mains leads to be connected to the hull. If it is desired to connect the battery to the hull, it is important to make the connection right at the battery, never in the transmitter. Max. permissible peak voltage between the battery terminals and earth is 250 V.

7.5. Antennas

In order to minimize duplex noise, the transmitting and receiving antennas should be kept as far away from each other as possible. Stays, wires, steel masts, etc. should either be earthed effectively or insulated.

Likewise in order to minimize duplex noise, every other electric installation such as cable braiding (screens) and instruments should be earthed effectively, and the instruments in question should be fitted with noise-interference suppression devices, effective in the range 0.1 MHz to 4.5 MHz.

The antennas should be suspended well in the clear, away from objects whose influence on the antennas may vary, such as derricks etc. Insulators should be of the best type having low leakage even when wet.

7.5.1. Transmitter Antenna Terminal:

The transmitter antenna terminal is located on the front of the Transmitter Unit.

7.5.2. Transmitter Antenna:

The Automatic Antenna Coupler will tune at any frequency in the range 1.6 to 4.22 MHz to wire and/or whip antennas of 7 to 18 metres total length, including earth strap length. See page 7-10.

To ensure the greatest possible radiated power the transmitter antenna should be as long as possible. The antenna should be terminated in a lead-in insulator in the roof or side wall of the radio room. The lead-in insulator should be located in such a way that the distance between the insulator and the transmitter antenna terminal is as short as possible to avoid losses and radiated RF-power inside the radio room which might disturb other equipment.

A short length of coaxial cable type RG-213/U, of which only the braid and the outer insulation is used, is inserted between the lead-in insulator and the transmitter antenna terminal. Both ends of the coaxial screen are soldered to cableshoes of suitable dimensions for the lead-in insulator and the transmitter antenna terminal.

If, for practical reasons, it should be necessary to mount the lead-in insulator some distance from the transmitter, the connection from the insulator to the vicinity of the transmitter should be done with a length of copper tubing mounted on stand-off insulators. A length of coaxial cable, as described above, should then be inserted between the last stand-off and the transmitter antenna terminal; any play between the transmitter and the bulkhead will then be taken up by the cable.

7.5.3. Receiver Antenna Terminal:

The receiver antenna terminal is a UHF-connector (PL 259 type) located in the receiver antenna connection box.

7.5.4. Receiver Antenna:

Length: 7 - 30 m. The receiving antenna should be brought in with a length of coaxial cable, which should be as short as possible, especially in the case of a short antenna.

If a long coaxial cable is used in order to separate receiver and transmitter antennas it will often be advantageous to insert an impedance matching transformer at the antenna end of the coaxial cable.

7.6. Extension Speaker

If an extension speaker is to be installed it should be connected to terminal strip TS1 in the Control Unit. The terminals are located at the rear of the front panel.

An audio power of 5 watts is available into a 4 ohms load. This power can be shared between several loudspeakers if so desired. The built-in speaker in the Transmitter Unit has an impedance of 8 ohms. When connecting the extension speaker(s) the minimum value of the total impedance should be 4 ohms including the built-in speaker. If 5 watts is required in the extension speaker(s), the built-in speaker must be disconnected.

7.7. Equipment-On and Transmitter-Keyed Indications

Indications of equipment-on and transmitter-keyed conditions can be obtained by means of two voltages (both 24 V at max. 0.4A) which are controlled by the Supply Switch and the Keying Relay respectively. The voltages can be taken off at a terminal strip located on the Power Supply Module in the

Transmitter Unit. The terminals are marked 24 V (+) WHEN ON and 24 V (+) WHEN KEYED respectively. The voltages may be used for activating an antenna relay or an earth-free relay in another apparatus, e.g. C.A.S., direction finder or an extra receiver.

7.8. Use of Shortening Capacitor

The shortening capacitor in the Automatic Antenna Coupler is normally shorted when the equipment is delivered from the factory as this gives the highest output power on short antennas. To check if the shortening capacitor is necessary in the actual installation select the highest possible transmitting frequency and activate the TUNE button. If the Automatic Antenna Coupler fails to tune (motor runs for 20 seconds and large variometer roller is positioned to the utmost right) the shortening capacitor must be inserted.

To insert the shortening capacitor pull the Automatic Antenna Coupler unit partly out of the cabinet. Move the connector behind the antenna insulator to the left hand terminal above the capacitor.

If the Automatic Antenna Coupler still fails to tune, the antenna is too long and must be shortened.

7.9. Final Installation Check

7.9.1. 2182 Labels:

Switch to 2182 kHz and press "TUNE".

Remove the frequency table on the front plate of the Automatic Antenna Coupler. Partially remove the self-adhesive plastic film covering the cut-outs on the front plate and place the two red labels marked 2182 so that the arrows point exactly at the positions of the two variometer rollers. See fig. 4.6.1. Replace the self-adhesive plastic film and the frequency table.

7.9.2. Memory Programming:

Program the frequency pairs marked with an RCL number on the frequency table into the user programmable memory as described in chapter 2 of this manual.

7.10. Transmit Frequency PROM Programming

The authorized transmit frequencies are programmed into the transmit frequency PROM normally localized on p.c.b. 402 accessible through a slot in the box, when the two screws securing the front panel have been loosened.

Up to 80 transmit frequencies may be stored as channel-numbers 20 to 99. The coding chosen is the simplest possible: write down the desired transmit frequency with 100 Hz resolution as a 5-digit number, add a leading "zero" and program the resulting 6-digit number as 3 consecutive bytes (groups of 8 bits) using BCD-code as illustrated by the following example (table 7.2). The frequencies may be programmed in an arbitrary order and cancelled by programming 0000 0000 into the 3 bytes corresponding to the particular frequency. New frequencies can be added until the capacity is exhausted; however no vacant space (locations containing 1111 1111) must be left between programmed frequencies.

PROM-types which can be installed

Manufacturer	Types
Monolithic Memories	6335-1 6336-1 5335-1 5336-1 6340-1 6341-1 5340-1 5341-1
Harris	HM-7640 A HM-7641 A
Motorola	MCM 7640 MCM 7641
Fairchild	93438 93448

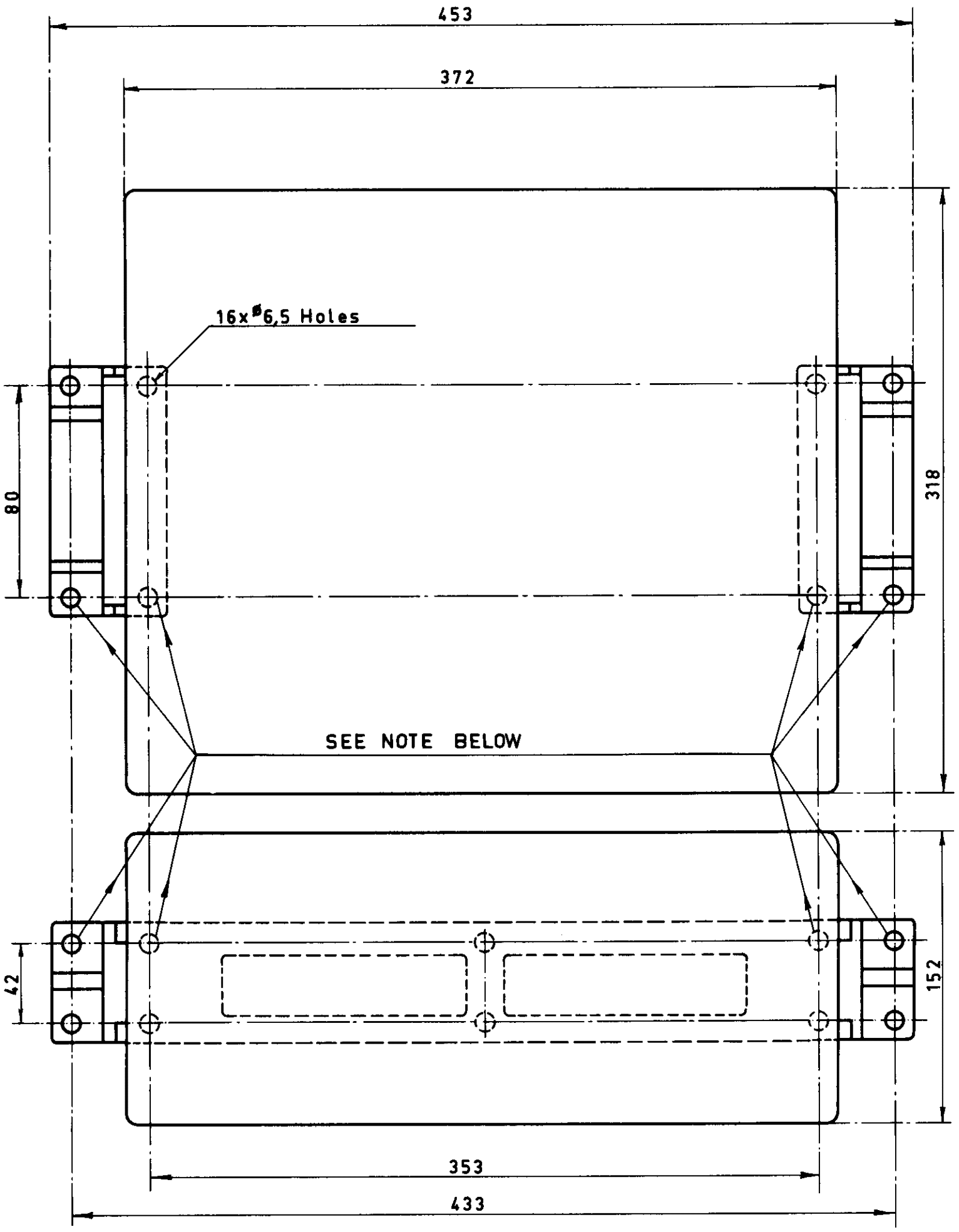
ADDRESS		DATA								
dec.	hex.	0_7	0_6	0_5	0_4	0_3	0_2	0_1	0_0	
0	00	0	0	0	0	0	0	1	0	
		(0)					(2)			
1	01	0	0	0	0	0	1	1	0	2069 kHz (channel 20)
		(0)					(6)			
2	02	1	0	0	1	0	0	0	0	
		(9)					(0)			
3	03	0	0	0	0	0	0	1	0	
		(0)					(2)			
4	04	0	0	1	0	0	1	1	0	2263.5 kHz (channel 21)
		(2)					(6)			
5	05	0	0	1	1	0	1	0	1	
		(3)					(5)			
6	06	0	0	0	0	0	0	1	1	
		(0)					(3)			
7	07	0	1	0	1	0	1	1	0	3567.5 kHz (channel 22)
		(5)					(6)			
8	08	0	1	1	1	0	1	0	1	
		(7)					(5)			
237	ED	0	0	0	0	0	0	0	1	
		(0)					(1)			
238	EE	1	0	0	0	0	0	1	1	1834 kHz (channel 99)
		(8)					(3)			
239	EF	0	1	0	0	0	0	0	0	
		(4)					(0)			

Decimal number	BCD-code
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001

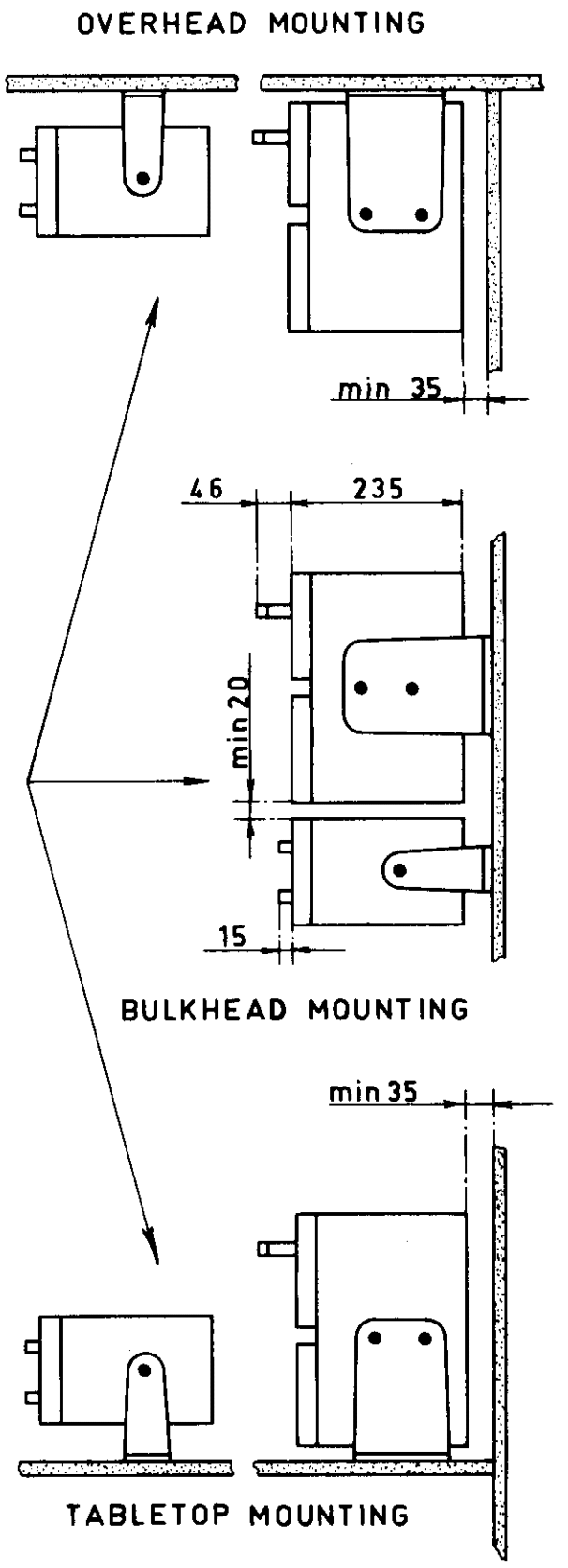
Table 7.2

PROGRAMMING WORK SHEET - TRANSMITTER FREQUENCY PROM

FREQUENCY	ADR	0_7	0_6	0_5	0_4		0_3	0_2	0_1	0_0	
		0	0	0	0	(0)					( )
f= ______ kHz						( )					( )
						( )					( )
		0	0	0	0	(0)					( )
f= ______ kHz						( )					( )
						( )					( )
		0	0	0	0	(0)					( )
f= ______ kHz						( )					( )
						( )					( )
		0	0	0	0	(0)					( )
f= ______ kHz						( )					( )
						( )					( )
		0	0	0	0	(0)					( )
f= ______ kHz						( )					( )
						( )					( )
		0	0	0	0	(0)					( )
f= ______ kHz						( )					( )
						( )					( )
		0	0	0	0	(0)					( )
f= ______ kHz						( )					( )
						( )					( )
		0	0	0	0	(0)					( )
f= ______ kHz						( )					( )
						( )					( )



DRILLING PLAN



MOUNTING POSSIBILITIES

NOTE : CU 6000 BRACKET MAY BE USED AS A JIG FOR THE MARKING OF TU 6X00 BRACKETS HOLES AS SHOWN.

UNIT:	APPR.WEIGHT:
CU 6000	7.3 kg
TU 6200	16.0 kg
TU 6400	18.0 kg

TOLERANCES: ± 1mm

DIMENSIONS IN mm

MOUNTING OF TRP 6000

343 423 82

THE TRANSMITTER ANTENNA

Important :

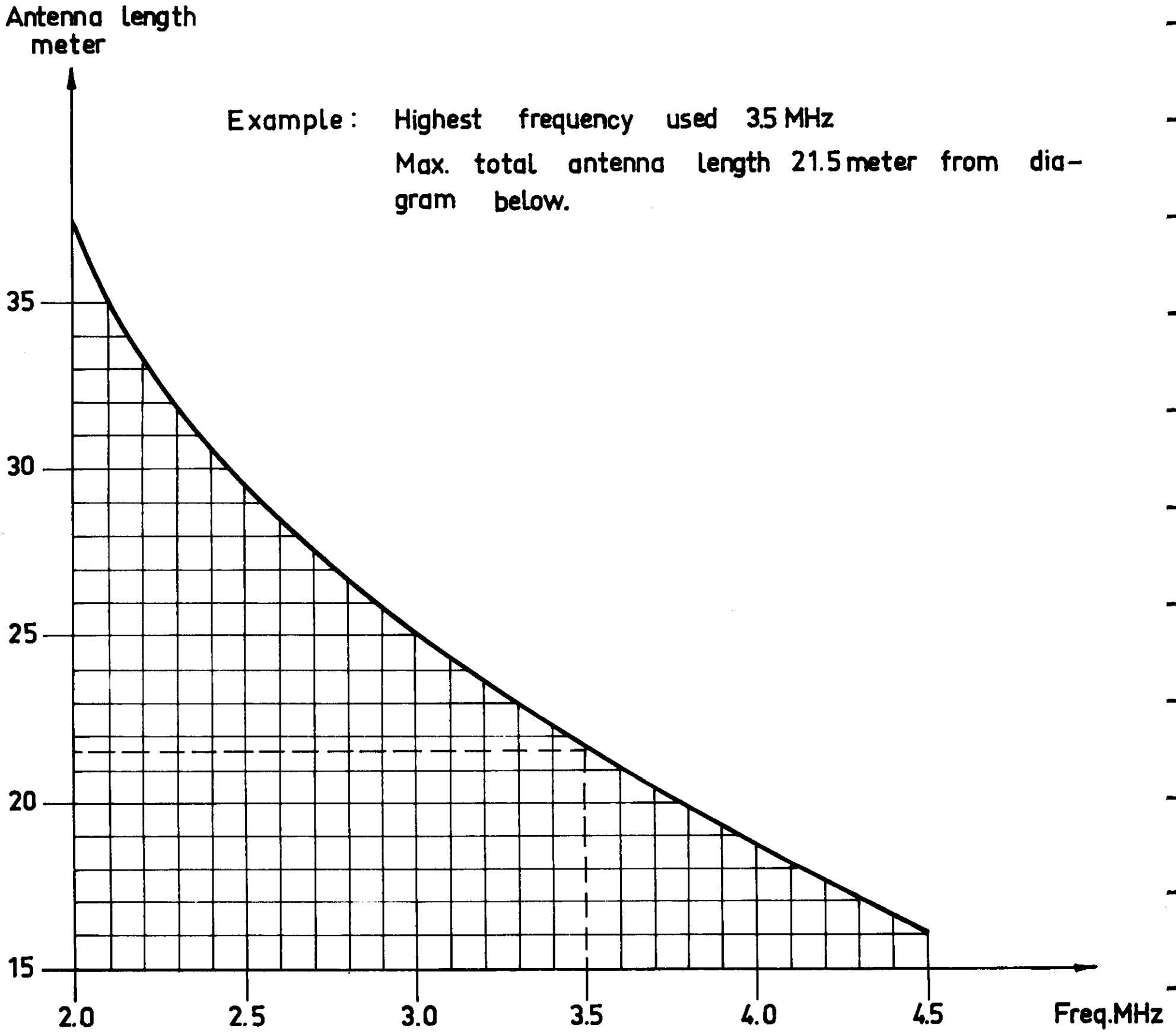
The antenna length must always be shorter than a quarter wavelength on the highest operating frequency.

The maximum length (including down lead and earth connection) versus frequency is shown in the diagram below.

A whip antenna with built-in loading coil is not tuneable above its quarterwave resonance, and therefore is not recommended.

Example : Highest frequency used 3.5 MHz

Max. total antenna length 21.5 meter from diagram below.



Max. Antenna length versus frequency
with the shortening capacitor inserted.