Distortion Analyzers

INTRODUCTION

The introduction of the Model 6800 Distortion Analyzer in 1979 represents not only the first in a new product line for KROHN-HITE, but also a significant contribution to distortion measurement technology.

Within the last decade, refinements to circuit-design techniques plus the availability of higher quality components, have resulted in a marked reduction in distortion levels inherent to such instruments as sinewave oscillators, waveform generators, high power audio amplifiers and receivers. Present distortion levels on the order of .005% created a need for a more sophisticated measurement system than was presently available. Several manufacturers, including KROHN-HITE, responded to this need, but it is KROHN-HITE alone, through its own innovative technology, that has gone one step further, namely to offer for the first time, an instrument that offers fast and accurate distortion measurements over a continuous frequency range, without the need to constantly readjust amplitude and/or frequency settings with each measurement! This represents a significant savings in man-hours, when several measurements must be made within a particular frequency range, especially in an on-line production testing environment.

GENERAL DEFINITIONS

A distortion analyzer is an instrument that measures the amount of distortion present in an otherwise pure sinusoidal, and displays that amount of distortion as a percentage or dB ratio of the original input signal being measured.

Distortion, broadly defined, is the undesireable change that occurs in the shape of a waveform when that waveform is passed through or generated from a non-linear system. Several types of distortion can exist, depending upon the system. *Harmonic* distortion, for example, commonly occurring in waveform generators, consists of unwanted frequency components which are multiple integrals of the fundamental frequency, and which vary in amplitude and phase; *Intermodulation* (IM) distortion, found in audio amplifiers, occurs as multiple-integral components of the sum and difference of the two input test frequencies; *Pulse* or delay distortion occurs when a pulse is passed through a non-linear phase system, resulting in a characteristic "overshoot", "droop" or "ringing" of the pulse.

The KROHN-HITE Low Distortion Analyzers measure harmonic distortion. Harmonic distortion is measured by detecting the resultant sum of the amplitudes of all harmonics contained within the fundamental, after the fundamental has been filtered out; the resultant sum is then displayed on a meter as a percentage or dB ratio of the original input signal. The Distortion Analyzers also provide an AC voltmeter as a secondary mode of operation.

MEASUREMENT TECHNIQUE

A simplified block diagram is shown in Figure 1.

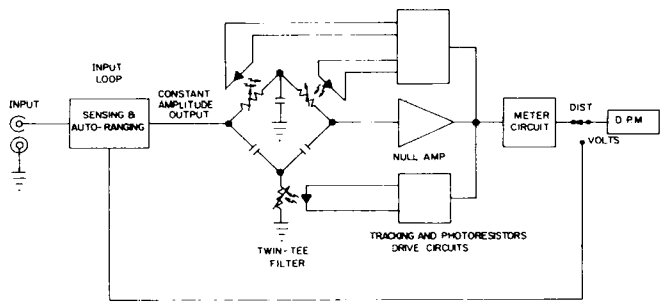


Figure 1. Distortion Analyzer Simplified Block Diagram.

The signal under observation is processed through an input loop that contains a high impedance input amplifier and a sophisticated AGC circuit that covers over a 100:1 amplitude range. The output of the input loop is maintained at a constant voltage, regardless of the input amplitude. This constant amplitude level becomes the full-scale reference for the meter circuit. The output signal is then processed through a frequency-tracking rejection amplifier; a twin-tee rejection filter with photo-resistive elements is tuned by the amplifier's sensing network to produce a sharp null at the fundamental frequency. After the fundamental is filtered out, the residual harmonics are then buffered and applied to the meter circuit, which produces a DC voltage proportional to the distortion. A tracking low-pass filter eliminates high frequency noise. The distortion is displayed directly in percent by the autoranging digital panel meter.

In the VOLTMETER mode, the input loop converts the AC voltage to DC, where it is then displayed by the digital panel meter.

PERFORMANCE CHARACTERISTICS

The KROHN-HITE Analyzers measure harmonic distortion and AC voltage over the frequency range from 1Hz to 110kHz or 5Hz to 1MHz . The outstanding features simplify and reduce set-up time when making repeated distortion or voltage measurements over a wide frequency range. They are custom engineered to fit well within any testing or calibration laboratory environment since it contains a minimum number of operator controls.

Ultra-Low Distortion Measurements:

Distortion measurements can be made down to .003%, typically, with .001% resolution. The auto-ranging digital display reads directly in percent, and eliminates the need to change ranges for different levels of distortion. The digital meter also eliminates ambiguities commonly encountered in reading analog meters.

Total, Automatic Setting of Input Level:

Unlike other distortion analyzers whose so-called "auto set-level" feature actually involves several, manually selected ranges, the Krohn-Hite Analyzers provide *total* automatic level setting over the entire voltage range. Front Panel, Hi-Lo indicators will signal an out-of-range condition.

Auto-Nulling of Frequency:

Other distortion analyzers must be pre-tuned to within a few percent of the fundamental input frequency, before the auto-nulling circuit takes over. Krohn-Hite Distortion Analyzers provide auto-nulling of frequency over the entire range of the instrument, (6800/6801 require decade switching only). Now, continuous distortion (or voltage) measurements can be made within 4-5 seconds, as compared to 30-45 seconds with other manually tuned analyzers.

Additional Features:

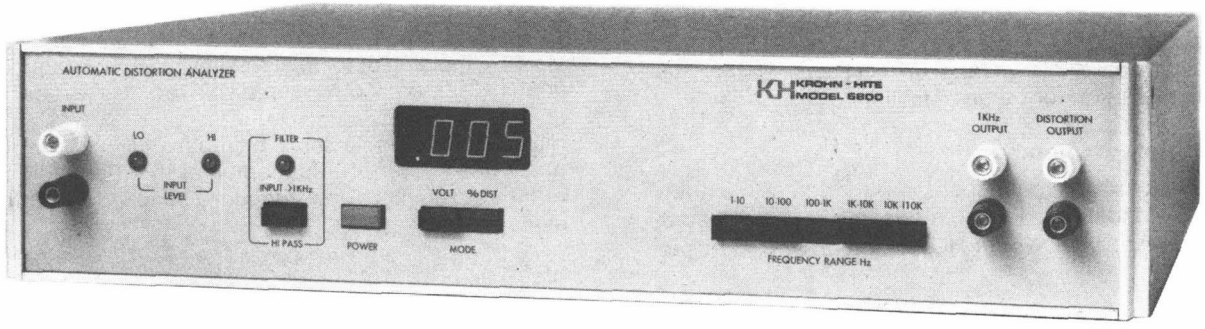
Oscillator Output: a 1kHz, 5 volt RMS sinewave, with less than .003% distortion, is provided for use as a low distortion excitation source.

Distortion Output: The distortion signal is made available for visual inspection or for spectral analysis; the output is approximately 100mV/% distortion displayed.

Filter: A switch selectable high-pass filter is provided. Normally used when the fundamental is greater than 1kHz, to reduce the effects of low frequency hum and noise on the input signal.

AUTOMATIC DISTORTION ANALYZER

model 6800



- **Automatic Level Set from 1-130 Volts RMS**
- **Automatic Frequency Nulling**
- **Frequency Range:** 1 Hz to 110kHz
- **Measures Distortion down to .005%, with Resolution of .001%**
- **Digital Display:** 3½ Digit, Auto-Ranging
- **AC Voltmeter:** 0 .1-130 Volts RMS, 1Hz to 110kHz
- **Internal Oscillator:** 1kHz, Less Than .003% Distortion

The KROHN-HITE Model 6800 Automatic Distortion Analyzer features an auto-ranging digital readout to simplify and enhance distortion measurements!

The 6800 measures total harmonic distortion and AC voltages over the frequency range from 1Hz to 110kHz. The unique auto set level feature eliminates the need to adjust the meter for different amplitudes. Input voltages may range from 1 volt to 130 volts RMS. To further add to the ease of operation we've provided pushbutton frequency range selectors for auto-nulling of frequency over a 10:1 range. The fast settling time allows most distortion measurements to be made in less than 4 seconds. Ultra-low distortion can now be measured with resolution of 0.001%. A switch-selectable high pass filter is provided to reduce the effects of hum and low frequency noise on the input signal. A low pass tracking filter is also incorporated to eliminate high frequency noise. This tracking filter is automatically tuned with a change in input frequency.

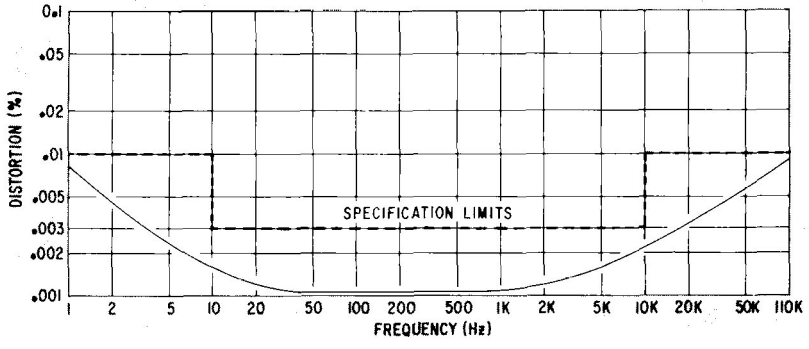
As an AC voltmeter, the 6800 covers the wide frequency range of 1Hz to 110kHz and will measure from 100 millivolts to 130 volts RMS. The 3½ digit auto-ranging display eliminates ambiguities commonly found in analog voltmeters.

A distortion output is provided for visual inspection or spectral analysis of the input signal after the fundamental has been filtered out.

An analog output provides a DC voltage proportional to the distortion reading.

An ultra-low distortion (< .003%) sine wave output is provided for use as a standard to test circuit or system distortion characteristics.

This truly unique, low priced, automatic distortion system can solve many of your measurement problems, and provide fast and easy results even for the unskilled tester. It is the ideal workhorse for any lab and satisfies many applications including calibration labs, production testing and general lab use.



TYPICAL INTERNAL DISTORTION

SPECIFICATIONS

DISTORTION METER

FUNDAMENTAL FREQUENCY RANGE: 1Hz to 110kHz.

AUTOMATIC FREQUENCY TUNING: Self-tuning of frequency over 10:1 range, as selected by 5 position FREQUENCY RANGE switch.

BAND	TUNING RANGE (Hz)
1	1 - 10
2	10 - 100
3	100 - 1K
4	1K - 10K
5	10K - 110K

An intermittent meter display indicates an out-of-range condition.

DISTORTION RANGE: A digital panel meter with auto-ranging displays percentage of Total Harmonic Distortion (THD) to 12.0%.

RANGE (%)	RESOLUTION (%)
.000 - .100	.001
.10 - 1.00	.01
1.0 - 12.0	.1

DISTORTION MEASUREMENT ACCURACY:
10Hz to 10kHz: ±15% of reading or ±.002%, whichever is greater.
1Hz to 110kHz: ±15% of reading or ±.02%, whichever is greater.
NOTE: Specifications apply for harmonics < 500kHz at distortion levels > 0.1%. Below 0.1%, specifications apply up to the 5th harmonic.

INTERNALLY GENERATED DISTORTION:

1Hz-10Hz:	< .01%	(-80dB)
10Hz-10kHz:	< .003%	(-90dB)
10kHz-110kHz:	< .01%	(-80dB)

AUTOMATIC SET LEVEL: No presetting of input level required for distortion measurements from 1-130 volts RMS. HI-LO indicators signal an out-of-range condition.

SETTLING TIME (to 0.1%):

BAND	TYPICALLY
1	50 seconds
2	10 seconds
3-5	3 seconds

FUNDAMENTAL REJECTION: >90dB (.003%), 1Hz-10kHz; >80 dB (.01%), 10kHz-110kHz.

RESIDUAL NOISE:

BAND	LEVEL (%)
1-3	.001
4	.003
5	.01

INPUT LEVEL: 1 to 130 volts RMS.

INPUT IMPEDANCE: 110k ohms shunted by 75pf.

FILTER, HIGH PASS: Switch selectable. Normally used when the fundamental is greater than 1kHz, to reduce the effect of hum and low frequency noise components on the input signal. Attenuation rate, 12dB/octave.

FILTER, LOW PASS: Filter tracks input frequency and is switched on automatically when the distortion level is less than 0.1%, to minimize the effects of high frequency noise. The Filter 3dB cutoff is approximately 10 times the input frequency. Attenuation rate is 6dB/octave.

MAXIMUM DC COMPONENT: 100V.

ISOLATION TO CHASSIS: 500V DC.

DISTORTION OUTPUT: (For visual inspection or spectral analysis of the distortion signal):

Output Voltage: 100mV RMS/% THD.
Output Impedance: 300-500 ohm.

ANALOG OUTPUT: DC voltage proportional to distortion, 100mV/1%.

AC VOLTMETER

FREQUENCY RANGE: 1Hz to 110kHz.

VOLTAGE RANGE: 100 millivolts to 130 volts RMS.

VOLTAGE RANGE (VOLTS)	RESOLUTION (VOLTS)
.10 - 12.99	.01
13.0 - 130.0	.1

DISPLAY: 3½ digit panel meter with auto-ranging.

ACCURACY: ± 2%, ±1 digit.

INPUT IMPEDANCE: 110k ohms shunted by 75pf.

MAXIMUM DC COMPONENT: 100V.

ISOLATION TO CHASSIS: 500V DC.

OSCILLATOR OUTPUT

FREQUENCY: 1kHz, fixed.

OUTPUT VOLTAGE: 5 volts RMS.

OUTPUT CURRENT: 3 milliamperes RMS.

DISTORTION: < .003%.

OUTPUT IMPEDANCE: 600 ohms.

GENERAL

METER DISPLAY: .55", 7 segment planar gas discharge.

CONTROLS:

Front Panel: Push-button MODE and FREQUENCY Hz selectors.

Rear Panel: Slide switches for NORM/LO line and 115V/230V AC operation.

CONNECTORS: Front panel, binding posts; rear panel, BNC.

OPERATING TEMPERATURE RANGE: 0°C to 45°C.

POWER REQUIREMENTS: Switch selectable, 90-110, 108-132, 180-220 or 216-264 volts, single phase, 50-400Hz, 15 watts.

DIMENSIONS AND WEIGHTS:

	H	W	D	Net	Gross
U.S.	3 1/2"	16 5/8"	14"	10.5 lbs.	12.5 lbs.
Metric	9cm	42.3cm	36.2cm	4.8kgs	5.7kgs.

OPTIONAL RACK-MOUNTING KIT:

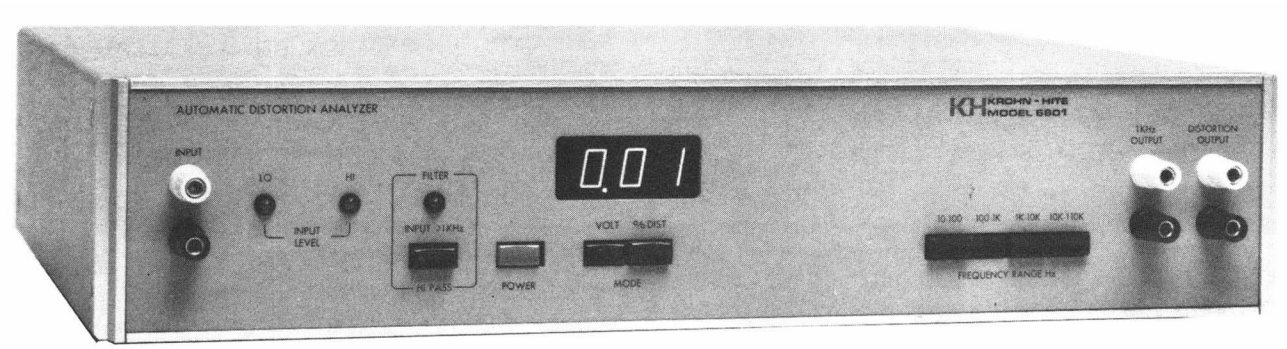
Part No. RK-319 permits installation of the Model 6800 into a standard 19" rack-spacing.

BCD OUTPUT (OPTIONAL): Provides 13 lines of parallel BCD output, plus 1 MODE output, 3 decimal point outputs and 4 separate 3-state control lines. Compatible with DTL, RTL and TTL logic.

Specifications subject to change without notice.

AUTOMATIC DISTORTION ANALYZER

model 6801



- **Automatic Level Set from 0.1 - 13 Volts RMS**
- **Automatic Frequency Nulling**
- **Frequency Range:** 10 Hz to 110kHz
- **Measures Distortion down to .005%, with Resolution of .001%**
- **Digital Display:** 3½ Digit, Auto-Ranging
- **AC Voltmeter:** 10 Millivolts to 13 Volts RMS, 10 Hz to 110kHz
- **Internal Oscillator:** 1kHz, Less Than .003% Distortion

The KROHN-HITE Model 6801 Automatic Distortion Analyzer features an auto-ranging digital readout to simplify and enhance distortion measurements! It is ideally suited for low distortion measurements.

The 6801 measures total harmonic distortion and AC voltages over the frequency range from 10Hz to 110kHz. The unique auto set level feature eliminates the need to adjust the meter for different amplitudes. Input voltages may range from 0.1 volt to 13 volts RMS. To further add to the ease of operation we've provided pushbutton frequency range selectors for auto-nulling of frequency over a 10:1 range. The fast settling time allows most distortion measurements to be made in less than 3 seconds. Low distortion can now be measured with resolution of 0.001%. A switch-selectable high pass filter is provided to reduce the effects of hum and low frequency noise on the input signal. A low pass tracking filter is also incorporated to eliminate high frequency noise. This tracking filter is automatically tuned with a change in input frequency.

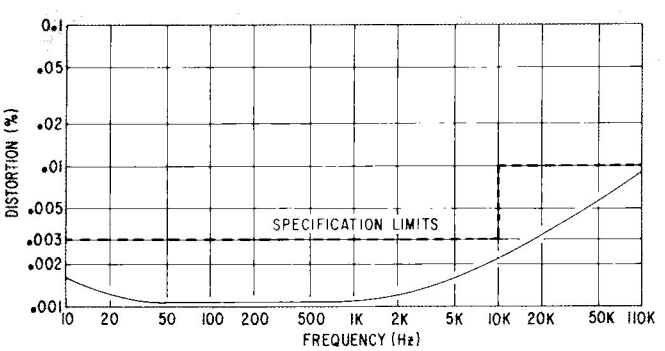
As an AC voltmeter, the 6801 covers the wide frequency range of 10Hz to 110kHz and will measure from 10 millivolts to 13 volts RMS. The 3½ digit auto-ranging display eliminates ambiguities commonly found in analog voltmeters.

A distortion output is provided for visual inspection or spectral analysis of the input signal after the fundamental has been filtered out.

An analog output provides a DC voltage proportional to the distortion reading.

An ultra-low distortion (<.003%) sine wave output is provided for use as a standard to test circuit or system distortion characteristics.

This truly unique, low priced, automatic distortion system can solve many of your measurement problems, and provide fast and easy results even for the unskilled tester. It is the ideal workhorse for any lab and satisfies many applications including telephony, calibration labs, production testing and general lab use.



TYPICAL INTERNAL DISTORTION

Options

models 6800/6801

OPTION 001: BCD OUTPUT

This option provides an equivalent BCD output of the front panel display, plus 4 additional control lines and a programming ground return. The logic levels are compatible with DTL, RTL, and TTL logic.

Each digit of the display, with the exception of the 100's digit is represented by 4 data output lines coded in a 1-2-4-8 format (pins 4-15); the 100's digit is represented by a single output line (pin 3).

The MODE output line (pin 1) indicates when the MODE switch is in the % DIST or VOLTS position; the output logic level remains "high" for VOLTS and switches to its "low" state for % DIST.

The decimal point outputs pins B, F and N indicate the location of the decimal point in the digital display. A "high" state, on B, F or N indicates that respective decimal point is lit.

The 4 remaining control lines, labelled "3-state control" (pins J, K, L and M) provide a disable function for each digit. The "3-state control" refers to the 3 possible states of the data output lines. When the control lines are left "low" or open-circuit, the digits will be enabled; all data output lines will be "high" or "low" depending on the digits displayed. The source impedance of the output lines is low during the enable state. When the control lines are pulled "high" transfer of data will be inhibited, all output lines disabled will be at zero output level and exhibit a high source impedance. The advantage of this "3-state control" is that it allows the user to externally reconnect the data output lines for serial or multiplex operation, without the need for buffer stages.

Table 1 lists the programming pin connections for this option. A programming edge connector, TRW type 251-15-30-160 is also provided.

OPTION 002: dB READOUT

Switch selectable. Displays the distortion being measured either in percent (%) or dB, as referenced to the level at the Analyzer INPUT.

OPTION 003: 30kHz, 80kHz LOW PASS FILTERS

Switch selectable. Provides two, internal low pass filters, with 18dB/octave rolloff, at frequencies of approximately 30kHz and 80kHz. Used to eliminate high frequency noise components.

MODEL 6880

Option 001: Extends frequency range to 1Hz.

BCD OUTPUT PIN CONNECTIONS

Pin	Function	Description
1	MODE	"low" for % DIST "high" for VOLTS
2	N/C	—
3	1000	↑ DPM BCD OUTPUT
4	0800	
5	0400	
6	0200	
7	0100	
8	0080	
9	0040	
10	0020	
11	0010	
12	0008	
13	0004	
14	0002	
15	0001	↓
A	N/C	—
B	X.XXX	Decimal Point
C	N/C	—
D	N/C	—
E	N/C	—
F	XX.XX	Decimal Point
H	N/C	—
J	1XXX 3-state	"high" for "high Z"
K	X1XX 3-state	"low" or open-circuit
L	XX1X 3-state	for enable
M	XXX1 3-state	—
N	XXX.X	Decimal Point
P	N/C	—
R	N/C	—
S	⏚	Programming Ground

BCD, MODE and Decimal Point Output Levels:

Voh = 2.5V, I_{source} = −4.2mA
Vol = 0.4V, I_{Sink} = 2.1mA

Disable Input Levels:

Voh > 3.5V
Vol < 1.5V R_{load} = 47K ohms

SPECIFICATIONS

DISTORTION METER

FUNDAMENTAL FREQUENCY RANGE: 10Hz to 110kHz.

AUTOMATIC FREQUENCY TUNING: Self-tuning of frequency over 10:1 range, as selected by 4 position FREQUENCY RANGE switch.

BAND	TUNING RANGE (Hz)
1	10 - 100
2	100 - 1K
3	1K - 10K
4	10K - 110K

An intermittent meter display indicates an out-of-range condition.

DISTORTION RANGE: A digital panel meter with auto-ranging displays percentage of Total Harmonic Distortion (THD) to 12.0%.

RANGE (%)	RESOLUTION (%)
.000 - .100	.001
.10 - 1.00	.01
1.0 - 12.0	.1

DISTORTION MEASUREMENT ACCURACY:

INPUT	FREQUENCY	SPECIFICATION
1V - 10V	10Hz - 10kHz	±15% of reading or .005% whichever is greater
	10kHz - 110kHz	±15% of reading or .02% whichever is greater
.1V - 1V	10Hz - 10kHz	±15% of reading or .03% whichever is greater
	10kHz - 110kHz	±15% of reading or .1% whichever is greater

NOTE: Specifications apply for harmonics < 500kHz at distortion levels > 0.1%. Below 0.1%, specifications apply up to the 5th harmonic.

INTERNALLY GENERATED DISTORTION:

10Hz-10kHz:	< .003%	(-90dB)
10kHz-110kHz	< .01%	(-80dB)

AUTOMATIC SET LEVEL: No presetting of input level required for distortion measurements from 0.1-13 volts RMS. HI-LO indicators signal an out-of-range condition.

SETTLING TIME (to 0.1%):

BAND	TYPICALLY
1	10 seconds
2-4	3 seconds

FUNDAMENTAL REJECTION: > 90dB (.003%), 10Hz-10kHz; > 80dB (.01%), 10kHz-110kHz.

RESIDUAL NOISE (Input > 0.2 Volts RMS):

BAND	(%)
1-2	< .003
3	< .005
4	< .03

INPUT LEVEL: 0.1 to 13 volts RMS.

INPUT IMPEDANCE: 11k ohms shunted by 300 pf.

FILTER, HIGH PASS: Switch selectable. Normally used when the fundamental is greater than 1kHz, to reduce the effect of hum and low frequency noise components on the input signal. Attenuation rate, 12dB/octave.

FILTER, LOW PASS: Filter tracks input frequency and is switched on automatically when the distortion level is less than 0.1%, to minimize the effects of high frequency noise. The Filter 3dB cutoff is approximately 10 times the input frequency. Attenuation rate is 6dB/octave.

MAXIMUM DC COMPONENT: 100V.

ISOLATION TO CHASSIS: 500V DC.

DISTORTION OUTPUT: (For visual inspection or spectral analysis of the distortion signal):

Output Voltage: 100mV RMS/% THD.
Output Impedance: 300-500 ohm.

ANALOG OUTPUT: DC voltage proportional to distortion, 100mV/1%.

AC VOLTMETER

FREQUENCY RANGE: 10Hz to 110kHz.

VOLTAGE RANGE: 10 millivolts to 13 volts RMS.

VOLTAGE RANGE (VOLTS)	RESOLUTION (VOLTS)
.01 - 1.29	.01
1.3 - 13	.1

DISPLAY: 3½ digit panel meter with auto-ranging.

ACCURACY: ± 2%, ± 1 digit.

INPUT IMPEDANCE: 11k ohms shunted by 300 pf.

MAXIMUM DC COMPONENT: 100V.

ISOLATION TO CHASSIS: 500V DC.

OSCILLATOR OUTPUT

FREQUENCY: 1kHz, fixed.

OUTPUT VOLTAGE: 5 volts RMS.

OUTPUT CURRENT: 3 milliamperes RMS.

DISTORTION: < .003%.

OUTPUT IMPEDANCE: 600 ohms.

GENERAL

METER DISPLAY: .55", 7 segment planar gas discharge.

CONTROLS:

Front Panel: Push-button MODE and FREQUENCY Hz selectors.

Rear Panel: Slide switches for NORM/LO line and 115V/230V AC operation.

CONNECTORS: Front panel, binding posts; rear panel, BNC.

OPERATING TEMPERATURE RANGE: 0°C to 45°C.

POWER REQUIREMENTS: Switch selectable, 90-110, 108-132, 180-220 or 216-264 volts, single phase, 50-400Hz, 15 watts.

DIMENSIONS AND WEIGHTS:

	H	W	D	Net	Gross
U.S.	3 1/2"	16 5/8"	14"	10.5 lbs.	12.5 lbs.
Metric	9cm	42.3cm	36.2cm	4.8kgs	5.7kgs.

OPTIONAL RACK-MOUNTING KIT:

Part No. RK-319 permits installation of the Model 6801 into a standard 19" rack-spacing.

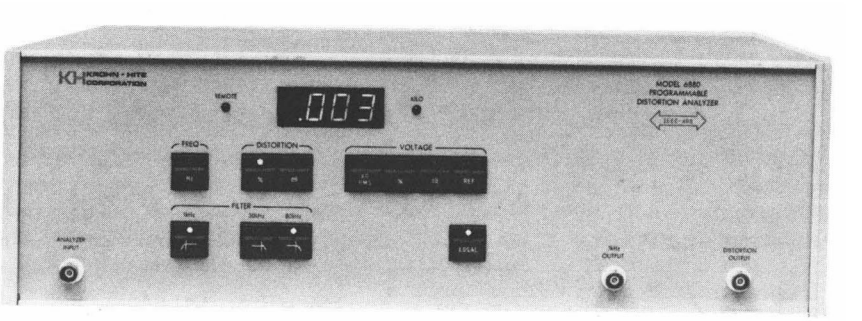
BCD OUTPUT (OPTIONAL): Provides 13 lines of parallel BCD output, plus 1 MODE output, 3 decimal point outputs and 4 separate 3-state control lines. Compatible with DTL, RTL and TTL logic.

Specifications subject to change without notice.

IEEE-488

model 6880

1Hz to 110kHz Programmable Distortion Analyzer



- **Totally Automatic Distortion Measurements:** Completely Eliminates Frequency and Amplitude Adjustments
- **Measures Total Harmonic Distortion down to .003%/-90dB**
- **Measures AC Voltage and Deviation from 0.01 Volts to 130 Volts RMS**
- **Measures Frequency from <1.000Hz to >500kHz**
- **IEEE-488 Bus (GPIB) Compatible**

The KROHN-HITE Model 6880 is the first totally Automatic Distortion, Voltage and Frequency Measurement instrument (1Hz to 110kHz) with IEEE-488 Bus compatibility.

The 6880 combines a low distortion analyzer, AC voltmeter and frequency counter in one instrument and covers the frequency range from 10Hz to 110kHz (1Hz optional). All measurement capabilities are simple to use and are controlled by an internal microprocessor. Press a key or send a simple command to obtain maximum resolution and accuracy of desired measurement.

As a distortion analyzer, the 6880 measures total harmonic distortion, in percent or dB, down to .003% (-90dB), with .001% (0.1dB) resolution for any input level from 0.1 volts to 130 volts RMS. The 6880 requires no manual tuning of frequency; it automatically tunes itself to the frequency of the external signal over the entire range. The unique Auto Set Level feature completely eliminates any need to preset an amplitude reference for any input level. The fast settling time allows most distortion measurements to be made in less than 2 seconds. Switch-selectable high and low pass filters are provided to reduce the effects of hum and noise during distortion measurements. The 1kHz high pass filter reduces the effects of hum and low frequency noise components. The 30kHz and 80kHz low pass filters provide a controlled bandwidth for special tests.

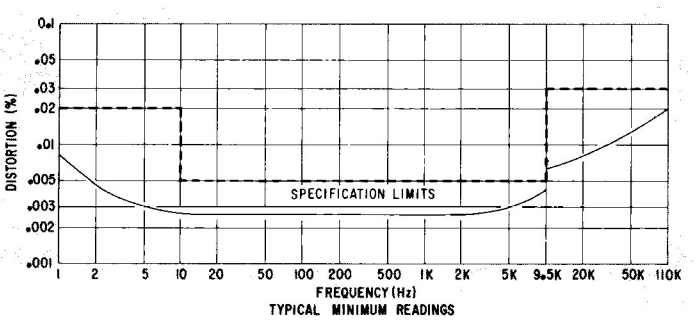
As an AC voltmeter, the 6880 provides RMS voltage measurements between 10mV and 130 volts RMS. Accuracy is typically 2% (0.2dB) The 6880 also provides deviation measurements, in percent or dB with respect to either its internal reference of 0dBm (1mW into 600Ω) or any selected reference.

As a frequency counter, the 6880 will display the fundamental input frequency from <1.000Hz to >500kHz.

Additional features of the Model 6880 include: a distortion output for visual inspection or spectral analysis of the input signal after the fundamental is nulled out; an analog output which provides a DC voltage proportional to the % distortion reading; and an ultra-low distortion (<.003%) 1kHz sinewave output for use as a standard to test circuit or system distortion characteristics.

For ATE systems, the Model 6880 is totally compatible with the IEEE-488 Interface Bus.

The Model 6880 is one of the most versatile bus-programmable distortion measurement systems on the market today. It is outstanding in terms of performance and versatility. With essentially "hands-off" operation, the 6880 provides fast and accurate measurements in both the design lab and during production line testing.



DISTORTION ANALYZER

model 6880

SPECIFICATIONS

DISTORTION METER

FUNDAMENTAL FREQUENCY RANGE: 10Hz to 110kHz (1Hz optional)

INPUT LEVEL: 100mV to 130V rms.

DISTORTION RANGE: 0.001% to 50%; -99.9dB to -6dB.

RESOLUTION: 0.001%, <0.2% distortion; 0.01%, <2% distortion; 0.1%,<20% distortion; 1%, 20% to 50% distortion; 0.1dB, -99.9dB to -6dB distortion; auto-ranging.

ACCURACY: 10Hz to 110kHz, ±15% (±1.5dB), for harmonics <500kHz at distortion levels >0.1% (-60dB). Below 0.1% specifications apply up to the fifth harmonic.

DISTORTION OUTPUT: 10mV rms/percent distortion, Impedance, <600 ohms.

ANALOG OUTPUT: 10mV dc/percent distortion, Impedance, <600 ohms.

RESIDUAL NOISE AND DISTORTION: 0.005% (-86dB) or 10uV, whichever is higher, 10Hz to 9.5kHz, 80kHz BW. 0.02% (-74dB) or 30uV, whichever is higher, 10Hz to 9.5kHz, 500kHz BW; 0.03% (-70dB), or 60uV, whichever is higher, 9.5kHz to 110kHz, 500kHz BW.

FILTERS:
1kHz High Pass: 40dB/decade rolloff.
30kHz Low Pass: 60dB/decade rolloff.
80kHz Low Pass: 60dB/decade rolloff.
10th Harmonic Low Pass: 20dB/decade rolloff automatically switched in at distortion levels below 0.1%.

AC VOLTMETER

FREQUENCY RANGE: 10Hz to 110kHz (1Hz optional).

VOLTAGE RANGE: 10mV to 130V rms.

ACCURACY: ±2% ±1 digit.

DEVIATION RANGE: -100% to >+100%, 0 to ±70dB.

RESOLUTION: autoranging 0.001V, 0.010 to 1.050V; 0.01V, 0.95 to 10.50V; 0.1V, 9.5 to 130V.

FREQUENCY COUNTER

FREQUENCY RANGE: 10.00Hz to 500kHz (1Hz optional).

ACCURACY: ±1 digit.

RESOLUTION: 3½ digits with auto-ranging.

INPUT SENSITIVITY: 100mV to 130V rms.

OSCILLATOR OUTPUT

FREQUENCY: 1kHz, ±5%, fixed.

VOLTAGE: 5 volts rms ±5%.

DISTORTION: <0.003% (-90dB).

OUTPUT IMPEDANCE: 600 ohms ±10%.

OUTPUT CURRENT: 3mA rms.

GENERAL

DISPLAY MODES:
FREQ Hz, displays fundamental frequency.
DISTORTION %, displays total harmonic distortion in percent.
DISTORTION dB, displays total harmonic distortion in dB.
VOLTAGE AC RMS, displays the input voltage level calibrated in rms.
VOLTAGE %, displays deviation of input voltage in percent.
VOLTAGE REF, used with VOLTAGE % or dB to select either internal OdBm (600 Ω) or external reference level.

INPUT IMPEDANCE: 110k ohms shunted by 75pF.

MAXIMUM DC COMPONENT: 100V.

METER DISPLAY: 0.5", 7 segment LED display.

ISOLATION TO CHASSIS: 500V dc.

CONTROLS: Front panel keyboard entry of operational modes. Rear panel power, floating ground switch, and slide switches to select 120V/240V ac operation and normal/low ac line.

OPERATING TEMPERATURE RANGE: 0°C to 45°C.

POWER REQUIREMENTS: Switch selectable, 90-110, 108-132, 180-220 or 216-264 volts; single phase, 85 watts maximum.

DIMENSIONS AND WEIGHTS:
16.625"/42.4cm wide, 5.25"/13.3cm high, 15"/38.1cm deep, 20lb/9.1kg.

Specifications apply at 25°C ±5°C, unless specified otherwise.

PROGRAM INTERFACE: GPIB, conforms to IEEE Std. 488-1978, optically isolated from Analyzer.

IMPLEMENTATION SUB SETS: SH1, AH1, T5, L4, SR1, RL1, PP1, DC1, DTO, CO, E1.

PROGRAM STATUS CONTROL INDICATORS: REMOTE (LED): Indicates a remote programming status; front panel keyboard is disengaged.

LOCAL (key and LED): Returns programming control to the front panel keyboard.

OPTION 001: Extends range to 1Hz.

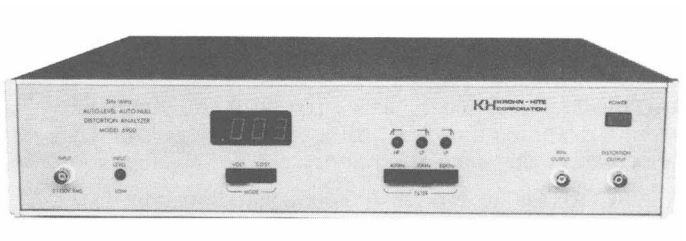
RACK-MOUNTING KIT: Part no. RK-519 permits installation of the Model 6880 into a standard 19" rack.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

model 6900

NEW!

WIDE RANGE .1-130 Volts 5Hz-1MHz FULLY AUTOMATIC DISTORTION ANALYZER



- Fully Automatic Distortion Measurements
- Frequency Range: 5Hz to 1MHz - Auto Nulling
- Voltage Range: .1 to 130 Volts RMS - Auto Level
- Measures Distortion down to .005%
- Measures AC Voltage: .010 - 130 Volts RMS, 5Hz to 1MHz
- Internal Oscillator: 1 KHz, $<$.003% Distortion
- "Hands Off" Operation

The KROHN-HITE Model 6900 is the first fully automatic Distortion Analyzer to provide an easy solution to your distortion and AC voltage measurements over the frequency range from 5Hz to 1MHz.

Compare the ease of operation of the 6900 to any other distortion analyzer. The 6900 requires only an input signal. Auto frequency nulling, auto level setting, and autoranging of the digital meter automatically displays the total harmonic distortion (THD).

The 6900 measures THD from typically 3Hz to an unprecedented 1MHz and input levels from 100mV to 130 volts RMS. Ultra-low distortion can be measured with a resolution of 0.001%. Measurements can be made in less than 3 seconds from 50Hz to 1MHz.

Three switch-selectable filters are provided. A 400Hz high pass to reduce the effects of hum, 30KHz and 80KHz low pass to reduce the effects of high frequency noise. An internal low pass tracking filter is automatically activated at distortion levels below 0.1%.

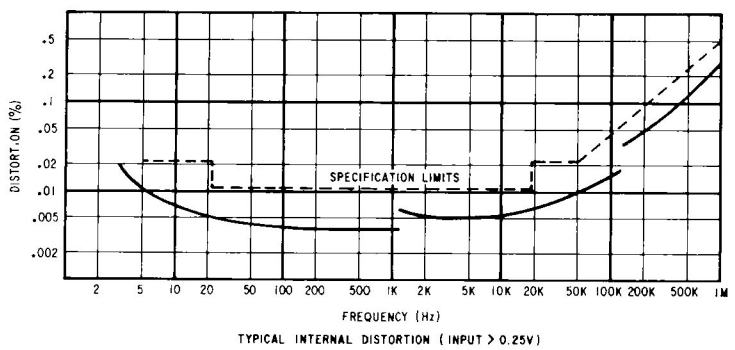
As an AC Voltmeter, the 6900 measures RMS voltage from typically 3Hz to 1MHz at input levels from 10mV to 130 volts with an accuracy of 2%. A 3 digit autoranging display provides 1mV resolution.

The Model 6900 provides a distortion output signal which is the input signal after the fundamental is removed. This distortion signal can be used for additional analysis with an oscilloscope or spectrum analyzer. An analog output provides a DC voltage proportional to the distortion signal.

An ultra-low distortion ($<$ .003%) 1KHz sinewave oscillator can be used as a source for checking linearity of components and system distortion characteristics.

An optional BCD output is available making the 6900 very useful in an automatic test system.

This fully automatic distortion analyzer is ideal for both precision laboratory measurements and routine production testing. It provides faster error free measurements for the unskilled operator. Applications include performance of components, audio amplifiers, oscillators, function generators, tape recorders, line equalizers, and filters.



TYPICAL INTERNAL DISTORTION (INPUT > 0.25V)

SPECIFICATIONS

DISTORTION METER

FUNDAMENTAL FREQUENCY RANGE: 5Hz to 1MHz automatically tuned over entire specified input frequency range. An intermittent meter display indicates an out-of-range condition.

INPUT: No presetting required over input level from 100mV to 130 volts RMS. Impedance, 110k ohms shunted by 100pF.

DISTORTION RANGE: A digital panel meter with auto-ranging displays percentage of Total Harmonic Distortion (THD) to 19.9%.

MEASUREMENT (%)	RESOLUTION (%)
.000-.100	.001
.10 -2.00	.01
2.0 -19.9	.1

DISTORTION MEASUREMENT ACCURACY:

INPUT VOLTS	DIST LEVELS	FREQUENCY	SPECIFICATION
.1-.25	> .01%	10Hz-50kHz	± 15% of reading or .01% whichever is greater
		5Hz-100kHz	± 15% of reading or .02% whichever is greater
		100kHz-500kHz	± 15% of reading or 0.1% whichever is greater
		500kHz-1MHz	± 25% of reading or 0.5% whichever is greater
.25-130	> .005%	10Hz-50kHz	± 15% of reading or .005% whichever is greater
		5Hz-100kHz	± 15% of reading or .01% whichever is greater
		100kHz-500kHz	± 15% of reading or .05% whichever is greater
		500kHz-1MHz	± 25% of reading or 0.5% whichever is greater

RESIDUAL DISTORTION AND NOISE:

INPUT	FREQUENCY	SPECIFICATIONS
.1V-.25V	20Hz-20kHz	Less than .02%
	5Hz-1MHz	Less than 0.03% from 5Hz to 50kHz rising to 0.5% at 1MHz
.25V-130V	20Hz-20kHz	Less than 0.01%
	5Hz-1MHz	Less than 0.02% from 5Hz to 50kHz rising to 0.5% at 1MHz

SETTLING TIME (to 0.1% THD): Typically less than 3 seconds from 50Hz to 1MHz. Longer at lower frequencies.

FUNDAMENTAL REJECTION: Greater than 10dB below residual THD.

FILTERS:
400Hz High Pass: -3dB at 400Hz ± 10%: 40dB/decade rolloff.
30kHz Low Pass: -3dB at 30kHz ± 5%: 60dB/decade rolloff.
80kHz Low Pass: -3dB at 80kHz ± 5%: 60dB/decade rolloff.

DISTORTION OUTPUT (Residual signal after fundamental is nulled): Voltage: 100mV RMS/%THD. Impedance: Less than 500 ohms.

ANALOG OUTPUT: 100mV dc/%THD. Impedance: Less than 1k ohm.

DISPLAY: 3 digit meter with auto-ranging.

Specifications subject to change without notice.

AC VOLTMETER

FREQUENCY RANGE: 5Hz to 1MHz

VOLTAGE RANGE: 0.01 to 130 volts RMS.

VOLTAGE RANGE (volts)	RESOLUTION (volts)
0.01 - 1	.001
1 - 10	.01
10 - 130	.1

ACCURACY: ± 2% ± 1 digit from 10Hz to 500kHz, ± 5% ± 1 digit from 5 Hz to 1MHz over specified voltage range.

DISPLAY: 3 digit meter with auto-ranging.

INPUT IMPEDANCE: 110k ohms shunted by 100pF.

OSCILLATOR OUTPUT

FREQUENCY: 1kHz, fixed.

OUTPUT (RMS): 5 volts at 3 milliamperes max.

DISTORTION: < .003%.

IMPEDANCE: 600 ohms.

GENERAL

METER DISPLAY: .55", 7 segment planar gas discharge.

CONTROLS:
Front Panel: MODE switch for selecting either VOLTMETER or DISTORTION operation. FILTER switch for selecting 400Hz high pass, 30kHz and 80kHz low pass operation. Power switch.
Rear Panel: Switches for selecting 120/240V AC operation or NORMAL/LOW AC line voltage.

CONNECTORS (BNC):
Front Panel: INPUT, 1kHz OSCILLATOR OUTPUT and DISTORTION OUTPUT.
Rear Panel: INPUT, ANALOG OUTPUT.

OPERATING TEMPERATURE RANGE: 0° C to 45° C.

MAXIMUM DC COMPONENT: 100V

ISOLATION TO CHASSIS: 500V DC.

POWER REQUIREMENTS: Switch selectable, 90-110, 108-132, 180-220 or 216-264 volts, single phase, 50-400Hz, 15 watts.

DIMENSIONS AND WEIGHTS:

	H	W	D	Net	Gross
U.S.	3½"	16⅝	14¾"	11.5 lbs.	13.5 lbs.
Metric	9cm	42.3cm	37.5cm	5.2 kgs.	6.1 kgs.

OPTIONAL RACK-MOUNTING KIT:
Part No. RK-319 permits installation of the Model 6900 into a standard 19" rack-spacing.

BCD OUTPUT (optional): Provides 13 lines of parallel BCD output, plus 1 MODE output, 3 decimal point outputs and 4 separate 3-state control lines. Compatible with DTL, RTL and TTL logic.