Contents

Chapter 1

Notes on Safety and Use, Maintenance and Service

1.1 Safety notes

This instrument is built and tested according to EN 61010-1 (protective measures for electronic measuring instruments) with attached power cable.

Important! This instrument may only be powered with the power cable originally delivered from the factory.

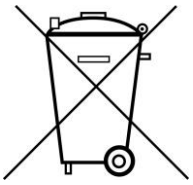
The instrument is in perfect working order upon leaving the factory. To ensure safe and proper operation, and to keep the instrument in a safe condition, the user must observe all the notes and warnings contained in this instruction manual.

The instrument has protection class IP20 in accordance with EN 60529.

Discharges across the plug connector can damage the instrument. Protect the instrument from electrostatic discharge when handling and operating it.

The maximum external voltage that van be applied to the measuring receiver's RF input is 24 V. A higher voltage may destroy the input circuits.

Do not cover the ventilation slots on the instrument. Covering the slots can result in reduced air circulation in the instrument, which can cause heat build-up and overheating of the electronic components.



Passage from the battery regulations (BattV)
This device contains a battery which incorporates hazardous substances. It must not be disposed of I domestic waste. At the end of its working life it should be disposed of only through the ESC customer service department or at a designated collection point.

1.2 Usage Notes

The guarantee for a new instrument ends 12 months after delivery.

The guarantee is invalidated if the instrument is opened.

Sharp tools (e.g. a screwdriver) can damage the plastic glass in front of the TFT display, thus destroying the TFT.

The contrast of the TFT display deteriorates at ambient temperatures below 5°C.

The TFT display does not reach maximum brightness for a few seconds after the instrument is cold-started.

The instrument reaches full measurement accuracy after about 5 minutes of operation.

The use of wireless DECT phones and GSM phones close to the instrument can cause disturbances and faulty measurements.

1.3 Maintenance

The instrument is maintenance-free.

1.4 Cleaning

The case and the TFT display should be cleaned with a soft, lint-free dust cloth. Never use solvents such as diluents for cellulose lacquers, acetone or similar since they may damage plastic parts or the coating on the front panel.

Any dust should be removed from the ventilation slots regularly so that the air circulation provided by the built-in ventilator is not obstructed.

1.5 Calibration

The instrument should be recalibrated at least every two years. It is automatically calibrated at the factory in case of upgrading, repairs or servicing.

1.6 Service

Service address: see back cover of operating manual.

Chapter 2

Specifications

Subject to technical change!

FREQUENCY RANGE		
SAT		910 - 2150 MHz resolution 1 MHz Transponder frequency or 1st IF entry
OPERATING MODES		DVB-S, DVB-S2 Analyzer in all ranges
OPERATION		
Input		via keypad
Monitor		5.7" Color-TFT, VGA resolution
User Prompting		via OSD (On Screen Display) in German, English, French and Italian
Built-in speaker for audio reproduction		
RF-INPUT		F socket / 75 Ohm (IEC 60169-24) (accessories, exchangeable)
Return loss		> 8 dB (910 - 2150 MHz)
INPUT ATTENUATOR		0 – 30 dB in 4 dB-increments
LEVEL MEASUREMENT		
Measuring range		30 – 100 dBµV
Information range		30 – 110 dBµV
Resolution		0.5 dB
Measuring accuracy (Measuring range)		± 2.0 dB (at 20°C) ± 2.5 dB (0°C-40°C)
Measuring bandwidth (RB)		> = 10 MHz depending on symbol rate
Acoustic level trend indicator		can be switched on/off
Level trend bar		with MaxHold Indicator
ANALYZER digital analyzer		
Measuring bandwidth (RB)		10 MHz (full span) 4 MHz (span 1 and 2)
Span (frequency segment)		total range, 300 MHz or 76 MHz
Switch directly between analyzer and receiver modes		
DVB-S		
QPSK demodulator		(per ETS 300421)
Symbol rates		2 – 45 MSym/s
Measuring parameters		(per ETR 290)
	VBER	10^{-2} to 10^{-8} (bit error rate per Viterbi)
	CBER	10^{-2} to 10^{-8} (bit error rate before Viterbi)
	MER	2 – 20 dB resolution 0.1 dB
Searching function		

DVB-S2		
QPSK/8PSK demodulator		(per ETS 302307)
16APSK, 32APSK		not supported
FEC 1/4, 1/3, 2/5		not supported
Symbol rates		2 – 45 MSym/s
Measuring parameters		(per ETR 290)
	LBER	10^{-1} to 10^{-8} (bit error rate per LDPC)
	CBER	10^{-2} to 10^{-8} (bit error rate before LDPC)
	MER	1 – 20 dB resolution 0.1 dB
Automatic detection of DVB-S/DVB-S2 Searching function		

MPEG2 decoder, MPEG4 decoder	NIT evaluation Direct tuning of the receiver from the NIT Display of MPEG video parameters Video bit rate measurement in Mbit/s
Video decoding	MPEG-2 (ISO/IEC 13818-2) H.264/AVC Level 4.1 HP (ISO/IEC 14496-10)
Audio decoding	MPEG-2 (ISO/IEC 13818-3), Dolby Digital AC-3, Dolby Digital Plus, MPEG-2 AAC (ISO/IEC 13818-7), MPEG-4 AAC (ISO/IEC 14496-3)

CI (Common Interface)	1 CI slot Presentation of card menu

Data logger	Stores measurements automatically in the form of an XML file on a USB stick

INTERFACES	
DVI	Digital video output for connecting a TV device with a DVI/HDMI input. Output impedance 100 Ohm Difference output level typ. 1 V_{pp}
USB-A	USB-A socket for data logger and software update USB 2.0

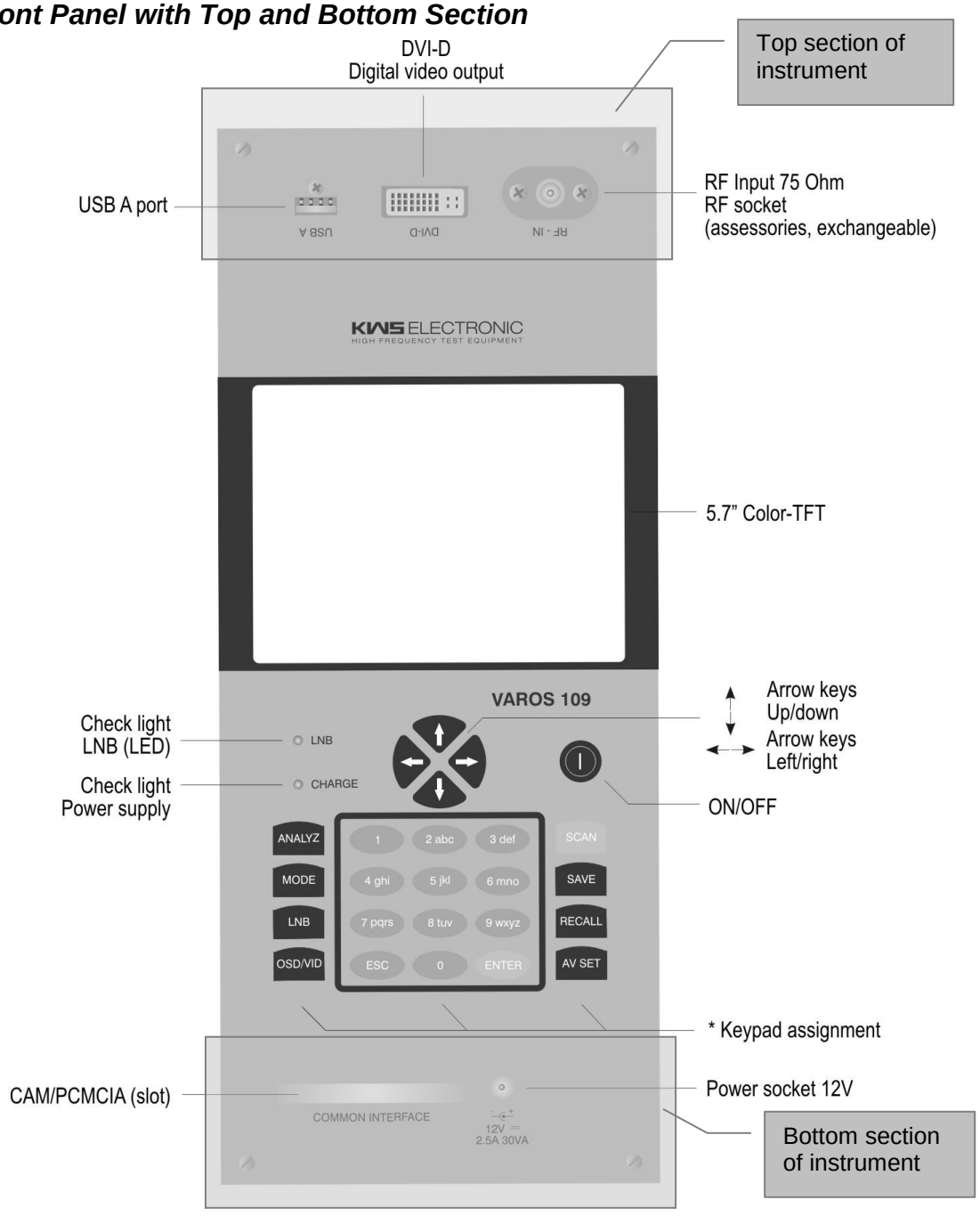
TUNING MEMORY	99 Memory locations memory protection function

REMOTE SUPPLY		
	Maximum power	500 mA (short circuit-proof)
	Voltages	14V / 18V
	22 kHz modulation	U_{PP} = 0.8 V_{PP}
	DiSEqC	version V1.0, V1.1, V1.2, V2.0
	UNICABLE	
	Current measuring	
	measuring range	0 – 500 mA
	resolution	1 mA
	measuring accuracy	± 5% of final value

POWER SUPPLY		
External 12V		11 – 15V DC max. 2.5A or external primary power supply 12V/2.5A (included in delivery) via extra-low voltage jack according to DIN 45323 Power consumption max. 30 W
Storage battery	Operating time	Li-Ion battery pack 7.2V / 6.6Ah approx. 3.5 hours (dependant upon the LNB load) automatic cutout as protection against exhaustive discharge
	Charging time	approx. 3 hours
	Battery management	Battery can be charged using 12 V external supply
ELECTROMAGNETIC COMPATIBILITY		according to EN 61000-6-2 and EN 61000-6-3
PROTECTION		according to EN 61010-1
DIMENSIONS (W x H x D)		164mm x 266 x 70mm
WEIGHT		approx. 1.3 kg with battery pack
QUANTITY OF DELIVERY		
Included in the delivery		Transport case IEC measuring cable 75 ohm Power supply and external power cable USB stick Manual

Control and connection elements, pin configurations

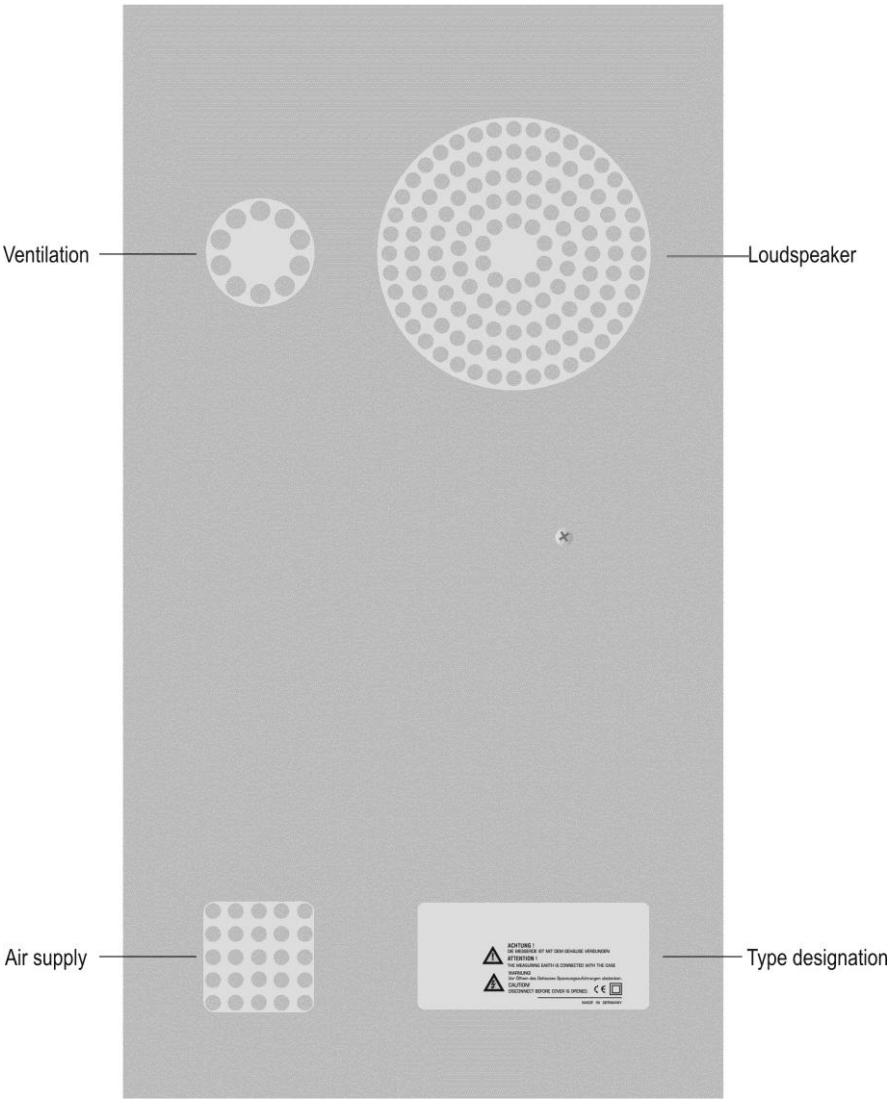
3.1 Front Panel with Top and Bottom Section



*** Keypad assignment**

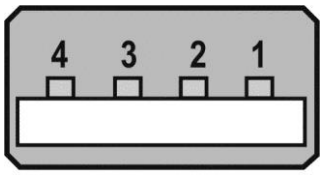
ANALYZ	-Analyzer function	0 - 9	-Numeric entry	SCAN	-SAT report selection
MODE	-Special programs	ENTER	-Confirm entry/ trigger function	SAVE	-Save to memory
LNB	-LNB/remote feed			RECALL	-Recall from memory
OSD/VID	-On-screen display/ video image	ESC	-Reset one menu range	AV SET	-Audio (Volume) Video (Brightness)

3.2 Rear panel



3.3 USB-A socket

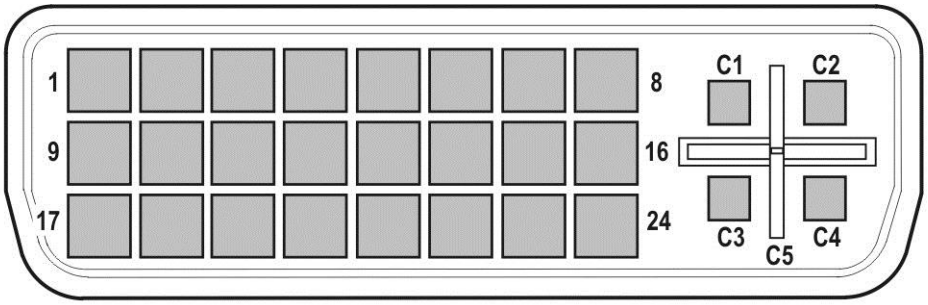
Pin 1 = V_{CC} (+5 V)
Pin 2 = Data D -
Pin 3 = Data D +
Pin 4 = GND



Socket A

3.4 DVI output

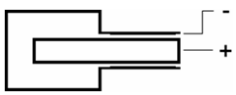
Compliant with DDWG (Digital Display Working Group) DVI (Digital Visual Interface) Revision 1.0



1 = T.M.D.S. Data 2-	11 = T.M.D.S. Data 1/3 Shield	21 = n.c.
2 = T.M.D.S. Data 2+	12 = n.c.	22 = T.M.D.S. Clock Shield
3 = T.M.D.S. Data 2/4 Shield	13 = n.c.	23 = T.M.D.S. Clock+
4 = n.c.	14 = +5V Power	24 = T.M.D.S. Clock-
5 = n.c.	15 = GND	
6 = DDC Clock	16 = Hot Plug Detect	C1 = n.c.
7 = DDC Data	17 = T.M.D.S. Data 0-	C2 = n.c.
8 = n.c.	18 = T.M.D.S. Data 0+	C3 = n.c.
9 = T.M.D.S. Data 1-	19 = T.M.D.S. Data 0/5 Shield	C4 = n.c.
10 = T.M.D.S. Data 1+	20 = n.c.	C5 = n.c.

3.5 12V power supply

Extra-low voltage jack per DIN 45 323



Chapter 4

Startup

4.1 Mains operation

Only power the instrument from the mains using an external mains adapter connected to the 12 V extra-low voltage jack. A suitable adapter with connecting cable is included in delivery (see “External power supply”).

Important! *Always disconnect the instrument from the power supply when disassembling the instrument (e.g. replacing batteries).*

4.2 Battery operation

4.2.1 Replacing the battery

Only the manufacturer or service technicians authorised by the manufacturer may replace the internal battery. The manufacturer’s guarantee will be void if the housing of the measuring receiver is opened by anyone else.

4.2.2 Battery management

The instrument has internal battery management, which optimises the charging and discharging of the battery. The battery begins to charge as soon as the instrument is connected to the mains or an external voltage supply. The instrument starts in charging mode if it is not being used; during this time only the OSD window on the top left is shown with the text “Charging BATT” and the battery symbol. The display screen turns off after a minute. Pressing any button turns the display back on. If the instrument is operated in measuring mode, the charging current may be reduced somewhat depending on the operating status, causing the charging process to take longer. When the battery is being charged, the “charge” LED lights up red. Once the battery is fully charged, the internal battery management switches to maintenance charging and the “charge” LED turns green. The instrument also has a charge status indicator. A status bar in the frequency window indicates the remaining charge of the battery at all times. If the battery charge becomes critical, the word “low” appears in red next to the bar. You can still complete the current measurement, but the battery should then be recharged as soon as possible. The instrument shuts down automatically to prevent total discharge.

Storing the battery and operating the device at low temperatures
Because of the chemical reactions inside the battery the performance of the built in battery is somewhat reduced at low temperatures. It is not possible to charge the battery when the temperature is below 0°C.

4.3 Operation using an external power supply

In addition to using the battery, you can run the device on external direct current supplied by the mains adapter or the cigarette lighter adapter in a vehicle, for example. Direct current is fed via the extra-low voltage jack on the bottom section of the instrument. The external voltage supply must be in the range of 11 V to 15 V. The maximum current consumption is 2.5 A. When the instrument is supplied with appropriate voltage, the “charge” LED on the front side of the instrument lights up.

4.4 Ventilation control

A small, in-built fan ensures that the electronic components are well ventilated. This fan is controlled by the microprocessor using a temperature sensor.

4.5 Switching on

The instrument processor requires approx. 5 seconds to boot up. During this time, the “charge” LED lights up yellow. Afterwards, a display appears on the screen.

4.6 Setting screen brightness and volume

Pressing the **AV SET** button calls up two control bars, one for screen brightness the other for volume. Enter the desired settings using the arrow keys. This function is not possible in some operating modes, such as level measurement. Pressing **AV SET** again or pressing **ESC** hides the bars and restores the original function of the arrow keys.

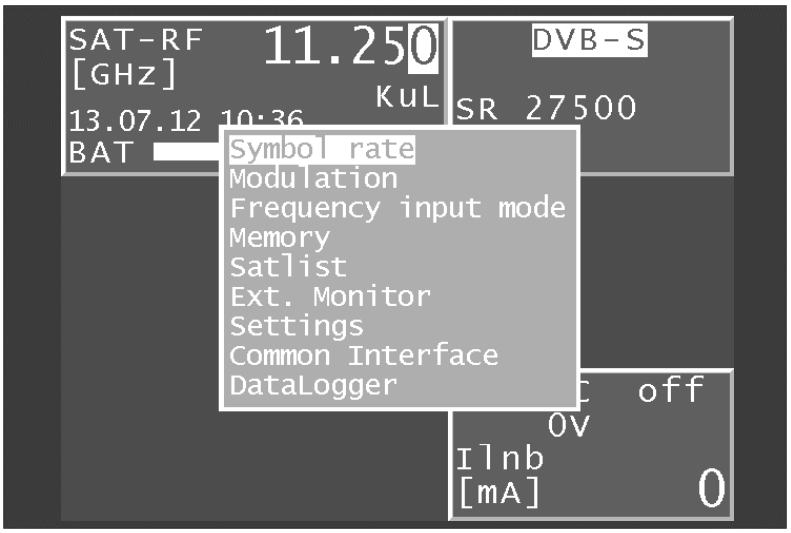
Chapter 5

Menu structure

Most functions of the instrument can be selected in a clear menu structure.

The main menu of the instrument is adjusted to the currently set operating mode respectively. This ensures that functions can only be selected where needed.

- Selecting main menu: Press **MODE** key
- Leaving the menu: Press **MODE** or **ESC** key
- Selecting a menu point: Select the desired menu item using the arrow keys (**Up** or **Down**) and press **ENTER**.
- Back to previous menu level: Press **ESC** key



The picture shows the menu in the DVB-S range with RF frequency input mode.

Chapter 6

Measuring range

6.1 Frequency input

Frequencies are displayed in the frequency window. Enter the value of the frequency in MHz or GHz (see below). Set the desired frequency using the number keys or arrow keys. The decimal unit can be changed from 0-9 by pressing the **Up** and **Down** arrow keys when the cursor is on that unit. Use the **<-** and **->** keys to move the cursor left and right. Pressing a number key enters the corresponding value in the lowest decimal unit. All the positions above are set to zero. Every time an additional number is entered, the existing value shifts a position to the left and the latest entry is used for the lowest unit. Confirm by pressing **ENTER**. If the value entered is not within the valid range, it will be limited to the corresponding minimum or maximum value.
After that, the receiver is tuned and the actual measured values are displayed.

Press the **ESC** key, an arrow key or a number key to end the measurement procedure. A new frequency can be set as described above.

6.1.1 IF input

To change the instrument to IF input, select **MODE -> Frequency input mode -> SAT-IF**. The frequency window displays **SAT-IF [MHz]**.

6.1.2 RF input

To change the instrument to RF input, select **MODE -> Frequency input mode -> RF[GHz]**. The frequency window displays **SAT-RF [GHz]**. This function serves to incorporate frequency conversion in an LNB from the transponder frequency (RF) to the first SAT IF, depending on the LNB oscillator frequency (LO).

For Ku band LNBs:	IF = RF – LO.	The instrument calculates: RF = IF + LO.
For C band LNBs:	IF = LO – RF.	The instrument calculates: RF = LO – IF.

6.1.2.1 Ku band

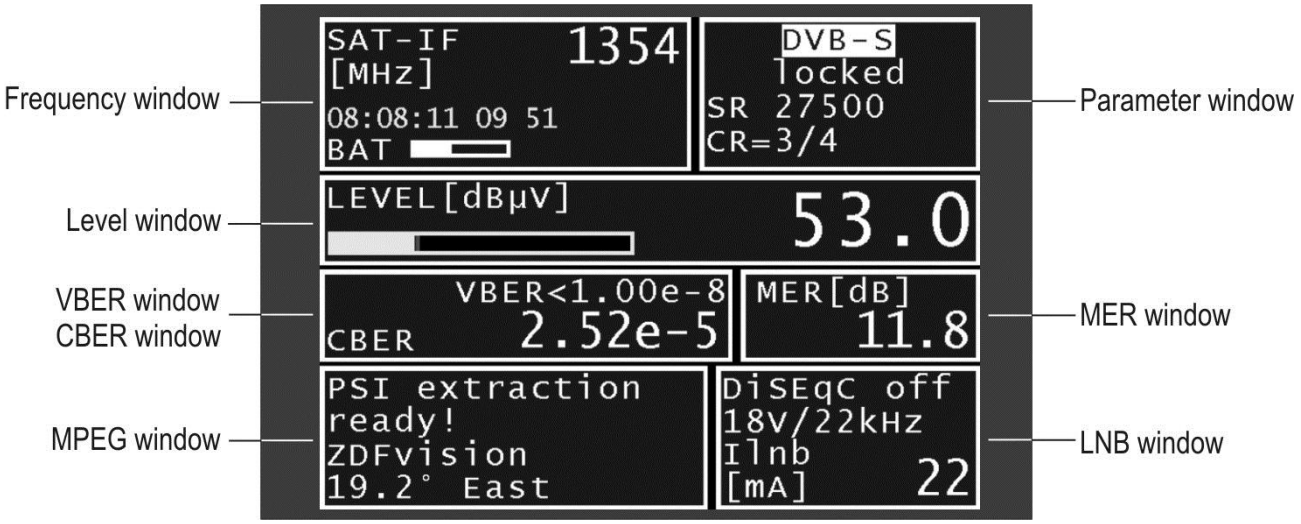
The device provides two user-defined LNB oscillator frequencies for RF inputs in the Ku band. These can be changed under **MODE -> Settings -> LNB-Frequencies -> Ku low band** (Ku high band) within the range of 9000 to 11000 GHz. The factory presettings are 9750 GHz (low band) and 10600 GHz (high band).
The device also provides three ways of using the two oscillator frequencies: Using the menu **MODE** -> **Settings** -> **LO-Allocation**, choose between “Ku standard” (coupled to the LNB setting), “Ku LOLow” (low-band oscillator always incorporated regardless of LNB setting) and “Ku LOHigh” (the high-band oscillator respectively).

6.1.2.2 C band

The instrument provides one user-defined LNB oscillator frequency for RF inputs in the C band. This can be changed under **MODE -> Settings -> LNB-Frequencies -> C band** within the range of 4,000 to 6000 GHz. The factory presetting is 5150 GHz. To use the LNB oscillator frequency, select the “C band” menu item via **MODE -> Settings -> LO-Allocation**.
If the device is operating with RF input, the LO used is shown in the frequency window with the abbreviations “KuL” (LO for Ku low band), “KuH” (LO for Ku high band) or “_C_” (LO for C band).

6.2 DVB-S mode

Using this mode, QPSK-modulated DVB-S signals can be received and measured.



6.2.1 Symbol rate input

You must set the corresponding symbol rate before receiving a DVB-S signal. The instrument offers the operator five preset symbol rates for rapid input. Select **MODE -> Symbol rate** to use one of the five preset symbol rates. Use the **Up/Down** arrow keys to select the required symbol rate. The new symbol rate is selected when you press **ENTER**. Press **->** to change the preset symbol rate between 2,000 and 45000 kBd (2.000 – 45.000 MSym/s). The default symbol rates are 27500, 22000, 5632, 4000 and 2400 kBd.

6.2.2 Scan

Use this function to search the entire satellite frequency range (910 – 2.150 MHz) for DVB-S signals whose symbol rates correspond to the value that is currently set in the instrument. During the search, the instrument alternates between the currently set symbol rate and the first two preset symbol rates. This means that the instrument scans the satellite range with a maximum of three different symbol rates.
Start the scan by tuning the measuring receiver to a frequency at which the scan should begin (see "Frequency input"). Pressing **ENTER** begins the process, as indicated by the "SCAN" message in the frequency window. When the instrument finds a transponder, the scan is halted and the measuring receiver measures the frequency found. Stop the scan by pressing a number key, the **Up** or **Down** keys, or the **ESC** key.
During the scan, the instrument also detects DVB-S and DVB-S2 signals and switches the measuring receiver to the relevant operating mode.

Note:
In the UNICABLE and JESS operating mode the scan function is deactivated.

6.2.3 DVB-S parameters

The parameters are shown in the parameter window. If the measuring receiver is tuned to a frequency (see "Frequency input"), the DVB-S channel decoder attempts to synchronise with the signal that is present; this activity can be traced using the "SCAN" message in the parameter window.
The measuring receiver attempts to synchronise to the DVB-S signal that is present using the set symbol rate. If this is not successful, all of the preset symbol rates are set one after another.
If a QPSK signal with the set symbol rate is present, the channel decoder locks and **LOCKED** is displayed in the instrument's parameter window.
Otherwise, the **UNLOCKED** message is shown. This may be caused by the following: none of the set symbol rates fit; the receive level is too low; there is too much noise in the signal; or there is no DVB-S signal at this frequency.

When the DVB-S channel decoder receives a signal, the instrument shows its code rate and modulation scheme in the parameter window. At the same time, bit error rate and MER measurement is activated. The measured values are shown in the BER window and the MER window. The MPEG window is also displayed; here you can follow the search for PSI (program service information) in the transport stream. Further information can be found in the “MPEG Decoder” section.

6.2.4 BER measurement (bit error rate measurement)

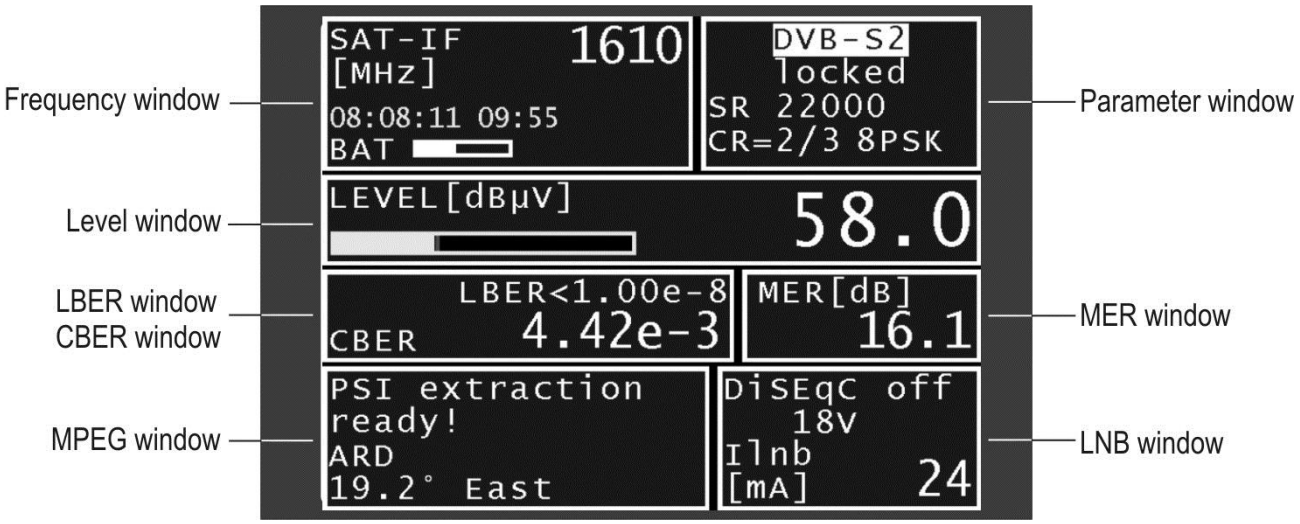
As mentioned in the previous section, the BER measurement result is displayed in the BER window. The measuring receiver can measure the bit error rate before Viterbi (CBER) and after Viterbi (VBER) simultaneously. VBER is displayed in a smaller font on the top line of the BER window. CBER is below in a large font.

6.2.5 MER measurement

The MER value of the signal in the baseband (after the demodulator) is displayed in dB in the MER window. The measuring range is between 2.0 and 20.0 dB. The resolution is 0.1 dB.

6.3 DVB-S2 mode

Use this mode to receive and measure QPSK/8PSK-modulated DVB-S2 signals.



DVB-S2 is a further development of DVB-S. In addition to QPSK a higher-quality modulation scheme (8PSK) has been introduced. As an option, pilots can be transmitted to help the receiver synchronise when reception conditions are not favourable. Furthermore, more efficient error protection (LDPC/BCH) increases bandwidth effectiveness (bit rate/bandwidth at the same MER).

6.3.1 Symbol rate input

You must set the corresponding symbol rate before receiving a DVB-S2 signal. The instrument offers the operator five preset symbol rates for rapid input. **MODE -> Symbol rate** opens the selection area for the five preset symbol rates. Use the **Up/Down** arrow keys to select the required symbol rate. The new symbol rate is set when you press **ENTER**.
Press **->** to change the preset symbol rate between 2,000 kBd and 45,000 kBd (2000 - 45000 MSym/s). The default preset symbol rates are 27500, 22000, 5632, 4000 and 2400 kBd.

6.3.2 Scan

Use this function to scan the entire satellite frequency range (910 – 2,150 MHz) for DVB-S signals whose symbol rates correspond to the value that is currently set in the instrument.
During the scan, the instrument alternates between the currently set symbol rate and the first two preset symbol rates.
This means that the instrument scans the satellite range with a maximum of three different symbol rates.

Start the scan by tuning the measuring receiver to a frequency at which the scan should begin (see “Frequency input”). Pressing **ENTER** begins the process, as indicated by the “SCAN” message in the frequency window. When the instrument finds a transponder, the search is halted and the measuring receiver measures the frequency found. You can stop the scan by pressing a number key, an arrow key (**Up**/**Down**) or the **ESC** key.
During the scan, the instrument also detects DVB-S and DVB-S2 signals and adjusts the measuring receiver to the relevant operating mode.

Note:
In the UNICABLE and JESS operating mode the scan function is deactivated.

6.3.3 DVB-S2 parameters

The parameters are shown in the parameter window. If the measuring receiver is tuned to a frequency (see “Frequency input”), the DVB-S2 channel decoder attempts to synchronise with the signal that is present; this activity can be traced using the “SCAN” message in the parameter window.
The receiver first attempts to synchronise to the DVB-S2 signal that is present using the set symbol rate. If this is not successful, all of the preset symbol rates are set one after another. In addition, the instrument automatically detects the DVB-S/DVB-S2 operating modes.
If a QPSK/8PSK signal with the set symbol rate is present, the channel decoder locks and **LOCKED** is displayed in the parameter window. Otherwise, the **UNLOCKED** message is shown. This may be caused by the following: none of the set symbol rates fit; the receive level is too low; the signal is too noisy; or there is no DVB-S2 signal at this frequency.
When the DVB-S2 channel decoder receives a signal, the instrument shows its code rate and modulation scheme in the parameter window. At the same time, bit error rate and MER measurement is activated. The measured values are shown in the BER window and the MER window. The MPEG window is also displayed; here you can follow the search for PSI (program service information) in the transport stream. Further information can be found in the “MPEG Decoder” section.

6.3.4 BER measurement (bit error rate measurement)

As mentioned in the previous section, the BER measurement result is displayed in the BER window. The measuring receiver can measure the bit error rate before LDPC (CBER) and afterwards (LBER) at the same time. The LBER is displayed in a smaller font on the top line of the BER window. CBER is below in a large font.

Note:
The internal error protection is called LDPC (Low Density Parity Check) in the DVB-S2 standard, and the external error protection is called BCH (Bose Chaudhuri Hocquenghem). In particular, the performance of the LDPC error protection is significantly better than that of the inner error protection of DVB-S (Viterbi).

6.3.5 MER measurement

The MER value of the signal in the baseband (after the demodulator) is displayed in dB in the MER window. The measuring range extends to 20.0 dB; the resolution is 0.1 dB.

6.3.6 Packet error measurement

Short interruptions in the DVB-S/S2 signal usually cannot be detected using MER or BER measurements. They can make entire packets in the transport stream unusable for the MPEG decoder, however. This can cause the picture to freeze temporarily or the sound to crackle. The extent of this depends largely on the receiver hardware.

In the MODE menu, a function can be activated which sums up all corrupt transport stream packets starting from the time of activation or when a new frequency is entered. The number of packet errors (PE = Packet Error) and the amount of time that has passed since the last tuning process is displayed in the BER window instead of the VBER or LBER. This function can be deactivated again in the above menu or by performing a restart.

6.4 Level measurement

As soon as the instrument is set to a frequency (see “Frequency setting”), it begins to measure the level and displays the measured value in dBµV in the level window.
The measuring range extends from 30 to 110 dBµV with a resolution of 0.5 dB.
The measuring bandwidth is automatically adjusted to the channel bandwidth being measured. The measuring rate for the numerical level value is approx. 3 Hz.

6.4.1 MAX Hold function

In addition to the numerical level value, the level window also displays a yellow level trend bar whose length changes proportionally to the level value.
A vertical red line remains on the trend bar to indicate its maximum level since the last tuning process.
The repetition rate of the level bar is 10 Hz. Use this function as an aid when aligning the parabolic antenna.

6.4.2 Acoustic level trend indicator

The acoustic level trend signal also helps you to align a parabolic antenna. The loudspeaker emits a tone whose frequency changes in proportion to the level that is measured. The frequency of the signal tone rises as the level increases.
The function can be switched on or off at any time via the menu **MODE** -> **Acoustic level** -> **on (off)**.

6.5 LNB supply

The measuring receiver controls a connected LNB or a multiswitch using the conventional 14/18 V - 22 kHz control (max. four SAT IF levels) or with the DiSEqC control. The supply is short-circuit-proof and provides a maximum current of 500 mA. In the event of a short circuit, or if the current is too high, the instrument automatically turns off the LNB feed. If an external LNB feed is present that is higher than that set, this feed is also switched off. The LNB-LED lights up as soon as the LNB feed is active.

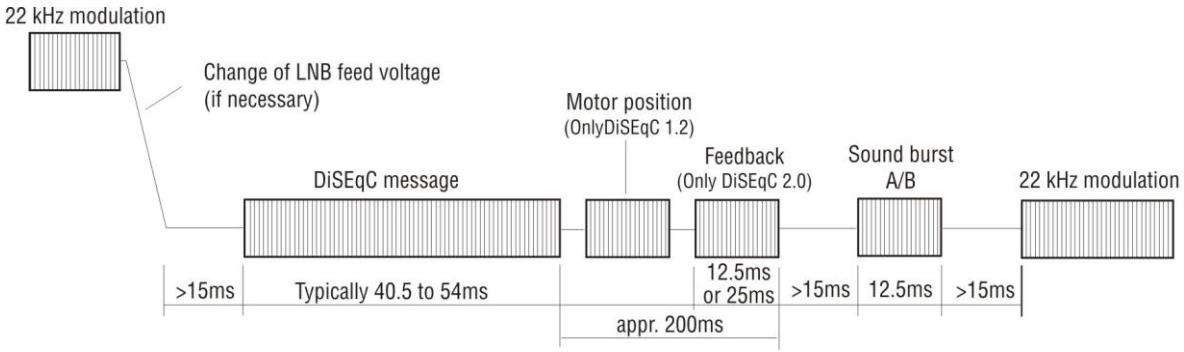
6.5.1 14/18 V – 22 kHz control

LNB -> DiSEqC -> off activates the 14/18 V - 22 kHz control (or DiSEqC off). Once it is active, the LNB feed is set to 0 V. The required SAT IF layer can be set via the menu **LNB** -> **SAT-IF-Layer** -> **14 V, 18V, 14 V/22 kHz, 18 V/22 kHz**.

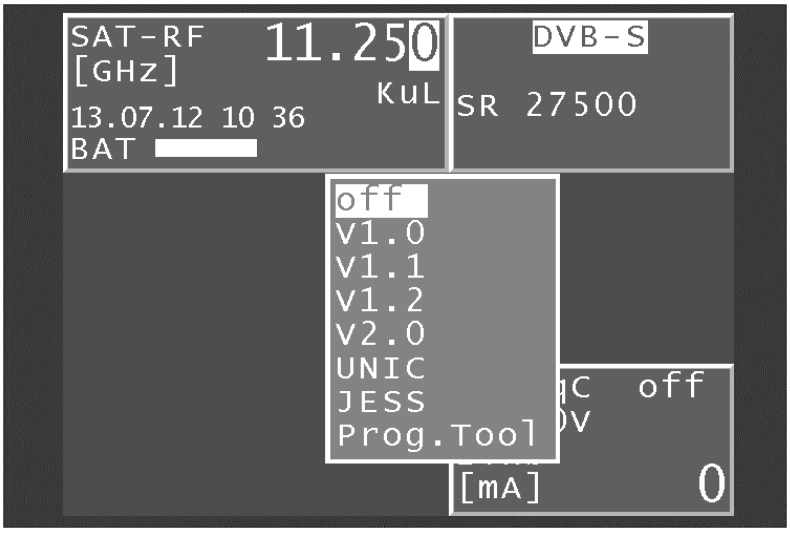
6.5.2 DiSEqC

DiSEqC defines a standard which transmits control commands from the master (e.g. receiver) via the RF cable to the slave (e.g. multiswitch, positioner) using FSK (frequency shift keying with 22kHz). DiSEqC is backward compatible with the 14/18 V – 22 kHz control.

The following diagram shows the chronological sequence of a DiSEqC1.0 sequence:



The 14/18 V - 22 kHz control follows immediately after a DiSEqC sequence. This allows non-DiSEqC-compatible components to be run when DiSEqC control is active.



The image shows the selection menu for the DiSEqC versions and single-cable standards.

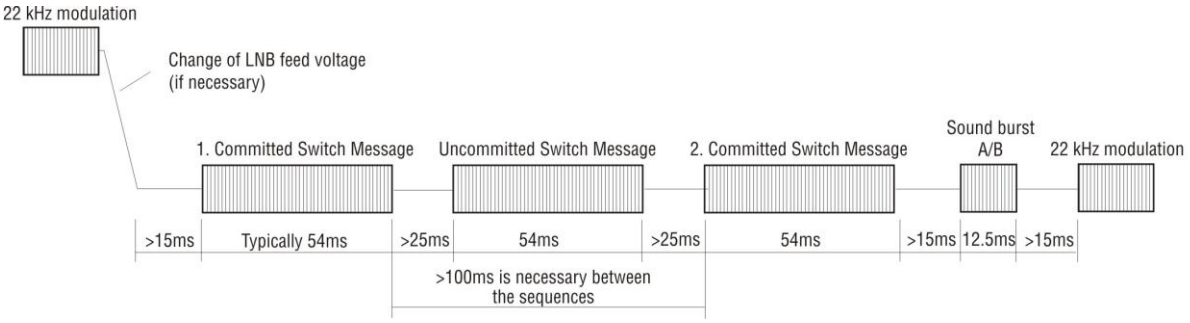
6.5.2.1 DiSEqC V1.0 control

When **LNB -> DiSEqC -> V1.0** is set, the instrument operates according to DiSEqC Standard V1.0 and allows you to control up to four satellite positions with up to four SAT IF levels each. A SAT IF level is set using **LNB -> SAT-IF-Layer > V/Lo, H/Lo, V/Hi, H/Hi**.
Set a satellite position using **LNB -> Satellite -> P1 – P4**. P1 can be used for ASTRA and P2 for EUTELSAT, for example.

6.5.2.2 DiSEqC V1.1 control

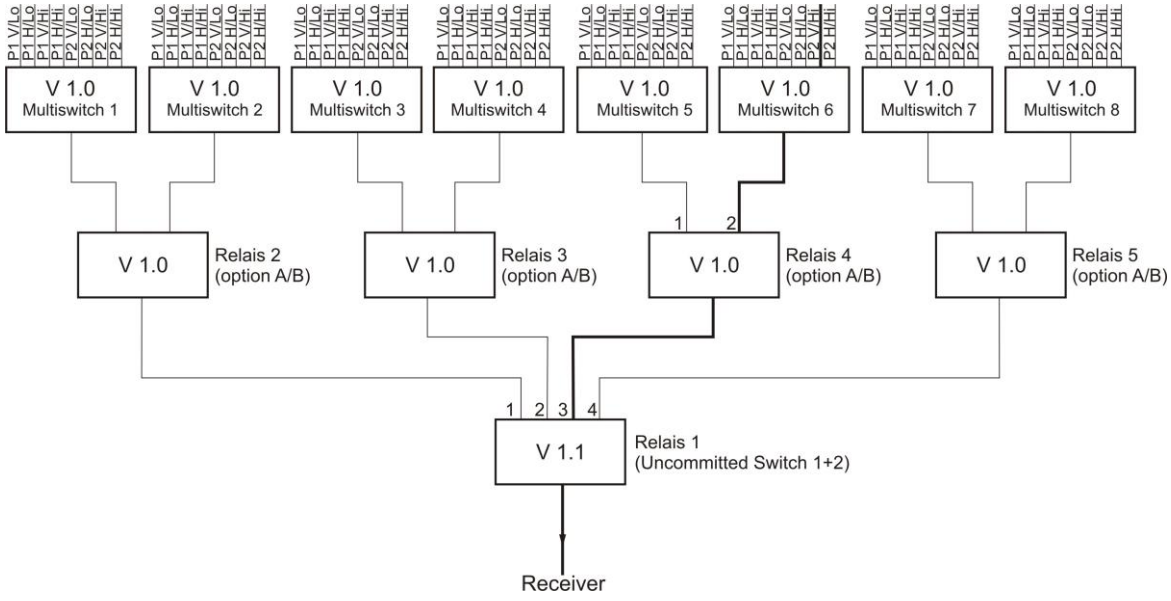
LNB -> DiSEqC -> V1.1 activates the DiSEqC V1.1 menu. V1.1 allows you to control a total of up to 256 SAT IF levels. V1.1 also allows for DiSEqC component cascading.
This means that compatible multiswitches or switching relays can be connected in series. Multiple repetitions of the DiSEqC command(s) are required for this. See the following example for further information.
The SAT IF level settings and satellite position settings are identical to those for V1.0. Added to this is the control “Uncommitted switches”, which is operated via **LNB -> Uncommitted Switch**. With “Uncommitted switches” you can split the 16 SAT IF levels that are possible with V1.0 into another 16 branches using the cascading option; this is achieved using 4 additional switches (uncommitted switches). In total, up to 256 SAT IF levels can be controlled. The “uncommitted switches” are binary controlled. The **Up/Down** arrow keys allow one of the 16 possible combinations of the 4 “uncommitted switches” to be selected using a hexadecimal number (“0” hex - “F” hex). Press **ENTER** to confirm the setting.
V1.1 incorporates DiSEqC component cascading. Therefore, the commands must be repeated. Select the minimal necessary number of repetitions to prevent unnecessary DiSEqC commands being sent, which would slow the control. **LNB -> Repeats** allows you to select between 0, 1 (default), 2 or 3 repetitions. Press **ENTER** to confirm the setting.

DiSEqC1.1 control sequence with 1 repetition



As mentioned above, DiSEqC1.1 is capable of cascading. The control sequences must therefore be repeated a number of times. DiSEqC components further back in the chain cannot receive the commands intended for them until the earlier components in the chain have processed their commands.

DiSEqC1.0 (committed switches) and DiSEqC1.1 (uncommitted switches) commands are repeated for this reason. The next picture shows a possible configuration in which 64 SAT IF levels are controlled.



The structure incorporates three hierarchy levels; two repetitions must therefore be set. The following settings must be made to connect the SAT IF route marked in bold:

Relay 1 works with “uncommitted switches” and reacts to switches 1 and 2. The binary combination “10” is required to connect the route to output 3, which corresponds to “2 hex” in hexadecimal.

Relay 4 works with “committed switches” and reacts to the option bit. The option bit must be set to connect the route to output 2. This corresponds to DiSEqC1.0 positions P3 or P4.
Multiswitch 6 switches 8 SAT IF levels. The selected path can be reached via P2V/Hi. However, as relay 4 requires the option bit to be set, the “committed switches” setting must be P4V/Hi.
Settings must thus be made in all 4 DiSEqC1.1 submenus for the marked SAT IF route:

- **Set SAT-IF level to V/Hi**
- **Set satellite position to P4**
- **Set ‘uncommitted switches’ to ‘2 hex’**
- **Set repetitions to 2**

Afterwards, the display should show “P42V/Hi”. This setting connects the SAT IF route marked bold in the example. All settings are incorporated in the tuning memory and can conveniently be recalled at a later date.

6.5.2.3 DiSEqC V1.2 control

Enter **LNB -> DiSEqC -> V1.2** to open the DiSEqC V1.2 menu. V1.2 can be used to control positioners with DiSEqC rotors. The menu includes the selection of the 4 LNB levels (identical to V1.0) and the control of a DiSEqC positioner.
The display of the position after “P” in the LNB window does not refer to the position of the position bit as in DiSEqC1.0. Instead, it corresponds to the position number most recently called from the position memory of the DiSEqC rotor. If you switch to DiSEqC V1.1 position number 1 of the DiSEqC rotor is moved to first.

Open the corresponding menu using **LNB -> Positioner**.

Drive:
This allows the positioner to be moved to the east and west.
The cursor is at STOP when the menu is open. You can move the cursor to the “East” or “West” menu item using the arrow keys. The motor then moves immediately to the east or west. You do not have to press **ENTER** first. The positioner stops immediately when the **STOP** menu item is activated.
Limit east:
This allows you to set an eastern limit that the positioner cannot pass. To do so, proceed as follows: First use the “Drive” function to move the positioner to the position to be set as the eastern limit.

Then open the “Limit east” function. The limit is saved in the positioner when you press **ENTER** to confirm.

Limit west:
This allows you to set a western limit that the positioner cannot pass. To do so, proceed as follows: First use the “Drive” function to move the positioner to the position to be set as the western limit. Then open the “Limit west” function. The limit is saved in the positioner when you press **ENTER** to confirm.
Limits off:
This function allows you to cancel the east and west limits of the positioner. The motor can then travel back and forth between its mechanical limits.
Save:
This function allows you to save a position reached using the “Drive” function in one of the position memory spaces 0-99.
Position 0 is reserved for the reference position of 0 degrees. When called up, some positioners are subject to a special function (e.g. Enable limits).
Go to:
The “Recall” function allows you to open positioner positions that were previously stored using the “Save” function. The positioner then turns to the saved position. Position 0 corresponds to the reference position of 0 degrees. The last position accessed is displayed in the LNB window after “P”, e.g. “P03”. This position is incorporated into the tuning memory. As a result, various orbital positions can conveniently be recalled from the tuning memory. There is no need do so indirectly via the **Positioner -> Go to** menu.

6.5.2.4 DiSEqC V2.0 control

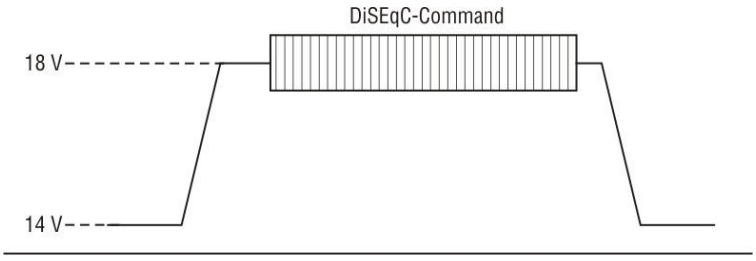
LNB -> **DiSEqC** -> **V2.0** activates the DiSEqC control V2.0. The difference from V1.0 is the additional feedback query of a controlled DiSEqC component. When the device controls a multiswitch with DiSEqC V2.0, it sends an answer back to the device. The instrument evaluates this feedback and reports “**DiSEqC reply correctly received**” if successful, or “**DiSEqC reply incorrectly received**” if there is an error.

6.5.3 UNICABLE

The UNICABLE version (satellite signal distribution over a single coaxial cable distribution network) is a variant of the DiSEqC control and corresponds to DIN EN 50494. With this system, the desired transponder is converted to a fixed frequency (centre frequency of the UB slot or bandpass) in the UNICABLE unit (LNB or multiswitch). The information co-ordinating transponders and UB slots is transmitted via the special DiSEqC command to the UNICABLE unit. The standard supports up to 8 UB slots. This allows up to 8 receivers to be operated on 1 cable.

The UNICABLE message contains the following information:
SCR address, horizontal and vertical polarisation, low or high band, and the transponder frequency to be set.

The following control routine is used in this device:



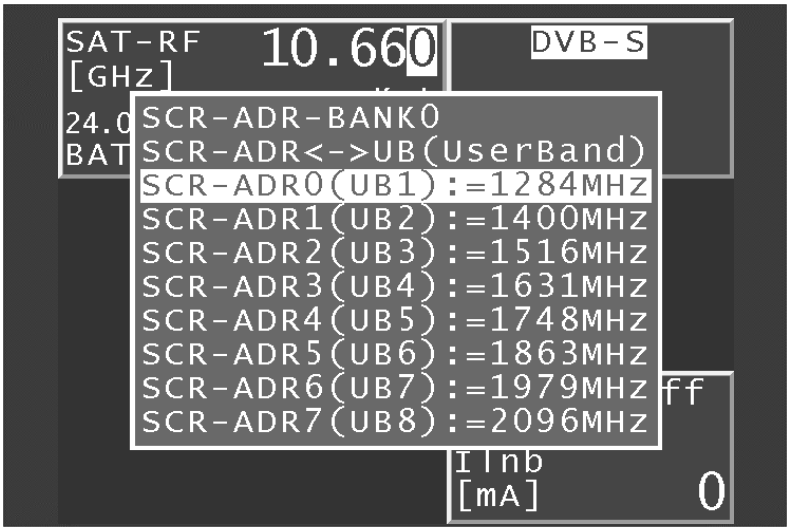
With UNICABLE systems, the signal-generating receiver generates a high DC level as it transmits, which is added to the UNICABLE message (special DiSEqC command).

After transmitting the UNICABLE message, the receiver returns to an idle state, in which a low DC level is generated. The receiver must return to a low DC level so that the system is available for other receivers.

The measuring receiver uses 14 V for the low DC level and 18 V for the high DC level.

6.5.3.1 Activation and Configuration

The UNICABLE control is activated via **LNB** -> **DiSEqC** -> **UNIC**.
The first menu that appears allows users to choose between setting the SCR-ADR-BANK and setting the SCR-ADR (satellite channel router address).
In the SCR-ADR menu, users can select the user band (UB) bandpass slot for the measuring receiver to use and edit the corresponding centre frequency. These parameters can be obtained from the data sheet of the UNICABLE unit being used.

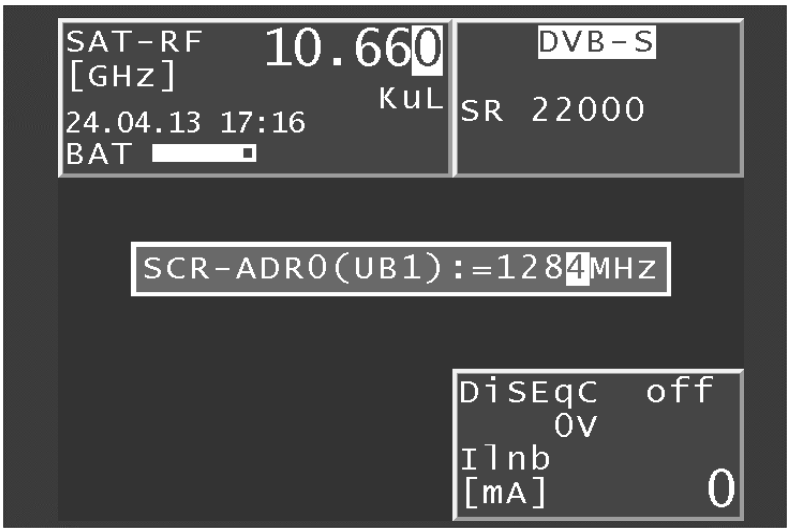


This figure shows the default settings with the following relationships:

SCR-ADR0:= 1284 MHz	SCR-ADR1:= 1400 MHz
SCR-ADR2:= 1516 MHz	SCR-ADR3:= 1631 MHz
SCR-ADR4:= 1748 MHz	SCR-ADR5:= 1863 MHz
SCR-ADR6:= 1979 MHz	SCR-ADR7:= 2096 MHz

Note:
Manufacturers have different methods for numbering the UBs. They are numbered either from 0 to 7 or from 1 to 8. The physical address always goes from 0 to 7. For example, the lowest slot, which could also be marked as UB1 on the converter unit, can be activated by selecting SCR-ADR0 (UB1).

To change the settings displayed, proceed as follows:
Use the **Up** and **Down** keys to select the required SCR address. Then press the **->** key to access the following menu.



Here you can set the UB centre frequency that corresponds to the selected SCR address. This is the frequency that a connected receiver needs to tune to. Use the **Up** and **Down** keys, the **<-** and **->** keys, or the numeric keypad to set the UB centre frequencies within the range from 950 MHz to 2.150 MHz.

Press **ENTER** to save the entry; the menu with the SCR address list reappears. Press **ENTER** again to complete configuration of the UNICABLE control in the measuring receiver.
All entries are stored in non-volatile memory; the instrument will operate using these settings when it is next switched on.

- SCR address bank
Some UNICABLE units operate with eight receivers per cable and others with four receivers. Such units generally operate with differing UB centre frequencies.

To simplify the procedure for the user, the instrument offers a feature that enables switching between four SCR-ADR banks. That means that the device has three banks of SCR addresses for UNICABLE units that operate with 8 receivers and a different bank of SCR addresses for UNICABLE units that operate with 4 receivers. The UB centre frequencies can also be changed within the banks as described above. That means that the next time the device is switched on, it will operate again with these SCR-ADR <-> UB centre frequency settings. In addition, the bank setting is stored in the tuning memory. This makes it possible for you to combine memory locations with Bank 0 and Bank 1 as desired.

- Entering a name for the bank
You can select a bank in the SCR-ADR-Bank menu. Press the -> key to open a menu where you can assign a name to the bank, for example the name of the manufacturer of the UNICABLE components. Using the **<-** or **->** arrow keys, you can move the cursor to the desired position in the label. You can edit the label with alphanumeric characters using the arrows or the number keys. The name can be up to 20 spaces in length.

- Confirming and saving the entry
Pressing the **ENTER** key closes the input menu and stores the values in the non-volatile memory.

- Wideband RF mode
Some UNICABLE units (LNB) work exclusively on a single oscillator frequency. This means that the low band and the high band are combined in a single band. This special mode can be set on the instrument via **LNB** -> **MODE** -> **WIDEBAND RF**. The UNICABLE control can be switched back into standard mode (2 oscillator frequencies) via **LNB** -> **MODE** -> **STANDARD RF**.

This is also the instrument's default setting. The setting is non-volatile; the measuring receiver will work in this mode when UNICABLE control is next accessed. This setting is also stored in the tuning memory.

- LO Frequency (applies to wideband RF mode only)
As already mentioned, some UNICABLE units (LNB) work exclusively on a single oscillator frequency. This frequency must be set before in the instrument can be used to control such units. You can choose between oscillator frequencies 10.000, 10.200, 13.250 and 13.450 GHz via **LNB** -> **LO-Frequency**. The setting is also non-volatile. This position is also incorporated in the tuning memory. The default setting is 10.200 GHz.

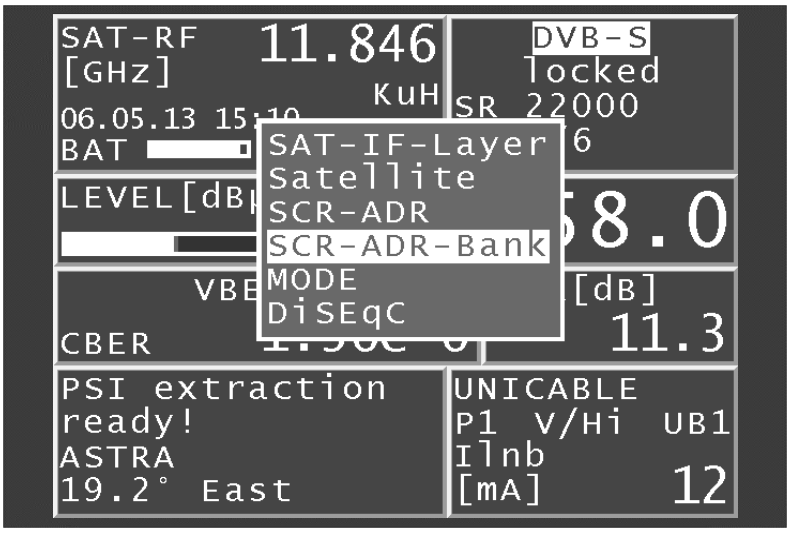
6.5.3.2 Operation

The UNICABLE control can be used to convert up to eight SAT IF levels in up to eight UB slots. These are further divided into two satellite positions, each with four SAT IF levels. Each connected receiver (max. 8) operates using a dedicated UB slot. This is defined via the SCR address.
These UNICABLE control parameters are set via **LNB** -> **SAT-IF-Layer** -> **Satellite** and -> **SCR-ADR.**

The measuring receiver is tuned as described in "Frequency input".
The difference when using the UNICABLE control is that the desired transponder frequency is converted to the centre frequency of a UB slot in the UNICABLE unit.

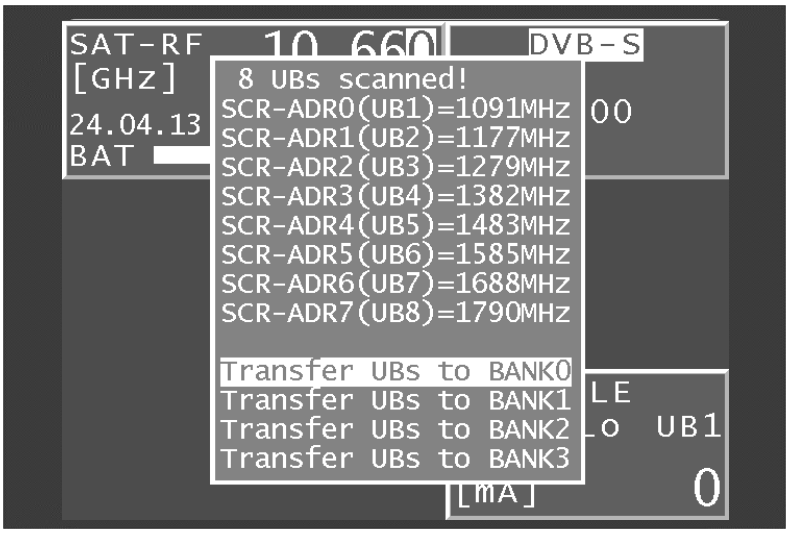
This means that the measuring receiver must send the transponder frequency to the UNICABLE unit as a UNICABLE command and then tune itself to the correct UB slot centre frequency.
Whenever there is a new tuning process, the entire UNICABLE control command is sent to the UNICABLE unit. Since UNICABLE enables up to eight receivers to be connected to a single cable, collisions may occur between the connected receivers during control. If this situation arises when using the measuring receiver, send the control command again by pressing **ESC** and **ENTER** in sequence.

The following figure shows the instrument in UNICABLE mode with the LNB menu open.



- Wideband RF mode
As described above, these UNICABLE units operate with a single oscillator frequency and the low and high bands combined on one band. This reduces the number of SAT IF levels to 2 (vertical and horizontal). If the instrument is in this mode, vertical (V) or horizontal (H) polarisation can be set via **LNB** -> **SAT-IF-Layer**. This also switches the measuring receiver to RF frequency input mode. A transponder frequency of between 10.700 GHz and 12.750 GHz can be entered.

- Scan SCR-ADR
This menu is only shown when the instrument is not tuned (default status). When this menu is opened, the number of available UB slots (SCR-ADR) on the connected converter is determined, and they are displayed along with their centre frequencies. This may take a few seconds.



Selecting one of the **Transfer UBs to BANKx!** menu items saves the displayed frequencies in the non-volatile memory of the bank selected and overwrites the existing frequencies.

Note:
Switched-in antenna wall outlets or poor signal conditions could impede the SCR-ADR scan.
The search function in the operating mode of UNICABLE and JESS has been deactivated.

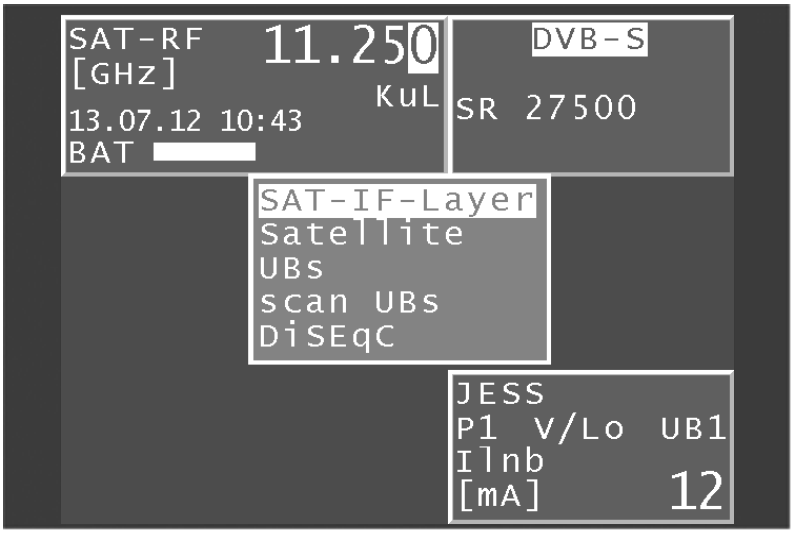
6.5.4 JESS

JESS (Jultec Enhanced Stacking System) is an expansion on UNICABLE Standard with a larger range of functions. Among other functions, it supports 16 UB slots and allows the frequency of the individual slots to be read directly from the converter unit. The transmission of the commands occurs exactly as described above for UNICABLE and in accordance with the DIN EN 50494 standard.

6.5.4.1 Activation and Configuration

The JESS control is activated by selecting **LNB** -> **DiSEqC** -> **JESS**.
Afterwards, a menu appears, allowing users to select the user band (UB) bandpass slot for the measuring receiver to use and edit the corresponding centre frequency. These parameters can be obtained from the data sheet of the converter unit being used. 16 UB slots are available in one bank. Individual UB frequencies can be edited as described above for UNICABLE.

The following figure shows the instrument in JESS mode with the LNB menu open.

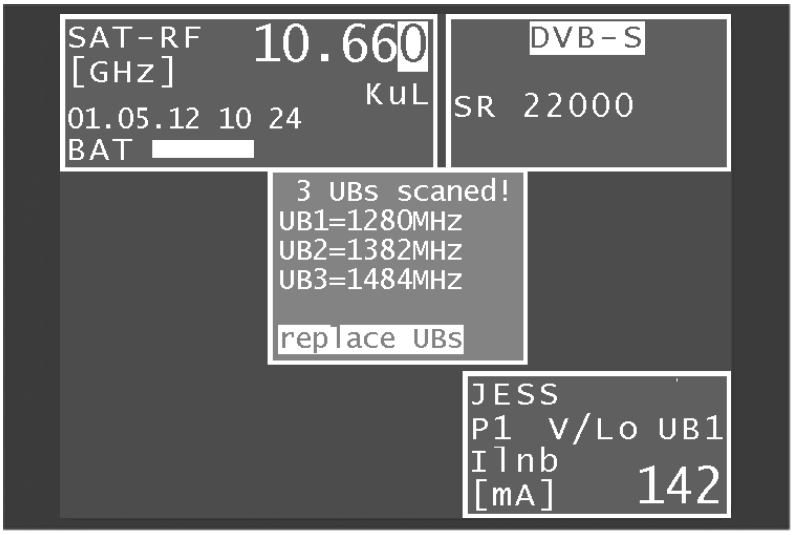


6.5.4.2 Operation

The JESS control can be used to convert 16 SAT-IF layers in a maximum of 16 UB slots. These are further divided into 4 satellite positions with 4 SAT-IF layers each. Each connected receiver (maximum of 16) operates using a dedicated UB slot. This is defined via the UB number.
These JESS control parameters are set via **LNB** -> **SAT-IF-Layer** -> **Satellite** and -> **UBs**.

The measuring receiver is tuned as described in the “Frequency input” chapter.
The difference when using the JESS control is that the desired transponder frequency is converted to the centre frequency of a UB slot in the converter unit.
That means that the measuring receiver must send the transponder frequency to the converter unit as a JESS command and then tune itself to the correct UB slot centre frequency.
Whenever there is a new tuning process, the entire JESS control command is sent to the converter unit again. Because JESS enables the use of up to 16 receivers connected to one cable, clashes may occur between the connected receivers during control. If this situation arises when using the measuring receiver, send the control command again by pressing the **ESC** and **ENTER** key combination.

- Scan UBs
When this menu is opened, the number of available UB slots on the connected converter is determined, and they are displayed along with their centre frequencies.

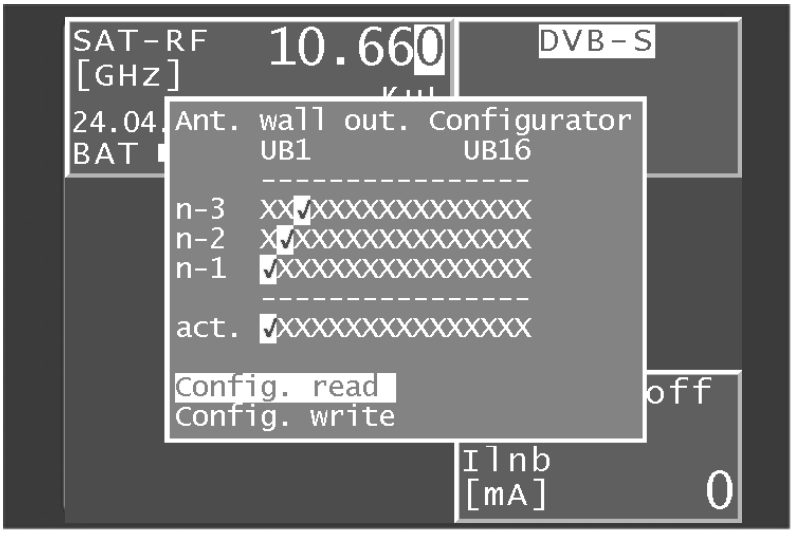


Selecting the **replace UBs** menu item saves these frequencies in non-volatile memory and overwrites the existing frequencies.

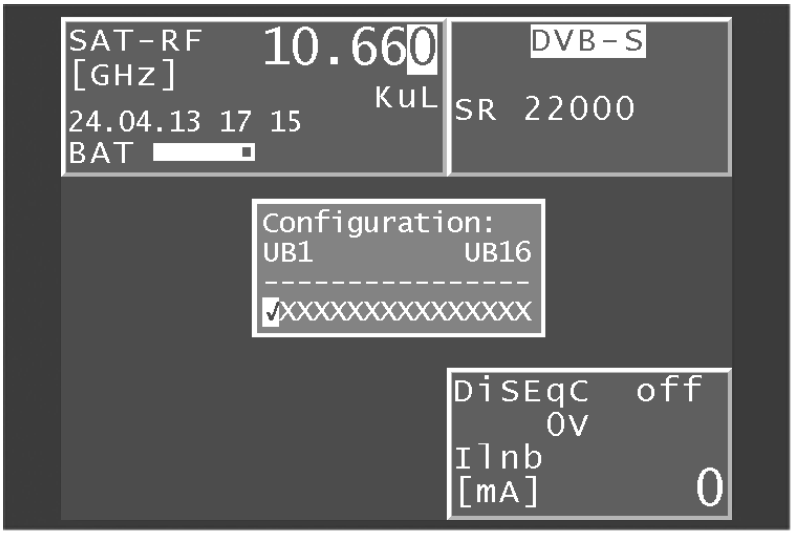
Note:
Switched-in antenna wall outlets or poor signal conditions could impede the SCR-ADR scan.
In the JESS operating mode the scan function is deactivated.

6.5.5 Programming antenna wall outlets

For single-cable systems, there is a possibility that participants sharing a cable will cause each other interference by using the same UB slots. To prevent this, programmable antenna wall outlets are available which accept only UNICABLE or JESS commands for the programmed UB slots (e.g., the SSD6 series of wall outlets from Axing or the JAP series from Jultec, etc.).
Selecting **LNB** -> **Prog.ADo.** opens a “Configurator” which can be used to analyse and program an antenna wall outlet connected to the measuring instrument. The figure below shows the measuring instrument in the antenna wall outlet configuration mode.



An X represents a locked user band (UB) bandpass slot and a green check mark indicates an unlocked UB slot. The current configuration is displayed in the “act.” line. This configuration can be determined by selecting “**Config. read**” or edited by selecting “**Config. write**”. The “n-1” line displays the last successfully programmed configuration, “n-2” displays the configuration previous to this, etc.
To change the current configuration, proceed as follows:
Select the “**Config. write**” menu using the **up** and **down** keys. Then press the **->** key to access the following menu.



The desired configuration can be set using the up and down keys as well as the **<-** and **->** keys. Pressing **ENTER** programs this configuration and returns you to the original menu.
If the programming was successful, this configuration is shown in the lines “n-1” and “akt.”, the previous contents of line “n-1” is now in line “n-2”, etc. If the programming was not successful, the message “**DiSEqC answer incorrect**” appears briefly and the lines n-1 to n-3 remain unchanged (the configuration is transmitted using DiSEqC commands).

Note:
The search function in the operating mode of JESS has been deactivated.

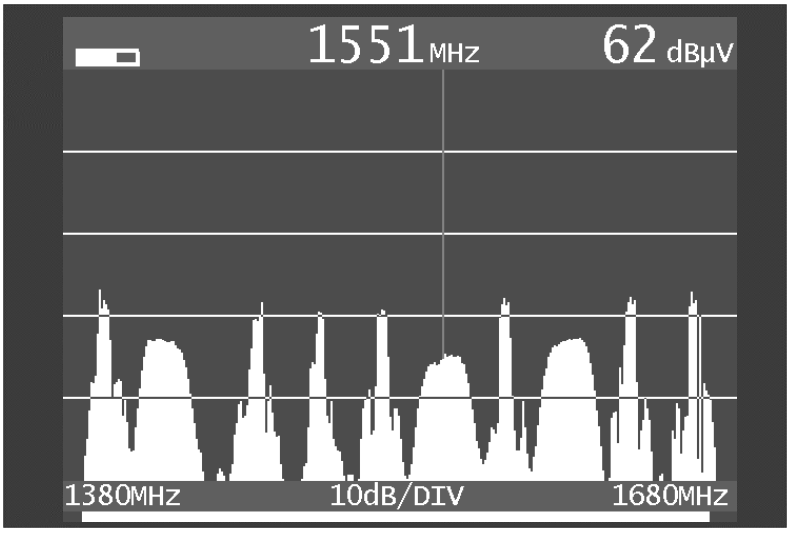
6.5.6 *LNB current measurement*

The measuring receiver measures the power of the direct current that comes from the RF input (e.g. for a LNB supply) and indicates it in mA in the LNB window. The measuring range is between 0 and 500mA, the resolution is 1mA.

Chapter 7

Analyzer

The safest way to look for a satellite position is in the analyzer mode. By rotating the dish, one tries to locate a satellite system while adjusting the transponder to maximal level.
The picture below shows an analyzer screen.



The level grid is 10 dB/DIV. The start and stop frequencies are shown at the bottom of the screen. The level display (top right) and the frequency display (top centre) relate to the cursor position.

7.1 Accessing the analyzer

Press **ANALYZ** to initiate the analyzer. The status of the measuring receiver is now important. If the receiver is not tuned to a channel (e.g. **ESC** was previously pressed), the analyzer sweeps over the entire measuring range (FULLSPAN). But if the instrument is in tuned mode (measuring mode), the analyzer shows a smaller section of the frequency spectrum (SPAN1) above and below the measuring frequency. When the UNICABLE control is active, the analyzer displays the frequency spectrum above and below the centre frequency of the last UB slot that was activated.

7.2 Frequency segment (SPAN)

The frequency segment (SPAN) can be changed.
In “FULLSPAN” mode, the frequency segment spans the entire measuring range. The frequency segment (SPAN) can be changed using the **Up** and **Down** arrow keys.

The table below provides an overview of the frequency segments that may be set.

Total (FULLSPAN)	SPAN1	SPAN2
910 – 2150 MHz	300 MHz	76 MHz

7.3 Cursor

The cursor appears as a vertical red line on the screen. You can use the **<-** and **->** keys to move the cursor within the frequency segment. The current cursor frequency is shown in the upper centre of the screen. A new cursor frequency can also be entered with the numeric keypad and confirmed with **ENTER**. The cursor is then shifted to the new position, or the frequency segment is shifted so that the cursor is in the middle if the distance to the frequency limits allows it.

7.4 Level measurement

During each sweep, the level of the cursor frequency is measured and displayed at the top right of the screen in dBµV. Level measurement in analyzer mode is comparable to that of a pure spectrum analyzer. The power within the measuring bandwidth (RB) is measured and converted into dBµV as a level. On the other hand, the level measurement in measuring receiver mode always measures the power (level) in the channel.

7.5 Progress bar

A yellow bar at the bottom of the screen runs from left to right during each new search by the analyzer. This allows you to trace the progress of the sweep.

7.6 Switching to measuring receiver mode

You can switch directly from analyzer mode to measuring receiver mode. The instrument uses the current cursor frequency to tune the measuring receiver. However, frequency segment SPAN1 or SPAN2 must be set.

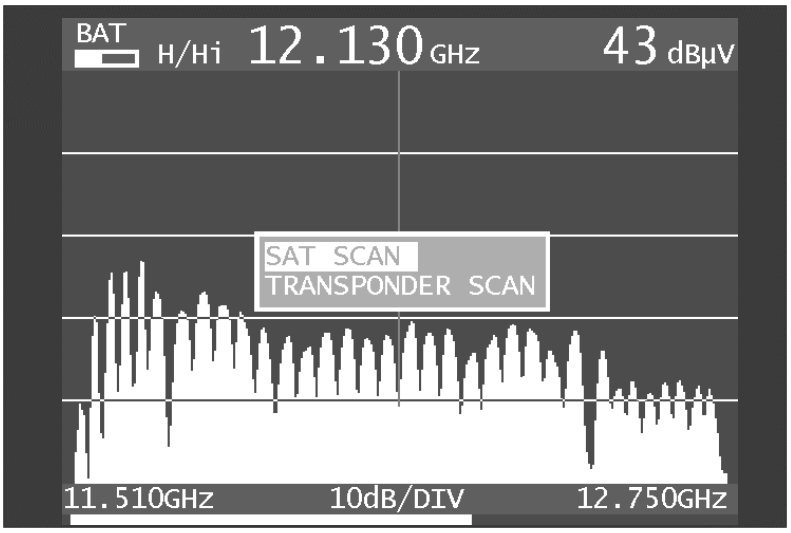
Press **ENTER** to begin the process.

When the UNICABLE control is active, the frequency display always refers to the spectrum that was converted by the UNICABLE unit.

If the **ANALYZ** button is then pressed again, the instrument returns to analyzer mode.

7.6.1 Switching to measuring receiver mode with SCAN

A menu will appear as soon as the scan button is pressed, here you can choose between **SAT SCAN** and **TRANSPONDER SCAN**. Access for this function can be obtained by pressing either the **SCAN** or **ENTER** button.



7.6.2 Transponder SCAN

Depending on the respective SPAN, the following additional functions are executed when the **SCAN** button is pressed.

FULLSPAN: Starting from the current cursor position, the next maximum is searched and the centre frequency of this transponder is determined. The analyzer then switches to SPAN1 with the frequency it has determined as the cursor position.

SPAN1: As is the case with FULLSPAN, the centre frequency of the next transponder is searched and tuned to. In addition to the five preset symbol rates, the entire range of the symbol rates is searched from 2 to 45 MSym/s.

SPAN2: For fine-tuning, the instrument is tuned directly to the frequency of the cursor position. In addition to the five preset symbol rates, the entire range of the symbol rates is searched from 2 to 45 MSym/s.

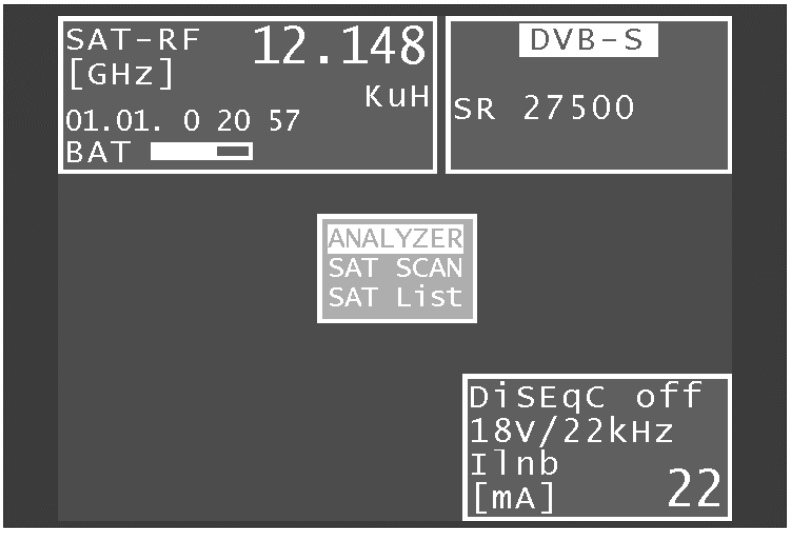
7.7 Activating the remote supply

The LNB supply can be activated while in analyzer mode in the same way as was discussed in previous sections. First press the **LNB** button to access the relevant menu.

Chapter 8

SCAN Support for Finding Satellites

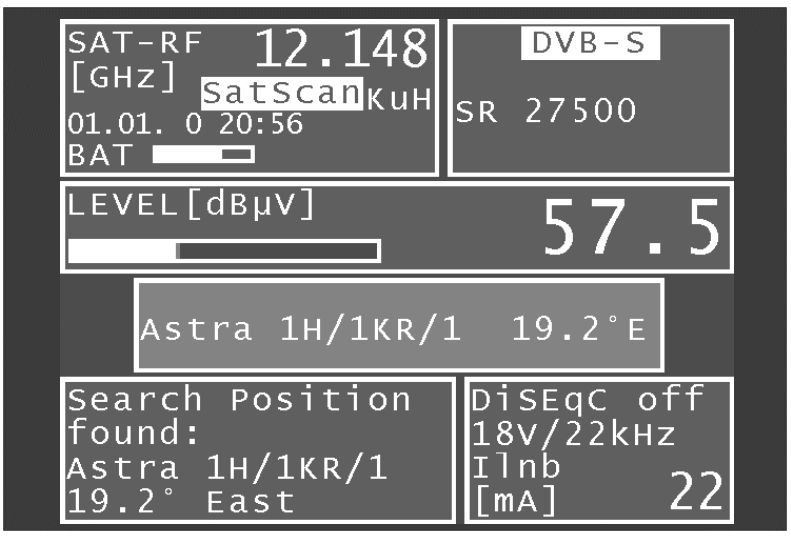
Several Functions are gathered together in the SCAN-function which makes looking and identifying a satellite position easier. As soon as the **SCAN** function is selected, a submenu will appear where the following functions can be selected: ANALYZER; SAT SCAN; SAT List.



A spectral illustration appears on the screen as soon as the analyzer is activated and then it switches to the input connector from the LNB-supply 18V/22kHz. The SCAN function from the analyzer mode is in the chapter „ANALYZER“ - changing over into the measurement mode is described in „SCAN“.

8.1 SAT SCAN

This function can be choosen from the above displayed menu with the keys **SCAN** or **ENTER**. A search cycle starts in a range from east to west where the most important satellites are tuned to the transponder. The positions that are being tested will be shown in a distinct red window and a reference „ searching for position“ will be shown in the MPEG window. If the satellite system can be clearly identified out of this data stream, the adjusted position will be shown in the MPEG-window with the level specification (view picture). The search cycle can be continued with SCAN, discontinued with ESC, switched to analyzer mode with **ANALYZ** and changed into regular measurement mode with **ENTER**.

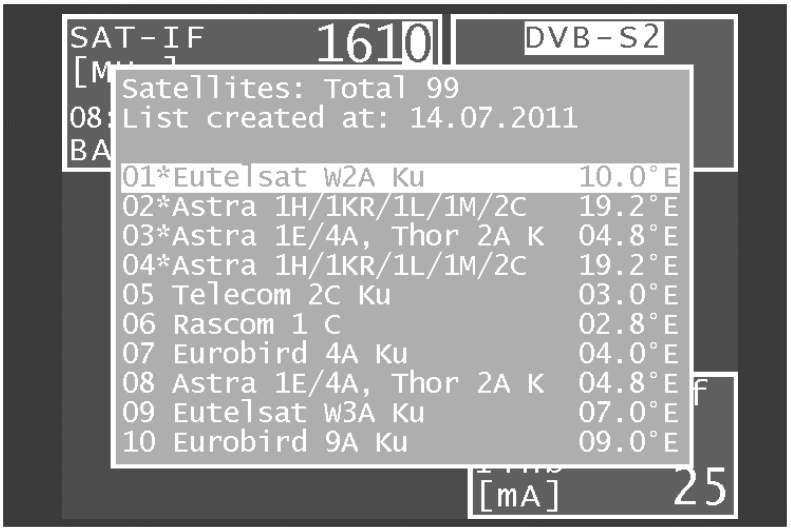


The scan parameter (satellite, transponder frequency etc.) are a fixated componant of the satellite and cannot be found in lists prior to 21.1.2011. Therefore the SAT lists should be kept up-to-date. (View the chapter „SAT- lists import“).

Note:
If Quattro LNBs are used, the various SAT identifications are not sent on all levels.
The LNB should be connected to the connectors for the horizontal high or vertical low levels since only these levels are searched.
The relevant data can be found in the document which accompanies the SAT list.

8.2 SAT list

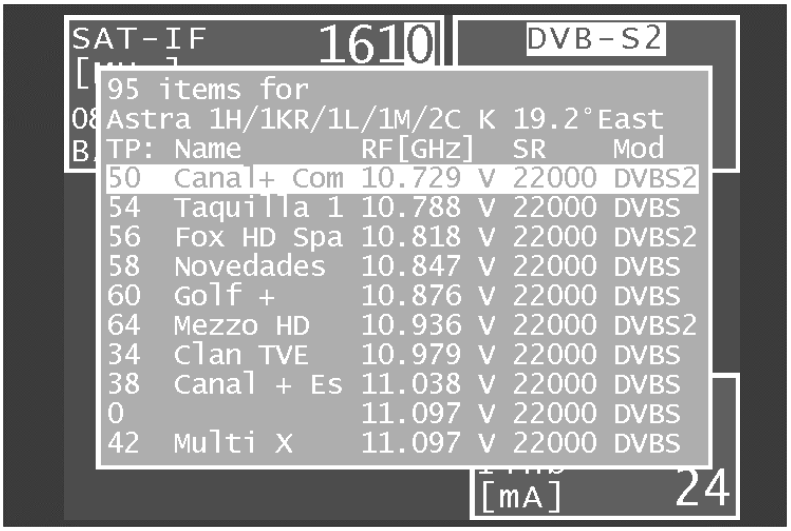
Open the SAT list by pressing **SCAN** in the main menu. Use the **<-** and **->** arrow keys to browse through the list page by page; individual satellites can be selected using the **Up** and **Down** keys. Pressing the **SCAN** button again displays the transponder list for the selected satellite.



The SAT list is provided by the instrument manufacturer and updated on a regular basis. Check whether the list being used is up-to-date (use the date code in the second line of the list for this). To update the list please view the chapter SAT-list import.

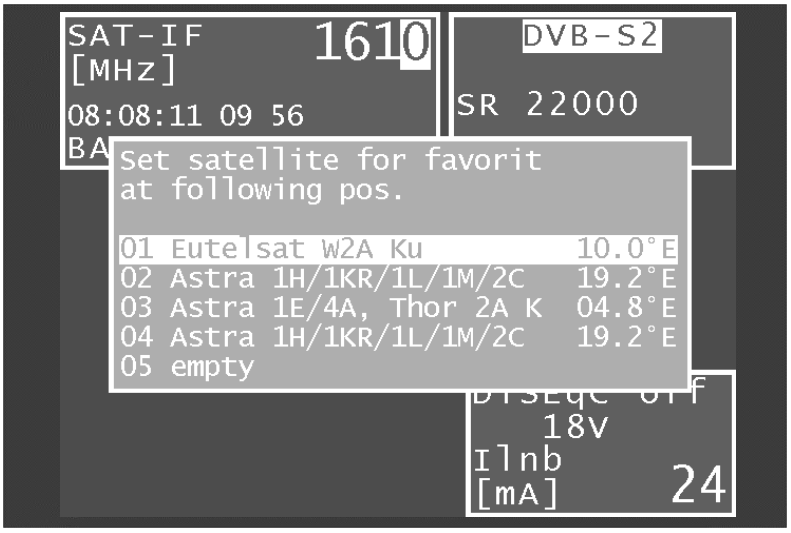
8.3 Transponder list

In addition to reception parameters such as frequency and modulation, the transponder list includes transponder numbers and names if they are known. As for other lists, one element can be selected. Press **SCAN** or **ENTER** to tune. Press **ESC** to return to the previous list.



8.4 Favourites list

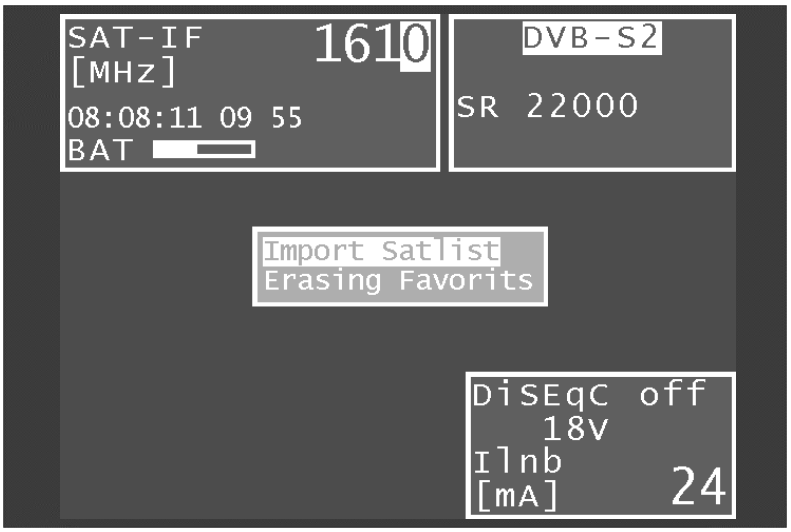
You can save frequently required satellites in a favourites list so that they can be found more quickly. To do so, select the corresponding satellite from the SAT list and press **SAVE**. The following menu appears:



You can now select the position in the favourites list. Pressing **SAVE** again saves the item as a favourite and the SAT list is displayed again. The favourites now appear at the top of the SAT list and are marked with (*). You can replace one favourite with another at any time. With **MODE** -> **Satlist** -> **Erasing Favourites list** to erase all favourites.

8.5 Importing a SAT list

Open the “Satlist” menu from the main menu (press **MODE**). The following submenu is then displayed.



The current SAT-list can be found at www.kws-electronic.de. To import a SAT list, you first need to connect a USB memory device with a corresponding file. Select **Import Satlist** to call up all of the “.sat” files stored on the memory device. Select and import the desired list by pressing **ENTER**. This action overwrites any list that previously existed on the instrument.

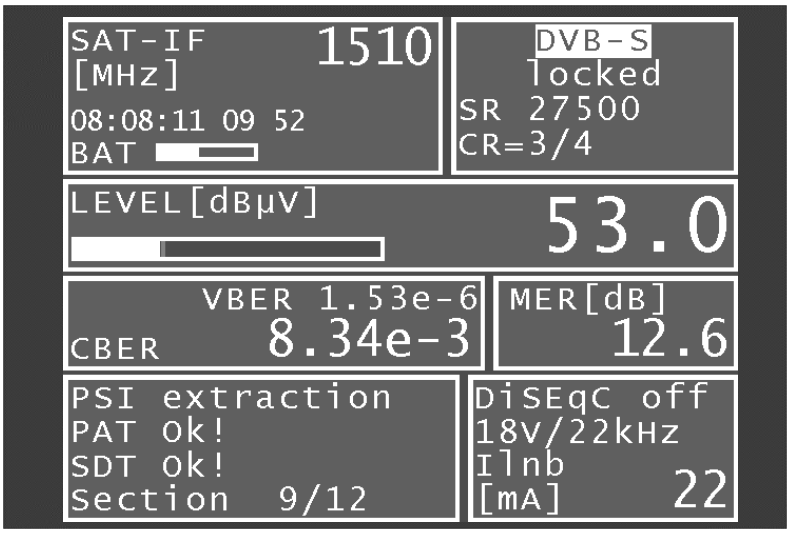
Chapter 9

MPEG decoder

An MPEG2/4 decoder is included in the delivery of this instrument. It functions as the Back-End of a DVB receiver. It evaluates the Program Service Information (PSI) and decodes the digital audio and video data.

9.1 Program Service Information (PSI)

In digital television (DVB) technology, data is transmitted in byte-serial format via a transport stream (TS). The transport stream usually contains several audio and video channels as well as data streams and additional program information, all of which is transmitted in time-division multiplexing. Special tables transmitted in the transport stream provide information about the channels and data services being sent. The receiver first needs to interpret these PSI tables in order to give the user an overview in the form of channel lists. This process can take a few seconds (depending on the number of programs they contain) and can be monitored in the MPEG window.

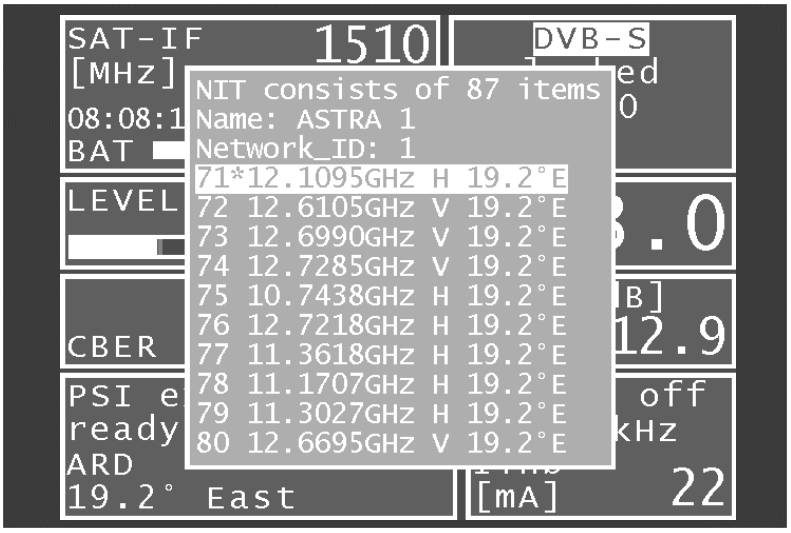


The MPEG window is seen at the bottom left of the screen. While this is being displayed, a new channel search is running in a DVB-S transponder.

For a quick overview of the current transponder, the provider name and its orbital position are shown in the MPEG window when the channel search is finished.

9.2 Network Information Table (NIT)

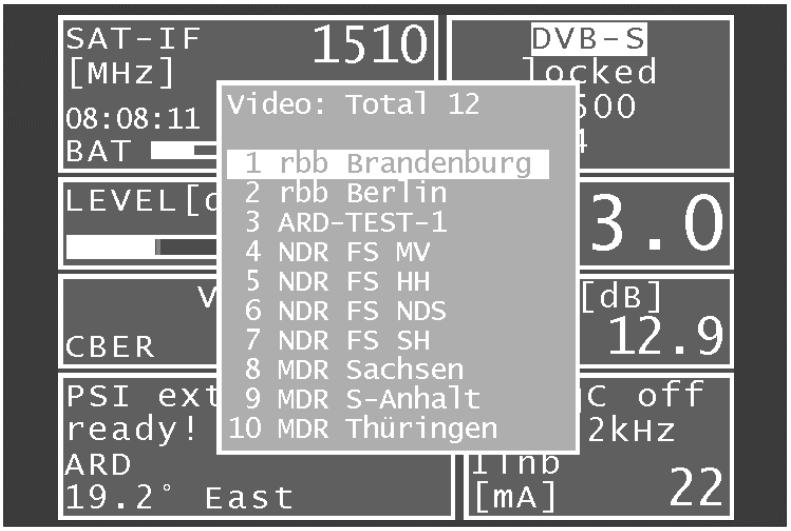
The NIT (Network Information Table) is a special table that contains information about other transponders and channels within the network (e.g. satellite, cable, DVB-T network). The information from the NIT can be used for navigation (programme search).
The measuring receiver first needs to receive a digital channel. **MODE** -> **NIT** starts the NIT search. If a NIT is found, the decoder lists the entries of the NIT.



The transponder or channel that is being tuned on the receiver at any specific time is marked in the NIT with (*). You can now select another entry with the **Up** and **Down** keys. Press **ENTER** to tune the receiver to the new transponder or channel. The instrument fetches the information from the previously selected NIT entry.
For the SAT NIT, transponders transmitted by different satellites can be listed. Only transponders on the same satellite that is sending the NIT can be selected directly from the NIT.
You can assign items to the tuning memory directly from the NIT. To do so, select the corresponding entry from the NIT. As described in section “Memory management (saving)”, you can then select a memory location and save the NIT entry. **SAVE** takes you to the SAVE menu.
If the NIT has more than 10 entries, the **<-** and **->** keys can be used to scroll between the pages of the list.

9.3 Picture and sound control

As explained in section “Program Service Information (PSI)”, several video and audio channels are transmitted in the same multiplex (TS). As soon as the MPEG decoder recognises a TS, the PSI data is analysed and the channel lists are created. This process can be monitored in the MPEG window. Once the decoder has created the channel lists, “PSI extraction ready” appears in the MPEG window. You can then display the channel list by pressing the **OSD/VID** button. The picture below shows a video channel list.



The list of video channels always appears first. **MODE** -> **AUDIO List** displays the list of audio channels. **MODE** > **VIDEO List** takes you back to the video list. All channels marked with (*) are encrypted.

Use the **Up**/**Down** arrow keys to select the required channel from the list. The ← or → buttons scroll between the pages of the channel list.
Press **ENTER** to call up additional details about the selected channel. This includes the channel name, provider and PIDs (packet identifiers) of the associated elementary streams.

Some channels are broadcast with second audio programming (e.g. several languages). You can choose the required audio programme in the “programme properties” menu.

Pressing **ENTER** again switches to the channel. The screen now shows just the video channel. The speaker sound can be checked at the same time.

Note:
For digital transmission, no conclusions can be drawn about the reception quality based on the quality of the picture and sound. The picture and sound are always perfect to a certain transmission quality, below which the signal cannot be reproduced. Only within a small threshold range can you notice characteristic blocks in the picture (“brick wall effect”) and constant interruptions to the sound. Broadcast quality can only be determined based on measurements (BER, MER).

Press **ESC** to return to the previous channel list, from which you can select another channel. **OSD/VID** takes you back to normal measuring mode.

9.4 Display of MPEG video parameters

As soon as a live picture can be seen, the MPEG decoder displays the following parameters in a window at the lower right edge of the screen.

Profile and level:	e.g. MP @ ML
Chroma format:	e.g. 4:2:0
Video resolution:	e.g. 720*576
Letter Box Format:	4:3 or 16:9

The parameter window can be displayed or hidden at any time using the ← or → arrow keys.

9.5 Video bit rate measurement

The MPEG decoder measures the current bit rate of the video stream being broadcast while a live picture is shown. It is shown in the unit [Mbit/s] in the window described in the section above. The measuring period is 1 second.

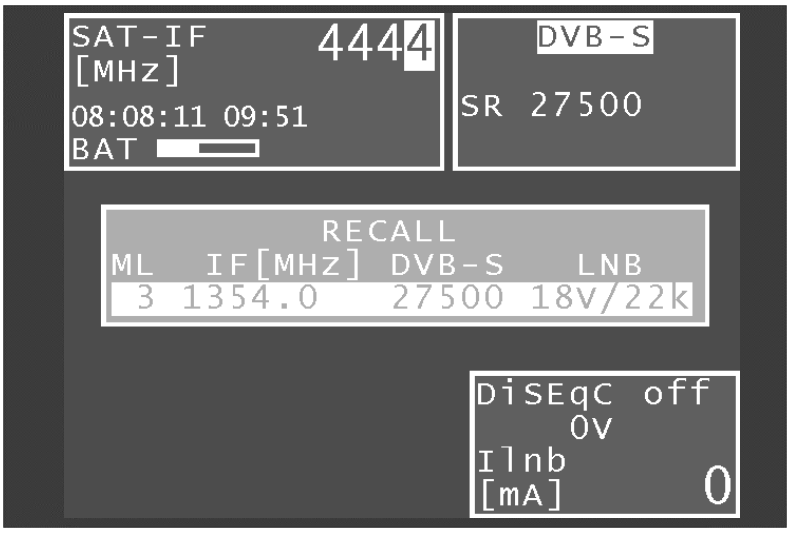
9.6 Dynamic program switching

Some program providers divide their programming into regional content at specific times. This means that, for example, 4 programs may appear in the MPEG program list which have the same content at certain times and different content at other times. The program map table (PMT) in the data stream therefore changes over time. In this way, the station can prompt the receiver to use different packet identities (PIDs).
In the standard setting, the MPEG decoder of the instrument uses the PMT that was sent at the time of the last program search. In other words a static PMT.
The dynamic PMT update function can be activated using **MODE** -> **Settings** -> **Dyn.program switching**. If you start the program now, the decoder continually searches for a new PMT version. If the device detects a change in the PMT, the current program is stopped, the message “Dyn. program switching” appears and then the program is restarted with the updated PIDs. These settings are saved in the non-volatile memory and remain active until they are deactivated in the above menu.

Chapter 10

Memory management

The tuning memory of the instrument can store up to 99 channels. The memory preview function provides an overview of the turning memory without requiring the user to call up all memory locations ahead of time or to note down information when saving. The memory preview is activated when saving and recalling program locations and with many memory functions. Use the **Up** and **Down** keys to navigate in the tuning memory; the **<-** and **->** buttons scroll through pages.



10.1 Saving

As a first step, the receiver needs to be tuned. **SAVE** takes you to the “SAVE” menu. The instrument searches the tuning memory for the first free location and suggests this as the number to be used for saving. You can also use the keypad to enter any memory location between 0 and 99. The contents of the memory location are displayed next to the location number. Press **SAVE** or **ENTER** to save the location. If the desired memory location is already assigned, the instrument issues a warning. To overwrite the memory, press the **ENTER** or **SAVE** button a second time.

10.2 Recalling

Press the **RECALL** button to open the “Recall” menu. When this menu is opened for the first time after the instrument is switched on, the instrument suggests memory location 1. Each time the recall function is accessed, the memory location number increases by one. That means that the instrument will suggest memory location 2 next. It is also possible to select any other memory location using the numeric keypad or up/down keys (1 memory location) – **<-** and **->** keys (10 memory locations). Press **RECALL** or **ENTER** to recall the memory. The measuring receiver then accepts the settings from the memory. If the memory location is empty, the old settings remain unchanged.

10.3 Memory functions

The memory functions can only be operated if the measuring receiver is not tuned.

10.3.1 Erasing the memory

Use **MODE** -> **memory** -> **erasing all memory** to erase the entire tuning memory. A warning is issued before the information is erased. The instrument does not erase the tuning memory until you confirm again by pressing **ENTER**. This can take a few seconds.
The instrument then issues a message that the process is complete.

10.3.2 Erasing a memory location

This function can be used to erase a continuous block of memory locations or an individual memory location within the tuning memory.

Access this function via **MODE** -> **memory** -> **erasing memory location**. The instrument first asks for the first location to be erased. After you confirm with **ENTER**, the instrument asks for the last location. If the first and last numbers refer to the same memory location, only one memory location is deleted. The instrument issues a warning before erasing anything in either case. Acknowledge the warning by pressing **ENTER**, at which point the instrument erases the memory location(s). Afterwards, the instrument confirms that the process is complete.

10.3.3 Sorting the memory

This function can be used to sort the entire tuning memory according to a variety of criteria.

Sorting by frequency:
To sort the memory by ascending frequency, enter: **MODE** -> **Memory** -> **sorting memory** -> **according frequency**.

Sorting by range:
To sort the memory by DVB-S (beginning) and DVB-S2, enter: **MODE** -> **Memory** -> **sorting Memory** -> **according range**.

Sorting by satellite:
This option sorts the memory by satellite positions.
However, it is only available for SAT memories with DiSEqC. To access the function, enter: **MODE** > **Memory** -> **sorting memory** -> **according position**.

Sorting the memory can take a few seconds. The instrument does not respond during this time. A message is issued once the process is complete.

10.3.4 Memory protection

This function can be used to protect the entire tuning memory, groups of memory locations, or individual memory locations. This prevents a memory location from being overwritten by mistake.
Access via **MODE** -> **Memory** -> **Protection memory**. Similar to the description in section “Erasing a memory location”, the instrument asks for the first and last memory location to be protected. Press **ENTER** to start the process. The instrument issues a message when the process is complete. The next section explains how to disable memory protection.
Memory locations marked with (*) are protected.

10.3.5 Disable memory protection

Use this function to disable an existing memory protection.
Access via **MODE** -> **Memory** -> **Disable memory protection**. This is done in the same way as when activating memory protection. The instrument confirms that protection has been disabled with a corresponding message.

10.3.6 Memory export

Use this function to copy the entire tuning memory onto a USB memory device as a “mem” file.
Access via **MODE** -> **Memory** -> **Export all memory**.
The instrument suggests a file name that might stand for a system (measuring location), for example. This can be changed in alphanumeric format using the arrow keys or the numeric keypad and the **<-** and **->** keys. Press **ENTER** to complete the entry. The entered name is identical to the file name of the “mem” file. If a file with the same name already exists, you will receive a warning. Enter a different name by pressing **ESC**, or press **ENTER** to overwrite the existing file. The next section describes how to import a tuning memory.

10.3.7 Memory import

Use this function to import an existing tuning memory as a “mem” file from a USB memory device onto the instrument.

Access via **MODE** -> **Memory** -> **Import memory**. A selection screen appears with all saved “mem” files. Use the **Up**/**Down** arrow keys to move the cursor to the desired file. Press **ENTER** to overwrite the current tuning memory of the instrument with the data from the “mem” file. The name of the selected “mem” file is saved in the instrument as a system name and displayed in the header of the Save menu.
This name is suggested as a file name during the next measurement.

Note:
Any other general settings by the user, such as LNB oscillator frequencies for RF inputs or the UB centre frequency for UNICABLE or JESS, are not transferred with the memory. These may have to be adjusted manually.

Chapter 11

USB-A interface

The instrument has a USB-A interface. The corresponding port is at the top of the instrument. The interface is compatible with USB 2.0 specification in high speed mode. The measuring instrument only supports the MASS STORAGE DEVICE class (USB stick).

The measuring receiver software can read files from, and write files to, a USB stick using the FAT32 file system. A USB stick is used to carry out firmware updates or to record measurement data (DataLogger).

We recommend using the original USB stick from the instrument manufacturer. The USB stick is included in delivery.

Chapter 12

Common Interface

The instrument is equipped with a CI interface. This consists of a PCMCIA slot (see the bottom of the instrument). The PCMCIA slot is compatible with all common conditional access modules (CAM). The instrument also supports Premiere CAM. This means that all DVB channels can be decoded with an appropriate CA module and activated smartcard. Data streams are exclusively decoded in the inserted CAM, not in the MPEG decoder itself.

12.1 Inserting a CA module

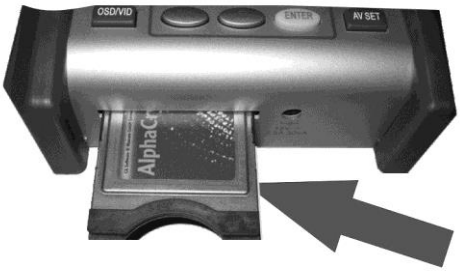
12.1.1 Install before version Vxx.02

The instrument must be switched off when a CA module is inserted. Insert the module into the port at the bottom of the instrument. When inserting the module, ensure that the polarity is correct and that the barcode is pointing **up**. Do not force the module into the slot if there is significant resistance.

Place the Barcode on top

12.1.2 Install after version V01.02

The instrument must be switched off when a CA module is inserted. Insert the module into the port at the bottom of the instrument. When inserting the module, ensure that the polarity is correct and that the barcode is pointing **down**. Do not force the module into the slot if there is significant resistance.



Place the Barcode underneath

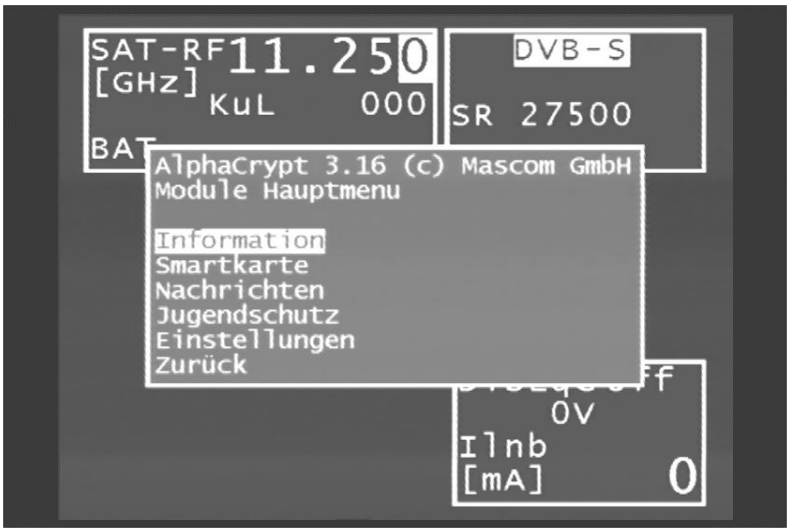
The version (firmware) can be activated in the instrument by **MODE** -> **Settings** -> **Software** -> **Info**.

12.2 Operation

The inserted module is initialised when the instrument is cold-started. Use the Common Interface menu to query the inserted CA module. Enter **MODE** -> **Common Interface** to access the menu. The CA module name is shown as a menu title.
Use the first menu item (“CA-SystemIDs”) to query CA systems supported by the module. The next section explains the second menu item (“Card Menu”). To check the picture and sound quality of encoded channels, proceed as described in the “MPEG decoder” section.

12.3 Card menu

This option allows you to access the module-specific menu. Various details and services can be called up for each module. For example, smartcard information, software version, software update, PIN code entry for child protection, and so on. The menu is laid out just like the other menus on the instrument. The text and menu items come from the CAM itself, however. The language is also defined by the module. The picture below shows the card menu of an AlphaCrypt CAM.


SAT-RF 11.250
[GHz]
KuL 000
BAT
DVB-S
SR 27500
AlphaCrypt 3.16 (c) Mascom GmbH
Module Hauptmenu
Information
Smartkarte
Nachrichten
Jugendschutz
Einstellungen
Zurück
0V
Ilnb
[mA] 0

Chapter 13

Management of the instrument

These functions can only be accessed when the instrument is not tuned.

13.1 Language of the user guidance

The user guidance (menu interface) can be displayed in German, English, French or Italian. Use **MODE** -> **Settings** -> **Language** -> **German, English, French, Italian** to select the desired language.

13.2 Software version

Use this function to query the software (firmware) version of the instrument.
This is done as follows: **MODE** -> **Settings** -> **Software** > **Info**.

13.3 Software update

You can upload a new firmware release onto the device at any time.
The software is saved as a ".bin" file. Request this file from the manufacturer and copy it from a computer onto the included USB stick.
When updating the firmware, the instrument should be plugged in to the mains for safety reasons. Do not switch the instrument off while the update is in progress.
Next insert the USB stick into the instrument and select **MODE** -> **Settings** -> **Software** -> **Update**. A selection appears containing all saved ".bin" files. Select the desired file using the arrow keys (**Up**/**Down**) and press **ENTER** to start the software update. The instrument deletes the old version from the memory before writing the new software to the internal flash drive.
This takes approximately 1 minute.

Note: You can find the latest information about software on our homepage.

13.4 Serial number

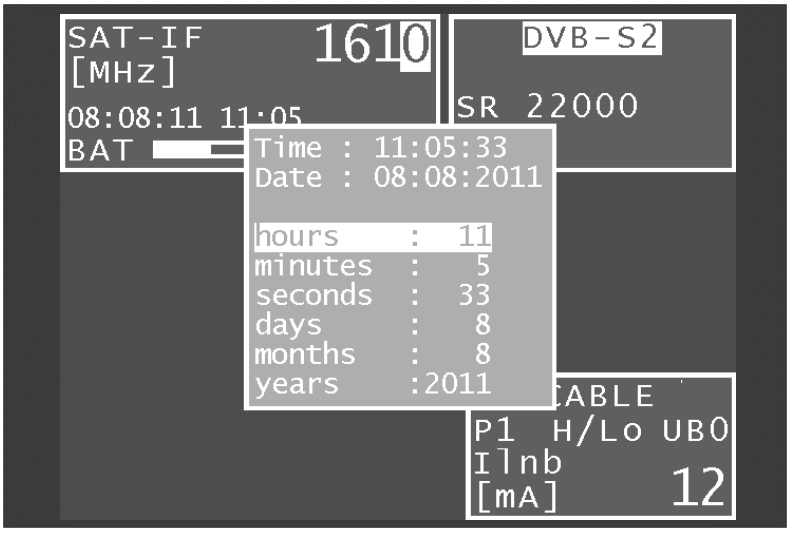
The serial number can be found on the name plate on the back of the instrument. It can also be requested on the device using **MODE** -> **Settings** -> **Serial number**.

13.5 Default setting

Use the "PRESET" function (**MODE** -> **Settings** -> **Factory settings** to reset all instrument settings to the factory default settings. The content of the tuning memory is not included; PRESET does not make any changes to it.

13.6 Clock

The instrument has a real time clock that is powered by the internal battery.
Set the date and time using the **Clock** menu. To do this, select the corresponding menu item and open it with **ENTER**. You can now set the time and date. Press **ENTER** to accept the value and return to the previous menu.



13.7 Modulation

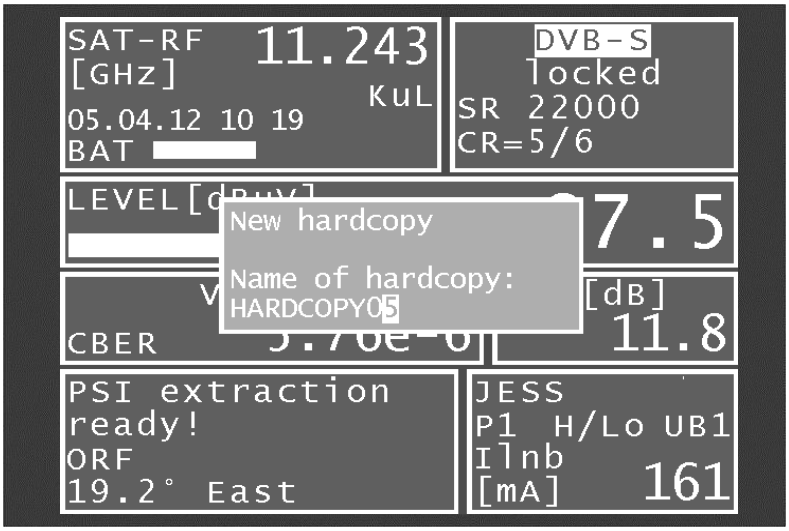
Use the **MODE** -> **Modulation** menu to preset the standard to DVB-S or DVB-S2. During tuning, the instrument first attempts to log into the preset standard and then tries the other. The standard with which log-in was successful then becomes the new preset standard.

13.8 Botton tone (beeper)

The instrument has a signal generator that can confirm that a button or key has been pressed.
You can switch this function on and off via **MODE** -> **Settings** -> **Keyboard buzzer**.

13.9 Hardcopy

For documentation purposes, the contents of the screen can be saved on a USB stick, provided the instrument is in tuned mode or analyzer mode. By selecting **MODE** -> **Hardcopy**, you can access a menu where you can choose between **New hardcopy** and **Directory**. In the Directory menu, you can delete existing files which have the ending “BMP”. In the **New hardcopy** menu, you can enter a name for the new file and create it with **ENTER**.



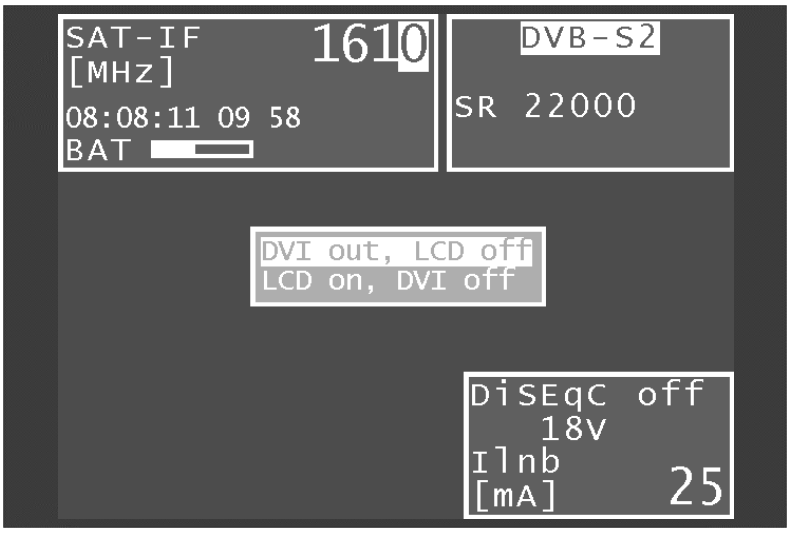
Chapter 14

DVI Output

The measuring instrument is equipped with a DVI/HDMI interface for connecting a Full HD TV set. This allows you to check the functionality of the DVD/HDMI interface on an LCD screen, for example. The DVI interface is on the top of the instrument.

The instrument cannot output a video signal to the DVI output and to the internal instrument display at the same time. Do not tune the instrument to a station if you wish access the monitor function. This function can be accessed via **MODE** -> **Ext. Monitor**.

When you call up the **DVI out, LCD off** menu item, the screen of the instrument darkens and the video signals are only output through the DVI output. For this reason you should connect the instrument to a suitable display device via the DVI output before the instrument is switched over. When the instrument is switched off and restarted, the picture is shown again on the internal display.



DVI stands for “Digital Visual Interface” (HDMI means “High-Definition Multimedia Interface”). Physically, the interface is designed as a DVI-I socket. However, the protocol is HDMI-compliant. This means that both video and audio data are transmitted. The measuring instrument can be connected to the HDMI input of a TV set using a DVI/HDMI adapter. However, the measuring receiver does not support HDCP (High-bandwidth Digital Content Protection). HDCP prevents digital and audio material from being tapped within the HDMI connection. HDCP is required by the playback program. If an HDTV program requires HDCP, the measuring instrument cannot transmit the data via the DVI/HDMI interface. The connected TV set remains blank in this case.

Important! - The device’s screen is dimmed when the DVI output is active.
- The screen resolution is fixed at 1920x1080i.

Chapter 15

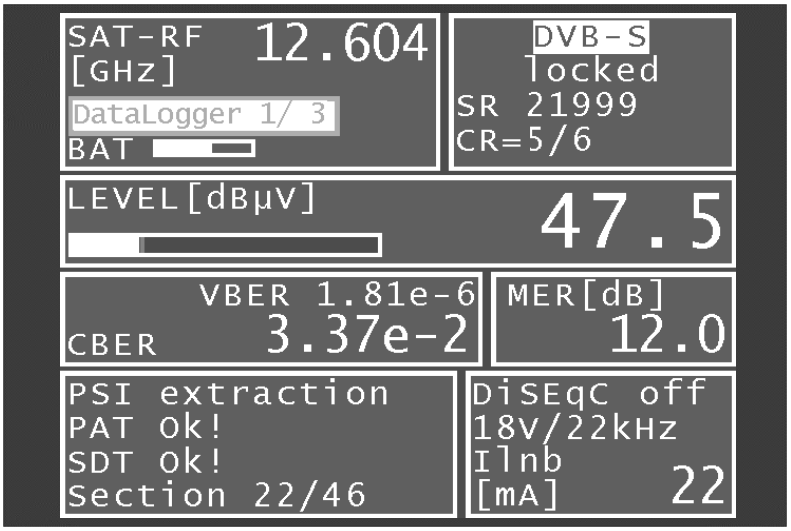
DATA LOGGER

The instrument is equipped with measurement data memory (a data logger). This allows you to save measured values automatically on a USB stick as an ".xml" file. The data can then be read and processed using applications such as MSExcel or OpenOfficeCalc.

15.1 Automatic recording of measurement sets

To call up the "DataLogger" menu item enter **MODE > DataLogger**. The menu then appears with the selection "New Measurement" or "Directory". Add measurements by selecting the menu item "New Measurement". A prompt asks for a name for the system (measuring location). Set this in alphanumeric format using the arrow keys or the numeric keypad. Press **ENTER** to complete the entry. The entered name is identical to the file name of the ".xml" file containing the measured values at the end. If a file with the same name already exists, you will receive a warning. Enter a different name by pressing **ESC**, or press **ENTER** to overwrite the existing file. Then enter the individual measurement parameters. The instrument now refers to the tuning memory, whereby only the first and last memory locations need to be entered for the measurements. Any unassigned memory locations are skipped. The instrument then automatically accesses the tuning memory locations one by one and saves the measured values in the ".xml" file mentioned above. The progress of the measurement can be traced in a corresponding message in the frequency window.

The following picture shows the process.

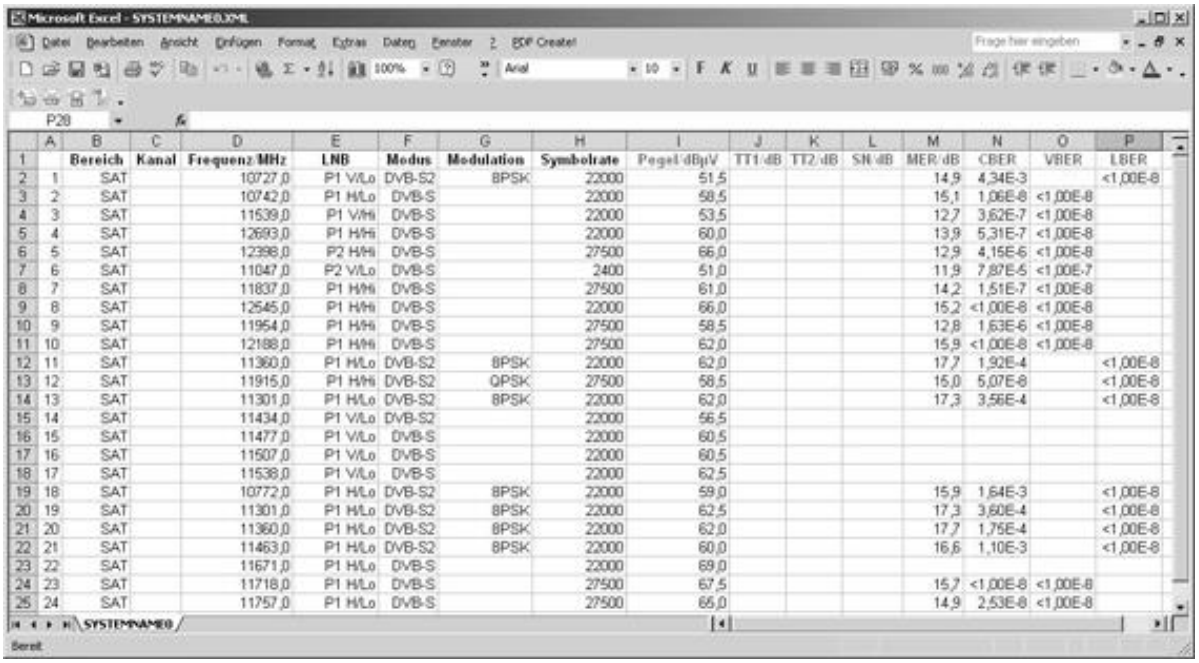


15.2 Transferring and evaluating the measurements on a PC

To evaluate, document or process a set of measurements, the data must first be transferred to a PC or laptop using the USB stick. As previously mentioned, the measurement data ".xml" file on the USB stick can be read and processed by MSExcel or OpenOfficeCalc. Right-click the required file and select "Open with" then choose from MSExcel or OpenOfficeCalc.

Important! ⚠ *Transfer is only possible with MSExcel vers. 2002 or later.*

The illustration below shows a set of measurements in MSExcel.



Microsoft Excel - SYSTEMNAME0.XML

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1		Bereich	Kanal	Frequenz MHz	LNB	Modus	Modulation	Symbolrate	Pegel dBµV	TT1 dB	TT2 dB	SN dB	MER dB	CBER	VBER	LBER
2	1	SAT		10727,0	P1 V/Lo	DVB-S2	8PSK	22000	51,5				14,9	4,34E-3		<1,00E-8
3	2	SAT		10742,0	P1 H/Lo	DVB-S		22000	58,5				15,1	1,06E-8	<1,00E-8	
4	3	SAT		11539,0	P1 V/Hi	DVB-S		22000	53,5				12,7	3,62E-7	<1,00E-8	
5	4	SAT		12693,0	P1 H/Hi	DVB-S		22000	60,0				13,9	5,31E-7	<1,00E-8	
6	5	SAT		12398,0	P2 H/Hi	DVB-S		27500	66,0				12,9	4,15E-6	<1,00E-8	
7	6	SAT		11047,0	P2 V/Lo	DVB-S		2400	51,0				11,9	7,87E-5	<1,00E-7	
8	7	SAT		11837,0	P1 H/Hi	DVB-S		27500	61,0				14,2	1,51E-7	<1,00E-8	
9	8	SAT		12545,0	P1 H/Hi	DVB-S		22000	66,0				15,2	<1,00E-8	<1,00E-8	
10	9	SAT		11954,0	P1 H/Hi	DVB-S		27500	58,5				12,8	1,63E-6	<1,00E-8	
11	10	SAT		12188,0	P1 H/Hi	DVB-S		27500	62,0				15,9	<1,00E-8	<1,00E-8	
12	11	SAT		11360,0	P1 H/Lo	DVB-S2	8PSK	22000	62,0				17,7	1,92E-4		<1,00E-8
13	12	SAT		11915,0	P1 H/Hi	DVB-S2	QPSK	27500	58,5				15,0	5,07E-8		<1,00E-8
14	13	SAT		11301,0	P1 H/Lo	DVB-S2	8PSK	22000	62,0				17,3	3,56E-4		<1,00E-8
15	14	SAT		11434,0	P1 V/Lo	DVB-S2		22000	56,5							
16	15	SAT		11477,0	P1 V/Lo	DVB-S		22000	60,5							
17	16	SAT		11507,0	P1 V/Lo	DVB-S		22000	60,5							
18	17	SAT		11538,0	P1 V/Lo	DVB-S		22000	62,5							
19	18	SAT		10772,0	P1 H/Lo	DVB-S2	8PSK	22000	59,0				15,9	1,64E-3		<1,00E-8
20	19	SAT		11301,0	P1 H/Lo	DVB-S2	8PSK	22000	62,5				17,3	3,60E-4		<1,00E-8
21	20	SAT		11360,0	P1 H/Lo	DVB-S2	8PSK	22000	62,0				17,7	1,75E-4		<1,00E-8
22	21	SAT		11463,0	P1 H/Lo	DVB-S2	8PSK	22000	60,0				16,6	1,10E-3		<1,00E-8
23	22	SAT		11671,0	P1 H/Lo	DVB-S		22000	69,0							
24	23	SAT		11718,0	P1 H/Lo	DVB-S		27500	67,5				15,7	<1,00E-8	<1,00E-8	
25	24	SAT		11757,0	P1 H/Lo	DVB-S		27500	65,0				14,9	2,53E-8	<1,00E-8	

SYSTEMNAME0

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15.3 Deleting measurement sets from the device

If the USB stick is in the instrument, you can enter **MODE** -> **DataLogger** -> **Directory** to access the files saved on the external memory. The remaining memory capacity of the USB stick can also be seen in percent. For example, the file shown above takes up 18 KB on a USB stick. With a capacity of 512 MB, approx. 29.000 measurement sets of this type can be saved.
To delete a file, move the cursor with the arrow keys (**Up**/**Down**) onto the file you wish to remove and select **ENTER**. The instrument issues a warning message. This function allows you to remove measurement sets that are no longer needed on-site, which gives a clearer overview for later evaluations.

Index