

# 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
- 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 ft. 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 03-1000A and DO-181C certification testing
- 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**

<i>Transponder Testing</i>	1, 2, 3A, C, S, 4, 5
<i>Interrogator Testing</i>	1, 2, 3A, C, S, 4, 5
<i>DME/TACAN Testing</i>	G/A, INV G/A, BG/A, BA/A, A/A, INV A/A

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## SIGNAL GENERATOR

### Frequency Range

955 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	25±5° C
	-10 to 55° C
Direct 0 to -80 dBm	±0.5 dB
Direct -80 to -110 dBm	±1 dB
Antenna +30 to -30 dBm	±1 dB
Antenna -30 to -60 dBm	±2 dB

### Pulse Formats

Transponder/Interrogator	1, 2, 3/A, C, S
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 03-1000A	
DME/TACAN	G/A, A/A, INVERSE G/A, INVERSE A/A (capability dependent on options purchased)

### Pulse Deviations

Pulse Position	XP	±1 μs @ 7.8125 ns steps
	IP, Non-Mode 5	±1 μs @ 7.8125 ns steps
	IP, Mode 5	±0.25 μs @ 7.8125 ns steps
	TACAN*	±12.0 μs @ 7.8125 ns steps
Pulse Width	XP/IR	±0.5 μs @ 7.8125 ns steps
	TACAN	±5.5 μs @ 7.8125 ns steps
Pulse Amplitude		+3 to -12 dB @ 0.1dB steps

### Interference Pulse Characteristics (1 or 3 pulses)

Position (1st pulse relative to reference pulse)		
Offset range	XP	-44 μs to 400 μs
	IP	-1 μs to 400 μs
Resolution		7.8125 ns
Accuracy		±10 ns

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

Range		0 to the end of the 1st pulse range
(max 2nd pulse position = 400 μs - 1st pulse position)		
Resolution		7.8125 ns
Accuracy		±10 ns

### Range Delay

Range	DME/TACAN	-1 to 400.00 nmi
	Interrogator	0 to 400.00 nmi
Resolution		0.01 nmi
Accuracy		±0.02 nmi

\* Pulse overlap not allowed

### 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
DME/TACAN	30 nmi, fixed
Amplitude Variation	+3 to -12 dB, relative to P1

### Channel Signal Assignment

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

### Interrogation Generator

Independent/Unique Interrogations	1-12
Fixed Mode	
SIF Mode	1-10,000 PRF
Mode 5	1-1,200 PRF
Mode S	1-2500 PRF
Mode 4	1-3500 PRF

### Double/Supernode

Spacing between interrogations (slaved delay)	0-400 μs
Pair generation rate	1-400 PRF
Supernode interrogations	2 interrogations

### Burst Mode

Bursts/trigger	1-1000 or infinite
Interrogations/burst	1-2500
Interrogation rate (within a burst)	1-2500 PRF
Spacing between burst sequences	0.1-20 sec

### Interlaced Mode

Interlace ratio	1:1 - 1:64
Group rate	1-400 PRF

### 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

## 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

#### Direct

Antenna +30 to -40 dBm

-40 to -60 dBm

#### Resolution

25 ± 5° C	-10° to 55° C
±0.5 dB	±0.75 dB
±1dB	±2 dB
±2dB	±3 dB
0.1 dB	0.1 dB

### Pulse to Pulse Spacing

#### XP/IR

Non-Mode 5 ±0.25 μs @ <10 ns resolution, ±25 ns accuracy

Mode 5 ±0.0625 μs @ <10 ns resolution, ±25 ns accuracy

TACAN ±2 μs @ <10 ns resolution, ±100 ns accuracy

### Pulse Width

XP/IR ±0.175 μs @ <10 ns resolution, ±25 ns accuracy

TACAN ±1 μs @ <10 ns resolution, ±100 ns 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 1 - 1000 interrogations

## SPECIFIC APPLICATION

### TACAN/DME

#### Pulse Characteristics

##### Pulse Shape

Rise Time (10% to 90%) <3.0 μs

Fall Time (90% to 10%) <3.0 μs

Width (50% to 50%)

Range 3.5 μs to 9.0 μs

Resolution 100 ns

Accuracy ±0.5 μs

### 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

#### 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 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

15, rear panel, 3.3 V

### Programmable Inputs

15, rear panel, 3.3 or 5 V

### Suppression Out

Amplitude 5 V to 80 V in 0.1 V steps  
Variable Pulse Width 1 - 250  $\mu$ s @ 0.1  $\mu$ s steps

### Suppression In

Amplitude 24 V nominal  
Impedance 2 K $\Omega$   
Action Inhibits response to incoming signal

## GENERAL

### Frequency/Time Reference

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

### External Reference Input

1 to 50 VRMS

### Temp Range

-10° C to 55° C

### Warmup (for specified accuracy)

5 minutes

### Size

17.75" wide, 4" high, 21" deep  
(45 cm x 10 cm x 53 cm)

### Weight

24 lbs. (10kg)

### VSWR

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

## VERSIONS AND ACCESSORIES

When ordering please quote the full ordering number information.

### Ordering Numbers

### Versions

IFF45TS-110	Base Unit 110 V, Transponder Modes 1,2,3/A,4 (Internal Crypto),C,S
IFF45TS-220	Base Unit 220 V, Transponder Modes 1,2,3/A,4 (Internal Crypto),C,S
45TSOPT1	Transponder Mode 5
45TSOPT2	Interrogator Modes 1,2,3/A,4,C,S
45TSOPT3	Interrogator Mode 5
45TSOPT4	DME/TACAN
45TSOPT5	(Reserved)
45TSOPT6	KIV 77 Adapter
45TSOPT7	KIV 6 Adapter
45TSOPT8	KIT/KIR-1C Adapter
45TSOPT9	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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