

Video Noise Meter UPSF2

USES



The **Video Noise Meter UPSF 2** measures noise voltages occurring in transmission systems either in the unweighted mode from 40 Hz to 10 MHz or in the weighted mode with the appropriate filters incorporated. The **Video Level/Chroma Noise Meter UPSF2E2** (plugged in on the righthand side) affords further measuring possibilities. The relevant IEC and CCIR specifications are satisfied.

Special features of basic unit:

- Automatic switchover to 625-line or 525-line systems (dual-standard unit)
- Free choice of test point: full field or any test line
- Measurement of true rms and peak values
- Autoranging over 80 dB
- Alphanumeric readout of measured value and operation status (see below)
- System-compatible thanks to IEC-bus interface (option)

The UPSF 2 functions both in 625-line and 525-line systems whatever the standard. Switchover is automatic, including the standard-dependent filters.

Filters. The basic unit includes the following filters:

Band-limiting filter (lowpass filters to CCIR Rec. 567) preventing measurement errors due to noise voltages above the upper video cutoff frequency. The filters with a cutoff frequency of 4.2 MHz and 5 MHz are selected automatically.

Noise-weighting filter (to CCIR Rec. 567). Unified weighting network for noise voltage weighting in accordance with the response of the eye to noise.

1-kHz lowpass filter for measuring hum voltages superimposed on a line-repetitive signal.

200-kHz highpass filter (to CCIR Rec. 567) for measurement without low-frequency components, always connected into circuit for test-line and spot measurements; please enquire for 100-kHz highpass filter.

Wave trap for attenuating any residual colour subcarrier components by at least 26 dB. The colour subcarrier frequency of 4.43 MHz or 3.58 MHz is selected automatically.

10-kHz highpass/lowpass filter (to CCIR Rec. 567) for measurement below or above 10 kHz.



Readout section on UPSF 2; left: 7-segment readout for numerical value of test result, cutoff frequency, line number, etc.; right: alphanumeric 16-segment readout for parameter designation (unit), mode, reference and operating error messages

The second functions of the keys are used for entering the test-point coordinates, line numbers, etc.

OPERATION

Operation The UPSF2 is quickly set up and easily operated.

Signal connections required

- Test signal (picture signal or composite video signal) to front-panel input or rear-panel loop-through filter
- Sync signal S or H (required only with picture signal) to rear-panel loop-through filter S/H

Setting up

- Select input for test signal (front or rear panel)
- Select synchronization for blanking: internal, external or without
- Select filter:
 - lowpass 1 kHz, 10 kHz, weighting, band-limiting; subcarrier trap f_{sc} ;
 - highpass 10 kHz, 200 kHz (100 kHz)
- Select mode:
 - full field measurement (FF), i.e. measurement in all lines for a duration of 40 μ s; in the presence of a V signal no measurement in the V interval or measurement in the test line (VIT); change of line number on the stroke of a pushbutton
- Select type of rectification:
 - V_{rms} true rms measurement or
 - V_{pp} peak-responsive measurement

Additional convenience

- Permissible settings are executed and signalled by continuous pilot lights
- Erroneous operations are not executed, but signalled by flashing lights until a permissible operation is made or the wrong entry cancelled
- Autoranging from 0 to -80 dB in steps of 10 dB
- The standard (525 or 625 lines) is recognized from the composite or the sync signal and the suitable filter and 0-dB reference are automatically selected

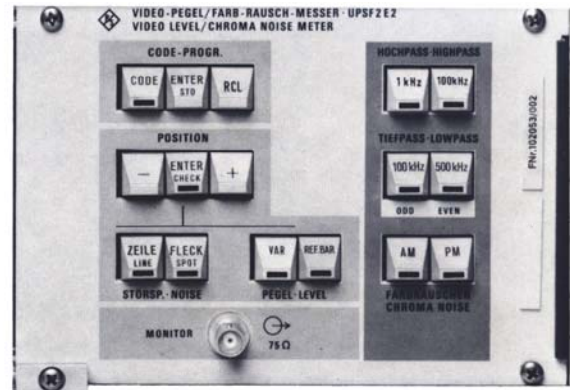
Information displayed

- Data of self-test after switching on
- Measured value in dB and type of rectification RMS or PP
- Status of operation such as line number, selected test line, selected video cutoff frequency and frequency of subcarrier trap

Video Level/Chroma Noise Meter UPSF2E2

This plug-in which is to be ordered separately for a colour subcarrier frequency of either 4.43 MHz or 3.58 MHz adds the following measurement capability to the basic unit:

- Chroma-noise measurement on magnetic tapes and VTRs in the range from 100 Hz to 1 MHz, measurement in line with the IEC standard currently being prepared for chroma-noise, separate measurement of amplitude and phase, automatic correction of differences in the colour sub-carrier amplitudes; the lower and upper cutoff frequencies can be switch-selected for assessment,
 - lower f_c : 100 Hz, 1 kHz, 10 kHz, 100 kHz, 200 kHz,
 - upper f_c : 10 kHz, 100 kHz, 500 kHz, 1 MHz, WGHT



Video Level/Chroma Noise Meter UPSF2E2

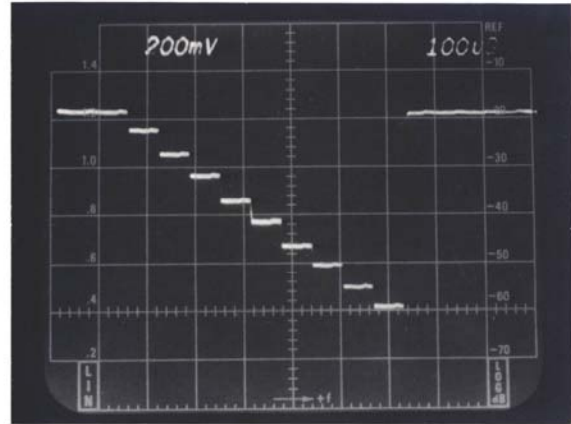
- Luminance measurements (referred to the measured luminance bar) with free selection of test point:
 - any line or
 - variable spot at any point
- Level measurement:
 - measurement of luminance bar amplitude
 - level difference measurement (sample-and-hold technique) between any two points
- Greater measuring convenience thanks to (code) programs available, e.g. for output of measured values (in mV, % or IRE units) and determination of measurement range

Examples from the code table:

- noise-voltage output in mV
- pulse-level output in mV, % or IRE units
- disabling luminance-bar reference
- determination of gain range

DESCRIPTION

The **UPSF 2** is a wideband voltmeter which determines the peak-to-peak or rms value of a signal. To enable weighted and unweighted noise-voltage measurements on TV signals, the TV signal must have no picture content during the measurement interval and the sync pulses plus the picture content must be eliminated outside the measurement interval. After amplification at the input, the UPSF 2 suppresses all signal components outside the measurement time in a first **blanking circuit** and replaces them by the average value of the noise signal to be measured (see block diagram). Depending on the input signal, an amplifier which can be switched by 30 dB ensures that the appropriate level is applied to the subsequent filters. The **filters** are accommodated on two boards and connected into circuit with the aid of electronic switches. After further amplification by 40 dB, which can be switch-selected in 10-dB steps, the signal is blanked a second time, thus eliminating the amplified interference introduced by the first blanking circuit. Then the signal path is divided, taking the signal to the monitoring output on the front panel and to the peak- and rms-responding rectifiers.



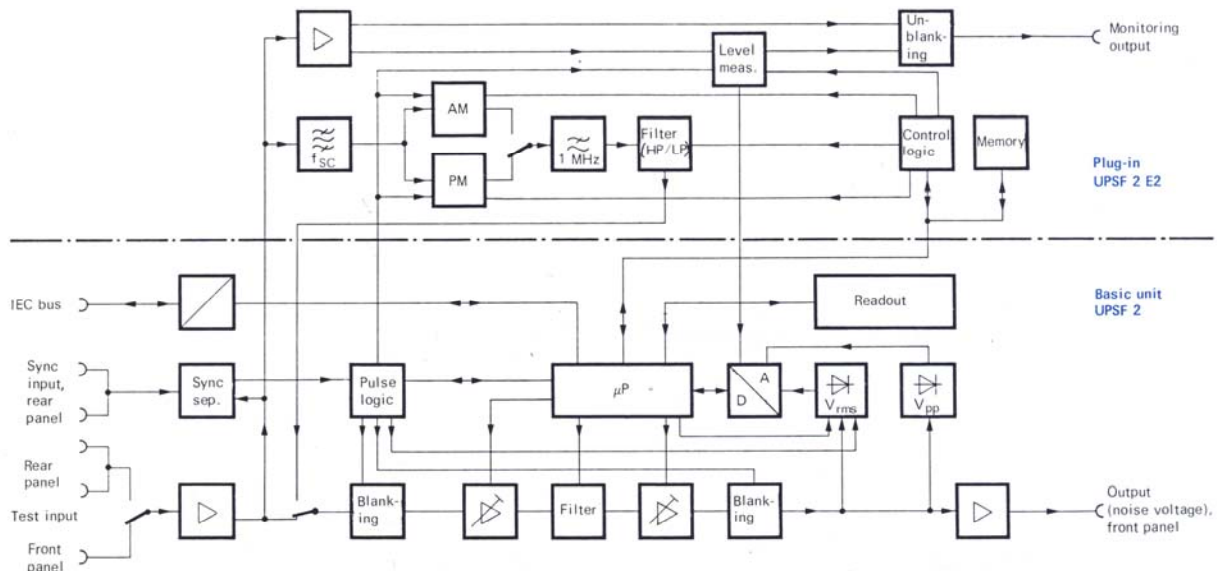
Oscillogram of voltage integration over $10 \times 4 \mu s$

Using a four-quadrant multiplier, the **rms-responding rectifier** squares the voltage applied. In the case of full-field measurements an RC network follows to produce the time average of the result. With test-line measurements a current source charges a capacitor; at the end of the measurement time the integrated voltage is transferred to a storage capacitor and the integrator is discharged for the next measurement. In spot measurements the current source can be switched off, the integration interrupted and then restarted as a function of the spot configuration until the test-line integration time of $40 \mu s$ is reached (see oscillograms above and on next page). The microprocessor calculates the square root in the case of the rms measurement and the S/N ratio as well.

The **peak-responding rectifier** using the full-wave principle detects even very short noise peaks. The signal applied to the rectifiers is available at the **front-panel output** (75Ω) for checking with an oscilloscope or spectrum analyzer.

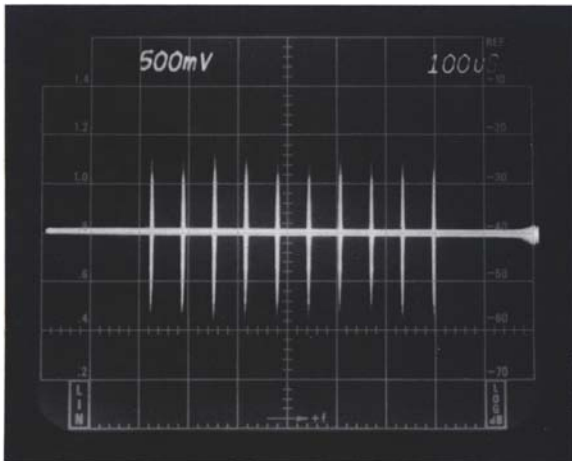
After the input amplifier the signal is distributed to the sync separator for internal synchronization and to the plug-in Video Level/Chroma Noise Meter UPSF2E2. The **sync separator** is designed to handle both 525- and 625-line systems. It uses a flywheel circuit to compensate for irregularities of the sync pulses as may occur particularly with video recorders. Moreover, the synchronization is continuously monitored so that a change in standard or a synchronization failure is immediately recognized.

Block diagram of Video Noise Meter UPSF 2 with Video Level/Chroma Noise Meter UPSF2E2



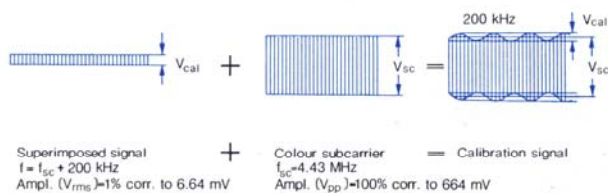
DESCRIPTION

The **Video Level/Chroma Noise Meter UPSF2E2** (see block diagram) permits luminance measurement in any line or spot at any point of the picture. The position of the line or spot can be checked and varied at any time. There is a special output for the connection of a monitor, on whose screen the test point is highlighted. If this plug-in is fitted, the luminance value measured is related to the reference luminance bar. If the luminance bar is too small or is absent, the reference of the basic unit to the nominal picture value (700 mV or 714 mV) is maintained. The value of the luminance bar is displayed in %, IRE units or mV. In addition to the luminance bar, a level difference between any two points of the full field can be measured with a sampling time of 1 μ s (for instance linearity measurement on a grey scale).

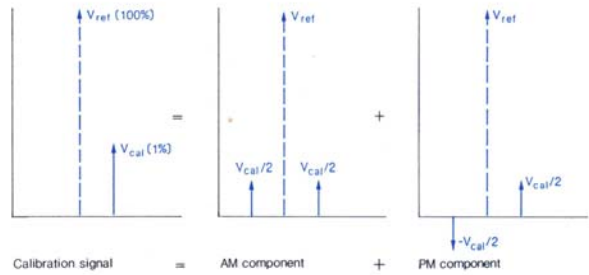


Oscillogram at noise-voltage output

For chroma-noise measurement in the plug-in the signal is taken to the AM and PM demodulators via a colour-subcarrier bandpass filter. The PM demodulator uses a crystal reference, which is locked to the mean phase value of the full-field colour area irrespectively of whether a PAL or an NTSC signal is being handled. Any departure of the colour-subcarrier amplitude from nominal (e.g. a decrease in the case of video recorders) is automatically corrected. The demodulated chroma-noise signal is returned to the basic unit after filtering and measured in the same way as a luminance-noise signal. A large choice of filters in the basic unit and in the plug-in permits precise assessment of chroma noise. Calibration meets the IEC standard in preparation (see diagram below).



Calibration signal for chroma-noise for standards B, G (625 lines) according to IEC



Separation of calibration signal for chroma-noise into AM and PM components. Squared mean value of sideband components yields calibration value of 43 dB

$$\text{AM: } 20 \lg \frac{V_{ref}}{\sqrt{(V_{cal}/2)^2 + (V_{cal}/2)^2}} = 20 \lg \frac{V_{ref}}{V_{cal}/\sqrt{2}} = 43 \text{ dB,}$$

$$\text{PM: } 20 \lg \frac{V_{ref}}{\sqrt{(V_{cal}/2)^2 + (-V_{cal}/2)^2}} = 20 \lg \frac{100\%}{1\%/\sqrt{2}} = 43 \text{ dB.}$$

A four-digit seven-segment LED readout is fitted on the basic unit for **measured-value indication**. In addition, a smaller eight-digit 16-segment readout is provided to indicate the physical unit and the mode, but it is also used to prompt the user and to display error messages. Thanks to the clearly arranged front panel incorrect operation is practically impossible; moreover, the microprocessor does not act upon incorrect settings but instead signals the error by a blinking message on the readout. The amplification range and the TV standard need not be selected; the instrument automatically sets the correct range and selects the TV standard in accordance with the number of lines applied. When standard-dependent keys ("Blank", "Lowpass", "f_{sc}", "VIT") are pressed, the corresponding function (e.g. 625 lines) is briefly displayed. Code programs can be called up for special purposes, for instance to disable the auto-ranging facility and to select a fixed range, to switch over from dB to V, % or IRE units or to disable the luminance-bar reference.

The option IEC Bus UPSF 2-Z for **remote control to IEC 625-1** (IEEE 488) affords the UPSF2 full system compatibility. It is easily retrofitted in the basic unit. All functions of the basic unit and of the plug-in can be controlled via the IEC-bus interface.

SPECIFICATIONS

Basic unit	
Frequency range	40 Hz to 10 MHz (with frequency response flat ±0.25 dB)
Test signal	picture or composite video signal with and without test lines
Standard	625 or 525 lines (automatic switchover)
Modes of operation	full field and test line
Synchronization	internal or external
Measurement range	0 to -80 dB
Range switchover	automatic
Reference	0 dB corresponding to 714 mV or 700 mV (automatic switchover)
Types of rectification	true rms- or peak-responsive measurement
Readout	digital
Error	±1 dB
Inherent S/N ratio (limited)	≳80 dB _{rms}
Filters used	see text
Test input on front panel	1 MΩ 30 pF
on rear panel	75-Ω loop-through filter
Return loss	≳40 dB (up to 6 MHz)
Synchronization input	75-Ω loop-through filter (on rear panel)
Return loss	≳36 dB (up to 6 MHz)
Sync amplitude	-4 V ±1 V
Noise-voltage output (test signal blanked out)	on front panel
Output impedance	75 Ω
Return loss	≳36 dB (up to 6 MHz)
Remote control (option)	interface to IEC 625-1 (IEEE 488)
Basic unit plus plug-in	
Chroma-noise measurement	
Colour subcarrier	AM and PM components 4.43 or 3.58 MHz (depending on order No.)
Measurement range	-25 to -70 dB
TV Standard	PAL and NTSC
Filters used	see text
Luminance-noise voltage measurement	
Reference	current luminance bar in test line
Modes of operation	
Line	measurement time 40 μs
Line number	freely selectable
Spot	4 μs, 10 lines
Test point	freely selectable

Level measurement	
Measurement range	0 to ±1500 mV
Tolerance range	±0.5% ± 3 mV
Luminance bar	to CCIR Rec. 569
Video signals	test points can be selected in 1-μs steps
Level-difference measurement	
sampling-pulse duration	1 μs
sampling points	freely selectable
Monitor output	on front panel (unblanking of test-point coordinates)
General data	
Rated temperature range	+5 to +45 °C
AC supply	115/125/220/235 V +10/-15%, 47 to 63 Hz (65 VA)
Dimensions, weight	
19" bench model	492 mm x 161 mm x 514 mm, 18 kg
19" rackmount	483 mm x 132 mm x 506 mm, 14.5 kg
Ordering information	
Order designations	
Basic unit (without plug-in) for 625 and 525 lines	▶ Video Noise Meter UPSF 2 341.7019.09 341.7019.08
19" bench model	
19" rackmount	
Plug-in	Video Level/Chroma Noise Meter UPSF2E2
for colour subcarrier	
4.43361875 MHz	▶ 342.0018.03
3.579545 MHz	342.0018.13
Accessories supplied	
Termination (75 Ω), power cord	
Option	
IEC Bus UPSF2-Z	341.8238.02

Video Level/Chroma Noise Meter UPS2-E2

1. Characteristics

1.1 Uses

The Video Level/Chroma Noise Meter UPS2-E2 for the Video Noise Meter UPSF 2 extends the measuring capability of the basic unit as follows:

Noise measurements: The modes with free line selection (LINE) and selection of a test spot (SPOT) are possible in addition to the full field (FF) and test line (VIT) modes of the basic unit.

Level measurements: Difference measurement between two freely selectable test points (VAR) plus the special case of standard luminance bar measurement (REF. BAR).

Chroma noise measurement: Separate measurement of AM noise and PM noise in the chrominance channel with the aid of the built-in filters (max. ± 1 MHz).

1.2 Description

The CCV test signal from the basic unit is distributed in the plug-in to permit the following measurements:

Noise voltage measurement

The LINE and SPOT modes augment the FF and VIT modes of the basic unit, making use of the programmability of the plug-in. The line number can be programmed for line measurements and the upper lefthand corner as the coordinate - line/ μ s after S leading edge - for spot measurements (spot dimensions 4μ s x 10 lines).

Level measurement

The signal components required for the VAR and REF. BAR modes are gated from the test signal. The measured values are sampled, digitized with the A/D converter of the basic unit and the difference between the two values is indicated.

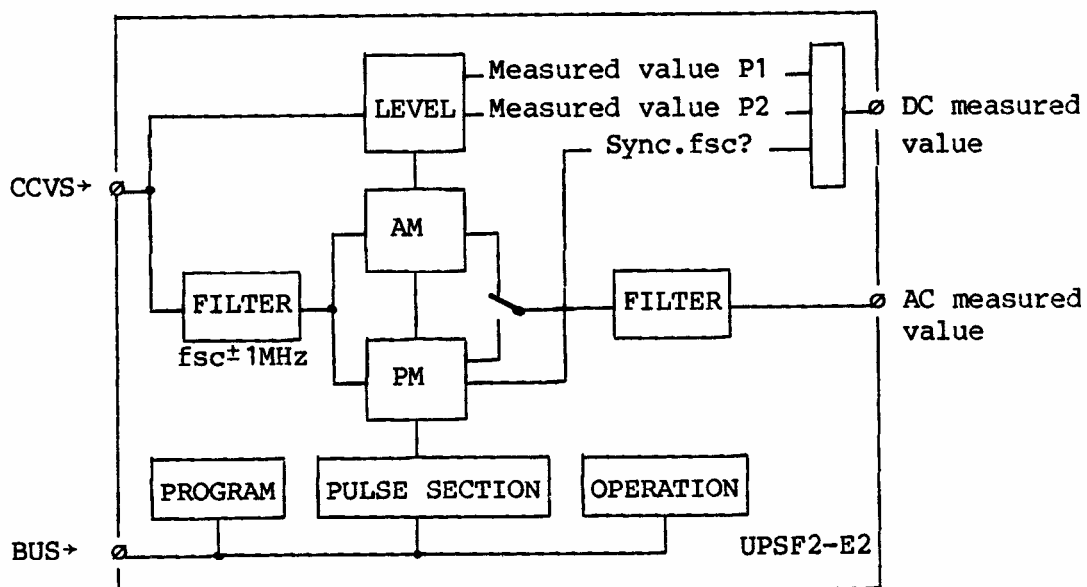
Chroma noise measurement

A bandpass filter extracts the colour subcarrier from the test signal (colour area). An envelope detector is provided for measuring the AM noise. The

detector output signal contains, in the form of ripple, the AM noise components superimposed on the colour subcarrier. To measure the PM noise, a crystal oscillator is synchronized with the colour subcarrier via a slow control circuit. The oscillator signal contains extremely little phase noise and is used as the reference signal for phase measurement. The phase detector output signal contains, in the form of ripple, the PM noise components superimposed on the colour subcarrier. The subsequent chroma filters (highpass and lowpass filters) determine the weighting bandwidth for the two measurements. In addition, the filters of the basic unit can be used if required.

Control

The microprocessor of the basic unit is used for controlling the plug-in. The program parts required for the specific measuring tasks of the UPSF2-E2 are included in an EPROM of the plug-in, but in addition subroutines of the basic unit are used. The normal microprocessor bus is used to establish the connection between the basic unit and the plug-in; this bus also controls the keyboard on the front panel and filter switchover as well.



1.3 Specifications

1.3.1 Noise Measurement Modes

The two noise measurement modes expand the FF and VIT measuring capability of the basic unit. The plug-in delivers the program flow without using its analog section.

LINE mode

Range, dynamic range	same as on basic unit (VIT mode)
Measured value	224 line measurements each taking 40 μ s are averaged
Line selection	+/- keys or direct entry of numbers (on basic unit)
Model 03 (Std B/G)	line Nos. 1 to 625
Model 13 (Std M)	line No. and 1st/2nd field FIRST (ODD) - SECOND (EVEN)

SPOT mode

Range, dynamic range	same as on basic unit (VIT mode)
Measured value	224 spot measurements each taking 40 μ s are averaged
Spot selection	+/- keys and/or direct entry of numbers for line and μ s after S leading edge (= upper lefthand corner of spot) line ranges see under LINE mode
Spot dimensions	
Standard	4 μ s each in 10 consecutive lines
Variable	by way of CODE PROGR. (20 μ s x 2 lines to 4 μ s x 10 lines)

1.3.2 Level Measurement Modes

The two level measurement modes yield the level difference between two test points of a full field. The sampling time for each test point is 1 μ s. In the VAR mode, the two test points P1 and P2 are freely selectable (line and H/64 position) whereas in the REF. BAR mode, the test points for standard luminance bar measurement must be located in one line.

VAR mode

Measurement range referred to
mean value of test signal -1.5 V to +1.5 V

Measured value output magnitude $|P1 - P2|$

Indication on readout of basic unit

 Resolution 1 mV

 Error $\pm 0.5 \% \pm 3$ mV

Selection of test points (P1/P2)

 Line range see under LINE noise measurement mode

 H/64 position in 1- μ s steps after S leading edge

 Entry of numerics +/- keys or direct entry on basic unit

REF. BAR mode

Range, indication same as for VAR mode

Test points

Model 03 (Std B/G)	line:	17
	luminance bar:	17/64 H
	black level:	36/64 H
Model 13 (Std M)	line:	17, 1st field
	luminance bar:	21/64 H
	black level:	43/64 H

Selection of test points same as in VAR mode, however, both test points in one line

1.3.3 Chroma Noise Measurement Modes

The two chroma noise measurement modes enable separate evaluation of AM noise and PM noise. A CCVS which contains the colour subcarrier with an amplitude of at least 0.14 V as the picture content must be applied to the test item. The frequency range from 1 MHz below to 1 MHz above the colour subcarrier is evaluated.

Colour subcarrier frequency

Model 03 (Std B/G)	$f_{SC} = 4.43$ MHz
Model 13 (Std M)	$f_{SC} = 3.58$ MHz

AM + PM noise measurement

Measurement range -25 to -70 dB

Indication on readout of basic unit

Resolution 0.1 dB
 Error ± 1 dB
 Weighting filters see Figs. in Appendix
 Modes FF, LINE, SPOT

1.3.4 Free Programming

With measurements using the CODE PROGR., additional test parameters with code numbers or further additional numbers can be entered. A table inserted to the right of the plug-in contains a list of the functions implemented in the program.

The following table gives an overview on the most important code programs:

Code	Function	Additional function
-1-	Output of noise measurement and chroma noise measurement	0 = mV, 1 = dB
-2-	Output of level measurement	0 = %/IRE, 1 = dB, 2 = mV
-3-	Reference to luminance bar	0 = without reference to lum. bar 1 = with reference to lum. bar
-4-	Mode of line counting	0 = full field 1 = field
-5-	525-line system selected	---
-6-	625-line system selected	---
-7-	Spot dimensions	Height: 2/4/5/8/10; lines Width: 40 μ s/line number
-8-	Sensitivity (gain)	0 to 7 = select range 8 = retain range 9 = autoranging
-9-	Servicing program for A/D converter	0 to 7 = A/D converter inputs on basic unit UPSF 2 10 to 17 = A/D converter inputs on plug-in UPSF2-E2

1.3.5 General Data

Temperature range same as for basic unit UPSF 2
 Power supply +12 V, +5 V, -12 V from UPSF 2
 Dimensions (W x H x D) approx. 190 mm x 132 mm x 300 mm
 Weight approx. 9 kg