

# Technical Manual 5820/028-13

Parts 1 – 3

## Short-wave receiver

EK 07/2 and EK 07 D/2

Technical Manual 5820/028-13

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- Part 1 Description of the device
- Part 2 Operation, maintenance and service instructions, including safety measures
- Part 3 Field maintenance and repair by military personnel

## Short-wave receiver

EK 07/2 and EK 07 D/2

August 1963

This manual applies to:

| Device                                     | Order Number      |
|--|-------------------|
| Receiver, radio, set<br>(Type EK 07 D / 2) | 5820-12-137-9965  |
| Receiver, radio, set<br>(Type EK 07/2)     | 5820-12-121 -2592 |

Construction: as from December 1962

I adopt this Technical Manual

Parts 1 – 3

Radio receiver 0.5 to 30.1 MHz. set

Short-wave receiver

EK 07/2 and EK 07 D / 2

Technical Manual 5820/028-13

On behalf

Foertsch

## Foreword

1. The original instructions from the Rohde & Schwarz company for receivers type EK 07/2 and EK 07 D / 2 have been adopted for this manual.
2. The assembly of switching parts on pages 50-106 is not a requirement document. For this purpose, the ET list must be used. This will be delivered at a later stage.
3. Any possible errors found in this document are to be reported to the Bundeswehr Bureau of Telecommunications

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## 1. General information and applications

The short-wave receiver type EK 07 D / 1 or EK 07 D / 2 can be used as a service or as a monitoring receiver in fixed and mobile radio stations.

Because of its special features, it is particularly suitable for use in large stations under difficult reception conditions for commercial telegraphy and telephony transmissions. It is easily adapted to receive amplitude-modulated transmitters of modes A1 to A4.

However, with the appropriate accessories it is also suitable for the reception of frequency-modulated signals (F1 to F4 and F6) and single-sideband transmissions (A3a and A3b).

Special features include: high accuracy of better than 1 kHz; High scale resolution of 300 Hz / mm scale length in the whole short wave range; Clear linear frequency scale, whereby only the scale of the active sub-range (of 3 MHz per sub-range) is visible, to prevent confusing the scales;

High selectivity and image rejection by means of three tuned input circuit selectors; High cross-modulation blocking and good selectivity against strong local stations; 6 selectable IF bandwidths of  $\pm 0.15$  kHz to  $\pm 6$  kHz; Controllable (and switchable) noise limiter;

Particularly good amplitude control with five different and partly differently delayed control voltages; Variable time constant control with three options (0.1 / 1 / 10 sec); Switchable control mode (manual, edge + autom., Automatic) with adjustable signal threshold.

Diversity separation is possible by connecting the control voltage outputs of two or three receivers. For transceiver operation, a transmitter-key mute relay is provided. It is also possible to remove the first and second intermediate frequencies (3.3 MHz and 300 kHz) and to connect additional devices, such as, for example, our NZ 10 SSB demodulator or the NZ 07 CW demodulator.

The receiver can be remotely operated through a control unit (available soon), even over long distances, via a conventional two-wire cable. The AF output level of the receiver is also fed back to the control location via this line. Loss of calibration

or settings is prevented; The position of the scale is fed back to the control location.

The two versions EK 07 D / 1 and EK 07 D / 2 differ only in the coaxial cable connections on the rear. For the EK 07 D / 1, convertible 13 mm sockets FMU 90100 are provided, whereas the EK 07 D / 2 has 50-0 Amphenol connections (see section 3.21.).

## 2. Features

### 2.1 Electric data

|   |      |  |
|---|------|--|
| <u>Frequency coverage:</u>  |      | 0.5 – 30.1 MHz                             |
| <u>Range A</u>  |      | 3.1 – 30.1 MHz                             |
| Coarse dial: Range  | IV   | 3.1 – 6.1 MHz                              |
|   | V    | 6.1 – 9.1 MHz                              |
|   | VI   | 9.1 – 12.1 MHz                             |
|   | VII  | 12.1 – 15.1 MHz                            |
|   | VIII | 15.1 – 18.1 MHz                            |
|   | IX   | 18.1 – 21.1 MHz                            |
|   | X    | 21.1 – 24.1 MHz                            |
|   | XI   | 24.1 – 27.1 MHz                            |
|   | XII  | 27.1 – 30.1 MHz                            |
| Fine dial:  |      | 0 – 100 KHz                                |
| Dial resolution:  |      | About 0.3 kHz / mm on the main range dial. |
| Accuracy after 30 minutes running under a room temperature of between 15 – 25C: |      | Better than 1kHz                           |
| <u>Range B</u>  |      | 0.5 – 3.1 MHz                              |
| Coarse dial: Range  | I    | 0.5 – 1.1 MHz                              |
|   | II   | 1.1 – 2.1 MHz                              |
|   | III  | 2.1 – 3.1 MHz                              |
| Fine dial:  |      | With 100 divisions (through interpolation) |

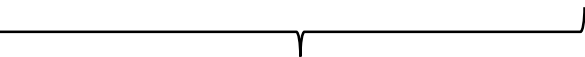
For both ranges:

Operation modes: A1, A2, A3, A4  
With accessories: F1, F2, F3, F4, F6, A3a, A3b

Intermediate frequency  
In ranges I – IV: 300 KHz  
V – XII: 1st IF: 3.3 MHz  
2nd IF: 300 kHz

IF selectable bandwidth: ±0.15, ±0.3, ±0.75 kHz  
±1.5, ±3.0, ±6.0 kHz

| Selectivity (stationary)  | 20 db   | 40 db   | 60 db       |
|---------------------------|---------|---------|-------------|
| at IF bandwidth ±0.15 kHz | < ±0.45 | < ±0.95 | < ±1.35 kHz |
| ±0.3 kHz                  | < ±0.55 | < ±1.00 | < ±1.50 kHz |
| ±0.75 kHz                 | < ±0.85 | < ±2.05 | < ±3.25 kHz |
| ±1.5 kHz                  | < ±1.00 | < ±2.00 | < ±2.90 kHz |
| ±3.0 kHz                  | < ±1.00 | < ±2.10 | < ±3.50 kHz |
| ±6.0 kHz                  | < ±1.70 | < ±3.50 | < ±6.00 kHz |



Separation from the band limit

IF rejection >90 db in Range A

Image rejection  
In ranges I – IV >70 db  
V – XII >80 db

Cross-modulation blocking A 50% modulated noise source separated 20 kHz from the center of a useful signal will cause over 10% cross-modulation when the ratio of the noise source to the amplitude of the useful signal is <60 db and the noise voltage is <50 mV

Limit sensitivity About 10 kT<sub>0</sub>

Signal to Noise ratio

|   |  |                    |
|---|--|--------------------|
| In mode A1 with<br>IF bandwidth $\pm 0.3$ kHz | 20 db at $0.4 \mu V$<br>30 db at $1.3 \mu V$<br>40 db at $5.5 \mu V$ | } Input<br>voltage |
|---|--|--------------------|

|   |   |                    |
|---|---|--------------------|
| In mode A3 with<br>IF bandwidth $\pm 6$ kHz | 20 db at $4 \mu V$<br>30 db at $15 \mu V$<br>40 db at $100 \mu V$ | } Input<br>voltage |
|---|---|--------------------|

Oscillator voltage

At the antenna input  
point with  $60 \Omega$  About  $5 \mu V$

Calibration oscillator Controlled by 300 kHz crystal

Antenna connection a) coaxial input for feeding  
lines  $50 - 75 \Omega$   
b) phone jack for high impedance  
lines

IF output 300 kHz, EMF = 0.1V,  $R_i = 250 \Omega$

Control Forward and reverse regulation  
between  $0.7 \mu V$  and 100 mV input  
voltage varies the output  
voltage by less than 3 db

Time constant control 0.1, 1 or 10 seconds

Voltage output control For recording purposes and for  
the direct connection of 2 or 3  
external receivers for diversity  
reception

CW sidetone  $\pm 3$  kHz adjustable, switchable

Antenna voltage monitor with instrument from 1 to  $10^5 \mu V$

AF response 3 db from 40 to 6,000 Hz

Noise limiter adjustable, switchable

Line output level 0 db at  $600 \Omega$   
at  $m=30\%$ , distortion  $< 1.5\%$

Power output 2W at  $15 \Omega$   
Distortion  $\approx 1.5\%$  at 1 W

|                          |   |
|--------------------------|---|
| Headphones output broad  | Frequency response 3 db<br>from 40 to 6,000 Hz, $R_1 = 4 \text{ k}\Omega$<br>$EMK_{\text{max}} = 8 \text{ V}$ |
| Headphones output narrow | Passband from 800 to 1,100 Hz,<br>$R_1 = 4 \text{ k}\Omega$ , $EMK_{\text{max}} = 20 \text{ V}$               |
| Output levels monitoring | with instrument from 0 to 6 V<br>for power output; -6 - +16 db<br>for line output.                            |
| Valve monitoring         | with instrument controlled by<br>22-position switch   |
| Operation stages         | Off, Preheating, On (scale<br>lighting on), On (scale lighting<br>off)  |
| Mains connection         | 115/125/220/235 V, 47 - 63 Hz,<br>about 130 VA  |

## 2.2 Dimensions and weight

|                              |  |
|------------------------------|--|
| Front panel for 520 mm frame | 520 x 304 mm                                 |
| "    "    "    19 inch frame | 482,5 x 311,2 mm                             |
| Steel cabinet                | 540 x 325 x 552 mm<br>For 520 mm front panel |
| Weight with cabinet          | about 65 kg                                  |

## 2.3 Components

3 valves EAA 901 S  
 6 valves ECC 801 S  
 8 valves EF 805 S  
 1 valve EL 84  
 3 valves E 88 CC  
 4 valves E 180 F  
 1 stabilizer 85 A 2  
 1 stabilizer 150 C 2  
 6 dial lamps  
 R&S Part nr RL 165 S  
 1 glow lamp  
 R&S Part nr RL 290  
 1 fuse 0,4 C DIN 41571  
 2 fuses 1 C DIN 41571  
 1 crystal R&S Part  
 nr QA 15000/300  
 1 crystal R&S Part  
 nr QA 16000/3000  
 2 crystal R&S Part  
 nr QA 15010/300

## 2.4 Accessories

1 connection cable  
 R&S Part nr LK 333

### 3. Start up

#### 3.1 Connection to the mains

The receiver is set at the factory for a mains voltage of 220 V. To convert to 115, 125 or 235 V, first loosen the cylinder head screws at the left and right edges of the front plate and pull the receiver out of its steel cabinet. Then, on the voltage selector (accessible on the underside of the power supply), find the pair of spring jumpers that indicate the operation voltage. For 220 and 235, two 1-A fuses (1 C DIN 41571) are present in their sockets in the rear panel (Si 2 and Si 3). For 115 and 125 V operation, these must be replaced by 2 A fuses (2 D DIN 41571). A third 4-A fuse (0.4 C DIN 41571) is independent of the mains voltage used (Si 1). The connection cable is used to connect the receiver to the mains (R & S Part No. LK 333). The connector is located at the bottom left of the receiver.

#### 3.2 Mechanical setting of the display instruments

When the receiver is switched off, the needles of the two display instruments must point at zero: on the left instrument, to the zero point of the scale graduated from 0-6 V, on the right instrument to the zero point of the scale divided from 0-20. A slot screw inserted in each instrument housing is used for this adjustment.

#### 3.3 Installation

The receiver must be placed so that air can enter unobstructed through the openings at the bottom, and come out through the round opening (fan) at the rear.

#### 3.4 Power on (see front panel, page 21)

The receiver is switched on with the mains switch (22). Apart from the "Off" position, this switch has three positions: "Vorheizen" (Preheating), "Ein Hell" (On with lighting on) and

"Ein Dunkel" (On with scale lighting dimmed). In the "Vorheizen" position, the valves are just heated, but there is no anode voltage. This position is intended for short operating periods. In the "Ein Hell" position, the heating and anode voltages are switched on, and the lamps of the frequency scales ① and ⑥ light up. In the "Ein Dunkel" position, the heating and anode voltages are also switched on, but the scale lights are dimmed. This position is selected to operate the receiver when full illumination of the scales is not needed. To switch on the receiver, set the power switch to "Ein Hell". The receiver is ready for operation approximately one minute after switching on. However, its full accuracy is only achieved after a running-in period of about one hour.

### 3.5 Monitoring (See front side of page 21 and back of page 23)

To check the most important receiver stages, use the "Überwachung" (monitoring) switch ④ and the instrument to the left, ②④. The switch has 22 positions from 1 to 27, and a red mark is placed on the dial of the instrument under the two scales. The pointer must be within the red scale mark, in which case the following settings must be in place:

- a) Switch ②⑩ "ZF-Bandbreite" (IF bandwidth) at "0,15 kHz"
- b) Switch ①⑥ "Regelung" (Control) at "Autom"
- c) Switch ①① "Frequenzbereich" (Frequency Range) set for Range VI to appear in window ①
- d) Rotate knob ①④ "Abstimmung" (Tuning) to set the dial pointer ③ at 10.6 MHz
- e) Unplug any antennas from connectors "Antenne hochohmig" and "Antenne 50 – 75  $\Omega$ " on the rear panel.
- f) In the positions 2 and 18 of the monitoring switch, nothing must be connected to the connection "Anschluß für Sender-Tastrelais" (mute relay) on the rear panel.
- g) In the position 6 of the monitoring switch, press the button ② "Abstimmung" (tuning control) or the button ⑧ "Eichquarz 300 kHz" (300 kHz calibration quartz).

h) In the positions 10, 11, 13 and 14 of the monitoring switch, the key "Hauptosz. fremd" (external VFO, on the rear panel) should not be pressed.

### 3.6 Grounding

Connect an earth cable to the back of the unit, to one of the jacks marked with an earth sign ( $\perp$ ).

### 3.7 Connecting a headset

Headphones are either plugged into the socket ⑩ "Hörer breit" (wide) or into the socket ⑬ "Hörer schmal" (narrow). The terms "wide" and "narrow" indicate an audible frequency range. The socket "Hörer breit" (wide) provides a frequency range of 40-6000 Hz, which is suitable for telephony listening, while the socket "Hörer schmal" (narrow) provides a frequency range 800 - 1100 Hz, adequate for telegraphy.

### 3.8 Connecting a loudspeaker

To connect a loudspeaker with an impedance of about 15  $\Omega$ , a 3-pin socket and a pair of jacks are provided on the rear panel. These are connected in parallel and are marked "Leistungsausgänge 15  $\Omega$ ". A Tuchel-type plug T 3079 (R&S Part No. FTS 20315) is inserted into the 3-pin socket, while 4 mm plugs will fit into the jacks pair.

### 3.9 Connecting the antenna

Two connections are provided at the rear: a) "Antenne 50 - 75  $\Omega$ " for a low impedance coaxial cable input; b) "Antenne hochohmig" (antenna high-impedance) for a conventional L or T antenna without a transformer (balun). Since both antenna inputs are unbalanced, a suitable balun must be used if a symmetrical antenna is to be employed. See section 3.21 on page 15 for the connector type of the coaxial antenna input.

### 3.10 Connecting a 600 ohm line

If the sound output voltage is to be used for a high impedance speaker or other purposes, connect the line (for example a 600-ohm telephone line) to the 3-pin socket labelled "Leitungsausgang 600  $\Omega$ " (Line output 600  $\Omega$ ) on the back of the receiver. A T 3079 (R & S part number 20315) is used for the socket.

### 3.11 Break-in operation

Break-in operation (with an external transmitter) is possible by connecting a twin line to the pair of sockets on the rear panel labelled "Sender-Tastrelais". Each socket has a switch. When 4 mm plugs are inserted in the sockets the first HF and IF valves are disengaged. Reception immediately reactivates when both lines get connected (e.g., by means of a microphone PTT key).

### 3.12 "Hauptosz. fremd" connection

The coaxial input "Hauptosz. Fremd" can be used to connect an external oscillator (e.g. the one from a decadic control stage) to be used instead of the main frequency oscillator of the receiver.

When the key above the input is pressed, the built-in main oscillator is switched off and the path for an external VFO is released. The button can be locked by turning it by approximately 90 ° when pressed in. For the jack type of this input, see section 3.21 on page 15.

### 3.13 "3 MHz fremd" connection

The 3 MHz IF frequency can be obtained from the "3 MHz fremd" coaxial socket, after pressing and locking the button above it. If the button is not pressed, the socket can be used to record the 3-MHz frequency. For the connector type of this connector, see section 3.21. On page 15.

### 3.14 "Hauptosz. Ausgang" connection

The frequency of the main oscillator is provided by this coaxial socket on the rear panel. This frequency, for example, can be used as a "master oscillator frequency" when receiving in diversity mode. For the type of jacks used in the socket, see section 3.21 on page 15.

### 3.15 "Eichosz. Ausg. 300 kHz" connection

The frequency of the 300-kHz calibration crystal is provided by this coaxial socket on the rear panel. For the jack type, see section 3.21 on page 15

### 3.16 "Steuerosz. Ausgang" connection

This coaxial output on the rear panel provides the frequency (3.4–6.4 MHz) of the control oscillator, for example for measuring purposes. For the jack type, see section 3.21 on page 15.

### 3.17 "ZF Ausg. 300kHz, 0,1 V, 250 $\Omega$ " connection

A coaxial socket on the rear panel provides the 300 kHz Intermediate Frequency signal. The output voltage is approx. 0.1 V, and the impedance is 250  $\Omega$ . An additional device can be connected at this output, for example the single-sideband demodulator type NZ 10 or a telegraphy demodulation device type NZ 07. For the output jack type, see section 3.21 on page 15.

### 3.18 "Regelspannung" connection

These two coaxial sockets are wired in parallel. The output signal can be used for recording purposes. In addition, two or three receivers can be linked for diversity reception, by connecting the receiver's control outputs. Regardless of the number of receivers connected, the time constant pattern remains the same. The control outputs are automatically disconnected so

that no diversity splitter device is necessary if the AF outputs of the receivers are connected in parallel in such a way that the AF output voltages are phase-added. For the sockets of these outputs, see section 3.21.

### 3.19 "Ausgang 1. Mischrohr" connection

This coaxial output on the rear panel provides the voltage at the cathode resistor (R27 + R28) of the first mixer tube (Rö12 I in the HF section). This output can be used for special applications, or to feed a different voltage. For the jack type, see section 3.21.

### 3.20 "NF-Eingang" connection

An AF voltage can be fed into this coaxial socket on the back panel and amplified at the AF output when the key to the right of the input socket is pressed. This key can also be locked when it is pressed and rotated by about 90 °. For the coaxial connector type, see section 3.21.

### 3.21 Type of coaxial connectors on the rear panel

The type of each of the 11 coaxial connections on the rear panel depends on the kind of device to be connected. The EK 07 D / 1 version is fitted with convertible 13 mm sockets R&S Part No. FMU 90100. Coaxial DIN 47284 13 mm connectors easily fit into these sockets, for example, R&S parts no. FS 413/11 or FS 41-3 / 12. Each socket can be converted by using an adaptor. The following adaptors are available:

| Desired connection               | R&S Part Number |
|----------------------------------|-----------------|
| Short-stroke connector Dezifix B | FMU 10990       |
| Siemens connector 4/13 DIN 47283 | FID 90990       |
| UHF connector (e.g. Amphenol)    | FHD 10990       |
| N connector (e.g. Amphenol)      | FHD 20990       |
| C connector (e.g. Amphenol)      | FHD 30990       |
| BNC connector (e.g. Amphenol)    | FHD 40990       |
| General Radio 874 B              | FLA 20990       |

The conversion process is very simple: just screw the conversion kit into the internal thread of the 13mm socket and secure it with the two lateral screws.

In the EK 07 D / 2 version of the receiver, coaxial Amphenol sockets are installed. These have the Amphenol number 82 504 resp. Military number UG-568 / U resp. R & S part no. FD / UG-568 / U.

#### 4. Operation (See front of page 21)

Operation of the receiver is explained in the following sections of this manual.

##### 4.1 Frequency dials (See also frequency scale page 22)

The frequency range is selected using the large knob ⑪. For tuning, use the tuning controls ⑭ (coarse) and ⑬ (fine). These will move the pointer ③ in the twelve frequency scales I-XII and the round scale calibrated in kHz ⑥.

In the frequency ranges I-III (0.5 - 3.1 MHz), the reading of the frequency can be done by interpolation on the scale divided in 100 parts ⑥.

In the ranges IV-XII (3.1 - 30.1 MHz) the frequency can be read on the respective scales as well as on the scale calibrated from 0-100 kHz ⑥.

As the large scale pointer ③ advances by 0.1 MHz, the round scale makes a full revolution corresponding to a frequency change of 100 kHz. This round scale thus serves as a magnification of each 0.1 MHz segment of the scales IV-XII. So to speak, it is as every 0.1 MHz segment of these 9 scales was divided in two hundred sections of 0.0005-MHz each. If, for example, the hairline of the pointer ③ of the large scales is between 6.5 and 6.6 MHz, and the hair stroke of the pointer of the round scale is indicating 75.5 kHz, the reception frequency is 6.5755 MHz.

To prevent the accidental rotation of the tuning knob during radio monitoring, it can be braked if desired with the small button ⑫.

#### 4.2 Calibration crystal 300 kHz ⑧

The calibration of the 12 scales I-XII as well as the zero point of the 0-100 kHz scale can be aligned by means of the 300 kHz calibration crystal. To do this, set the "Regelung" (control) switch ⑬ to the position "Hand" (manual), turn the "HF-Regelung" ⑮ (RF control) knob clockwise, and press the button "Eichquarz 300 kHz" ⑧ (Calibration crystal 300 kHz.) A heterodyne signal will be audible in the headphones (set at the position "breit", or wide) or in the loudspeaker. If the tuning knob is turned slowly clock and counter-clockwise around such a point, we will find a null, that is, a position at which the sound becomes deeper and finally inaudible. That is the zero-beat point.

At this point, the scale pointer ③ should be on a mark which is a multiple of 300 kHz. On the dial scales I-XII, the calibration marks at these spots are slightly longer in the lower part; For example, on the dial scale V we will find such calibration marks at 6.3 MHz, 6.6 MHz, 6.9 MHz, etc.

The "HF-Regelung" knob ⑮ should be turned only to the point of making the beat signal just audible. It is not necessary that the pointer is exactly positioned on the calibration mark, but it is important however, that the zero-beat point coincides with the 0 kHz point on the round scale. If that is not the case, adjust the scale with a screwdriver at the slot on the shaft ⑤. The push button "Eichquarz 300 kHz" ⑧ can be left engaged by turning it by about 90 ° when pressed.

#### 4.3 Tuning control

If the "Abstimmung" (Tuning) control ② is pressed, the receiver can be very accurately tuned to the transmitter frequency as a heterodyne beat signal is generated, as described under 4.2. This knob ② can be locked, the same as ⑧.

#### 4.4 Left display instrument ②④

This instrument ②④ is used for monitoring the most important receiver stages, as described in Section 3.5, and for measuring the output voltage of the "Leistungsausgänge 15 Ω" (line outputs 15 Ω) and the output level of the "Leitungsausgang 600 Ω" (Line output 600 Ω).

To measure the output voltage of "Leistungsausgänge 15 Ω" (rear panel), set the "Überwachung" (monitoring) switch ④ to the "U~15 Ω" position. The output voltage is set with the "NF-Regelung" (AF control) knob ②①, and it is read in the scale calibrated from 0-6 V.

To measure the output level of the "Leitungsausgang 600 Ω" (rear panel), the "Überwachung" switch ④ is set to "U~600 Ω". The output level is read on the scale calibrated from -6 - +16 dB.

#### 4.5 Right display instrument ⑨

When the "Regelung" (control) switch ⑩ is set to "Autom.", this instrument ⑨ shows the voltage present at the antenna input. The scale is roughly calibrated between 1 and  $10^5$  μV.

Also, it is possible to read from this scale the threshold voltage (μV) above which the automatic control will function. Move the switch ⑩ to the "Hand + Autom." position and set the "HF-Regelung" knob ⑮ to indicate the desired voltage. No voltage should be present at the antenna input while setting

this value (the receiver should not be tuned to any signal while adjusting this).

The scale, which is linearly divided from 0 to 20 (current-proportional-calibrated), is used in the "Hand" position of the "Regelung" switch (16) for relative measurements, e.g. for voltage comparisons.

#### 4.6 RF Control (15)

The setting of the "HF-Regelung" knob (15) determines the sensitivity (gain) of the receiver when the "Regelung" switch (16) is set to "Hand" or "Hand + Autom".

#### 4.7 Control (type of Control)

The type of control being used is selected with the "Regelung" switch (16). The "Hand" and "Autom." positions are the same as in other receivers. In the position "Hand + Autom" the control will only happen automatically above a certain input voltage. You can set the threshold of the automatic control by pressing the "HF-Regelung" knob (15), and setting the knob so that the right instrument shows the desired voltage (in  $\mu\text{V}$ ). While doing this, the receiver should not be tuned to any signal. With this combined type of control, it is often possible to reduce the average noise level while taking advantage of automatic control (constant AF output voltage).

#### 4.8 Time-constant adjustment (17)

With this switch (17), it is possible to select three different control time constants: 0.1 sec, 1 sec, or 10 sec. The position "0.1 sec" is mainly intended for receiving telephony, while the positions "1 sec" and "10 sec" are more appropriate for telegraphy reception (A1). In the case of strong selective fading, however, it may be advantageous to select one of the

longer time constants also when receiving telephony.

#### 4.9 Noise Limiter ⑱

In the "Off" position of the switch the noise limiter is inactive. The limiter is increasingly effective by turning this knob clockwise, but may cause some distortion at the AF output voltage.

#### 4.10 Bandwidth ⑳

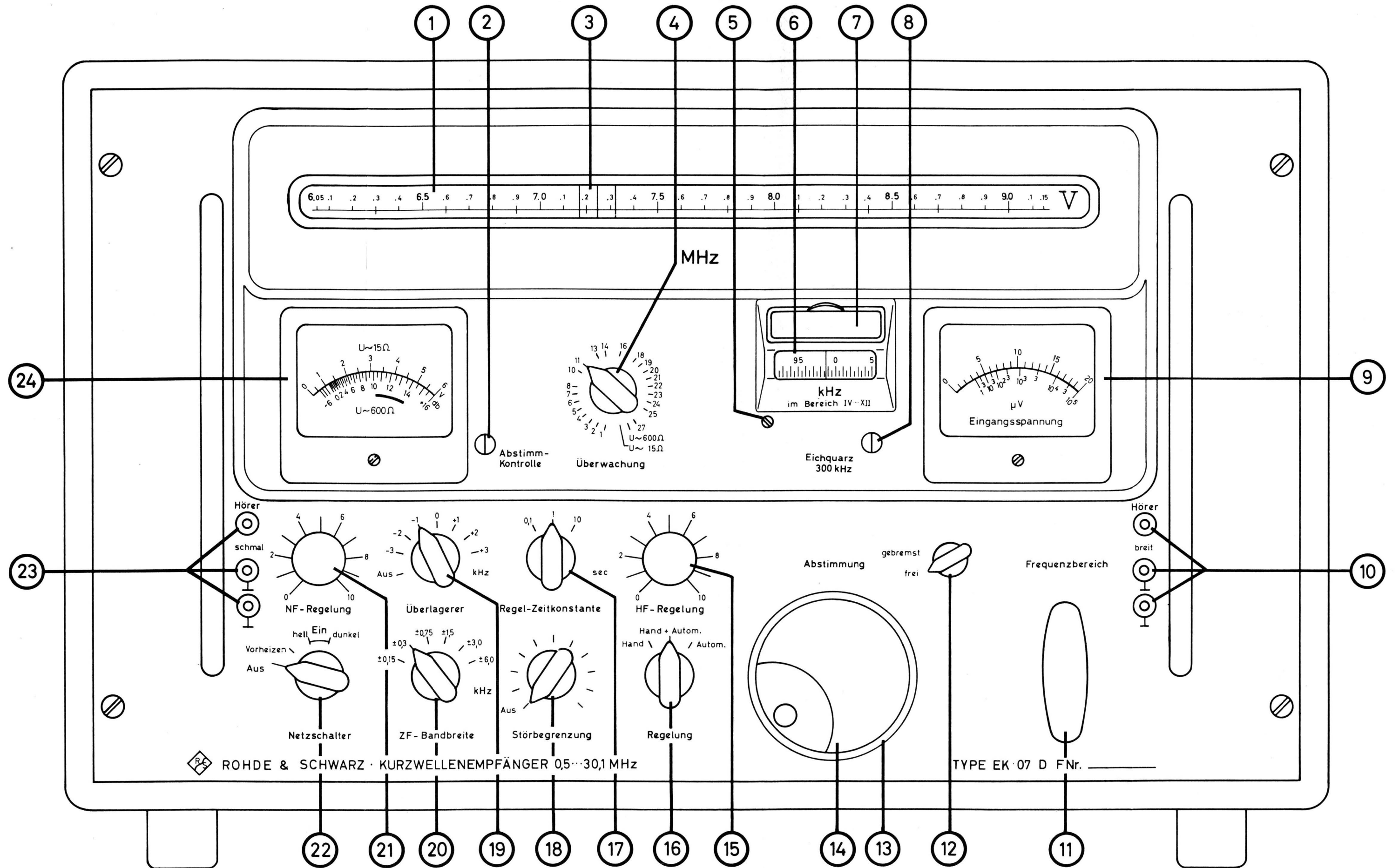
This switch sets the total bandwidth of the receiver. 6 IF bandwidths can be selected:  $\pm 0.15$  kHz,  $\pm 0.3$  kHz,  $\pm 0.75$  kHz,  $\pm 1.5$  kHz,  $\pm 3.0$  kHz and  $\pm 6.0$  kHz. The choice depends on the audio frequency range to be received. For telephony (A3), for example,  $\pm 6.0$  kHz or  $\pm 3.0$  kHz would be adequate, while telegraph (A1) can be comfortably listened to down to a bandwidth of  $\pm 0.15$  kHz.

#### 4.11 BFO ㉑

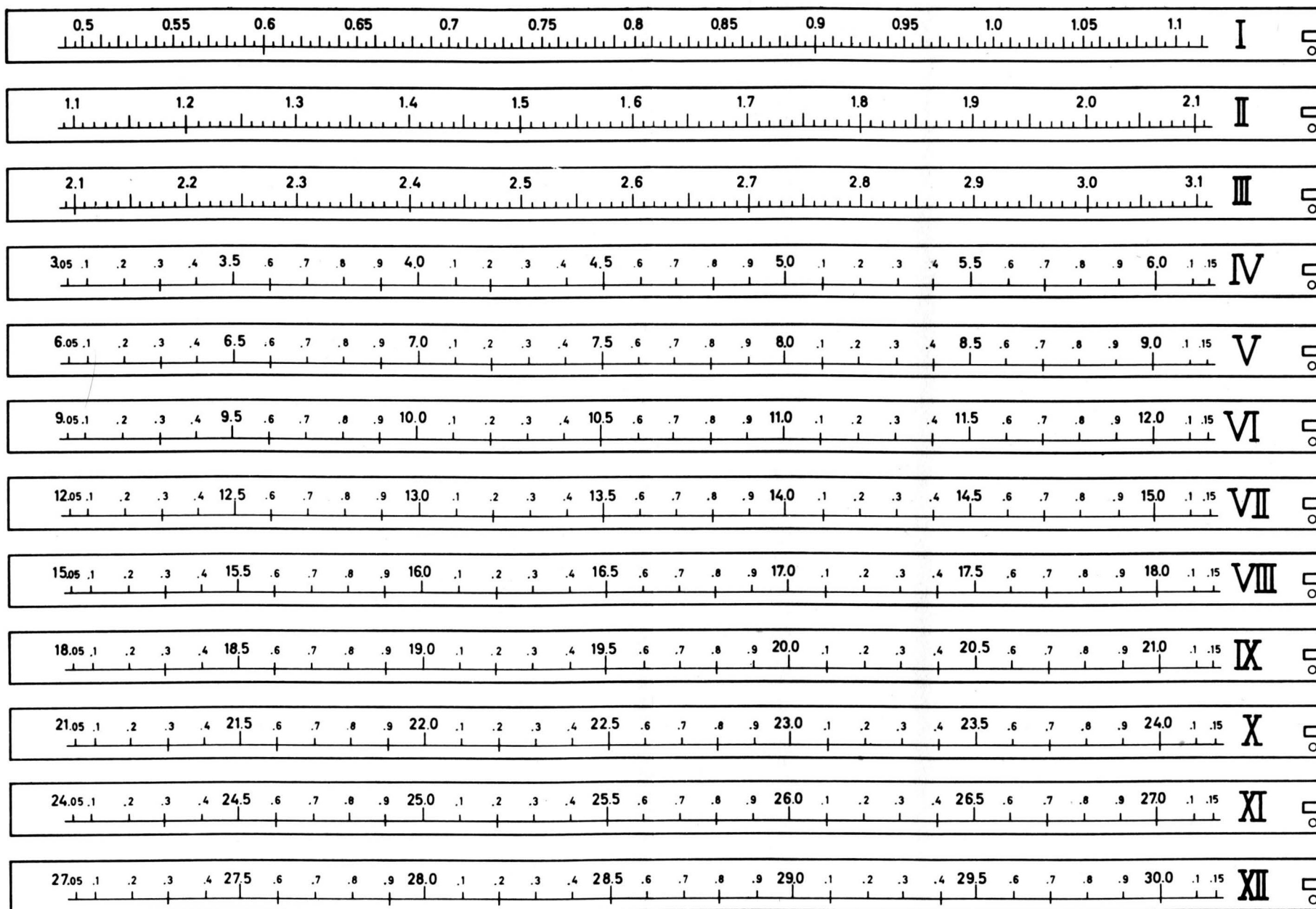
This "overlay" controller ㉑, which is mainly intended for telegraphy reception, has no effect while in the "Off" position. From the middle position "0", you can change the tone up to 3 kHz. The controller is disengaged when the "Tuning control" key ㉒ is pressed. Thus, a tuned carrier can also be precisely tuned.

#### 4.12 Audio Frequency adjustment ㉓

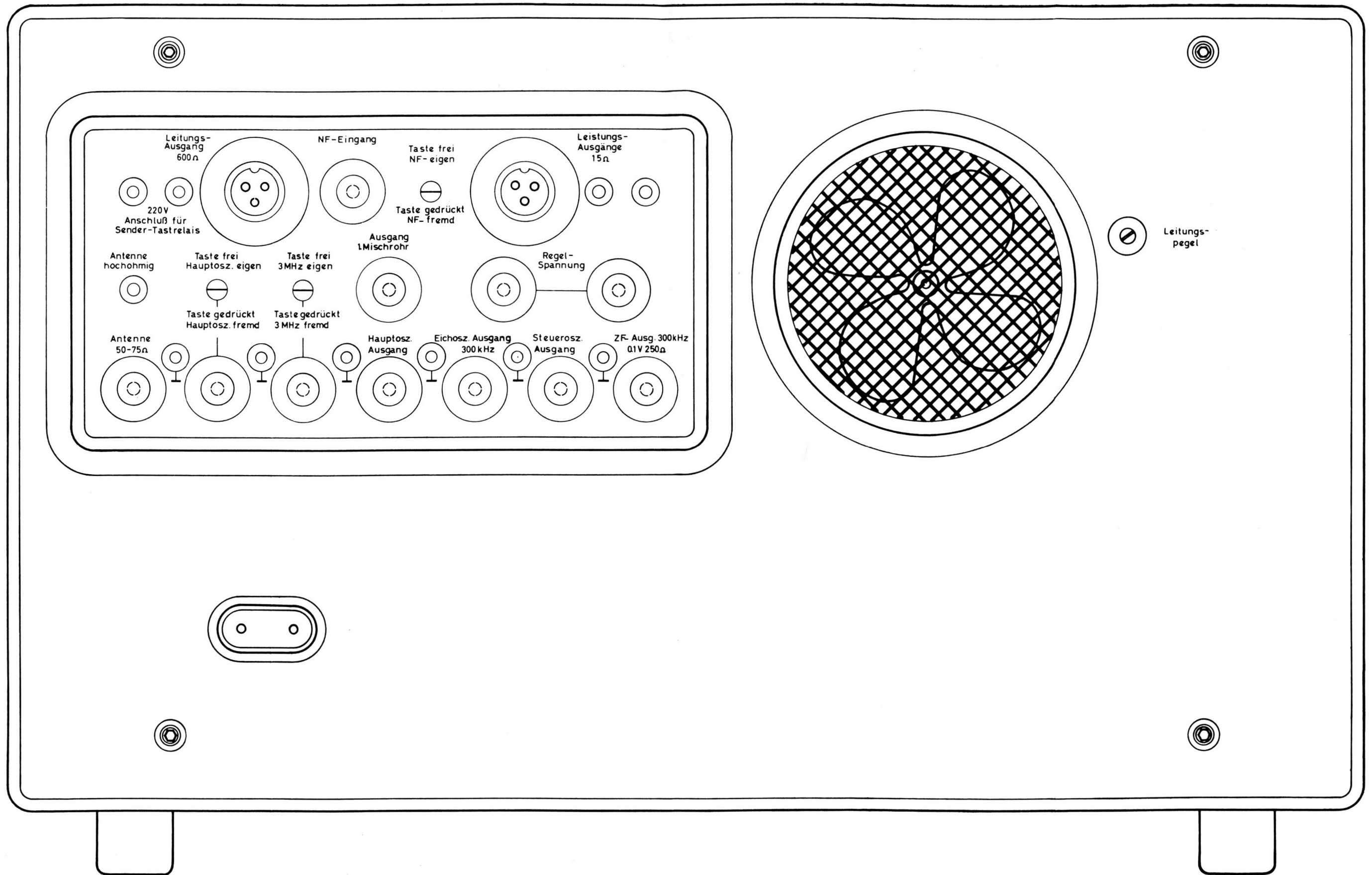
This knob is used to adjust the output voltage of the two headphone jacks and the "Leistungsausgänge 15  $\Omega$ " ((Line output 15  $\Omega$ , on the rear panel). The level of the "Leitungsausgang 600  $\Omega$ " (Line output 600  $\Omega$ , rear panel) is independent from this AF controller.



Front Panel



Dial scales I - XII



Rear panel