STABILOCK 4031/4032

Option card

Hardware Option 236 033

Operating Instructions

Doc. Version: 9812-100-B

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Supplement to operating manual; file under Chapter 9

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Contents

☞ **For differences from former versions:** see the Lifeline at the end of this supplement.

Introduction

The OPTION CARD can hold up to six optional modules at the same time, this OPTION CARD merely being the motherboard for the individual modules. As soon as an optional module is installed, it can be cut into the appropriate signal path of the STABILOCK by means of the OPTION CARD mask (callup with [AUX]) or taken out of it again. The following optional modules are presently available:

Optional modules

Optional module	Ordering code	Optional module	Ordering code
300-Hz highpass filter	248 199	4-kHz bandpass filter	248 175
300-Hz lowpass filter	248 174	6-kHz bandpass filter	248 176
var. notch filter (200 to 600 Hz)	248 179	6-kHz notch filter	248 177
var. notch filter (200 to 1200 Hz)	248 195	C-Net expander	248 116
var. notch filter (150 to 600 Hz)	248 204	DTMF module	248 171
DC V/A meter	248 172	50-Hz...15-kHz-bandpass filter	248 278
3-kHz lowpass filter	248 186	Filter adapter	248 269

Fitting on OPTION CARD

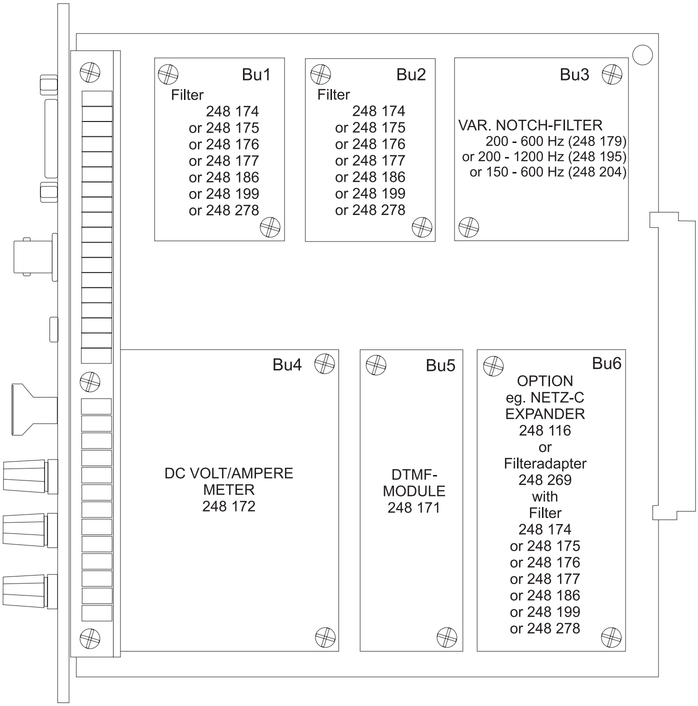


Fig. 9.1: The various modules have locations on the OPTION CARD (figure). Only locations Bu 1, Bu 2 and Bu 6 offer a choice: Bu 1 and Bu 2 can each hold one of the AF filters, Bu 6 can hold the C-Net expander or another special option (eg the filter adapter and one AF filter). For making contact, each module has a plug connector that uniquely matches the corresponding socket connector on the OPTION CARD. Before installing the DC V/A meter, first remove the shield from the OPTION CARD that covers the leadthrough of the connecting sockets.

Installation of OPTION CARD

1. Switch off the Communication Test Set and withdraw the power cable.
2. Unscrew the cover plate at location 2 on the back panel.
3. Slide the OPTION CARD along the guide as far as it will go into the slot that is provided.
4. Screw the OPTION CARD firmly to the chassis.
5. If the OPTION CARD is fitted with one of the four AF filters or the variable notch filter: join socket
   90 (OPTION CARD) and socket 15 (AF DETECTOR) with the adapter cable.
6. Reconnect the power cable.

Meaning of sockets

Socket 90 (Bu 90): Interface (AF and control signals) for connecting the OPTION CARD to module 1.

Socket 95 (Bu 95): AF input (AF EXT) for optional DTMF module (see also Chapter 8).
0.1 V V_{rms} 1 V
R_i = > 10 kΩ

Socket 94 (Bu 94): GND terminal for Bu 93.

Socket 93 (Bu 93): DC voltage test input of optional module DC-V/A meter.
V_{max} = 42 V
R_i = 850 kΩ to 5.6 MΩ (depending on test range; see Chapter 8).

Socket 92 (Bu 92):
Socket 91 (Bu 91): The 10-mΩ precision resistor of the ammeter (optional module DC-V/A meter) is across Bu 92 and Bu 91. Both sockets are floating (see also "AF Signal Paths").
I_{max} = 15 A

Operational check

1. Switch the unit on with [OFF] + [POWER].
2. Call up the OPTIONS mask with (OPTIONS) and check whether the installation of the OPTION CARD and its optional modules is indicated.
3. Call up the OPTION CARD mask with [AUX] and check whether the availability of the optional modules is indicated there too.

Filter adapter (248 269)

Application

You can use the filter adapter to insert an extra filter in slot Bu 6 instead of the C-Net expander.

Installation

Plug the filter adapter onto the OPTION CARD and the required filter onto the filter adapter.

300-Hz Highpass Filter (248 199)

Technical data

Filter type	5-pole Chebishev-Cauer filter
3-dB cutoff frequency	280 Hz
Stopband attenuation	27 dB
Ripple	+0.2 to –1.3 dB (in passband)

Application

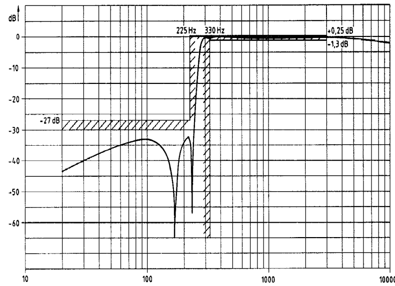
Elimination of system hum or low-frequency SAT (supervisory audio tone, pilot tone) from AF signal.

Operation

Call up the OPTION CARD mask with [AUX]. Depending on the slot in which the highpass filter is inserted (Bu 1 or Bu 2), the appropriate mask text field indicates for example `Filter 1 :  300 Hz HP.` [HELP] shows that there is a scroll field following the colon of the text field. This field can be accessed with the cursor keys. If the filter is to be cut into the AF signal path of the STABILOCK, enter the scroll variable `X` in the field ("crossing" of the scroll field) by turning the handwheel for example. The filter can be cut out of the signal path again by selecting the second scroll variable (space). In both cases the switching function occurs as you leave the OPTION CARD mask.

If the second slot is also fitted with a filter, the two filters are connected in series if both scroll fields are crossed at the same time in the OPTION CARD mask.

Fig. 9.2:
Frequency characteristics of the 300-Hz Highpass filter.



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300-Hz Lowpass Filter (248 174)

Technical data

Filter type	2nd-order Butterworth filter
3-dB cutoff frequency	338 Hz ±15 Hz
Insertion loss	0 dB ±0.5 dB
Stopband attenuation	40 dB (at 3 kHz)

Application

Suppression of higher-frequency interference components when measuring pilot tones (SAT).

Operation

Call up the OPTION CARD mask with [AUX]. Depending on the slot in which the lowpass filter is inserted (Bu 1 or Bu 2), the appropriate mask text field indicates for example `Filter 2 :  300 Hz TP.` [HELP] shows that there is a scroll field following the colon of the text field. This field can be accessed with the cursor keys. If the filter is to be cut into the AF signal path of the STABILOCK, enter the scroll variable `X` in the field ("crossing" of the scroll field) by turning the handwheel for example. The filter can be cut out of the signal path again by selecting the second scroll variable (space). In both cases the switching function occurs as you leave the OPTION CARD mask.

If the second slot is also fitted with a filter, the two filters are connected in series if both scroll fields are crossed at the same time in the OPTION CARD mask.

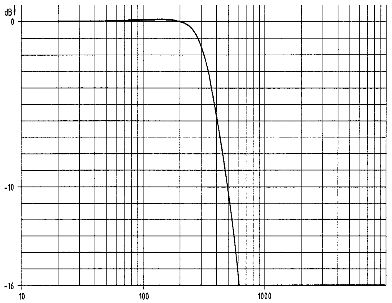


Fig. 9.3:
Frequency characteristics of the 300-Hz Lowpass filter.

3-kHz Lowpass Filter (248 186)

Technical data

Filter type	6th-order Butterworth filter
3-dB cutoff frequency	4.75 kHz ±100 Hz
Insertion loss	0 dB ± 0.5 dB
Stopband attenuation	min. 50 dB (at 15 kHz)

Application

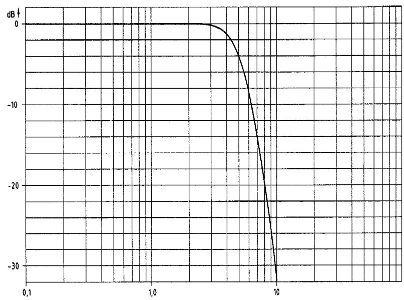
Elimination of higher-frequency interference components from speech band.

Operation

Call up the OPTION CARD mask with [AUX]. Depending on the slot in which the lowpass filter is inserted (Bu 1 or Bu 2), the appropriate mask text field indicates for example `Filter 1 :   3 kHz TP.` [HELP] shows that there is a scroll field following the colon of the text field. This field can be accessed with the cursor keys. If the filter is to be cut into the AF signal path of the STABILOCK, enter the scroll variable `X` in the field ("crossing" of the scroll field) by turning the handwheel for example. The filter can be cut out of the signal path again by selecting the second scroll variable (space). In both cases the switching function occurs as you leave the OPTION CARD mask.

If the second slot is also fitted with a filter, the two filters are connected in series if both scroll fields are crossed at the same time in the OPTION CARD mask.

Fig. 9.4:
Frequency characteristics of the
3-kHz Lowpass filter



4-kHz Bandpass Filter (248 175)

Technical data

Filter type	asymmetrical H section
Insertion loss	0 dB ±0.2 dB (at centre frequency 4 kHz)
Ripple	≤ 0.2 dB (at 4 kHz ±54 Hz)
Bandwidth.	±100 Hz (–3 dB) or ±180 Hz (–6 dB)
Far-off attenuation	–28 dB (for f < 2 kHz and f > 7 kHz)

Application

Measurement of the pilot tone (SAT) in NMT radio-data systems.

Operation

Call up the OPTION CARD mask with AUX. Depending on the slot in which the bandpass filter is inserted (Bu 1 or Bu 2), the appropriate mask text field indicates for example `Filter 2 :  4 kHz BP.` HELP shows that there is a scroll field following the colon of the text field. This field can be accessed with the cursor keys. If the filter is to be cut into the AF signal path of the STABILOCK, enter the scroll variable `X` in the field ("crossing" of the scroll field) by turning the handwheel for example. The filter can be cut out of the signal path again by selecting the second scroll variable (space). In both cases the switching function occurs as you leave the OPTION CARD mask.

If the second slot is also fitted with a filter, the two filters are connected in series if both scroll fields are crossed at the same time in the OPTION CARD mask.

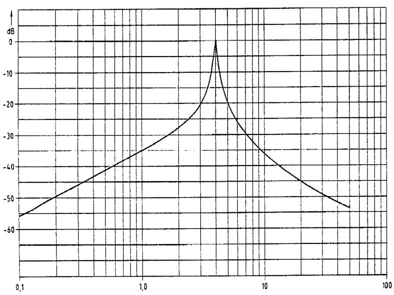


Fig. 9.5:
Frequency characteristics of the 4-kHz Bandpass filter.

6-kHz Bandpass Filter (248 176)

Technical data

Filter type	inverted H section
Insertion loss	0 dB ±0.2 dB (at centre frequency 6 kHz)
Ripple	≤ 0.2 dB (at 6 kHz ±54 Hz)
Bandwidth.	±80 Hz (–3 dB) or ±150 Hz (–6 dB)
Far-off attenuation	–33 dB (for f < 3 kHz and f > 10 kHz)

Application

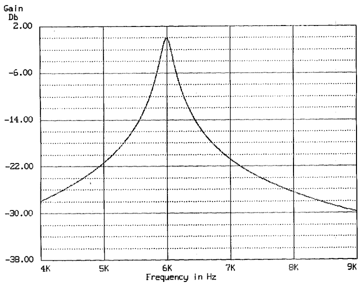
Measurement of the pilot tone (SAT) in AMPS radio-data systems.

Operation

Call up the OPTION CARD mask with [AUX]. Depending on the slot in which the bandpass filter is inserted (Bu 1 or Bu 2), the appropriate mask text field indicates for example `Filter 2 :  6 kHz BP.` [HELP] shows that there is a scroll field following the colon of the text field. This field can be accessed with the cursor keys. If the filter is to be cut into the AF signal path of the STABILOCK, enter the scroll variable `X` in the field ("crossing" of the scroll field) by turning the handwheel for example. The filter can be cut out of the signal path again by selecting the second scroll variable (space). In both cases the switching function occurs as you leave the OPTION CARD mask.

If the second slot is also fitted with a filter, the two filters are connected in series if both scroll fields are crossed at the same time in the OPTION CARD mask.

Fig. 9.6:
Frequency characteristics of the 6-kHz Bandpass filter.



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6-kHz Notch Filter (248 177)

Technical data

Filter type	H section
Tuning band	6 kHz ±30 Hz
Measuring range	±100 Hz (<–30 dB)
Insertion loss	0 dB
Minimum attenuation in notch band	typ. 60 dB

Application

Measurement of the pilot tone (SAT) in AMPS and ETACS radio-data systems.

Operation

Call up the OPTION CARD mask with [AUX]. [HELP] shows that there is a scroll field following the colon of the text field `Filter 2:  6 kHz NF`. This field can be accessed with the cursor keys. If the filter is to be cut into the AF signal path of the STABILOCK, enter the scroll variable `X` in the field ("crossing" of the scroll field) by turning the handwheel for example. The filter can be cut out of the signal path again by selecting the second scroll variable (space).

The 6 kHz notch filter replaces the standard 1-kHz notch filter in the AF signal path if the appropriate scroll variable has been crossed and the DIST meter is called up with [DIST] after returning to a basic mask (eg RX or TX). The filter tunes automatically to the fundamental of the current AF signal as long as the frequency of the fundamental is within the tuning range of the filter. The distortion that is determined is read off the DIST meter just like in standard distortion measurement.

☞ When you measure with the variable notch filter, none of the other AF filters may be cut in, because these are in series with the notch filter and would falsify the measured result.

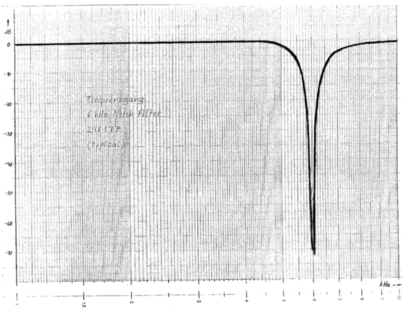


Fig. 9.7:
Frequency characteristics of the 6 kHz notch filter.

50-Hz to 15-kHz Bandpass Filter (248 278)

Technical data

Filter type	Bessel filter
Tuning band	50 Hz to 15 kHz
Insertion loss	0 dB
Ripple	≤ 0.2 dB (at 4 kHz ±54 Hz)
Far-off attenuation	–16 dB (for f < 20 Hz) –13 dB (for f > 30 kHz)

Application

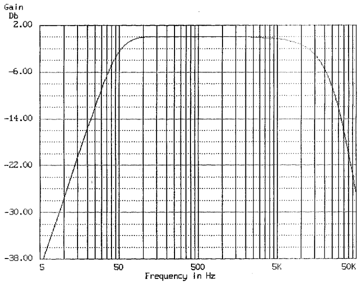
Measurement of distortion at fundamental frequencies.

Operation

Call up the OPTION CARD mask with [AUX]. [HELP] shows that there is a scroll field following the colon of the text field `Filter 2:  Customer`. This field can be accessed with the cursor keys. If the filter is to be cut into the AF signal path of the STABILOCK, enter the scroll variable `X` in the field ("crossing" of the scroll field) by turning the handwheel for example. The filter can be cut out of the signal path again by selecting the second scroll variable (space).

☞ When you measure with the variable notch filter, none of the other AF filters may be cut in, because these are in series with the notch filter and would falsify the measured result.

Fig. 9.8:
Frequency characteristics of the 50-Hz to 15-kHz bandpass filter.



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Variable Notch Filter (248 179)

Technical data

Filter type	self-tuning digital filter
Tuning band	200 to 600 Hz
Measuring range (–3dB)	50 Hz to 5.5 kHz
Insertion loss	0 dB
Minimum attenuation in notch band	typ. 60 dB
Collar width (–3 dB)	$\pm 0.2\ f_{notch}$

Application

Measurement of distortion at fundamental frequencies between 200 and 600 Hz.

Operation

Call up the OPTION CARD mask with [AUX]. [HELP] shows that there is a scroll field following the colon of the text field `Var. Notch:`. This field can be accessed with the cursor keys. If the filter is to be cut into the AF signal path of the STABILOCK, enter the scroll variable `X` in the field ("crossing" of the scroll field) by turning the handwheel for example. The filter can be cut out of the signal path again by selecting the second scroll variable (space).

The variable notch filter replaces the standard 1-kHz notch filter in the AF signal path if the appropriate scroll variable has been crossed and the DIST meter is called up with [DIST] after returning to a basic mask (eg RX or TX). The filter tunes automatically to the fundamental of the current AF signal as long as the frequency of the fundamental is within the tuning range of the filter. The distortion that is determined is read off the DIST meter just like in standard distortion measurement.

☞ When you measure with the variable notch filter, none of the other AF filters may be cut in, because these are in series with the notch filter and would falsify the measured result.

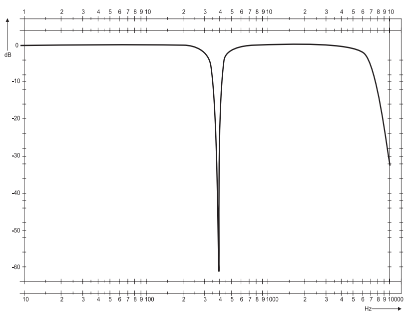


Fig. 9.9:
Frequency characteristics of the variable notch filter.

Variable Notch Filter (248 195)

Technical data

Filter type	self-tuning digital filter
Tuning band	200 to 1200 Hz
Measuring range (–3dB)	50 Hz to 5.5 kHz
Insertion loss	0 dB
Minimum attenuation in notch band	typ. 60 dB
Collar width (–3 dB)	$\pm 0.2 \ f_{notch}$

Application

Measurement of distortion at fundamental frequencies between 200 and 2000 Hz.

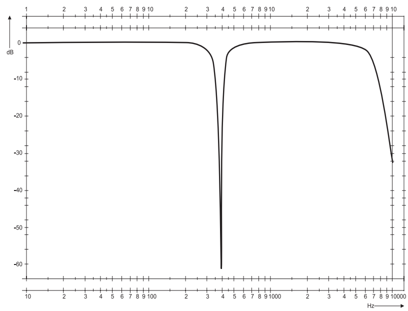
Operation

Call up the OPTION CARD mask with [AUX]. [HELP] shows that there is a scroll field following the colon of the text field `Var. Notch:`. This field can be accessed with the cursor keys. If the filter is to be cut into the AF signal path of the STABILOCK, enter the scroll variable `X` in the field ("crossing" of the scroll field) by turning the handwheel for example. The filter can be cut out of the signal path again by selecting the second scroll variable (space).

The variable notch filter replaces the standard 1-kHz notch filter in the AF signal path if the appropriate scroll variable has been crossed and the DIST meter is called up with [DIST] after returning to a basic mask (eg RX or TX). The filter tunes automatically to the fundamental of the current AF signal as long as the frequency of the fundamental is within the tuning range of the filter. The distortion that is determined is read off the DIST meter just like in standard distortion measurement.

☞ When you measure with the variable notch filter, none of the other AF filters may be cut in, because these are in series with the notch filter and would falsify the measured result.

Fig. 9.10:
Frequency characteristics of the variable notch filter.



Variable Notch Filter (248 204)

Technical data

Filter type	self-tuning digital filter
Tuning band	150 to 600 Hz
Measuring range (–3dB)	50 Hz to 5.5 kHz
Insertion loss	0 dB
Minimum attenuation in notch band	typ. 60 dB
Collar width (–3 dB)	$\pm 0.2\ f_{notch}$

Application

Measurement of distortion at fundamental frequencies between 150 and 600 Hz.

Operation

Call up the OPTION CARD mask with [AUX]. [HELP] shows that there is a scroll field following the colon of the text field `150 Hz...600 Hz:`. This field can be accessed with the cursor keys. If the filter is to be cut into the AF signal path of the STABILOCK, enter the scroll variable `X` in the field ("crossing" of the scroll field) by turning the handwheel for example. The filter can be cut out of the signal path again by selecting the second scroll variable (space).

The variable notch filter replaces the standard 1-kHz notch filter in the AF signal path if the appropriate scroll variable has been crossed and the DIST meter is called up with [DIST] after returning to a basic mask (eg RX or TX). The filter tunes automatically to the fundamental of the current AF signal as long as the frequency of the fundamental is within the tuning range of the filter. The distortion that is determined is read off the DIST meter just like in standard distortion measurement.

☞ When you measure with the variable notch filter, none of the other AF filters may be cut in, because these are in series with the notch filter and would falsify the measured result.

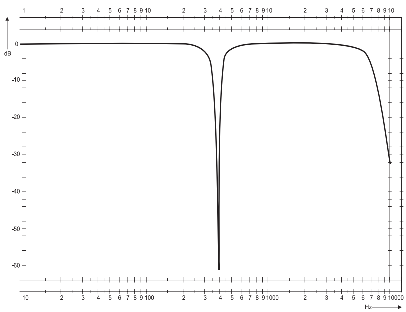


Fig. 9.11:
Frequency characteristics of the variable notch filter.

DC Voltmeter/Ammeter (248 172)

Technical data

Voltmeter
V_{max} = 42 V
Measuring error ≤1% ±1 digit

Measuring ranges	Resolution	Input impedance
V ≤ 400 mV	100 µV	5,6 MΩ
V ≤ 4 V	1 mV	910 kΩ
V ≤ 40 V	10 mV	850 kΩ
V > 40 V	100 mV	850 kΩ

Ammeter
I_{max} = 15 A
Measuring error ≤4% ±10 mA

Measuring ranges	Resolution
I ≤ 0,8 A	1 mA
I ≤ 1 A	2 mA
I≤ 8 A	10 mA
I ≤ 10 A	20 mA
I > 10 A	100 mA

Precision resistor: 10 mΩ

The voltmeter and ammeter appear in the OPTION CARD mask (callup with [AUX]) as simulated pointer meters with an additional digital display. Both meters work with automatic range switching.

Application

DC voltage measurements, eg operating voltage of a radio set.

Test inputs

Back panel of OPTION CARD
Bu 91 – Bu 92 Ammeter (both sockets floating)
Bu 93 – Bu 94 Voltmeter (Bu 94 = ground)

DTMF Device (248 171)

Application

Generation and evaluation of dual tones as necessary for checking telephones in the VDEW network for example (DTMF: dual-tone multi-frequency).

Functional description

The DTMF device consists of an analyzer and a generator. The input signal for the analyzer is normally the demodulated received signal, but an externally derived AF signal (AF EXT) can also be applied to socket Bu 95 of the OPTION CARD (back panel).
In the AF signal the analyzer separates the upper frequency-band group from the lower one and determines the DTMF frequencies. If the comparison with the 16 standard DTMF frequencies shows that a tone has been correctly detected, this tone will be evaluated.
Upon an enabling pulse from the RF/AF microprocessor the generator feeds the modulator of the STABILOCK with dual tones (all standard frequencies). The upper and lower tones are generated separately and fed to a summing amplifier.

Operation

Following selection of the basic RX/TX parameters (transmit frequency, transmit level, modulation, receive frequency, etc), first call up the OPTION CARD mask with [AUX]. Then branch from there with (DTMF) to the DTMF mask (figure). This branching is only possible if the OPTION CARD is fitted with the DTMF device.

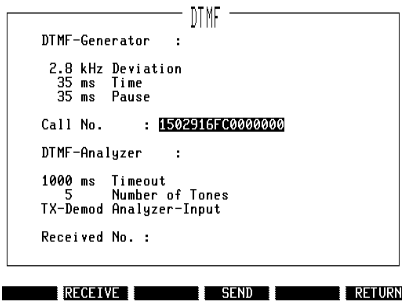


Fig. 9.12:
DTMF mask: In this mask the essential parameters are defined for transmitting and receiving DTMF-coded call numbers. The `Call No.` field (call number to be transmitted) shows that the call number may also contain the hex digits A through F.

In the upper half of the DTMF mask it is possible to set parameters for transmitting a call number (`DTMF Generator`), and in the lower half of the mask the corresponding parameters for receiving a call number (`DTMF Analyzer`). If you are not yet familiar with the locations of the entry fields, [HELP] will briefly brighten up all available entry fields. Each field can be accessed with the cursor keys. Entries in numeric fields must be terminated as usual with [ENTER]. The meanings of the individual entry fields are as follows:

`Deviation`	(pure numeric field); determines the FM deviation with which the DTMF signals are transmitted on the carrier frequency of the STABILOCK signal generator (setting in RX mask).
`Time`	(pure numeric field); specifies the duration of the individual dual tones.
`Pause`	(pure numeric field); specifies the duration of the pauses between the individual dual tones.
`Call No.`	(pure hexadecimal numeric field); entry field for the maximally 16-digit call number that is to be transmitted. Entry of the decimal digits on the numeric cluster and of the hexadecimal digits on the softkeys. Incorrect entries can be changed by moving back to them with the cursor and overwriting them.
`Timeout`	(pure numeric field); defines the waiting time that starts after the arrival of the first dual tone. When this timeout has elapsed, the evaluation of the DTMF signals is terminated.
`Number of tones`	(pure numeric field); specifies how many of the arriving dual tones are actually evaluated (permissible values: 0 to 16).
`Analyzer Input`	(scroll field); the two scroll variables determine with what signal the DTMF analyzer is fed: `TX-Demod` = Evaluation of demodulated received signal `AF-EXT` = Evaluation of signal applied to socket Bu 95 (OPTION CARD, back panel)
`Received No.`	(display field); shows the received call number.

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(SEND) produces one-time transmission of the entered call number with the appropriate parameters. As long as transmission is being made, the softkey has the alternative function `STOP` for terminating transmission.

(RECEIVE) sets up the DTMF analyzer for the arrival of dual tones. As long as the analyzer is waiting for dual tones, the softkey has the alternative function `STOP`. In this way the analysis mode can still be exited from when the very first dual tone fails to appear.

Results readout on controller

The digits of a decoded call number (content of `Received No.` field) can be read to a controller with the IEEE command RESULt1.

C-Net Expander (248 116)

Application

C-Net radiotelephones: removal of the "burst signaling" from the demodulated signal and expansion of the signal (compressed at the transmitting end). The resulting pure AF signal can be examined in the customary manner; the usual conclusions can be drawn about the modulation characteristics of the radio set's transmitter.

Functional description

The C-Net expander is fed with the demodulated received signal TX DEMOD. The signal has been compressed at the transmitting end (radio set) by a factor of 0.1. This has produced a time slot of 1.136 ms into which the radio set has inserted part of the data-block sequence (burst signaling). The expander digitizes the TX DEMOD signal with an 8-bit A/D converter and loads the data that do not fall into the time slot into a first-in-first-out buffer. The synchronization is performed by control pulses derived from the DATA module. The data are then read out of the buffer more slowly by a factor of 0.1 than they were written in. In this way the burst signaling is removed from the signal and the latter is expanded. For restoring the original form of the signal, it is applied to a D/A converter and filters before being transferred to the AF DETECTOR for evaluation. The inherent distortion of the C-Net expander is less than 1 % for full modulation in the frequency range 300 Hz through 3 kHz.

Operation

Call up the OPTION CARD mask with [AUX]. If location Bu 6 on the OPTION CARD is fitted with the expander, the mask will indicate this with `Option : C-Net Expander`. For activating the expander, enter the scroll variable `X` in the scroll field following the colon. If you then call up the basic TX mask, the usual measurements will be possible of the modulation characteristics of the subscriber set (eg modulation distortion and modulation frequency response). The results are no longer falsified by the burst signaling.

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☞ If the C-Net Expander is fed with an AF signal without "burst signaling", it will block this signal (no output signal).

To disconnect the expander, enter the scroll variable " " (space) following the text field `Option :` in the OPTION CARD mask.

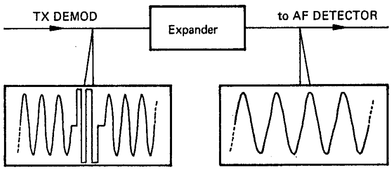

Fig. 9.13: The expander eliminates burst signaling from the AF signal and closes the signal gap by expanding the signal.

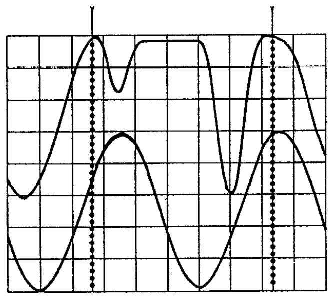

Fig. 9.14: AF signal with burst signaling (between marking lines) before the expander and without signaling after the expander.

Lifeline

The chronological lifeline tells you what modifications have been made to the hardware (HW) and the operating instructions. After a hardware update the lifeline helps you to find out quickly about all major changes (see code) in the updated operating instructions that are supplied.

Code: C = Correction, IN = Important Note, NF = New Feature

Doc. Version	Δ pages	Code	Changes
9604-100-A	9-13	NF	6 kHz bandpass filter added.
	9-14	NF	6 kHz notch filter added.
	9-15	NF	50 Hz to 15 kHz bandpass filter added.
	9-8	NF	Filteradapter added.
9812-100-B	9-5 9-6 9-17 9-18	NF	Variable notch filters (248 195 and 248 204) added.
	9-8 to 9-23	C	Ordering codes added.

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