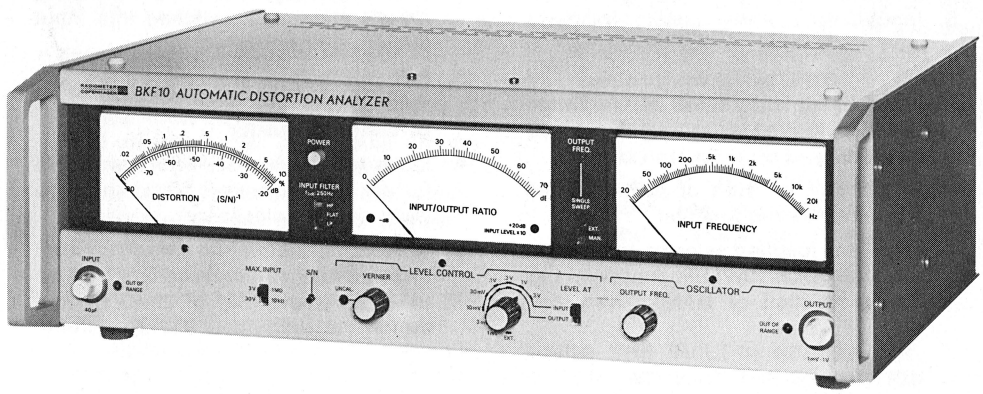
BKF10
automatic distortion analyzer

OPERATING INSTRUCTIONS



INTRODUCTION

The BKF10 Automatic Distortion Analyzer provides fully automatic total harmonic distortion and amplitude response measurements with comprehensive facilities for automatic recording of the measurements, and external control facilities that enable it to form a natural part of automatic test systems instrumentation. The BKF10 is intended for measurements on Hi-Fi equipment, broadcast transmission lines, audio studio equipment, etc., and provides facilities for measurements in accordance with the relevant sections of DIN 45,500.

Because of its rather special nature, it is strongly recommended that these operating instructions are read completely before taking the BKF10 in use.

Instructions are given for the basic operating routine, which is the same whatever the application, so that the user will quickly become familiar with the BKF10 and its facilities.

A short description of the internal function of the BKF10 is included to assist in understanding the principles of its operation.

All measurements made with the BKF10 can be recorded.

While almost any x–y or x–t recorder may be used with the BKF10, preference should be given to the Radiometer REC61S2 Servograph, an x–t recorder fully compatible with the BKF10, which includes all the necessary interface items (interface unit, interconnecting cable and specially calibrated recording charts) for making recordings with a high degree of accuracy and resolution.

It is our intention, from time to time, to issue Application Notes concerning specific applications of Radiometer products. Please call your nearest Radiometer representative and have him send you any Application Notes available for the BKF10.

RADIOMETER COPENHAGEN

FRONT PANEL – CONTROLS and CONNECTORS

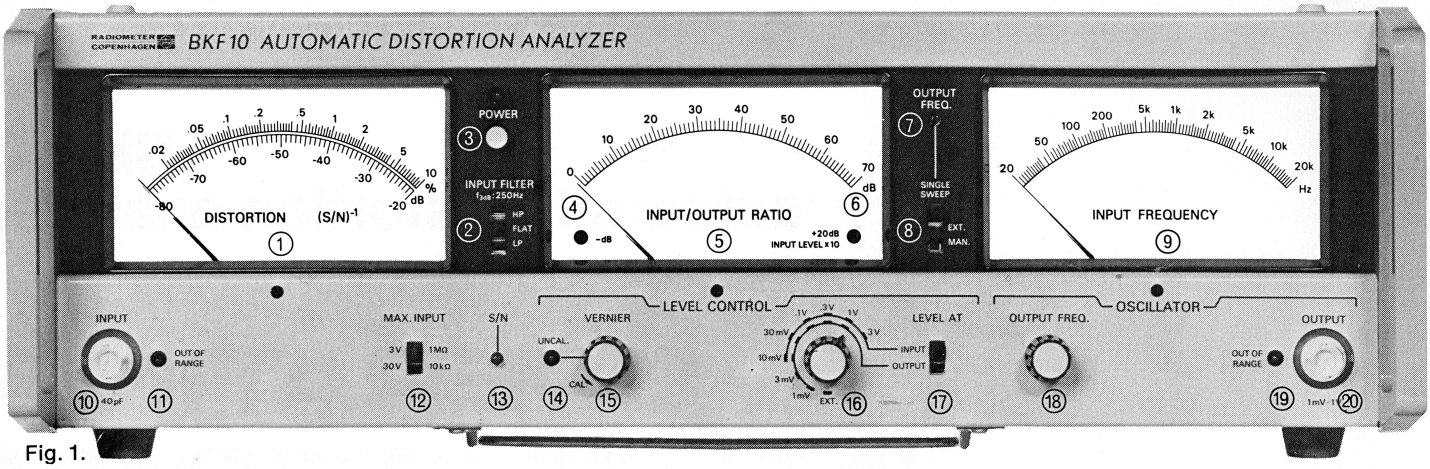


Fig. 1.

1. Distortion meter – S/N meter. Indicates distortion directly in % on upper scale and S/N ratio in dB on lower scale.
2. HP-LP filter selector switch. Permits measurement of, or suppression of, hum and noise.
3. Line power ON/OFF switch. Red lamp indicates power ON.
4. Lamp warns when indicated ratio is NEGATIVE dB.
5. Input/Output Ratio meter. Indicates gain or loss of device under test in dB.
6. Lamp warns when MAX. INPUT switch is set to 30 V/10 kΩ setting. Add 20 dB to reading.
7. Pushbutton for start of built-in single frequency sweep function.
8. Oscillator function selector switch. Selects SINGLE SWEEP function. EXTernal function or MANual freq. setting.
9. Input Frequency meter. Indicates the frequency of signal present at the input of the BKF10.
10. INPUT connector (BNC).
11. Lamp warns if signal present at INPUT is either too low or too high. Check setting of MAX. INPUT switch.
12. MAX. INPUT selector switch. Sensitivity in 3 V/1 MΩ setting: 10 mV to 3 V. Sensitivity in 30 V/10 kΩ setting (20 dB attenuator switched into input circuit): 100 mV to 30 V.
13. S/N pushbutton. Depress button and read off S/N ratio directly on dB scale of Distortion Meter.
14. Lamp warns when VERNIER control is turned off calibrated (CAL) position (fully counter-clockwise).
15. VERNIER control for level control switch settings. Increases OUTPUT up to 10 dB above that of Level Control switch (16) setting (OUTPUT deteriorates above 1V) with LEVEL AT switch (17) in OUTPUT position. Increases INPUT similarly with LEVEL AT switch (17) in INPUT position.
16. LEVEL CONTROL switch. Outer scale refers to voltage level at INPUT connector. Inner scale refers to voltage level at OUTPUT connector.
    EXT. setting permits external dc analogue control of BKF10 output or input voltage.
17. Selector switch for constant INPUT level to, or constant OUTPUT level from, BKF10.
18. Manual frequency control of oscillator when oscillator function switch is set to MAN.
19. Lamp warns when OUTPUT from BKF10 is too low or too high (1 mV to 1 V). Check settings of MAX. INPUT switch and LEVEL CONTROL switch/VERNIER.
20. OUTPUT connector (600 Ω) (BNC).

OPERATING INSTRUCTIONS

The identification numbers in parentheses refer to the circled numbers in Figs. 1 and 5.

BEFORE USE

Before connecting the BKF10 to the line supply, ensure the following:
Check line voltage selector (24) and line supply fuse (see REAR PANEL CONNECTORS page 4). To change: remove plate, switch to alternative line voltage and replace plate. Line fuse values are printed below fuse holder.

1. Plug line cord into receptacle (26), connect to supply and depress POWER switch (3) to switch on. Red lamp indicates power ON.
2. If the instrument is to be used on a work table, pull down the stand fitted under the front of the bottom plate. It will be found easier to read the meters in this position.
3. Always ensure adequate ventilation for the cooling fins (29) on the rear panel.
4. The GREEN ⏚ jack located to the right of the line fuse is used to ground the BKF10 if it is not grounded through the power cord. To obtain reliable measurements, it is essential that the instrument be properly grounded. This jack is also connected to the centre pin of the line cord receptacle (26) and to pin 6 of the multiconnector (28).

   Note: This jack should **NOT** be used as a substitute for the four common signal GROUND jacks (22).

BASIC OPERATING ROUTINE

This routine uses both the Distortion Meter and the built-in oscillator of the BKF10.

1. Connect the device under test to the BKF10, using screened leads as shown below.

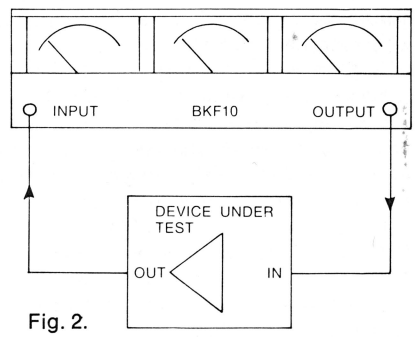


Fig. 2.

2. Set the controls of the BKF10 as follows:
   INPUT FILTER: FLAT

   MAX. INPUT:
   To suit output level from device under test. (10 mV to 3 V or 100 mV to 30 V.)

   VERNIER: CAL.

   LEVEL CONTROL switch (16):
   To suit output or input level of the device under test.

   LEVEL AT:
   A) INPUT (of BKF10), if a constant output from the device under test is required.
   B) OUTPUT (of BKF10), if a constant input to the device under test is required.

   Oscillator function switch (8): MAN.

   OUTPUT FREQ. control (18):
   To indicate, say, 1 kHz on INPUT FREQUENCY meter.

3. Check that neither OUT OF RANGE lamp lights.

4. Set oscillator function switch (8) to SINGLE SWEEP and momentarily depress the SINGLE SWEEP button (7). This starts the automatic sweep function.
   The BKF10 sweeps **downwards** in frequency from 20 kHz to 20 Hz. When the sweep is completed (about 60 seconds) the BKF10 will reset automatically in readiness for the next sweep. The single sweep function may be stopped at any time during a sweep by simply setting the oscillator function switch (8) to the MAN. position, which may then be reset to SINGLE SWEEP by repeating item (4).

5. During the sweep the three meters show simultaneously:
   INPUT FREQUENCY meter:
   The frequency at which the measurements are being made.
   DISTORTION meter:
   The total harmonic distortion at the frequency indicated by the Input Frequency meter. (Harmonics measured, 10 Hz to 150 kHz).
   INPUT/OUTPUT RATIO meter:
   The input/output ratio of the device under test at the frequency indicated by the Input Frequency meter.

SIGNAL-TO-NOISE RATIO MEASUREMENTS

Signal-to-noise measurements are made by depressing the S/N button (13) on the front panel. The bandwidth of the signal-to-noise measurements is 10 Hz to 150 kHz. Depressing the S/N button holds the ALC pre-amplifier gain constant while at the same time muting the oscillator. A dc analogue output of the S/N measurements is available as long as the S/N button is held depressed. Facilities for external control of the S/N function are available at the multiconnector (28). See page 5 for details.

INPUT/OUTPUT RATIO MEASUREMENTS

Input/output ratios are indicated on the linear dB scale of the INPUT/OUTPUT RATIO meter.
The INPUT/OUTPUT RATIO meter is provided with two indicator lamps, "–dB" (4) and "+20 dB" (6), which function as follows:

–dB Lamp (4)
When a negative dB value or loss occurs in a device under test, the –dB lamp will light and the value indicated on the meter will represent the loss directly in dB.

+20 dB Lamp (6)
When the MAX. INPUT switch is set to the 30 V position, a 20 dB attenuator is connected into the input circuit of the BKF10. This will result in a 20 dB lower reading on the INPUT/OUTPUT RATIO meter and on the associated recorder output. As a reminder, the "+20 dB" lamp lights whenever the MAX. INPUT switch is set to "30 V". **The operator then adds +20 dB to the INPUT/OUTPUT RATIO reading and the recorded level.**
If the LEVEL AT switch is at INPUT, the actual INPUT voltage of BKF10 is **10 times (20 dB)** that indicated by the LEVEL CONTROL switch (16).
Example:
MAX. INPUT switch is at "30 V", the "–dB" and "+20 dB" lamps are lit, and the meter reads 7 dB. Then the true INPUT/OUTPUT ratio is: –7 dB + 20 dB = +13 dB.

OUT-OF-RANGE LAMPS

a. If the INPUT out-of-range lamp lights, check MAX. INPUT switch setting. This will occur if the input level to the BKF10 is either too high or too low.
b. If the OUTPUT out-of-range lamp lights, check the settings of the level control switch (16), VERNIER (15) and LEVEL AT switch (17).
c. If both out-of-range lamps light, this normally indicates that either there is no signal path through the device under test (LEVEL AT switch at INPUT only) or the output level from the device under test is inadequate for making measurements.
d. If either of the out-of-range lamps lights, for example, during a sweep, check the characteristics of the device under test. This can be the case particularly where measurements are made at a constant output from the device under test (LEVEL AT switch (17) set to INPUT), and where its characteristics prevent the BKF10 from delivering an output level sufficient to maintain the constant output required from the device under test.

HIGH-PASS AND LOW-PASS FILTERS

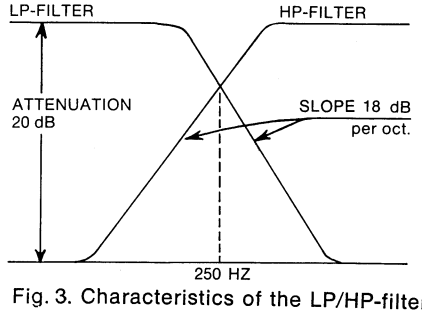


Fig. 3. Characteristics of the LP/HP-filters.

1. To eliminate the effects of hum and noise below 250 Hz, set the INPUT FILTER (2) switch to HP. Note that only fundamental frequencies above 250 Hz are relevant.
2. To measure distortion due to hum and noise below 250 Hz, set the INPUT FILTER switch to LP. If the fundamental frequency is above 500 Hz, the "DISTORTION" indicated will be essentially due to hum. When measuring distortion with the low-pass filter, only signals with a fundamental frequency below approx. 80 Hz are relevant.
3. In the FLAT setting of the INPUT FILTER switch, both filters are out of action.

USING THE DISTORTION METER WITHOUT THE BUILT-IN OSCILLATOR

1. Connect the output, for example, of an AF generator to the INPUT of the BKF10.
2. Check the input level (MAX. INPUT switch setting).
3. Read off the distortion factor directly on the Distortion Meter. No calibrating or balancing is necessary.
   The INPUT FREQUENCY meter will indicate the fundamental frequency.
   The INPUT/OUTPUT RATIO meter can be used to indicate the signal level in dB relative to the setting of the LEVEL CONTROL switch (16) and the VERNIER (15), provided the LEVEL AT switch is set to OUTPUT.
   The S/N function is not in use under these conditions.
   If it is desired to sweep the AF generator, do so at a constant rate (per decade). The sweep rate should not exceed 1 decade per 20 seconds for full resolution.

USING THE BUILT-IN OSCILLATOR OUTPUT WITHOUT THE DISTORTION METER

The BKF10 Oscillator with its extremely low distortion (<0.01%) may be used separately as an AF signal source.

1. Set LEVEL A switch (17) to OUTPUT.
2. Use LEVEL CONTROL (16) (and VERNIER (15), if necessary) to obtain the output level required.
3. Set oscillator function switch (8) to either SINGLE SWEEP, MAN. or EXT., as required.
4. To monitor the frequency (output level above 10 mV only), use a BNC T-connector and connect the OUTPUT to the INPUT with a short length of screened cable. See Fig. 4.

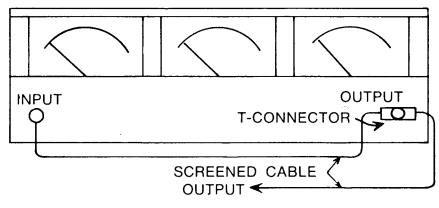


Fig. 4.

REAR PANEL – CONNECTORS

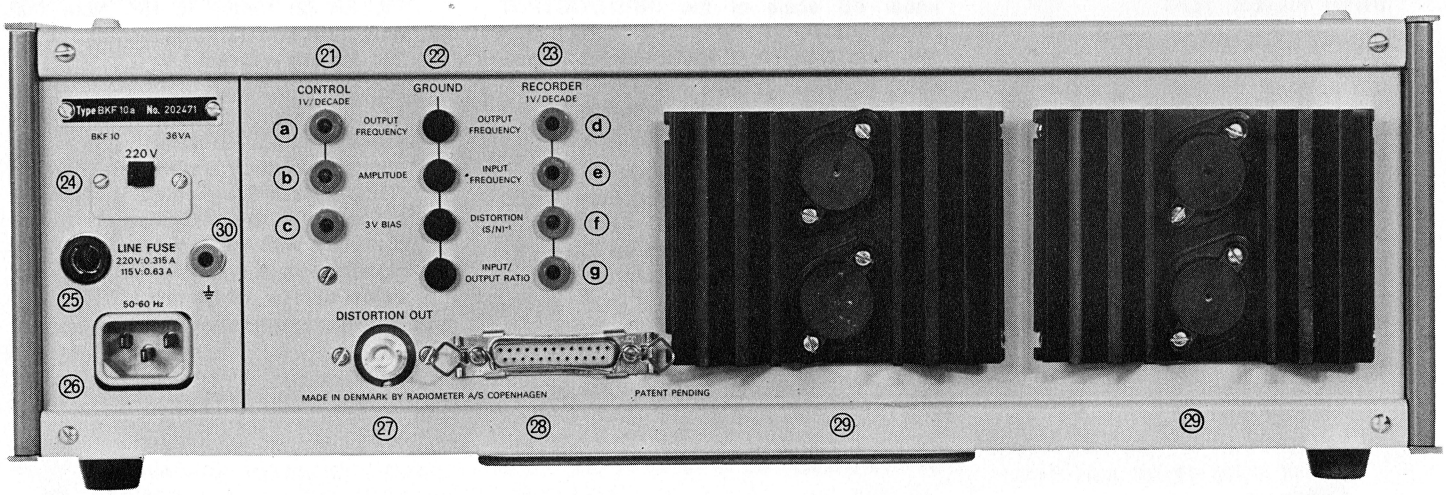


Fig. 5.

21. Jacks for connection of external dc analogue voltages for external control of frequency and output level.

Jack 21a.
OUTPUT FREQUENCY. 0 to +3 V dc between jacks (21a) and (22) changes frequency at OUTPUT from 20 Hz to 20 kHz (1 V/decade), with oscillator function switch (8) set to EXT., input resistance >1 MΩ.

Expression: $Vdc = \log \frac{f}{20\ Hz}$ [Volt]

Jack 21b.
AMPLITUDE. A dc analogue voltage between jacks (21b) and (22) changes level as given in I and II below with LEVEL CONTROL switch (16) set to EXT., input resistance >1 MΩ.
I. With LEVEL AT switch (17) set to OUTPUT, the level at OUTPUT changes from 1 V to 1 mV (1 V/decade) with analogue voltage of 0 to –3 V dc.

Expression: $Vdc = \log \frac{V_{ouput}}{1\ V}$ [Volt]

II. With LEVEL AT switch (17) set to INPUT, level at INPUT changes from 3 V to 10 mV (1 V/decade) with an analogue voltage of +0.48 V to –2 V dc.

Expression: $Vdc = \log \frac{V_{input}}{1\ V}$ [Volt]

Jack 21c.
3 V BIAS. dc bias voltage for recording, etc., output resistance <1Ω, max. load 5 mA.

22. Four common signal GROUND jacks.

23. Jacks for connection of dc analogue output voltages to recorder, etc:
All output resistances <1 Ω, max. loads 4 mA.

Jack 23d.
OUTPUT FREQUENCY, dc analogue voltage of oscillator output frequency: +3 V at 20 kHz to 0 V at 20 Hz, 1 V/decade.

Expression: $Vdc = \log \frac{f}{20\ Hz}$ [Volt]

Jack 23e.
INPUT FREQUENCY, dc analogue voltage of INPUT FREQUENCY meter: +3 V at 20 kHz to 0 V at 20 Hz, 1 V/decade.

Expression: $Vdc = \log \frac{f}{20\ Hz}$ [Volt]

Jack 23f.
DISTORTION – S/N^{-1}, dc analogue voltage of DISTORTION meter:
I. –4 V at 0.01% to –1 V at 10%, 1 V/decade.
II. With S/N button depressed: –4 V at –80 dB to –1 V at –20 dB signal-to-noise ratio, 1 V/20 dB.
Expression: Vdc = log k [Volt]
k = distortion factor (100%~k=1)

Jack 23g.
INPUT/OUTPUT RATIO, dc analogue voltage of INPUT/OUTPUT RATIO meter: –2 V at –40 dB to +3.5 V at 70 dB, 1 V/20 dB.

Expression: $Vdc = \log \frac{V_{input}}{V_{ouput}}$ [Volt]

24. Line voltage selector.

25. Line supply fuse.

26. Line cord receptacle.

27. AF frequency output (BNC) from band-stop filter (harmonics only with fundamental freq. rejected). Intended for connection to oscilloscopes, etc.

28. Multiconnector. All dc analogue voltages, both for external control and for recording, are also available here for connection to accessories, e.g., the Radiometer REC61S2 Servograph. For details of the individual pin connections, see page 5.

29. Cooling fins. The BKF10 should be placed so that adequate ventilation is possible, particularly when mounted in racks and cabinet systems.

30. Ground jack ⏚ This jack is used to ground the instrument if it is not grounded via the power cord.

EXTERNAL CONTROL OF BKF10

Frequency Control

Set oscillator function switch (8) to EXT. Apply a dc analogue voltage between the rear panel jacks OUTPUT FREQUENCY (21a) and common signal ground jack (22), or between pins 15 and 20 of the multiconnector (28). For details of the voltage levels, see page 4.

If an external sweep function is desired, the sweep rate should not exceed 1 decade per 20 seconds for full resolution.

To obtain spot frequencies, the analogue voltage should be arranged as a step function. Do not measure before both OUT OF RANGE lamps are off. The 3 V BIAS voltage available at jacks (21c) and (22) may be used in conjunction with a suitable, external, switched resistance divider to achieve this.

Amplitude Control

The amplitude at the OUTPUT or the INPUT may be controlled externally.

Set the LEVEL CONTROL switch (16) to EXT. Apply a dc analogue voltage between the rear panel jacks marked AMPLITUDE (21b) and (22), or between pins 17 and 20 of the multiconnector. For details of the voltage levels, see page 4.

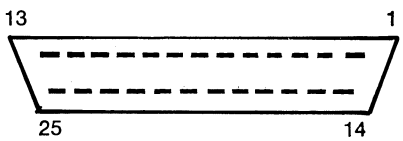


Fig. 6. The multiconnector (28), rear panel view.

PIN CONNECTIONS OF MULTICONNECTOR ON REAR PANEL

Pin 1
dc analogue output of INPUT/OUTPUT RATIO meter.
Equivalent to jack (23g).

Pin 2
dc analogue output of INPUT FREQUENCY meter.
Equivalent to jack (23e).

Pin 3
I: dc analogue output of DISTORTION meter.
II: dc analogue output of S/N measurement when S/N button (13) is depressed (or a short circuit connected between pins 18 and 20).
Equivalent to jack (23f).

Pin 4
Fly-back. During frequency sweep this pin is at logic 1 (+2.4 V to +5 V). During fly-back (i.e., as frequency returns from 20 Hz to 20 kHz after sweep) this pin is at logic 0 (0 V to +0.4 V).

Pin 5
Reset. A momentary connection of this pin to 0 V (pin 20) will reset the oscillator frequency to 20 kHz at any time during operation.

Pin 6
Ground connection for chassis and cabinet. (Not to be used as substitute for the 0 V pins 20, 21 and 22, or for the common GROUND jacks (22) on rear panel).

Pins 7 to 13
No connections.

Pin 14
+3 V dc bias (max. 5 mA) for recording (see RECORDING below).
Equivalent to jack (21c).

Pin 15
For connection of external dc analogue voltage for control of the oscillator output frequency.
Equivalent to jack (21a).

Pin 16
dc analogue voltage of oscillator output frequency.
Equivalent to jack (23d).

Pin 17
For connection of external dc analogue voltage for control of level at OUTPUT and INPUT.
Equivalent to jack (21b).

Pin 18
A short circuit of this pin to 0 V (pin 20) activates the S/N function.

Pin 19
Sweep start. A momentary short circuit of this pin to 0 V (pin 20) starts the single sweep function.

Pins 20, 21 and 22
0 V. While these pins are, in effect, connected together, it is intended that pin 20 be used for the 0 V connection of the functions connected to pins 1 through 19, and that pins 21/22 be used for the 0 V connections of the supplies available at pins 23, 24 and 25.

Pin 23
+5 V dc (max. 50 mA).

Pin 24
–12 V dc (max. 20 mA).

Pin 25
+12 V dc (max. 20 mA).

RECORDING

The BKF10 provides dc analogue voltages for recording of all measurements made.

REC61S2 SERVOGRAPH

For instructions on the use of the preferred REC61S2 Servograph with BKF10, please refer to the operating instructions for the REC61 and the REA240 Distortion Interface.

X–Y RECORDER

Recording distortion as a function of frequency

1. Connect the x-axis between the rear panel jacks (23e) and (22) marked INPUT FREQUENCY. For details of the voltage levels, see page 4.
2. Connect the y-axis between the rear panel jacks (23f) and (22) marked DISTORTION. For details of the voltage levels, see page 4.
3. Adjust the sensitivities of the recorder axes to the dc analogue voltage of the BKF10 and proceed with the operating routine.

Recording amplitude response as a function of frequency

4. Connect the recorder as for 1. above.
5. Connect the y-axis between the rear panel jacks (23g) and (22) marked INPUT/OUTPUT RATIO. For details of the voltage levels, see page 4.
6. Proceed as in 3. above.

X–Y_1–Y_2 RECORDER

Simultaneous recordings of distortion and amplitude response as a function of frequency

Proceed as in 1. through 6. above. Connect as at 2. to the y_1-axis, and as at 5. to the y_2-axis.

If the off-set between the y_1 and y_2 pens is not excessive, there should be no difficulties in interpreting the simultaneously recorded measurements.

S/N Ratio

An analogue voltage of the S/N ratio is available between the rear panel jacks (23f) and (22) marked $(S/N)^{-1}$ (common with distortion) when the S/N button is depressed or when a short circuit is connected between pins 18 and 20 of the multiconnector (28).

The dc analogue voltage of the S/N ratio measurement present at these jacks remains as long as the S/N button is held depressed.

ABRIDGED PERFORMANCE CHECK

This abridged performance check may be used at any time to check the basic performance of the BKF10. The test procedure does not replace the Service Performance Check included in the Service Manual for the BKF10, but is intended only to satisfy the operator that the instrument is without a major fault.

1. Connect the OUTPUT to the INPUT using a short length of 50 Ω coaxial cable.
2. Set the controls as follows:

   MAX. INPUT: 3 V

   VERNIER: CAL.

   LEVEL CONTROL switch: 1 V

   LEVEL AT selector: OUTPUT

   Oscillator function switch:
   SINGLE SWEEP

   INPUT FILTER: FLAT

3. Depress momentarily the SINGLE SWEEP button (7), and note the following:
   a. INPUT FREQUENCY meter should slowly sweep (approx. 60 secs.) from 20 kHz to 20 Hz, whereafter it should return (fly back) to 20 kHz.
   b. The DISTORTION meter should indicate a value not greater than 0.03 to 0.05% during the sweep.
   c. The INPUT/OUTPUT RATIO meter should indicate 0 (zero) on the scale.
   d. The following lamps should **NOT** light during the sweep:
      OUT-OF-RANGE lamps (11) and (19)
      +20 dB (6)
      UNCAL (14)
   e. Set MAX. INPUT switch to 30 V and resweep. Check as for a, b and c above, except that the –dB (4) and +20 dB lamps (6) **should** light, and the INPUT/OUTPUT RATIO meter should indicate 20.5 on the scale (10 kΩ/(10 kΩ+600 Ω) ~ 0.48 dB loss).
   f. Depress the S/N pushbutton (13) and check that an S/N ratio of approx. –80 dB and an input/output ratio of approx. 90 dB are obtained. Release the S/N pushbutton.
   g. Set the oscillator function switch to MAN. and, using the OUTPUT FREQ. control (18), check that the INPUT FREQUENCY meter can be set to any desired value on the scale.
      Reset the oscillator function switch to SINGLE SWEEP and check that the INPUT FREQUENCY meter returns to 20 kHz.
   h. Set the LEVEL AT selector to INPUT and the LEVEL CONTROL switch to 0.1 V. Repeat check e. above.

SHORT DESCRIPTION OF INTERNAL FUNCTION

The BKF10 consists primarily of four sections: a distortion meter section, a frequency measuring section, a level control section and an AF sweep oscillator.

The simplified block diagram (Fig. 7) shows the interconnection of the sections. The distortion meter section comprises, firstly, a 20 dB switch-selected attenuator and an automatic level control (ALC) pre-amplifier with a 50 dB dynamic range, and secondly, an automatically tuned 3-stage band-stop filter for suppression of the fundamental frequency in the range 20 Hz to 20 kHz, an RMS detector and a meter.

The ALC pre-amplifier ensures that the level to the band-stop filter is held constant. The frequency and the characteristics of the band-stop filter are electronically controlled. The band-stop filter has 3 stages which ensure an adequate suppression of the fundamental frequency.

A coarse frequency control of the filter is provided from the frequency measuring circuit, and a level control signal is passed from the RMS detector.

The RMS detector measures the level of harmonics passing through the band-stop filter, and by means of the gain measuring circuit the ratio of the harmonics to the total signal, i.e., the distortion factor, is determined. The output from the detector is then fed to the distortion meter which indicates the total harmonic distortion factor directly on a logarithmic scale covering the range 0.02 to 10%. A recorder output from the detector, which is intended especially for sweep-frequency distortion recordings, provides a dc analogue voltage proportional to the logarithm of the distortion factor. A high-pass and a low-pass filter are included in this section and can be selected on the front panel. These filters allow the measurements of, or the suppression of, any hum and noise present in the input signal.

The frequency measuring section includes the frequency measuring circuit and the frequency meter. The input signal is converted to an analogue voltage proportional to the log of the input frequency. This voltage is used to provide a coarse control of the band-stop filter and the output for the frequency meter. The meter indicates the frequency of the input signal on a logarithmic scale (20 Hz–20 kHz). The analogue voltage is also fed to recorder jacks and can be used, for example, to drive the x-axis of an x–y recorder.

The level-control section comprises two amplitude log converters and a level-control circuit. The input to the level-control circuit is taken from one of the two amplitude log converters, dependent upon the setting of the Level Control switch on the front panel. In the upper position of the switch the level-control circuit holds the output of the device under test constant via a feedback loop to the ALC output amplifier. In the lower position of the switch the level-control circuit holds the input to the device under test constant.

The Input/Output meter, which has a linear dB scale, is connected via a comparator to the amplitude log converters and responds to the analogue difference voltage between the input and the output of the BKF10.

The built-in AF sweep oscillator has an extremely low distortion factor (<0.01%) and can be both amplitude and frequency controlled. The frequency is controlled in three different manners, which are selected by a switch on the front panel: a built-in single sweep function, a manual frequency control function, using the Output Frequency control on the front panel, or an external function. The latter permits control of the frequency by means of an external dc analogue voltage, either as a continuous sweep or as a step-function to provide spot frequencies.

The output level from the oscillator is controlled in two ways: internally by using the combination of the level controls on the front panel, and externally by a dc analogue voltage. Control of the output level is achieved by regulating the gain of the ALC output amplifier, which is derived from the level control circuit. The level control circuit compares the level from either the amplitude log. converters or the external dc analogue voltage with an internal reference level. When switched to external level control, however, the amplitude log. converters continue to function, providing information for a comparator to obtain an input/output ratio, irrespective of the external control of the ALC output amplifier.

To facilitate operation with a strip-chart recorder, a 3 volt dc bias voltage is provided for connection to a passive chart-tracking potentiometer associated with strip-chart recorders, for example, the Radiometer REC51 or 61.

If the REC61S2 Servograph is used, this bias voltage is passed via the multiconnector to the Distortion Interface on the REC61, which ensures complete compatibility. With either arrangement the time axis of the recorder driving the chart-tracking potentiometer determines the frequency of the oscillator.

Other external control facilities are provided; for example, to allow the BKF10 to be used in automatic test systems applications. Details of these facilities will be found on pages 4 and 5.

The signal/noise ratio of a device under test can be measured very simply by depressing the S/N button on the front panel. Depressing the S/N button holds the gain of the ALC pre-amplifier constant while at the same time muting the oscillator output. The S/N ratio is then read off directly from the dB scale of the Distortion meter.

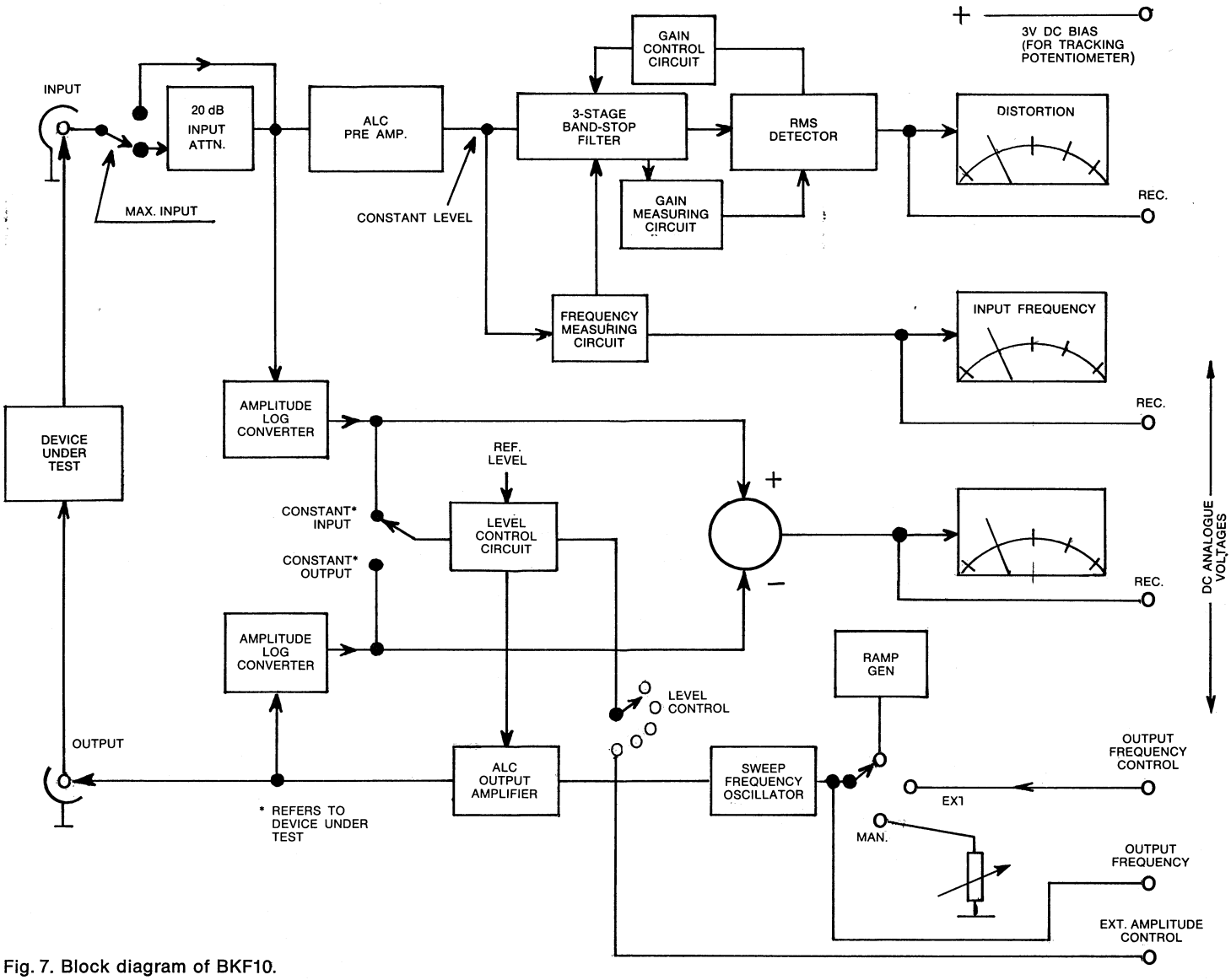


Fig. 7. Block diagram of BKF10.

SPECIFICATIONS

Distortion meter

Fundamental frequency:	20 Hz to 20 kHz
Harmonics and noise (–3 dB):	10 Hz to 150 kHz
Distortion range:	0.02% to 10%
Accuracy (0.1%–10% distortion):	±1 dB
Intrinsic distortion:	<0.02%
Input voltage limits:	10 mV–30 V
Input impedance: V_{in} = <3 V	1 MΩ
V_{in} = <30 V	10 kΩ
Input noise voltage: (BW = 150 kHz)	<8 μV rms
Pre-amp. dynamic range:	50 dB
Min. sweep time (20 Hz–20 kHz):	approx. 1 min.
S/N range:	–80 dB to –20 dB
Recorder output voltage:	Vdc = log k [Volt] (100%~k=1) k = distortion factor
HP–LP filter: Cutt-off frequency	250 Hz
Attenuation	20 dB

Input/output ratio meter

Frequency range:	20 Hz to 20 kHz
Measuring range:	–40 to +90 dB
Accuracy:	±1 dB
Recorder output voltage:	$Vdc = \log \frac{V_{INPUT}}{V_{OUTPUT}}$ [Volt]

Input frequency meter

Measuring range:	20 Hz to 20 kHz
Accuracy:	±5%
Recorder output voltage:	$Vdc = \log \frac{f}{20\ Hz}$ [Volt]

Oscillator

Frequency range:	20 Hz to 20 kHz
Output freq. control:	$Vdc = \log \frac{f}{20\ Hz}$ [Volt]
Accuracy of frequency:	±5%
Time constant of freq. reg.:	0.16 s
Harmonic distortion:	<0.01%
Output voltage (EMF):	1 mV to 1 V
Accuracy of output voltage:	±0.5 dB
Output impedance:	600 Ω
Output voltage control:	$Vdc = \log \frac{V_{OUTPUT}}{1\ V}$ [Volt]
Input voltage control:	$Vdc = \log \frac{V_{INPUT}}{1\ V}$ [Volt]
Time constant of V output reg.:	0.25 s
Power requirements:	115/220 V (95–130/190–260), 47.5–63 Hz, 50 VA
Ambient temp. range:	+5°C to +40°C
Storage temp.:	–40°C to +70°C
Dimensions (W×H×D):	440×144×344 mm
Weight:	9.5 kg
Accessories supplied:	Operating Instructions Power cord
Patents:	US and other patents pending

Data subject to change without notice.

982-701 PRINTED BY RADIOMETER A/S COPENHAGEN DENMARK 405A

RADIOMETER
COPENHAGEN

9/9-74

Supplement to
BKF10 OPERATING INSTRUCTIONS

Cooling Fan

In order further to improve the long-term stability of BKF10, a cooling fan has been introduced on the rear panel.

Ensure that there is at least 25 mm (1 inch) clearance at the air intake of the fan.

Check the filter regularly for dirt. If it is dirty, take the filter house off (2 screws) and simply wash the filter.

Rear Panel Jacks

The introduction of the cooling fan has made it necessary to remove the extra control and recorder in- and output banana jacks. However, all functions are still available on the 25-pole connector as described in the Operating Instructions (pages 4-5).