# Avionics

# IFR 4000 nav/comm test set

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 *
- Accurate measurement of 406 MHz COSPAS/SARSAT emergency beacon transmitter frequency, output power. Decode and display of all location and user protocols *
- 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

* Option 1 Required

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 50 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 400.0000 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

-22 to -100 dBm

± 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, 1020 and 9960 Hz tones

30% AM, each tone

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/SSB) 1000 Hz***

*±0.02%*

***Variable (SSB) 25 to 3000 Hz***

*±0.02%*

***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 KHz deviation*

***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***

*sngle 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***

*≥-10 dBm*

***AUX I/O Connector***

*≥1 Vp-p*

## 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*

*100 to 300 W*
*Resolution 1 W (NOTE 1)*

***Accuracy***

*± 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***

*≥+ 5 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***

*≥-10 dBm*

## SWR METER (SWR CONNECTOR)

***Frequency Range***

*10.0 to 400.0 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***

*≥ -35 dBm*

***RF I/O Connector***

*≥-10 dBm*

## 406 MHZ BEACON MONITOR (OPTION)

***Sensitivity***

***Antenna Connector***

*≥-35 dBm*

***RF I/O Connector***

*≥-10 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 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° to 55°C*

***Storage Temperature (NOTE 4)***

*-30° 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° 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)*

## 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

### 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 |

### Optional Accessories

| | |
|---|---|
| AC0820 | Desk top stand |
| AC0821 | RS-232 cable |
| AC0822PP | 4000 maintenance manual (paper) |
| AC0822CD | 4000 maintenance manual (CD) |
| AC0823PP | 4000 operation manual (paper) |
| AC0823CD | 4000 operation manual (CD) |

***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*

*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.*


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AEROFLEX
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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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