R&S® Series 890
VLF-HF Receivers
R&S® EK895/ R&S® EK896
User Manual

6164.0171.02 - 01

Radiocommunications Systems Division

User Manual

ROHDE&SCHWARZ

The documentation describes following models:

R&S® EK895 — 6057.8996.xx — SW Version: 04.00 — DSP Version: 02.00
R&S® EK896 — 6038.2509.xx — SW Version: 04.00 — DSP Version: 02.00

81671 Munich, Germany

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ROHDE&SCHWARZ

KONFORMITÄTSERKLÄRUNG gemäß dem Gesetz über Funkanlagen und Telekommunikationsendeinrichtungen (FTEG) und der Richtlinie 1999/5/EG (R&TTE)
DECLARATION OF CONFORMITY in accordance with the Radio and Telecommunications Terminal Equipment Act (FTEG) and Directive 1999/5/EC (R&TTE Directive)

CE

Zertifikat-Nr.: / Certificate No.: 2006-77

Hiermit wird bescheinigt, dass die Funkanlage
This is to certify that the radio equipment

Gerätetyp Equipment Type	Materialnummer Stock No.	Benennung Designation
EK895	**6057.8996.02/.12/.14/.17/.37**	**VLF-HF-Digital-Empfänger** VLF-HF Digital Receiver

Geräteklasse: / Equipment class: 1.7 (Receive-only radio equipment)

inklusive ihrer in der Anlage aufgelisteten Bestückungsoptionen bei bestimmungsgemäßer Verwendung den grundlegenden Anforderungen des § 3 und den übrigen einschlägigen Bestimmungen des FTEG (Artikel 3 der R&TTE) entspricht. *)
including all options and variants listed in the enclosure complies with the essential requirements of §3 and the other relevant provisions of the FTEG (Article 3 of the R&TTE Directive), when used for its intended purpose. *)

- Gesundheit und Sicherheit gemäß § 3 (1) 1 (Artikel 3 (1) a))
- Health and safety requirements pursuant to § 3 (1) 1 (Article 3(1) a))

- Schutzanforderungen in Bezug auf die elektromagn. Verträglichkeit § 3 (1) 2, Artikel 3 (1) b))
- Protection requirements concerning electromagnetic compatibility § 3(1)(2), (Article 3(1)(b))

- Maßnahmen zur effizienten Nutzung des Funkfrequenzspektrums
- Measures for the efficient use of the radio frequency spectrum

- Luftschnittstelle bei Funkanlagen gemäß § 3(2) (Artikel 3(2))
- Air interface of the radio systems pursuant to § 3(2) (Article 3(2))

Angewendete harmonisierte Normen: Harmonized standards applied:	EN 60950-1 : 2001 ETSI EN 300373-1 V1.2.1 (2002-10) *) ETSI EN 300373-2 V1.1.1 (2004-01) ETSI EN 300373-3 V1.1.1 (2004-01)
Einhaltung der grundlegenden Anforderungen auf andere Art und Weise (hierzu verwendete Standards/Spezifikationen): Other means of proving conformity with the essential requirements (standards/specifications used):	---

*) Einschränkungen zu Kapitel 7.5 und 7.6 siehe Bedienhandbuch.
*) For limitations regarding chapters 7.5 and 7.6 see operating manual.

Anbringung des CE-Zeichens ab: 2006 / Affixing the EC conformity mark as from 2006

ROHDE & SCHWARZ GmbH & Co. KG
Mühldorfstr. 15, D-81671 München

München, den 18. Januar 2007
Munich, 2007-01-18

Zentrales Qualitätsmanagement MF-QZ / Radde
Central Quality Management

6164.0717.02_01

KONFORMITÄTSERKLÄRUNG gemäß dem Gesetz über Funkanlagen und Telekommunikationsendeinrichtungen (FTEG) und der Richtlinie 1999/5/EG (R&TTE)
DECLARATION OF CONFORMITY in accordance with the Radio and Telecommunications Terminal Equipment Act (FTEG) and Directive 1999/5/EC (R&TTE Directive)

Anlage zu Zertifikat-Nr.: 2006-77
Enclosure to Certificate No.:

Gerätetyp Equipment Type	Materialnummer Stock No.	Benennung Designation
FK890H1	**6007.7750.02**	**Preselection Unit**
GM893	**6051.8494.03**	**Broadband IF Output**
GC890	**6007.7809.02**	**BCD-Interface**
GB899	**6037.3501.03**	**Remote Control Unit**
UX895	**6077.0261.02**	**IF conversion**
GH890	**6007.6054.02**	**TTY Line Current Source**
GB899	**6037.3501.02/03**	**Remote Control Unit**

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Hiermit wird bescheinigt, dass die Funkanlage
This is to certify that the radio equipment

Gerätetyp Equipment Type	Materialnummer Stock No.	Benennung Designation
EK896	**6038.2509.12/.14/.17/.37**	**VLF-HF-Digital-Suchempfänger** VLF-HF Digital Search Receiver

Geräteklasse: / Equipment class: 1.7 (Receive-only radio equipment)

inklusive ihrer in der Anlage aufgelisteten Bestückungsoptionen bei bestimmungsgemäßer Verwendung den grundlegenden Anforderungen des § 3 und den übrigen einschlägigen Bestimmungen des FTEG (Artikel 3 der R&TTE) entspricht. *)
including all options and variants listed in the enclosure complies with the essential requirements of §3 and the other relevant provisions of the FTEG (Article 3 of the R&TTE Directive), when used for its intended purpose. *)

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Notice:

The HF Receivers R&S® EK 895 / R&S® EK 896 were tested in accordance with ETSI EN 300 373-1 V1.2.1 (2002-10) with the following deviations:

1. ETSI EN 300 373-1 / 7.5 Temperature Tests

   In accordance with the R&S® EK895 / R&S® EK896 specification, the device was tested at -10 °C to +45 °C (ETSI EN 300 373-1 demands a temperature range of -15 °C to +55 °C for internally mounted equipment).

2. ETSI EN 300 373-1 / 7.6 Corrosion Test

   The device must be operated in a room where it is protected against the effects of corrosive environment.

CAUTION

When switching the VLF-HF Receiver EK 895 on at an ambient temperature of -25 °C, allow approx. 15 minutes for the receiver to reach its full serviceability.

Definitions

BIT	In the BIT (built-in test) it is checked whether all modules of the basic unit are installed and operative. If required, error messages are output which may also inform on the operating status of the installed options. In addition, the Tx and Rx paths are checked. The BIT is initiated either through switch-on or on purpose during operation by pressing softkey BIT in the MAIN menu.
Check	In appropriate measurements by means of the specified test equipment proper functioning of a unit or module is established.
CM	In CM (continuous monitoring) all important equipment functions are permanently monitored. This check is automatic. Error messages are output following which the operator can initiate the BIT to localize the fault.
Disconnect	Pull off connector.
Examine	In case of trouble the unit / module or components such as e.g. connectors, are to be thoroughly checked for obvious mechanical damage.
Functional check	This means that components / modules / units are checked for proper functioning while installed.
Hazardous voltages	Voltages $> 30\ V_{rms}$ or $50\ V_{pp}$ (AC) or 50 V (DC)
Make sure	Ascertain whether all mentioned requirements are met or all measures are taken to establish the required condition.
Open	Access is to be gained to the unit / module by observing the given instructions and safety precautions.
Perfect condition	This means that a component / module / unit has to be in a state which does not give cause to complaints.
Replacement	In case of trouble the replacement of modules is carried out in order to localize and eliminate the fault.
Replace	Components / modules / units which - due to damage and / or other defects - no longer meet the respective requirements or components / modules / units which during troubleshooting were identified as the cause of fault, are to be replaced.
Simple measurements	In addition to the BIT, the operating condition of the overall equipment can be checked directly by measuring the transmit and receive functions. If the given nominal values are not reached, the entire transceiver must be sent for repair.

Visual examination	This is a visual inspection of the outer appearance and completeness of a component / module / unit without manual interference by the examiner. This does not include the necessary preparations and finishing work such as e.g. opening and closing of covers or similar.

Notices

The three different notices used in this User Manual have the following meaning:

WARNING

This heading is used to indicate that inaccurate observance or nonobservance of instructions or methods can cause injury or even fatal accidents or during an operation described hazardous material can be set free in the unit or system.

CAUTION

This heading is used to indicate that inaccurate observance or nonobservance of instructions or methods can cause damage to the unit.

Note:

This heading is used to draw the reader's attention to a particular fact.

This User Manual contains the following 'Warning':

WARNING

Do not open the cover unless the VLF-HF receiver is disconnected from mains voltage!

User Information

Purpose of the Manual

This Manual provides all information the operators and service staff need to maintain levels 1 and 2 of repairs.

It contains all necessary information and instructions concerning the installation, putting into operation and control of the unit, plus troubleshooting instructions down to module level. In case of trouble this allows straightforward error localization as well as easy replacement of the module concerned. This permits the unit to be put back into proper working order and operation with minimum delay.

We recommend to keep complete spare units / modules in store.

Measuring Units

In this Manual the basic SI measuring units and units coherently derived from them are used by preference. In exceptional cases units legally derived from the SI units acc. to DIN 1301 may also be used.

Symbols

The different symbols used in this Manual have the following meaning:

• = listing

→ = steps to be followed

User Manual

VLF - HF RECEIVERS
R&S EK 895 R&S EK 896

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1. Characteristics

1.1 Application

The digital VLF-HF Receiver R&S EK 895 is a powerful receiver for voice reception and data communication. It operates in the frequency range of 10 kHz to 30 MHz with a resolution of 1 Hz.

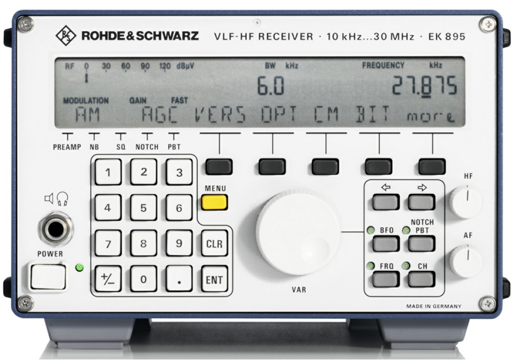
It is especially designed for civil, administrative and military applications, which require not only excellent HF characteristics such as large-signal strength but also optimum reliability.

The receiver can be locally controlled by means of the control and display elements on its front panel. These elements are part of a logically structured, menu-based operating concept, which allows to exclude forbidden or nonsense settings as well as any possible operating errors.

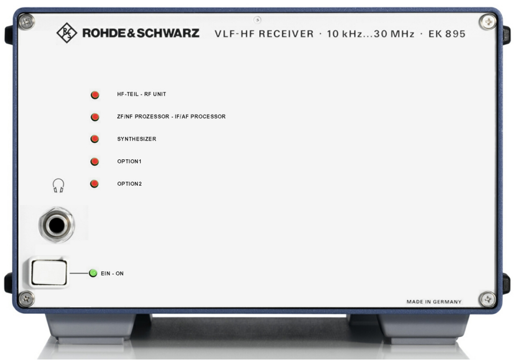
The receiver is also suitable for remote control via a conventional PC or an ASCII terminal.

The digital VLF-HF Receiver R&S EK 896 excels by the same high-performance features as the Receiver R&S EK 895. However, it is more intended to handle the complex tasks of radio monitoring, detection and intelligence. For this purpose it is additionally fitted with a loudspeaker. Many of the HF-specific operating functions are implemented in separate keys which offers optimum operating convenience.

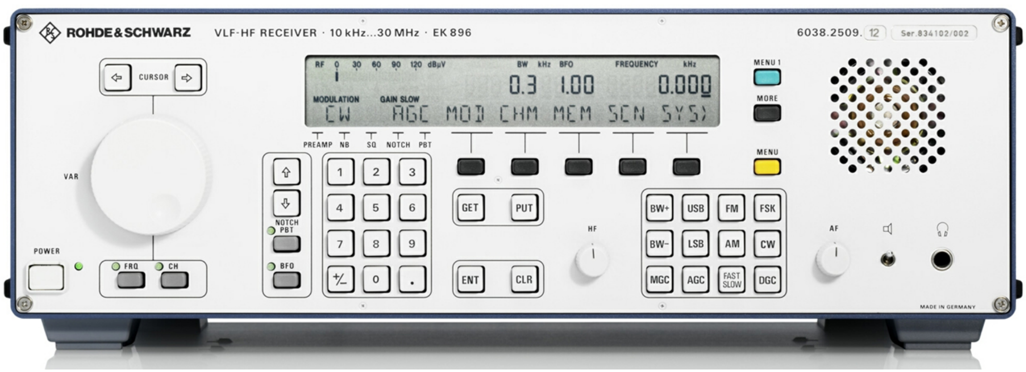
Both receivers are able to control up to 99 detached receivers within a master / slave network. For this application, the R&S EK 895 is also available without control and display elements.



R&S EK 895, Local-controlled



R&S EK 895, Remote-controlled



R&S EK 896

Fig. 1.1 VLF-HF Receivers

1.2 Design and Functioning

1.2.1 Design of VLF-HF Receiver R&S EK 895

The VLF-HF Receiver R&S EK 895 is accommodated in a case of the R&S Series KB90. The case has approx. half the width of a standard 19" slide-in unit.

This allows to place two Receivers R&S EK 895 side by side by using a special 19" adapter, thus combining them to form a 19" slide-in unit.

At the bottom of the case four sturdy equipment stands are located. The two front stands are designed to be set up, so that the receiver front part can be raised. This makes for better readability of the displays and improves the operating ease.

At the front of the case a front panel is located. Depending on the respective receiver design, the front panel accommodates various control and display elements for local control or only LED status indicators for mere remote control.

The front panel for local control contains a graphic display, several separate keys and key pads as well as a highly sensitive tuning knob and so-called softkeys.

As a function of the operating mode and the operational requirements, different functions can be assigned to the tuning knob. It is for instance possible to adjust the receive frequency digitally via the numeric keypad and also quasi-analogously via the tuning knob.

Another specialty are the so-called softkeys. Depending on the set operating mode and the relevant operating level, these keys handle different functions. The currently active function is indicated in plain text in the display box directly above the relevant key.

The rear panel of the case is mainly formed by a heat sink for the integrated power supply unit.

The remaining space is occupied by the external interface connectors and the mains voltage selector.

Also located at the rear are two supportive elements preventing damages to the connectors in case the equipment is put down on its rear panel.

The case accommodates the following modules which form the actual receiver:

- A1 Frame
- A2 Control Unit 1 'Remote'
  or
- A2 Control Unit 2 'Local'
  (option 'Control Unit R&S GB 890')
- A3 Processor
- A4 Synthesizer
- A5 HF Unit
- A6 Power Supply
- A7 IF / AF Processor

Further the receiver comprises top and bottom panelling as well as an RF cable set.

Except for the power supply, all modules are designed as plug-in devices with extracting levers. This offers high ease of replacement even in the maximum configuration where modules are installed very close to each other.

In addition to the standard modules listed above, two plug-in slots for extensions are available with complete cabling and connection to the internal control bus.

For special applications the following modules can be provided as options:

- Preselection R&S FK 890H1
- BCD Interface R&S GC 890
- TTY Line Current Source R&S GH 890
- IF Converter R&S UX 895
- IF Processor R&S GM 893

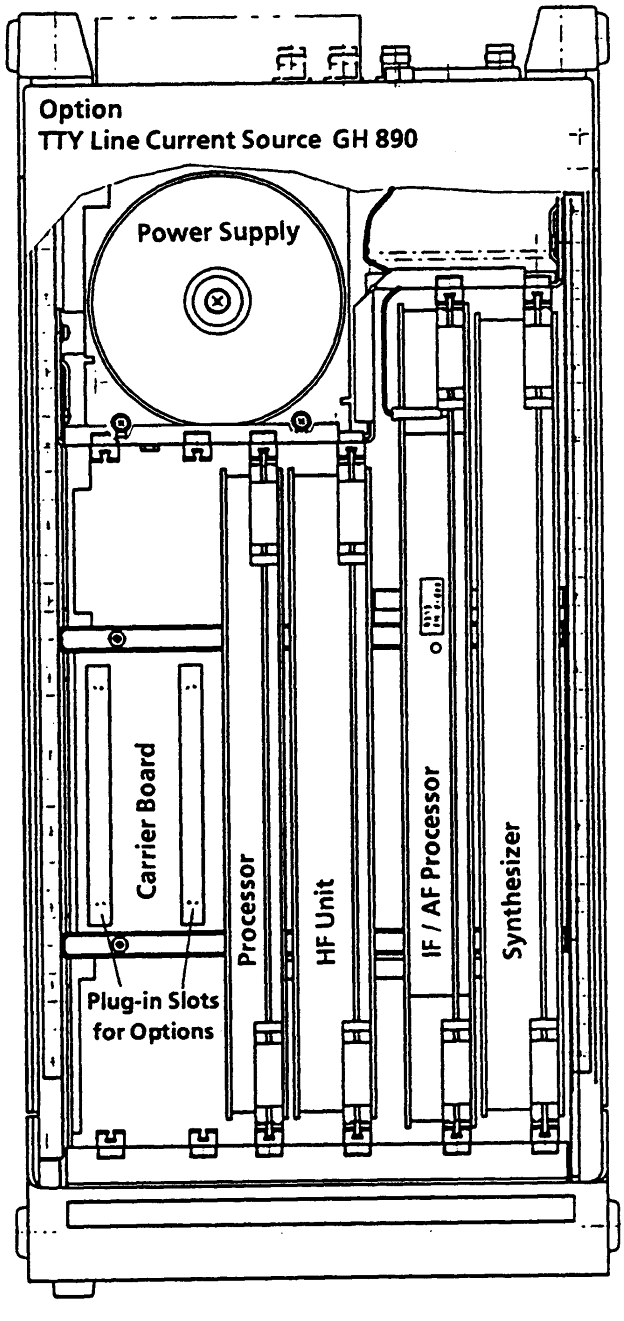


Fig. 1.2 Design of VLF-HF Receiver R&S EK 895

1.2.2 Design of VLF-HF Receiver R&S EK 896

The VLF-HF Receiver R&S EK 896 is accommodated in a case of the R&S Series KB90. The case has approx. the entire width of a standard 19" slide-in unit.

The receiver is designed as a desk-top unit. The use of a special 19" adapter, however, also permits its installation into a 19" rack.

At the bottom of the case four sturdy equipment stands are located. The two front stands are designed to be set up, so that the receiver front part can be raised. This makes for better readability of the displays and improves the operating ease.

At the front of the case a front panel is located. Depending on the respective receiver design, the front panel accommodates various control and display elements for local control or only LED status indicators for mere remote control.

The front panel for local control contains a graphic display, several separate keys and key pads as well as a highly sensitive tuning knob and so-called softkeys.

As a function of the operating mode and the operational requirements, different functions can be assigned to the tuning knob. It is for instance possible to adjust the receive frequency digitally via the numeric keypad and also quasi-analogously via the tuning knob.

Another specialty are the so-called softkeys. Depending on the set operating mode and the relevant operating level, these keys handle different functions. The currently active function is indicated in plain text in the display box directly above the relevant key.

One half of the rear panel of the case is mainly formed by a heat sink for the integrated power supply unit. This part also accommodates the external interface connectors and a mains voltage selector.

This rear panel part is nearly identical with the R&S EK 895 rear panel. The other half of the rear panel only carries an additional headphone interface connector.

Also located at the rear are two supportive elements preventing damages to the connectors in case the equipment is put down on its rear panel.

The case accommodates the following modules which form the actual receiver:

- A1 Frame
- A2 Control Unit
- A3 Processor
- A4 Synthesizer
- A5 HF Unit
- A6 Power Supply
- A7 IF / AF Processor

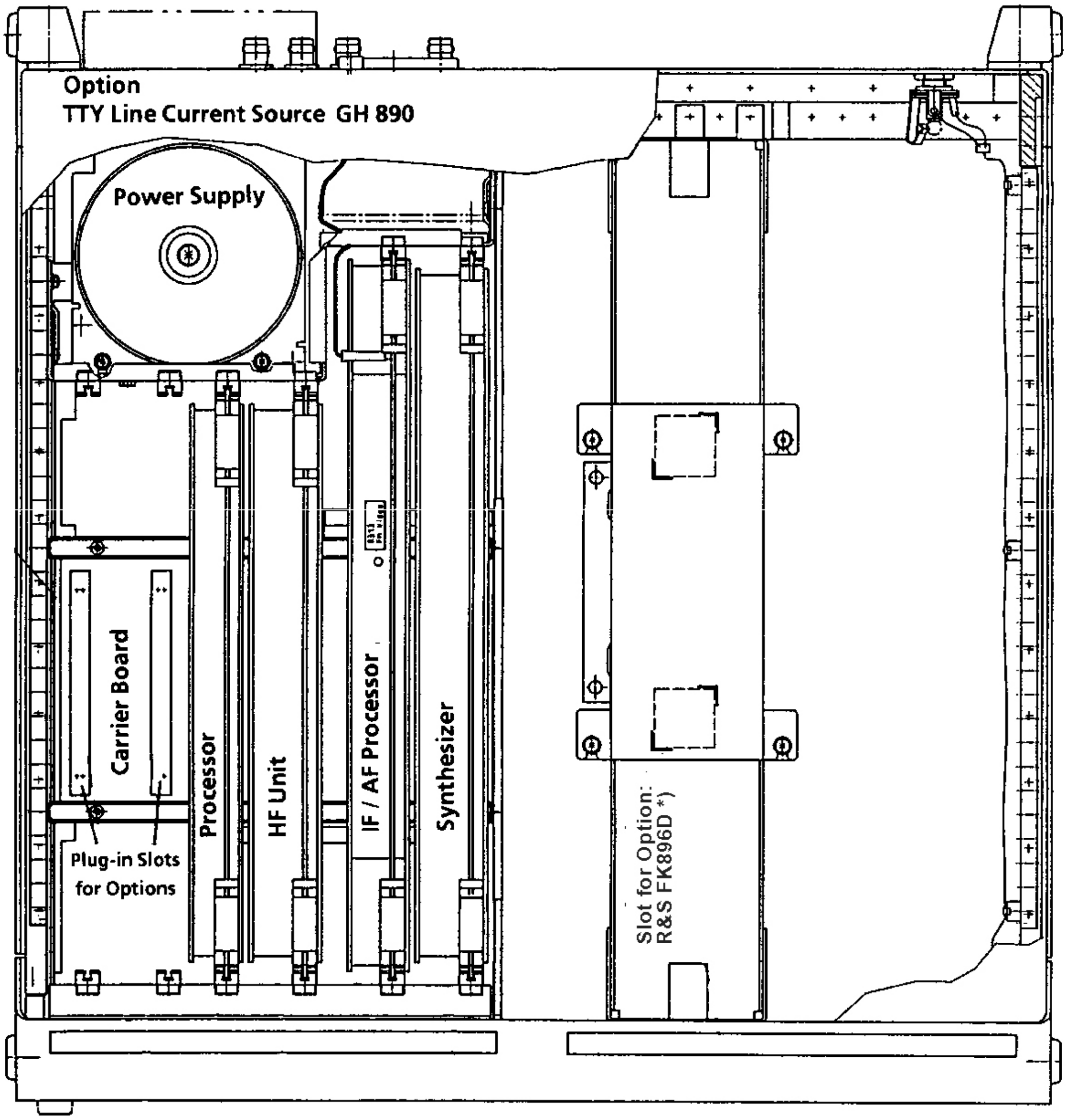
Further the receiver comprises top and bottom panelling as well as an RF cable set.

Except for the power supply, all modules are designed as plug-in devices with extracting levers. This offers high ease of replacement even in the maximum configuration where modules are installed very close to each other.

In addition to the standard modules listed above, two plug-in slots for extensions are available with complete cabling and connection to the internal control bus.

For special applications the following modules can be provided as options:

- Preselection — R&S FK 890H1
- BCD Interface — R&S GC 890
- TTY Line Current Source — R&S GH 890
- IF Converter — R&S UX 895
- IF Processor — R&S GM 893
- Digitally Tuned RF Selector 20 or 40 dB — R&S FK 896D



*) Part of the Digitally Tuned RF Selector R&S FK 896D

Fig. 1.3 Design of VLF-HF Receiver R&S EK 896

1.2.3 Functioning

(See Figs. 1.20 and 1.21)

The input signal from the antenna is routed via the antenna socket at the rear to a lowpass filter in the **HF unit**. The filter is used for image frequency selection and suppression of oscillator reradiation. Subsequently the signal is applied to the input mixer where it is converted to the 1st IF of 41.44 MHz by means of an oscillator variable in 1-Hz increments.

The crystal filter which follows determines the maximum receive bandwidth of 10 kHz and provides for selection of the second image frequency. Conversion to the 2nd IF of 1.44 MHz is obtained by using a 40-MHz fixed frequency.

A powerful mixer at the receiver input ensures excellent large-signal behaviour. The intercept points are typically +70 dBm (IP_2) and +35 dBm (IP_3); with an interfering signal of +21 dBm the crossmodulation transfer is 10 %. Therefore in most cases no additional filters are required.

In the **IF / AF processor** the 2nd IF is routed via a filter and then converted to the 3rd IF of 25 kHz by using a 5.66-MHz fixed frequency. After digitization of the 3rd IF in a 16-bit A/D converter, the DSP (Digital Signal Processor) carries out all signal generation and processing tasks such as:

- Automatic, remote or manual control,
- Measurement of receive levels,
- Filtering with 17 fixed or 128 quasi-continuously adjustable filter bandwidths
- Demodulation, passband tuning,
  double notch filter,
- Noise blanker, syllable squelch,
- Generation of BFO frequency, analog IF from 0 to 40 kHz and digital IF as serial data and I/Q data current.

The **synthesizer** supplies all conversion frequencies required by the HF unit and the IF demodulator. By direct digital frequency synthesis the frequency of the first conversion oscillator is varied in 1-Hz increments. The settling time of the oscillator is 5 ms with any frequency variation. Two phase-locked loops (PLLs) generate the fixed frequencies of 40 MHz and 5.66 MHz. The operation of the total of four PLLs in the synthesizer is continuously monitored.

In the basic version, all frequencies are derived from a temperature-compensated crystal oscillator. Higher precision requirements can be met by integrating an optional oven-controlled crystal oscillator or by using an external frequency standard.

The **processor** is made up of a modern 16-bit-microprocessor in CMOS technology. It not only provides for control and management of the individual modules, but also communicates via the front panel and the data interface with the outside world and executes the internal programs. The following routines increase the operational reliability:

- Non-volatile storage of all settings
- Continuous monitoring of CPU, RAM and PROM functions
- Continuous monitoring of synthesizer (CM)
- Built-in test (BIT) for module testing

Local control of the receiver (R&S EK 895, Mod. 12 / R&S EK 896) takes place via the control and display elements of the **control unit** (A2). Remote control is also possible.

Remote control via ASCII commands (e.g. R&S EK 895, Mod. 02) takes place via a multi-standard interface (RS 232C, RS 485, RS 422 / 423). In the simplest case a terminal can be used as control unit, more complex functions can be handled by a Personal Computer.

1.3 Design and Functioning of Modules

1.3.1 Frame

1.3.1.1 Design

The frame consists of a KB 90 housing (see Fig. 1.4), frame accessories, rods for connection to the power switch and the carrier board (A11).

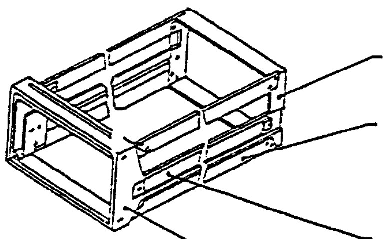


Fig. 1.4 KB 90 Housing

Part of the frame accessories are for example the guiding rails, which together with the extracting levers on the modules guarantee that the plugs on the modules and the sockets on the carrier board engage correctly.

The carrier board accommodates the female connector strips and is connected to the power supply and the control unit via ribbon cables.

1.3.1.2 Functioning

(See circuit diagrams 6057.8996.01S, sheet 2 (= R&S EK 895) and 6038.2509.01S, sheet 2 (= R&S EK 896) appended to this section 1)

The carrier board interconnects all modules and supplies them with the following signals and voltages:

- AF signals
  (AF, AFL, AF option, AF Out)
- Demodulation signals
  (sign, FSK-TTL, F6-V28, FSK-V28, FM-Video, FAX a, FAX b, FSK)
- Control and status signals
  (Read, Write, LED0 to LED4, PZG1 to PZG3, RESET, Stop, Inhibit, IRQCM, IRQF, CM Mains, TxD, RxD, RTS, RxC, CTS, DSR, DTR)
- Address, data and CS bits
  (MD0 to MD15, MS0A to MS3A, MS0B to MS3B, MS0C to MS3C, MAD0 to MAD2)
- Voltages
  (+15 V, -15 V, +5 V, +3.0 V, +3.75 V, MGC, AGC, DGC)

1.3.2 Control Unit 1 "REMOTE" (EK 895)

1.3.2.1 Design

Control unit 1 "REMOTE" consists of a mounting plate, a control panel (A22) and a recessed jack-type socket.

The control panel contains the interface to the carrier board.

1.3.2.2 Functioning

(See Fig. 1.5)

The AF signal *AFL* from the IF / AF processor is fed to the jack-type socket where headphones can be connected.

The signal *CM-MAINS* from the monitoring circuit in the power supply drives the LED *MAINS*.

The LED will be illuminated to indicate that the power supply is working properly.

Via the signal lines *LED0* to *LED4* the processor is connected to the LEDs *MAINS*, *RF UNIT, IF / AF PROCESSOR, SYNTHESIZER, OPTION 1* and *OPTION 2*.

As soon as one of the modules signals a fault as result of the built-in equipment test (BIT status = NoGo), the respective LED will light up.

The synthesizer is being continuously monitored during operation. As soon as a fault is detected in this module, the LED *SYNTHESIZER* (CM status = NoGo) will light up. During the LED test all LEDs are illuminated.

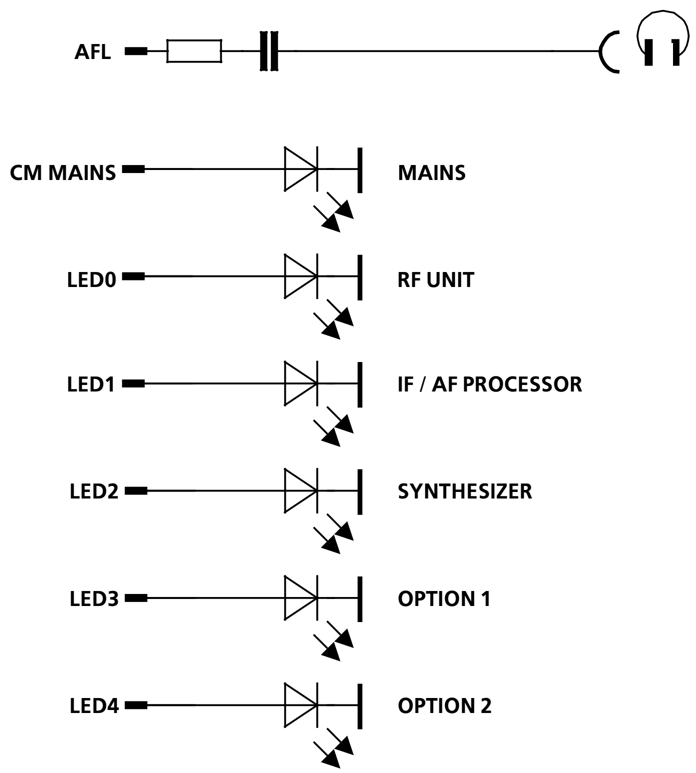


Fig. 1.5 Control Unit 1 "REMOTE" (EK 895), Block Diagram

1.3.3 Control Unit 2 "LOCAL" (R&S EK 895, = Option 'Control Unit R&S GB 890')

1.3.3.1 Design

The control unit consists of a mounting plate, a logic circuit (A2.1) a keyboard (A2.2), a display (A2.3), and a recessed jack-type socket.

The logic circuit contains the interfaces to the carrier board as well as to the keyboard and the display.

1.3.3.2 Functioning

(See Fig. 1.6)

The internal processes within the key decoder are derived from a 4-MHz quartz oscillator.

The key decoder continuously monitors the key matrix and the tuning knob. For this purpose, a sampling signal is sent out in turns via the sampling lines. If a key is activated, the sampling pulse returns via the respective line to the key decoder. The tuning knob consists of an angular-momentum generator (24 steps / revolution) and two Hall probes (= pulse receivers). As a result of the rotation of the angular-momentum generator, pulses are produced in the Hall probes, which are evaluated by the key decoder.

As soon as the key decoder receives a sampling pulse or pulses from the Hall probes, the respective message is sent via interrupt line *IRQF* to the CPU in the processor. As a reaction, the CPU inquires via the data bus the 8-bit data item from the key decoder. The data item contains the information which key or softkey was actuated or by how many increments the tuning knob was turned clockwise or counter-clockwise.

The information is processed within the CPU. If the operator activates for example the BFO key, the LED BFO will light up and the display will change. Instead of the modulation type, type and time of control as well as the softkey assignment, the display BFO_ kHz and the cursor appear in the BFO field. For this change on the display, the CPU sends 8-bit data items via the data bus to the LCD drivers and an intermediate memory. Which driver becomes effective upon which data item, is selected by the CPU via the 8-out-of-3 converter.

The signal *CM MAINS* provided by the monitoring circuit in the the power supply drives a green LED. Illumination of this LED will indicate that the power supply is working properly.

By means of the HF control the control voltage for manual gain control may be adjusted. The MGC voltage is routed to the control loop in the IF / AF processor.

The AF signal *AFL* produced through demodulation in the IF / AF processor is amplified by the AF amplifier, the gain being adjustable by means of the AF control. Through headphones or a loudspeaker to be connected the AF signal can be made audible.

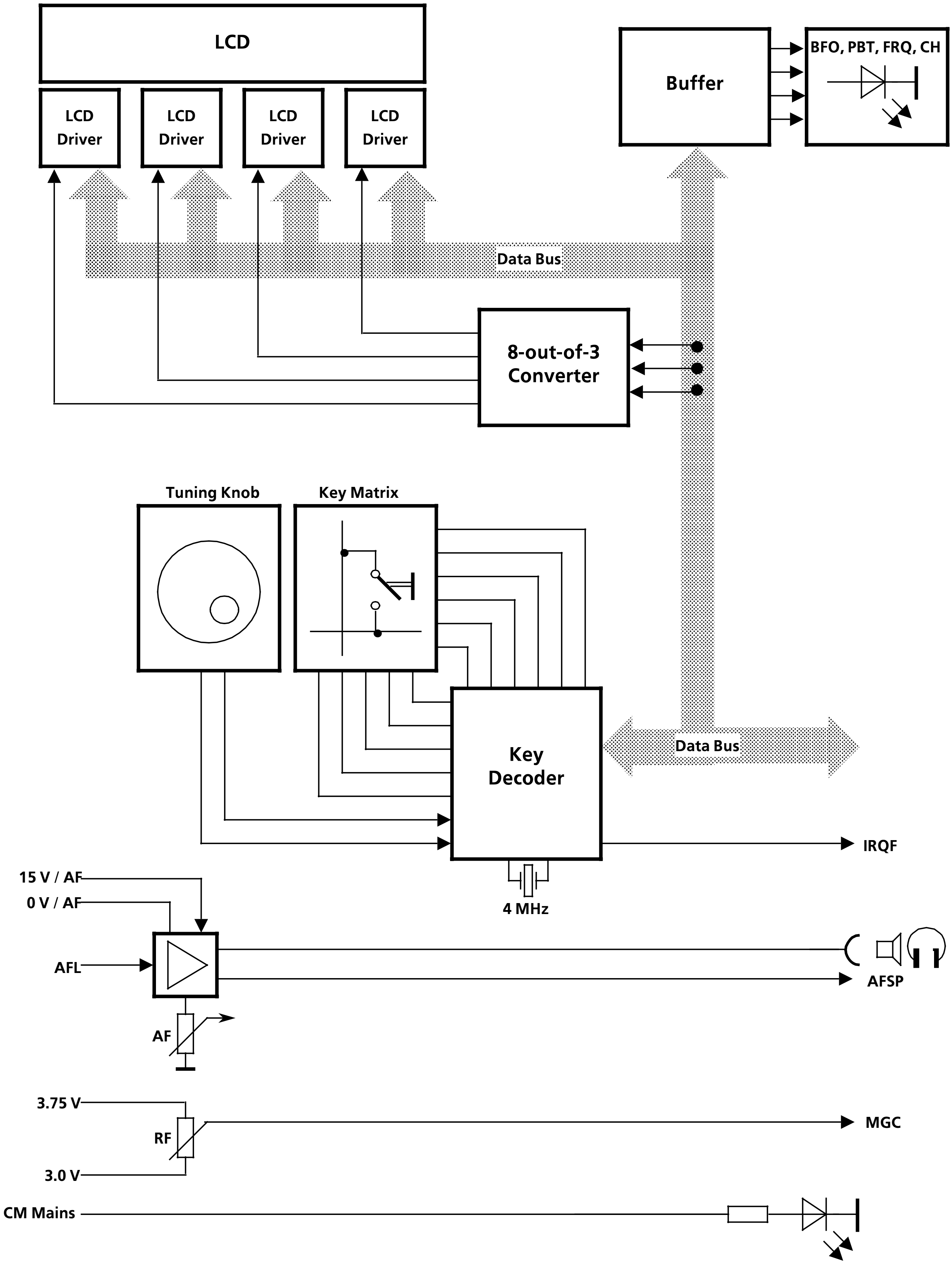


Fig. 1.6 Control Unit 2 "LOCAL" (R&S EK 895, Option 'Control Unit R&S GB 890'), Block Diagram

1.3.4 Control Unit (R&S EK 896)

1.3.4.1 Design

The control unit consists of a mounting plate, a keyboard (A2.2), a display (A2.3), a toggle switch, a recessed jack-type socket as well as a miniature loudspeaker.

The keyboard circuitry contains jumpers for selecting the direction of rotation for the HF control, interfaces to the carrier board, the display, the jack-type socket and the loudspeaker / switch as well as to the jack-type socket in the power supply.

1.3.4.2 Functioning

(See Fig. 1.7)

The internal processes within the key decoder are derived from a 4-MHz quartz oscillator.

The key decoder continuously monitors the key matrix and the tuning knob. For this purpose, a sampling signal is sent out in turns via the sampling lines. If a key is activated, the sampling pulse returns via the respective line to the key decoder. The tuning knob consists of an angular-momentum generator (24 steps / revolution) and two Hall probes (= pulse receivers). As a result of the rotation of the angular-momentum generator, pulses are produced in the Hall probes, which are evaluated by the key decoder. In the case that to a specific key a secondary function is assigned, it is activated by additionally actuating the SHIFT key.

As soon as the key decoder receives a sampling pulse or pulses from the Hall probes, the respective message is sent via interrupt line *IRQF* to the CPU in the processor. As a reaction, the CPU inquires via the data bus the 8-bit data item from the key decoder. The data item contains the information which key or softkey was activated or by how many increments the tuning knob was turned clockwise or counterclockwise.

The information is processed within the CPU. If the operator activates for example the BFO key, the LED BFO will light up and the display will change. Instead of the modulation mode, type and time of control as well as the softkey assignment, the display BFO_ kHz and the cursor appear in the BFO field. For this change on the display, the CPU sends 8-bit data items via the data bus to the LCD drivers and a buffer (A). Which driver becomes effective upon which data item, is selected by the CPU via the 8-out-of-3 converter.

Also via the 8-out-of-3 converter the CPU selects which 8-bit data item is taken over into the buffer (B). The data item contains information which of the receivers is switched to local control. Thus the control unit permits local control of up to three receivers RX1 to RX3.

Receiver RX1 is locally controlled:

- The 3.0-VDC voltage from the IF / AF processor (RX1) is fed via switch S1 and jumper X11 to the HF control.
- The 3.75-VDC voltage from the IF / AF processor (RX1) is fed via switch S1 and jumper X12 to the HF control.
- The MGC voltage (0 to 120 dBμV) set with the aid of the HF control is fed via switch S1 to the IF / AF processor (RX1). The direction of rotation of the HF control is selected by means of jumpers X11 and X12.
- The signal AF1 from the IF / AF processor (RX1) is routed via switch S1 to the AF control.

The AF control is followed by an amplifier. Provided that switch S2 is closed, the amplified AF signal is forwarded to a loudspeaker. Simultaneously, the amplifier output is connected to a jack-type socket as well as via the interface AF OUT and a cable to another jack-type socket in the power supply. To the jack-type sockets headphones can be connected.

The 5-VDC voltage from the power supply drives a green LED. Illumination of this LED will indicate that the power supply is functioning properly.

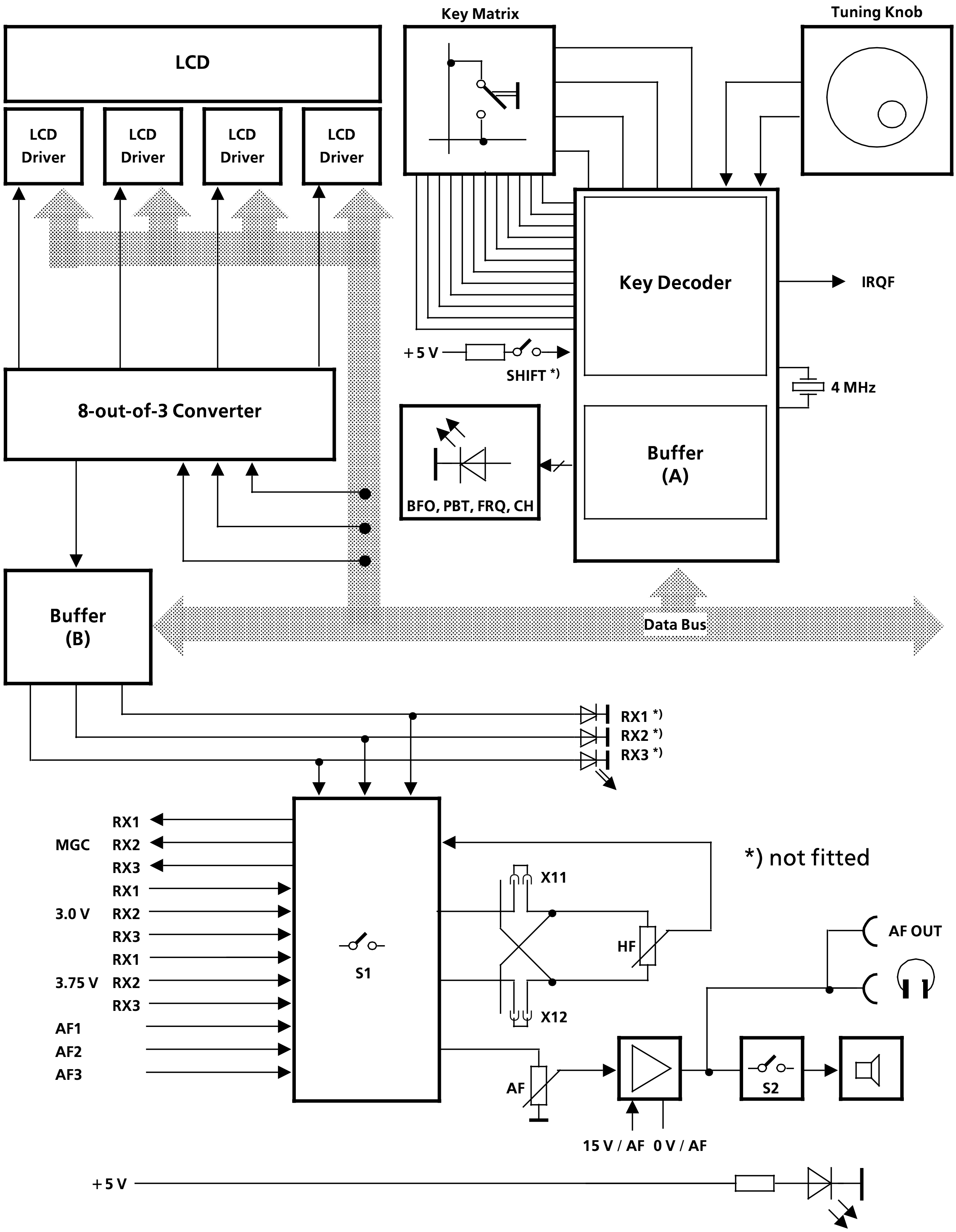


Fig. 1.7 Control Unit (R&S EK 896), Block Diagram

1.3.5 Processor

1.3.5.1 Design

The processor consists of a printed circuit board, a set of screens, two screw tops, two yellow extracting levers, the software (A100) and the interface to the carrier board.

The processor contains a lithium battery, four coding switches (address, transmission rate, operating mode) and a jumper for switchover between RS423/ RS232 and RS422.

1.3.5.2 Functioning

(See Fig. 1.8)

The core of the processor is the 16-bit central processing unit. The internal processes within the CPU are synchronized by a 15-MHz crystal. From the synchronization signal the CPU generates the 7.5-MHz system clock.

Via a control bus and a multiplexed 16-bit address/data bus, the CPU is connected to the periphery. The data bits are fed directly to the periphery, whereas the address bits are first routed via an intermediate memory.

Part of the periphery are the 64k×16-bit EPROM, the 32k×16-bit RAM, a serial as well as several parallel data interfaces.

The battery-buffered RAM contains control variables and also the control data for the programmable serial interface USART. In the EPROM the program for the central unit is stored. Together with a line driver and receiver the USART forms a standardized data interface in compliance with RS232C - RS485. The internal processes within the serial interface are derived from the system clock.

The characteristics of the standardized data interface RS232C - RS485 can be set via the two coding switches S3 (transmission rate) and S4 (operating mode) as well as a jumper (RS422 or RS423). By means of another two coding switches, namely S1 (×1) and S2 (×10) addresses in the range 0 to 99 (00 = unaddressed operation) can be set. Addressing is required, if several VLF-HF receivers are to be controlled from a central unit.

The settings of coding switches S1 and S4, which are stored in an intermediate memory, are inquired by the CPU via the data bus and then stored in the RAM. The whole process is controlled via the program stored in the EPROM.

Depending on the EXT signal (S3), the USART either receives the BAUD signal from a programmable timer in the CPU or the CLK signal from the RS232C - RS485 interface of the power supply. The line driver is set via the V.24-MOD signal (S4) to BUS or RS232 operation.

For local operation the control commands, which the operator has entered via the control elements of the control unit 2 "LOCAL" (R&S EK 895), of the optional local Control Unit R&S GB 890 (R&S EK 895) or of the control unit (R&S EK 896), are fed via the 16-bit data bus to the CPU. For remote operation the control commands, which the operator has entered on the central control unit (e.g. a computer), are routed via the RS232C - RS485 interface of the power supply to the standardized data interface. In the USART the RxD data are converted into parallel data. As soon as conversion is terminated successfully, this is indicated to the CPU via the INT signal. Controlled by the INT signal, the data are routed to the CPU for further processing.

After having been processed, the control data (frequency, BFO frequency, bandwidth, type of modulation, control type, digital threshold) are transferred via the 16-bit data bus to the individual modules. Coordination which control data are fed to which module is performed by the CPU via the CS control bus.

If a BIT is initiated, the CPU addresses the modules one after the other via the CS control bus. Via the 16-bit data bus, the addressed module indicates the BIT status to the CPU. If via the BIT status a NoGo message is indicated, the CPU sets the level of the respective line *LED0 to 4* to high.

The synthesizer and IF / AF processor modules are connected via signal line IRQCM and the control unit via signal line IRQF to the CPU.

With the signal BYPASS the processor switch on or off the connected Motor Selection R&S FK 2850.

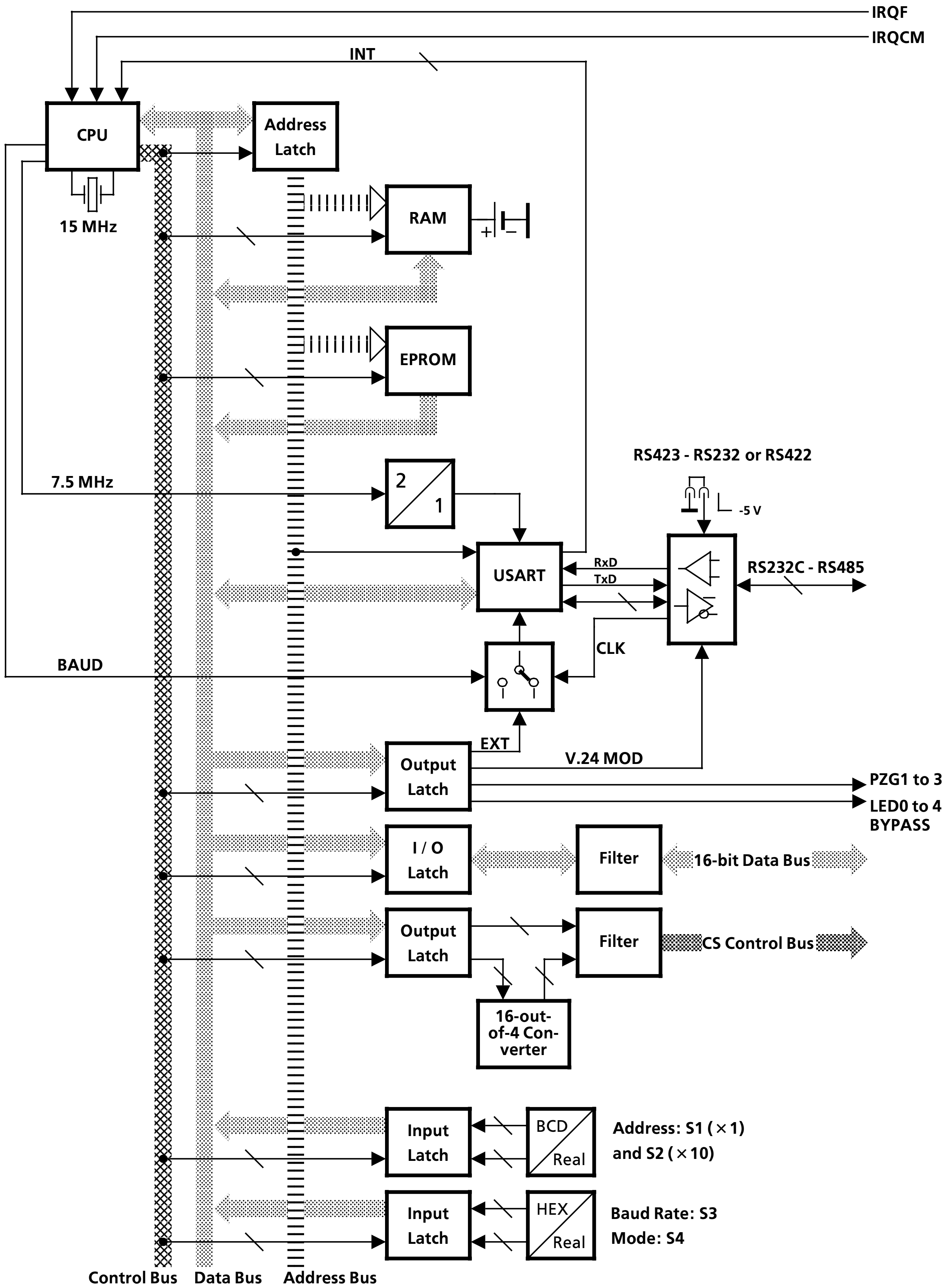


Fig. 1.8 Processor, Block Diagram

1.3.6 Synthesizer

1.3.6.1 Design

The synthesizer consists of a printed circuit board, a set of screens, two RF covers, two blue extracting levers, the EPROM program set (A41), the interface to the carrier board as well as HF interfaces. Via the HF interfaces and cables contained in the cable set, the synthesizer is connected to the rear panel, the HF unit and the IF / AF processor.

The synthesizer contains jumpers for switchover between internal and external synchronization and for setting the division ratio (1:1, 5:1 or 10:1).

1.3.6.2 Functioning

(See Fig. 1.9)

All frequencies generated in the synthesizer are derived from a 10-MHz crystal oscillator (TCXO, mod. 02) or a 10-MHz oven controlled crystal oscillator (OCXO, mod. 03).

The crystal oscillator can also be substituted by an external frequency standard (direction-finding applications, higher precision). For this purpose the jumper for internal/external switchover must be set to external. Depending on the frequency standard used, the required division ratio 10:1 for $f_{ext.}$ = 10 MHz and internal synchronization, 5:1 for $f_{ext.}$ = 5 MHz or 1:1 for $f_{ext.}$ = 1 MHz is to be set via jumpers in the divider switchover circuit.

In the logic circuit the digital frequency information from the processor is split up into two information blocks, the first block containing the 100-kHz, 1-MHz and 10-MHz positions and the second one the positions 1 Hz to 10 kHz. The sum of the first block and the number 413 (41.3 MHz) gives the division ratio N = 413 to 713 for the 1:N divider in phase-locked loop 2. The preset VCO2 thus oscillates on a frequency of $f_{VCO2} = N \times 1{:}10 \times 1$ MHz= 41.3 to 71.3 MHz. The output signals of VCO2 and of preset VCO3 are converted in the conversion stage into a signal with a frequency of $f_2 = f_{VCO3} - f_{VCO2}$. The phase regulator $\phi 3$ regulates to the phase difference between the frequency f_2 and the frequency ($f_{synthesis}$) of the output signal of the analog/digital converter.

For this the EPROM (stored sine table) is controlled by the logic circuit in such a way that on the output of the buffer a digital sinusoidal signal is produced (DDS, direct digital synthesis). The frequency of the sinusoidal signal results from the sum of the second block and the number 140000 (140 kHz). Therefore VCO3 oscillates on a frequency of $f_{VCO3}=f_{VCO2} + f_{synthesis}$ = 41.44 to 71.44 MHz. The signal generated by phase-locked loop 3 is fed to the 1st-IF converter stage in the HF unit.

The frequency on which VCO1 oscillates is determined by the division ratio of the two frequency dividers and the reference signal → $f_{VCO1} = 4{:}1 \times 10{:}1 \times 1$ MHz = 40 MHz. The signal generated by phase-locked loop 1 is transferred to the 2nd-IF converter stage in the HF unit and to the IF / AF processor.

The frequency on which the VCO4 oscillates is determined by the 875:1 divider, the converter stage, and the f_1 signal as follows:

→ $f_{VCO4} = 875{:}1 \times f_1 + 10$ MHz
→ $f_1 = 40\,\text{MHz} \times 1{:}4 \times 1{:}26 \times 1{:}625 = 640$ Hz
→ $f_{VCO4} = 10.56$ MHz

The signal synchronized by phase-locked loop 4 is fed via a frequency divider with the division ratio 1:8 to the converter stage. The converter stage is followed by a selective amplifier for suppression of unwanted mixing products and another frequency divider. The 5.66-MHz signal thus generated is routed to the IF / AF processor.

In case of a test, the 1-MHz signal is fed via a 10:1 divider into the receive path.

In the CM test the phase-locked loops and the 2:1 divider level are continuously monitored. If the level falls below a minimum value and/or if a phase-locked loop is not synchronized, this information is transmitted in the form of an 'interrupt' via the IRQCM line to the processor. Via line CM SYNTH, the processor can inquire the CM status.

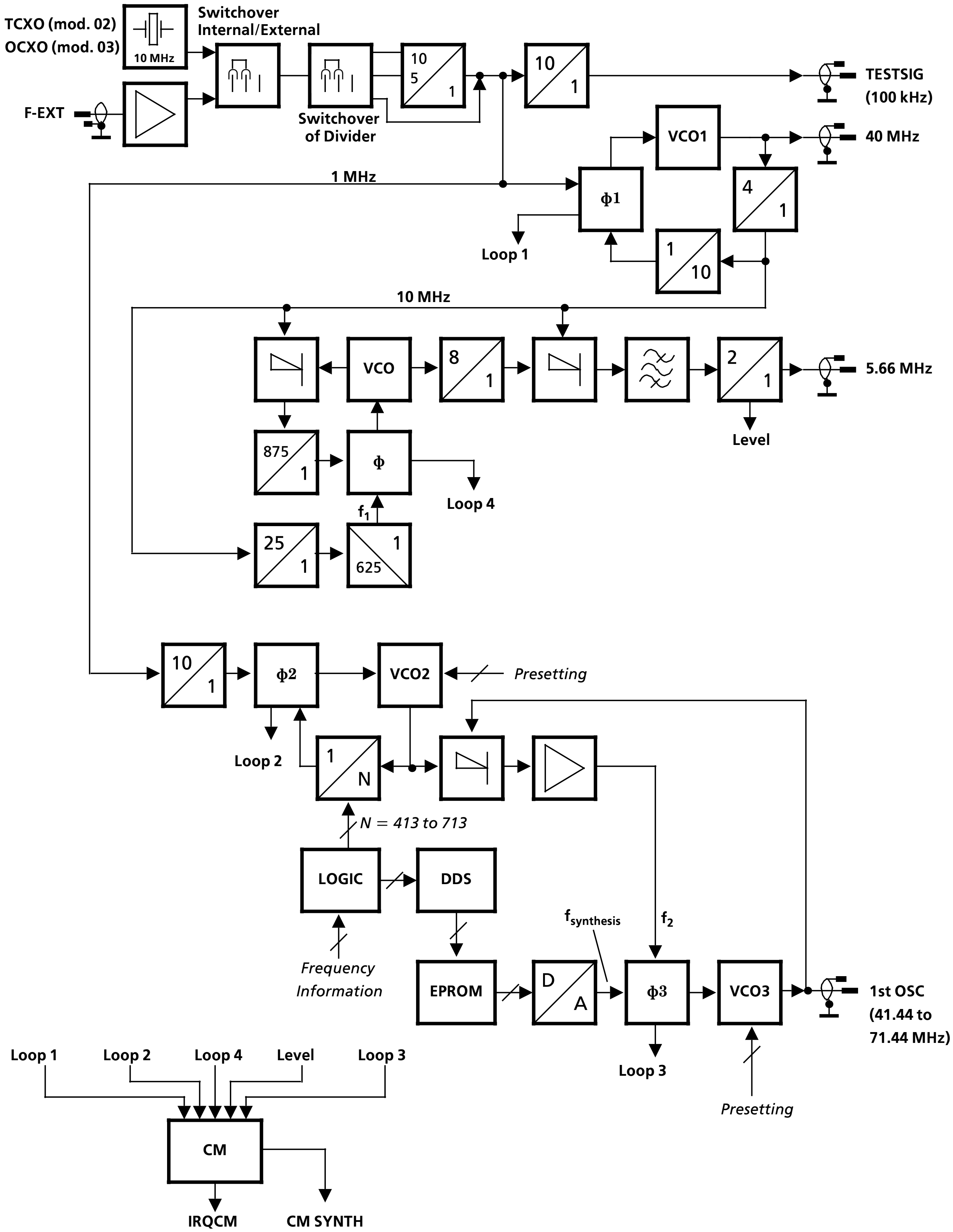


Fig. 1.9 Synthesizer, Block Diagram

1.3.7 HF Unit

1.3.7.1 Design

The HF unit consists of a printed circuit board, a set of screens, two RF covers, two green extracting levers, a transformer board (A51), the interface to the carrier board and HF interfaces.

Via the HF interfaces and cables contained in the cable set, the HF unit is connected to the rear panel, the synthesizer and the IF / AF processor.

1.3.7.2 Functioning

(See Fig. 1.10)

Depending on the position of the switch, either the HF signal (ANT, 10 kHz to 30 MHz) from the IF / AF processor or the 100-kHz test signal (TESTSIG) is routed from the synthesizer via a lowpass filter to the 1st converter stage. By means of the adjustable attenuator, the test signal is attenuated. The attenuation factor as well as selection of the signal to be transmitted to the converter stage are controlled by the processor via two signal lines (attenuation, test). The lowpass filter provides for suppression of image frequencies and oscillator reradiation.

In the 1st converter stage, the antenna signal is mixed with the oscillator frequency adjustable in 1-Hz increments and supplied by the synthesizer to form the first intermediate frequency of 41.44 MHz. The following crystal filter suppresses the 2nd image frequency and fixes the maximum receive bandwidth to 8.0 kHz.

The 41.44-MHz signal is fed via the controllable amplifier to the 2nd converter stage.

In the 2nd converter stage the 41.44-MHz signal is mixed with the 40-MHz fixed frequency from the synthesizer to form the 2nd intermediate frequency of 1.44 MHz. The following IF amplifier provides the IF2 signal for the IF / AF processor and another signal for the rectifier.

In transmit/receive operation, the IF amplifier can be inhibited via the signal Inhibit.

The rectifier supplies the BIT signal and the control voltage for the controllable amplifier. Via an adder, to this control voltage the control voltage from the IF / AF processor (AGC HF) is added. Thus overloading is prevented.

In case the built-in equipment test is initiated, the processor also inquires the status of the BIT signal from the HF unit.

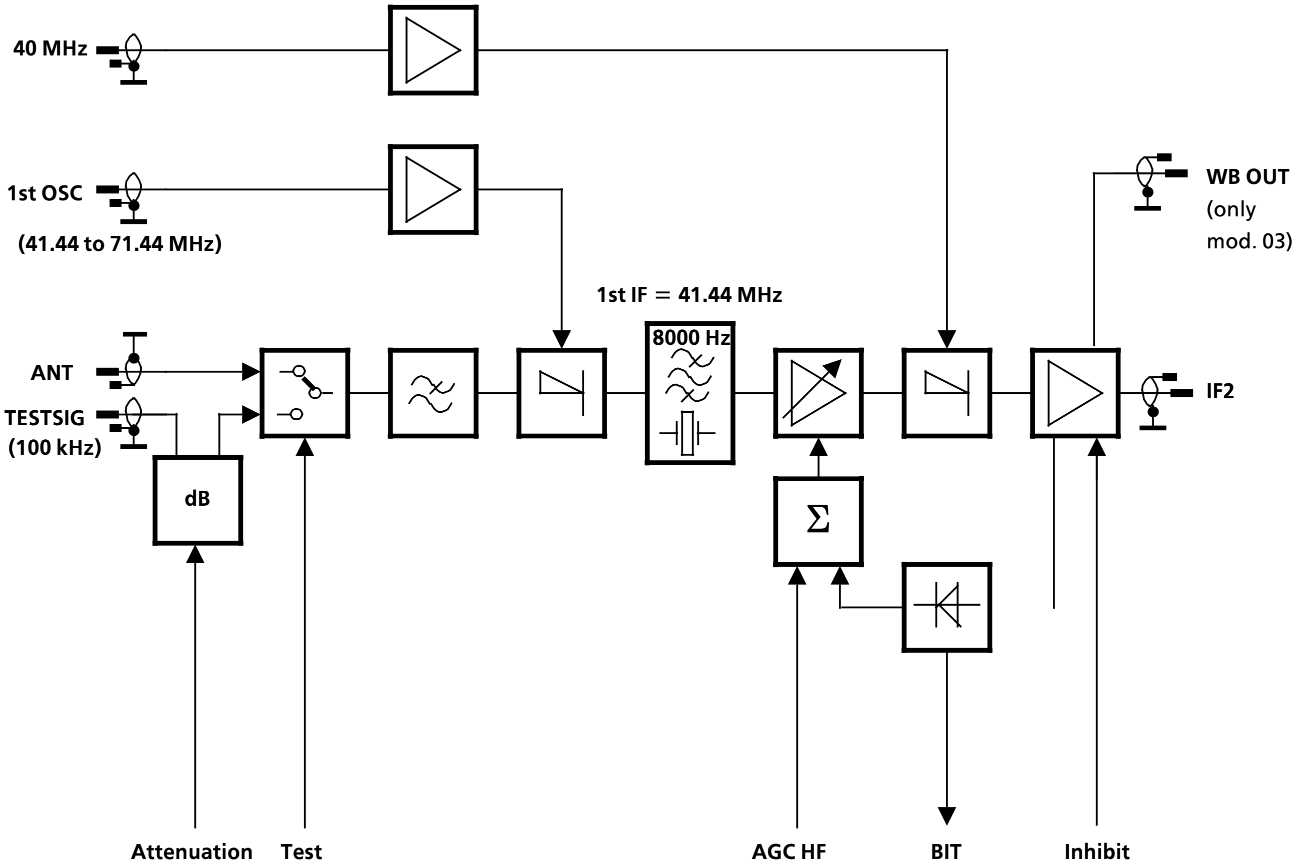


Fig. 1.10 HF Unit, Block Diagram

1.3.8 Power Supply

1.3.8.1 Design

The power supply consists of the printed circuit board A66, a rear panel, a transformer, a switch and the interface to the carrier board. The rear panel contains the external interfaces. Via cables the external HF interfaces are directly connected to the respective modules. The external AF interface (R&S EK 896) is connected to the control unit via cables. To the rear panel a heat sink is fixed.

Variable jumpers in the power supply permit the line driver (600-Ω transformer) to be used bidirectionally.

1.3.8.2 Functioning

(See Fig. 1.11)

If the power switch is closed by actuation of the respective key on the control unit, the external AC voltage (100 to 240 VAC / 47 to 420 Hz) is fed from the mains connector via a mains filter and a voltage selector to the transformer. By means of the voltage selector the transformer is set to the external mains voltage. A protection facility in the voltage selector protects the input circuit against too high currents. In case the temperature in the transformer rises above 113 °C, the input circuit is interrupted as a result of the heat protection facility (→ send power supply for repair).

The DC voltages generated from the secondary voltage of 20 VAC by way of rectification and filtering are stabilized via two fixed-voltage regulators to +15 VDC and - 15 VDC. The +15-VDC fixed-voltage source feeds for example a 5-VDC voltage regulator as well as the reset and monitoring circuit.

Another secondary voltage of 20 VAC is rectified and filtered. The DC voltage thus produced is stabilized by a fixed-voltage regulator to +15 VDC. The stabilized DC voltage supplies the AF amplifier in the control unit. The 15-VDC voltage regulators contain internal current limiting facilities and a protection against excessive heat.

The DC voltage produced from the secondary voltage of 9.1 VAC by way of rectification and filtering is fed to an externally adjustable voltage regulator as well as to the reset and monitoring circuit. The voltage regulator is set to an output voltage of +5.2 V. The voltage regulator is automatically switched off, as soon as the output current exceeds the nominal value set (short-circuit current). Current supply of the option 'TTY Line Current Source R&S GH 890' is made via the secondary voltage of 25.6 VAC.

The reset circuit ensures that for switch-off of the mains voltage all receiver settings are stored in the processor and for switch-on all stored receiver settings are again read in. The monitoring circuit controls the LED MAINS on the front panel of the control unit via the signal CM.

The AF signal AFL from the IF / AF processor is fed via an amplifier and a 600-Ω transformer to the interface *OUTPUT*. The AF level is adjustable via the variable resistor *LINE* in the range between -10 and +10 dBm.

In case the level of the PZG signal is exceeded, the processor switches an open-collector transistor. The open collector is connected to the interface *OUTPUT*.

The option 'TTY Line Current Source R&S GH 890' is connected via a cable to the power supply. The carrier board is connected via EMC filters and a cable to the interface *OUTPUT* as well as via another cable to the *RS232C - RS485* interface. The connector *BCD INTERFACE* is connected via a cable to the optional 'BCD Interface R&S GC 890'.

The external HF interfaces are connected via HF cables to the following modules:

External interface	Module
	IF / AF processor or option 'R&S FK 890H1'
IF 1.44 MHz	not used
1/5/10 MHz	Synthesizer
IF 0...40 kHz	IF / AF processor
OPTION	HF unit, mod. 03 or option IF Processor R&S GM 893

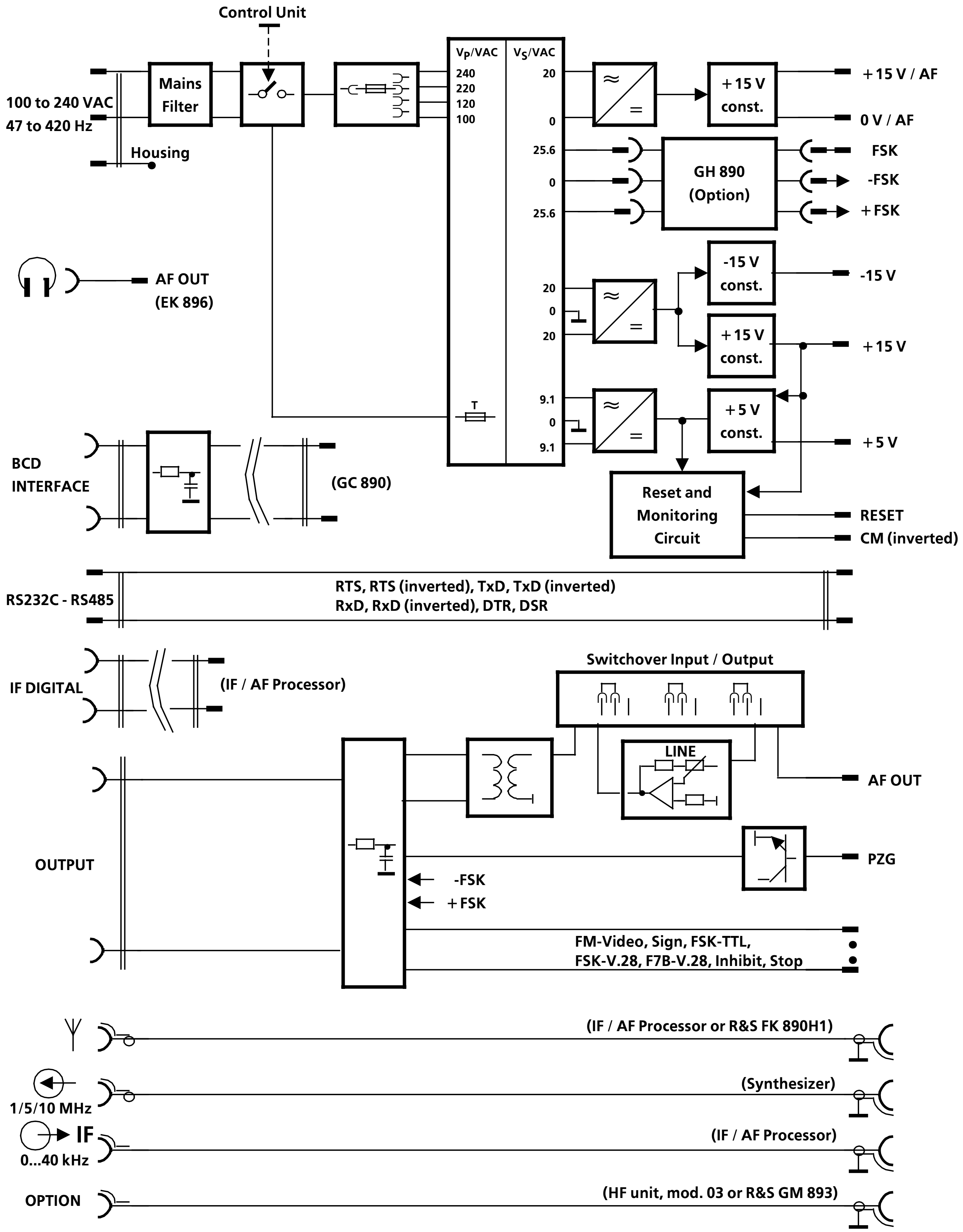


Fig. 1.11 Power Supply, Block Diagram

1.3.9 IF / AF Processor

1.3.9.1 Design

The IF / AF processor consists of a printed circuit board and a DSP module (A1, DSP = Digital Signal Processor), a set of screens, two RF covers, two red extracting levers, the interface to the carrier board as well as HF interfaces.

The IF / AF processor is connected via the HF interfaces and cables contained in the cable set to the rear panel, the HF unit and the synthesizer. In addition, the IF / AF processor is connected via a 5-way connector (X79) and a signal line to the rear panel.

1.3.9.2 Functioning

(See Figs. 1.12 and 1.13)

The IF / AF processor has a dynamic range of approx. 90 dB.

The IF2 signal (1.44 MHz) from the HF unit is fed via a filter and an amplifier to a converter stage. The latter converts the IF2 signal by using an auxiliary frequency into the third intermediate frequency of 25 kHz. The auxiliary frequency is obtained from the 5.66-MHz fix frequency of the synthesizer with the aid of a 4:1 divider. The converter stage is followed by an analog / digital converter. The digital signal produced by this converter is evaluated by the DSP. Synchronization of the A / D converter is carried out with a frequency of 12.8 MHz. This frequency is produced from the 40-MHz fix frequency of the synthesizer by two dividers (2:1, 50:1) and a phase-locked loop (PLL).

The DSP has the following functions:

- IF filtering in the following fixed bandwidths (in Hz):

  150, 300, 400, 600, 800, 1000, 1500, 1800, 2100, 2400, 2700, 3100, 3600, 4000, 4800, 6000, 8000
  or

  128 quasicontinuously adjustable filter bandwidth
- IF control for the following control types and times: AGC, MGC, AGC+MGC, AGC+DGC, 25 ms, 150 ms, 500 ms, 1 s, 3 s
- Generation of the AGC-HF voltage for the control amplifier in the HF unit
- Evaluation of the MGC voltage adjusted by means of the HF control (control unit 2 "LOCAL" (R&S EK 895), = option 'Control Unit R&S GB 890' or control unit (R&S EK 896))
- Generation of the IF signal with a frequency variable between 300 Hz and 40 kHz or optionally with a fix frequency of 455 kHz (IF Converter R&S UX 895). Here the stepwidth is 10 Hz. The bandwidth of the IF signal is either the set bandwidth (150 Hz to 8 kHz) or the maximum bandwidth of approx. 10 kHz.
- Demodulation for the following modulation types:

  AM, FM, USB, LSB, ISB, CW, FSK, AFSK, FAX, F7B

  The FSK, AFSK and F7B demodulators can be adapted to the different baud rates and deviation frequencies in order to yield optimum results.
- Filtering by two independent notch filters in the range of -5 to 5 kHz. Here the stepwidth is 10 Hz.
- Syllable squelch
- Suppression of pulse-shaped interences at the antenna input (= noise blanker).
- Mean-value indication for the modulation types AM, FM, CW and FAX or minimum / maximum indication for the modulation types FSK, AFSK, F7B

In addition the DSP provides the following signals:

- AF signals

  AF2 (balanced) or FM-Video
  AFL and I-component of the AF signal
  AFOUT or Q-component of the AF signal
  The AF2 level is adjustable via the variabel resistor LINE2 in the range between -10 and +10 dBm.
- FSK bus (TTL or V.28 level and signal)
- Serial data bus (SData, SCLK, SFrame)

In the CM test the oscillator levels of the 200:1, 50:1 and 10:1 dividers, the 20-MHz signal, the DSP watchdog and the logic circuitry for overload protection are continuously monitored.

Once a fault is detected, it will be signalled to the processor via the IRQCM line.

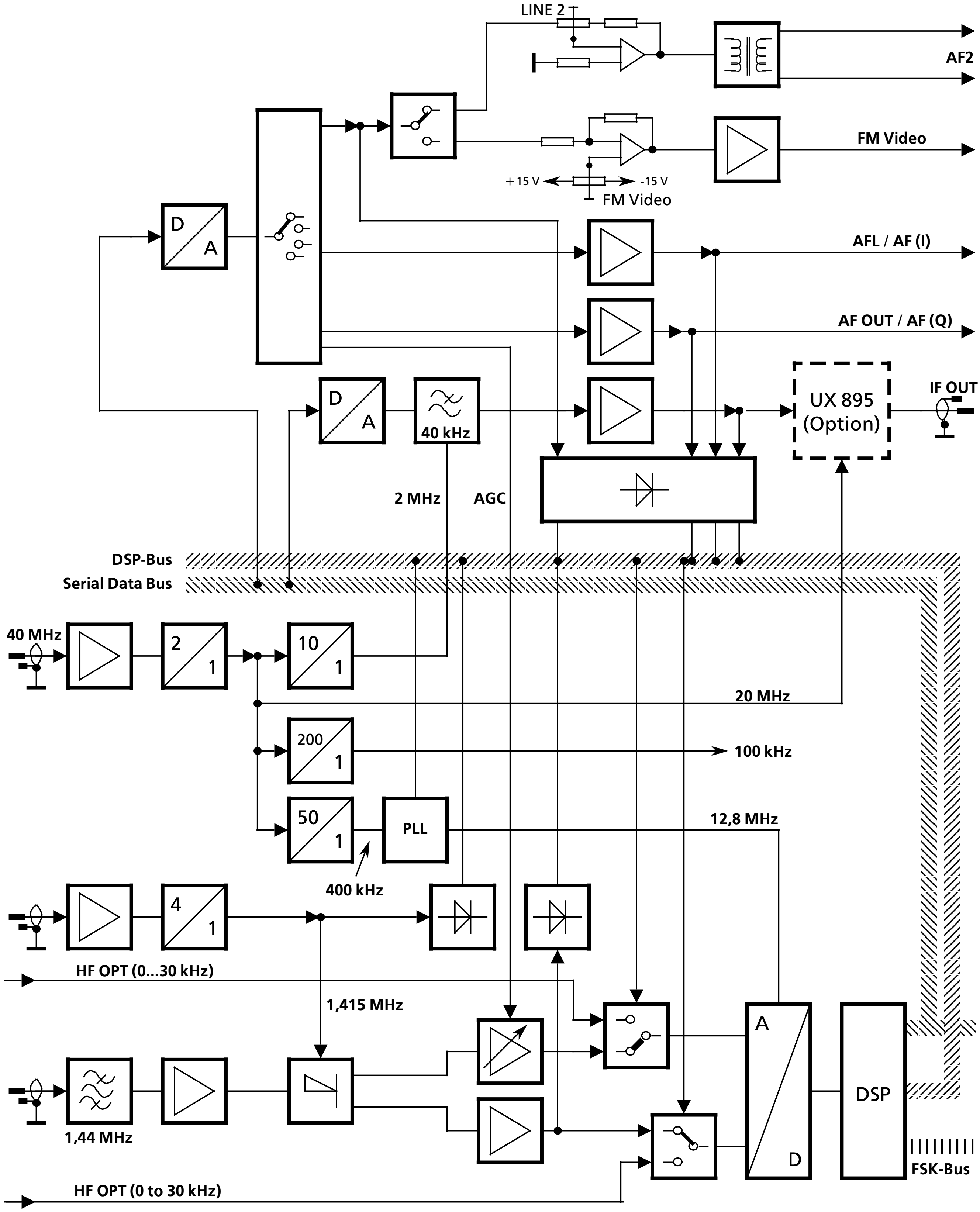


Fig. 1.12 IF / AF Processor Block Diagram

The HF signal from the antenna or the optional 'Preselection FK 890H1' is applied via relays K1 to K3 to the HF unit. Relay K1 is energized by a logic circuit.

As soon as the logic circuit detects an overvoltage at the input, the input signal will be cut out for approx. 3 s. This procedure is repeated for as long as an overload is being detected.

Relays K2 and K3 permit the low-noise preamplifier to be enabled or inhibited. The preamplifier test (built-in equipment test) is carried out with the aid of a 100-kHz test signal.

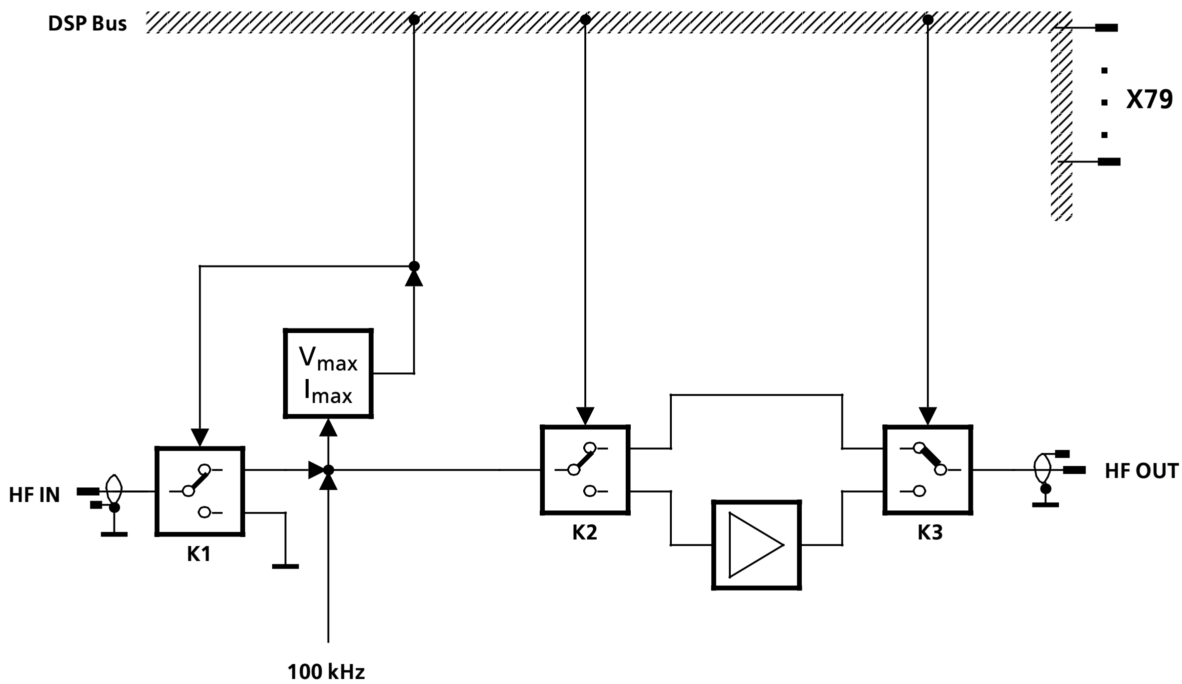


Fig. 1.13 IF / AF Processor (Preamplifier and Protective Circuit), Block Diagram

1.3.10 Preselection R&S FK 890H1 (Option)

1.3.10.1 Design

Preselection R&S FK 890H1 consists of a printed circuit board, a screen set, two RF covers, two black extracting levers, the interface to the carrier board and of HF interfaces.

Preselection R&S FK 890H1 is connected to the rear panel via the HF interfaces and a cable from the cable set and to the IF / AF processor via cable W13.

1.3.10.2 Functioning

(See Fig. 1.14)

Depending on the receive frequency (f_{Rx}) selected by the operator, the antenna signal is routed to the HF unit either via the lowpass filter (10 to 500 kHz) or via the bandpass filter (0.5 to 1.5 MHz) or via one of the eight suboctave filters.

The suboctave filters cover the following frequency ranges:

- 1.500 to 2.181 MHz
- 2.181 to 3.172 MHz
- 3.172 to 4.613 MHz
- 4.613 to 6.708 MHz
- 6.708 to 9.755 MHz
- 9.755 to 14.186 MHz
- 14.186 to 20.630 MHz
- 20.630 to 30.000 MHz

By means of the suboctave filters, signals in the short-wave range (1.5 to 30 MHz) with an

- interfering frequency $f_{inter} = f_1 - f_2$ are further attenuated by more than 20 dB and signals with an
- interfering frequency $f_{inter} = f_1 + f_2$ are attenuated by more than 40 dB.

If the frequency of the interfering signal is inside the stopband of the lowpass or bandpass filter, the interfering signal is attenuated in the VLF range (10 kHz to 1.5 MHz) in the same way as in the short-wave range.

In the stopbands of the filters interference caused by cross modulation and distortion products of the third order ($f_{inter} = 2 \times f_1 \pm f_2$) decreases with the second / third exponent of the selection value.

By use of the preselection the oscillator interfering voltage at the antenna input is reduced and the attenuation for the first image frequency ($f_{image} = f_{Rx} + 2 \times f_{1st\ IF}$ with $f_{1st\ IF}$ = 41.44 MHz) improved by more than 20 dB.

A limiting circuit at the output of Preselection R&S FK 890H1 protects the receiver input.

By use of the preselection the permissible input voltage at the antenna input is increased to 30 V_{EMF}.

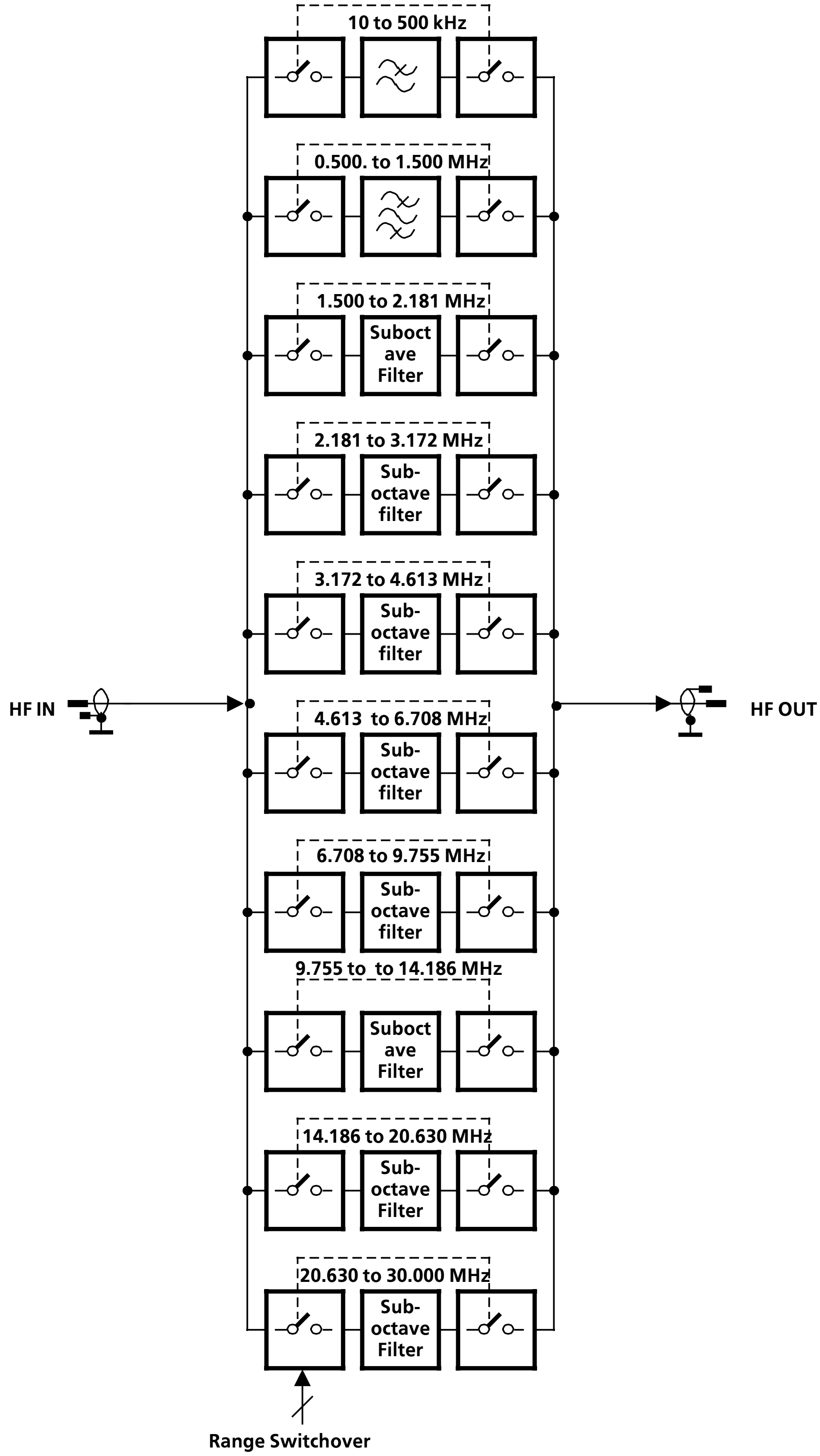


Fig. 1.14 Preselection R&S FK 890H1 (Option), Block Diagram

1.3.11 BCD Interface R&S GC 890 (Option)

1.3.11.1 Design

The BCD interface consists of the printed circuit boards interface (A81) and filter (A82) and, in addition, of two grey extracting levers, a ribbon cable, the interface to the carrier board and the external interface.

The ribbon cable is used to electrically interconnect the two PCBs.

The filter is fixed to the rear panel by means of two spacing pieces, two M3 x 5 Phillips screws and two locking bolts.

1.3.11.2 Functioning

(See Fig. 1.15)

The receive frequency selected by the operator is routed to interface *BCD INTERFACE* as a 22-bit BCD data word via a buffer and RC filters. At the interface HF Selector FK 101 may be connected for example.

In SSB operation not the nominal but the center frequency of the selected sideband is buffered.

By means of the RC filters any external interferences are blocked off.

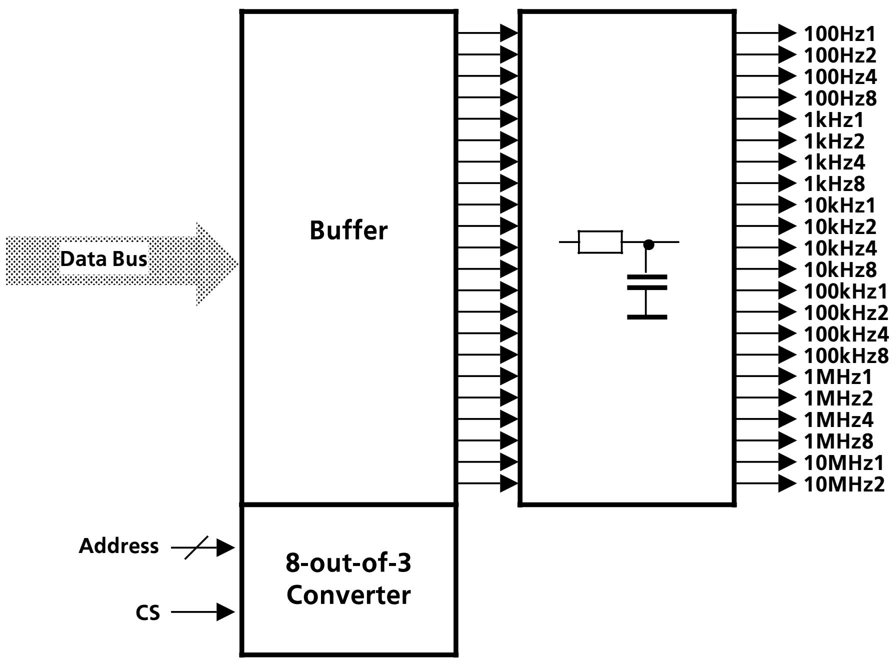


Fig. 1.15 BCD Interface R&S GC 890 (Option), Block Diagram

1.3.12 TTY Line Current Source R&S GH 890 (Option)

1.3.12.1 Design

The TTY line current source consists of a printed circuit board and a ribbon cable. Via the ribbon cable the TTY line current source is electrically connected to the printed circuit board A66 in the power supply.

Among others, the line current source contains jumpers for switchover between single current (40 mA) and double current (±20 mA).

1.3.12.2 Functioning

(See Fig. 1.16)

The AC voltages of +30 V and -30 V generated from the 25.6-V secondary AC voltage by means of rectification and filtering are routed to the respective constant current sources via PTC resistors.

The PTC resistors ensure an automatic current limiting in the case of an overload.

The FSK signal from option IF / AF processor controls the positive and negative constant current sources via the respective optocoupler. Both, the +FSK and -FSK signals, are galvanically decoupled by these optocouplers.

By means of jumpers the constant current sources may be switched in parallel (→ single current: 0 and 40 mA) or in series (→ double current: -20 and +20 mA).

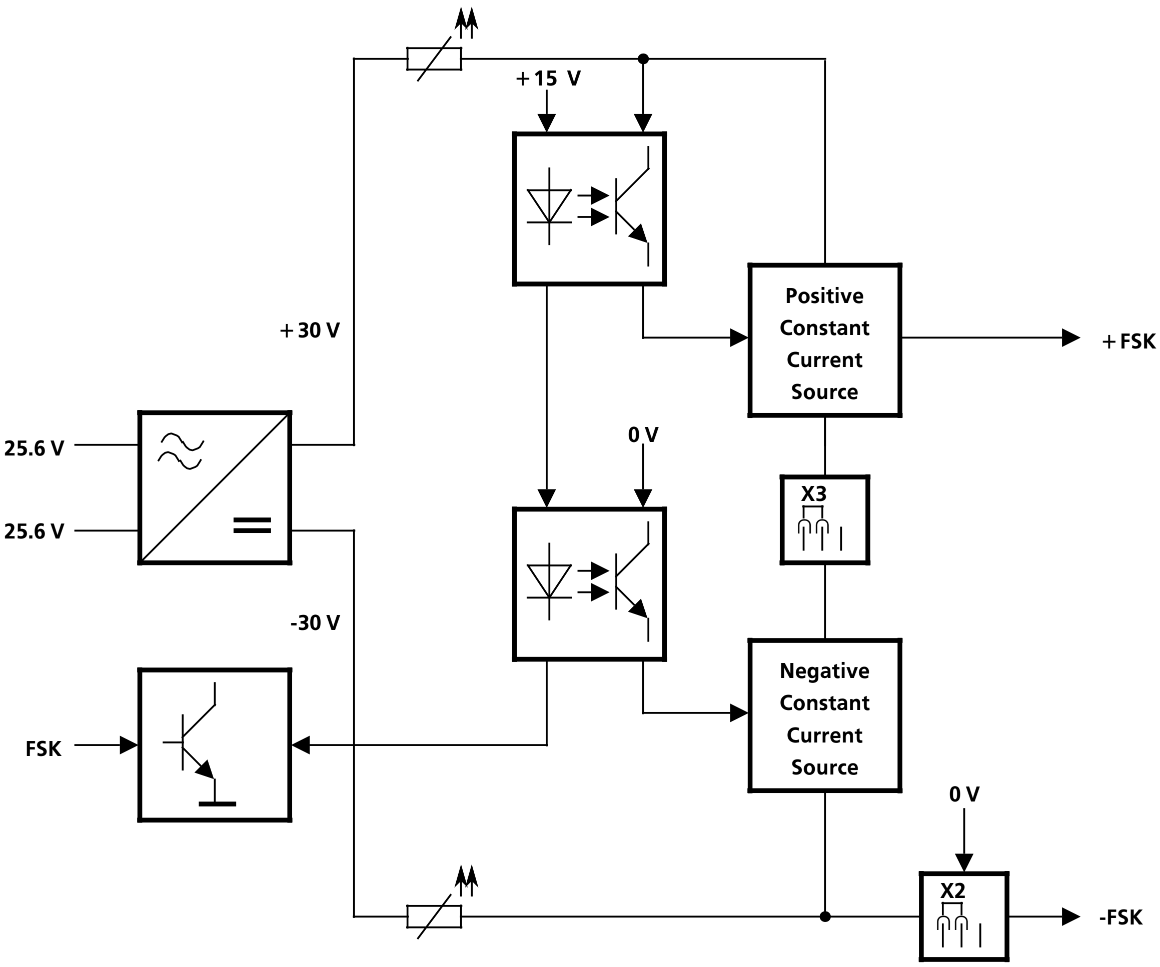


Fig. 1.16 TTY Line Current Source R&S GH 890 (Option), Block Diagram

1.3.13 IF Converter R&S UX 895 (Option)

1.3.13.1 Design

The IF Converter UX 895 consists of a printed circuit board and the interfaces to the IF / AF signal processor.

1.3.13.2 Functioning

(See Fig. 1.17)

The IFIN signal from the IF / AF processor is fed, depending on signal OPT2, either via switch S1 to a line driver or via switch S2 to a converter stage.

If switch S1 is closed, the IFIN signal (0 to 40 kHz) is routed unchanged to the line driver.

If switch S2 is closed, the converter stage converts the IFIN signal (20.218 kHz) into the intermediate frequency of 455 kHz with the aid of an auxiliary frequency.

The auxiliary frequency is obtained from the 20-MHz fixed frequency of the IF / AF processor and via a 46:1 divider. The following amplifier provides for adaptation to the input impedance of the ceramic filter. The filter suppresses the auxiliary frequency as well as unwanted mixing products. The ceramic filter is followed by the line driver.

The low-impedance signal of the line driver is in addition rectified and evaluated in the built-in equipment test as BIT signal.

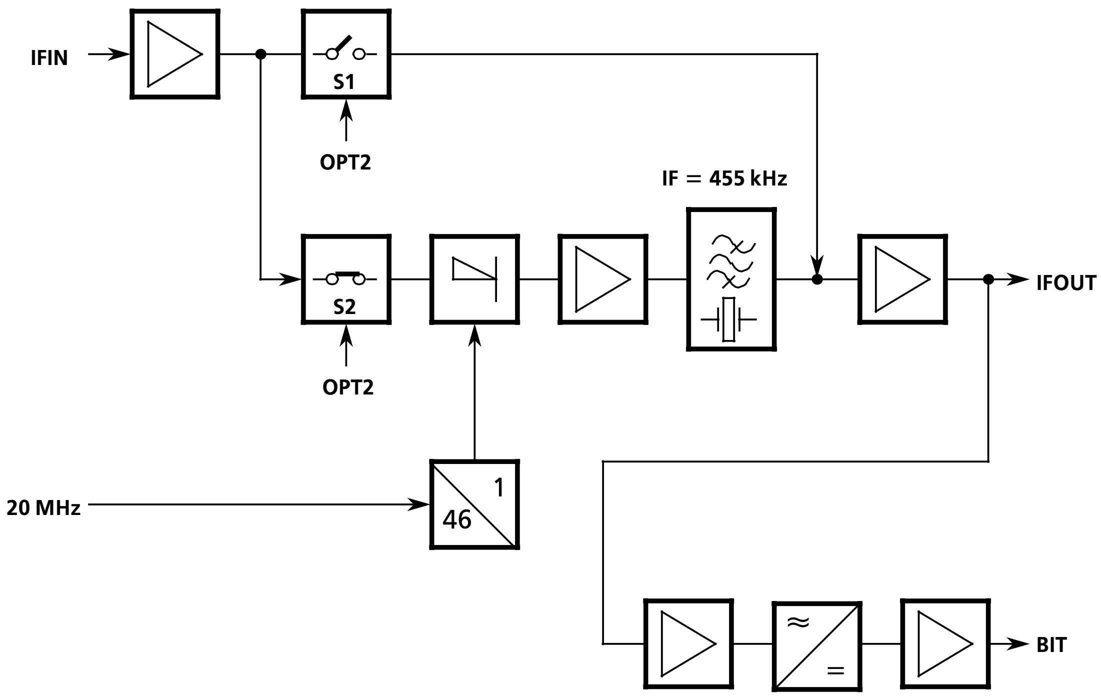


Fig. 1.17 IF Converter R&S UX 895 (Option), Block Diagram

1.3.14 IF Processor R&S GM 893 (Mod. 03 = Wideband Output, Option)

1.3.14.1 Design

The IF Processor R&S GM 893 (Mod. 03 = wideband output) consists of a printed circuit board, a set of screens, two RF covers, two grey extracting levers, the interface to the carrier board as well as HF interfaces.

1.3.14.2 Functioning

(See Fig. 1.18)

The receive signal ANTIN (f > 500 kHz) from the IF / AF processor is routed via a relay to a transformer. The latter provides for signal level matching, decouples the IF processor from the preceding modules and splits up the receive signal.

Part of the receive signal ANT OUT is fed to the HF unit.

The transformer is connected via a lowpass filter to a converter stage.

The converter stage converts the receive signal into the intermediate frequency of 41.44 MHz by using the oscillator frequency variable in 1-Hz increments from the synthesizer.

The 41.44-MHz signal is applied via a lowpass filter to an active bandpass filter.

The bandpass filter is followed by an amplifier. The latter works in common-base connection and thus ensures a high HF gain and a large bandwidth. The amplified signal WB OUT is routed via an RF cable to interface OPTION.

The receive signal ANTIN (f ≤ 500 kHz) from the IF / AF processor is fed via a relay to the HF unit.

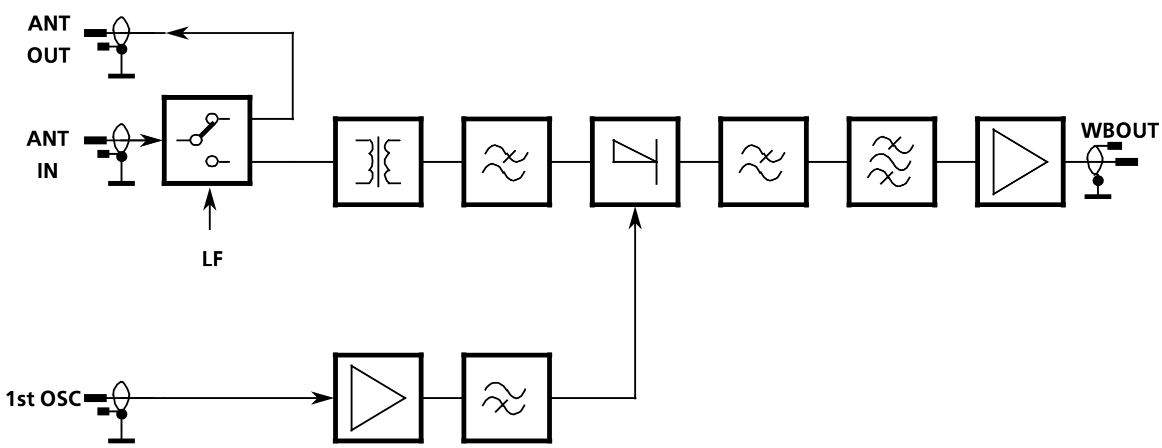


Fig. 1.18 IF Processor R&S GM 893 (Mod. 03 = Wideband Output, Option), Block Diagram

1.3.15 Digitally Tunded RF Selector R&S FK 896D (Option)

1.3.15.1 Design

The optional Digitally Tuned RF Selector R&S FK 896D consists of two printed circuit boards, namely the actual Digital Selection R&S FK 2020 (R&S FK 896D, mod.02) or Digital Selection R&S FK 2040 (R&S FK 896D, mod.04), an interface module as well as an adapter (part of interface module). It contains three interface connectors which are used for HFsignal input and output as well as for connection to the SERBUS.

1.3.15.2 Functioning

(See Fig. 1.19)

The Digitally Tuned RF Selector R&S FK 896D is used in VLF-HF Receiver R&S EK 896, where it is switched into the receive path between the HF amplifier and the HF unit. At a spacing of 10 % from the nominal frequency, the digitally tuned RF selector ensures a selectivity of > 20 dB (R&S FK 2020) or > 40 dB (R&S FK 2040).

The receive signal is routed from HF socket X41 (RXIN) to the overload circuit. The latter ensures that the HF signal path is interrupted at input currents of > 4 A and input voltages of > 10 V EMF.

Further the receive signal is routed via a 50-MHz lowpass filter (suppression of VHF and UHF frequencies) to the contacts of two relays. In bypass operation the filters of the digitally tuned RF selector are bypassed by these relays.

The only exception is the 50-MHz lowpass filter in which case the receive signal is directly routed to HF output X45 (RXOUT) via the relay contacts.

If selection is switched on, the receive signal is controlled by the 1.5-MHz signal. At receive frequencies in the range from 0 to 1.5 MHz, the HF signal is routed to a 1.5-MHz lowpass filter and further to HF output X45 (RXOUT). At receive frequencies in the range from 1.5 to 30 MHz, the receive signal is routed via avariable single-circuit filter to an amplifier or an attenuator depending on signal GAINCONTROL. The latter guarantees, at switched-on selection, a gain of 0 to +2 dB from X41 (RXIN) to X45 (RXOUT). From the amplifier, the signal SELOUT is routed to HF output X45 (RXOUT) via relay contacts.

Depending on its use, the digital selection can either be controlled via the SERBUS or else via discrete lines. The following functions are ensured:

- Exchange of control, data, acknowledgeand monitoring signals with the processorof the Receiver R&S EK 896
- Switchover of filter assemblies in accordance with the set operating frequency
- Bypass / selection operation switchover
- Interruption of receive signal path in thecase of overcurrent or overvoltage
- Switchover between amplifier and attenuator

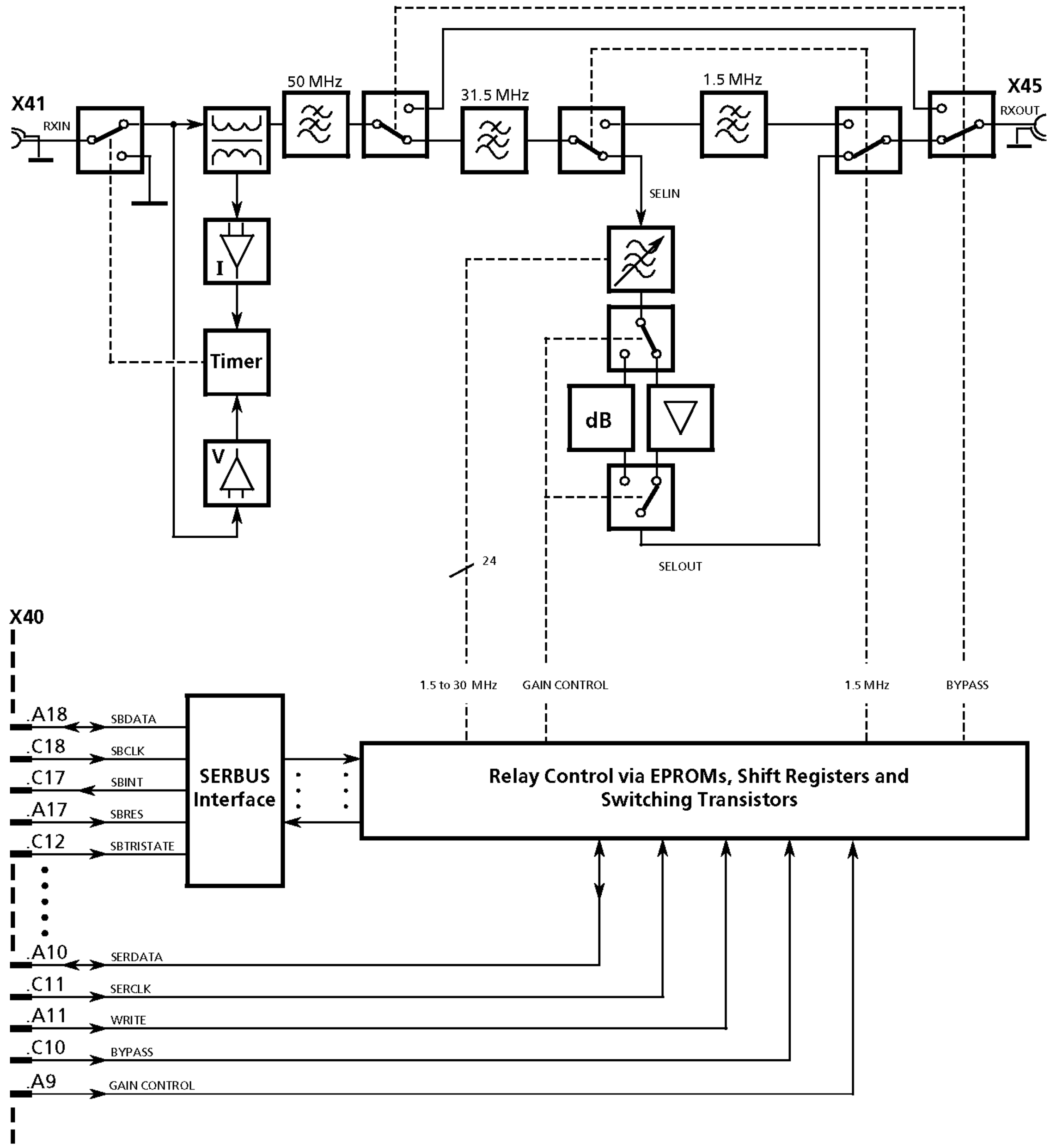


Fig. 1.19 Digitally Tuned RF Selector R&S FK 896D

1.4 Technical Data

The Technical Data of the VLF-HF receivers are described in the Data Sheet PD 0758.0251.32 (appended to this Section 1).

1.5 Explanation of Models

Model Modules	R&S EK 895								R&S EK 896			
	.02	.04	.07	.12	.14	.17	.37	.63	.12	.14	.17	.37
Frame 6057.9092.02	x	x	x	x	x	x	x	x				
Frame 6038.1254.02									x	x	x	x
Control Unit 1 6007.5506.02	x	x	x									
Control Unit 2 6057.9140.02				x	x	x	x	x				
Control Unit 6038.1502.03									x	x	x	x
Processor 6007.6954.04	x	x		x	x			x				
Processor (Data Link) 6007.6954.07			x			x	x					
Processor 6007.6954.05									x	x		
Processor (Data Link) 6007.6954.17											x	x
Synthesizer 6007.3255.04	x			x			x	x	x			x
Synthesizer (OCXO) 6007.3255.05		x	x		x	x				x	x	
RF Unit 6007.4400.02	x	x	x	x	x	x	x		x	x	x	x
RF Unit (WB Output) 6007.4400.03								x				
Power Supply 6057.9192.02	x	x	x	x	x	x	x	x				
Power Supply 6057.9192.03									x	x	x	x
IF/AF Processor 6057.9240.03	x	x	x	x	x	x	x	x	x	x	x	x

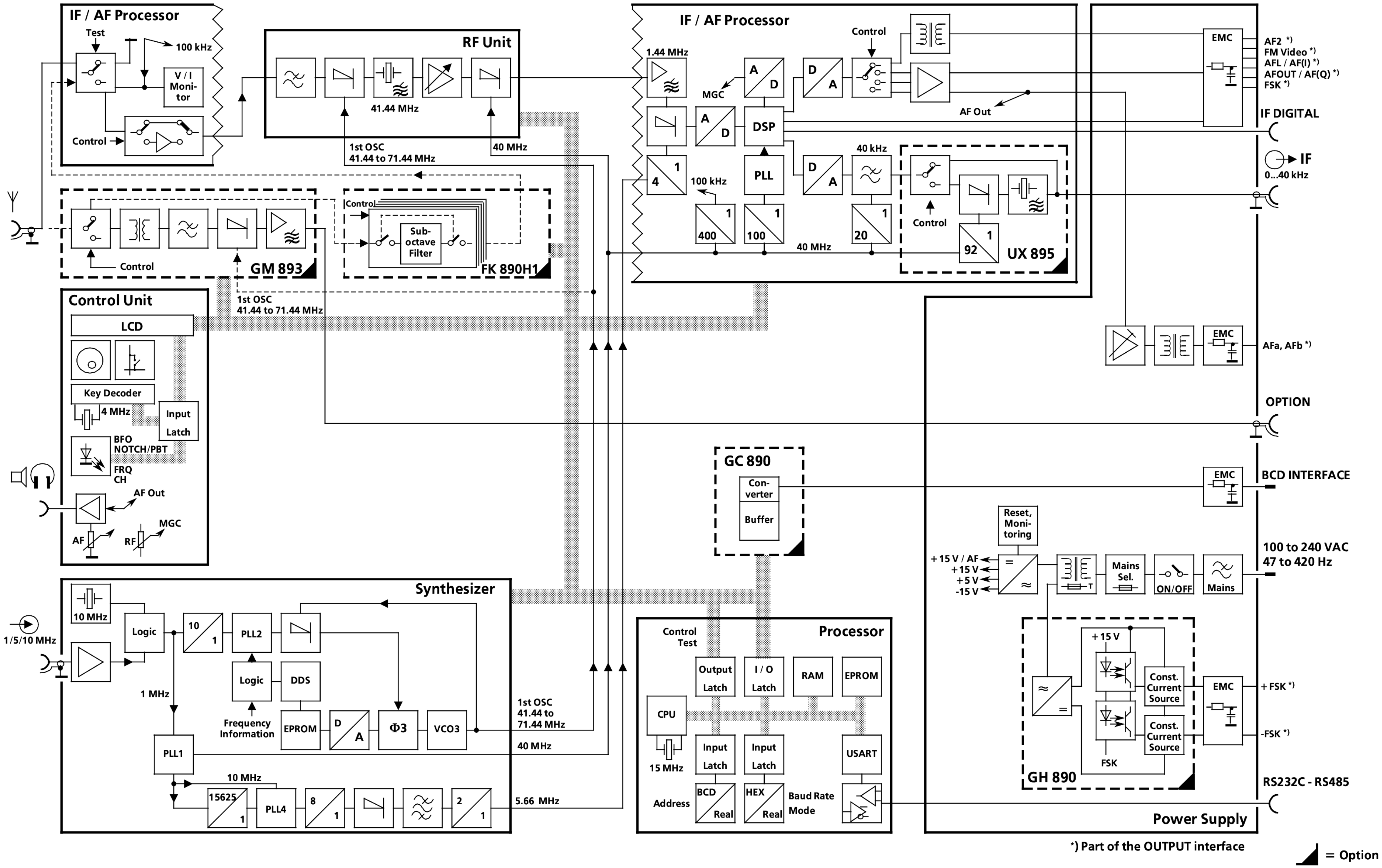


Fig. 1.20 VLF-HF Receivers R&S EK 895, Block Diagram

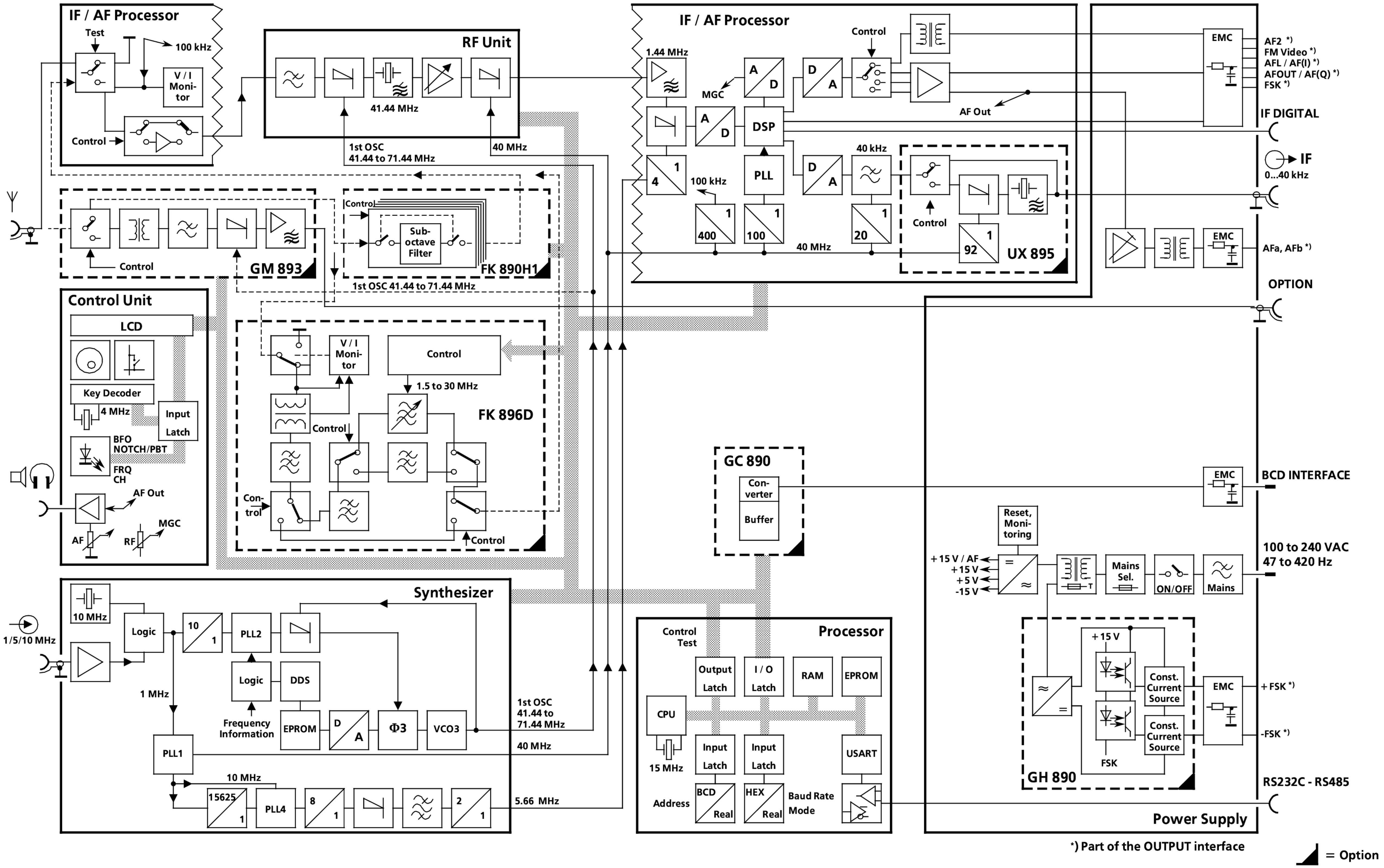


Fig. 1.21 VLF-HF Receivers R&S EK 896, Block Diagram

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2. Preparation for Use

2.1 Safety Notes

In the setting up of premises for the operation of electrical installations and in the setting up and operation of the installations themselves, the relevant national or international safety regulations and requirements should be observed and maintained.

The essence of these are contained in the safety guidelines of the IEC 364, in VDE 0100 (= DIN 57100) and DIN 57800.

They cover the following aspects:

a) Protective measures:

- accident prevention
- protection against excessive voltage
- insulation of installations
- grounding

b) Nature and laying of lines and cables

c) Rules for operating facilities and installations of a special kind:

- premises for the installation of electrical installations
- charging stations and charging devices for batteries

WARNING

The VLF-HF receivers operate on an AC mains voltage of 100 VAC, 120 VAC, 220 VAC or 240 VAC. This voltage is a life hazard.

When dealing with this voltage be extremely careful and take appropriate safety measures!

2.2 Unpacking and Checking

- Unpack the respective VLF-HF receiver.
- Check whether the packing is damaged. If so, check whether the unit is also damaged. In this case, please notify the forwarding agency immediately.

  Note:

  We recommend to keep the packing for later service purposes.

- Check whether the options you ordered are installed (see Fig. 2.25 (R&S EK 895) or Fig. 2.26 (R&S EK 896)).

2.3 Operations Functions Set Ex Works

2.3.1 Power Supply

The power supply is set ex works to an operating voltage of

- 220 VAC.

For this operating voltage a fuse, type T630/250 V is required.

The AF output level is set to

- 0 dBm.

Appendix 1 provides information on how the operating voltage and the level can be altered.

2.3.2 Control Unit (R &S EK 896)

The direction of rotation of the HF control in the control unit is set ex works so that by turning the control

- clockwise

the gain increases.

Appendix 1 provides information on how the direction of rotation can be altered.

2.3.3 Processor

The RS232C-RS485 interface parameters in the processor are set ex works as follows:

- unaddressed operation
- 2400 Bd, one stop bit
- RS232, odd parity, CTS / RTS handshake

Appendix 1 provides information on how one or several interface parameters can be altered.

2.3.4 Synthesizer

The synthesizer is set ex works to

- internal synchronization
- division ratio 10:1

Appendix 1 provides information on how the synthesizer can be externally synchronized and which division ratio is to be set.

2.3.5 IF / AF Processor

Ex works the AF output level is set to

- 0 dBm

Appendix 1 provides information on how to alter the AF output level.

The variable resistor FM Video permits the adjustment of the DC offset ($\leq$ 10 mV) for the signal FM-Video.

2.3.6 TTY Line Current Source R&S GH 890 (Option)

The optional TTY Line Current Source
R&S GH 890 is set ex works to

- single current.

Appendix 1 provides information on how the line current source can be set to double current.

2.4 Installation

2.4.1 General

The VLF-HF receivers are designed for operation under adverse environmental conditions without impairing their characteristics. The vibrations encountered in normal transport will not detract from their functioning. For the environmental conditions the limit values stated in the data sheet apply.

The VLF-HF receivers are suitable to be used in both stationary and mobile operation.

The VLF-HF receivers are supplied as desk-top models. By using the optional 19" Service Kit R&S ZZA-98 (for one R&S EK 895) or Parts Set R&S KA 890L1 (for two R&S EK 895), installation into a 19" rack is also possible.

The installation into such a rack can be carried out in a fix manner or with the aid of telescopic rails.

For mobile applications we recommend to use a shockmount, e.g. for R&S EK 895:
R&S KS 890C1 or R&S KS 890M1 (MIL-STD-810D). In this case make sure that the selected shockmount is able to fulfil the requirements of the respective application.

When installing the VLF-HF receivers, make sure that the following is taken care of:

- Make sure that enough space is available is front of the respective receiver for its local control, if need be.

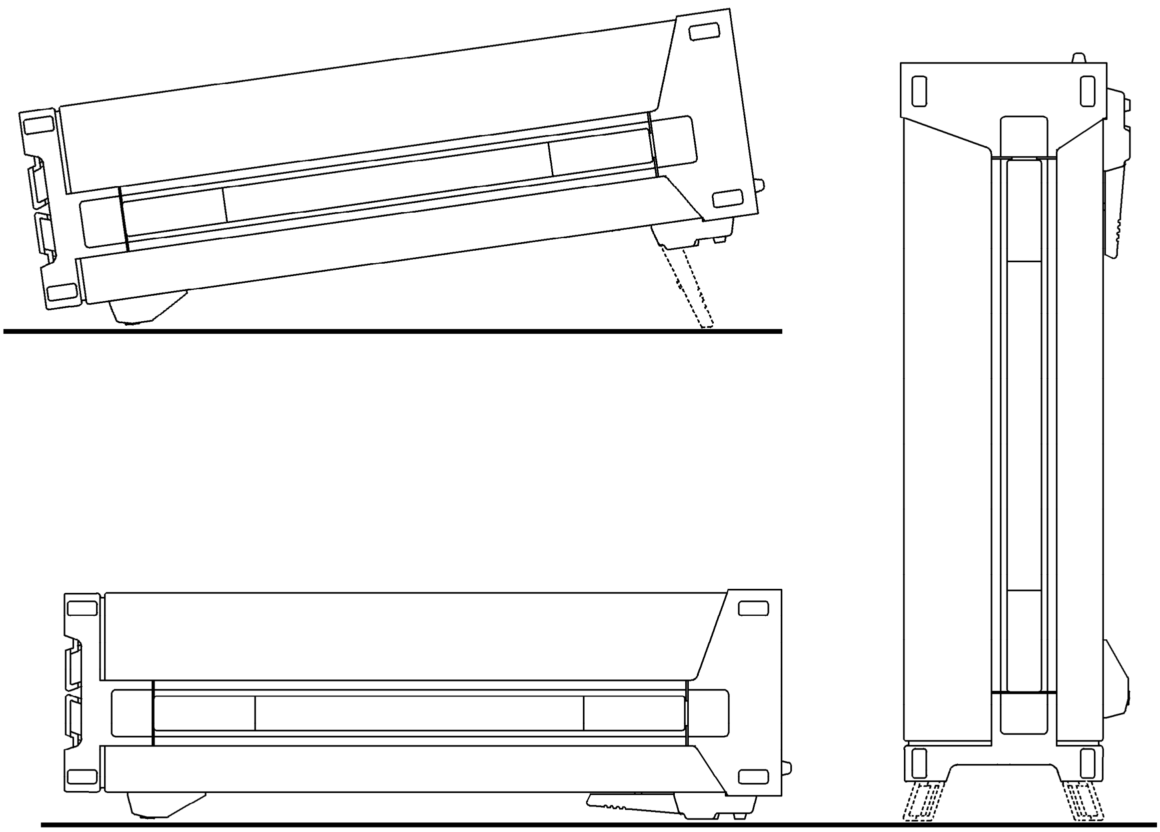


Fig. 2.1 Possible Positions for Installation

2.4.2 Installation into a 19" Rack

(see Fig. 2.25)

Note:

If one VLF-HF Receiver R&S EK 895 is to be installed into a 19" Rack, the 19"-Service Kit R&S ZZA-98 (Rohde&Schwarz 827.4533) is required. For installation of two VLF-HF receivers into a 19" rack the Parts Set R&S KA 890L1 (Rohde&Schwarz 6041.6699.03) should be used. If one VLF-HF Receiver R&S EK 896 is to be installed into a 19" rack, the 19"-Service Kit R&S ZZA-93 (R&S 396.4892) is required. The following tools are necessary:

Screw drivers for Phillips screws, sizes 0, 1 and 2
Allan key (SW 2.5 mm)

2.4.2.1 Preparations

1. Remove spreaders in front stands (1) of receiver by means of screw driver for Phillips screws.
2. Remove front stands of receiver.
3. Remove threaded studs in rear stands (2) by means of Allan key.
4. Remove rear stands of receiver.
5. Remove all lateral stands (3).

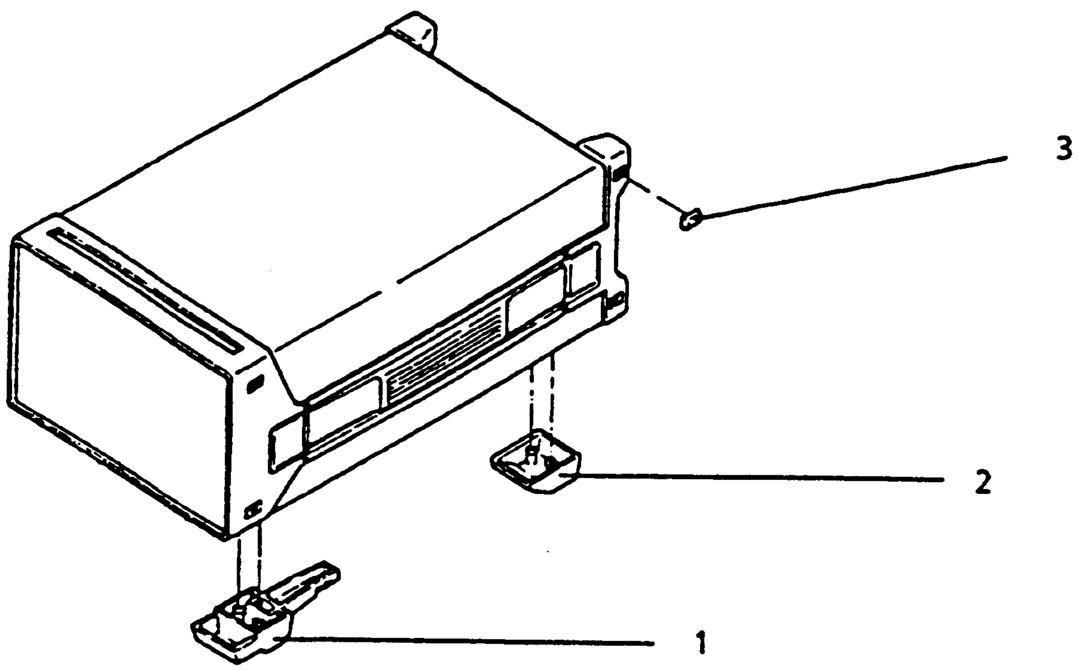


Fig. 2.2 Removal of Stands

2.4.2.2 Installation of a Single Receiver R&S EK 895 with 19" Service Kit R&S ZZA-98

1. Make preparations acc. to 2.4.2.1.
2. If the service kit is to be fixed to the right-hand side of the receiver:

   On the right-hand side of the receiver remove cover (5) and carrying handle (6).

   If the service kit is to be fixed to the left-hand side of the receiver:

   On the left-hand side of the receiver remove cover (5).
3. Connect front bracket (7) with two front connecting elements (15) on left or right to front frame by means of two screws (21) and spring washers (27).
4. Fix front grip (14) and rack bracket (13) to the other equipment side by means of two screws (20) and toothed washers (26).
5. Fix rear bracket (10) to plate (11) by means of two screws (22).
6. Fix plate (11) with screw (21), spring washer (25), washer (27) and spacer (17) to rear of frame.
7. Fix plate (11) with two screws (19), spring washers (25) and washers (27) to rear panel stand.
8. Fix lateral sheet (9), front bracket (7), front grip (14) and rack bracket (13) to each other by means of two screws (20) and toothed washers (26).
9. Fix lateral sheet (9) to rear bracket (10) by means of two screws (19) and spring washers (25).
10. Remove paper from adhesive layer and affix guiding rails (16) to the bottom of the receiver, previously cleaned with isopropyl alcohol for example.
11. Secure the receiver to the rack by means of four screws.

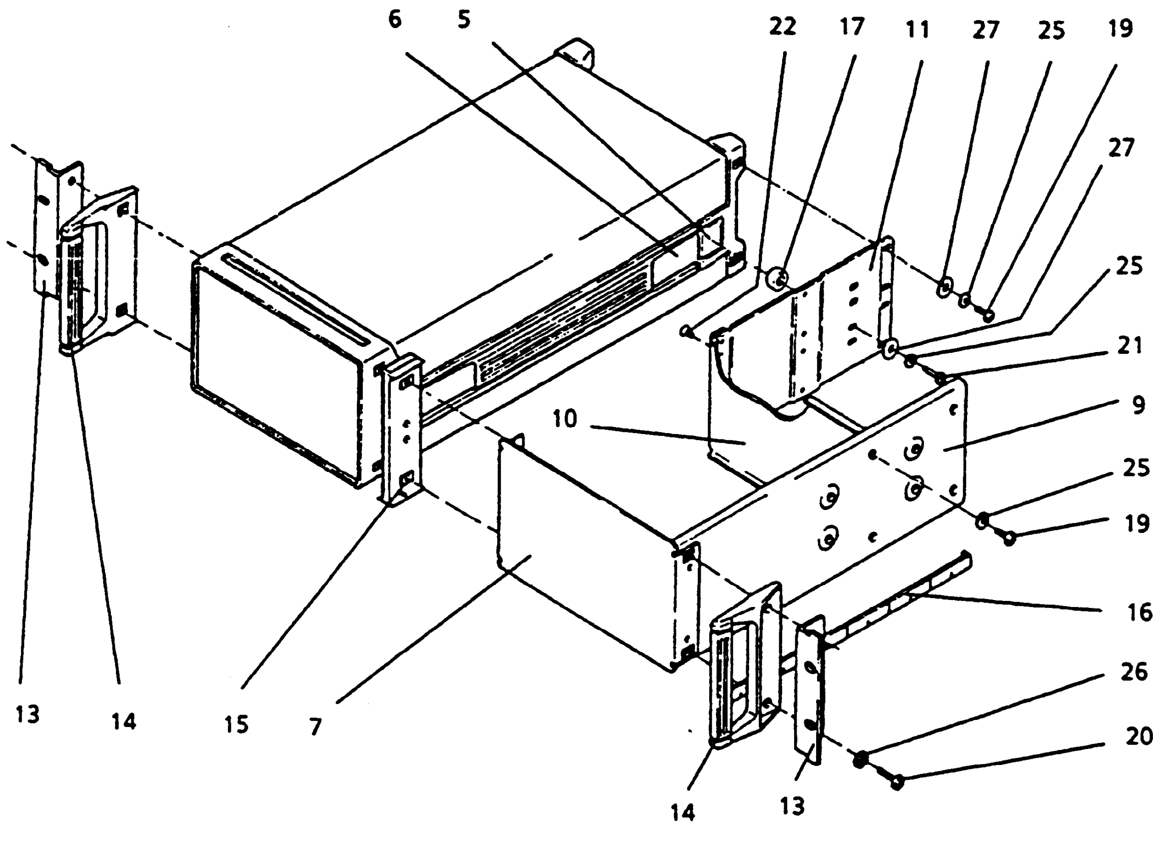


Fig. 2.3 19" Service Kit R&S ZZA-98

2.4.2.3 Installation of Two Receivers R&S EK 895 with Parts Set R&S KA 890L1

1. Make preparations acc. to 2.4.2.1.
2. Fix front (10) and rear connecting elements (20) with two screws each (30) to both units.
3. Slide one front connecting elements into the other until a stop is reached.
4. Fix the two rear connecting elements to each other by means of two screws (40) and spring washers (50).
5. Fix each of the two front grips (60) and brackets (80) to the units by means of two screws (70) and toothed washers (100).
6. Remove paper from adhesive layer and affix guiding rails (102, 104) to the equipment bottom, previously cleaned with isopropyl alcohol for example.
7. Secure the receivers to the rack by means of four screws.

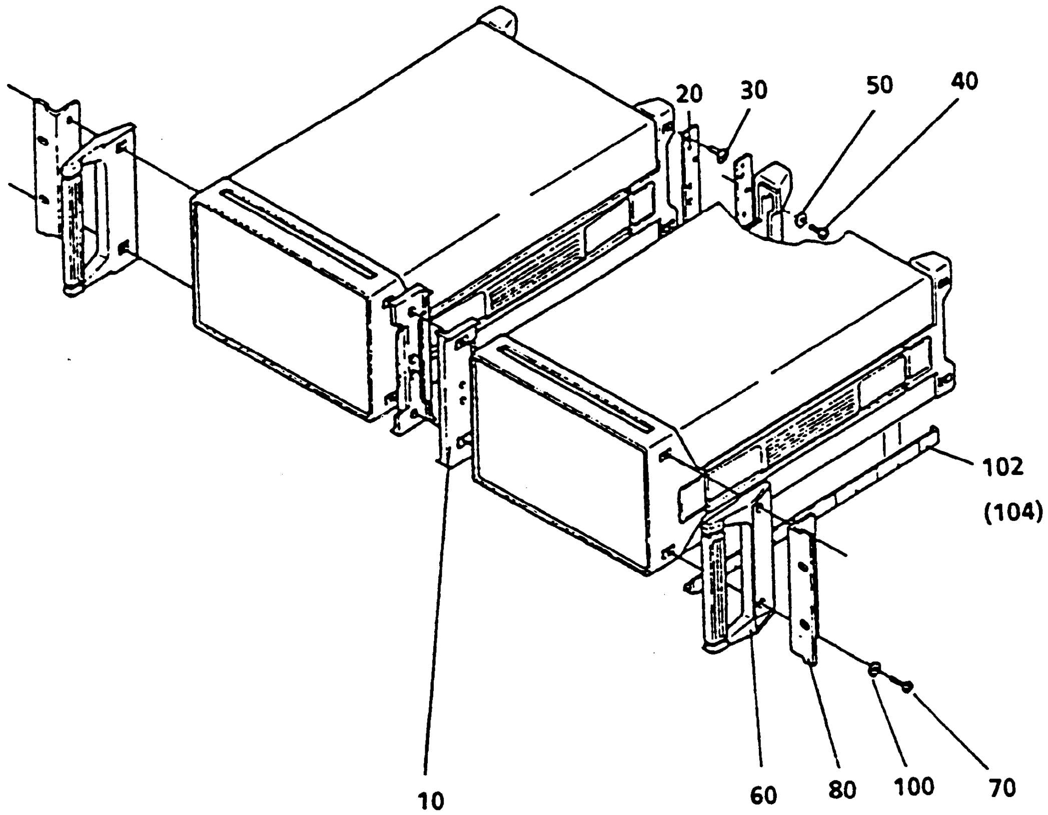


Fig. 2.4 Parts Set R&S KA 890L1

2.4.2.4 Installation of One Receiver R&S EK 896 with 19" Service Kit R&S ZZA-93

1. Remove spreaders in front stands (1) of receiver by means of screw driver for Phillips screws.
2. Remove front stands of receiver.
3. Remove threaded studs in rear stands (2) by means of Allan key.
4. Remove rear stands of receiver.
5. Remove all lateral stands (4).
6. Screw front grip (5) and rack bracket (6) by means of two screws (7) and toothed washers (8) to right side of receiver.
7. Screw front grip and rack bracket by means of two screws and toothed washers to left side of receiver.
8. Remove paper from adhesive layer and affix guiding rails (9) to the bottom of the receiver, previously cleaned with isopropyl alcohol for example.
9. Secure the receiver to the rack by means of four screws.

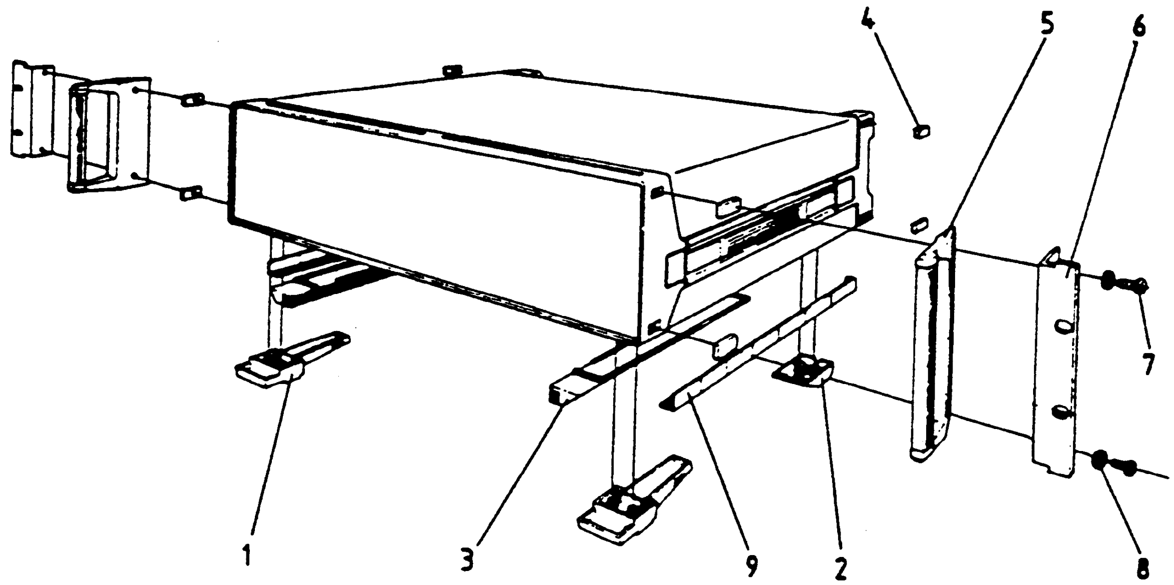


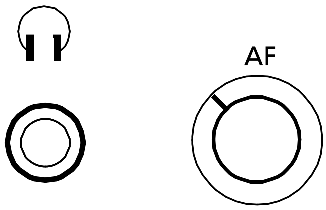
Fig. 2.5 19" Service Kit R&S ZZA-93

2.5 Cabling

(See also Appendix A2 as well as Figs. 2.27 and 2.28)

CAUTION

Before beginning the cabling make sure that the equipment has been switched off and is not connected to the external mains.

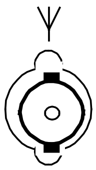


1. **Connection of headphones (R&S EK 896, rear)**

   Connect the jack-type socket to external headphones.

   As the mating contact we recommend the use of a 6.3-mm plug (FT 019.0487).

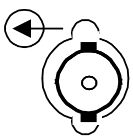
   Adjust the volume with the AF control on the front panel, as required.



2. **Connection of an antenna**

   Connect the recessed BNC socket via an RF cable to an antenna.

   As the mating contact we recommend a straight BNC cable plug (FJ 075.8421). In connection with the recommended mating contact, the 75-Ω coaxial cable (DH 025.2142) can be used.



3. **Connection of an external frequency standard**

   Connect the recessed BNC socket via an RF cable to an external frequency standard (1, 5 or 10 MHz).

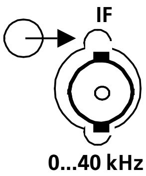
   Set the synthesizer for external synchronization and the required division ratio acc. to Appendix A1.3.

   As the mating contact we recommend a straight BNC cable plug (FJ 075.8421). In connection with the recommended mating contact the 75-Ω coaxial cable (DH 025.2142) can be used.

4. Connection of a FET analyzer

Note:

If the optional IF Converter R&S UX 895 is installed, interface IF 0...40 kHz will also provide the 455-kHz intermediate frequency.



Connect the recessed BNC socket via an RF cable to an analyzing device (e.g. analyzer FET).

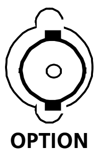
Configure the IF signal acc. to 3.1.19.11 (local operation) or via the 25-way connector strip RS232C-RS485 acc. to A3.8.6.

As the mating contact we recommend a straight BNC cable plug (FJ 075.8421). In connection with the recommended mating contact the 75-Ω coaxial cable (DH 025.2142) can be used.

5. Connection of a spectrum display (option)

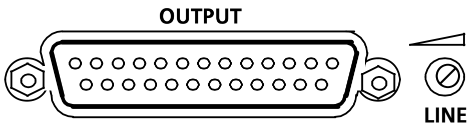
Note:

For this the optional IF Processor R&S GM 893, model 03 is required.



Connect the recessed BNC socket via an RF cable to an analyzing device (e.g. Spectrum Display EPY 513).

As the mating contact we recommend to use a straight BNC cable connector (FJ 075.8421). In connection with the recommended mating contact the 75-Ω coaxial cable (DH 025.2142) can be used.



6. **Connection of a data line (AF and FSK signals)**

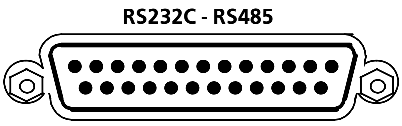
Connect the 25-way female connector strip via a data line to an external device.

Fix the trapezoidal connector strip by means of locking screws.

As the mating contact we recommend a 25-way trapezoidal male connector strip, series D (FM 018.6430) and in addition a protective housing (FM 627.1826).

Adjust the AF signal level (600-Ω line output) via variable resistor LINE (see also A1.6) as required (setting range -10 to +10 dBm).

Adjust the AF2 signal level (600-Ω line output) via variable resistor LINE2 (see also A1.8) as required (setting range -10 to +10 dBm).



7. **Connection of a control line (RS232C-RS485)**

Connect the 25-way male connector strip via a control line to one of the following devices:

- PC
- Terminal
- VLF-HF Receiver R&S EK 896
- VLF-HF Receiver R&S EK 895 with Control Unit 1 (= R&S GB 890)
- VLF-HF Receiver R&S EK 085

Fix the trapezoidal connector strip by means of locking screws.

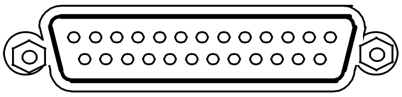
For this purpose the interface parameters of the units interconnected via the RS232C/RS485 interface must be identical. Set RS232C/RS485 interface parameters acc. to A1.4, as required.

As the mating contact we recommend a 25-way trapezoidal female connector strip, series D (FM 018.5756) and in addition a protective housing (FM 627.1827).

8. Connection of an HF selector (option)

Note:

For this the optional BCD Interfac R&S GC 890 is required.



Connect the 25-way female connector strip via a control cable to the control input of an HF selector (e.g. R&S FK 101) or HF antenna system (e.g. R&S AK 001).

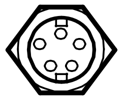
Fix the trapezoidal connector strip by means of locking screws

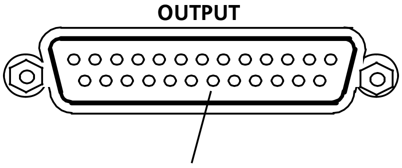
As mating connector we recommend the use of a 25-way trapezoidal male connector strip, series D (FM 018.6430) and in addition a hand-protecting housing (FM 627.1826).

9. Connection of a data line (digital IF signal)

Note:

How the signals depend on each other with respect to time is described in Appendix A2.9. For synchronization the signal BFO-Reset (OUTPUT connector, contact .20)





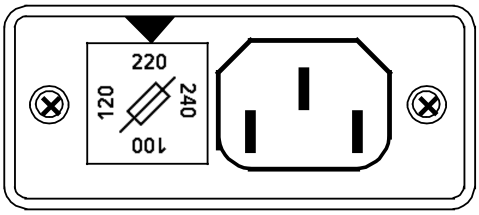
At the 5-way recessed socket the following signals are available for further processing:

- SFRAME
- SCLK
- SDATA

As the mating contact we recommend a 5-way cable plug, Submin-D, series 711 (FO 562.6220).

10. Connection of a mains voltage

Connect the recessed 3-way socket via the supplied power cable to the external mains.



Fuse:

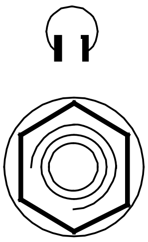
100 / 120 V: IEC 127 - T1.25/250 V
220 / 240 V: IEC 127 - T630/250 V

CAUTION

Before connecting the receiver to the external AC supply network check whether the set mains voltage (see voltage selector) agrees with the mains voltage available. Perform this check also for the fuse. If required, alter the setting (see A1.2) and / or insert new fuse (see A1.2).

The cable (DS 025.2365) required for connection to the external mains is supplied as an accessory.

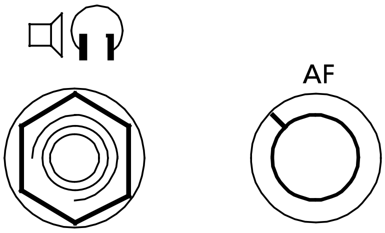
11. Connection of headphones (R&S EK 895, remote-controlled)



Connect the jack-type socket to external headphones.

As the maing contact we recommend to use a 6.3-mm jack-type connector (FT 019.0487).

12. Connection of headphones or a loudspeaker (R&S EK 895, local-controlled)

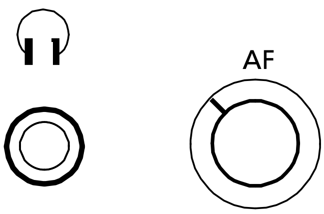


Connect the jack-type socket to external headphones or a loudspeaker.

As the maing contact we recommend to use a 6.3-mm jack-type connector (FT 019.0487).

Adjust the volume by means of the AF control on the front panel, as required.

13. Connection of headphones (R&S EK 896, front)



Connect the jack-type socket to external headphones.

As the maing contact we recommend to use a 6.3-mm jack-type connector (FT 019.0487).

Adjust the volume by means of the AF control on the front panel, as required.

2.6 Basic Cabling

The following figures show various cabling examples.

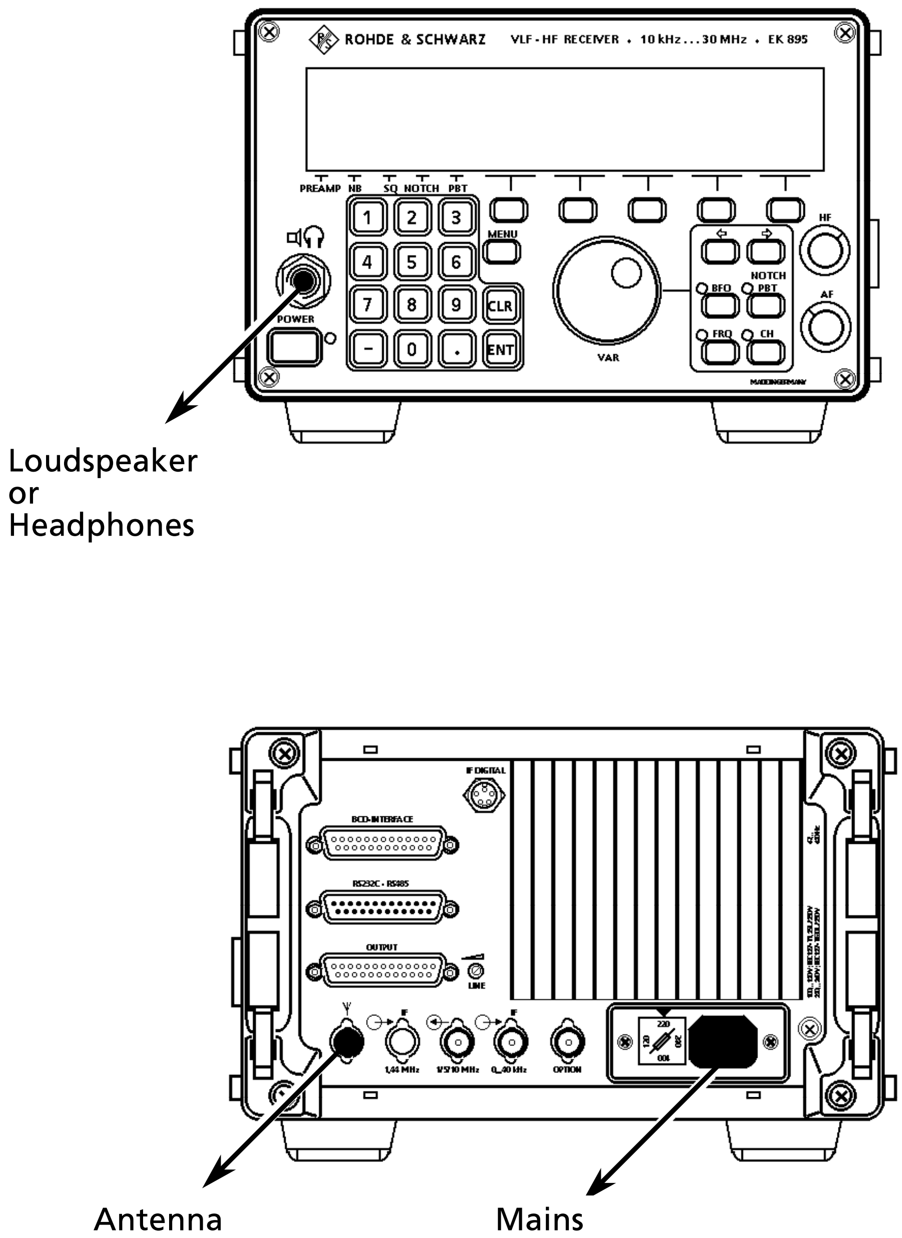


Fig. 2.6 Basic Cabling, EK 895

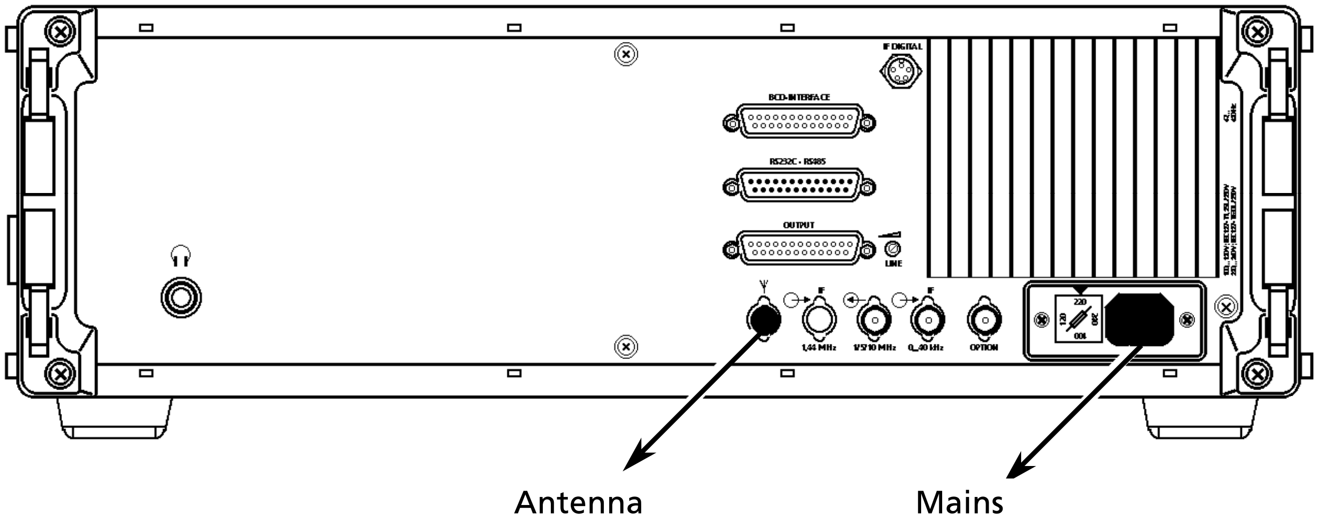


Fig. 2.7 Basic Cabling, EK 896

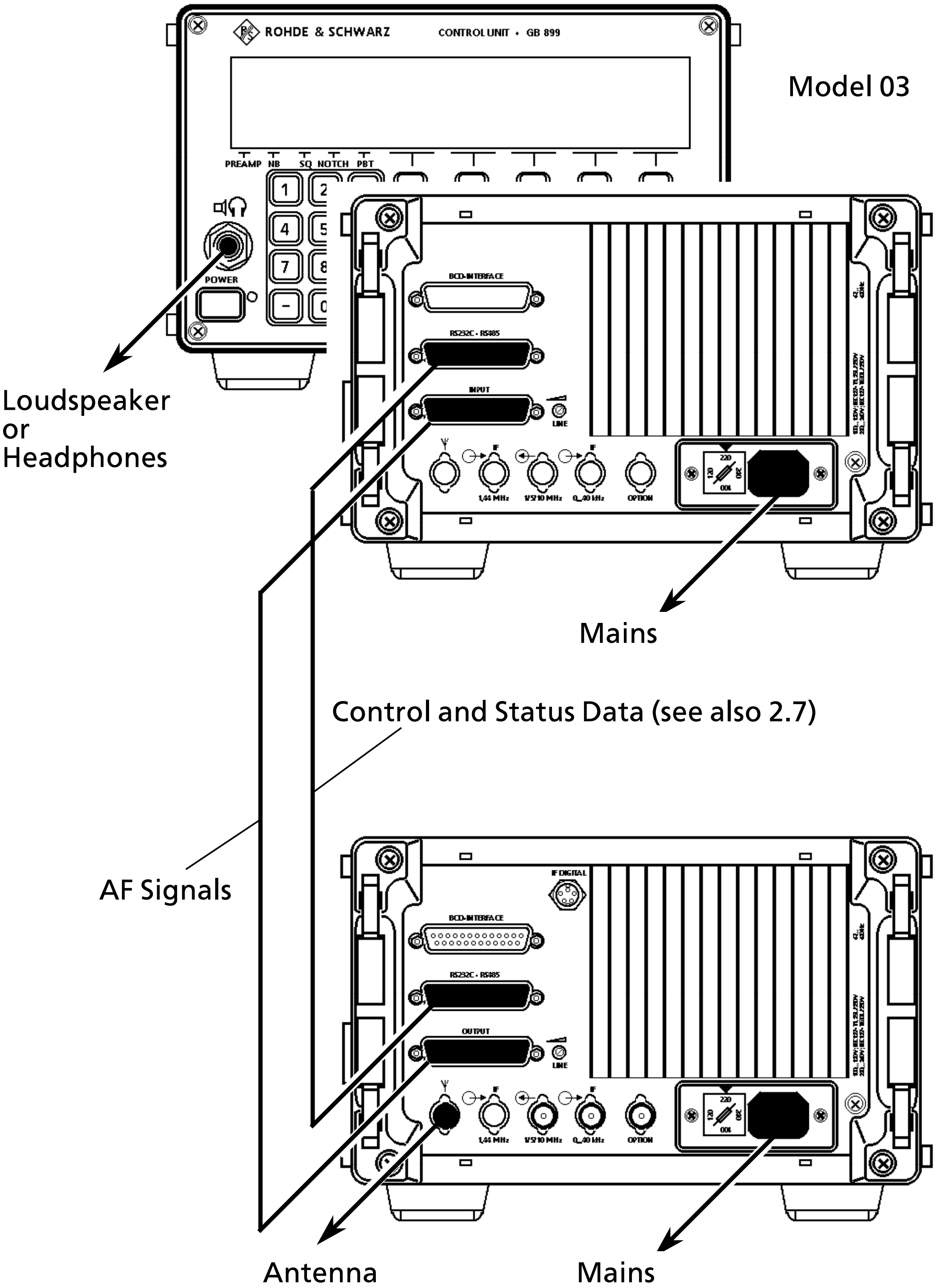


Fig. 2.8 Connection of Control Unit GB 899 to VLF-HF Receiver EK 895

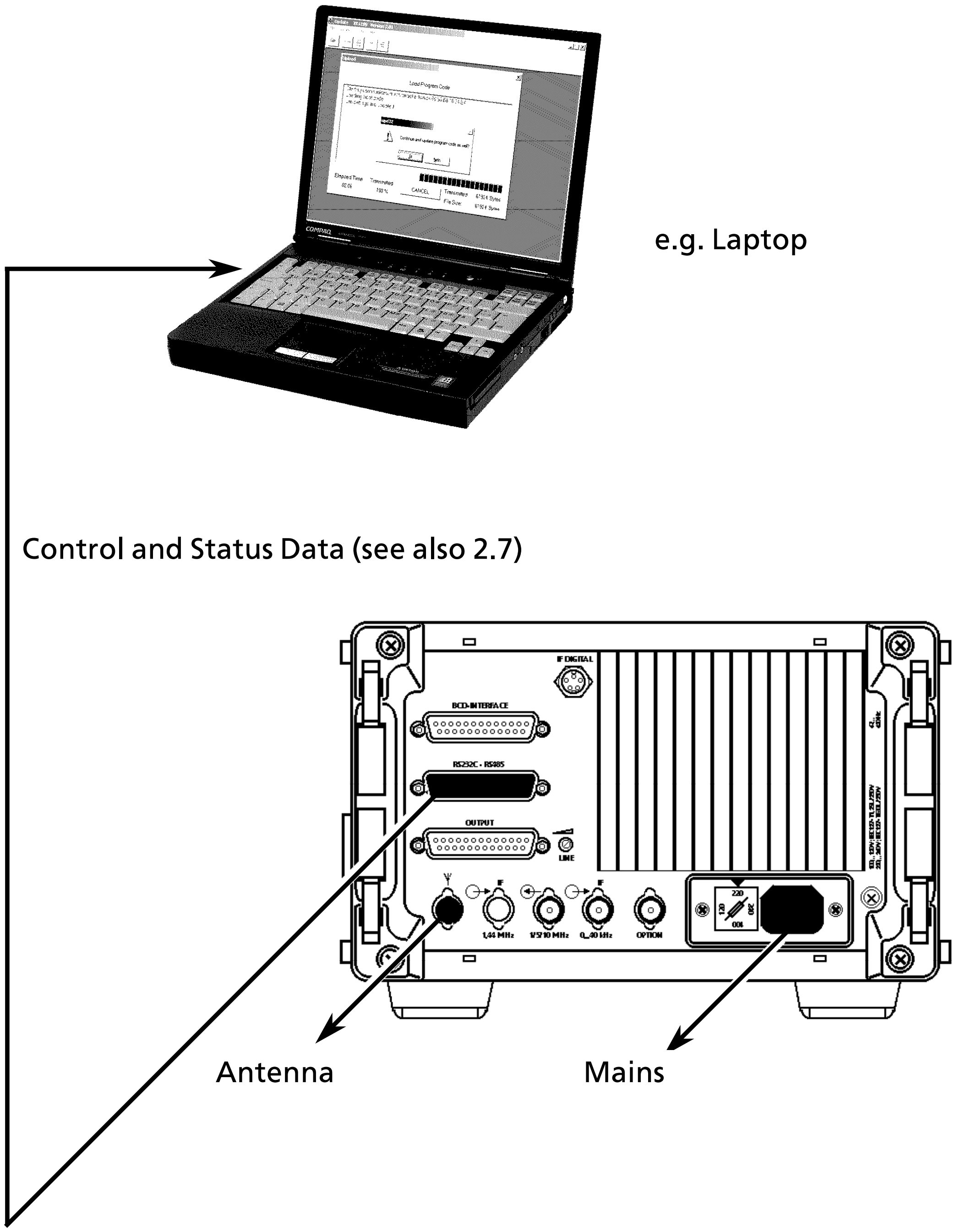


Fig. 2.9 Connection of a PC to VLF-HF Receiver EK 895

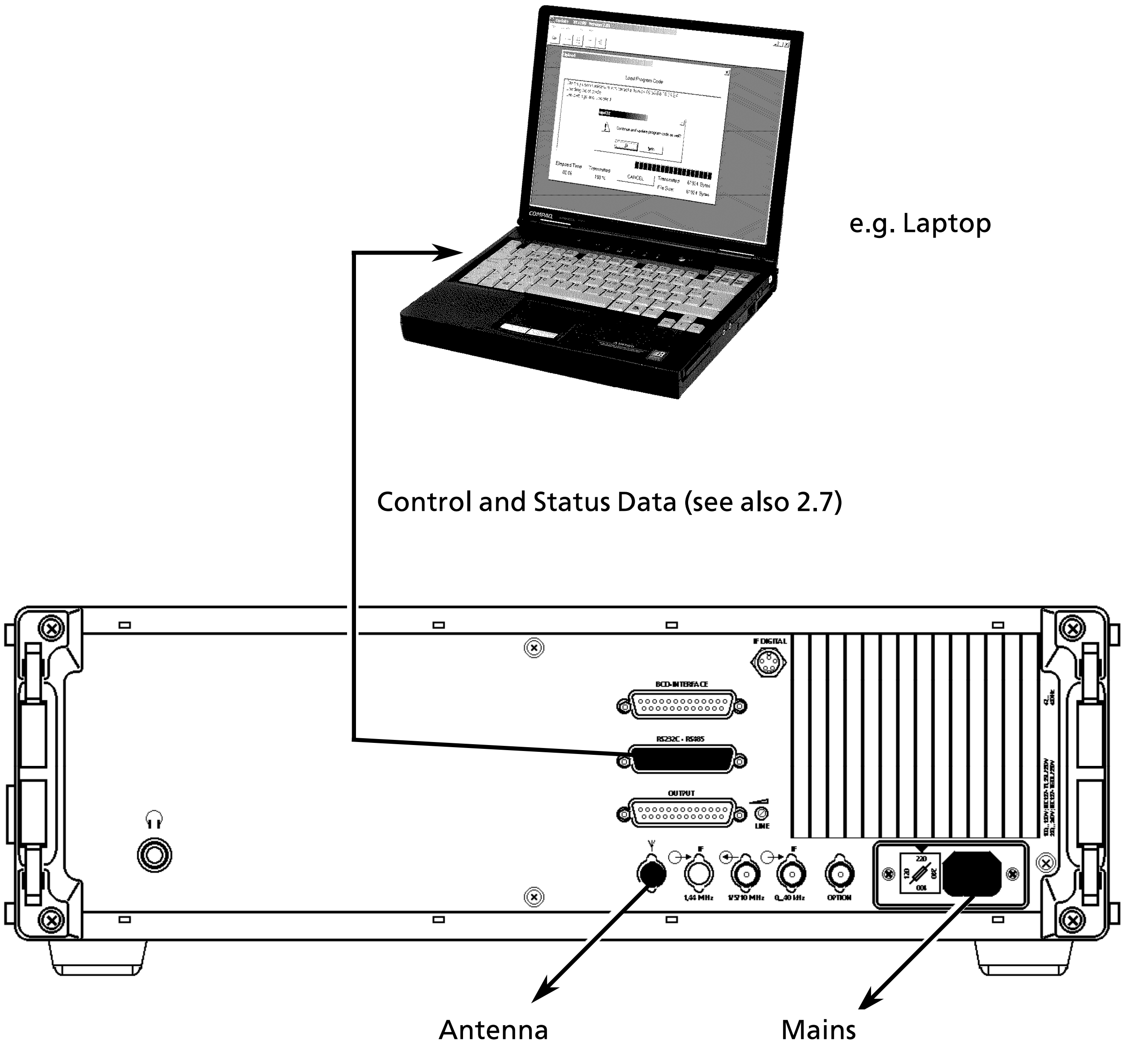
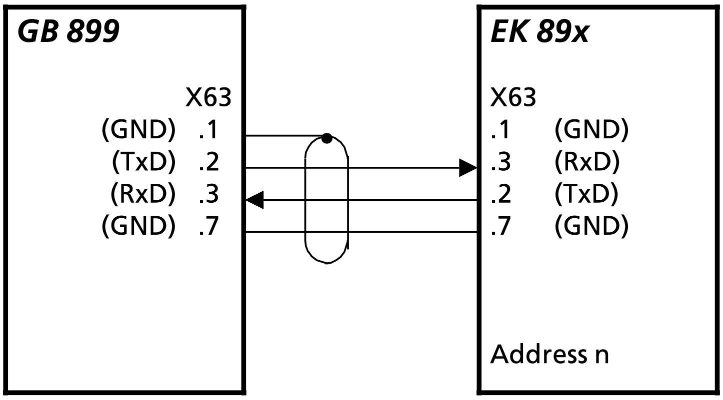


Fig. 2.10 Connection of a PC to VLF-HF Receiver EK 896

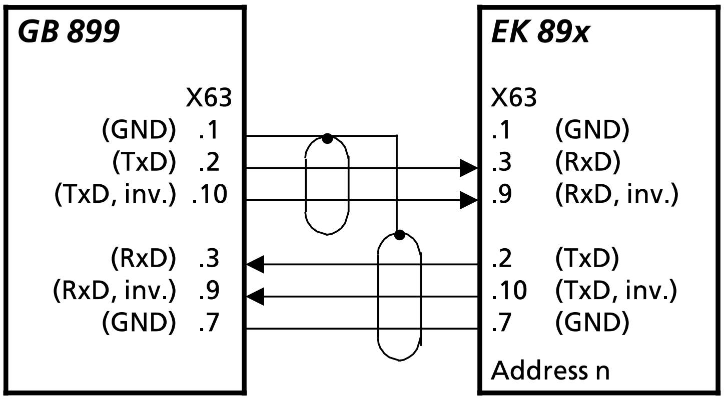
2.7 Cables for Control and Status Data

The following figures show various cables for control and status data.



S4 = 0 or 1, X3 on 1 and 2; see A1.4

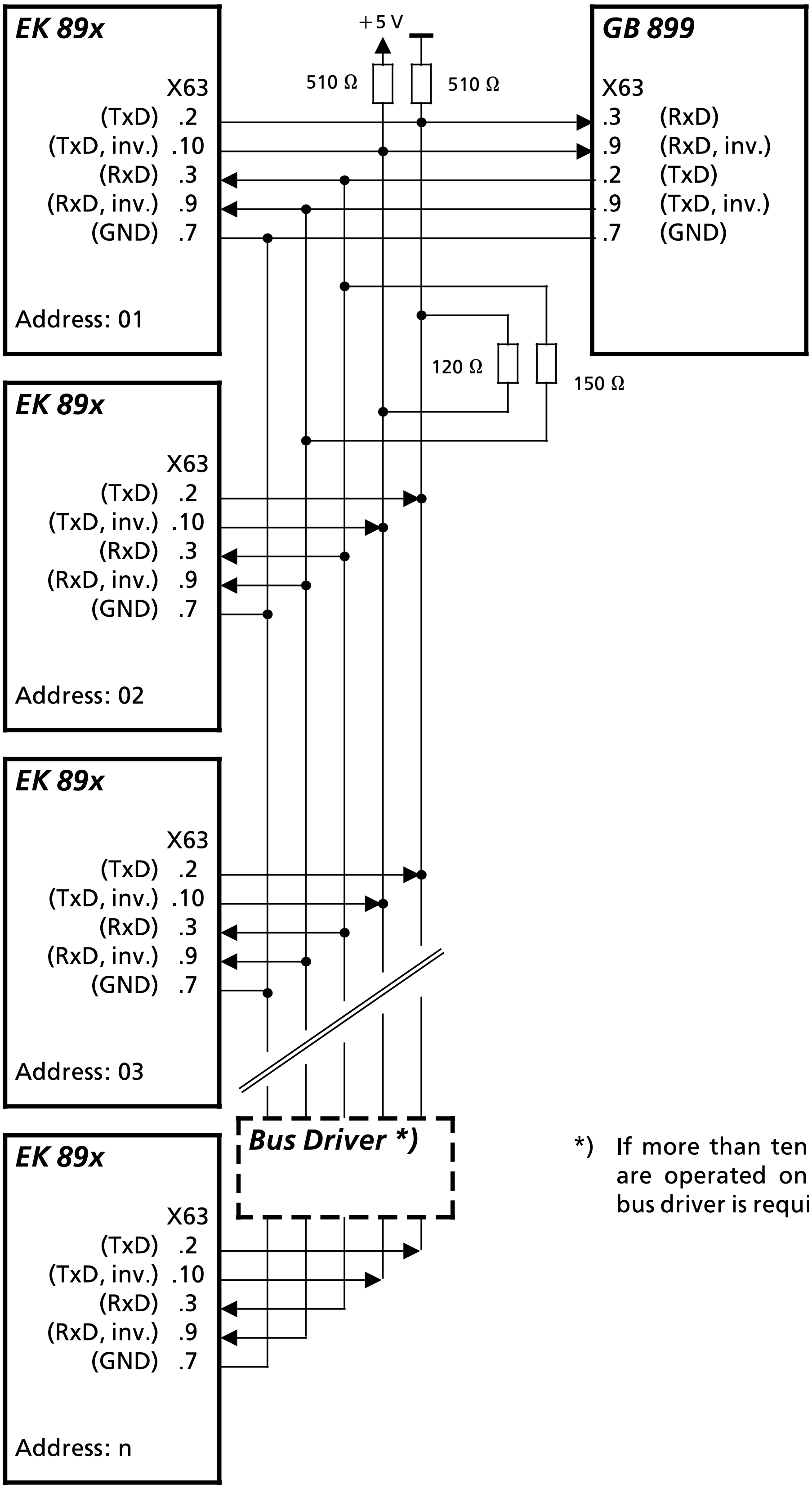
Fig. 2.11 Operating Mode: RS232



S4 = C or D,
X3 on 2 and 3

S4 = 6 or 7
X3 on 2 and 3; see A1.4

Fig. 2.12 Operating Mode: RS422



*) If more than ten receivers are operated on a bus, a bus driver is required.

S4 = C or D, X3 on 2 and 3 ; see A1.4

Fig. 2.13 Operating Mode: Four-wire Bus (RS485)

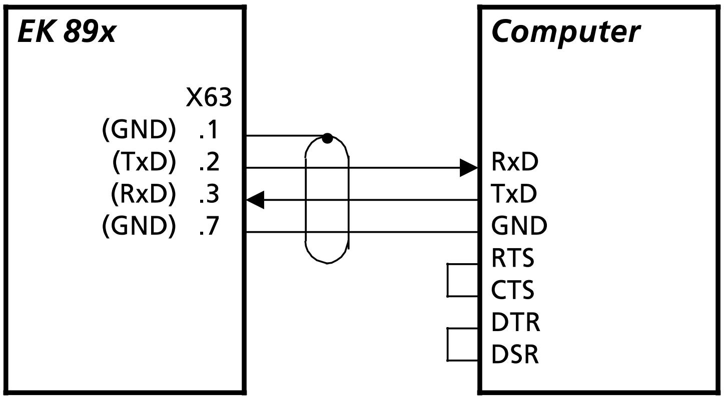


Fig. 2.14 Operating Mode: RS232 with XON-XOFF Handshake (S4 = 0, 1, 2 or 3; see A1.4)

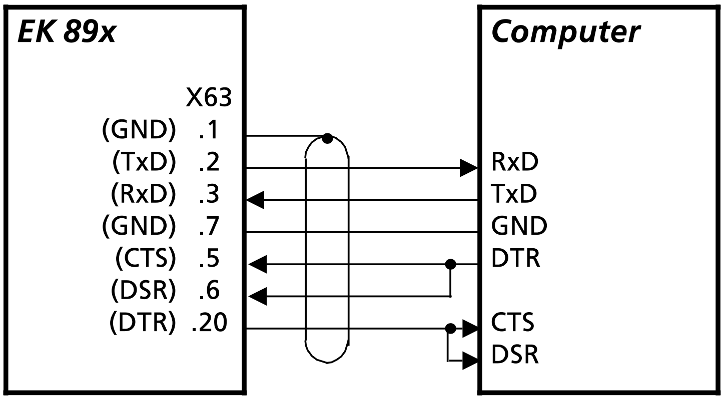


Fig. 2.15 Operating Mode: RS232 with CTS-RTS Handshake (S4 = 0 or 1; see A1.4)

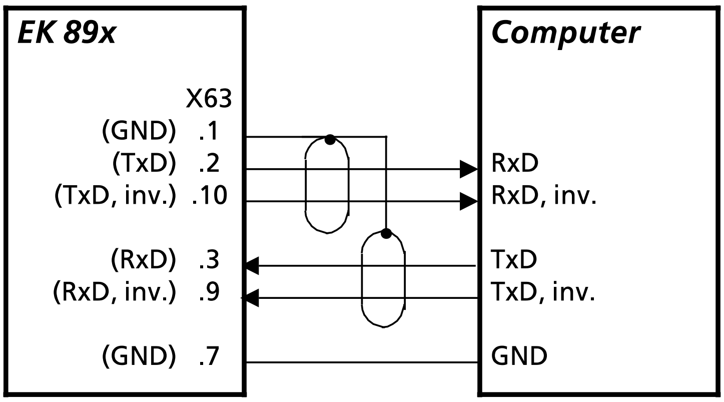


Fig. 2.16 Operating Mode: RS422 with XON-XOFF Handshake (S4 = 6 or 7; see A1.4)

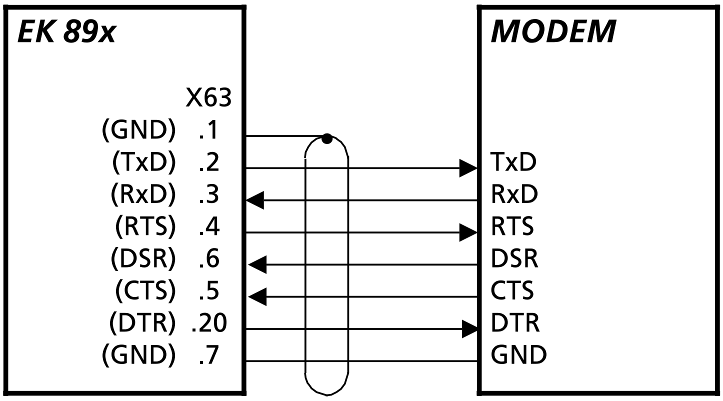


Fig. 2.17 Operating Mode: RS232 with CTS-RTS Handshake, Asynchronous (S4 = 0 or 1; see A1.4)

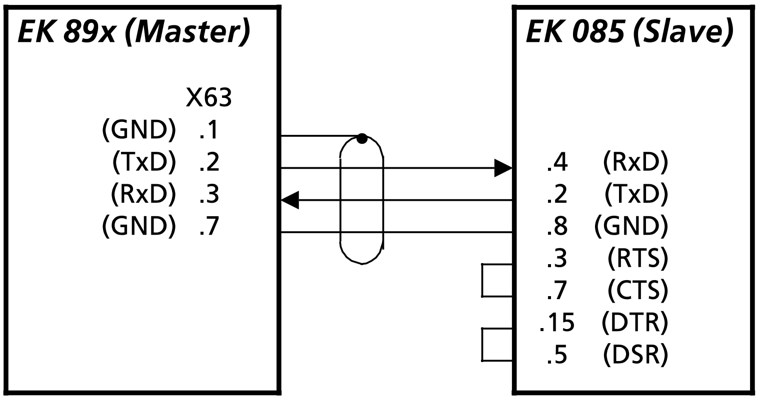


Fig. 2.18 Operating Mode: RS232 with XON-XOFF Handshake, Master / Slave Operation (S4 = 0 or 1; see A1.4)

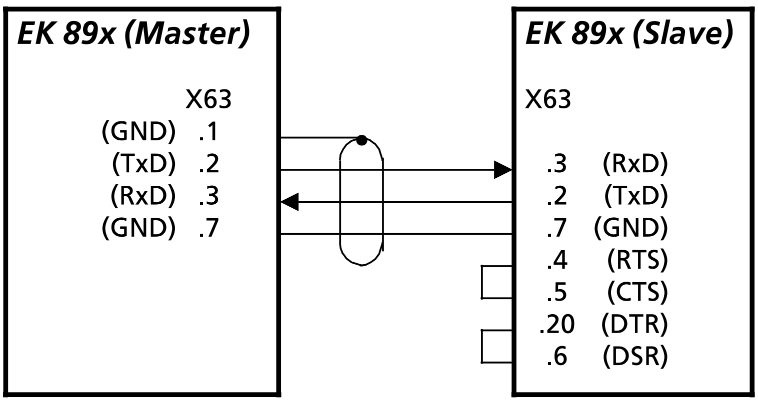
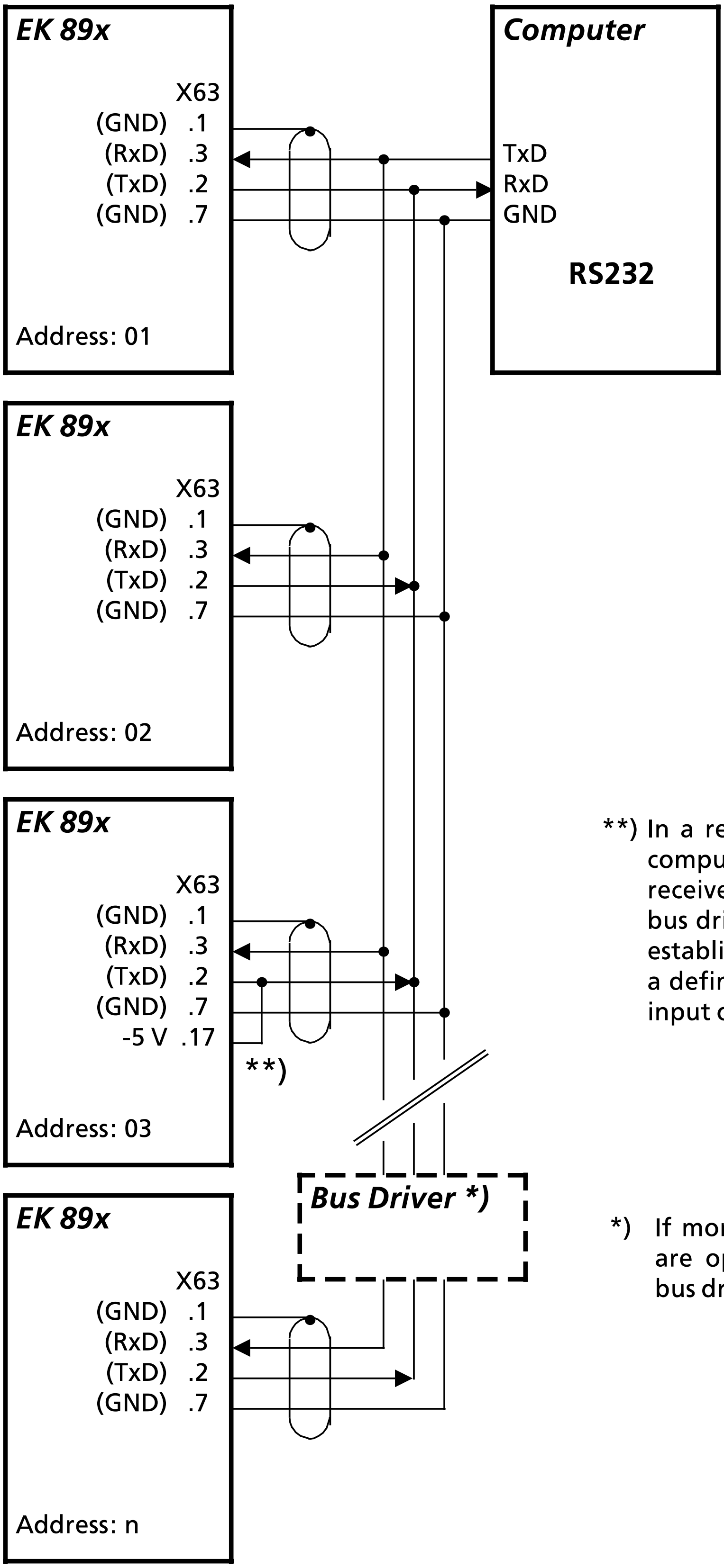


Fig. 2.19 Operating Mode: RS232 with XON-XOFF Handshake, Master / Slave Operation (S4 = 0 or 1; see A1.4)



**) In a receiver system in which the computer uses RS232, on the last receiver in the chain preceding a bus driver this wire link should be established within the cable. Thus a defined rest position of the RxD input of the computer is achieved.

*) If more than ten receivers are operated on a bus, a bus driver is required.

Fig. 2.20 Operating Mode: Four-wire Bus (RS232) with XON-XOFF Handshake (S4 = E or F; see A1.4)

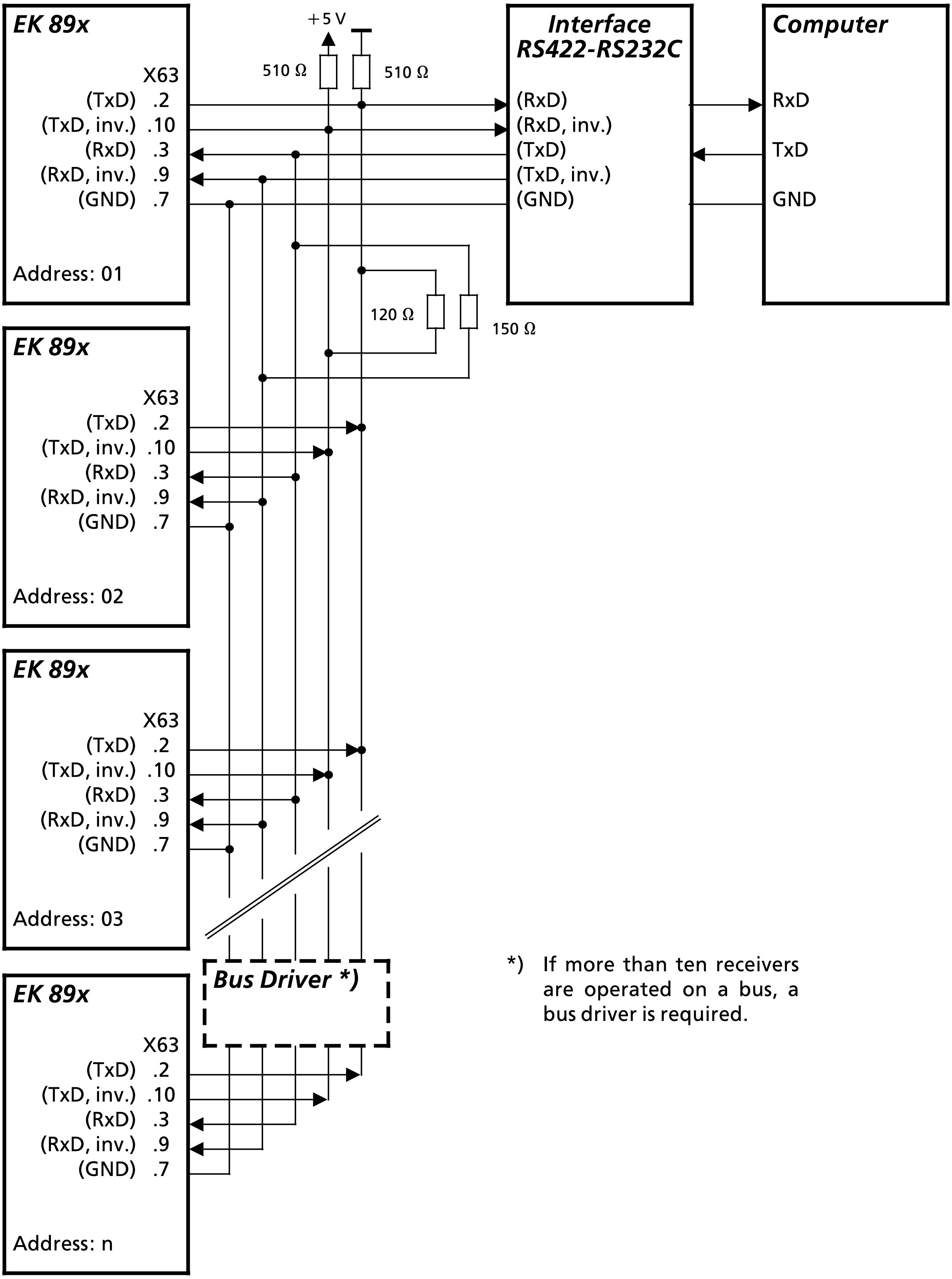
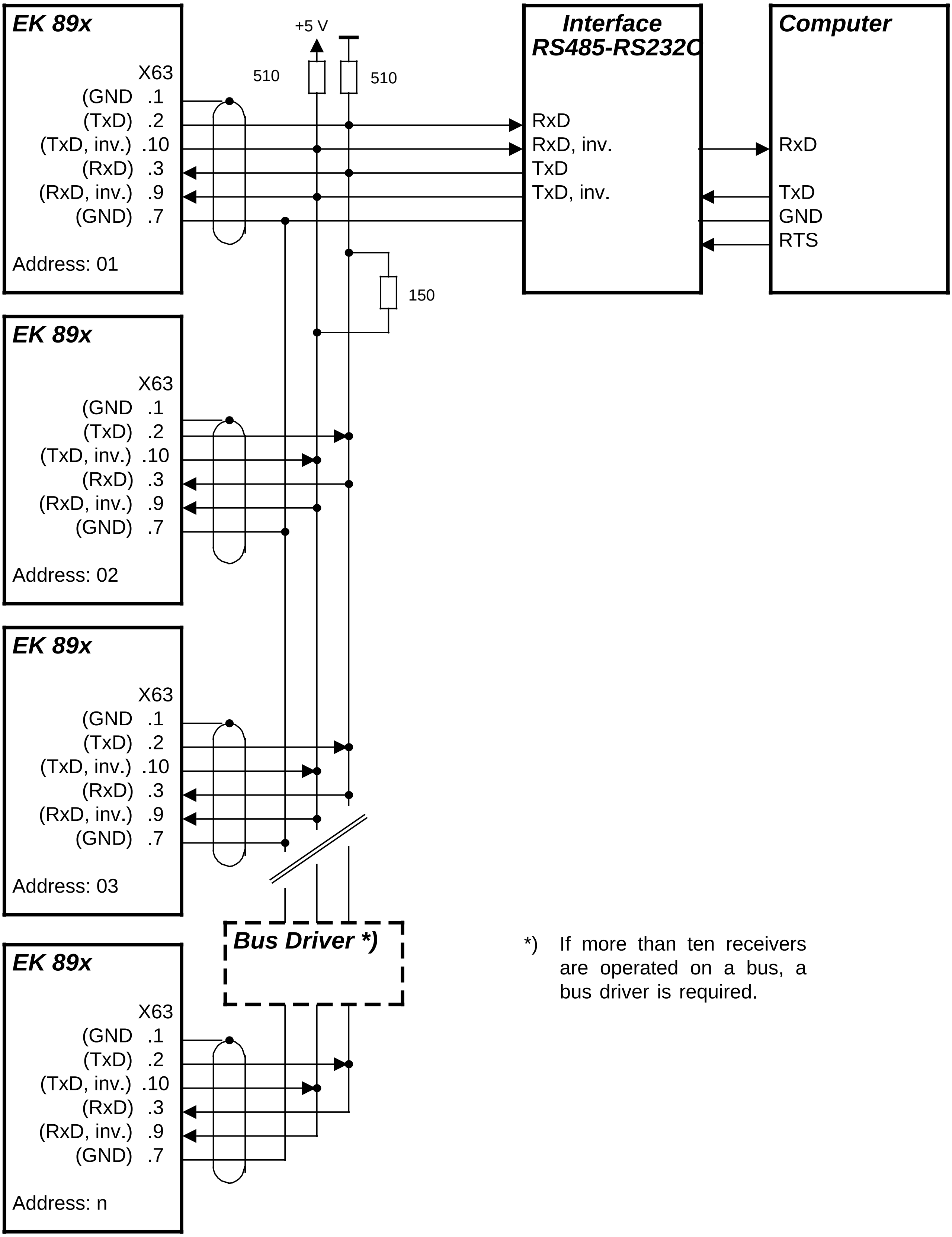


Fig. 2.21 Operating Mode: Four-wire Bus (RS485) with XON-XOFF Handshake (S4 = E or F; see A1.4)



*) If more than ten receivers are operated on a bus, a bus driver is required.

Fig. 2.22 Operating Mode: Two-wire Bus (RS485) with XON-XOFF Handshake (S4 = 8, 9, A or B; see A1.4)

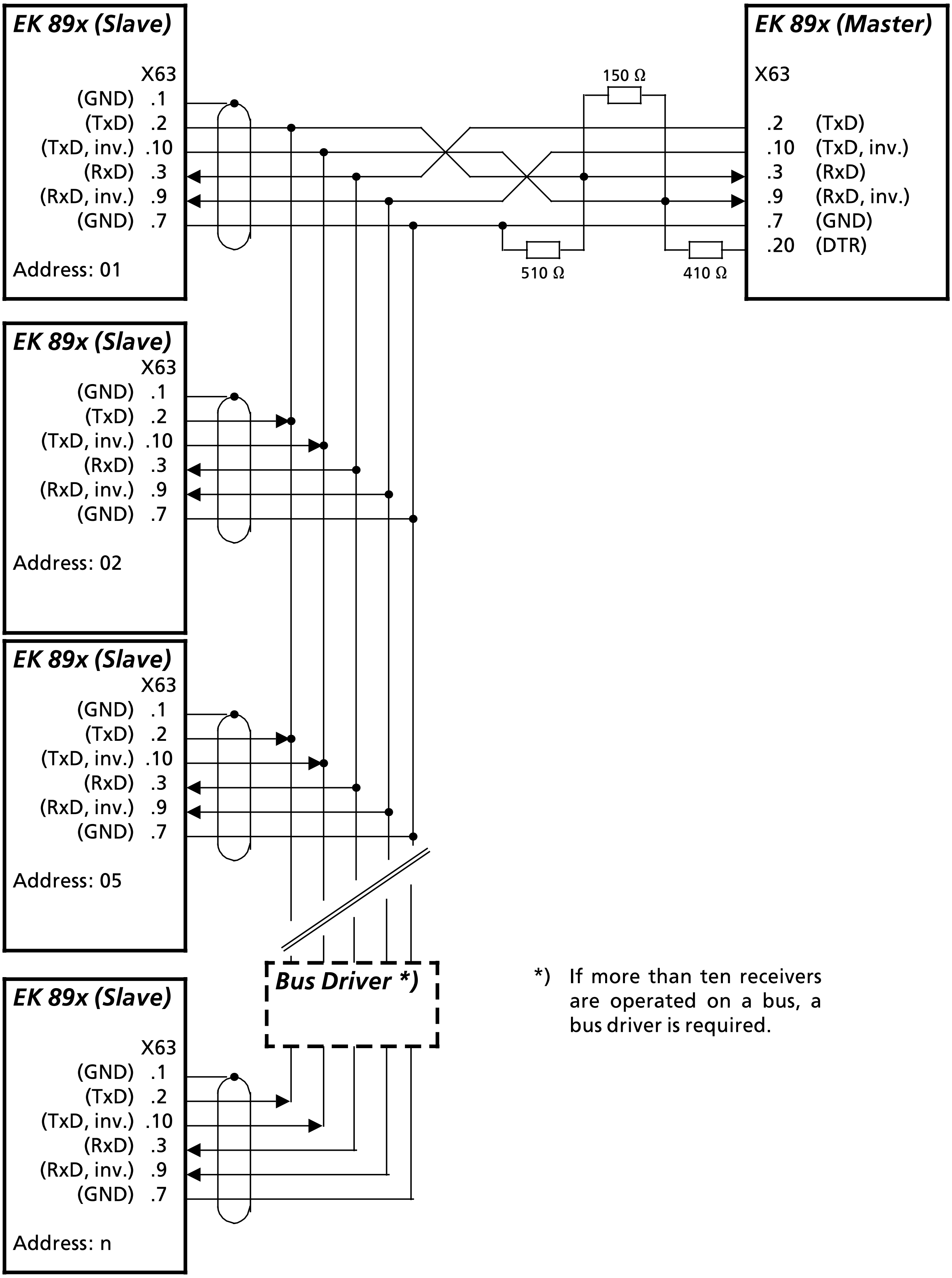
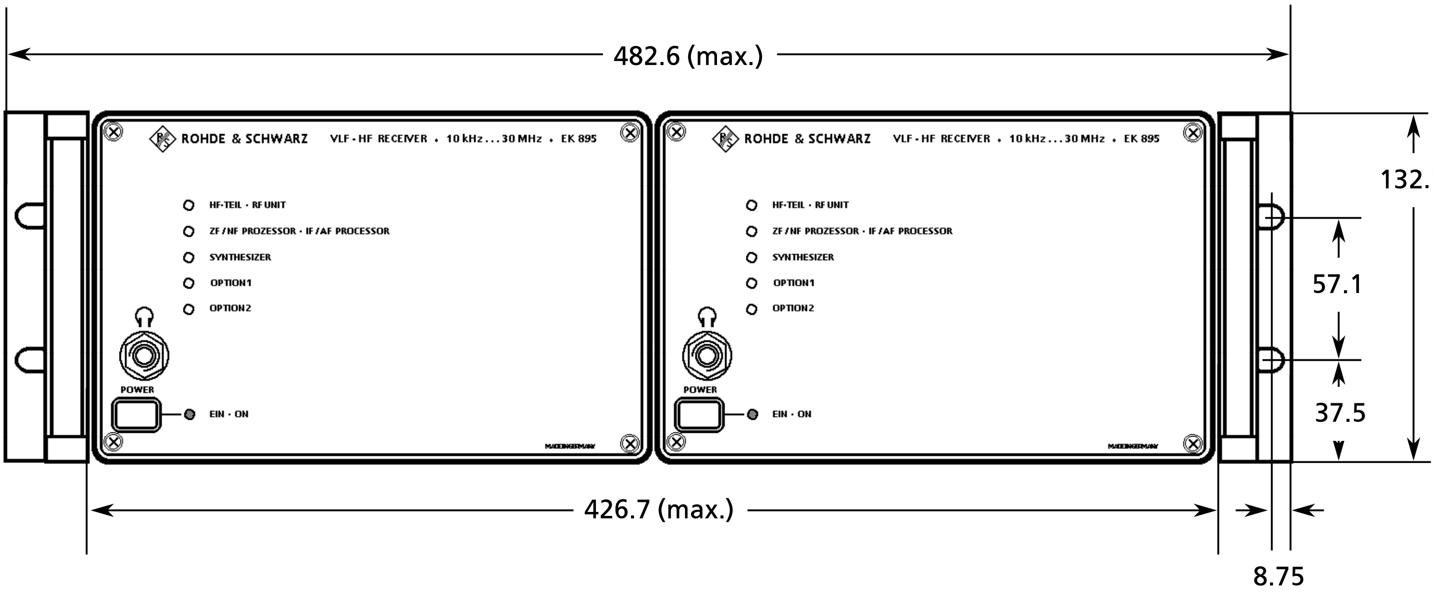
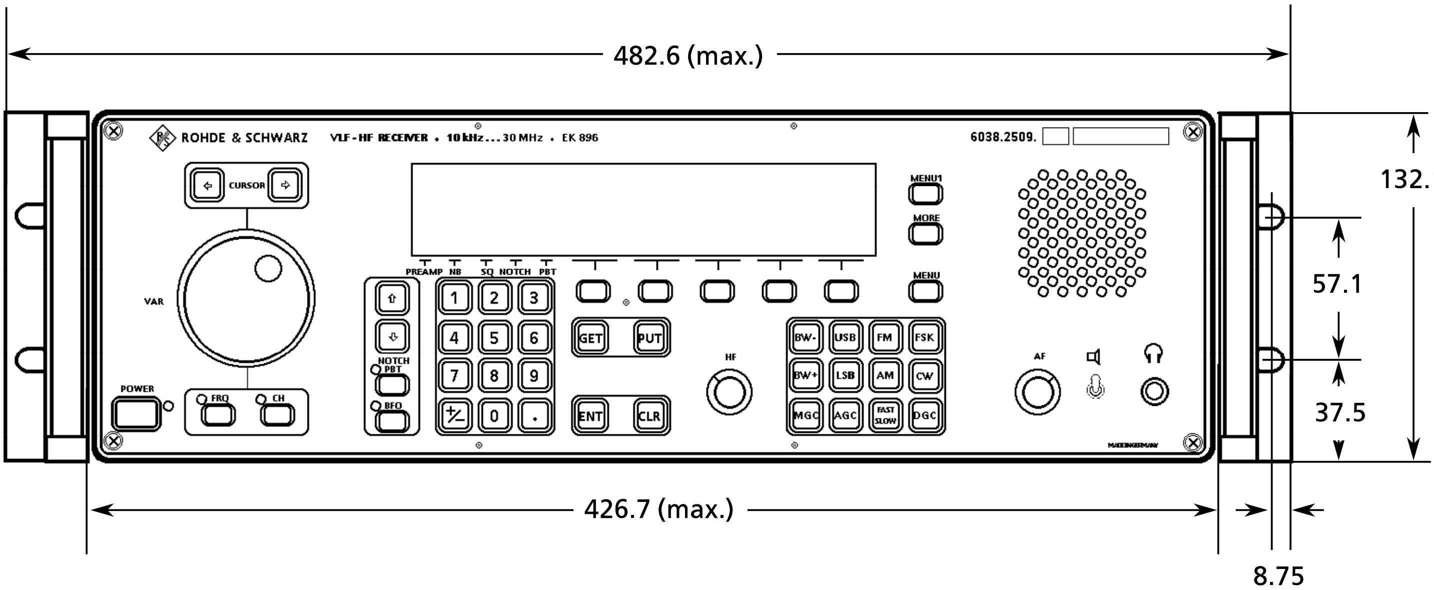


Fig. 2.23 Operating Mode: Four-wire Bus (RS485) with XON-XOFF Handshake, Master / Slave Operation ($S4_{Master}$ = 6 or 7 and $S4_{Slave}$ = E or F; see A1.4)





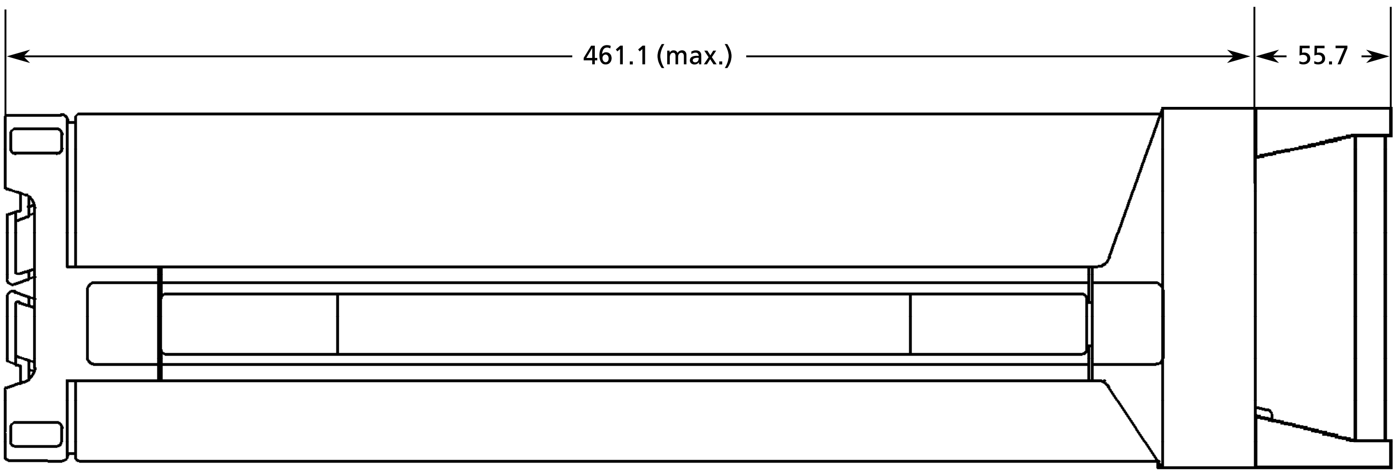


Fig. 2.24 Installation Drawing

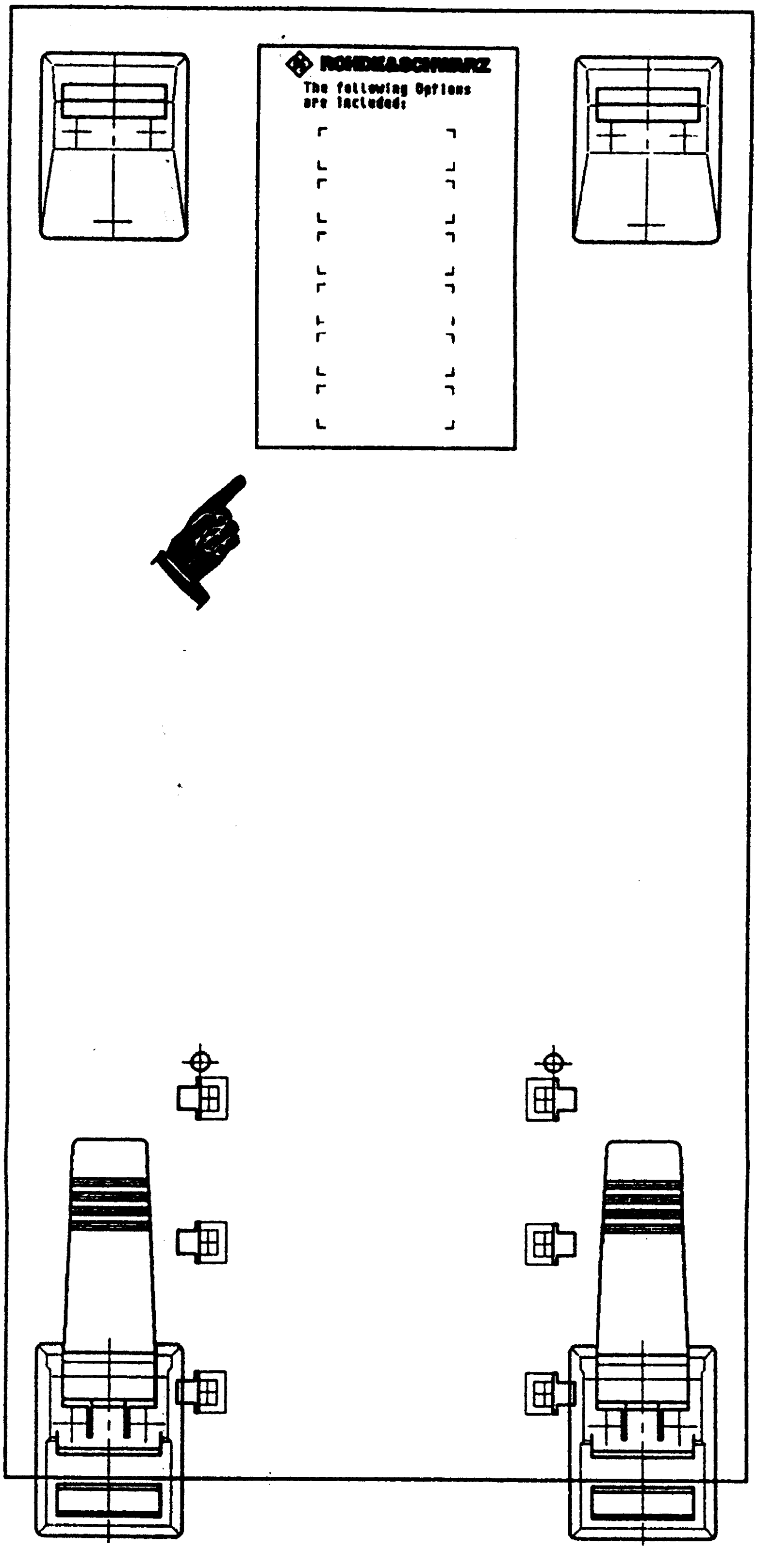


Fig. 2.25 Installed Options (R&S EK 895)

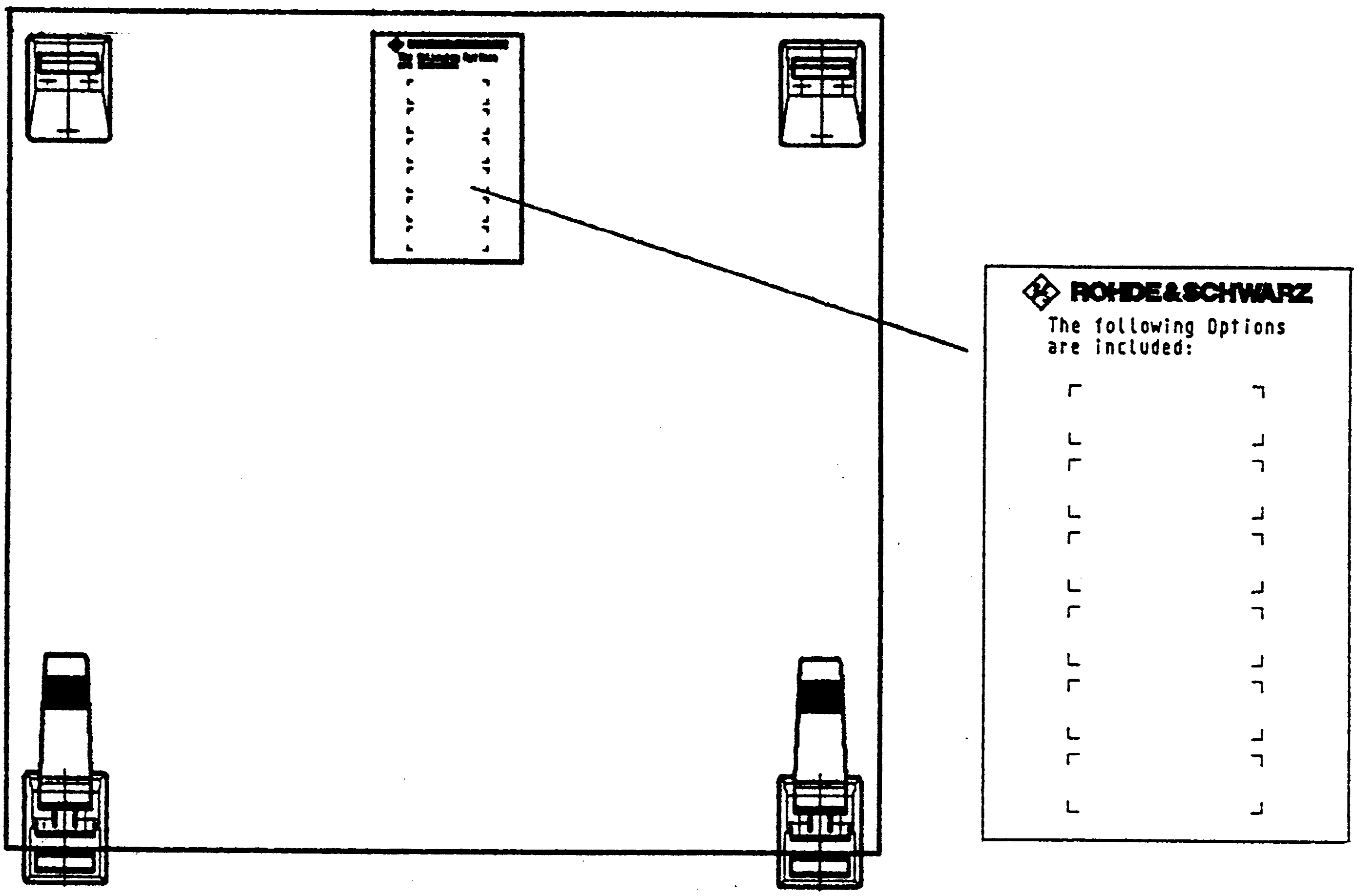


Fig. 2.26 Installed Options (R&S EK 896)

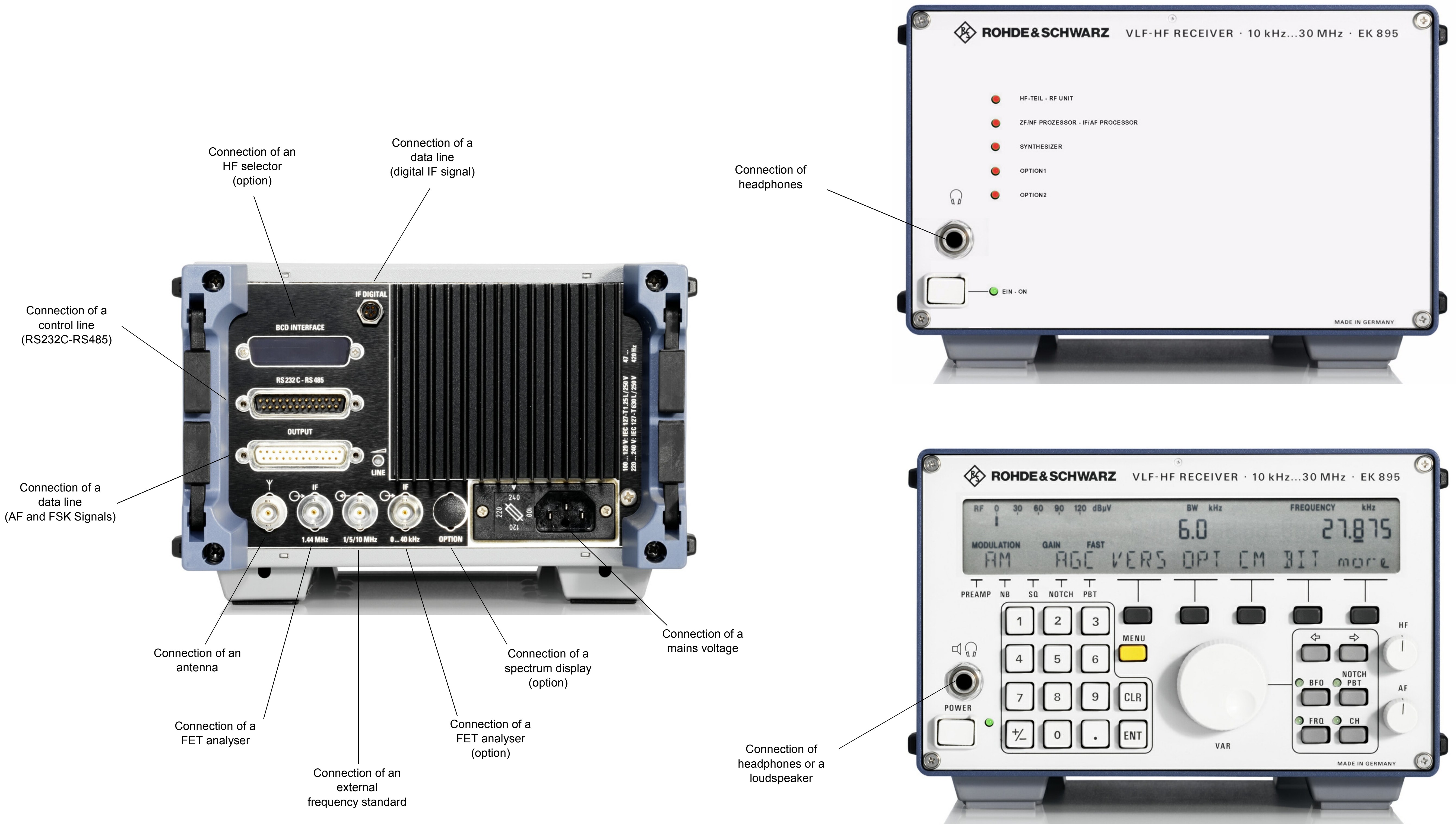


Fig. 2.27 Location of External Interfaces (R&S EK 895)

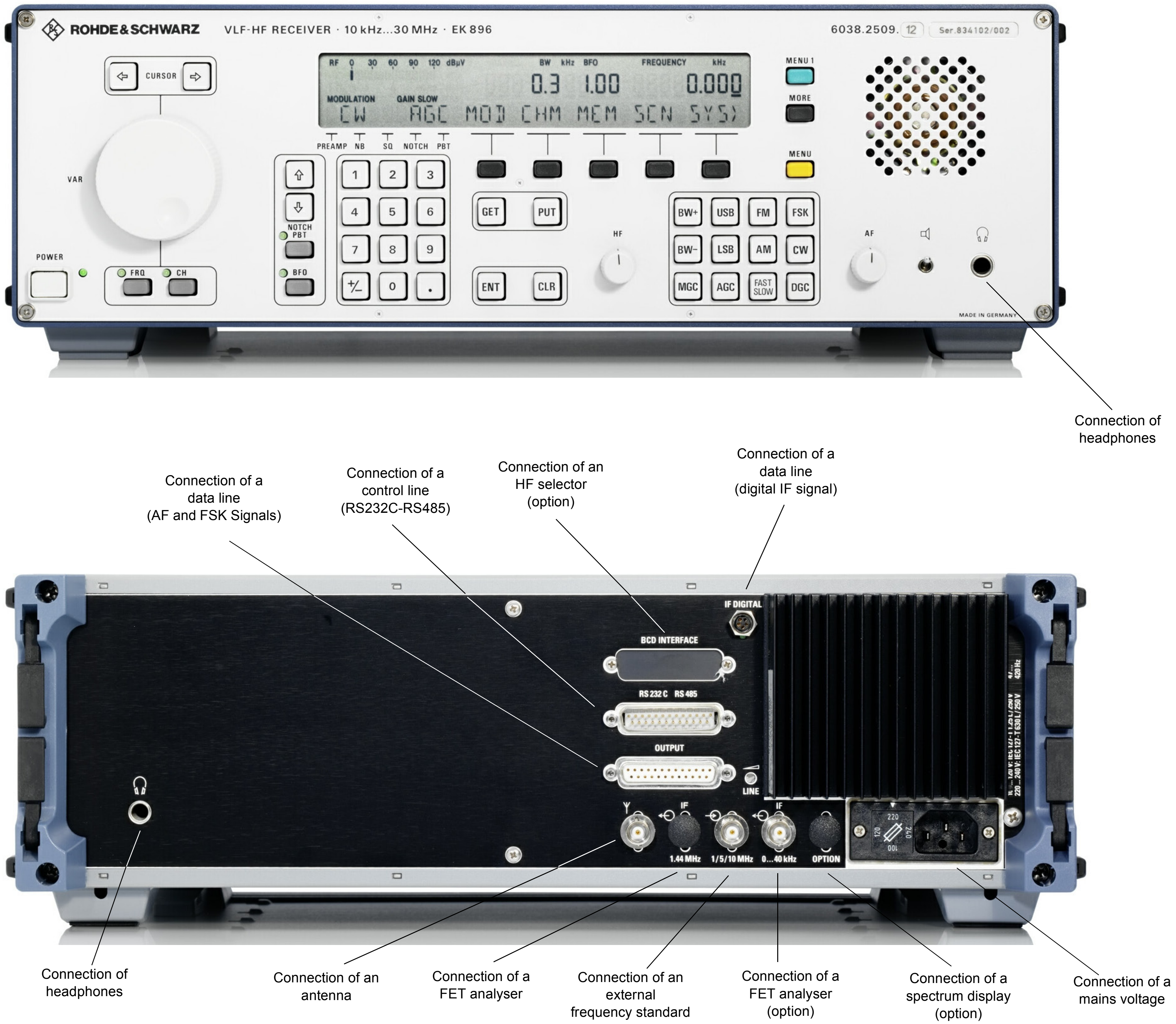


Fig. 2.28 Location of External Interfaces (R&S EK 896)

C A U T I O N

The system administrator should remove this sheet from the manual immediately and keep it at a safe place for protection against unauthorized access. The sheet provides the password which is required for enabling or disabling the FIXED CHANNEL operation mode.

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Note:

The password is firmly programmed and cannot be altered by the system administrator.

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3. Operation

3.1 Control Unit 2 "LOCAL" (R&S EK 895, = Option 'Control Unit R&S GB 890') or Control Unit (R&S EK 896)

(see Fig. 3.1 for EK 896 or Fig. 3.2 for EK 895)

3.1.1 General

Local control is carried out via

- Keys with a fix function (hardkeys),
- Multi-functional keys (softkeys),
- Switches,
- Controls and a
- Tuning knob.

All essential receiver settings can be entered directly:

- Frequency
- Channel
- BFO frequency
- Passband tuning / notch filter
- Modulation mode
- Type and time of control
- Bandwidth

The technical data stated in the data sheet are guaranteed for frequencies as of 10 kHz.

For entries via the numeric keypad the following should be observed:

- Entries can be corrected at any time by actuation of key CLR.
- Entry of leading zeros is not required (0.04 = .04).
- Entry of zeros following the decimal point is not required (1 = 1.000).
- Complete entries are to be terminated by actuating key ENT or softkey ENT or NEXT.
- Entries outside the permitted entry range will not be accepted.
- If within approx. 5 s no entry is made for frequency, BFO frequency or channel, the initial indication will be displayed again.

For R&S EK 895 only:

The softkeys obtain their different functions either by selection from the menu (software) or via previous actuation of the ENT key (special functions menu 1).

The LEDs assigned to keys FRQ, BFO and CH indicate which function the tuning knob and the numeric keypad currently have an effect upon. If the LED assigned to key FRQ or BFO is illuminated, the stepwidth of the tuning knob can be altered by means of the cursor control keys (→ and ←).

For illumination of the LED assigned to key NOTCH / PBT the notch filter frequency and / or the frequency shift can be altered by using the tuning knob.

Once the maximum or minimum value is reached, turning the tuning knob further will have no effect on the indication (this does not apply to the channel number!).

For R&S EK 896 only:

The softkeys obtain their different functions either by selection from the menu (software) or via keys MENU 1 (separate functions menu 2) as well as PUT and GET (master / slave operation).

The LEDs assigned to keys FRQ and CH indicate which function the tuning knob and the numeric keypad currently have an effect upon. If the LED assigned to key FRQ is illuminated, the stepwidth of the tuning knob can be altered by means of the cursor control keys (→ and ←).

Once the minimum or maximum value is reached, turning the tuning knob further will have no effect on the frequency or BFO indication.

The LEDs assigned to keys BFO and NOTCH / PBT indicate which function the step keys (↓ and ↑) have an effect upon. The step keys are also provided with a repeater function, i.e., if the operator keeps pressing the key, the function is performed continuously after a certain delay.

Once the minimum or maximum value is reached, actuating the respective step key (↓ or ↑) will have no further effect on the indication.

The key MORE only obtains a function if on the right-hand side on the display the character '>' appears.

Note:

The individual functions are called up via the main menu (see Figs. 3.1 and 3.2).

A description of how the operator gets from the individual sublevels back to the main menu is not provided. Unrestricted control of the receiver is still possible with a particular function being called up. If required, the main menu can be called up again by pressing the key MENU several times.

3.1.2 Display

In all operating modes the following receiver settings are continuously displayed:

- Receive level, control voltage set (manually) indicated by the bargraph (resolution, see 3.1.18.15 for R&S EK 895 or 3.1.21.8 for R&S EK 896),

  or

  Frequency offset and / or frequency deviation indicated by the bargraph with a resolution of 10 Hz or 100 Hz.

  Note:

  Switchover of the bargraph function is carried out with key ENT and softkey IND. The resolution depends on the set frequency deviation (modulation modes FSK, AFSK and F7B) or on the selected bandwidth (modulation modes AM, CW, FM, FAX1 and FAX2).

- Frequency with a resolution of 1 Hz
- BFO frequency with a resolution of 10 Hz
- Bandwidth with a resolution of
  100 Hz (R&S EK 895) or
  1 Hz (R&S EK 895S7 and R&S EK 896)
- Channel
- Status for preamplifier (PREAMP), noise blanker (NB), squelch (SQ), notch filter (NOTCH), passband tuning (PB)

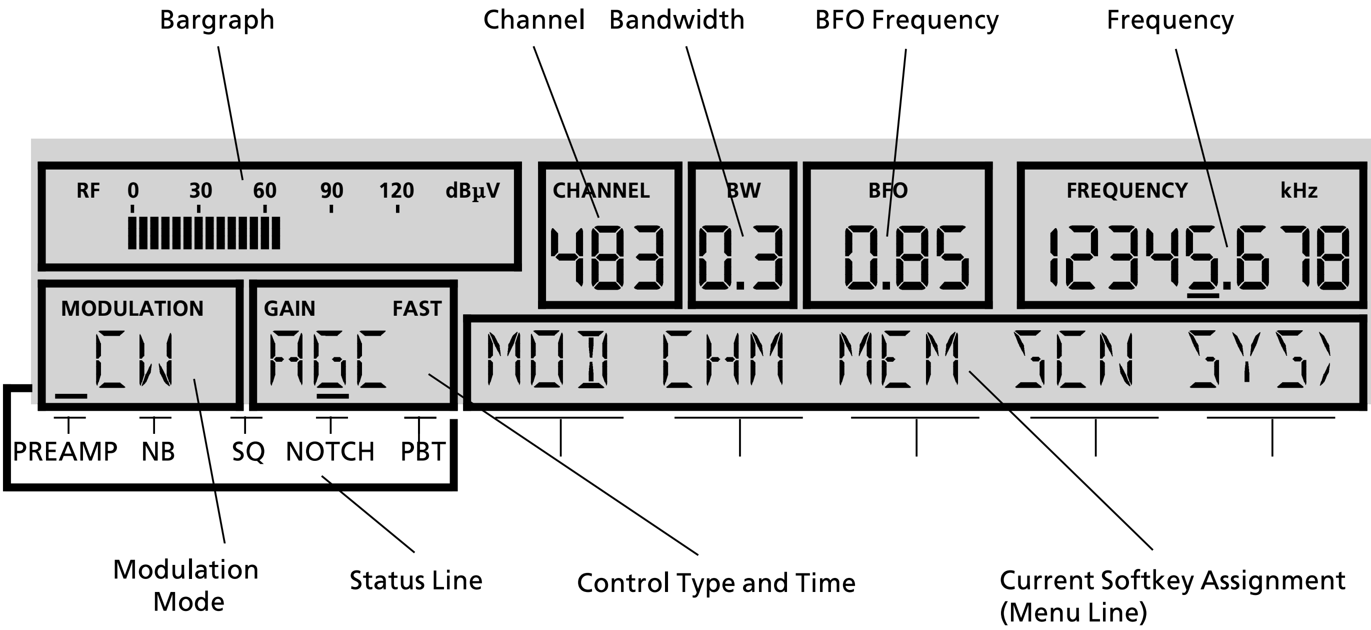
Except for entries, e.g. of a frequency, the following receiver settings are additionally indicated:

- Modulation mode
- Type and time of control (SLOW, FAST)
- Current softkey assignment (menu line)

or

- Receive level (see 3.1.18.15 for R&S EK 895 or 3.1.21.8 for R&S EK 896)
- Current softkey assignment (menu line)

e.g. R&S EK 896



3.1.3 Operating Modes

The receiver can be operated in the following six operating modes:

- Manual
- Frequency scanning
- Channel
  - fixed channel
- Channel scanning
- Channel scanning with freely programmable channel list

For all manipulations with the exception of system reset, store and clear, the stored channel contents remain unchanged.

Complete receiver settings, consisting of frequency, modulation mode, bandwidth, type and time of control, frequency deviation and offset, baud rate, polarity, TTY status, DGC value as well as BFO frequency, can be stored in a single channel.

3.1.3.1 MANUAL

In the operating mode MANUAL no channel is set. In manual operation the following manipulations are possible:

- Entry or modification of frequency
- Selection of modulation mode
- Bandwidth selection
- Passband tuning
- Setting of notch filter
- Selection of control type and time
- Entry or modification of BFO frequency
- Programming of scan process
- Selection of special function
- Selection of system function
- Selection of separate function
- Master / slave operation
- Storage into a channel
- Clearing a channel

In the MANUAL mode the different software levels may be called up without affecting the receive operation.

3.1.3.2 FREQUENCY SCANNING

Frequency scanning is determined by the following parameters:

- Start frequency
- Stop frequency
- Step width
- Digital threshold
- Dwell time
- Hold time

The digital threshold determines the point in time from which the hold time is added to the dwell time.

As soon as one or several scanning parameters are altered, a running scanning program is interrupted and the receiver is automatically in the MANUAL mode of operation (see 3.1.3.1).

The frequency selected last remains set.

3.1.3.3 CHANNEL

In the operating mode CHANNEL there is a channel set. In channel operation, the following manipulations are possible:

- Channel call-up and scanning
- Editing the channel data

As soon as one of the basic settings (frequency, modulation mode, bandwidth, control type, control time, BFO frequency, digital threshold) is altered, the receiver is automatically in the operating mode MANUAL (see 3.1.3.1) . That is, no channel will be indicated.

Cleared (inhibited) channels cannot be called up.

3.1.3.3.1 FIXED CHANNEL

In the operating mode FIXED CHANNEL it is possible to call up only those channels which were previously stored. All other operating functions are blocked. However, this does not apply to remote operation.

The operating mode FIXED CHANNEL can only be activated and deactivated by entering a password.

3.1.3.4 CHANNEL SCANNING

Channel scanning is determined by the following parameters:

- Start channel
- Stop channel
- Dwell time
- Hold time

The digital threshold, which determines the point in time from which the hold time is added to the dwell time, is stored in the respective channels.

Cleared (inhibited) channels between the start and the stop channel are not called up by a running scan program.

As soon as one or several scanning parameters are altered, a running scan program is interrupted and the receiver is automatically in the operating mode CHANNEL (see 3.1.3.3).

The channel called up last remains set.

3.1.3.5 CHANNEL SCANNING with Freely Programmable Channel List

Channel scanning with freely programmable channel list is determined by the following parameters:

- Channel list (max. 20 channels)
- Dwell time
- Hold time

The digital threshold, which determines the point in time from which the hold time is added to the dwell time, is stored in the respective channels.

As soon as one or several scanning parameters are altered, a running scan program is interrupted and the receiver is automatically in the operating mode CHANNEL (see 3.1.3.3).

The channel called up last remains set.

3.1.4 Software

(See Fig. 3.4 for R&S EK 895 or Fig. 3.5 for R&S EK 896)

3.1.5 Switching On

Actuate switch POWER.

Through receiver switch-on the primary circuit is closed. The LED POWER is illuminated to indicate that the power supply is working perfectly (→ CM display).

After switch-on the RAM contents are automatically checked (→ initialization). Unpermitted settings are overwritten with a default value. If overwriting with a default value takes place in a channel, this channel is additionally inhibited.

In the operating modes CHANNEL, CHANNEL SCANNING and FIXED CHANNEL call-up of inhibited channels is not possible. Via the channel editing menu, inhibited channels can be reactivated. In the case that inhibited channels are called up in the channel editing menu, the display UNUSED appears.

Following initialization the LCD illumination is switched on.

In the LED test the function of LEDs FRQ, BFO, CH and NOTCH / PBT is checked.

In the LCD test all segments are switched on for approx. 2 s and then switched off again. This allows a visual check of the LCD.

In the built-in equipment test (BIT) it is first checked whether the modules synthesizer, HF unit and IF / AF processor are installed.

Subsequently a 100-kHz test signal is fed into the receive path instead of the antenna signal, and the receiver is set to a receive frequency of 100 kHz.

The processor evaluates the BIT messages (BIT criterion) from the HF unit as well as the CM messages from the synthesizer and the IF / AF processor.

As soon as one of the following messages is displayed, carry out troubleshooting acc. to 4.2.

- RF UNIT MISSING
- IF / AF MISSING
- SYNTH MISSING
- RF UNIT NOGO
- IF / AF NOGO
- SYNTH NOGO
- PROC UNIT NOGO
- IF CONV NOGO

If the message BIT FAILED appears, actuate key MENU and switch receiver over to local operation acc. to 3.1.19.7. Switch receiver off and on again.

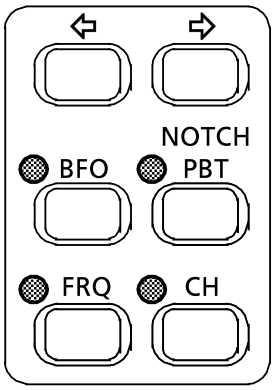
Once the BIT is terminated successfully, the last receiver setting is reactivated and the main menu is displayed. In the FIXED CHANNEL mode the display CHANNEL MODE EXIT is indicated instead of the main menu.

3.1.6 Switching Off

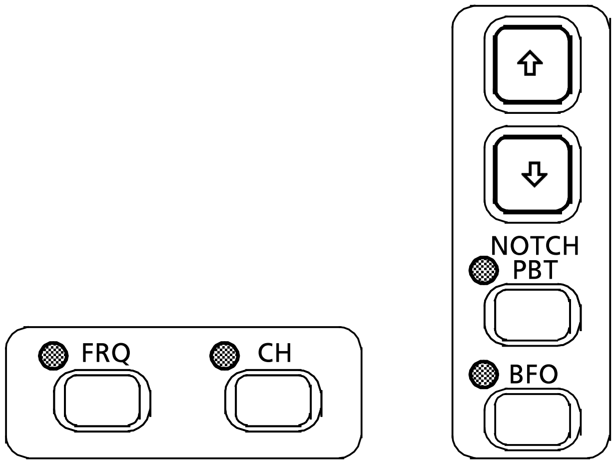
Actuate switch POWER.

LED Test:

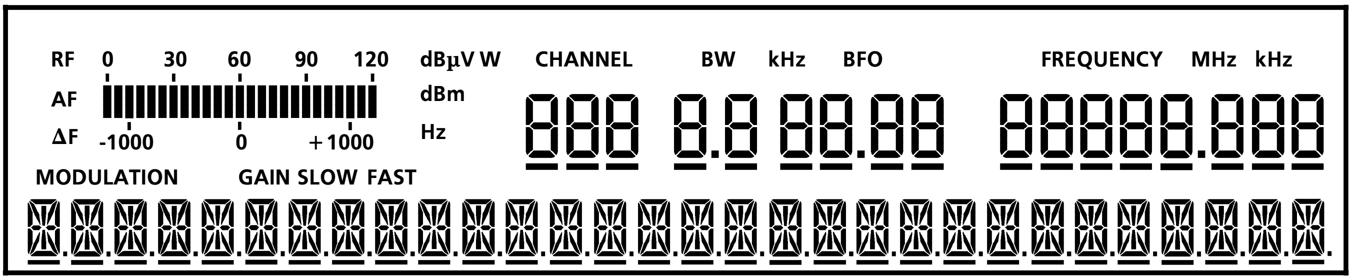
For EK 895:



For EK 896:



LCD Test:



3.1.7 Frequency

If the LED assigned to key FRQ is illuminated, the frequency can be altered by means of the tuning knob or via the numeric keypad. The currently effective frequency is indicated in the frequency field.

Shifting the cursor by means of the cursor control keys alters the stepwidth of the tuning knob.

Cursor position	Stepwidth
12345.678	freely programmable (1 Hz to 1000 kHz)
12345.67$\underline{8}$	0.001
12345.6$\underline{7}$8	0.01
12345.$\underline{6}$78	0.1
1234$\underline{5}$.678	1
123$\underline{4}$5.678	10
12$\underline{3}$45.678	100
1$\underline{2}$345.678	1000

3.1.7.1 Entering a Frequency

If the LED FRQ is not illuminated, actuate key FRQ. Upon actuation of key FRQ it appears the following display:

```
FREQUENCY _           KHZ
```

The flashing cursor (_) indicates that an entry is being expected. Enter new frequency via the numeric keypad.

Range of entry: .... 0 Hz to 30.000 MHz
Resolution: .... 1 Hz
Entry: .... in kHz

3.1.7.2 Altering the Frequency with the Tuning Knob

If the LED FRQ is not illuminated, actuate key FRQ. Upon actuation of key FRQ it appears the following display:

```
FREQUENCY _           KHZ
```

In order to increase the frequency ($\leq$ 30 MHz) turn tuning knob clockwise.

In order to decrease the frequency ($\geq$ 0) turn tuning knob counter-clockwise.

3.1.7.3 Altering the Tuning Knob Stepwidth with the Cursor Control Keys

If the LED FRQ is not illuminated, actuate key FRQ. Upon actuation of key FRQ it appears the following display:

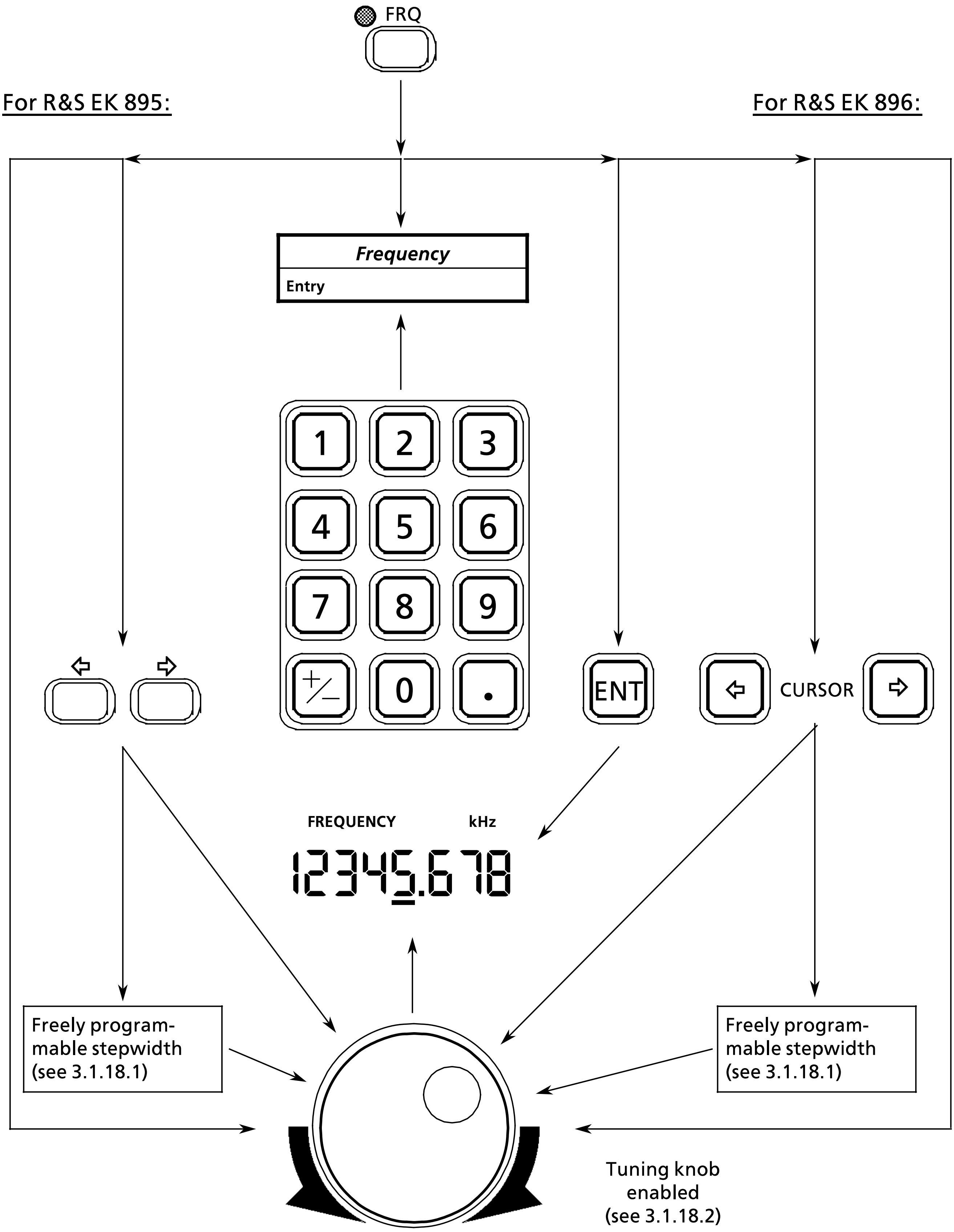
```
FREQUENCY  _          KHZ
```

In order to reduce the stepwidth ($\geq$ 0.001) actuate key → (R&S EK 895) or CURSOR → (R&S EK 896).

In order to activate the freely programmed stepwidth (see 3.1.18.1) actuate key → (R&S EK 895) or key CURSOR → (R&S EK 896) several times, as necessary, until the cursor is no longer indicated.

In order to increase the stepwidth ($\leq$ 1000) actuate key ← (R&S EK 895) or key CURSOR ← (R&S EK 896).

Once the minimum or maximum value is reached, the display does not change any more when actuating key ← (R&S EK 895) or key CURSOR ← (R&S EK 896) respectively.


FRQ
For R&S EK 895:
For R&S EK 896:
Frequency
Entry
1
2
3
4
5
6
7
8
9
+/–
0
.
ENT
CURSOR
FREQUENCY
kHz
12345.678
Freely programmable stepwidth (see 3.1.18.1)
Freely programmable stepwidth (see 3.1.18.1)
Tuning knob enabled (see 3.1.18.2)

3.1.8 Modulation Mode

The modulation mode can be selected by actuating the modulation mode keys (R&S EK 896) or, once the modulation mode menu has been called up, by softkey actuation. The currently effective modulation mode is indicated in the modulation mode field.

The following modulation modes are available:

- AM (A3E, amplitude modulation)
- CW (A1A, Morse telegraphy)
- USB (J3E, upper sideband)
- LSB (-J3E, lower sideband)
- FAX1 (F1C, facsimile)
- FSK (F1B, TTY)
- AFSK (F1B, TTY)
- F7B (diplex telegraphy)
- FAX2 (F3C, facsimile)
- FM (F3E, frequency modulation)
- ISBLSB (B8E, monitoring sideband, lower sideband)
- ISBUSB (B8E, monitoring sideband, upper sideband)

If the default value setting is activated, altering the modulation mode automatically sets the appropriate values for bandwidth, BFO frequency, type and time of control, frequency deviation and offset, baud rate, signal polarity and demodulation.

3.1.8.1 Modulation Mode Menu (R&S EK 895)

Upon actuation of softkey MOD the modulation mode menu is called up. By pressing

softkey AM or
softkey CW or
softkey LSB or
softkey USB

the respective modulation mode will be set.

Upon actuation of softkey more the modulation mode menu 2 is called up. By pressing

softkey FSK or
softkey AFSK or
softkey F7B

the respective modulation mode will be set and the modulation parameter menu will be activated (see 3.1.8.4).

Upon actuation of softkey more the modulation mode menu 3 is called up. By pressing

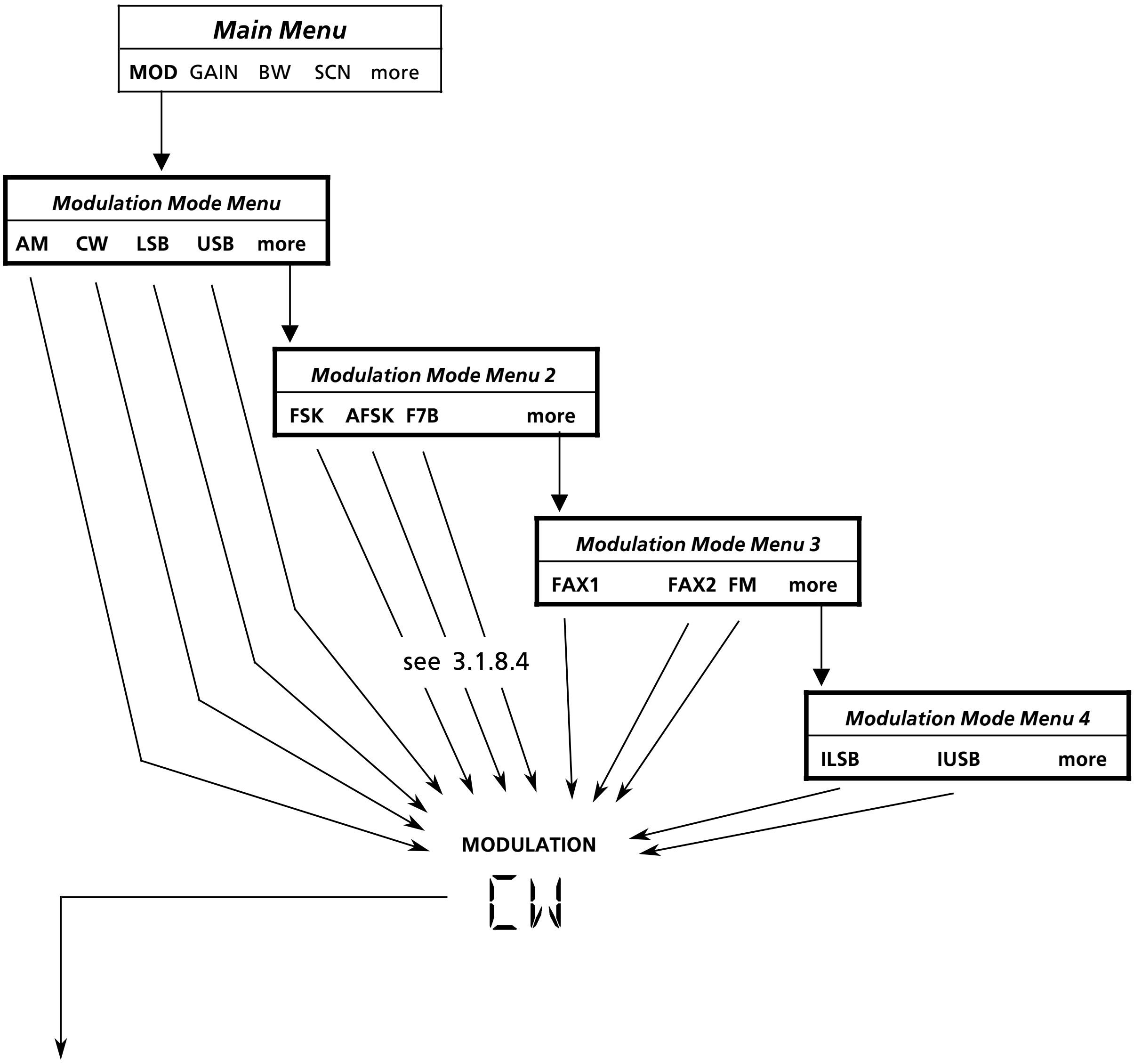
softkey FAX1 or
softkey FAX2 or
softkey FM

the respective modulation mode will be set.

Upon actuation of softkey more the modulation mode menu 4 is called up. By pressing

softkey ILSB or
softkey IUSB

the respective modulation mode will be set.



Default	AM	CW	LSB USB	FSK	AFSK	F7B	FAX1	FAX2	FM	ISBUSB ISBLSB
Bandwidth / kHz	6.0	0.3	2.7	1.5	1.5	1.0	2.4	2.4	6.0	2.7
Control type	AGC	AGC	AGC	AGC	AGC	AGC	AGC	AGC	AGC	AGC
Control time / ms	150	1000	1000	150	150	150	150	150	150	1000
BFO frequency / kHz	-----	1.0	-----	1.0	-----	1.0	1.9	1.9	-----	-----
Freq. deviation / Hz	-----	-----	-----	425	425	225	-----	-----	-----	-----
Frequency offset / kHz	-----	-----	-----	0	1.7	-----	-----	-----	-----	-----
Baud rate / Bd	-----	-----	-----	50	50	50	-----	-----	-----	-----
Polarity	-----	-----	-----	+	+	+ +	-----	-----	-----	-----
TTY status	-----	-----	-----	RUN	RUN	RUN	-----	-----	-----	-----
Bargraph	Level	Level	Level	⊢--------------- Tuning Indication ----------------⊣						Level

3.1.8.2 Selecting the Modulation Mode (R&S EK 896)

By pressing

key AM or
Key USB or
key LSB or
key CW or
key FM or
key FSK

the respective modulation mode will be set.

3.1.8.3 Modulation Mode Menu (R&S EK 896)

Upon actuation of softkey MOD the modulation mode menu 2 * is called up. By pressing

softkey FSK or
softkey AFSK or
softkey F7B

the respective modulation mode will be set and the demodulation parameter menu will be activated (see 3.1.8.4).

If the key MORE is pressed instead of a softkey, the modulation mode menu 3* is called up. By pressing

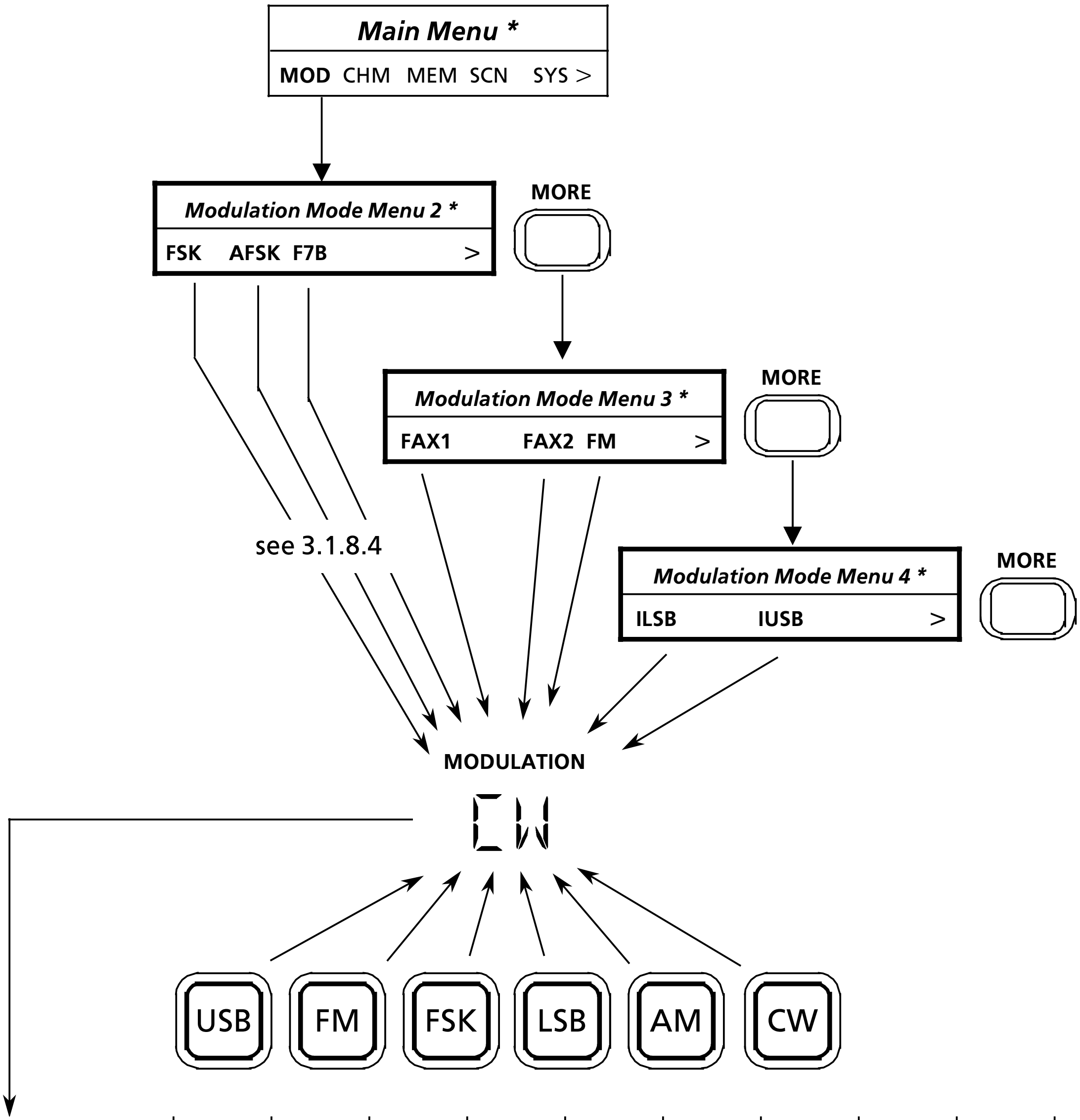
softkey FAX1 or
softkey FAX2 or
softkey FM

the respective modulation mode will be set.

If the key MORE is pressed instead of a softkey, the modulation mode menu 4* is called up. By pressing

softkey ILSB or
softkey IUSB

the respective modulation mode will be set.



Default	AM	CW	USB LSB	FSK	AFSK	F7B	FAX1	FAX2	FM	ISBUSB ISBLSB
Bandwidth / kHz	6.0	0.3	2.7	1.5	1.5	1.0	2.4	2.4	6.0	2.7
Control type	AGC	AGC	AGC	AGC	AGC	AGC	AGC	AGC	AGC	AGC
Control time / ms	150	1000	1000	150	150	150	150	150	150	1000
BFO frequency / kHz	-----	1.0	-----	1.0	-----	1.0	1.9	1.9	-----	-----
Freq. deviation / Hz	-----	-----	-----	425	425	225	-----	-----	-----	-----
Frequency offset / kHz	-----	-----	-----	0	1.7	-----	-----	-----	-----	-----
Baud rate / Bd	-----	-----	-----	50	50	50	-----	-----	-----	-----
Polarity	-----	-----	-----	+	+	+ +	-----	-----	-----	-----
TTY status	-----	-----	-----	RUN	RUN	RUN	-----	-----	-----	-----
Bargraph	Level	Level	Level	├--------------- Tuning Indication ----------------┤						Level

3.1.8.4 Demodulation Parameter Menu

By actuation of softkey FSK, AFSK or F7B (see 3.1.8.1 (R&S EK 895) or 3.1.8.3 (R&S EK 896)) the demodulation parameter menu is called up. The menu offers the following functions:

- SHFT (Freq. deviation menu)
- BD (baud rate menu)
- POL (alter signal polarity)
- STOP (TTY status menu)
  - RUN (switch teletyper on)
  - STOP (switch teletyper off)
- ΔF (Entering the frequency offset, for FSK and AFSK only)

3.1.8.4.1 Selecting the Frequency Deviation

Actuation of softkey SHFT calls up the following frequency deviation menu:

- 42 Hz
- 85 Hz
- 225 Hz
- 425 Hz
- more (R&S EK 895)

Upon actuation of softkeys SHFT and more (for R&S EK895: FSK and F7B only) calls up the following frequency deviation menu 2:

- 62 Hz
- 125 Hz
- 250 Hz
- 500 Hz
- more

The currently effective frequency deviation is indicated on the display by an underline of the relevant value, e.g. <u>42</u>.

If 'more' is underlined, the currently effective value is displayed in the other frequency deviation menu.

3.1.8.4.2 Entering the Frequency Offset (for FSK and AFSK only)

Upon actuation of softkey ΔF it appears the following display:

```
ΔF xx_      KHZ     ENT
```

(xx= frequency offset last stored)

The flashing cursor (_) indicates that an entry is being expected.

Enter new frequency offset via the numeric keypad.

Range of entry: .... -3.000 to 3.000 kHz
Resolution: .... 1 Hz
Entry: .... in kHz

3.1.8.4.3 Selecting the Baud Rate

Actuation of softkey BD calls up the following baud rate menu:

- 50 Bd
- 75 Bd
- 150 Bd
- 300 Bd
- 600 Bd

The currently effective baud rate is indicated on the display by an underline of the relevant value, e.g. <u>150</u>.

3.1.8.4.4 Altering the Polarity

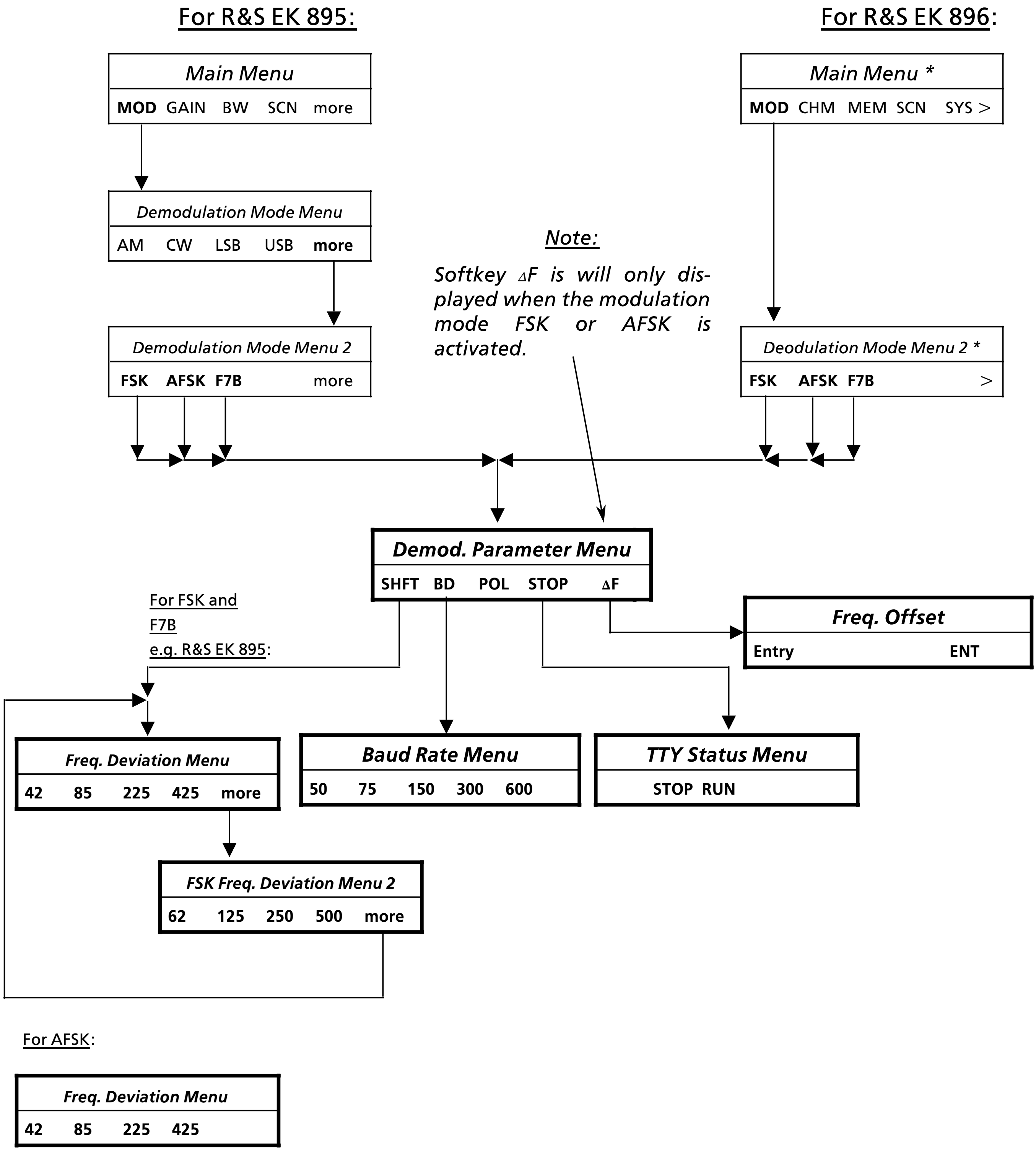
By actuating softkey POL the signal polarity is switched over. The polarity switchover sequence varies as a function of the modulation mode:

- FSK + → - → +,
- AFSK + → - → + and
- F7B ++ → -- → +- → -+ → ++.

Actuate softkey POL several times, as necessary, until the desired polarity is indicated.

3.1.8.4.5 Switching the Demodulation On / Off

Upon actuation of softkey STOP, it is possible to switch the FSK signal (the same holds for the signals AFSK and F7B) on (RUN) or off (STOP). The currently effective setting is indicated on the display by an underline, e.g. <u>STOP</u>.


For R&S EK 895:
For R&S EK 896:
Main Menu
MOD GAIN BW SCN more
Main Menu *
MOD CHM MEM SCN SYS >
Demodulation Mode Menu
AM CW LSB USB more
Note:
Softkey ΔF is will only displayed when the modulation mode FSK or AFSK is activated.
Demodulation Mode Menu 2
FSK AFSK F7B more
Deodulation Mode Menu 2 *
FSK AFSK F7B >
Demod. Parameter Menu
SHFT BD POL STOP ΔF
For FSK and F7B e.g. R&S EK 895:
Freq. Offset
Entry ENT
Freq. Deviation Menu
42 85 225 425 more
Baud Rate Menu
50 75 150 300 600
TTY Status Menu
STOP RUN
FSK Freq. Deviation Menu 2
62 125 250 500 more
For AFSK:
Freq. Deviation Menu
42 85 225 425

3.1.8.5 Modulation Menu (Data Link)

The modulation mode can be selected by softkey actuation in the modulation menu. The currently effective modulation mode is indicated in the modulation mode field.

The following modulation modes are available:

- LL (B8D, amplitude modulation, monitoring sideband = lower sideband, no USB signal)
- LU (B8D, amplitude modulation, monitoring sideband = upper sideband, no LSB signal)
- LIL (B8D, amplitude modulation, monitoring sideband = lower sideband, LSB and USB signal)
- LIU (B8D, amplitude modulation, monitoring sideband = upper sideband, LSB and USB signal)

For EK 895:

Upon actuation of softkeys MOD, more, more, more and more, the modulation mode menu 5 is called up. By actuation of

softkey LL or
softkey LU or
softkey LIL or
softkey LIU

the respective modulation mode is set.

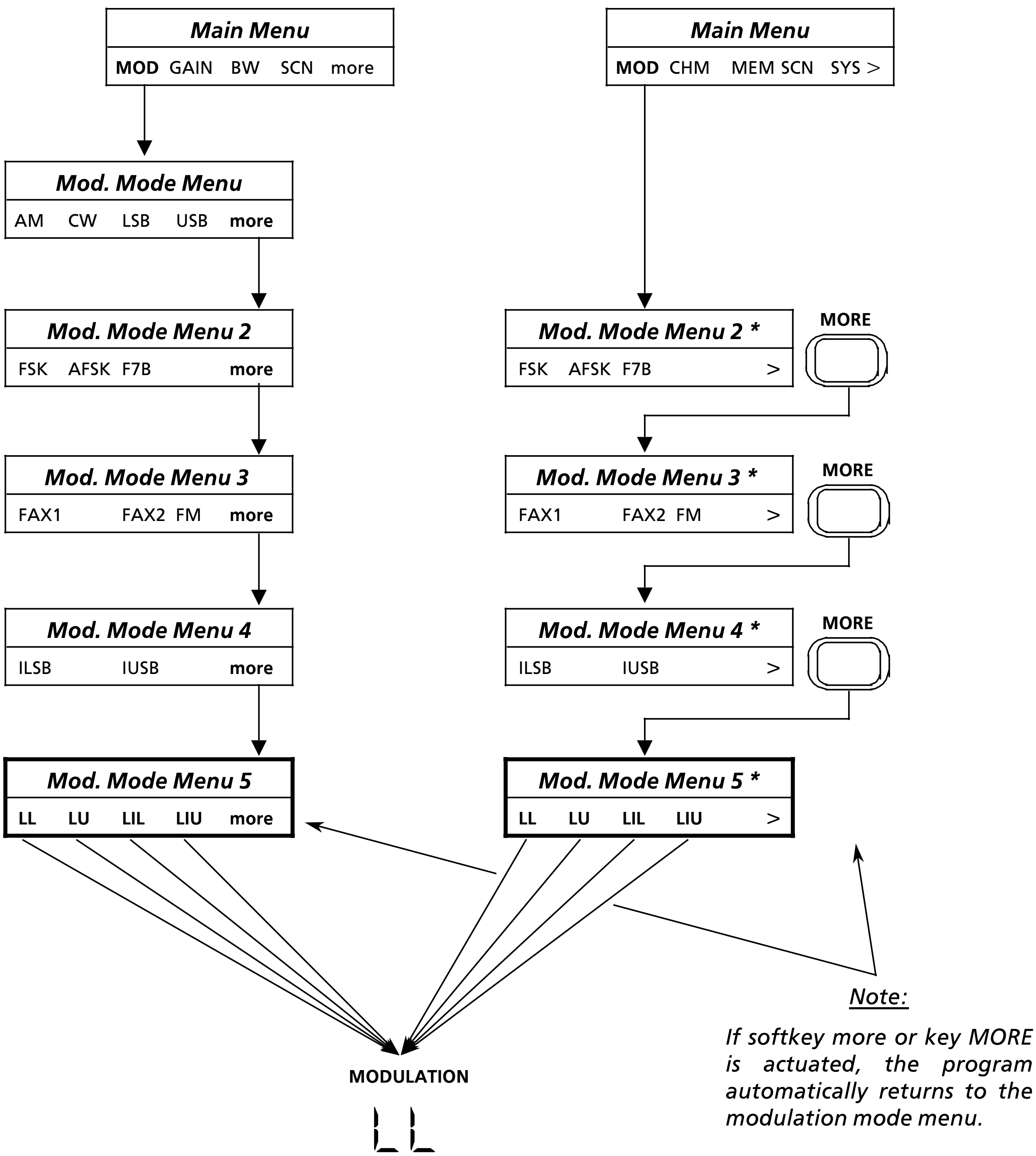
For EK 896:

Upon actuation of softkey MOD, key MORE, key MORE and key MORE, the modulation mode menu 5* is called up. By actuation of

softkey LL or
softkey LU or
softkey LIL or
softkey LIU

the respective modulation mode is set.

For EK 895: For EK 896:



3.1.9 Bandwidth

3.1.9.1 Selecting a Bandwidth (R&S EK 895)

By actuating particular softkeys while in the bandwidth selection menu the operator can select between 17 bandwidths. The currently effective bandwidth is indicated in the bandwidth field.

The following bandwidths (indications) are possible:

- 150 Hz (0.1)
- 300 Hz (0.3)
- 400 Hz (0.4)
- 600 Hz (0.6)
- 800 Hz (0.8)
- 1 kHz (1.0)
- 1.5 kHz (1.5)
- 1.8 kHz (1.8)
- 2.1 kHz (2.1)
- 2.4 kHz (2.4)
- 2.7 kHz (2.7)
- 3.1 kHz (3.1)
- 3.6 kHz (3.6)
- 4.0 kHz (4.0)
- 4.8 kHz (4.8)
- 6 kHz (6.0)
- 8 kHz (8.0)

Note:

Depending on the set modulation mode, only certain bandwidths can be set resp. only these bandwidths make sense:

FM: ≥ 4 kHz
ISB: 2.1 to 3.1 kHz
SSB: 150 Hz to 3.6 kHz
2.7 kHz (for data link models)

In order to move to the next larger bandwidth actuate

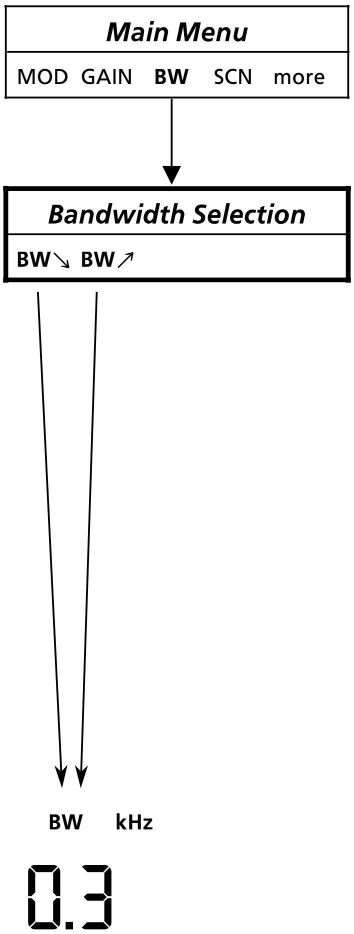
softkey BW↗.

In order to move to the next smaller bandwidth actuate

softkey BW↘.

Actuate the relevant softkey several times, if need be, until the desired bandwidth is indicated.

Once the maximum or minimum value is reached, the display does not change any more for further actuation of the relevant softkey.


Main Menu
MOD GAIN BW SCN more
Bandwidth Selection
BW↘ BW↗
BW kHz
0.3

3.1.9.2 Altering the Bandwidth Quasi-continuously or Selecting a Fixed Bandwidth (R&S EK 895)

Note:

For this the Software Option R&S EK 895S7 is required.

The bandwidth can be either selected from a choice of fixed frequencies or be set quasi-continuously.

Upon actuation of softkey BW the bandwidth selection menu is called up. The menu offers the following functions:

- BW↘ (move to the next lower fixed bandwidth)
- BW↗ (move to the next higher fixed bandwidth)
- VAR (switchover to quasi-continuous bandwidths)

Once the bandwidth selection menu has been called up, the tuning knob will only have effect on the function BW.

The currently effective bandwidth is displayed in the bandwidth field (in kHz) and in the menu line (in Hz).

3.1.9.2.1 Altering the Bandwidth Quasi-continuously

The available bandwidth range (100 Hz to 9 kHz) is subdivided into 128 bandwidths. Neighbouring bandwidths differ by approx. 3 %.

Example: ....155 Hz → 161 Hz → 166 Hz...

Depending on the set modulation mode, the bandwidth can be altered within certain limits (see table on the folllowing page) by turning the tuning knob.

For decreasing the bandwidth turn the tuning knob counter-clockwise. For increasing the bandwidth turn the tuning knob clockwise.

Turning the tuning knob automatically activates the quasi-continuous bandwidth selection and the displayed VAR is underlined.

3.1.9.2.2 Selecting a Fixed Bandwidth

Note:

Depending on the set modulation mode, only certain bandwidths can be set resp. only these bandwidths make sense:

FM: $\geq$ 4 kHz
ISB: 2.1 to 3.1 kHz
SSB: 150 Hz to 3.6 kHz
2.7 kHz (for data link models)

Depending on the set modulation mode, the operator can select from up to 17 bandwidths by actuating softkey BW↘ or BW↗.

The following bandwidths (indications) are possible:

- 150 Hz (0.1)
- 300 Hz (0.3)
- 400 Hz (0.4)
- 600 Hz (0.6)
- 800 Hz (0.8)
- 1 kHz (1.0)
- 1.5 kHz (1.5)
- 1.8 kHz (1.8)
- 2.1 kHz (2.1)
- 2.4 kHz (2.4)
- 2.7 kHz (2.7)
- 3.1 kHz (3.1)
- 3.6 kHz (3.6)
- 4.0 kHz (4.0)
- 4.8 kHz (4.8)
- 6 kHz (6.0)
- 8 kHz (8.0)

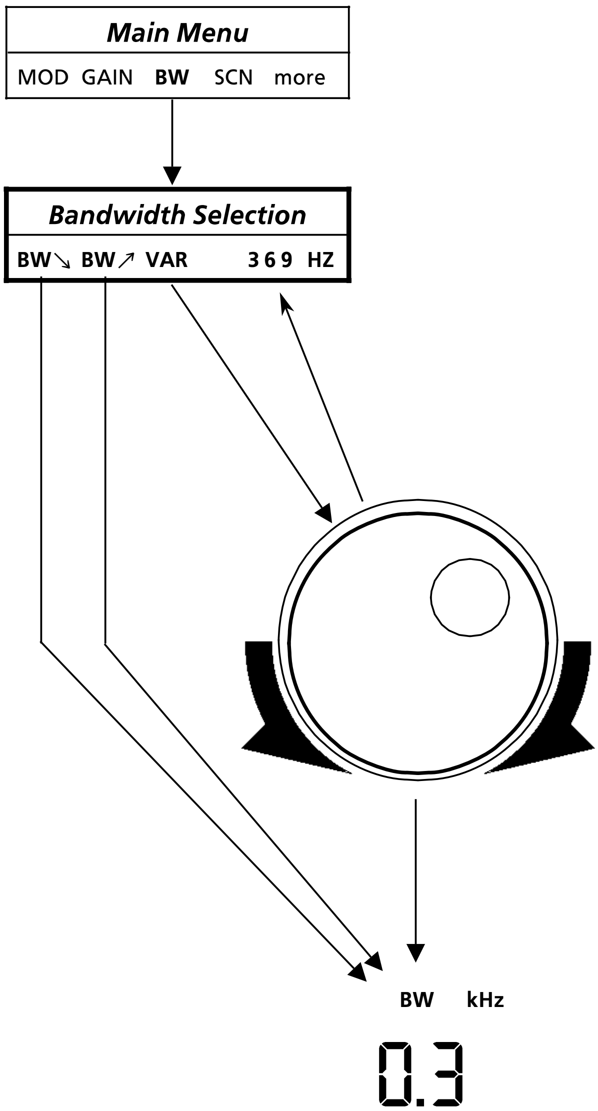
In order to move to the next larger bandwidth actuate softkey BW↗.

In order to move to the next smaller bandwidth actuate softkey BW↘.

Actuate the relevant softkey several times, as necessary, until the desired bandwidth is indicated.

Once the maximum or minimum value is reached, the display does not change any more for further actuation of the relevant softkey.

By actuating softkey BW↘ or BW↗, selection from the fixed bandwidths is automatically activated and the VAR indication will no longer be underlined.



	AM	CW	USB LSB	FSK	AFSK	F7B	FAX1	FAX2	FM	ISBUSB ISBLSB
Fixed / kHz										
Min. bandwidth / kHz	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	2.1
Max. bandwidth / kHz	8.0	8.0	3.6	8.0	8.0	8.0	8.0	8.0	8.0	3.1
Quasi-continuos										
Min. bandwidth / kHz	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.836
Max. bandwidth / kHz	9.0	9.0	3.674	9.0	9.0	9.0	9.0	9.0	9.0	3.375

3.1.9.3 Altering the Bandwidth Quasi-continuously or Selecting a Fixed Bandwidth (R&S EK 896)

The bandwidth can be either selected from a choice of fixed frequencies or be set quasi-continuously.

Upon actuation of key BW+ or BW- the bandwidth selection menu is called up. The menu offers the following functions:

- BW↘ (move to the next lower fixed bandwidth)
- BW↗ (move to the next higher fixed bandwidth)
- VAR (switchover to quasi-continuous bandwidths)

The currently effective bandwidth is displayed in the bandwidth field (in kHz) and in the menu line (in Hz).

3.1.9.3.1 Altering the Bandwidth Quasi-continuously

Select quasi-continuous setting by actuating softkey VAR. Indication VAR is now underlined.

The available bandwidth range (100 Hz to 9 kHz) is subdivided into 128 bandwidths. Neighbouring bandwidths differ by approx. 3 %.

Example: ....155 Hz → 161 Hz → 166 Hz...

Depending on the set modulation mode, the bandwidth can be altered within certain limits by actuating key BW+ or BW- (see table on the following page).

For decreasing the bandwidth acuate key BW-.

For increasing the bandwidth actuate key BW+.

3.1.9.3.2 Selecting a Fixed Bandwidth

Note:

Depending on the set modulation mode, only certain bandwidths can be set or only these bandwidths make sense:

FM: ≥ 4 kHz
ISB: 2.1 to 3.1 kHz
SSB: 150 Hz to 3.6 kHz
2.7 kHz (for data link models)

Upon actuation of softkey BW↘ or BW↗ selection from a fixed range of bandwidths is activated automatically. As a result indication VAR is no longer underlined.

Depending on the set modulation mode, the operator can select from up to 17 bandwidths by actuating key BW+ or BW- or softkey BW↘ or BW↗, respectively.

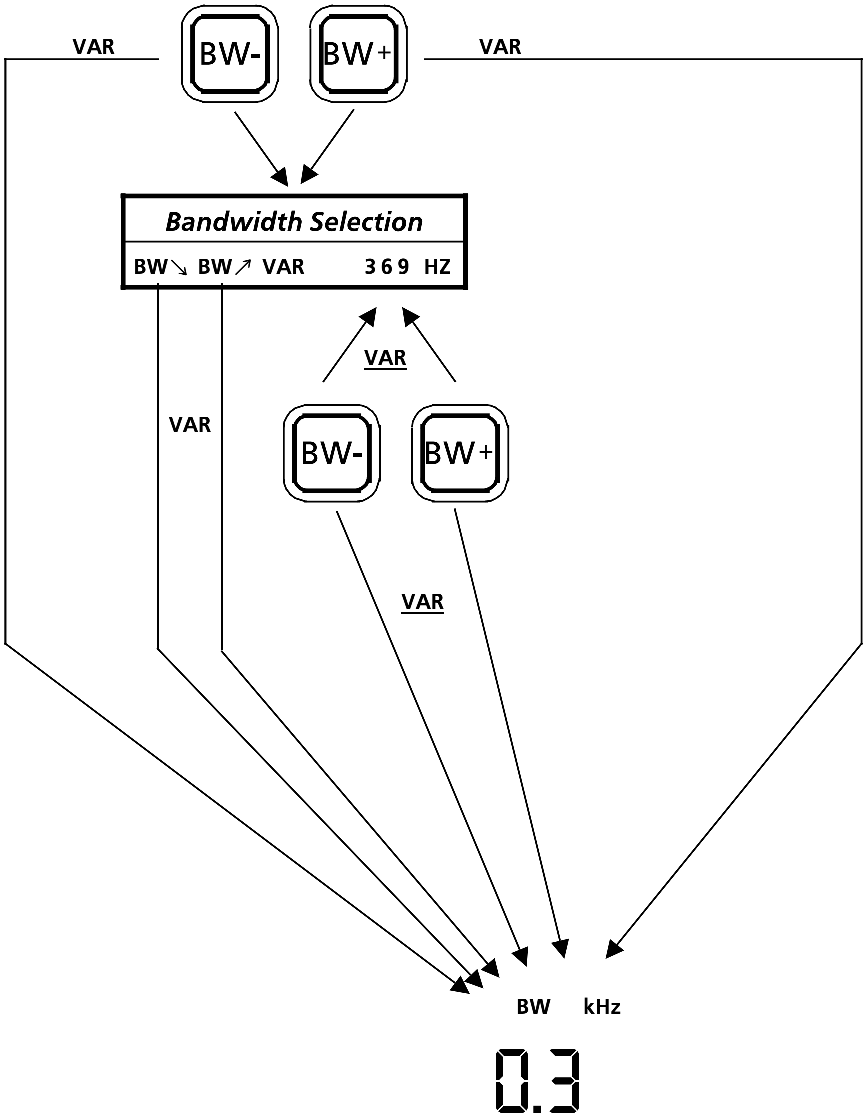
The following bandwidths (indications) are possible:

- 150 Hz (0.1)
- 300 Hz (0.3)
- 400 Hz (0.4)
- 600 Hz (0.6)
- 800 Hz (0.8)
- 1 kHz (1.0)
- 1.5 kHz (1.5)
- 1.8 kHz (1.8)
- 2.1 kHz (2.1)
- 2.4 kHz (2.4)
- 2.7 kHz (2.7)
- 3.1 kHz (3.1)
- 3.6 kHz (3.6)
- 4.0 kHz (4.0)
- 4.8 kHz (4.8)
- 6 kHz (6.0)
- 8 kHz (8.0)

In order to move to the next larger bandwidth actuate key BW+ or softkey BW↗. In order to move to the next smaller bandwidth actuate key BW- or softkey BW↘.

Actuate the relevant softkey or BW key several times, as necessary, until the desired bandwidth is indicated.

Once the maximum or minimum value is reached, the display does not change any more for further actuation of the relevant softkey or BW key.



	AM	CW	USB LSB	FSK	AFSK	F7B	FAX1	FAX2	FM	ISBUSB ISBLSB
Fixed / kHz										
Min. bandwidth / kHz	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	2.1
Max. bandwidth / kHz	8.0	8.0	3.6	8.0	8.0	8.0	8.0	8.0	8.0	3.1
Quasi-continuos										
Min. bandwidth / kHz	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.836
Max. bandwidth / kHz	9.0	9.0	3.674	9.0	9.0	9.0	9.0	9.0	9.0	3.375

3.1.10 Passband Tuning and Notch Filter

<u>*Note:*</u>

The frequency offset should be used for modulation modes AM, CW, SSB, F7B, FAX and FM only. In the ISB mode, the notch filter only has an effect on the monitoring sideband. For the SSB mode, the setting of negative filter frequencies is not required.

If the LED assigned to the key NOTCH / PBT is illuminated, it is possible by using either the tuning knob (R&S EK 895) or the step keys (R&S EK 896) to

- offset the passband curve of the IF filter with respect to the receive frequency
- adjust the notch filter frequency.

The currently effective offset or filter frequency is indicated above the softkeys, e.g.:

```
PBT OFFSET x.xx    KHZ
```

or

```
    NOTCH A x.xx    KHZ
```

Due to the offset and / or the filters, interfering receive frequencies, which are also in the passband of the IF filter, can be suppressed.

<u>Default Setting is activated (see 3.1.18.10):</u>

The maximum (+bandwidth/2) or minimum (-bandwidth/2) offset is determined by the currently effective IF filter bandwidth (see bandwidth field). As soon as the effective offset is ≠0, a black bar will appear in the status line above PBT.

When changing one of the following parameters the frequency offset is reset to 0.00:

- Frequency
- Bandwidth
- BFO frequency
- Modulation mode
- Channel

Each of the two notch filters may be adjusted in the range of -5 kHz to 5 kHz. Only if a black bar is visible above NOTCH in the status line, will the notch filters be active. Cut in notch filters acc. to 3.1.20.2, if necessary.

When changing one of the following parameters the notch filter A/B is set to 4.00 kHz:

- Frequency
- Modulation mode
- Channel

<u>Default Setting is inhibited (see 3.1.18.11):</u>

The offset may be adjusted in the range of -5 kHz to 5 kHz.

3.1.10.1 Altering the Frequency Offset or the Filter Frequency by Using the Tuning Knob (R&S EK 895)

If the LED NOTCH / PBT is not illuminated, actuate key NOTCH / PBT several times, as necessary, until the desired frequency offset or filter frequency is displayed. The indication will change as follows:

```
PBT OFFSET x.xx    KHZ
    NOTCH A x.xx    KHZ
    NOTCH B x.xx    KHZ
```

(x.xx = frequency offset or filter frequency last entered)

In order to reduce the frequency offset or the filter frequency turn the tuning knob counterclockwise.

In order to increase the frequency offset or the filter frequency turn the tuning knob clockwise.

For passband tuning the reset to zero is possible at any one time by pressing key CLR.

3.1.10.2 Altering the Frequency Offset or the Filter Frequency by Using the Step Keys (R&S EK 896)

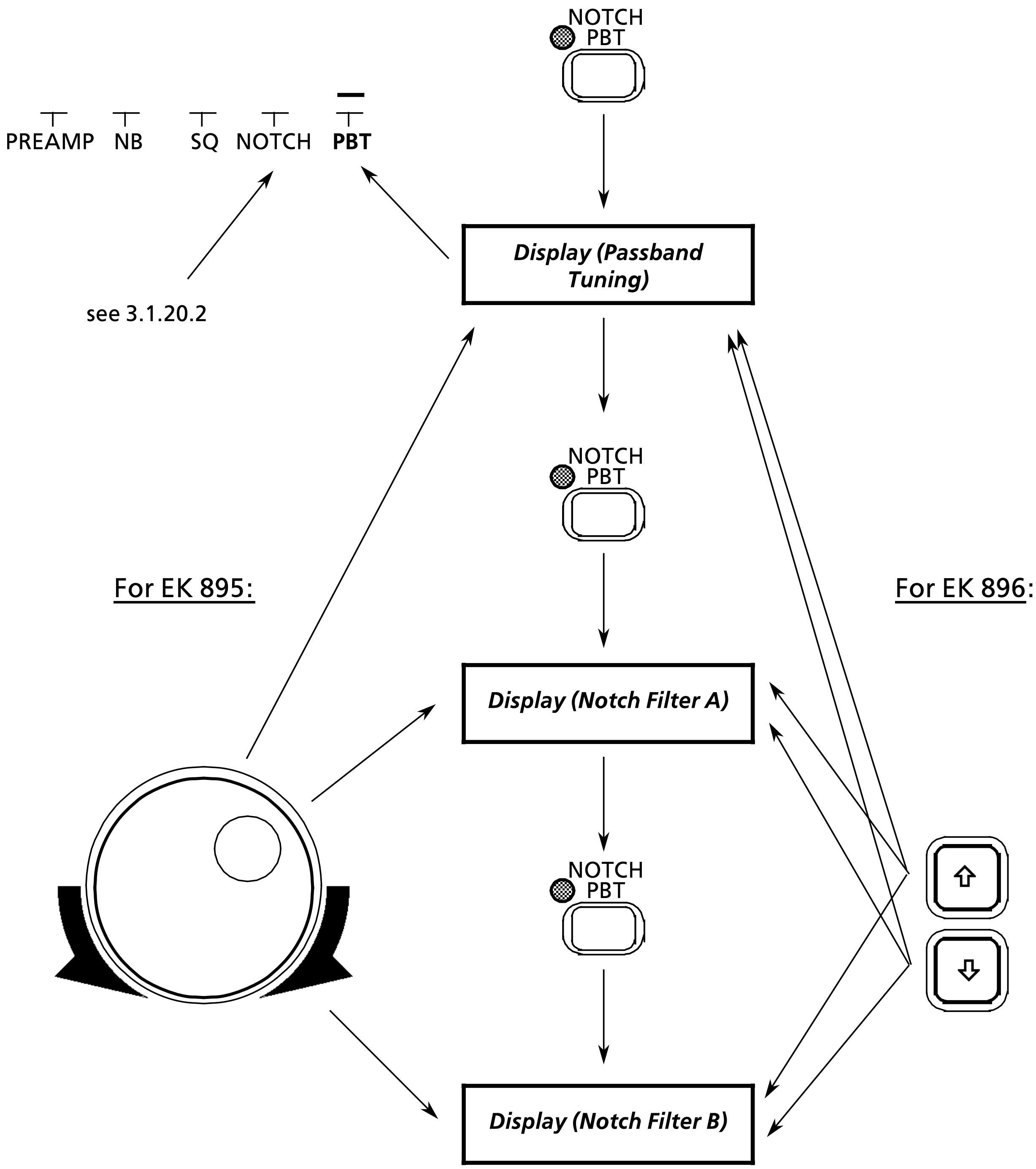
If the LED NOTCH / PBT is not illuminated, actuate key NOTCH / PBT several times, if need be, until the desired frequency offset or filter frequency is displayed. The indication will change as follows:

```
PBT OFFSET x.xx    KHZ
    NOTCH A x.xx    KHZ
    NOTCH B x.xx    KHZ
```

(x.xx = frequency offset or filter frequency last entered)

In order to reduce the frequency offset or the filter frequency actuate step key ↓.

In order to increase the frequency offset or the filter frequency actuate step key ↑.



3.1.11 Control Type

The type of control can be selected by actuating softkeys in the control type menu (R&S EK 895) or the control type keys (R&S EK 896). The currently effective type of control is displayed in the control type field.

The following types of control are available:

- AGC (automatic gain control)
- MGC (manual gain control)
- A+M (combined control AGC+MGC)
- A+D (combined control AGC+DGC)

Depending on which key has been actuated, control is carried out

automatically (AGC → control voltage set by signal processor),

manually (MGC → control voltage set via HF control),

digitally (DGC → DGC value entered via the numeric keypad).

A combination of these control types is also possible.

Digital control is equivalent to manual control with the exception that the control voltage can be stored.

For the type of control AGC, the bargraph indicates the current receive level.

For the type of control MGC, the bargraph indicates the HF voltage set via the HF control (constant gain).

For the type of control A+M, the bargraph indicates either the control voltage set via the HF control (receive level < control voltage) or the current receive level (receive level > control voltage).

For the type of control A+D, the bargraph indicates the digital threshold entered via the numeric keypad (constant gain).

In all four cases the display bargraph range is from 0 to 120 dBµV with a resolution of 5 dBµV.

If in the control types A+M and A+D respectively the receive level exceeds the set control voltage respectively the programmed DGC value, the automatic gain control (AGC) prevents the receiver from being overmodulated.

3.1.11.1 Control Type Menu (R&S EK 895)

Upon actuation of softkey GAIN the control type menu is called up. By pressing

softkey AGC or
softkey MGC or
softkey A+M or
softkey A+D

the respective control type will be set.

Upon actuation of softkey A+D a DGC value can be entered in addition (see 3.1.11.3).

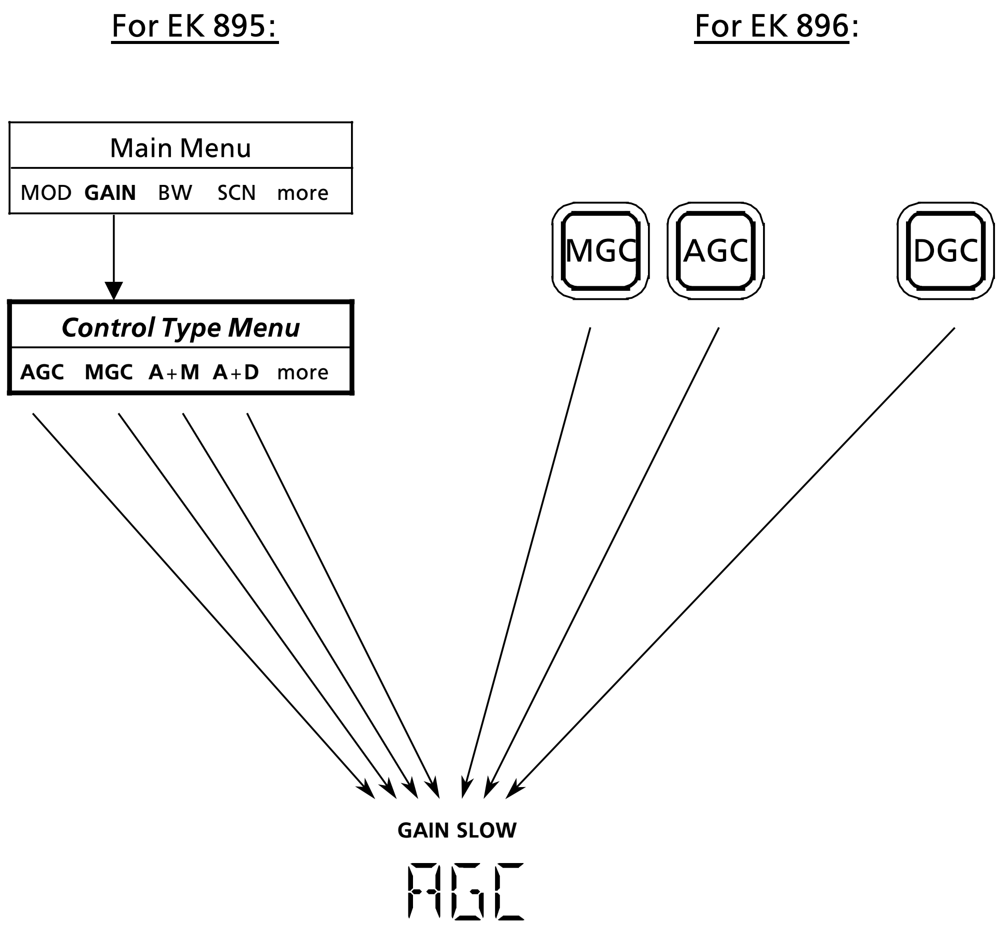
Upon actuation of softkey A+M a control voltage can be entered in addition (see 3.1.11.4) by using the HF control.

3.1.11.2 Selecting the Control Type (R&S EK 896)

Actuate the relevant control type key (19) several times, as necessary, until the desired type of control is displayed.

Desired control type	Display	Actuate key(s)
AGC	MGC A+D A+M	AGC + AGC AGC AGC
MGC [1]	AGC A+D A+M	MGC + MGC MGC + MGC MGC
A+M [1]	AGC MGC A+D	MGC AGC MGC
A+D [2]	xxx	DGC

[1] Set control voltage acc. to 3.1.11.4.
[2] Alter DGC value acc. to 3.1.11.3


For EK 895:
For EK 896:
Main Menu
MOD GAIN BW SCN more
Control Type Menu
AGC MGC A+M A+D more
MGC
AGC
DGC
GAIN SLOW
AGC

3.1.11.3 Entering a DGC Value

Upon actuation of softkey A+D (R&S EK 895, see 3.1.11.1) or of key DGC (R&S EK 896) it appears the following display:

```
DGC VALUE xx_      dBµV
```

(xx = DGC value last stored)

The flashing cursor (_) indicates that an entry is being expected.

Enter new DGC value (constant gain) via the numeric keypad.

Range of entry: ..... 0 to 120 dBµV
Resolution: .... 1 dBµV

In order to increase the new DGC value in steps of 1 dBµV turn tuning knob clockwise.

In order to decrease the new DGC value in steps of 1 dBµV turn tuning knob counter-clockwise.

3.1.11.4 Setting the Control Voltage

Actuate softkey MGC or A+M (R&S EK 895, see 3.1.11.1) or key MGC (R&S EK 896).

Set the control voltage by means of the HF control.

The set value is indicated by the bargraph with a resolution of 5 dBµV.

For VLF-HF Receiver R&S EK 895 the following applies:

Control turned fully counter-clockwise: 0 dBµV (max. gain)

Control turned fully clockwise: 120 dBµV (min. gain)

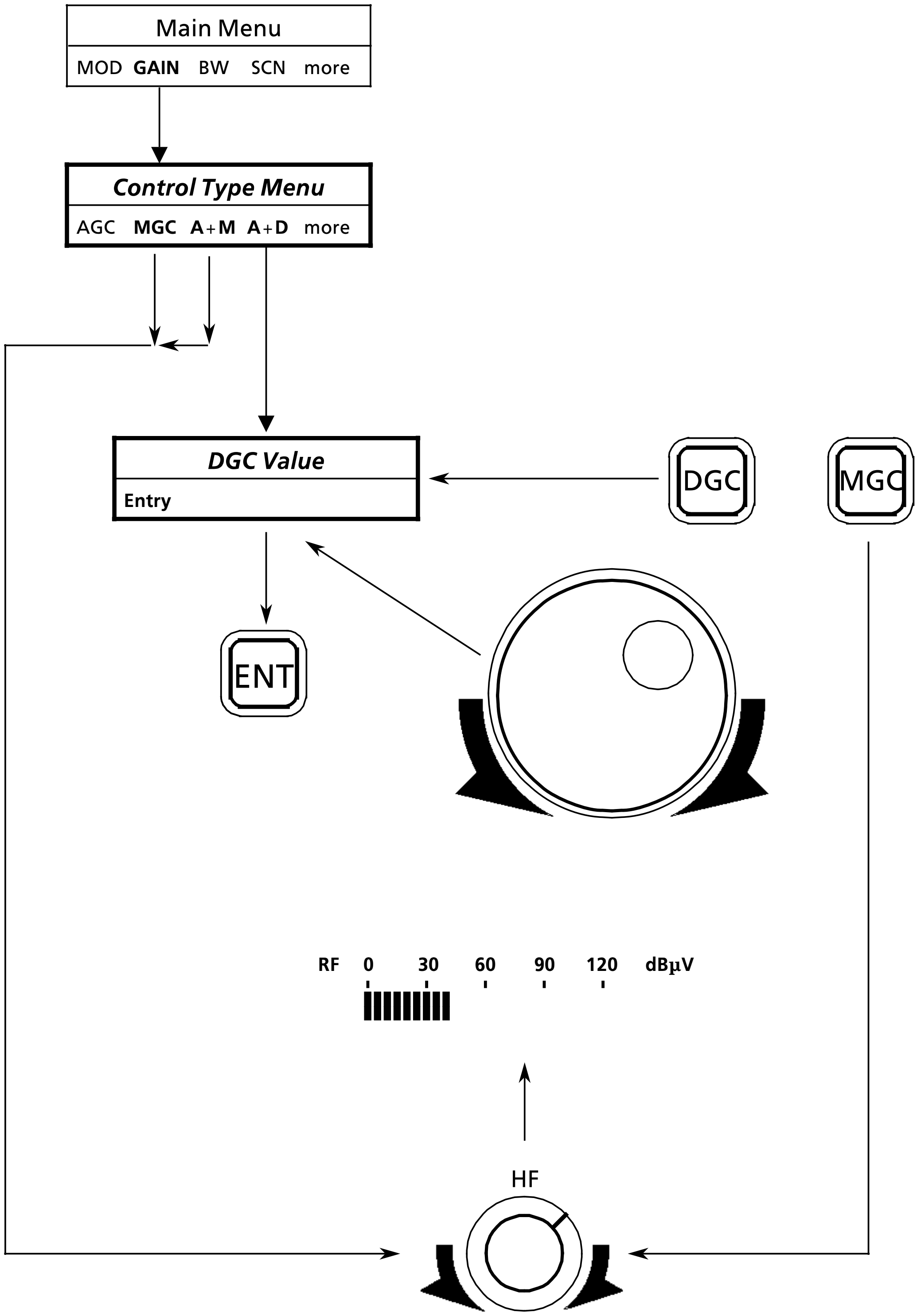
For VLF-HF Receiver R&S EK 896 the following applies depending on the jumper position in the control unit defining the direction of rotation for the HF control (see A1.5):

Control turned fully counter-clockwise: 0 dBµV (max. gain)

Control turned fully clockwise: 120 dBµV (min. gain)

For R&S EK 895:

For R&S EK 896:



3.1.12 Control Time

The control time can be selected by actuating softkeys in the control time menu. The currently effective control time is displayed in the control type field above the set control type.

The following control times (displays) are possible:

- 25 ms (FAST)
- 150 ms (FAST)
- 500 ms (SLOW)
- 1 s (SLOW)
- 3 s (SLOW)

3.1.12.1 Control Time Menu

Upon actuation of softkeys GAIN and more (EK 895) or of key FAST SLOW (EK 896) the control time menu is called up.

By pressing

softkey 25 or

softkey 150 or

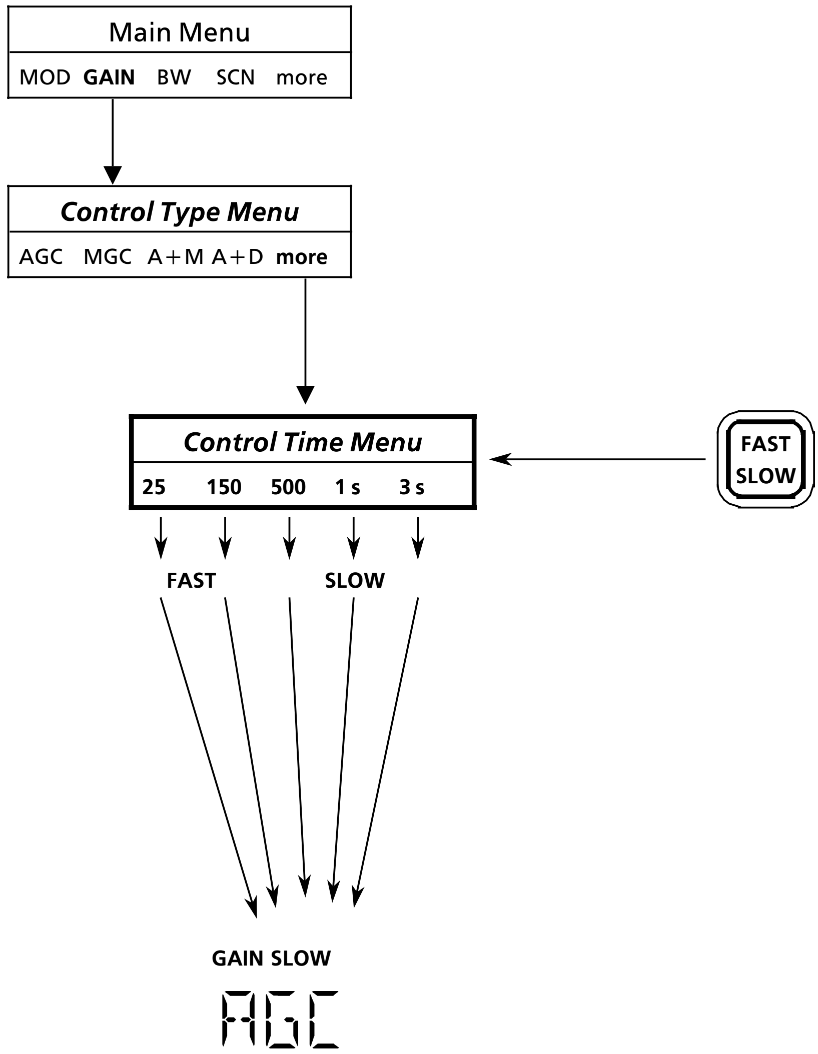
softkey 500 or

softkey 1 s or

softkey 3 s

the respective control time is set.

For R&S EK 895: For R&S EK 896:



3.1.13 BFO Frequency

Note:

For modulation modes CW, FSK, AFSK and FAX only.

If the LED assigned to the LED BFO is illuminated, the BFO frequency can be altered by means of the tuning knob (R&S EK 895), the step keys (R&S EK 896) or via the numeric keypad (both R&S EK 895 and R&S EK 896). The currently effective BFO frequency is indicated in the BFO field. There is no display in modulation modes AM, F7B, FM and ISB.

By shifting the cursor with the aid of the cursor control keys the stepwidth of the tuning knob is altered.

Cursor position	Stepwidth
5.00	0.01
5.00	0.1
5.00	1

3.1.13.1 Entering the BFO Frequency

Upon actuation of the key BFO the following display appears:

```
BFO _          KHZ
```

The flashing cursor (_) indicates that an entry is being expected. Enter a new BFO frequency via the numeric keypad.

Range of entry: .... -5.00 to 5.00 kHz
Resolution: .... 10 Hz
Entry: .... in kHz

3.1.13.2 Inverting the BFO Frequency

Actuate key +/-.

3.1.13.3 Altering the BFO Frequency by Using the Tuning Knob (EK 895)

If the LED BFO is not illuminated, actuate key BFO. Upon actuation of the key BFO the following display appears:

```
BFO _          KHZ
```

If the frequency (≤ 5 kHz) is to be increased turn the tuning knob clockwise.

If the frequency (≥ -5 kHz) is to be reduced turn the tuning knob counter-clockwise.

3.1.13.4 Altering the Tuning Knob Stepwidth by Using the Cursor Control Keys (EK 895)

If the LED BFO is not illuminated, actuate key BFO. Upon actuation of the key BFO the following display appears:

```
BFO  _         KHZ
```

If the stepwidth (≥ 0.01) is to be reduced actuate key →.

If the stepwidth (≤ 1) is to be increased actuate key ←.

Once the minimum or maximum value is reached, the display does not change any further for actuation of the respective key ← or →.

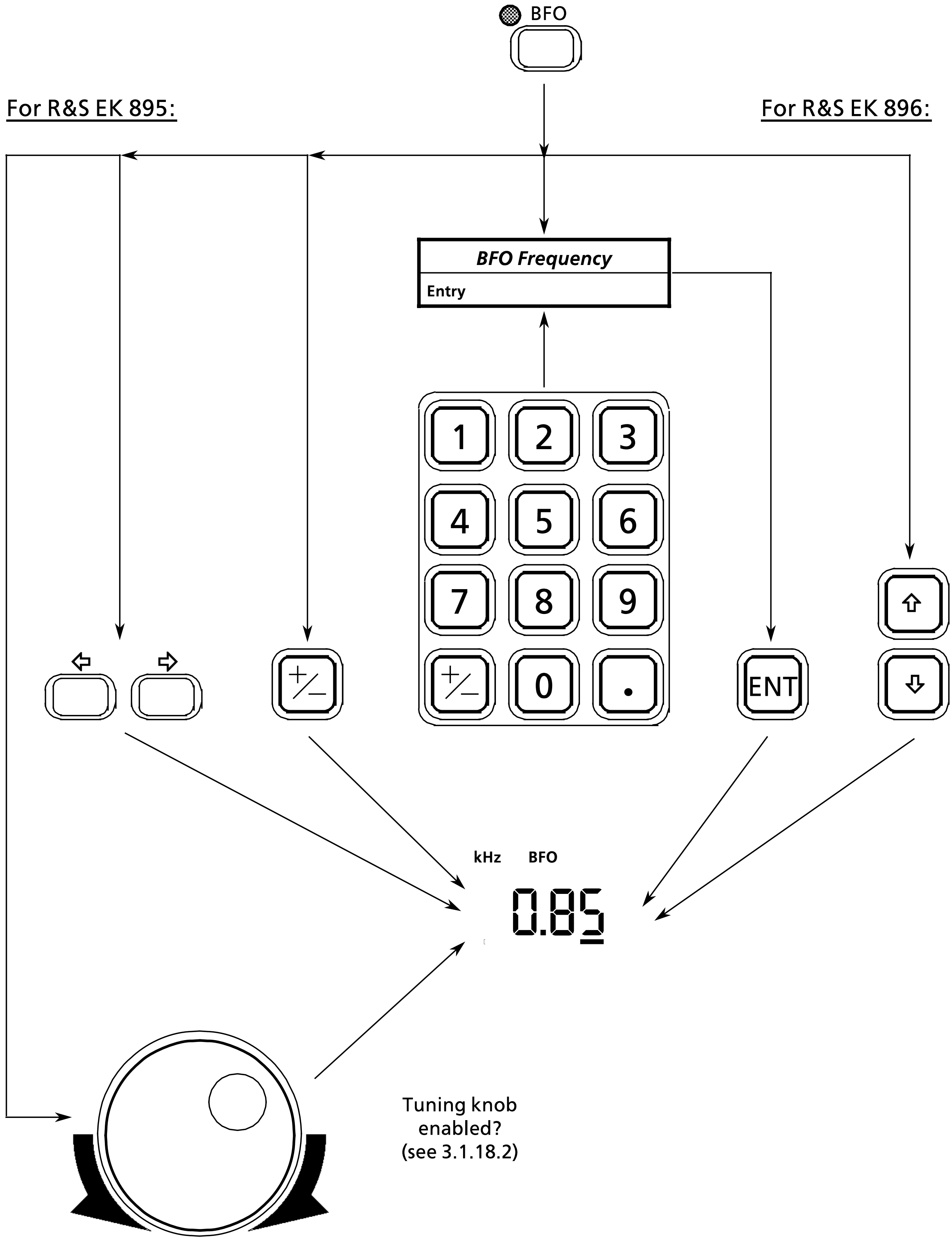
3.1.13.5 Altering the BFO Frequency by Using the Step Keys (EK 896)

If the LED BFO is not illuminated, actuate key BFO. Upon actuation of the key BFO the following display appears:

```
BFO _           KHZ
```

If the frequency (≥ -5 kHz) is to be reduced actuate step key ↓.

If the frequency (≤ 5 kHz) is to be increased actuate step key ↑.


BFO
For R&S EK 895:
For R&S EK 896:
BFO Frequency
Entry
1
2
3
4
5
6
7
8
9
0
.
ENT
kHz
BFO
0.85
Tuning knob
enabled?
(see 3.1.18.2)

3.1.14 Channel

If the LED assigned to the key CH is illuminated, each channel stored and not cleared (inhibited) can be called up via the tuning knob or the numeric keypad.

The currently effective channel is indicated in the channel field.

The following channel settings are effective:

- Frequency
- Modulation mode
- Bandwidth
- Control type and time
- BFO frequency
- DGC value
- Frequency deviation and offset
- Baud rate
- Polarity
- TTY status

3.1.14.1 Calling Up a Channel

If the LED is not illuminated, actuate key CH. Upon actuation of key CH it appears the following display:

```
CHANNEL _
```

The flashing cursor (_) indicates that an entry is being expected.

Enter the new channel number via the numeric keypad.

Range of entry: .... 0 to 999

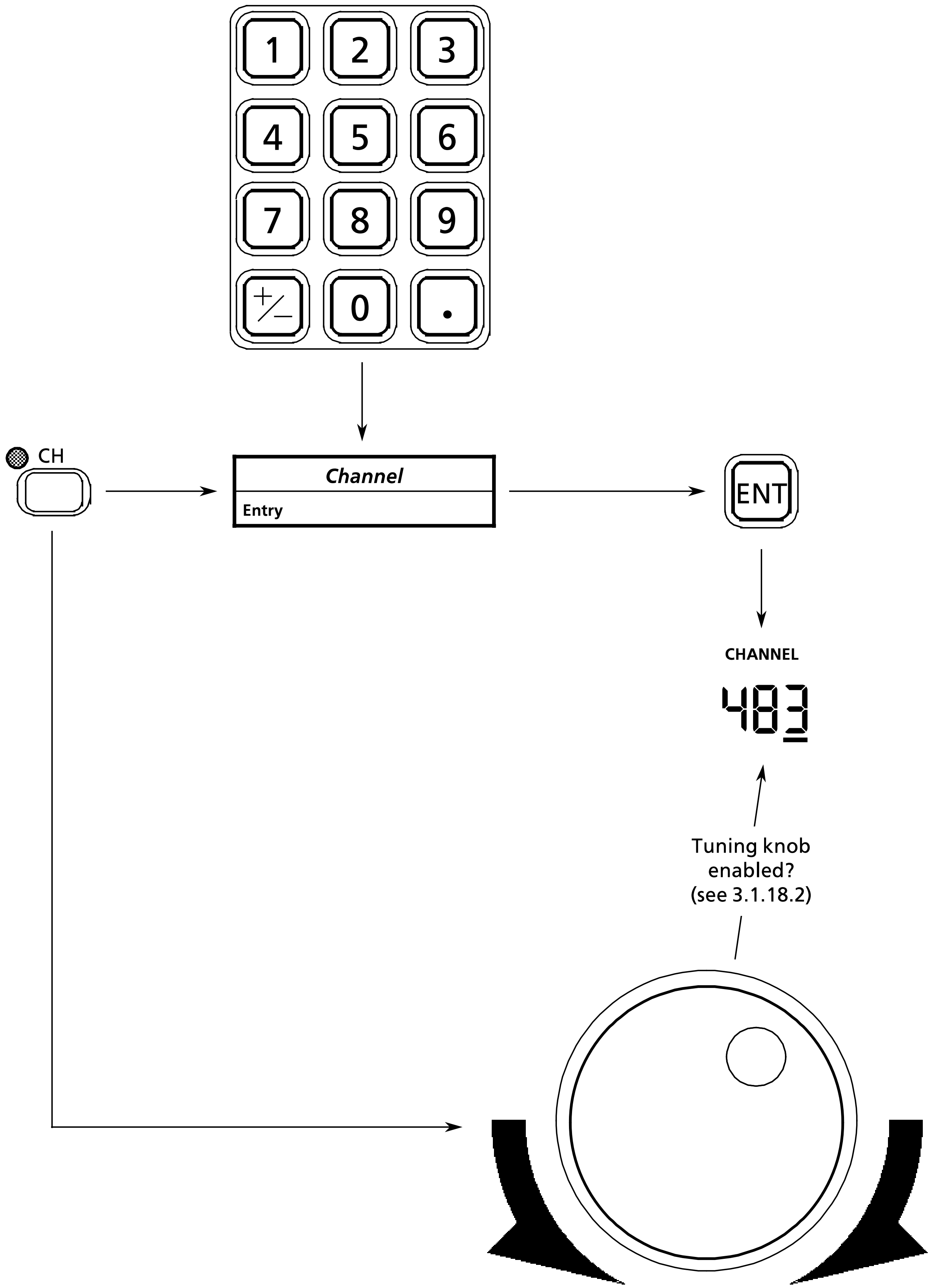
3.1.14.2 Channel Scanning by Using the Tuning Knob

If the LED is not illuminated, actuate key CH. Upon actuation of key CH it appears the following display:

```
CHANNEL _
```

In order to call up the next higher channel number (≤999) turn the tuning knob clockwise.

In order to call up the next lower channel number (≥ 0) turn the tuning knob counter-clockwise .


1
2
3
4
5
6
7
8
9
+/−
0
.
CH
Channel
Entry
ENT
CHANNEL
483
Tuning knob enabled? (see 3.1.18.2)

3.1.15 Storing and Clearing

By actuation of softkeys more and MEM (R&S EK 895) or of softkey MEM (R&S EK 896) the storage menu is called up. The menu offers the following functions:

- CLA (clear all channels)
- CLCH (clear a particular channel)
- STCH (store into a particular channel)
- STO (store into the next free channel with the lowest channel number).

Up to 1000 complete receiver settings can be stored failure-safe into the channels (0 to 999). A complete receiver setting consists of frequency, bandwidth, BFO frequency, demodulation mode, control type and time, frequency deviation and offset, baud rate, polarity, TTY status, error flag and DGC value.

It is possible to store the current receiver setting into the next free channel with the lowest channel number (→ STO) or into a channel (→ STCH) to be entered via the numeric keypad.

In the channels, individual receiver settings can be altered or complete receiver settings can be cleared (inhibited) via the channel editing menu (see 3.1.16).

It is possible to clear (inhibit) all channels (→ CLA) or clear (inhibit) one particular channel (→ CLCH) entered via the numeric keypad.

Channels which have been cleared via the key CLR or via the softkey CLCH or CLA are still physically available, that is, the channel is inhibited. Via the function RAM, however, the memory content is overwritten with logic naughts (see 3.1.19.5).

In the operating modes CHANNEL and FIXED CHANNEL and via the function CHS inhibited channels cannot be called up.

It is, however, possible to reactivate inhibited channels via the channel editing menu (see 3.1.16).

3.1.15.1 Clearing All Channels

Upon actuation of softkeys more and MEM (R&S EK 895) or of softkey MEM (R&S EK 896) as well as of softkey CLA the following display appears:

```
CLEAR ALL            YES NO
```

Actuate softkey YES to confirm that all channels be cleared.

Actuate softkey NO to indicate that not all or no channels are to be cleared.

3.1.15.2 Clearing a Particular Channel

Upon actuation of softkeys more and MEM (R&S EK 895) or of softkey MEM (R&S EK 896) as well as of softkey CLCH the following display appears:

```
CLEAR CH _                ENT
```

The flashing cursor (_) indicates that an entry is being expected. Enter the channel number via the numeric keypad.

Range of entry: .... 0 to 999

3.1.15.3 Storing into a Particular Channel

Upon actuation of softkeys more and MEM (R&S EK 895) or of softkey MEM (R&S EK 896) as well as of softkey STCH the following display appears:

```
STORE CH _                ENT
```

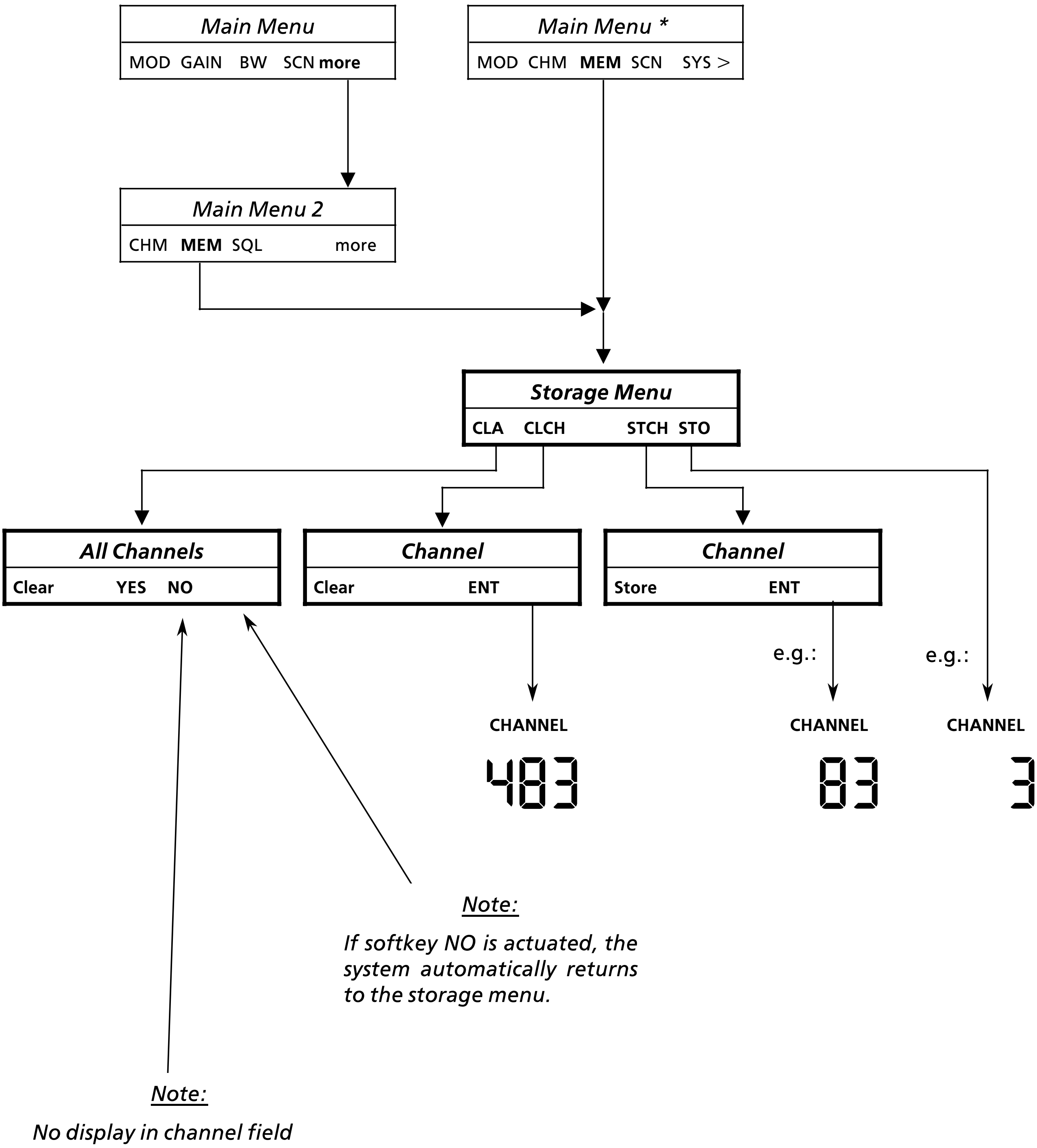
The flashing cursor (_) indicates that an entry is being expected. Enter the channel number via the numeric keypad.

Range of entry: .... 0 to 999

3.1.15.4 Storing into the Next Free Channel

Actuate softkeys more and MEM (EK 895) or softkey MEM (EK 896) as well as softkey STO.

For R&S EK 895: For R&S EK 896:



3.1.16 Editing the Channel Contents

<u>*Note:*</u>

Channel manipulations (CHM) are only possible if receiver settings were already stored acc. to 3.1.15.

In the channel manipulations menu, it is not the currently effective receiver setting which is indicated but that of the called-up channel. Channel manipulations do not alter the current receiver setting, that is, receive operation is not affected.

Upon actuation of softkeys more and CHM (R&S EK 895) or of softkey CHM (R&S EK 896) the channel number in the channel field flashes (indicating that the channel editor is activated) and the LED assigned to key CH is illuminated. Call up the channel whose contents are to be edited acc. to 3.1.14.

By way of direct key actuation or softkey actuation in the channel manipulations menu, the operator can carry out the following actions:

- Alter the frequency (see 3.1.7)
- Alter the demodulation mode (see 3.1.8)
- Alter the bandwidth (see 3.1.9)
- Alter the control type (see 3.1.11)
- Alter the control time (see 3.1.12)
- Alter the BFO frequency (see 3.1.13)
- Alter the digital threshold (see 3.1.16.1)
- Inhibit a channel (see 3.1.16.2)
- Reactivate a channel (see 3.1.16.3

3.1.16.1 Entering the Digital Threshold

<u>*Note:*</u>

The bargraph indicates the digital threshold stored in the channel.

Upon actuation of softkeys more and CHM (R&S EK 895) or of softkey CHM (R&S EK 896) as well as of softkey THLD the following display appears:

```
THRESHOLD xx_     dBµV
```

(xx = digital threshold last stored)

The flashing cursor (_) indicates that an entry is being expected. Enter the new digital threshold via the numeric keypad.

Range of entry: .... 0 to 120 dBµV
Resolution: .... 1 dBµV

3.1.16.2 Inhibiting a Channel

Upon actuation of softkeys more and CHM (R&S EK 895) or of softkey CHM (R&S EK 896) as well as of key CLR the following display appears:

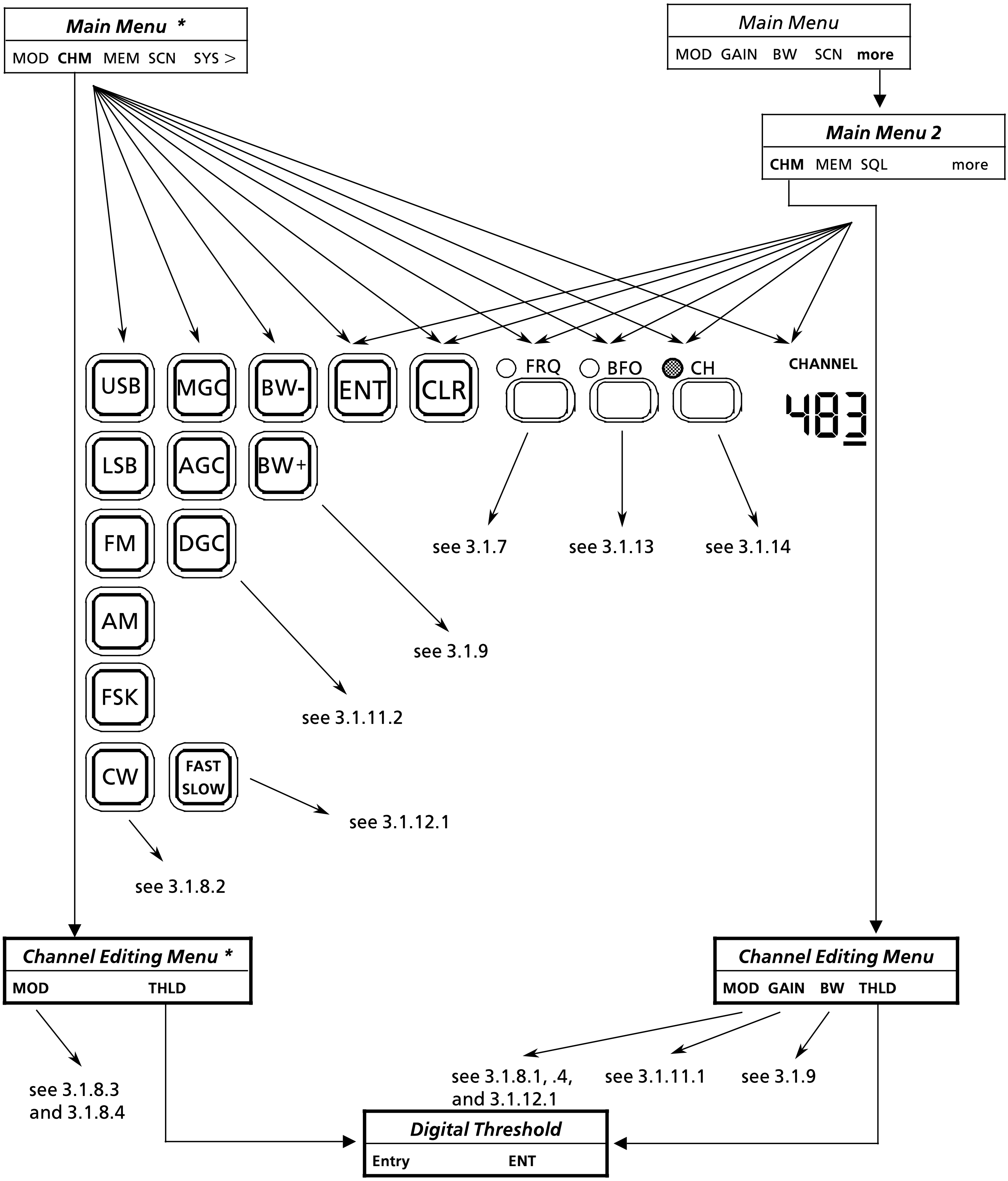
```
UNUSED
```

3.1.16.3 Reactivating a Channel

Upon actuation of softkeys more and CHM (R&S EK 895) or of softkey CHM (R&S EK 896) as well as of key ENT the displays for modulation mode and control type and time will appear.

For R&S EK 896:

For R&S EK 895:



3.1.17 Scanning

Upon actuation of softkey SCN the following display appears:

```
SCANNING
```

At the same time the scanning menu is indicated which offers the following functions:

- FRQ (frequency scanning)
- CHP (channel scanning with freely programmable channel list)
- CHS (channel scanning with ascending channel number sequence)
- S / C (stopping a running scan program or resuming a disrupted program)
- PRO (programming menu)

Once a scanning sequence has been activated, the receiver remains on the new frequency (channel) for as long as determined by the dwell time. In case the receive level exceeds the digital threshold, a hold time is added to the dwell time.

Note:

For frequency scanning only the frequency changes, whereas for channel scanning the entire receiver setting is altered.

Upon actuation of softkeys SCN and PRO the following display appears:

`PROGRAMME` scanning menu

The scanning menu offers the following functions:

- FRQ (frequency scanning parameter, dwell and hold times, digital threshold)
- CHP (channel list, dwell and hold times)
- CHS (channel scanning parameters, dwell and hold times)
- CLR (clear a programmed channel list)

Note:

For channel scanning programs the digital threshold can only be entered via the channel editing function THLD for the respective channel.

3.1.17.1 Starting Frequency Scanning

Upon actuation of softkeys SCN and FRQ the display FREQUENCY is flashing in the frequency field, and the frequency indication constantly changes from the start frequency to the stop frequency in increments which are determined by the frequency stepwidth.

3.1.17.2 Starting Channel Scanning (Freely Programmable Channel List)

Upon actuation of softkeys SCN and CHP the display CHANNEL in the channel field is flashing, and the channel indication constantly changes in line with the programmed channel list. In the channel list up to 20 channels can be stored.

3.1.17.3 Starting Channel Scanning (Ascending Channel Number Sequence)

Upon actuation of softkeys SCN and CHS the display CHANNEL in the channel field is flashing, and the channel indication constantly changes from start to the stop channel. Cleared (inhibited) channels are not called up.

3.1.17.4 Stopping or Resuming Channel Scanning

By actuating softkeys SCN and S / C a running scanning process is stopped or a disrupted scanning process is reactivated.

If upon actuation of softkey S / C the display FREQUENCY in the frequency field is flashing, a frequency scanning process has been reactivated.

If upon actuation of softkey S / C the display CHANNEL in the channel field is flashing, a channel scanning process has been reactivated.

3.1.17.5 Programming a Frequency Scanning Process

Upon actuation of softkeys SCN, PRO and FRQ the following display appears:

```
START FRQ xxxx _ KHZ    NEXT
```

Actuate softkey NEXT or key ENT several times until the desired display appears:

```
  STOP FRQ xxxx  _ KHZ     NEXT
  STEP FRQ xxxx  _ KHZ     NEXT
 THRESHOLD xxx  _  dBµV    NEXT
 DWELLTIME xx  _   MS      NEXT

  HOLDTIME xx  _       F/T NEXT
```

or

```
  HOLDTIME FOREVER     F/T NEXT
```

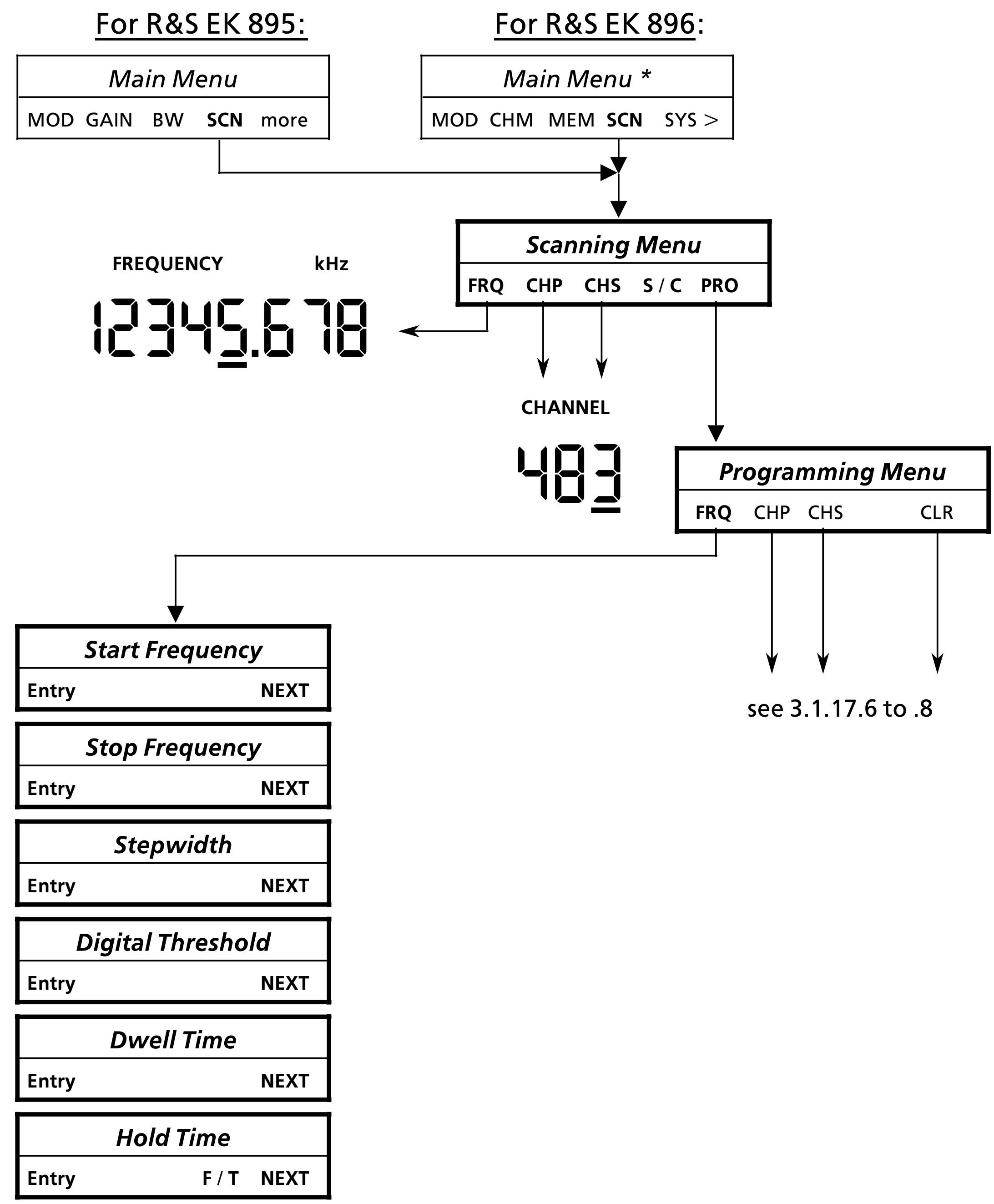
(xxx = last stored values for start and stop frequency, stepwidth, digital threshold, dwell and hold times)

The flashing cursor (_) indicates that an entry is being expected. Enter new start frequency, stop frequency, stepwidth, digital threshold, dwell time and / or hold time via the numeric keypad.

Actuate softkey F / T when

- a hold time is to be entered via the numeric keypad, but HOLDTIME FOREVER is displayed,

or



- scanning is to be stopped as soon as the entered digital threshold is exceeded (T = ∞), but HOLDTIME xx _ is displayed.

Range of entry:

Start frequency	0 Hz to 30.000 MHz
Stop frequency	0 Hz to 30.000 MHz
Step width	1 Hz to 30.000 MHz
Digital threshold ...	0 to 120 dBµV
Dwell time	50 to 65535 ms
Hold time	0 to 65534 ms

Resolution:

Frequency	1 Hz
Digital threshold ...	1 dBµV
Time	1 ms

3.1.17.6 Programming a Channel Scanning Process (Freely Programmable Channel List)

Upon actuation of softkeys SCN, PRO and CHP it appears the following display:

```
yy  CHAN xx  _      NEXTEND
```

(yy= channel list counter
xx = indication of the first channel in an already programmed channel list)

The channel list counter indicates the number of channels contained in the channel list (max. 20).

When a channel is indicated on the display, actuate softkey NEXT several times until only the flashing cursor appears.

Actuate softkey END, if no further channels are entered.

Actuate softkey NEXT or key ENT several times, as necessary, until the required display appears:

```
DWELLTIME xx  _   MS     NEXT
 HOLDTIME xx  _      F/T NEXT
```

or

```
 HOLDTIME FOREVER    F/T NEXT
```

(xx= last stored value for dwell time and hold time)

The flashing cursor (_) indicates that an entry is being expected. Enter new channel numbers, dwell and / or hold time via the numeric keypad.

Actuate softkey F / T (see 3.1.17.5)

Range of entry (see 3.1.17.5):

Channel list	≤ 20 channels

3.1.17.7 Programming a Channel Scanning Process (Ascending Channel Number Sequence)

Upon actuation of softkeys SCN, PRO and CHS the following display appears:

```
START CH xx  _            NEXT
```

Actuate softkey NEXT or key ENT several times until the desired display appears:

```
  STOP CH xx  _            NEXT
DWELLTIME xx  _    MS      NEXT
 HOLDTIME xx  _        F/T NEXT
```

or

```
 HOLDTIME FOREVER      F/T NEXT
```

(xx= last stored values for start and stop channel, dwell and hold time)

The flashing cursor (_) indicates that an entry is being expected. Enter new start channel, stop channel, dwell time and / or hold time via the numeric keypad.

Actuate softkey F / T (see 3.1.17.5)

Range of entry (see 3.1.17.5):

Start channel	0 to 999
Stop channel	0 to 999

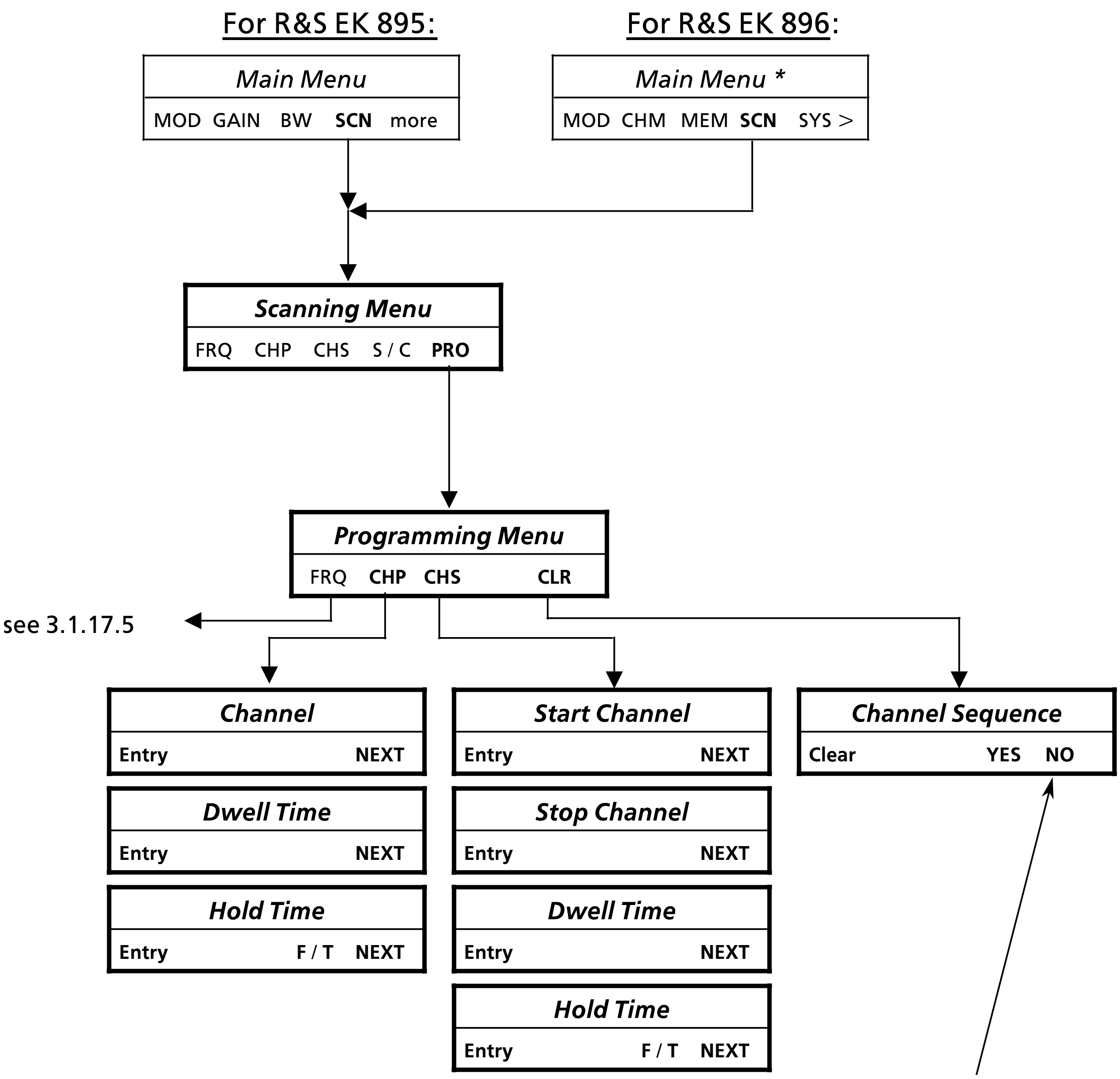
3.1.17.8 Clearing a Channel List

Upon actuation of softkeys SCN, PRO and CLR the following display appears:

```
CLEAR CHP                YES NO
```

Actuate softkey YES to confirm that the channel list is to be cleared.

Actuate softkey NO if the channel list is not to be cleared.



Note:

If softkey NO is actuated, the program automatically returns to the programming menu.

3.1.18 Special Functions

By actuation of softkeys more, more and SPEC (R&S EK 895) or of keys MORE and MORE (R&S EK 896) the special functions menu is called up. The menu offers the following functions:

- KNOB (tuning knob menu)
  - STEP (alter stepwidth)
  - ON (enable tuning knob)
  - OFF (disable tuning knob)
- PZG (PZG line menus)
  - ON (enable level control for PZG line and / or alter level squelch threshold)
  - OFF (disable level control for PZG line)
  - SPF (enable level control for PZG line, extended function)
  - more (R&S EK 895) or MORE (R&S EK 896)
    - ON (enable syllabic control for PZG line and / or alter syllabic squelch threshold)
    - OFF(disable syllabic control for PZG line)
- SER (indicate setting of serial interface)
- DEF (default value menu)
  - ON (activate default value setting)
  - OFF (inhibit default value setting)
- REM (LOC / REM menu)
  - LOC (switchover to local operation)
- SSBM (SSB Rx filter mode menu, only R&S EK 895)
  - VOICE
  - DATA
- BAR (bargraph mode menu, only R&S EK 895)
  - dBuV
  - dS
  - NORM

3.1.18.1 Altering the Stepwidth of the Tuning Knob

Upon actuation of softkeys more, more and SPEC (R&S EK 895) or of keys MORE and MORE (R&S EK 896) as well as of softkeys KNOB and STEP the following display appears:

```
VAR STEP xxxx  _ KHZ    ENT
```

(xxxx = last stored stepwidth)

The flashing cursor (_) indicates that an entry is being expected. Enter the new stepwidth via the numeric keypad.

Range of entry: .... 1 Hz to 1000 kHz
Resolution: .... 1 Hz

The programmed stepwidth for the tuning knob becomes effective, as soon as in the operating mode FREQUENCY the cursor is shifted to the right and out of the frequency field by means of the cursor control keys.

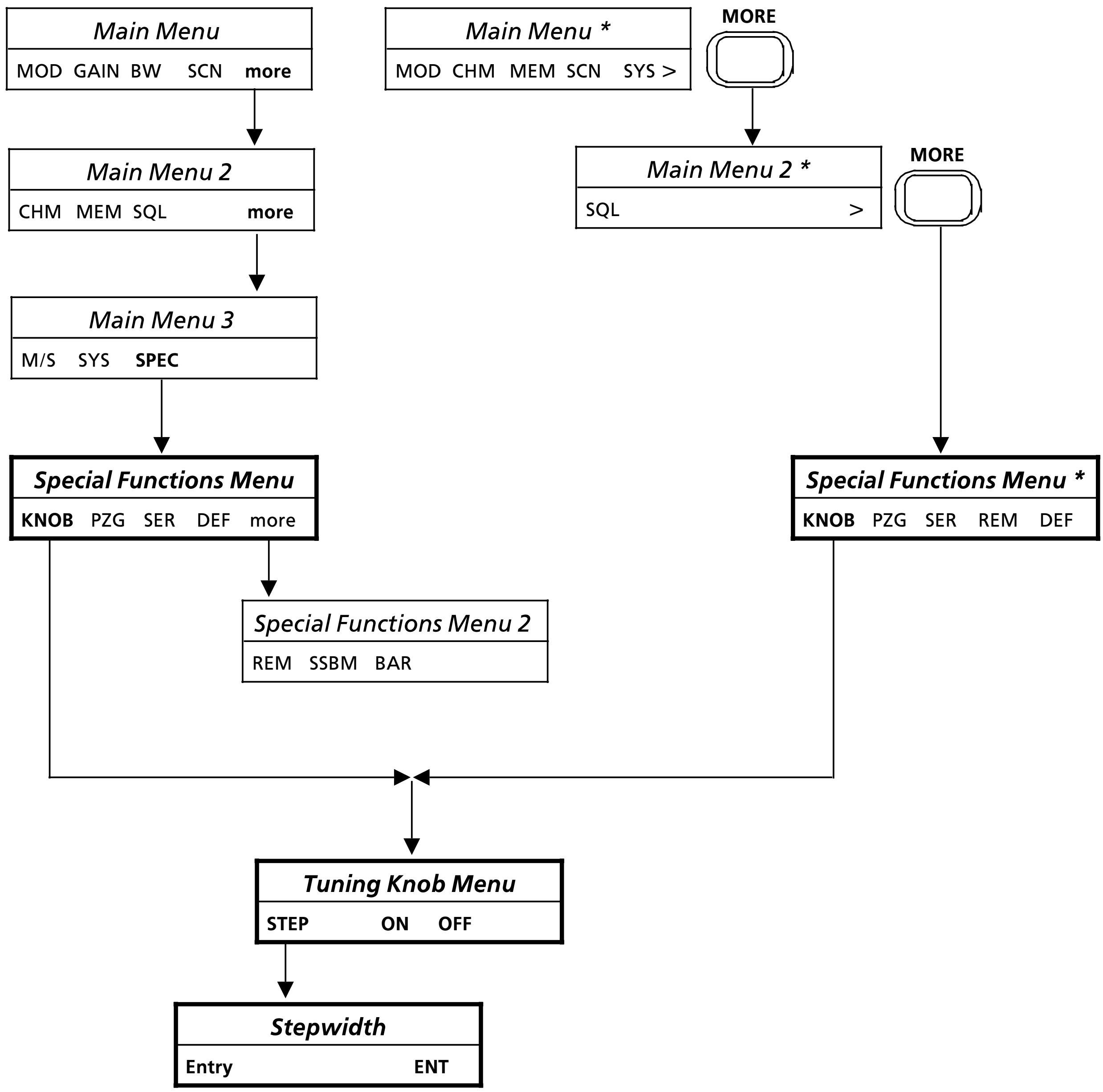
3.1.18.2 Enabling the Tuning Knob

Actuate softkeys more, more and SPEC (R&S EK 895) or keys MORE and MORE (R&S EK 896) as well as softkeys KNOB and ON. The display ON is now marked by an underline.

3.1.18.3 Disabling the Tuning Knob

Actuate softkeys more, more and SPEC (R&S EK 895) or keys MORE and MORE (R&S EK 896) as well as softkeys KNOB and OFF. The display OFF is now marked by an underline.

For R&S EK 895: For R&S EK 896:



3.1.18.4 Enabling the Level Control for PZG Line and / or Altering Level Threshold

Upon actuation of softkeys more, more and SPEC (R&S EK 895) or of keys MORE and MORE (R&S EK 896) as well as of softkeys PZG and ON the following display appears:

`LEV. THLD xxx _ dBµV ENT`

(xxx = last stored level threshold)

The flashing cursor (_) indicates that an entry is being expected. Enter new level squelch threshold via the numeric keypad.

Range of entry: .... 0 to 120 dBµV
Resolution: .... 1 dBµV

Via the ENT function the entry is stored.

The display ON is now underlined.

In order to increase the new level squelch threshold in steps of 1 dBµV turn tuning knob clockwise.

In order to decrease the new level squelch threshold in steps of 1 dBµV turn tuning knob counter-clockwise.

If the receive level exceeds the set level threshold, an open-collector transistor will become conductive. Thus output X66.9 (see A2.6) is connected to ground.

3.1.18.5 Disabling the Level Control for PZG Line

Actuate softkeys more, more and SPEC (R&S EK 895) or keys MORE and MORE (R&S EK 896) as well as softkeys PZG and OFF. The display OFF is now underlined.

3.1.18.6 Enabling Level Control for PZG Line, Extended Function

Actuate softkeys more, more and SPEC (R&S EK 895) or keys MORE and MORE (R&S EK 896) as well as softkeys PZG and SPF. The display SPF is now underlined. For the receive signal the information under 3.1.18.4 applies. In addition, after approx. 100 ms the string "U1" is emitted via the RS 232 / RS 485 interface.

3.1.18.7 Enabling the Syllabic Control for PZG Line and / or Altering Syllabic Threshold

Upon actuation of softkeys more, more and SPEC (R&S EK 895) or of keys MORE and MORE (R&S EK 896) as well as of softkeys PZG, MORE and ON the following display appears:

`SYL. THLD xxx _ % ENT`

(xxx = last stored syllabic threshold)

The flashing cursor (_) indicates that an entry is being expected. Enter new syllabic threshold via the numeric keypad.

Range of entry: .... 0 to 100 %
Resolution: 1

Via the ENT function the entry is stored.

The display ON is now underlined.

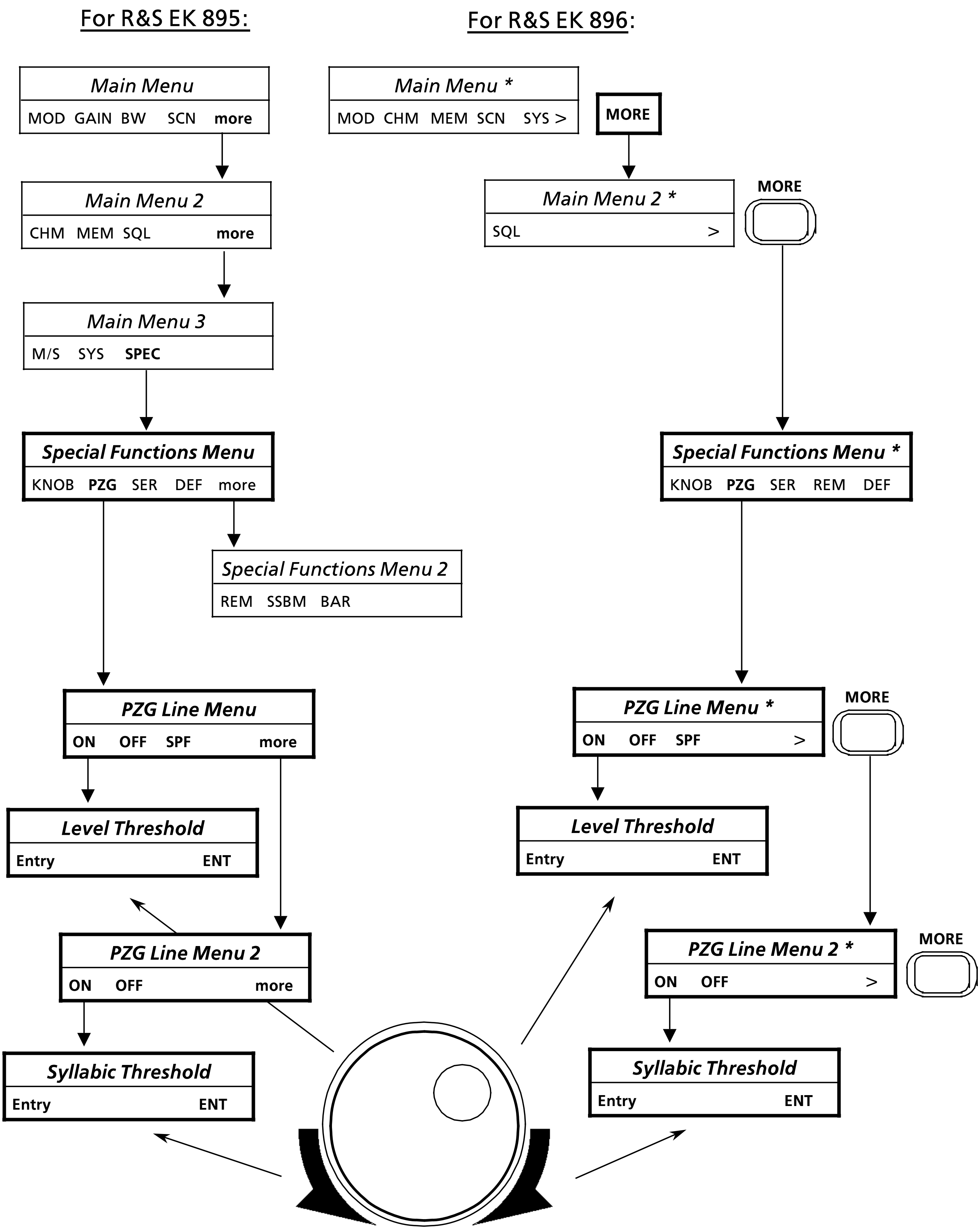
In order to increase the new syllabic threshold in steps of 1 % turn tuning knob clockwise.

In order to decrease the new syllabic threshold in steps of 1 % turn tuning knob counter-clockwise.

If the receive level exceeds the set syllabic threshold, an open-collector transistor will become conductive. Thus output X66.9 (see A2.6) is connected to ground.

3.1.18.8 Disabling the Syllabic Control for PZG Line

Actuate softkeys more, more and SPEC (R&S EK 895) or keys MORE and MORE (R&S EK 896) as well as softkeys PZG, MORE and OFF. The display OFF is now underlined.


For R&S EK 895:
For R&S EK 896:
Main Menu
MOD GAIN BW SCN more
Main Menu 2
CHM MEM SQL more
Main Menu 3
M/S SYS SPEC
Special Functions Menu
KNOB PZG SER DEF more
Special Functions Menu 2
REM SSBM BAR
PZG Line Menu
ON OFF SPF more
Level Threshold
Entry ENT
PZG Line Menu 2
ON OFF more
Syllabic Threshold
Entry ENT
Main Menu *
MOD CHM MEM SCN SYS >
MORE
Main Menu 2 *
SQL >
MORE
Special Functions Menu *
KNOB PZG SER REM DEF
PZG Line Menu *
ON OFF SPF >
MORE
Level Threshold
Entry ENT
PZG Line Menu 2 *
ON OFF >
MORE
Syllabic Threshold
Entry ENT

3.1.18.9 Calling Up the Serial-interface Setting

Note:

Via the function SER the setting cannot be altered, but only be displayed. Alter the interface parameters in compliance with A1.4.

Upon actuation of softkeys more, more and SPEC (R&S EK 895) or of keys MORE and MORE (R&S EK 896) as well as of softkey SER for example the following display appears:

```
ADR 00   9600  7 ODD 1   2-WIRE H
   ↓        ↓      ↓          ↓    |
(Address  Baud rate  Format   Mode  ↓
                             Handshake)
```

For the address displays between 0 and 99 are possible.

For the baud rate the following displays are possible:

- EXT (external clock)
- 50 Bd
- 100 Bd
- 110 Bd
- 300 Bd
- 600 Bd
- 1200 Bd
- 2400 Bd
- 4800 Bd
- 9600 Bd
- 19200 Bd
- 38400 Bd

For the format the following displays are possible:

- Data bits = 7
- Parity = EVEN or ODD
- Stop bit = 1 or 2

For the mode the following displays are possible:

- RS232
- RS485
- 2-WIRE
- 4-WIRE

For handshake the following displays are possible:

- H = CTS / RTS
- X = XON / XOFF

3.1.18.10 Activating the Default Value Setting

Actuate softkeys more, more and SPEC (R&S EK 895) or keys MORE and MORE (R&S EK 896) as well as softkeys DEF and ON.

The display ON is now underlined.

If the default value setting is activated (→ ON), for selection of a new modulation mode the respective default values for bandwidth, type and time of control, BFO frequency, frequency deviation and offset, Notch filter A/B frequency, baud rate, signal polarity as well as for the demodulation parameters (see 3.1.8) are set automatically.

A frequency offset which may be set is reset to 0.

3.1.18.11 Inhibiting the Default Value Setting

Actuate softkeys more, more and SPEC (R&S EK 895) or keys MORE and MORE (R&S EK 896) as well as softkeys DEF and OFF.

The display OFF is now underlined.

If the default value setting is inhibited (→ OFF), for selection of a new modulation mode the last set values for bandwidth, type and time of control, BFO frequency, frequency deviation and offset, Notch filter A/B frequency, baud rate, signal polarity as well as for the demodulation parameters are set automatically.

A frequency offset which may be present remains set.

3.1.18.12 Inhibiting Local Control

Upon actuation of softkeys more, more, SPEC and more (R&S EK 895) or keys MORE and MORE (R&S EK 896) as well as softkey REM the following display appears:

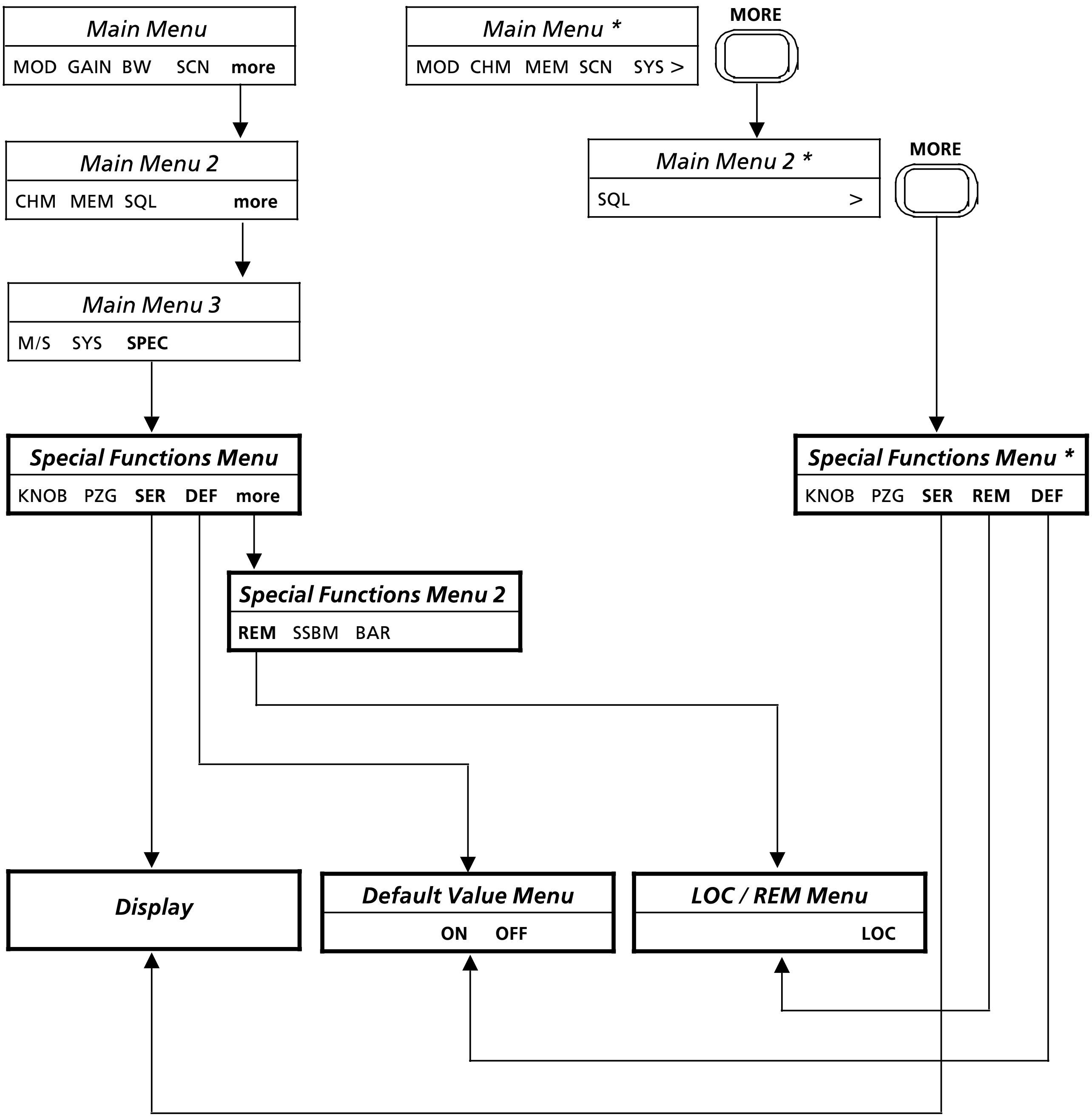
```
---- REMOTE ----    LOC
```

Once local control has been inhibited, only softkey LOC and key POWER will be operable.

3.1.18.13 Enabling Local Control

Actuate softkey LOC

For R&S EK 895: For R&S EK 896:



3.1.18.14 Selecting the SSB Rx Filter Mode (R&S EK 895)

Upon actuation of softkeys more, more, SPEC , more and softkey SSBM calls up the following SSB Rx filter mode menu:

- VOICE
- DATA

The currently effective SSB Rx filter mode is indicated on the display by an asterix of the relevant value, e.g. VOICE*.

The setting of the own local-controlled receiver is displayed by an underline, e.g. DATA.

Note:

When changing the modulation mode via the remote interface the SSB Rx filter mode is reset to DATA. The change of the modulation mode via the MMI has no effect on the SSB Rx filter mode.

3.1.18.15 Selecting the Bargraph Mode (R&S EK 895)

Upon actuation of softkeys more, more, SPEC , more and softkey BAR calls up the following bargraph mode menu:

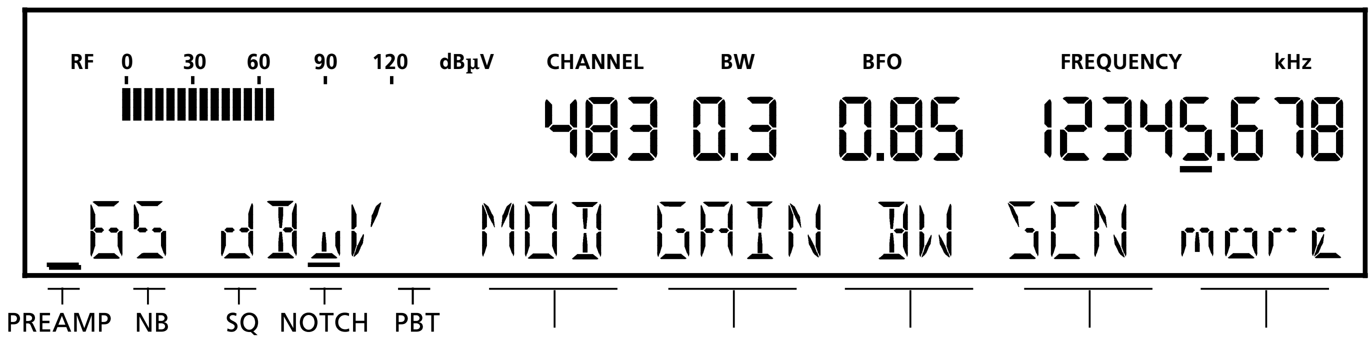
- dBµV (resolution of 1 dBµV)
- dS (resolution of 0.5 S)
- NORM (resolution of 5 dBµV)

The currently effective bargraph mode is idicated on the display by an underline of the relevant value, e.g. dS.

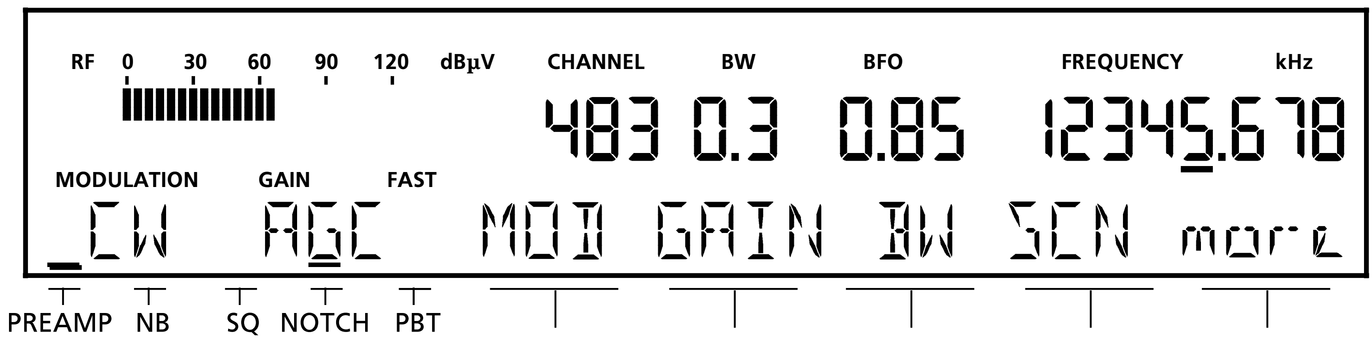
If setting dBµV or dS is selected, the receiver level will be displayed instead of modulation mode and control type and time.

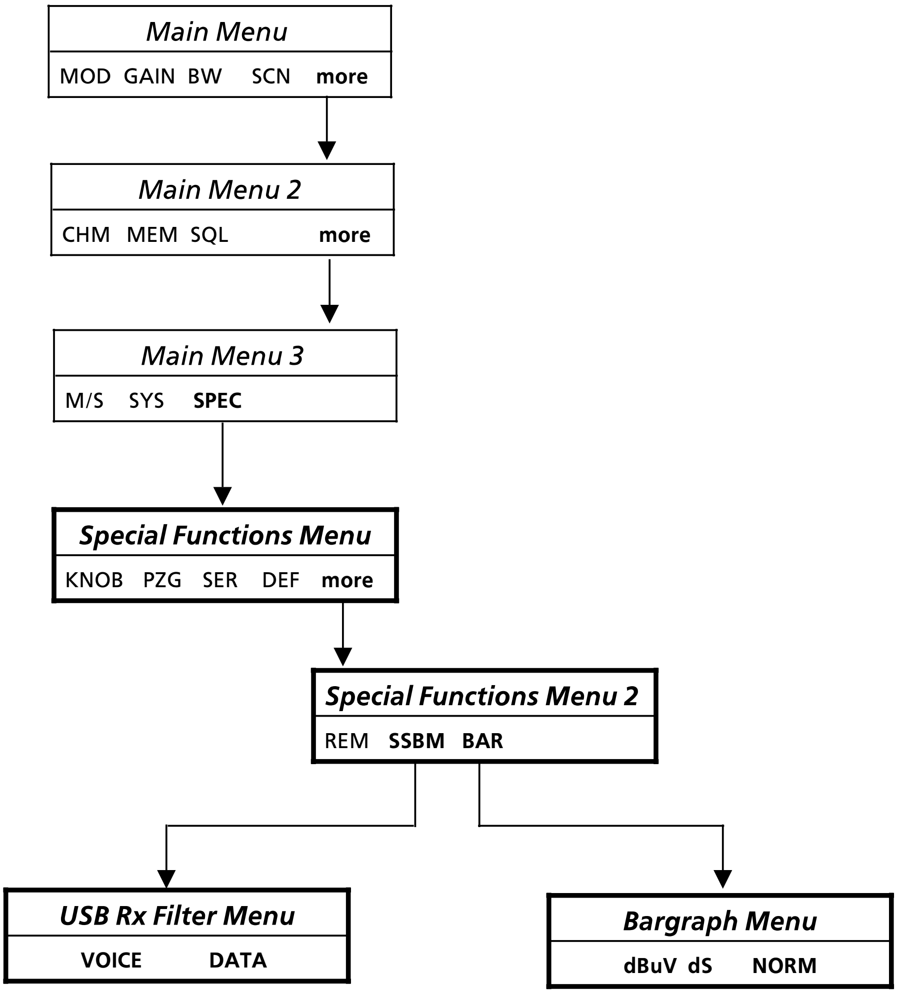
After pressing softkey more and after making an entry, the modulation mode and control type will be displayed for 3 s.

Bargraph mode: dBµV



Bargraph mode: NORM




Main Menu
MOD GAIN BW SCN more
Main Menu 2
CHM MEM SQL more
Main Menu 3
M/S SYS SPEC
Special Functions Menu
KNOB PZG SER DEF more
Special Functions Menu 2
REM SSBM BAR
USB Rx Filter Menu
VOICE DATA
Bargraph Menu
dBuV dS NORM

3.1.19 System Functions

Upon actuation of softkeys more, more and SYS (R&S EK 895) or of softkey SYS (R&S EK 896) the system functions menu is called up. The menu offers the following functions:

- VERS (indicate software version)
- OPT (indicate installed options)
- CM (indicate CM status)
- BIT (initiate BIT and indicate BIT status)

If softkey more (R&S EK 895) or key MORE (R&S EK 896) is actuated, the system functions menu 2 is called up. The menu offers the following functions:

- RAM (initiate system reset)
- LOCK (LOC / fixed-channel menu)
  - EXIT (switchover to local operation)
- SIG (signal BYPASS menu)
  - OFF (set signal to high level)
  - ON (set signal to low level)
  - ACT (signal level depends on scanning status)
- IF (IF menu)
  - FRQ (altering the IF frequency)
  - CTRL (control type menu)
  - SET (frequency type menu)

<u>*Note:*</u>

The signal BYPASS menu is required, if the Motor Selection R&S FK 2850 is connected via the option 'BCD Interface R&S GC 890' to the VLF-HF receiver. However, this calls for modifications on the carrier board, the processor and the interface!

3.1.19.1 Indicating the Software Version

Upon actuation of softkeys more, more and SYS (R&S EK 895) or of softkey SYS (R&S EK 896) as well as of softkey VERS it will appear the following display:

`VERSION xx.xx    DSPyy.yy`

(xx.xx = current software version
yy.yy = IF/AF processor software version)

3.1.19.2 Indicating Installed Options

Upon actuation of softkeys more, more and SYS (R&S EK 895) or of softkey SYS (R&S EK 896) as well as of softkey OPT the following displays will appear:

- `NO OPTION`
  no option installed
- `PRESELECTOR`
  Preselection R&S FK 890H1 is installed
- `BCD INTERF`
  BCD Interface R&S GC 890 is installed
- `IF CONV 100KHZ`
  IF converter (100 kHz) is installed
- `IF CONV 455KHZ`
  IF Converter R&S UX 895 (455 kHz) is installed
- `QUASI CONT BW`
  Option R&S EK 895S7 (quasi-continuous bandwidth) is installed
- `DIG SELECTION` (EK 896 only)
  Digitally Tuned RF Selector R&S FK 896D is installed
- `WIDEBAND`
  IF Processor R&S GM 893, mod. 03 is installed

As soon as more than one option is installed, in addition to the displays mentioned above the display MORE (R&S EK 895) or the character > (R&S EK 896) will appear. By actuating softkey more or key MORE further options installed can be indicated.

3.1.19.3 Indicating the CM Status

If upon actuation of softkeys more, more and SYS (R&S EK 895) or of softkey SYS (R&S EK 896) as well as of softkey CM the display

`CM GO`

fails to appear, carry out troubleshooting acc. to 4.2.

3.1.19.4 Initiating the BIT and Indicating the BIT Status

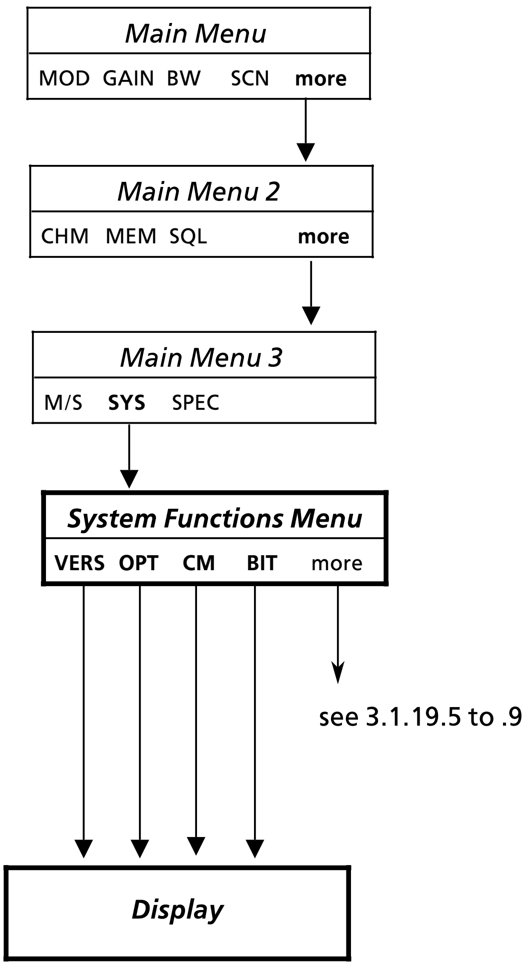
Upon actuation of softkeys more, more and SYS (R&S EK 895) or of softkey SYS (R&S EK 896) as well as of softkey BIT all LEDs and display elements of the LCD are activated (see 3.1.5) and the BIT is initiated.

If after termination of the BIT the display

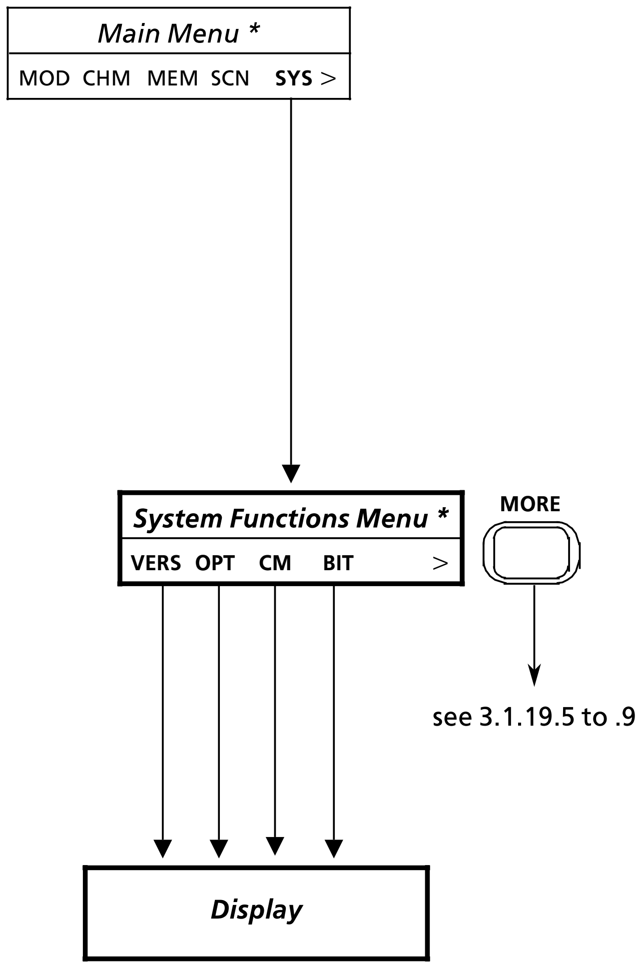
`BIT GO`

fails to appear, carry out troubleshooting acc. to 4.2.

For R&S EK 895:



For R&S EK 896:



3.1.19.5 Initiating a System Reset

Upon actuation of softkeys more, more, SYS and more (R&S EK 895) or of softkey SYS and key MORE (R&S EK 896) as well as of softkey RAM the operator is invited via the display

```
RAM CLEAR            YES      NO
```

to confirm the command (→ YES) or to cancel it (→ NO).

In the case that the command has been confirmed, all memory locations in the RAM are overwritten with a logic naught while

--------------- SYSTEM RESET -------------

is indicated.

After the SYSTEM RESET the receiver is initialized, that is, all unpermitted data stored in the RAM are substituted by a default value. Channels with unpermitted stored data additionally receive an error flag (e for empty). When such a channel is called up in the channel editing menu (see 3.1.16), this error flag leads to the message UNUSED.

Initialization is followed by LED and LCD tests as well as the BIT (see 3.1.5). When the BIT is terminated successfully, the main menu and, provided that the default setting has been activated, the default values for the receiver setting are displayed.

3.1.19.6 Switchover to Fixed-channel Operation

Upon actuation of softkeys more, more, SYS and more (R&S EK 895) or of softkey SYS and of key MORE (R&S EK 896) as well as of softkey LOCK the following display appears:

```
PASSWORD  _
```

The flashing cursor (_) indicates that an entry is being expected. Enter the password (four digits) via the numeric keypad. If following the correct entry key ENT is actuated, the following displays appears:

```
CHANNEL MODE       EXIT
```

From now on only stored channels can be called up. For this purpose actuate key CH and enter the desired channel number via the numeric keypad (see 3.1.14).

3.1.19.7 Inhibiting Fixed-channel Operation

Upon actuation of softkey EXIT the following display appears:

```
PASSWORD  _
```

The flashing cursor (_) indicates that an entry is being expected. Enter password (four digits) via the numeric keypad. If following the correct entry key ENT is actuated, the main menu appears. Now receiver control is possible again without any restrictions.

3.1.19.8 Setting Signal BYPASS to High Level

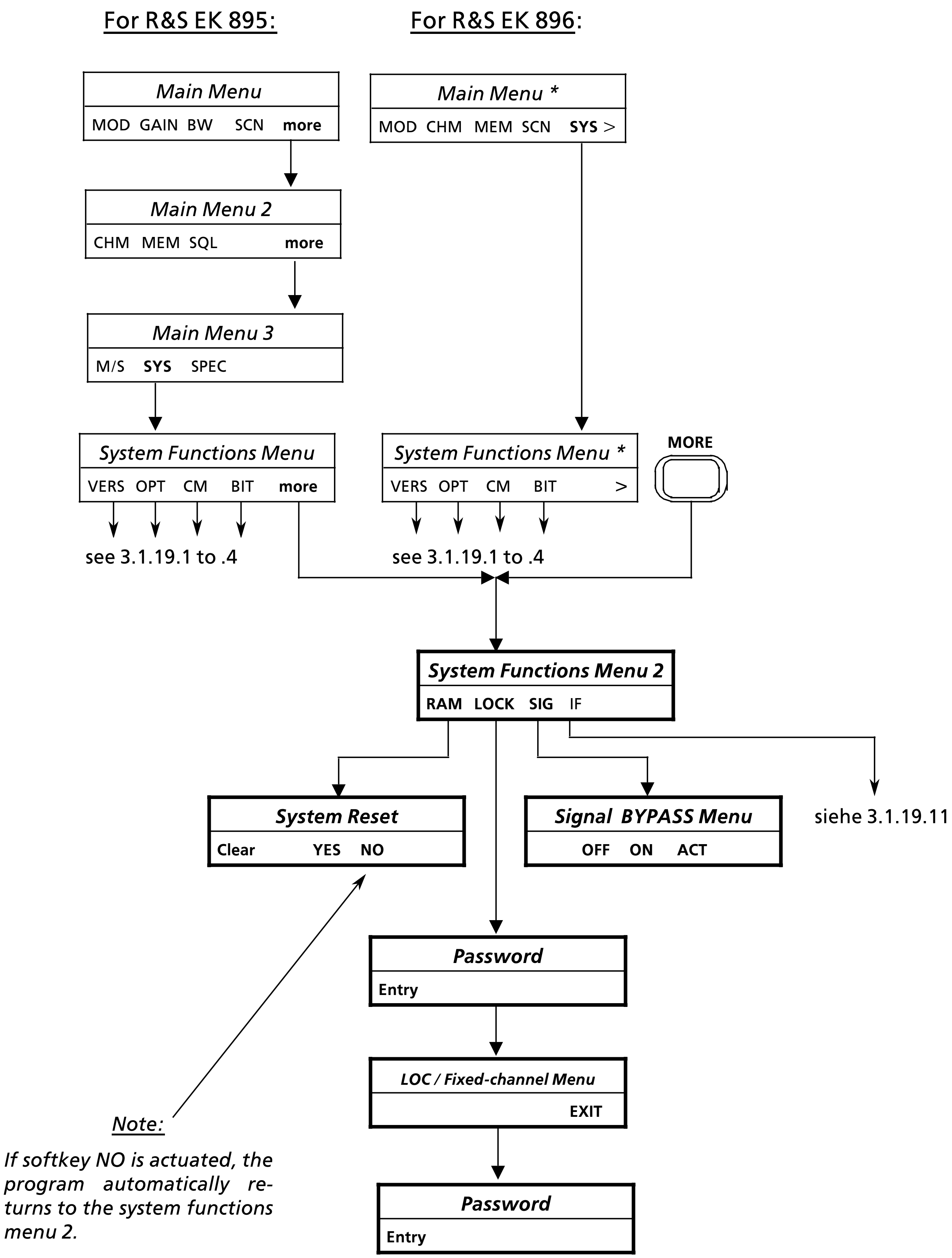
Actuate softkeys more, more, SYS and MORE (R&S EK 895) or softkey SYS and key MORE (R&S EK 896) as well as softkey OFF. On the display now OFF is underlined and the level at interface X89.12 is high, i.e., the Preselector FK 101Motor Selection R&S FK 2850 to be connected externally is always bypassed.

3.1.19.9 Setting Signal BYPASS to Low Level

Actuate softkeys more, more, SYS and more (R&S EK 895) or softkey SYS and key MORE (R&S EK 896) as well as softkey ON. On the display now ON is underlined and the level at interface X89.12 is low, i.e., the Motor Selection R&S Fk 2850 to be connected externally is always active.

3.1.19.10 Linking Signal BYPASS to the Scanning Status

Actuate softkeys more, more, SYS and more (R&S EK 895) or softkey SYS and key MORE (R&S EK 896) as well as softkey ACT. On the display now ACT is underlined. Depending on the scanning status the Motor Selection R&S FK 2850 to be connected externally is active (scanning active) or bypassed (no scanning).


For R&S EK 895:
For R&S EK 896:
Main Menu
MOD GAIN BW SCN more
Main Menu 2
CHM MEM SQL more
Main Menu 3
M/S SYS SPEC
System Functions Menu
VERS OPT CM BIT more
see 3.1.19.1 to .4
Main Menu *
MOD CHM MEM SCN SYS >
System Functions Menu *
VERS OPT CM BIT >
see 3.1.19.1 to .4
MORE
System Functions Menu 2
RAM LOCK SIG IF
System Reset
Clear YES NO
Signal BYPASS Menu
OFF ON ACT
siehe 3.1.19.11
Password
Entry
LOC / Fixed-channel Menu
EXIT
Password
Entry
Note:
If softkey NO is actuated, the program automatically returns to the system functions menu 2.

3.1.19.11 IF Menu

Upon actuation of softkeys more, more, SYS and more (R&S EK 895) or of softkey SYS and key MORE (R&S EK 896) as well as of softkey IF the IF menu is called up. The menu offers the following functions:

- FRQ (altering the IF frequency)
- CTRL (control type menu)
  - OFF (deactivate AGC)
  - ON (activate AGC)
- SET (frequency type menu)
  - OFF (switching off IF signal)
  - VAR (switching on IF signal with variable frequency)
  - OPT (switching on IF signal with fixed frequency)

Note:

The function OPT will only be displayed when the optional IF converter is installed.

3.1.19.11.1 Altering the IF Frequency

Note:

The frequency change will only take effect if in the frequency type menu the display VAR (see 3.1.19.11.5) is underlined.

Upon actuation of softkey FRQ it will appear the following display:

```
IF FREQ x.xx_   KHZ    ENT
```

(xxx= IF frequency last stored)

The flashing cursor (_) indicates that an entry is being expected. Enter new IF frequency by means of the numeric keypad.

Range or entry: .... 0 to 40 kHz
Resolution: .... 1 Hz
Entry: .... in kHz

By pressing the ENT key the entry is stored.

In order to increase the new IF frequency in steps of 1 Hz turn tuning knob clockwise.

In order to decrease the new IF frequency in steps of 1 Hz turn tuning knob counter-clockwise.

3.1.19.11.2 Deactivating AGC

Actuate softkeys CTRL and OFF. On the display now OFF is underlined. The IF signal at the output IF 0...40 kHz is not controlled.

3.1.19.11.3 Activating AGC

Actuate softkeys CTRL and ON. On the display now ON is underlined. The IF signal at the output IF 0 to 40 kHz is controlled.

3.1.19.11.4 Switching the IF Signal Off

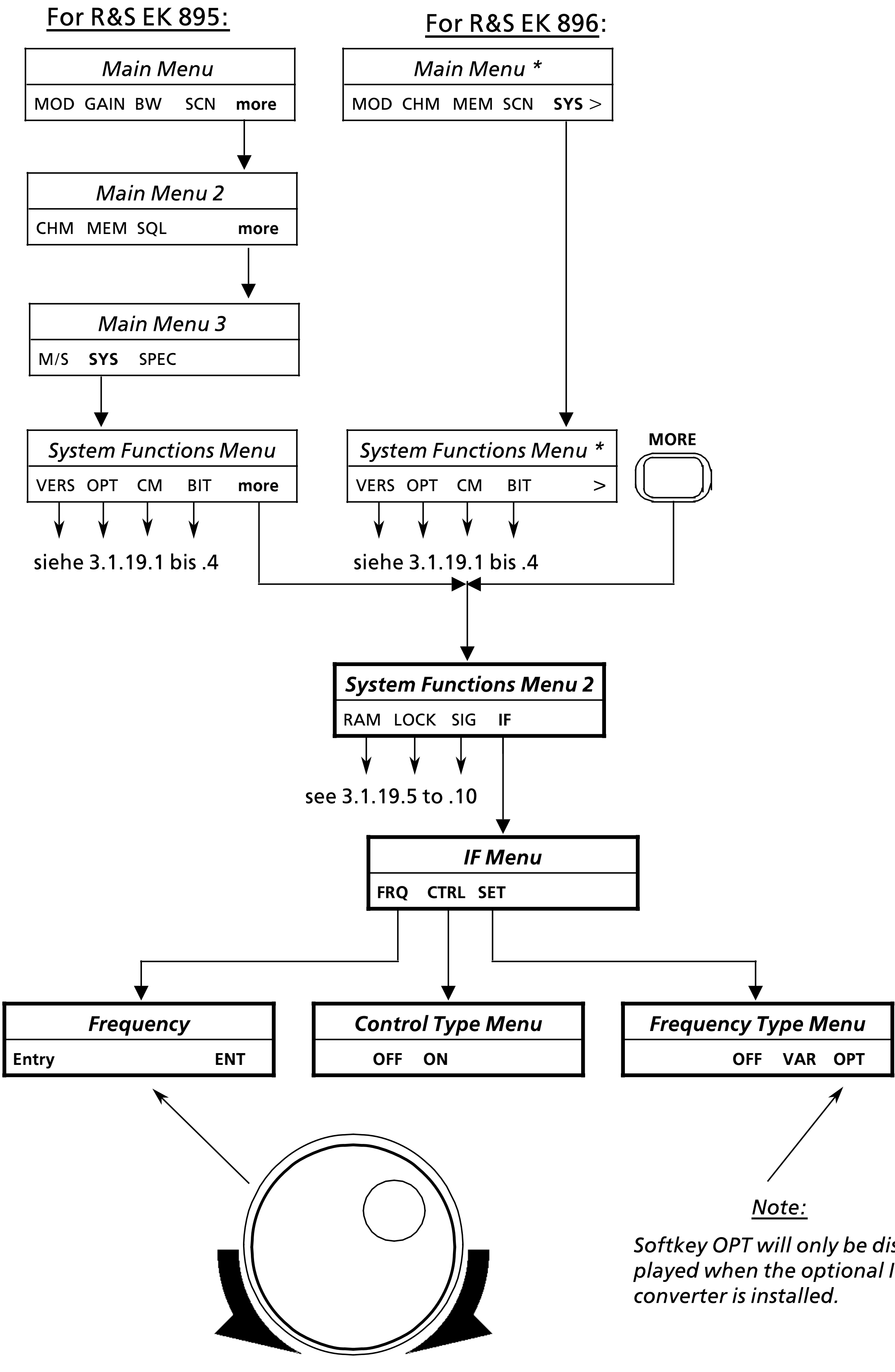
Actuate softkeys SET and OFF. On the display now OFF is underlined. The IF signal at the output IF 0...40 kHz is disconnected.

3.1.19.11.5 Switching the IF Signal with Variable Frequency On

Actuate softkeys SET and VAR. On the display now VAR is underlined. The IF signal with the frequency set acc. to 3.1.19.11.1 is fed to output IF 0...40 kHz.

3.1.19.11.6 Switching the IF Signal with Fixed Frequency On (Option)

Actuate softkeys SET and OPT. On the display now OPT is underlined. The IF signal with a fixed frequency (100 kHz or 455 kHz) is fed to output IF 0...40 kHz.



Note:

Softkey OPT will only be displayed when the optional IF converter is installed.

3.1.20 Separate Functions 1

By actuating the key ENT the separate functions menu 1 is called up. The menu offers the following functions:

- IND (fast switchover of bargraph function (level / tuning indication))
- NTCH (switch notch filter on or off)
- NB (switch noise blanker on or off)
- SQ (switch squelch function on or off)
- PAMP (switch preamplifier on or off)

The currently effective status for the functions NTCH, NB, SQ and PAMP is displayed in the status line. Activation of a function is indicated by a black bar.

In the function level indication the bargraph indicates the following, depending on the set type of control (see control type field):

- In the type of control AGC and A+D, the bargraph indicates the current receive level.
- In the type of control MGC, the bargraph indicates the control voltage set via the HF control.
- In the type of control A+M, the bargraph indicates either the control voltage set via the HF control (receive level < set control voltage) or the current receive level (receive level > set control voltage).
- In the function CHM (see 3.1.16) the bargraph indicates the digital threshold stored in the channel.

Display range: .... 0 to 120 dBµV
Resolution: .... 5 dB

In the function tuning indication the bargraph indicates the following, depending on the set modulation mode (see modulation mode field):

- For the modulation modes FSK, AFSK and F7B the bargraph indicates the actual frequency deviation as well as a frequency offset, if set.

For a frequency deviation of 42 Hz or 85 Hz holds the following:

Display range: .... -120 to +120 Hz
Resolution: .... 10 Hz

For a frequency deviation of 225 Hz or 425 Hz holds the following:

Display range: .... -1200 to +1200 Hz
Resolution: .... 100 Hz

The set frequency deviation is indicated in the frequency deviation menu (see 3.1.8.4.1).

- For the modulation modes AM, CW, FAX1, FAX2 and FM the bargraph indicates a frequency offset, if set.

For a bandwidth of 200 Hz holds the following:

Display range: .... -120 to +120 Hz
Resolution: .... 10 Hz

For bandwidths larger than 200 Hz holds the following:

Display range: .... -1200 to +1200 Hz
Resolution: .... 100 Hz

The set bandwidth is indicated in the bandwidth field.

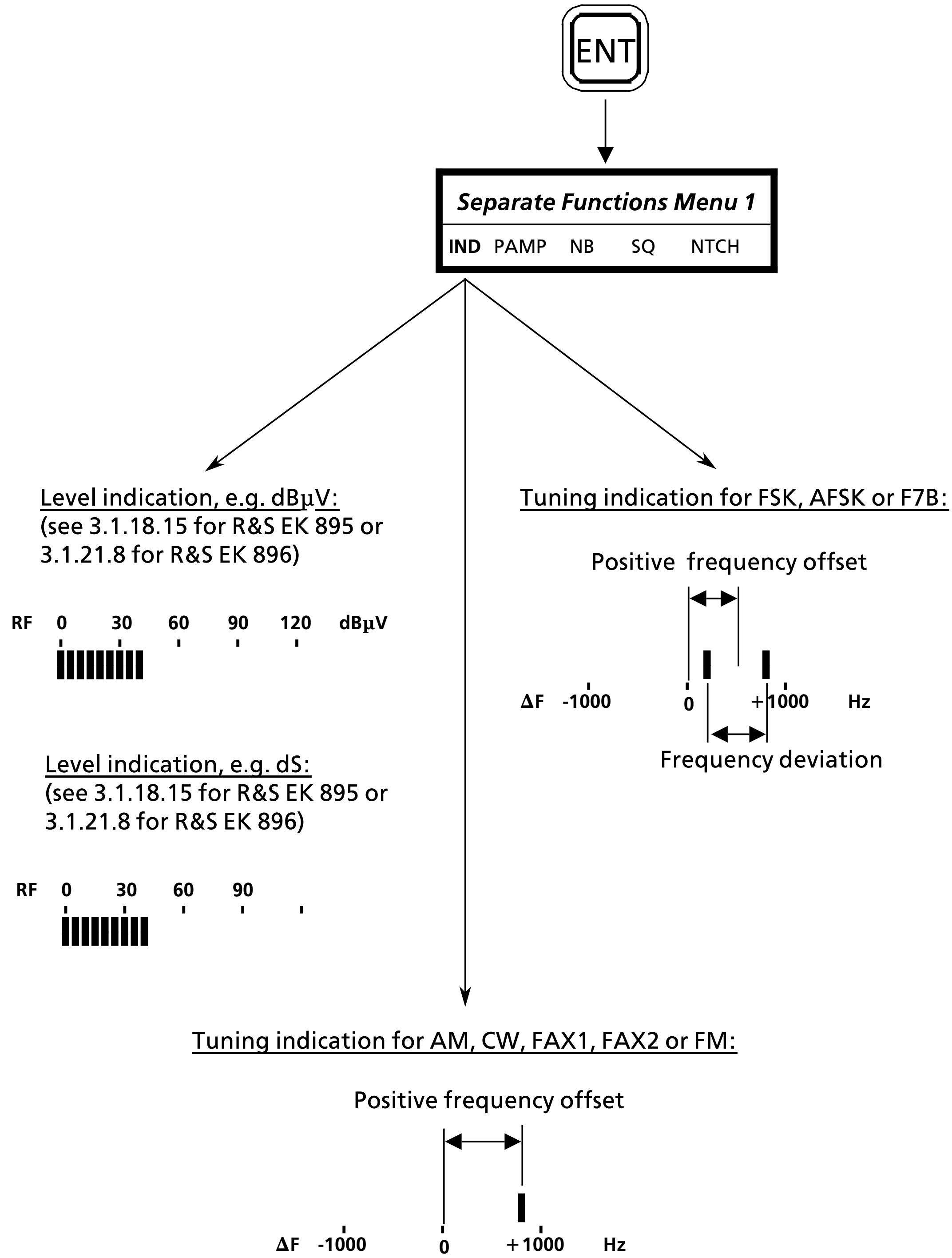
3.1.20.1 Fast Switchover of Bargraph Function (Level / Tuning Indication)

<u>Note:</u>

In the modulation modes ISB, USB and LSB the function tuning indication is not effective.

Except for entries, e.g. of a frequency , the bargraph function is switched over from level indication to tuning indication and vice versa by actuating key ENT and softkey IND.

The switchover of the bargraph function has no effect on the bargraph mode (see 3.1.18.15).


ENT
Separate Functions Menu 1
IND PAMP NB SQ NTCH
Level indication, e.g. dBµV:
(see 3.1.18.15 for R&S EK 895 or
3.1.21.8 for R&S EK 896)
RF 0 30 60 90 120 dBµV
Level indication, e.g. dS:
(see 3.1.18.15 for R&S EK 895 or
3.1.21.8 for R&S EK 896)
RF 0 30 60 90
Tuning indication for FSK, AFSK or F7B:
Positive frequency offset
ΔF -1000 0 +1000 Hz
Frequency deviation
Tuning indication for AM, CW, FAX1, FAX2 or FM:
Positive frequency offset
ΔF -1000 0 +1000 Hz

3.1.20.2 Switching the Notch Filters On or Off

Note:

In modulation mode ISB the notch filter acts upon the monitoring sideband only.

By actuating key ENT and softkey NOTC the two notch filters are switched on or off.

Once the notch filters are activated, a black bar will appear above NOTCH in the status line.

The notch filters can be tuned in accordance with 3.1.10.

3.1.20.3 Switching the Noise Blanker On or Off

By actuating key ENT and softkey NB the noise blanker is switched on or off.

Once the noise blanker is activated, a black bar will appear above NB in the status line.

3.1.20.4 Switching the Squelch Function On or Off

Note:

The squelch function is only effective in the SSB mode.

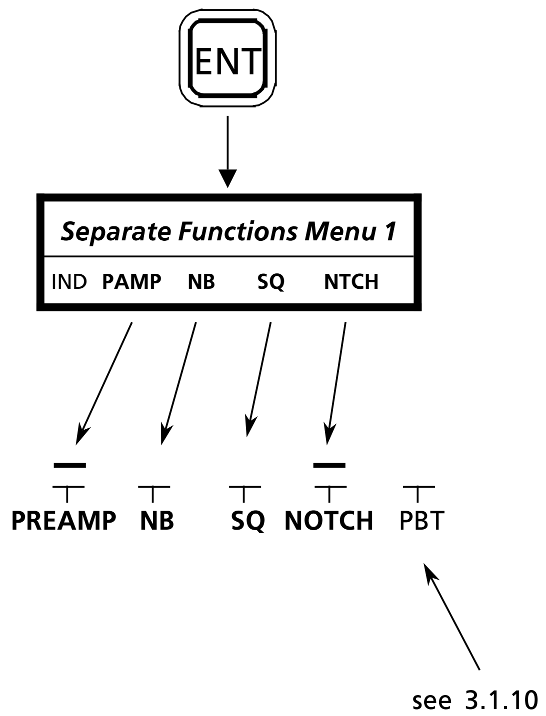
By actuating key ENT and softkey SQ the squelch function is switched on or off.

Once the squelch function is activated, a black bar will appear above SQ in the status line and the squelch type setting is activated (see 3.1.24).

3.1.20.5 Switching the Preamplifier On or Off

By actuating key ENT and softkey PAMP the preamplifier is switched on or off.

Once the preamplifier is activated, a black bar will appear above PAMP in the status line.



3.1.21 Separate Functions 2 (R&S EK 896)

By actuating key MENU1 the separate functions menu 2 is called up. The menu offers the following functions:

- LOC (switch remote control off)
- ME+ (storage into the buffer)
- ME- (activation of buffer contents)
- S / C (stopping a running scan process or resuming a stopped scan process)
- BYP (activating or deactivating Digitally Tuned RF Selector R&S FK 896D)

<u>*Note:*</u>

The function BYP is only displayed if the optional Digitally Tuned RF Selector R&S FK 896D is installed.

If key MORE is actuated, the separate functions 3 is call up. The menu offers the following functions:

- SSBM (selecting the SSB Rx filter mode)
- BAR (selecting the bargraph mode)

3.1.21.1 Switching Remote Control Off

After switch-on the receiver status is Remote / Local. That means the receiver can be controlled both via the front panel and the remote control interface.

Actuate key MENU1 and softkey LOC.

Now the receiver status is Local. That means control via the remote control interface is now impossible except for command REM (see A4.9.11)

3.1.21.2 Storage into the Buffer

Actuate key MENU1 and softkey ME+.

Now the entire receiver setting is stored in the buffer.

3.1.21.3 Calling up the Buffer Contents

Actuate key MENU1 and softkey ME-.

The receiver settings stored in the buffer are now activated.

3.1.21.4 Starting or Stopping Scanning

By actuation of key MENU 1 and softkey S / C an activated scan process is stopped or a stopped scan process is resumed.

If after actuation of softkey S / C the display FREQUENCY in the frequency field is flashing, frequency scanning was reactivated.

If after actuation of softkey S / C the display CHANNEL in the channel field is flashing, channel scanning was reactivated.

3.1.21.5 Activating the Digitally Tuned RF Selector R&S FK 896D (Option)

By actuation of key MENU 1 and softkey <u>BYP</u> the Digitally Tuned RF Selector R&S FK 896D is activated. The HF signal is routed via the R&S FK 896D to the HF unit.

3.1.21.6 Deactivating the Digitally Tuned RF Selector R&S FK 896D (Option)

By actuation of key MENU 1 and softkey BYP the R&S FK 896D is deactivated. The HF signal is routed directly to the HF unit. In the display now BYP is underlined.

3.1.21.7 Selecting the USB Rx Filter Mode (R&S EK 896)

Upon actuation of key MENU 1 and softkey SSBM calls up the following USB Rx filter mode menu:

- VOICE
- DATA

The currently effective SSB Rx filter mode is indicated on the display by an asterix of the relevant value, e.g. VOICE*.

The setting of the own local-controlled receiver is displayed by an underline, e.g. <u>DATA</u>.

<u>Note:</u>

When changing the modulation mode via the remote interface the SSB Rx filter mode is reset to DATA. The change of the modulation mode via the MMI has no effect on the SSB Rx filter mode.

3.1.21.8 Selecting the Bargraph Mode (R&S EK 896)

Upon actuation of key MENU 1 and softkey BAR calls up the following bargraph mode menu:

- dBuV (level, resolution of 1 dBuV)
- dS (levelS value, resolution of 0.5 S)
- NORM (level, resolution of 5 dBuV)

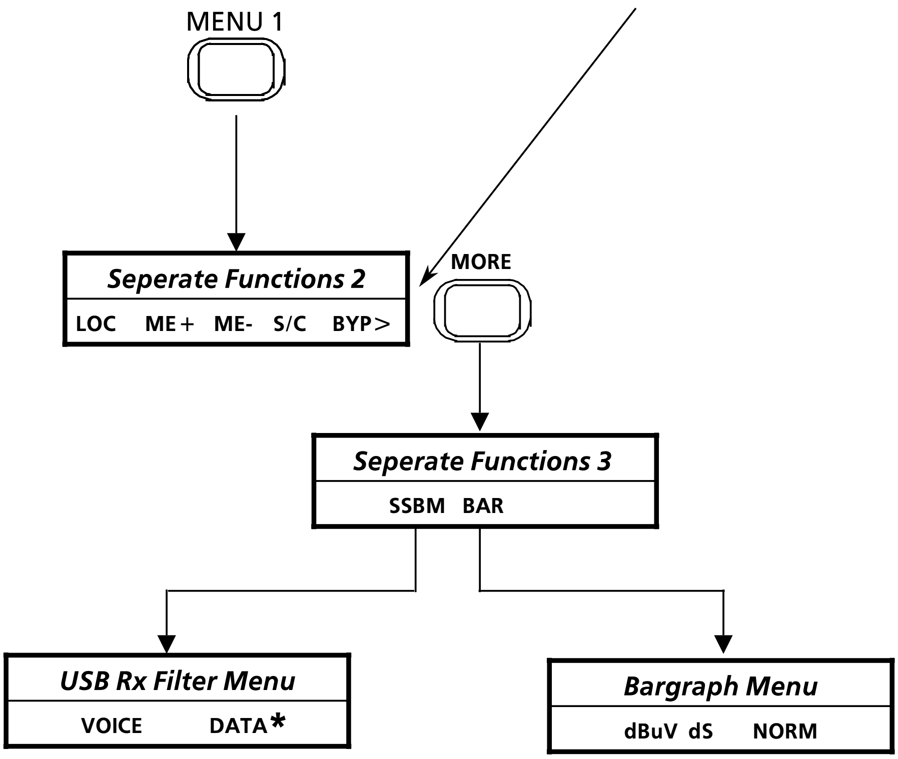
The currently effective bargraph mode is idicated on the display by an underline of the relevant value, e.g. <u>dS</u>.

If setting dBμV or dS is selected, the receiver level will be displayed instead of modulation mode and control type and time.

After pressing softkey more and after making an entry, the modulation mode and control type will be displayed for 3 s.

Note:

Softkey BYP will only be displayed when the optional Digitally Tuned RF Selector R&S FK 896D is installed.



3.1.22 Master / Slave Operation (R&S EK 895)

By actuation of softkeys more, more and M / S the master / slave menu is called up. The menu offers the following functions:

- ADR (altering the slave address)
- GET (transferring the master receiver setting)
- PUT (calling up the slave receiver setting)

In the master / slave menu the last entered slave address is also displayed, e.g. 28.

In master / slave operation the operator can make an addressed receiver (e.g. EK 895), which is also connected to the RS485 bus, his slave receiver.

In order to do so only softkey PUT has to be actuated. If necessary, the slave address must be altered beforehand.

Via the command PUT the receiver (→ slave) with the entered address takes over the current master receiver setting.

<u>Note:</u>

Via the command PUT only the basic receiver settings, consisting of frequency, BFO frequency, passband tuning, bandwidth, modulation mode as well as control type and time are transferred to the slave receiver.

In contrast, scanning commands and parameters as well as system and special functions are not transmitted from the master to the slave receiver. Therefore it is, for example, neither possible to program a scanning process nor to start a scan run which has been programmed.

Via the command GET one's own receiver (→ master) takes over the setting of the slave receiver with the entered address.

3.1.22.1 Altering the Slave Address

Upon actuation of softkeys more, more, M / S and ADR it appears the following display:

```
SLAVE ADR _
```

The flashing cursor (_) indicates that an entry is being expected. Enter the new slave address via the numeric keypad.

Range of entry: .... 1 to 99

3.1.22.2 Transferring the Master Receiver Setting

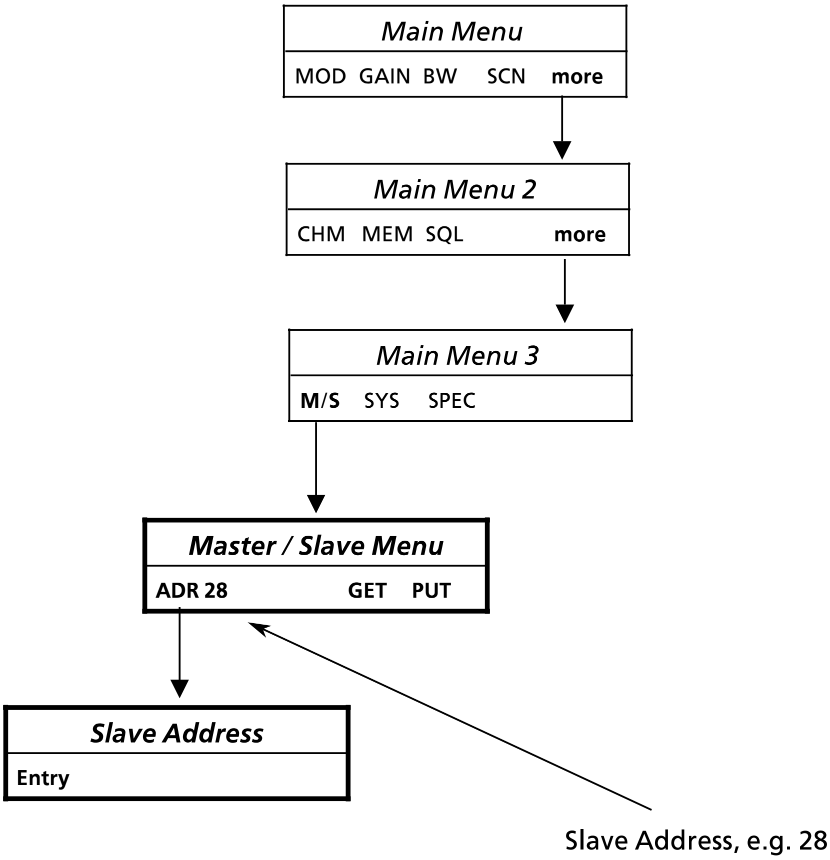
Actuate softkeys more, more, M / S and PUT.

Alter the slave address acc. to 3.1.22.1, if necessary.

3.1.22.3 Calling Up the Slave Receiver Setting

Actuate softkeys more, more, M / S and GET.

Alter the slave address acc. to 3.1.22.1, if necessary.


Main Menu
MOD GAIN BW SCN more
Main Menu 2
CHM MEM SQL more
Main Menu 3
M/S SYS SPEC
Master / Slave Menu
ADR 28 GET PUT
Slave Address
Entry
Slave Address, e.g. 28

3.1.23 Master / Slave Operation (R&S EK 896)

Via the master / slave menu the operator can make up to 14 receivers (e.g. R&S EK 895), which are interconnected via an RS485 bus, his slave receivers.

For this it is only necessary to actuate key PUT and enter the slave address.

Five freely programmable addresses can be selected via the softkeys. Entry of addresses 1 to 9 is possible directly via the numeric keypad.

Via the command PUT the receiver (→ slave) with the entered address takes over the current master receiver setting.

<u>*Note:*</u>

Via the command PUT only the basic receiver settings, consisting of frequency, BFO frequency, passband tuning, bandwidth, modulation mode as well as control type and time are transferred to the slave receiver.

In contrast, scanning commands and parameters as well as system and special functions are not transmitted from the master to the slave receiver. Therefore it is, for example, neither possible to program a scanning process nor to start a scan run which has been programmed.

It is also possible that one's own receiver (→ master) takes over the setting of the slave receiver with the entered address via the command GET.

3.1.23.1 Transferring the Master Receiver Setting

Upon actuation of key PUT the following display appears:

```
SELECT ADR 11  23  56  67  98>
```

11, 23, 56, 67 and 98 are the last stored slave addresses (= selection menu).

Actuate either a key of the numeric keypad (1 to 9) or a softkey.

3.1.23.2 Calling Up the Slave Receiver Setting

Upon actuation of key GET it appears the following display:

```
SELECT ADR 11  23  56  67  98>
```

11, 23, 56, 67 and 98 are the last stored slave addresses (= selection menu).

Actuate either a key of the numeric keypad (1 to 9) or a softkey.

3.1.23.3 Programming a Slave Address

Upon actuation of key GET or PUT and then MORE the following is displayed:

```
PROGRAMME 11  23  56  67  98
```

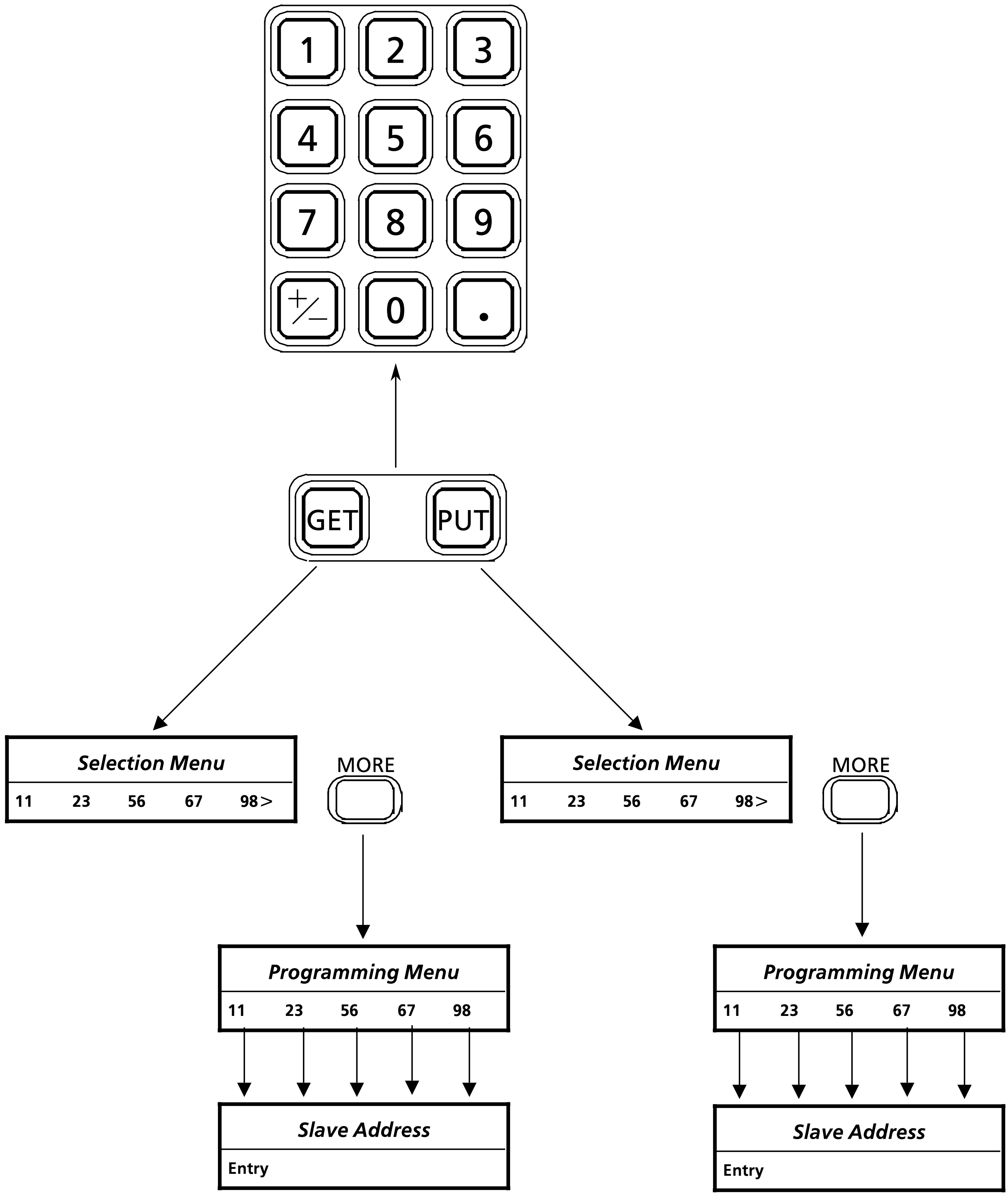
11, 23, 56, 67 and 98 are the last stored slave addresses (= programming menu).

Upon actuation of the softkey which is assigned to the address to be altered, the following display appears:

```
SLAVE ADR _
```

The flashing cursor (_) indicates that an entry is being expected. Enter the new slave address via the numeric keypad.

Range of entry: .... 1 to 99


1
2
3
4
5
6
7
8
9
+/–
0
.
GET
PUT
Selection Menu
11 23 56 67 98>
MORE
Selection Menu
11 23 56 67 98>
MORE
Programming Menu
11 23 56 67 98
Programming Menu
11 23 56 67 98
Slave Address
Entry
Slave Address
Entry

3.1.24 Squelch Type Setting

<u>*Note:*</u>

Make sure that the squelch function (see 3.1.20.4) is switched on.

The type of squelch function can be selected by actuating softkeys in the squelch setting menu.

The following types of squech function are available:

- LEV (level squelch)
- SYL (syllabic squelch)
- L+SYL (combined level and syllabic squelch)

Level squelch works as a function of pre-selected level of the wanted signal strength. Only when this threshold is exceeded will the audio signal be unmuted.

Syllabic squelch acts upon the voice part of wanted signal. I.e. the wanted signal is checked for voice signal parts, and only if such voice signal parts are contained, will the audio signal be unmuted.

3.1.24.1 Selecting Level Squelch and/or Altering Level Squelch Threshold

Upon actuation of softkey more (R&S EK 895) or of key MORE (R&S EK 896) as well as of softkeys SQL and LEV the following display appears:

```
LEV. THLD xxx  _ dBµV   ENT
```

(xxx= last stored level squelch threshold)

The flashing cursor (_) indicates that an entry is being expected. Enter new level squelch threshold via the numeric keypad.

Range of entry: .... 0 to 120 dBµV
Resolution: .... 1 dBµV

Via the ENT function the entry is stored.

The display LEV is now underlined.

In order to increase the new level squelch threshold in steps of 1 dBµV turn tuning knob clockwise.

In order to decrease the new level squelch threshold in steps of 1 dBµV turn tuning knob counter-clockwise.

3.1.24.2 Selecting Syllabic Squelch and/or Altering Syllabic Squelch Threshold

Upon actuation of softkey more (R&S EK 895) or of key MORE (R&S EK 896) as well as of softkeys SQL and SYL the following display appears:

```
SYL. THLD xxx  _ %      ENT
```

(xxx= last stored syllabic squelch threshold)

The flashing cursor (_) indicates that an entry is being expected. Enter new syllabic squelch threshold via the numeric keypad.

Range of entry: .... 0 to 100 %
Resolution: 1

Via the ENT function the entry is stored.

The display SYL is now underlined.

In order to increase the new syllabic squelch threshold in steps of 1 % turn tuning knob clockwise.

In order to decrease the new syllabic squelch threshold in steps of 1 % turn tuning knob counter-clockwise.

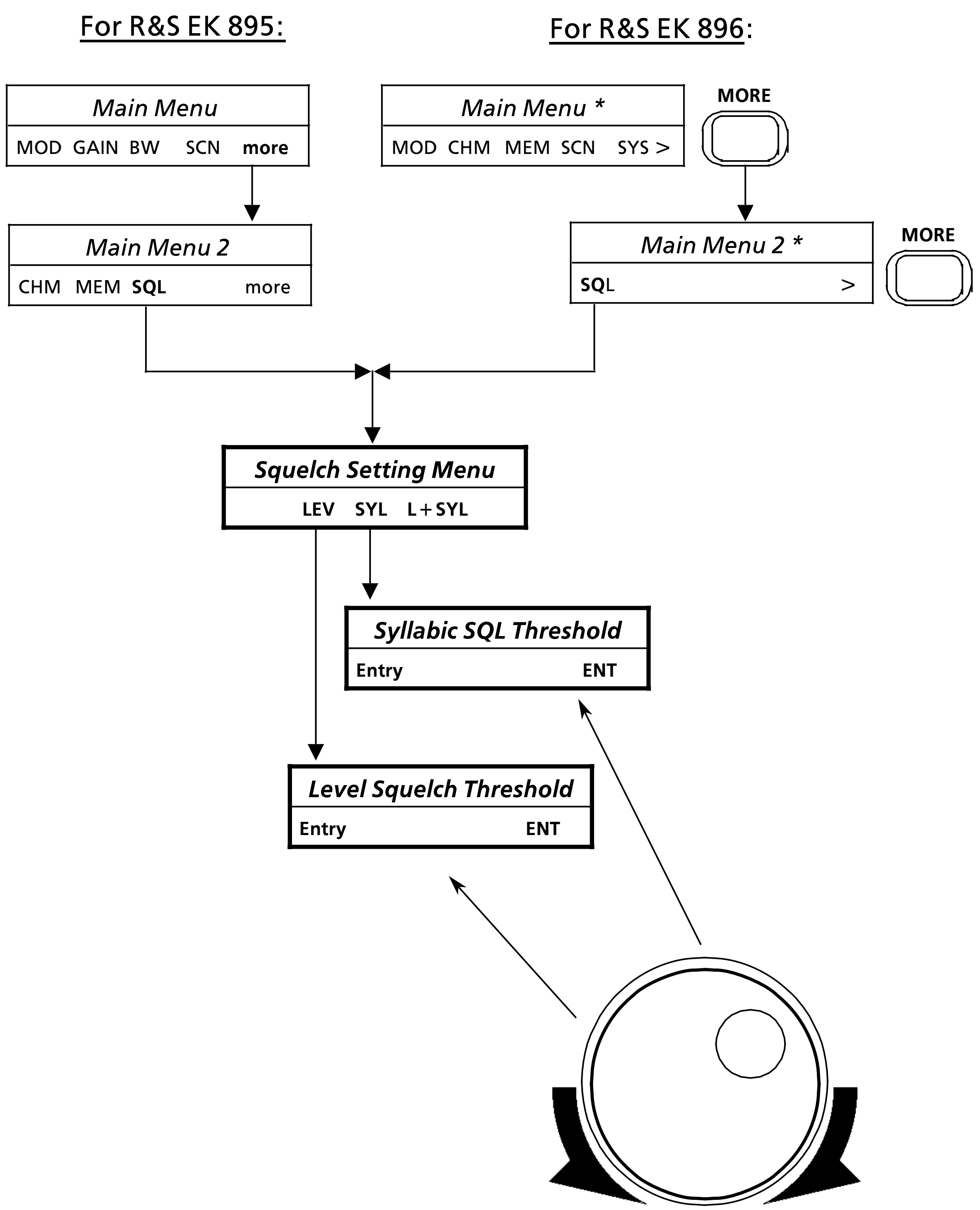
3.1.24.3 Selecting Level/Syllabic Squelch

<u>*Note:*</u>

The thresholds acc. to 3.1.24.1 and .2 are used .

Actuate softkey more (R&S EK 895) or key MORE (R&S EK 896) as well as softkeys SQL and L+SYL .

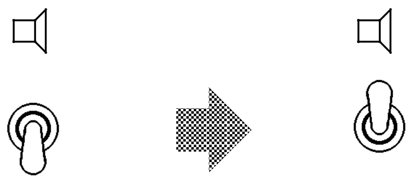
The display L+SYL is now underlined.


For R&S EK 895:
For R&S EK 896:
Main Menu
MOD GAIN BW SCN more
Main Menu *
MOD CHM MEM SCN SYS >
MORE
Main Menu 2
CHM MEM SQL more
Main Menu 2 *
SQL >
MORE
Squelch Setting Menu
LEV SYL L+SYL
Syllabic SQL Threshold
Entry ENT
Level Squelch Threshold
Entry ENT

3.1.25 Loudspeaker (EK 896)

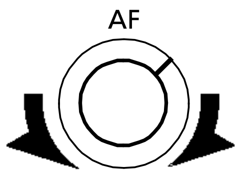
3.1.25.1 Switching the Loudspeaker On

Actuate switch as shown by the figure below.



3.1.25.2 Adjusting the Volume

When the toggle switch is in the upper position (see 3.1.25.1), it is possible to adjust the volume with the aid of the AF control.



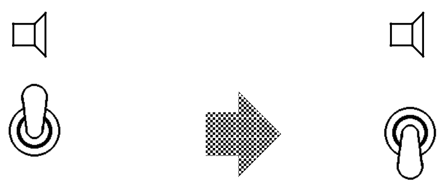
Here the direction of rotation signifies the following:

Control turned fully counter-clockwise: low volume

Control turned fully clockwise: high volume

3.1.25.3 Switching the Loudspeaker Off

Actuate switch as shown by the figure below.



3.2 Control Unit 1 "REMOTE" (R&S EK 895)

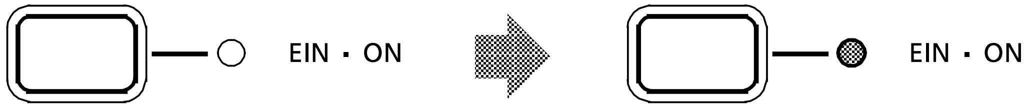
(see Fig. 3.2)

3.2.1 General

The VLF-HF Receiver R&S EK 895 with control unit 1 'REMOTE' does not contain any control elements other than the power switch. Its control is carried out with the aid of a computer with control program, Control Unit R&S GB 899 or another receiver (R&S EK 895 with control unit 2 'LOCAL' or Control Unit R&S GB 890, R&S EK 896). In the event that there is no control program for the computer available or such a program is to be established, the remote control commands (see Appendix A3) are required.

3.2.2 Switching On

Actuate switch ON.



→ LED ON is illuminated.
→ A POWER reset (LED test and BIT) is initiated.

LED Test

- HF-TEIL · RF UNIT
- ZF / NF PROZESSOR · IF / AF PROCESSOR
- SYNTHESIZER
- OPTION 1
- OPTION 2

→ All LEDs must be illuminated.

BIT

→ Module check

→ After the BIT none of the yellow LEDs is allowed to be illuminated.

○ HF-TEIL · RF UNIT

○ ZF / NF PROZESSOR · IF / AF PROCESSOR

○ SYNTHESIZER

○ OPTION 1

○ OPTION 2

→ NoGo message as result of the BIT

As soon as one of the LEDs RF UNIT, IF / AF PROCESSOR, SYNTHESIZER, OPTION 1 or OPTION 2 is illuminated, carry out troubleshooting acc. to 4.2.

Example: synthesizer defective

○ HF-TEIL · RF UNIT

○ ZF / NF PROZESSOR · IF / AF PROCESSOR

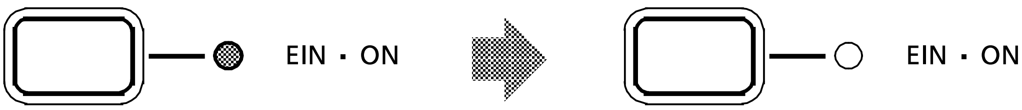
● SYNTHESIZER

○ OPTION 1

○ OPTION 2

3.2.3 Switching Off

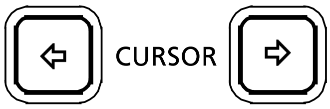
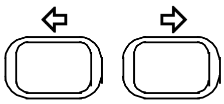
Actuate switch ON.

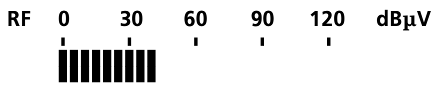
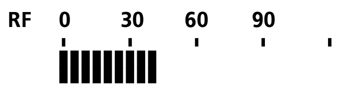


→ LED ON is dark.

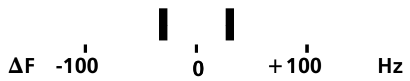
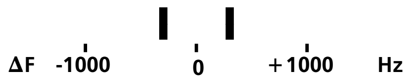
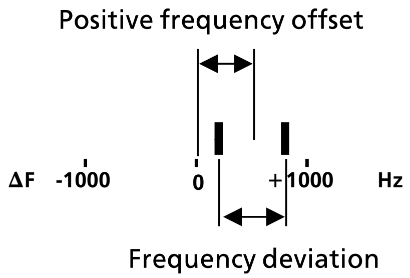
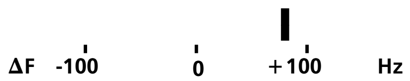
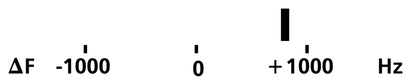
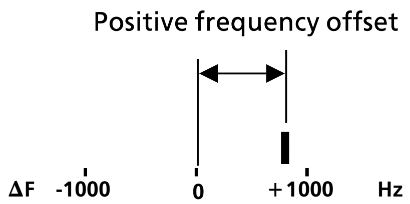
3.3 Control and Display Elements of Control Unit 2 "LOCAL" (R&S EK 895) or Control Unit (R&S EK 896)

(see Fig. 3.1 for R&S EK 896 or Fig. 3.2 for R&S EK 895)

No.	Control or display element	Design	Description
1	R&S EK 896:  R&S EK 895: 	Two push-buttons with protective caps (10.5×10.5 mm) Two push-buttons with protective caps (6 × 10.5 mm)	If the LED assigned to key FRQ (32) is illuminated, the cursor (10) can be positioned by means of the cursor control keys within the frequency field (9) below any of the displayed figures. This does not apply to the 10-MHz place! In addition the cursor (10) can be shifted to the right and out of the frequency field (9), as a consequence the freely programmed stepwidth (see 3.1.7.3 and 3.1.18.1) for the tuning knob will become effective. <u>For R&S EK 895 only:</u> Upon actuation of key BFO (28) the cursor (10) can be positioned by means of the cursor control keys within the BFO field (8) below any of the displayed figures.
2	PREAMP NB SQ NOTCH PBT		A black bar in the status line indicates that • the preamplifier and / or • the noise blanker and / or • the level/syllabic squelch and / or • the notch filters A and B and / or • a frequency offset are active. If necessary, activate the respective function via the separate functions menu 1 (see 3.1.20.2 to .5) and / or via the key NOTCH / PBT (29).

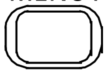
No.	Control or display element	Design	Description
3	MODULATION 	Modulation mode field consisting of the display MODULATION and three 14-segment display elements	In the modulation mode field the currently effective modulation mode (e.g. CW) is displayed. Possible displays: AM, CW, USB, LSB, FAX1, FSK+, FSK-, AFSK+, AFSK-, F7B--, F7B+-, F7B-+, F7B++, FM, IUSB, ILSB For R&S EK 895 only: Via the modulation mode menu (see 3.1.8.3) the modulation mode can be altered. For R&S EK 896 only: With the modulation mode keys (19) and the modulation mode menu (see 3.1.8.2) the modulation mode can be altered.
4	e.g. dBµV  e.g. dS 	Bargraph consisting of 25 individual bars	LEVEL INDICATION, e.g. dBµV see 3.1.18.15 for R&S EK 895 or 3.1.21.8 for R&S EK 896 Depending on the set type of control (see control type field (5)) the bargraph indicates either the receive level or the control voltage. **AGC** The bargraph indicates the current receive level. **MGC** The bargraph indicates the control voltage set by means of the HF control (22).

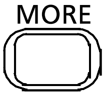
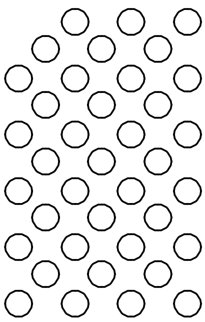
No.	Control or display elements	Design	Description
4			--- continued **A + M** The bargraph indicates either the control voltage set by means of the HF control (22) (receive level < set control voltage) or the current receive level (receive level > set control voltage). **A + D** The bargraph indicates the DIGI GAIN value entered via the numeric keypad (27). In the function CHM (see 3.1.16) the bargraph indicates the digital threshold stored in the channel. TUNING INDICATOR Except for an entry, e.g. frequency, actuation of key ENT (25) or MENU 1 (11) and softkey IND switches the bargraph function from level indication to tuning indication and vice versa. In the modulation modes ISB, USB and LSB this function is ineffective.

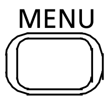
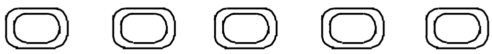
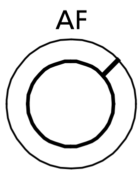
No.	Control or display element	Design	Description
4			--- continued
			Modulation mode: FSK, AFSK or F7B
			<u>Frequency deviation = 42 Hz or 85 Hz</u> Display range: -120 to +120 Hz Resolution: 10 Hz
			<u>Frequency deviation = 225 Hz and 425 Hz</u> Display range: -1200 to +1200 Hz Resolution: 100 Hz
			The set frequency deviation is indicated in the frequency deviation menu (see 3.1.8.4.1). The tuning indicator shows the currently set frequency deviation and the frequency offset, if set.
			Modulation mode: AM, CW, FAX1, FAX2 or FM The modulation modes FAX1, FAX2 and FM are not shown.
			<u>Bandwidth = 150 Hz</u> Display range: -120 to +120 Hz Resolution: 10 Hz
			<u>Bandwidth > 150 Hz</u> Display range: -1200 to +1200 Hz Resolution: 100 Hz
			The set bandwidth is indicated in the bandwidth field (7). The tuning indicator shows the frequency offset, if present.

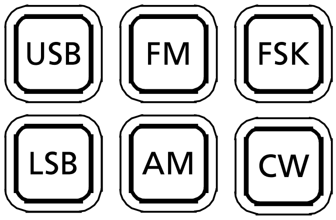
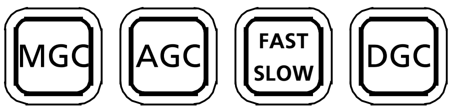
No.	Control or display element	Design	Description
5	GAIN SLOW AGC	Control type field consisting of the display GAIN SLOW FAST and three 14-segment display elements	In the control type field the currently effective type (e.g. AGC) and time of control (e.g. SLOW) are displayed. The control time can be altered via the control time menu (see 3.1.12). Possible control times: FAST (25 ms or 150 ms) SLOW (500 ms or 1 s or 3 s) <u>For R&S EK 895 only:</u> Via the control type menu (see 3.1.11.1) the control type can be altered. <u>For R&S EK 896 only:</u> By means of the control type keys (20) the control type can be altered. Possible displays: AGC SLOW or AGC FAST MGC A+M SLOW or A+M FAST A+D SLOW or A+D FAST
6	CHANNEL 483	Channel field consisting of the display CHANNEL and three 7-segment display elements	The channel number (e.g. 483) indicates the currently active channel. Display range: 0 to 999 The cursor (10) in the channel field indicates, that key CH (31) was actuated → operating mode CHANNEL (see 3.1.3.3) or FIXED CHANNEL (see 3.1.3.3.1). In the operating mode CHANNEL the tuning knob (34) and the numeric keypad (27) act upon the channel field. In the operating mode FIXED CHANNEL only the tuning knob (27) acts upon the channel field. When the display CHANNEL is flashing, a channel scan program (see 3.1.17.2 and 3.1.17.3) was started → operating mode CHANNEL SCANNING (see 3.1.3.4 and 3.1.3.5). When the channel number (e.g 483) is flashing, the function CHM (channel editing menu, see 3.1.16) was called up.

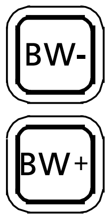
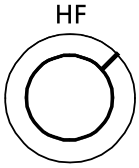
No.	Control or display element	Design	Description
7	**BW kHz** 0.3 1) In addition display in the menu line with a resolution of 1 Hz	Bandwidth field consisting of the display BW kHz and two 7-segment display elements	In the bandwidth field the currently active IF filter (e.g. with a bandwidth of 0.3 kHz) is displayed. For R&S EK 895 only: Via the bandwidth selection menu (see 3.1.9) or the tuning knob (34, only with option EK 85S7) the bandwidth can be altered. For R&S EK 896 only: Via the bandwidth keys (21) or the bandwidth selction menu (see 3.1.9) or the tuning knob (34) the bandwidth can be altered. Possible displays in kHz: 0.1 - 0.3 - 0.4 - 0.6 - 0.8 - 1.0 - 1.5 - 1.8 - 2.1 - 2.4 - 2.7 - 3.1 - 3.6 - 4.0 - 4.8 - 6.0 - 8.0 Resolution: 100 Hz Possible displays in kHz (R&S EK 896, R&S EK 895 with option R&S EK 895S7) 1): 0.1 to 9.0 (neighbouring bandwidths differ by approx. 3 %) Resolution: 100 Hz
8	**kHz BFO** 0.85 for EK 895 only	BFO field consisting of the display kHz BFO and four 7-segment display elements	In the BFO field the currently effective BFO frequency (e.g. 0.85 kHz) is displayed. Not with modulation modes AM, F7B, FM and ISB. If the LED assigned to key BFO (28) is illuminated, the step keys (30) and the numeric keypad (27) act upon the BFO field. Display range: -5.00 to 5.00 kHz Resolution: 10 Hz For R&S EK 895 only: The BFO frequency can also be altered by using the tuning knob (34) and the cursor control keys (1) acc. to 3.1.13.3 and .4.

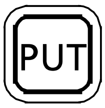
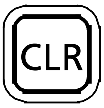
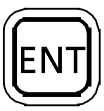
No.	Control or display element	Design	Description
9	FREQUENCY kHz 12345.678	Frequency field consisting of the display FREQUENCY kHz and eight 7-segment display elements	In the frequency field the currently effective frequency (e.g. 12345.678 kHz) is displayed. The cursor (10) in the frequency field indicates, that the key FRQ (32) was actuated → operating mode MANUAL (see 3.1.3.1). The tuning knob (34) as well as the cursor control keys (1) and the numeric keypad (27) act upon the frequency field. If the cursor (10) is in neither of the fields for BFO (EK 895 only), channel or frequency, for the tuning knob (34) a freely programmed stepwidth is activated. When the display FREQUENCY is flashing, a frequency scanning process (see 3.1.17.1) is started → operating mode FREQUENCY SCANNING (see 3.1.3.2). Display range: 0 to 30 MHz Resolution: 1 Hz
10	–		The cursor indicates which of the 7-segment display elements the tuning knob (34) directly acts upon. The cursor can be shifted in the BFO field (EK 895 only) and the frequency field by means of the cursor control keys (1). If the cursor fails to appear in the frequency field (9), for the tuning knob the freely programmed stepwidth is activated.
11	MENU1  for EK 896 only	Blue pushbutton with protective cap (6 × 10.5 mm)	By actuation of key MENU 1 the following functions are assigned to the softkeys (16): LOC Switch remote control off, see 3.1.21.1) ME+ Storage into the buffer (see 3.1.21.2)

No.	Control or display element	Design	Description
	1) The function BYP is only displayed with the optional R&S FK 896D being installed.		--- continued ME- Calling up the buffer contents (see 3.1.21.3) S/C Stopping or continuing scanning (see 3.1.21.4) BYP1) Activating or deactivating Dgitally Tuned RF Selector R&S FK 896D (see 3.1.21.5 and .6) SSBM Selecting the SSB Rx filter mode (see 3.1.21.8) BAR Selecting the bargraph mode (see 3.1.21.7)
12	MORE  for EK 896 only	Pushbutton with protective cap (6 × 10.5 mm)	The key MORE is only effective if the symbol '>' appears on the right in the softkey assignment field (14). By actuating key MORE another menu (14) or another display (36) is called up.
13		Miniature loud-speaker	Whether the loudspeaker emits an AF signal, depends on the position of the toggle switch (17). The volume of the emitted AF signal depends on the direction of rotation of the AF control (18).
14		Softkey assignment field consisting of 20 14-segment display elements	In the softkey assignment field the currently active menu is indicated. To the softkey assignment field belongs the softkey block (16). Possible displays see Fig. 3.4 for R&S EK 895 see Fig. 3.5 for R&S EK 896

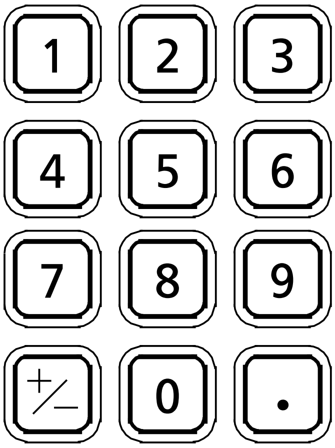
No.	Control or display element	Design	Description
15	 <u>*Note:*</u> *After pressing key MENU on the highest level, the modulation mode and control type will be displayed for 3 s, if setting dBµV or dS is selected (see 3.1.18.15 or 3.1.21.8).*	Yellow push-button with protective cap (6 × 10.5 mm)	By actuating key MENU either a programming process is terminated or the program returns to the next higher level (see 3.1.4). If e.g. in the softkey assignment field (14) the programming menu is displayed, the program returns to the scanning menu by actuation of the MENU key. Pressing the MENU key once more calls up the main menu.
16		Five pushbuttons with protective caps (6 × 10.5 mm)	The softkeys receive their respective functions via the softkey assignment field (14). Via the softkeys the operator moves from the highest (see 3.1.4) to the lowest level. In order to move from a lower to the next higher level, the operator has only to actuate key MENU (15).
17		1-way toggle switch	If the toggle switch is in the upper position, the AF signal is fed from the output of the AF amplifier in the control unit to the loudspeaker (13). By means of the AF control (18) the volume can be adjusted, as required.
18		Variable resistor with rotary knob control span 270°	By means of the AF control the volume of a loudspeaker or headphones to be connected at the interface (see A2.1) can be adjusted. Control turned fully counter-clockwise: low volume Control turned fully clockwise: high volume <u>For R&S EK 896 only:</u> Via the AF control the volume of that AF signal is set, that is emitted by the loudspeaker (13) depending on the position of the toggle switch (17).

No.	Control or display element	Design	Description
19	 for EK 896 only	Six pushbuttons with protective caps (10.5×10.5 mm)	Actuate the respective modulation mode key in order to select the desired modulation mode. If the default setting is activated, altering the modulation mode automatically sets the appropriate values (see 3.1.8) for bandwidth, BFO frequency as well as type and time of control. The demodulation parameters for the modulation mode FSK are altered via the demodulation parameter menu (see 3.1.8.4). Another possibility of altering the modulation mode is via the modulation mode menus 2 *, 3 * and 4 * (see 3.1.8.2). The currently effective modulation mode is indicated in the modulation mode field (3).
20	 for EK 896 only	Four pushbuttons with protective caps (10.5×10.5 mm)	Actuate the respective control type key several times, if need be, until the desired type of control is indicated in the control type field (9). After actuating the key DGC the following display appears in the display field (36): DGC VALUE _ dBµV A DIGI GAIN value can be entered via the numeric keypad (27) acc. to 3.1.11.3. After actuating the key FAST SLOW the following display appears in the display field (14): *25 150 500 1s 3s* *└ Fast ┘ └ Slow ┘* Select the desired time of control. The currently effective time of control is displayed in the control type field (5).

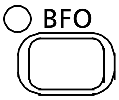
No.	Control or display element	Design	Description
21	 for EK 896 only	Two push-buttons with protective caps (10.5×10.5 mm)	By actuation of the BW key (see also 3.1.9.3) the softkeys (16) obtain the following functions: BW↘ BW↗ VAR. Actuate the relevant BW key or softkey (BW↘ BW↗) several times, as necessary, until the desired bandwidth is indicated in the bandwidth field (7). Possible bandwidths in kHz: 0.1 - 0.3 - 0.4 - 0.6 - 0.8 - 1.0 - 1.5 - 1.8 - 2.1 - 2.4 - 2.7 - 3.1 - 3.6 - 4.0 - 4.8 - 6.0 - 8.0 Actuate key BW+ or softkey BW↗ for moving to the next higher bandwidth. Actuate key BW- or softkey BW↘ for moving to the next lower bandwidth. After actuating softkey VAR the bandwidth can be adjusted quasi-continuously in the range of 100 Hz to 9 kHz by using the tuning knob. Turn the tuning knob counter-clockwise for decreasing the bandwidth. Turn the tuning knob clockwise for increasing the bandwidth.
22	HF 	Variable resistor with rotary knob control span 270°	If in the control type field (5) MGC or A+M is displayed, the HF control can be used to set the control voltage. Control turned fully counter-clockwise: 0 dBμV Control turned fully clockwise: 120 dBμV The set control voltage is indicated by the bargraph (4). <u>For R&S EK 896 only:</u> The direction of rotation of the HF control can be reversed by means of jumpers in the control unit.

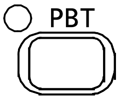
No.	Control or display element	Design	Description
23	 for EK 896 only	Pushbutton with protective cap (10.5×10.5 mm)	Upon acutation of the key PUT the following appears on the display (36): SELECT ADR *11 23 56 67 98* > 11, 23, 56, 67 and 98 are the last stored slave addresses (= selection menu). Entry of the required slave address is either via the numeric keypad (27) or the selection menu (see 3.1.23.1). Via the numeric keypad addresses from 1 to 9 can be entered. The receiver with the entered address takes over the master receiver setting. The stored slave addresses can be altered acc. to 3.1.23.3.
24		Pushbutton with protective cap (10.5×10.5 mm)	By actuating key CLR numerical entries in the display field (36) are cleared. By actuating key CLR in the channel editing menu the channel indicated in the channel field (6) is cleared (disabled, see 3.1.16.2). If the LED assigned to key NOTCH / PBT (29) is illuminated, the set shift of the receiver frequency within the IF passband curve is reset to 0 by actuation of key CLR and in the status line (2) there is no black bar indicated above PBT.
25		Pushbutton with protective cap (10.5×10.5 mm)	By actuation of key ENT the numerical displays in the display field (36) are stored. By actuating key ENT in the channel editing menu the channel indicated in the channel field (6) is reactivated (see 3.1.16.3).

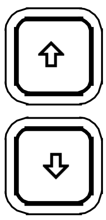
No.	Control or display element	Design	Description
			--- continued Except for entries, e.g. frequency, and in the channel editing menu, actuation of the ENT key assigns to the softkeys (16) the following functions: IND Fast switchover of bargraph function (level / tuning indication, see 3.1.20.1) NTCH Switching the notch filters on or off (see 3.1.20.2) NB Switching the noise blanker on or off (see 3.1.20.3) SQ Switching the syllable squelch on or off (see 3.1.20.4) PAMP Switching the preamplifier on or off (see 3.1.20.5) The status for the individual functions is indicated in the status line (2). Activation of a function is indicated by a black bar. The function SQ is only effective in the SSB mode. In the ISB mode the notch filters only act upon the monitoring sideband.
26	GET for EK 896 only	Pushbutton with protective cap (10.5×10.5 mm)	After actuating key GET the following appears in the display field (36): SELECT ADR *11 23 56 67 98* > 11, 23, 56, 67 and 98 are the last stored slave addresses (= selection menu). The required slave address is entered via the numeric keypad (27) or via the selection menu (see 3.1.23.2). Via the numeric keypad the addresses 1 to 9 can be entered. The master receiver takes over the setting of the receiver with the entered address. The stored slave addresses can be altered acc. to 3.1.23.3.

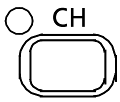
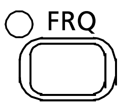
No.	Control or display element	Design	Description
27		Twelve push-buttons with protective caps (10.5×10.5 mm)	Entries via the numeric keypad are indicated above the flashing cursor (35) in the display field (36). The entry can be modified at any time by actuating key CLR (24). The entry can be disrupted by actuating key MENU (15). Complete entry by actuating key ENT (25). Leading zeros are not required (example: 0.05 = .05). Zeros which may be required after the decimal point are automatically inserted (example: 100.2 = 100.200). Unpermissible entries are replaced by a default value after actuating key ENT (25). • If the LED assigned to key FRQ (32) is illuminated, the frequency can be entered via the numeric keypad. • If the LED assigned to key CH (31) is illuminated, the channel number can be entered via the numeric keypad. • For R&S EK 895 only: If the LED assigned to key BFO (28) is illuminated, the BFO frequency can be entered via the numeric keypad. Before entering a • BFO frequency (EK 896) or • frequency offset or • notch filter frequency the appropriate key (BFO [28], NOTCH / PBT [29]) must be actuated.

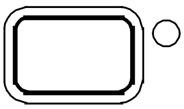
No.	Control or display element	Design	Description
27			--- continued If the LED assigned to the BFO key (28) is illuminated, the BFO frequency can be inverted by using the ± key. In addition the operator may be prompted via the menus (see display field [36]) to enter via the numeric keypad a • digital threshold, • DIGI GAIN value, • frequency offset, • start frequency, • stop frequency, • stepwidth, • channel, • start channel, • stop channel, • dwell time, • hold time, • slave address, • IF frequency, • password, • level squelch threshold or • syllabic squelch threshold

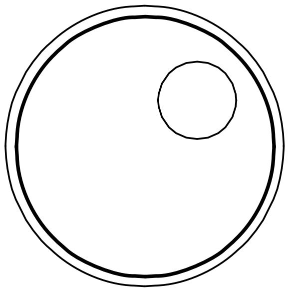
No.	Control or display element	Design	Description
28	 *Note:* *With modulation modes CW, FSK and FAX only!*	Pushbutton with protective cap (6 × 10.5 mm) and green LED	After actuating key BFO in the display field (35) the indication BFO _ KHZ appears and the LED assigned to the pushbutton is illuminated. At the same time the cursor (10) is in the BFO field (8). The display will be replaced by the initial display if no entry is made within approx. 2 s. The currently effective BFO frequency is indicated in the BFO field (8). No display in modulation modes AM, F7B, FM and ISB. Enter BFO frequency via numeric keypad (27) acc. to 3.11.3.1. For R&S EK 895 only: By means of the tuning knob (34) and the cursor control keys (1) the BFO frequency can be altered. Clockwise rotation (≤ 5.00 kHz) Counter-clockwise rotation (≥ -5.00 kHz) For R&S EK 896 only: By means of the step keys (29) the BFO frequency can be altered. • Actuate key ↓ in order to reduce the frequency (≥ -5.00 kHz). • Actuate key ↑ in order to increase the frequency (≤ 5.00 kHz).

No.	Control or display element	Design	Description
29	NOTCH PBT 	Pushbutton with protective cap (6 × 10.5 mm) and green LED	After actuating key NOTCH / PBT in the display field (35) the indication PBT OFFSET x.xx KHZ appears and the LED is illuminated. If the key NOTCH / PBT is pressed once again, in the display field (35) the following indication appears: NOTCH A x.xx KHZ. If the key NOTCH / PBT is pressed once again, in the display field (35) the following indication appears: NOTCH B x.xx KHZ. In modulation mode ISB the notch filter only acts upon the monitoring sideband. In modulation mode SSB the setting of negative filter frequencies is not required. (x.xx = last altered frequency offset and / or notch filter frequency) <u>For R&S EK 895 only:</u> By means of the tuning knob (34) the frequency offset or the notch filter frequency can be altered. • Clockwise rotation (≤ 5.00 kHz or ≤ 0.5 x bandwidth) • Counter-clockwise rotation ≥ -5.00 kHz or ≥ -0.5 x bandwidth) <u>For R&S EK 896 only:</u> By means of the step keys (20) the frequency offset or the notch filter frequency can be altered. • Actuate key ↓ in order to reduce the frequency offset or the notch filter frequency (≥ - 5.00 kHz or ≥ -0.5 x bandwidth). • Actuate key ↑ in order to increase the frequency offset or the notch filter frequency (≤ 5.00 kHz or ≤ 0.5 x bandwidth).

No.	Control or display element	Design	Description
29			--- continued The currently effective bandwidth is indicated in the bandwidth field (7). Once a frequency offset of $\neq 0$ is set, a black bar will appear above PBT in the status line (2). A reset to 0 is possible at any time by actuation of key CLR (24). The notch filter frequencies are only effective if a black bar is indicated above NOTCH in the status line (2). Activate notch filter acc. to 3.1.20.2, if necessary.
30	 for EK 896 only	Two push-buttons with protective caps (10.5×10.5 mm)	• If the LED assigned to key BFO (28) is illuminated, the BFO frequency can be altered via the step keys. • If the LED assigned to key NOTCH / PBT (29) is illuminated, the frequency offset or the notch filter frequency can be altered via the step keys. The step keys have a repeater function, i.e., when the operator keeps pressing the key, after a certain delay the function will be executed automatically in a continuous fashion. Once the minimum or maximum value is reached, further actuation of the relevant key will not produce any more changes on the display.

No.	Control or display element	Design	Description
31		Pushbutton with protective cap (6 × 10.5 mm) and green LED	After actuating key CH in the display field (36) the indication CHANNEL _ appears and the LED assigned to the push-button is illuminated → operating mode CHANNEL (see 3.1.3.3) or FIXED CHANNEL (see 3.1.3.3.1). At the same time the cursor (10) is located in the channel field (6). The display is replaced by the initial value, if no entry is made within approx 2 s. By means of the tuning knob (34) all channels which are not cleared (inhibited) can be called up. Not in FIXED CHANNEL operation! Clockwise rotation (≤ 999) Counter-clockwise rotation (≥ 0) It is also possible to call up a channel via the numeric keypad (27) acc. to 3.1.14.1. The currently effective channel is indicated in the channel field (5).
32		Pushbutton with protective cap (6 × 10.5 mm) and green LED	After actuating key FRQ in the display field (36) the indication FREQUENCY _ KHZ appears and the LED assigned to the push-button is illuminated → operating mode MANUAL (see 3.1.3.1). At the same time the cursor (10) is located in the frequency field (9). If the cursor is not in the frequency field, the freely programmed stepwidth is activated. The display is replaced by the initial value, if no entry is made within approx 2 s. By means of the tuning knob (34) and the cursor control keys (1) the frequency can be altered.

No.	Control or display element	Design	Description
32			--- continued Clockwise rotation (≤ 30 MHz) Counter-clockwise rotation (≥ 0) It is also possible to enter the frequency via the numeric keypad (27) acc. to 3.1.7.1. The currently effective frequency is indicated in the frequency field (9).
33	POWER 	Power switch, with rod and protective cap and green LED	By actuating the power switch (see also 3.1.5) the primary circuit of the power supply module is closed. After actuating the power switch the LED POWER is illuminated to indicate that the power supply is working properly (→ CM message for the power supply module). Subsequently the display illumination is switched on and the POWER reset, consisting of LED test and BIT, is initiated. Once the BIT is terminated successfully, the last basic receiver setting is reactivated and the main menu is displayed. In the operating mode FIXED CHANNEL the display CHANNEL MODE EXIT appears instead of the main menu. In the case of a failure the defective or missing module(s) is (are) indicated in the display field (36). In the FIXED CHANNEL mode the display BIT FAILED appears. Carry out troubleshooting acc. to 4.2, if necessary.

No.	Control or display element	Design	Description
34		Rotary knob 24 steps / turn	The tuning knob can be disabled acc. to 3.1.18.3 or enabled acc. to 3.1.18.2. The blocked state of the tuning knob is automatically cancelled when the receiver is switched off. In addition the stepwidth of the tuning knob can be freely programmed acc. to 3.1.18.1 or can be altered via the cursor control keys (1). • If the LED assigned to key FRQ (32) is illuminated, the tuning knob can be used to alter the frequency. • If the LED assigned to key CH (31) is illuminated, the tuning knob can be used to alter the channel number. • For R&S EK 895 only: If the LED assigned to key BFO (28) is illuminated, the tuning knob can be used to alter the BFO frequency. • For R&S EK 895 with option R&S EK 895S7 only: After actuation of softkeys BW and VAR, the bandwidth can be altered quasi-continuously by means of the tuning knob. • For EK 896 only: After actuation of key BW and softkey VAR, the bandwidth can be altered quasi-continuously by means of the tuning knob. Once the minimum or maximum value is reached, the display does not change any further when turning the tuning knob.
35	—		The flashing cursor indicates that an entry via the numeric keypad (27) is being expected. After an entry the respective character (numeral, sign or decimal point) is indicated and the cursor is dislocated to the right by one digit (maximally by one digit beyond the permitted entry format).

No.	Control or display element	Design	Description
36	1) For modulation mode FSK and AFSK only	Display field consisting of 30 14-segment display elements	The display field shows the operator, which quantity can be entered via the numeric keypad (27) or altered by means of the tuning knob (34) or the step keys (30). Possible displays: FREQUENCY _ KHZ DGC VALUE _ dBµV ENT BFO _ KHZ CHANNEL _ PBT FRQ x.xx KHZ NOTCH A x.xx KHZ NOTCH B x.xx KHZ STORE CH _ CLEAR CH _ THRESHOLD _ dBµV ENT START FRQ _ KHZ NEXT STOP FRQ _ KHZ NEXT STEP FRQ _ KHZ NEXT THRESHOLD _ dBµV NEXT DWELLTIME _ MS NEXT HOLDTIME _ F/T NEXT START CH _ NEXT STOP CH _ NEXT 00 CHAN _ NEXT END VAR STEP _ KHZ ENT SLAVE ADR _ PASSWORD _ ΔF _ KHZ ENT 1) LEV. THLD _ dBµV ENT SYL. THLD _ % ENT Also via the display field the operator may be invited to actuate a softkey. Possible displays: CLEAR ALL YES NO RAM CLEAR YES NO

No.	Control or display element	Design	Description
36	2) For R&S EK 896 the symbol '>' is displayed instead of more.		--- continued Also via the display field status messages may be displayed to the operator. Possible displays: NO OPTION PRESELECTOR more [2] BCD INTERF more [2] IF CONV 100 KHZ more [2] IF CONV 455 KHZ more [2] QUASI CONT BW more [2] DIG SELECTION more [2] WIDEBAND more [2] SYNTH NOGO more [2] SYNTH MISSING more [2] RF UNIT NOGO more [2] RF UNIT MISSING more [2] IF / AF NOGO more [2] IF / AF MISSING more [2] PROC UNIT NOGO more [2] IF CONV NOGO more [2] UNUSED SCANNING PROGRAMME SELECT ADR ------ REMOTE ------ LOC CHANNEL MODE EXIT CM GO CM SYNTH NOGO CM IF AF NOGO CM SYNTH + IF AF NOGO BIT GO BIT FAILED ---------------- SYSTEM RESET ----------------- The display more or > appears only if more than one error has occurred and / or more than one option is installed.

3.5 Control and Display Elements of Control Unit 1 "REMOTE" (R&S EK 895)

(see Fig. 3.3)

No.	Control or display element	Design	Description
1	EIN · ON	Power switch, rods with protective cap and green LED	By actuating the power switch the primary circuit of the power supply module is closed. Upon actuation of the power switch the LED ON is illuminated to indicate that the power supply is working properly (→ CM message for the power supply module). Subsequently the POWER reset, consisting of LED test and BIT, is initiated. Once the BIT is terminated successfully, none of the LEDs OPTION 2 (2), OPTION 1 (3), SYNTHESIZER (4), IF / AF PROCESSOR (5) and RF UNIT (6) is illuminated. Carry out troubleshooting acc. to 4.2, if necessary.
2	OPTION 2	yellow LED	Upon actuation of the power switch (1) the LED OPTION 2 is illuminated during the LED test. Once the BIT is terminated successfully, the LED goes out (→ CM message for the option 2). If an error occurs after release of the command BIT or RESET, the LED will be illuminated (see Appendix A3). For illumination of LED OPTION 2 carry out troubleshooting acc. to 4.2.
3	OPTION 1	yellow LED	Upon actuation of the power switch (1) the LED OPTION 1 is illuminated during the LED test. Once the BIT is terminated successfully, the LED goes out (→ CM message for the option 1). If an error occurs after release of the command BIT or RESET, the LED will be illuminated (see Appendix A3). For illumination of LED OPTION 1 carry out troubleshooting acc. to 4.2.

No.	Control or display element	Design	Description
4	○ SYNTHESIZER	yellow LED	Upon actuation of the power switch (1) the LED SYNTHESIZER is illuminated during the LED test. Once the BIT is terminated successfully, the LED goes out (→ CM message for the synthesizer module). If an error occurs after release of the command BIT, CM or RESET, the LED will be illuminated (see Appendix A3). For illumination of LED SYNTHESIZER carry out troubleshooting acc. to 4.2.
5	○ ZF/NF PROZESSOR ▪ IF/AF PROCESSOR	yellow LED	Upon actuation of the power switch (1) the LED IF/AF PROCESSOR is illuminated during the LED test. Once the BIT is terminated successfully, the LED goes out (→ CM message for the IF/AF processor module). If an error occurs after release of the command BIT or RESET, the LED will be illuminated (see Appendix A3). For illumination of LED IF/AF PROCESSOR carry out troubleshooting acc. to 4.2.
6	○ HF-TEIL ▪ RF UNIT	yellow LED	Upon actuation of the power switch (1) the LED RF UNIT is illuminated during the LED test. Once the BIT is terminated successfully, the LED goes out (→ CM message for the HF unit). If an error occurs after release of the command BIT or RESET, the LED will be illuminated (see Appendix A3). For illumination of LED RF UNIT carry out troubleshooting acc. to 4.2.

1 Cursor keys:
← Increases increment
→ Decreases increment
Increase of frequency or channel number: turn clockwise
- Activate the freely programmed increment

30 Cursor keys:
- LED BFO on: Alter the BFO frequency
- LED NOTCH/PBT on: Alter the frequency offset and / or notch filter frequency 1 and / or 2

↑ Increases value
↓ Decreases value

Display:
- Level or tuning display
- Channel number display
- Bandwidth display
- BFO frequency display
- Frequency display
- Function or menu asignment for softkes or status display (CM, BIT) or installed option display or software display
- Control type and time display
- Modulation mode display

16 Softkeys:
- Activate a function
- Calls up a menu

11 Key MENU1:
Calls up the special functions menu

12 Key MORE:
- Calls up a menu
- Shows further status messages

34 Tuning knob:
- LED FRQ on: alters the frequency
- LED CH on: alters the channel number

Increase of frequency or channel number:
- turn clockwise

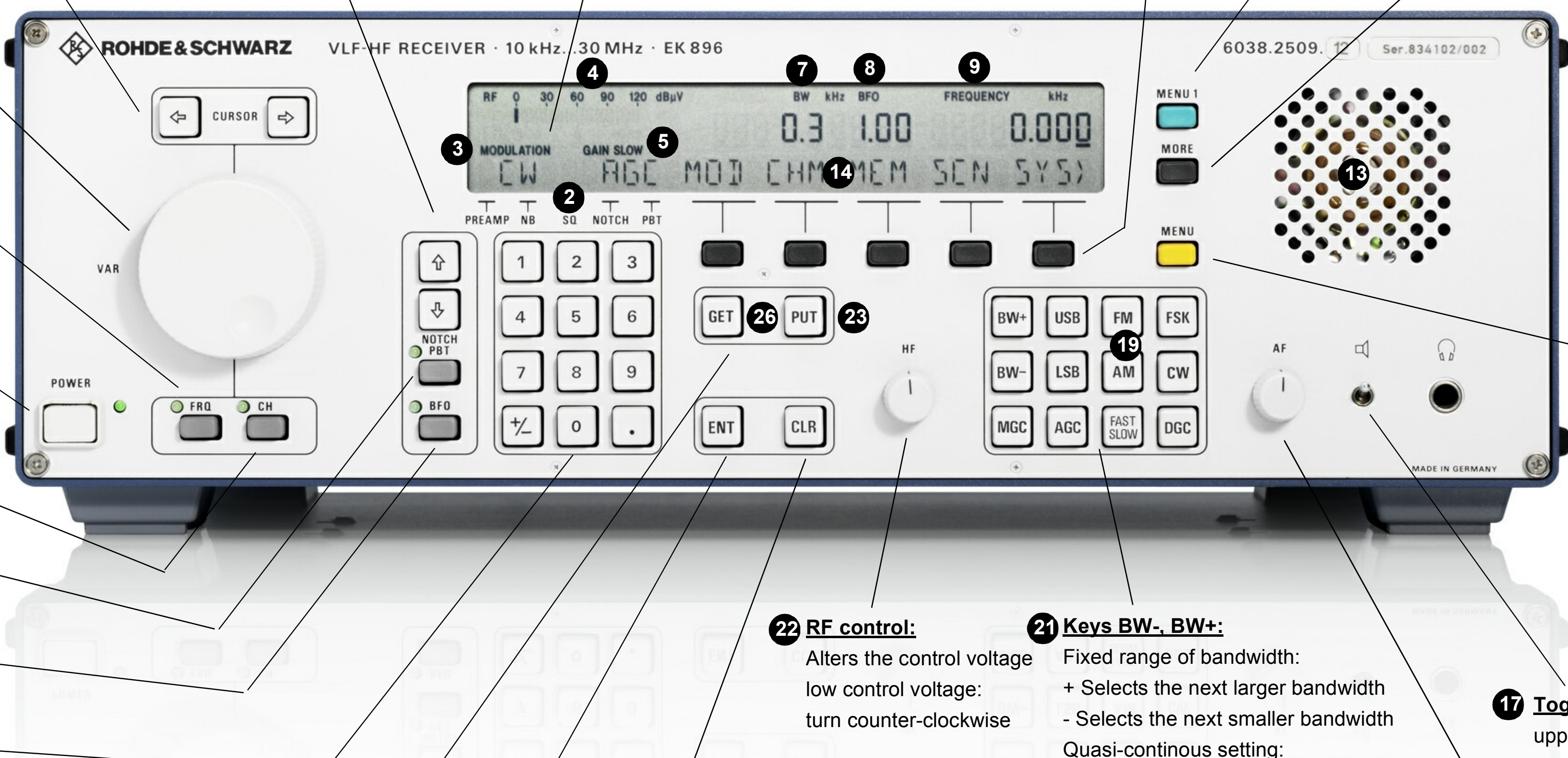
32 Key FREQ:
LED on: frequency change is enabled

33 Key POWER:
Switches receiver on or off
LED on: receiver switched on

31 Key CH:
LED on: channel number change is enabled

29 Key NOTCH/PBT:
LED on: frequency offset change and notch filter frequency change are enabled

28 Key BFO:
LED on: BFO frequency change is enabled



15 Key MENU:
Return to the next higher level

27 Numerical keypad
Entry of:
- frequency
- channel number
- BFO frequency
- DGC value
- frequency offset
- start frequency
- stop frequency
- increment
- channel
- start channel
- stop channel
- dwell time
- hold time
- slave address
- IF frequency
- password

Master / slave keys:
- Key PUT: Transfers the master receiver setting
- LED GET: Calls up the slave receiver setting

25 Key ENT:
- Confirm an entry
- Calls up the separate function menu 1

24 Key CLR:
- Clears an entry
- LED NOTCH/PBT on: resets frequency offset to zero

22 RF control:
Alters the control voltage
low control voltage:
turn counter-clockwise

21 Keys BW-, BW+:
Fixed range of bandwidth:
+ Selects the next larger bandwidth
- Selects the next smaller bandwidth
Quasi-continous setting:
+ Increases value
- Decreases value
- Calls up bandwidth selection menu

20 Keys MGC, AGC, DGC, FAST/SLOW :
- Selects the control type
- Key DGC: enters a DIDI GAIN value
- Key FAST/SLOW : calls up the control time menu

17 Toggle switch:
upper position:
loudspeaker is switched on:

18 AF control:
Alters the volume
low volume:
turn counter-clockwise

Fig. 3.1 Control and Display Elements of VLF-HF Receivers R&S EK 896

Display:
- Level or tuning display
- Channel number display
- Bandwidth display
- BFO frequency display
- Frequency display
- Function or menu asignment for softkes or status display (CM, BIT) or installed option display or software display
- Control type and time display
- Modulation mode display

16 Softkeys:
- Activate a function
- Calls up a menu

27 Numerical keypad

Entry of:
- frequency
- channel number
- BFO frequency
- DGC value
- frequency offset
- start frequency
- stop frequency
- increment
- channel
- start channel
- stop channel
- dwell time
- hold time
- slave address
- IF frequency
- password

22 RF control:

Alters the control voltage

low control voltage:

turn counter-clockwise

1 Cursor keys:

← Increases increment

→ Decreases increment

Increase of frequency or channel number:

turn clockwise

- Activate the freely programmed increment

18 AF control:

Alters the volume

low volume:

turn counter-clockwise

33 Key POWER:

Switches receiver on or off

LED on: receiver switched on

34 Tuning knob:
- LED FRQ on: alters the frequency
- LED CH on: alters the channel number
- LED BFO on: alters the BFO frequency
- LED NOTCH PBT on: alters the frequency offset or notch filter frequency

Increase of frequency or channel number:
- turn clockwise

28 Key BFO:

LED on: BFO frequency change is enabled

29 Key NOTCH PBT:

LED on: frequency offset change and notch filter frequency change are enabled

32 Key FREQ:

LED on: frequency change is enabled

31 Key CH:

LED on: channel number change is enabled

24 Key CLR:
- Clears an entry
- LED NOTCH PBT on: resets frequency offset to zero

25 Key ENT:
- Confirm an entry
- Calls up the separate function menu 1

15 Key MENU:

Return to the next higher level

Fig. 3.2 Control and Display Elements of VLF-HF Receivers R&S EK 895 (Local)

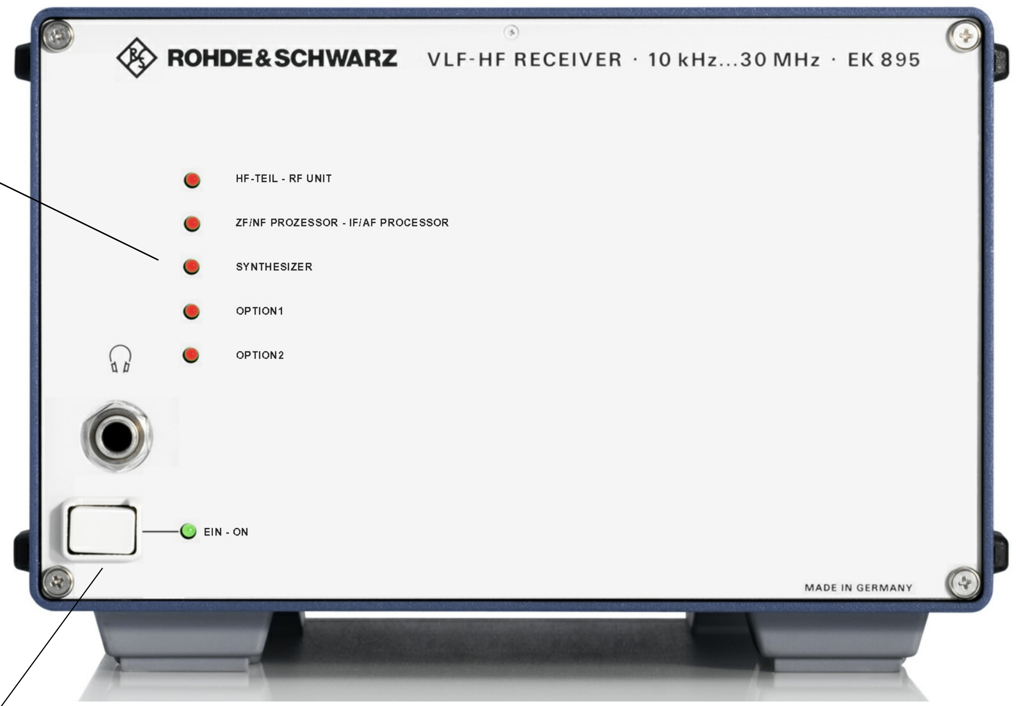
6 **<u>LED HF-Teil - RF UNIT:</u>**
LED on:
- LED test (by power on or BIT)
- Module RF unit defective

5 **<u>LED ZF/NF PROZESSOR - IF/AF PROCESSOR:</u>**
LED on:
- LED test (by power on or BIT)
- Module IF/AF processor defective

4 **<u>LED SYNTHESIZER:</u>**
LED on:
- LED test (by power on or BIT)
- Module synthesizer defective

3 **<u>LED OPTION1:</u>**
LED on:
- LED test (by power on or BIT)
- Module in plug-in slot 1 defective

2 **<u>LED OPTION2:</u>**
LED on:
- LED test (by power on or BIT)
- Module in plug-in slot 2 defective



1 **<u>Key POWER:</u>**
Switches receiver on or off
LED on: receiver switched on

Fig. 3.3 Control and Display Elements of VLF-HF Receivers R&S EK 895 (Remote)

Fig. 3.4 Structure of Software for VLF-HF Receiver R&S EK 895

Fig. 3.5 Structure of Software for VLF-HF Receiver R&S EK 896

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4. Maintenance and Troubleshooting

4.1 Maintenance

4.1.1 General

The VLF-HF Receivers R&S EK 895 and R&S EK 896 do not require any scheduled maintenance works.

The following text deals with service measures which might be necessary.

Service measures comprise cleaning and repair of paint blemishes on the unit. For this purpose the following material is required.

No.	Description
1	Soft brush
2	Duster
3	Isopropyl alcohol
4	Lacquer, light gray, RAL 7035

4.1.2 Cleaning

WARNING

- ***Beware of risk of explosion when using isopropyl alcohol.***

  Make sure to work in a well ventilated room when cleaning with isopropyl alcohol.

- ***Wear goggles when working with compressed air in order to avoid any eye injury.***

CAUTION

- ***Direct compressed air first towards ground until no more condensed water is contained in the air jet.***
- ***Keep a minimum distance of 20 cm between compressed air and unit.***

1. First of all clean outside of the unit with compressed air.
2. Continue cleaning with a soft brush or a duster.
3. Clean heavily contaminated surfaces, especially grease stains, with a soft, lint-free cloth soaked in isopropyl alcohol.
4. Clean open printed circuit board carefully with soft brush and / or compressed air.

4.1.3 Retouching Paint Blemishes

Retouch blemishes on the paint work of the VLF-HF receiver as follows:

1. Remove any loose paint particles from the area of repair.
2. Clean area to be retouched with a soft, lint-free cloth soaked in isopropyl alcohol.
3. Wait for the isopropyl alcohol to dry out.
4. Retouch with paint carefully and allow plenty of time to dry out.
5. Once the first coat is completely dry, apply a second coat and again allow it to dry. Retouching is thus completed.

4.2 Troubleshooting

Note:

Under normal operating conditions the lithium battery in the processor of the VLF-HF receivers has a service life of at least 5 years. Replacing the battery at regular intervals is therefore not required. If, however, the basic receiver settings last stored are not reactivated after switch-on and the channels only contain default values, a battery discharge must be suspected. In this case measure the battery voltage by means of a high-impedance voltmeter. Make the required preparations in line with 4.3.5.1, as necessary. The nominal no-load voltage is approx. 3.6 VDC. For voltages below 3.0 VDC the battery must be replaced.

4.2.1 Lists of Faults

4.2.1.1 CM Messages

No.	Fault message	Possible causes of fault
1	GO	no fault
2	SYNTH NOGO	• Phase-locked loop (40 MHz) not synchronizing • Phase-locked loop (5.66 MHz) not synchronizing • Oscillator level of 2:1 divider (5.66 MHz) < nominal value • Phase-locked loops (1st osc.) not synchronizing
3	IF AF NOGO	• 20-MHz signal missing • Oscillator level of 100:1 divider (200 kHz) missing • Oscillator level of 50:1 divider (400 kHz) missing • Oscillator level of 10:1 divider (2 MHz) missing • Phase-locked loop not synchronizing • Digital signal processor signals a fault via watchdog line • HF input inhibited due to overload
4	SYNTH + IF AF NOGO	see 1 and 2

Note:

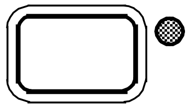
As soon as a CM message appears on the display, carry out the built-in equipment test acc. to 4.2.2.4.

4.2.1.2 BIT Messages

No.	Fault message	Measure
1	GO	
2	SYNTH NOGO	Replace synthesizer acc. to 4.3.6.
3	SYNTH MISSING	Install synthesizer acc. to 4.3.6.
4	RF UNIT NOGO	Replace HF unit acc. to 4.3.7.
5	RF UNIT MISSING	Install HF unit acc. to 4.3.7.
6	IF / AF NOGO	Replace IF / AF processor acc. to 4.3.9.
7	IF / AF MISSING	Install IF / AF processor acc. to 4.3.9.
8	PROC UNIT NOGO	Replace modules one after another until the fault has been eliminated. If by this measure the fault cannot be found, send the entire receiver for repair.
9	FAILED	Actuate key MENU and switch receiver to local operation acc. to 3.1.18.7. Then switch receiver off and on again.
10	IF CONV NOGO	Replace optional IF Converter R&S UX 895 acc. to 4.3.13.

4.2.2 Troubleshooting with Control Unit 2 "LOCAL" (R&S EK 895, = Option 'Control Unit R&S GB 890') or Control Unit (R&S EK 895)

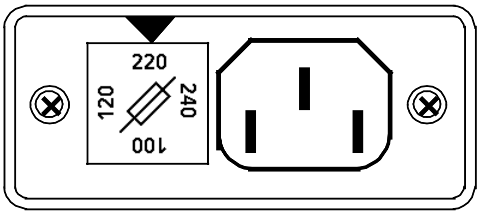
4.2.2.1 Fault Recognition Through Switch-on



By switching on the VLF-HF receiver the primary circuit is closed. The LED POWER is illuminated, if the power supply module works perfectly (→ CM display).

→ LED POWER is illuminated.

If the LED is not illuminated,



Fuse:

100 / 120 V: IEC 127 - T1.25/250 V
220 / 240 V: IEC 127 - T630/250 V

- but otherwise the receiver operates impeccably, send the control unit for repair as soon as possible (→ LED defective).
- check fuse and replace, if necessary. For this purpose undo fuse holder.
- check cabling on interface X67. If necessary, close open connection or replace mains cable.
- replace power supply module acc. to 4.3.8.

Upon switching on the receiver, the entire RAM contents are automatically checked (→ initialization). Unpermitted settings are replaced by a default value. If overwriting with a default value takes place in a channel, this channel is additionally inhibited.

Inhibited channels cannot be called up in the operating modes CHANNEL, CHANNEL SCANNING and FIXED CHANNEL. Via the channel manipulation menu, reactivation of inhibited channels is possible. In case inhibited channels are called up via the channel manipulation menu, the display UNUSED appears.

After initialization, the LCD illumination is switched on.

→ LCD is illuminated

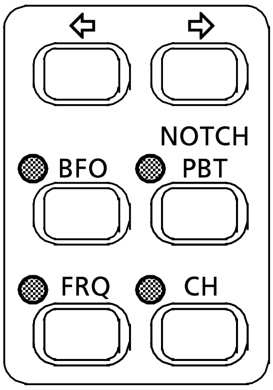
If the LCD is not illuminated,

- replace control unit 2 "LOCAL" (R&S EK 895, = 'Control Unit R&S GB 890') acc. to 4.3.3

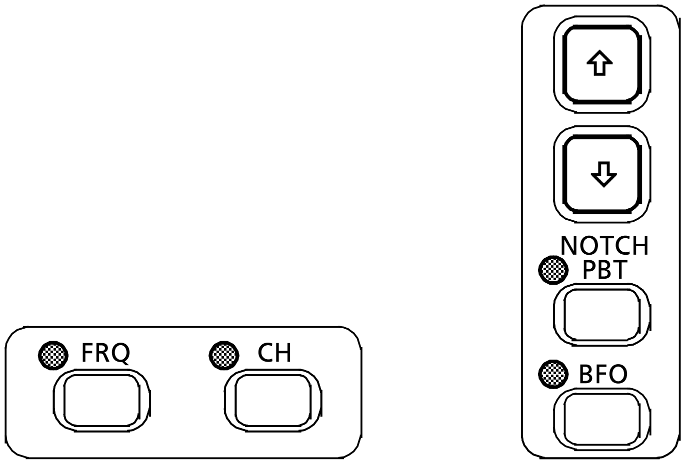
or

- replace control unit (R&S EK 896) acc. to 4.3.4.

Via the LED test, functioning of the LEDs FRQ, BFO, CH and PBT / NOTCH is checked.



(R&S EK 895)



(R&S EK 896)

→ All LEDs are illuminated.

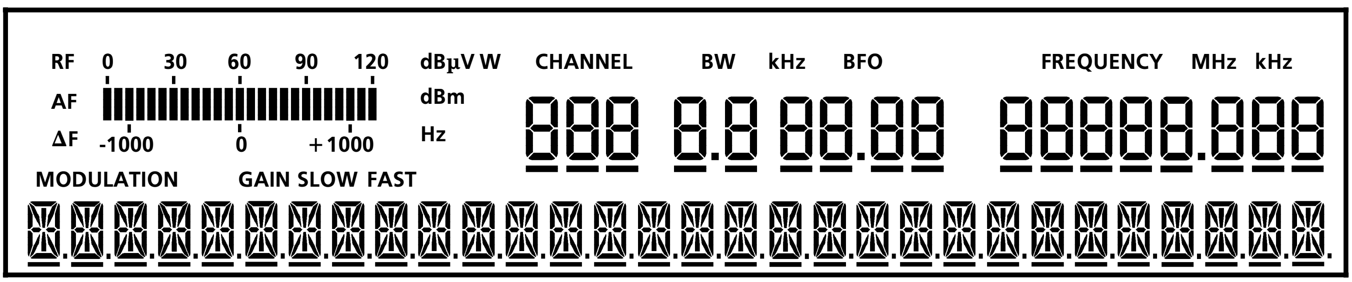
As soon as one of the LEDs is not illuminated,

- replace control unit 2 "LOCAL" (R&S EK 895, = 'Control Unit R&S GB 890') acc. to 4.3.3

or

- replace control unit (R&S EK 896) acc. to 4.3.4.

In the LCD test, functioning of the LCD is checked.



→ All display elements are illuminated.

As soon as one display element is not illuminated,

- replace control unit 2 "LOCAL" (R&S EK 895, = 'Control Unit R&S GB 890') acc. to 4.3.3

or

- replace control unit (R&S EK 896) acc. to 4.3.4.

The built-in equipment test (BIT, see 4.2.2.4) is initiated.

Once the BIT is terminated successfully, the last basic receiver setting will be reactivated and the main menu (see Fig. 4.7 [R&S EK 895] or Fig. 4.8 [R&S EK 896]) will be displayed.

In the operating mode FIXED CHANNEL the display CHANNEL MODE EXIT will appear instead of the main menu.

→ If a BIT message is displayed, eliminate the fault acc. to 4.2.1.2.

If the receiver does not work and the faulty module is not indicated by the appropriate fault message, replace the following modules and options, if available, one after another until the fault is eliminated:

- Replace processor acc. to 4.3.5.
- Replace optional 'TTY Line Current Source R&S GH 890' acc. to 4.3.10.
- Replace optional 'BCD Interface R&S GC 890' acc. to 4.3.11.
- Replace optional 'Preselection R&S FK 890H1' acc. to 4.3.12.
- Replace optional 'IF Processor R&S GM 893' acc. to 4.3.14.
- Replace optional 'Digitally Tuned RF Selector R&S FK 896D' acc. to 4.3.15..

4.2.2.2 Automatic Fault Recognition During Operation

Within the synthesizer the phase-locked loops for the

- 40-MHz signal (required for conversion of the 1st IF into the 2nd IF and as system clock for the IF / AF processor),
- 1st oscillator signal (required for conversion of the receive frequency into the 1st IF) and the
- 5.66-MHz signal (required as auxiliary frequency for the IF / AF processor)

as well as the oscillator level of the 2:1 divider (5.66 MHz) are continuously monitored.

Within the IF / AF processor the oscillator levels for the

- 100:1 divider (200 kHz),
- 50:1 divider (400 kHz) and the
- 10:1 divider (2 MHz)

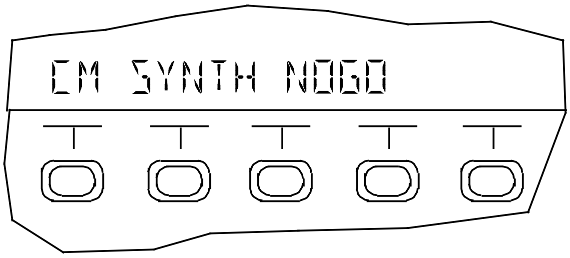
as well as for the phase-locked loop and the watchdog of the digital signal processor are continuously monitored. In addition, the HF input is continuously monitored for overloading (overvoltage and overcurrent).

Note:

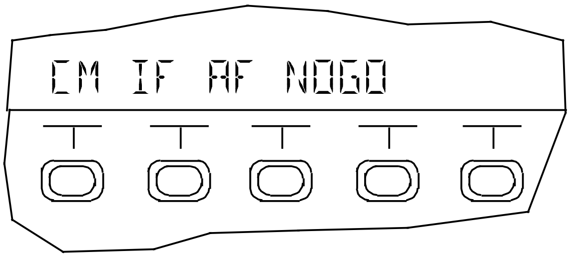
The CM status can be inquired acc. to 4.2.2.3.

If during operation the CM status changes, the display changes as follows:.

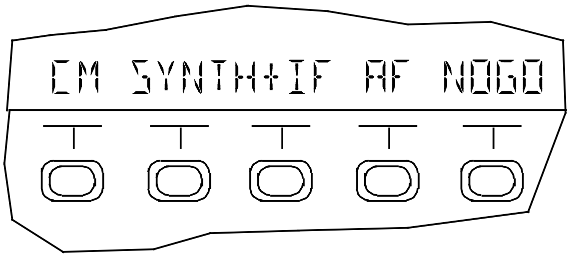
Synthesizer defective



or IF / AF processor defective



or both synthesizer and IF / AF processor defective



- Carry out BIT acc. to 4.2.2.4.
- In fixed channel operation, actuate key MENU and switch receiver over to local operation acc. to 3.1.18.7. Then carry out BIT acc. to 4.2.2.4.

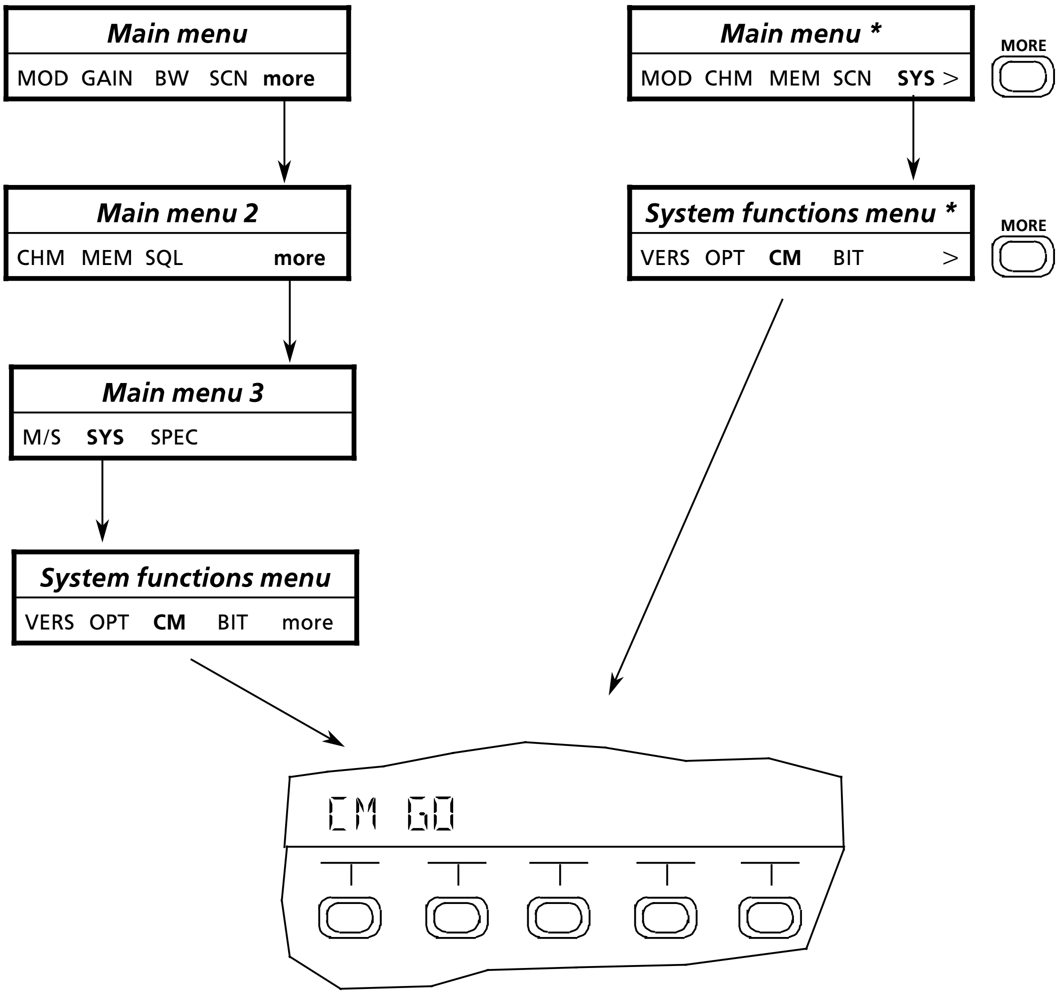
4.2.2.3 Fault Recognition During Operation by Inquiry of the CM Status

R&S EK 895

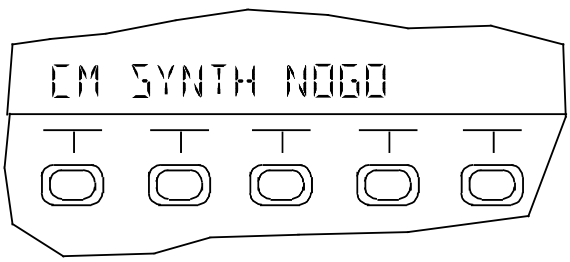
Actuate softkeys MORE, MORE, SYS and CM.

R&S EK 896

Actuate softkeys SYS and CM.



or in case of a fault, e.g. synthesizer defective



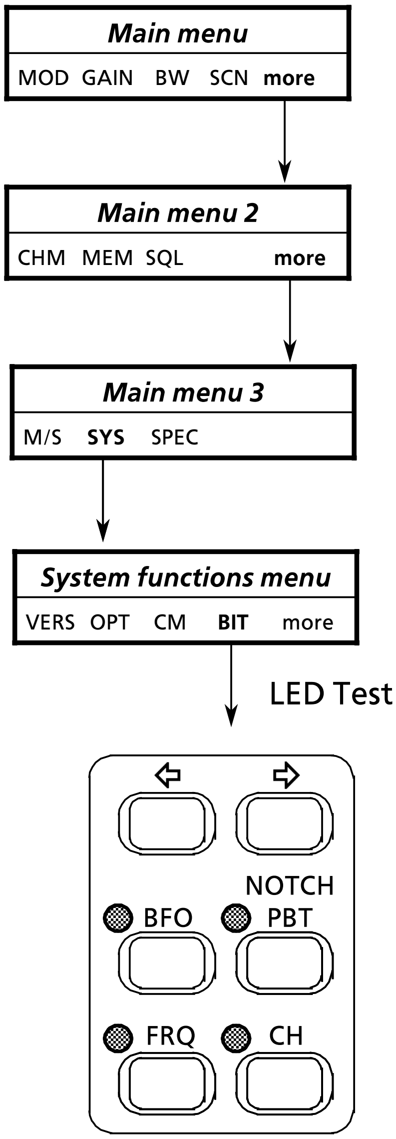
If the message CM GO fails to be indicated,

- carry out BIT acc. to 4.2.2.4.

4.2.2.4 Fault Recognition During Operation by Initiation of the BIT

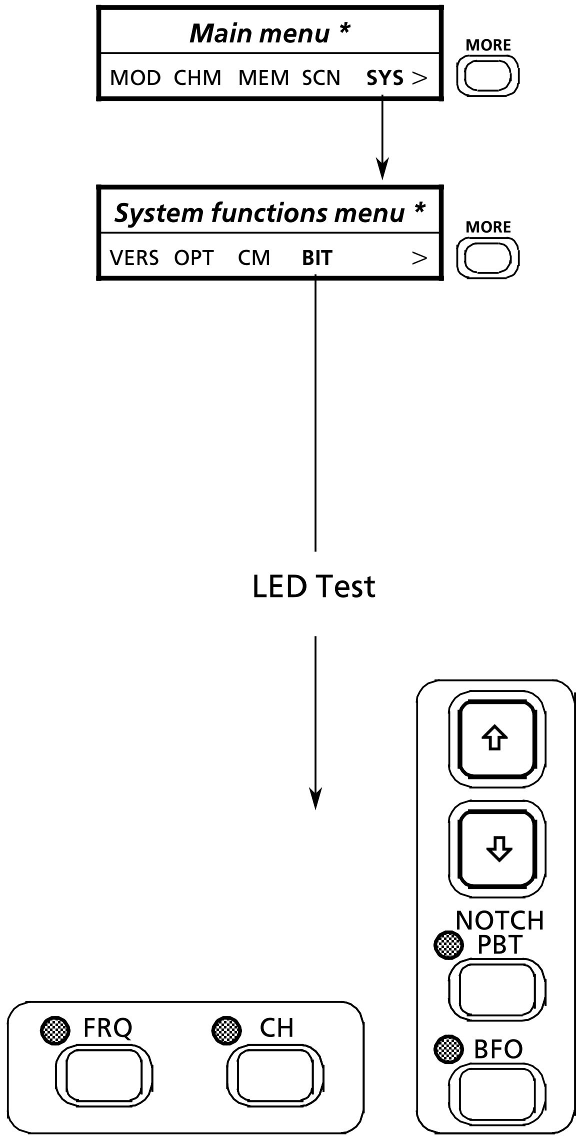
R&S EK 895

Actuate softkeys MORE, MORE, SYS and BIT.



R&S EK 896

Actuate softkeys SYS and BIT.



Via the LED test the function of LEDs FRQ, BFO, CH and PBT / NOTCH is checked.

→ All LEDs are illuminated.

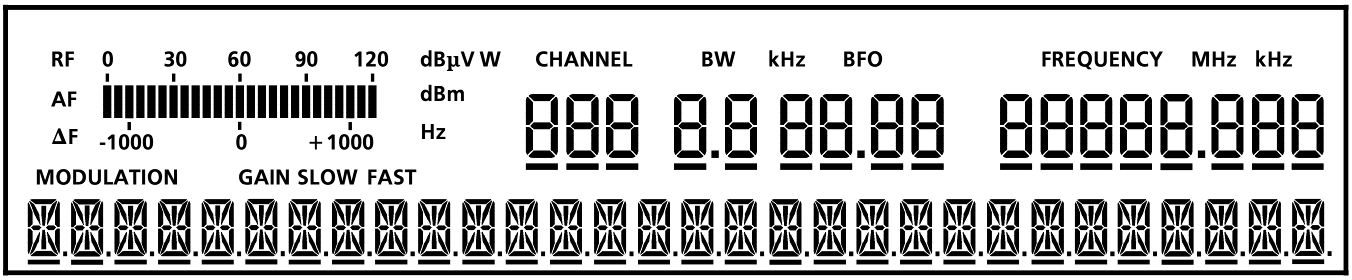
As soon as one of the LEDs fails to be illuminated,

- replace control unit 2 "LOCAL" (R&S EK 895, = option 'Control Unit R&S GB 890') acc. to 4.3.3

or

- replace control unit (R&S EK 896) acc. to 4.3.4.

Via the LCD test, the function of the LCD is checked.



→ All display elements are illuminated.

As soon as one of the display elements fails to be illuminated,

- replace control unit 2 "LOCAL" (R&S EK 895, = option 'Control Unit R&S GB 890') acc. to 4.3.3

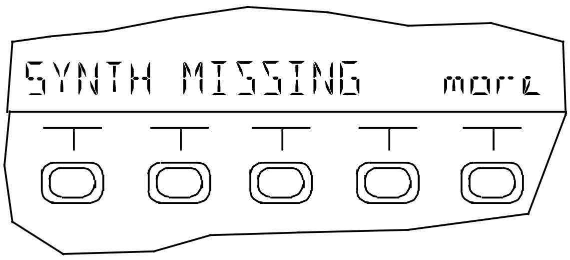
or

- replace control unit (R&S EK 896) acc. to 4.3.4.

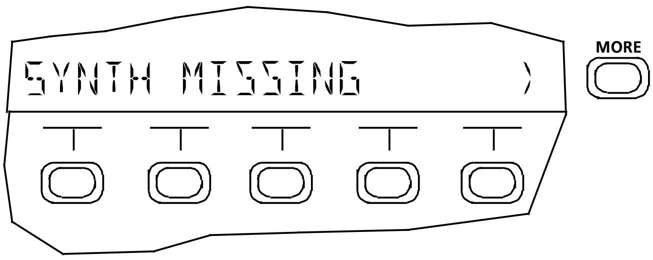
In the BIT it is first checked whether the synthesizer, HF unit and IF / AF processor are installed.

Missing modules are indicated by the respective message. If more than one module is missing, indication of the others missing is possible by actuating softkey MORE (R&S EK 895) or key MORE (R&S EK 896).

Example: synthesizer missing



for R&S EK 895



for R&S EK 896

If the message SYNTH MISSING is displayed,

- install synthesizer acc. to 4.3.6.

If the message RF UNIT MISSING appears,

- install HF unit acc. to 4.3.7.

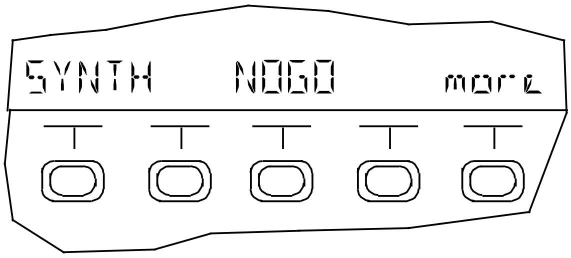
If the message IF / AF MISSING appears,

- install IF / AF processor acc. to 4.3.9.

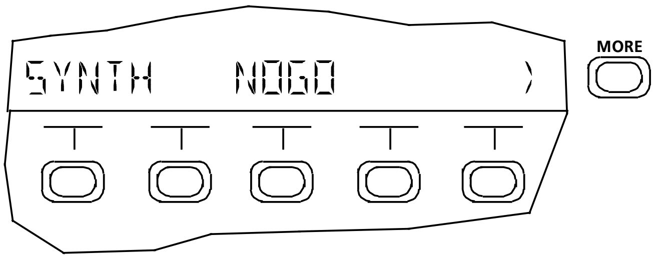
Subsequently, a 100-kHz test signal instead of the antenna signal is fed into the receive path and the receiver is set to a receive frequency of 100 kHz. The processor evaluates the BIT messages (BIT criterion) from the HF unit (DC voltage of the IF amplifier for the 2nd IF) as well as the CM messages from the synthesizer (phase-locked loops and oscillator level of the 2:1 divider) and the IF / AF processor (oscillator levels of various dividers, phase-locked loop, 20-MHz signal, watchdog of the DSP and overload at the HF input).

Example: synthesizer defective

Defective modules are indicated by the message NOGO. If more than one module is defective, indication of the other defective ones is possible by actuation of softkey MORE (R&S EK 895) or key MORE (R&S EK 896).



for EK 895



for EK 896

If the message SYNTH NOGO is displayed,

- replace synthesizer acc. to 4.3.6.

If the message RF UNIT NOGO is displayed,

- replace HF unit acc. to 4.3.7.

If the message IF / AF NOGO is displayed,

- replace IF / AF processor acc. to 4.3.9.

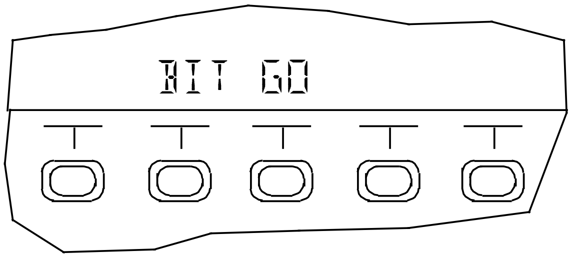
If the message PROC UNIT NOGO is displayed,

- replace modules one after the other until fault is eliminated. If the fault cannot be remedied by this measure, send the entire VLF-HF receiver for repair.

If the message IF CONV NOGO is displayed,

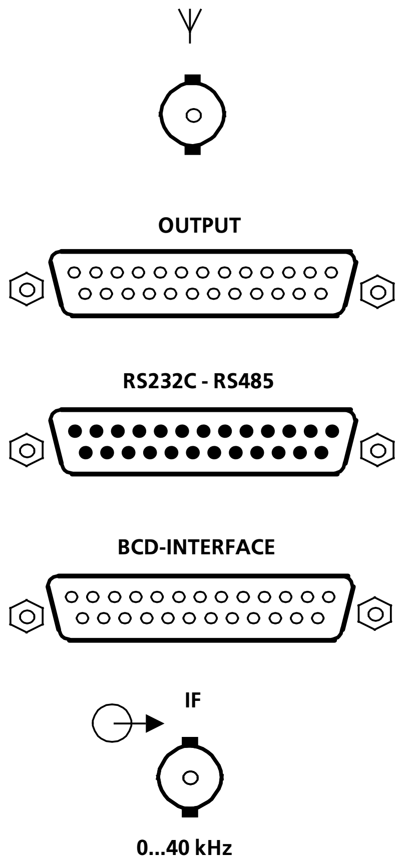
- replace optional IF Converter R&S UX 895 acc. to 4.3.13.

When the BIT has been successful, the display BIT GO will appear.



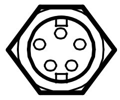
If the fault cannot be pinpointed to one of the modules synthesizer, HF unit or IF / AF processor, replace the following modules, if available, one after another and check the cabling until the fault is eliminated:

- Replace processor acc. to 4.3.5.
- Replace option 'TTY Line Current Source R&S GH 890' acc. to 4.3.10.
- Replace option 'BCD Interface R&S GC 890' acc. to 4.3.11.
- Replace option 'Preselection R&S FK 890H1' acc. to 4.3.12.
- Replace option 'IF Processor R&S GM 893' acc. to 4.3.14.
- Replace option 'Digitally Tuned RF Selector R&S FK 896D' acc. to 4.3.15.

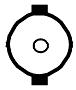


- Check cabling on interface X65. If necessary, close open connection and / or replace antenna cable.
- Check cabling on interface X66. If necessary close open connection and / or replace line cable.
- Check cabling on interface X63. If necessary, close open connection and / or replace control cable.
- Check cabling on interface X89. If necessary, close open connections or replace control cable.
- Check cabling on interface X64. If necessary, close open connections or replace RF cable.

IF DIGITAL



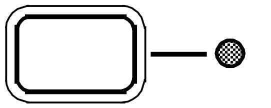
- Check cabling on interface X69. If necessary, close open connection or replace control cable.



Option

- Check cabling on interface X68. If necessary, close open connection or replace RF cable.

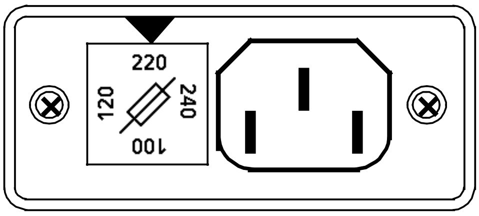
4.2.3 Troubleshooting with Control Unit 1 ”REMOTE” (R&S EK 895 only)



By switching on the VLF-HF receiver the primary current circuit is closed.

The LED ON is illuminated to indicate that the power supply is functioning properly (→ CM indication).

→ LED ON is illuminated.



Fuse:

100 / 120 V: IEC127 - T1.25/250 V
220 / 240 V: IEC127 - T630/250 V

If the LED is not illuminated,

- but otherwise the receiver operates impeccably, send the power supply module for repair as soon as possible (→ LED defective).
- check fuse and replace, if necessary. For this purpose undo fuse holder.
- check cabling on interface X67. If necessary, close open connection or replace mains cable.
- replace power supply module acc. to 4.3.8.

Upon switching on the receiver, the entire RAM contents are automatically checked (→ initialization). Unpermitted settings are replaced by a default value. If overwriting with a default value takes place in a channel, this channel is additionally inhibited.

Inhibited channels cannot be called up in the operating mode CHANNEL SCANNING. Via the channel manipulation menu, reactivation of inhibited channels is possible.

Via the LED test, functioning of the LEDs RF UNIT, IF / AF PROCESSOR, SYNTHESIZER, OPTION 1 and OPTION 2 is checked.

→ All LEDs are illuminated.

HF-TEIL ▪ RF UNIT

ZF / NF PROZESSOR ▪ IF / AF PROCESSOR

SYNTHESIZER

OPTION 1

OPTION 2

As soon as one of the LEDs is not illuminated,

- replace control unit 1 "REMOTE" acc. to 4.3.2.

In the BIT it is first checked whether the modules synthesizer, HF unit and IF / AF processor are installed.

Subsequently, a 100-kHz test signal instead of the antenna signal is fed into the receive path and the receiver is set to a receive frequency of 100 kHz. The processor evaluates the BIT messages (BIT criterion) from the HF unit (DC voltage of the IF amplifier for the 2nd IF) as well as the CM messages from the synthesizer (phase-locked loops and oscillator levels of various dividers, phase-locked loop, 20-MHz signal, watchdog of the DSP and overload at the HF input).

A defective module is indicated by illumination of the respective LED.

If the LED SYNTHESIZER is illuminated,

- replace synthesizer acc. to 4.3.6.

If the LED RF UNIT is illuminated,

- replace HF unit acc. to 4.3.7.

If the LED IF / AF PROCESSOR is illuminated,

- replace IF / AF processor acc. to 4.3.9.

Example: synthesizer defective

HF-TEIL ▪ RF UNIT

ZF / NF PROZESSOR ▪ IF / AF PROCESSOR

SYNTHESIZER

OPTION 1

OPTION 2

If all LEDs are illuminated,

- replace modules one after the other until fault is eliminated. If the fault cannot be remedied by this measure, send the entire VLF-HF receiver for repair.

When the BIT has been successful, the LEDs RF UNIT, IF / AF PROCESSOR, SYNTHESIZER, OPTION 1 and OPTION 2 are dark.

If the receiver does not work and the defective module is not indicated by illumination of the respective LED, replace the following modules and options, if available, one after another and check the cabling until the fault is eliminated:

- Replace processor acc. to 4.3.5.
- Replace option 'TTY Line Current Source R&S GH 890' acc. to 4.3.10.
- Replace option 'BCD Interface R&S GC 890' acc. to 4.3.11.
- Replace option 'Preselection R&S FK 890H1' acc. to 4.3.12.
- Replace option 'IF Converter R&S UX 895' acc. to 4.3.13.
- Replace option 'IF Processor R&S GM 893' acc. to 4.3.14.
- Replace option 'Digitally Tuned RF Selector R&S FK 896D' acc. to 4.3.15.
- Check cabling on interface X65. If necessary, close open connection and / or replace antenna cable.
- Check cabling on interface X66. If necessary close open connection and / or replace line cable.
- Check cabling on interface X63. If necessary, close open connection and / or replace control cable.

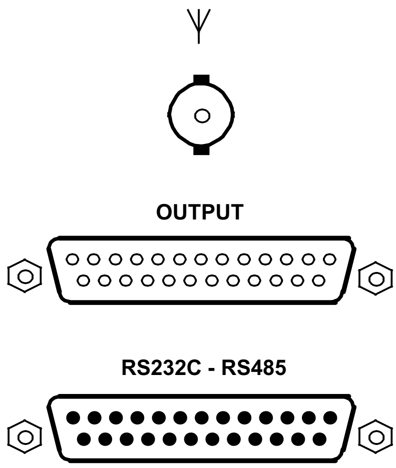
HF-TEIL · RF UNIT

ZF / NF PROZESSOR · IF / AF PROCESSOR

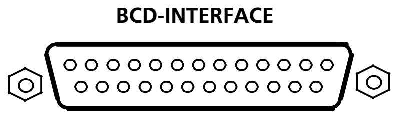
SYNTHESIZER

OPTION 1

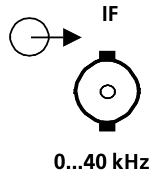
OPTION 2



- Check cabling on interface X89. If necessary, close open connections or replace control cable.

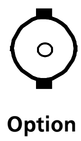


- Check cabling on interface X64. If necessary, close open connections or replace RF cable.



- Check cabling on interface X69. If necessary, close open connection or replace control cable.

- Check cabling on interface X68. If necessary, close open connection or replace RF cable.



4.2.4 Troubleshooting with a Computer

In the case that the VLF-HF receiver is remotely controlled, the troubleshooting can be carried out by making use of the control program stored in the computer (see software manual).

If the control program does not cover one of the functions CM and BIT, troubleshooting is also possible through use of the remote control commands on the DOS level (see appendix A3).

4.2.5 Simple Measurements

4.2.5.1 Required Test Equipment

• Audio Analyzer	R&S UPA	372.6014.02
• Distortion Meter	R&S UPA-B8	373.1616.02
• Signal Generator	R&S SMX	826.4517.02

4.2.5.2 Preparations

1. Switch off the VLF-HF receiver.
2. Disconnect RF cable from antenna socket.
3. Disconnect AF line from female connector strip OUTPUT.
4. Connect signal generator to antenna socket.
5. Connect audio analyzer to contacts X66.1 (AFa) and X66.2 (AFb).
6. Switch on VLF-HF receiver, signal generator and audio analyzer.

4.2.5.3 Sensitivity

1. Make preparations acc. to 4.2.5.2.
2. On VLF-HF receiver set modulation mode USB.
3. On signal generator set a level of 1 mV_{EMF}.
4. On signal generator vary the frequency in the range between 1.5 and 30 MHz. At the same time set the VLF-HF receiver to the relevant signal generator frequency.
5. By means of audio analyzer measure the sensitivity.

   Nominal value: $\geq$ 10 dB (SINAD)

6. Carry out the steps of 4.2.5.2 in the reverse order.

4.2.5.4 Automatic Gain Control

1. Make preparations acc. to 4.2.5.2.
2. On VLF-HF receiver set modulation mode USB and a frequency of 5.100 MHz.
3. On signal generator set a frequency of 5.101 MHz and a level of 1 V_{EMF}.
4. By means of audio analyzer measure AF level (= value 1).
5. On signal generator reduce the level to 1 mV_{EMF}.
6. By means of audio analyzer measure AF level (= value 2).

   Nominal value: difference between value 1 and 2 $<$ 3 dB

7. Carry out the steps of 4.2.5.2 in the reverse order.

4.2.5.5 Signal-to-Noise Ratio

1. Make preparations acc. to 4.2.5.2.
2. On VLF-HF receiver set modulation mode USB, a bandwidth of 2700 Hz and a frequency of 5.100 MHz.
3. On signal generator set a frequency of 5.101 MHz and a level of 1 V_{EMF}.
4. By means of audio analyzer measure signal-to-noise ratio.

   Nominal value: $>$ 46 dB (SINAD)

5. On VLF-HF receiver set modulation mode LSB.
6. On signal generator set a frequency of 5.099 MHz.
7. By means of audio analyzer measure signal-to-noise ratio.

   Nominal value: $>$ 46 dB (SINAD)

6. Carry out the steps of 4.2.5.2 in the reverse order.

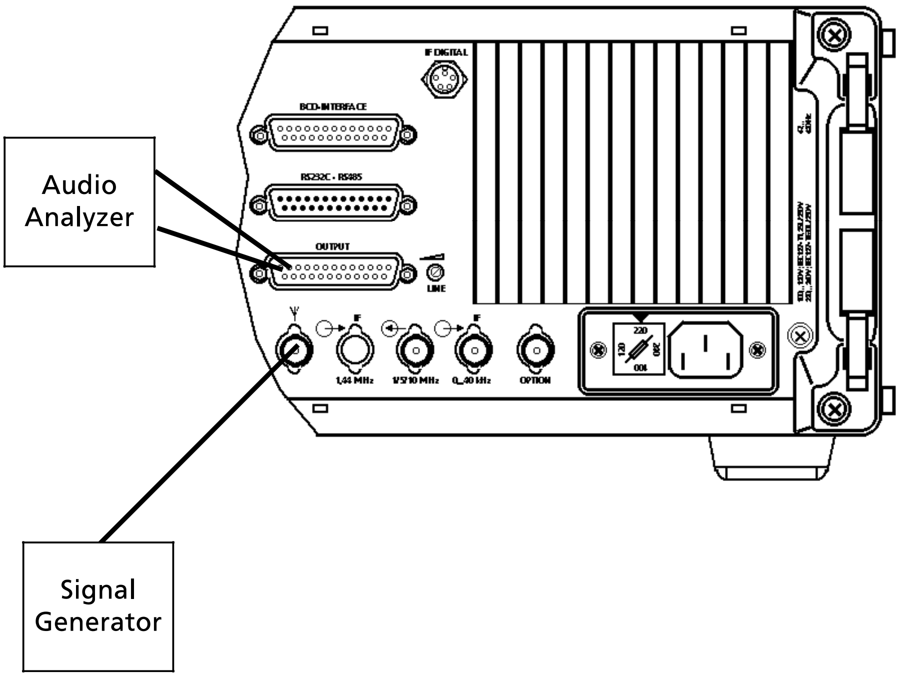


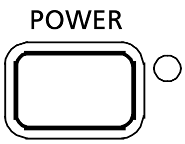
Fig. 4.1 Test Setup

4.3 Replacement of Modules

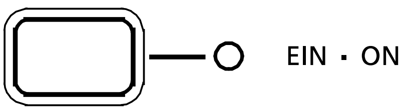
4.3.1 Preparations

1. Switch off VLF-HF receiver.

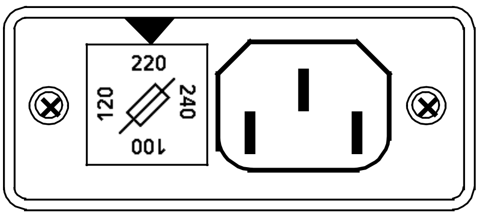
→ LED POWER is dark
(control unit 2 "LOCAL" (R&S EK 895, = option 'Control Unit R&S GB 890') or control unit (R&S EK 896)).



→ LED ON is dark
(control unit 1 "REMOTE" (R&S EK 895))



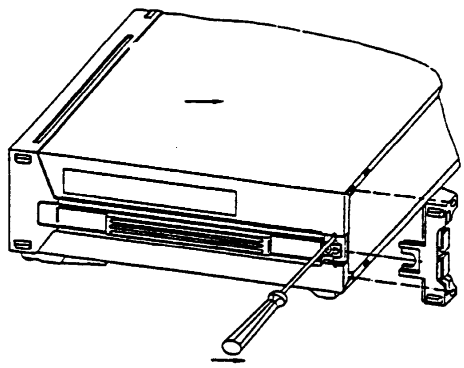
2. Disconnect mains cable from plug X67.



3. Undo and remove four screws (1, Fig. 4.10 (R&S EK 895) or Fig. 4.11 (R&S EK 896)) fixing the rear panel stands.

4. Remove rear panel stands.

5. By means of a screw driver remove top and bottom hoods.



6. After replacement of modules proceed in the reverse order of steps 3 to 5.

4.3.2 Control Unit 1 "REMOTE" (R&S EK 895)

Removal

1. Make preparations acc. to 4.3.1.
2. Undo and remove four screws (1a, Fig. 4.8) fixing the control unit 1.
3. Carefully pull control unit 1 out to the front until male connector X20 (see Fig. 4.2) becomes accessible.
4. Push off locking devices on left and right.
5. Pull off female connector strip.
6. Pull control unit 1 completely out and remove.

Installation

Installation is to be carried out in the reverse order of removal.

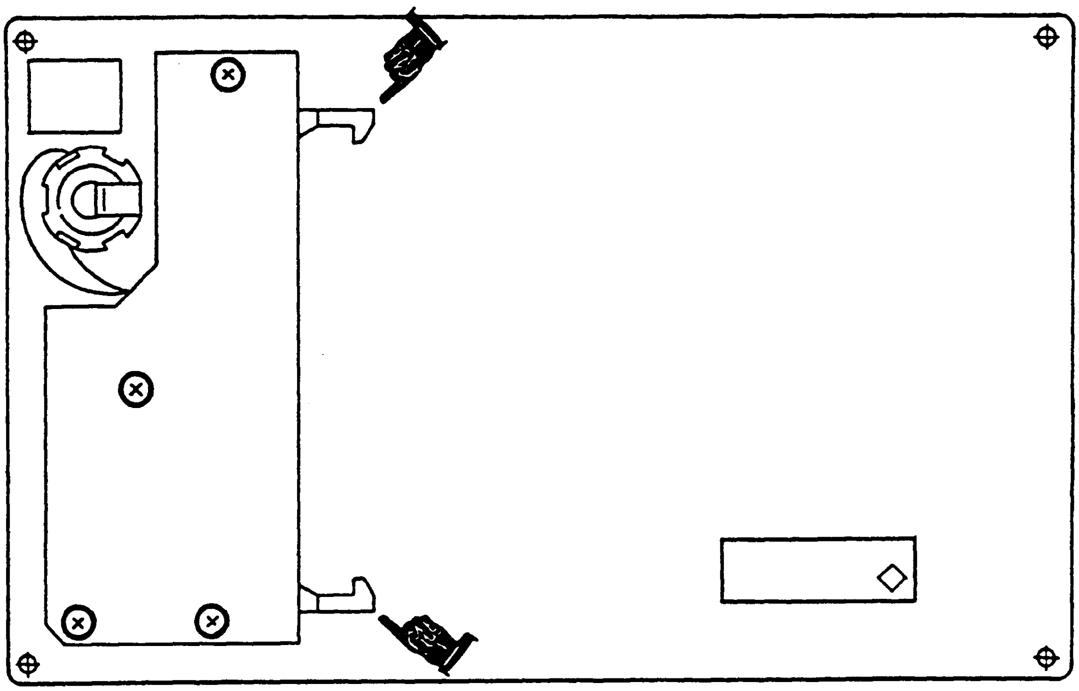


Fig. 4.2 Location of Connector X20 (Control Unit 1)

4.3.3 Control Unit 2 "LOCAL" (R&S EK 895,= Option 'Control Unit R&S GB 890')

Removal

1. Make preparations acc. to 4.3.1.
2. Undo and remove four screws (1b, Fig. 4.8) fixing control unit 2.
3. Carefully pull control unit 2 out to the front until male connector X20 (see Fig. 4.3) becomes accessible.
4. Push off locking devices on left and right.
5. Pull off female connector.
6. Pull control unit 2 completely out and remove.

Installation

Installation is to be carried out in the reverse order of removal.

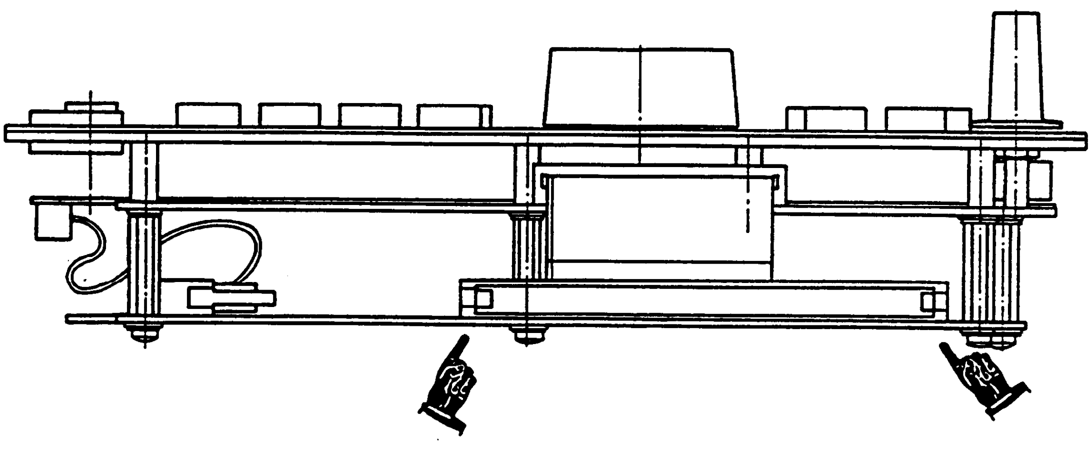


Fig. 4.3 Location of Connector X20 (Control Unit 2)

4.3.4 Control Unit (R&S EK 896)

Removal

1. Make preparations acc. to 4.3.1.
2. Undo and remove four screws (see Fig. 4.9) fixing the control unit.
3. Carefully pull control unit out to the front until male connector X20 (see Fig. 4.4) and male connector strip X5 become accessible.
4. Disconnect female connector from X20.
5. Disconnect female connector from 3-way male connector X5.
6. Pull control unit completely out and remove.

Installation

Installation is to be carried out in the reverse order of removal.

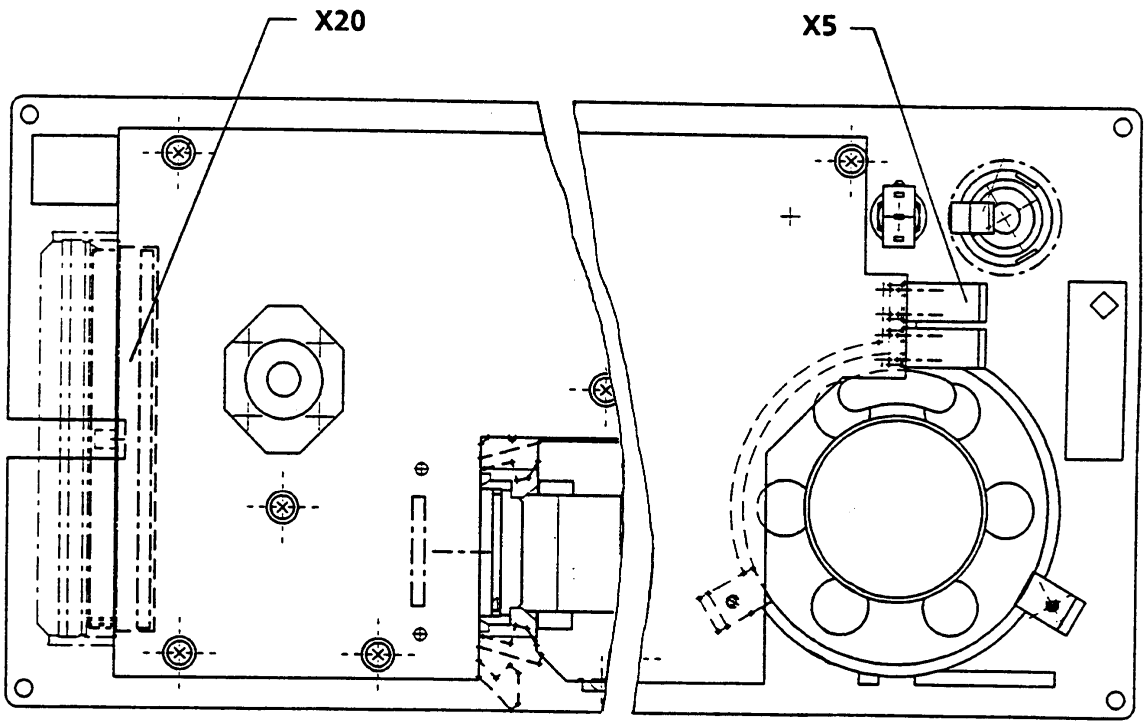


Fig. 4.4 Location of Connectors X5 and X20 (Control Unit)

4.3.5 Processor

Removal

1. Make preparations acc. to 4.3.1.
2. Open yellow extracting levers on processor (see Fig. 4.12 (R&S EK 895) or Fig. 4.13 (R&S EK 896)).
3. Pull out processor by taking hold of yellow levers.

Installation

Installation is to be carried out in the reverse order of removal.

4.3.5.1 Replacement of Back-up Battery

1. Remove processor acc. to 4.3.5.
2. Undo and remove ten screws fixing screw top to components side.
3. Remove screw top.
4. Open cable binder.
5. Unsolder back-up battery (Fig. 4.5) and remove.

   Note:

   Replaced lithium batteries are special waste and should be disposed of accordingly.
6. Replace old cable binder by a new one (DZ 015.9038).
7. Remove old soldering tin from soldering tags and apply new solder.
8. Solder in new battery (EB 565.1687).

CAUTION

Make sure that correct polarity is kept.

9. Secure battery by means of cable binder.
10. Perform steps 1 to 3 in the reverse order.

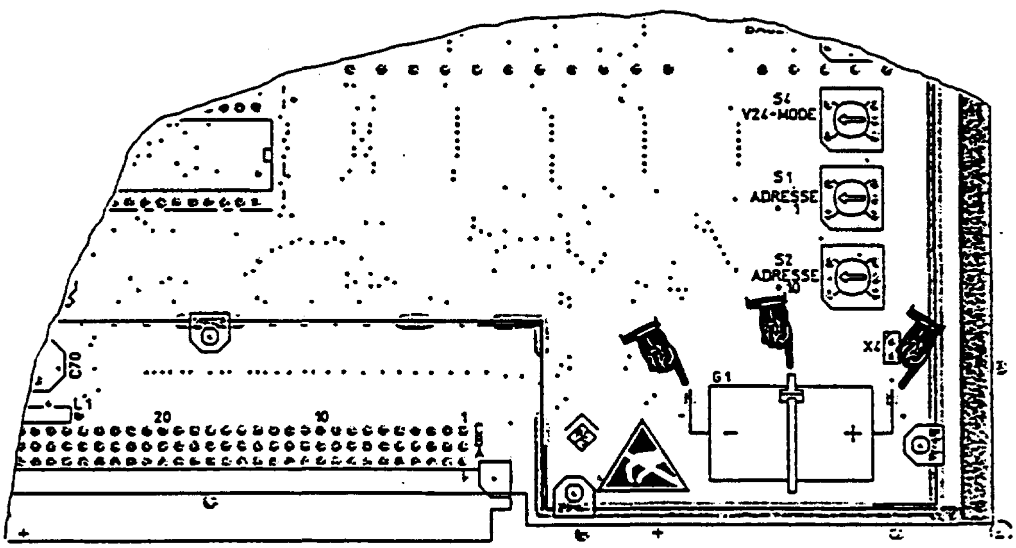


Fig. 4.5 Location of Back-up Battery

4.3.6 Synthesizer

Removal

1. Make preparations acc. to 4.3.1.

2. Pull off socket on RF cable W4 (see Fig. 4.14) connected to plug X41.

3. Without option:

   Pull off socket on RF cable W2 connected to plug X42.

   With option 'IF Processor R&S GM 893':

   Pull off socket on RF cable W21 / W25 (see Fig. 4.15) connected to plug X42.

4. Pull off socket on RF cable W3 connected to plug X43 (see Fig. 4.14).

5. Pull of socket on RF cable W6 connected to plug X44.

6. Pull off socket on RF cable W5 connected to plug X45.

7. Open blue extracting levers on synthesizer (see Fig. 4.12 (R&S EK 895) or Fig. 4.13 (R&S EK 896).

8. Pull out synthesizer by taking hold of blue levers.

Installation

Installation is to be carried out in the reverse order of removal.

4.3.7 HF Unit

Removal

1. Make preparations acc. to 4.3.1.
2. Pull off socket on RF cable W7 (see Fig. 4.14) connected to plug X51.
3. Pull off socket on RF cable W2 connected to plug X52.
4. Pull off socket on cable W3 / W15 connected to plug X53.
5. Pull off socket on RF cable W1 connected to plug X54.
6. Pull off socket on RF cable W5 connected to plug X55.
7. Open green extracting levers on HF unit (see Fig. 4.12 (R&S EK 895) or Fig. 4.13 (R&S EK 896)).
8. Pull out HF unit by taking hold of green levers.

Installation

Installation is to be carried out in the reverse order of removal.

4.3.8 Power Supply

Removal

1. Make preparations acc. to 4.3.1.
2. Without options:

   Pull off socket on RF cable W1 (see Fig. 4.14) connected to plug X73 (IF / AF processor).

   With option 'Preselector FK 890H1':

   Pull off socket on RF cable W1 (see Fig. 4.15) connected to plug X81 (option 'Preselector FK 890H1).

   With option 'Digital Selection R&S FK 896 or R&S FK 896D':

   Pull off socket on RF cable W1 (see Fig. 4.16) connected to plug on RF cable W101.

   With option 'IF Processor R&S GM 893':

   Pull off socket on RF cable W22 (see Fig. 4.15) connected to plug X95 (option 'IF Processor R&S GM 893').
3. Pull off socket on RF cable W8 connected to plug X72 (IF / AF processor).
4. Pull off socket on RF cable W4 connected to plug X41 (synthesizer).
5. Pull off socket on signal line connected to plug X79 (IF / AF processor).
6. For R&S EK 896: undo connector X23 (see Fig. 4.13).
7. Remove cable clamps, as necessary.
8. For R&S EK 895:

   Undo and remove four screws (2, Fig. 4.10) on the rear panel and two screws (see Fig. 4.6) fixing the power supply.

   For R&S EK 896:

   Undo and remove six screws (2, Fig. 4.11) on the rear panel and two screws (see Fig. 4.6) fixing the power supply.
9. Pull power supply carefully out to the rear until plug X60 becomes accessible.
10. Pull off female connector strip.
11. Pull power supply completely out and remove.

Installation

Installation is to be carried out in the reverse order of removal.

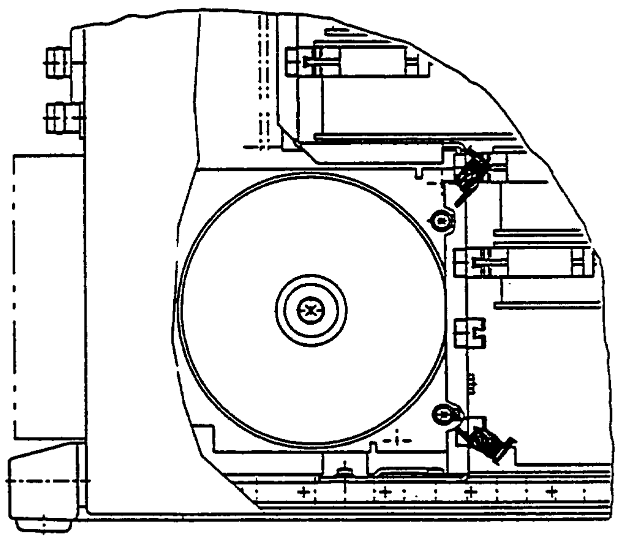


Fig. 4.6 Location of Screws

4.3.9 IF / AF Processor

Removal

1. Make preparations acc. to 4.3.1.
2. Pull off socket on RF cable W7 (see Fig. 4.14) connected to plug X71.
3. Pull off socket on RF cable W8 connected to plug X72.
4. Pull off socket on RF cable W6 connected to plug X74.
5. Pull off socket on RF cable W15 / W3 connected to plug X75.
6. Pull off socket on signal line connected to plug X79.
7. Open red extracting levers on IF / AF processor (see Fig. 4.12 (R&S EK 895) or Fig. 4.13 (R&S EK 896)).
8. Pull IF / AF processor out by taking hold of extracting levers, until plugs X73 and X74 become accessible.
9. Without options:

   Pull off socket on RF cable W1 connected to plug X73.

   With option 'Preselector R&S FK 890H1':

   Pull of socket on RF cable W13 (see Fig. 4.15) connected to plug X73.

   With option 'IF Processor R&S GM 893':

   Pull off socket on RF cable W24 (see Fig. 4.15) connected to plug X73.

   With option 'Digital Selection R&S FK 896 or R&S FK 896D':

   Pull off socket on RF cable W102 (see Fig. 4.16) connected to plug X73.
10. Pull off socket on RF cable W15 / W3 connected to plug X75.
11. Pull IF / AF processor completely out by taking hold of red extracting levers.

Installation

Installation is to be carried out in the reverse order of removal.

4.3.10 TTY Line Current Source R&S GH 890

Removal

1. Remove power supply acc. to 4.3.8.
2. Press locking levers of plug X12, located on printed circuit A66 of the power supply, off to left and right.
3. Pull off female connector strip.
4. Undo four screws (3, Fig. 4.10 (R&S EK 895) or Fig. 4.11 (R&S EK 896)) fixing TTY Line Current Source R&S GH 890 to the heat sink.
5. Remove screws plus washers.
6. Remove TTY Line Current Source R&S GH 890.

Installation

Installation is to be carried out in the reverse order of removal.

4.3.11 BCD Interface R&S GC 890

4.3.11.1 Interface

Removal

1. Make preparations acc. to 4.3.1.

2. Pull off socket on RF cable W4 connected to plug X41 (synthesizer, see Fig. 4.14).

<u>*Note:*</u>

The interface module (A81) of BCD Interface R&S GC 890 can be inserted into the grey as well as the black guiding rails.

3. In case the interface module (A81) is in the grey guiding rails, proceed acc. to the following steps:
   a) Open grey extracting levers on interface (see Fig. 4.12 (R&S EK 895) or Fig. 4.13 (R&S EK 896)).
   b) Pull out interface module (A81) until the locking devices of plug X86 become laterally accessible (space between rail on frame and lateral strip).
   c) Push off locking devices on left and right.
   d) Disconnect female connector strip from ribbon cable W86.
   e) Pull interface module (A81) entirely out by taking hold of grey extracting levers.

4. In case the interface module (A81) is in the black guiding rails, proceed acc. to the following steps:
   a) Push off locking devices of plug X86 on left and right.
   b) Disconnect female connector strip from ribbon cable W86.
   c) Open grey extracting levers on interface (see Fig. 4.12 (R&S EK 895) or Fig. 4.13 (R&S EK 896)).
   d) Pull out interface module (A81) by taking hold of gray extracting levers.

5. If necessary also remove filter module (A82) acc. to 4.3.11.2.

Installation

Installation is to be carried out in the reverse order of removal.

4.3.11.2 Filter

Removal

1. Remove interface module acc. to 4.3.11.1.

2. Undo two locking bolts (4, Fig. 4.10 (R&S EK 895) or Fig. 4.11 (R&S EK 896)) fixing female connector strip X89 to the rear panel.

3. Remove locking bolts.

4. Carefully remove filter module (A82) with ribbon cable W86.

Installation

1. Insert female connector strip X89 from the inner side of the rear panel into the opening.

2. Fix female connector strip to the rear panel by means of the two locking bolts (4, Fig. 4.10 (R&S EK 895) or Fig. 4.11 (R&S EK 896)).

   <u>*Note:*</u>

   We recommend to secure the locking bolts by using protective lacquer.

3. Slide ribbon cable W86 of the filter module (A82) through the opening in the transverse panel and below ribbon cable W21 bend by 90°.

4. Install interface module acc. to 4.3.11.1.

4.3.12 Preselection R&S FK 890H1

Removal

1. Make preparations acc. to 4.3.1.
2. Disconnect socket of RF cable W13 (see Fig. 4.15) from plug X82.
3. Disconnect socket of RF cable W1 from plug X81.

   With option 'IF Processor R&S GM 893':

   Pull off socket on RF cable W24 connected to plug X81.
4. Open black extracting levers on preselector (see Fig. 4.12 (R&S EK 895) or Fig. 4.13 (R&S EK 896)).
5. Carefully pull out preselector by taking hold of the black levers.

Installation

Installation is to be carried out in the reverse order of removal.

4.3.13 IF Converter R&S UX 895

Removal

1. Remove IF / AF Processor acc. to 4.3.9.
2. Undo and remove 13 screws fixing the RF cover to the components side.
3. Cautiously pull IF Converter R&S UX 895 out of terminal strips X77 (see Fig. 4.7) and X78 towards the top.

Installation

Installation is to be carried out in the reverse order of removal.

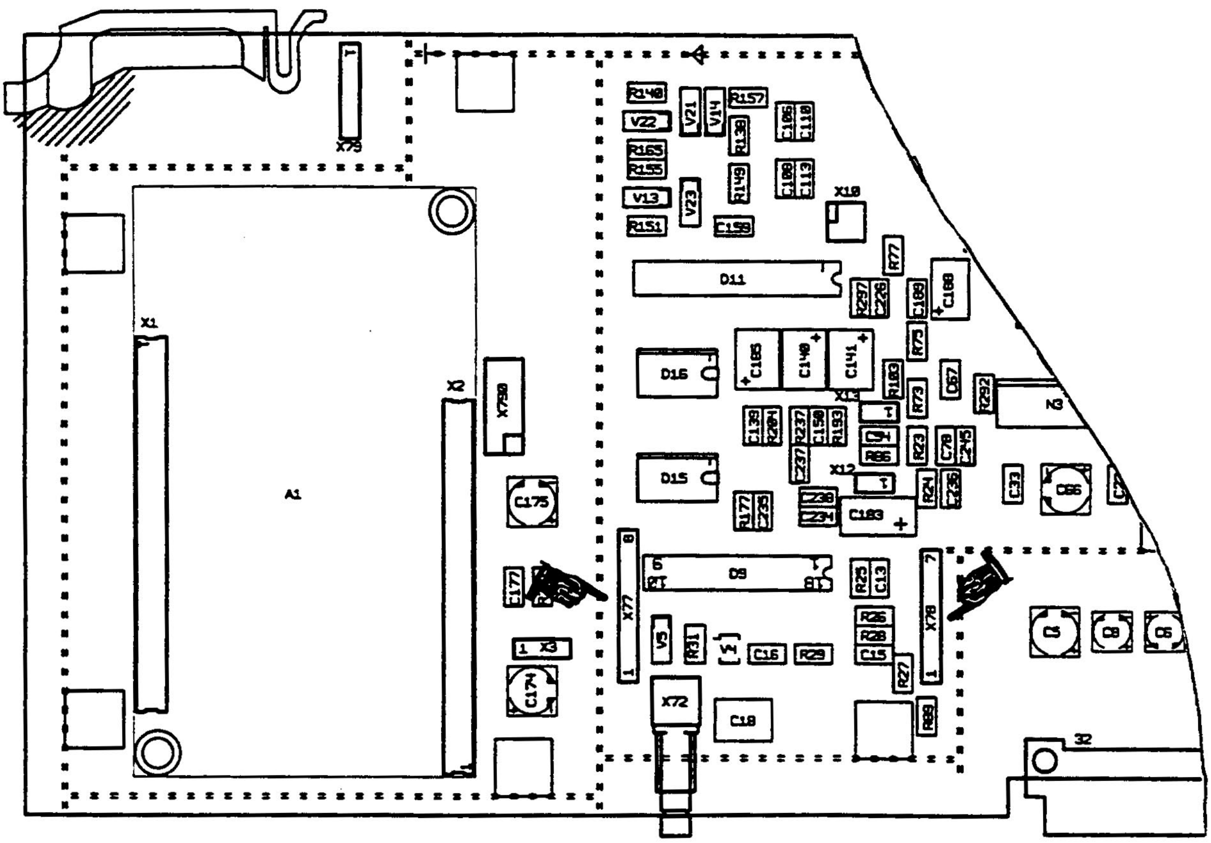


Fig. 4.7 Location of Terminal Strips X77 and X78

4.3.14 IF Processor R&S GM 893

Removal

1. Make preparations acc. to 4.3.1.
2. Pull off socket on RF cable W22 connected to plug X95 (see Fig. 4.15).
3. Pull off socket on RF cable W24 connected to plug X96.
4. Pull off socket on RF cable W25 connected to plug X97.
5. Pull off socket on RF cable W23 connected to plug X98.
6. Open grey extracting levers on IF processor (see Fig. 4.12 (R&S EK 895) or Fig. 4.13 (R&S EK 896)).
7. Pull IF processor completely out by taking hold of the extracting levers.

Installation

Installation is to be carried out in the reverse order of removal.

4.3.15 Digitally Tuned RF Selector R&S FK 896D

Note:

The Digital Selection R&S FK 896D consists of the actual Digital Selection R&S FK 2020 (R&S FK 896D, mod. 02) or Digital Selection R&S FK 2040 (R&S FK 896D, mod. 04), an interface module as well as an adapter (part of interface module).

4.3.15.1 Digital Selection

Removal

1. Make preparations acc. to 4.3.1.
2. Undo and remove four screws (see Fig. 4.16) fixing the down-hold to the trough.
3. Push down-hold towards the rear panel until it can be removed.
4. Pull digital selection out by taking hold of the cord.

Installation

Installation is to be carried out in the reverse order of removal.

4.3.15.2 Interface

Removal

1. Remove digital selection acc. to 4.3.15.1.
2. Push off locking devices on connector X180 (see Fig. 4.16) on left and right.
3. Pull off socket on ribbon cable W180.
4. Open black extracting levers on interface.
5. Pull out interface by taking hold of the black extracting levers.

Installation

Installation is to be carried out in the reverse order of removal.

4.3.15.3 Adapter

Removal

(See Figs. 4.16 and 4.17)

1. Remove digital selection acc. to 4.3.15.1.
2. Push off locking devices on connector X180 (see Fig. 4.16) on left and right.
3. Pull off socket on ribbon cable W180.
4. Without further options:

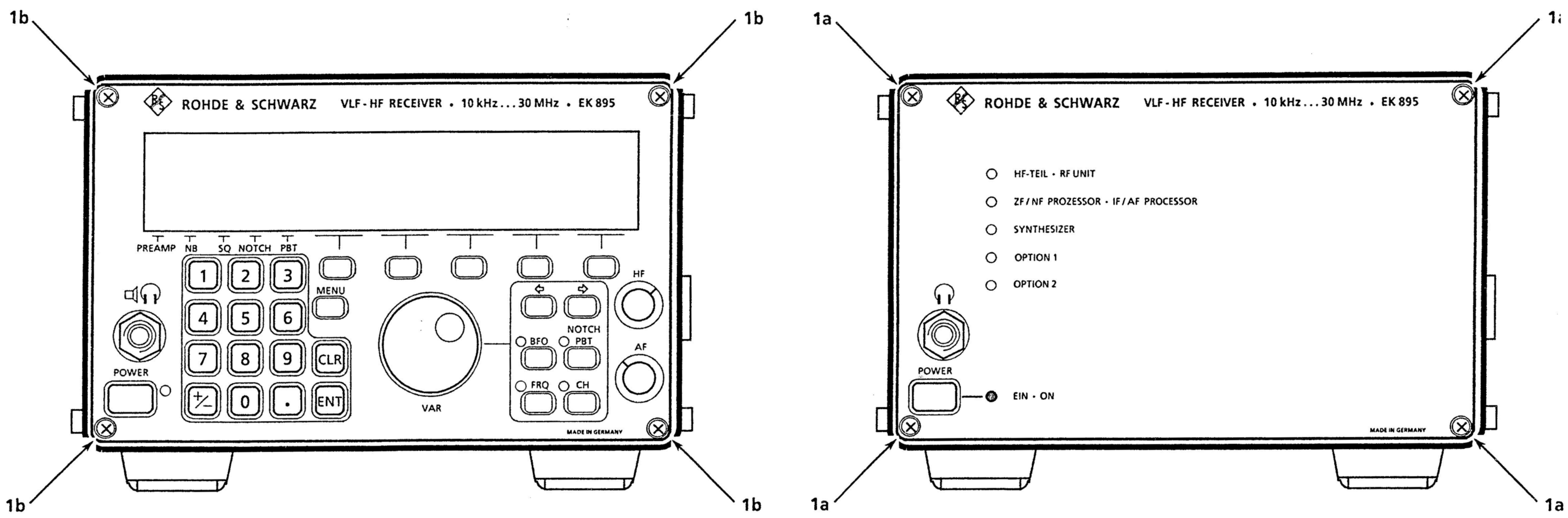
   Separate connection between RF cables W1 and W101.

   With option 'IF Processor GM 893':

   Separate connection between RF cables W24 and W101.
5. Open red extracting levers on IF / AF processor.
6. Pull IF / AF processor carefully out by taking hold of the red extracting levers until connectors X73 and X74 are accessible.
7. Pull off socket on RF cable W102 connected to plug X73.
8. Perform steps 5 and 6 in the reverse order.
9. Undo and remove four screws fixing the adapter to the trough.
10. Remove adapter carefully.

Installation

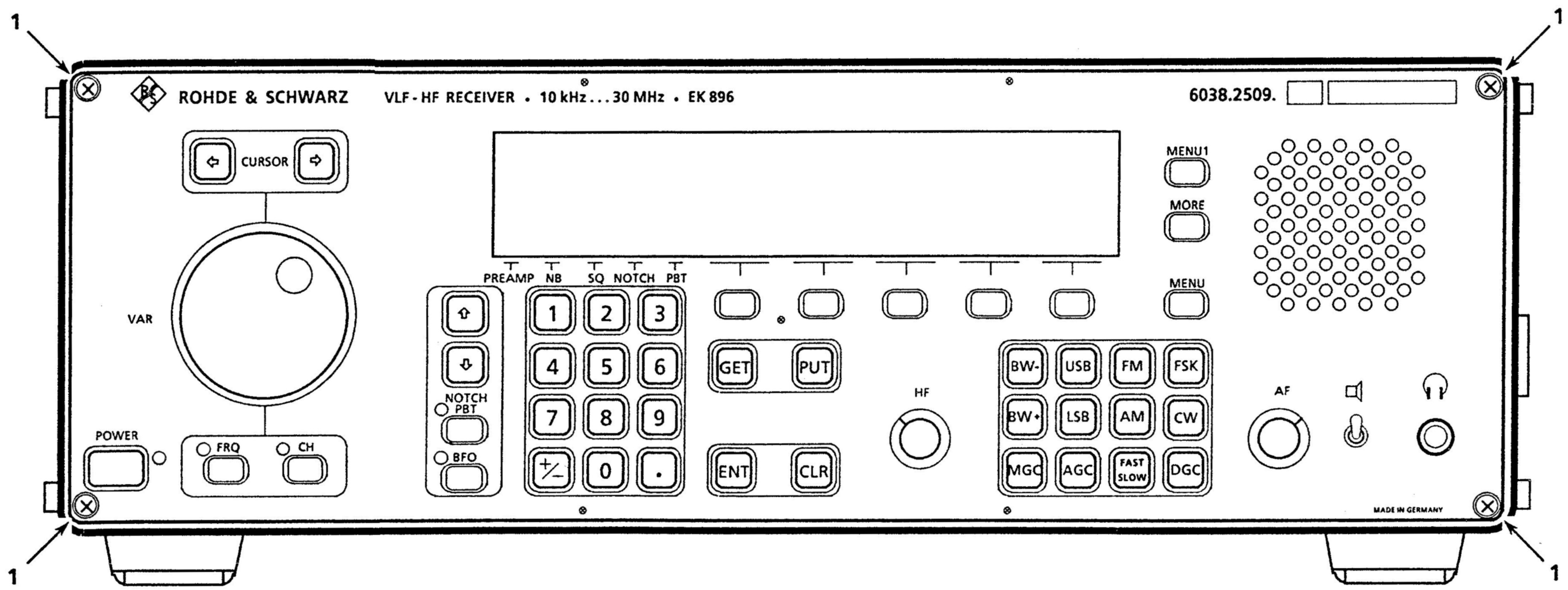
Installation is to be carried out in the reverse order of removal.



C A U T I O N

Before replacing any modules switch of the VLF-HF Receiver and disconnect the Receiver from the mains.

Fig. 4.8 Location of Screws to Be Undone On Front (R&S EK 895)



C A U T I O N
Before replacing any modules switch of the VLF-HF Receiver and disconnect the Receiver from the mains.

Fig. 4.9 Location of Screws to Be Undone On Front (R&S EK 896)

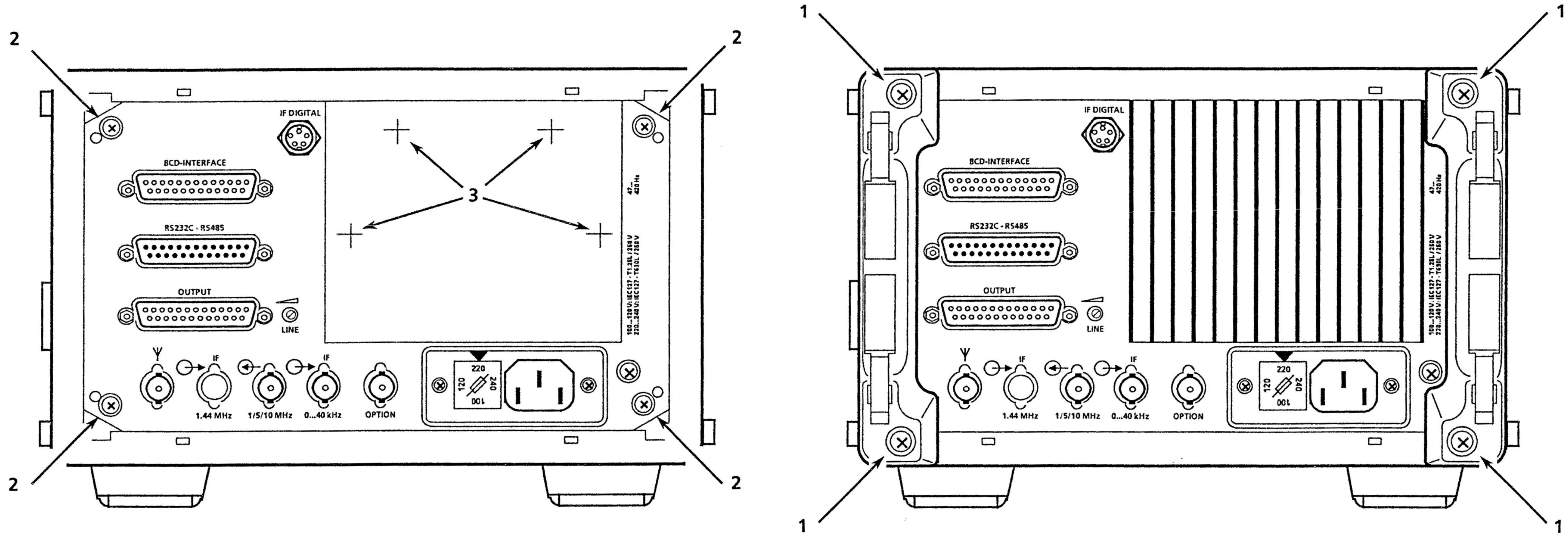


Fig. 4.10 Location of Screws to Be Undone On Front (R&S EK 895)

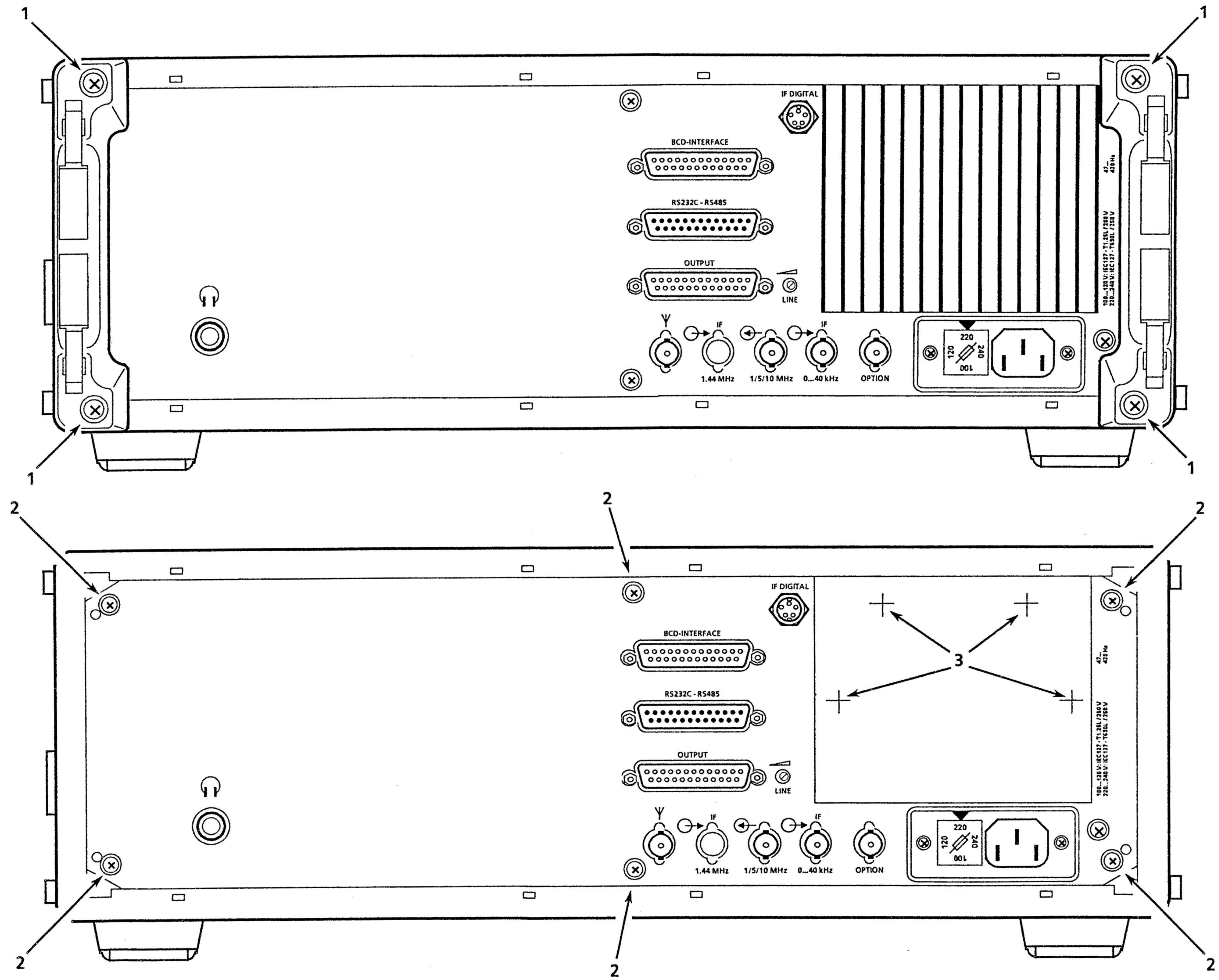


Fig. 4.11 Location of Screws to Be Undone On Front (R&S EK 896)

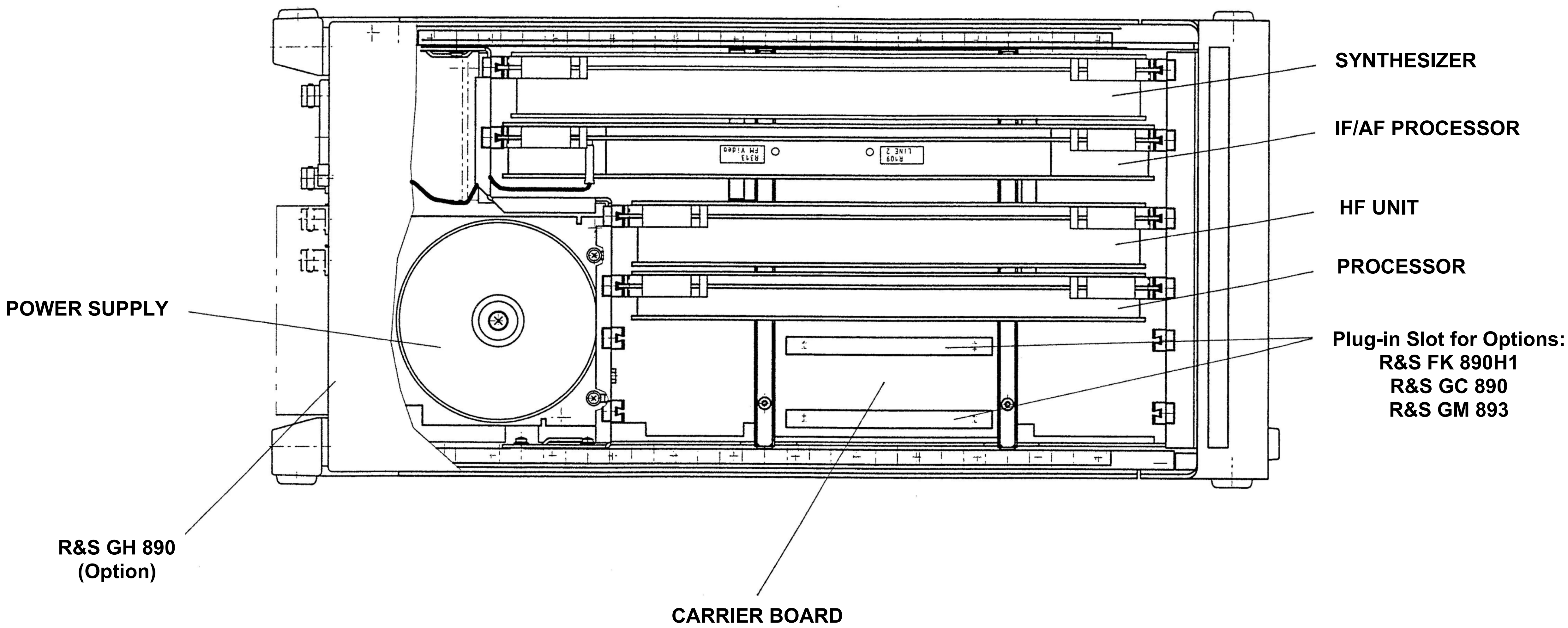


Fig. 4.12 Arrangement of Modules and Options (R&S EK 895)

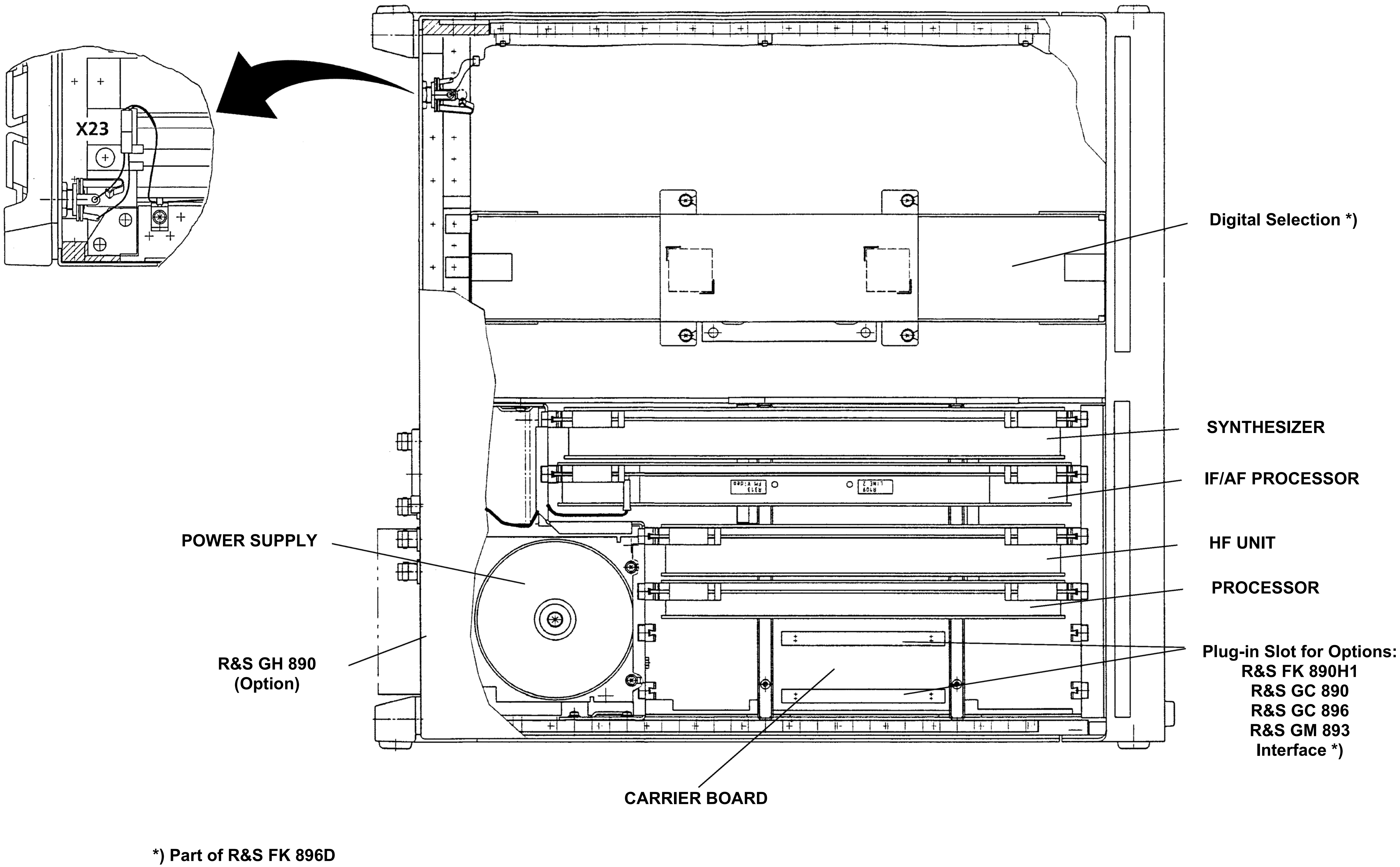


Fig. 4.13 Arrangement of Modules and Options (R&S EK 896)

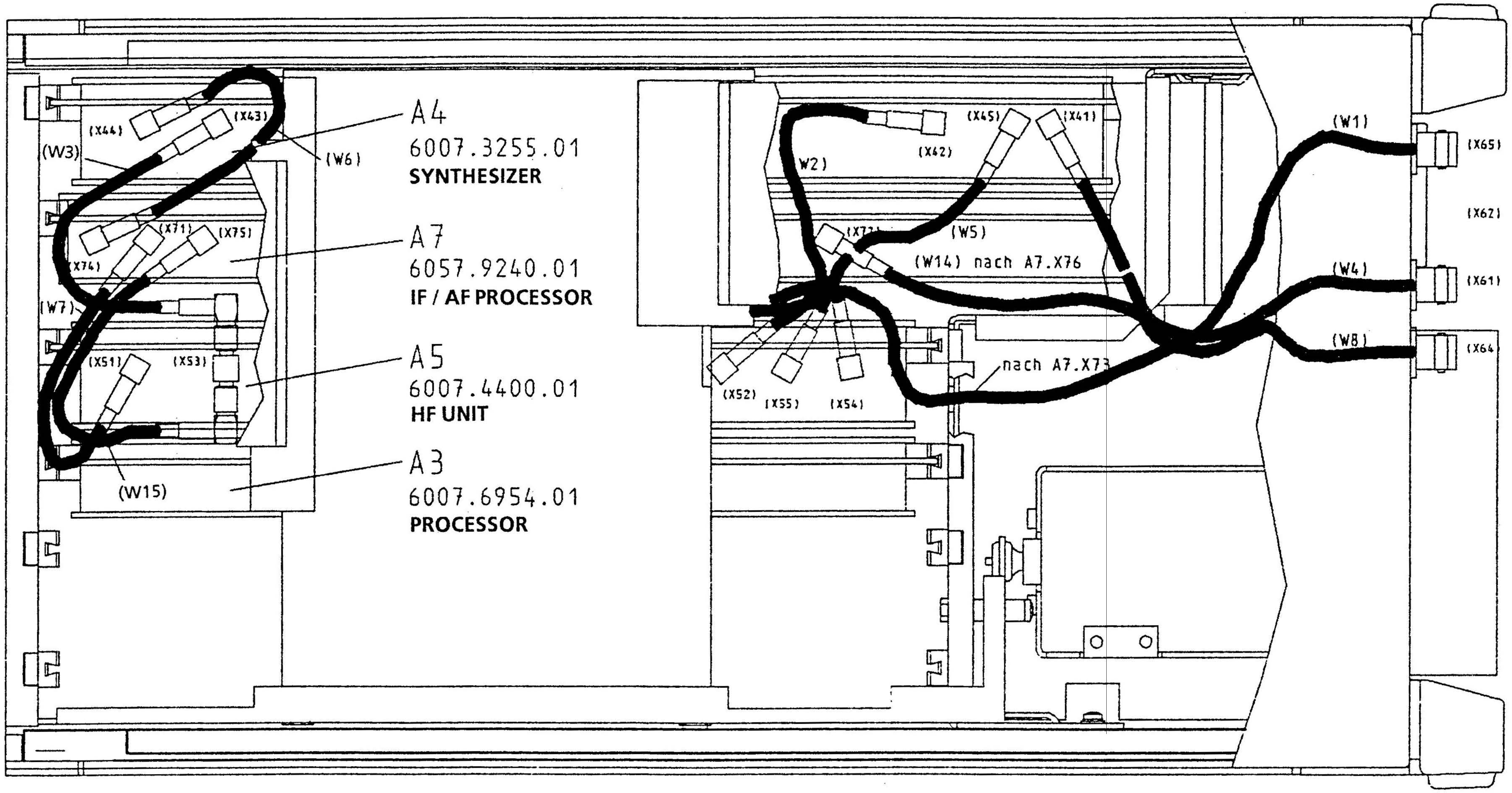


Fig. 4.14 Internal Cabling

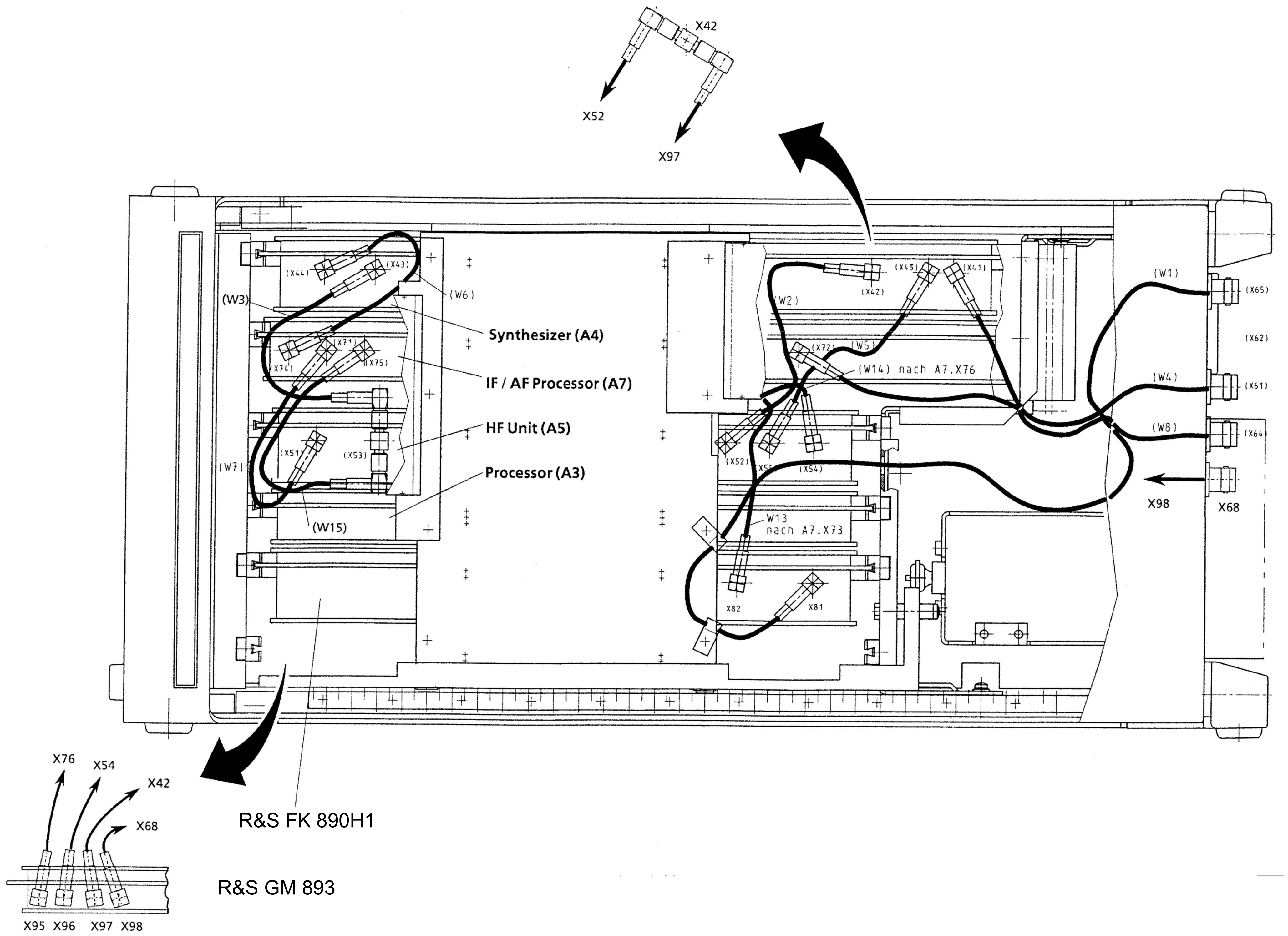


Fig. 4.15 Internal Cabling (with Options)

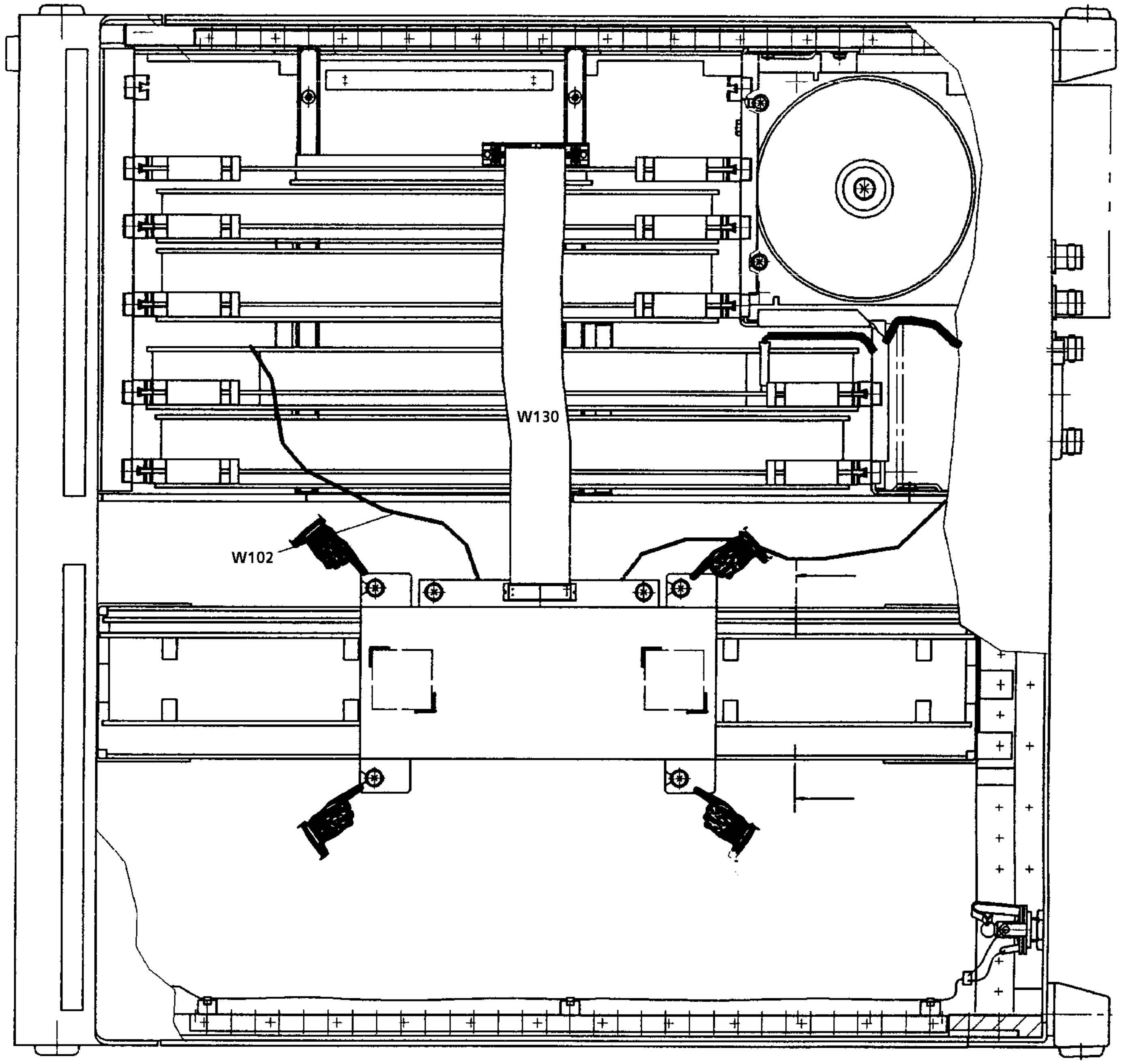


Fig. 4.16 Removal of Digitally Tuned RF Selector R&S FK 896D

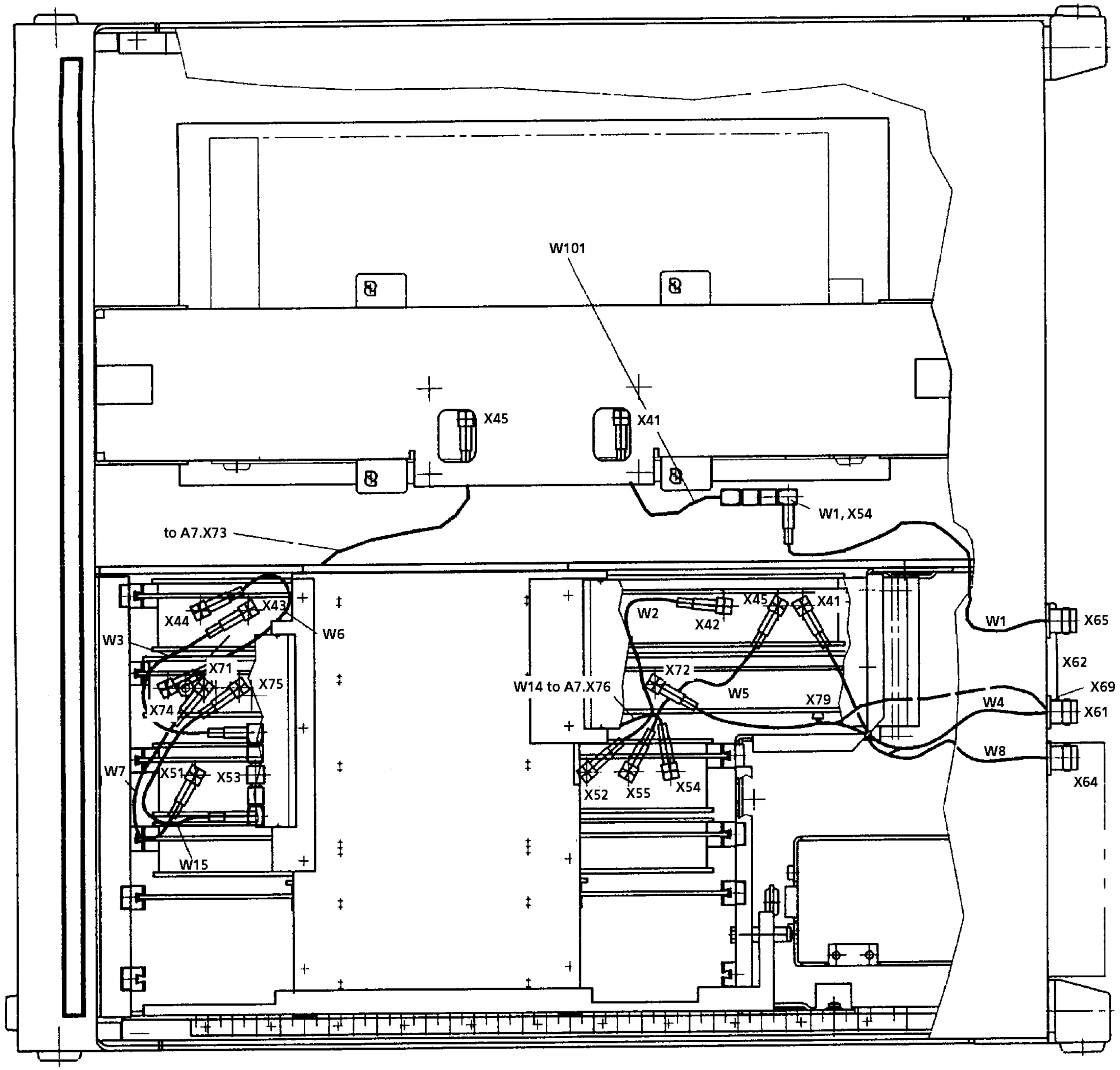


Fig. 4.17 Cabling of VLF-HF Receiver R&S EK 896 with Digitally Tuned RF Selector R&S FK 896D

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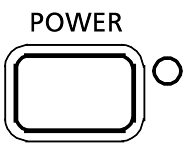
A1. Settings

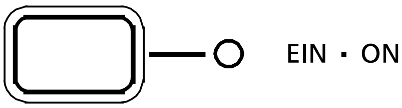
A1.1 Preparations

1. Switch the VLF-HF receiver off.

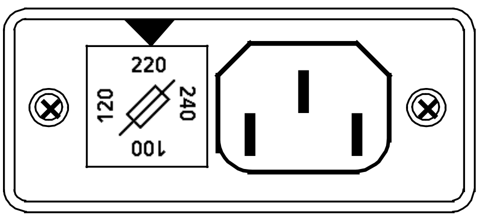
→ LED POWER is dark
(control unit 2 "LOCAL" (R&S EK 895, = option 'Control Unit R&S GB 890') or control unit (R&S EK 896)).



→ LED ON is dark
(control unit 1 "REMOTE" (R&S EK 985)).



2. Disconnect mains cable from plug X67.



3. Undo and remove four screws (1, Fig. A1.2 (R&S EK 895) or Fig. A1.3 (R&S EK 896)) fixing the rear panel stands.

4. Remove rear panel stands.

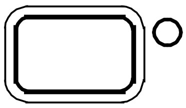
5. Undo and remove the cover by means of a screw driver.

A1.2 Altering the Operating Voltage

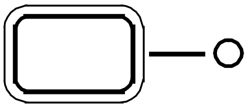
1. Switch VLF-HF receiver off.

→ LED POWER is dark
(control unit 2 "LOCAL" (R&S EK 895, = option 'Control Unit GB 890') or control unit (R&S EK 896)).

POWER

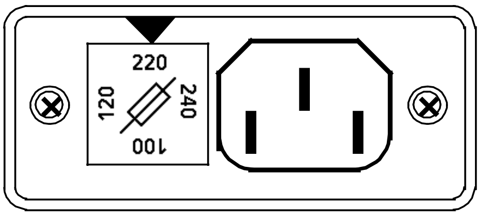


→ LED ON is dark
(control unit 1 "REMOTE" (R&S EK 895)).

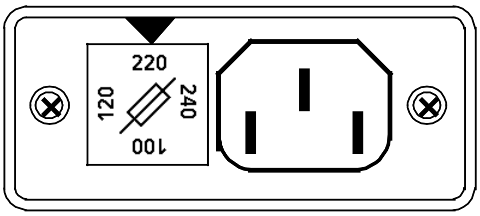


EIN · ON

2. Disconnect mains cable from plug X67.



3. Open fuse holder.



4. For the desired operating voltage insert respective fuse into the fuse holder.

100 V = T1.25/250 V

120 V = T1.25/250 V

220 V = T630/250 V
(basic fitting ex works)

240 V = T630/250 V

5. Insert fuse holder in such a way that the arrow (∇) points to the desired operating voltage.

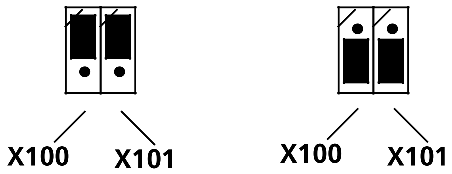
Basic setting ex works: 220 V

6. After the operating voltage has been altered, carry out steps 1 and 2 in the reverse order.

A1.3 Use of an External Frequency Standard

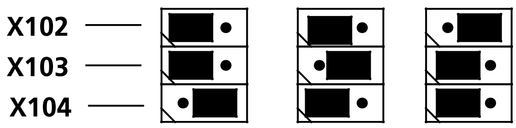
1. Carry out preparations according to A1.1.
2. Disconnect socket on RF cable W4 from plug X41 (see Fig. A1.7).
3. Disconnect socket on RF cable W5 from plug X45.
4. Disconnect socket on RF cable W2 from plug X42.
5. Disconnect socket on RF cable W3 from plug X43.
6. Disconnect socket on RF cable W6 from plug X44.
7. Open blue extracting levers on synthesizer (see Fig. A1.5 (EK 895) or Fig. A1.6 (EK 896)).
8. Carefully pull out synthesizer by taking hold of the levers.
9. Undo and remove twelve screws fixing the screw top to the components side.
10. Remove screw top.
11. With the aid of jumpers X100 and X101 (see Fig. A1.9) the synthesizer can be set to the following types of synchronization:

Internal*)	External
X100 on 1-2	X100 on 2-3
X101 on 1-2	X101 on 2-3



12. Depending on the frequency standard used, jumpers X102 to X104 are to be set as follows:

	1 MHz	5 MHz	10 MHz*)
X102 on	1-2	1-2	2-3
X103 on	1-2	2-3	1-2
X104 on	2-3	1-2	1-2



13. Once the new setting has been made carry out steps 1 to 10 in the reverse order.

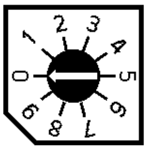
*) Basic setting ex works

A1.4 Setting the RS232C - RS485 Interface Parameters

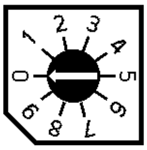
1. Carry out preparations according to A1.1.
2. Open yellow extracting levers on processor (see Fig. A1.5 (R&S EK 895) or Fig. A1.6 (R&S EK 896)).
3. Carefully pull out processor by taking hold of the levers.
4. Undo and remove ten screws, fixing the screw top to the components side.
5. Remove screw top.
6. Set the desired address by means of coding switches S1 and S2 (see Fig. A1.10).

   Permitted addresses are from 0 to 99. For unaddressed operation set both switches to '0'.

S1
ADDRESS
• 1



S2
ADDRESS
• 10



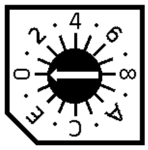
Note:

If several VLF-HF receivers are operated on one bus, each receiver must be addressed separately, i.e. address '0' is not permitted.

Basic setting ex works: address = 00

7. Set the required baud rate by means of coding switch S3 and the table below.

S3
BAUD RATE



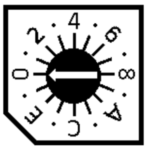
Baud rate table:

S3	Baudrate	Stop bit
0	external clock	1
1	50 Bd	2
2	100 Bd	2
3	110 Bd	2
4	300 Bd	1
5	600 Bd	1
6	1200 Bd	1
7*)	2400 Bd	1
8	4800 Bd	1
9	9600 Bd	1
A	19200 Bd	1
B	38400 Bd	1
C	9600 Bd	1
D	9600 Bd	1
E	9600 Bd	1
F	9600 Bd	1

*) Basic setting ex works

8. Set the required mode by means of coding switch S4 and the table below.

S4
V24 MODE



Mode table:

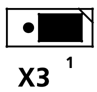
S4	Parity	Mode	Handshake
0	even	RS232	CTS RTS
1*)	odd	RS232	CTS RTS
2	even	RS232	XON XOFF
3	odd	RS232	XON XOFF
4	even	RS422	CTS RTS
5	odd	RS422	CTS RTS
6	even	RS422	XON XOFF
7	odd	RS422	XON XOFF
8	even	RS485	CTS RTS 2-wire
9	odd	RS485	CTS RTS 2-wire
A	even	RS485	XON XOFF 2-wire
B	odd	RS485	XON XOFF 2-wire
C	even	RS485	CTS RTS
D	odd	RS485	CTS RTS
E	even	RS485	XON XOFF
F	odd	RS485	XON XOFF

Note:

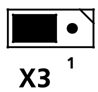
Seven data bits are transmitted at any one time. If XON XOFF handshake is activated RTS CTS, too, is active.

9. The serial interface may be set to the following levels with the aid of jumper X3:

RS423 / RS232
X3 on 1-2*)



RS422
X3 on 2-3



Note:

Level setting RS422 is only permitted if switch S4 is in one of the positions 4 to F.

10. As soon as the setting has been made carry out steps 1 to 5 in the reverse order.

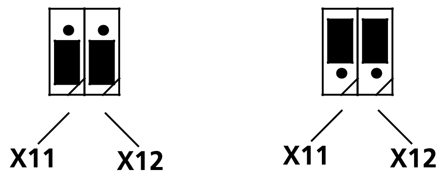
*) Basic setting ex works

A1.5 Altering the Direction for Rotation for the HF Control (EK 896 only)

1. Carry out preparations acc. to A1.1.
2. Undo and remove four screws (see Fig. A1.11) fixing the control unit.
3. Carefully pull control unit out to the front until plug X20 and male connector strip X20 are accessible.
4. Pull socket from X20.
5. Pull off female connector strip from X5.
6. Pull control unit entirely out and remove.
7. Undo and remove eleven screws fixing the keypad.
8. Push locking devices of 20-way male connector strip X20 off to left and right.
9. Pull off female connector strip (part of ribbon cable W33).
10. Disconnect female connector strip from 3-way male connector strip X6.
11. With the aid of two jumpers (see Fig. A1.12) alter the direction of rotation of the HF control as follows:

Gain increases by turning the control

counter-clockwise	clockwise*).
X11 on 1-2	X11 on 2-3
X12 on 1-2	X12 on 2-3



12. Once the new setting has been made carry out steps 1 to 10 in the reverse order.

*) Basic setting ex works

A1.6 Setting the AF Output Level

A1.6.1 Required Test Equipment

Voltmeter	URE	342.1214.02
Signal Generator	SMK	348.0010.03

A1.6.2 Procedure

1. Switch off the VLF-HF receiver.
2. Disconnect RF cable from antenna socket (see Fig. A1.1).
3. Disconnect AF line from female connector strip OUTPUT.
4. Connect signal generator to antenna socket.
5. Switch on signal generator.
6. On signal generator set a frequency of 5.001 MHz and a level of 1 mV_{EMF}.
7. Switch on VLF-HF receiver.
8. On VLF-HF receiver set a frequency of 5.000 MHz and modulation mode USB.
9. By means of voltmeter measure level via 600 Ω at contacts X66.1 (AFa) and X66.2 (AFb).

   Nominal value: 0 dBm

   Adjust output level to 0 dBm by means of variable resistor LINE (-10 to +10 dBm), as necessary.
10. Perform steps 1 to 7 in the reverse order.

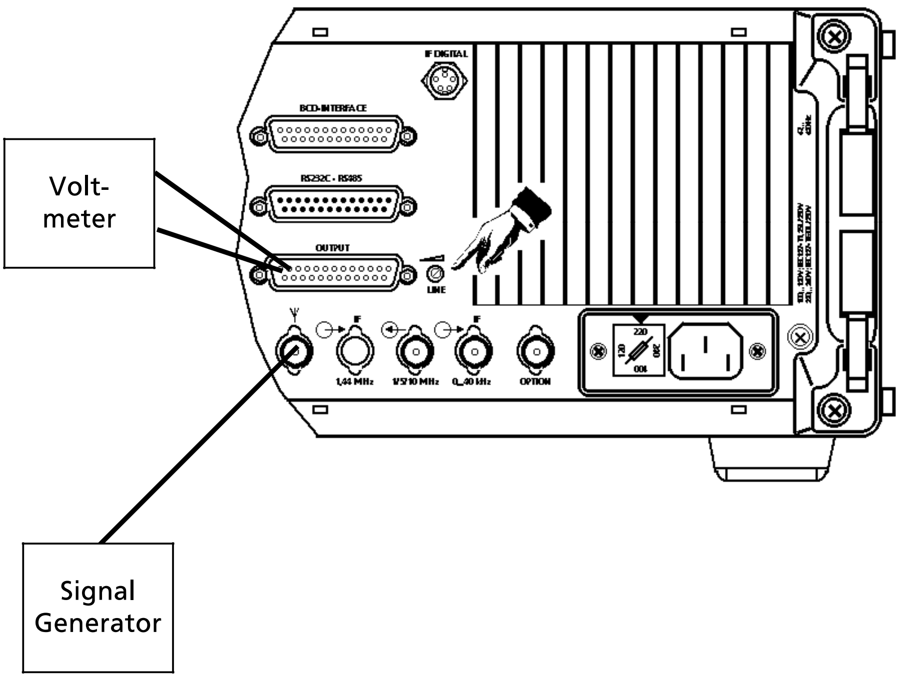
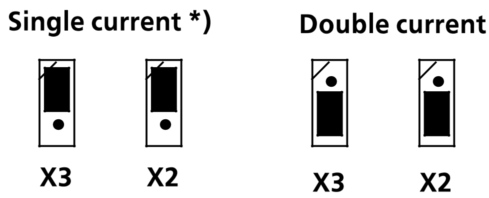


Fig. A1.1 Location of Variable Resistor LINE and Test Setup

A1.7 Altering the Type of Current (Single Current ⇔ Double Current, Option)

1. Carry out preparations according to A1.1.
2. Disconnect socket on RF cable W1 from plug X54 (see Fig. A1.8).
3. Disconnect socket on RF cable W8 from plug X72.
4. Disconnect socket on RF cable W4 from plug X41.
5. Undo connector X23 (see Fig. A1.5 (EK 895) or Fig. A 1.6 (EK 896)).
6. Remove cable clamps, as necessary.
7. Undo and remove six screws (2, Fig. A1.3 (EK 895) or Fig. 1.4 (EK 896)) on the rear and the two screws near the resonators, securing the power supply.
8. Carefully pull out power supply towards the rear until plug X60 becomes accessible.
9. Disconnect the female connector strip.
10. Push back locking levers of plug X12 on right and left.
11. Disconnect female connector strip from ribbon cable W1.
12. Undo four screws (3, Fig. A1.3 (EK 895) or Fig. A1.4 (EK 896)) and remove together with curved washers and other washers fixing the TTY line current source and the heat sink to the rear.
13. Remove heat sink and TTY line current source.
14. Set the type of current by means of two jumpers (see Fig. A1.12).



***) Basic setting ex works**

15. Once the type of current has been set, carry out steps 1 to 13 in the reverse order. Fold ribbon cable W1 and turn by 90°.

A1.8 Setting the AF2 Output Level

A1.8.1 Required Test Equipment

- Voltmeter URE 342.1214.02
- Signal Generator SMK 348.0010.03

A1.8.2 Procedure

1. Switch off VLF-HF receiver.
2. Undo and remove four screws (1, Fig. A1.3 (EK 895) or Fig. A1.4 (EK 896)) fixing the rear panel stands.
3. Remove rear panel stands.
4. Remove covers by means of a screw driver.
5. Disconnect RF cable from antenna socket (see Fig. A1.2).
6. Disconnect AF line from female connector strip OUTPUT.
7. Connect signal generator to antenna socket.
8. Switch on signal generator.
9. On signal generator set a frequency of 5.001 MHz and a level of 1 mV_{EMF}.
10. Switch on VLF-HF receiver.
11. On VLF-HF receiver set a frequency of 5.000 MHz and modulation mode USB.
12. By means of voltmeter measure level via 600 Ω at contacts X66.24 (AF2a) and X66.21 (AF2b).

    Nominal value: 0 dBm

    Adjust output level to 0 dBm by means of variable resistor LINE2 (-10 to +10 dBm, see Fig. A1.5 (EK 895) or Fig. A1.6 (EK 896)), as necessary.
13. Perform steps 1 to 10 in the reverse order.

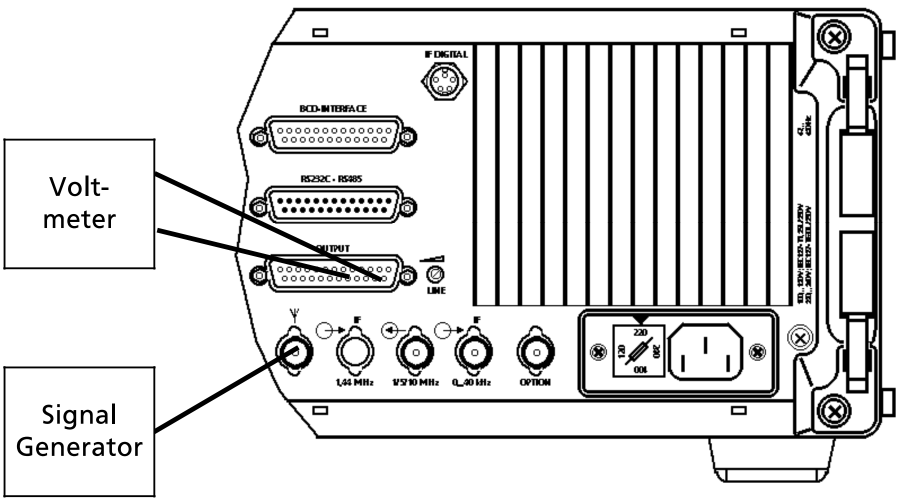


Fig. A1.2 Test Setup

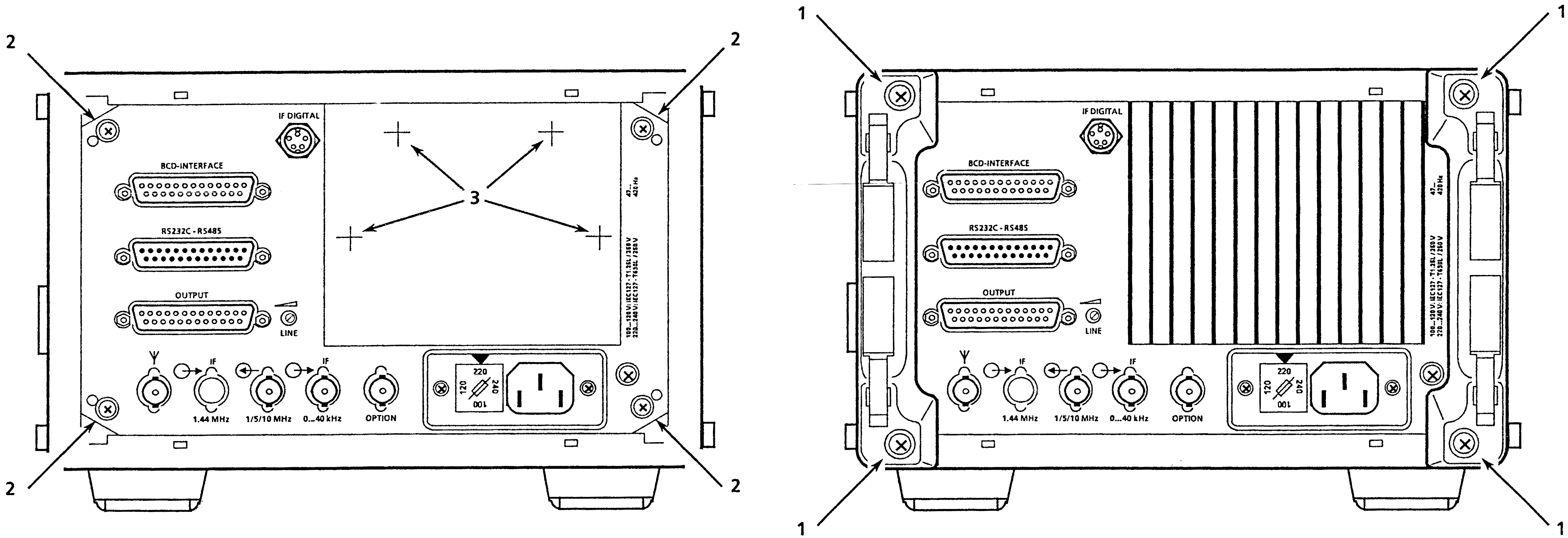


Fig. A1.3 Location of Screws to Be Undone on Rear (EK 895)

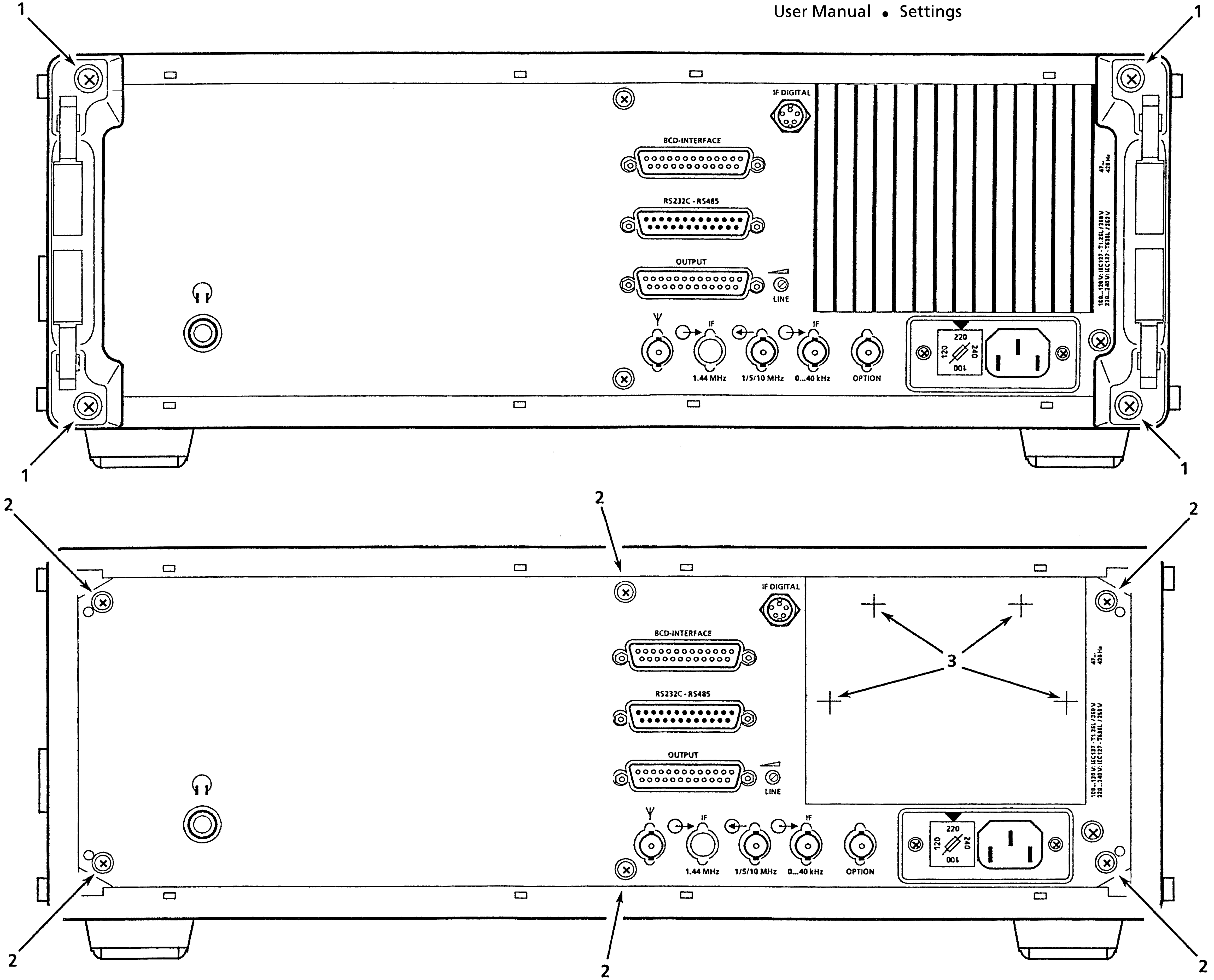


Fig. A1.4 Location of Screws to Be Undone on Rear (EK 896)

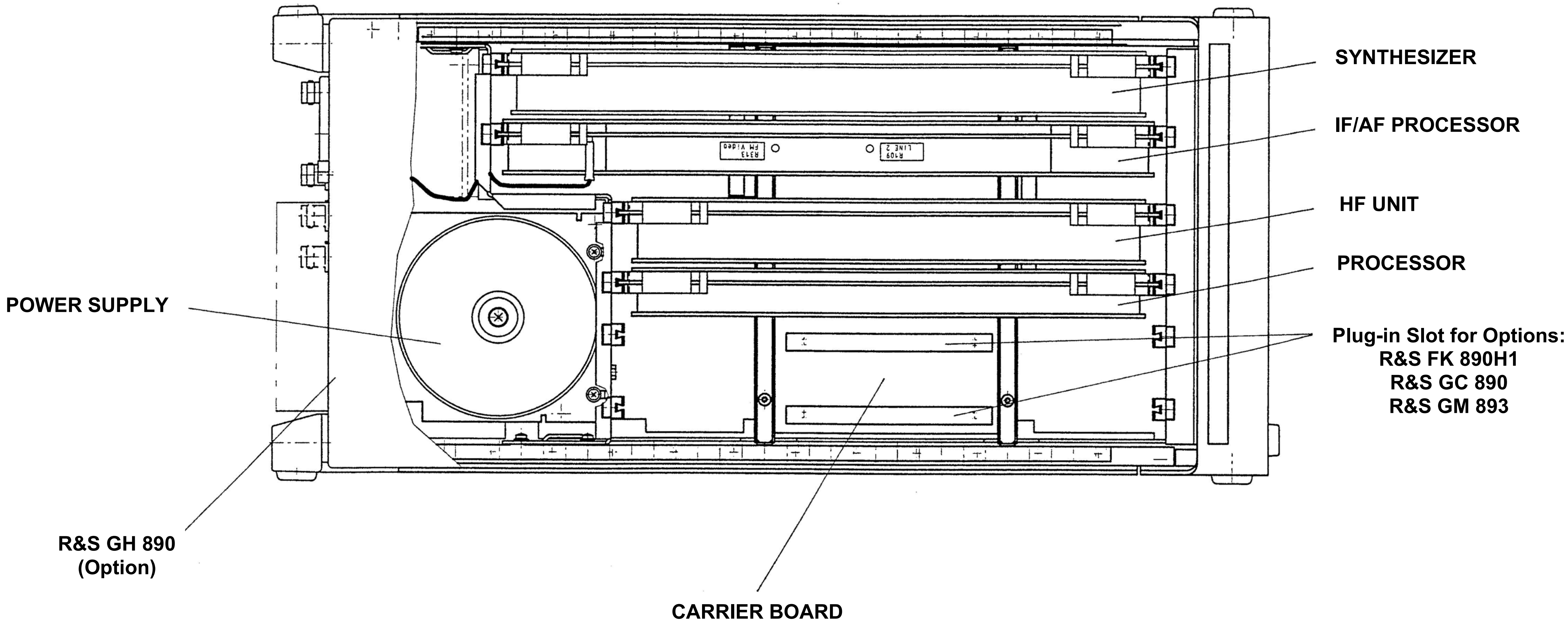
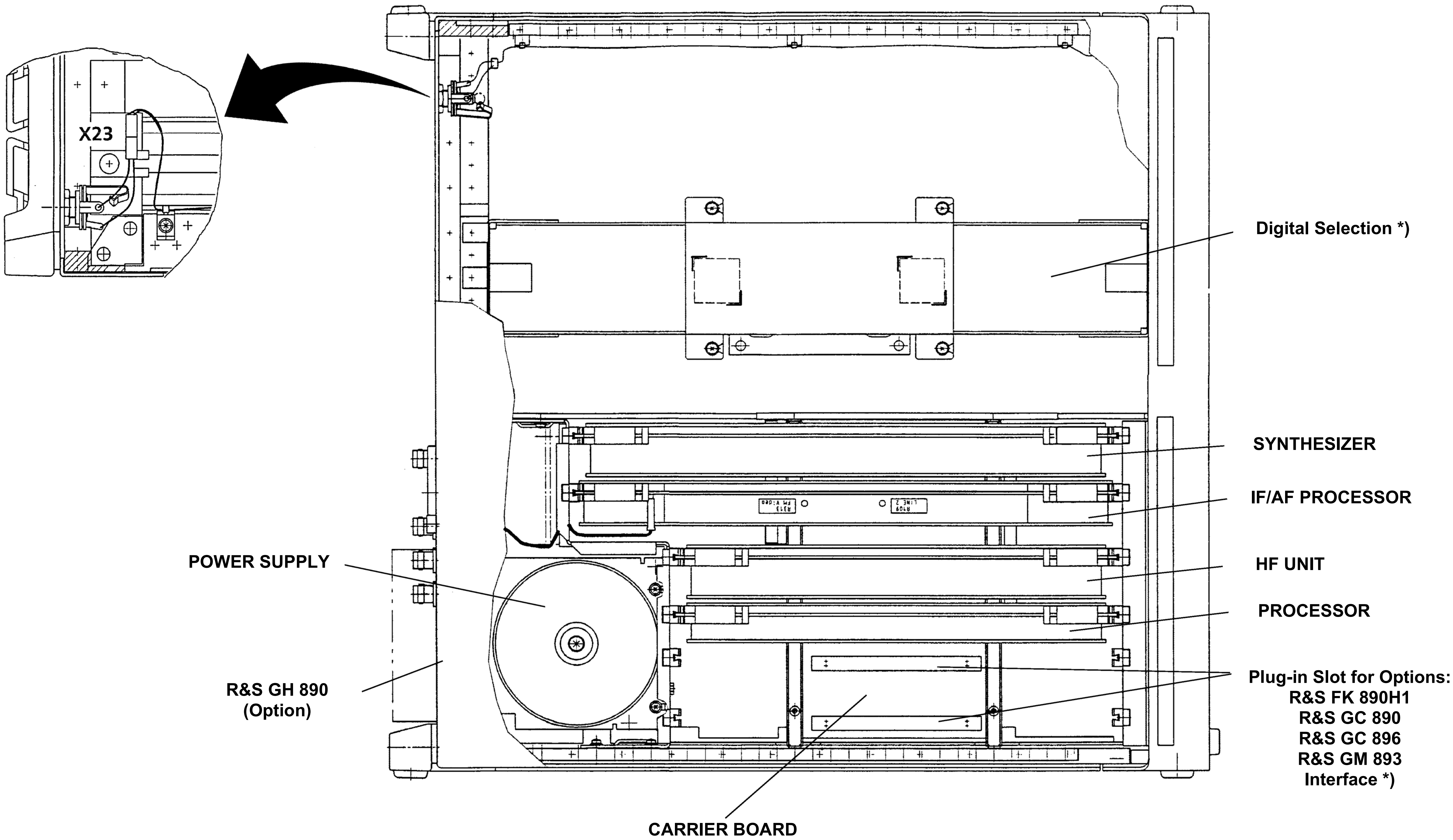


Fig. A1.5 Arrangement of Modules and Options (R&S EK 895)



*) Part of R&S FK 896D

Fig. A1.6 Arrangement of Modules and Options (R&S EK 896)

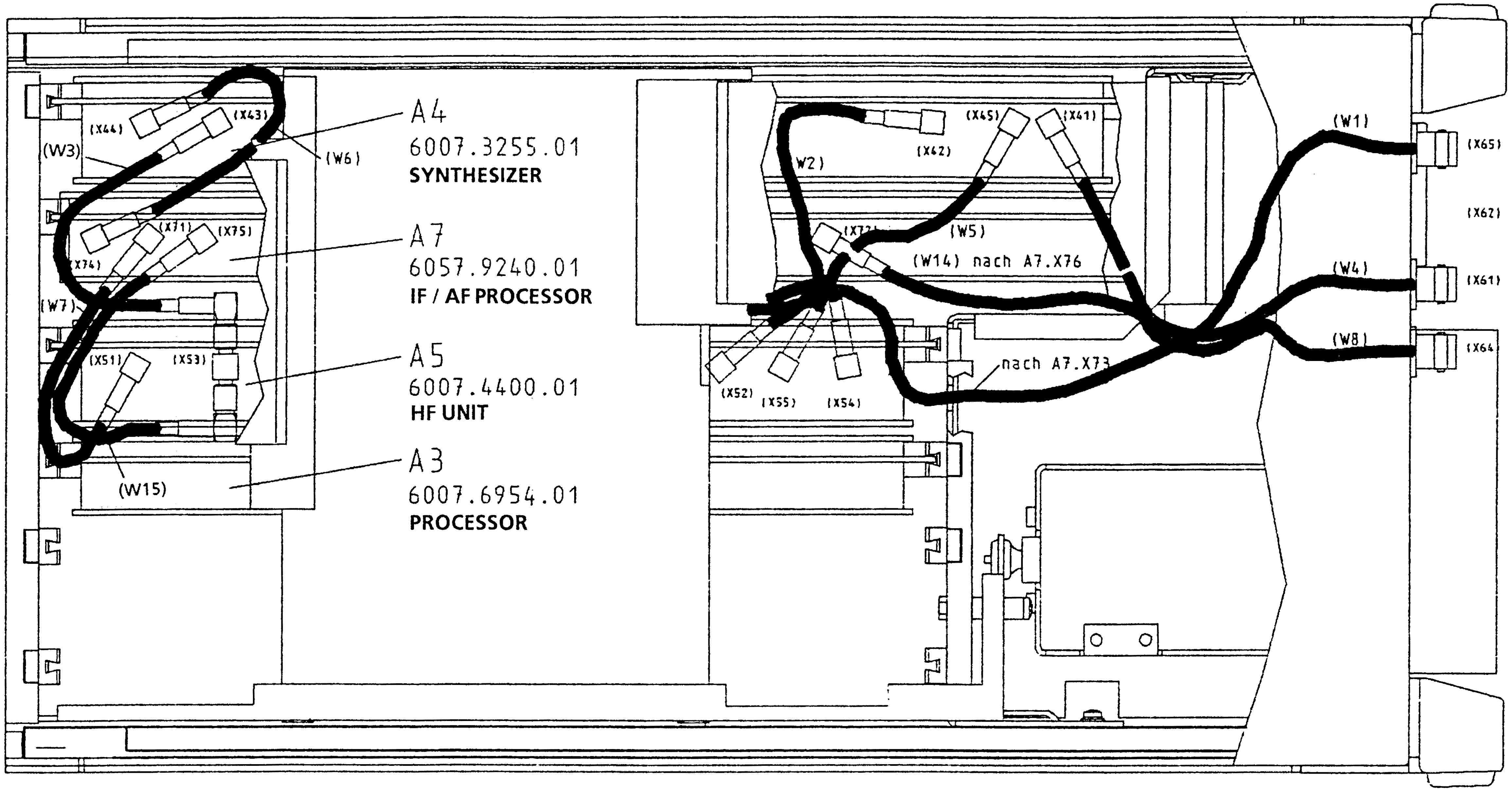


Fig. A1.7 Internal Cabling

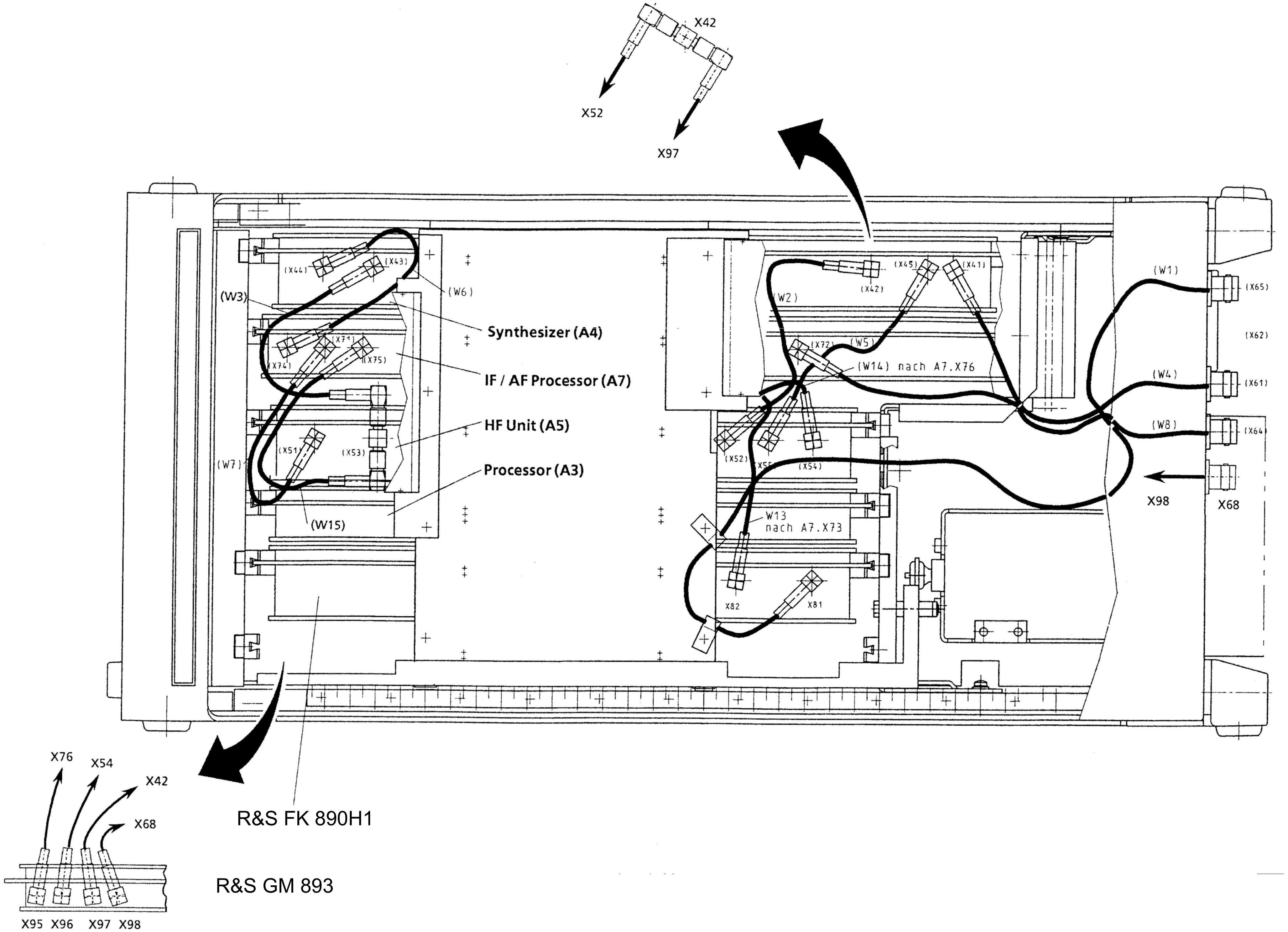
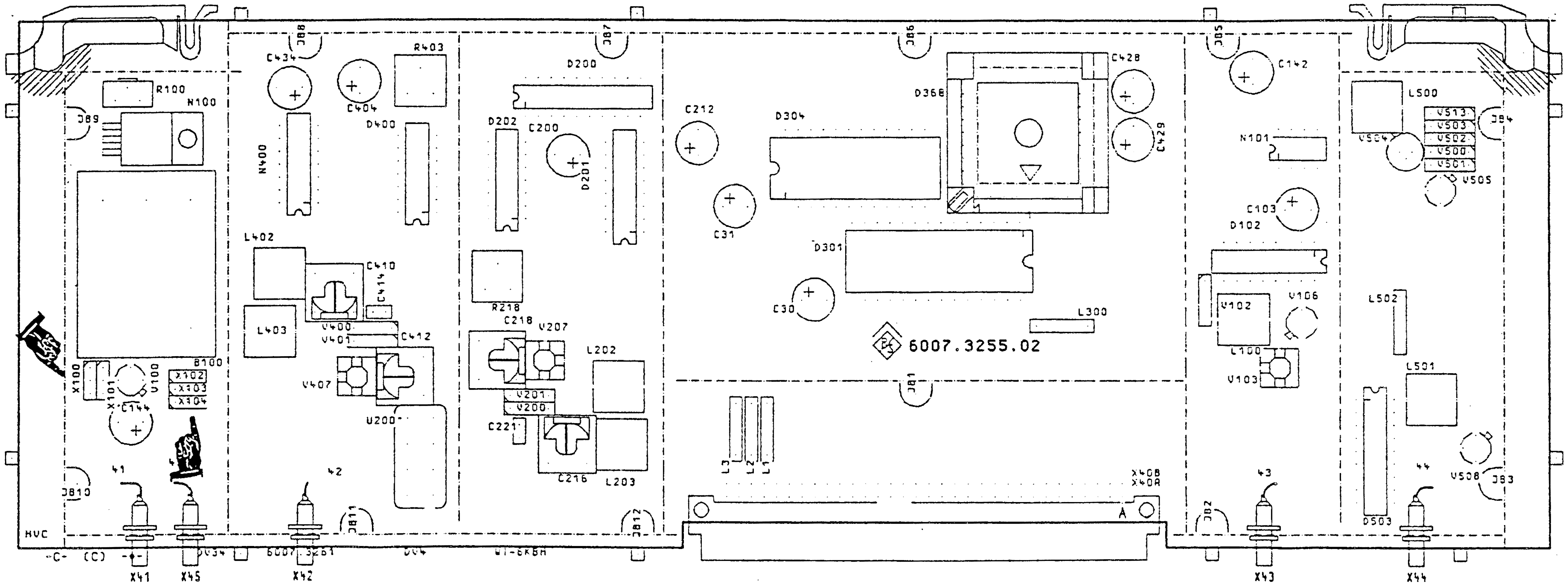
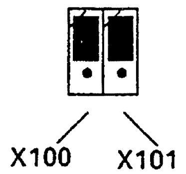
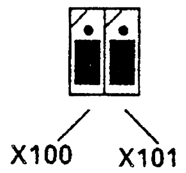


Fig. A1.8 Internal Cabling (with Options)

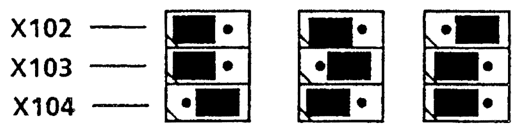


Internal*)	External
X100 on 1-2	X100 on 2-3
X101 on 1-2	X101 on 2-3





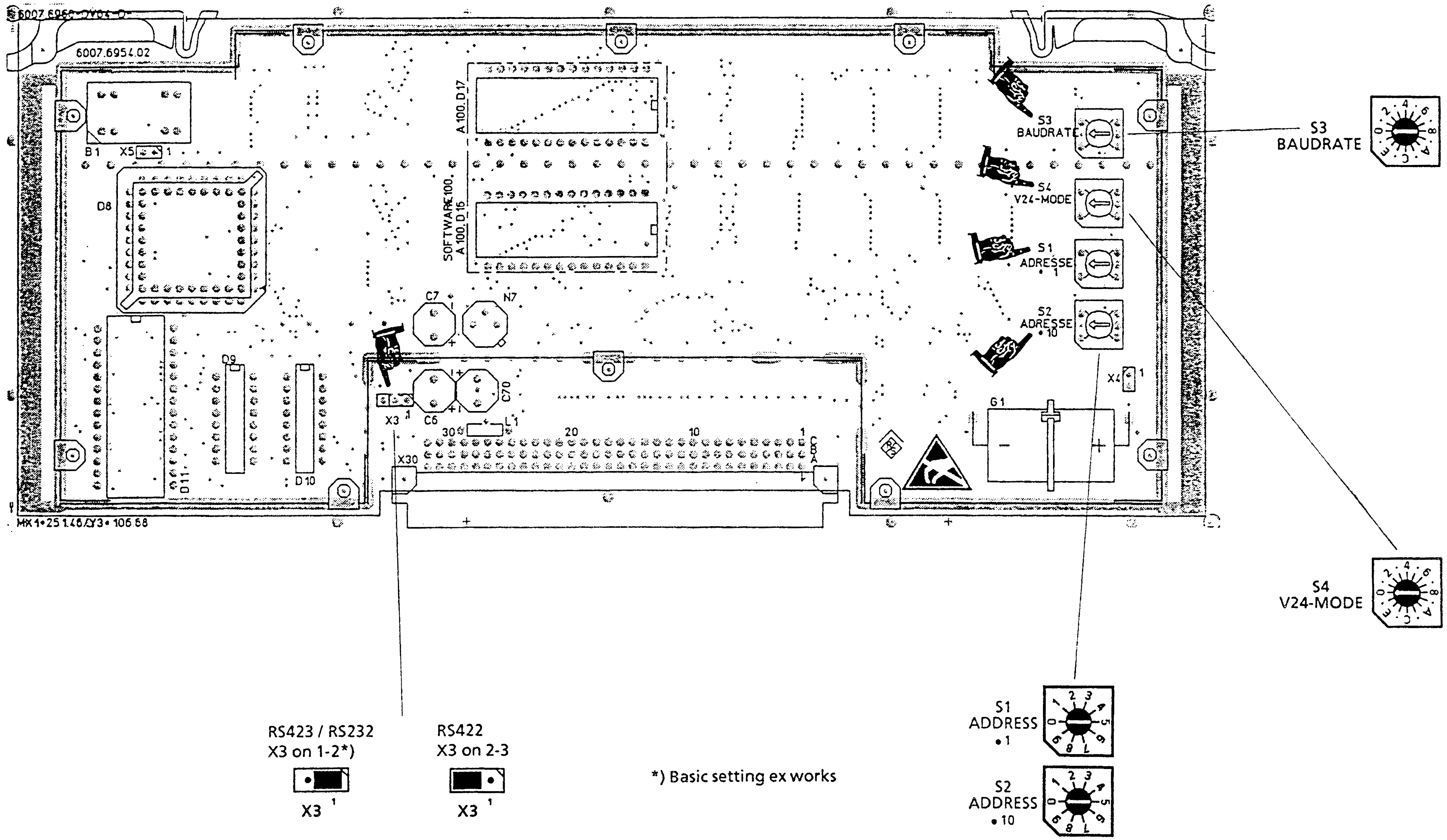
	1 MHz	5 MHz	10 MHz*)
X102 on	1-2	1-2	2-3
X103 on	1-2	2-3	1-2
X104 on	2-3	1-2	1-2



*) Basic setting ex works

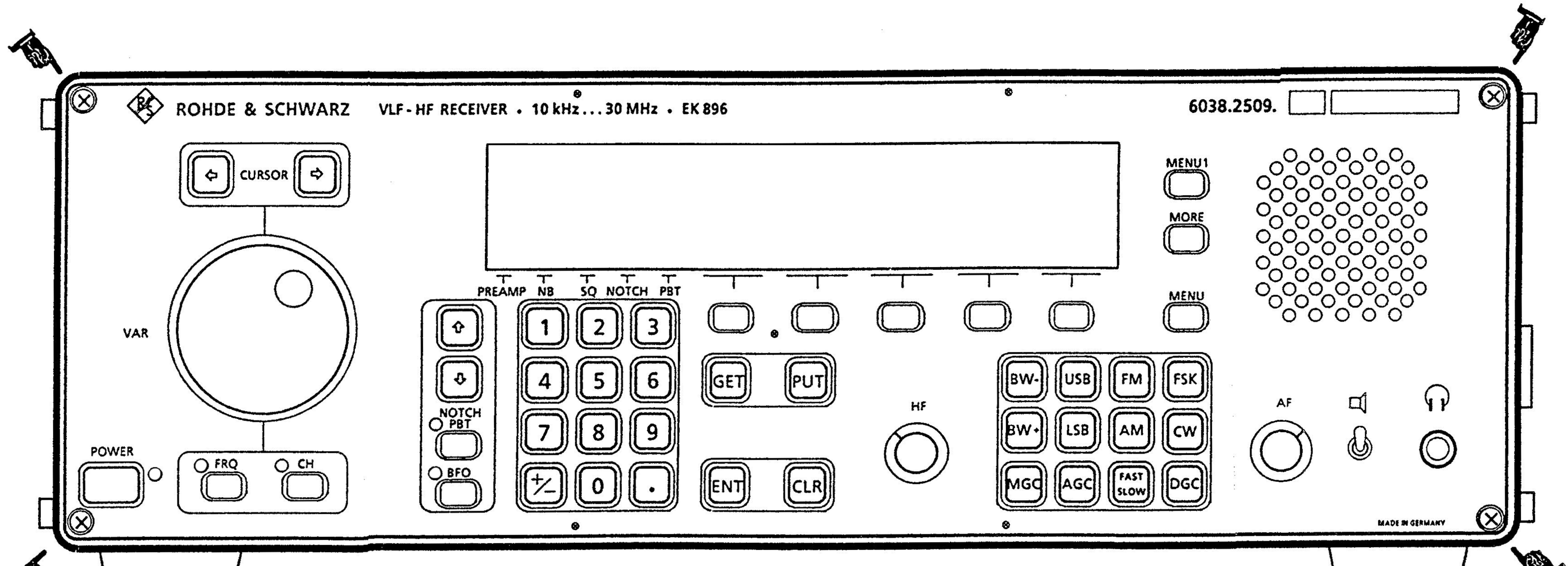
Fig. A1.9 Location of Jumpers on Synthesizer

S3	Baudrate	Stop bit
0	external clock	1
1	50 Bd	2
2	100 Bd	2
3	110 Bd	2
4	300 Bd	1
5	600 Bd	1
6	1200 Bd	1
7*)	2400 Bd	1
8	4800 Bd	1
9	9600 Bd	1
A	19200 Bd	1
B	38400 Bd	1
C	9600 Bd	1
D	9600 Bd	1
E	9600 Bd	1
F	9600 Bd	1



S4	Parity	Mode	Handshake
0	even	RS232	CTS RTS
1*)	odd	RS232	CTS RTS
2	even	RS232	XON XOFF
3	odd	RS232	XON XOFF
4	even	RS422	CTS RTS
5	odd	RS422	CTS RTS
6	even	RS422	XON XOFF
7	odd	RS422	XON XOFF
8	even	RS485	CTS RTS 2-wire
9	odd	RS485	CTS RTS 2-wire
A	even	RS485	XON XOFF 2-wire
B	odd	RS485	XON XOFF 2-wire
C	even	RS485	CTS RTS
D	odd	RS485	CTS RTS
E	even	RS485	XON XOFF
F	odd	RS485	XON XOFF

Fig. A1.10 Location of Jumper and Switches on Processor



C A U T I O N

Before replacing any modules switch of the VLF-HF Receiver and disconnect the Receiver from the mains.

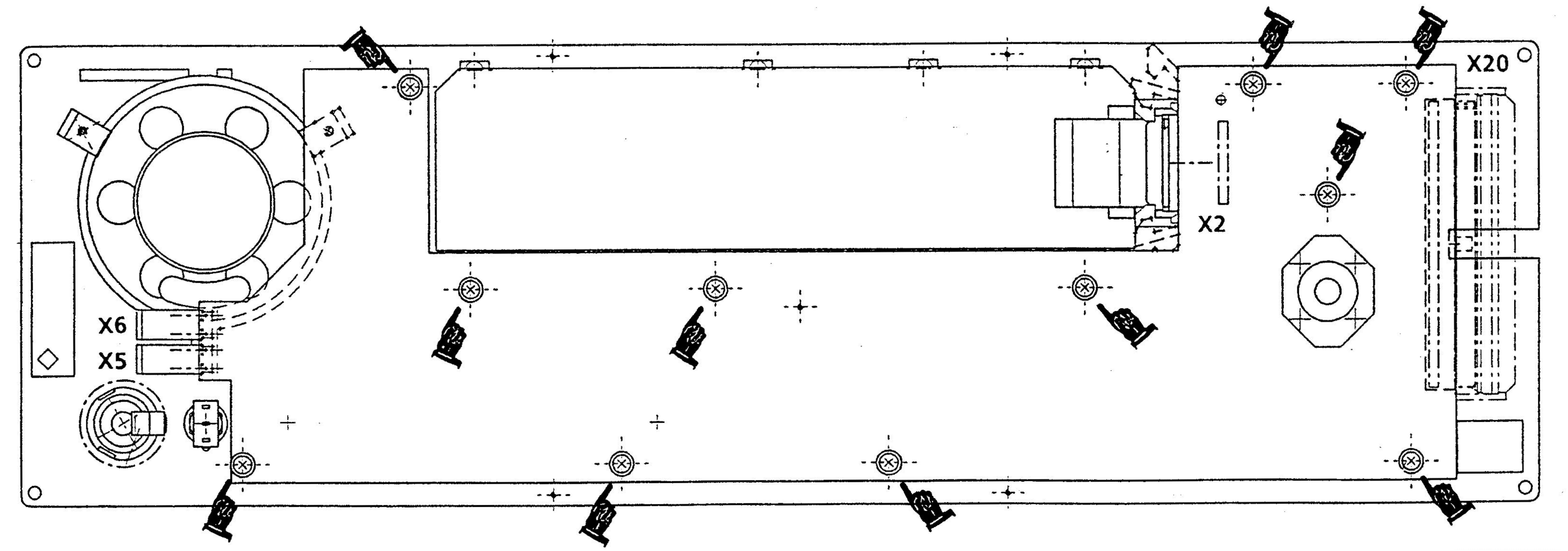
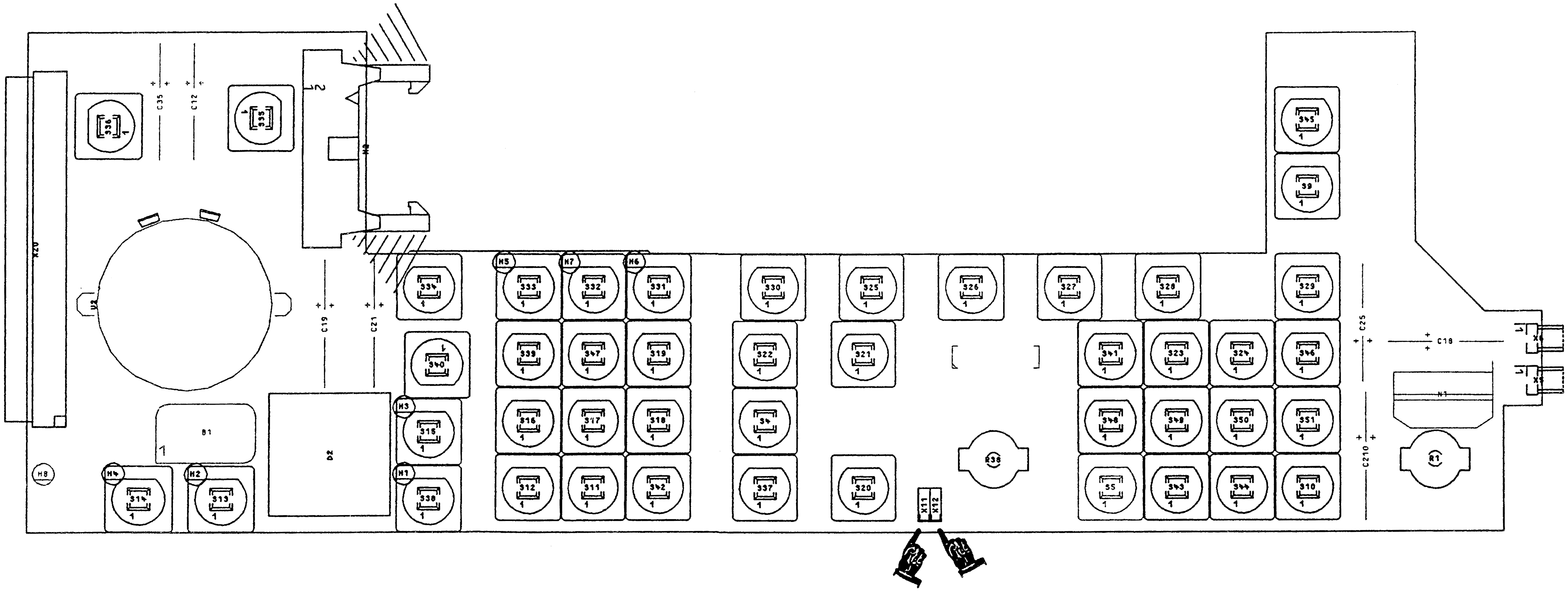
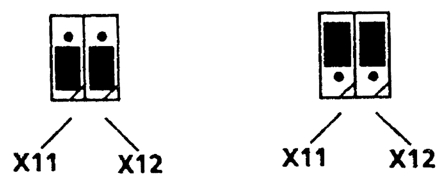


Fig. A1.11 Removal of Control Unit (R&S EK 896 only)



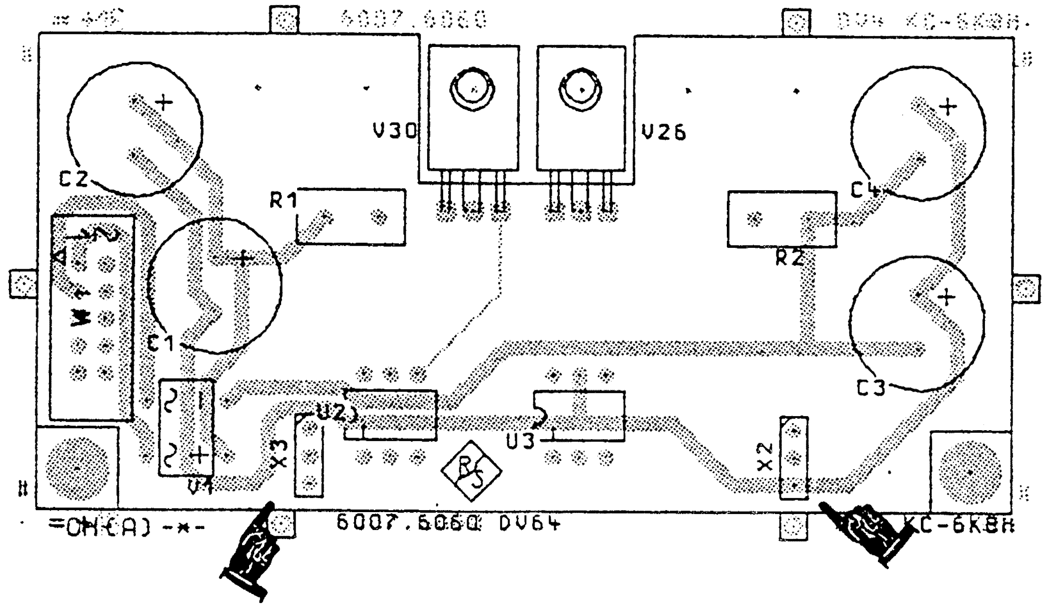
Gain increases by turning the control
counter-clockwise clockwise*).

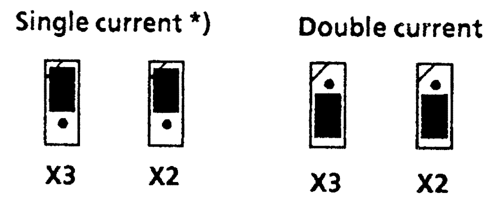
X11 on 1-2 X11 on 2-3
X12 on 1-2 X12 on 2-3



*) Basic setting ex works

Fig. A1.12 Location of Jumpers on Control Unit (EK 896 only)





*) Basic setting ex works

Fig. A1.13 Location of Jumpers on Optional 'TTY Line Current Source GH 890'

List of Contents

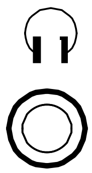
A2. External Interfaces

List of Figures

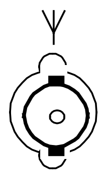
A2. External Interfaces

(See Fig. A2.2 for VLF-HF Receiver EK 895 and Fig. A2.3 for VLF-HF Receiver EK 896)

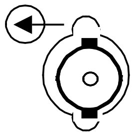
A2.1 Headphone Connection (EK 896, Rear)

Recessed jack-type socket, 2-way (FT 019.0493)	Contact	Signal designation / level
 Mating connector: 6.3-mm jack-type plug, 2-way (FT 019.0487)		AF OUT (AF output) / $P_{max} = 1 \pm 0.2$ W, $R_l = 8\ \Omega$ at $f = 1$ kHz

A2.2 Antenna Connection

Recessed RF socket, system BNC (FJ 017.6636)	Contact	Signal designation / level
 Mating connector: Cable plug, straight, system BNC (FJ 075.8421) Recommended cable DH 025.2142		ANT (antenna input) / max. permissible input voltage 15 V_{EMF} (≤ 30 MHz), $R_i = 50\ \Omega$, VSWR < 3

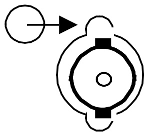
A2.3 Frequency Standard Connection

<table>
<tr><td rowspan="2">Recessed RF socket, system BNC
(FJ 017.6636)

1/5/10 MHz

Mating connector:

Cable plug, straight,
system BNC
(FJ 075.8421)
Recommended cable
DH 025.2142</td><td>Contact</td><td>Signal designation / level</td></tr>
<tr><td></td><td>F-EXT (external synchronization input) /
1 / 5 / 10 MHz, 0.2 to 1 V_{rms}</td></tr>
</table>

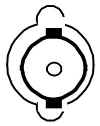
A2.4 FET Analyzer Connection

Recessed RF socket, system BNC (FJ 017.6636)	Contact	Signal designation / level
 0...40 kHz Mating connector: Cable plug, straight, system BNC (FJ 075.8421) Recommended cable DH 025.2142		IF OUT (IF output) / 0 to 40 kHz, -2 dBm into 600 Ω or 455 kHz, -2 dBm into 50 Ω

A2.5 Spectrum Display Connection (Option)

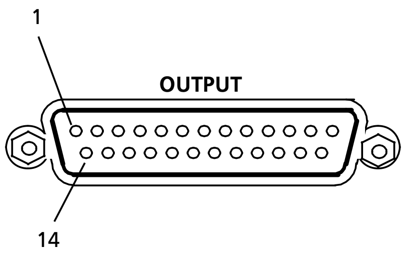
<u>Note:</u>

The recessed RF socket is part of the optional 'IF Processor GM 893, Mod. 03'.

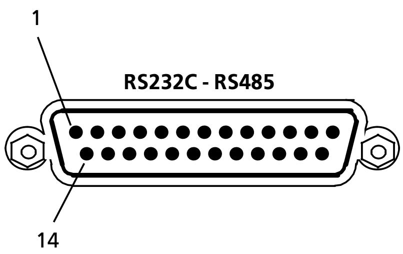
<table>
<tr><td rowspan="2">Recessed RF socket, system BNC
(FJ 017.6636)

OPTION

<u>Mating connector:</u>
Cable plug, straight,
system BNC
(FJ 075.8421)
Recommended cable:
DH 025.2142</td><td>ContaCt</td><td>Signal designation / level</td></tr>
<tr><td></td><td>WBOUT (wideband output) /
41.44 MHz, f_{ANT} = 1.5 to 30 MHz</td></tr>
</table>

A2.6 Data Line Connection (AF and FSK Signals)

Female connector strip, 25-way (FM 570.4345)	Contact	Signal designation / level
	1	AF a (line output) / -10 to +10 dBm, R_i = 600 Ω (see also A1.6)
	2	AF b (line output) / -10 to+10 dBm, R_i = 600 Ω (see also A1.6)
	3	n.c.
	4	FM-VIDEO / 1 V / kHz, R_L > 1 kΩ, R_i = 100 Ω
	5	FSK-TTL / CMOS, V_{CC} = 5 V
	6	Ground, same potential as contacts .11, .12 and .19
	7	F6-V28
	8	AF(Q)
	9	PZG (inv.) / open collector, receive level ≥ DIGI GAIN → transistor reverse-biased, V_{in} < 1 VDC, V_{out} = 15 ±0.6 VDC
	10	AFL / AF(I)
	11	Ground, same potential as contacts .6, .12 and .19
	12	Ground, same potential as contacts .6, .11 and .19
	13	SCITXD
	14	n.c.
	15	n.c.
	16	INHIBIT (inverted, receiver inhibited)
	17	SIGN / CMOS, V_{CC} = 5 V
	18	FSK-V28
	19	Ground, same potential as contacts .6, .11 and .12
	20	BFO reset
	21	AF 2b / -10 to +10 dBm, R_i = 600 Ω (see also A1.8)
	22	+FSK (option), + line current / ±20 mA, ±30 V or 40 mA, 60 V
	23	- FSK (option), - line current / ±20 mA , ±30 V or 40 mA, 60 V
	24	AF 2a / -10 to +10 dBm, R_i = 600 Ω (see also A1.8)
Mating connector: Trapezoidal male connector strip, 25-way (D-series) (FM 018.6430) Housing screened (FM 627.1826)	25	STP (stop scanning) / ground on contact X66.25 → stop of scanning

A2.7 Control Line Connection (RS232C - RS485)

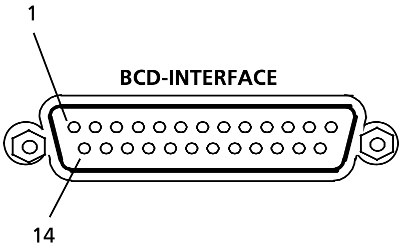
Male connector strip, 25-way (FM 099.8573)	Contact	Signal designation / level
	1	Ground, same potential as contact .7
	2	TxD (transmit data)
	3	RxD (receive data)
	4	RTS (request to send)
	5	CTS (clear to send)
	6	DSR (data set ready)
	7	Ground, same potential as contact .1
	8	not used
	9	RxD (inverted, receive data)
	10	TxD (inverted, transmit data)
	11	not used
	12	not used
	13	not used
	14	not used
	15	not used
	16	not used
	17	Tx/RxC (transmit / receive clock, if switch S3 is set to position 0_{HEX}; for all other switch positions the output is connected to -5 V via 12 kΩ)
	18	not used
	19	not used
	20	DTR (data terminal ready)
	21	not used
	22	not used
	23	not used
	24	not used
	25	RTS (inverted, request to send)
<u>Mating connector:</u> Trapezoidal female connector strip, 25-way (D-series) (FM 018.5756) Housing screened (FM 627.1826)		

A2.8 HF Selector Connection (Option)

<u>*Note:*</u>

The female connector strip is part of the optional 'BCD Interface GC 890'.

Female connector strip, 25-way
(FM 680.2375)

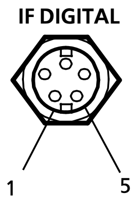


Mating connector:

Trapezoidal male connector strip, 25-way (D-series)
(FM 018.6430)
Cover shielded
(FM 627.1826)

Contact	Signal designation / level
1	100 Hz 1 / CMOS
2	100 Hz 4 / CMOS
3	1 kHz 1 / CMOS
4	1 kHz 4 / CMOS
5	10 kHz 1 / CMOS
6	10 kHz 4 / CMOS
7	100 kHz 1 / CMOS
8	100 kHz 4 / CMOS
9	1 MHz 1 / CMOS
10	1 MHz 4 / CMOS
11	10 MHz 1 / CMOS
12	not used
13	$+5$ V / $+5.2_{-0.2}$ V and $R_i = 150\ \Omega$
14	100 Hz 2 / CMOS
15	100 Hz 8 / CMOS
16	1 kHz 2 / CMOS
17	1 kHz 8 / CMOS
18	10 kHz 2 / CMOS
19	10 kHz 8 / CMOS
20	100 kHz 2 / CMOS
21	100 kHz 8 / CMOS
22	1 MHz 2 / CMOS
23	1 MHz 8 / CMOS
24	10 MHz 2 / CMOS
25	Ground

A2.9 Data Line Connection (Digital IF Signal)

Female circular connector, 5-way (FO 562.6594)	Contact	Signal designation / level
	1	SDATA / CMOS / data, digital output
	2	SCLK / CMOS 3.2 MHz / clock, digital output
	3	SFRAME / CMOS 100 kHz / frame, digital output
	4	GND
	5	not used
<u>Mating connector:</u> Subminiature cable plug, 5-way (series 711) (FO 562.6220)		

The internal frame counter is synchronized with the negative edge of a BFO reset pulse ($\geq$ 10 µs) at contact X66.20 (input). Once synchronization is completed, the signal SCITxD (contact X66.13) will be active for the next complete frame sequence, i.e. with the beginning of the first frame the signal changes from low to high and after the fourth frame back to low.

Each frame sequence consists of four frames. A frame is 10 µs long and is made up of two 12-bit data words. Each data word starts with the bit with the highest value. The data at output SDATA become valid with each negative edge of the SCLK signal.

Every other data word contains the digital IF information.

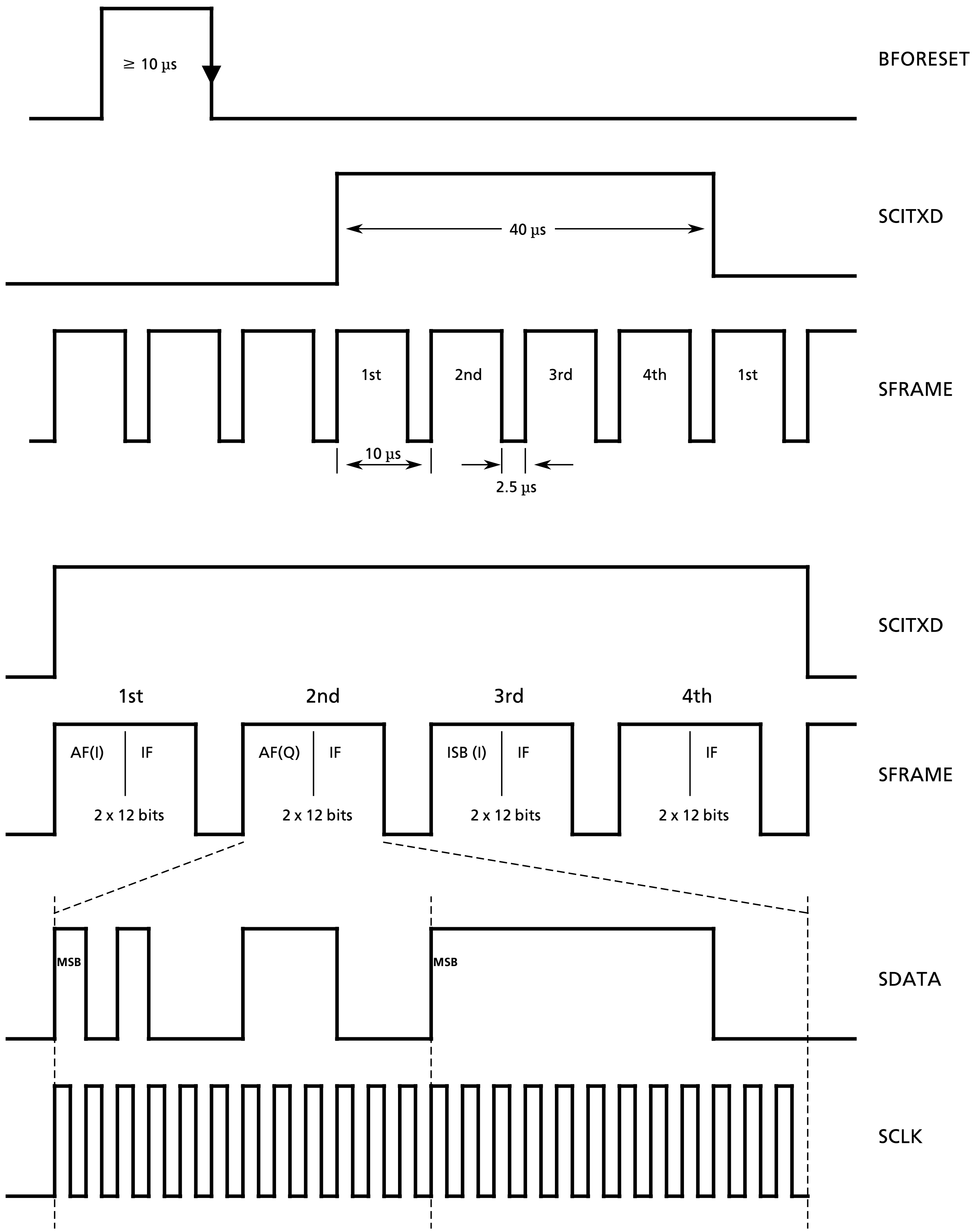
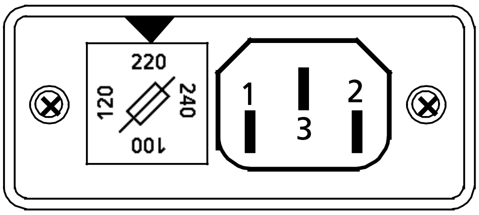
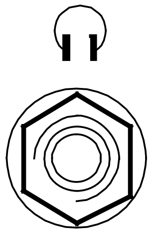


Fig. A2.1 Representation of Signals SFRAME, SCLK, SDATA, SCITxD and BFO Reset

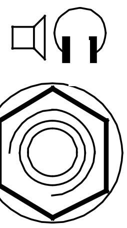
A2.10 Mains Connection

Recessed plug with filter, voltage selector and fuse holder, 3-way (FN 099.3313)	Contact	Signal designation / level
		
	1/2	Mains input / 110 to 240 VAC, -15 to +10%, 47 to 420 Hz
	3	Protective wire
Mating connector: The mating connector is contained in the mains cable (DS 025.2365, part of the supplied accessories).		Note: Fuse for 110/120 VAC = T1.25 / 250 V Fuse for 220/240 VAC = T6.30 / 250 V

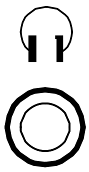
A2.11 Headphone Connection (EK 895, Remote-controlled)

Recessed jack-type socket, 3-way (FT 843.8000)	Contact	Signal designation / level
 Mating connector: 6.3-mm jack-type plug, 2-way (FT 019.0487)		Headphones / 450 to 510 mV, $R_i = 332\ \Omega$

A2.12 Headphone or Loudspeaker Connection (EK 895, Local-controlled)

Recessed jack-type socket, 3-way (FT 843.8000)	Contact	Signal designation / level
 Mating connector: 6.3-mm jack-type plug, 2-way (FT 019.0487)		AF OUT / $P_{max} = 1 \pm 0.2$ W, $R_L \geq 8\ \Omega$ at $f = 1$ kHz

A2.13 Headphone Connection (EK 896, Front)

Recessed jack-type socket, 3-way (FT 019.0493)	Contact	Signal designation / level
 <u>Mating connector:</u> 6.3-mm jack-type plug, 2-way (FT 019.0487)		AF OUT (AF output) / $P_{max} = 1 \pm 0.2$ W, $R_l \geq 8\ \Omega$ at $f = 1$ kHz

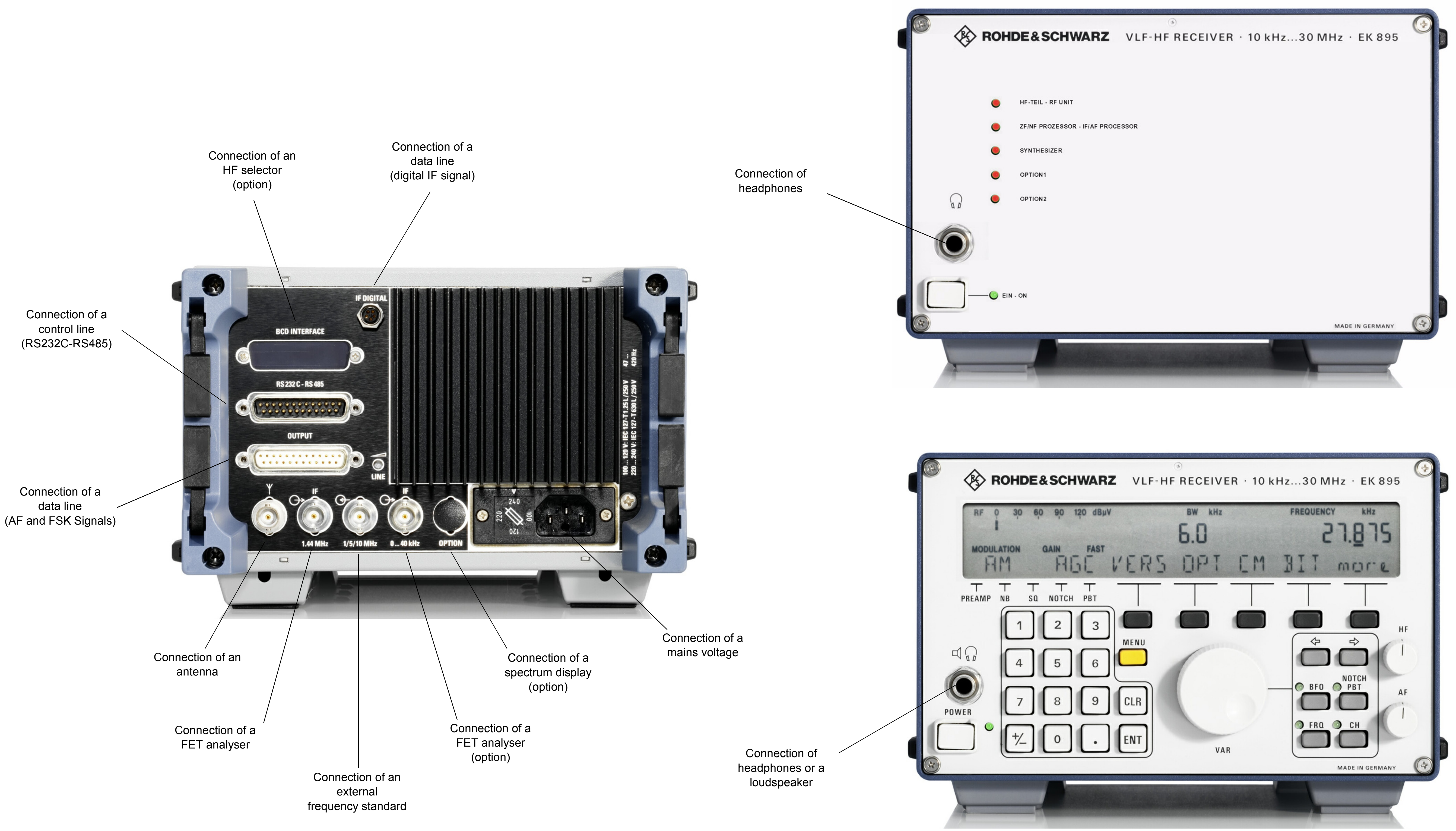


Fig. A2.2 Location of External Interfaces (R&S EK 895)

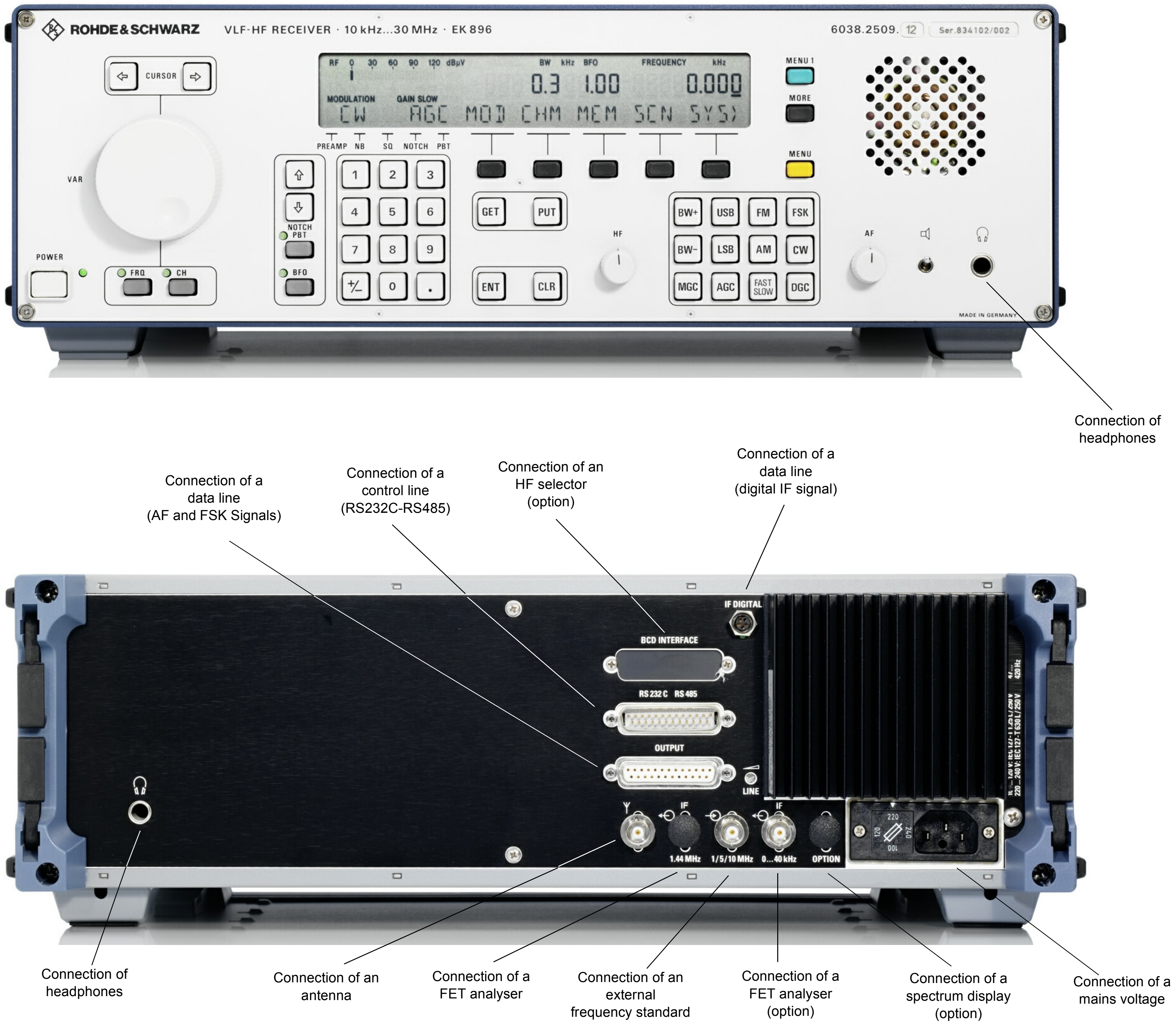


Fig. A2.3 Location of External Interfaces (R&S EK 896)

List of Contents

A3. Remote Control

A3. Remote Control

A3.1 General

The commands entered on the computer have to be in a specific format. The format or the command block consists of up to 150 characters. Each command block begins with the ASCII character LF (= line feed, 10_{dec}, in the following represented by ≡) and ends with the ASCII character CR (= carriage return, 13_{dec}, in the following represented by ↙).

≡<command block>↙

The ASCII character LF is followed by the equipment address in addressed operation or the first command in unaddressed operation. Addresses from A01 to A99 are admissible. In addressed operation the equipment address is followed by the first command.

Addressed operation

≡<address><command 1><command 2> ... <command x>↙

Command blocks beginning with the address A00 are accepted by all receivers, regardless of the set receiver address.

Unaddressed operation

≡<command 1><command 2> ... <command x>↙

The command itself consists of a code and up to 21 parameters. Consecutive parameters have to be separated by a comma. For parameter entry guiding zeros and the plus sign can be omitted.

<code><parameter 1>,<parameter 2> ... <parameter 21>

The code consists of up to five capital letters. The parameters may come as numerical parameter (numbers and the minus sign), character (small letter) and the question mark. The question mark (?) signals that a reply is requested.

The reply consists of the code followed by the question mark and the setting value(s). The reply(ies) is (are) inserted into a reply block, the sequence is not required to be the same as for the command block. The reply block begins with the ASCII character F (≡) and ends with the ASCII character CR (↙). In addressed operation LF is followed by the equipment address. Leading zeros are not integrated into the reply.

Consecutive commands without parameters are to be separated by a blank (in the following represented by └┘).

e.g.: ≡<command 1>└┘<command 2>↙

A3.2 Operating Modes

The receiver can be operated in the following five operating modes:

- MANUAL
- FREQUENCY SCANNING
- CHANNEL
- CHANNEL SCANNING
- CHANNEL SCANNING with freely programmable channel list

A3.2.1 MANUAL

In the MANUAL mode no channel is set.

For the basic settings of the VLF-HF receiver the following codes are possible:

- F (frequency)
- B (BFO frequency)
- W (bandwidth)
- Q (quasi-continuous bandwidth, R&S EK 896 and R&S EK 895 with option R&S EK 895S7)
- I (modulation mode)
- R (control type)
- DT (control time)
- D (DGC value)

In the MANUAL mode the following scanning parameters can be altered:

- SW (see A3.2.2),
- CS (see A3.2.4) and
- CH (see A3.2.5) as well as
- DS (digital level threshold (for frequency scanning, level squelch detection and PZG line control)),
- DWC, DWQ, DWS (dwell time) and
- HTC, HTQ, HTS (hold time)

At the same time one of the following scanning processes can be started:

- Frequency scanning (STS, see A3.2.2)
- Channel scanning (STQ, see A3.2.4)
- Channel scanning with freely programmable channel list (STC, see A3.2.5)

The possible special functions are characterized by the following codes:

- PB (passband tuning)
- L (receive level)
- PL (level control for PZG line)
- PS (syllabic control for PZG line)
- P (PZG line status)
- C (CM status)
- BI (BIT status)
- ST (storage into channel)
- K, CL, RS (editing of channel contents)
- MS (master / slave operation)
- DF (frequency deviation and / or offset)
- NB (noise blanker)
- NF (notch filter)
- SQ (squelch)
- SQT (squelch type)
- PA (preamplifier)
- DEF (default setting)
- SE (switching digital selection on or off, with R&S FK 896D only)
- DS (digital level threshold (for frequency scanning, level squelch detection and PZG line control))
- SST (syllabic squelch threshold (for syllabic squelch detection and PZG line control))
- SSBM (USB Rx filter mode)

The possible system functions are characterized by the following codes:

- A (address)
- V (software version)
- FIB (IF filter)
- OP (options)
- SA (signal BYPASS)
- IF (IF signal)
- M (operating status)
- CO (scanning status)
- ERR (error status)
- RESET (software reset)
- REM (local control)
- IDENT (software type and ident. no.)
- VER (software version and DSP version)

Via the command Ks<parameter> a channel can be called up, and the receiver is automatically in the CHANNEL mode (see A3.2.3).

A3.2.2 FREQUENCY SCANNING

Frequency scanning is started via the command STS. The scan process is determined by the following codes (parameters):

- SW (start frequency, stop frequency, step width)
- DS (digital level threshold (for frequency scanning, level squelch detection and PZG line control))
- DWS (dwell time)
- HTS (hold time)

The digital threshold determines the point in time from which the hold time is added to the dwell time.

When a running scanning program is interrupted, the receiver automatically operates in the MANUAL mode (see A3.2.1). The frequency set last is maintained.

A3.2.3 CHANNEL

In the CHANNEL mode there is a channel set.

In channel operation, as in the MANUAL mode (see A3.2.1), it is possible to

- alter scanning parameters, hold time and dwell time
- start a scanning process
- execute special functions and
- execute system functions.

If one of the basic settings (frequency, BFO, modulation mode, bandwidth, DGC value, type and time of control) is altered, the receiver automatically operates in the MANUAL mode (see A3.2.1).

A3.2.4 CHANNEL SCANNING

CHANNEL SCANNING is started via the command STQ. Scanning is determined by the following codes (parameters):

- CS (start channel, stop channel)
- DWQ (dwell time)
- HTQ (hold time)

The digital threshold, which determines the point in time from which the hold time is added to the dwell time, is stored in the respective channels.

Cleared (inhibited) channels between the start and the stop channel are not called up by a running scan program.

When a running scan program is interrupted, the receiver automatically operates in the CHANNEL mode (see A3.2.3). The channel which has been called up last, remains set.

A3.2.5 CHANNEL SCANNING with Freely Programmable Channel List

CHANNEL SCANNING with freely programmable channel list is started via the command STC. Scanning is determined by the following codes (parameters):

- CH (channel list)
- DWC (dwell time)
- HTC (hold time)

The digital threshold, which determines the point in time from which the hold time is added to the dwell time, is stored in the respective channels.

When a running scan program is interrupted, the receiver automatically operates in the CHANNEL mode (see A3.2.3). The channel which has been called up last, remains set.

A3.3 Basic Settings

In the MANUAL mode the following values can be entered or altered:

- F (frequency)
- B (BFO frequency)
- W (bandwidth)
- Q (quasi-continuous bandwidth, R&S EK 896 and R&S EK 895 with option R&S EK 895S7)
- I (modulation mode)
- R (control type)
- DT (control time)
- D (DGC value)

<u>*Note:*</u>

Channel manipulations (see A3.7.9 to A3.7.12) permit individual basic settings within the channels to be altered.

A3.3.1 Frequency

Command syntax:

Code: F	
Parameter:	a
<u>Possible entries / replies</u>	
Range:	0 to 30000000
Stepwidth:	1 Hz
Entry:	in Hz

<u>*Note:*</u>

The technical data stated in the data sheet are guaranteed for frequencies as of 10 kHz.

<u>Example 1:</u>

Setting a receive frequency of 21.5 MHz

Command = ≡AxxF21500000↙

<u>Example 2:</u>

Inquiry of the set receive frequency

Command = ≡AxxF?↙
→ Reply = ≡AxxF21500000↙

The VLF-HF receiver is set to a frequency of 21.5 MHz.

A3.3.2 BFO Frequency

Command syntax:

Code: B	
Parameter:	a
<u>Possible entries / replies</u>	
Range:	-5000 to 5000
Stepwidth:	10 Hz
Entry:	in Hz

<u>*Note:*</u>

Units which may have been entered are automatically rounded off. A BFO frequency of 0 appears in the reply as follows: B⊔.

<u>Example 1:</u>

Setting a BFO frequency of -100 Hz

Command = ≡AxxB-100↙

<u>Example 2:</u>

Inquiry of the set BFO frequency

Command = ≡AxB?↙
→ Reply = ≡AxxB⊔↙

No BFO frequency is set.

A3.3.3 Modulation Mode

Command syntax:

Code: I
Parameter: .... a,b,c,d,e,f

Possible entries / replies

a-parameter: modulation mode

1 = AM	9 = FM
2 = USB	10 = F7B
3 = LSB	13 = ISBUSB
4 = FAX1	14 = ISBLSB
5 = CW	15 = L USB
6 = FSK	16 = L LSB
7 = AFSK	17 = L ISB USB
8 = FAX2	18 = L ISB LSB

b-parameter: TTY status
(for FSK, AFSK and F7B only)

0 = run
1 = stop

c-parameter: signal polarity
(for FSK, AFSK and F7B only)

FSK / AFSK	F7B (channel 1 / channel 2)
0 = -	0 = - / -
1 = +	1 = + / -
	2 = - / +
	3 = + / +

d-parameter: frequency deviation
(for FSK, AFSK and F7B only)

1 = 42 Hz	7 = 62 Hz
2 = 85 Hz	8 = 125 Hz
4 = 225 Hz	9 = 250 Hz
5 = 425 Hz	10 = 500 Hz

e-parameter: baud rate
(for FSK, AFSK and F7B only)

1 = 50 Bd	5 = 300 Bd
2 = 75 Bd	6 = 600 Bd
4 = 150 Bd	

f-parameter: frequency offset
(for FSK and AFSK only)

Range: .... -3000 to 3000
Stepwidth: .... 1 Hz
Entry: .... in Hz

Note:

To each modulation mode an appropriate bandwidth, BFO frequency and control type and time are assigned.

Therefore, when the default setting (see A3.7.19) is activated, altering the modulation mode automatically changes the bandwidth, BFO frequency and control type and time. If this setting is not the required one, the receiver settings concerned must be altered as desired.

The parameter order must not be altered. However, the parameters may be entered selectively, i.e., parameters which are not needed can be omitted.

In modulation mode ISB, the operator can select the monitoring sideband (USB or LSB) as desired.

Example 1:

Activating modulation mode USB

Command = ≡AxxI2↙

Example 2:

Inquiry of the currently active modulation mode

Command = ≡AxxI?↙
→ Reply = ≡AxxI2↙

The modulation mode USB is now active.

Example 3:

Set the receiver as follows:

- Modulation mode: FSK → a = 6
- Demodulation: run → b = 0
- Polarity: + → c = 1
- Frequency deviation: 225 Hz → d = 4
- Baud rate: 75 Bd → e = 2

Command = ≡AxxI6,0,1,4,2↙

Example 4:

Selective entry of a baud rate of 300 Bd with request for acknowledgement

Command = ≡AxxI,,,,5,?↙
→ Reply = ≡AxxI6,0,1,4,5↙

The baud rate now is 300 Bd.

A3.3.4 Bandwidth (R&S EK 895)

Command syntax:

Code: W
Parameter: .... a

Possible entries / replies

1	=	150 Hz
3	=	300 Hz
4	=	400 Hz
6	=	600 Hz
8	=	800 Hz
10	=	1000 Hz
15	=	1500 Hz
18	=	1800 Hz
21	=	2100 Hz
24	=	2400 Hz
27	=	2700 Hz
31	=	3100 Hz
36	=	3600 Hz
40	=	4000 Hz
48	=	4800 Hz
60	=	6000 Hz
80	=	8000 Hz

Note:

In the IF / AF processor 17 bandwidths are firmly programmed. Depending on the set modulation mode, only specific bandwidths can be set or only these settings make sense.

FM: ≥ 4 kHz
ISB: 2.1 to 3.1 kHz
SSB: 150 Hz to 3.6 kHz
2.7 kHz (for data link models)

Example 1:

Activating the IF filter with a bandwidth of 3100 Hz

Command = ≡AxxW31↙

Example 2:

Inquiry of the currently active IF bandwidth

Command = ≡AxxW?↙
→ Reply = ≡AxxW31↙

The IF filter with a bandwidth of 3100 Hz is currently active.

A3.3.5 Quasi-continuous Bandwidth (R&S EK 896 and R&S EK 895 with Option R&S EK 895S7)

Command syntax:

Code: Q
Parameter: .... a, b

Possible entries / replies

a-parameter: bandwidth

Range: .... 100 to 9000 Hz
Stepdwidth: 1
Entry: .... in Hz

b-parameter:

0 = select bandwidth from choice of fixed bandwidths
1 = set bandwidth quasi-continuously

Note:

With the function of quasi-continuous bandwidth selection, the maximum available bandwidth range (100 Hz to 9 kHz) is subdivided into 128 single bandwidths. Neighbouring bandwidths differ from each other by approx. 3 %. In the IF / AF processor 17 fixed bandwidths are programmed (150 Hz, 300 Hz, 400 Hz, 600 Hz, 800 Hz, 1000 Hz, 1500 Hz, 1800 Hz, 2100 Hz, 2400 Hz, 2700 Hz, 3100 Hz, 3600 Hz, 4000 Hz, 4800 Hz, 6000 Hz, 8000 Hz). If the entered value is neither a fixed bandwidth (b = 0) nor a single bandwidth (b = 1), the next higher value will be used. Depending on the set modulation mode, only particular bandwidths within a defined range (see table) can be activated.

Example 1:

Activating the IF filter with the fixed frequency 3100 Hz

Command = ≡AxxQ3100,0↙

Example 2:

Inquiry of the currently effective IF bandwidth

Command = ≡AxxQ?↙
→ Reply = ≡AxxQ3100,0↙

The IF filter with the fixed bandwidth 3100 Hz is currently active.

Example 3:

Activating the IF filter with the quasi-continuous bandwidth 700 Hz with request for acknowledgement

Command = ≡AxxQ700,1,?↙
→ Reply = ≡AxxQ711,1↙

Since the entered value (700 Hz) is no single bandwidth, the next higher value (711 Hz) is used.

	AM	CW	USB LSB	FSK	AFSK	F7B	FAX1	FAX2	FM	ISBUSB ISBLSB
Fixed / kHz										
Min. bandwidth / kHz	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	2.1
Max. bandwidth / kHz	8.0	8.0	3.6	8.0	8.0	8.0	8.0	8.0	8.0	3.1
Quasi-continuos										
Min. bandwidth / kHz	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.836
Max. bandwidth / kHz	9.0	9.0	3.674	9.0	9.0	9.0	9.0	9.0	9.0	3.375

A3.3.6 Control Type

Command syntax:

Code: R
Parameter: .... a

<u>Possible entries / replies</u>

0 = AGC	4 = AGC + DGC
1 = AGC + DGC	5 = MGC
2 = AGC + DGC	6 = AGC + MGC
3 = AGC	7 = AGC + MGC

<u>Note:</u>

For reasons of compatibility with the VLF-HF Receiver R&S EK 085, the type of control selected by the commands R1 and R2 is the same for both.

<u>Example 1:</u>

Activating type of control AGC

Command = ≡AxxR0↙

<u>Example 2:</u>

Inquiry of the currently effective type of control

Command = ≡AxxR?↙
→ Reply = ≡AxxR0↙

The type of control AGC is currently effective.

A3.3.7 Control Time

Command syntax

Code: DT
Parameter: .... a

<u>Possible entries / replies:</u>

0 = 25 ms
1 = 150 ms
2 = 500 ms
3 = 1 s
4 = 3 s

<u>Example 1:</u>

Activating the control time 500 ms

Command = ≡AxxDT2↙

<u>Example 2:</u>

Inquiry of the currently effective control time

Command = ≡AxxDT?↙
→ Reply = AxxDT2↙

The control time of 500 ms is currently effective.

A3.3.8 DGC Value

Command syntax

Code: D	
Parameter:	a
Possible entries / replies:	
Range:	0 to 120
Stepwidth:	1 $dB\mu V_{EMF}$
Entry:	in $dB\mu V_{EMF}$

Example 1:

Setting DGC value to 35 $dB\mu V_{EMF}$

Command = ≡*AxxD35*↙

Example 2:

Inquiry of the currently effective DGC value

Command = ≡*AxxD?*↙
→ Reply = ≡AxxD35↙

The DGC value is set to 35 $dB\mu V_{EMF}$.

A3.3.9 Programming Examples

Example 1:

The unaddressed VLF-HF receiver is to be set to the following basic values:

- Frequency: 801 kHz = F801000
- Type of modulation: AM = I1
- Bandwidth: 8 kHz = W80
- Control type: AGC = R0
- Control time: 150 ms = DT1

At the same time the setting is to be acknowledged.

Command: ≡F801000,?I1,?W80,?R0,?DT1,?↙
→ Reply: ≡F801000I1W80R0DT1↙

Example 2:

The VLF-HF receiver with the address 15 is to be set to the following basic values:

- Frequency: 6.1 MHz = F6100000
- Modulation mode: CW = I5
- BFO frequency: 1 kHz = B1000
- Bandwidth: 150 Hz = W1

At the same time the setting is to be acknowledged.

Command: ≡A15F6100000,?I5,?B1000,?W1,?↙
→ Reply: ≡A15F6100000I5B1000W1↙

Example 3:

The VLF-HF receiver with address 15 and option R&S EK 895S7 is to be set to the following basic values:

- Frequency: 6.1 MHz = F6100000
- Modulation mode: CW = I5
- BFO frequency: 1 kHz = B1000
- Quasi-continuous bandwidth: 1200 Hz = Q1200,1

At the same time the setting is to be acknowledged.

Command: ≡A15F6100000,?I5,?B1000,?Q1200,1,?↙
→ Reply: ≡A15F6100000I5B1000Q1225↙

A3.4 Frequency Scanning

In the modes MANUAL and CHANNEL it is possible to start a

- frequency scanning process

or to alter the scanning process via the following codes (parameters):

- SW (start frequency, stop frequency, stepwidth)
- DS (digital level threshold (for frequency scanning, level squelch detection and PZG line control))
- DWS (dwell time)
- HTS (hold time)

In the FREQUENCY SCANNING mode the operator can

- stop an active frequency scanning process or
- reactivate a stopped frequency scanning process.

A3.4.1 Start Frequency Scanning

Command syntax:

Code: STS

Example:

Starting a frequency scanning process which has already been programmed

Command = ≡AxxSTS↙
→ Operating mode FREQUENCY SCANNING

A3.4.2 Stop Frequency Scanning

Command syntax:

Code: STO

Example:

Stopping a running scan program

Command = ≡AxxSTO↙
→ Operating mode MANUAL (see A3.2.1)

A3.4.3 Resume Frequency Scanning

Command syntax:

Code: CO

Possible replies

Parameter: .... a

0 = no scanning
1 = frequency scanning
3 = channel scanning with freely programmed channel list
4 = channel scanning

Example 1:

Inquiry which scan process was last activated

Command = ≡AxxCO?↙
→ Reply = ≡AxxCO1↙

A frequency scanning process was last activated.

Example 2:

Reactivating a stopped frequency scanning process

Command = ≡AxxCO↙
→ Operating mode FREQUENCY SCANNING

A3.4.4 Frequency Scanning Parameters

Command syntax:

Code: SW
Parameter: .... a,b,c

Possible entries / replies

a- and b-parameters (start and stop frequency, respectively):

Range: .... 0 to 30000000

Stepwidth: .... 1 Hz
Entry: .... in Hz

c-parameter (stepdwidth):

Range: .... 1 to 30000000
Stepwidth: .... 1 Hz
Entry: .... in Hz

Note:

The parameter order must not be altered. However, parameter entry may be made selectively, i.e., parameters which are not needed can be omitted. The technical data stated in the data sheet are guaranteed for frequencies as of 10 kHz.

Example 1:

Entry of the following scanning parameters:

- Start frequency = 10 MHz
- Stop frequency = 25 MHz
- Stepwidth = 10 Hz

Command =
≡AxxSW10000000,25000000,10↙

Example 2:

Inquiry of the programmed scanning parameters

Command = ≡AxxSW?↙
→ Reply =
≡AxxSW10000000,25000000,10↙

For scanning a start frequency of 10 MHz, a stop frequency of 25 MHz and a stepwidth of 10 Hz are programmed.

Example 3:

Selective entry of a stepwidth of 20 Hz and request for acknowledgement

Command = ≡AxxSW,,20,?↙
→ Reply=
≡AxxSW10000000,25000000,20↙

The scanning process is programmed to a start frequency of 10 MHz, a stop frequency of 25 MHz and a stepwidth of 20 Hz.

A3.4.5 Digital Level Threshold

Command syntax:

Code: DS	
Parameter:	a
Possible entries / replies	
Range:	0 to 120
Stepwidth:	1 $dB\mu V_{EMF}$
Entry:	in $dB\mu V_{EMF}$

Note:

The digital level threshold is required for frequency scanning (see A3.4) and for level control of the PZG line (A3.7.3).

Example 1:

Entering a digital level threshold of 35 $dB\mu V_{EMF}$

Command = ≡AxxDS35↙

Example 2:

Inquiry of the currently effective digital level threshold

Command = ≡AxxDS?↙
→ Reply = ≡AxxDS35↙

A threshold of 35 $dB\mu V_{EMF}$ is set.

A3.4.6 Dwell Time

Command syntax:

Code: DWS	
Parameter:	a
Possible entries / replies	
Range:	50 to 65535
Stepwidth:	1 ms
Entry:	in ms

Note:

The dwell time is required for frequency scanning (see A3.4).

The dwell time is the period during which a frequency in an active scan process remains set.

Example 1:

Entering a dwell time of 3.5 s

Command = ≡AxxDWS3500↙

Example 2:

Inquiry of the currently effective dwell time

Command = ≡AxxDWS?↙
→ Reply = ≡AxxDWS3500↙

A dwell time of 3.5 s is set.

A3.4.7 Hold Time

Command syntax:

Code: HTS	
Parameter:	a
Possible entries / replies	
Range:	0 to 65534
Stepwidth:	1 ms
Entry:	in ms
Command: HTSf (automatic stop of scanning)	

Note:

The hold time is required for frequency scanning (see A3.4).

Due to the command HTS<parameter>, to the dwell time (see A3.4.6) the hold time is added, once the receive level exceeds the set digital threshold (see A3.4.5).

The command HTSf automatically stops scanning, once the receive level exceeds the set digital threshold (see A3.4.5).

Example 1:

Entering a hold time of 3.5 s.

Command = ≡AxxHTS3500↙

Example 2:

Inquiry of the currently effective hold time

Command = ≡AxxHTS?↙
→ Reply = ≡AxxDWS3500↙

A hold time of 3.5 s is set.

Example 3:

Programming an automatic stop of scanning

Command = HTSf
→ Operating mode MANUAL

A3.4.8 Programming Example

Example:

The unaddressed VLF-HF receiver is to be set to the following frequency scanning parameters:

- Start frequency: 6 MHz
- Stop frequency: 6.5 MHz
- Step width: 5 kHz

SW6000000,6500000,5000

- Dwell time: 100 ms = DWS100
- Hold time: automatic stop of scanning = HTSf
- Digital level threshold: 60 dBµV_{EMF} = DS60
- Control type: AGC = R0
- Control time: 25 ms = DT0

Subsequently scanning is to be started (= STS) and the operating status (= M) is to be inquired.

Command: ≡*SW6000000,6500000,5000DWS100HTSfDS60R0DT0STS*⌊⌋*M?*↙
→ Reply: ≡M1↙

The receiver is in the operating mode FREQUENCY SCANNING.

As a result of the programmed scanning process the receive frequency changes, starting at 6 MHz, in increments of 5 kHz until the receive frequency of 6.5 MHz is reached. The receiver remains on each new frequency for 100 ms. If the currently effective receive level exceeds the digital threshold of 60 dBµV_{EMF}, scanning is automatically stopped → operating mode MANUAL.

A stopped scanning process can be resumed via the command CO.

A3.5 Channel Scanning

In the operating modes MANUAL and CHANNEL it is possible to

- start channel scanning

or alter the scan process via the following codes (parameters):

- CS (start channel, stop channel)
- DWQ (dwell time)
- HTQ (hold time)

In the operating mode CHANNEL SCANNING the operator can

- stop an active channel scanning process

or

- reactivate a stopped channel scanning process.

A3.5.1 Start Channel Scanning

Command syntax:

Code: STQ

Example:

Starting an already programmed channel scanning process

Command = ≡AxxSTQ↙
→ Operating mode CHANNEL SCANNING

A3.5.2 Stop Channel Scanning

Command syntax:

Code: STO

Example:

Stopping a running channel scanning process

Command = ≡AxxSTO↙
→ Operating mode CHANNEL (see A3.2.3)

A3.5.3 Resume Channel Scanning

Command syntax:

Code: CO

Possible replies

Parameter: .... a

0 =	no scanning
1 =	frequency scanning
3 =	channel scanning with freely programmed channel list
4 =	channel scanning

Example 1:

Inquiry which scan program was last activated

Command = ≡AxxCO?↙
→ Reply = ≡AxxCO4↙

Channel scanning was active.

Example 2:

Reactivating a stopped channel scanning process

Command = ≡AxxCO↙
→ Operating mode CHANNEL SCANNING

A3.5.4 Channel Scanning Parameters

Command syntax:

Code: CS	
Parameter:	a,b
<u>Possible entries / replies</u>	
a (start channel):	0 to 999
b (stop channel):	0 to 999

<u>Note:</u>

Inhibited channels (see A3.7.10) are not called up.

<u>Example 1:</u>

Entry of the following scanning parameters:

- Start channel = 700
- Stop channel = 900

Command = ≡AxxCS700,900↙

<u>Example 2:</u>

Inquiry of the programmed scanning parameters

Command = ≡AxxCS?↙
→ Reply = ≡AxxCS700,900↙

For scanning the start channel 700 and the stop channel 900 are programmed.

A3.5.5 Dwell Time

Command syntax:

Code: DWQ
Parameter: .... a

Possible entries / replies

Range:	50 to 65535
Stepwidth:	1 ms
Entry:	in ms

Note:

The dwell time is required for channel scanning (see A3.5).

The dwell time is the time during which a channel in an active scan process remains set.

Example 1:

Entering a dwell time of 3.5 s

Command = ≡AxxDWQ3500↙

Example 2:

Inquiry of the currently valid dwell time

Command = ≡AxxDWQ?↙
→ Reply = ≡AxxDWS3500↙

The dwell time is set to 3.5 s.

A3.5.6 Hold Time

Command syntax:

Code: HTQ
Parameter: .... a

Possible entries / replies

Range:	0 to 65534
Stepwidth:	1 ms
Entry:	in ms

Command: HTQf (automatic stop of scanning)

Note:

The hold time is required for channel scanning (see A3.5).

Due to the command HTQ<parameter>, to the dwell time (see A3.5.5) the hold time is added, once the receive level exceeds the set digital level threshold (see A3.3.6).

The command HTQf automatically stops scanning, once the receive level exceeds the set digital threshold (see A3.3.6).

Example 1:

Entering a hold time of 3.5 s

Command = ≡AxxHTQ3500↙

Example 2:

Programming an automatic stop of scanning

Command = ≡AxxHTQf↙
→ Operating mode CHANNEL

A3.5.7 Programming Example

Example:

The unaddressed VLF-HF receiver is to be set to the following channel scanning parameters:

- Start channel: 100 } CS100,150
- Stop channel: 150 }
- Dwell time: 100 ms = DWQ100
- Hold time: 1500 ms = HTQ1500

Subsequently scanning is to be started (= STQ) and in addition the operating status (= M) is to be inquired.

Command: ≡CS100,150DWQ100HTQ1500STQ⊔M?↙
→ Reply: ≡M4↙

The receiver is in the operating mode CHANNEL SCANNING.

In the programmed scan process each channel which is not inhibited is called up, starting with channel 100 and stopping with channel 150. The receiver remains for 100 ms on each new basic setting which is effected by the channel call-up. If the currently available receive level exceeds the digital threshold stored in the channel, the dwell time is automatically extended by 1500 ms.

Via the command CO a temporarily stopped scan process can be reactivated.

A3.6 Channel Scanning with Freely Programmable Channel List

In the operating modes MANUAL and CHANNEL it is possible to

- start channel scanning

or

to alter the scan process via the following codes (parameters):

- CH (channel list, up to 20 channels)
- DWC (dwell time)
- HTC (hold time)

In the operating mode CHANNEL SCANNING with freely programmable channel list the operator can

- stop an active channel scanning process

or

- reactivate a stopped channel scanning process.

A3.6.1 Start Channel Scanning

Command syntax:

Code: STC

Example:

Starting a channel scanning process which has already been programmed

Command = ≡AxxSTC↙
→ operating mode CHANNEL SCANNING with freely programmable channel list

A3.6.2 Stop Channel Scanning

Command syntax:

Code: STO

Example:

Stopping a running scanning process

Command = ≡AxxSTO↙

→ operating mode CHANNEL (see A3.2.3)

A3.6.3 Resume Channel Scanning

Command syntax:

Code: CO

Possible replies

Parameter: .... a

0 = no scanning
1 = frequency scanning
3 = channel scanning with freely programmed channel list
4 = channel scanning

Example 1:

Inquiry which scan process was last active

Command = ≡AxxCO?↙
→ Reply = ≡AxxCO3↙

Channel scanning with freely programmed channel list was active.

Example 2:

Reactivating a stopped channel scanning process

Command = ≡AxxCO↙

→ operating mode CHANNEL SCANNING with freely programmed channel list

A3.6.4 Channel List

Command syntax:

Code: CH	
Parameter:	$a_1,a_2,a_3,...a_{19},a_{20}$
Possible entries / replies	
Range:	0 to 999
Command:	CHc (clear channel list)

Note:
A channel list can contain up to 20 channels.

Example 1:

Entry of the following channel list:

- 100
- 70
- 75
- 5

Command = ≡AxxCH100,70,75,5↙

Example 2:

Inquiry of a programmed channel list

Command = ≡AxxCH?↙
→ Reply = ≡AxxCH100,70,75,5↙

The channel list consists of the channel numbers 100, 70, 75 and 5.

Example 3:

Clearing a programmed channel list

Command = ≡AxxCHc↙

The channel list is cleared.

A3.6.5 Dwell Time

Command syntax:

Code: DWC	
Parameter:	a
<u>Possible entries / replies</u>	
Range:	50 to 65535
Stepwidth:	1 ms
Entry:	in ms

<u>Note:</u>

The dwell time is required for channel scanning (see A3.6).

The dwell time is the period during which a frequency in an active scan process remains set.

<u>Example 1:</u>

Entering a dwell time of 3.5 s

Command = ≡AxxDWC3500↙

<u>Example 2:</u>

Inquiry of the currently effective dwell time

Command = ≡AxxDWC?↙
→ Reply = ≡AxxDWC3500↙

A dwell time of 3.5 s is set.

A3.6.6 Hold Time

Command syntax:

Code: HTC	
Parameter:	a
<u>Possible entries / replies</u>	
Range:	0 to 65534
Stepwidth:	1 ms
Entry:	in ms
Command: HTCf (automatic stop of scanning)	

<u>Note:</u>

The hold time is required for channel scanning (see A3.6).

Due to the command HTC<parameter>, to the dwell time (see A3.6.5) the hold time is added, once the receive level exceeds the set digital threshold (see A3.3.6).

The command HTCf automatically stops scanning, once the receive level exceeds the set digital threshold (see A3.3.6).

<u>Example 1:</u>

Entering a hold time of 3.5 s

Command = ≡AxxHTC3500↙

<u>Example 2:</u>

Programming an automatic stop of scanning

Command = ≡AxxHTCf↙
→ Operating mode CHANNEL

A3.6.7 Programming Example

Example:

The unaddressed VLF-HF receiver is to be programmed for the following channel scanning process:

- Channel list: 100, 70, 75 and 5 = CH100,70,75,5
- Dwell time: 100 ms = DWC100
- Hold time: automatic stop of scanning = HTCf

Subsequently, scanning is to be started (= STC) and in addition the operating status is to be inquired (= M).

Command: ≡CH100,70,75,5DWC100HTCf*STC*⊔*M?*↙
→ Reply: ≡M3↙

The receiver is in the operating mode CHANNEL SCANNING with freely programmed channel list.

Due to the channel list the channels 100, 70, 75 and 5 are called up one after the other. The receiver remains for 100 ms on each new basic receiver setting which is effected by the channel call-up. If the currently effective receive level exceeds the digital threshold stored in the channel, scanning is automatically stopped → operating mode CHANNEL.

Via the command CO the stopped scanning process can be resumed.

A3.7 Special Functions

The following special functions are possible:

- Passband tuning
- Inhibiting or enabling level control for the PZG line
- Setting the level squelch threshold
- Inhibiting or enabling syllabic control for the PZG line
- Setting the syllabic squelch threshold
- Inquiry of level line status
- Initiation of BIT and/or inquiry of BIT status
- Inquiry of CM status
- Inquiry of receive level
- Storage into a channel
- Channel call-up
- Editing the channel contents
- Master / slave operation
- Inquiry of frequency deviation and / or offset
- Setting the notch filters, switching on and off
- Switching the noise blanker on or off
- Switching the digital selection on or off (with R&S FK 896D only)
- Switching the squelch function on or off
- Setting the squelch function type
- Switching the preamplifier on or off
- Setting the SSB Rx Filter Mode
- Enabling or disabling default setting
- Inquiry of receive level (extended)

A3.7.1 Passband Tuning

Command syntax:

Code: PB
Parameter: .... a

Possible entries / replies

DEF=0 (see A3.7.25)

Range:	-5000 to 5000
Stepwidth:	10 Hz
Entry:	in Hz

DEF=1 (see A3.7.25)

Range:	± bandwidth / 2
Stepwidth:	10 Hz
Entry:	in Hz

Note:

The frequency offset function should only be used in modulation modes AM, CW, SSB, F7B, FAX and FM. Units which may have been entered are automatically rounded off.

DEF=1 (see A3.7.25): The maximum (+bandwidth/2 and minimum (-bandwidth/2) values depend on the currently effective IF bandwidth. If necessary, inquire currently effective bandwidth via command W? (see A3.3.4) or Q (see A3.3.5).

Example 1:

Shifting the passband curve of the currently active IF filter by -100 Hz as regards the receive frequency.

Command = ≡AxxPB-100↙

Example 2:

Inquiry of the currently effective shift

Command = ≡AxxPB?↙
→ Reply = ≡AxxPB-100↙

A shift of -100 Hz is effective.

A3.7.2 Inquiry of PZG Line Status

Command syntax:

Code: P

Possible replies

Parameter: .... a

0 = receive level < level and / or syllabic threshold or level line inhibited
1 = receive level ≥ level and / or syllabic threshold

The PZG line status is P0, if the level and syllabic control was inhibited via command PL0 and PS0 (see A3.7.3 and .5).

Via command PL1 and / or PS1 (see A3.7.3 and / or .5) the level and / or syllabic control is enabled, that is, the PZG line status depends on the current receive level and the programmed thresholds (see A3.7.4 and / or A3.7.6).

P0 = receive level < level and / or syllabic threshold → transistor is blocked
P1 = receive level ≥ level and / or syllabic threshold → transistor is conductive

An inquiry of the PZG line status switches the PZG line to OFF. The line is switched to ON as soon as the PZG line status changes from P0 to P1.

Thus several VLF-HF receivers can be connected via the PZG line to an interrupt input of the CPU.

Note:

Inquiry of the status is not permitted if the PZG line status is used as the switching criterion.

Example:

Inquiry of the PZG line status

Command = ≡AxxP?↙
→ Reply = ≡AxxP1↙

The receive level is higher than the programmed threshold.

A3.7.3 Inhibiting or Enabling the Level Control for PZG Line (Automatic Indication of Changes in PZG Line Status)

Command syntax:

Code: PL	
Parameter:	a
Possible entries / replies	
0 = inhibit (OFF)	
1 = enable (ON)	
2 = extended function	

By means of the command PL0 the level control is inhibit.

By means of the command PL1 the level control is enabled.

If the receive level exceeds the set digital level threshold (see chapter A3.7.4), an open-collector transistor will become conductive. Thus output X66.9 (see chapter A2.6) is connected to ground.

By means of the command PL2 the extended function is enabled.

In addition to command PL1, after approx. 100 ms the string "U1" is emitted via the RS232 / RS485 interface.

Example 1:

Inquiry whether level control is inhibited or enabled

Command = ≡AxxPL?↙
→ Reply = ≡AxxPL0↙

The level control for PZG line is inhibited.

Example 2:

Enabling the level line control for PZG line

Command = ≡AxxPL1↙

A3.7.4 Setting the Level Threshold

Command syntax:

Code: DS	
Parameter:	a
Possible entries / replies	
Range:	0 to 120
Stepwidth:	1 dBµV_{EMF}
Entry:	in dBµV_{EMF}

Note:

The level threshold is required for level control of the PZG line (A3.7.3).

Example 1:

Entering a digital level threshold of 35 dBµV_{EMF}

Command = ≡AxxDS35↙

Example 2:

Inquiry of the currently effective digital level threshold

Command = ≡AxxDS?↙
→ Reply = ≡AxxDS35↙

A threshold of 35 dBµV_{EMF} is set.

A3.7.5 Inhibiting or Enabling the Syllabic Control for PZG Line

Command syntax:

Code: PS
Parameter: .... a

Possible entries / replies

0 = inhibit (OFF)
1 = enable (ON)

By means of the command PL0 the syllabic control is inhibit.

By means of the command PL1 the syllabic control is enabled.

If the receive level exceeds the set syllabic threshold (see chapter A3.7.6), an open-collector transistor will become conductive. Thus output X66.9 (see chapter A2.6) is connected to ground.

Example 1:

Inquiry whether syllabic control is inhibited or enabled

Command = ≡AxxPS?↙
→ Reply = ≡AxxPS0↙

The syllabic control for PZG line is inhibited.

Example 2:

Enabling the syllabic line control for PZG line

Command = ≡AxxPS1↙

A3.7.6 Setting the Syllabic Squelch Threshold

Command syntax:

Code: SST
Parameter: .... a

Possible entries / replies

Range: .... 0 to 100
Stepwidth: .... 1 %
Entry: .... in %

Note:

The syllabic squelch threshold is required for syllabic control of the PZG line (A3.7.5).

Example 1:

Entering a syllabic squelch threshold of 35 %

Command = ≡AxxSST35↙

Example 2:

Inquiry of the currently effective syllabic squelch threshold

Command = ≡AxxSST?↙
→ Reply = ≡AxxSST35↙

A threshold of 35 % is set.

A3.7.7 Initiation of BIT and / or Inquiry of BIT Status

Command syntax:

Code: BI

Possible replies

Parameter: .... a

0 = no error
10 = synthesizer missing
1 = synthesizer defective
20 = HF unit missing
2 = HF unit defective
5 = module bus defective
60 = IF / AF processor missing
6 = IF / AF processor defective
7 = IF Converter R&S UX 895 defective

Command: BIs (initiate BIT)

Note:

As soon as a reply other than BI0 is indicated, carry out troubleshooting acc. to chapter 4.2.

Example 1:

Inquiry of the BIT status

Command = ≡AxxBI?↙
→ Reply = ≡AxxBI0↙

The receiver works perfectly.

Example 2:

Initiation of BIT and inquiry of BIT status

Command = ≡AxxBIs,?↙
→ Reply = ≡AxxBI0↙

The receiver works perfectly.

Example 3:

Initiation of BIT and inquiry of BIT status

Command = ≡AxxBIs,?↙
→ Reply = ≡AxxBI10,20↙

The modules synthesizer and HF unit are missing.

A3.7.8 Inquiry of CM Status

Command syntax:

Code: C

Possible replies

Parameter: .... a

0 = no error
1 = synthesizer defective
4 = IF / AF processor defective
5 = synthesizer and IF / AF processor defective

Note:

If during operation a change in the CM status occurs, this change is automatically signalled to the PC. However, this does not apply to bus operation. As soon as a reply other than C0 appears, carry out troubleshooting acc. to chapter 4.2.

Example:

Inquiry of CM status

Command = ≡AxxC?↙
→ Reply = ≡AxxC0↙

The synthesizer and the IF / AF processor both work perfectly.

A3.7.9 Inquiry of Receive Level

(see A3.7.26 for extended range)

Command syntax:

Code: L

Possible replies

Parameter: .... a

Range: .... 0 to 120
Resolution: .... 1 $dB\mu V_{EMF}$

Example:

Inquiry of the currently effective receive level

Command = ≡AxxL?↙
→ Reply = ≡AxxL65↙

The currently effective receive level is 65 $dB\mu V_{EMF}$.

A3.7.10 Storage into a Channel

Command syntax:

Code: ST	
Parameter:	a
Possible entry	
Range:	0 to 999

Example:

Storing the currently effective receiver setting into channel 873

Command = ≡AxxST873↙

A3.7.11 Channel Call-up

Command syntax:

Code: K	
Parameter:	a,b
z:	s (set)
Possible entry	
Range:	0 to 999

Note:

Inhibited channels (K<parameter>,e; see A3.7.13) are automatically reactivated upon command Ks,<parameter>, that is, the flag 'e' is cancelled.

Example:

Activating channel 873

Command = ≡AxxKs,873↙
→ Operating mode CHANNEL

A3.7.12 Editing the Channel Contents

Command syntax:

Code: K	
Parameter:	a
Possible entry	
Range:	0 to 999

Note:

The code K without parameter 's' in the command block means, that all receiver settings following the K are not carried out directly, but are only stored under the respective channel number.

The receiver status is not affected by the command K<parameter>.

Example 1:

Program channel 125 as follows:

- Frequency: 6 MHz = F6000000
- Modulation mode: CW = I5
- Control type: AGC+DGC = R1
- Control time: 500 ms = DT2
- Bandwidth: 150 Hz = W1
- BFO frequency: 800 Hz = B800
- DGC value: 45 dBµV_{EMF} = D45

Command =
≡AxxK125F6000000I5R1DT2W1B800D45↙

Example 2 (with option EK 895S7):

Program channel 125 as follows:

- Frequency: 6 MHz = F6000000
- Modulation mode: CW = I5
- Control type: AGC+DGC = R1
- Control time: 500 ms = DT2
- Bandwidth: 1200 Hz = Q1200,1
- BFO frequency: 800 Hz = B800
- DGC value: 45 dBµV_{EMF} = D45

Command =
≡AxxK125F6000000I5R1DT2Q1200,1
B800D45↙

A3.7.13 Inquiry of Channel Contents

Command syntax:

Code: K	
Parameter:	a
Possible entries	
Range:	0 to 999

Example 1:

Inquiry of the contents of channel 125

Command = ≡AxxK125,?↙
→ Reply =
≡AxxK125F6000000I5B800W1R2DT2D45↙

In channel 125 the following settings are stored:

- Frequency: F6000000 = 6 MHz
- Modulation mode: I5 = CW
- BFO frequency: B800 = 800 Hz
- Bandwidth: W1 = 150 Hz
- Control type: R2 = AGC+DGC
- Control time: DT2 = 500 ms
- DGC value: D45 = 45 dBµV_{EMF}

Example 2:

Inquiry of current receiver setting

Command = ≡AxxK?↙
→ Reply =
≡AxxK␣F12345678I3B-100W31R0DT1D25↙

Note:

The blank '␣' following the letter K means, that there is no channel set.

The following settings are effective at the moment:

- Operating mode: K␣ = MANUAL
- Frequency: F12345678 = 12345.678 kHz
- Modulation mode: I3 = LSB
- BFO frequency: B-100 = -100 Hz
- Bandwidth: W31 = 3.1 kHz
- Control type: R0 = AGC
- Control time: DT1 = 150 ms
- DGC value: D25 = 25 dBµV_{EMF}

Example 3:

Inquiry of current receiver setting

Command = ≡AxxK?↙
→ Reply =
≡AxxK232F800000I1B␣W60R0DT1D25↙

The following settings are effective at the moment:

- Operating mode: K232 = CHANNEL
- Frequency: F800000 = 800 kHz
- Modulation mode: I1 = AM
- BFO frequency: B␣ = none
- Bandwidth: W60 = 6.0 kHz
- Control type: R0 = AGC
- Control time DT1 = 150 ms
- DGC value: D25 = 25 dBµV_{EMF}

Example 4 (with option EK 895S7):

Inquiry of contents of channel 125

Command = ≡AxxK125,?↙
→ Reply =
≡AxxK125F6000000I5B800Q1225,1
R2DT2D45↙

In channel 125 the following settings are stored:

- Frequency: F6000000 = 6 MHz
- Modulation mode: I5 = CW
- BFO frequency: B800 = 800 Hz
- Quasi-continuous bandwidth: Q1225 = 1225 Hz
- Control type: R2 = AGC+DGC
- Control time: DT2 = 500 ms
- DGC value: D45 = 45 dBµV_{EMF}

A3.7.14 Inhibiting a Channel

Command syntax:

Code: CL	
Parameter:	a
Possible entries	
Range:	0 to 999
Command: CLa (clear all)	

Example 1:

Inhibiting channel 125 and indicating the channel contents

Command = ≡AxxCL125K125,?↙
→ Reply =
≡AxxK125,eF6000000I5B800W2R1DT2D45↙

Note:

The small letter 'e' indicates, that this channel is inhibited. Channels of this kind are not called up during CHANNEL SCANNING (see A3.5).

In channel 125 the following settings are stored:

- Channel status: K125,e = inhibited
- Frequency: F6000000 = 6 MHz
- Modulation mode: I5 = CW
- BFO frequency: B800 = 800 Hz
- Bandwidth: W1 = 150 Hz
- Control type: R1 = AGC+DGC
- Control time: DT2 = 500 ms
- DGC value: D45 = 45 dBµV_{EMF}

Example 2:

Inhibiting all channels

Command = ≡AxxCLa↙

A3.7.15 Reactivating a Channel

Command syntax:

Code: RS	
Parameter:	a
Possible entries	
Range:	0 to 999

Example:

Reactivating channel 125 and indicating the channel contents

Command = ≡AxxRS125K125,?↙
→ Reply =
≡Axx K125F6000000I5B800W2R1DT2D45↙

In channel 125 the following settings are stored:

- Frequency: F6000000 = 6 MHz
- Modulation mode: I5 = CW
- BFO frequency: B800 = 800 Hz
- Bandwidth: W1 = 150 Hz
- Control type: R1 = AGC+DGC
- Control time: DT2= 500 ms
- DGC value: D45 = 45 dBµV_{EMF}

Note:

The channel can now be called up again during CHANNEL SCANNING (see A3.5).

A3.7.16 Master / Slave Operation

Command syntax:

Code: MS	
Parameter:	a
Possible entries	
Range:	0 to 99

Note:

The command block generated via command MS<parameter> contains all basic receiver settings, consisting of frequency, BFO frequency, modulation mode, DGC value, bandwidth, type and time of control as well as the currently effective difference between receive frequency and IF passband curve.

Example:

Transfer of the currently effective receiver setting from the receiver with the master address 03 to a receiver with the slave address 04

Command = ≡A03MS04↙

In the receiver with the address 03 a command block with the format

≡A04F6000000I5R2DT1W1B800D45PB-100↙

is generated.

The command block contains the following information:

- Slave address: A04 = 4
- Frequency: F6000000 = 6 MHz
- Modulation mode: I5 = CW
- Control type: R2 = AGC+DGC
- Control time: DT1 = 150 ms
- Bandwidth: W1 = 150 Hz
- BFO frequency: B800 = 800 Hz
- DGC value: D45 = 45 dBµV_{EMF}
- Passband tuning: PB-100 = -100 Hz

A3.7.17 Inquiry of Frequency Deviation and / or Offset

Command syntax:

Code: DF	
Reply	
Parameter:	a, b
Possible values for a- (lower frequency) and b-parameters (upper frequency)	
Range:	-1200 to 1200
Resolution:	1 Hz
Freq. deviation (Hz):	(b - a)
Freq. offset (Hz):	(b+a)÷2

Note:

Via this command the frequency deviation (only in modulation modes FSK and AFSK) as well as the frequency offset (not in modulation modes USB, LSB and ISB) can be determined.

Example 1:

Determining the currently effective frequency deviation and offset

Command = ≡DF?↙
→ Reply = ≡DF-210,210↙

The frequency deviation is 420 Hz, and the frequency offset is 0.

Example 2:

Determining the currently effective frequency deviation and offset

Command = ≡DF?↙
→ Reply = ≡DF1000,1040↙

The frequency deviation is 40 Hz, and the frequency offset is 1020 Hz. Thus the set receive frequency is to be reduced by 1020 Hz.

Example 3:

Determining currently effective frequency offset

Command = ≡DF?↙
→ Reply = ≡DF-900,-900↙

The frequency offset is -900 Hz. Thus the set receive frequency is to be increased by 900 Hz.

A3.7.18 Setting the Notch Filters, Switching On or Off

Command syntax:

Code: NF

Parameter: .... a,b,c

Possible entries / replies

a- (notch filter A) and b-parameters (notch filter B)

Range: .... -5000 to 5000
Resolution: .... 1 Hz

c-parameter

0 = switch off (OFF)
1 = switch on (ON)

Note:

The parameter order must not be altered. However, parameter entry can be made selectively, i.e., parameters which are not needed can be omitted.

Example 1:

Inquiry of notch filter status

Command = ≡AxxNF?↙
→ Reply = ≡AxxNF-600,-400,0↙

The notch filters are switched off.

Example 2:

Switching the notch filters on with request for acknowledgement

Command = ≡AxxNF,,1,?↙
→ Reply = ≡AxxNF-600,-300,1↙

With the notch filters being switched on, the interfering frequencies f_{Rx} - 600 Hz and f_{Rx} - 300 Hz are filtered out.

Example 3:

Setting notch filter B to a frequency of 2.5 kHz

Command = ≡AxxNF,2500↙

A3.7.19 Switching the Noise Blanker On or Off

Command syntax:

Code: NB

Parameter: .... a

Possible entries / replies

0 = switch off (OFF)
1 = switch on (ON)

Example 1:

Inquiry of the noise blanker status

Command = ≡AxxNB?↙
→ Reply = ≡AxxNB0↙

The noise blanker is switched off.

Example 2:

Switching the noise blanker on

Command = ≡AxxNB1↙

A3.7.20 Switching the Digital Selection On or Off (with R&S FK 896D only)

Command syntax:

Code: SE

Parameter: .... a

Possible entries / replies

0 = switch on (ON)
1 = switch off (OFF)

Example 1:

Inquiry of the digital selection status

Command = ≡AxxSE?↙
→ Reply = ≡AxxSE1↙

The digital selection is switched off.

Example 2:

Switching the digital selection on

Command = ≡AxxSE0↙

A3.7.21 Switching the Squelch Function On or Off

Command syntax:

Code: SQ
Parameter: .... a
Possible entries / replies
0 = switch off (OFF) 1 = switch on (ON)

Example 1:

Inquiry of status for squelch function

Command = ≡AxxSQ?↙
→ Reply = ≡AxxSQ0↙

The squelch function is switched off.

Example 2:

Switching the squelch function on

Command = ≡AxxSQ1↙

The squelch function is switched on and the squelch type acc. to A3.7.22 is activated.

A3.7.22 Setting the Squelch Function Type

Command syntax:

Code: SQT
Parameter: .... a
Possible entries / replies
0 = level squelch 1 = syllabic squelch 2 = combined level and syllabic squelch

Note:

Make sure that the squelch function (see 3.7.21) is switched on.

Example 1:

Inquiry of the current type of squelch function

Command = ≡AxxSQT?↙
→ Reply = ≡AxxSQT0↙

The level squelch is activated.

Level squelch works as a function of preselected level (see chapter 3.7.4) of the wanted signal strength. Only when this threshold is exceeded will the audio signal be unmuted.

Example 2:

Setting the squelch function type to syllabic squelch

Command = ≡AxxSQT1↙

Syllabic squelch acts upon the voice part of wanted signal. I.e. the wanted signal is checked for voice signal parts, and only if such voice signal parts are contained, will the audio signal be unmuted.

A3.7.23 Switching the Preamplifier On or Off

Command syntax:

Code: PA
Parameter: .... a
Possible entries / replies
0 = switch off (OFF) 1 = switch on (ON)

Example 1:

Inquiry of preamplifier status

Command = ≡AxxPA?↙
→ Reply = ≡AxxPA0↙

The preamplifier is switched off.

Example 2:

Switching the preamplifier on

Command = ≡AxxPA1↙

A3.7.24 Setting the SSB Rx Filter Mode

Command syntax:

Code: SSBM
Parameter: .... a
Possible entries / replies
0 = DATA (default) 1 = VOICE

Example 1:

Inquiry of the current filter mode

Command = ≡AxxSSBM?↙
→ Reply = ≡AxxSSBM0↙

The SSB Rx filter mode DATA is set.

Example 2:

Activating the SSB filter mode VOICE.

Command = ≡AxxSSBM1↙

A3.7.25 Enabling or Disabling the Default Setting

Command syntax:

Code: DEF
Parameter: .... a
Possible entries / replies
0 = disable (OFF) 1 = enable (ON)

Example 1:

Inquiry of status for default setting

Command = ≡AxxDEF?↙
→ Reply = ≡AxxDEF0↙

For selection of a new modulation mode the values for

- Bandwidth,
- Control type and time,
- BFO frequency,
- Frequency deviation and offset,
- Baud rate,
- Signal polarity and for
- Demodulation

stored last for this mode are automatically set.

Example 2:

Enabling the default setting

Command = ≡AxxDEF1↙

For selection of a new modulation mode the appropriate default values (see A3.7.23.1) are automatically set.

A3.7.25.1 Default Settings

	AM	CW	USB LSB	FSK	AFSK	F7B	FAX1	FAX2	FM	ISBUSB ISBLSB
Bandwidth / kHz	6.0	0.3	2.7	1.5	1.5	2.7	2.4	2.4	6.0	2.7
Control type	AGC	AGC	AGC	AGC	AGC	AGC	AGC	AGC	AGC	AGC
Control time / ms	150	1000	1000	150	150	150	150	150	150	1000
BFO frequency / kHz	-----	1.0	-----	1.0	-----	1.0	1.9	1.9	-----	-----
Freq. deviation / Hz	-----	-----	-----	425	425	225	-----	-----	-----	-----
Frequency offset / kHz	-----	-----	-----	0	1.7	-----	-----	-----	-----	-----
Baud rate / Bd	-----	-----	-----	50	50	50	-----	-----	-----	-----
Polarity	-----	-----	-----	+	+	+ +	-----	-----	-----	-----
TTY status	-----	-----	-----	RUN	RUN	RUN	-----	-----	-----	-----
Bargraph	Level	Level	Level	⊢--------------- Tuning Indication ---------------⊣						Level

A3.7.26 Inquiry of Receive Level (extended)

Command syntax:

Code: LX

Possible replies

Parameter: .... a

Range: .... -20 to 120
Resolution: .... 1 dBµV$_{EMF}$

Example:

Inquiry of the currently effective receive level

Command = ≡AxxLX?↙
→ Reply = ≡AxxLX65↙

The currently effective receive level is 65 dBµV$_{EMF}$.

A3.8 System Functions

The following system functions are possible:

- Addressed operation
- Inquiry of software version
- Inquiry of IF filter bandwidths
- Inquiry of options
- Signal BYPASS
- Inquiry of operating status
- Inquiry of scanning status
- Inquiry of error status
- Initiating a reset
- Activating command IF
- Disabling or enabling local control
- Inquiry of software type and ident. no.
- Inquiry of software version and DSP version

A3.8.1 Addressed Operation

Command syntax:

Code: A	
Parameter:	a
Range:	0 to 99

Note:

For unaddressed operation, entry of the address is not required. Command blocks beginning with address A00 are accepted by all receivers, irrespective of the set receiver address.

Example 1:

Transferring a command block to the receiver with the address A12

Command = ≡A12<command block>↙

Example 2:

Transferring a command block to all receivers

Command = ≡A00<Command block>↙

A3.8.2 Inquiry of Software Version

Command syntax:

Code: V
<u>Reply</u>
Parameter: .... a

<u>Example:</u>

Inquiry of software version

Command = ≡AxxV?↙
→ Reply = ≡AxxV04.00↙

In the EPROM of the processor module the firmware version 04.00 is loaded.

A3.8.3 Inquiry of IF Filter Bandwidth

Command syntax:

Code: FIB
<u>Reply</u>
Parameter: .... $a_1, a_2, \ldots, a_{12}, a_{13}$

<u>Example:</u>

Inquiry of IF filter bandwidth

Command = ≡AxxFIB?↙
→ Reply =
≡AxxFIB1,3,4,6,8,10,15,18,21,24,27,31,36,40,48,60,80↙

In the VLF-HF receiver the following IF filter bandwidths can be set:

150 Hz
300 Hz
400 Hz
600 Hz
800 Hz
1000 Hz
1500 Hz
1800 Hz
2100 Hz
2400 Hz
2700 Hz
3100 Hz
3600 Hz
4000 Hz
4800 Hz
6000 Hz
8000 Hz

A3.8.4 Inquiry of Options

Command syntax:

Code: OP

<u>Reply</u>

Parameter: .... a

0 = no option
1 = Control Unit R&S GB 890
8 = BCD Interface R&S GC 890
9 = Preselection R&S FK 890H1
11 = VLF-HF Receiver R&S EK 895
12 = VLF-HF Receiver R&S EK 896
13 = IF Converter (100 kHz)
14 = IF Converter R&S UX 895 (455 kHz)
15 = R&S EK 895S7 (quasi-continuous bandwidth for R&S EK 895)
16 = R&S EK 896S7 (quasi-continuous bandwidth for R&S EK 896)
17 = Digitally Tuned RF Selector R&S FK 896D (R&S EK 896 only)
18 = IF Processor R&S GM 893, Mod. 03 (Wideband)
19 = Data Link
20 = Ext. Ctrl. Interface for R&S EK 896

<u>Example 1:</u>

Inquiry of options

Command = ≡AxxOP?↙
→ Reply = ≡AxxOP1,11↙

In VLF-HF Receiver R&S EK 895 the option 'Control Unit R&S GB 890' is installed.

<u>Example 2:</u>

Inquiry of options

Command = ≡AxxOP?↙
→ Reply = ≡AxxOP9,12↙

In VLF-HF Receiver R&S EK 896 the options 'BCD Interface R&S GC 890' and 'Preselector R&S FK 890H1' are installed.

<u>Example 3:</u>

Inquiry of options

Command = ≡AxxOP?↙
→ Reply = ≡AxxOP11,14,15↙

In VLF-HF Receiver R&S EK 895 the options 'IF Converter R&S UX 895 (455 kHz)' and 'R&S EK 895S7 (quasi-continuous bandwidth)' are installed.

A3.8.5 Signal BYPASS

Command syntax:

Code: SA
Parameter: .... a

<u>Possible entries / replies</u>

0 = signal level high (OFF)
1 = signal level low (ON)
2 = signal level depends on scanning status (ACTIVE)
low: scanning active
high: no scanning

<u>Note:</u>

The command SA is required, when Motor Selection R&S FK 2850 is connected via the optional 'BCD Interface R&S GC 890' to the VLF-HF receiver. However, this calls for modifications on the carrier board, the processor and the interface. The values high and low refer to the output of R&S GC 890.

<u>Example 1:</u>

Inquiry of status of signal BYPASS

Command = ≡AxxSA?↙
→ Reply = ≡AxxSA0↙

Preselector FK 101 is bypassed.

<u>Example 2:</u>

Cancel bypassed state of Preselector R&S FK101 manually.

Command = ≡AxxSA1↙

<u>Example 3:</u>

Bypass Preselector R&S FK101 depending on the scanning status.

Command = ≡Axx*SA2↙*

Once scanning is started the bypassed state of Preselector R&S FK101 is automatically cancelled.

A3.8.6 Inquiry of Operating Status

Command syntax:

Code: M

Reply

Parameter: .... a

0 = manual
1 = frequency scanning
2 = channel
3 = channel scanning with freely programmed channel list
4 = channel scanning

Example:

Inquiry of the current operating status of the VLF-HF receiver

Command = ≡AxxM?↙
→ Reply = ≡AxxM0↙

The receiver is in the operating mode MANUAL (see A3.2.1).

A3.8.7 Inquiry of Scanning Status

Command syntax:

Code: CO

Reply

Parameter: .... a

0 = no scanning
1 = frequency scanning
3 = channel scanning with freely programmed channel list
4 = channel scanning

Example:

Inquiry which scanning process was last activated

Command = ≡AxxCO?↙
→ Reply = ≡AxxCO0↙

There was no scanning process activated.

A3.8.8 Inquiry of Error Status

Command syntax:

Code: ERR <u>Reply</u> Parameter: .... a,b Possible values: 0,0 = no error

Via the command 'ERR?' it can be detected whether during initialization errors (e.g.: unpermissible settings in the channel memories due to battery failures) have occurred and/or whether the RAM contains defective memory locations.

<u>Note:</u>

The first parameter in the reply indicates an initialization error, the second one a defective memory location. The second parameter results from the RAM test, which is only activated via the command RESET1 (see A3.8.9). If both parameters are = 0, no error could be detected. In case of a fault, the second parameter indicates the first defective memory location. In the RAM test checking starts at the location with the highest number and then goes further down.

<u>Example:</u>

Inquiry of error status

Command = ERR?
→ Reply = ERR0,0

No error occurred.

A3.8.9 Initiating a Reset

Command syntax:

Code: RESET Parameter: .... a Possible entries: 0 = software reset 1 = software reset, RAM test and RAM clear

Via the commands RESET0 and RESET1 the VLF-HF receiver is initialized, that is, the RAM contents are checked for unpermissible settings. Such entries are replaced by a default value. If replacement by a default value takes place in a channel, this channel is additionally inhibited. Inhibited channels are not called up in channel scanning (see A3.5).

Initialization is followed by the LED test and the BIT. By means of the command BI? (see A3.7.4) the BIT status can be subsequently inquired.

By means of the command RESET1 all memory locations in the RAM are overwritten with a logic naught. The system reset is followed by the RAM test. Via the command ERR? (see A3.8.6) the error status can be subsequently inquired.

<u>Example:</u>

Initiating a system reset

Command = RESET1≡AxxV?↙

A3.8.10 Activating Command IF

Command syntax:

Code: IF

Parameter: .... a,b,c

Possible entries / replies

a-parameter

0 = signal disconnected
1 = signal with variable frequency
2 = signal with fixed frequency (option)

b-parameter

0 = signal not controlled
1 = signal controlled

c-parameter

Range : .... 0 to 40000
Stepwidth: .... 1 Hz
Entry: .... in Hz

Note:

Units and tens places which may have been entered will be rounded off automatically. The parameter order must not be altered. However, the parameters may be entered selectively, i.e., parameters which are not needed can be omitted.

Example 1:

Inquiry of the IF signal status

Command = ≡AxxIF?↙
→ Reply = ≡AxxIF1,0,10000↙

The IF signal is switched on, it is not controlled and has a frequency of 10 kHz.

Example 2:

Control on

Command = ≡AxxIF,1↙

A3.8.11 Enabling or Disabling Local Control

Command syntax:

Code: REM

Parameter: .... a

Possible entries / replies

0 = control via front panel and remote control interface
1 = control via remote control interface only
2 = control via front panel only (as reply)

Note:

When the VLF-HF receiver is switched on, it can be controlled via both the front panel and the remote control interface.

Example 1:

Inquiry of the local control status

Command = ≡AxxREM?↙
→ Reply = ≡AxxIREM0↙

The VLF-HF receiver can be controlled via the front panel and the remote control interface.

Example 2:

Disable control via the front panel

Command = ≡AxxREM1?↙

Local control of the VLF-HF receiver via the front panel is not possible.

The display reads ---REMOTE ONLY---.
To cancel the blocked state locally, switch the VLF-HF receiver off and on again

Example 3:

Inquiry of the local control status

Command = ≡AxxREM?↙
→ Reply = ≡AxxIREM2↙

Remote control of the VLF-HF receiver is not possible. To cancel the blocked state enter command REM0 or REM1.

A3.8.12 Inquiry of Software Type and Ident. Number

Command syntax:

Code: IDENT

Parameter: .... a,b

Possible replies

a-parameter: software type
ek896
ek896l11 (data link)
ek895
ek895s7 (quasi cont. bandwidth)
ek895l11 (data link)
ek895s7l11

b-parameter: software ident. no

Example:

Inquiry of the software type and ident. no.

Command = ≡*AxxIDENT?*↙
→ Reply = ≡AxxIDENTek896,6038297302↙

The VLF-HF Receiver R&S EK896 contains software with the ident. no. 6038.2973.02.

A3.8.13 Inquiry of Software and DSP Version

Command syntax:

Code: VER

Parameter: .... a,b

Possible replies

a-parameter: software version

b-parameter: DSP version

Example:

Inquiry of the software and DSP version.

Command = ≡*AxxVER?*↙
→ Reply = ≡AxxVER400,200↙

The VLF-HF Receiver R&S EK896 contains software of the version 04.00 and the DSP version is 02.00.

A3.9 List of Commands

Code	Function (entry in)	Input	Output (requested with ?)	Remark
A	Address	00 to 99	01 to 99	see A3.8.1
B	BFO frequency (Hz)	-5000 to +5000	-5000 to +5000	see A3.3.2
BI	Initiate BIT Inquire BIT status	s	 0 = no fault 10 = synthesizer missing 1 = synthesizer defective 20 = HF unit missing 2 = HF unit defective 5 = module bus defective 60 = IF / AF processor missing 6 = IF / AF processor defective 7 = IF Converter R&S UX 895 defective	see A3.7.7
C	Inquire CM status		0 = no fault 1 = synthesizer defective 4 = IF / AF processor defective 5 = synthesizer and IF / AF processor defective	see A3.7.8
CH	Program channel list	0 to 999 up to 20 channels	0 to 999 up to 20 channels	see A3.6.4
CHc	Clear channel list			see A3.6.4
CL	Inhibit channel	0 to 999		see A3.7.14
CLa	Inhibit all channels			see A3.7.14
CO	Continue scanning			see A3.4.3 see A3.5.3 see A3.6.3

Code	Function (entry in)	Input	Output (requested with ?)	Remark
CO1	Inquire scanning status		0= no scanning 1= frequency scanning 3= channel scanning with freely programmed channel list 4= Channel scanning	see A3.8.7
CS	Channel scanning parameters Start channel Stop channel	 0 to 999, 0 to 999	 0 to 999 0 to 999	see A3.5.4
D	DGC value (dBµV_{EMF})	0 to 120	0 to 120	see A3.3.8
DEF	Default setting	0 to 1	0 =disable 1 = enable	see A3.7.25
DF	Inquire frequency deviation and offset Lower frequency (x 10 Hz) Upper frequency (x 10 Hz)		 -1200 to 1200 -1200 to 1200	see A3.7.17
DS	Digital level threshold (dBµV_{EMF})	0 to 120	0 to 120	see A3.4.5 see A3.7.4
DT	Control time	0 to 4	0= 25 ms 1= 150 ms 2= 500 ms 3= 1 s 4= 3 s	see A3.3.7
DWC	Dwell time (ms) Channel scanning with freely programmed channel list	10 to 65535	50 to 65535	see A3.6.5
DWQ	Dwell time (ms) Channel scanning	10 to 65535	50 to 65535	see A3.5.5
DWS	Dwell time (ms) Frequency scanning	10 to 65535	50 to 65535	see A3.4.6
ERR	Inquire error status		0,0= no error	see A3.8.8
F	Frequency (Hz)	0 to 30000000	0 to 30000000	see A3.3.1

Code	Function (entry in)	Input	Output (requested with ?)	Remark
FIB FIB1	Inquire IF filter bandwidths		1= 150 Hz 3= 300 Hz 6= 600 Hz 10= 1000 Hz 15= 1500 Hz 21= 2100 Hz 24= 2400 Hz 27= 2700 Hz 31= 3100 Hz 40= 4000 Hz 48= 4800 Hz 60= 6000 Hz 80= 8000 Hz	see A3.8.3 see A3.8.3
HTC	Automatic stop of scanning Hold time (ms) Channel scanning with freely programmed channel list	f 0 to 65534	 0 to 65534	see A3.6.6
HTQ	Automatic stop of scanning Hold time (ms) Channel scanning	f 0 to 65534	 0 to 65534	see A3.5.6
HTS	Automatic stop of scanning Hold time (ms) Frequency scanning	f 0 to 65534	 0 to 65534	see A3.4.7
I	Modulation mode	1 2 3 4 5 6,a,b,c,d 7,a,b,c,d,e 8 9 10,a,b,c,d 13 14 15 16 17 18	1= AM 2= USB 3= LSB 4= FAX1 5= CW 6,a,b,c,d= FSK 7,a,b,c,d,e= AFSK 8= FAX2 9= FM 10,a,b,c,d= F7B 13= ISBUSB 14= ISBLSB 15= L USB 16= L LSB 17= L ISB USB 18= L ISB LSB	see A3.3.3 1) For FSK and F7B parameters a to d are additionally required. 2) For AFSK parameters a to e are additionally required
Ia	Parameter a Switch TTY modem on or off	0 to 1	0= RUN 1= STOP	see A3.3.3

Code	Function (entry in)	Input	Output (requested with ?)	Remark
Ib	Parameter b Switch FSK / AFSK signal polarity over	0 to 1	0= - 1= +	see A3.3.3
	Switch F7B signal polarity over	0 to 3	0= - / - 1= + /- 2= - /+ 3= + /+	
Ic	Parameter c Frequency deviation	1, 2, 4, 5, 7, 8, 9, 10	1= 42 Hz 2= 85 Hz 4= 225 Hz 5= 425 Hz 7= 62 Hz 8= 125 Hz 9= 250 Hz 10= 500 Hz	see A3.3.3
Id	Parameter d Baud rate	1, 2, 4, 5, 6	1= 50 Bd 2= 75 Bd 4= 150 Bd 5= 300 Bd 6= 600 Bd	see A3.3.3
Ie	Parameter e Frequency offset (Hz)	-3000 to 3000	-3000 to 3000	see A3.3.3
IDENT	Inquire software type and ident. no			see A3.8.12
	Parameter a Software type		ek896 ek896l11 ek895 ek895s7 ek895l11 ek895s7l11	l11=data link s7= quasi cont. bandwidth
	Parameter b Software ident. no.		xxxxxxxxxx	

Code	Function (entry in)	Input	Output (requested with ?)	Remark
IF	IF signal Parameter a Type of frequency Parameter b Control type Parameter c CFrequency (Hz)	 0 to 2, 0 to 1, 0 to 40000	 0 = no signal 1 = signal with variable frequency 2 = signal with fixed frequency (option) 0 = no control 1 = AGC 0 to 40000	see A3.8.10
K	Edit channel contents Inquire current receiver setting	0 to 999	0 to 999 ⌴ = MANUAL 0 to 999 = CHANNEL 0,e to 999,e = Channel inhibited	see A3.7.12 see A3.7.13
Ks,	Call up a channel	0 to 999		see A3.7.11
L	Inquire receive level (dBμV)		0 to 120	see A3.7.9
LX	Inquire receive level, extended (dBμV)		-20 to 120	see A3.7.26
M M1	Inquire operating status		0 = MANUAL 1 = FREQUENCY SCANNING 2 = CHANNEL 3 = CHANNEL SCANNING with freely programmed channel list 4 = CHANNEL SCANNING	see A3.8.6 see A3.8.6
MS	Master / slave operation	0 to 99		see A3.7.16
NB	Switch noise blanker on or off	0 or 1	0 = OFF 1 = ON	see A3.7.19

Code	Function (entry in)	Input	Output (requested with ?)	Remark
NF	Set notch filters, switch on or off Notch filter A (Hz) Notch filter B (Hz)	 -5000 to 5000, -5000 to 5000, 0 to 1	 -5000 to 5000 -5000 to 5000 0 = OFF 1 = ON	see A3.7.18
OP	Inquire options		0 = none 1 = Control Unit R&S GB 890 8 = BCD Interface R&S GC 890 9 = Preselector R&S FK 890H1 11 = VLF-HF Receiver R&S EK 895 12 = VLF-HF Receiver R&S EK 896 13 = IF Converter (100 kHz) 14 = IF Converter R&S UX 895 (455 kHz)	see A3.8.4
OP1			15 = R&S EK895S7 (quasi-continuous bandwidth) 16 = R&S EK896S7 (quasi-continuous bandwidth) 17 = Digital Selection R&S FK 896 18 = IF Processor R&S GM 893, Mod. 03 (Wideband) 19 = Data Link 20 = Ext. Ctrl. Interface for R&S EK 896	see A3.8.4

Code	Function (entry in)	Input	Output (requested with ?)	Remark
P	Inquire PZG line status		0= OFF or inhibited 1= ON	see A3.7.2
PA	Switch preamplifier on or off	0 or 1	0= OFF 1= ON	see A3.7.21
PB	Passband tuning (Hz) DEF=0 (see A3.7.25) DEF=1 (see A3.7.25)	 ±5.00 kHz ±half the currently effective bandwidth	 -5000 to 5000 <-bandwidth / 2> to <bandwidth / 2>	see A3.7.1
PL	Inhibit or enable the level control for PZG line	0 to 2	0= inhibit 1= enable 2= extended function	see A3.7.3
PS	Inhibit or enable the syllabic control for PZG line	0 to 1	0= inhibit 1= enable	see A3.7.5
Q	Quasi-continuous bandwidth Parameter a bandwidth (Hz) Parameter b	 100 to 9000 0 or 1	 100 to 9000 0 = fixed bandwidth 1 = quasi-continuous bandwidth	see A3.3.5
R	Control type	0 to 7	0= AGC 1= AGC + DGC 2= AGC + DGC 3= AGC 4= AGC + DGC 5= MGC 6= AGC + MGC 7= AGC + MGC	see A3.3.6
REM	Disable or enable local control	0= enable 1= disable	0= enable 1= disable 2= remote control interface disabled	see A3.8.11

Code	Function (entry in)	Input	Output (requested with ?)	Remark
RESET	Reset	0= software reset 1= software reset, RAM test and RAM clear		see A3.8.9
RS	Reactivate channel	0 to 999		see A3.7.15
SA	Signal BYPASS	0 to 2	0= high (filter on) 1= low (filter off) 2= ACTIVE	see A3.8.5
SE	Switch digital selection on or off (with R&S FK 896 or R&S FK 896 only)	0 to 1	0= ON 1= OFF	see A3.7.20
SQ	Switch squelch function on or off	0 to 1	0= OFF 1= ON	see A3.7.21
SQT	Set the squelch function type	0 to 2	0= level squelch 1= syllabic squelch 2= combined	see A3.7.22
SSBM	Set the SSB filter mode	0 to 1	0= DATA 1= VOICE	see A3.7.24
SST	Set the syllabic squelch level	0 to 100	0 to 100	see A3.7.6
ST	Store into a channel	0 to 999		see A3.7.10
STC	Start channel scanning with freely programmed channel list			see A3.6.1
STO	Stop scanning			see A3.4.2 see A3.5.2 see A3.6.2
STQ	Start channel scanning			see A3.5.1
STS	Start frequency scanning			see A3.4.1
SW	Frequency scanning parameters Start frequency (Hz) Stop frequency (Hz) Increment (Hz)	 0 to 30000000, 0 to 30000000, 1 to 30000000	 0 to 30000000 0 to 30000000 1 to 30000000	see A3.4.4
V	Inquire software version		e.g. 01.31	see A3.8.2

Code	Function (entry in)	Input	Output (requested with ?)	Remark
VER	Inquire software and DSP version Parameter a: SW version Parameter b: DSP version		 xxx xxx	see A3.8.12
W	Bandwidth (basic unit)	1 3 4 6 8 10 15 18 21 24 27 31 36 40 48 60 80	1 = 150 Hz 3 = 300 Hz 4 = 400 Hz 6 = 600 Hz 8 = 800 Hz 10 = 1000 Hz 15 = 1500 Hz 18 = 1800 Hz 21 = 2100 Hz 24 = 2400 Hz 27 = 2700 Hz 31 = 3100 Hz 36 = 3600 Hz 40 = 4000 Hz 48 = 4800 Hz 60 = 6000 Hz 80 = 8000 Hz	see A3.3.4

A4. List of Abbreviations

A

A	Address	
A1A		Morse telegraphy (= CW)
A3E		Amplitude modulation (= AM)
A / D	Analog / Digital	Analog / digital converter
A+D	Automatic and Digital gain control	Combined gain control of AGC and DGC
A+M	Automatic and Manual gain control	Combined gain control of AGC and MGC
AC	Alternating Current	
ACT	ACTual	BYPASS signal depends on scanning status
ADR	ADdRess	
AF	Audio Frequency	
AFL		AF signal for loudspeaker
AFSK	Audio-Frequency-Shift Keying	TTY telegraphy
AFSP		AF signal for loudspeaker (amplified)
AGC	Automatic Gain Control	
AM	Amplitude Modulation	
ANT	ANTenna	
ASCII	American Standard Code for Information Interchange	

B

B		BFO
B8E		Amplitude modulation (IUSB, ILSB)
BCD	Binary Coded Decimal	
Bd	Baud	
BFO	Beat-Frequency Oscillator	
BI		BIT status
BIs		Start command for BIT
BIT	Built-In Test	Equipment test
BW	BandWidth	Bandwidth selection
BW+	BandWith up	Move to the next larger bandwidth
BW↗	BandWith up	Move to the next larger bandwidth
BW-	BandWith down	Move to the next smaller bandwidth
BW↘	BandWith down	Move to the next smaller bandwidth

C

C		CM status
CH	CHannel	Channel Channel list
CHAN	CHANnel	
CHc	CHannel clear	Clear channel list
CHM	CHannel Manipulation	Channel manipulations menu
CHP	CHannel Program	Channel scanning with freely programmable channels list

CHS	CHannel Sequence	Channel scanning with ascending channel number sequence
CL	CLear	Clear Inhibit channel
CLa	CLear All	Clear all channels
CLCH	CLear CHannel	Clear particular channels
CLK	CLocK	
CLR	CLeaR	Clear Clear channel list
CM	Continuous Monitoring	
CO	COntinue	Scanning status, reactivate stopped scanning program
const.	CONSTant	
CONV	CONVerter	
CPU	Central Processing Unit	
CR	Carriage Return	ASCII character
CS		Channel scanning parameter
CS	Chip Select	Enabling integrated circuits
CTS	Clear To Send	
CW	Continuous Wave	Morse telegraphy

D

D		DIGI GAIN
D / A	Digital / Analog	Digital / analog converter
DC	Direct Current	
DDS	Direct Digital Synthesis	
DEF	DEFault	
DEMOD	DEMODulator	
DEZ		decimal
DF		Frequency deviation and offset
DGC	Digital Gain Control	
DIGI	DIGItal	Digital threshold
DIN		German Industry Standard
DS		Digital threshold
DSP	Digital Signal Processor	
DSR	Data Set Ready	
DT		Control time
DTR	Data Terminal Ready	
DWC	DwellTime Channel	Dwell time (channel scanning with freely programmed channel list)
DWQ	DwellTime sequence	Dwell time (channel scanning)
DWS	DwellTime Sweep	Dwell time (frequency scanning)

E

EMC	ElectroMagnetic Compatibility	
EMF	ElectroMagnetic Force	
ENT	ENTer	Completion of entry of numerals
EPROM	Erasable Programmable Read-Only Memory	
ERR	Error	Error status
EXT	EXTernal	
Ext.	External	

F

F	....	Frequency
F1B	....	TTY telegraphy (= FSK)
F1C	....	Facsimile (= FAX)
F3C	....	Facsimile (= FAX)
F3E	....	Facsimile (= FAX)
F6	....	Diplex telegraphy
F7B	....	Diplex telegraphy (= F6)
F/T	Forever/Time	Setting mode for hold time
FAX	....	Facsimile
FFT	Fast Fourier Transform	
FIB	FIlter Bandwith	IF filter bandwidth
FFT	Fast Fourier Transformation	
FM	Frequency Modulation	
FRQ	FReQuency	
FSK	Frequency-Shift Keying	TTY telegraphy

G

GND	GrouND	

H

HEX	....	Hexadecimal code
HF	High Frequency	
HTC	HoldTime Channel	Hold time (channel scanning with freely programmed channel list)
HTCf	HoldTime Channel forever	Automatic stop of scanning
HTQ	HoldTime seQuence	Hold time (channel scanning)
HTQf	HoldTime seQuence forever	Automatic stop of scanning
HTS	HoldTime Sweep	Hold time (frequency scanning)
HTSf	HoldTime Sweep forever	Automatic stop of scanning

I

I	....	Modulation mode
I/O	Input/Output	
IF	Intermediate Frequency	
ILSB	Independend Side Band Lower Side Band .	
IND	INDicator	Switchover level / tuning indication
INT	INTerrupt	
INTERF	INTERFace	BCD interface
inv.	inverted	
IRQCM	Interrupt ReQuest Continuous Monitoring	Interrupt request from synthesizer
IRQF	Interrupt ReQuest Front panel	Interrupt request from control unit
ISB	Independend Side Band	Two independent sidebands (ISBLSB = ILSB, ISBUSB = IUSB)
IUSB	Independend Side Band Upper Side Band	

J

J3E	....	Single sideband (= SSB, LSB, USB)

K

K	....	Channel manipulations
Ks	....	Call up channel

L

L	....	Receive level
LCD	Liquid Crystal Display	
LED	Light-Emitting Diode	
LEV	LEVel line	
LF	Line Feed	ASCII character
LOC	LOCal	Receiver locally controlled
LSB	Lower Side Band	

M

M	Mode	Operating status
M/S	Master/Slave	Master / slave operation
ME+	MEmory	Store into buffer
ME-	MEmory	Activate buffer contents
MEM	MEMory manipulation	Storage commands
MGC	Manual Gain Control	
MOD	MODulation	Modulation modes
MS	....	Transfer of basic receiver settings to slave receiver

N

NB	Noise Blanker
NF	Notch Filter

O

OP	....	Installed options
OPT	OPTion	Installed options
OSC	....	Oscillator
OUT	OUTput	

P

P	....	Level line status
PA	PreAmplifier	
PB	....	Passband tuning
PBT	PassBand Tuning	
PL	....	Level line
PLL	Phase Look Loop	
PREAMP	PREAMPlifier	
PRO	PROgramming	Programming of scan process
PROC	PROcessor	
PZG	....	Level too high

R

R	....	Control type and time
RAM	Random Access Memory	System reset, RAM reset (all memory locations in the RAM are overwritten with a logic naught)
REF	....	Reference
REM	REMote	Receiver is remotely controlled
RF	Radio Frequency	
RS	....	Reactivate channel
RTS	Request To Send	
RxC	Receive Clock	
RxD	Receive Data	

S

S/C	Stop/Continue	Stop / continue running / stopped scanning program
SA	....	Parts list
SA	....	Signal BYPASS
SCA	SCAn	Scanning commands
SER	SERial interface	Characteristics of serial interface
SHFT	SHiFT	Frequency offset
SIG	SIGnal	BYPASS signal
SPEC	SPEcial	Special functions
SQ	SQuelch	Syllable squelch
SSB	Single Side Band	
ST	STore	
STC	Start Channel	Start channel scanning with freely programmed channel list
STCH	STore CHannel	Store current setting into a particular channel
STO	STOre	Store current setting into the next free channel (with the lowest channel number)
	STOp	
STQ	Start seQuence	Start channel scanning
STS	STart Sweep	Start frequency scanning
SW	Sweep	Frequency scanning parameters
SYNTH	SYNTHesizer	
SYS	SYStem	System functions

T

T		
TESTSIG	....	Test signal
THLD	THresholD	Digital threshold
TTL	....	Transistor / transistor logic
TTY	....	Teletyper
TxD	Transmit Data	

U

USART	Universal Synchronous Asynchronous Receiver Transmitter	Programmable serial interface
USB	Upper Side Band	

V

V	Version	Firmware version
VAR	VARiable	Variable stepwidth
VAR.	....	Version
VCO	Voltage-Controlled Oscillator	
VERS	VERSion	Software version
VLF	Very Low Frequency	

W

W	bandWidth	

X

X	....	Connector

Z

Z	....	IF Filter

Δ

Δf	....	Frequency offset

Σ

Σ	....	Adder

τ

τ	....	Timer

Φ

φ	....	Phase regulator

A5. Remote Control Software

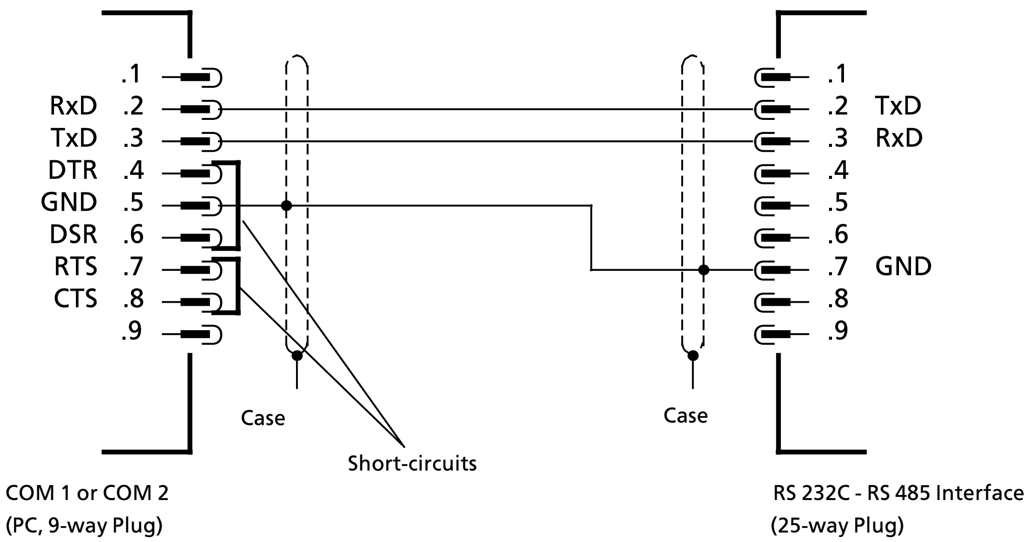
For the VLF-HF receiver the Remote Control Software R&S EK 895S2 is available on special order under the order number 6073.2260.02.

Stored on a 3½" program disk, it offers a high convenience for remote control of the EK 895. The program disk contains the following files:

- ***EK895.EXE***
- ***EK895.DOC***
- ***README.BAT***

This program can be used provided that the following requirements are met:

- ***IBM-AT compatible PC with***
  - ***RS 232C interface (COM1 or COM2),***
  - ***3½" disk drive and***
  - ***MS DOS in version 3.0 or above.***
- ***Connecting cable (zero modem, see figure below)***



For starting the remote control software proceed as follows:

1. Switch on computer and, if required, associated monitor.
2. Insert appropriate program disk into disk drive.
3. On hard disk create directory EK895.
4. Copy files from program disk into EK895 directory.
5. Open directory EK895.
6. Start software by actuating the ENTER key.

The DOC file may be viewed after entry of the command READ.ME.

```
===============================================================================
 EK895 / EK896 Remote Control Software Version 01.02 (c) 1995 ROHDE & SCHWARZ
===============================================================================

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Remote Control Software 01.02 requires
         a EK895' SW Version of 01.27 or higher.
         a EK896' SW Version of 01.04 or higher.
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

Demo software for operating one or several EK895 / EK896' receivers from an
IBM-compatible computer.
Entries made to the program are shown on a simulated front panel to facilitate
operation.

1) Hardware requirements
------------------------

- EK895 program floppy
- IBM-compatible computer with  MS-DOS, version 3 or higher
- 512 kB Memory minimum requirements
- RS 232 interface
- program can run on all standard monitors (mono/colour)
- connecting cable for EK895 / EK896 (25-contact Canon / 9-contact Canon)

  25-contact Canon EK895 / EK896       9-contact Canon IBM
    Pin 7  ---------------------------------  Pin 5
    Pin 2  ---------------------------------  Pin 2
    Pin 3  ---------------------------------  Pin 3

                                        link  Pin 4
                                              Pin 6

                                        link  Pin 7
                                              Pin 8

2) Program start
----------------

EK895 [RETURN]                  (for colour monitor)
EK895 m [RETURN]                (for monochrom monitor)
The main menu appears on the screen.
Note: If the message "No connection to receiver EK895 / EK896" appears on the
screen, the following faults may be present:

- EK895 / EK896 switched off
- connecting cable missing or faulty
- baud rate or parity configured incorrectly
  (default on EK895 / EK896: 2400, odd) For settings, see also 2.1
- different values set for the device address

All the essential settings and indications can be effected by the simulated
front-panel display on the screen. Parameters are modified by pressing
associated keys which are indicated by highlighted letters on the screen.
Entries are terminated with the RERUTN key. The receiver is then set to the
entered value.

F (frequency):    value range 0 to 30000000 Hz, for setting the active receive
                  frequency

N (bandwidth):    setting the active bandwidth with cursor up/down

G (gain control): setting the active control mode with cursor up/down

T (threshold):    value range 0 to 120 dB in 1-dB steps

B (BFO):          value range -5.000 kHz to 5.000 kHz in 10-Hz steps.
```

```
                     Setting the active BFO frequency in kHz (not for AM)

M (modulation):   setting the active demodulation mode with cursor up/down

U (baud):         setting the active baudrate with cursor up/down
                  only available in modulation FSK AFSK F7B

H (shift):        setting the active shift with cursor up/down
                  only available in modulation FSK AFSK F7B

L (polarity):     the polarity is toggled
                  only available in modulation FSK AFSK F7B

O (stop):         enable or disable the output of the demodulator
                  only available in modulation FSK AFSK F7B

D (delta freq.):  value range -3000 to 3000 Hz = freq. offset
                  only available in modulation AFSK

1 (notch a):      value range -5000 to 5000 Hz = freq. offset
                  notch filter a.

2 (notch b):      value range -5000 to 5000 Hz = freq. offset
                  notch filter b.

I (disable notch):enable or disable the function for the
                  notch filter a and b

Q (squelch):      enable or disable the squelch

N (noise blanker):enable or disable the noise blanker function

R (preamplifier): enable or disable the preamplifier

P (passband):     value range half of bandwidth in 10Hz steps

E (step):         setting the stepwidth of frequency change (in kHz) with
                  cursor left/right

C (channel):      value range 0 to 999, calling and setting the selected
                  channel

S (store):        value range 0 to 999, for saving settings for bandwidth,
                  control mode, BFO, modulation type and DGC for a specific
                  channel

A (address):      value range 0 to 99, for linking computer with called
                  receiver

L (slave)         value range 0 to 99, the status of the actual receiver
                  is transmitted to the slave receiver

2.1 Function Keys
-----------------

F1: built-in test equipment:
    triggering the selftest. Error messages are output in plain test on the
    screen

F2: spectrum:

    S (start freq.): value range 0 to 30000000 Hz

    T (step freq.): valuse range 1 to 30000000 Hz

    F1: start the spectrum display

    F2: stop the spectrum display
```

F3: setting the frequency with the highest level

F3: RS 232 interface configuration:

COM port:
selection of active COM port (COM1, COM2) on computer

baud rate:
selection of active baud rate (110 to 19200)

parity:
setting the active parity (even, odd)

save parameter:
saving the following parameters in file ek895.cfg
- COM Port
- Baudrate
- Parity
- Address

the file ek895.cfg is placed in the same directory of the file ek895.exe

F4: programming the scan parameters

Frequency sweep:
The parameters can be modified by pressing the associated keys as indicated by the highlighted letters on the screen. Entries are terminated with the RETURN key.

S (start frequency) value range 0 to 30000000 Hz, entry is in kHz.

T (stop frequency) value range 0 to 30000000 Hz, entry is in kHz.

E (step frequency) value range 1 to 30000000 Hz, entry is in kHz.

R (sweep threshold) value range 0 to 120 in steps of 5 db

D (dwell time) value range (10 to 65535 ms)

H (hold time) value range (0 to 65534 ms)

F (forever) infinite hold time

CH CH Sweep:

CH CH Tab.:

A maximum of 20 out of 1000 channels can be edited for a channel scan routine in the vertical window. The channels are called up during the scan routine starting with the first channel of the list and following the order in which they were entered.

When no list has been entered:
The first channel to be edited is called up by pressing the RETURN key. Value range 0 to 499. Editing is terminated by pressing the RETURN again. Further entries are made the same way.

When a list has been made up:
The required entry (two bars flashing) is selected with the cursor up/down key. Press RETURN and enter new channel number, then complete with RETURN.

F1: deleting all edited channels

Hold Dwelltime:

D (dwell time) value range (10 to 65535 ms)

H (hold time) value range (0 to 65534 ms)

F (forever)   infinite hold time

Channel Sequenz Sweep:

S (startchannel)   value range (0 to 999)

T (stopchannel)   value range (0 to 999)

D (dwell time)   value range (10 to 65535 ms)

H (hold time)   value range (0 to 65534 ms)

F (forever)   infinite hold time

F5: display channel contents
The contents of 19 channels is displayed on the screen.

F1: enter the first channel to be displayed

PGUP: display previous 19 channels

PGDN: display next 19 channels

ESC: main menu

F6: terminating the program

F7: starting the frequency scan

F8: starting the channel scan

F9: starting the channel sequence scan

SPACE: Scan (frequency or channel) can be halted by pressing the SPACE key.
It can be continued by pressing the key again.