

# Avionics

## IFF-45TS MK XIIA/TACAN Bench Test Set



*Optional controller shown*

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

The IFF-45TS is an RF signal generator that provides support for transponder, interrogator, TACAN and ADS-B beacon testing. The IFF-45TS was designed primarily for ATE/remote operation. Using the supplied Aeroflex Graphical User Interface (GUI) or integration into an ATE utilizing the extensive command set, the IFF-45TS provides RF signal generation and parametric measurement of the device being tested. Being well suited for bench/lab or over-the-air testing, the IFF-45TS can be utilized in typical applications including:

- Support for engineering development of MK XIIA equipment including Mode 5, ADS-B beacons and TACAN interrogators
- Manufacturing ATE for MK XIIA equipment including Mode 5 and TACAN interrogators
- Support for DO-260B, AIMS 03-1000A and DO-181D certification testing (Note: some limitations)
- Over-the-air platform testing of MK XIIA equipment including Mode 5, ADS-B beacons and TACAN interrogators
- Test ranges of up to 3 km with appropriate antennas
- Ramp testing of installed equipment performance

The IFF-45TS is the centerpiece in the Aeroflex IFF-7300S Automated Test System, which is our recommended solution for transponder/interrogator, TACAN and crypto appliqué testing requirements.

#### **Features of the IFF-45TS include:**

- MKXIIA AIMS certified for Level 1 and Level 2
- Accommodates DOD AIMS 04-900A Option A (KIV-78) and Option B (KIV-77)
- Dual I/O for diversity testing of transponders or SUM/DIFFERENCE on interrogators
- Separate connections for direct or over-the-air testing
- Software defined radio design allows waveform flexibility and future growth potential
- Dual signal generator design allows coordinated signal production for interference and echo testing
- Remote interfaces consist of RS-232, Ethernet and GPIB
- Aeroflex GUI allows easy access to test features
- Industry wide use in development and end item testing of transponders and interrogators

*Contact Aeroflex for additional information regarding the IFF-45TS or IFF-7300S testing capabilities. Please visit our website [www.aeroflex.com](http://www.aeroflex.com).*

# GENERAL SPECIFICATIONS

## USER INTERFACE

### Interfaces Supported

IEEE-488, RS232 and Ethernet (VXI-11)  
PC Windows based GUI provided.

## MODES OF OPERATION

Transponder Testing 1, 2, 3/A, C, S, 4, 5  
Interrogator Testing 1, 2, 3/A, C, S, 4, 5  
DME/TACAN Testing G/A, INV G/A, BG/A, A/A, INV A/A  
ADS-B Transponder Out, GCIB Decode

## SIGNAL GENERATOR

### Frequency Range

955 to 1223 MHz, 10 KHz resolution

### Output Amplitude

**Direct Port** 0.0 dBm to -110.0 dBm  
(into 50  $\Omega$ ) in 0.1 dB increments

Accuracy @ 25°  $\pm$  5° C  
0.0 dBm to -80.0 dbm  $\pm$ 0.5 dB  
<-80.0 dBm to -100 dBm  $\pm$ [0.5 dB + 0.05 dB per dB  
below -80 dBm]<sup>1</sup>  
<-100.0 dBm  $\pm$ [1.5 dB + 0.35 dB per dB  
below -100 dBm]<sup>2</sup>

Accuracy over full temp  
0.0 dBm to -80.0 dbm  $\pm$ 1.0 dB  
<-80.0 dBm to -100 dBm  $\pm$ [1.0 dB + 0.10 dB per dB  
below -80 dBm]<sup>2</sup>  
<-100.0 dBm  $\pm$ [3.0 dB + 0.70 dB per dB  
below -100 dBm]<sup>2</sup>

**Antenna Port** +30.0 dBm to -60.0 dBm (into  
50  $\Omega$ ) in 0.1 dB increments

Accuracy @ 25°  $\pm$  5° C  
Power  $\geq$ -30.0 dBm  $\pm$ 1.0 dB  
Power <-30.0 dBm  $\pm$ [1.0 dB + 0.033 dB per dB  
below -30 dBm]<sup>2</sup>

Accuracy over full temp  
Power  $\geq$ -30.0 dBm  $\pm$ 2.0 dB  
Power <-30.0 dBm  $\pm$ [2.0 dB + 0.066 dB per dB  
below -30 dBm]<sup>2</sup>

### Pulse Formats

Transponder/Interrogator 1, 2, 3/A, C, S  
Secure Modes 4, 5

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, BEACON G/A,  
BEACON A/A

### Pulse Position Deviations

XPDR  $\pm$ 1  $\mu$ s  
INT Non-Mode 5  $\pm$ 1  $\mu$ s  
NT Mode5  $\pm$ 0.25  $\mu$ s  
Accuracy [XPDR/INT]  $\pm$ 10 ns  
TACAN\*  $\pm$ 12.0  $\mu$ s  
Accuracy [TACAN]  $\pm$ 50 ns

## NOTES

1Hence, for a power setting of -85 dBm, the accuracy will be  
 $\pm$ [0.5 + 0.05\*5], or  $\pm$ 0.75 dB, and for a power setting of -95 dBm,  
the accuracy will be  $\pm$ [0.5 + 0.05\*15], or  $\pm$ 1.25 dB

2As per example above

\* Pulse overlap not allowed

### Pulse Width Deviations

XPDR/INT  $\pm$ 0.5  $\mu$ s  
Accuracy [XPDR/INT]  $\pm$ 10 ns  
TACAN  $\pm$ 5.5  $\mu$ s  
Accuracy [TACAN]  $\pm$ 50 ns  
Pulse Amplitude  
XPDR/INT +5 to -15 dB  
TACAN  $\pm$ 5 to -15 dB

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

Position 1st pulse relative to reference  
pulse  
Offset range  
XPDR -44  $\mu$ s to 400  $\mu$ s  
INT -1  $\mu$ s to 400  $\mu$ s  
Accuracy  $\pm$ 10 ns

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

Range 0 to the end of the 1<sup>st</sup> pulse  
range  
Max 2nd pulse position 400  $\mu$ s - 1<sup>st</sup> pulse position  
Accuracy  $\pm$ 10 ns

### Range Delay

Range  
DME/TACAN -1 to 400.00 nmi in 0.01 nm  
steps  
INT 0 to 400.00 nmi  
Accuracy  $\pm$ 0.02 nmi  $\pm$ 0.00003% of  
simulated range

### Diversity

Timing (either channel) 0 to  $\pm$ 1  $\mu$ s,  $\pm$ 10 ns accuracy  
Amplitude Variation  $\pm$ 20 dB between outputs for  
specified accuracy

### Echo

DME/TACAN 30 nmi, fixed  
Amplitude Variation +5 to -15 dB, relative to PI  
Accuracy  $\pm$ 0.25 dB

### 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 1-10000 PRF  
Mode 5 1-1200 PRF  
Mode S 1-2500 PRF  
Mode 4 1-3500 PRF  
Double/Supermode  
Spacing between interrogations  
(slaved delay) 0-400  $\mu$ s  
Pair generation rate 1-400 PRF  
Supermode 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 - 1:63  
Group rate 1-400 PRF

### Reply Generator

Independent/Unique Replies	1-12
Data and Range	Individually configured
Selectable Modes	1,2,3/A,C,S,4,5
Selectable Efficiency	1-100%

### Spectral Purity Residual Level

Harmonics	
Direct	<50 dBc
Antenna	<40 dBc
Spurious (> modulation BW)	<60dBc, 350 - 1800 MHz
Phase Noise	<80 dBc/Hz @ 100 kHz

## SIGNAL RECEIVER MEASUREMENTS

### Frequency Range

1020 to 1155 MHz

### Input Amplitude

Pulse Power Measurements

#### 25 ±5° C

Direct +30 dBm to +66 dBm:	±0.5 dB
Antenna -40 to +30 dBm:	±1 dB
Resolution:	0.01 dB

#### -10° to 55° C

Direct +30 dBm to +66 dBm:	±1 dB
Antenna -40 to +30 dBm:	±2 dB
Resolution:	0.01 dB

### Pulse to Pulse Spacing

XPDR/INT	
Non-Mode 5	±0.3 µs
Mode 5	±0.0625 µs
Accuracy	±10 ns
TACAN	±0.5 µs
Accuracy	±50 ns

### Pulse Width

XPDR/INT	±0.200 µs
Accuracy	±10 ns
TACAN	±0.5 µs
Accuracy	±50 ns

### Reply Delay

Accuracy	±20 ns
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### Reply Delay Jitter

Accuracy	±20 ns
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### Frequency

Accuracy	±50 KHz
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### % Reply

Range	0-100% for each interrogation type
Resolution	0.0125% (for sample size = 8000)
Sample Size	1 - 8000 interrogations

## SPECIFIC APPLICATION

### TACAN/DME

#### Pulse Width

Range	(50% to 50%) 3.5 µs to 9.0 µs
Accuracy	±0.1 µs

#### Ident

Variable	10 sec to 60 sec
Alphanumeric char.	1 to 8 [A to Z]

#### Bearing

Range	0° to 359.9° in 0.01° steps
Accuracy	±0.05°
Rate	0° to 39° sec in 1° steps

#### Velocity

Range	0 to 9999 Kts in 1 Kt steps
Accuracy	±0.001%

#### Squitter

Range	10 to 8000 Hz
Accuracy	10 Hz or 2%, whichever is greater
Distribution	Compliant with ARINC 568 @ 2700 Hz

#### Main Reference Burst

Adjustable Burst (all modes)	+1, +2, -1 or -2
Selectable	On/Off
X Channel	12 pulse pairs
Y Channel	13 single pulses
A/A (all channels)	10 single pulses
Accuracy	±100 ns

#### Auxiliary Reference Burst

Adjustable Burst (all modes)	+1, +2, -1, or -2
X Channel	6 pulse pairs
Y Channel	13 single pulses
Accuracy	±100 ns

#### TACAN Modulation

Range	0% to 39% in 1 Hz steps (15 Hz and 135 Hz separately adjustable)
Accuracy	±1%
Distortion	<5% of either tone
A/A Interrogation Rate	0 to 3999 Hz in 1 Hz steps
Reply Efficiency	0 to 100% in 1% steps

#### Crypto Appliqué Compatibility

KIV-77 - AIMS Type B, Mode 4/5	
KIV-78 - AIMS Type A, Mode 4/5	
KIV-6 - Mode 4	
KIT-1(A/C) / KIR-1(A/C) cables (external power cable)	

#### Built-in Crypto Appliqué Function

Mode 4 Internal Crypto Simulator (standard)	
Word A/B, C1 - C16	
Mode 5 Internal Crypto Simulator (standard with options 1 and 3)	
As defined by the U.S. Navy Mode 5 Program Office	

## INTERFACE SIGNALS

<b>Analog Signal Ports</b> (programmable output)	2
Programmable Sources Level	Various $\pm 1$ V into 50 $\Omega$
<b>Trigger Out (front panel)</b> Programmable Source Level	TX timing ref, RX detection 3.3 V logic
<b>Trigger In (front panel)</b> Functions	Interrogation Trigger Reply Trigger
Level	3.3 or 5 V logic
<b>Programmable Outputs</b>	15, rear panel, 3.3 V
<b>Programmable Inputs</b>	15, rear panel, 3.3 or 5 V
<b>Suppression Out</b> Amplitude into 2 K $\Omega$ Variable Pulse Width 0.25 $\mu$ s - 300 $\mu$ s	12 V to 80 V
<b>Suppression In</b> Amplitude Impedance Action	24 V nominal 2 K $\Omega$ Inhibits response to incoming signal

## GENERAL

<b>Frequency/Time Reference</b> 2.5 ppm composed of 1 ppm/year aging and 1 ppm accuracy over temp	
<b>External Reference Input</b> 10 dBm nominal	
<b>Temp Range</b> -10° C to 55° C	
<b>Warmup (for specified accuracy)</b> 45 minutes	
<b>Size</b> 17.75" wide, 4" high, 21" deep (45 cm x 10 cm x 53 cm)	
<b>Weight</b> 24 lbs (10kg)	
<b>VSWR</b> Direct Antenna	= 1.2:1 over frequency range = 2.5:1 over frequency range

## VERSIONS AND ACCESSORIES

Order Number	Description
72438	IFF45TS Transponder Modes 1,2,3/A,4 (Internal Crypto),C,S (Mode 5 capable)
72439	IFF45TS-A Transponder Modes 1,2,3/A,4 (Internal Crypto),C,S
83404	45TSOPT1 IFF Transponder Mode 5
83405	45TSOPT2 Interrogator Modes 1,2,3/A,C,S,4
83406	45TSOPT3 IFF Interrogator Mode 5 (requires option 2)
83407	45TSOPT4 DME/TACAN
91684	45TSOPT5 ADS-B Out

### Standard Accessories

PC Windows-based GUI  
Getting Started Manual  
Operation Manual (CD)  
AC power cord

### Optional Accessories

88631	45TSOPT6 KIV 77 adapter
89879	45TSOPT8 KIT/KIR-1A/C adapter
86075	45TSOPT9 KIV 78/KIV 6 adapter
63975	AC45TS-CNTR Touchscreen monitor/controller
86931	UC-584 Universal Transponder Antenna Coupler

### Extended Warranty

84363	Extended standard warranty 36 months with scheduled calibration
84364	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.

### EXPORT WARNING:

Aeroflex's military products are controlled for export under the International Traffic in Arms Regulations (ITAR) and may not be sold or proposed or offered for sale to certain countries including: Belarus, Burma, China, Cuba, Haiti, Iran, Liberia, Libya, North Korea, Somalia, Syria, Sudan, and Vietnam. See ITAR 126.1 for complete information.

#### FINLAND

Tel: [+358] (9) 2709 5541  
Fax: [+358] (9) 804 2441

#### FRANCE

Tel: [+33] 1 60 79 96 00  
Fax: [+33] 1 60 77 69 22

#### GERMANY

Tel: [+49] 8131 2926-0  
Fax: [+49] 8131 2926-130

#### INDIA

Tel: [+91] 80 5115 4501  
Fax: [+91] 80 5115 4502

#### KOREA

Tel: [+82] (2) 3424 2719  
Fax: [+82] (2) 3424 8620

#### SCANDINAVIA

Tel: [+45] 9614 0045  
Fax: [+45] 9614 0047

#### UK Cambridge

Tel: [+44] (0) 1763 262277  
Fax: [+44] (0) 1763 285353

#### UK Stevenage

Tel: [+44] (0) 1438 742200  
Fax: [+44] (0) 1438 727601  
Freephone: 0800 282388

#### USA Wichita

Tel: [+1] (316) 522 4981  
Fax: [+1] (316) 522 1360  
Toll Free: 800 835 2352

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[www.aeroflex.com](http://www.aeroflex.com)  
[info-test@eroflex.com](mailto:info-test@eroflex.com)



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