2. Preparation for Use and Operation

2.1 Table of Controls (see Figs. 2-1 and 2-2)

Ref.	Engraving	Function
1	401 to 484 MHz 293 to 404 MHz 183.5 to 294.5 MHz 129 to 184.5 MHz 74 to 129.5 MHz 47 to 74.7 MHz 0.4 to 48 MHz	Pushbuttons for frequency-range selection with recessed screws for calibration. Calibration is accomplished by adjustment of the pointers.
2	MHz	Frequency dial, consisting of the drum with engraved frequency scales and of pointers. Only the pointer associated with the range selected with **1** is visible. The frequency ranges can be calibrated with the screws recessed in the frequency buttons **1**.
3	INDICATION φM [$\Delta f/f_{MOD}$] FM [kHz] MOD. GEN. x 10 [mV] AM [%]	Switch for selecting the type of indication of the meter: modulation index $\Delta f/f_{mod}$, frequency deviation in kHz, AF output voltage at **20** (mV), modulation depth in %.
4	INDICATION 1 4 10 40 100	Range selector for meter **5**. In mode of operation AM, the ranges 1 and 4 are used for checking purposes only; the indicated values are not guaranteed.
5		Meter for the ranges selected with **3** and **4**.
6	MOD. OFF	This button permits the modulation to be cut off to check whether the receiver connected is correctly tuned to the signal generator.
7	MOD. GEN. 0.3/0.4/0.7/1/1.3/1.5/ 1.75/2.07/2.4/2.7/3/6 kHz	Selector for internal modulation frequency.
8	AMPLITUDE MOD. GEN.	Knob for the adjustment of the modulation-generator output voltage available at **20**; the amplitude of the output voltage is indicated on meter **5** if **3** is at MOD. GEN. The modulation generator is in operation when the FM/φM switch **19** or the AM Switch **9** is in the position INT. or UNMOD.

Ref.	Engraving	Function
9	AM INT. UNMOD. EXT.	Selector for type of amplitude modulation: INT. = modulation with an internal frequency of the SMDA selected with **7** (modulation generator in operation). UNMOD. = no modulation (mod. gen. in operation). EXT. = modulation with external signals applied at **26** (mod. gen. not in operation if switch **19** is also in position EXT.)
10	FREQ. FINE	Knob for fine tuning of the modulation generator frequency selected with **7** (fine tuning range: −30 Hz to +400 Hz). At the left stop (CAL.) the knob is disabled, i. e. the modulation generator frequency is that selected with **7**.
11	AM	Knob for continuous adjustment of modulation depth. The types of amplitude modulation are selected with **9**.
12		Fine scale of attenuator; calibrated in steps of 0.2 dB for adjusting small level differences (see also item **17**).
13		Knob for the adjustment of the RF output voltage.
14	POWER	Button for switching on the AC supply voltage.
15		Lamp lights when the set is switched on.
16	OUTPUT R_i = 50 Ω	Output socket for the RF voltage (adaptable). The level of the output voltage can be read on **17**.
17	OUTPUT U_A 50 Ω | 6 dB | dBV EMK	Scale reading the level adjusted with the RF output control **13**. The RF output voltage is available at **16**. In the range outside the black mark, the fine scale of attenuator **12** can be used for the interpolation of level differences; the specified VSWR is maintained. From −20 dBV the line for E_{out} into 50 Ω on the cursor of the attenuator applies. **NOTE:** The attenuator is calibrated in V_{EMF}, the line for E_{out} into 50 Ω may have an error of ±1 dB. • < 1 W: Attenuator setting for frequency deviation measurements with the test assembly for radiotelephone systems when the input to the Power Test Adapter is < 1 W.

Ref.	Engraving	Function
		● > 1 W: Attenuator setting for frequency deviation measurements with the test assembly for radiotelephone systems when the input to the Power Test Adapter is > 1 W.
18	φM, FM	Knob for continuous adjustment of frequency deviation and modulation index. The types of modulation are selected with **19**.
19	FM INT. EXT. φM EXT. INT. UNMOD.	Selector for type of phase and frequency modulation: INT. = modulation with the internal frequencies of the SMDA selected with **7** (modulation generator in operation). UNMOD. = no modulation (mod. gen. in operation). EXT. = modulation with external signals applied at **28** (mod. gen. not in operation if switch **9** is also in position EXT. At f_{mod} = 1 kHz, the frequency deviation is the same for φM and FM (level adjustment frequency).
20	MOD. GEN. OUTPUT	Modulation-generator output socket. The amplitude of the output voltage can be adjusted with **8** and read on **5** if **3** is at MOD. GEN. x 10 mV. Modulation generator only in operation if the FM switch **19** and the AM switch **9**, respectively are at INT. or UNMOD. It is switched off, if both switches are in position EXT.
21	$\Delta f > \Delta f_{MAX}$	Pilot lamp which lights if the maximum frequency deviation of 75 kHz is exceeded with phase or frequency modulation (switch **19**).
22		Pilot lamp of overload protection; lights or blinks if RF power is fed to output **16**.
23		Incremental tuning knob. The frequency is indicated on scale **2**, the frequency increment on scale **25**.
24		Coarse tuning knob. Incremental tuning with **23**. The frequency is indicated on scale **2**.
25		Incremental tuning scale calibrated in kHz. The adjustment is correct if the cams having the same colour as the pointers of the frequency range concerned coincide. The figures appearing in the windows give the frequency increment in kHz.

Ref.	Engraving	Function
		The incremental tuning scale can be set to 0 from any position while the incremental tuning knob **23** is held in its position; the pointer can be adjusted by $\pm 45°$.
26	AM EXT. $R_E \approx 600\ \Omega$, $U_E \approx 1.5$ V	Input socket for external AM signal. Switch **9** must be at AM EXT. Modulation depth can be selected with **11**. Voltage requirement approx. 1.2 V into 600 Ω (for 95 % modulation).
27	SWEEP INP. MAX. 10 V_s $R_E \approx 2$ kΩ	Input socket for applying a sweep voltage. The sweep frequency may be 0 to 1 kHz. The sweep width is indicated on Frequenzkontroller 100.4542.
28	FM EXT. $R_E \approx 600\ \Omega$	Input socket for external FM signal or phase modulation. Switch **19** must be at FM EXT. or φM EXT. Frequency deviation can be selected with **18**. Voltage requirement approx. 2.5 V into 600 Ω (for maximum sweep width).
29	CALIB.	Meter for calibration of the lower frequency range by the beat method.
30	AC SUPPLY KONTROLLER	AC supply voltage output for connection of the Frequenzkontroller, which is switched on together with the signal generator.
31	VOR-ILS UNIT	Output for connection of a VOR-ILS Unit 214.3115 for ATC purposes.
32		Chassis socket
33	RF OUTPUT II	A frequency-modulated signal is available at this output. This signal is mainly used as an input signal for the Frequenzkontroller. It may also be fed to a frequency meter, deviation meter, counter, etc. The output voltage is independent of the output-attenuator setting.
34	SYNCHRONISATION KONTROLLER	Multipoint connector for the control lines of the Frequenzkontroller.
35	SYNCHRONISATION	Input (BNC) for the connection of the control voltage of the Frequenzkontroller, used for the synchronization of the SMDA.
36	AC SUPPLY ADAPTER	AC supply voltage output for connection of the Power Test Adapter or VOR-ILS Unit, which are switched on together with the signal generator.

Ref.	Engraving	Function
37	110 V M 0,2 C 125 V 220 V M 0,1 C 235 V	Tapping panel with power fuse (upper right-hand corner) and fuse container.
38	AC SUPPLY	Receptacle
39 **40**	± 24 V 500 mA	Sockets for connection of battery.
41 **42**	± 24 V 120 mA	Sockets for connection of battery.

2.2 Adjusting to the Local AC Supply Voltage

Type SMDA has been built in compliance with the safety regulations according to VDE 0411 Class I. Class I requires insulation of the AC supply during operation. In addition, all exposed conducting elements that are likely to be immediately alive in the case of a failure must be properly and permanently connected with each other and with the non-fused earthed conductor. The power plug should therefore be inserted only into an earthing contact type socket. Do not interrupt the non-fused earthed conductor when using extension lines. Connect the terminal, if any, permanently to a non-fused earthed conductor.

The SMDA is factory-adjusted for operation from 220 V. Prior to switching on make sure that the tapping panel **37** (Fig. 2-2) is adjusted for the available AC supply voltage. The four AC supply voltages selectable are engraved in the four corners of the fuse box. The line beside the screw cap in the upper right-hand corner must point to the value of the available AC supply voltage (turn the box correspondingly). To adjust for a different AC supply voltage or to change a fuse proceed as follows:

a) Unscrew the screw cap with the power fuse (upper right-hand corner) from the tapping panel **37**.

b) Remove cover plate of tapping panel **37**.

c) Take the appropriate fuse from the fuse container on the inside of the cover plate and insert it into the screw cap.

d) Introduce the bolt of the cover plate **37** into the guide hole and turn the cover plate until the marking line points to the corresponding value.

e) Tighten screw cap.

Two fuses are provided for 220/235 V AC supply and two for 115/125 V. If the same AC supply voltage is always used only one type of spare fuses may of course be stored in all three containers. A fine-wire fuse M 0,1 C DIN 41571 is used for 220 or 235 V and a fine-wire fuse M 0,2 C DIN 41571 for 115 or 125 V.

Variations of the AC supply voltage of ± 10% from the rating do not affect the performance of the set as specified in 1.3. Heavier fluctuations should be avoided or a transformer or voltage stabilizer should be connected ahead of the signal generator. The set is switched on with button **14** (Fig. 2-1). When the set is switched on and the power fuse is intact, lamp **15** lights.

2.3 Adjusting the Zero of the Meter

If the set is switched off the pointer of the meter **5** should be at scale zero. Correct, if necessary, with the recessed screw below the meter. Before checking or adjusting the zero, wait at least 3 minutes after the SMDA has been switched off in order to ensure that the charging capacitor of the meter circuit is completely discharged. The electrical zero is identical with the mechanical zero. Meter **29** serves as an indicator; the zero (arrow) cannot be corrected.

2.4 Frequency Setting

2.4.1 Adjusting the Frequency of the RF Oscillator

Select the frequency range with the corresponding button **1**. The frequency ranges are indicated beside the buttons. When a button is pressed, a pointer appears on the corresponding scale. Adjust the frequency first roughly with the coarse tuning knob **24** and then to the exact desired value with the incremental tuning ring **23**.

2.4.2 Calibration of the Frequency Scale

The pointers of the frequency scale can be adjusted with the screws recessed in the buttons **1**. When using one of the lower two frequency ranges – where the output frequency is obtained by the beat method – a check of the zero frequency which is marked by a red line on the frequency scale is recommended:

When the pointer is near the red line, tune the SMDA to zero beat, using the incremental tuning ring **23**. At zero beat the pointer of the meter goes back to 0 which is marked by the direction of the arrow. A sudden, large pointer deflection indicates that the zero beat is exceeded in either direction. If the SMDA is adjusted to zero beat, the pointer of the frequency scale can be set exactly to the red zero line by means of the corresponding screw. After this calibration, the specified frequency accuracy is attained also in the lower two ranges. In the other ranges, an adjustment of the pointer is recommended only if an accurate frequency meter is available, because of the high frequency stability of the SMDA. The calibration may, however, also be carried out to ensure particularly high frequency accuracy, corresponding to the reading accuracy of the scale, in the vicinity of a particular operating frequency. For example, in operating with a crystal-controlled channel receiver, the SMDA can be accurately calibrated for the channel frequency used; a considerable improvement in frequency accuracy will then result also for the adjacent channels.

2.4.3 Incremental Tuning

The SMDA has an incremental tuning facility **25** calibrated in kHz. Since the bandwidths of the frequency ranges differ, the value corresponding to one scale division is also different in each frequency range. For this reason, the incremental tuning scale is provided with windows in which the values applicable for the frequency range selected are shown. The scale dial and the figure dial behind it are provided with cams marked by corresponding colour dots. If the two cams marked by the same colour as the pointer of the frequency scale **2** are brought to coincidence, the figures applying to the frequency range concerned appear in the windows; for example 50 and 100 are obtained when the cams marked green coincide, corresponding to the green pointer for the frequency ranges 74 to 129.5 MHz and 129 to 184.5 MHz. The spacing between two long lines then corresponds to 10 kHz. The incremental tuning scale can be set to 0 for the measurement of frequency increments. In addition, the pointer can be shifted without changing the tuning, in order to avoid unwanted detuning of the signal generator during rotation of the incremental tuning scale when a fine correction is made or the zero shifted by a small defined amount, say, in order to refer the zero to an adjacent channel.

2.5 Output Voltage Adjustment

2.5.1 Setting the RF Output Voltage and Taking the Reading

The output voltage can be adjusted with knob **13** and is available at socket **16**. The upper volt scale of **17** reads twice the voltage into a 50-Ω load. The lower scale reads the EMF in dB below 1 V (dBV). This EMF calibration ensures that errors in the output impedance caused by varying film thickness of the output potentiometer are taken into account in the calibration of the output-voltage scale. Any additional error due to variation of the frequency-independent output impedance are thus avoided.

Small level differences below −20 dBVcan be easily adjusted with the fine scale **12** of the attenuator knob. The fine scale is calibrated in 0.2-dB steps and the volt scale in 0.1-V steps. One rotation of the fine scale (10 dB) may cause an error of ±0.8 dB, i. e. the EMF or dBV calibration of the scale may differ from the fine scale by this amount. On scale **17**, a shorter line for E_{out} into 50 Ω is engraved at 6 dB to the right from the long line for EMF and dBV. As the scale is calibrated in V_{EMF} and dBV, the line for E_{out} into 50 Ω may have an additional error of ±0.5 dB, due to the constant surface resistance of the attenuator.

VSWR is approximately 2.5 with maximum output voltage and < 1.3 with attenuator settings > 10 dB (level range outside the black mark). (These values hold true for Dezifix A connectors only). Although the special calibration of the output attenuator largely compensates for the error resulting from this VSWR, a smaller VSWR is desired in certain precision measurement and in cases where the SMDA must constitute a reflection-free termination for the load. In this case, the interconnection of 10-dB Attenuator Pads Type DPF 100.1795.50, equipped with Dezifix A connectors, is recommended to reduce the reflection coefficient to about 5 to 3 %, depending on the output-attenuator setting.

2.5.2 Connecting the Load

The RF output **16** of the SMDA is fitted with an N connector, therefore a cable with an N connector is required for the connection of a load. Care should be taken that the N connectors are not damaged by shocks or blows. The face of the connectors should always be kept clean; this makes for better contact and reduces the reflection coefficient. If an optimum RF connection and minimum reflection coefficient are not essential, the other end of the cable can be adapted to the output connector or the test item. Should it not be possible to connect the test items with N connectors, the RF output **16** of Type SMDA can be adapted for use with other connector systems, as described in section 2.5.6.

No DC or AC voltage must be applied to the SMDA from the load. If a voltage of ≥ 2 V is applied to the RF output socket **16**, this output is cut off from the SMDA. Smaller voltages, from about 0.1 V on, may disturb the automatic output level control if the output attenuator **13** is set to maximum. If only part of the output attenuator is cut in, the RF voltage fed to RF output **16** may be higher by the attenuation ratio but not exceed approx. 2 V. Type SMDA contains a coaxial relay which disconnects the signal-generator output from the output socket **16** as soon as the voltage fed into this socket exceeds a few volts.

The RF output **16** of Type SMDA is also protected against any DC voltages applied inadvertently. If the output attenuator is set to maximum, a DC voltage of 20 V does not cause damage and with output voltages below 0.1 V up to 250 V DC may be applied. If the DC voltage fed to the output socket exceeds approx. 2 V, the output of the SMDA is cut off.

2.5.3 Voltage at the Load

If the input impedance of the test item is complex and does not exactly agree with the source impedance of the signal generator, the voltage E at the load can be calculated from the open-circuit voltage EMF adjusted on the signal generator and the complex input impedance Z_I of the load:

$$E = EMF \frac{Z_I}{Z_I + Z_S}$$

This formula applies if the characteristic impedance of the cable connecting the load is equal to the signal-generator output impedance (50 Ω) and with attenuator settings < 10 dB. It is advisable to select the load impedance equal to the source impedance of the signal generator. Then the voltage at the load is half the EMF adjusted and indicated on the signal generator (also with levels > – 10 dBV). The output impedance of the signal generator is 50 Ω. The cable impedance, contact resistances and other discontinuities are negligible. The conversion factors for the voltage and the level at the load for different terminating resistances are given in Table 1.

R_l Ω	k	a_{k2} dB
50	0.5	6
60	0.545	5.3
75	0.6	4.4
150	0.75	2.5
240	0.828	1.6
600	0.92	0.7

Table 1: Conversion factors for voltage and level at the load with different load resistances

R_l = input resistance of load
E_l = voltage at the load
a_l = level at the load
EMF = EMF adjusted on the signal generator
a_E = level adjusted on the signal generator

k_l = conversion factor
a_{k2} = dB values to be subtracted with different load resistances
Voltage at the load E_l = EMF k_l
Levels in dB at the load $a_l = a_E - a_{2k}$

2.5.4 Power Consumption of the Load

The RF output scale **17** indicates the voltage offered by the SMDA to an ideal load, in dB below 1 V (dBV). This way of specifying the level is particularly advantageous since slight mismatch of the load to the voltage source has very little influence on the power consumed. The power drop caused by a different characteristic impedance is almost negligible. As can be seen in Fig. 2-3, a mismatch of Z_l/Z_s = 1/3 results in a power drop of about 2.5 dB, Z_l/Z_s = 1/2 produces a power drop of 1 dB.

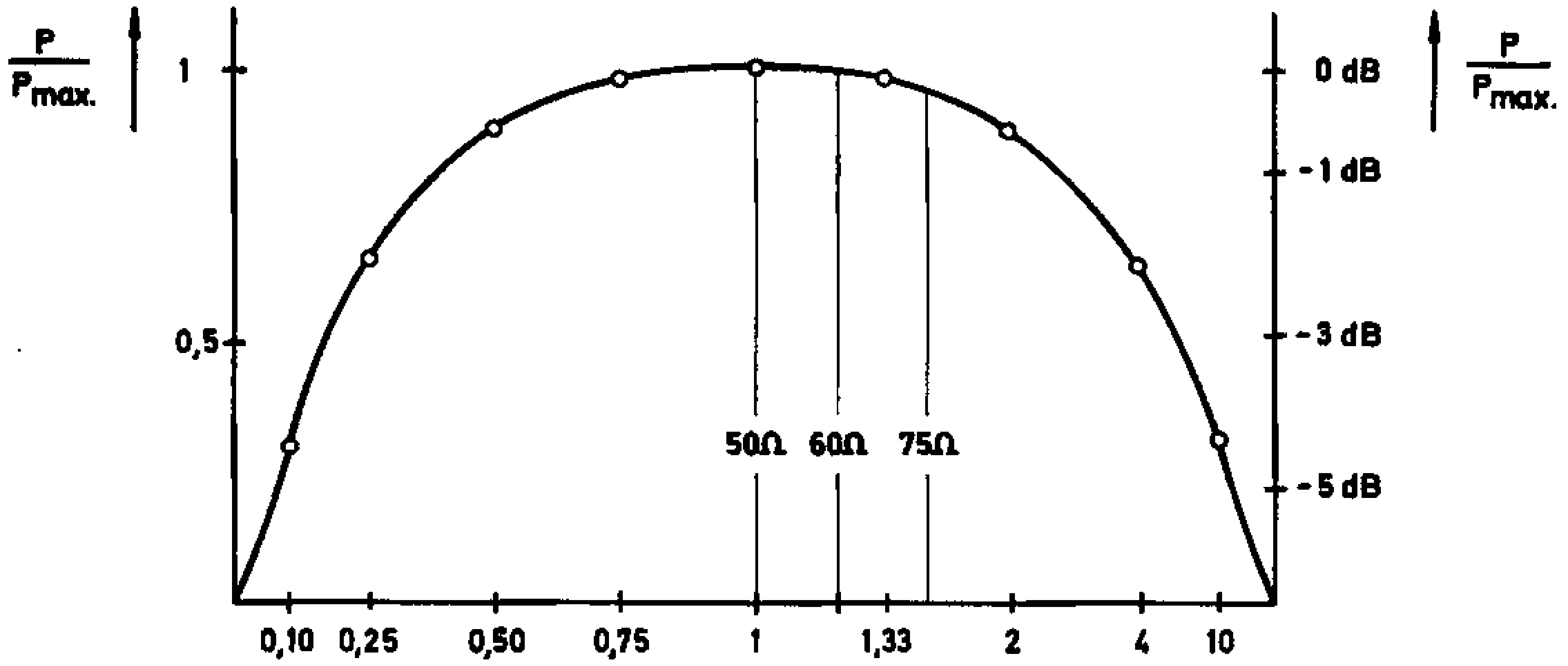

Fig. 2-3 Active power in case of mismatch

2.5.5 Adjusting Extremely Small Output Voltages

The high-quality output attenuator and good shielding of the SMDA make accurate setting of extremely small output voltages possible. Whether these small voltages arrive at the input stage of the test item or whether they are invalidated by superimposed noise voltages depends on the test item and the cables used. In general, noise voltages can be prevented by good shielding of the test item, use of short connections (no cables, if possible) and AC supply from twin wall sockets. Noise voltages may develop as follows:

Noise voltage sources: Two types of noise voltage are distinghuished by their sources: noise voltages developing from hum pickup and noise voltages caused by inductive leakage. Fig. 2-4 illustrates the development of a noise voltage. The noise voltage E_s is effective at the load input if the noise current J_s on the outer conductor of the cable with an impedance Z_K causes the voltage drop $E_s = J_s Z_K$. The noise voltage source E_Q is somewhere in the noise voltage loop formed by Z_1, Z_K and Z_2.

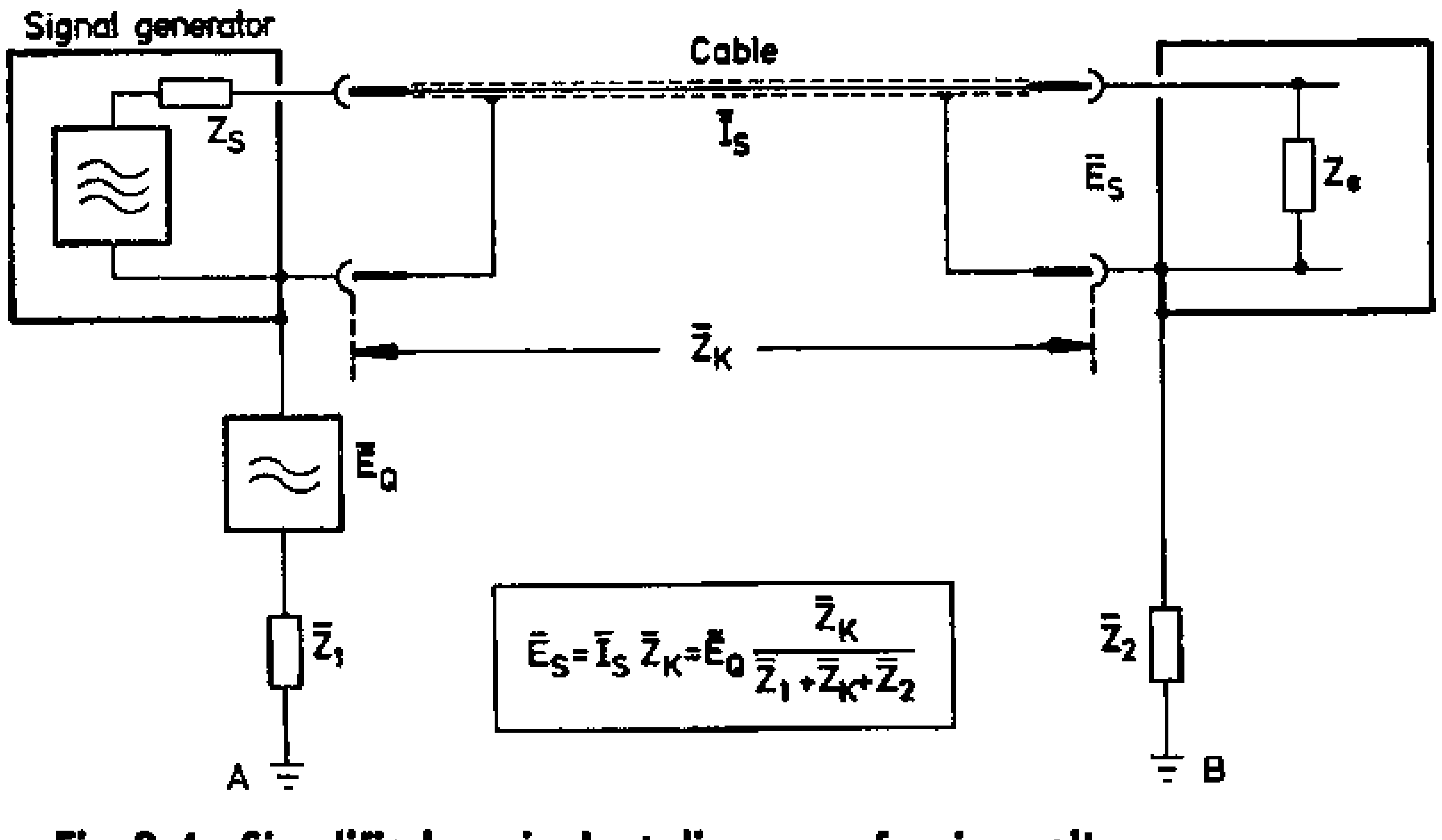

Fig. 2-4 Simplified equivalent diagram of noise voltage source

This equation shows that the noise voltage at the load decreases with decreasing noise source E_Q and impedance Z_K and with increasing earth wire impedances Z_1 and Z_2. Since Z_1 and Z_2 must be kept small for reasons of safety the impedance Z_K must be minimized. The impedance Z_K depends not only on the cable jacket and on the contact resistances of the outer conductor but also on the shielding of the input stage of the test item. The shielding and connection to the outer conductor of the connecting cable should be short and of low impedance.

The noise voltage source E_Q may exist between the earthing points A and B if the neutral conductor of the AC supply is at the same time used as a non-fused earth conductor. If the signal generator and the test item are earthed at different points of the AC supply, the voltage drop between A and B (Fig. 2-4) may also be caused by the power consumption of a third load. Noise voltages of a frequency of 50 Hz and its harmonics then result. The noise source can be avoided by minimizing the distance between points A and B (twin socket). Noise voltages can be induced in the hum-pickup loop Z_1, Z_K, Z_2 by inductive leakage of power transformers or poorly shielded RF voltage sources. These noise voltages can be prevented by making the pickup loop as short as possible by suitable wiring.

2.5.6 Adapting the RF Output 16 to Other Connector Systems

The output **16** of the SMDA can readily be adapted, according to data sheet 902110, to suit other connector systems. Simply unscrew the end pieces of the outer and inner conductors of the N socket and replace them by the corresponding parts of the desired connector.

Data sheet 902110 lists the connector systems for which screw-in assemblies are available. The specified stock numbers serve as order numbers for a complete screw-in assembly (inner conductor and outer conductor). Attention is drawn to the fact that the conversion of the N connector into another system, with the exception of Dezifix A, affects the reflection coefficient of the output and possibly the RF leakage.

2.6 Modulation Generator

2.6.1 Frequency Setting

The fixed frequency of the built-in modulation generator can be adjusted with switch **7**. Each fixed frequency can be finely tuned over a range from −30 Hz to +400 Hz by means of knob **10**. Thus any desired frequency between 270 Hz and 3.4 kHz may be adjusted. The fine tuning can be read from the engravings provided around the knob. The frequencies selected with switch **7** are accurate to within ±1.5 % only if knob **10** is at the left stop (CAL.). The voltage of this AF generator can be used for internal AM, φM or FM (switch **9** or **19** at INT.) and is available at output **20** for measurements. The built-in modulation generator is in operation if at least one of the switches FM **19** or AM **9** is at INT. or UNMOD.

2.6.2 Voltage Setting

In position AM INT., FM INT., AM UNMOD. or FM UNMOD., the output voltage of the RC oscillator is available at output **20**. Knob **8** ganged with the shaft of a logarithmic potentiometer serves for the adjustment of the output voltage. To measure the output voltage, set switch **3** to the centre position MOD. GEN. x 10 [mV]. Select the range of indication with **4** and read the output voltage on meter **5**. The full-scale meter deflections in the different ranges correspond to the following voltages:

Full-scale value	voltage
1	10 mV
4	40 mV
10	100 mV
40	400 mV
100	1000 mV

Table 2 Range of indication

Voltage between0.5and 1000 mV are thus readily adjustable.

2.7 Types of Modulation

2.7.1 Frequency Modulation

Frequency modulation is selected with the FM swifch **19**. In the INT. position of **19** the built-in modulation generator is used and in the EXT. position an external voltage may be fed into socket **28** for the modulation of the SMDA. To ensure that the SMDA operates free from interferences in the unmodulated mode, set the two switches **9** and **19** to EXT. The modulation generator is then inoperative. In the FM INT. position, the modulation frequency can be selected on the built-in modulation generator according to section 2.6.1. The external or internal modulation can be interrupted with button **6**. Thus it is easy to find out whether the signal present in a connected receiver comes from the SMDA.

In the FM EXT. position of switch **19** an AF signal between 30 Hz and 20 kHz must be fed to the FM EXT. socket **28**. With modulation frequencies $>$ 20 kHz and $<$ 30 Hz, performance complying with the specifications of section 1.3 is no longer guaranteed. The voltage required for maximum deviation is about 2.5 V into 600 Ω. The voltage applied to socket **28** should not be greater than 3 V since otherwise the deviation cannot be properly adjusted with potentiometer **18**. The permissible load limit is 30 V_{pp}.

The frequency deviation adjusted with knob **18** is read in kHz on meter **5**. The INDICATION switch **3** must be at FM. The range selector **4** should be set to the lowest range possible with the desired deviation in order to avoid appreciable reading errors. If the maximum frequency deviation of 75 kHz is exceeded, the lamp **21** lights up. Simultaneous amplitude and frequency modulation of the SMDA is possible according to the switch positions of **9** and **19**.

2.7.2 Phase Modulation

Phase modulation is selected with switch **19**. In the position φM INT. of the switch, the built-in modulation generator is used and in the position φM EXT. an external signal can be fed into socket **28** for the modulation of the SMDA. To ensure that the SMDA operates free from interferences in the unmodulated mode, set the two switches **9** and **19** to EXT. The modulation generator is then inoperative. In the position φM INT., the desired modulation frequency is adjusted on the built-in modulation generator according to section 2.6.1. By depressing push-button **6**, external or internal modulation may be switched off to check whether the signal present in a connected receiver comes from the SMDA.

In the position φM EXT. of switch **19**, an AF signal between 30 Hz and 10 kHz can be applied to socket **28**. At modulation frequencies $>$ 10 kHz and $<$ 30 Hz, the specifications according to section 1.3 are no longer guaranteed. The voltage required for maximum frequency deviation is approximately 2.5 V at a modulation frequency of 1 kHz. At other modulation frequencies, the voltage required is correspondingly greater or smaller. The maximum permissible input voltage at socket **28** is 30 V_{pp}.

The level adjustment frequency is 1 kHz, i. e. at a modulation frequency of 1 kHz, the frequency deviation is the same for φM and FM if the modulation voltage is the same. The modulation index $\Delta f/f_{mod}$ which is adjusted with knob **18** can be read on meter **5**. For this purpose, the type-of-indication selector **3** must be in position φM. It is also possible to measure the frequency deviation in the phase modulation mode. To do so, set switch **3** to FM. If the maximum frequency deviation of 75 kHz is exceeded, pilot lamp **21** lights up. To avoid appreciable indicating errors, the indicating range selector **4** should be in a position corresponding to the lowest range possible with the selected modulation index or frequency deviation. Simultaneous amplitude and phase modulation of the SMDA is possible with the switches **9** and **19** adjusted accordingly.

2.7.3 Amplitude Modulation

Amplitude modulation is selected with the AM switch **9**. In the INT. position of **9** the built-in modulation generator is used and in the EXT. position an external signal can be fed into socket **26** for the modulation of the SMDA. To ensure that the SMDA operates free from interferences in the unmodulated mode, set the two switches **9** and **19** to EXT. The modulation generator is then inoperative. In the FM INT. position, the modulation frequency can be selected on the built-in modulation generator according to section 2.6.1. In the EXT. position an AF signal between 30 Hz and 10 kHz must be fed to the AM EXT. socket **26**. With modulation frequencies > 10 kHz and 30 Hz, performance complying with the specifications of section 1.3 is not guaranteed. The voltage required for 80 % modulation is about 1.2 V into 600 Ω. The voltage applied to socket **26** should not be greater than 1.5 V since otherwise the modulation depth cannot be properly adjusted with potentiometer **11**. The modulation depth adjusted with knob **11** is read on meter **5** in per cent. The INDICATION switch **3** must be at AM. The range selector **4** should be set to the lowest range possible with the desired modulation depth in order to avoid appreciable reading errors.

The indicated modulation depth is the ratio of the voltage of the envelope U_H of the modulated RF carrier to the voltage U_T of the unmodulated RF carrier. The peak values of both voltages are used in the equation:

$$m\,[\%] = \frac{U_H}{U_T} \times 100\,\%$$

2.8 Frequency Deviation Measurement with Frequenzkontroller BN 413115

If for the automatic frequency deviation measurement Frequenzkontroller of former design (BN 413115) are to be used, an additional resistor must be soldered into the subassembly deviation meter 413115-9.20 (in the Frequenzkontroller).

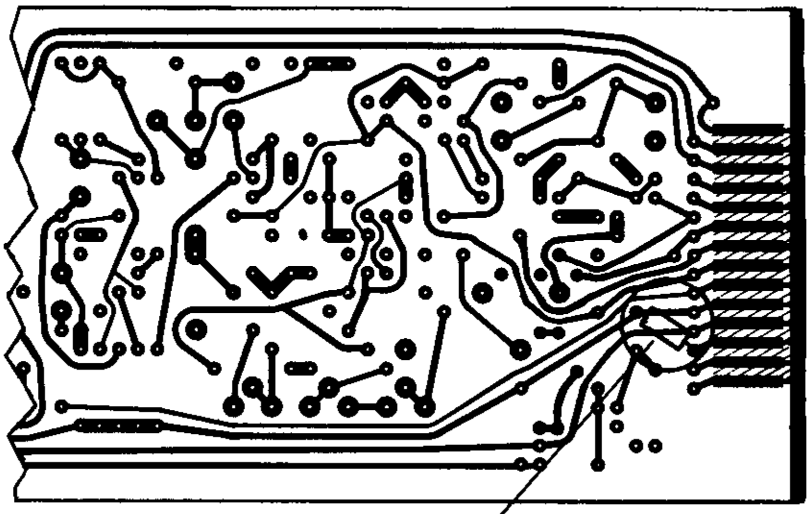

Fig. 2-5 Subassembly deviation meter 413115-9.20