

# Fox Valley Metrology

3114 Medalist Drive  
 Oshkosh, WI 54902  
 (920) 426-5894 • Fax (920) 426-8120  
<https://www.FoxValleyMetrology.com>

## CERTIFICATE OF CALIBRATION



Certificate No. ACT-1272

<b>CERTIFICATION NUMBER</b> CP134-00143-840 <b>FOR</b> Sample Manufacturing 3121 Medalist Drive Oshkosh, WI 54902 <b>TEST INSTRUMENT</b> Signal Generator <b>MAKE</b> Keysight <b>MODEL</b> N5181A <b>RANGE</b> 100kHz to 6GHz <b>CUSTOMER LOCATION</b> Location1 Location2 <b>CONDITION RECEIVED</b> In Tolerance <b>CONDITION RETURNED</b> In Tolerance <b>CALIBRATED BY</b> Christopher Melah <b>REVIEWED/ISSUED</b> D.P. 07/29/2025 <b>CALIBRATION LOCATION</b> FVM <b>ENVIRONMENT</b> 69.0°F, 31.0%RH, 28.92inHg <b>CALIBRATION DATE</b> 05/14/2025 <b>RECALIBRATION DUE</b> 05/14/2026	<b>IDENTIFICATION</b> EL-016B <b>SERIAL NUMBER</b> 143 <b>PURCHASE ORDER #</b> <b>PROCEDURES FOLLOWED</b> EL-016B rev. 1 <b>STANDARDS USED</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>INSTRUMENT</th> <th>SERIAL NUMBER</th> <th>TRACE NUMBER</th> <th>NEXT CAL</th> </tr> </thead> <tbody> <tr> <td>FRF-025A</td> <td>122096</td> <td>C0277-38071-693</td> <td>09/30/2025</td> </tr> <tr> <td>FRF-025B</td> <td>102128</td> <td>C0277-36196-693</td> <td>09/30/2025</td> </tr> <tr> <td>FRF-025C</td> <td>101075</td> <td>C0277-36367-693</td> <td>09/30/2025</td> </tr> <tr> <td>FVS-275E</td> <td>16783134</td> <td>C0134-20963-690</td> <td>05/31/2025</td> </tr> </tbody> </table>	INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL	FRF-025A	122096	C0277-38071-693	09/30/2025	FRF-025B	102128	C0277-36196-693	09/30/2025	FRF-025C	101075	C0277-36367-693	09/30/2025	FVS-275E	16783134	C0134-20963-690	05/31/2025
INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL																		
FRF-025A	122096	C0277-38071-693	09/30/2025																		
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FVS-275E	16783134	C0134-20963-690	05/31/2025																		



### CALIBRATION RESULTS

\* DENOTES "OUT OF TOLERANCE"

FEATURE	NOMINAL	LOWER LIMIT	UPPER LIMIT	AS FOUND	AS LEFT	UNCERTAINTY
FREQUENCY ACCURACY						
10MHz Referency Accuracy	(MHz)	(MHz)	(MHz)	(MHz)	(MHz)	(MHz)
10MHz	10.000000000	9.999990000	10.000100000	9.999998682	9.999998682	6.0E-11
Displayed Accuracy						
(MHz)	111.11111000	111.11111000	111.11112000	111.11110999	111.11110999	6.0E-10
(MHz)	222.22222000	222.22222000	222.22223000	222.22221997	222.22221997	6.0E-10
(MHz)	333.33333000	333.33332000	333.33334000	333.33332998	333.33332998	6.0E-10
(MHz)	444.44444000	444.44443000	444.44445000	444.44443996	444.44443996	6.0E-10
(MHz)	555.55555000	555.55554000	555.55556000	555.55554999	555.55554999	6.0E-10
(MHz)	666.66666000	666.66665000	666.66667000	666.66665997	666.66665997	6.0E-10
(MHz)	777.77777000	777.77776000	777.77778000	777.77776996	777.77776996	6.0E-10
(MHz)	888.88888000	888.88887000	888.88889000	888.88887994	888.88887994	6.0E-10
(MHz)	999.99999000	999.99998000	1000.00000000	999.99998993	999.99998993	6.0E-10
HARMONIC DISTORTION						
Carrier Frequency:	(db)	(db)	(db)	(db)	(db)	(db)
0.25MHz dBc@2harm (0.5MHz)	-30.00	-130.00	-30.00	-65.84	-65.84	6.0E-3
dBc@3harm (0.75MHz)	-30.00	-130.00	-30.00	-55.21	-55.21	6.0E-3

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dBc@4harm (1MHz)	-30.00	-130.00	-30.00	-65.67	-65.67	6.0E-3
dBc@5harm (1.25MHz)	-30.00	-130.00	-30.00	-81.59	-81.59	6.0E-3
Carrier Frequency: 249.999MHz						
dBc@2harm (499.998MHz)	-30.00	-130.00	-30.00	-65.87	-65.87	6.0E-3
dBc@3harm (749.997MHz)	-30.00	-130.00	-30.00	-55.21	-55.21	6.0E-3
dBc@4harm (999.996MHz)	-30.00	-130.00	-30.00	-65.67	-65.67	6.0E-3
dBc@5harm (1.249995GHz)	-30.00	-130.00	-30.00	-81.59	-81.59	6.0E-3
Carrier Frequency: 275MHz						
dBc@2harm (550MHz)	-30.00	-130.00	-30.00	-44.96	-44.96	6.0E-3
dBc@3harm (825MHz)	-30.00	-130.00	-30.00	-68.68	-68.68	6.0E-3
dBc@4harm (1.1GHz)	-30.00	-130.00	-30.00	-72.85	-72.85	6.0E-3
dBc@5harm (1.375GHz)	-30.00	-130.00	-30.00	-88.60	-88.60	6.0E-3
Carrier Frequency: 500MHz						
dBc@2harm (1GHz)	-30.00	-130.00	-30.00	-48.68	-48.68	6.0E-3
dBc@3harm (1.5GHz)	-30.00	-130.00	-30.00	-68.19	-68.19	6.0E-3
dBc@4harm (2GHz)	-30.00	-130.00	-30.00	-69.35	-69.35	6.0E-3
dBc@5harm (2.5GHz)	-30.00	-130.00	-30.00	-92.28	-92.28	6.0E-3
Carrier Frequency: 1GHz						
dBc@2harm (2GHz)	-30.00	-130.00	-30.00	-48.16	-48.16	6.0E-3
dBc@3harm (3GHz)	-30.00	-130.00	-30.00	-67.23	-67.23	6.0E-3
dBc@4harm (4GHz)	-30.00	-130.00	-30.00	-90.30	-90.30	6.0E-3
dBc@5harm (5GHz)	-30.00	-130.00	-30.00	-93.09	-93.09	6.0E-3
Carrier Frequency: 2GHz						
dBc@2harm (4GHz)	-30.00	-130.00	-30.00	-51.12	-51.12	6.0E-3
dBc@3harm (6GHz)	-30.00	-130.00	-30.00	-90.29	-90.29	6.0E-3

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RF LEVEL	(dbm)	(dbm)	(dbm)	(dbm)	(dbm)	(dbm)
ACCURACY						
4dBm @0.1MHz	4.000	3.400	4.600	4.033	4.033	6.0E-4
3dBm @0.1MHz	3.000	2.400	3.600	3.028	3.028	6.0E-4
0dBm @0.1MHz	0.000	-0.600	0.600	0.054	0.054	6.0E-4
-10dBm @0.1MHz	-10.000	-10.600	-9.400	-9.909	-9.909	6.0E-4
-20dBm @0.1MHz	-20.000	-20.600	-19.400	-19.965	-19.965	6.0E-4
-30dBm @0.1MHz	-30.000	-30.600	-29.400	-29.960	-29.960	6.0E-4
-40dBm @0.1MHz	-40.000	-40.600	-39.400	-39.970	-39.970	6.0E-4
-50dBm @0.1MHz	-50.000	-50.600	-49.400	-49.948	-49.948	6.0E-4
-60dBm @0.1MHz	-60.000	-60.600	-59.400	-59.955	-59.955	6.0E-4
-70dBm @0.1MHz	-70.000	-71.000	-69.000	-69.910	-69.910	6.0E-4
-80dBm @0.1MHz	-80.000	-81.000	-79.000	-79.930	-79.930	6.0E-4
-90dBm @0.1MHz	-90.000	-91.000	-89.000	-89.916	-89.916	6.0E-4
-100dBm @0.1MHz	-100.000	-101.000	-99.000	-99.867	-99.867	6.0E-4
7dBm @0.255MHz	7.000	6.400	7.600	7.015	7.015	6.0E-4
5dBm @0.255MHz	5.000	4.400	5.600	5.020	5.020	6.0E-4
3dBm @0.255MHz	3.000	2.400	3.600	3.029	3.029	6.0E-4
0dBm @0.255MHz	0.000	-0.600	0.600	0.029	0.029	6.0E-4
-10dBm @0.255MHz	-10.000	-10.600	-9.400	-9.928	-9.928	6.0E-4
-20dBm @0.255MHz	-20.000	-20.600	-19.400	-19.933	-19.933	6.0E-4
-30dBm @0.255MHz	-30.000	-30.600	-29.400	-29.960	-29.960	6.0E-4
-40dBm @0.255MHz	-40.000	-40.600	-39.400	-39.947	-39.947	6.0E-4
-50dBm @0.255MHz	-50.000	-50.600	-49.400	-49.940	-49.940	6.0E-4
-60dBm @0.255MHz	-60.000	-60.600	-59.400	-59.930	-59.930	6.0E-4
-70dBm @0.255MHz	-70.000	-70.700	-69.300	-69.902	-69.902	6.0E-4
-80dBm @0.255MHz	-80.000	-80.700	-79.300	-79.905	-79.905	6.0E-4
-90dBm @0.255MHz	-90.000	-90.700	-89.300	-89.855	-89.855	6.0E-4
-100dBm @0.255MHz	-100.000	-100.700	-99.300	-99.966	-99.966	6.0E-4
7dBm @0.95MHz	7.000	6.400	7.600	7.026	7.026	6.0E-4
5dBm @0.95MHz	5.000	4.400	5.600	5.020	5.020	6.0E-4
3dBm @0.95MHz	3.000	2.400	3.600	3.021	3.021	6.0E-4
0dBm @0.95MHz	0.000	-0.600	0.600	0.031	0.031	6.0E-4
-10dBm @0.95MHz	-10.000	-10.600	-9.400	-9.953	-9.953	6.0E-4
-20dBm @0.95MHz	-20.000	-20.600	-19.400	-19.952	-19.952	6.0E-4
-30dBm @0.95MHz	-30.000	-30.600	-29.400	-29.941	-29.941	6.0E-4
-40dBm @0.95MHz	-40.000	-40.600	-39.400	-39.925	-39.925	6.0E-4
-50dBm @0.95MHz	-50.000	-50.600	-49.400	-49.918	-49.918	6.0E-4
-60dBm @0.95MHz	-60.000	-60.600	-59.400	-59.905	-59.905	6.0E-4
-70dBm @0.95MHz	-70.000	-70.700	-69.300	-69.894	-69.894	6.0E-4
-80dBm @0.95MHz	-80.000	-80.700	-79.300	-79.896	-79.896	6.0E-4
-90dBm @0.95MHz	-90.000	-90.700	-89.300	-89.840	-89.840	6.0E-4

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-100dBm @0.95MHz	-100.000	-100.700	-99.300	-99.957	-99.957	6.0E-4
7dBm @10MHz	7.000	6.400	7.600	7.006	7.006	6.0E-4
5dBm @10MHz	5.000	4.400	5.600	4.995	4.995	6.0E-4
3dBm @10MHz	3.000	2.400	3.600	3.006	3.006	6.0E-4
0dBm @10MHz	0.000	-0.600	0.600	-0.003	-0.003	6.0E-4
-10dBm @10MHz	-10.000	-10.600	-9.400	-9.954	-9.954	6.0E-4
-20dBm @10MHz	-20.000	-20.600	-19.400	-19.945	-19.945	6.0E-4
-30dBm @10MHz	-30.000	-30.600	-29.400	-29.930	-29.930	6.0E-4
-40dBm @10MHz	-40.000	-40.600	-39.400	-39.931	-39.931	6.0E-4
-50dBm @10MHz	-50.000	-50.600	-49.400	-49.974	-49.974	6.0E-4
-60dBm @10MHz	-60.000	-60.600	-59.400	-59.941	-59.941	6.0E-4
-70dBm @10MHz	-70.000	-70.700	-69.300	-69.941	-69.941	6.0E-4
-80dBm @10MHz	-80.000	-80.700	-79.300	-79.969	-79.969	6.0E-4
-90dBm @10MHz	-90.000	-90.700	-89.300	-90.132	-90.132	6.0E-4
-100dBm @10MHz	-100.000	-100.700	-99.300	-100.078	-100.078	6.0E-4
-110dBm @10MHz	-110.000	-110.700	-109.300	-109.868	-109.868	6.0E-4
7dBm @500MHz	7.000	6.400	7.600	6.960	6.960	6.0E-4
5dBm @500MHz	5.000	4.400	5.600	4.961	4.961	6.0E-4
3dBm @500MHz	3.000	2.400	3.600	2.962	2.962	6.0E-4
0dBm @500MHz	0.000	-0.600	0.600	-0.033	-0.033	6.0E-4
-10dBm @500MHz	-10.000	-10.600	-9.400	-10.014	-10.014	6.0E-4
-20dBm @500MHz	-20.000	-20.600	-19.400	-20.016	-20.016	6.0E-4
-30dBm @500MHz	-30.000	-30.600	-29.400	-29.993	-29.993	6.0E-4
-40dBm @500MHz	-40.000	-40.600	-39.400	-39.961	-39.961	6.0E-4
-50dBm @500MHz	-50.000	-50.600	-49.400	-49.940	-49.940	6.0E-4
-60dBm @500MHz	-60.000	-60.600	-59.400	-59.955	-59.955	6.0E-4
-70dBm @500MHz	-70.000	-70.700	-69.300	-69.940	-69.940	6.0E-4
-80dBm @500MHz	-80.000	-80.700	-79.300	-79.945	-79.945	6.0E-4
-90dBm @500MHz	-90.000	-90.700	-89.300	-89.931	-89.931	6.0E-4
-100dBm @500MHz	-100.000	-100.700	-99.300	-99.981	-99.981	6.0E-4
-110dBm @500MHz	-110.000	-110.700	-109.300	-109.825	-109.825	6.0E-4
7dBm @950MHz	7.000	6.400	7.600	6.967	6.967	6.0E-4
5dBm @950MHz	5.000	4.400	5.600	4.965	4.965	6.0E-4
3dBm @950MHz	3.000	2.400	3.600	2.959	2.959	6.0E-4
0dBm @950MHz	0.000	-0.600	0.600	-0.034	-0.034	6.0E-4
-10dBm @950MHz	-10.000	-10.600	-9.400	-10.011	-10.011	6.0E-4
-20dBm @950MHz	-20.000	-20.600	-19.400	-20.010	-20.010	6.0E-4
-30dBm @950MHz	-30.000	-30.600	-29.400	-29.973	-29.973	6.0E-4
-40dBm @950MHz	-40.000	-40.600	-39.400	-39.972	-39.972	6.0E-4
-50dBm @950MHz	-50.000	-50.600	-49.400	-49.949	-49.949	6.0E-4
-60dBm @950MHz	-60.000	-60.600	-59.400	-59.952	-59.952	6.0E-4
-70dBm @950MHz	-70.000	-70.700	-69.300	-69.954	-69.954	6.0E-4
-80dBm @950MHz	-80.000	-80.700	-79.300	-79.934	-79.934	6.0E-4
-90dBm @950MHz	-90.000	-90.700	-89.300	-89.929	-89.929	6.0E-4
-100dBm @950MHz	-100.000	-100.700	-99.300	-99.908	-99.908	6.0E-4
-110dBm @950MHz	-110.000	-110.700	-109.300	-109.939	-109.939	6.0E-4
7dBm @1.5GHz	7.000	6.300	7.700	6.965	6.965	6.0E-4
5dBm @1.5GHz	5.000	4.300	5.700	4.950	4.950	6.0E-4
3dBm @1.5GHz	3.000	2.300	3.700	2.945	2.945	6.0E-4
0dBm @1.5GHz	0.000	-0.700	0.700	-0.051	-0.051	6.0E-4

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-10dBm @1.5GHz	-10.000	-10.700	-9.300	-10.023	-10.023	6.0E-4
-20dBm @1.5GHz	-20.000	-20.700	-19.300	-20.024	-20.024	6.0E-4
-30dBm @1.5GHz	-30.000	-30.700	-29.300	-29.991	-29.991	6.0E-4
-40dBm @1.5GHz	-40.000	-40.700	-39.300	-39.977	-39.977	6.0E-4
-50dBm @1.5GHz	-50.000	-50.700	-49.300	-49.946	-49.946	6.0E-4
-60dBm @1.5GHz	-60.000	-60.700	-59.300	-59.955	-59.955	6.0E-4
-70dBm @1.5GHz	-70.000	-70.900	-69.100	-69.957	-69.957	6.0E-4
-80dBm @1.5GHz	-80.000	-80.900	-79.100	-79.958	-79.958	6.0E-4
-90dBm @1.5GHz	-90.000	-90.900	-89.100	-89.948	-89.948	6.0E-4
-100dBm @1.5GHz	-100.000	-100.900	-99.100	-99.919	-99.919	6.0E-4
-110dBm @1.5GHz	-110.000	-110.900	-109.100	-109.959	-109.959	6.0E-4
7dBm @2GHz	7.000	6.300	7.700	6.922	6.922	6.0E-4
5dBm @2GHz	5.000	4.300	5.700	4.926	4.926	6.0E-4
3dBm @2GHz	3.000	2.300	3.700	2.931	2.931	6.0E-4
0dBm @2GHz	0.000	-0.700	0.700	-0.074	-0.074	6.0E-4
-10dBm @2GHz	-10.000	-10.700	-9.300	-10.032	-10.032	6.0E-4
-20dBm @2GHz	-20.000	-20.700	-19.300	-20.019	-20.019	6.0E-4
-30dBm @2GHz	-30.000	-30.700	-29.300	-29.991	-29.991	6.0E-4
-40dBm @2GHz	-40.000	-40.700	-39.300	-39.967	-39.967	6.0E-4
-50dBm @2GHz	-50.000	-50.700	-49.300	-49.951	-49.951	6.0E-4
-60dBm @2GHz	-60.000	-60.700	-59.300	-59.952	-59.952	6.0E-4
-70dBm @2GHz	-70.000	-70.900	-69.100	-69.948	-69.948	6.0E-4
-80dBm @2GHz	-80.000	-80.900	-79.100	-79.970	-79.970	6.0E-4
-90dBm @2GHz	-90.000	-90.900	-89.100	-89.920	-89.920	6.0E-4
-100dBm @2GHz	-100.000	-100.900	-99.100	-99.994	-99.994	6.0E-4
-110dBm @2GHz	-110.000	-110.900	-109.100	-109.999	-109.999	6.0E-4
7dBm @3GHz	7.000	6.300	7.700	6.940	6.940	6.0E-4
5dBm @3GHz	5.000	4.300	5.700	4.948	4.948	6.0E-4
3dBm @3GHz	3.000	2.300	3.700	2.942	2.942	6.0E-4
0dBm @3GHz	0.000	-0.700	0.700	-0.057	-0.057	6.0E-4
-10dBm @3GHz	-10.000	-10.700	-9.300	-10.024	-10.024	6.0E-4
-20dBm @3GHz	-20.000	-20.700	-19.300	-20.023	-20.023	6.0E-4
-30dBm @3GHz	-30.000	-30.700	-29.300	-29.997	-29.997	6.0E-4
-40dBm @3GHz	-40.000	-40.700	-39.300	-39.974	-39.974	6.0E-4
-50dBm @3GHz	-50.000	-50.700	-49.300	-49.967	-49.967	6.0E-4
-60dBm @3GHz	-60.000	-60.700	-59.300	-59.953	-59.953	6.0E-4
-70dBm @3GHz	-70.000	-70.900	-69.100	-69.942	-69.942	6.0E-4
-80dBm @3GHz	-80.000	-80.900	-79.100	-79.940	-79.940	6.0E-4
-90dBm @3GHz	-90.000	-90.900	-89.100	-89.955	-89.955	6.0E-4
-100dBm @3GHz	-100.000	-100.900	-99.100	-99.970	-99.970	6.0E-4
-110dBm @3GHz	-110.000	-110.900	-109.100	-109.926	-109.926	6.0E-4

### COMMENTS

Example certificate, actual results and uncertainties will be reported at the time of calibration. Nominal and limits may vary based on actual make/model.

- This certificate shall not be altered in any form or reproduced, except in full, without prior written approval from originating lab. These results relate only to the item(s) calibrated. Form Revision 10: 06/04/2024
- Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in nominal units.
- The calibrations within the certificate/report are traceable through NIST or another National Metrology Institute to the International System of Units (SI). Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.