

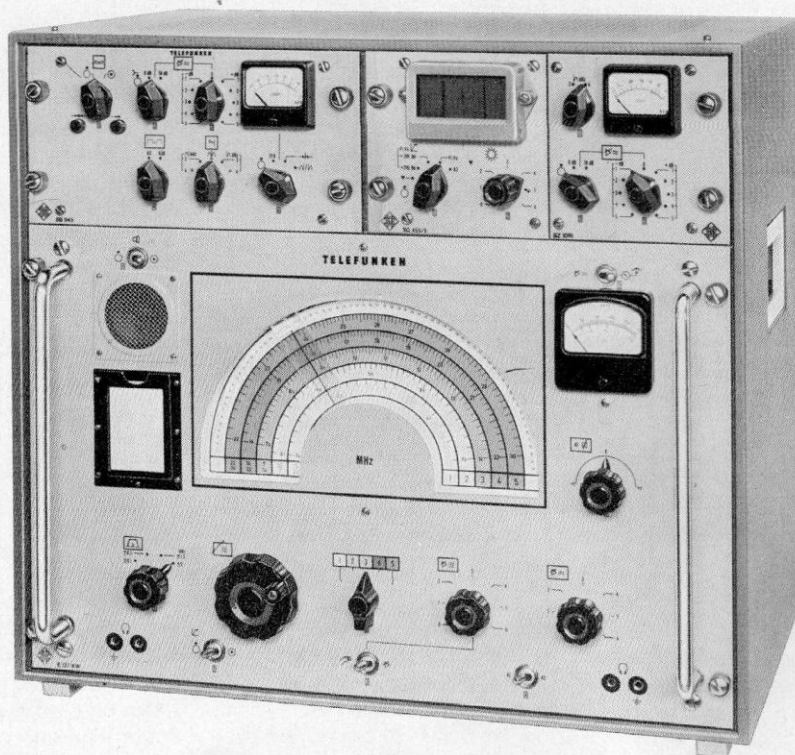


Receivers Direction Finders

TRANSRADIO 8

HF Long Distance Traffic
Receiver Equipment
1.5 to 30.1 MHz

Leaflet
IB 689 E



3-16797.1Mo

HF Long Distance Traffic Receiver Equipment TRANSRADIO 8

Possible Utilisation

The HF Long Distance Traffic Receiver Equipment TRANSRADIO 8 serves for reception of single and multichannel SSB telephony or telegraphy transmissions in the HF band. Double sideband reception with interference rejection is possible too.

Special Features

Synoptical frequency dial

Four RF tuned circuits for signal frequency preselection

High immunity to cross-modulation effects

Strong rejection of response ambiguities

Very efficient AGC system with AGC amplifier and forward-controlled IF stage

On request can be fitted with crystal oscillator with any 6 desired spot frequencies

Simultaneous demodulation of the upper and lower sideband with a bandwidth of 3 kHz

Mechanical SSB filters with high flank slope used in the Sideband Unit SB 1145

Carrier tuning indicator with meter and cathode ray display unit



Technical Data

Frequency Range:	1.5 MHz to 30.1 MHz (220 m to 9.5 m)
Types of Service	
Double Sideband:	A1 CW telegraphy A2 MCW telegraphy A3 Telephony A4 Picture transmission
Single Sideband with Full Carrier:	A3H Telephony
Single Sideband with Reduced Carrier:	A3A Telephony A4A Facsimile, picture transmission A7A Multiplex telegraphy
Two Independent Sidebands with Reduced Carrier:	A3B Telephony A7B Multiplex telegraphy
Single Sideband with Suppressed Carrier:	A3J Telephony

For the specified types of service, no amplitude control (AGC) is possible alone according to the carrier or residual carrier, but in all cases except A3J service type, automatic frequency control (AFC) is possible according to the carrier or residual carrier component. No demodulation of the individual telegraphy channels is effected for the service types A7A and A7B.

The following technical specifications concern the characteristics of the complete TRA 8 equipment for A3A signal with the carrier suppressed by 20 dB. For equipment characteristics determined only by a single unit, please consult the descriptions of the individual units.

Amplitude/Frequency Response	
Attenuation in Passband:	< 3 dB
Attenuation in Stop Bands:	60 dB The selectively measured interference tone level is < -60 dBm for an interfering signal which would produce an AF level of 0 dBm across 600 Ω in the passband of the filters with MGC, and which actually lies in a stop band, 600 Hz from the nominal limit of the passband of the sideband filters.
Sensitivity:	The required sideband EMF is < 3 μV for an interference level of -20 dBm in the upper or lower 3 kHz sideband, referred to an AF level of 0 dBm across 600 Ω.
Output Interference Level:	with a sideband EMF of 10 mV in the upper or lower 3 kHz sideband, referred to an AF level of 0 dBm across 600 Ω: < -55 dBm
Nonlinear Crosstalk Level:	with two sideband signals having 10 mV EMF each, in the upper or lower sideband, referred to a single tone level of 0 dBm across 600 Ω: < -35 dBm
Harmonic Distortion Factor:	with a sideband signal of 10 mV EMF in the upper or lower sideband, referred to a tone level of 0 dBm across 600 Ω: < -45 dBm
AFC Tolerance:	The residual frequency error is ≤ 1 Hz with a sideband EMF > 3 μV
AFC Correction Rate:	< 30 Hz/s

Technical Remarks

Communications Transmissions

The received signal may be a transmission with one (SSB) or two independent (ISB) sidebands each with a bandwidth of 3 kHz, or it may be an HF-band double sideband (DSB) transmission. In the latter case, the DSB transmission is evaluated with a SSB receiver because, in case of interference through other transmissions, the undisturbed sideband can be selected with this system. Furthermore, SSB-demodulation avoids the effect of selective carrier fading which would otherwise produce disturbing distortion of the AF signal if A3-demodulation (carrier rectification) were to be used.

Maritime Radio

The introduction of single sideband operation with residual carrier in maritime radio for HF band telephony traffic calls for single-channel SSB receiver equipments on board the ships as well as in the coastal radio stations. DSB reception facilities are also important for these radio receiving stations, because DSB transmitters will still be in operation on board many ships throughout a long transition period. CW telephony reception is desirable for handling the service traffic under poor conditions of signal propagation.

Single Sideband Telegraphy Transmissions

The voice channels of a SSB link may also be used to accommodate VF telegraphy channels. In such systems with small frequency deviations, or when cascading several SSB links, the maximum tolerable frequency error is only a few Hertz. To satisfy this condition, the residual carrier component is used in the Sideband Unit SB 1145 for operating an AFC system. For this operating mode we recommend utilisation of the crystal oscillator in the Receiver E 127 KW/4.

Crystal Oscillator in the Receiver

For radio services which always use the same frequencies, or when trained operators are not available, it is desirable to stabilise the receiver oscillator by crystal control. The transmitter can then be heard as soon as it switches on and the residual carrier component is seen on the screen of the cathode ray display unit. The radio link is then ready for operation after slight fine tuning adjustment of the receiver crystal oscilla-

tor to bring the carrier frequency into the carrier filter passband. This system avoids confusion with closely adjacent transmitters running the same type of service.

Mechanical Filters

The utilisation of mechanical filters in the Sideband Unit SB 1145 for sideband and carrier filtering (200 kHz) ensures high flank slopes of the adjacent channel selectivity curve, thus giving good protection from interference through other transmitters operating on adjacent RF channels.

Amplitude Control (AGC)

The Sideband Unit SB 1145 is not equipped for automatic amplitude control (AGC) of the receiver according to the carrier component, residual carrier component or communications content of a sideband. This function is fulfilled by the Receiver E 127 itself.

Frequency Control (AFC)

The equipment is fitted with an AFC system which automatically holds the residual carrier component within the passband of the carrier filter. It is important to ensure that the AFC system is affected as little as possible by external interference. This problem arises in particular in case of selective fading of the carrier component, even though the amplitude in the carrier channel is held constant with the aid of limiters.

The following measurement simulating actually encountered operating conditions conveys a general impression of the dependability of the AFC system: AFC lock is retained in case of selective fading of the carrier component down to a level which is 10 dB less than the signal/noise ratio in the sideband (for 20 dB carrier suppression).

A sideband EMF of 3 μ V (residual carrier component EMF = 0.3 μ V) gives a signal/noise ratio of 20 dB according to the technical data. Thus the carrier may fade by 10 dB (down to 0.1 μ V) before the AFC system loses control.

To avoid the need for a mechanical coupling between the fine tuning motor and the tuning controls of the Sideband Unit SB 1145, the motor tunes the crystal oscillators in the SB 1145 via a potentiometer.

Tuning

Under poor conditions of signal propagation it is difficult to tune single side-

band receivers because the small residual carrier component then tends to be lost in the noise background. Thus the TRA 8 equipment includes a Cathode Ray Display Unit SG 455, on whose screen the carrier appears as a vertical line or as a Lissajous figure. The line stands at the center of the screen when the frequency of the residual carrier in the carrier channel is equal to its nominal value. In all other cases, the line is displaced to one side or the other, whereby the direction of this displacement indicates the sense of the frequency discrepancy. Proper functioning of the AFC system can readily be checked with the Lissajous figure.

Bandwidth and Selectivity

The bandwidth of the single sideband filters for the upper sideband and for the lower sideband is 3 kHz. The static selectivity characteristics of the equipment are determined solely by the very steep flanks of the sideband filter response curves.

The AFC system lies beyond the IF filters of the receiver, so that in the limiting case the actually utilisable bandwidth reduces to the lock range of the AFC system. In other words, a signal level reduction by about 6 dB may result for audio frequencies above 2700 Hz.

Nonlinear Crosstalk

Due to residual nonlinearities of the transmitter and the receiver, multichannel single sideband transmission systems are subject to nonlinear crosstalk, from one sideband to the other as well as within one and the same sideband. Power efficiency considerations for the transmitter preclude suppression of this nonlinear crosstalk at the transmitter by a factor greater than 35 dB (below the level of one single tone when driving with two tones of nominal level). The nonlinear crosstalk, suppression factor of the TRA 8 equipment is also about 35 dB.



AFC Range: Referred to the tuned-in reception frequency, the control range of the AFC system with a sideband EMF $> 3 \mu\text{V}$ is:
Lock range at least $\pm 500 \text{ Hz}$
Pull-in range at least $\pm 50 \text{ Hz}$

Tuning Indication with Cathode Ray Display Unit SG 455: Line display of the carrier according to frequency discrepancy, or display of the Lissajous figure formed with the carrier signal and the demodulating oscillator

without cathode ray display unit, only with the Sideband Unit SB 1145: Display on built-in meter, by forming the difference frequency between the carrier and the demodulating oscillator

Power Supply

Mains Switch: Central on the Receiver E 127 KW/4
Mains Voltage: 110/220 V $\pm 10 \%$, 45 to 60 Hz
Power Consumption: 150 VA maximum

Dimensions and Weight:

Height mm	Width mm	Depth mm	Weight approx. kg
490	535	400	56

Scope of Delivery

- 1 HF Receiver E 127 KW/4
- 1 Sideband Unit SB 1145
- 1 Sideband Adapter SZ 1091
- 1 Cathode Ray Display Unit SG 455 with EO 455
- 1 Equipment Cabinet with wiring
- 1 Mains Connecting Cable, 2 m long, according to 5L 4941.001-19
- 1 RF Plug SHF 13/s-2 according to 5N 4521.401-11
- 1 5-pole Line Plug according to 5L 4541.002-46
- 1 Set of Descriptions and Operating Instructions for the equipment and for the individual units

Accessory Units:
(to special order)

Crystal Oscillator for incorporation in E 127 KW/4
Crystals for crystal oscillator (please specify frequencies with order)

Accessories:
(to special order)

Adapter Cards