

# Avionics

## IFF-45TS Transponder/Interrogator/TACAN Bench Test Set

**AEROFLEX**  
A passion for performance.



A leading edge RF signal generator designed for Mode 5 engineering and manufacturing applications

- Dual I/O for diversity transponder or sum / difference interrogator testing; optional third direct I/O for testing interrogators with sum / difference / omni antenna configurations
- Separate RF I/O for direct connection to equipment under test, or connection to antennas for over-the-air testing
- Supports AIMS 04-900 Type B (KIV-77) Mode 4/5 cryptographic equipment
- Upgradeable to support AIMS 97-900 (external: KIT-1C, KIR-1C, KIT-1A, KIR-1A, KIV-6) Mode 4 cryptographic equipment or appliqué AIMS 04-900 Type A (KIV-78). (Planned)
- Software Defined Radio design provides waveform flexibility and future growth potential
- Dual signal generators can produce coordinated signals for echo and interference testing
- Antenna ports provide one watt signal generator outputs and -60 dBm sensitive receivers to allow for extended range over-the-air testing
- Maximum dynamic range of transponder receiver can be tested at a range of up to 30 feet using a unity gain antenna
- Can produce levels above MTL at up to 10,000 ft. (greater distances or power levels are achievable with a directional antenna)
- Remote interfaces: GPIB, RS-232 and Ethernet

The IFF-45TS is an RF signal simulator that provides support for AIMS Mark XIIA transponders and interrogators. It operates under remote control from a computer or ATE system and provides versatile signal generation and measurement capability of Mark XIIA system signals in bench and over-the-air applications. Typical applications include:

- Support for engineering development of Mark XIIA equipment (Mode 5)
- Manufacturing ATE for Mark XIIA equipment
- Support for AIMS 03-1000 and DO-181 certification testing
- AIMS certification due May '07
- Over-the-air testing of Mark XIIA equipment
- Test range to 3 km with appropriate antennas
- Ramp testing of installed equipment performance

### **SPECIFICATIONS**

#### **USER INTERFACE**

Interfaces supported      IEEE-488, RS232 and Ethernet

No display included. PC Windows based GUI (graphical user interface) optional accessory available.

#### **MODES OF OPERATION**

Transponder Testing      1, 2, 3A, C, S, 4, 5

Interrogator Testing      1, 2, 3A, C, S, 4, 5

DME/TACAN Testing

P  
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## SIGNAL GENERATOR

### Frequency Range

952 to 1223 MHz, 10 KHz resolution

### Output Amplitude

Direct 0 dBm to -100 dBm  
 Antenna +30 dBm to -60 dBm  
 Resolution 0.1 dBm

### Accuracy

Direct 0 to -80 dBm  
 Direct -80 to -110 dBm  
 Antenna +30 to -30 dBm  
 Antenna -30 to -60 dBm

25±5°C	-10 to 55° C
±0.5 dB	±1 dB
±1 dB	±2 dB
±1 dB	±2 dB
±2 dB	±3 dB

### Pulse Formats

Transponder / Interrogator 1, 2, 3A, C, S (level 4), ADSB, TSB  
 Secure Modes 4, 5 (level 2)  
 Modes 3/A, C, S comply with RTCA/DO-181C; Modes 1, 2, 4, 5 comply with DOD AIMS 03-1000  
 DME / TACAN A/G, A/A, inverse A/A (capability dependent on options purchased)

### Pulse Deviations

Pulse Position XP/IR ±2 us @ 25 ns steps  
 TACAN ±8 us @ 25 ns steps  
 Pulse Width XP/IR 0.2 to 1.5 ns @ 25 ns steps  
 TACAN ±8 us @ 25 ns steps (Note: overlapping pulses will "merge")  
 Pulse Amplitude +5 to -15 dB @ 0.1 dB steps (Note: Max amplitude limits apply to highest pulse)

### Interference Pulse Characteristics (1 or 2 pulses)

Position (1st pulse relative to P1)  
 Offset Range -15 to +400 us  
 Resolution 25 ns  
 Accuracy ±10 ns

### Interference Pulse Spacing (dual pulse interference mode)

Range 0 to the end of the 1st pulse range  
 (max 2nd pulse position = 400 us - 1st pulse position)  
 Resolution 25 ns  
 Accuracy ±10 ns

### Range Delay

Range -1 to 400.00 nmi (P1 of interrogation to P1 of reply.)  
 Resolution 0.01 nmi  
 Accuracy ±0.02 nmi

### Diversity

Timing (either channel) 0 to -1000 ns, <10 ns resolution, ±10 ns accuracy  
 Amplitude Variation ±20 dB between outputs for specified accuracy

### Echo

Timing (either channel) 0 to -1000 ns, <10 ns resolution, ±10 ns accuracy  
 Amplitude Variation +5 to -20 dB, relative to P1

### Channel Signal Assignment

Transponder Test Top / Bottom  
 Interrogator Test Sum / Difference  
 TACAN Top / Bottom

### Interrogation Generator

Fixed Rate (uniform or random) 0 - 10,000 SIF, 0-500 Mode S / 5  
 Slaved Delay 2 us to 1 ms after preceding interrogation  
 Supermode Interrogations Up to 10 slaved interrogations  
 Independent Interrogations Up to 10  
 Burst 2 to 10,000 or continuous

### Spectral Purity Residual Level

< -100 dBm (direct) or < -70 dBm (antenna)  
 Harmonics  
 Direct < -30 dBc  
 Antenna < -50 dBc  
 Spurious (> modulation BW) < -60 dBc, 350 - 1800 MHz  
 Phase Noise < -90 dBc / Hz @ 800 kHz  
 Modulation Sidebands (XP / IR) < -70 dBc @ 25 MHz offset

## GENERAL

### Frequency / Time Reference

2.5 ppm composed of 1 ppm / year aging and 1 ppm accuracy over temp

### External Reference Input

10 MHz 1 to 50 VRMS

### Temp Range

-10° C to 55° C

### Warmup (for specified accuracy)

5 minutes

### Size

19" wide, 3.8" high, 20" deep

### VSWR

Direct = 1.2:1 over frequency range  
 Antenna = 1.5:1 over frequency range

## SIGNAL RECEIVER MEASUREMENTS

### Frequency Range

952 to 1223 MHz

### Input Amplitude

Direct +30 dBm to +68 dBm (1W to 6.3 kW)

Antenna -60 dBm to +30 dBm

### Pulse Power Measurements

	25 ± 5°C	-10° to 55° C
Direct	±0.5 dB	±0.75 dB
Antenna +30 to -40 dBm	±1dB	±2 dB
-40 to -60 dBm	±2dB	±3 dB
Resolution	0.1 dB	0.1 dB

### Pulse to Pulse Spacing

XP / IR ±2 us @ <10 ns resolution, ±25 ns accuracy

TACAN ±10 us @ <10 ns resolution, ±100 ns accuracy

### Pulse Width

XP / IR 0.2 to 7 us @ <10 ns resolution, ±25 ns accuracy

TACAN ±10 us @ <10 ns resolution, ±100 ns accuracy

### Pulse to Pulse Amplitude (within pulse group)

±5 dB @ 0.1 dB resolution, 0.25 dB accuracy

### Reply Delay

<10 ns resolution, ±50 ns accuracy

### Jitter

0-500 ns, <10 ns resolution, 25 ns accuracy

### Frequency Measurement

XP / IR 10 KHz resolution, ±50 KHz accuracy

DME / TACAN 10 KHz resolution, ±20 KHz accuracy

### % Reply

Range 0-100% for each interrogation type

Resolution 1% (for sample size > 100)

Sample Size 10 - 100 interrogations

## SPECIFIC APPLICATION

### TACAN / DME

#### Pulse Characteristics

##### Pulse Shape

Rise Time (10% to 90%) < 3.0 us

Fall Time (10% to 90%) < 3.0 us

Width (50% to 50%)

Range 3.5 us to 9.0 us

Resolution 100 ns

Accuracy ±0.5 us

##### Pulse Spacing

P2 Position (ref to P1) 12.0 us, X Mode

30.0 us, Y Mode

Offset Range ±7.9 us

Resolution 0.1 us

Accuracy ±0.1 us

#### Velocity

Range 0 to 10,000 kts

Resolution 1 kt

Accuracy ±0.001%

#### Acceleration

Range 0 to 400 ft/s/s

Selectable Step 1 ft/s/s

Accuracy ±0.05% of setting

#### Squitter

Range 10 to 8,000 Hz

Selectable Step 1 Hz

Accuracy 10 Hz or 2%, whichever is greater

Distribution Compliant with ARINC 568 @ 2700 Hz

#### Secure IFF Compatibility

##### Appliqué (standard)

KIV-77 - AIMS Type B, Mode 4/5

KIV-114 - Mode 4

##### Appliqué (planned optional upgrade)

KIV-78 - AIMS Type A, Mode 4/5

KIV-6 - Mode 4

##### External Crypto Interface (planned optional upgrade)

KIT-1C/KIR-1C cables (internal powered cable)

KIT-1A/KIR-1A cables (external powered cable)

##### Mode 5 Internal Crypto Simulator (compatible with U.S. Navy algorithm)

Fixed waveforms

Software emulator

##### Mode 4 Internal Crypto Simulator (standard)

Word A/B

## INTERFACE SIGNALS

### Analog Signal Ports (programmable output) 2

Frequency Response	> 30 MHz @ -3 dB
Programmable Sources	RX IF, GEN IF, DEMOD RX, DEMOD GEN, DEMOD DATA
Level	± 1 V into 50 Ω

### Trigger Out (front panel)

Programmable Source	RX start, Gen start
Level	3.3 V logic

### Trigger In (front panel)

Functions	Interrogation Trigger or Gate Reply Trigger or Gate
Level	3.3 or 5 V logic

### Programmable Outputs

16, rear panel, 3.3 or 5 V logic

### Programmable Inputs

16, rear panel, 3.3 or 5 V logic

### Suppression Out

Amplitude	0 to 80 V
Mode	Generate Frame or Variable Width
Variable Pulse Width	1 - 250 us @ 0.1 us steps

### Suppression In

Amplitude	3.3 V
Impedance	2 KΩ
Action	Inhibits response to incoming signal

## VERSIONS AND ACCESSORIES

When ordering please quote the full ordering number information.

### Ordering Numbers

IFF45TS-110

IFF45TS-220

45TSOPT1

45TSOPT2

45TSOPT3

45TSOPT4

45TSOPT5

45TSOPT6

45TSOPT7

45TSOPT8

45TSOPT9

### Versions

Base Unit 110 V, Transponder Modes 1,2,3/A,4 (Internal Crypto),C,S

Base Unit 220 V, Transponder Modes 1,2,3/A,4 (Internal Crypto),C,S

Transponder Mode 5

Interrogator Modes 1,2,3/A,4,C,S

Interrogator Mode 5

DME/TACAN

Omni port (monopulse interrogator)

KIV 77 Adapter

KIV 6 Adapter

KIT/KIR-1C Adapter

KIV 78 Adapter

### Optional Accessories

AC45TS-GUI PC Windows based graphical user interface

### Extended Warranty

W45TS/203C Extended standard warranty 36 months with scheduled calibration

W45TS/205C Extended standard warranty 60 months with scheduled calibration

### EXPORT CONTROL:

This product is controlled for export under the International Traffic in Arms Regulations (ITAR). A license from the U.S. Department of State is required prior to the export of this product from the United States.

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