Avionics

IFR 4000 Nav/Comm Test Set

AEROFLEX
A passion for performance.

The IFR 4000 is a compact, lightweight and weatherproof unit designed for testing ILS, VOR, Marker Beacon and VHF/UHF Communications avionics systems.

- Accurate measurement of VHF/UHF transmitter, frequency, output power, modulation (AM and FM and receiver sensitivity)
- Accurate measurement of HF transmitter, frequency, output power, modulation (AM and SSB USB/LSB) receiver sensitivity
- Generation of ARINC 596 Selective Calling Tones
- Accurate measurement of HF/VHF/UHF antenna and or feeder SWR (Standing Wave Ratio)
- Simulation of Localizer and Glideslope (CAT I, II and III Ground Station) Signals with variable DDM settings
- Swept Localizer DDM for coupled Auto Pilot testing (Simultaneous Localizer, Glideslope and Marker signals)
- Simulation of VOR beacon with variable bearing
- Simulation of Marker Beacon, Selectable Airways (Z), Outer and Middle Marker Tones
- Accurate measurement of 121.5/243 MHz emergency beacon transmitter frequency, output power, modulation (AM). Headphone audio output to monitor swept tone (Option 1 required)
- Accurate measurement of 406 MHz COSPAS/SARSAT emergency beacon transmitter frequency, output power. Decode and display of all location and user protocols (Option 1 required)
- Guided Test capability cuts down total test time
- 5.7 inch LCD display with user adjustable backlight and contrast
- Internal battery allows eight hours of operation before recharge

The IFR 4000 verifies the operation and installation of ILS, VOR and Marker Beacon receivers and VHF/UHF AM/FM and HF AM/SSB transceivers.

The IFR 4000, with its lightweight size (under 8 lbs.), long run time battery (8 hrs) and ergonomic design, will provide the user with the most portable navigational communications ramp test set on the market today. Cockpit and bench use testing can be easily interchanged. The menu driven functionality and guided test capability make this instrument extremely easy to use. Combine these benefits with the outstanding price and the user has an instrument that delivers total value.

The IFR 4000 is designed to provide test support for ramp or bench environments by utilizing the supplied trimode antenna for over the air measurements or direct connection to the unit's RF I/O port.

VOR provides signal generation over the VOR band of 108.00 to 117.95 MHz with 30 Hz variable phase and 9960 Hz (sub-carrier frequency modulated with 30 Hz reference phase) amplitude modulated at 30% per tone. VOR bearing selection is provided in pre-set steps of 30 degrees and variable steps of 0.1 degrees.

Localizer provides signal generation over the Localizer band of 108.10 to 111.95 MHz with 90 Hz and 150 Hz tones, amplitude modulated at 20% per tone. Variable and fixed DDM control is provided.

Glideslope provides signal generation over the Glideslope band of

329.15 to 335.00 MHz with 90 Hz and 150 Hz tones, amplitude modulated at 40% per tone. Variable and fixed DDM control is provided.

Marker Beacon provides 75 MHz signal generation, amplitude modulated at 95% with selectable 400, 1300 and 3000 Hz tones.

ILS provides simultaneous Localizer (with swept DDM), Glideslope and Marker Beacon signals.

COMM AM provides signal generation and monitoring of transmitter power and modulation depth over the range of 10.0000 to 400.0000 MHz. A 1020 Hz tone, amplitude modulated at 30% is also provided. Frequency control is provided in 8.33 kHz / 25 kHz channel steps or 1 kHz variable steps.

COMM FM provides signal generation and monitoring of transmitter power and FM deviation over the range of 10.0000 to 400.0000 MHz. A 1000 Hz tone, frequency modulated at 5 kHz deviation is also provided. Frequency control is provided in 25/12.5 kHz channel steps or 1 kHz variable steps.

COMM SSB provides signal generation and monitoring of transmitter power and modulation depth over the range of 10.0000 to 30.0000 MHz. A 1000 Hz tone or variable tone 25 to 3000 Hz, SSB modulated (LSB or USB), is also provided. Frequency control is provided in 100 Hz steps.

SWR provides selected CW frequency, SWR measurement or swept SWR measurement over a 10.0000 to 400.0000 MHz range.

SELCAL (Selective Calling) provides selectable consecutive tone pulse pairs which may be sent continuously or as a burst (VHF AM) for testing SELCAL decoders.

MORSE CODE provides 1 - 4 characters transmitted in the VOR and ILS localizer mode.

FREQUENCY COUNTER provides external frequency measurement over the RF I/O connector and ANT connector from 10 to 400 MHz and over the AUX connector from 1 to 10 MHz.

121.5/243 BCN provides monitoring for 121.5/243 MHz swept tone short range emergency beacons including monitoring of transmitter power, frequency, AM modulation depth, modulation swept tone start and stop frequencies. A headphone receive audio output is provided via the Aux Port (requires user manufactured adapter cable).

406 BCN provides monitoring for 406 MHz COPAS/SARSAT Emergency Locator Transmitter (ELT), Emergency Position Indicating Radio Beacons (EPIRB and Personal Locator) PLB Beacons including transmitter frequency and power. The beacon utilizes BPSK data to transmit position information derived from a long range navigation system or GPS receiver. All protocols defined in COSPAS/SARSAT G.005 Issue 2 Rev 1 are supported. They consist of 6 user protocols (plus a test protocol), 5 location protocols (plus a test protocol). The Protocol management and data field decode is automatically handled by the IFR 4000. Transmitter frequency and power are monitored.

SPECIFICATION

NOTE: A 15 minute warm-up period is required for all specifications.

RF SIGNAL GENERATOR

OUTPUT FREQUENCY

Marker Beacon Channel	72.0 to 78.0 MHz in 25 kHz steps
Marker Beacon Pre-set	74.5, 75.0 or 75.5 MHz
Marker Beacon Variable	72.0 to 78.0 MHz in 1 kHz steps
VOR Channel	108.0 to 117.95 MHz in 50 kHz steps
VOR Pre-set	108.0, 108.05 or 117.95 MHz
VOR Variable	107.0 to 118.0 MHz in 1 kHz steps
LOC Channel	108.1 to 111.95 MHz in 50 kHz steps
LOC Pre-set	108.1, 108.15 or 110.15 MHz
LOC Variable	107.0 to 113.0 MHz in 1 kHz steps
G/S Channel	329.15 to 335.0 MHz in 50 kHz steps
G/S Pre-set	334.25, 334.55 or 334.70 MHz
G/S Variable	327.0 to 337.0 MHz in 1 kHz steps
Comm AM Channel	10.0000 to 400.0000 MHz in 25 kHz steps, 118.0000 to 156.0000 in 8.33 KHz steps
Comm AM Preset	118.00, 137.00 or 156.00 MHz (VHF Band) 225.00, 312.00, 400.00 MHz (UHF Band)
Comm AM Variable	10.0000 to 400.0000 MHz in 1 kHz steps
Comm FM Channel	10.0000 to 400.0000 MHz in 12.5 or 25 kHz steps
Comm FM Pre-set	156.00, 165.00 or 174.00 MHz
Comm FM Variable	10.0000 to 400.0000 MHz in 1 kHz steps
Comm SSB Channel	10.0000 to 30.0000 MHz in 100 Hz steps
SELCAL Channel	118.0 to 156.0 MHz in 25 kHz steps
SELCAL Pre-set	118.0, 137.0 or 156.0 MHz
SELCAL Variable	117.0 to 157.0 MHz in 1 kHz steps

FREQUENCY ACCURACY

Same as time base

OUTPUT LEVEL

ANTENNA CONNECTOR

Single Carrier

10 MHz to 75 MHz

-17 to -67 dBm in 0.5 dB steps

75 MHz to 400 MHz

+13 to -67 dBm in 0.5 dB steps

Accuracy

±3 dB

Dual Mode - LOC

0 dBm fixed

Accuracy

±2.5 dB

Dual Mode - G/S

0 to -76 dBm in 0.5 dB steps

Accuracy

±3 dB

Tri-Mode - Marker

+13 dBm fixed

Accuracy

±2 dB

Tri-Mode - LOC

-7 dBm fixed

Accuracy

±2 dB

Tri-Mode - G/S

-7 to -83 dBm in 0.5 dB steps

Accuracy

±3 dB

RF I/O CONNECTOR

Single Carrier

10 MHz to 75 MHz

-40 to -130 dBm in 0.5 dB steps

75 MHz to 400 MHz

-12 to -130 dBm in 0.5 dB steps

Accuracy

-12 to -39.5 dBm

±2.5 dB

-40 to -94.5 dBm

±2.0 dB

-95 to -120 dBm

±3 dB

Dual Mode - LOC

-22 dBm fixed

Accuracy

±2 dB

Dual Mode - G/S

-22 to -101 dBm in 0.5 dB steps

±2.5 dB

SPECTRAL PURITY

HARMONICS

<-20 dBc

NON-HARMONIC SPURIOUS

<-35 dBc between 10 and 400 MHz

VOR MODE

VOR TONE FREQUENCY ACCURACY

30 Hz Reference	*±0.02%*
30 Hz Variable	*±0.02%*
1020 Hz	*±0.02%*
9960 Hz	*±0.02%*

AM MODULATION

CAL

30 and 9960 Hz tones

30% AM, each tone

Accuracy

±1% modulation

1020 Hz tone

30% AM

1020 Hz Morse Code

10% AM

Accuracy

± 2% modulation

Variable

Range

0% to 55% AM (30, 9960 and 1020 Hz tones)

Distortion

<2.0 % in CAL position

FM MODULATION

30 Hz reference at ±480 Hz peak deviation on 9960 Hz sub-carrier

Accuracy

±25 Hz peak deviation

BEARING

To - From selectable

Preset Bearing

0°, 30°, 60°, 90°, 120°, 150°°, 180°, 210°, 240°, 270°, 300°, and 330°

Variable Bearing

3600 digitally derived courses in 0.1° increments

Accuracy

±0.1°

LOC MODE

LOC TONE FREQUENCY ACCURACY

90 Hz	*±0.02%*
150 Hz	*±0.02%*
1020 Hz	*±0.02%*

MODULATION

CAL

90 and 150 Hz Tones	*20% AM each tone*
1020 Hz Audio Tone	*30% AM*
1020 Hz Morse Tone	*10% AM*
Accuracy	*±2% modulation*

Variable

Range

0% to 28% AM (90 and 150 Hz Tones)
0 to 42% AM (1020 Hz tone)

Distortion

<2.5% in CAL position

LOC DDM

Fixed

Range

±0, 0.093, 0.155 or 0.200 DDM and tone delete

Accuracy

±0.0015 DDM (±1.5 µA) ±3% of setting ≤+10 dBm output level)

Variable

Range

±0.4 in 0.001 DDM steps

Accuracy

±0.0025 DDM (±2.5 µA) ±3% of setting ≤+10 dBm output level)

Variable Sweep

(Available only in dual and tri-modes)

Range

0 to ±30 µA

Sweep Rates

5 to 40 sec

Step Size

5 sec

Accuracy

±0.5 sec/sweep

Phase Shift

Range

0 to 120 degrees in 5 degree increments (150 Hz phase relative to 90 Hz)

Accuracy

±0.5°

G/S MODE

TONE FREQUENCY ACCURACY

90 Hz	*±0.02%*
150 Hz	*±0.02%*

MODULATION

CAL

90 and 150 Hz Tones

40% AM , each tone

Accuracy

±2% modulation

Variable

Range

0% to 50% AM (90 and 150 Hz tones)

Distortion

<2.5% in CAL position

G/S DDM

Fixed

Range

±0, 0.091, 0.175 or 0.400 DDM and tone delete

Accuracy

±0.003 DDM (±2.5 µA) ±3% of setting ≤+10 dBm output level)

Variable

Range

±0.8 DDM in 0.001 DDM steps

Accuracy

±0.0048 DDM (±4.0 µA) ±3% of setting ≤+10 dBm output level)

Phase Shift

Range

0 to 120 degrees in 5 degree increments (150 Hz phase relative to 90 Hz)

Accuracy

±0.5°

MARKER MODE

MARKER TONE FREQUENCY ACCURACY

400 Hz	*±0.02%*
1300 Hz	*±0.02%*
3000 Hz	*±0.02%*

MODULATION

CAL

Setting

95% AM

Accuracy

±5% modulation

Variable (single carrier only)

Range

0% to 95% AM

Distortion

Single Carrier

<2.5% in CAL position (-67 to +10 dBm)

Tri-Mode

<5% in CAL position

COMM MODE (COMM AM, COMM FM, COMM SSB)

COMM TONE FREQUENCY ACCURACY

Pre-set (AM) 1020 Hz

±0.02%

Pre-set (FM) 1000 Hz

±0.02%

Pre-set (SSB) 1000 Hz / Variable (SSB) 25 to 3000 Hz

±6.25 Hz

Variable Steps (SSB)

25 Hz

AM MODULATION

CAL

1020 Hz tone

30% AM

Accuracy

±2% modulation

Variable

Range

0% to 95% AM (1% steps)

Distortion

<2.5% in CAL position

FM MODULATION

CAL

1000 Hz tone

5 KHz deviation

Accuracy

±0.5%

Variable

Range

1 to 15 KHz (1 KHz steps)

Distortion

<5% in CAL position

SSB MODULATION

USB/LSB offset carrier

SELCAL MODE

Provides amplitude modulation with SELCAL (SELective CALling) tones

SELCAL TONE FREQUENCY ACCURACY

± 0.02%

TRANSMIT MODES

Single

single transmission

Continuous

7.5 sec interval (typical)

MODULATION

CAL

Per SELCAL Tone

40% AM

Accuracy

±2% modulation

Variable

Range

0% to 55% AM

Distortion

<2.5% in CAL position

EXTERNAL FREQUENCY COUNTER

FREQUENCY RANGE

Antenna and RF I/O Connectors

Range

10 to 400 MHz

Resolution

100 Hz

Accuracy

Same as time base, ±1 count

AUX I/O Connectors

Range

1 to 10 MHz

Resolution

1 Hz

Accuracy

Same as time base, ±1 count

SENSITIVITY

ANT Connector

≥-35 dBm

RF I/O Connector

≥0 dBm

AUX I/O Connector

≥1 Vp-p (from a 50 ohm source)

POWER METER (RF I/O CONNECTOR)

FREQUENCY RANGE

10.0 to 400.0 MHz

POWER RANGE

0.1 to <1 W
Resolution 0.01 W

1 to <100 W
Resolution 0.1 W (NOTE 1)

100 to 1999 W
Resolution 1 W (NOTE 1)

Accuracy

<100 MHz
±12% of reading, ±1 count, CW only (NOTE 2)

100 to 400 MHz
±8% of reading, ±1 count, CW only (NOTE 2)

DUTY CYCLE

≤10 W, continuous
>10 W to ≤20 W, 3 min on, 2 min off
>20 W to ≤30 W, 1 min on, 2 min off

AM METER

Audio Range

50 to 3000 Hz

Percent Modulation Range

10% to 99%

Accuracy

±10% of reading

Sensitivity

Antenna Connector

≥-20 dBm

RF I/O Connector

≥+15 dBm

FM METER

Audio Range

50 to 3000 Hz

Deviation Range

1 to 15 kHz

Accuracy

±(0.4 kHz + 8% of reading)

Minimum Input Level

Antenna Connector

≥-35 dBm

RF I/O Connector

≥0 dBm

SWR METER (SWR CONNECTOR)

Frequency Range

10.0 MHz to 410.0 MHz

Accuracy

SWR <3:1
±0.2, ±20% of reading

SWR ≥3:1
±0.3, ±20% of reading

121.5/243 BEACON MONITOR (OPTION)

Swept Audio Tone Range

100 Hz to 3000 Hz

Accuracy

±10% of reading

Sensitivity

Antenna Connector

≥-30 dBm

RF I/O Connector

≥0 dBm

406 MHZ BEACON MONITOR (OPTION)

Sensitivity

Antenna Connector

≥-35 dBm

RF I/O Connector

≥0 dBm

INPUTS/OUTPUTS

RF I/O CONNECTOR

Type

Input/Output

Impedance

50 Ω typical

Maximum Input Level

30 W, 1 min on, 2 min off

VSWR

10 to ≤300 MHz
<1.3:1

>300 to 400 MHz
<1.35:1

ANTENNA CONNECTOR

Type

Input/Output

Impedance

50 Ω typical

Maximum Input Level

0.5 W

SWR CONNECTOR

Type

Output

Impedance

50 Ω typical

Maximum Reverse Power

+25 dBm

VSWR

10 to ≤300 MHz
<1.3:1

>300 to 400 MHz
<1.35:1

AUX CONNECTOR

Type

Input/Output

Impedance

800 Ω typical

Maximum Input Level

5 Vp-p maximum, 3 VDC maximum

TIMEBASE (TCXO)

Temperature Stability

±1 ppm

Aging

±1 ppm per year

Accuracy

±1 ppm when Auto Cal is performed

BATTERY

Type

Li Ion

Duration

>8 hrs continuous operation

INPUT POWER (TEST SET)

Input Range

11 VDC to 32 VDC

Power Consumption

55 W maximum

16 W nominal at 18 VDC with charged battery

Fuse Requirements

5 A, 32 VDC, type F

INPUT POWER (SUPPLED EXTERNAL AC TO DC CONVERTER)

Input Range

100 to 250 VAC, 1.5 A maximum, 47-63 Hz

Main Supply Voltage Fluctuations

≤10% of the nominal voltage

Transient Over-voltages

According to installation category II

ENVIRONMENTAL (TEST SET)

Use

Pollution degree 2

Altitude

≤4800 meters

Operating Temperature (NOTE 3)

-20°C to 55°C

Storage Temperature (NOTE 4)

-30°C to 70°C

Relative Humidity

80% from 5°C to <10°C
95% from 10°C to <31°C
75% from 31°C to <40°C
45% from 40°C to 50°C

ENVIRONMENTAL (SUPPLIED EXTERNAL AC TO DC CONVERTER)

Use

Indoors

Altitude

≤3,000 meters

Temperature

5°C to 40°C

PHYSICAL CHARACTERISTICS

Dimensions:

Height

11.2 in (28.5 cm)

Width

9.1 in (23.1 cm)

Depth

2.7 in (6.9 cm)

Weight (Test Set Only)

<8 lbs. (3.6 kg)

SUPPLEMENTAL INFORMATION

Audio distortion characteristics are measured in a 20 Hz to 15 kHz post detection bandwidth.

All DDM measurements are made on RF output signal.

Test Set Certifications

Altitude, operating	MIL-PRF-28800F	Class 2
Altitude, not operating	MIL-PRF-28800F	Class 2
Bench Handling	MIL-PRF-28800F	Class 2
Blowing Dust	MIL-STD-810F	Method 510.4, Procedure I
Drip-proof	MIL-PRF-28800F	Class 2
Explosive Atmosphere	MIL-STD-810F	Method 511.4, Procedure 1
Relative Humidity	MIL-PRF-28800F	Class 2
Shock, Functional	MIL-PRF-28800F	Class 2
Vibration Limits	MIL-PRF-28800F	Class 2
Temp, operating NOTE 5	MIL-PRF-28800F	Class 2
Temp, not operating NOTE 6	MIL-PRF-28800F	Class 2
Transit Drop	MIL-PRF-28800F	Class 2
Safety Compliance	UL-61010B-1 EN 61010-1 CSA 22.2 No 61010-1	
EMC	EN 61326	

External AC-DC Converter Certifications

Safety Compliance	UL 1950 DS CSA 22.2 No. 234 VDE EN 60 950	
EMI/RFI Compliance	FCC Docket 20780	Curve “B”
EMC	EN 61326	

Transit Case Certifications

Drop Test	FED-STD-101C	Method 5007.1 Paragraph 6.3, Procedure A, Level A
Falling Dart Impact	ATA 300	Category I
Vibration, Loose Cargo	FED-STD-101C	Method 5019
Vibration, Sweep	ATA 300	Category I
Simulated Rainfall	MIL-STD-810F	Method 506.4 Procedure II of 4.1.2
	FED-STD-101C	Method 5009.1 Sec 6.7.1
Immersion	MIL-STD-810F	Method 512.4

VERSIONS AND ACCESSORIES

Ordering Numbers	Versions
4000-110	IFR 4000 Nav/Comm Ramp Test Set, with US mains leads
4000-220	IFR 4000 Nav/Comm Ramp Test Set, with European mains leads
4000OPT1	ELT (121.5/243 MHz beacon and 406 MHz COSPAS/SARSAT beacon test)

Standard Accessories

VHF/UHF multi-band antenna

Customized transit case

Operation manual (CD)

AC/DC power supply

AC line cord

TNC (male) to TNC (male) coaxial cable

TNC short

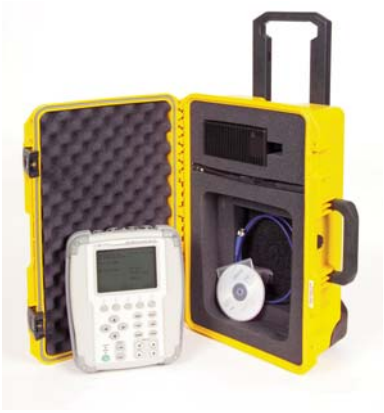
Spare fuse

Optional Accessories

AC0820	Desk top stand
AC0821	RS-232 cable
AC0822CD	4000 maintenance manual (CD)
AC0823CD	4000 operation manual (CD)

Extended Standard Warranties with Calibration for 4000

W4000/203C	Extended standard warranty 36 months with scheduled calibration
W4000/205C	Extended standard warranty 60 months with scheduled calibration



NOTES

Note 1 - External attenuator required for input power greater than 30 W

Note 2 - Accuracy specification excluding external attenuator

Note 3 - Battery charging temperature range: 5° to 40°C (controlled by internal charger)

Note 4 - Li Ion battery must be removed below -20°C and above 60°C

Note 5 - Temperature range extended to -20°C to 55°C.

Note 6 - Temperature range reduced to -30°C to 71°C.

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AEROFLEX
A passion for performance.

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Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.

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