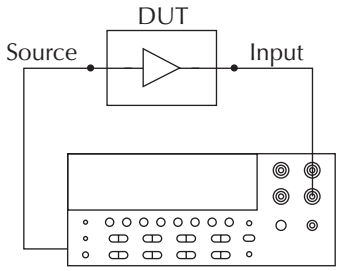
Audio Analysis Capabilities of the 2015/2015-P/2016

I. 2015/2015-P/2016 Calculations

A. Frequency Domain Computations



1. THD
2. THD + Noise
3. SINAD

   Example code to obtain a computation:

```
:DISTortion:TYPE <name>     ' Path to choose either THD,
      <name> = THD          ' THD + Noise, or SINAD
             = THDN         ' measurements
             = SINAD

:READ?

"Enter from 2015"
```

   THD, THD+Noise, and SINAD measurements are also accessible from the front panel.

4. VAC RMS

   Vrms readings are calculated along with a THD calculation.

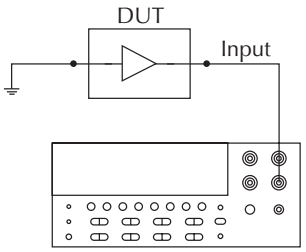
```
:DISTortion:RMS?

"Enter from 2015"
```

B. Time Domain Computations

The Model 2015 contains a true 6½-digit DMM, providing the functionality of the popular Model 2000 in the same chassis.

II. Noise Measurements

A. Noise Measurements in the Absence of an Input Signal



1. Frequency Domain **Narrow Band** Noise

   The 2015 measures narrow band noise in the absence of a signal using the high and low cutoff filters. Note: The internal frequency must be set to 20Hz to ensure capture of all the noise.

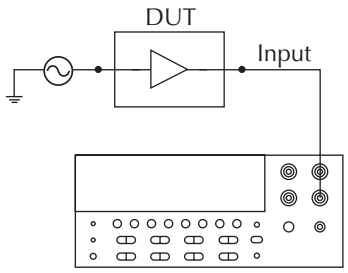
   Example noise measurement for the 300–1000Hz frequency band:

```
:DISTortion:HCO 1000        ' High cutoff frequency
                            ' (20 to 5000Hz)
:DISTortion:HCO:STATe ON
:DISTortion:LCO 300         ' Low cutoff frequency
                            ' (20 to 5000Hz)
:DISTortion:LCO:STATe ON    ' Trigger and read a distortion
                            ' measurement immediately
                            ' before returning the narrow
                            ' band noise measurement
:DISTortion:RMS?

"Enter from 2015"
```

2. Time Domain Wide Band Noise

   Wideband noise can be measured in the time domain using the VAC command on the DMM side.

B. Noise Measurements in the Presence of a Signal (external source or 2015 source) – Background Noise (BNOISE)



Note: A stimulus signal with a frequency greater than 61Hz is required to measure background noise.

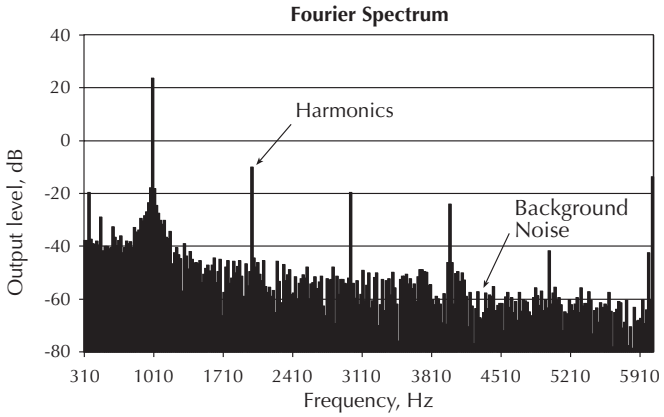
Example code for measuring BNOISE after a THD measurement is taken:

```
:SENSe:DISTortion:BNOISe?
"Enter from 2015"
or
:OUTPut:LIST:ELEMents BNOISe   ' Background noise can
:OUTPut:LIST:DATA?             ' also be an option for the
"Enter from 2015"              ' internal sweep
                               ' measurement
```

III. Frequency Domain Spectrum Analysis

A. The 2015 can output the **complete Fourier spectrum**.

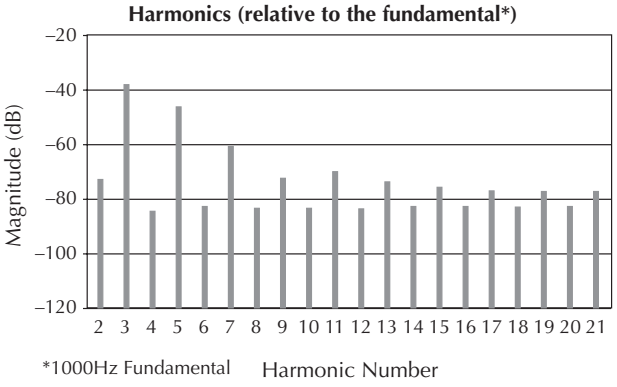
```
:DISTortion:FFTtransform:BINS? <1, 1023>
                    ' The entire spectrum is returned,
"Enter from 2015"   ' after a THD measurement is taken
```



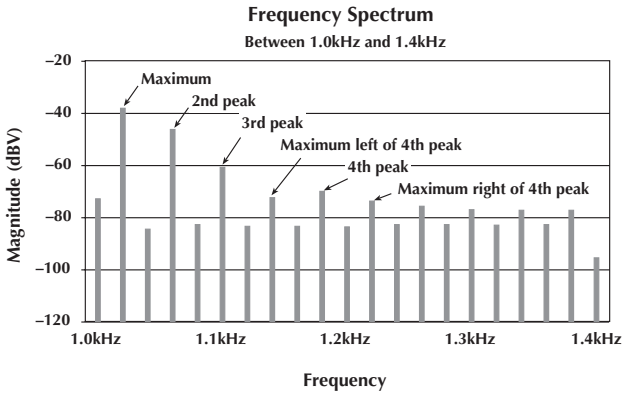
B. Alternatively, the Model 2015 can return the value of individual harmonics without triggering a new reading.

Example code to return the first three harmonics:

```
:DISTortion:HARMonic:UPPer <4>
                    ' Individual harmonics are returned
:DISTortion:HARMonic:UPPer:MAGNitude? <2,4>
                    ' after a THD meausrement
"Enter from 2015"
```



C. The new Model 2015-P can identify and return data on peaks in the frequency spectrum (the peaks may or may not be harmonic components). Furthermore, the Model 2015-P can determine the difference in amplitude between two components in the frequency spectrum.



Example code to obtain a peak spectral component and the next highest peak spectral component:

```
:DIST:PEAK:MAX?   ' Return the frequency and amplitude in
                  dBV of the maximum peak value
:DIST:PEAK:NEXT?  ' Return the frequency and amplitude in
                  dBV of the next highest peak value
```

Example code to determine the difference in amplitude between the frequency spectrum component at 1200kHz and the peak frequency component:

```
:DIST:PEAK:MAX?    ' Return the frequency and amplitude in
                     dBV of the maximum peak value
:DIST:PEAK:SREF    ' Mark the location of the maximum
                     spectrum component as the reference
                     location
:DIST:PEAK:SFR 1200
                   ' Acquire the amplitude of the spectral
                     component at 1200kHz
:DIST:PEAK:DELTA?  ' Return the difference in frequency and
                     in amplitude between the reference
                     location and the 1200kHz component
```

IV. How the 2015, 2015-P, and 2016 can thoroughly characterize an audio circuit in the production test environment

Verify frequency response	Using the fast sweep capability
Determine circuit noise levels	Using the wideband and narrow band noise measurement capability
Determination of distortion levels	THD, THD + noise, and SINAD computation capability
Identify anomalies in the spectrum	Identification of peaks in the frequency spectrum

Models 2015, 2015-P, 2016 Sales Brief

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