CAL labs, Incorporated www.callabsinc.com callabs@callabsinc.com
2525 Santa Anna Ave • Dallas, Texas 75228 • (800) 693-7308 • (214) 321-7205 • Fax (214) 324-4921

CERTIFICATION OF CALIBRATION

ID No.:	073270	**Report No.:**	173750
Model No.:	IFR 4000	**Report Date:**	Dec/10/2024 14:02
Serial No.:	1000685882	**Page No:**	1 of 7
Manufacturer:	IFR	**Customer:**	INNOVATEC INDUSTRIAL SOLUTIONS
Description:	NAV/COMM TEST SET	**Address:**	DIEGO ALMEIDA/SANDRA VITERI
P.O. No.:	INN-016		914 IBIS AVENUE
			MIAMI SPRINGS, FL 33166

TEST STANDARDS USED

ASSET#	Model	Mfr.	Description	Cal Due
STD001	5560A/600M	FLUKE	CALIBRATOR	Feb/28/2025
STD002	58503A	H.P.	FREQ.STANDARD	Oct/02/2025
STD003	8902A	H.P.	MEAS. RECEIVER	Nov/18/2025
STD004	11722A	H.P.	SENSOR MODULE	Oct/21/2025
STD005	TDS3032B	TEK	OSCILLOSCOPE	Jan/08/2025
STD006	8903B	H.P.	AUDIO ANALYZER	Jan/10/2025
STD007	ASI-223	IFR	PHASE STANDARD	Oct/03/2025

Receipt Date:	Dec/05/2024		
Calibration Date:	Dec/10/2024	**Temperature:**	71F
Calibration Due:	Dec/10/2025	**Humidity:**	45%
Calibration Procedure:	10000008948AB	**Technician:**	AN
Condition Received:	In Tolerance	**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 Institue 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 bereproduced, except in full, without the written authorization of Cal Labs, Inc.

Miguel A. Cancea

General Manager

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TEST REPORT

Id No.: 073270
Model No.: IFR 4000
Serial No.: 1000685882
Manufacturer: IFR
Description: Nav/Com Test Set
P.O. No.: INN-016

Report No. 173750
Report Date: DEC/10/2024

Customer: INNOVATEC

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	334.69996	MHz
75.000 MHz	± 1 ppm	74.99999	MHz
118.000 MHz	± 1 ppm	117.99998	MHz
137.000 MHz	± 1 ppm	136.99998	MHz
225.000 MHz	± 1 ppm	224.99997	MHz
312.000 MHz	± 1 ppm	311.99996	MHz
400.000 MHz	± 1 ppm	399.99995	MHz
118.001 MHz	± 1 ppm	118.00098	MHz
118.002 MHz	± 1 ppm	118.00198	MHz
118.003 MHz	± 1 ppm	118.00298	MHz
118.004 MHz	± 1 ppm	118.00398	MHz
RF Level Accuracy			
Antenna Connector			
108.000 MHz, -30 dBm	± 3 dBm	-30.57	dBm
108.100 MHz, -30 dBm	± 3 dBm	-30.57	dBm
334.700 MHz, -30 dBm	± 3 dBm	-30.59	dBm
75.0000 MHz, -30 dBm	± 3 dBm	-30.83	dBm
400.000 MHz, -30 dBm	± 3 dBm	-30.49	dBm
137.000 MHz, -30 dBm	± 3 dBm	-30.71	dBm
118.000 MHz, +13 dBm	± 3 dBm	+14.05	dBm
118.000 MHz, +3 dBm	± 3 dBm	+3.89	dBm
118.000 MHz, -7 dBm	± 3 dBm	-6.16	dBm
118.000 MHz, -17 dBm	± 3 dBm	-17.41	dBm
118.000 MHz, -27 dBm	± 3 dBm	-27.56	dBm
118.000 MHz, -37 dBm	± 3 dBm	-37.60	dBm
118.000 MHz, -47 dBm	± 3 dBm	-47.67	dBm
118.000 MHz, -57 dBm	± 3 dBm	-57.49	dBm
RF I/O Connector			
108.000 MHz, -40 dBm	± 2 dBm	-40.14	dBm
108.100 MHz, -40 dBm	± 2 dBm	-40.13	dBm
334.700 MHz, -40 dBm	± 2 dBm	-40.17	dBm
75.0000 MHz, -40 dBm	± 2 dBm	-40.27	dBm
400.000 MHz, -40 dBm	± 2 dBm	-40.26	dBm
137.000 MHz, -40 dBm	± 2 dBm	-40.23	dBm
118.000 MHz, -12 dBm	± 2.5 dBm	-12.33	dBm
118.000 MHz, -22 dBm	± 2.5 dBm	-22.44	dBm
118.000 MHz, -32 dBm	± 2.5 dBm	-32.46	dBm

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Id No.: 073270
Model No.: IFR 4000
Serial No.: 1000685882
Manufacturer: IFR
Description: Nav/Com Test Set
P.O. No.: INN-016

Report No.: 173750
Report Date: DEC/10/2024

Customer: INNOVATEC

TEST	LIMITS	RESULTS	
118.000 MHz, -42 dBm	± 2 dBm	-42.23	dBm
118.000 MHz, -52 dBm	± 2 dBm	-52.36	dBm
118.000 MHz, -62 dBm	± 2 dBm	-62.39	dBm
118.000 MHz, -72 dBm	± 2 dBm	-72.24	dBm
118.000 MHz, -82 dBm	± 2 dBm	-82.38	dBm
118.000 MHz, -92 dBm	± 2 dBm	-92.40	dBm
118.000 MHz, -102 dBm	± 3 dBm	-102.21	dBm
118.000 MHz, -112 dBm	± 3 dBm	-112.32	dBm
118.000 MHz, -120 dBm	± 3 dBm	-120.38	dBm
RF Level Flatness			
ANT Connector: Verify flatness is ≤ 1 dBm between +10 levels and -10 levels			
108.000 MHz	Record +10 dBm level	+10.86	dBm
	Record -10 dBm level	-9.32	dBm
110.150 MHz	Record +10 dBm level	+10.88	dBm
	Record -10 dBm level	-9.30	dBm
75.000 MHz	Record +10 dBm level	+10.92	dBm
	Record -10 dBm level	-9.24	dBm
118.000 MHz	Record +10 dBm level	+10.95	dBm
	Record -10 dBm level	-9.23	dBm
137.000 MHz	Record +10 dBm level	+11.11	dBm
	Record -10 dBm level	-9.06	dBm
156.000 MHz	Record +10 dBm level	+11.13	dBm
	Record -10 dBm level	-9.04	dBm
225.000 MHz	Record +10 dBm level	+10.50	dBm
	Record -10 dBm level	-9.65	dBm
312.000 MHz	Record +10 dBm level	+10.50	dBm
	Record -10 dBm level	-9.63	dBm
334.700 MHz	Record +10 dBm level	+10.43	dBm
	Record -10 dBm level	-9.69	dBm
400.000 MHz	Record +10 dBm level	+10.29	dBm
	Record -10 dBm level	-9.81	dBm
RF I/O Connector: Verify flatness is ≤ 1 dB between -20 levels and -40 levels			
108.000 MHz	Record -20 dBm level	-20.33	dBm
	Record -40 dBm level	-40.14	dBm
110.150 MHz	Record -20 dBm level	-20.41	dBm
	Record -40 dBm level	-40.20	dBm
75.000 MHz	Record -20 dBm level	-20.42	dBm
	Record -40 dBm level	-40.27	dBm
118.000 MHz	Record -20 dBm level	-20.40	dBm
	Record -40 dBm level	-40.19	dBm
137.000 MHz	Record -20 dBm level	-20.34	dBm
	Record -40 dBm level	-40.23	dBm
156.000 MHz	Record -20 dBm level	-20.32	dBm
	Record -40 dBm level	-40.22	dBm

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Id No.: 073270
Model No.: IFR 4000
Serial No.: 1000685882
Manufacturer: IFR
Description: Nav/Com Test Set
P.O. No.: INN-016

Report No. 173750
Report Date: DEC/10/2024

Customer: INNOVATEC

TEST	LIMITS	RESULTS	
225.000 MHz	Record -20 dBm level	-20.20	dBm
	Record -40 dBm level	-40.20	dBm
312.000 MHz	Record -20 dBm level	-20.03	dBm
	Record -40 dBm level	-40.13	dBm
334.700 MHz	Record -20 dBm level	-20.04	dBm
	Record -40 dBm level	-40.17	dBm
400.000 MHz	Record -20 dBm level	-20.05	dBm
	Record -40 dBm level	-40.26	dBm

Modulation:

Function	Tones	Modulation Limits	Modulation Readings (%)	Distortion Limits	Distortion Readings (%)
Marker Beacon	400 Hz, 95%	± 5%	93.6	< 2.5 %	0.538
	1300 Hz, 95%	± 5%	93.9	< 2.5 %	0.241
	3000 Hz, 95%	± 5%	93.6	< 2.5 %	0.713
VOR	1020 Hz, 30%	± 2%	29.76	< 2.0%	0.199
	30 Hz, 30%	± 2%	29.65	< 2.0%	0.075
	9960 Hz, 30%	± 2%	29.69	< 2.0%	0.228
	FM Dev 480 Hz	±25 Hz	480		
Localizer	1020 Hz, 30%	± 2%	28.05	< 2.5 %	0.157
	90Hz, 20%	± 2%	20.00	< 2.5 %	0.079
	150 Hz, 20%	± 2%	20.06	< 2.5 %	0.208
Glideslope	90 Hz, 40%	± 2%	40.0	< 2.5 %	0.186
	150 Hz, 40%	± 2%	40.1	< 2.5 %	0.239
Comm VHF	1020 Hz, 30%	± 2%	28.69	< 2.5 %	0.182
Comm UHF	1020 Hz, 30%	± 2%	29.11	< 2.5 %	0.183

Mode Accuracy:

VOR Bearing	Accuracy	Measured Error	
0° To	± 0.1°	-0.044	
0° From	± 0.1°	-0.007	
180° To	± 0.1°	+0.001	
180° From	± 0.1°	-0.047	
90° To	± 0.1°	-0.014	
90° From	± 0.1°	+0.016	
270° To	± 0.1°	+0.006	
270° From	± 0.1°	-0.014	
Localizer DDM			
0.000	± 0.0015 DDM	+0.000000	DDM
0.093 Left	± 0.0015 DDM + 3% of setting	-0.093336	DDM
0.155 Left	± 0.0015 DDM + 3% of setting	-0.155494	DDM
0.200 Left	± 0.0015 DDM + 3% of setting	-0.200600	DDM
0.093 Right	± 0.0015 DDM + 3% of setting	+0.093205	DDM
0.155 Right	± 0.0015 DDM + 3% of setting	+0.155429	DDM
0.200 Right	± 0.0015 DDM + 3% of setting	+0.200405	DDM

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Id No.: 073270
Model No.: IFR 4000
Serial No.: 1000685882
Manufacturer: IFR
Description: Nav/Com Test Set
P.O. No.: INN-016

Report No. 173750
Report Date: DEC/10/2024

Customer: INNOVATEC

TEST	LIMITS		RESULTS	
Glideslope DDM				
0.000	± 0.003 DDM		+0.000000	DDM
0.091 Up	± 0.003 DDM + 3% of setting		+0.091151	DDM
0.175 Up	± 0.003 DDM + 3% of setting		+0.175351	DDM
0.400 Up	± 0.003 DDM + 3% of setting		+0.400869	DDM
0.091 Down	± 0.003 DDM + 3% of setting		-0.091217	DDM
0.175 Down	± 0.003 DDM + 3% of setting		-0.175614	DDM
0.400 Down	± 0.003 DDM + 3% of setting		-0.400803	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	9.8	%
	50%	±10% of reading	48.2	%
	90%	±10% of reading	93.1	%
ANT. / -10 dBm	10%	±10% of reading	9.8	%
	50%	±10% of reading	48.9	%
	90%	±10% of reading	93.3	%
RF I/O / 5 dBm	10%	±10% of reading	9.6	%
	50%	±10% of reading	47.9	%
	90%	±10% of reading	94.1	%

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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)÷1.08]< reading <[(X1+0.4)÷0.92]	15.0	kHz
	400 Hz/10 kHz (X2)	[(X2-0.4)÷1.08]< reading <[(X2+0.4)÷0.92]	10.1	kHz
	400 Hz/1 kHz (X3)	[(X3-0.4)÷1.08]< reading <[(X3+0.4)÷0.92]	1.1	kHz
	1000Hz/15 kHz (X4)	[(X4-0.4)÷1.08]< reading <[(X4+0.4)÷0.92]	14.9	kHz
	1000Hz/10 kHz (X5)	[(X5-0.4)÷1.08]< reading <[(X5+0.4)÷0.92]	10.1	kHz
	1000Hz/1 kHz (X6)	[(X6-0.4)÷1.08]< reading <[(X6+0.4)÷0.92]	1.1	kHz
RF I/O / 0 dBm	1000Hz/15 kHz (X4)	[(X4-0.4)÷1.08]< reading <[(X4+0.4)÷0.92]	15.0	kHz
	1000Hz/10 kHz (X5)	[(X5-0.4)÷1.08]< reading <[(X5+0.4)÷0.92]	10.2	kHz
	1000Hz/1 kHz (X6)	[(X6-0.4)÷1.08]< reading <[(X6+0.4)÷0.92]	1.1	kHz

SWR Meter:

Output Freq.	Applied Load	LIMITS	RESULTS	
75 MHz	50 Ω	1.000 (± 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 (±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 (±0.2 + 20% Reading)	2.0	
137 MHz			2.0	
225 MHz			2.1	
312 MHz			2.2	
400 MHz			2.3	
75 MHz	150 Ω	3.000 (±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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Id No.: 073270
Model No.: IFR 4000
Serial No.: 1000685882
Manufacturer: IFR
Description: Nav/Com Test Set
P.O. No.: INN-016

Report No: 137150
Report Date: DEC/10/2024

Customer: INNOVATEC

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	4.8	W
10.0 Watt	± 8%/reading +1 count	9.5	W
20.0 Watt	± 8%/reading +1 count	19.3	W
25.0 Watt	± 8%/reading +1 count	23.9	W