



CAL labs, Incorporated

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2525 Santa Anna Ave • Dallas, Texas 75228 • (800) 693-7308 • (214) 321-7205 • Fax (214) 324-4921

CERTIFICATION OF CALIBRATION

ID No.: 073270
Model No.: IFR 4000
Serial No.: 1000685882
Manufacturer: IFR
Description: NAV/COMM TEST SET
P.O. No.: 012

Report No.: 162894
Report Date: Nov/22/2023 08:55
Page No: 1 of 7
Customer: INNOVATEC INDUSTRIAL SOLUTIONS
Address: DIEGO ALMEIDA/SANDRA VITERI
914 IBIS AVENUE
MIAMI SPRINGS, FL 33166

TEST STANDARDS USED

ASSET#	Model	Mfr.	Description	Cal Due
STD001	5520A	FLUKE	CALIBRATOR	Dec/20/2023
STD002	58503A	H.P.	FREQ. STANDARD	Oct/03/2024
STD003	8902A	H.P.	MEAS. RECEIVER	Oct/16/2024
STD004	11722A	H.P.	SENSOR MODULE	Oct/14/2024
STD005	TDS3032B	TEK	OSCILLOSCOPE	Jan/12/2024
STD006	8903B	H.P.	AUDIO ANALYZER	Nov/10/2024
STD007	ASI-223	IFR	PHASE STANDARD	Jul/31/2024

Receipt Date: Nov/08/2023
Calibration Date: Nov/22/2023
Calibration Due: Nov/22/2024
Calibration Procedure: 10000008948AB
Condition Received: In Tolerance

Temperature: 72F
Humidity: 37%
Technician: AN
Condition as Left: In Tolerance

Technical Notes:

Normal Calibration

Calibration was performed by direct comparison between the named instrument and the test standards. The certified measurements of the standards used are traceable to internationally recognized SI units by means of an unbroken chain of calibrations traceable to the National Institute of Standards and Technology. The total uncertainty of each measurement shall not exceed twenty five percent of the specification of the named instrument, unless noted in the technical notes. Cal Labs, Inc. quality assurance system satisfies the requirement of the customer purchase order, ANSI/NCSL Z540-1, and ISO 10012. This certificate shall not be reproduced, except in full, without the written authorization of Cal Labs, Inc.

General Manager

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TEST REPORT

Id No.: 073270
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TEST	LIMITS	RESULTS
Frequency Accuracy		
108.000 MHz	± 1 ppm	107.99999 MHz
108.100 MHz	± 1 ppm	108.09999 MHz
334.700 MHz	± 1 ppm	334.69999 MHz
75.000 MHz	± 1 ppm	74.99999 MHz
118.000 MHz	± 1 ppm	117.99999 MHz
137.000 MHz	± 1 ppm	136.99999 MHz
225.000 MHz	± 1 ppm	224.99999 MHz
312.000 MHz	± 1 ppm	311.99999 MHz
400.000 MHz	± 1 ppm	399.99999 MHz
118.001 MHz	± 1 ppm	118.00099 MHz
118.002 MHz	± 1 ppm	118.00199 MHz
118.003 MHz	± 1 ppm	118.00299 MHz
118.004 MHz	± 1 ppm	118.00399 MHz
RF Level Accuracy		
Antenna Connector		
108.000 MHz, -30 dBm	± 3 dBm	-30.32 dBm
108.100 MHz, -30 dBm	± 3 dBm	-30.35 dBm
334.700 MHz, -30 dBm	± 3 dBm	-30.35 dBm
75.0000 MHz, -30 dBm	± 3 dBm	-30.60 dBm
400.000 MHz, -30 dBm	± 3 dBm	-30.28 dBm
137.000 MHz, -30 dBm	± 3 dBm	-30.46 dBm
118.000 MHz, +13 dBm	± 3 dBm	+14.28 dBm
118.000 MHz, +3 dBm	± 3 dBm	+4.12 dBm
118.000 MHz, -7 dBm	± 3 dBm	-5.93 dBm
118.000 MHz, -17 dBm	± 3 dBm	-17.19 dBm
118.000 MHz, -27 dBm	± 3 dBm	-27.33 dBm
118.000 MHz, -37 dBm	± 3 dBm	-37.38 dBm
118.000 MHz, -47 dBm	± 3 dBm	-47.45 dBm
118.000 MHz, -57 dBm	± 3 dBm	-57.27 dBm
RF I/O Connector		
108.000 MHz, -40 dBm	± 2 dBm	-39.81 dBm
108.100 MHz, -40 dBm	± 2 dBm	-39.81 dBm
334.700 MHz, -40 dBm	± 2 dBm	-39.87 dBm
75.0000 MHz, -40 dBm	± 2 dBm	-39.94 dBm
400.000 MHz, -40 dBm	± 2 dBm	-40.05 dBm
137.000 MHz, -40 dBm	± 2 dBm	-39.91 dBm
118.000 MHz, -12 dBm	± 2.5 dBm	-12.00 dBm
118.000 MHz, -22 dBm	± 2.5 dBm	-22.11 dBm
118.000 MHz, -32 dBm	± 2.5 dBm	-32.12 dBm

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TEST	LIMITS	RESULTS
118.000 MHz, -42 dBm	± 2 dBm	-41.88 dBm
118.000 MHz, -52 dBm	± 2 dBm	-52.02 dBm
118.000 MHz, -62 dBm	± 2 dBm	-62.04 dBm
118.000 MHz, -72 dBm	± 2 dBm	-71.92 dBm
118.000 MHz, -82 dBm	± 2 dBm	-82.03 dBm
118.000 MHz, -92 dBm	± 2 dBm	-92.07 dBm
118.000 MHz, -102 dBm	± 3 dBm	-101.88 dBm
118.000 MHz, -112 dBm	± 3 dBm	-111.99 dBm
118.000 MHz, -120 dBm	± 3 dBm	-120.03 dBm
RF Level Flatness		
ANT Connector: Verify flatness is ≤ 1 dBm between +10 levels and -10 levels		
108.000 MHz	Record +10 dBm level	+11.10 dBm
	Record -10 dBm level	-9.08 dBm
110.150 MHz	Record +10 dBm level	+11.04 dBm
	Record -10 dBm level	-9.14 dBm
75.000 MHz	Record +10 dBm level	+11.16 dBm
	Record -10 dBm level	-9.02 dBm
118.000 MHz	Record +10 dBm level	+11.18 dBm
	Record -10 dBm level	-8.99 dBm
137.000 MHz	Record +10 dBm level	+11.34 dBm
	Record -10 dBm level	-8.83 dBm
156.000 MHz	Record +10 dBm level	+11.36 dBm
	Record -10 dBm level	-8.80 dBm
225.000 MHz	Record +10 dBm level	+10.73 dBm
	Record -10 dBm level	-9.42 dBm
312.000 MHz	Record +10 dBm level	+10.73 dBm
	Record -10 dBm level	-9.41 dBm
334.700 MHz	Record +10 dBm level	+10.66 dBm
	Record -10 dBm level	-9.47 dBm
400.000 MHz	Record +10 dBm level	+10.52 dBm
	Record -10 dBm level	-9.57 dBm
RF I/O Connector: Verify flatness is ≤ 1 dB between -20 levels and -40 levels		
108.000 MHz	Record -20 dBm level	-20.00 dBm
	Record -40 dBm level	-39.81 dBm
110.150 MHz	Record -20 dBm level	-20.10 dBm
	Record -40 dBm level	-39.90 dBm
75.000 MHz	Record -20 dBm level	-20.10 dBm
	Record -40 dBm level	-39.94 dBm
118.000 MHz	Record -20 dBm level	-20.07 dBm
	Record -40 dBm level	-39.87 dBm
137.000 MHz	Record -20 dBm level	-20.03 dBm
	Record -40 dBm level	-39.91 dBm
156.000 MHz	Record -20 dBm level	-19.99 dBm
	Record -40 dBm level	-39.88 dBm



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TEST		LIMITS		RESULTS	
225.000 MHz		Record -20 dBm level		-19.89	dBm
		Record -40 dBm level		-39.89	dBm
312.000 MHz		Record -20 dBm level		-19.72	dBm
		Record -40 dBm level		-39.80	dBm
334.700 MHz		Record -20 dBm level		-19.72	dBm
		Record -40 dBm level		-39.87	dBm
400.000 MHz		Record -20 dBm level		-19.79	dBm
		Record -40 dBm level		-40.05	dBm
Modulation:					
Function	Tones	Modulation Limits	Modulation Readings (%)	Distortion Limits	Distortion Readings (%)
Marker Beacon	400 Hz, 95%	± 5%	93.3	< 2.5 %	0.560
	1300 Hz, 95%	± 5%	93.5	< 2.5 %	0.238
	3000 Hz, 95%	± 5%	93.2	< 2.5 %	0.712
VOR	1020 Hz, 30%	± 2%	29.68	< 2.0%	0.196
	30 Hz, 30%	± 2%	29.57	< 2.0%	0.073
	9960 Hz, 30%	± 2%	29.62	< 2.0%	0.235
	FM Dev 480 Hz	±25 Hz	480		
Localizer	1020 Hz, 30%	± 2%	28.14	< 2.5 %	0.163
	90Hz, 20%	± 2%	19.98	< 2.5 %	0.077
	150 Hz, 20%	± 2%	20.02	< 2.5 %	0.216
Glideslope	90 Hz, 40%	± 2%	39.95	< 2.5 %	0.181
	150 Hz, 40%	± 2%	40.0	< 2.5 %	0.231
Comm VHF	1020 Hz, 30%	± 2%	28.64	< 2.5 %	0.182
Comm UHF	1020 Hz, 30%	± 2%	29.05	< 2.5 %	0.181
Mode Accuracy:					
VOR Bearing		Accuracy		Measured Error	
0° To		± 0.1°		-0.057	
0° From		± 0.1°		+0.003	
180° To		± 0.1°		+0.004	
180° From		± 0.1°		-0.057	
90° To		± 0.1°		-0.028	
90° From		± 0.1°		+0.018	
270° To		± 0.1°		+0.013	
270° From		± 0.1°		-0.024	
Localizer DDM					
0.000		± 0.0015 DDM		+0.000065	DDM
0.093 Left		± 0.0015 DDM + 3% of setting		-0.093119	DDM
0.155 Left		± 0.0015 DDM + 3% of setting		-0.155134	DDM
0.200 Left		± 0.0015 DDM + 3% of setting		-0.200200	DDM
0.093 Right		± 0.0015 DDM + 3% of setting		+0.093054	DDM
0.155 Right		± 0.0015 DDM + 3% of setting		+0.155199	DDM
0.200 Right		± 0.0015 DDM + 3% of setting		+0.200200	DDM

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Model No.: IFR 4000
Serial No.: 1000685882
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TEST		LIMITS		RESULTS	
Glideslope DDM					
0.000	± 0.003 DDM		+0.000000 DDM		
0.091 Up	± 0.003 DDM + 3% of setting		+0.090945 DDM		
0.175 Up	± 0.003 DDM + 3% of setting		+0.174894 DDM		
0.400 Up	± 0.003 DDM + 3% of setting		+0.399869 DDM		
0.091 Down	± 0.003 DDM + 3% of setting		-0.091010 DDM		
0.175 Down	± 0.003 DDM + 3% of setting		-0.175286 DDM		
0.400 Down	± 0.003 DDM + 3% of setting		-0.399804 DDM		
Frequency Counter:					
Test	Frequency	LIMITS		RESULTS	
Ant Connector	10.000 MHz	±1 ppm + 1 count		10.0000	MHz
	10.001 MHz	±1 ppm + 1 count		10.0010	MHz
	100.101 MHz	±1 ppm + 1 count		100.1010	MHz
	399.999 MHz	±1 ppm + 1 count		399.9991	MHz
RF I/O Connector	10.000 MHz	±1 ppm + 1 count		10.0000	MHz
	10.001 MHz	±1 ppm + 1 count		10.0010	MHz
	100.101 MHz	±1 ppm + 1 count		100.1010	MHz
	399.999 MHz	±1 ppm + 1 count		399.9991	MHz
AUX I/O Connector	1.00000 MHz	±1 ppm + 1 count		1.000000	MHz
	1.00001 MHz	±1 ppm + 1 count		1.000010	MHz
	5.10001 MHz	±1 ppm + 1 count		5.100010	MHz
	9.99999 MHz	±1 ppm + 1 count		9.999990	MHz
AM Modulation Meter:					
Input Jack/RF	Modulation	LIMITS		RESULTS	
ANT. / -20 dBm	10%	±10% of reading		9.6	%
	50%	±10% of reading		48.2	%
	90%	±10% of reading		92.3	%
ANT. / -10 dBm	10%	±10% of reading		9.8	%
	50%	±10% of reading		48.8	%
	90%	±10% of reading		92.4	%
RF I/O / 5 dBm	10%	±10% of reading		9.6	%
	50%	±10% of reading		48.0	%
	90%	±10% of reading		92.1	%



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FM Modulation Meter:

Input Jack / RF Level	Mod Freq & Deviation	LIMITS	RESULTS	
ANT / -20 DBm	400 Hz/15 kHz (X1)	$[(X1-0.4) \div 1.08] < \text{reading}$ $< [(X1+0.4) \div 0.92]$	14.9	kHz
	400 Hz/10 kHz (X2)	$[(X2-0.4) \div 1.08] < \text{reading}$ $< [(X2+0.4) \div 0.92]$	10.1	kHz
	400 Hz/1 kHz (X3)	$[(X3-0.4) \div 1.08] < \text{reading}$ $< [(X3+0.4) \div 0.92]$	1.0	kHz
	1000Hz/15 kHz (X4)	$[(X4-0.4) \div 1.08] < \text{reading}$ $< [(X4+0.4) \div 0.92]$	14.8	kHz
	1000Hz/10 kHz (X5)	$[(X5-0.4) \div 1.08] < \text{reading}$ $< [(X5+0.4) \div 0.92]$	10.1	kHz
	1000Hz/1 kHz (X6)	$[(X6-0.4) \div 1.08] < \text{reading}$ $< [(X6+0.4) \div 0.92]$	1.0	kHz
RF I/O / 0 dBm	1000Hz/15 kHz (X4)	$[(X4-0.4) \div 1.08] < \text{reading}$ $< [(X4+0.4) \div 0.92]$	14.9	kHz
	1000Hz/10 kHz (X5)	$[(X5-0.4) \div 1.08] < \text{reading}$ $< [(X5+0.4) \div 0.92]$	10.2	kHz
	1000Hz/1 kHz (X6)	$[(X6-0.4) \div 1.08] < \text{reading}$ $< [(X6+0.4) \div 0.92]$	1.0	kHz

SWR Meter:

Output Freq.	Applied Load	LIMITS	RESULTS	
75 MHz	50 Ω	1.000 ($\pm 0.2 + 20\%$ Reading)	1.0	
137 MHz			1.0	
225 MHz			1.0	
312 MHz			1.0	
400 MHz			1.0	
75 MHz	75 Ω	1.500 ($\pm 0.2 + 20\%$ Reading)	1.4	
137 MHz			1.4	
225 MHz			1.4	
312 MHz			1.4	
400 MHz			1.4	
75 MHz	100 Ω	2.000 ($\pm 0.2 + 20\%$ Reading)	2.1	
137 MHz			2.1	
225 MHz			2.1	
312 MHz			2.2	
400 MHz			2.3	
75 MHz	150 Ω	3.000 ($\pm 0.2 + 20\%$ Reading)	2.9	
137 MHz			2.8	
225 MHz			2.7	
312 MHz			2.5	
400 MHz			2.6	

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Power Meter:

TEST	LIMITS	READINGS	
0.1 Watt	± 8%/reading +1 count	0.10	W
1.0 Watt	± 8%/reading +1 count	0.99	W
5.0 Watt	± 8%/reading +1 count	4.9	W
10.0 Watt	± 8%/reading +1 count	10.7	W
20.0 Watt	± 8%/reading +1 count	19.5	W
25.0 Watt	± 8%/reading +1 count	24.4	W