

# Avionics

## IFR 4000 Nav/Comm Test Set

AEROFLEX



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.

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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

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

### RF SIGNAL GENERATOR

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#### OUTPUT FREQUENCY

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

&lt;-20 dBc

**NON-HARMONIC SPURIOUS**

&lt;-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**

&lt;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**

&lt;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  $\pm 30 \mu\text{A}$

**Sweep Rates**

5 to 40 sec

**Step Size**

5 sec

**Accuracy**

$\pm 0.5$  sec/sweep

**Phase Shift**

**Range**

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

**Accuracy**

$\pm 0.5^\circ$

**G/S MODE**

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**TONE FREQUENCY ACCURACY**

90 Hz	$\pm 0.02\%$
150 Hz	$\pm 0.02\%$

**MODULATION**

**CAL**

**90 and 150 Hz Tones**

40% AM, each tone

**Accuracy**

$\pm 2\%$  modulation

**Variable**

**Range**

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

**Distortion**

<2.5% in CAL position

**G/S DDM**

**Fixed**

**Range**

$\pm 0$ , 0.091, 0.175 or 0.400 DDM and tone delete

**Accuracy**

$\pm 0.003$  DDM ( $\pm 2.5 \mu\text{A}$ )  $\pm 3\%$  of setting  $\leq +10$  dBm output level)

**Variable**

**Range**

$\pm 0.8$  DDM in 0.001 DDM steps

**Accuracy**

$\pm 0.0048$  DDM ( $\pm 4.0 \mu\text{A}$ )  $\pm 3\%$  of setting  $\leq +10$  dBm output level)

**Phase Shift**

**Range**

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

**Accuracy**

$\pm 0.5^\circ$

**MARKER MODE**

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**MARKER TONE FREQUENCY ACCURACY**

400 Hz	$\pm 0.02\%$
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1300 Hz	$\pm 0.02\%$
3000 Hz	$\pm 0.02\%$

**MODULATION**

**CAL**

**Setting**

95% AM

**Accuracy**

$\pm 5\%$  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)**

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**COMM TONE FREQUENCY ACCURACY**

**Pre-set (AM) 1020 Hz**

$\pm 0.02\%$

**Pre-set (FM) 1000 Hz**

$\pm 0.02\%$

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

$\pm 6.25$  Hz

**Variable Steps (SSB)**

25 Hz

**AM MODULATION**

**CAL**

**1020 Hz tone**

30% AM

**Accuracy**

$\pm 2\%$  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**

$\pm 0.5\%$

**Variable**

**Range**

1 to 15 KHz (1 KHz steps)

**Distortion**

<5% in CAL position

## SSB MODULATION

USB/LSB offset carrier

## SELCAL MODE

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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

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### 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)

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### 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

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### 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

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### 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)

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### 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)

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#### 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)

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#### Sensitivity

##### Antenna Connector

≥ -35 dBm

##### RF I/O Connector

≥ 0 dBm

### INPUTS/OUTPUTS

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#### 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)

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#### Temperature Stability

±1 ppm

#### Aging

±1 ppm per year

#### Accuracy

±1 ppm when Auto Cal is performed

### BATTERY

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#### Type

Li Ion

#### Duration

>8 hrs continuous operation

### INPUT POWER (TEST SET)

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#### 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 (SUPPLIED EXTERNAL AC TO DC CONVERTER)

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#### 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)

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### Use

Pollution degree 2

### Altitude

≤4800 meters

### Operating Temperature <sup>(NOTE 3)</sup>

-20°C to 55°C

### Storage Temperature <sup>(NOTE 4)</sup>

-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

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### 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

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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 1
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 <sup>NOTE 5</sup>	MIL-PRF-28800F	Class 2
Temp, not operating <sup>NOTE 6</sup>	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

## 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.

## VERSIONS AND ACCESSORIES

Order Number	Versions
72418	IFR 4000 Nav/Comm Ramp Test Set IFR 4000AR (U.S Military version w/ protective cover)
83402	4000OPT1 ELT (121.5/243 MHz beacon and 406 MHz COSPAS/SARSAT beacon test)  <b>NSN Information:</b>  6625-01-516-4656 (IFR 4000)  6625-01-559-2384 (IFR 4000AR)  6625-01-553-1956 (IFR 4000 with ELT option installed)

### Standard Accessories

9140	Antenna, 75 MHz
9137	Antenna, telescoping
10238	Transit case
6081	Operation Manual (CD)
6087	Getting Started Manual
67366	AC/DC power supply
62302	Power cord, 110 V
64020	Power cord set, 220 V
62398	TNC (male) to TNC (male) coaxial cable
24140	TNC (female) shorting cap
56080	Spare fuse
24141	50 $\Omega$ load
63958	Flip cover (IFR 4000AR only)

### Optional Accessories

63656	Desk top stand
62400	RS-232 cable
6083	Maintenance Manual (CD)

### Extended Standard Warranties with Calibration for 4000

84354	Extended standard warranty 36 months with scheduled calibration
84356	Extended standard warranty 60 months with scheduled calibration



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# AEROFLEX