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 (2), 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

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

**RF SIGNAL GENERATOR**

**OUTPUT FREQUENCY**
- **Marker Beacon Channel**: 74.5, 75.0 or 75.5 MHz
- **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 110.15 MHz
- **VOR Variable**: 107.0 to 113.0 MHz in 50 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 MHz in 8.33 kHz steps
- **Comm AM Pre-set**: 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

**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

**SPECTRAL PURITY**
- **HARMONICS**
  - < -20 dBc
- **NON-HARMONIC SPURIOUS**
  - < -35 dBc between 10 and 400 MHz

**AM MODULATION**
- **CAL**
  - 30, 1020 and 9960 Hz tones
  - 30% AM, each tone
  - **1020 Hz Morse code**
  - 10% AM
  - **Accuracy**: ±2% modulation

**VOR MODE**
- **VOR TONE FREQUENCY ACCURACY**
  - **30 Hz Reference**: ±0.02%
  - **30 Hz Variable**: ±0.02%
  - **1020 Hz**: ±0.02%
  - **9960 Hz**: ±0.02%
**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°, 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**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 Hz</td>
<td>±0.02%</td>
</tr>
<tr>
<td>150 Hz</td>
<td>±0.02%</td>
</tr>
<tr>
<td>1020 Hz</td>
<td>±0.02%</td>
</tr>
</tbody>
</table>

**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

**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**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 Hz</td>
<td>±0.02%</td>
</tr>
<tr>
<td>150 Hz</td>
<td>±0.02%</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 Hz</td>
<td>±0.02%</td>
</tr>
<tr>
<td>1300 Hz</td>
<td>±0.02%</td>
</tr>
<tr>
<td>3000 Hz</td>
<td>±0.02%</td>
</tr>
</tbody>
</table>
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
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
≥ -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)

Accuracy
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 (SUPPLIED 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

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

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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