HPE1432/33A Manual Performance Verification

Rev A.01
September 10, 1999

E1432A

E1432 Residual DC

Specification : ≤ ± 1% of range, ± 10mV

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- 50? terminator

Hardware setup:

- Connect E3240A to E1432A
- place terminator(s) on channel (s) to be tested

E1432 setup:

- Frequency Resolution……..50 Lines
- Frequency Span……31.25 Hz
- Input Coupling…….DC
- Input Range……..100mV

Measurement 1:

- make measurement
- record reading at peak maximum
- convert to Volts and compare to specification
- repeat for remaining channels

Measurement 2:

- Change E1432
  Input Range ……. 1V
- make measurement
- record reading at maximum
- convert to Volts and compare to specification
- repeat for remaining channels

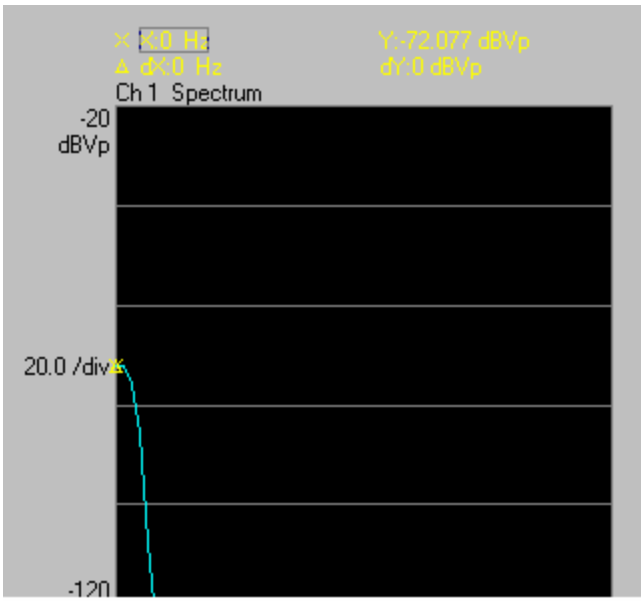

Figure 1 – Residual DC

E1432 Spurs

Specification: < -80dBfs

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- 50? terminator

Hardware setup:

- Connect E3240A to E1432A
- Place terminator(s) on channel (s) to be tested

E1432 setup:

- Frequency Resolution……..3200 Lines
- Frequency Span……20 kHz
- Input Coupling……AC
- Input Range……..100mV
- Average Type……RMS
- Average Count……..8
- Average Window……..Flattop

Measurement:

- Make measurement
- Move marker to noise area of spectrum (away from DC peak) and record value for highest peak
- Record in Full Scale and compare to specification
- Repeat for remaining channels

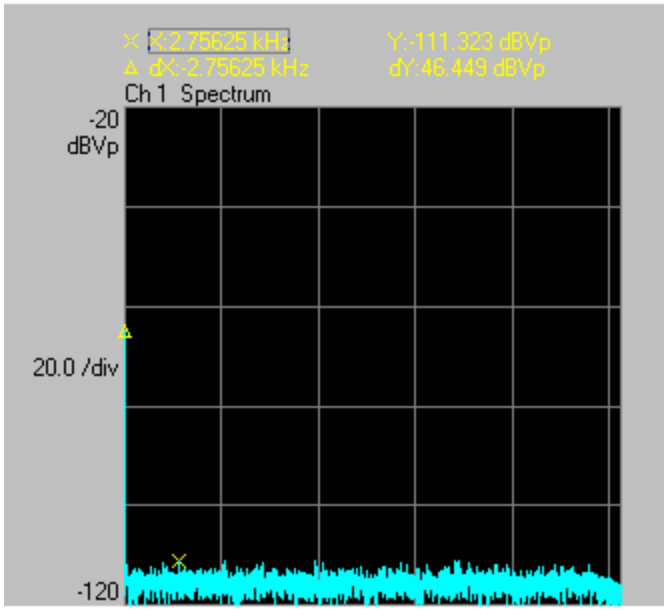

Figure 2 – Spurs

E1432 Input Noise

Specification: Noise density above 100Hz : < 300 nVrms/ v Hz

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- 50? terminator

Hardware setup:

- Connect E3240A to E1432A
- Place terminator(s) on channel (s) to be tested

E1432 setup:

- Frequency Resolution……..400 Lines
- Frequency Span……5 kHz
- Input Coupling…….AC
- Input Range……..100mV
- Average Type……RMS
- Average Count……..64
- Average Window……..Flattop

Measurement:

- Make measurement
- Record value for peak at or above 100Hz
- Repeat for remaining channels
- Convert reading to nVrms/ v Hz

Convert reading to Volts…….. X = 20*log(Volt)
Convert to rms……707*X
Convert to nVrms/ v Hz…….X/ v (3.82*(5000/400))

5000/400 = Narrow band width
3.82 = factor required for using flattop

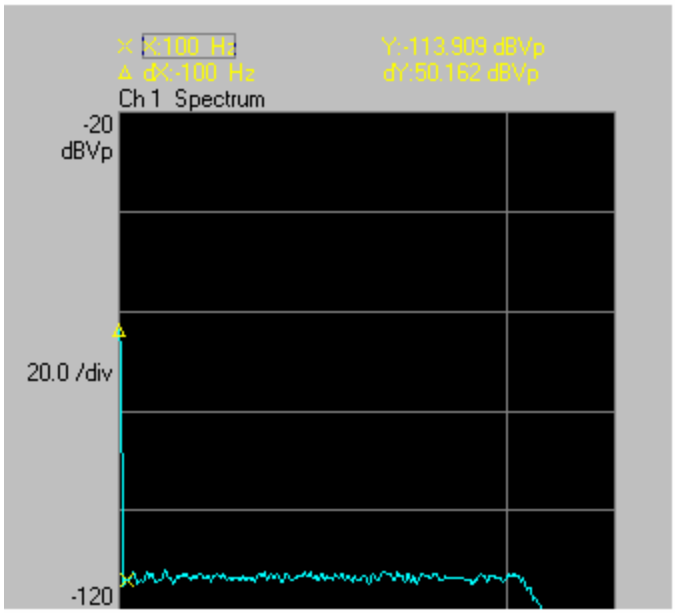

Figure 3 – Input Noise

E1432 Harmonic Distortion

Specification: < -80 dBfs

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- ***Low Distortion*** Source
  Hp 339A (obsolete) or
  Stanford Research DS360 or
  Comparable
- 50? terminator

Source Setup:

- Amplitude…….. 1V
- Frequency……...1 kHz

Hardware setup:

- Connect E3240A to E1432A
- Connect source to channel(s) to be tested (terminate connection)

E1432 setup:

- Frequency Resolution……..400 Lines
- Frequency Span……20 kHz
- Input Coupling……..……AC
- Input Range……..1V
- Average Type……Off
- Average Window……..Flattop

Measurement:

- Make measurement
- Move marker to 2nd and 3rd harmonic and record values
- Compare to specification
- Repeat for remaining channels.

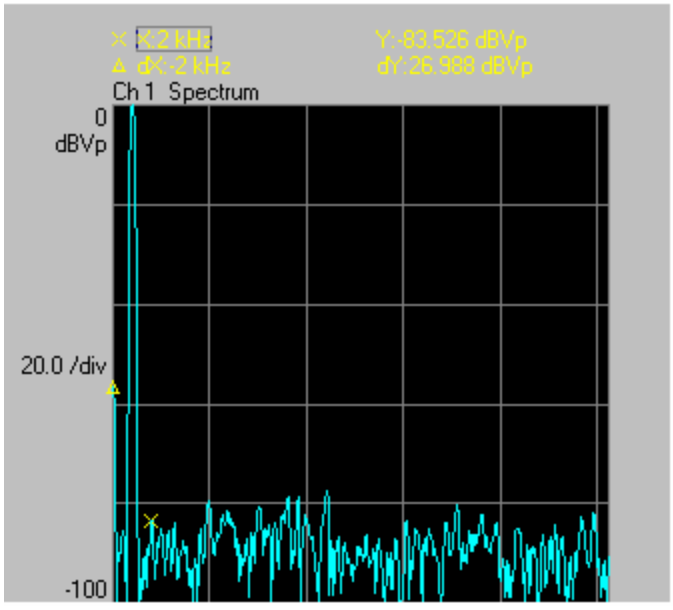

Figure 4 – Harmonic Distortion

E1432 AC Coupling Loss – AC Coupling 3dB Corner Frequency

Specification: 3dB or less drop

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- Function Generator
  HP3325A/B or comparable
- 50? terminator

Function Generator Setup:

- Amplitude…….. 1V
- Frequency……...1 Hz

Hardware setup:

- Connect E3240A to E1432A
- Connect function generator to channel(s) to be tested (terminate connection)

E1432 setup:

- Frequency Resolution…….400 Lines
- Frequency Span……78 Hz
- Input Coupling…….DC
- Input Range……..1V
- Average Type……RMS
- Average Count……..4
- Average Window……..Flattop

Measurement:

- Make measurement
- Set marker to 1Hz peak and record value
- Change E1432A
  Input Coupling…….AC
- Make measurement
- Set marker to 1Hz peak and record value.
- Compare DC reading with AC reading and compare to specification
- Repeat for remaining channels.

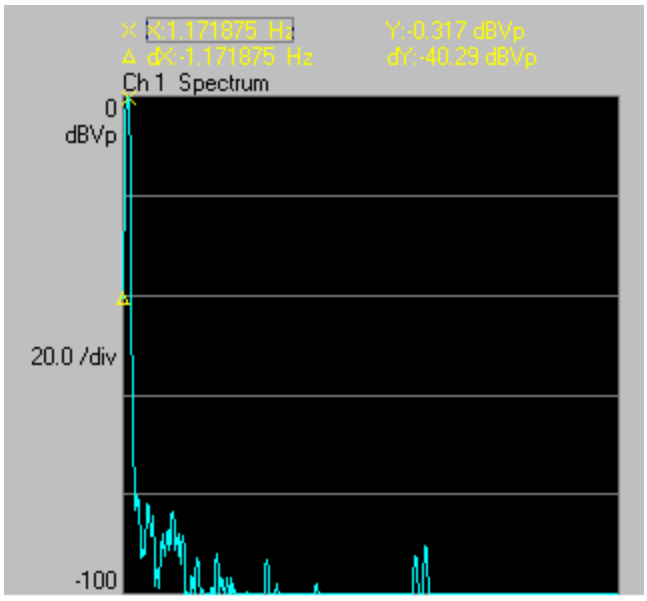

Figure 5 – AC Coupling Loss

E1432 Cross Channel Matching

Specification: ± 0.1 dB

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- Function Generator
  HP3325A/B or comparable
- 50? terminator

Function Generator Setup:

- Amplitude…….. 1V
- Frequency……..20 kHz

Hardware setup:

- Connect E3240A to E1432A
- Connect function generator to channel 1 and channel to be tested (terminate connection)

E1432 setup:

- Frequency Resolution……..400 Lines
- Frequency Span…….……20 kHz
- Input Coupling…….AC
- Input Range……..1V
- Average Type……RMS
- Average Count……..4
- Average Window……..Flattop

Measurement 1:

- Make measurement
- Move marker to 20 kHz peak on channel 1 and record value.
- Move marker to 20 kHz peak on channel 2 and record value.
- compare to specification.
- repeat for channel 1:3, 1:4,….

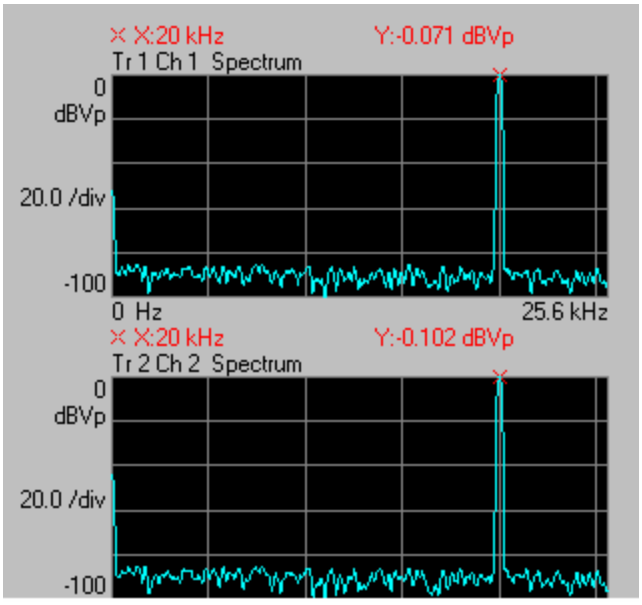

Figure 6 – Cross Channel measurement 1

Measurement 2:

- Switch E1432 to ***Phase*** mode
- Make measurement
- Move marker to 20 kHz on channel 1 and record value.
- Move marker to 20 kHz on channel 2 and record value.
- compare to specification.
- repeat for channel 1:3, 1:4, …..

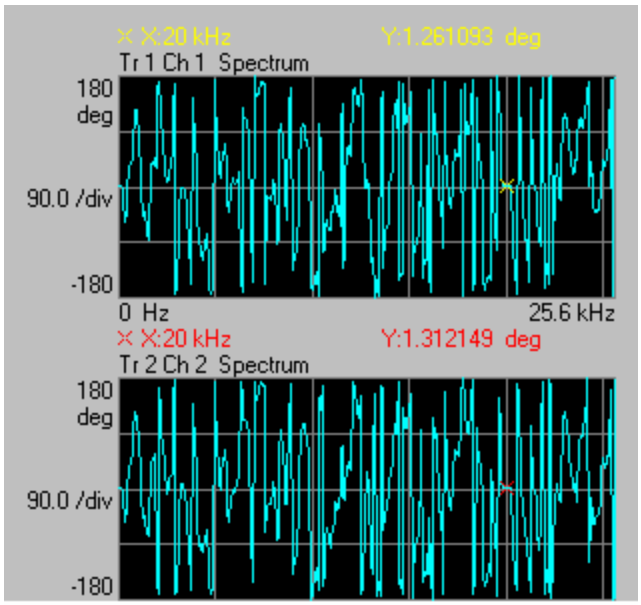

Figure 7 – Cross Channel measurement 2 (phase)

E1432 Amplitude Flatness – relative to 1 kHz at full scale

Specification: ± 0.1% (.09dB)

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- Function Generator
  HP3325A/B or comparable
- 50? terminator

Function Generator Setup:

- Amplitude…….. 1V
- Frequency……...1 kHz

Hardware setup:

- Connect E3240A to E1432A
- Connect function generator to channel(s) to be tested (terminate connection)

E1432 setup:

- Frequency Resolution……..400 Lines
- Frequency Span……1 kHz
- Input Coupling…….AC
- Input Range……..1V
- Average Type……RMS
- Average Count……..4
- Average Window……..Flattop

Measurement 1:

- Make measurement
- record peak at 1kHz
- Set function generator Frequency to 200Hz
- Make measurement
- record peak at 200 Hz
- Compare to reading from 1kHz reading and compare to specification.
- repeat for remaining channels

Measurement 2:

- Change function generator
  Frequency ……..5 kHz
- Make measurement
- record peak at 5kHz
- Compare to original 1kHz reading and compare to specification.
- repeat for remaining channels.

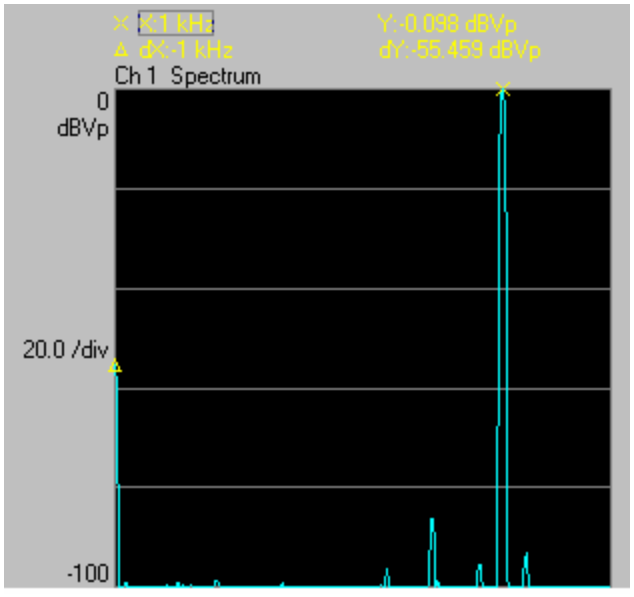

Figure 8 – Amplitude Flatness measurement 1

Measurement 3:

- Change function generator
Frequency ……..20 kHz
- Change E1432
Frequency Span …… 20kHz
- Make measurement
- record peak at 5kHz
- Compare to reading from 1kHz reading and compare to specification.
- repeat for remaining channels

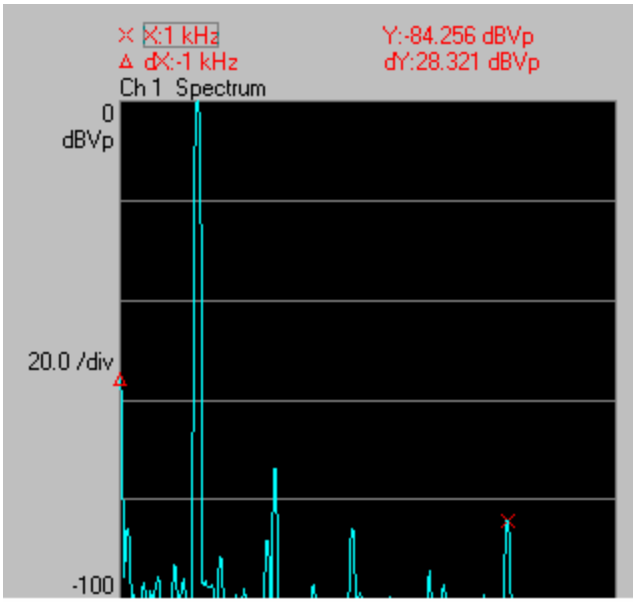

Figure 9 – Amplitude Flatness measurement 2

E1432 Amplitude Accuracy at 1kHz

Specification: ± 0.7% of reading, ± .01% of full scale

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- Function Generator
  HP3325A/B or comparable
- 50? terminator

Function Generator Setup:

- Amplitude…….. 100 mV
- Frequency……...1 kHz

Hardware setup:

- Connect E3240A to E1432A
- Connect function generator to channel(s) to be tested (terminate connection)

E1432 setup:

- Frequency Resolution……..400 Lines
- Frequency Span……1 kHz
- Input Coupling…….AC
- Input Range……..100 mV
- Average Type……RMS
- Average Count……..4
- Average Window……..Flattop

Measurement 1:

- Make measurement
- Record value at 1 kHz peak
- Convert to Volts and compare to specification.

Measurement 2:

- Change function generator
  Amplitude ……..2 V.
- Change E1432A
  Input Range ……. 2 V.
- Make measurement
- Record value at 1 kHz peak
- Convert to Volts and compare to specification.

Measurement 3:

- Change function generator
  Amplitude …….10 V.
- Change E1432
  Input Range …… 10 V.
- Make measurement
- Record value at 1 kHz peak
- Convert to Volts and compare to specification.

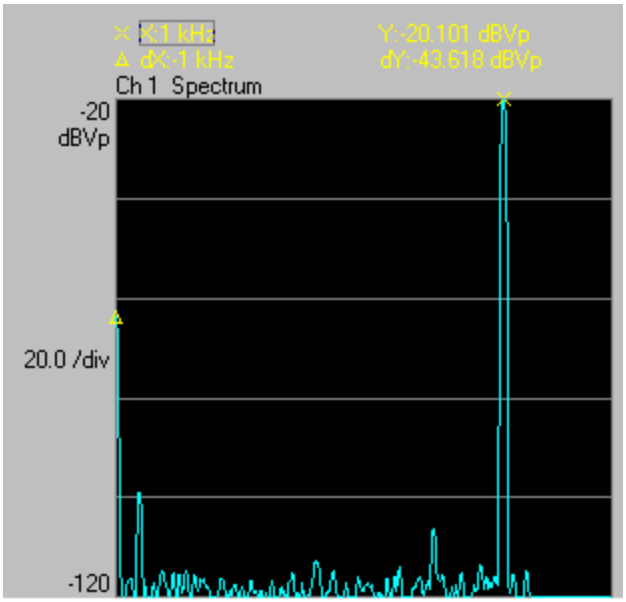

Figure 10 - Amplitude Accuracy

E1432 Common Mode Rejection

Specification: > 50dB from DC to 1kHz, DC coupled
< 45 dB from 40Hz to 1 kHz, AC coupled

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- Function Generator
  HP3325A/B or comparable
- 50? terminator
- BNC to alligator clip connector. Connector will connect cable from function generator output to the outside of the 50? terminator on clip end and chassis ground on the other.

Function Generator Setup:

- Amplitude…….. 1 V
- Frequency……...1 kHz

Hardware setup:

- Connect E3240A to E1432A
- Connect function generator to alligator connector to channel(s) to be tested (terminate connection)

E1432 setup:

- Frequency Resolution……..400 Lines
- Frequency Span……1.25 kHz
- Input Coupling…….DC
- Input Range……..1 V
- Average Type……RMS
- Average Count……..4
- Average Window……..Flattop

Measurement 1:

- Make measurement
- Record reading at 1 kHz peak
- Compare to specification
- Repeat for remaining channels

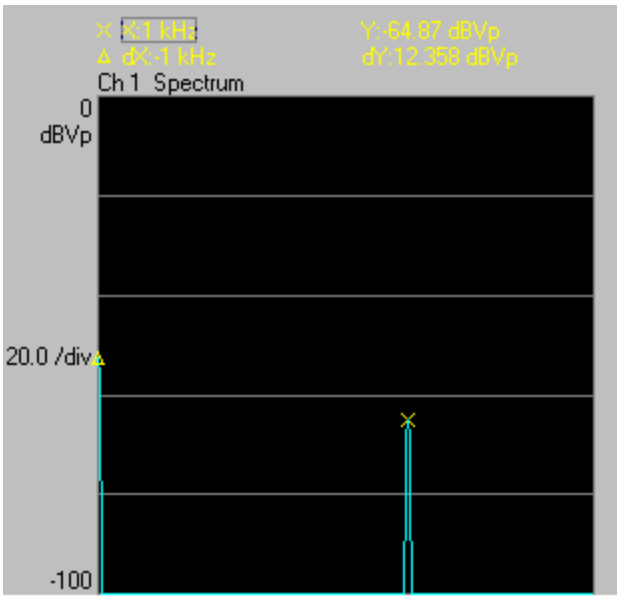

Figure 11 – Common Mode Rejection measurement 1

Measurement 2:

- Change function generator
  Frequency……40Hz
- Change E1432A
  Input Coupling…….AC
- Make measurement
- Record reading at 40 Hz peak
- Compare to specification
- Repeat for remaining channels.

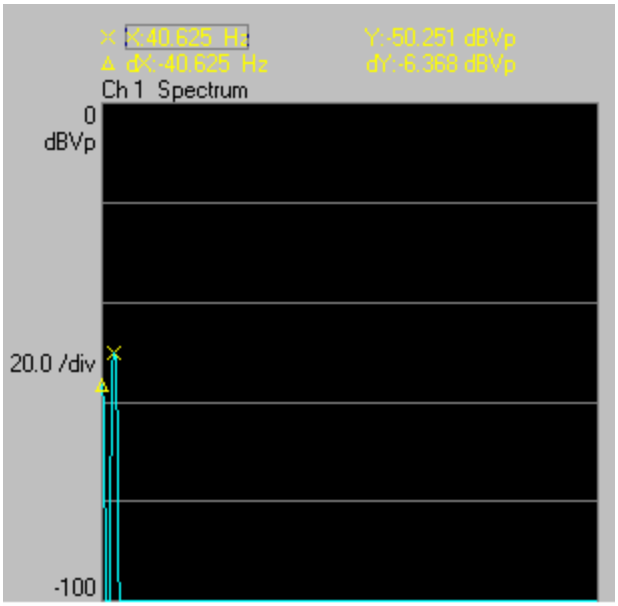

Figure 12 – Common Mode Rejection measurement 2

E1432 Source Amplitude Accuracy

Specification: 1kHz sine wave

10 Vp to 0.158 Vp ranges ± 0.20 dB (2.3%)

0.152 Vp to 79 mVp ranges ± 0.40 dB (4.7%)

Hardware needed:

- HP 3458A Multimeter or equivalent
- SMB to BNC cable

Hardware setup:

- Connect SMB cable to the OUT connector of the E1432A source
- Connect the BNC end off the cable to the input of the Multimeter

E1432 setup:

- Source Mode……..Sine
- Source Amplitude……..79.43mVp (-22dB)
- Source Frequency……..1kHz

Measurement 1:

- Make measurement
- Record reading from Multimeter
- Convert from rms to Vp if necessary by dividing reading by .707
- Compare to specification
- Repeat at :
  - 112.2 mV (-19dB)
  - 158.5 mV (-16dB)
  - 239.9 mV (-13dB)
  - 316.2 mV (-10dB)
  - 446.7 mV (-7dB)
  - 631.0 mV (-4dB)
  - 891.3 mV (-1dB)
  - 1.26 V (2dB)
  - 1.78 V (5dB)
  - 2.51 V (8dB)
  - 3.55 V (11dB)
  - 5.01 V (14dB)
  - 7.08 V (17dB)
  - 10 V (20dB)

E1432 Source Flatness

Specification: (relative to 1kHz) ± 0.5 dB

Hardware needed:

- HP 3458A Multimeter or equivalent
- SMB to BNC cable

Hardware setup:

- Connect SMB cable to the OUT connector of the E1432A source
- Connect the BNC end off the cable to the input of the Multimeter

E1432 setup:

- Source Mode……..Sine
- Source Amplitude……..1 V
- Source Frequency……..1kHz
- 6.4 kHz filter……..OFF

Measurement 1:

- Make measurement
- Record reading from Multimeter
- Convert from rms to Vp if necessary by dividing reading by .707
- Change E1432A Source Frequency to…….2kHz
- Make measurement
- Record reading from Multimeter
- Compare to reading at 1kHz
- Compare to specification
- Repeat at :

  3kHz – 25kHz at 1kHz intervals comparing results to initial 1kHz result.

Measurement 1:

- Turn on 6.4kHz Filter
- Change E1432A Source Frequency to……1kHz
- Make Measurement.
- Record reading from Multimeter.
- Make measurements at 2kHz, 3kHz, 4kHz, 5kHz, and 6kHz, comparing each measurement to the 1kHz reading.

E1432 Source Distortion

Specification: 1 Vp range, 1.0 scale factor, 0-6.4kHz < -80 dBc
2 to 10Vp range, 0.05 to 1.0 scale factor, 0 to 25.6 kHz < -70 dBc

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- 50? terminator
- SMB to BNC cable

Hardware setup:

- Connect E3240A to E1432A
- Connect source to channel(s) to be tested (terminate connection)
- Source data will be analyzed using the E1432A

E1432 setup:

- Frequency Resolution……..800 Lines
- Frequency Span……6.4 kHz
- Sampling Clock Speed…….51.2Ksamples
- Input Coupling…….AC
- Input Range……..1V
- Average Type……RMS
- Averages……8
- Average Window……..Flattop
- Source Mode……..Sine
- Source Amplitude……..1 V
- Source Frequency……..1kHz
- 6.4kHz Filter……..ON

Measurement:

- Make measurement
- Move marker to 2nd and 3rd harmonic of 1kHz fundamental and record values
- Compare to specification

Measurement 2:

- Change 6.4kHz Filter……..OFF
- Change Source Amplitude.……10 V
- Change E1432 - Sampling Clock Speed…… 65Ksamples
- Change Source Frequency……..5kHz
- Change E1432A Frequency Span……25.6 kHz
- Change E1432A Input Range……..10V
- Make measurement
- Move marker to 2nd and 3rd harmonic of 1kHz fundamental and record values
- Compare to specification

E1432 Source Spurs

Specification < -60 dBVp

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- 50? terminator
- SMB to BNC cable

Hardware setup:

- Connect E3240A to E1432A
- Connect source to channel(s) to be tested (terminate connection)
- Source data will be analyzed using the E1432A

E1432 setup:

- Frequency Resolution……..1600 Lines
- Frequency Span……25.6 kHz
- Sampling Clock Speed…….51.2Ksamples
- Input Coupling…….AC
- Input Range……..1V
- Average Type……RMS
- Average Window……..Flattop
- Average Number ……8
- Source Mode……..Sine
- Source Amplitude……..1 V
- Source Frequency……..5kHz
- 6.4kHz Filter……..OFF

Measurement:

- Make measurement
- Move marker to largest peaks in the noise region > 500 Hz above or below 5kHz peak.
- Compare to specification

Measurement 2:

- Change 6.4kHz Filter……..ON
- Change E1433A Frequency Span……6.4 kHz
- Make measurement
- Move marker to largest peaks in the noise region > 500 Hz above or below 5kHz peak.
- Compare to specification

E1433A/B

E1433 Amplitude Accuracy at 1kHz

Specification: ± 0.5% of reading, ± .01% of full scale

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- Function Generator
  HP3325A/B or comparable
- 50? terminator

Function Generator Setup:

- Amplitude…….. 10 mV
- Frequency……...1 kHz

Hardware setup:

- Connect E3240A to E1433A
- Connect function generator to channel(s) to be tested (terminate connection)

E1433 setup:

- Frequency Resolution……..400 Lines
- Frequency Span……1 kHz
- Sampling Clock Speed…….65Ksamples
- Input Coupling…….AC
- Input Range……..10 mV
- Average Type……RMS
- Average Count……..4
- Average Window……..Flattop

Measurement 1:

- Make measurement
- Record value at 1 kHz peak
- Convert to Volts and compare to specification.
- Repeat for remaining channels.

Measurement 2:

- Change function generator
  Amplitude ……..20mV.
- Change E1433A
  Input Range ……. 20mV.
- Make measurement
- Record value at 1 kHz peak
- Convert to Volts and compare to specification.
- Repeat for remaining channels.

Measurement 3:

- Repeat Measurement 2 for:
  100mV, 200mV, 500mV, 1V,
  5V, and 10V.

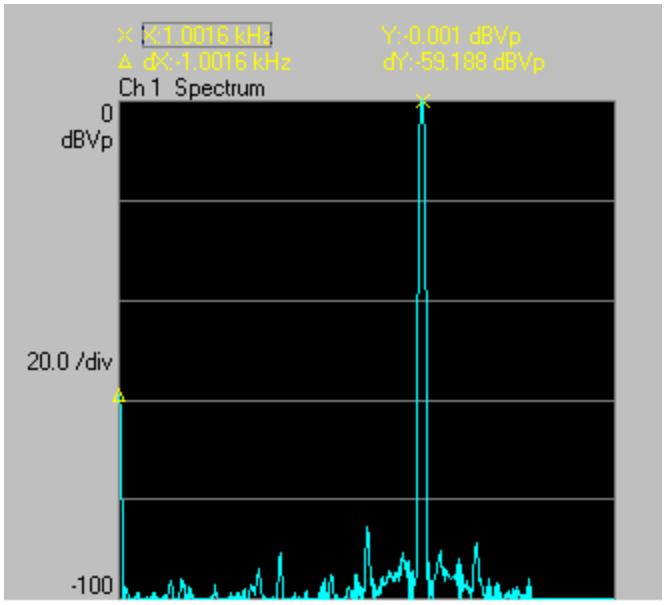

Figure 13 – E1433A Amplitude Accuracy

E1433 Amplitude Flatness – relative to 1 kHz at full scale

Specification: <29kHz ± 0.1% (±.09dB)
<88kHz ± 0.2% (±.17dB)

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- Function Generator
  HP3325A/B or comparable
- 50? terminator

Function Generator Setup:

- Amplitude…….. 1V
- Frequency……...1 kHz

Hardware setup:

- Connect E3240A to E1433A
- Connect function generator to channel(s) to be tested (terminate connection)

E1432 setup:

- Frequency Resolution……..400 Lines
- Frequency Span……65.5 kHz
- Sampling Clock Speed…….65Ksamples
- Input Coupling…….AC
- Input Range……..1V
- Average Type……RMS
- Average Count……..4
- Average Window……..Flattop

Measurement 1:

- Make measurement
- record peak at 1kHz
- Set function generator Frequency …….. 25.6 kHz
- Make measurement
- record peak at 25.6 kHz
- Compare to reading from 1kHz reading and compare to specification.
- repeat for remaining channels

Measurement 2:

- Change function generator Amplitude……500 mV
- Change function generator Frequency…….1 kHz
- Change E1433A Input Range……500 mV
- Change E1433A Frequency Span…..76.8 kHz
- Change E1433A
  Sampling Clock Speed……196 kSa
- Make measurement
- record peak at 1kHz
- Set function generator
  Frequency …….. 76.8 kHz
- Make measurement
- record peak at 76.8 kHz
- Compare to reading from 1kHz reading and compare to specification.
- repeat for remaining channels

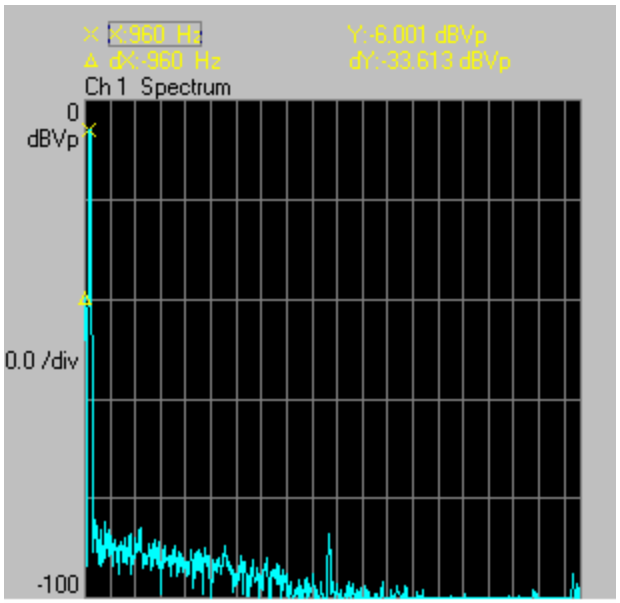

Figure 14 – Amplitude Flatness: 500 mV , 1 kHz

Measurement 3:

- Change function generator Amplitude……10 mV
- Change function generator Frequency…….1 kHz
- Change E1433A Input Range……10 mV
- Make measurement
- record peak at 1kHz
- Set function generator

Frequency …….. 76.8 kHz

- Make measurement
- record peak at 76.8 kHz
- Compare to reading from 1kHz reading and compare to specification.
- repeat for remaining channels

E1433 Residual DC

Specification : ≤ ± 1% of range, +2mV

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- 50? terminator

Hardware setup:

- Connect E3240A to E1433A
- place terminator(s) on channel (s) to be tested

E1433 setup:

- Frequency Resolution……..50 Lines
- Frequency Span……40 Hz
- Sampling Clock Speed…….65Ksamples
- Input Coupling…….DC
- Input Range……..10mV

Measurement 1:

- make measurement
- record reading at peak maximum
- convert to Volts and compare to specification
- repeat for remaining channels

Measurement 2:

- Change E1433
  Input Range ……. 50mV
- make measurement
- record reading at maximum
- convert to Volts and compare to specification
- repeat for remaining channels

Measurement 2:

- Change E1433
  Input Range ……. 200mV
- make measurement
- record reading at maximum
- convert to Volts and compare to specification
- repeat for remaining channels

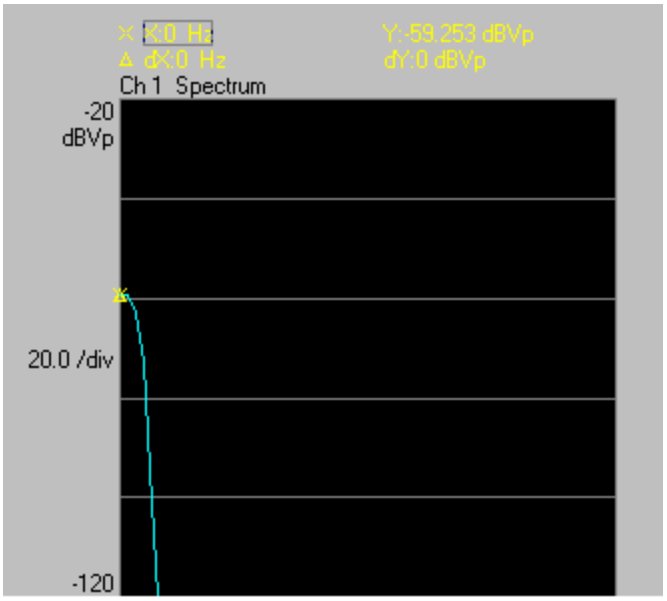

Figure 16 – E1433A Residual DC

E1433 Input Noise

Specification: Noise density above 100Hz : < 70 nVrms/ v Hz

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- 50? terminator

Hardware setup:

- Connect E3240A to E1433A
- Place terminator(s) on channel (s) to be tested

E1433 setup:

- Frequency Resolution……..400 Lines
- Frequency Span……6.4kHz
- Sampling Clock Speed…….65Ksamples
- Input Coupling…….AC
- Input Range……..10mV
- Average Type……RMS
- Average Count……..40
- Average Window……..Flattop

Measurement:

- Make measurement
- Record value for peak at or above 100Hz
- Repeat for remaining channels
- Convert reading to nVrms/ v Hz

Convert reading to Volts…….. X = 20*log(Volt)
Convert to rms……707*X
Convert to nVrms/ v Hz…….X/ v (3.82*(5000/400))

5000/400 = Narrow band width
3.82 = factor required for using flattop

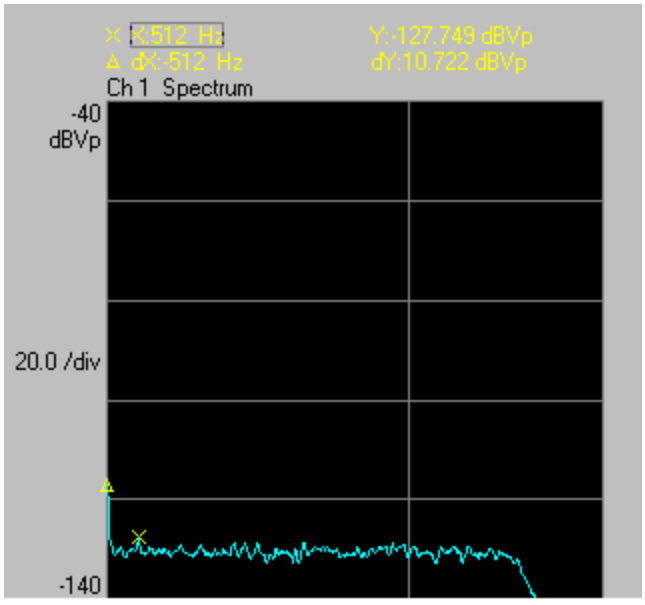

Figure 17 – E1433A Input noise

E1433 Spurs

Specification: < -80dBfs

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- 50? terminator

Hardware setup:

- Connect E3240A to E1433A
- Place terminator(s) on channel (s) to be tested

E1433 setup:

- Frequency Resolution……..6400 Lines
- Frequency Span……25.6 kHz
- Sampling Clock Speed…….65Ksamples
- Input Coupling…….AC
- Input Range……..10mV
- Average Type……RMS
- Average Count……..8
- Average Window……..Flattop

Measurement:

- Make measurement
- Move marker to noise area of spectrum (away from DC peak) and record value for highest peak
- Record in Full Scale and compare to specification
- Repeat for remaining channels

Measurement 2:

- Change E1433A Sampling Clock Speed……196Ksa
- Change E1433A Freq Span……..76.8kHz
- Make measurement
- Move marker to noise area of spectrum (away from DC peak) and record value for highest peak
- Record in Full Scale and compare to specification
- Repeat for remaining channels.

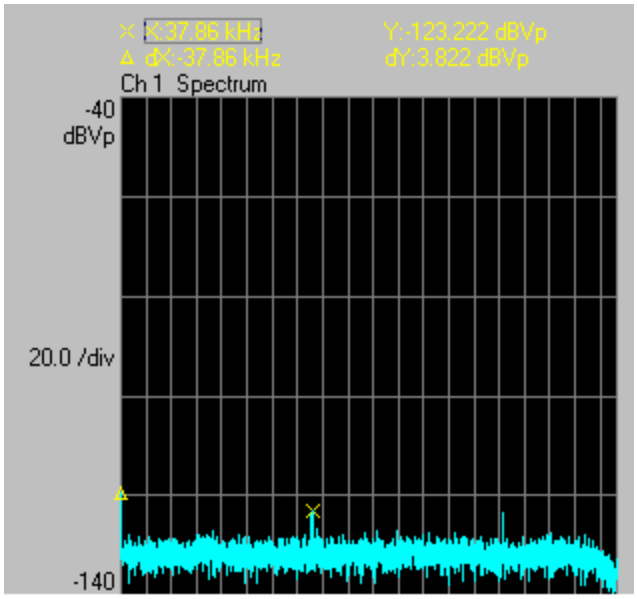

Figure 18 – E1433A Spurious response

E1433 Common Mode Rejection

Specification: AC or DC coupled, 10Hz to 1 kHz ; > 70dB

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- Function Generator
  HP3325A/B or comparable
- 50? terminator
- BNC to alligator clip connector. Connector will connect cable from function generator output to the outside of the 50? terminator on clip end and chassis ground on the other.

Function Generator Setup:

- Amplitude…….. 1 V
- Frequency……...1 kHz

Hardware setup:

- Connect E3240A to E1433A
- Connect function generator to alligator connector to channel(s) to be tested (terminate connection)

E1432 setup:

- Frequency Resolution……..400 Lines
- Frequency Span……1.6 kHz
- Sampling Clock Speed…….65Ksamples
- Input Coupling…….DC
- Input Range……..1 V
- Average Type……RMS
- Average Count……..4
- Average Window……..Flattop

Measurement 1:

- Make measurement
- Record reading at 1 kHz peak
- Compare to specification
- Repeat for remaining channels

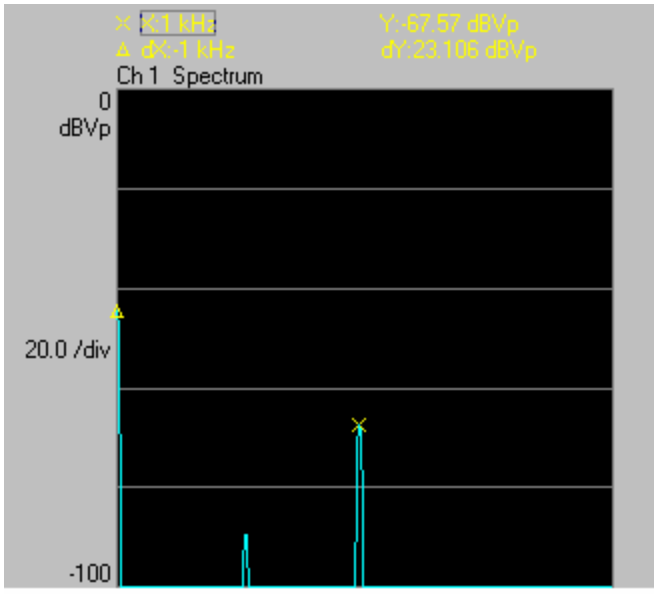

Figure 19 – CMR DC Mode

Measurement 2:

- Change function generator
  Frequency……10Hz
- Change E1433A
  Input Coupling…….AC
- Change E1433A Frequency Span…..320Hz
- Make measurement
- Record reading at 10 Hz peak
- Compare to specification
- Repeat for remaining channels.

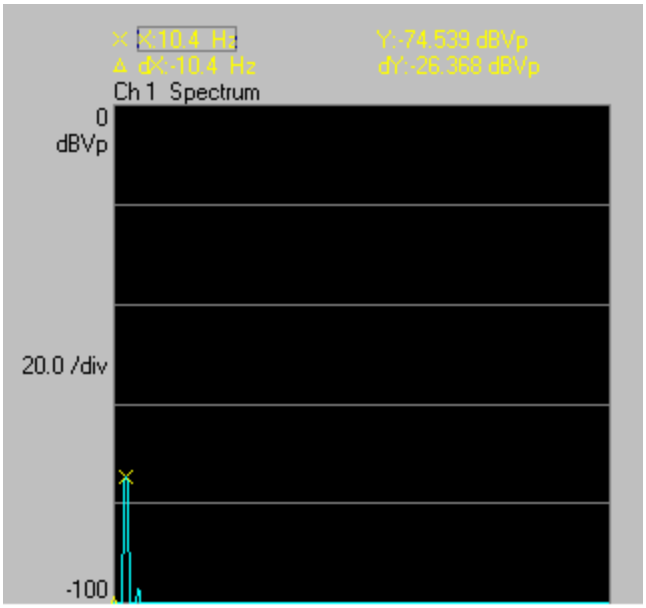

Figure 20 – CMR AC Mode

E1433 Harmonic Distortion

Specification: < -80 dBfs, when ≤ 65kSa sampling clock speed
< -74 dBfs, when > 65kSa sampling clock speed

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- ***Low Distortion*** Source
  Hp 339A (obsolete) or
  Stanford Research DS360 or
  Comparable
- 50? terminator

Source Setup:

- Amplitude…….. 1V
- Frequency……...1 kHz

Hardware setup:

- Connect E3240A to E1433A
- Connect source to channel(s) to be tested (terminate connection)

E1433 setup:

- Frequency Resolution……..800 Lines
- Frequency Span……6.4 kHz
- Sampling Clock Speed……65Ksamples
- Input Coupling……AC
- Input Range……..1V
- Average Type……Off
- Average Window……..Flattop

Measurement:

- Make measurement

Figure 21 E1433A Harmonic Distortion

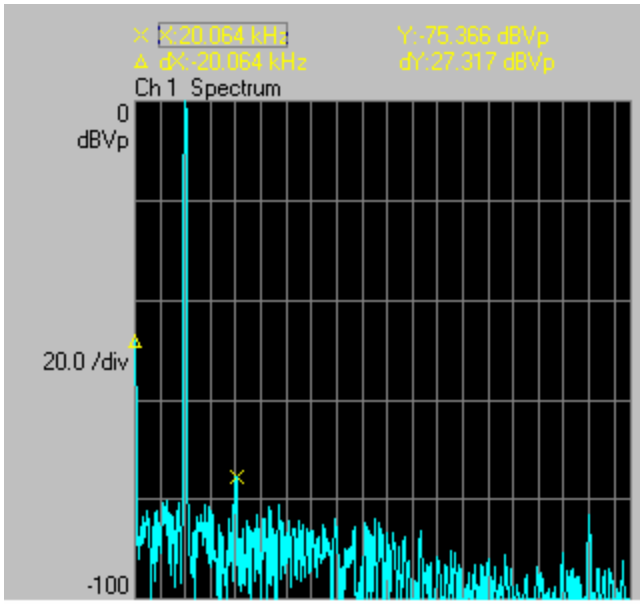

Figure 21 – Harmonic Distortion at 10kHz

- Move marker to 2nd and 3rd harmonic of 1kHz fundamental and record values
- Compare to specification
- Repeat for remaining channels.

Measurement 2:

- Change Source Frequency……10kHz
- Change E1433A Frequency Span……76.8kHz
- Change E1433A Clock Sampling Speed…….196kSamples
- Make measurement
- Move marker to 2nd and 3rd harmonic of 10kHz fundamental and record values
- Compare to specification
- Repeat for remaining channels.

E1433 Cross Channel Matching

Specification:

Amplitude: up to 29 kHz…… ± 0.1 dB
29 kHz to 88 kHz……. ± 0.2 dB
Phase: AC coupled (freq > 2X HPF corner frequency)
To 750 Hz……..0.9 deg
750 Hz to 88 kHz…….. ±(f/22000) deg.
DC coupled
10 Hz to 88 kHz…….±(f/22000) deg.
At 1 kHz…… ….± 0.045 deg.

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- Function Generator
  HP3325A/B or comparable
- 50? terminator

Function Generator Setup:

- Amplitude…….. 1V
- Frequency……...10 Hz

Hardware setup:

- Connect E3240A to E1433A
- Connect function generator to channel 1 and channel to be tested (terminate connection)

E1432 setup:

- Frequency Resolution……..1600 Lines
- Frequency Span……1600 Hz
- Sampling Clock Speed…….65Ksamples
- Input Coupling……AC
- Input Range……..1V
- Average Type……RMS
- Average Count……..4
- Average Window……..Flattop

Measurement 1:

- Make measurement
- Move marker to 10 Hz peak on channel 1
  and record value.
- Move marker to 10 Hz peak on channel 2
  and record value.
- compare to specification.
- repeat for channel 1:3, 1:4,….1:8.

Measurement 2:

- Change E1433 to PHASE mode
- Make measurement
- Move marker to 10 Hz peak on channel 1
  and record value.
- Move marker to 10 Hz peak on channel 2
  and record value.
- compare to specification.
- repeat for channel 1:3, 1:4,….1:8.

Measurement 3:

- Change E1433 back to Magnitude mode
- Change function generator Frequency……..76.8 kHz
- Change E1433 Sampling Clock Speed……196Ksamples
- Change E1433 Frequency Span……76.8 kHz
- Change E1433 Input Coupling…….DC

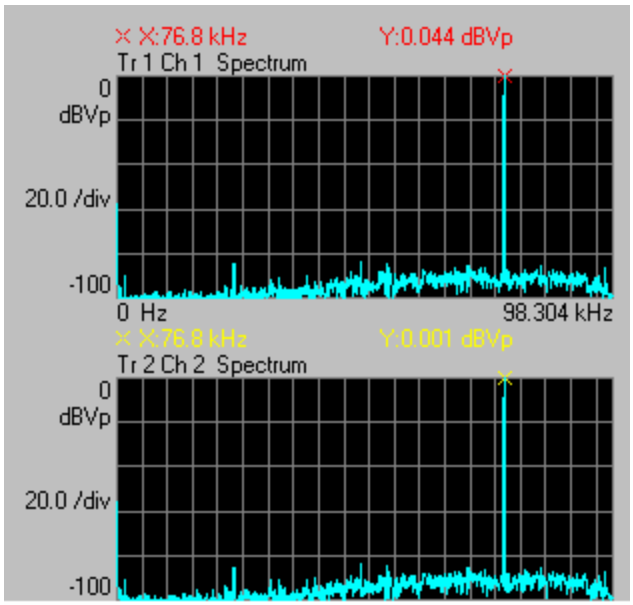

Figure 22 – Cross Channel, MAG mode, 76.8 kHz

- Make measurement
- Move marker to 76.8 kHz peak on channel 1 and record value.
- Move marker to 76.8 kHz peak on channel 2 and record value.
- compare to specification.
- repeat for channel 1:3, 1:4,….1:8.

Measurement 3:

- Change E1433 back to PHASE mode
- Change function generator Frequency……..1 kHz
- Change E1433 Sampling Clock Speed…….65.6 Ksamples
- Change E1433 Frequency Span……25.6 kHz
- Make measurement
- Move marker to 1 kHz on channel 1 and record value.
- Move marker to 1 kHz on channel 2 and record value.
- compare to specification.
- repeat for channel 1:3, 1:4,….1:8.

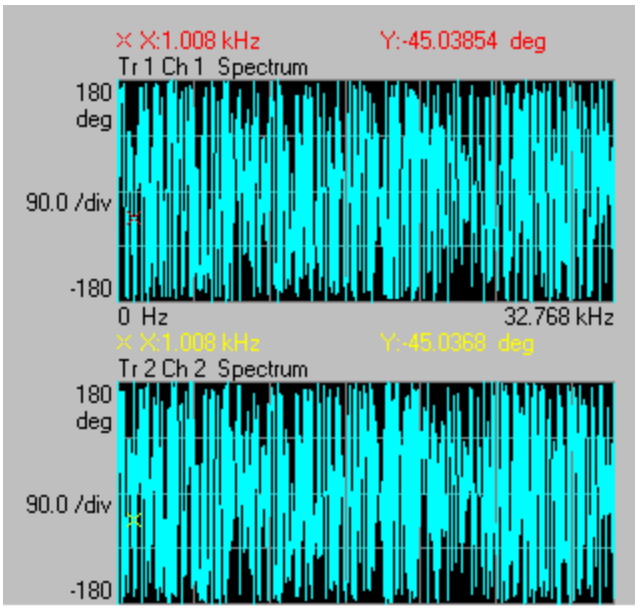

Figure 23 – Cross Channel, PHASE mode, 1 Khz

E1433 Source Amplitude Accuracy

Specification: 1kHz sine wave

10 Vp to 0.158 Vp ranges ± 0.20 dB (2.3%)

0.152 Vp to 79 mVp ranges ± 0.40 dB (4.7%)

Hardware needed:

- HP 3458A Multimeter or equivalent
- SMB to BNC cable

Hardware setup:

- Connect SMB cable to the OUT connector of the E1433A source
- Connect the BNC end off the cable to the input of the Multimeter

E1433 setup:

- Source Mode……..Sine
- Source Amplitude……..79.43mVp (-22dB)
- Source Frequency……..1kHz

Measurement 1:

- Make measurement
- Record reading from Multimeter
- Convert from rms to Vp if necessary by dividing reading by .707
- Compare to specification
- Repeat at :

112.2 mV (-19dB)
158.5 mV (-16dB)
239.9 mV (-13dB)
316.2 mV (-10dB)
446.7 mV (-7dB)
631.0 mV (-4dB)
891.3 mV (-1dB)
1.26 V (2dB)
1.78 V (5dB)
2.51 V (8dB)
3.55 V (11dB)
5.01 V (14dB)
7.08 V (17dB)
10 V (20dB)

E1433 Source Flatness Relative to 1kHz

Specification: (relative to 1kHz) ± 0.5 dB

Hardware needed:

- HP 3458A Multimeter or equivalent
- SMB to BNC cable

Hardware setup:

- Connect SMB cable to the OUT connector of the E1433A source
- Connect the BNC end off the cable to the input of the Multimeter

E1433 setup:

- Source Mode……..Sine
- Source Amplitude……..1 V
- Source Frequency……..1kHz
- 6.4 kHz filter……..OFF

Measurement 1:

- Make measurement
- Record reading from Multimeter
- Convert from rms to Vp if necessary by dividing reading by .707
- Change E1433A Source Frequency to…….2kHz
- Make measurement
- Record reading from Multimeter
- Compare to reading at 1kHz
- Compare to specification
- Repeat at :

  3kHz – 25kHz at 1kHz intervals comparing results to initial 1kHz result.

Measurement 1:

- Turn on 6.4kHz Filter
- Change E1433A Source Frequency to……1kHz
- Make Measurement.
- Record reading from Multimeter.
- Make measurements at 2kHz, 3kHz, 4kHz, 5kHz, and 6kHz, comparing each measurement to the 1kHz reading.

E1433 Source Distortion

Specification: 1 Vp range, 1.0 scale factor, 0-6.4kHz < -80 dBc
2 to 10Vp range, 0.05 to 1.0 scale factor, 0 to 25.6 kHz < -70 dBc

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- 50? terminator
- SMB to BNC cable

Hardware setup:

- Connect E3240A to E1433A
- Connect source to channel(s) to be tested (terminate connection)
- Source data will be analyzed using the E1433A

E1433 setup:

- Frequency Resolution……..800 Lines
- Frequency Span……6.4 kHz
- Sampling Clock Speed…….51.2Ksamples
- Input Coupling……AC
- Input Range……..1V
- Average Type……Off
- Average Window……..Flattop
- Source Mode……..Sine
- Source Amplitude……..1 V
- Source Frequency……..1kHz
- 6.4kHz Filter……..ON

Measurement:

- Make measurement
- Move marker to 2nd and 3rd harmonic of 1kHz fundamental and record values
- Compare to specification

Measurement 2:

- Change 6.4kHz Filter……..OFF
- Change Source Amplitude.……10 V
- Change E1433 - Sampling Clock Speed…… 65Ksamples
- Change Source Frequency……..5kHz
- Change E1433A Frequency Span……25.6 kHz
- Change E1433A Input Range……..10V
- Make measurement
- Move marker to 2nd and 3rd harmonic of 1kHz fundamental and record values
- Compare to specification

E1433 Source Spurs

Specification < -60 dBVp

Hardware needed:

- E3240A (E1432-61600) ICP/Charge breakout box
- 50? terminator
- SMB to BNC cable

Hardware setup:

- Connect E3240A to E1433A
- Connect source to channel(s) to be tested (terminate connection)
- Source data will be analyzed using the E1433A

E1433 setup:

- Frequency Resolution……..1600 Lines
- Frequency Span……25.6 kHz
- Sampling Clock Speed…….51.2Ksamples
- Input Coupling…….AC
- Input Range……..1V
- Average Type……RMS
- Average Window……..Flattop
- Average Number ……8
- Source Mode……..Sine
- Source Amplitude……..1 V
- Source Frequency……..5kHz
- 6.4kHz Filter……..OFF

Measurement:

- Make measurement
- Move marker to largest peaks in the noise region > 500 Hz above or below 5kHz peak.
- Compare to specification

Measurement 2:

- Change 6.4kHz Filter……..ON
- Change E1433A Frequency Span……6.4 kHz
- Make measurement
- Move marker to largest peaks in the noise region > 500 Hz above or below 5kHz peak.
- Compare to specification

NOTES:

A. The graphics included in the tests are from our frontpanel test system.This system includes the following:

- VXI Mainframe of your choice
- PC running WIN 3.1 or 95 (NOT NT)
- E1483A VX Link kit which includes a C size controller, PC card, and cable ($3200.00)
- Frontpanel software disk : A homemade disk obtained from Lake Stevens that contains a special version of Frontpanel and some supporting drivers. This is not an official product so it may not meet the same QA specs as released
software.