Übersetzung von
R 14677

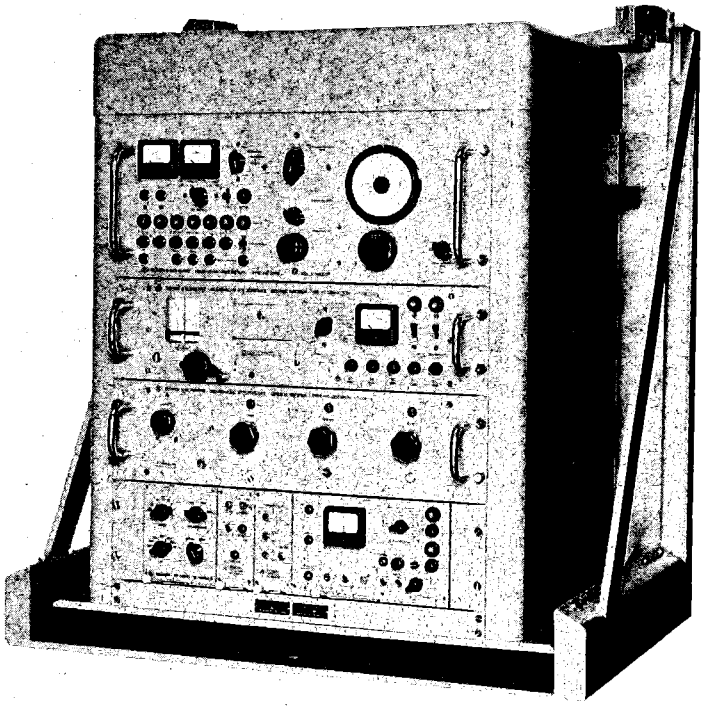
General Description

100-W SHORTWAVE TRANSMITTER

Type SKO10/3202

Printed in Western Germany

Photograph No. 15507



R 11659 Bl.2

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1. General

The Shortwave Transmitter Type SK 010/3202 has been designed for use in fixed or mobile stations and covers a frequency range of 1.5 to 24 MHz. It can be employed for the following classes of emission:

A1 = Telegraphy on pure continuous waves
A2 = Telegraphy on keyed modulated waves
A3 = Telephony, double sideband
A3A = Telephony, single sideband, reduced carrier
A3H = Telephony, single sideband, full carrier
A3J = Telephony, single sideband, suppressed carrier
F1 = Frequency-shift keying
F3 = Telephony (frequency modulated)

The peak envelope power for all classes of emission is 100 W and can be maintained during contiuous operation (24 hours in 24 hours).

Frequencies are generated in a decade exciter with very high frequency stability; they are set in decades by means of three switches (DFO) in steps of 1 MHz, 100 kHz and 10 kHz as well as continuously by means of an interpolation oscillator (LCO) with a range of 0 to 11 kHz. In this way the high frequency stability of a crystal-controlled exciter is combined with the wide frequency range of a variable-frequency oscillator. In contrast to transmitters which are purely crystal-controlled, the frequency can be changed by any desired amount without any deterioration in stability in order to avoid interfering transmitters. A monitoring facility provides a check on the transmitted information except in the case of emission classes A3A, A3J and F3.

The transmitter is designed for use with a 50-Ω feeder. It is, however, possible with the aid of a separate antenna matching unit, such as Type HS 550/..., to use the whip and wire antennas commonly employed for the shortwave range.

A built-in antenna switching relay permits the use of the antenna for reception during transmission intervals. During transmission the receiver can be blocked by means of a contact provided for this purpose.

By means of a built-in quiet-tuning facility the transmitter can be tuned with practically no output, the output with this facility in use being 0.5 mW, maximum.

The transmitter can be connected to an AC power supply of either 220 V, 50 Hz or 117 V, 60 Hz. Normal operation is assured within voltage fluctuations of ±10%.

2. Construction

The transmitter is constructed for rack mounting and consists of the following units:

Cabinet Rack	Type HS 5048/02
100-W Amplifier	Type HS 2043
Decade Exciter	
Plug-in 1	Type HS 1205/4
Plug-in 2	Type HS 1206/41
Control Panel	Type HS 8915/0
A3A Module	Type HS 6151/01
Keying Module	Type HS 6150/01
Modulator Core Unit	Type HS 6142/01

For mobile use a Shock-Mounted Frame Type HS 5054 can be supplied. With this installed in a vehicle, completely vibrationless transport of the transmitter is assured.

No soldering is necessary when setting up the transmitter, only a few plug and socket or terminal connections being required for the power supply, antenna, keying and modulation leads. Thanks to the modular construction of the transmitter, any plug-in unit or subunit can easily be exchanged for a new one. This is of great advantage in large stations with several transmitters, where interruptions of the service due to breakdown can be reduced to a minimum time by having a single set of plug-in units in reserve.

Checking and repairs of the separate units can be performed outside the cabinet rack with the aid of the adapter cable which is supplied. The units

themselves, moreover, are largely composed of self-contained assemblies and modular boards with printed circuits. Transistors are largely employed. Silicon rectifiers are used exclusively in all power supply sections, including the high tension voltage supply.

The front panels of all units are shockproof in accordance with the safety regulations, thus eliminating any danger to operating personnel.

3. Electrical Specifications

Frequency range	1.5 to 24 MHz
Classes of emission	A1, A2, A3, A3A, A3H, A3J, F1, F3
Generation of RF carrier	by Decade Exciter Type NO 262
Frequency setting	with decade frequency oscillator
in decade steps	1 to 24 x 1 MHz 0 to 9 x 100 kHz 0 to 9 x 10 kHz
continuously with LCO	0 to 11 kHz
Accuracy of the output frequency is maintained within a temperature range of	+15 to +40°C
AC supply fluctuations of	117/220 V ±10%
AC supply frequency range of . . .	47 to 63 Hz
Decade setting with automatic control	
Error after adjustment against an external frequency standard . .	$\leq 5 \times 10^{-8}$
Fluctuations during 24 hours . . .	$\leq 5 \times 10^{-8}$
Average frequency deviation after at least 10 days of continuous operation:	

within one day	$\leq 1 \times 10^{-8}$
within one month	$\leq 2 \times 10^{-7}$
within one year	$\leq 5 \times 10^{-7}$

Warm-up time at +15°C ambient temperature for an error $\leq 10^{-6}$ . . . . . $\leq$ 2 hours

Continuously variable setting of the LCO after at least 10 days of operation: Error after adjustment against driving frequency . $\leq \pm 5$ Hz

Fluctuation within 12 hours . . . $\leq \pm 5$ Hz

Additional errors with class F1 emission

after 30 minutes warm-up time . . $\leq \pm 10$ Hz in a day

after 5 hours warm-up time . . . $\leq \pm 5$ Hz in a day

Limits of error at an ambient temperature of 25 ± 5°C after a warm-up time of 5 hours . . . . . $\leq \pm 2$ Hz in a day

RF amplification

Output power of the 100-W amplifier

(Continuous operation, 24 hours in 24 hours)

PEP with A1, F1, F3	100 W
Carrier output with A2, A3 . . .	25 W
PEP with A2, A3, A3A, A3H, A3J .	100 W

Transmitter output . . . . . 50 Ω unbalanced, Dezifix B connector

Maximum permissible mismatch . . VSWR = 2

Spurious emission . . . . . $\leq$ 40 dB below PEP

Modulation

Class A1 emission

DC keying

Single current (internal and external .	20 to 40 mA, adjustable
Double current (external)	±20 mA, adjustable
Permissible loop resistance, using the built-in power source of 80 V	at 20 mA: 2 kΩ, max. at 40 mA: 200 Ω, max.
Keying speed	4000 bauds, max.
Keying signals without and with filter, switchable for 50, 120, 300 bauds . . .	as per CCIR No. 328
Signal distortion at 50 bauds	≤ 5%

Tone keying

Frequency range of the tone carrier . .	800 to 3000 Hz
Input impedance	600 Ω ±20%, floating
Input level	-20 to +10 dB, adjustable

Other data: same as for DC keying

Class A2 emission

Modulation frequency	500 Hz ±10% or 1000 Hz ±10%, switchable
Modulation depth	approx. 90%
DC keying and tone keying	as with class A1, but with
Keying speed	300 bauds, maximum

Class A3 emission

Input, switch-selected

(a) for carbon microphone with series-connected push-to-talk button. Power supply for microphone from built-in CB

Microphone current	approx. 20 mA
Permissible line resistance	1000 Ω, max.

Carrier cut-in by microphone current

(b) for connection of a line, separate carrier cut-in

Permissible resistance of the carrier cut-in loop	1500 Ω, max.
Input impedance	600 Ω ±20%, floating
Input level (for 100% mod.)	-20 to +10 dB, adjustable

Frequency response	±1 dB from 500 to 4000 Hz ±2.5 dB from 100 to 500 and from 4000 to 6000 Hz referred to 1000 Hz	
Distortion factor at 80% mod.	5%	
Signal-to-noise ratio, unweighted . .	40 dB	referred to 100% modulation
Signal-to-noise ratio, weighted . . .	50 dB	

Class A3A and A3J emissions

Inputs switch-selected as with A3	
Input impedance	600 Ω ±20%, floating
Input level (for 100% mod.)	-20 to +10 dB
Side band	upper
Frequency response	±1 dB from 500 to 4000 Hz ±2.5 dB from 100 to 500 and from 4000 to 6000 Hz referred to 1000 Hz
Residual carrier, adjustable in 2.5-% steps from 0 to 20%, 50% and 100% with respect to PEP	
Residual carrier at 0%	≤ 50 dB with respect to PEP
S/N ratio unweighted (for line connection) with residual carrier of 15%	≥ 40 dB with respect to PEP
Suppression of 3rd-order intermodulation products ($2f_2 - f_1$, $2f_1 - f_2$) referred to PEP	≥ 41 dB

Class A3H emission

Inputs switch-selected as with A3	
Input impedance	600 Ω ±20%, floating
Input level for 100% mod.	-20 to +10 dB
Modulation depth	100%, maximum
Distortion factor at 30% mod. (with linear demodulation of the envelope)	≤ 10%
Side band	upper

Class F1 emission

Additional error in frequency response	see Bl. 10
Shift	0 to ±850 Hz, adjustable
Preset frequency-shift steps	±0, ±100, ±140, ±200 ±280, ±400, ±600 Hz

Signal reversal (see 5.7.2.6) . . .	switch-selected
Separate carrier cut-in	
Permissible resistance of the carrier cut-in loop	1500 Ω, maximum
DC keying and tone keying	as with A1
Class F3 emission	
Inputs, switch-selected as with A3	
Input impedance	600 Ω ±20%, floating
Input level for 1.5 kHz frequency deviation	-20 to +10 dB, adjustable
Frequency response	as with A3
Frequency deviation	1.5 kHz, maximum
Facilities for break-in operation	
Antenna switch-over: Transmitter/Receiver	by built-in relay
Drop-out delay	adjustable, max. 100 msec
Receiver blocking	by floating switch-over contact (250 V, 1 A)
Carrier suppression in reception position	≥ 120 dB
Quiet tuning	
Output during tuning	≤ 0.5 mW
RF output after quiet tuning and 1 to the mark for AC anode voltage	100 ±25 W
1 with RF input level adjusted for deflection	
Remote control	is possible with a three-wire line (see 7.6.2.6)
Power supply	
AC supply voltages and frequencies	220 V / 50 Hz and 117 V / 60 Hz
Voltage selection	by changing connections at terminals in cabinet rack and 100-W amplifier (see 7.5)

Power consumption

in standby operation	approx. 300 W
in class F1 operation	approx. 900 W
in class A3A operation (2 tones) . .	approx. 800 W

Connections

Type of connection	screw terminals
Minimum cross section of connection lines	1.5 mm^2
Maximum value for power supply fuse .	10 A

Voltage stabilization

The supply voltages for the exciter and the heater filaments are stabilized with a magnetic voltage stabilizer

Permissible AC supply fluctuations

Unless otherwise stated, the above data are valid for the rated voltage. The transmitter will operate within AC supply fluctuations of ±10%.

Other data

Valves, fuses and glos lamps

Valves

E 55 L	2 each
E 88 CC	12 each
E 180 F	11 each
E 810 F	5 each
EAA 91	1 each
EF 94	3 each
EL 83	1 each
OA 2 WA	1 each
5654	17 each
4 CX 350 A	1 each
EW 3 - 9/0,83	1 each

Fuses

Type	Quantity required for 220-V operation	Quantity required for 117-V operation
M 0,032 C DIN 41571	1	1
M 0,1 C DIN 41571	1	1

M 0,125 C DIN 41571	1	1
M 0,2 C DIN 41571	2	2
M 0,25 C DIN 41571	1	1
T 0,25 B DIN 41571	1	1
M 0,135 C DIN 41571	2	1
M 0,63 C DIN 41571	1	2
T 0,63 B DIN 41571	1	1
T 0,8 B DIN 41571	1	1
M 4 D DIN 41571	1	
M 6,3 D DIN 41571		1

Glow lamps

RL 210 (clear, socket E 10)	2 each
RL 214 (red, socket E 10)	9 each
RL 215 (green, socket E 10)	1 each

Weights

HS 1205/4	Decade Exciter	28 kg
HS 1206/41	Decade Exciter	20 kg
HS 2043	100-W Amplifier	34 kg
HS 5048/02	Cabinet Rack	73.5 kg
HS 6142/01	Modulator Core Unit	9 kg
HS 6150/01	Keying Module	1.5 kg
HS 6151/01	A3A Module	3 kg
HS 8915/0	Control Panel	0.5 kg
	Total	169.5 kg

Accessories

2 Test Cables, 16-pole	HS 8244/1/1.5
3 Test Cables, 30-pole	HS 8244/30/1.5
1 RF Test Cable, 50 Ω	HS 8204/239
5 RF Test Cables, 50 Ω	HS 8204/134
1 RF Plug for transmitter antenna	FNB 1007/50
1 RF Plug for receiver connection	FMS 9010
1 Telephone Plug	FS/PL 68

Supplementary equipment

Carbon Microphone with push-to-talk button	HS 190/4
Telegraphy Key	HS 876/1
Shock-Mounted Frame	HS 5054

4. Functioning of the Transmitter (see block diagram)

Generation of the frequencies takes place in the decade exciter, composed of two rack-mounting units, which works on the principle of frequency synthesis. Basic frequencies in decade steps are derived from a standard frequency. Harmonics of the basic frequency are selected and mixed in the decade frequency oscillator (DFO) by means of frequency-change oscillators, mixers and filters. The sum of these harmonics, together with the frequency obtained from an interpolation oscillator which is tunable over the smallest frequency step, results in the output frequency.

The output frequency thus consists of two components: one which is derived from the DFO and which has the full stability of the frequency standard, and the other which comes from the continuously variable interpolation oscillator (LCO).

In order to attain the high degree of frequency stability required for a modern shortwave transmitter, the first three decades of output frequencies below 10 MHz and the first four of those above 10 MHz are derived by means of three decade frequency oscillators (DFO 1 MHz, DFO 100 kHz and DFO 10 kHz) from a signal generator (frequency standard) of very high stability. The intermediate steps 0 to 10 kHz are generated by the continuously variable interpolation oscillator (LCO).

Rack-Mounting Unit Type HS 1205/4 contains the three decade frequency oscillators, which are the most important part of the decade exciter, and the subsequent wide-band amplifier for the output frequency.

Further details regarding the method of frequency synthesis with triple-mix here employed will be found in the instruction book for the Decade Exciter Type NO 262.

Rack-Mounting Unit Type HS 1206/41 contains the continuously variable interpolation oscillator, the crystal-controlled frequency standard with the crystal housed in an oven, and the power supply for the complete decade exciter.

The 100-kHz DFO also contains a modulation stage to which an "information frequency" of 300 kHz is fed. This information frequency is modulated in accordance with the class of emission in use and is produced in the modulation

assembly from a frequency of 100 kHz which is derived from the frequency standard.

The Modulation Assembly Type NA 3302/01 is composed of the subunits Types HS 6142/01 (Modulator Core Unit), HS 6150/01 (Keying Module), and HS 6151/01 (A3A Module).

The Keying Module Type HS 6150/01 transforms the DC or audio frequency signals delivered to it into keying voltages. It also contains the keying filters for telegraphy speeds of 50, 120 and 300 bauds.

In the A3A Module Type HS 6151/01 production of the single sideband takes place, also the processing of low frequency signals for class A3 and class F3 emissions.

In the Modulator Core Unit Type HS 6142/01 amplitude and frequency modulation is carried out. The 25-kHz single sideband signal delivered by the A3A module is converted to the information frequency of 300 kHz. The modulator core also contains the monitoring facility for classes A1, A2, A3, A3H and F3 emissions, together with other measuring and checking facilities, and the power supply.

Further details concerning the Modulation Assembly Type NA 3302/01 can be found in the corresponding instruction book.

The switches for class of emission, for the keying filter, for the selection of one of six preset or a freely adjustable frequency deviation for class F1 emissions, and for tuning/operation are all situated on the Control Panel Type HS 8915/0.

The 100-W Amplifier Type HS 2043 contains the 100-W output stage and also a pre-amplifier equipped with three switch-selected band-pass filters. It amplifies the output of approximately 100 mW delivered by the exciter to 100 W. This plug-in unit also contains the power supply for the output stage, switching, monitoring, measuring and checking facilities, as well as the quiet tuning device which permits the output circuit to be tuned with a power output of only 0.5 mW.

The Cabinet Rack Type HS 5048/02 accommodates the rack-mounting units and provides the necessary connections between them. It also contains the voltage stabilizer for the exciter and valve filaments, the autotransformer for the selection of 117 V or 220 V AC supply, the antenna relay for switching over from transmission to reception and the blowers for ventilation.

For your special attention:
The transmitter Type SK 010/3202 must under no circumstances be operated at frequencies above 24 MHz, despite the fact that the Decade Exciter can be set up to 30 MHz. Operation at frequencies higher than 24 MHz would most certainly damage the output stage.

5. Operating Instructions (see operating diagram)

5.1 Switching on the Exciter and the Modulation Assembly

With the 100-W Transmitter Type SK 010/3202 the exciter and the modulation assembly are switched on independently of the 100-W amplifier. The switch (1) on the 100-W amplifier remains at first in the OFF position. In order to attain full frequency stability the exciter and the modulation assembly should be switched on well in advance of commencing operation, at least two hours beforehand.

5.1.1 Close the STANDBY switch (12) . The associated signal lamp will light up.

5.1.2 At least five minutes before commencing transmission, close the OPERATION switch (11) . The associated signal lamp will light.

5.2 Setting the Frequency

The decadic setting is made with the knobs (15) , (16) and (17) and the continuous setting with knob (42) in accordance with the indication on the drum scale.

Example:

Desired frequency	Setting knob	Setting
21.25375 MHz		
	(15)	21 x 1 MHz
	(16)	2 x 100 kHz
	(17)	5 x 10 kHz
	(42)	3.75 kHz

The frequency is immediately available on being set.

5.3 Checking the Exciter

The functioning of the individual assemblies can be checked with CHECK switch (10) and meter (13). The valve voltmeter must first be set to its electrical zero point. For this purpose turn switch (10) to the position EL 0 and with a screwdriver turn the potentiometer adjustment (14) marked EL 0 until the meter pointer is at zero.

Now put switch (40) to the position "0.1 W" and turn switch (37) on the control panel to the position TUNING.

At each position of the CHECK switch (10) the indication on the meter (13) must lie within the black field, with the following exceptions:

OVEN	At this position the heating current for the oven is indicated. Until the oven has reached its rated temperature of +65°C, the meter should indicate about 75 scale divisions. At the rated temperature the contact thermometer switches the heating current off and on (about every 60 sec). The corresponding meter indications are 5 and 75 scale divisions.
DFO 100 kHz A	Since switch (40) on the 100-W transmitter is always in position "0.1 W" the output level of DFO 100 kHz is so low that no exact meter reading is possible.
DFO 1 MHz A	In this position the output level of the decade exciter is indicated. The indication depends to a large extent on the output power needed for the frequency in use and from the class of emission.
RECALIB. LCO-FM	In this position the adjustable output frequency can at 1,000.000 kHz and 999.999 kHz be beaten against the frequency of the frequency standard. This enables the frequency of the LCO to be checked. Details regarding this recalibration are given in section 6 of the maintenance instructions.

5.4 Adjusting the Quiescent Currents for the 100-W Amplifier

The quiescent currents should be checked and adjusted daily, since these currents have an important effect on the efficiency of the valves and hence on their life.

This adjustment is absolutely necessary before putting the transmitter into operation for the first time, or after it has not been used for a lengthy period.

5.4.1 Put OPERATION switch (11) to OFF position.
STANDBY switch (12) remains at ON position.

5.4.2 Turn the function selector (1) to OPERATION.
The green signal lamp (2) lights up after 30 to 45 seconds.

5.4.3 Turn the CHECK switch (47) to the position "Ia (Rö3)".

5.4.4 After removing the protective cap with a screwdriver, use the adjustment (44) to set the grid bias voltage so that the pointer of meter (49) is at the beginning of the large red field (≈ 120 to 130 mA).

5.4.5 Turn CHECK switch (47) to "Ia (Rö1 + 2)".

5.4.6 After removing the protective cap with a screwdriver, use the adjustment (45) to set the grid bias voltage so that the pointer of meter (49) is about in the middle of the small red field (≈ 110 mA).

5.4.7 Turn switch (1) to OFF or STANDBY.

5.4.8 Put OPERATION switch (11) to ON if it is intended to tune or operate the transmitter, otherwise it remains at OFF.

5.5 Tuning the 100-W Amplifier, Using the Quiet Tuning Facility

This facility should be employed whenever possible, since its use eliminates any overloading during tuning on the one hand, and on the other hand it prevents an unnecessary and undesirable radiation of RF energy.

5.5.1 Turn function selector (1) to the position QUIET TUNING. Tuning can be commenced after 5 seconds.

5.5.2 Turn the FREQUENCY RANGE switch (5) to the desired range, also the other FREQUENCY RANGE switch (9). If the desired frequency can be transmitted in two different ranges of FREQUENCY RANGE switch (5), a somewhat greater output will usually be obtained with the higher range.

5.5.3 Tune roughly on the circular scale (8).

5.5.4 Turn switch (36) to the position TUNING.

5.5.5 Depress button (46) CALIBRATION and hold.

5.5.6 Using knob (41) OUTPUT VOLTAGE, adjust the output of the exciter so that the pointer of meter (48) indicates CALIB. ("Eichen"), then release the button (46).

5.5.7 Find the resonance point, using the scale (8). (F.s.d. on meter (48).)

5.5.8 While correcting continuously with scale (8), manipulate the switch (6) COARSE MATCHING and the knob (7) FINE MATCHING until the deflection of meter (48) at resonance (maximum) coincides with the mark TUNING. Turning (6) or (7) counterclockwise increases the deflection, turning them clockwise decreases it.

5.5.9 Turn switch (47) to the position "$E_a \sim$".

5.5.10 Turn the function selector switch (1) to OPERATION.

5.5.11 When the green signal lamp (2) lights up, adjust the output voltage of the exciter with knob (41) until the pointer of meter (49) is on the green mark.

5.5.12 If it is absolutely necessary to have the maximum attainable power output, the transmitter can be re-tuned with power output functioning as described in sections 5.6.11 to 5.6.14.

5.5.13 Turn switch (36) to the position OPERATION.

5.5.14 According to the length of time before commencement of transmission, turn switch (1) to OFF, STANDBY or OPERATION.

5.6 Tuning the 100-W Transmitter with Power Output

5.6.1 Turn switch (1) to the position STANDBY.

5.6.2 Turn the FREQUENCY RANGE switches (5) and (9) to the desired frequency range.

5.6.3 Tune roughly on the circular scale (8).

5.6.4 Turn switch (36) to TUNING.

5.6.5 Turn OUTPUT VOLTAGE knob (41) counterclockwise to stop.

5.6.6 Turn switch (1) to OPERATION.

5.6.7 Turn switch (47) to the position "$E_g 1\sim$". Wait until the green signal lamp (2) lights up.

5.6.8 Turn the knob (41) clockwise until the meter (49) shows about 1/3 f.s.d.

5.6.9 Turn switch (47) to the position "$E_a\sim$" and tune for resonance with the aid of scale (8) and meter (49) (maximum deflection).

Should a fault occur during this adjustment or later under section 5.6.10 (FAILURE lamp (3) will light), turn knob (41) a little to the left, depress RESET button (4) and proceed with tuning.

5.6.10 While correcting continuously with scale (8), manipulate the switch (6) COARSE MATCHING and the knob (7) FINE MATCHING until at resonance the deflection (maximum) of meter (49) is approximately the same for the positions "$E_g 1\sim$" and "$E_a\sim$" of switch (47).

5.6.11 Turn switch (47) to the position "$E_g 1\sim$".

5.6.12 Using the OUTPUT voltage knob (41), bring the pointer of meter (49) to the green mark.

5.6.13 Turn switch (47) to the position "$E_a\sim$".

5.6.14 Alter matching and tuning as described under section 5.6.10 until the pointer of meter (49) coincides with the green mark.

5.6.15 Turn switch (47) to the position "Ia RÖ3"; the pointer of meter (49) must then be in the right-hand third of the large red field.

5.6.16 Turn switch (36) to OPERATION.

5.6.17 According to the length of time before commencement of transmission, turn switch (1) to OFF, STANDBY or OPERATION.

5.7 Setting the Modulation Assembly for the Various Classes of Emission

5.7.1 Classes A1, A2 1 kHz, A2 0.5 kHz

5.7.1.1 Set desired class of emission with TYPE OF EMISSION switch (39).

5.7.1.2 Select keying filter according to telegraphy speed with KEYING SPEED switch (38).

5.7.1.3 Select the desired input with the INPUTS switch (21).

Position LOCAL:	Telephone jack (33) on the front panel
Position REMOTE:	Terminals K1 1.11, 1.12, and 1.13 in the cabinet rack.

5.7.1.4 Turn the CURR. SOURCE switch (34) to the type of keying desired.

The inscriptions have the following meanings:

$\sim$	Tone keying
SINGLE-INT.	Single current, built-in source
SINGLE-EXT.	Single current, external source
DOUBLE-EXT.	Double current, external source

5.7.1.5 Adjust the level for marking signals (key depressed) according to the following table:

Position of switch (34)	Position of switch (20)	Reading on meter (19)
~	Tone A	green mark
SINGLE-INT.	KEY. CURR. A	±20 to ±40 mA (red field)
SINGLE-EXT.	KEY. CURR. A	as above
DOUBLE-EXT.	KEY. CURR. A	as above

With DC keying the average keying current is indicated. With DC and tone keying the level "Tone A" shown by the meter is the same as for a marking signal.

5.7.1.6 With marking signals the transmitter comes on the air automatically.

5.7.2 Class F1 emission

5.7.2.1 Set TYPE OF EMISSION switch (39) to F1.

5.7.2.2 Select keying filter according to telegraphy speed with KEYING SPEED switch (38).

5.7.2.3 Select the desired input with the INPUTS switch (21).

Position LOCAL: Telephone jack (33) on the front panel

Position REMOTE: Terminals K1 1.11, 1.12, and 1.13 in the cabinet rack.

5.7.2.4 Turn the CURR. SOURCE switch (34) to the type of keying desired.

The inscriptions have the following meanings:

~	Tone keying
SINGLE-INT.	Single current, built-in source
SINGLE-EXT.	Single current, external source
DOUBLE-EXT.	Double current, external source

5.7.2.5 Adjusting the level for marking signals according to the following table:

Position of switch (34)	Position of switch (20)	Reading on meter (19)
~	Tone A	green mark
SINGLE-INT.	KEY. CURR. A	±20 to ±40 mA (red field)
SINGLE-EXT.	KEY. CURR. A	as above
DOUBLE-EXT.	KEY. CURR. A	as above

With DC keying the average keying current is indicated. With DC and tone keying the level "Tone A" shown by the meter is the same as for a marking signal.

5.7.2.6 Select signal reversal with CHARACTER switch (35).

The sign + means frequency increase with marking signals and frequency decrease with spacing signals.

The sign - means frequency decrease with marking signals and frequency increase with spacing signals.

For other classes of emission the position of this switch is without effect.

5.7.2.7 Set the desired deviation with the FREQ. DEVIATION switch (37). The shift can be checked on meter (19). For this purpose switch (20) must be in the position A 400 Hz DEV. or A 800 Hz DEV. 400 Hz and 800 Hz indicate the measurement range of the meter. When switch (37) is in the position FREE the deviation can be adjusted with the potentiometer (18) DEV. F1.

5.7.2.8 Putting the transmitter on the air. The transmitter is not put on the air automatically with marking signals, as it is with A1 and A2 emissions. Instead, this is done by means of an emission on/off circuit which can be closed either on the front panel or with the cabinet rack terminals K1 1.6 and 1.7. The selection is made with the INPUTS switch (21).

Position LOCAL: Telephone jack (22) on the front panel.
Position REMOTE: Terminals

To check whether the transmitter is on the air, turn switch (20) to the position "300 kHz Ausg." (Ausg. = output). The deflection of meter (19) must then lie within the blue field.

5.7.3 Classes A3, F3, A3A, A3J and A3H emissions

5.7.3.1 Select the class of emission desired with the TYPE OF EMISSION switch (39).

5.7.3.2 Select the desired input with the INPUTS switch (21).

Position LOCAL:	Telephone jack (27) on the front panel.
Position REMOTE:	Terminals 1.8, 1.9 and 1.10 in the cabinet rack.

5.7.3.3 Turn the OPER./CHECK switch (29) to OPER.

5.7.3.4 Turn the switch (28) LINE/CARBON to the correct position. If a carbon microphone is used, the switch must be in the position CARBON. The transmitter is then put on the air by the microphone current when the push-to-talk button is depressed. With a dynamic microphone connected by a line, switch (28) must be turned to LINE. Emission on/off is then performed by a special circuit, as with class F1. See section 5.7.2.8.

5.7.3.5 Adjusting the level: Turn the CHECK switch (20) to AF A ("NF A"). With INPUT LEVEL switch (30) and potentiometer (26) adjust the level so that the pointer of meter (19) does not go beyond the end of the scale.

5.7.3.6 The reduced carrier with class A3A emission can be adjusted with the REDUCED CARRIER ("RESIDUAL CARRIER") switch (23).

6. Maintenance Instructions (see operating diagram)

6.1 Decade Exciter Type NO 262

6.1.1 Blower

The blower contained in Plug-in Unit Type HS 1205/4 should always run perfectly when OPERATION switch (11) is snapped on, since natural cooling is not sufficient in view of the maximum temperature attained in the transmitter. It is advisable to check the blower monthly and, if necessary, clean and lubricate the bearings.

6.1.2 Checking and Recalibrating the LCO

First set the output frequency to 1,000,000 or 999,999 kHz. Switches (11) and (12) must be at ON and switch (36) at TUNING; the output stage need not be switched on. Turn the CHECK switch (10) to the position RECALIB. LCO-FM. A deflection of meter (13), due to beating, indicates a fault at the beginning or end of the scale. Should recalibration be necessary, set the output frequency to 999,999 kHz and adjust with the L trimmer. This will be found under the protective screw cap (43) above the inscription LCO-FM RECALIBRATION.

6.1.3 Further Maintenance and Checking Instructions

See instruction book for Type NO 262

6.2 Modulation Assembly Type NA 3302/01

6.2.1 Recalibrating the F Modulator

Since any fault in the F modulator is fully reproduced in the output frequency, the modulator must be regularly checked and, if necessary, recalibrated. For this purpose adjust as for F1 (section 5.7.2 of the operating instructions). Turn the FREQ. DEVIATION switch (37) to "0 Hz". Turn the potentiometer (24) DEV. F6 on the front panel of the modulator core unit counter-clockwise to the stop. Set the CHECK switch (20) to

RECALIBRATION. Any difference between the 25-kHz frequency of crystal accuracy and the centre frequency of the F modulator will then appear as a beat on the meter 19 . Use potentiometer 25 FREQUENCY CALIBRATION to calibrate to zero beat. Checking and recalibration of the F modulator should not be attempted until after at least 30 minutes warm-up time. Move the STANDBY switch (12) to the ON position.

6.2.2 Further Checking of the Modulation Assembly

See instruction book for Type NA 3302/01.

6.3 100-W Amplifier Type HS 2043

6.3.1 Replacing Valves in the Penultimate Stage

If it is observed in the course of time that an exceptionally high output voltage is required from the decade exciter, or that there is a sharp decrease in the anode current of the penultimate stage, a valve replacement in the penultimate stage is generally indicated. Since the two valves are connected in parallel it is advisable to replace both valves E 55 L at the same time.

For this purpose withdraw the plug-in unit from the cabinet rack and remove the top cover after opening the quick-release fasteners. It is now essential to short the anode voltage lead of the output amplifier. Remove the valve shielding cans after loosening their retaining screws and replace the valves. Re-assemble in reverse order. The quiescent anode current must now be adjusted again (see section 5.4 of the operating instructions).

6.3.2 Replacing Valves in the Output Amplifier

If, after a lengthy period of service, the output fails to reach its rated power, valve 4 CX 350 A must be replaced. Withdraw the plug-in unit from the cabinet and remove the cover after opening the quick-release fasteners. It is now essential, in order to avoid accidents, to short the anode voltage lead., Loosen the knurled screws retaining the anode strap and remove the valve carefully.*) When inserting the new valve, make sure that it is fitted into the socket correctly. Secure the anode strap with moderate tension and replace the cover plate. Then adjust the quiescent current as per section 5.4 of the operating instructions.

*) The valve lifter for this purpose is stored underneath the cover.

6.3.3 Cleaning the Coils and Power Supply

About every three months the coils should be blown free of dust, or cleaned with Tri if they are very dirty. The spaces between the windings must be absolutely clean. Also clean the isolators with Tri and polish them with a cloth in order to avoid surface leakage paths. The same applies to the terminals of the secondary windings of the high-voltage transformer and to the ceramic bushings of the high-voltage capacitor.

The spindle and the current collector roller of the variometer must be thoroughly cleaned with Tri and polished. In no case should the spindle or roller be lubricated, since otherwise faulty contact will result. If the silver-graphite bearings of the roller are worn out, the roller must be discarded and replaced by a new one. The two contact faces must be cleaned with a pad of cotton wool, soaked with Tri and then lubricated with a very thin film of Molykote G paste.

6.3.4 Maintenance of the Blower Bearings

To gain access to the bearings the blower must be removed, a difficult operation which we do not recommend.

In the factory the bearings are provided with a permanent lubrication which lasts for years without attention, as experience has shown.

Bearing wear is indicated by an increase in noise from the bearings. This is rarely followed by an immediate breakdown, thus a convenient time can be chosen for replacing the blower, so avoiding any interruption of the service.

6.4 Cabinet Rack Type HS 5048/02

Maintenance of the cabinet rack is confined to cleaning it and replacing the air filter. To do this, pull the spring retaining clip on the upper side back a little and take out the filter.

Use soapy water or any of the usual domestic detergents for cleaning the filter. This filter is of the dry type and must under no curcumstances be soaked with oil or the like.
When inserting a new or cleaned filter pad, make sure that it is fitted properly in position and that the cover snaps into place.
If the transmitter is not accessible from the rear, the air filter can be replaced in the following manner: withdraw the decade exciter unit after removing the front panel screws. After undoing the quick-release fasteners a cover plate in the rear wall can be opened. Through this opening it is an easy manner to replace the filter.

The time between two filter cleanings depends largely upon the amount of dust in the air at the location of the transmitter, but in general the period is from 4 to 8 weeks.

Key to Operating Diagram

(1) Function selector

(2) Green signal lamp OPERATION

(3) Red signal lamp FAILURE

(4) Failure RESET button

(5) FREQUENCY RANGE

(6) COARSE MATCHING

(7) FINE MATCHING

(8) Scale and tuning knob for matching

(9) FREQUENCY RANGE

(10) CHECK switch for (13) (Exciter).

(11) OPERATION switch

(12) STANDBY switch

(13) Check meter

(14) Electrical zero correction "E1.0" for (13)

(15) Frequency setting knob 1 to 24 x 1 MHz

(16) Frequency setting knob 0 to 9 x 100 kHz

(17) Frequency setting knob 0 to 9 x 10 kHz

(18) DEV. F1

(19) Check meter (Modulation assembly)

(20) CHECK switch for (19)

(21) INPUT switch LOCAL/REMOTE

(22) CARRIER CUT-IN jack

(23) REDUCED ("RESIDUAL") CARRIER adjustment

(24) DEV. F6

(25) FREQUENCY RECALIB. (F modulator)

(26) AF INPUT LEVEL adjustment, fine

(27) AF ("NF") INPUT, local

(28) LINE/CARBON (Line/Carbon microphone) switch

(29) OPERATION/CHECK switch

(30) AF INPUT LEVEL adjustment, coarse

(31) TONE LEVEL adjustment

(32) KEYING CURRENT adjustment

(33) Keying input A1, A2, F1, F6

(34) Switch for CURRENT SOURCE

(35) Signal reversing switch CHARACTER for F1 emission

(36) TUNING/OPERATION switch

(37) FREQUENCY DEVIATION switch

(38) KEYING SPEED

(39) TYPE OF EMISSION switch

(40) 0.1-W/1-W switch

(41) OUTPUT VOLTAGE switch (Exciter)

(42) Continuous frequency setting knob (with locking lever positions LOOSE and LOCKED), and associated scale 0 to 11 kHz

(43) LCO-FM RECALIBRATION

(44) GRID VOLTAGE adjustment (final amplifier stage)

(45) GRID VOLTAGE adjustment (penultimate amplifier stage)

(46) QUIET TUNING CALIBRATION button

(47) CHECK switch for meter (49) (100-W amplifier)

(48) Quiet tuning and output voltage meter

(49) Check meter

7. Assembly Instructions

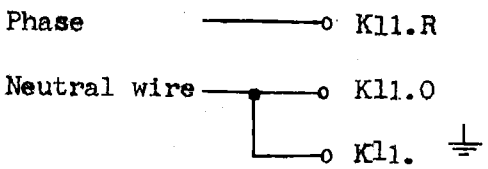
After unpacking the units remove any traces of packing material.

Check that the plug-in subassemblies are firmly seated.

7.1 Make the earth connection, connecting the earth terminal with earth with a line of adequate cross section (about 25 mm^2). Earthing the neutral wire of the AC supply connection is not sufficient.
The earth terminal and all other connecting terminals are situated at the bottom of the left-hand side of the cabinet rack and are accessible after withdrawing the bottom plug-in unit.

7.2 Connection to AC Supply

Connect the AC supply line to terminal K1 1 as shown below:



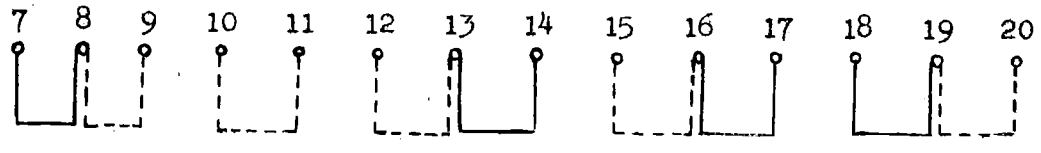
The minimum cross section for the connecting line is 1.5 mm^2; the rating of the associated fuse must not exceed 10 A.

7.3 Adjustment for AC Supply

Note: The transmitter is factory-adjusted for 220 V, 50 Hz. If it is to be operated from 117 V, 60 Hz the links on the tapping panel must be changed around.

Undo the screws holding the cabinet cover and remove same. The terminal K1 2 on the voltage stabilizer is now accessible. Change the position of the shorting link as shown below:

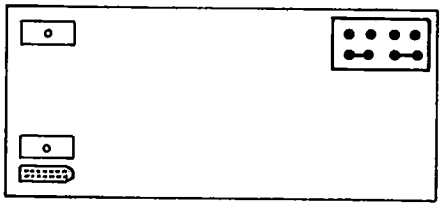
K1 2



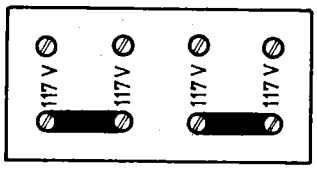
= link position for 220 V, 50 Hz

= link position for 117 V, 60 Hz

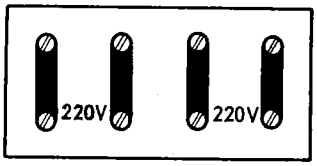
Change the links on the tapping panel on Plug-in Unit Type HS 2043 (100-W amplifier) to the 117 V position. Viewed from the rear, the tapping panel is in the right-hand upper corner of the unit.



Unit seen from the rear



Setting for 220 V



Setting for 117 V

7.4 Connection of the Modulation and Switching Lines

Connection to the Front Panel

See section 5.7 of the operating instructions.

Connections to the Cabinet Rack (see diagram below)

Connect the keying line (two-wire, shielded) to terminals K1 1.12 and K1 1.13, the shield to K1 1.11.

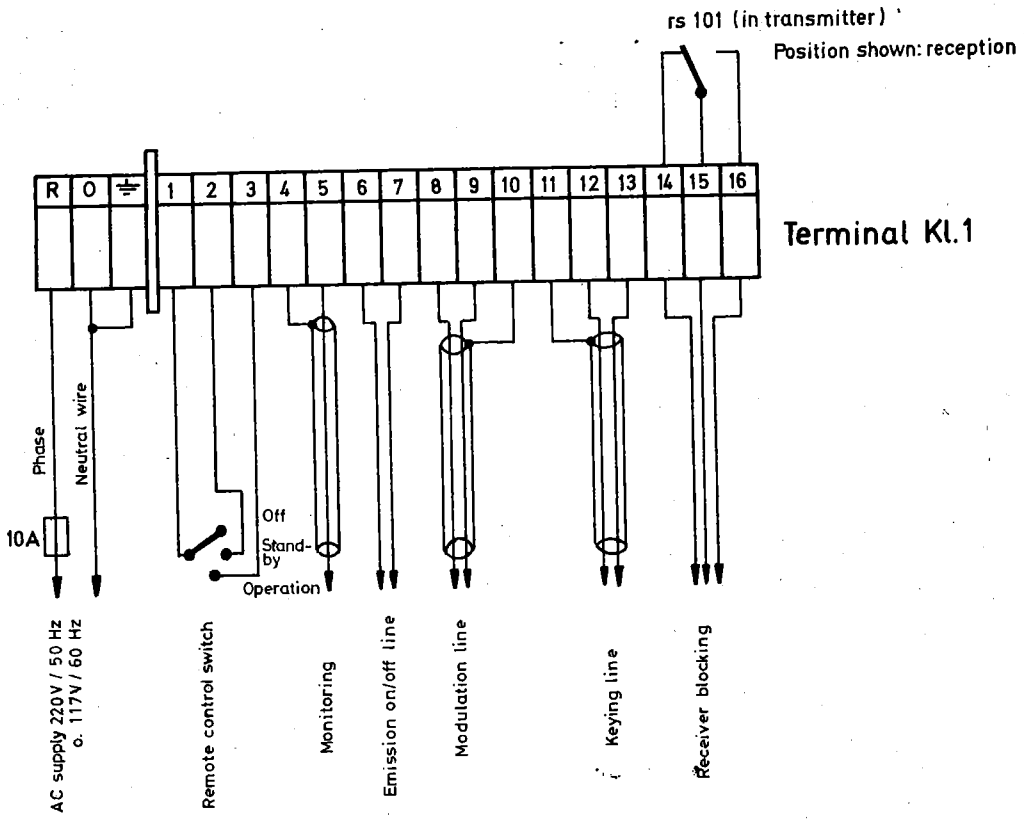
Connect the modulation line (two-wire, shielded) to terminals K1 1.8 and 1.9, the shield to K1 1.10.

Connect the on/off emission line to terminals K1 1.6 and 1.7.

Connect the monitoring line (single-wire, shielded), if required, to terminals K1 1.4 and 1.5, the shield to K1 1.4.

Connect the receiver blocking line, if required, to terminals K1 1.14, K1 1.15 and K1 1.16.

The transmitter can be remote-controlled via the terminals K1 1.1, K1 1.2 and K1 1.3.



7.5 Connect the antenna to socket Bu 106 marked ANTENNA on the top cover of the cabinet rack (Dezifix B connector, FNB 1007/50).

7.6 If the transmitting antenna is also to be used as a receiving antenna, connect the receiver input to the socket Bu 107 marked RECEIVER ("Empfänger") on the cover of the cabinet rack (13-mm plug, FMS 9010).

7.7 Commencing from below, insert the plug-in units as indicated in the drawing SK 010/3202.

Put the function selector (1) on the 100-W amplifier to OFF, as also switches (11) OPERATION and (12) STANDBY on the Decade Exciter Type HS 1206/41.

7.8 It is recommended to connect the transmitter to the AC supply via a separate main switch (e.g. with automatic cut-out) so that the whole transmitter assembly can be made dead when repairs or servicing are being carried out.