ROHDE&SCHWARZ

Instruments
Division

Operating Manual

VIDEO ANALYZER

Firmware V4.00 and higher

UAF

2013.0807... Std. B/G
2028.6212... Std. D/K

Printed in the Federal
Republic of Germany

2013.1684.12-06-

Certified Quality System

ISO 9001

DQS REG. NO 1954-04

Qualitätszertifikat

Sehr geehrter Kunde,

Sie haben sich für den Kauf eines Rohde & Schwarz-Produktes entschieden. Hiermit erhalten Sie ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unseres Qualitätsmanagementsystems entwickelt, gefertigt und geprüft. Das Rohde & Schwarz-Qualitätsmanagementsystem ist nach ISO 9001 zertifiziert.

Certificate of quality

Dear Customer,

You have decided to buy a Rohde & Schwarz product. You are thus assured of receiving a product that is manufactured using the most modern methods available. This product was developed, manufactured and tested in compliance with our quality management system standards.
The Rohde & Schwarz quality management system is certified according to ISO 9001.

Certificat de qualité

Cher client,

Vous avez choisi d'acheter un produit Rohde & Schwarz. Vous disposez donc d'un produit fabriqué d'après les méthodes les plus avancées. Le développement, la fabrication et les tests respectent nos normes de gestion qualité.
Le système de gestion qualité de Rohde & Schwarz a été homologué conformément à la norme ISO 9001.

095.1000 Bl.0-0796

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Support Center

Telefon / Telephone: **(0180) 512 42 42**

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e-mail: **CustomerSupport@rsd.rohde-schwarz.com**

Für technische Fragen zu diesem Rohde & Schwarz-Gerät steht Ihnen ab sofort unsere Hotline der Rohde & Schwarz Vertriebs-GmbH, Support Center, zur Verfügung.

Unser Team bespricht mit Ihnen Ihre Fragen und sucht Lösungen für Ihre Probleme.

Die Hotline ist Montag bis Freitag von 8.00 bis 17.00 Uhr besetzt.

Bei Anfragen außerhalb der Geschäftszeiten hinterlassen Sie bitte eine Nachricht oder senden Sie eine Notiz per Fax oder e-mail. Wir setzen uns dann baldmöglichst mit Ihnen in Verbindung.

Möchten Sie über Neuerungen und Updates zu einem bestimmten Gerät informiert werden, senden Sie bitte eine kurze e-mail unter Angabe des Gerätes. Sie erhalten dann regelmäßig die aktuellen Informationen zugesandt.

Should you have any technical questions concerning this Rohde & Schwarz product, please contact the hotline of Rohde & Schwarz Vertriebs-GmbH, Support Center.

Our hotline team will answer your questions and find solutions to your problems.

You can reach the hotline Monday through Friday from 8:00 until 17:00.

If you need assistance outside office hours, please leave a message or send us a fax or e-mail. We will contact you as soon as possible.

If you wish to receive the latest news about and updates for a specific instrument, please send us a short e-mail indicating the instrument. We will then send you up-to-date information on a regular basis.

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Supplement

VIDEO ANALYZER
UAF
2005.3000.08

The UAF model 08 differs from the basic unit in the following points:

1 Switch-on State

1.1 Language Output

German

1.2 Standard and Position of Test Signals

Mode	1	2	3	4	5	6	7	8
Test signal standard	CCIR	BRD-NAT	CCIR	CCIR	CCIR	BRD-NAT	CCIR	CCIR
Line position of test signals								
CCIR17	17	18	17	19	17	18	17	19
CCIR18	---	19 (1	18	20	---	19 (1	18	20
CCIR330	330	331	330	332	330	331	330	332
CCIR331	---	332	331	333	---	332	331	333
NOISE	335	22	22	22	335	22	22	22
BURST	23	23	23	23	23	23	23	23
SYNC PULSE	3	3	3	3	3	3	3	3
ZERO REFERENCE PULSE	15	15	15	15	15	15	15	15
RED BAR	---	332	331	333	---	332	331	333
H/64 position of zero reference control pulse	36	36	36	36	50	50	50	50
Note	Source	Section	ORF/RTL	SKY	Source	Section	ORF/RTL	SKY

(1 With the BRD-NAT test signal standard, the multiburst packet is evaluated in 4 CCIR18-4 stages.

2 Signal Inputs

Signal input C is designed as a 3-dB input. The nominal CVS level of the video signal to be applied is 0.707 V.

Supplement

VIDEO ANALYZER
UAF
2028.5768.10

The UAF model 10 differs from the basic unit in the following points:

1 Operation

The measurement CROSSTALK 4,43 MHz replaces the parameter CHROMINANCE/LUMINANCE INTERMODULATION. The level of the superimposed interference at subcarrier frequency is determined via a colour subcarrier bandpass filter. The most important application is in the measurement of video routing switchers. In this case, the crosstalk from unselected inputs of a switcher or of a VF-signal selector is measured at an output. For this purpose, a colour subcarrier signal of e.g. Upp = 700 mV (= 0 dB) should be applied to the unselected inputs.

The 1.07-MHz bandpass filter designed for the measurement CHROMINANCE/SOUND INTERMODULATION has been replaced by a subcarrier bandpass with a centre frequency of 4.43 MHz and a bandwidth of 400 kHz.

2 Differences in Hardware

The PCB SIGNAL CONDITIONING 1 (2013.1348) has been updated to carry out the above measurement. The additional board plugged in to the Berg-type pins so that the 5-MHz lowpass is still operational.

The 4.43-MHz bandpass filter bypasses the built-in 1.07-MHz bandpass. The subcarrier trap which is operative with CHROMINANCE/SOUND INTERMODULATION is switched off. However, it remains operative for S/N measurements.

Supplement
Video Analyzer UAF
2013.0807.02

for the Installation of Option 01 (2028.6406.02)

Option 01 extends the UAF range of measurement functions by two parameters.

50-Hz Tilt

The black-level signal may be modulated during transmission by a 50-Hz vision component. This modulation may be caused, for example, by the AC-coupling in the transmission link being too low. The interference caused by a 50-Hz vision modulation looks similar on the screen as that produced by superimposed hum.

To measure this type of interference, a field-repetitive test signal with a black-to-white transition in accordance with Fig. 1 is required. This test signal is supplied by signal generators SPF2, SVDF and SGPF. The 50-Hz tilt parameter is selected with the option key.

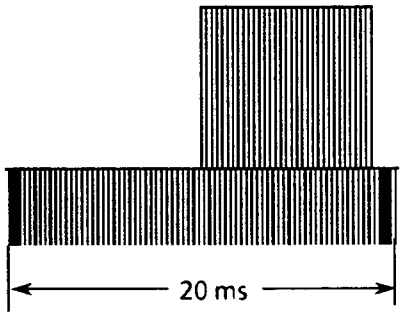


Fig 1

200-ns Base Line Distortion

This parameter is measured in accordance with CCIR (400 ns), however there is no Thomson lowpass filter used. The measurement is made exactly 200 ns after the trailing edge of the luminance bar in line CCIR 330.

Switchover to 200 ns is made via a softkey provided for the base line distortion parameter.

Technical Information

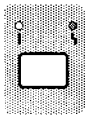
2 Preparations for Use

2.1 Putting into Operation

Before the UAF is put into operation, it must be ensured that

- the setting for the AC supply voltage is correct,
- the voltages at the inputs do not exceed the permissible limits,
- the instrument outputs are not overloaded or incorrectly connected,
- the operating temperature range is not exceeded.

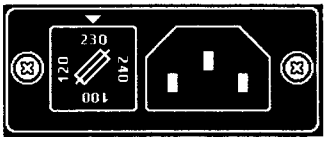
Any violation of the permissible voltage limits at the inputs and outputs can damage the instrument (see specifications).



Press the power switch to put the UAF into operation.

2.1.1 Setting to AC Supply

The instrument is factory-set to 230 V and can thus be operated at an AC supply voltage of 230 V + 10 to -15 %. For AC supply voltages other than 230 V the voltage selector must be set to the correct value and the power fuse on the rear panel must be exchanged.



To do this, remove the cap from the fuse holder using a screwdriver and position the fuse holder in the line filter so that the white arrow points to the required voltage.

2.1.2 Function Testing and Switching On

Upon switching on, Video Analyzer UAF outputs the following message:

```
ROHDE&SCHWARZ VIDEO ANALYZER UAF
SOFTWARE-VERSION x.x tt.mm.jj
```

The Video Analyzer makes an automatic background self-test of the most important functions. If no faults are detected, the normal screen display appears after approx. 10 s. The UAF goes into the initial status selected in the SETUP menu and is then ready for operation. If faults are detected during the self-test, error messages will be output which will be displayed constantly. The UAF will not be ready for operation until the faults are eliminated.

2.1.3 Operation with External Ground

The UAF is fitted with a removable safety earth link at the rear. This link allows the safety earth to be disconnected from the chassis. It may only be removed after the power cable has been disconnected.

To remove the link, simply unscrew the nuts and take off the metal clip.

In this case, however, chassis and bolt X12 must be taken to an external ground. Otherwise, VDE regulations would be violated and the user would be endangered.

Caution: *With the link removed, the chassis is not connected to the earthing wire of the power cable.*

In case of large test systems, the chassis may be taken to the system ground. The safety earth link must be refitted immediately if this system ground connection is removed.

2.1.4 Internal Codings

Internal codings must not be changed during operation as they are only used for servicing.

2.1.5 Protection against EMI

To prevent electromagnetic interference, the instrument may only be operated when closed and fitted with all shielding panels. Only suitably shielded cables are allowed to be used for connecting a printer and for the remote control of the UAF via the IEC/IEEE bus. Appropriate EMI protection measures must be taken when calibrating with the instrument open.

2.1.6 Buffer Battery

Video Analyzer UAF is fitted with a battery-buffered memory for storing instrument setups. If the lithium battery in the UAF is completely discharged, non-volatile storage of setups is not possible. The time from the built-in clock is also lost upon instrument switch-off. When the lithium battery is flat, the message "BATTERY EMPTY - DATA LOST" is output when the UAF is switched on. A flat battery should be replaced as soon as possible.

2.1.7 LCD Reading Angle

Optimal contrast setting of the LCD is obtained using the reading angle control on the right below the LCD.

2.1.8 Power-on Status

When the power is switched on, the UAF goes into the defined status that is stored in the memory.

2.2 Connectors

2.2.1 Video Inputs

Video Analyzer UAF is fitted with three equivalent video inputs (A, B, C).

All video inputs are loop-through filters with a characteristic impedance of 75 Ω. The two female connectors of the loop-through filters are identical, ie either of them can be used as an input or as an output. If no signals are connected through, the second female connector of the loop-through filter must be terminated with 75 Ω. Nominal level 1 V_{pp}.

2.2.2 Sync Input

The input for an external sync signal is also provided as a loop-through filter with a characteristic impedance of 75 Ω. As regards its connection, the same holds as for the video inputs. Nominal level 2 V_{pp}.

2.2.3 Monitor Output

For control purposes, the signal at the selected input can be applied to the monitor output. At this output, the measurement intervals can be represented by marker pulses (see section 3.2.3.1 SETUP/MONITOR OUTPUT).

2.2.4 IEC/IEEE-bus Interface

Via the IEC-625-1/IEEE-488-bus interface the Video Analyzer can be remote-controlled from an IEC/IEEE-bus controller (eg Rohde & Schwarz PSA...). For more details see section 3.3.

A commercial, shielded (25-contact) IEC/IEEE-bus cable is used for connection.

2.2.5 Printer Connector

Commercial printers, eg Epson compatibles, can be connected to the UAF.

The instrument software includes printer drivers which can be selected in the SETUP menu.

A commercial, shielded (24-contact) Centronics cable is used for connection.

3 Operating Instructions

3.1 Explanation of Front and Rear Panel Controls

Controls are grouped according to their functions:

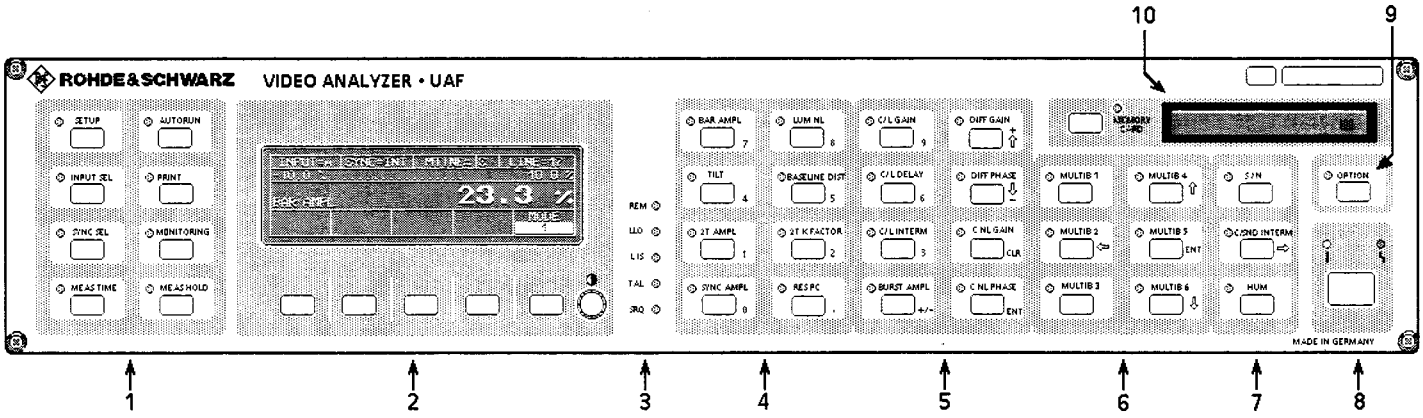
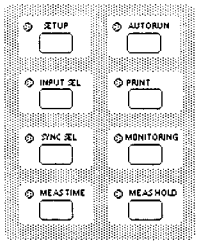
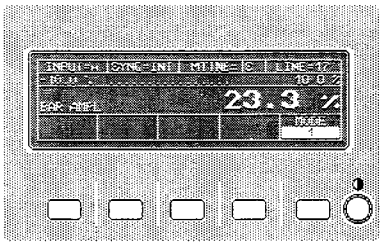
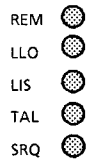
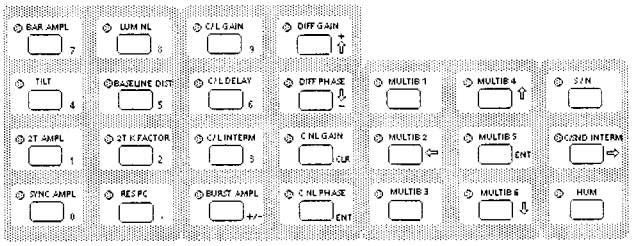
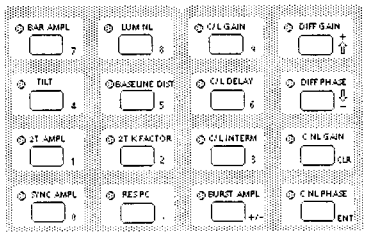
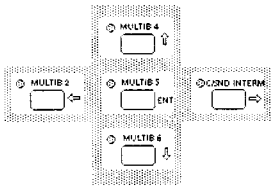
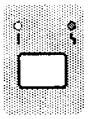


Fig. 3-1 Front panel

3.1.1 Front Panel Controls

(see Fig. 3-1)

Ref. No.	Labelling	Function
1		**Function keys for instrument setup** When one of these keys is pressed, the corresponding menu appears on the LCD.
2		**Back-lit LCD and five softkeys below** The functions of the softkeys are indicated in the bottom line of the display. The control for setting the LCD contrast is on the right of the softkeys.
3		**LEDs indicating the operating mode of the IEC/IEEE bus** REM Remote control LLO Local lockout LIS Listener TAL Talker SRQ Service request

Ref. No.	Labelling	Function
4 5 6 7	 	**Keys for parameter selection** The LED above the key lights up if the corresponding parameter is selected. These keys have a second function as numeric and cursor keys (see below).
	 	Second function: Number keys 0 to 9, "CLR" (clear) and "ENT" (enter), increment (↑ +) and decrement (↓ -)
	 	Second function: Cursor keys (←, ↑, ↓, →), "ENT" (enter)
8		**Power switch** with power-on control LED (green) and fuse control LED (red)
9	 	**Key for selection of optional parameters** (functions depending on the software used or on additional software of memory card; normally additional parameters)
10		**Memory card unit** (external memory) with key The LED lights up in case of access to the memory card. The card may not be withdrawn from the unit during access.

3.1.2 Rear Panel Controls

(see Fig. 3-2)

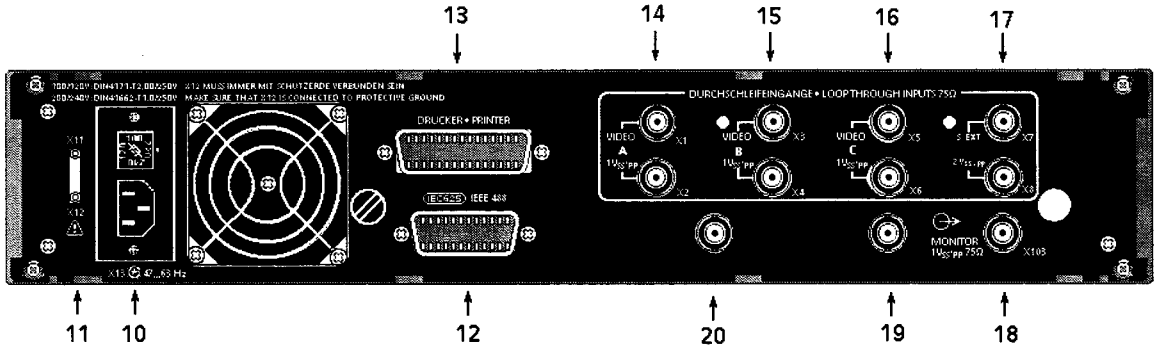
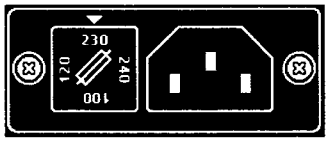
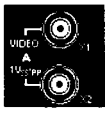
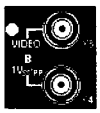
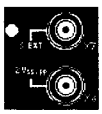


Fig. 3-2: Rear panel

Ref. No.	Labelling	Function
10		Line filter with low-power AC supply connector, fuse and voltage selector
11		Link for disconnecting safety earth from chassis **Caution:** *Observe VDE regulations (see section 2.1.3)*
12		IEC-625/IEEE-488-bus interface (see section 3.3)
13		Centronics parallel interface for printer (printer setting in SETUP menu)
14		Video input A with loop-through filter, BNC connector, Z = 75 Ω
15		Video input B with loop-through filter, BNC connector, Z = 75 Ω
16		Video input C with loop-through filter, BNC connector, Z = 75 Ω
17		External sync input with loop-through filter, BNC connector, Z = 75 Ω
18		Monitor output, BNC connector, Z = 75 Ω
19		Zero-reference pulse output, BNC connector, Z = 75 Ω
20		Input for external DC level, BNC connector, R_i > 10 kΩ

3.1.3 Display

3.1.3.1 Format of Display

During measurement, the current test conditions as well as name, value and dimension of the set parameter are displayed on Video Analyzer UAF. The format of the display is logical and clear and is illustrated using the BAR AMPL parameter as an example (see Fig. 3-3).

Status line:

The status line (first line) contains the following information from left to right:
selected input,
sync signal source,
selected measurement time,
selected test line.

Measurement value output:

The contents of the central part of the display depend on the selected form of measurement value output. The measurement value can be displayed in three different ways. Selection is made in the DISPLAY MODE submenu of the SETUP menu.

Label line:

The label line in the bottom part of the display consists of five adjoining fields assigned to the softkeys below. The functions of the softkeys are displayed in these fields. In Fig. 3-3, softkey No. 5 is assigned the function MODE (1 to 8) and softkey No. 1 the "parameter definition" function (relative measurement with reference to nominal in % or absolute measurement in mV).

3.1.3.2 Numeric Display of Measurement Values

In the case of numeric display, the parameter limits selected in the MONITORING menu are indicated below the status line (see Fig. 3-4). The area above the softkey labelling is subdivided into three fields.

Displayed items:

- parameter limits,
- error messages (upper left),
  parameter name (lower left),
- measurement value with dimension (right).

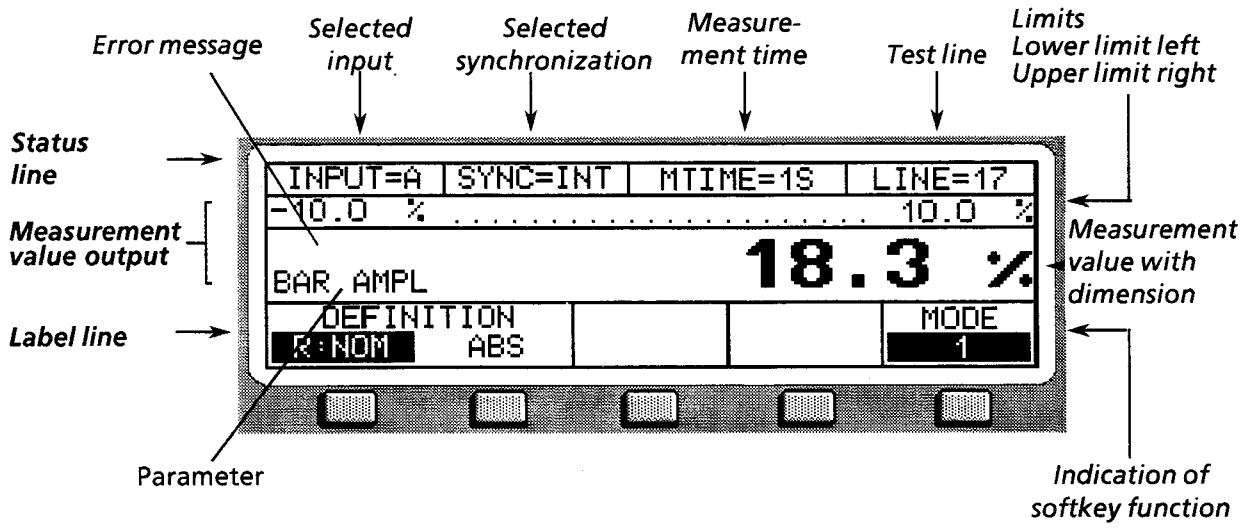


Fig. 3-3 Display (example: BAR AMPL)

3.1.3.3 Graphics Display of Measurement Values

The graphics display of measurement values is in the form of a scaled bar. The limit sets are indicated by arrows below the scale (in the bar area). The text appears in small characters. Parameter name, measurement value, dimension and error messages are output as described above.

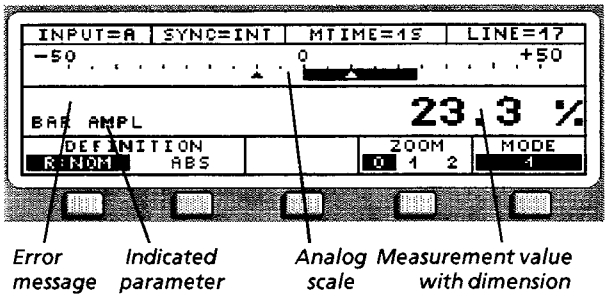


Fig. 3-5: Graphics display (example: BAR AMPL)

The format of the bar display depends on the parameter selected. The ZOOM function allows the resolution of the display to be expanded.

Displayed items:

- analog scale (top) with limit markers,
- parameter name (lower left),
- error messages (upper left),
- measurement value with dimension (right).

3.1.3.4 Numeric Display of Several Measurement Values

Up to three different parameters can be measured and displayed simultaneously.

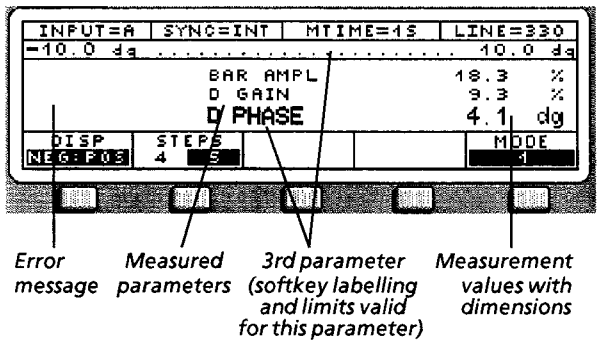


Fig. 3-6: Display of three parameters (example: BAR AMPL, differential gain and differential phase)

The names of the selected parameters are listed one beneath the other. The measurement values and their dimensions are shown on the righthand side of the display. The parameter selected last appears at the bottom of the list in larger characters than the other parameters. Softkey labelling and displayed numeric limits apply to this parameter. Error messages are output in the upper left beside the parameter list.

Displayed values:

- limits for 3rd parameter,
- error messages (upper left),
- parameter name (centre),
- measurement values with dimensions (right).

No.	*Key label*	*Parameter*
1	BAR AMPL	Luminance bar amplitude
2	TILT	Tilt of luminance bar
3	2T AMPL	Amplitude of 2T pulse
4	SYNC AMPL	Sync pulse amplitude
5	LUM NL	Luminance nonlinearity
6	BASELINE DIST	Black level distortion
7	2T K FACTOR	2T K factor
8	RES PC	Amplitude of residual picture carrier
9	C/L GAIN	Chrominance/luminance gain
10	C/L DELAY	Chrominance/luminance delay (on 20T pulse)
11	C/L INTERM	Chrominance/luminance intermodulation
12	BURST AMPL	Colour burst amplitude
13	DIFF GAIN	Colour subcarrier gain as a function of the luminance level
14	DIFF PHASE	Colour subcarrier phase as a function of the luminance level
15	C NL GAIN	Nonlinearity of colour subcarrier gain
16	C NL PHASE	Nonlinearity of colour subcarrier phase
17	MULTIB 1	Frequency response of multiburst 1
18	MULTIB 2	Frequency response of multiburst 2
19	MULTIB 3	Frequency response of multiburst 3
20	MULTIB 4	Frequency response of multiburst 4
21	MULTIB 5	Frequency response of multiburst 5
22	MULTIB 6	Frequency response of multiburst 6
23	S/N	Luminance signal-to-noise ratio
24	C/SND INTERM	Intermodulation between colour subcarrier and sound carrier
25	HUM	Low-frequency interference (hum)
26	EXT DC (options key)	DC voltage at "external" input

Table 3-1: Parameter keys

3.1.3.5 Error Messages on Display

The following messages can appear on the display:

Message	Meaning
WAIT ...	Wait until the measurement value is settled
SIGNAL ?	Video signal absent or faulty
BAR < 50%	Luminance bar too small
BAR > 50%	Luminance bar too large
TESTSIG<<	Test signal too small or absent
TEST SIG>>	Test signal too large
LOCKED	Parameter is not measured (see section 3.2.3.1, SETUP/TESTLINES)
NOT SAVED	Parameter value not stored on memory card

Additional error messages in case of difference measurement:

RBAR <50%	Reference luminance bar too small
RBAR >50%	Reference luminance bar too large
REFSIG <<	Reference test signal too small
REFSIG >>	Reference test signal too large
RSIG LCKD	Reference parameter not measured
MEM EMPTY	Measurement value memory for difference measurement with MEM not loaded

3.1.4 Display of Menus

If one of the function keys or the memory card key is pressed, a menu window is superimposed on the screen display which provides details on instrument setups. There are single-level and multi-level menus.

The first example shows the INPUT SELECT menu. This menu partly overwrites the display, its bottom line containing the softkey labelling.

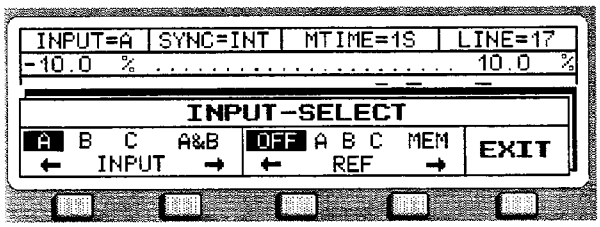


Fig. 3-7: Example of INPUT SELECT menu

The second example shows the SETUP menu which covers the entire display and represents a two-level menu.

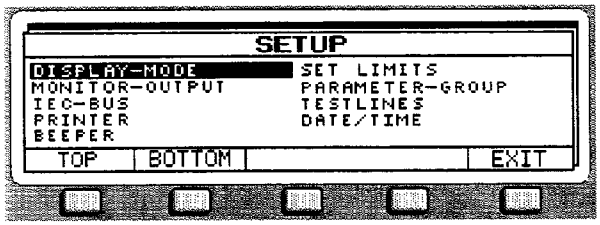


Fig. 3-8: Example of SETUP menu

After the menu has been called up, the cursor and numeric keys are activated automatically (second function of the parameter keys). Use the cursor keys to move the inverse-video bar to the desired function and activate by ENT.

3.2 Manual Operation

Video Analyzer UAF is manually controlled using the front-panel keys. Except for the parameter keys, the keys have only a single function. For data entry some of the parameter keys have a second function so that they can be used as numeric and cursor keys.

3.2.1 Entry of Numerical Data

If the UAF requires the entry of numerical data (eg for limits), the second-function level of the parameter keys (numeric and cursor keys) is activated automatically. The LEDs of the cursor keys light up to indicate the switchover. The green labelling of the front-panel keys refers to the second functions.

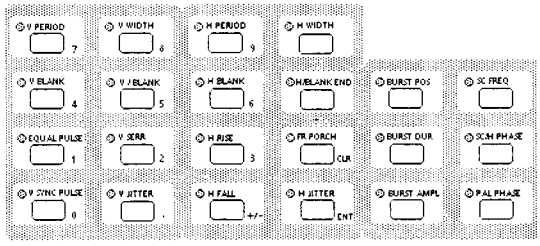


Fig. 3-9 Numeric and cursor keypads

The numeric keypad includes:
- keys for the numbers from 0 to 9,
- keys for the decimal point and the sign,
- a key for data entry,
- a clear key,
- an increment and a decrement key (↑ ↓).

The cursor keypad includes:
- four cursor keys (→ ← ↑ ↓)
- a key for data entry.

Either of the two ENT keys can be used as they have an identical function.

Data entry:

By means of the cursor keys the marker bar is shifted to the field of the value to be changed.

Numerical data can be entered in different ways.

- *Entry of a new numerical value:*

New numerical data are entered using the number keys. The input cursor instead of the marker bar marks the position where data can be entered.

In case of incorrect entry, the cursor can be shifted for editing by means of the cursor keys. Press the CLR key to erase the entire entry field and to call up again the previous contents. The ENT key is pressed to complete every entry and to trigger a syntax and range check.

If a fault is detected, the UAF outputs an error message. The incorrect digits are marked by the cursor and can be edited.

- *Change of numerical value:*

Pressing the CLR key activates the input cursor. Shift the cursor to the digit to be changed and enter a new one. The ENT key is pressed to complete the entry and to trigger a syntax and range check.

- *Minor modification of numerical value:*

The increment and decrement keys permit stepwise modification of the least significant digit of a numerical value. It is not necessary to press the ENT key.

3.2.1.1 Entering Text

To enter text (eg for IEC-bus commands to control external equipment under AUTORUN), a text editor is provided.

Getting into the text editor:
Using the cursor keys move the inverse-video marker to the input field or to the text to be changed, and press the ENT key.

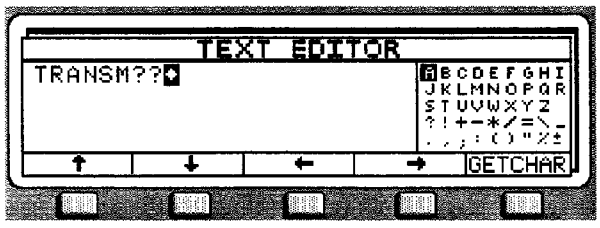


Fig. 3-10 Text editor

In the left-hand half of the screen, the text field with a text cursor is shown. The table on the right-hand side shows all the characters available and a character cursor.

Entering characters into the text:

Use the cursor keys to move the character cursor to the desired character, and press the GETCHAR softkey to copy the character thus marked to the location marked by the text cursor.
In order to be able to enter a character in the middle of the text, the text cursor can be moved around the text using the softkeys designated as cursor keys.

Entering numbers in the text:

Numbers can be entered directly using the keys for the numbers 0 through 9 in the numeric keypad.

Deleting characters or numbers:

By pressing the CLR key in the numeric keypad, the character on the left of the text cursor is deleted.

Leaving the text editor:

The ENT key of the cursor keypad terminates the key entry.

3.2.2 Softkeys

The five softkeys have variable functions which are displayed on the screen above the softkeys.

The section "Definition of Parameters" describes the options available for parameter-dependent measurement value definition.

3.2.3 Function Keys

The function keys are situated on the left of the screen display. They enable setting of the general test conditions and setups for all parameters and triggering of special functions. The individual functions are activated by pressing the corresponding keys. The window assigned to the function selected is superimposed on the screen display. The LED of the function key pressed lights up. Ongoing measurements are not stopped when another function is called up. The output of measurement values on the display may be concealed by windows superimposed until the function is exited.

The following eight menus can be called up via the function keys:

SETUP	instrument setups
INPUT SEL	selection of inputs
SYNC SEL	selection of synchronization
MEAS TIME	selection of measurement time
AUTORUN	activation of automatic test sequence
PRINT	output of data on printer
MONITORING	limit monitoring
MEAS HOLD	freezing of measurements

3.2.3.1 Configuration (SETUP)

The configuration parameters of the video analyzer are defined in various menus using the SETUP function (see Figs 3-11a and 3-11b).

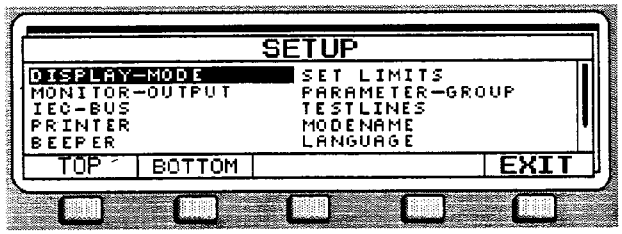


Fig. 3-11a SETUP function

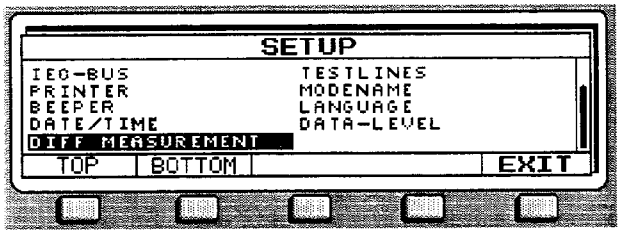


Fig. 3-11b SETUP function

After pressing the SETUP key, a menu with all available options is displayed. The keypad to the right of the display can now be used as a numerical keypad with cursor keys.

Select the desired setup function with the cursor keys and confirm your selection by pressing the <ENT> key.

The scroll bar at the right margin shows in which direction other menu items can be selected.

SETUP DISPLAY MODE
Display Mode for Measurement Values

This submenu permits selection of the display mode for measurement values.

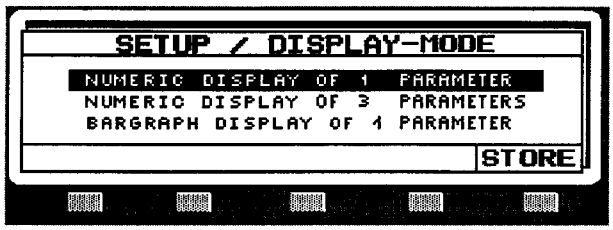


Fig. 3-12 SETUP / DISPLAY MODE submenu

The available display modes are listed, the current mode appearing in inverse video. The numeric and the cursor keypads are enabled.

Selection of display mode:

The desired mode is selected using the cursor keys and is activated by pressing the ENT key.

SETUP DATE-TIME
Setting of Date and Time

To be able to date test logs that are output on a printer, the UAF is fitted with a clock. The DATE/TIME submenu enables to select date and time and to change automatically to daylight saving time.

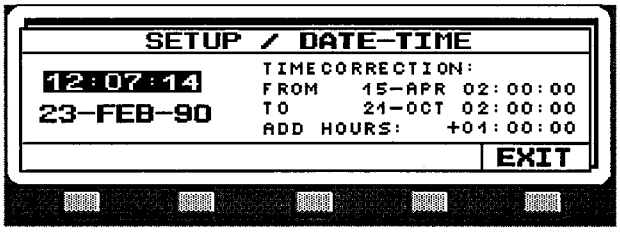


Fig. 3-13 SETUP / DATE - TIME submenu

The current time is displayed in the upper left corner of the screen, the date beneath. The time can be corrected automatically in the right half of the display.

Setting of time:

Shift the inverse-video bar to the field provided for entering the time. Enter the time as hours, minutes, seconds using the numeric keys (two digits per item) and press the ENT key.

Example: `8:30:00 o'clock,`
Entry: `0 8 3 0 0 0` [ENT]

The current time is not indicated during entry, but the clock does not stop working. When the ENT key is pressed, the instrument assumes the set time.

Setting of date:

Shift the inverse-video bar to the field provided for entering the date. Enter the date as day, month, year using the numeric keys (two digits per item) and press the ENT key.

Example: `7th April 1994,`
Entry: `0 7 0 4 9 4` [ENT]

The month is automatically output in letters.

Automatic time correction:

This function enables automatic conversion from normal to daylight saving time. For this purpose, the beginning and end of the daylight saving time period is entered with date and hour. During this period the freely selectable correction value (number of hours) is added to or subtracted from the time. For entry, proceed as described for setting the time and date. To disable automatic time correction select a correction value of +00:00:00.

To leave the menu press the EXIT softkey.

SETUP / SET LIMITS
Setting Limits of Optional Parameters

Using the SET LIMITS function, two pairs of limit values of a specific parameter as well as the hysteresis for monitoring can be set.
(see Fig. 3-14)

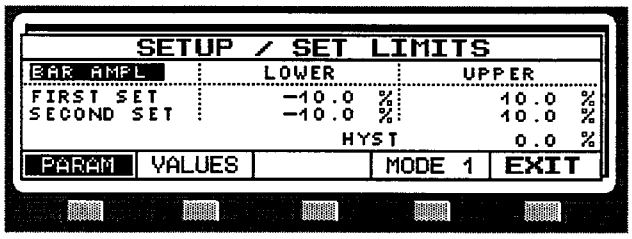


Fig. 3-14 SETUP / SET LIMITS submenu

Using the PARAM and VALUES softkeys, you can switch between selecting a parameter and changing its limit values. To set the limit values for an optional parameter, first switch to PARAM, then press the OPTION key and select the desired parameter after which the SETUP / SET LIMITS menu is displayed again.
The MODE softkey is used to select the next set of limit values without leaving this menu.

Parameter selection:

Press the PARAM softkey to activate this mode. Press the key of the desired parameter. The LED of the key starts to flash. In this mode, the limits of all parameters can be monitored but not varied.

Changing of limits, hysteresis:

Press the VALUES softkey to activate this mode. The numeric and the cursor keypads are enabled. The field where data can be entered appears in inverse video. Select the desired field by means of the cursor keys and enter the new value using the numeric keypad (see data entry). Upon entry the values are checked for plausibility. The upper limit must always be greater than or equal to the lower limit. In addition, the upper limit must exceed the lower one by the hysteresis at least. Otherwise, the entries are rejected and an error message is output.

These conditions may require a specific setting sequence when changing upper and lower limits and the hysteresis. The sequence depends on the direction in which the limits are moved.

To leave the menu press the EXIT softkey.

SETUP / MONITOR
Activation of Monitor Output

The MONITOR submenu allows superpositioning of marker pulses on the video signal at the monitor output for the purpose of marking time intervals.

Selecting the MONITOR mode:

Select the desired mode using the cursor keys and activate by pressing the ENT key.

SETUP / PARAMETER GROUP Assigning Parameters To A Parameter Group

This submenu permits to define a group of parameters. It is possible to monitor the limits of the parameters of this group and to log them (see section 3.2.3.6 PRINT and section 3.2.3.7 MONITORING functions).

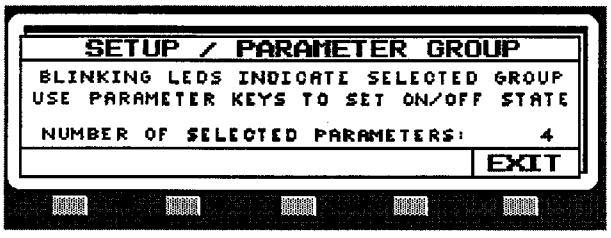


Fig. 3-15 SETUP / PARAMETER GROUP

Inclusion/exclusion of parameters:

To include a parameter in the group, press the corresponding key. To exclude it, press the key again. The LED flashes if the parameter is enabled. To include an optional parameter, press the OPTION key and select the desired parameter with the cursor keys. Include the selected parameter into or remove the parameter from the group by pressing the PARAM GROUP softkey. After pressing <ENT> or the OPTION key, the total number of selected parameters is displayed again. The defined group is stored and the menu is quit when the EXIT softkey is pressed.

SETUP / IEC BUS
IEC / IEEE-bus Address

This submenu permits setting of the IEC/IEEE-bus address of the Video Analyzer. The current IEC/IEEE-bus address is displayed on the screen, numeric and cursor keypads are enabled.

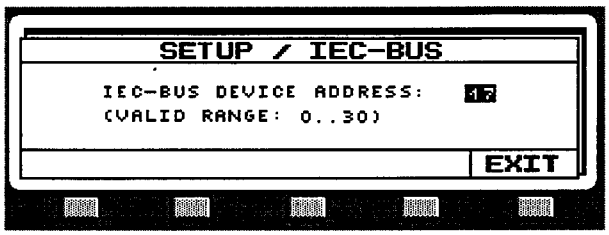


Fig. 3-16 SETUP / IEC BUS

Setting of IEC / IEEE-bus address:

Enter the new address using the numeric keypad (see data entry). In line with the standard, only addresses from 0 to 30 can be set.

To leave the menu press the EXIT softkey.

SETUP / PRINTER
Selection of Printer Type

The PRINTER submenu enables to select the type of printer to be connected to the UAF.

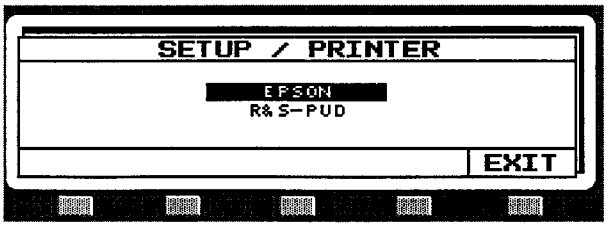


Fig. 3-17 SETUP / PRINTER

All selectable printers are displayed. The numeric and the cursor keypads are enabled.

Setting of printer type:

Select the desired printer with the cursor keys and press the <ENT> key.

SETUP BEEPER
Acoustic Alarm

The UAF is fitted with a beeper that outputs an alarm tone when limits are exceeded.

This submenu enables to select mode, volume and pitch of the beeper.

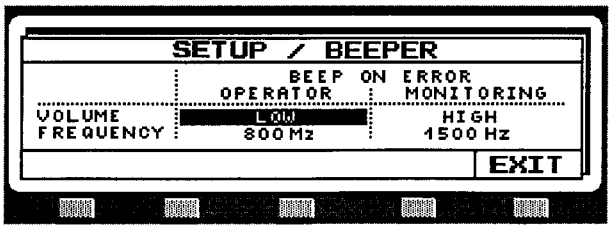


Fig. 3-18 SETUP / BEEPER

Beeper frequency in Hz, relative volume and mode are displayed. Press the EXIT softkey to leave the menu.

SETUP TESTLINES

Using the TESTLINES function, you can define for each mode:

- in which TV line
- which test signal (test line) is to be evaluated.

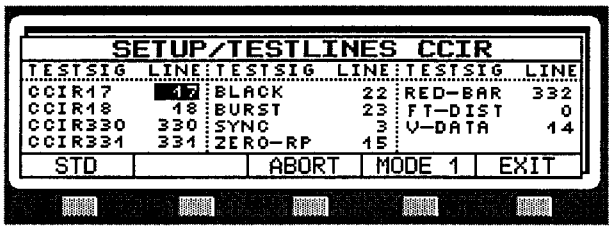


Fig. 3-19 SETUP / TESTLINES

The setup menu shows all the test signals that are needed to determine the parameters. The LINE column shows in which picture line the test signals are checked.
The numeric and the cursor keypads are enabled.

Changing the position of the test signal:

Select the TV line to be modified with the cursor keys and enter a new value using the numerical keys.

Please note that only

- the initial line (line 76 for the first field or line 389 for the second field) is to be entered for the FT-DIST test signal. This results in automatic assignment of three additional test lines (lines 158, 232, and 306 in the first field or lines 471, 545, and 619 in the second field). If one of these lines is used by another test signal, it is identified with a marker bar after leaving this menu.
- the allowed input range for line numbers is not exceeded (see below) and
- no line number is used twice. (The only exceptions are the RED BAR and CCIR331 test signals. If they have the same line number, then the C/SND intermodulation parameter is automatically measured in the CCIR331 line.)

To accept the current setup, use the MODE or EXIT softkeys.

If any of the conditions described above is not met, the corresponding location is highlighted and the operator requested to correct it. To escape from the current setup before MODE or EXIT is used, the ABORT softkey can be used.

Valid line numbers:

FT-DIST:

Line 76	Measurement of 50-Hz tilt in the first field
Line 389	Measurement of 50-Hz tilt in the second field

V-DATA:

Lines 6 through 310	First field, or
Lines 319 to 622	Second field

SYNC AMPLITUDE:

Line 3 or 313	V sync pulse, 1st or 2nd field or
Lines 6 to 310	line sync pulse, 1st field or
Lines 319 to 622	line sync pulse, 2nd field

All other test signals:

Lines 6 to 310	1st field, or
Lines 319 to 622	2nd field

If a test signal is not present, then the UAF can be inhibited from checking the test signal by entering line 0.

Selecting the test signals to be evaluated and the zero reference pulse:

In addition to standardized CCIR test signals, a whole series of test signals according to national standards can also be evaluated. Also the position and width of the zero reference pulse can be defined (see Fig. 3-20).

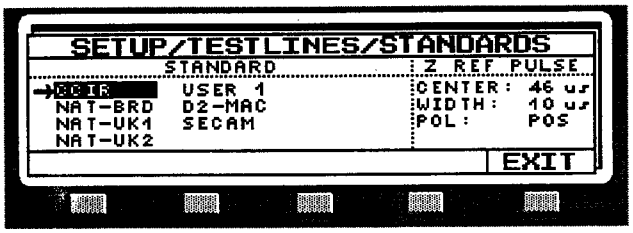


Fig. 3-20 Function SETUP/TESTLINES/STANDARD

When the STD softkey is pressed, the UAF will display on the lefthand half of the screen all the test signal standards that it can check. The right-hand half of the screen shows the settings for residual-carrier measurement.

The following table lists test signals together with associated TV standards:

Standards:

CCIR17/18/ 330/331	Test lines corresponding to CCIR recommendations
CCIR17 -S	Same as CCIR17, but bar amplitude can be measured in a separate line
CCIR18 -4	Multiburst signal with 4 frequency bursts
UK- ITS1/2	Test signals for United Kingdom with 10T pulse and colour subcarrier superimposed on staircase
UK- IBA	Test line for United Kingdom
BLACK	Line for S/N measurement (constant level between 0 and 100 % or sawtooth)
BURST	Colour subcarrier burst
SYNC	Sync pulse
ZERO RP	Zero reference pulse
RED BAR	Colour subcarrier burst extending over entire line
BAR AMPL	Luminanace bar same as in CCIR17.

CCIR	NAT-BRD	NAT-UK1	NAT-UK2	USER1	D2-MAC	SECAM
CCIR17	CCIR17	UK-ITS1	UK-IBA	CCIR17-S	CCIR17	CCIR17
CCIR18	CCIR18-4	CCIR18	CCIR18	CCIR18	CCIR18	CCIR18
CCIR330	CCIR330	UK-ITS2	---	CCIR330	CCIR330	CCIR330
CCIR331	CCIR331	---	---	CCIR331	CCIR331	CCIR331
BLACK	BLACK	BLACK	BLACK	BLACK	BLACK	BLACK
BURST	BURST	BURST	BURST	BURST	-----	BURST
SYNC	SYNC	SYNC	SYNC	SYNC	-----	SYNC
ZERO RP	ZERO RP	ZERO RP	ZERO RP	ZERO RP	-----	ZERO RP
RED BAR	RED BAR	RED BAR	RED BAR	RED BAR	-----	RED BAR
-----	-----	-----	-----	BAR AMPL	-----	-----
FT-DIST	FT-DIST	FT-DIST	FT-DIST	FT-DIST	FT-DIST	FT-DIST
V-DATA	V-DATA	V-DATA	V-DATA	V-DATA	V-DATA	V-DATA

Table 3-1 Assignment of test signals to standards

New test signals:

FT-DIST Line for measurement of 50-Hz tilt
V-DATA Amplitude measurement of teletext and data lines

For residual carrier measurements, the following settings can be mode:

- CENTER Middle of the zero reference pulse (5 to 60 µs) to determine the position on the line the zero reference pulse should be measured.
- WIDTH Width of zero-reference trigger pulse (1 to 64 µs)
- CONT PULSE Polarity of zero-reference trigger pulse

(All the timings are with reference to the leading edge of the sync pulse.)

If the chosen settings for CENTER and WIDTH result in a zero-reference trigger pulse which is longer than a line, the trigger pulse is automatically limited.

Examples:

CENTER = 50 µs,
WIDTH = 20 µs →
start 40 µs, end = 60 µs

CENTER = 40 µs,
WIDTH = 60 µs →
start 10 µs, end = 64 µs

- *Selecting the test signal standard*
  Select the desired standard using the cursor keys and then press the ENT key.

- *Setting the zero-reference pulse to be checked*
  Use the cursor keys to select the column to be changed, and enter the desired times with the numeric keys. To reverse the polarity of the trigger pulse, press the ENT key.

The EXIT key takes you back to the SETUP/ TESTLINES menu for entering the line numbers.

SETUP/ LANGUAGE
Language Selection

Using the SETUP LANGUAGE function, you can select the language to be used for display and printing of reports (refer to Fig. 3-21).

Fig. 3-21 Function SETUP/LANGUAGE

The available languages are listed in a menu. The selected language is highlighted. The cursor keys are activated.

Selecting the language:
Select the desired language with the cursor keys and confirm by pressing the <ENT> key.

Note: The IEC/IEEE bus does not depend on the selected language.

SETUP/DIFF MEASUREMENT Disabling Differential Measurements

Using the SETUP DIFF MEASUREMENT function, you can define which parameters should be included in a differential measurement selected using the INPUT function. The print-out first lists all parameters that are related to the reference channel. This list is followed by all parameters that are excluded from the differential measurement (see Fig. 3-22).

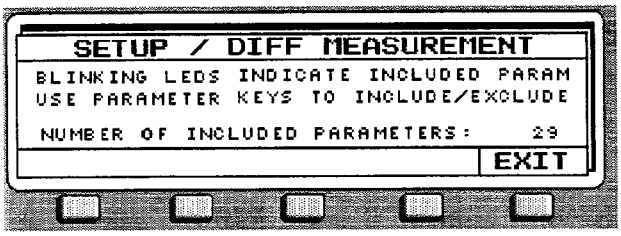


Fig. 3-22 Function SETUP DIFF MEASUREMENT

The keyboard is switched to parameter selection. The key lamps for the parameters assigned to the group will flash. The number of parameters included in the group is displayed on the screen.

Including removing a parameter:
A parameter can be included into or removed from a group by pressing the corresponding key. If a parameter is included within a group, the corresponding key lamp will be lit. If a parameter is removed from a group, the key lamp goes out.

To select an OPTION parameter, press the OPTION key and select the desired parameter with the cursor keys. Include the selected parameter into or remove the parameter from a group by pressing the DIFF MEAS softkey. After pressing the <ENT> or the OPTION key, the total number of selected parameters is displayed again.

By pressing the EXIT softkey, the defined group is saved and the current menu is left.

SETUP/ DATA LEVEL
Defining Reference Levels For Data Line

Using the SETUP/DATA LEVEL function, you can define two reference levels, ie one reference level for the data line and another one for videotext (see Fig. 3-23).

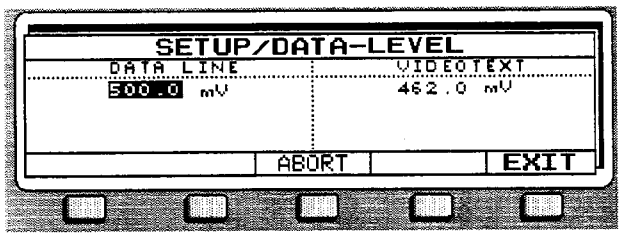


Fig. 3-23 Function SETUP DATA-LEVEL

The menu displays both reference levels. The numerical keypad and the cursor keys are activated.

Changing the reference level:
Select the level to be changed with the cursor keys and enter the new value with the numerical keys. After pressing the <ENT> or the OPTION key, the reference levels are saved and the current menu is left. Using the ABORT softkey, you can quit from the menu without saving the new values.

Permissible values:
For both levels, values from 0.1 mV to 999.9 mV can be used.

Factory settings:
DATA LINE: 500.0 mV
VIDEOTEXT: 462.0 mV

SETUP / MODENAME
Assigning Mode Names

Using the SETUP MODENAME function, you can assign a name to each mode. This name is then displayed on the screen together with the number of the selected mode. In addition, you can define for each mode, whether the parameters can be modified during a measurement using the softkey (see Fig. 3-24).

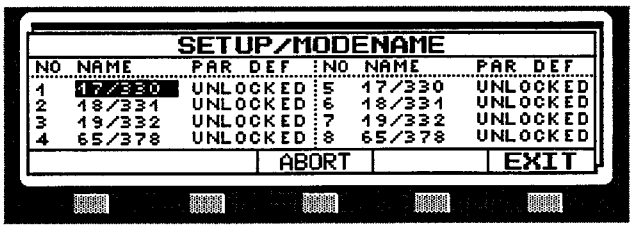


Fig. 3-24 Function SETUP MODENAME

The menu displays the name of each mode and identifies whether the parameters can be modified (column PAR DEF).

The numerical keypad and the cursor keys are activated.

Changing the name of a mode:
Select the name to be changed with the cursor keys, and activate the text editor by pressing the <ENT> key.

Enabling / Disabling Softkeys For Parameter Definitions:

Select the PAR DEF column with the cursor keys and enable (UNLOCKED) or disable (LOCKED) the softkeys by pressing the <ENT> key.

3.2.3.2 INPUT SELECT
Selection of Input and Measurement Mode

This function allows the signal input and the difference measurement mode to be selected.

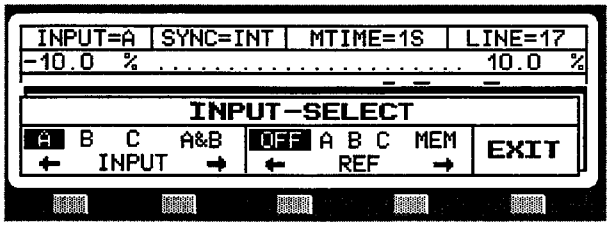


Fig. 3-25 INPUT SELECT function

The two softkeys 1 and 2 on the left allow display of the selectable signal inputs whereas softkeys 3 and 4 are associated with the possible reference sources for a difference measurement.

The activated signal input and the reference source appear in inverse video.

Selection of signal input:

Move the inverse-video marker to the desired signal input by pressing softkey 1 or 2 one or several times; A, B and C correspond to the signal inputs on the rear panel. A & B (Y/chrominance) is a special mode which permits a Y/chrominance component signal to be handled at inputs A (Y) and B (chrominance).

Selection of difference measurement mode:

Move the inverse-video marker to the desired reference signal by pressing softkey 3 or 4 one or several times. In the OFF position, difference measurement is disabled. The selection of A, B or C allows alternate measurements on the signal and the reference inputs. The measurement time (MEAS TIME) is thus doubled with respect to the selected value. In the MEM mode, the measurement is performed only at the signal input. The difference is obtained using values stored previously in the memory. The values are stored in the HOLD mode.

Pressing softkey EXIT stores the settings and allows the menu to be exited. As an alternative, it is possible to leave the menu without storage by pressing the INPUT SEL key or any other function key.

3.2.3.3 SYNC SEL
Selection of Synchronization Mode

This function enables to select the UAF synchronization mode.

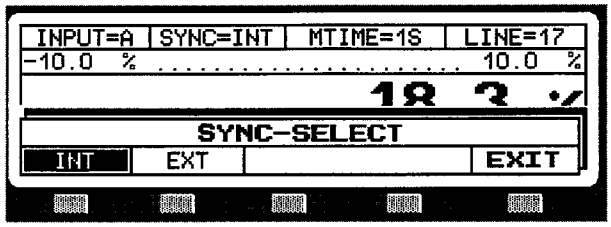


Fig. 3-26 SYNC SEL function

Setting the synchronization mode:

Press the INT softkey to activate internal synchronization. In this mode, the Video Analyzer synchronizes the measurement with the sync pulses of the signal applied to the selected input. External synchronization is selected by pressing the EXT softkey. In the external synchronization mode, the measurement is synchronized with sync pulses of the signal at the external sync input irrespective of the selected input.

Press the EXIT softkey to store the setup and leave the menu. The menu can also be exited by pressing the SYNC SEL or any other function key.

3.2.3.4 MEASUREMENT TIME
Measurement Time

This function allows the measurement time to be set.

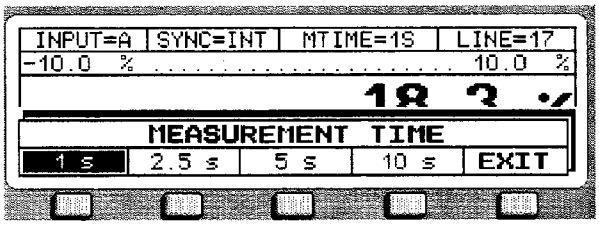


Fig. 3-27 MEASUREMENT TIME function

Setting of measurement time:

Press the softkey assigned to the desired measurement time.

Press the EXIT softkey to store the setup and leave the menu. The menu can also be exited by pressing the MEAS TIME or any other function key.

3.2.3.5 AUTORUN
Automatic Test Program

Using the AUTORUN function, an automatic test program can be defined, edited and executed without needing an external controller. The UAF itself can store one AUTORUN program in a non-volatile memory; additional programs can be stored on and retrieved from the memory card.

Before using the AUTORUN facility it is advisable to get acquainted with inputting data and text as described in the corresponding sections of the manual.

The command set includes device-specific commands and special instructions:

- *Device-specific: parameters that can be entered on the front panel, eg*

  - Measurement parameters
  - Parameter definitions
  - Test modes
  - Signal input
  - Synchronization
  - Measurement time
  - Printer commands

The SETUP function is not required, since the configuration of the UAF does not have to be changed while the program is being executed. For the MONITORING and MEMORY CARD functions, the AUTORUN facility has special instructions.

- *Special:*
  - Execution sequence (delays, unconditional and conditional jumps)
  - Outputting results to the memory card
  - Remote control of other devices via the IEC/IEEE-bus interface

Note regarding AUTORUN function:

- In the AUTORUN mode, the device operates as an IEC/IEEE-bus controller. Therefore no other controller may be on the bus.
- General data of AUTORUN program:
  - Max. length 300 lines
  - Max. number of lines with variable text strings 100 lines
  - Max. number of characters for text strings 23 characters

Calling up the AUTORUN menu

Pressing the AUTORUN key displays the AUTORUN menu.

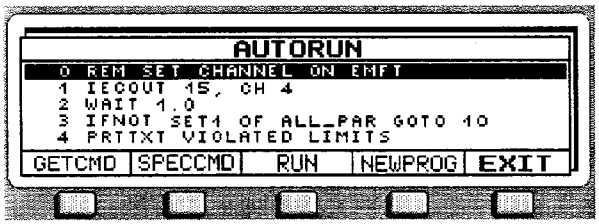


Fig. 3-28 AUTORUN menu

The upper half of the screen shows the first 5 lines of the AUTORUN program stored in the UAF. The cursor (arrow) keys can be used to move the inverse-video marker through the program.

<↑> to move it one line upwards
<↓> to move it one line downwards
<←> to move it five lines upwards
<→> to move it five lines downwards

The end of the AUTORUN program is indicated by the line PROGRAM END. If PROGRAM END is shown in the first line, then there is no program in the memory.

The softkeys are used to generate, erase and execute an AUTORUN program.

- **GETCMD** (GET COMMAND)
  The last command the operator entered on the front panel before calling up the AUTORUN menu is added as a command to the AUTORUN program.

- **SPECCMD** (SPECIAL COMMAND)
  Adds a special command to the AUTORUN program.

  When this softkey is pressed, all the available special commands are shown on the screen. Use the cursor keys to select the desired command, and use the ENT key to enter it. If additional operator input is required for the selected command, an input window appears requesting entry, as well as two more softkeys:

  STORE adds the command to the AUTORUN program

  ABORT does not add the command but takes the program back to the select-menu for special functions.

- **NEWPROG** (NEW PROGRAM) erases the AUTORUN program stored in the UAF.

- **RUN** starts executing the AUTORUN program. While the test program is running, the LED in the AUTORUN key blinks on and off.

Editing the AUTORUN Program

To edit an existing AUTORUN program, the cursor keys and the erase key CLR in the numeric pad can be used.

In order to add an extra command to a program, move the inverse-video marker to the desired location and use the GETCMD or SPECCMD softkey. The command where the marker was previously and all the subsequent commands will be moved down one line.

In order to delete an incorrect or superfluous command, move the marker to it and press the CLR key. This erases the command where the marker was before, and all the subsequent commands are moved up one line.

In order to move a command which is at the wrong location, delete it as described above and then enter it again at the desired location using GETCMD.

Stopping an AUTORUN Program

An AUTORUN program is automatically terminated at the end of the program or after execution of a program line containing an END instruction. A program can also be terminated manually by pressing any key and by confirming the displayed message with the YES softkey. A program is also automatically terminated if a command is to be executed that belongs to a non-implemented option. This may happen if an AUTORUN program is run on another UAF that is not equipped with the respective option. This may occur with the selection of filters for the luminance S/N ratio, the FT-DIST parameter and the selection of the test point for BASE LINE DIST. In these cases, the cursor remains over the command that cannot be executed.

Printing an AUTORUN Program

In each mode such as SETUP, MEMORY CARD, etc. or during a measurement, you can press the PRINT key and select the AUTORUN option from the menu.

Special AUTORUN Commands

As described above, the SPECCMD softkey is pressed to display all the special commands avaible.

Fig. 3-29 AUTORUN special commands

- ***LABEL n***
  Adds a numerical label n to the current location which can be used to define where a jump or IF goes to. The number is entered using the numeric pad.
  n can be in the range 0 to 999.

- ***GOTO n***
  Using this command, you can continue program execution at the marker with number n. The numbers from -1 to 999 are entered with the numerical keys. The marker of the command following the GOTO n command is stored and can be jumped to by entering "GOTO -1" which is the equivalent of a RETURN command. It is thus possible to program frequently used program sequences only once and to use them as subroutines. A return can also be made using conditional jump commands "IF.." and "IFNOT..".

- ***IF (a) OF (b) GOTO n***
  If condition (a) of parameter (b) is true, transfer execution to location n.

  Conditions:

  SET1 = Exceeded limits spec 1
  SET2 = Exceeded limits spec 2
  SET1OR2 = Exceeded limits spec 1 or 2
  PAR ERR = Parameter error
  SIG ERR = Signal error (for this condition, it is not necessary to add a parameter)

  Parameters:

  SEL PAR = Selected parameter
  GROUP = Parameter group defined with setup
  ALL PAR = All parameters

  Label:

  Any number from 0 to 999
  To select the condition and the parameter, use the cursor keys to select the desired field and press the ENT key until the desired text appears in the input window. To set the command location, select the numeric field with the cursor keys and use the numeric keys to enter the number in the range 0 through 999.

- ***IFNOT (a) OF (b) GOTO n***
  Same as IF instruction, but the jump only takes place if condition (a) is not true.

- ***WAIT n***
  Wait n seconds before continuing program.
  Use the numeric keys to enter the number n.
  Range 0.1 through 99999.9.

- ***IECOUT n, text***
  Controls other equipment via the IEC/IEEE-bus interface.
  n = IEC/IEEE-bus address of the equipment to be controlled (0 through 30)
  text = any IEC/IEEE-bus command required for the external equipment.

  To set the IEC/IEEE-bus address, select the numeric field with the cursor keys, use the numeric keys to enter the number and press the ENT key. To enter the IEC/IEEE command, select the text field with the cursor keys and activate the text editor with the ENT key.

- ***REMARK text***
  Add any desired comment, ie "text", to the AUTORUN program. Activate the text editor with the ENT key.

- ***PRINTTXT***
  This command outputs a definable text line to the printer port. Text entry requires the text editor to be activated with the <ENT> key.
  A form feed can, for instance, be issued by sending a control code to the printer. This code must begin with a backslash (\), and is to be followed by the decimal value of the control code (PRINTTXT "\12"). The control codes can be concatenated as required and be combined with normal text.

  The "\0" control code is not admissible but may be replaced with the "\48" code. Refer to the printer manual for other control codes.

- ***STORE (a) TO (text)***
  Store the results of parameter (a) using path and name given by text to the memory card.

  Parameters:

  SEL PAR = Selected parameter
  GROUP = Parameter group defined using SETUP
  ALL PAR = All parameters

  Path and name:

  Any desired path and name.

  To select the parameters, select the desired field using the cursor keys and press the ENT key until the desired text shows up in the input window. To enter the path and name, select the text field using the cursor keys and activate the text editor with the ENT key.

- ***END***
  Stops the AUTORUN program. For debugging purposes, this command can be inserted anywhere in the program. None of the subsequent commands in the program will be executed. No additional parameters are required.

3.2.3.6 PRINT Output To Printer

Using the PRINT function, you can output measurement values, AUTORUN programs and limit settings to the printer (see Fig. 3-30).

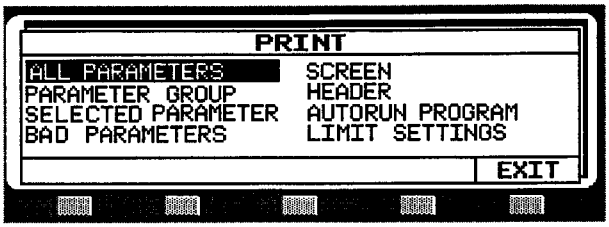


Fig. 3-30 PRINT function

After pressing the PRINT key, select the desired function with the cursor keys and confirm your selection with the <ENT> key.

SCREEN:
The information displayed on the screen is output as it was before displaying the PRINT menu. The screen display is output in graphics mode for the printer selected using the SETUP/PRINTER function.

SELECTED PARAMETER:
This function allows to output measurement values for the selected parameter.

PARAMETER GROUP:
This function allows to output measurement values for the parameters of the parameter group.

BAD PARAMETERS:
This function allows to output measurement values for all parameters whose limit values defined with SET1 or SET2 have been violated.

ALL PARAMETERS:
This function allows to output measurement values for all parameters.

AUTORUN PROGRAM:
This function allows to output the program saved in the memory.

LIMIT SETTINGS:
This function allows to output the limit settings that apply to the currently selected mode.

HEADER:
This function allows to print a header that includes date, time, selected measurement mode, input channel, synchronization mode and the time of the measurement performed.

Once an active function is finished, the menu is automatically left. By pressing the PRINT function key or the EXIT softkey, you can also leave the menu without activating a function.

3.2.3.7 MONITORING Limit monitoring

This menu enables automatic monitoring of parameter limits.

Features of limit monitoring:

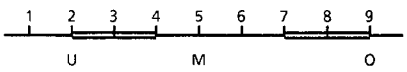
Automatic limit monitoring can be switched off or switched on for the selected parameter, group of parameters or all parameters. When limit monitoring is on, it is possible to detect signal and parameter errors and to check the measurement value by referring it to two independent limit sets. The limit sets are defined in the SETUP / SET LIMITS submenu. If the measurement value is out of limits or if there is a parameter/signal error, the limit monitoring circuit triggers the actions defined (PRINT, STORE) which can be selected independently of each other.

Principle of limit monitoring:

The measurement value is rated according to its position referred to the limits. If the measurement value changes from "within limits" (good) to "out of limits" (poor), or vice versa, the actions defined for the limits in question are triggered. This change is influenced by a selectable hysteresis.

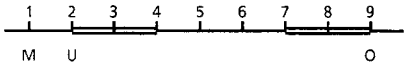
The following example is to illustrate this principle:

On a linear scale, the value 5 is the measurement value represented by an M below the scale. The upper limit is 9, the lower limit is 2. The position of the limits is marked by an O for the upper limit and a U for the lower limit. The hysteresis is 2 and is valid throughout the range marked by a double line.



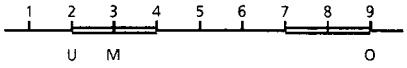
In the above figure, the measurement value is within the limits and rated good.

The next measurement value is 1.



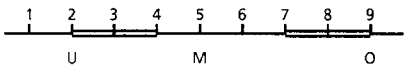
The measurement value falls below the lower limit and is rated poor. The actions defined for the limits are triggered.

The next measurement value is 3.



The measurement value is within the permissible range, but the spacing between the value and the limit does not comply with the hysteresis. The measurement value is still regarded as poor, but no actions are triggered.

The next measurement value is 5.



The value is again in the permissible range and is also at the required distance from the limit (spacing defined by the hysteresis). The measurement value is now considered good. The actions defined for the limits are triggered.

The hysteresis represents the minimum amount by which a poor measurement value must shift in the direction of the optimal result to be rated good. The use of a hysteresis has the advantage that a value varying around the limit will not constantly trigger actions. Therefore, the hysteresis must be larger than the variation width expected. If the hysteresis is set to 0, it does not have the described effect.

Limit monitoring:

The MONITORING function enables to set the limit monitoring mode and actions as well as the limits displayed on the LCD.

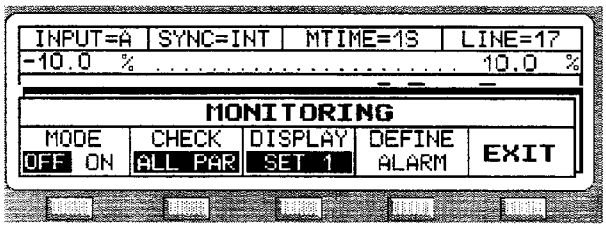


Fig. 3-31 MONITORING function

Setting of mode:

Use the MODE softkey to enable or disable limit monitoring.

Setting the parameters to be monitored:

Press the CHECK softkey to select the parameters to be monitored:

ALL PAR all parameters
SEL PAR individual parameter selected
GROUP parameter group

Selecting the limits to be displayed:

Use the DISPL softkey to select the limits to be displayed:

SET1 limit set 1
SET2 limit set 2

Selecting the logs to be triggered:

Press the DEFINE ALARM softkey to go to the menu defining the actions to be triggered.

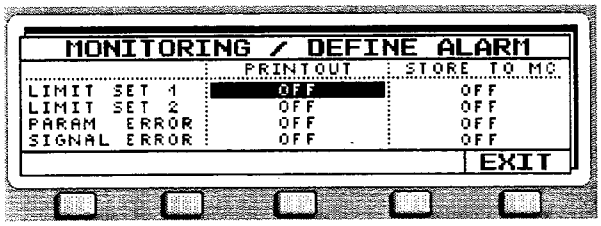


Fig. 3- 32 MONITORING DEFINE ALARM function

Different actions can be set for all monitoring criteria.

Monitoring criteria:

LIMIT SET 1	limit set 1 exceeded
LIMIT SET 2	limit set 2 exceeded
PARAM ERROR	parameter error
SIGNAL ERROR	signal error

Actions:

PRINT OUT	print out test log
STORE TO MC	store test log on memory card (prior to doing this, the name and path under which the measurement values are to be stored must be selected in the MEMORY CARD menu).

To activate these actions, move the inverse-video marker to the corresponding column and select the parameter to be logged by pressing the ENT key, if required several times.

Parameter check:

SELECTED PAR	individual parameter selected
PARAM GROUP	parameter group
BAD PARAMS	fault parameter which caused the alarm
ALL PARAMS	all parameters
OFF	no parameter log

3.2.3.8 MEASUREMENT HOLD Storing Of Measurement Results

The MEAS HOLD function permits to stop the measurement. During the interruption, the samples from the last test sequence can be stored in the reference memory for subsequent difference measurement. When the MEAS HOLD mode is activated or on standby, the function keys and the softkeys (exception: PRINT, MEAS HOLD, softkey No. 5) are disabled. Softkey No. 5 is assigned a new function.

Freezing of measurements:

When the MEAS HOLD key is pressed, the measurement is stopped. This mode can only be selected if no operating function is enabled. The MEAS HOLD mode is signalled by a message on the LCD (except for graphics display of measurement values) and the LED of the MEAS HOLD key. In this mode, all parameters can be called up in arbitrary order. The measurement is frozen. The measurement values displayed in this mode are always those from the last (stopped) test sequence. If the MEAS HOLD key is pressed before a measurement value is available (eg measurement value not yet settled, no signal), the UAF first goes into the standby status for MEAS HOLD which is signalled by the blinking of the MEAS HOLD key LED. As soon as the UAF receives the first measurement values, it assumes the MEAS HOLD mode.

Resuming measurements:

Press the MEAS HOLD key again to continue the measurement. The HOLD message on the LCD disappears and the LED goes out. When the settling time is over, measurement values are again output continuously.

Storing of sampled values into the reference memory:

By pressing the SAVE RESULTS softkey, the results obtained during the last measurement cycle are transferred into the reference memory and in addition stored in a non-volatile memory. Following power-up of the video analyzer, these measurement results are available for reference measurements.

3.2.4 Parameter Keys

The parameter keys are on the right of the display. They permit individual parameters to be called up. The corresponding screen display appears. The softkeys are labelled depending on the selected parameter and enable to call up submenus.

3.2.5 Option Key

Depending on the configuration of the video analyzer, additional parameters can be selected using the OPTION key (see Fig. 3-33).

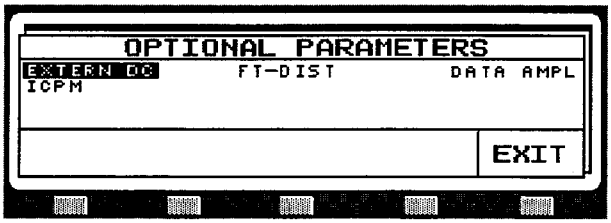


Fig. 3-33 Option Key

After pressing the OPTION key, a menu appears from which all additional parameters can be selected. Use the cursor keys to select the desired parameter and confirm your selection with the <ENT> or the OPTION key.

By pressing the EXIT softkey, you can leave the OPTION menu without switching the parameter.

Note: *The FT-DIST parameter is displayed but can only be used on a video analyzer that is equipped with the relevant option.*

3.2.6 Memory Card

Displaying the MEMORYCARD menu

To display the MEMORYCARD menu, insert the memory card into the appropriate slot and press the MEMORYCARD key (refer to Fig. 3-34).

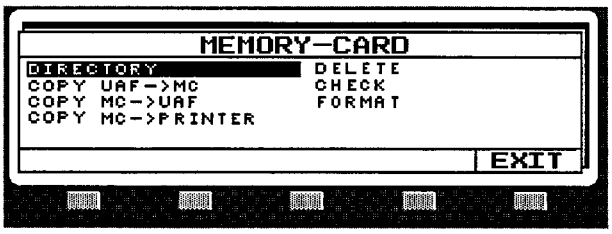


Fig. 3-34 Funktion 'MEMORY-CARD'

You will now see all functions required to control the memory card. The cursor keys are activated. Select the desired function with the cursor keys and confirm your selection with the <ENT> key.

General notes

- Before each new memory card is used, it needs to be formatted using the FORMAT command.
- Whenever a file is being read from the memory card, or written to it, the LED in the MEMORY CARD key blinks on and off. During this period, do not remove the card from its slot.
- If test results are to be written to the card, it is recommended to freeze them using the HOLD function before getting into the MEMORY CARD menu. This avoids the results getting changed as a result of using the MEMORY CARD function during the current measurement, or getting lost entirely.
- All of the files stored on the memory card need a name consisting of up to 8 characters, and an extension of up to 3 characters.

The **name** can be chosen as desired. The name chosen last will be suggested the next time you store a file. It is possible to always use the same filename and let all the files be numbered automatically. To do this, use question marks at the end of the filename. The number of question marks determines the number of files that can be stored under this name.

Example:

"DATA?" → "DATA0" through "DATA9"
"D??????" → "D000000" through "D999999"

Each time the file is saved, a counter is incremented by one relative to the last time it was saved. If the file has not been saved previously, it will be saved with the number 0.

The **extension to the filename** is automatically determined from the filetype, and thus makes it possible to identify the filetype.

MVI → Test results
ISI → Setups
LSI → Limit-value settings
ARI → AUTORUN Program

- The memory card has the same function in the UAF as a diskette in a PC. First, a few definitions are required:
  - The data to be stored (eg test results) are stored in a FILE.
  - A DIRECTORY holds a number of files.
  - A root directory can hold a number of SUBDIRECTORIES.
  - The way to a subdirectory is called the PATH (see example).

In order to create a new subdirectory, all you have to do is to state the desired path before you save

a file. If the stated path does not exist, then it will be created.

Note: *Another reason to use subdirectories is to be able to store a large number of files which otherwise would not be possible since the maximum number of files in the root directory is limited (see table: specifications on the memory card).*

Example:

In order to make it easier to find your way around a large memory card, each type of file (test results, setups, and AUTORUN programs) should be allocated to a separate directory. Since the measurements are to be carried out at two separate locations, the subdirectory for the test results is itself divided into subdirectories.

Getting into the memory card menu:

To get into the memory card menu, insert the card into its slot and press the MEMORY CARD key.

The screen will then show all the functions for handling the memory card, and the cursor block is turned on.

To activate one of the functions, select the desired function with the cursor keys, and then press ENT.

DIRECTORY

The directory function shows the contents of the memory card.

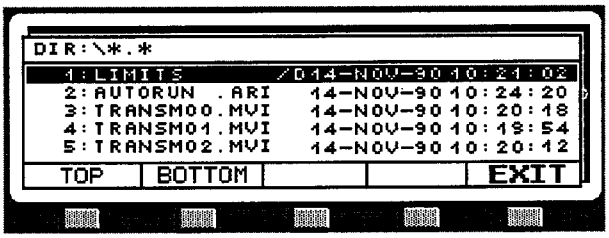


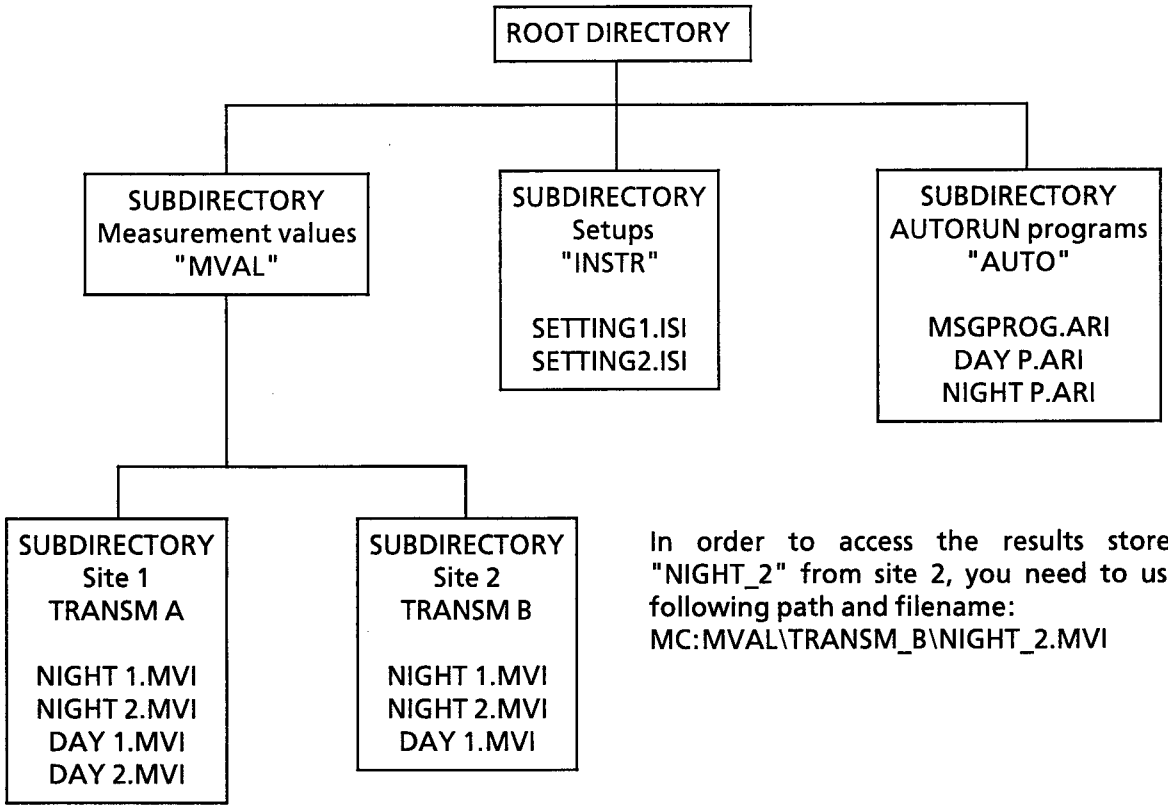
Fig. 3-34a Example for the DIRECTORY function

When this function is selected, the screen shows the first five filenames in the root directory. Next to the name, the date and time the files were saved is shown. Subdirectories are designated with "/D".

In order to read large directories, you can move the cursor up and down the directory using the cursor keys:

<↑>	to move it one line upwards
<↓>	to move it one line downwards
<←>	to move it five lines upwards
<→>	to move it five lines downwards

The softkeys TOP and BOTTOM can be used to select the first 5 filenames or last five, respectively.



In order to access the results stored as "NIGHT_2" from site 2, you need to use the following path and filename:
MC:MVAL\TRANSM_B\NIGHT_2.MVI

To identify the files, you can look at the "file info", which is automatically created with the file. You can read it by moving the reverse-video marker to the corresponding filename and pressing the ENT key. The UAF will then show for several seconds the name, file type, file size and the comment line entered when the file was saved.

To move to a subdirectory, use the cursor keys to select the directory name, and press the ENT key. Two dots in the first line of the directory then show that the currently displayed files are in a subdirectory. This can be repeated as often as required to get to whatever depth of sub-directories exists.

In order to get back to the previous level, move the reverse-video marker to the dots in the first line of the directory (eg by pressing the TOP softkey), and press the ENT key.

COPY UAF → MC

This function copies data from the UAF to the memory card and creates a file on it.

To do this, you need to enter the type of data to be copied, the path, the filename and a comment line.

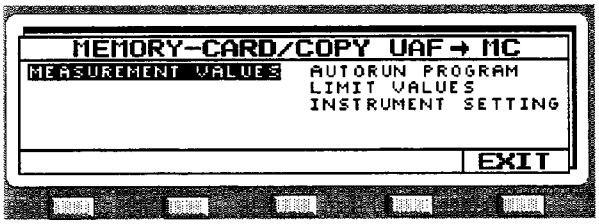


Fig. 3-35 UAF → MC

▸ *Choosing the data type:*
When you select the COPY function, all the copyable data types are displayed.

MEASUREMENT VALUES
INSTRUMENT SETTING
LIMIT VALUES
AUTORUN

Use the cursor keys to select the desired data type, and press the ENT key.

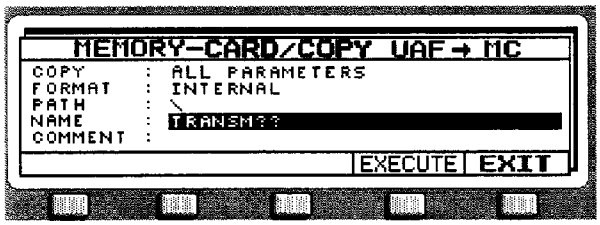


Fig. 3-36 COPY PARAMETER VALUES → MC

When storing the test results, it is also necessary to state what results are to be stored. To do this, move the reverse-video marker to the corresponding field and use the ENT key to select one of the available possibilities.

- Individual parameter
- Parameter group
- All parameters

▸ *Inputting the filename, path and comment line:*
Use the cursor keys to select the desired field and use the ENT key to activate the text editor. It is not absolutely necessary to enter a comment line or path. However, when defining the name you should make sure that no file with this filename already exists in the directory, since it would then be overwritten.

▸ *Starting the copy process:*
By pressing the EXECUTE softkey, the storage process is started.

COPY MC → UAF

This function copies the data from a file on the memory card into the UAF.
To do this, you need to state the data type, the path and the filename for the data to be copied.

▸ *Choosing the data type:*
When you select the COPY function, all the copyable data types are displayed.

MEASUREMENT VALUES
INSTRUMENT SETTING
LIMIT VALUES
AUTORUN

Use the cursor keys to select the desired data type, and press the ENT key.

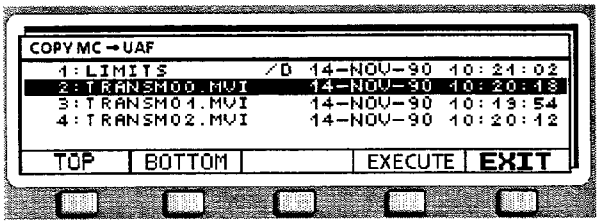


Fig. 3-37 COPY MC → UAF

- *Choosing the path and filename:*
  After data type is chosen, the UAF displays the names of all the files which contain such data. As with the DIRECTORY function, you can use the ENT key to move to a subdirectory, or to read the file info.

- *Starting a copy:*
  When the EXECUTE softkey is pressed, the UAF loads the data from the file designated with the reverse-video marker. After the results are loaded, the UAF automatically goes into the HOLD mode to interrupt the current measurement process.

Warning: *When setups, limits or AUTORUN programs are loaded, the data already stored in the UAF are irretrievably overwritten. If you do not want these data to be lost, you have to copy them first onto the memory card.*

COPY MC → PRINTER

This function outputs measurement values, AUTORUN programs and limit settings to the printer (see Fig. 3-37a).

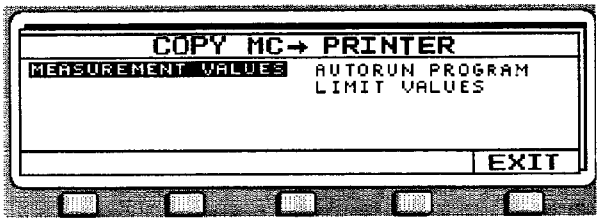


Fig. 3-37a Funktion 'MC → PRINTER'

After selecting the COPY function, another menu is displayed which can be used to select the type of data to be printed. Select the desired data type with the cursor keys and confirm your selection with the <ENT> key. This will bring up a display of all existing files of the corresponding type. Select the desired file with the cursor keys and subsequently press the EXECUTE softkey. If a subdirectory is highlighted, all files in this subdirectory whose type is identical to the previously selected type will be printed.

A print-out of the contents of an entire subdirectory can be aborted by pressing the ABORT softkey or the MEMORYCARD key.

DELETE

The DELETE function erases files or subdirectories on the memory card.

When the DELETE function is selected, all the files and subdirectories in the root directory are displayed. As with the DIRECTORY function, you

Specifications for various models of memory card:

	8k	32k	64k	128k	256k	512k	1M
Memory capacity in bytes	8192	32768	65536	131072	262144	524288	1048576
Formatted memory capacity in bytes	6656	31232	63488	126464	256024	518656	1037824
Maximum number of files in root directory	16	16	32	112	112	112	224
Maximum number of files in subdirectories	not limited						

can use the ENT key to move to a subdirectory, or to read the file info.

- *Delete process:*
  Once you have moved the inverse-video marker to the file or subdirectory to be deleted, press the EXECUTE softkey to delete it.

CHECK

This function checks the memory card and displays

- the total storage capacity
- the unused storage capacity
- and the name of the memory card.

Memory cards that were formatted using the UAF are always given a name of the form "UAF_Vx.x", where x.x is the version number of the UAF's firmware.

FORMAT

This function formats the memory card in order to make it usable in the UAF.

WARNING: *The FORMAT process completely erases the memory card, so be very careful when you use it!*

3.2.7 Mode Selection

After pressing the MODE softkey, a menu is displayed that can be used to select a new mode (see Fig. 3-38).

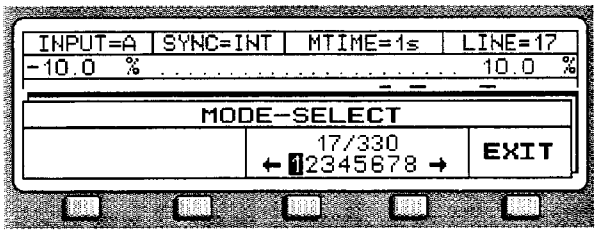


Fig. 3-38 Mode Selection

In the upper half of this menu, you will see the name (refer to Section SETUP/MODENAME) of the currently selected mode, and in the bottom half the corresponding mode number.

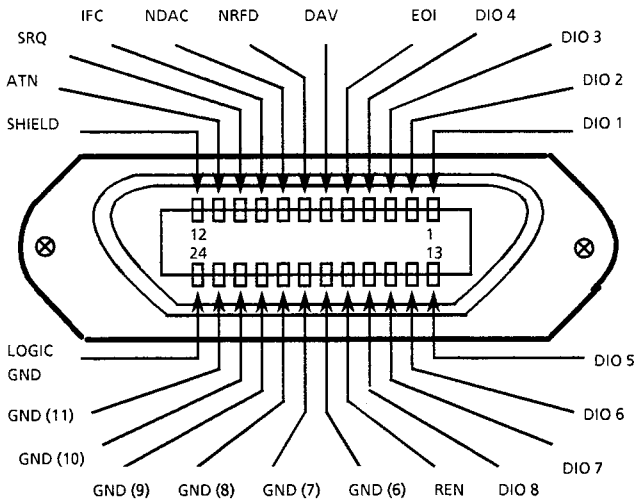
Selecting a new mode

Use the "<-" and "->" softkeys to select the desired mode and confirm your selection with the EXIT softkey.

3.3 Remote Control

A controller (eg PCA2 or PCA5) can be connected to the UAF via the IEC-625/IEEE-488 bus to make it fully system-compatible.

The UAF is fitted with an IEC-625/IEEE-488 connector as standard. The interface complies with IEC standard 625-1 as well as with IEEE standards 488.1 and 488.2 which will also be taken over by IEC. IEEE 488.2 specifies, for instance, data transmission formats and common commands.



Contact assignment of IEC/IEEE-bus connector

The bus connector is on the rear of the device. The analyzer is fitted with the 24-contact connector specified by IEEE 488. The interface includes three groups of bus lines:

1. **Data bus with 8 lines DIO 1 to DIO 8**

   Data transmission is bit parallel and byte serial, the characters being transmitted in the ISO 7-bit code (ASCII code).

   DIO 1 represents the least significant and DIO 8 the most significant bit.

2. **Control bus with 5 lines**

   The control bus is used to manage the information flow:

   ATN (attention)
   becomes active low during transmission of addresses, common or addressed commands to the devices on the bus.

   REN (remote enable)
   for switching the device to the remote state.

   SRQ (service request)
   asserting SRQ enables a device to send a service request to the controller.

   IFC (interface clear)
   is activated by the controller to place the IEC/IEEE-bus interfaces of the devices into a defined initial state.

   EOI (end or identify)
   identifies the end of data transmission and is used in parallel poll.

3. **Handshake bus with 3 lines**

   This bus controls data transmission timing.

   NRFD (not ready for data)
   in the active low state signals to the talker/controller that one of the devices connected is not ready to accept data.

   DAV (data valid)
   is activated by the talker/controller shortly after a new data byte has been put on the data bus.

   NDAC (not data accepted)
   is kept active low by the bus device until the device has accepted the data on the bus.

For further information, eg data transmission timing, see IEC standard 625-1.

According to IEC 625-1, devices which can be remote-controlled via the IEC/IEEE bus may be provided with different interface functions. See Table 3-2 for UAF interface functions.

Identification	Interface function
SH1	Source handshake, complete capability
AH1	Acceptor handshake, complete capability
L4	Listener, complete capability, unaddress if MTA
T6	Talker, complete capability, capability to answer serial poll, unaddress if MLA
SR1	Service request, complete capability
PP1	Parallel poll, remote configuration
RL1	Remote/local function, complete capability
DC1	Device clear, complete capability
DT1	Device trigger, complete capability
C1, C2,C3, C11	System controller, send IFC and take charge, send REN, send IF messages, receive control, pass control, take control synchronously

Table 3-2: Interface functions

3.3.1 Setting the Device Address

The device address can be selected in the SETUP menu by means of the IEC/IEEE-bus function. The address can range from 0 to 30 and is entered using the numeric keys. It remains stored even after the UAF has been switched off. 7 is the address set in the factory.

The address is the decimal equivalent of bits 1 to 5 of the talk or listen address. This format is also used in the IEC-625/IEEE-488-bus commands from the controller.

3.3.2 Local-to-Remote State Transition

After switching on, the device is in the local state (manual control).

If the UAF is addressed by the controller as a listener (in R&S controllers with BASIC commands IECOUT or IECLAD), it changes to the remote state (remote control) and also remains in this state after data transmission. The front-panel LED REM lights up to indicate this state. All front-panel controls are disabled.

There are two ways to return to the local state:

- The controller sends the addressed command GTL (go to local).
- Press any key and confirm the message displayed by pressing the softkey "YES". Prior to returning to the local state, output of data from the controller to the analyzer should be stopped. Otherwise, the UAF will immediately return to the remote state. Return to the local state can be disabled from the controller by sending the universal command LLO (local lockout).

Remote-to-local or local-to-remote state transition will not affect the other settings on the device.

No softkey menus are available in the remote state since manual operation is not possible as prescribed in the standard.

3.3.3 Interface Messages

Interface messages (as specified in IEC 625-1/ IEEE 488) are sent to the UAF via the data lines, the ATN line being active (low).

3.3.3.1 Universal Commands

Universal commands are encoded in the range 10 through 1F hex (see Table 3-5). They affect all devices connected to the bus without any addressing being required.

Command	BASIC command in R&S controllers	Function
DCL (Device Clear)	IECDCL	Interrupts processing of received commands and sets the command processing software to a defined initial state. No change of device setup.
LLO (Local Lockout)	IECLLO	Front-panel controls disabled.
SPE (Serial Poll Enable)	IECSPE*	Ready for serial poll
SPD (Serial Poll Disable)	IECSPD*	End of serial poll

Table 3-3: Universal commands

* The BASIC command "IECSPL address, status %", which includes the commands "IECSPE" and "IECSPD", also reads the status of the addressed device and stores it in the integer variable "status %".

3.3.3.2 Addressed Commands

The addressed commands are encoded in the range 00 through 0F hex (see Table 3-5). They only affect devices addressed as a listener (using the BASIC command "IECLAD address").

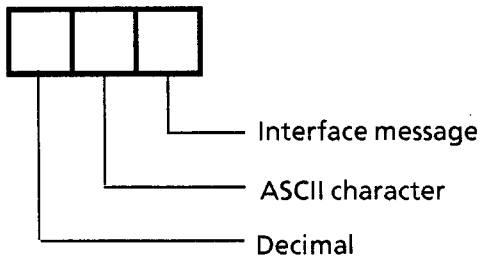
Command	BASIC command in R&S controllers	Function
SDC (Selected Device Clear)	IECSDC	Interrupts processing of received commands and sets the command processing software to a defined initial status. No change of device setup.
GTL (Go To Local)	IECGTL	Activates the local state (manual control).
GET (Group Execute Trigger)	IECGET	Transfers the current measurement value to the output buffer.

Table 3-4: Addressed commands

Control characters						Numbers and symbols				Upper case				Lower case			
0	NUL		16	DLE		32	SP	48	0	64	@	80	P	96	`	112	p
1	SOH	GTL	17	DC1	LLO	33	!	49	1	65	A	81	Q	97	a	113	q
2	STX		18	DC2		34	"	50	2	66	B	82	R	98	b	114	r
3	ETX		19	DC3		35	#	51	3	67	C	83	S	99	c	115	s
4	EOT	SDC	20	DC4	DCL	36	$	52	4	68	D	84	T	100	d	116	t
5	ENQ	PPC	21	NAK	PPU	37	%	53	5	69	E	85	U	101	e	117	u
6	ACK		22	SYN		38	&	54	6	70	F	86	V	102	f	118	v
7	BEL		23	ETB		39	'	55	7	71	G	87	W	103	g	119	w
8	BS	GET	24	CAN	SPE	40	(	56	8	72	H	88	X	104	h	120	x
9	HT	TCT	25	EM	SPD	41	)	57	9	73	I	89	Y	105	i	121	y
10	LF		26	SUB		42	*	58	:	74	J	90	Z	106	j	122	z
11	VT		27	ESC		43	+	59	;	75	K	91	[	107	k	123	{
12	FF		28	FS		44	,	60	<	76	L	92	\	108	l	124	|
13	CR		29	GS		45	-	61	=	77	M	93	]	109	m	125	}
14	SO		30	RS		46	.	62	>	78	N	94	^	110	n	126	~
15	SI		31	US		47	/	63	? / UNL	79	O	95	-	111	o	127	DEL
Addressed commands			Universal commands			Listen addresses				Talk addresses				Secondary addresses and commands			

Table 3-5: ASCII/ISO and IEC code chart

Key:



3.3.4 Device-dependent Messages

Device-dependent messages (in accordance with IEC 625-1) are transmitted on the data lines, with the ATN line being high, ie not active. The ASCII code (ISO 7-bit code) is used for transmission (see Table 3-5).

As can be seen from Table 3-6, device-dependent messages may be classified under two different aspects:

Type of message	Direction of transmission	
	to UAF	from UAF
Common commands (meeting IEEE 488.2)	see section 3.3.4.3	see Table 3-8
Device-specific commands (depending on device characteristics)	see section 3.3.4.4	see Table 3-9

Table 3-6: Classification of device-dependent messages

In the following, messages received by the UAF are referred to as commands.

Commands with the extension "?", eg "MEASUREMENT:HOLD?", make the analyzer output the set value, the syntax being the same as in the table. With respect to above example, this means

```
"MEASUREMENT:HOLD OFF",
```

3.3.4.1 Commands Received by the Analyzer in Listen Mode (Controller-to-Device Messages)

Input buffer:

All commands received are stored in a buffer with a maximum capacity of 256 bytes. Longer command lines can be processed as well, while the part already received is processed internally in the device.

Command syntax:

Fig. 3-34 shows the syntax of a command line (program message). Each message must be terminated by a delimiter.

Delimiters:

- New line = NL (ASCII code 10 decimal)
- End (EOI line active) together with either the last character of the command line or NL

Since a carriage return (ASCII code 13 decimal) is permissible as a filler without effect in front of the delimiter, the combination CR + NL can be used as well.

Separators:

A command line may contain several commands (program message units) that must be separated from each other by a semicolon (;).

Command syntax:

A command may consist of the following elements:

- Header only
  eg `*RST`
- Header and question mark (query)
  ("Query"-Kommando)

  eg `LIMIT:SET1:LOWER?`

When receiving such a combination, the analyzer makes the requested data available in an output buffer to enable their transmission via the IEC/IEEE bus as soon as the analyzer has been addressed as the talker (see section 3.3.4.2).

- Header and numerical value

  eg `LIMIT:SET1:LOWER 90`

According to IEEE 488.2, header and numerical value(s) must be separated by at least one space (ASCII code 32 decimal). In the case of device-specific commands the numerical value may be followed by a unit.

- Header and string

  eg `INPUT A`

The headers and their meaning are explained in section 3.3.4.4.

Lower/upper case:

Lower case and upper case are both permissible as they are equivalent. Units can thus be written in their usual form (eg dBm) instead of in upper case (eg HZ) which is also permissible.

Spaces:

Additional spaces may be inserted at the following positions:

- before the header,
- between header and numerical value,
- before and after the comma (,) and the semicolon (;),
- before the delimiter.

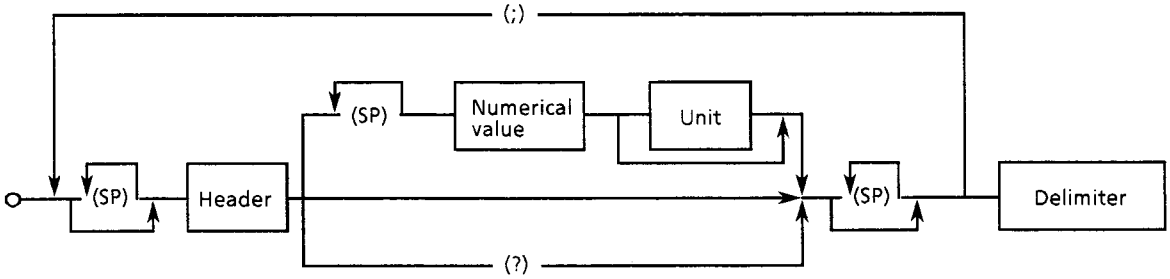
Numerical values:

Only decimal numbers and the following notations are permissible:

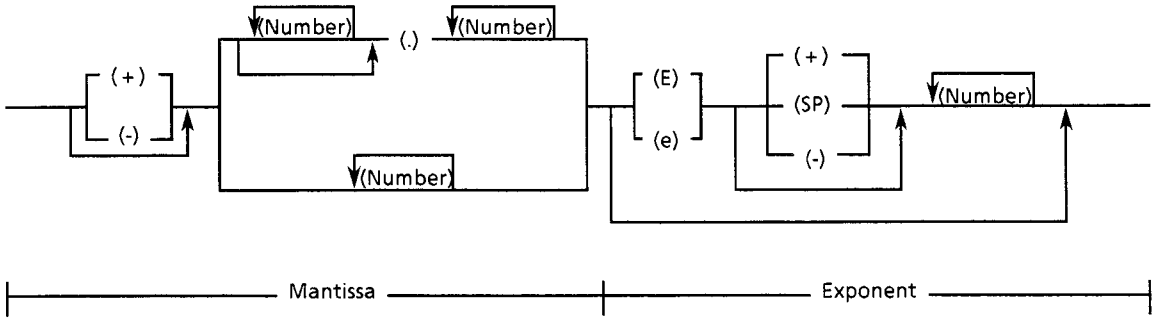
- With or without sign
  eg 5, +5, -5
- With or without decimal point, the position of the decimal point being freely selectable
  eg 1.234, -100.5, .327
- With or without exponent to the base of 10, "E" or "e" defining the exponent
  eg *.451, 451E-3, +4.51e-2*
- The exponent may be used with or without sign, a space being permitted instead of the sign.
  eg *1.5E+3, 1.5E-3, 1.5E 3*
- Mantissa and exponent may be preceded by zeros.
  eg *+0001.5, -01.5E-03*
- The numerical value inclusive of the exponent may consist of a maximum of 20 digits. The length of mantissa and exponent is only limited by this condition. Any digits exceeding the resolution of the device will be rounded up or off, but they are taken into consideration for the order of magnitude (power of 10).
  eg *150000000, 0.00000032*

Note: The exponent alone (eg E-3) must not be used; the correct format is 1E-3.

Command line



Numerical value



SP: Any character with the ASCII code 0 to 9 and 11 to 32 decimal, in particular the space character.

Fig. 3-38a Syntax diagram of a command line

3.3.4.2 Messages Sent by the Analyzer in Talk Mode (Device-to-Controller Messages)

The analyzer sends messages via the IEC/IEEE bus if:

- it has been requested by one or more queries (messages followed by a question mark) within a single command line to make data available in the output buffer,
- setting bit 4 (MAV = message available) in the status byte indicates that the requested data are available in the output buffer (see also section 3.3.5), and if
- it has been addressed as a talker (BASIC command "IECIN address, string variable").

It should be noted that the command line with the queries is sent immediately before the talk address. If another command line is sent in between, the output buffer is cleared.

A query is obtained by adding a question mark to the header, eg **"INPUT?"**.

If the UAF is addressed as a talker immediately after a query, the bus handshake is inhibited until the requested data are available.

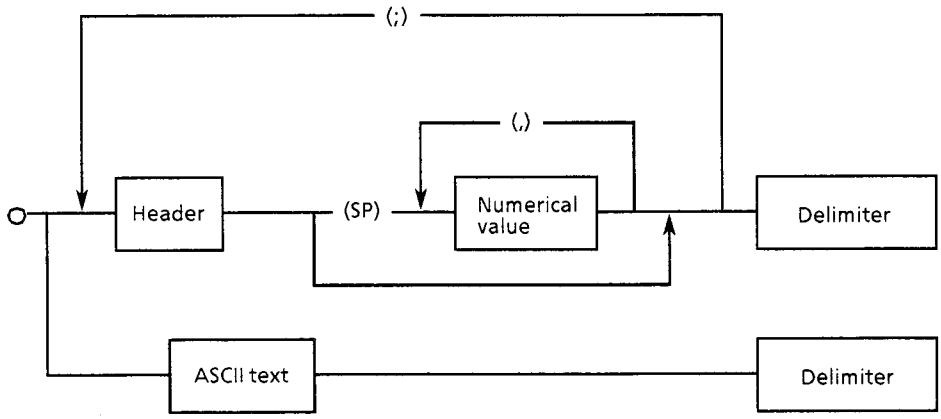
The syntax of the messages sent by the UAF is shown in Fig. 3-35. It is similar to that of the commands the UAF receives.

NL (ASCII code 10 decimal) together with End (line EOI active) is used as the delimiter.

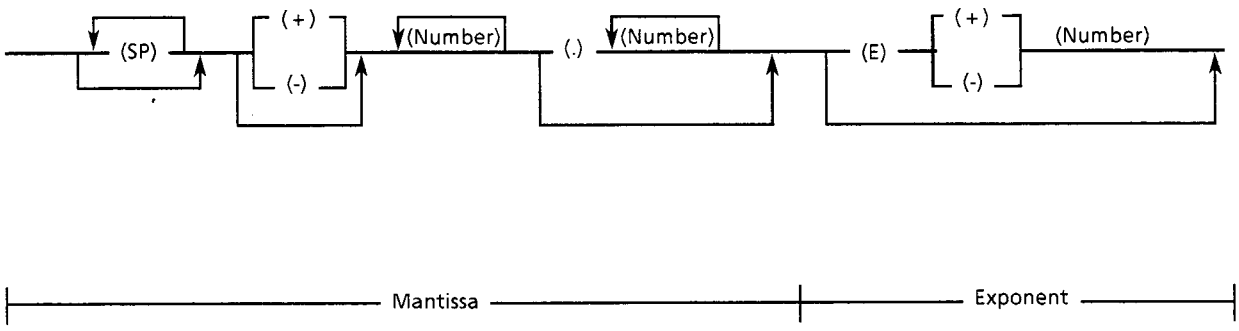
The transmission of headers plus numerical values allows messages sent by the UAF to be returned unchanged as commands. Any setting entered via the keyboard can thus be read out, stored in the controller and repeated later on via the IEC/IEEE bus.

- If the UAF receives several queries, it also returns several messages in a single line; these messages are separated from each other by a semicolon.
- Header and numerical values are always separated by a space.
- Headers only consist of upper case letters and the characters ":", "_", "*".
- Fig. 3-35 shows the syntax of the numerical values. As regards the exact format of the numerical values for each specific message, see Tables 3-8, 3-9 and 3-10.
- The messages sent by the UAF do not include any units. In the case of physical quantities, the numerical values are referred to the default units listed in Table 3-12.

Output message line



Numerical value



SP: Space (ASCII code 32 decimal)
ASCII text: Reply to query *IDN? (see Table 3-8)

Fig. 3-39: Syntax diagram of messages sent by the analyzer

3.3.4.3 Common Commands and Queries

The commands and queries are listed in Tables 3-7 and 3-8 and concern:

- commands referring to the service request function and the relevant status and enable registers,
- commands for device identification,
- commands regarding the parallel poll function,
- commands for triggering a sequence of actions,
- commands for internal device setups (reset, calibration) and for synchronization of a series of actions.

The commands and queries are in line with standard IEEE 488.2 which prescribes that these commands and queries have the same effect in different devices.

The headers of these commands consist of "*" followed by three letters.

Command	Numerical value, range	Description
***RST**	---	**Reset** Places the device in the initial state. This command does not change the IEC/IEEE interface status, the IEC/IEEE-bus address, the enable registers of the service request function nor the output buffer. A service request to be handled is only reset if it had not been caused by a command in the output buffer.
***PSC**	0 to 65535	**Power On Status Clear** If >0: The service request enable register (SRE) and the event status enable register (ESE) are cleared on power-on. If 0: The contents of the above registers are retained even if the device is switched on and off. This allows the UAF to assert a service request on power-on.
***OPC**	---	**Operation Complete** Sets bit 0 (operation complete) in the event status register if all preceding commands have been processed and executed (see section 3.3.7).
***CLS**	---	**Clear Status** ▸ Resets the status registers (ESR and STB) to zero. The enable registers of the service request function (ESE and SRE) remain unchanged. ▸ Clears the output buffer. Any service request to be handled is cleared (see section 3.3.5).
***ESE**	0 to 255	**Event Status Enable** The event status enable register is set to the defined value which is interpreted as a decimal number (see section 3.3.5).
***SRE**	0 to 255	**Service Request Enable** The service request enable register is set to the defined value which is interpreted as a decimal number (see section 3.3.5).
***PRE**	0 to 255	**Parallel Poll Register Enable**
***TRG**	---	**Trigger** Same function as the messages GET and PARAMETER:VALUE?
***WAI**	---	**Wait To Continue** The subsequent commands are only executed after all commands previously sent have been dealt with (see section 3.3.7).

Table 3-7 Common commands received by the analyzer

Query	Output message, data value		Description
	Digits	Range	
***IDN?**	23	alpha-numeric	**Identification Query** The following identification text is sent in reply to the *IDN? query via the IEC/IEEE bus (always without header): Example: `Rohde&Schwarz, UAF,02,1.0` Rohde&Schwarz = manufacturer UAF = device 02 = version (for example) 1.0 = firmware version (for example)
***PSC?**	1	0 or 1	**Power On Status Clear Query** For readout of the device's power-on-status-clear flag; see *PSC in Table 3-7
***OPC?**	1	1	**Operation Complete Query** The message "*OPC1" is placed into the output buffer and bit 4 (MAV) in the status byte is set if all previous commands have been processed and executed. In addition, bit 0 (OPC) in the event status register is set (see section 3.3.7).
***ESR?**	1 to 3	0 to 255	**Event Status Register Query** The contents of the event status register are output in decimal form, the register being reset to zero afterwards.
***ESE?**	1 to 3	0 to 255	**Event Status Enable Query** The contents of the event status enable register are output in decimal form.
***STB?**	1 to 3	0 to 255	**Read Status Byte Query** The contents of the status byte are output in decimal form.
***PRE?**	1 to 3	0 to 255	**Parallel Poll Register Enable Query**

Table 3-8 Queries sent by the analyzer

Query	Output message, data value		Description
	Digits	Range	
***SRE?**	1 to 3	0 to 255	**Service Request Enable Query** The contents of the service request enable register are output in decimal form.
***TST?**	1 to 3	0 to 255	**Self-Test Query** The self-test routine of the device is carried out. If "0" is output, no errors have been detected.
***IST?**	1	0 or 1	**Individual Status Query** This query allows the current state of the "ist" local message to be read (see section 3.3.5).

Table 3-8a Queries sent by the analyzer

3.3.4.4 Device-Specific Commands

All UAF functions that can be selected using the front-panel controls can also be set via the IEC/IEEE bus. Setting commands and front-panel entries have the same effect.

Corresponding to the output on the display, the values of all parameters can also be read out via the IEC/IEEE bus.

The Tables 3-9, 3-10 and 3-11 show the setting commands and the queries with the corresponding messages sent by the UAF.

The headers are identical or very similar to the corresponding key label so that easy-to-read (self-documenting) programs are obtained.

The headers may be truncated by omitting characters at the end (eg PAR instead of PARAMETER). The shortest possible names of the commands are identified by **bold** printing.

Many headers consist of several parts that are separated by colons (:), eg MEASUREMENT:TIME. Each part of the header can be abbreviated separately (eg MEA:T).

To facilitate reading some headers include the underscore (ASCII code 95 decimal).

All setting commands that may contain a numerical value are marked in the column "Data". Some commands may, however, contain a string as well, eg. "A" for signal input selection.

It is possible to add the unit of measurement directly to the numerical value (eg 10 ns). The permissible units are listed in Table 3-12. They may also be abbreviated and written in lower or upper case.

Device functions:

Command	Data	Unit	Description
DISPLAY **DISP**LAY?	**ON** **OFF** **GRA**PHIC **NUM1** **NUM3**	--- --- --- --- ---	Activate numeric display of one parameter Switch off display Activate graphic display Activate numeric display of one parameter Activate numeric display of three parameters
LANGUAGE **LANG**UAGE?	**ENG**LISH **GER**MAN **FRE**NCH **ITA**LIAN	---	Language selection
PRINT:SCREEN **PRINT:SEL**ECTED_PARAMETER **PRINT:DEF**INED_GROUP **PRINT:ALL**_PARAMETERS **PRINT:BAD**_PARAMETERS **PRINT:HEA**DER **PRINT:LIM**IT_SETTINGS **PRINT:AUTO**RUN	--- --- --- --- --- --- --- ---	--- --- --- --- --- --- --- ---	Print screen display Print selected parameter Print selected parameter group Print all parameters Print erroneous parameters Print header Print current set of limit values Print program stored in memory
PRINT:TYPE **PRINT:TYPE?**	**EPS**ON **RS**_**PUD**	---	Select printer type
MEASUREMENT:MODE:TESTLINES **MEAS**UREMENT:MODE:TESTLINES?	#0...	---	Define standard, test lines and zero reference pulse for current mode (*1
MEASUREMENT:MODE: NAME **MEAS**UREMENT:MODE: NAME?	#0...	---	Define name for current mode (*2
MEASUREMENT:MODE: PARDEF **MEAS**UREMENT:MODE: PARDEF?	**LOC**KED **UNL**OCKED	---	Disable softkeys in result display Enable softkeys in result display

Table 3-9aDevice-specific setting commands

Device Functions

Command	Data	Units	Description
INPUT **INP**UT?	**A** **D_A_A** **D_B_A** (*1 **B** **D_A_B** **D_B_B** **C** **D_A_C** **D_B_C** **SAB** **D_A_MEM** **D_B_MEM** **D_C_A** **D_SAB_A** **D_C_B** **D_SAB_B** **D_C_C** **D_SAB_C** **D_C_MEM** **D_SAB_MEM**	--	Test input and difference measurement
SYNCHRONIZATION **SYN**CHRONIZATION?	**INT**ERNAL **EXT**ERNAL	--	Synchronization
MEASUREMENT:**TIM**E **MEA**SUREMENT:**TIM**E?	**T1**_0 **T2**_5 **T5**_0 **T10**_0	--	Measurement time 1 s 2.5 s 5 s 10 s
MEASUREMENT:**HOL**D?	**OFF** **ON**	--	Get measurement hold status
MEASUREMENT:REF_STORE	--	--	Load current measurement values into reference memory. **Note:** *This command works only if the device is in the HOLD mode.*
MEASUREMENT: MODE	M1 M2 M3 M4 M5 M6 M7 M8		Measurement mode
OUTPUT_MARKER	**OFF** **ON**		Switch on/off marker pulses at monitor output
HEADER **HEA**DER?	**OFF** **ON**		Transmit queries without or with header
CLOCK:TIME? **CLO**CK:DATE?	11,05,30 26,JUN,90		Get time and date

Table 3-9b Device-specific setting commands

Examples:
Setting and reading device functions:

```
10 IECOUT 7, "INPUT B"
20 IECOUT 7, "SYNCHRONIZATION
EXTERNAL"
30 IECOUT 7, "MEASUREMENT:HOLD?"
40 IECIN 7, STRING$
```

Explanation of abbreviations reffing to INPUT command:

A	Input A
D_A_B	Difference measurement between inputs A and B
D_A_MEM	Difference measurement between input A and B measurement values stored in MEM
SAB	Inputs A + B for component signal Y/chrominance.

Parameter Commands

Command	Data	Units	Meaning
PARAMETER **PAR**AMETER?	<parametername> (*1	--	Setting and reading parameters
LIMIT:SET1:LOWER **LIMIT:SET1**:LOWER? **LIMIT:SET1**:UPPER **LIMIT:SET1**:UPPER?	-99999999.9 ... 99999999.9	(*2	Setting and output of limits of set 1 (*4
LIMIT:SET2:LOWER **LIMIT:SET2**:LOWER? **LIMIT:SET2**:UPPER **LIMIT:SET2**:UPPER?	-99999999.9 ... 99999999.9	(*2	Setting and output of limits of set 2 (*4
LIMIT:HYSTERESIS **LIMIT:HYSTERESIS**?	-99999999.9 ... 99999999.9	(*2	Hysteresis for limit monitoring (*4
LIMIT:REFERENCE **LIMIT:REFERENCE**?	-99999999.9 ... 99999999.9	(*2	Reference value
PARAMETER:**VALUE**? **PAR**AMETER:**NEXT**_VALUE?	<meßwert> (*3	--	Load measurement value into the output buffer immediately or upon appearance of the next valid measurement value. In case of signal error or WAIT, the measurement value 9999999 is always loaded immediately into the output buffer (*4
PARAMETER:**DIM**ENSION?	<dimension> (*2	--	Read parameter and unit of measurement
PARAMETER:**STA**TUS?	Number between 0 and 255, each bit being defined individually	--	Read parameter at moment when measurement was last made

Table 3-9c: Device-specific setting commands

(*1 Parameter name, see Table 3-12.
(*2 Units of measurement are a function of parameters, see Table 3-12.
(*3 Output string for measurement values depends on parameter, see section 3.3.4.4
(*4 All settings refer to the current parameter.

Table for command "PARAMETER:STATUS?"

This command provides a decimal number between 0 and 255, ie in binary an 8-bit number. The significance of each bit is shown in the following table to the right.

Bit 0 to 3 are set only if limit monitoring is switched on and none of bits 4 to 7 is set.

Bit No.	Deci-mal	Bit = 1: Meaning
0	0	Lower limit set 1 not reached
1	to	Upper limit set 1 exceeded
2	15	Lower limit set 2 not reached
3		Upper limit set 2 exceeded
4	16	Signal error
5	32	Parameter error
6	64	WAIT
7	128	1 = invalid status, since no parameter has been read

Parameter commands:

Command	Data	Unit	Description
PARAMETER **PAR**AMETER?	**DATA_**AMPL **FT_DIST** **ICPM**	--- --- ---	Setting and reading of parameters
PARAMETER:**SN_FIL**TER **PAR**AMETER:**SN_FIL**TER?	**SC_TR** **S_TR** **S_BP** **OFF**	--- --- --- ---	Activate colour-subcarrier trap 4) Activate bandstop filter 5) Activate bandpass filter Deactivate all filters
PARAMETER:**LEV**EL **PAR**AMETER:**LEV**EL? **PAR**AMETER:**LEV**EL:**DATA_**LINE **PAR**AMETER:**LEV**EL:**DATA_**LINE? **PAR**AMETER:**LEV**EL:**VTXT_** **PAR**AMETER:**LEV**EL:**VTXT?**	**DATA-**LINE **VTXT** 0.0001... 0.9999 1E-4... 0.9999	--- --- V --- V	Reference level for data line 4) Reference level for videotext line Adjust reference level for data line Adjust reference level for videotext line
PARAMETER:**LOCA**TION **PAR**AMETER:**LOCA**TION?	**T200NS** **T400NS**	--- ---	Time for measuring BASE LINE DIST 4)
PARAMETER:**M_VAL**UE? **PAR**AMETER:**MN_VAL**UE?	<MEASURE-MENT VALUE>	---	Load combined measurement values immediately or on next valid measurement values into output buffer 3)
PARAMETER:**GROUP**	**ON** **OFF**	--- ---	Include current parameter into group Remove current parameter from group
PARAMETER:**DIFF_MEAS**UREMENT	**ON** **OFF**	--- ---	Enable differential measurement of current parameter Disable differential measurement of current parameter

Table 3-9d Device-specific setting commands

1) "MEASUREMENT:MODE:TESTLINES #0..." defines the test lines and the timing programs for the current mode, and has the same function as the SETUP/TESTLINES menu. This command causes block data to be transferred; the data transfer is initiated by "#0". All subsequent data are to follow this character. The command line is to be terminated with a line-feed character.

The syntax is as follows:

MEASUREMENT:MODE:TESTLINES #0standard, test line, test line, ..., zero reference pulse_center, zero reference pulse_width, zero reference pulse_polarity

As many test lines have to be transferred as required by the appropriate standard (refer to Table 3-1 in Section SETUP/TESTLINES). Also the data for the zero reference pulse have to be transferred (refer to Table 3-11). If a syntax error or invalid standard codes/line numbers are detected, the actual setup is not changed. To check if the command was executed correctly, query the setup with "MEAS:MODE:TEST?" and compare with the previous command. After having received the setup data, the video analyzer requires approx. 1 second for processing of these data. Therefore, the setup command string should first be compared with the current setup to see whether a new initialization is required.

Table 3-9e: Coding of standards

Standard	Id No.
CCIR	1
NAT-BRD	2
NAT-UK1	3
NAT-UK2	4
USER1	5
D2-MAC	6
SECAM	7

Table 3-9f: Coding of zero reference pulse

Command Name	Description
Zero reference pulse_center	Position of pulse center, referred to start of line [µs]
Zero reference pulse_width	Pulse width [µs]
Zero reference pulse_polarity	"0" = positive polarity
	"1" = negative polarity

Example: - Mode 2 should be set for the NAT-UK2 standard, center of the zero reference pulse at 45 µs, a pulse width of 5 µs, and to negative polarity. The test lines should be as follows:

UK-IBA	in line 18
CCIR18	in line 19
BLACK	in line 22
BURST	in line 23
SYNC	in line 3
ZERO RP	in line 15
RED BAR	not measured -> line 0
FT-DIST	not measured -> line 0
V-DATA	in line 16

```
SETUP$ = "4,18,19,22,23,23,3,15,0,0,16,45,5,1" : REM setup command string
IECOUT 7,"HEADER OFF"
IECOUT 7,"MEAS:MODE M2" : REM select mode 2
IECOUT 7,"MEAS:MODE:TEST?" : REM query current setup
IECIN 7,CURRENT$
IF CURRENT$ <> SETUP$ THEN GOSUB TESTLINES : REM change only if required

TESTLINES:
COMMAND$ = "MEAS:MODE:TEST #0" + SETUP$ : REM generate command string
IECOUT 7,COMMAND$ : REM Wait approx. 1 second
RETURN
```

Note: *When interrogating the current setup with "MEAS:MODE:TEST?", no "#0" is output.*

2) This command allows to assign a name to the current mode. The syntax is as follows:
   MEAS:MODE:NAME #0...
   The name for the mode is to follow immediately the character "#0" and may have a length of up to seven alphanumeric characters.
3) If a measurement returns several measurement values, they can be queried using a single command. This is possible for: LUM NL, DIFF GAIN, DIFF PHASE, C NL GAIN, C NL PHASE, MULTIB1 through MULTIB6 and ICPM. The individual measurement values are separated with commas. If a measurement returns only a single measurement value, this command has the same result as "PAR:VALUE?".

Examples:

Note: Prior to executing the following examples, the controller must be set to the delimiter LF + EOI. With controllers from Rohde & Schwarz this is done by the command line "IECTERM 10" at the beginning of the program.

Get set parameter and select new parameter:

```
10 IECOUT 7, "PARAMETER?"
20 IECIN 7, OLDPAR$
30 IECOUT 7, "PARAMETER C_MULTIBURST"
```

Load measurement values of various parameters into the controller:

```
10 IECOUT 7, "PARAMETER BAR_AMPLITUDE"
20 IECOUT 7, "PARAMETER:VALUE?"
30 IECIN  7, VAL1$
40 IECOUT 7, "PARAMETER BAR_AMPLITUDE"
50 IECOUT 7, "PARAMETER:VALUE?"
60 IECIN  7, VAL2$
```

Set measurement conditions:

```
10 IECOUT 7, "PARAMETER BAR_AMPLITUDE":IECOUT 7,
  "PARAMETER:DEFINITION REL_NOM" or abbreviated form in program message
10 IECOUT 7, "PAR BAR;PAR:DEF REL_N"
20 IECOUT 7, "PAR C_L_G;TESTSIG CCIR17"
```

Load measurement conditions into the controller:

```
10 IECOUT 7, "PARAMETER BAR_AMPLITUDE":IECOUT 7
  , "PARAMETER:DEFINITION?"
20 IECIN  7, PARADEF$
```

Set limits:

```
10 IECOUT 7, "PARAMETER BAR_AMPLITUDE"
20 IECOUT 7, "LIMIT:SET1:LOWER  -10PCT"
30 IECOUT 7, "LIMIT:SET1:UPPER 7 10PCT"
40 IECOUT 7, "LIMIT:SET2:LOWER  -20PCT"
50 IECOUT 7, "LIMIT:SET2:UPPER  20PCT"
```

Load limits into the controller:

```
10 IECOUT 7, "LIMIT:SET1:LOWER?"
20 IECIN  7, LOWLIM$
30 IECOUT 7, "LIMIT:SET1:UPPER?"
40 IECIN  7, UPLIM$
```

Signal and Parameter Monitoring

Command	Data	Units	Description
MONITORING **MON**ITORING?	OFF ON	--	Enable and disable monitoring
" **:C**HECK " **:C**HECK?	SELECTED_PARAMETER DEFINED_GROUP ALL_PARAMETER		Monitoring mode
" **:R**ESET	--	--	Resetting all PRINT and STORE commands to OFF
" **:D**ISPLAY " **:D**ISPLAY?	SET1 SET2	--	Local display of limits
" **:SE**T1? " **:SE**T2? " : **P**ARAMETER ERROR? " **:SI**GNAL ERROR?	OK | UL | LL | BL (*1 OK ERROR	--	Get limit error or parameter and signal errors
" : " **:P**RINT " : " **:P**RINT?	OFF SELECTED_PARAMETER DEFINED_GROUP ALL_PARAMETER	--	Select log format of printout
" : " **:S**TORE " : " **:S**TORE?	OFF SELECTED_PARAMETER DEFINED_GROUP ALL_PARAMETER	--	Select log format for memory card
" : **SI**GNAL ERROR:**P**RINT?			Switch on printout
" : " **:S**TORE			Store log on memory card

Table 3-11: Signal and parameter monitoring

(*1 OK = limit values not exceeded or limit monitoring switched off
UL = upper limit exceeded
LL = lower limit exceeded
BL = both limits exceeded
(only possible with parameters yielding two measurement values)

Examples:

Enable monitoring of limit sets 1 and 2.
All parameters are to be monitored.
When limit sets 1 and 2 are exceeded, log it on the printer; log the parameter group if limit set 1 is exceeded, log all parameters if limit set 2 is exceeded.

```
10 REM *** DEFINE MONITORING ***
20 IECOUT 7, "MONITORING:RESET"
30 IECOUT 7, "MONITORING:SET1:PRINT DEFINED_GROUP"
40 IECOUT 7, "MONITORING:SET2:PRINT ALL_PARAMETER"
50 IECOUT 7,"MONITORING:CHECK ALL_PARAMETER"
60 REM *** START MONITORING ***
70 IECOUT 7, "MONITORING ON"
```

Parameter Names and Units of Measurement

The following table shows the parameter names and the units for setting and reading parameters, test conditions and limits and for calling up measurement values.

Parameter	Parameter Name	Units
Luminance bar amplitude	**BAR_AM**PLITUDE	PCT or V (*2
Tilt	**TILT**	PCT
Base line distortion	**BASELI**NE_DIST	PCT
Sync pulse amplitude	**SYNC_A**MPL	PCT or V (*2
Luminance nonlinearity	**LUM_NO**NLINEARITY	PCT
2T amplitude	**ZT_AMP**LITUDE(*1	PCT
2T K faktor	**ZT_K_F**ACTOR (*1	PCT
Residual picture carrier amplitude	**RES_PC**	PCT
Chrominance/luminance gain	**C_L_GA**IN	PCT
Chrominance/luminance delay	**C_L_DEL**	NS
Chrominance/luminance intermodulation	**C_L_I**NTERM	PCT or V (*2
Burst amplitude	**BURST**_AMPL	PCT
Differential gain	**DIFF_GA**IN	PCT
Differential phase	**DIFF_P**HASE	DEG
Nonlinearity of colour subcarrier gain	**C_NL_G**AIN	PCT
Nonlinearity of colour subcarrier phase	**C_NL_P**HASE	DEG
Multiburst, 1st packet	**A_MUL**TIBURST	PCT
Multiburst, 2nd packet	**B_MUL**TIBURST	PCT
Multiburst, 3rd packet	**C_MUL**TIBURST	PCT
Multiburst, 4th packet	**D_MUL**TIBURST	PCT
Multiburst, 5th packet	**E_MUL**TIBURST	PCT
Multiburst, 6th packet	**F_MUL**TIBURST	PCT
Luminance signal-to-noise ratio	**SN**	DB
Subcarrier/sound carrier intermodulation	**C_SND_I**NTERM	DB
Hum	**HUM**	DB
Extern DC	**EXTERN**_DC	V

Table 3-12: Parameter names and units of measurement

(*1 As the standard does not allow leading digits, the digit "2" has been replaced by the letter "Z".

(*2 With these parameters the unit is determined by the selected definition. Only the basic unit PCT (percent) may be used to set the limit values. (see 3.3.4.4 "Parameter Commands").

Note: When abbreviating parameter names, use at least 6 characters even if the name is clearly identified by fewer characters. This will prevent ambiguity if we define new parameters.

Output format of measurement values

When transmission with header is selected (see Table 3-9), the complete parameter name is output. In line with the standard it is followed by a space and the numerical measurement value. Leading zeros and the "+" sign are suppressed. The measurement value is always output in the default unit (see Table 3-12).

If several default units are possible, the current setting can be called up using the command "PARAMETER:DIMENSION?" (see Table 3-10).

Example: "98.0"
"1.5 E-9"
"9.0"

If a measurement value is not valid, "99999999.9" will be output. The reason can be found out by reading the event status register A (ERA, see section 3.3.5).

Example: "99999999.9"

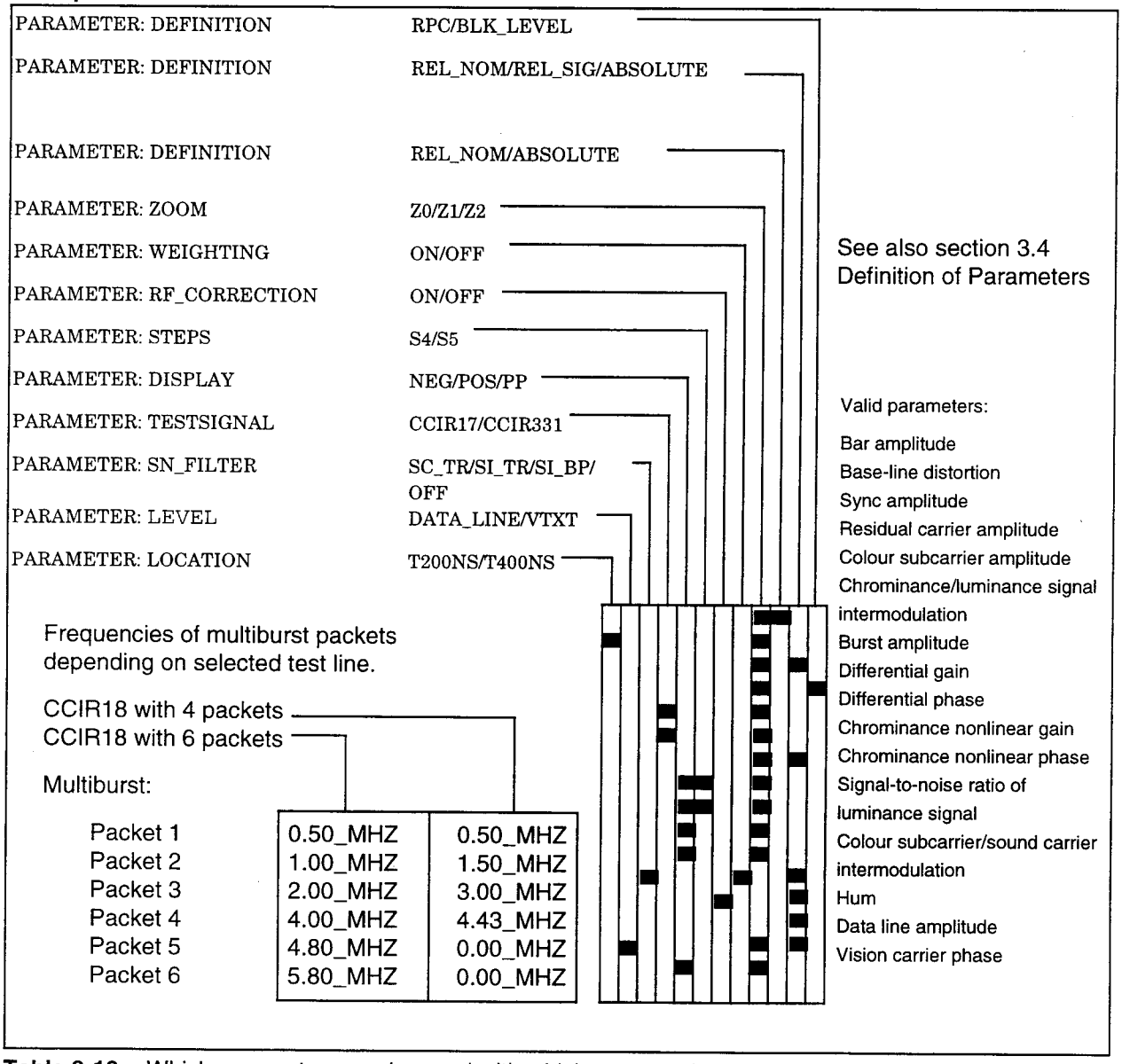


Table 3-13: Which parameters can be used with which commands

Output Format of Measurement Values

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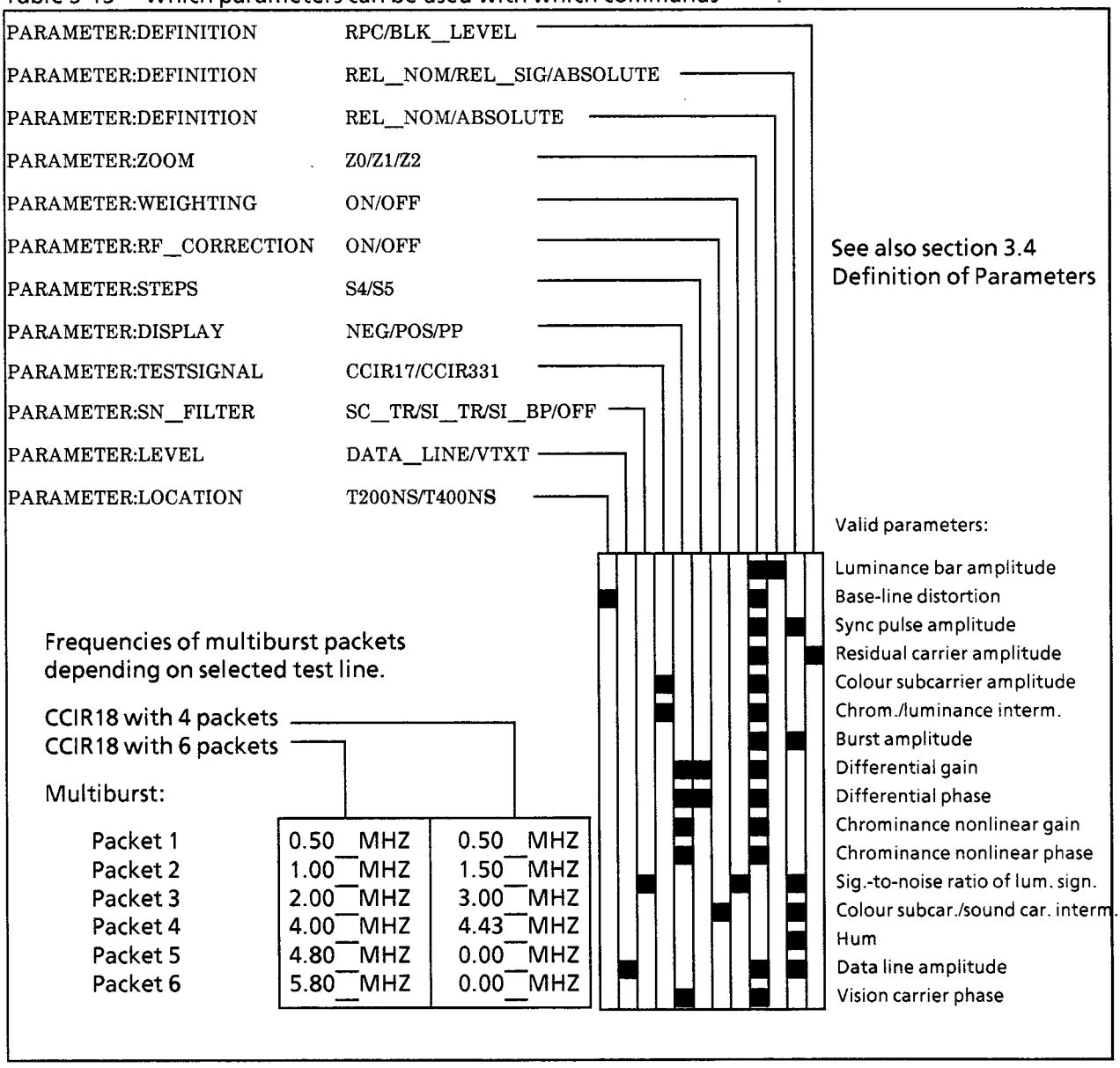
Example: "99999999.9"

Table 3-13 Which parameters can be used with which commands



3.3.5 Service Request and Status Registers

The figure below shows the status registers and how they are linked together. In line with IEEE 488.2, the status byte (STB) and its enable register (SRE), which are also used with older devices, are supplemented by the event status register (ESR) and the associated event status enable register (ESE).

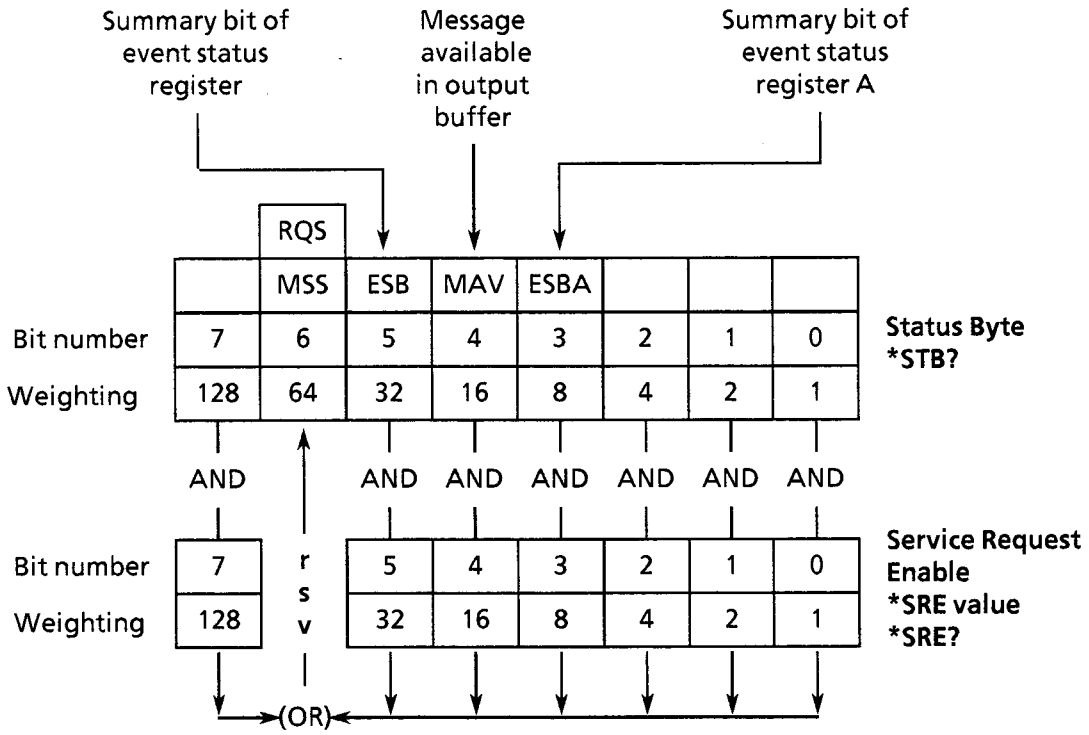


Fig. 3-40 Status Byte

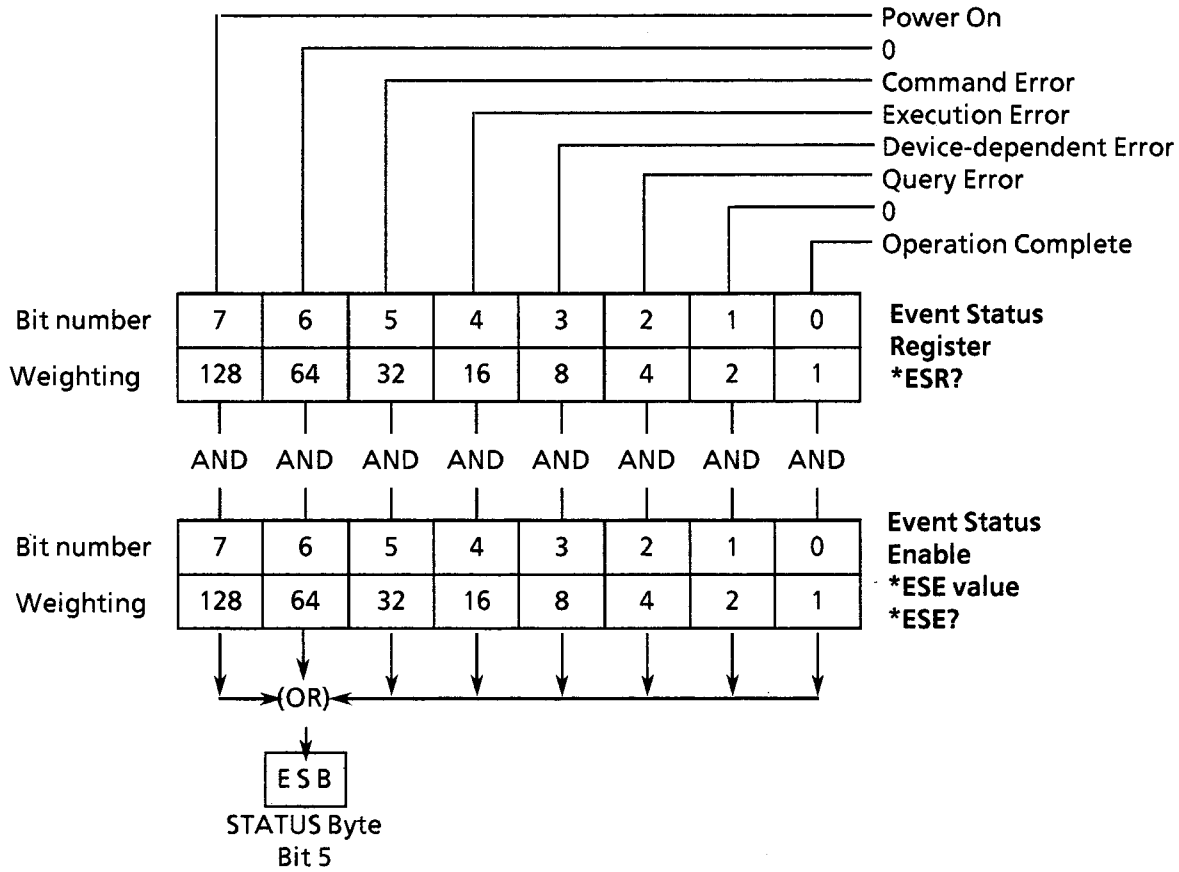


Fig. 3-41 Event Status Register

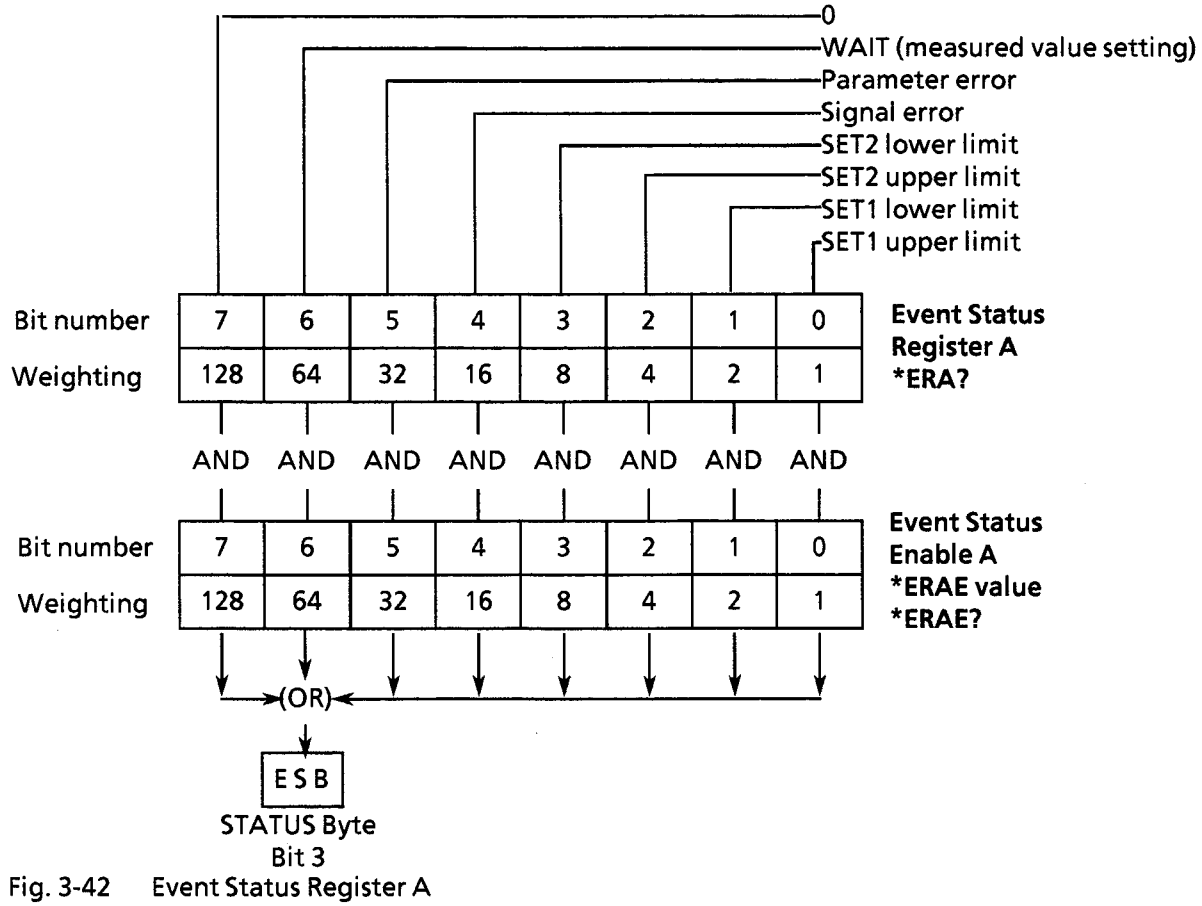


Fig. 3-42 Event Status Register A

Bit number	Description
7	**Power On** This bit is set when the UAF is switched on or when the power returns after an AC supply failure.
6	*Reserved for future applications*
5	**Command Error** This bit is set if one of the following errors is detected during the analysis of the commands received: • syntax error • incorrect unit of measurement • incorrect header • combination of a numerical value with a header that cannot be followed by a numerical value.
4	**Execution Error** This bit is set if one of the following errors is detected during the execution of the commands received: • A numerical value is outside of the legal range (of the corresponding parameter). • The command received is not compatible with the current device setup.
3	**Device-dependent Error** This bit indicates that an error has occurred which is neither a command, a query, nor an execution error.
2	**Query Error** This bit is set • if the controller tries to read data from the UAF without having issued a query, • if data available in the output buffer of the UAF have not been read out and if a new command is sent to the UAF instead. In the latter case, the output buffer will be cleared.
1	*Reserved for future applications*
0	**Operation Complete** This bit is set in response to the commands "OPC" and "OPC?" if all preceding commands have been executed.

Table 3-14 Description of event status register

Example: Reading the Event Status Register

```
10 IECOUT 7, "*ESR?"
20 IECIN 7, STATUS $
```

Bit number	Description
7	*Reserved for future applications*
6	WAIT, measured value not yet settled
5	Parameter error; it was not possible to measure the parameter, eg because no test signal was present.
4	Signal error
3	Lower limit of SET2 exceeded
2	Upper limit of SET2 exceeded
1	Lower limit of SET1 exceeded
0	Upper limit of SET1 exceeded

Table 3-15 Description of event status register A

Example: Reading of event status register A

```
10 IECOUT 7, "*ERA?"
20 IECIN 7, STATUS $
```

Using the service request enable register (SRE) the user can determine if the ESB, ESBA and/or MAV bits of the status byte are to set the RQS bit of the status byte and if the SRQ line is to be activated causing a service request to be sent to the controller. As every bit in the service request enable register is assigned a corresponding bit in the status byte, the following configurations (see Table 3-16) or combinations of them are possible.

Contents of SRE (decimal)	Bit No. set in SRE	Effect
0	--	No service request
8	3	Service request if the ESBA bit is set (at least 1 bit in the event status register A is set and not masked)
16	4	Service request if the MAV bit is set (message in the output buffer)
32	5	Service request if the ESB bit is set (at least 1 bit in the event status register is set and not masked)

Table 3-16 Description of service request enable register

The service request enable register (SRE) is written to with the command "***SRE value**" ("value" being the contents in decimal) and can be read with the command ***SRE?**. This register is set to 0 upon power-on when the power-on-status-clear flag is 1; this inhibits the service request function of the UAF. The SRE register is not changed by other commands or interface messages (DCL, SDC).

Several devices may simultaneously issue a service request, the open-collector drivers acting as an OR function on the SRQ line. To identify the device that issued the service request, the controller has to read the status bytes of the devices. A set RQS bit (bit 6/DIO 7) shows that the device is sending a service request.

The status byte of the UAF can be read in the following ways:

- By the query "***STB?**"

  The contents of the status byte are output in decimal. Reading does not change the status byte nor does it clear the service request.

- By a serial poll

  (With R&S controllers: IECSPL address, status %.) The contents are transferred in the form of a byte, which sets bit RQS to zero and disables the service request; the other bits of the status byte are not changed.

The status byte is cleared:

- By the command *CLS

  This command clears the event status register and the output buffer, which sets the ESB and MAV bits of the status byte to zero. This causes the RQS bit and the service request to be cleared.

- By reading the event status register (***ESR?**) or clearing the event status enable register (***ESE**) and reading the contents of the output buffer.

3.3.6 Resetting Device Functions

The table below holds the various commands and events causing a reset of individual device functions.

Event	Switching on operating voltage		DCL, SDC (Device Clear, Selected Device Clear)	Commands	
	Power-On-Status-Clear-Flag			*RST	*CLS
	0	1			
Basic device setup	--	--	--	yes	--
Clearing event status register ESR	yes	yes	--	yes	yes
Clearing ESE and SRE registers	--	yes	--	--	--
Clearing output buffer	yes	yes	yes	--	yes
Clearing service request	yes	1)	2)	3)	yes
Resetting command processing and clearing input buffer	yes	yes	yes	--	--

Table 3-17 Resetting device functions

1) Yes, but "service request on power on" possible.
2) Yes, if only caused by a message in the output buffer.
3) Yes, if not caused by a message in the output buffer.

3.3.7 Timing of Command Execution and Synchronization

Commands received by the UAF are first stored in an input buffer which can hold a maximum of 2560 characters. After the delimiter has been received, the commands are executed in the sequence in which they have been sent. During this time, the IEC/IEEE bus may be used for communication with other devices. Command lines exceeding the input buffer capacity are processed in several parts. The bus is occupied during this time.

OPERATION COMPLETE:

Commands ***OPC** and ***OPC?** (operation complete) are used for signalling back the time when the execution of the commands received has been terminated.

***OPC** sets bit 0 in the event status register so that a service request can be triggered when all preceding commands have been executed.

***OPC?** makes a message in the output buffer ready for use and sets bit 4 (MAV) in the status byte.

WAIT TO CONTINUE:

Within a command line sychronization can be obtained by ***WAI**, ie all subsequent commands will only be executed after complete execution of the commands received previously.

3.3.8 Error Handling

All errors detected by the UAF in connection with IEC/IEEE-bus control are signalled by setting a bit (bit 2, 4 or 5) in the event status register (see Table 3-14). Functional errors are signalled by bit 3. These bits remain set until the event status register is read out or cleared with commands ***RST** or ***CLS**. This complies with IEEE 488.2 and permits issuing a service request and program-controlled error evaluation.

3.4 Definition of Parameters

All parameters are measured in compliance with CCIR Rec. 569 for automatic evaluation of TV test lines.

3.4.1 Luminance Parameters

3.4.1.1 BAR AMPL - Luminance Bar Amplitude

Test signal:

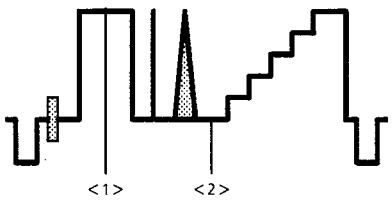


Fig. 3-43 Luminance bar amplitude of CCIR 17

Parameter description:

The luminance bar amplitude is referred to the 700-mV nominal value. The luminance bar level is also the reference value for other parameters. In formulas it is abbreviated to BAR AMPL.

Definition:

$$abs\,BAR\ AMPL = <1> - <2>\ [V]$$

$$rel\,BAR\ AMPL = \frac{BAR\ AMPL - 700\,mV}{700\,mV} \times 100\,[\%]$$

Definition for difference measurement:

$$rel\,BAR\ AMPL_{DIFF} = \frac{BAR\ AMPL - BAR\ AMPL_R}{BAR\ AMPL_R} \times 100\,[\%]$$

($BAR\ AMPL_R$ = *luminance bar amplitude of reference signal*)

Additional possibilities:

Definition (DEFINITION):
R:NOM relative referred to 700 mV
ABS absolute level

Error messages related to parameter:

none

3.4.1.2 TILT - Tilt of Luminance Bar

Test signal:

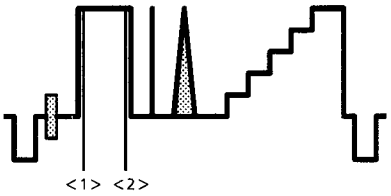


Fig. 3-44 Luminance bar of CCIR 17

Parameter description:

Luminance bar tilt referred to luminance bar amplitude.

The measurement is carried out 1 µs after the 50 % value of the leading edge and 1 µs before the 50 % value of the trailing edge of the luminance bar.

Definition:

$$TILT = \frac{<2> - <1>}{BAR\ AMPL} \times 100\,[\%]$$

Definition for difference measurement:

$TILT_{DIFF} = TILT - TILT_R\ [\%]$

($TILT_R$ = Dachschräge des Referenzsignals)

Additional possibilities:

none

Error messages related to parameter:

none

3.4.1.3 2T AMPL - 2T Pulse Amplitude

Test signal:

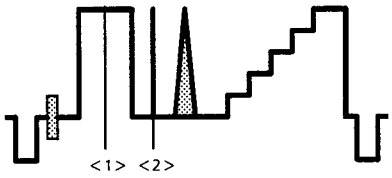


Fig. 3-45 2T pulse of CCIR 17

Parameter description:

Amplitude of 2T pulse referred to luminance bar amplitude.

Definition:

$$rel\,2T\,AMPL = \frac{<2> - <1>}{BAR\,AMPL} \times 100\,(\%)$$

Definition for difference measurement:

$$rel\,2T\,AMPL_{DIFF} =$$

$$\left(\frac{(<2> - <1>)\,x\,BAR\,AMPL_R}{(<2R> - <1R>)\,x\,BAR\,AMPL} - 1\right) \times 100\,\%$$

($<2R> - <1R>$ = 2T amplitude of reference signal)

Additional possibilities:

none

Error messages related to parameter:

none

3.4.1.4 SYNC AMPL - Sync Pulse Amplitude

Test signal:

Sync pulse on line 3 or on any line of the active picture region. The selection is made in the SETUP menu when determining the test lines.

Line 3

Any line

Parameter description:

Amplitude of sync pulse; it can be referred to the value of the signal amplitude or to nominal level.

Definition:

$$abs\,SYNC\,AMPL = <1> - <2>\,[V]$$

$$rel\,SYNC\,AMPL = \frac{SYNC\,AMPL - REF.}{REF..} \times 100\,[\%]$$

REFERENCE: Selectable between 3/7 x BAR, ??? x zero reference to signal amplitude or to 300-mV nominal value.

Definition for difference measurement:

$$rel\,SYNC\,AMPL_{DIFF} =$$

$$\left(\frac{abs\,SYNC\,AMPL\,x\,REF._R}{abs\,SYNC\,AMPL_R\,x\,REF.} - 1\right) \times 100\,[\%]$$

($abs\,SYNCAMPL_R$ = sync pulse amplitude of reference signal)

Additional possibilities:

Definition (DEFINITION):

R:NOM relative with reference to nominal value 300 mV

R:SIG relative with reference to signal amplitude 3/7 x bar amplitude

ABS absolute level

Error messages related to parameter:

none

3.4.1.5 LUM NL - Luminance Nonlinearity

Test signal:

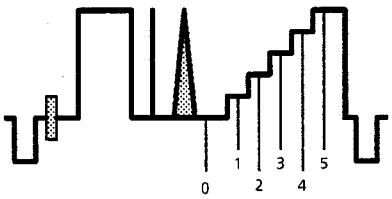


Fig. 3-46: 5-step grey pedestal of CCIR 17

Parameter description:

Nonlinearity of luminance signal. The difference between the largest and the smallest step is referred to the largest step.

Definition:

a) Determine staircase step size

T1 = <1> - <0>
T2 = <2> - <1>
T3 = <3> - <2>
T4 = <4> - <3>
T5 = <5> - <4>

b) Find largest and smallest step

T_{max} = largest step
T_{min} = smallest step

c) Calculate the parameter

$$LUM\,NL = \frac{T_{max} - T_{min}}{T_{max}} \times 100\,[\%]$$

Definition for difference measurement:

a) Normalize reference signal to signal amplitude and calculate the difference.

$$N = \frac{<5> - <0>}{<5R> - <0R>}; \quad Tsoll = \frac{<5> - <0>}{5}$$

T1 = (<1> - <0>) - (<1R> - <0R>) x N + T_{nom}
T2 = (<2> - <1>) - (<2R> - <1>) x N + T_{nom}
T3 = (<3> - <2>) - (<3R> - <2>) x N + T_{nom}
T4 = (<4> - <3>) - (<4R> - <3>) x N + T_{nom}
T5 = (<5> - <4>) - (<5R> - <4>) x N + T_{nom}

b) and c) same as above

Additional possibilities:

none

Error messages related to parameter:

none

3.4.1.6 BASE LINE DIST - Black Level Distortion on Luminance Bar

Measured signal:

CCIR17, UK-ITS2, UK-IBA, CCIR17-S at 400 ns and CCIR330, UK-ITS2 at 200 ns.

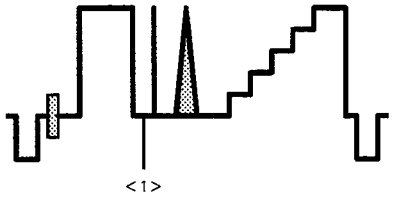


Fig. 3-47: Luminance bar of CCIR 17

Parameter description:

Distortion of the signal 400 ns or 200 ns after the 50-% value of the trailing edge of the luminance bar, referred to the luminance bar amplitude.

Definition:

$$BASE\,LINE\,DIST = \frac{<1>}{BAR\,AMPL} \times 100\,[\%]$$

Definition for difference measurement:

$$BASELINE\,DIST_{DIFF} = BASELINE\,DIST - BASLINE\,DIST_R\,[\%]$$

($BASELINE\,DIST_R$ = baseline distortion of reference signal)

Additional control capabilities:

LOCATION:

200ns The measurement is performed 200 ns after the trailing edge

400ns The measurement is performed 400 ns after the trailing edge

Note: Measurements at 200 ns require option B1 to be installed.

Error messages related to parameter:

none

3.4.1.7 2T K Factor

Test signal:

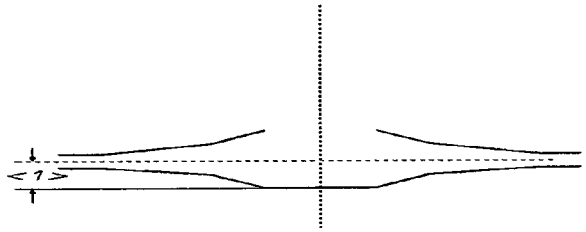


Fig. 3-48 2T pulse of CCIR 17

Parameter description:

Assessment of 2T pulse by means of standardized 2T K mask.

Definition:

$$2T\,K\,FACTOR = \frac{<1>}{4 \times 2T\ AMPL} \times 100\,[\%]$$

Definition for difference measurement:

$$2TK\,FACTOR_{DIFF} = 2T\,K\,FACTOR - 2TKFACTOR_R\,[\%]$$

($2T\,K\,FACTOR_R$ = 2T K factor of reference signal)

Additional possibilities:

none

Error messages related to parameter:

TESTSIG << or TESTSIG >>
The test signal (2T pulse) is smaller than -50% or larger than + 50%.

3.4.1.8 RPC - Residual Picture Carrier

Test signal:

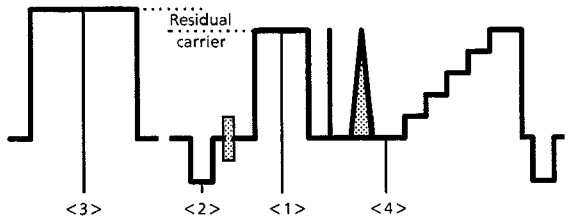


Fig. 3-49 Zero reference pulse and luminance bar of CCIR 17

Parameter description:

Amplitude-modulated vision transmission requires a residual carrier to permit simultaneous frequency-modulated sound transmission. For this parameter, the residual carrier amplitude is referred to the maximum amplitude of the (demodulated) vision carrier.

The residual carrier amplitude is the difference between the zero reference pulse and the luminance bar. The maximum amplitude of the vision carrier is obtained from the difference between the zero reference pulse and the sync level.

As an alternative, the black (blanking) level can be measured.

Definition:

$$RES\,PC = \frac{<3> - <1>}{<3> - <2>} \times 100\,[\%]$$

$$BLKLEVEL = \frac{<3> - <4>}{<3> - <2>} \times 100\,[\%]$$

Definition for difference measurement:

$$RES\,PC_{DIFF} = RES\,PC - RESPC_R$$

($RES\,PC_R$ = residual carrier amplitude of reference signal)

Additional possibilities:

Definition (DEFINITION):

RPC	residual picture carrier
BLKLEVEL	black (blanking) level

Error messages related to parameter:

TESTSIG <<
There is no zero reference pulse or the zero reference pulse is smaller than the luminance bar.

3.4.2 Colour Subcarrier Parameters

3.4.2.1 C/L GAIN - Chrominance/Luminance Gain

Test signal:

The parameter is measured in the two test lines shown below. The measured value to be displayed can be selected by means of a softkey.

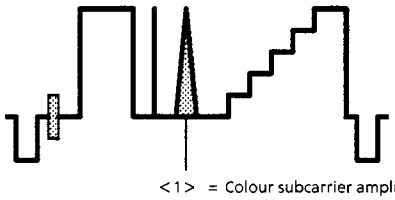


Fig. 3-50 20T pulse of CCIR 17

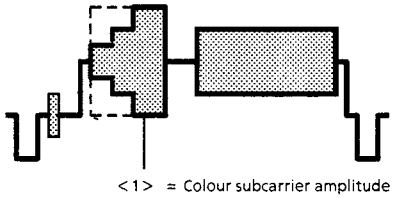


Fig. 3-51 Colour subcarrier packet of CCIR 331

Parameter description:

Colour subcarrier amplitude referred to luminance bar amplitude.

Definition:

$$rel\,C/L\,GAIN = \frac{<1> - BAR\,AMPL}{BAR\,AMPL} \times 100\,[\%]$$

Definition for difference measurement:

$$rel\,C/L\,GAIN = \left(\frac{<1> \times BAR\,AMPL_R}{<1R> \times BAR\,AMPL} - 1\right) \times 100\,[\%]$$

($<1R>$ colour sucarrier amplitude of reference signal)

($BAR\,AMPL_R$ luminance bar amplitude of reference signal)

Additional possibilities:

Test signal (TESTSIGNAL):
CCIR17
CCIR331

Error messages related to parameter:

none

3.4.2.2 C/L DELAY - Chrominance/Luminance Delay

Test signal:

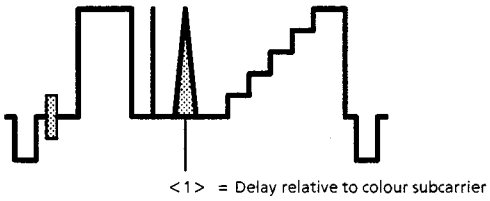


Fig. 3-52 20T pulse of CCIR 17

Parameter description:

Delay between colour subcarrier and luminance signal of 20T pulse.

Definition:

$C/L\,DELAY =$ *delay between the envelope of the 20T luminance component and the envelope of the 20T chrominance component in ns*

Definition for difference measurement:

$$C/L\,DELAY_{DIFF} = C/L\,DELAY - C/L\,DELAY_R$$

($C/L\,DELAY_R$ delay difference in reference signal)

Additional possibilities:

none

Error messages related to parameter:

none

3.4.2.3 C/L INTERM - Chrominance/Luminance Intermodulation

Test signal:

The parameter is measured in the two test lines shown below. The measured value to be displayed can be selected by means of a softkey.

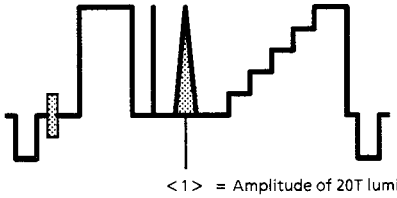


Fig. 3-53 20T pulse of CCIR 17

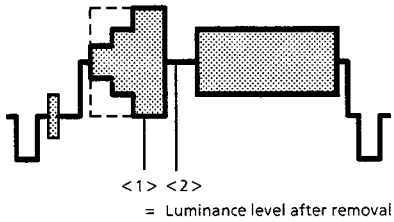


Fig. 3-54 Colour subcarrier packet of CCIR 331

Parameter description:

Intermodulation between chrominance and luminance.

Definition of signal complying with CCIR 17:

$$rel\,C/L\,GAIN = \frac{2\times<1> - BAR\,AMPL}{BAR\,AMPL} \times 100\,[\%]$$

Definition of signal complying with CCIR 331:

$$rel\,C/L\,GAIN = \frac{<2> - <1>}{BAR\,AMPL} \times 100\,[\%]$$

Definition for difference measurement with CCIR17:

$$rel\,C/C\,INT_{DIFF} = \left(\frac{<1> \times BARAMP_R}{<1R> \times BAR\,AMPL} - 1\right) \times 100\,[\%]$$

($<1R>$ amplitude of 20T luminance component of reference signal)

($BAR\,AMPL_R$ luminance bar amplitude of reference signal)

Definition for difference measurement with CCIR331:

$$rel\,C/L\,INT_{DIFF} = rel\,C/L\,GAIN - rel\,C/L\,GAIN_R\,[\%]$$

($rel\,C/I\,GAIN_R$ luminance bar amplitude of reference signal)

Additional possibilities:

TESTSIGNAL:
CCIR17
CCIR331

Error messages related to parameter:

none

3.4.2.4 BURST AMPL - Burst Amplitude

Test signal:

Colour burst on any signal line

<1> = Amplitude of burst pulse

Parameter description:

Amplitude of colour burst either referred to 3/7 x signal amplitude or to 300 mV (nominal value).

Definition:

$$abs\,BURST\,AMPL = <1>\ \ [V]$$

$$rel\,BURST\,AMPL = \frac{<1> - REFERENCE}{REFERENCE} \times 100\,[\%]$$

$REFERENCE$ = $^{3}/_{7}$ x BAR (signal) or 300 mV (nominal value)

Definition for difference measurement:

$$abs\,BURST\,AMPL_{DIFF} = <1> - <1_R>\ \ [V]$$

$$rel\,BURST\,AMPL_{DIFF} = \left(\frac{<1> \times REFERENCE_R}{<1R> \times REFERENCE} - 1\right) \times 100\,[\%]$$

($<1R>$ burst amplitude of reference signal)

($REFERENCE_R$ luminance bar amplitude of reference signal)

Additional possibilities:

Definition (DEFINITION):

R:NOM	relative with reference to nominal value (300 mV)
R:SIG	relative with reference to signal amplitude 3/7 x bar amplitude
ABS	absolute level

Error messages related to parameter:

none

3.4.2.5 DIFF GAIN - Differential Gain

Test signal:

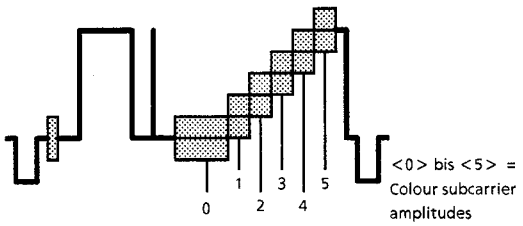


Fig. 3-55 Grey pedestal with superimposed colour subcarrier acc. to CCIR 330

Parameter description:

The colour subcarrier amplitude is a function of the luminance level. The colour burst on the black level is used as the reference. The differences between the amplitude of this colour burst and the amplitudes of all other bursts on the grey pedestal are calculated as follows. The positive distortion is obtained from the greatest positive difference, whereas the negative distortion is determined by the greatest negative difference.

These two values are either displayed simultaneously or added up and displayed as a sum (peak-to-peak).

Definition:

a) Calculate the level differences:

D1 = <1> - <0>
D2 = <2> - <0>
D3 = <3> - <0>
D4 = <4> - <0>
D5 = <5> - <0>

b) Determine the greatest differences:

D_{pos} = greatest positive difference
D_{neg} = greatest negative difference

c) Calculate the parameters:

$$DIFF\ GAIN\ pos = \frac{D_{pos}}{<0>} \times 100\,[\%]$$

$$DIFF\ GAIN\ neg = \frac{D_{neg}}{<0>} \times 100\,[\%]$$

$$DIFF\ GAIN\ pp = \frac{D_{pos} - D_{neg}}{<0>} \times 100\,[\%]$$

Definition for difference measurement:

a) Calculate the level differences taking into account the distortion of the reference signal.

$$N = \frac{<0>}{<0R>}$$

D1 = (<1> - <0>) - (<1R> - <0R>) x N
D2 = (<2> - <0>) - (<2R> - <0R>) x N
D3 = (<3> - <0>) - (<3R> - <0R>) x N
D4 = (<4> - <0>) - (<4R> - <0R>) x N
D5 = (<5> - <0>) - (<5R> - <0R>) x N

b) and c) same as above

Additional possibilities:

Measured value displayed (DISP):
NEG:POS negative and positive distortion
PP sum (peak-to-peak)

Assessed steps (STEPS):
4: steps 1 to 4
5: steps 1 to 5

Error messages related to parameter:

TESTSIG <<
Test signal (colour subcarrier amplitude) smaller than -80%

3.4.2.6 DIFF PHASE - Differential Phase

Test signal:

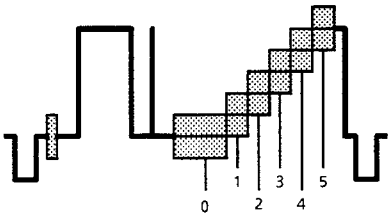


Fig. 3-56 Staircase with superimposed colour subcarrier acc. to CCIR 330

Parameter description:

The colour subcarrier phase is a function of the luminance signal modulation. The colour burst on the black level is the reference. The differences between the phase of this colour burst and the phases of all other bursts on the grey pedestal are calculated as follows . The positive distortion is obtained from the greatest positive difference, the negative distortion from the greatest negative difference.

These two values are either displayed simultaneously or added up and displayed as a sum (peak-to-peak).

Definition:

a) Calculate the differences:

D1 = <1> - <0>
D2 = <2> - <0>
D3 = <3> - <0>
D4 = <4> - <0>
D5 = <5> - <0>

b) Determine the greatest differences:

D_{pos} = greatest positive difference
D_{neg} = greatest negative difference

c) Calculate the parameters:

$$DIFF\ PHASE\ pos = \frac{D_{pos}}{<0>} \times 100\,[\%]$$

$$DIFF\ PHASE\ neg = \frac{D_{neg}}{<0>} \times 100\,[\%]$$

$$DIFF\ PHASE\ pp = \frac{D_{pos} - D_{neg}}{<0>} \times 100\,[\%]$$

Definition for difference measurement:

a) Calculate the phase differences taking into account the distortion of the reference signal.

D1 = (<1> - <0>) - (<1R> - <0R>)
D2 = (<2> - <0>) - (<2R> - <0R>)
D3 = (<3> - <0>) - (<3R> - <0R>)
D4 = (<4> - <0>) - (<4R> - <0R>)
D5 = (<5> - <0>) - (<5R> - <0R>)

b) and c) same as above

Additional possibilities:

Measured value displayed (DISP):
NEG:POS negative and positive distortion
PP sum (peak-to-peak)

Assessed steps (STEPS):
4: steps 1 to 4
5: steps 1 to 5

Error messages related to parameter:

TESTSIG <<
Test signal (colour subcarrier amplitude) smaller than -80%.

3.4.2.7 C NL GAIN - Gain Nonlinearity of Colour Subcarrier

Test signal:

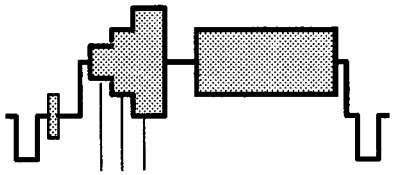


Fig. 3-57 Stepped colour burst of ccir 331

Parameter description:

Gain nonlinearity of the colour subcarrier is a function of the colour subcarrier amplitude. As a reference, the second colour burst is used. If the signal is not distorted, the amplitude of this second burst is three times that of the first burst but three fifths of that of the third burst. After normalization of the first and third bursts to the second burst, the gain differences are calculated. The positive distortion is obtained from the positive difference, the negative distortion from the negative difference.

The two values are either displayed simultaneously or added up to display their sum (peak-to-peak).

Definition:

a) Calculate the differences:

D1 = 3 x <1> - <2>
D2 = $^3/_5$ x <3> - <2>

b) Determine the differences:

D_{pos} = positive difference
D_{neg} = negative difference

c) Calculate the parameters:

$$C\,NL\,GAIN\,pos = \frac{D_{pos}}{<0>} \times 100\,[\%]$$

$$C\,NL\,GAIN\,neg = \frac{D_{neg}}{<0>} \times 100\,[\%$$

$$C\,NL\,GAIN\,pp = \frac{D_{pos} - D_{neg}}{<0>} \times 100\,[\%]$$

Definition for difference measurement:

a) Normalize reference signal to signal amplitude and determine the differences:

$$N = \frac{<2>}{<2R>} ;$$

$$D1 = (3 \times <1> - <2>) - (3 \times <1R> - <2R>) \times N$$

$$D2 = (^3/_5 \times <3> - <2> - (^3/_5 \times <3R> - <2R>) \times N$$

b) and c) same as above

Additional possibilities:

Measured value displayed (DISP):
NEG:POS negative and positive distortion
PP sum (peak-to-peak)

Error messages related to parameter:

TEST SIG?
Test signal (multi-pedestal colour burst) not present

3.4.2.8 C NL PHASE - Phase Nonlinearity of Colour Subcarrier

Test signal:

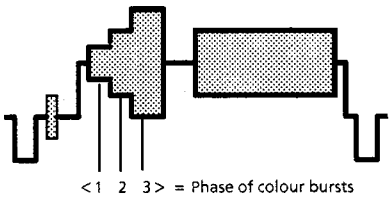


Fig. 3-58 Stepped colour burst of CCIR 331

Parameter description:

Phase nonlinearity of the colour subcarrier is a function of the colour subcarrier amplitude. The second colour burst is used as the reference. The differences between the phase of the second burst and the phases of the two other bursts are calculated. The positive departure is obtained from the positive difference, the negative departure from the negative difference.

The two values are either displayed simultaneously or added up to display their sum (peak-to-peak).

Definition:

a) Calculate the differences:

D1 = <1> - <2>
D2 = <3> - <2>

b) Determine the differences:

D_{pos} = positive difference
D_{neg} = negative difference

c) Calculate the parameters:

$$C\,NL\,PHASE\,pos = \frac{D_{pos}}{<0>} \times 100\,[\%]$$

$$C\,NL\,PHASE\,neg = \frac{D_{neg}}{<0>} \times 100\,[\%]$$

$$C\,NL\,PHASE\,pp = \frac{D_{pos} - D_{neg}}{<0>} \times 100\,[\%]$$

Definition for difference measurement:

a) Calculate the differences taking into account the distortion of the reference signal.

$$D1 = (<1> - <2>) - (<1R> - <2R>)$$

$$D2 = (<3> - <2>) - (<3R> - <2R>)$$

b) and c) same as above

Additional possibilities:

Measured value displayed (DISP):
NEG:POS negative and positive distortion
PP sum (peak-to-peak)

Error messages related to parameter:

TEST SIG?
Test signal (multi-pedestal colour burst) is not present.

3.4.3 Frequency Response Parameters

3.4.3.1 MULTIB 1 to 6 - Frequency Response of Multiburst Packets 1 to 6

Test signal:

The parameters can be measured in one of the two following test lines. The test line for which the measured value will be displayed is selected when defining the test signals for modes 1 to 8 (see SETUP/TESTLINES/STANDARDS).

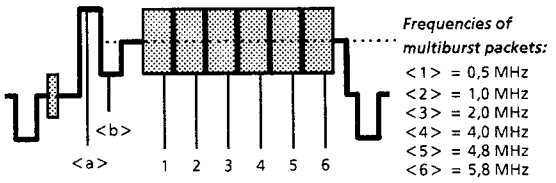


Fig. 3-59 6-packet multiburst of CCIR 18

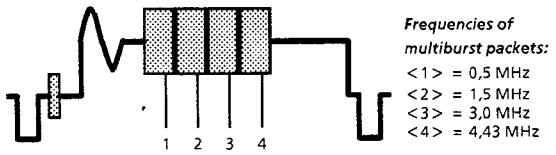


Fig. 3-60 4-packet multiburst of CCIR 18

Parameter description:

Frequency response of video signal.

Definition:

$$MULTIB\ n = \frac{<n> - REFERENCE}{REFERENCE} \times 100\,[\%]$$

REFERENCE <a> - <b> for CCIR18 with 6 packets
$^3/_5$ BARAMPL for CCIR18 with 4 packets

Definition for difference measurement:

$$MULTIBn = (\frac{<n> - REFERENCE_R}{<n_R> - REFERENCE} - 1) \times 100\,[\%]$$

(*<n>*: amplitudes of packets <1> to <4> or <1> to <6>)
(*n_R* multiburst amplitude of reference signal)
(*$REFERENCE_R$* reference level of reference signal)

Additional possibilites:

none

Error messages related to parameter:

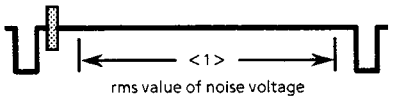
TESTSIG?
The selected multiburst signal is not available.

3.4.4 Noise Voltage Parameters

3.4.4.1 Signal-to-Noise Ratio of Luminance Signal

Test signal:

Empty line with or without grey pedestal, or lines with sawtooth signal.



Parameter description:

Ratio between amplitude of useful signal (luminance bar) and rms value of noise voltage.

Definition:

$$S/N = 20 \times log(\frac{REFERENCE}{<1>}) \times [dB]$$

REFERENCE: Selectable between luminance bar amplitude or 700-mV nominal value.

Definition for difference measurement:

$$S/N_{DIFF} = S/N - S/N_R$$

(S/N_R = noise voltage of reference signal)

Additional control capabilities:

Definition (DEFINITION):

R:NOM	Relative, referred to a nominal level of 700 mV
R:SIG	Relative, referred to the amplitude of the luminance bar
ABS	Absolute level

Weighting filter (WGHT):

ON:	Switched on
OFF:	Deactivated Switched on

Noise filter (FILTER):

SC TR	Colour-subcarrier trap
SI TR	Intermodulation bandstop filter according to installed option
SI BP	Intermodulation bandpass filter according to installed option
OFF	All noise filters deactivated

Note: Settings SI TR and SI BP require option B2 (552 kHz) or B3 (242 kHz) to be installed.

Error messages related to parameter:

none

3.4.4.2 C/SND INTERM - Colour Subcarrier/Sound Carrier Intermodulation

Test signal:

The parameter can be measured in one of the two test lines shown below. The line is selected during definition of the test signals for modes 1 to 8 (see SETUP / TESTLINES).

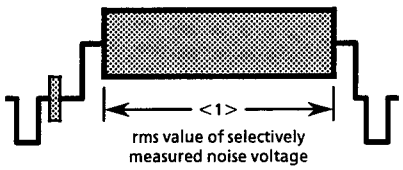


Fig. 3-61 Line with colour subcarrier

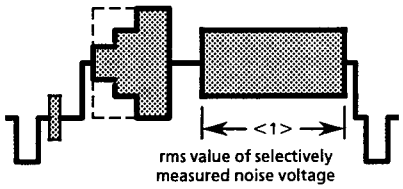


Fig. 3-62 Line CCIR 331

Parameter description:

Intermodulation between colour subcarrier and sound carrier. The test signal portion on which the colour subcarrier is superimposed passes through a bandpass filter whose centre frequency corresponds to the difference between colour subcarrier and sound carrier. With a colour subcarrier frequency of 4.43 MHz and a sound carrier frequency of 5.5 MHz, the difference is 1.07 MHz. The rms value of the voltage at the bandpass filter output can be referred to the luminance bar amplitude or to the 700-mV nominal value.

If this rms value is to be compared with a value measured at RF, 7 dB have to be added to the VF value measured with the UAF.

Example:

Measured VF value = 40 dB
Measured RF value = 47 dB

This correction can also be carried out automatically.

Definition:

$$C/SND\ INTERM = 20 \times \log\left(\frac{REF.}{<1>}\right) + CORR\ VALUE\ [db]$$

REFERENCE: Selectable between luminance bar amplitude and 700-mV nominal value.

CORR VALUE: Selectable between 0 dB and 7 dB

Definition for difference measurement:

$$C/SND\ INTERM_{DIFF} = C/SND\ INTERM - C/SND\ INTERM_R$$

($C/SND\ INTERM_R$ = intermodulation of reference signal)

Additional possibilities:

Definition (DEFINITION):

R:NOM relative with reference to nominal (700 mV)

R:SIG relative with reference to signal amplitude (luminance bar amplitude)

ABS absolute level

RF correction (RFCOR)

ON 7 dB are added to the measured value (see description of parameter)

OFF no correction

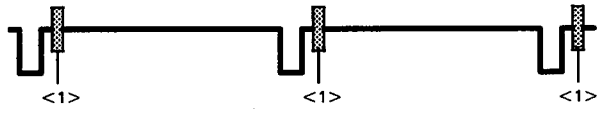
Error messages related to parameter:

none

3.4.4.3 HUM

Test signal:

The luminance level of each line of the video signal is measured at the point of the colour burst.



<1> = Absolute level of luminance signal

Parameter description:

Low-frequency noise voltage referred to luminance bar amplitude or 700-mV nominal value.

In each line of the video signal the luminance level is sampled at the point of the colour subcarrier. After band-limitation by a 1-kHz lowpass filter, the resulting voltage is used for determining the peak to peak value (<1>).

Definition:

$$HUM = 20 \times \log\left(\frac{REFERENCE}{<1>}\right) [db]$$

REFERENCE: Selectable between luminance bar amplitude and 700-mV nominal value.

Definition for difference measurement:

$HUM_{DIFF} = HUM - HUM_R$

(HUM_R = hum of reference signal)

Additional possibilities:

Definition (DEFINITION):

R:NOM	relative with reference to nominal (700 mV)
R:SIG	relative with reference to signal amplitude (luminance bar amplitude)
ABS	absolute level

Error messages related to parameter:

none

3.4.5 Optional Parameters

3.4.5.1 DC LEVEL

Test signal:

DC voltage between -5 V and +5 V at external input.

Additional possibilities:

none

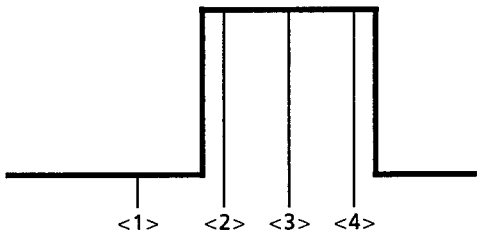
Error messages related to parameter:

none

3.4.5.2 50-Hz Tilt (FT-DIST) - Option B1

Test signal:

Squarewave at a repetition frequency of 50 Hz with the upper half of the TV screen being black and the lower half being white. The measurement can be performed in the first or second field.



Lines:	76	158	232	306	in the 1 st field
	389	471	545	619	in the 2 nd field

Parameter description:

Difference between the signal amplitudes of the squarewave's white portion, referred to the amplitude.

Definition:

$$\text{rel FT-DIST} = \frac{<4> - <2>}{<3> - <1>} \times 100\,[\%]$$

Definition for differential measurements:

FT-DISTDIFF = FT-DIST - FT-DISTR

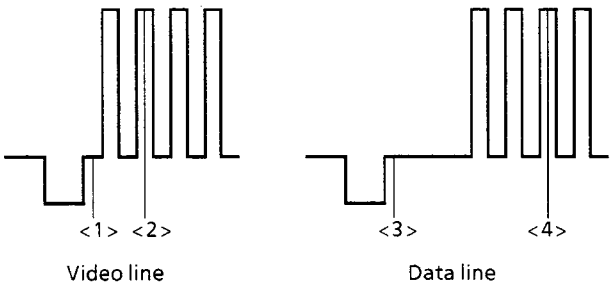
(FT-DISTR = tilt of reference signal)

Additional capabilities:
None

Error messages related to parameter:
TESTSIG?
The test signal is not available.

3.4.5.3 DATA-AMPL Amplitude of Data Line

Test signal:
Teletext or data line with run-in pulses.



Parameter description:
Amplitude of data or videotext line, referred to one of two adjustable levels (VTXT or DATAL).

Definition:

abs DATA-AMPL = <2> - <1> [V]
at reference level VTXT

abs DATA-AMPL = <4> - <3> [V]
at reference level DATAL

REFERENCE: Nominal VTXT or DATAL, as required, or VTXT or DATAL, referred to amplitude of luminance bar.

Definition for differential measurements:

$$\text{abs DATA-AMPL}_{DIFF} = \text{abs DATA-AMPL} - \text{abs DATA-AMPL}_R$$

$$\text{relDATA-AMPL}_{DIFF} = \left(\frac{\text{abs DATA-AMPL} \times \text{REF}_R}{\text{abs DATA-AMPL}_R \times \text{REF}} - 1 \right) \times 100\ [\%]$$

(abs DATA-AMPL$_R$ = data-line amplitude of the reference signal)

Additional capabilities:
Reference levels:

VTXT	Freely selectable reference amplitude for videotext line
DATALINE	Freely selectable reference amplitude for data line

Definition:

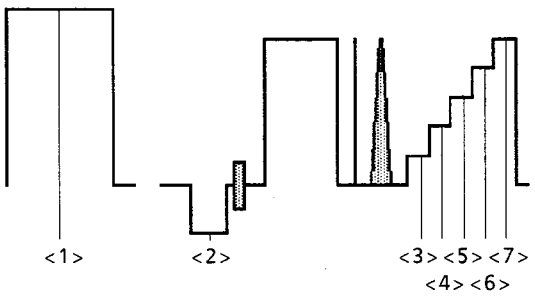
R:NOM	Relative, referred to a nominal VTXTor DATAL
R:SIG	Relative, referred to the amplitude of luminance bar and to VTXTor DATAL
ABS	Absolute level

Parameter-specific error messages:
None

Note: Adjust the reference levels as described in Section SETUP/DATA-LEVEL.

3.4.5.4 ICPM Intercarrier Phase Modulation

Test signal:
Zero reference pulse, sync pulse and CCIR17



Parameter description:
The vision carrier can be phase-modulated by the luminance signal which then affects the audio channel. To check this effect, the voltage differences between the residual-carrier amplitude and the individual steps of the grey scale as well as the sync pulse are determined.

The output signal from the synchronous demodulator is sampled concurrently with the CCIR17 test signal. If the ratio between these amplitudes and then the inverse tangent is calculated, the deviation of the vision-carrier phase is obtained in degrees.

Definition for differential measurements:

$$ICPM1 = ArcTan\left(\frac{DEMOD7}{<1> - <7>}\right)[dg]$$

$$ICPM2 = ArcTan\left(\frac{DEMOD6}{<1> - <6>}\right)[dg]$$

$$ICPM3 = ArcTan\left(\frac{DEMOD5}{<1> - <5>}\right)[dg]$$

$$ICPM4 = ArcTan\left(\frac{DEMOD4}{<1> - <4>}\right)[dg]$$

$$ICPM5 = ArcTan\left(\frac{DEMOD3}{<1> - <3>}\right)[dg]$$

$$ICPM6 = ArcTan\left(\frac{DEMOD2}{<1> - <2>}\right)[dg]$$

DEMODx = output voltage from the synchronous demodulator at time <1>, <2>, <3>,...

Additional capabilities:

Angezeigter Meßwert (DISP):

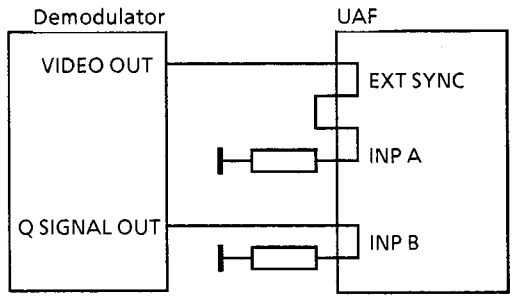
NEG:POS	Negative and positive phase deviation
PP	Peak-to-peak value

Error messages related to parameter:

DIFFMEAS?	Video analyzer is not in differential measurement mode

Notes: To measure the parameter, carry out the following setup:

Signal path:



Synchronization: EXT

Input selection: B-A or B-MEM, provided a reference measurement was made and the value measured at input A stored.

4 Maintenance and Troubleshooting

Note: *This chapter describes troubleshooting down to subassembly level (ie replacing subassemblies). For more details on troubleshooting, consult the service manual Order No.* 2013.1648.24

4.1 Maintenance

The instrument does not require regular maintenance. Basically, cleaning is all the maintenance the instrument needs. However, it is recommended to check the specifications from time to time. These data and their tolerances will be found in the data sheet. Minor deviations can usually be corrected with the trimmers.

4.1.1 Cleaning

It is recommended that a soft, lint-free duster be used for cleaning the unit on the outside.

External cleaning

External cleaning is best done with a soft, lint-free duster or brush. If the instrument is very soiled, meths or a mild detergent can be used. On no account should solvents such as nitro thinners or acetone be used as the front panel labelling or plastic parts will be damaged.

Dust should be removed from the inside of the instrument to ensure proper ventilation (approx. every 1 to 2 years depending on the amount of use, and on the duration and degree of exposure to dust at the place of use).

Note: *Do not use any nitro thinners, acetone, etc. since these solvents may damage the front-panel labelling or plastic parts.*

Internal cleaning

Remove the instrument from its enclosure or rack for internal cleaning. Dust can be removed with a brush or grease-free compressed air. Parts that carry high tension and the areas around them should be cleaned especially thoroughly to prevent sparkovers and sporadic malfunctions.

4.1.2 Storage

The UAF can be stored at temperatures between -40 and +70°C. The unit should be protected against dust if it is stored for a prolonged period.

4.2 Function Check

It is recommended to check the specifications from time to time. These data and their tolerances will be found in the data sheet. Minor deviations can usually be corrected with the trimmers.

4.3 Troubleshooting

If the instrument is opened, say for internal cleaning, check that the CRT is seated tightly. Also check for loose boards.

Mechanical troubleshooting also involves checking the correct operation of all controls such as potentiometers and switches.

4.4 Replacing Subassemblies

Opening the instrument

- Switch off the instrument and pull out the power cable.
- Remove all other cabling.
- Undo the screws in the two feet (2 in each) at the back of the instrument and remove.
- Pull the top panel off towards the rear.

To do this set a small screwdriver in the small holes in the sides of the cover near the feet and pull the cover backwards.

Replacing Lithium Batteries

CAUTION:

The instrument is fitted with high-power lithium batteries. Under no circumstances should the cells be short-circuited or charged. Do not open up old cells; treat them as TOXIC WASTE.

The instrument contains a lithium battery which is used for the back-up storage of the instrument status. The service life of the battery depends on how the battery is used. The battery should be

replaced after an appropriate period of time (eg after storage at high temperatures). A flat battery should be replaced by one of the same type. To do this open the instrument (see section 4.5). The battery should then be replaced by soldering the tags and fastening with cable ties.

Dismantling the Power Supply

To dismantle the power supply, remove the four screws on the unit for the two feet at the rear of the instrument and then remove the upper and lower panels.

Closing the Instrument

To close the instrument proceed as for dismantling but in the reverse order. When pushing on the cover make sure that it is properly in the grooves. When screwing down the feet, press down the cover so that the back of the cover locks into the metal stubs.