

Avionics

INTERROGATOR/TRANSPONDER TEST SET

APM-424(V)3

TS-4530/UPM (NSN: 6625-01-483-7194)

AEROFLEX
A passion for performance.



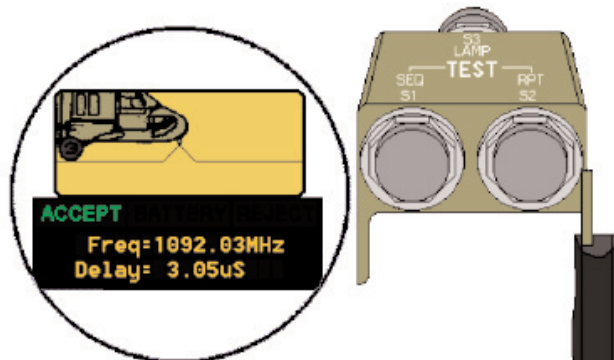
Easily accommodates a variety of aircraft, ground and ship platforms to test Transponder and Interrogator performance

- Transponder Test Set Modes 1, 2, 3/A, C, 4, S
- Interrogator Test Set Modes 1, 2, 3/A, C, 4, S, TCAS, ETCAS
- Can be upgraded to Mode 5 testing capability (planned)
- Hand-held, Battery Powered and Lightweight (under 11 lbs)
- One piece, 3-button point and shoot Go/No-Go Operation
- Self-diagnostic with extended calibration cycle
- Automated MTL measurement
- Parametric test results can be stored for immediate viewing or downloaded to PC for review or maintenance logging
- AN/APM-424(V)2 versions can be upgraded to (V)3

The AIMS certified APM-424(V)3 Test Set is a performance and capability upgrade to the popular AN/APM-424(V)2 "Star Wars" Test Set. The U.S. Military version is designated the TS-4530/UPM and is assigned NSN 6625-01-483-7194. The test set is ruggedized and has passed all military environmental testing as specified in the MIL-STD.

Northrop Grumman licensed Aeroflex to redesign the electronics inside the AN/APM-424(V)2 with the result being the APM-424(V)3 and the TS-4530/UPM (military designation). The test set provides Interrogator and Transponder testing capability in a one-box test set, as well as growth to Mode 5. The Mode S Interrogator/TCAS testing can provide as many as (8) different scenarios for testing TCAS systems.

The new test set has the same point-and-shoot, easy-to-use operation as the AN/APM-424(V)2. The small hand-held unit consists of an integrated mono-pulse antenna, electronics package and display unit. The antenna employs dual end-fire planar array elements mounted on the upper surface. The electronics package contains a transmitter, a two-channel digital receiver, DSP and FPGA based processing and control circuitry, power regulators and rechargeable battery stick. All modulation and demodulation is done in the digital domain and results in a highly accurate and flexible ramp or bench test platform. The display unit consists of an LED alphanumeric display and an optical sight. The unit automatically adjusts both transmitter power and receiver sensitivity to the test environment. This permits the operator to set a distance of 10 to 150 feet for transponder testing and 30 to 70 feet for interrogator testing according to the unit being tested.



For the very latest specifications visit www.aeroflex.com

SPECIFICATIONS

USER INTERFACE

Display

16 character by 2 line alpha-numeric LED, 0.18" character height with green Accept, red Reject and yellow Battery indicators

Controls

3 buttons: test sequence advance, test sequence repeat and test result data

MODES OF OPERATION

TRANSPONDER TESTING

Test Range

10 to 150 ft.

1,2,3A - displays code, identification and emergency status

C - displays altitude

4 - stand alone operation, but must be filled with challenge video patterns from COMSEC, displays code A or B and verification bit status

S - Interrogates with: UF0, UF11 (all call), UF4(altitude), UF4 asking for DF20 containing AIS, UF5(Identity), UF5 asking for DF21 containing Datalink capability report, DF16(long TCAS surveillance)

Capable of upgrade to add IFF Mode 5.

INTERROGATOR TESTING (INCLUDING TCAS)

Test Range

30 to 70 ft.

Static Targets

1 - responds with 12

2 - responds with 1202

3/A - responds with 1203 (4096 code)

C - responds with configurable altitude

4 - requires KIT or KIV to operate

S - Replies to: UF11(all call),UF0 (short TCAS surveillance), UF16 (long TCAS surveillance), UF4 (altitude), UF5 (Identity), UF20 (long altitude), UF21 (long identity)

Measures interrogation rate

Capable of upgrade to add IFF Mode 5

Dynamic Target Scenarios

Level - Intruder closing level at configured altitude

Above - Intruder closing level 2000 ft. above configured altitude

Dive - Intruder closing from 5000 ft. above descending to configured altitude

Climb - Intruder closing from 5000 ft. below climbing to configured altitude

Intruder starts at 15 nmi distance from UUT, ends at approx. 0 nmi

Closing speed fixed at 720 knots

Configured altitude is 0-20,000 ft.

Target Simulation

Multiple 4, 8, 16, 32, 64, 128, and 256 nmi

Single 4 nmi, IDENT On/Off, EMERG On/Off

TEST PARAMETERS

Correct Reply Code

Indicates reply code

Correct Pulse Timing

Displays pulse spacing error or pulse width error

Percent Reply

Indicates % reply

Receiver Sensitivity

Displays MTL in dBm

Transmitter Power

Displays dBm

Transmitter Frequency

Displays frequency

Mode 4 Word

Indicates presence of A or B word

VER BIT 1 Word

Indicates presence of A1 or B1 word

Reply Delay

Displays in μ s

ISLS Operation

Indicates % reply

Identify Response

Indicates presence

Emergency Response

Indicates presence

Angle Reflection

Indicates unacceptable levels of multi-path interference

Umbilical Testing

Connector provided for direct connection to transponder

Mode S Testing

Supports the RF link portion of the installed equipment performance requirements of DO-181C and ED-73A (Additional equipment is required to simulate aircraft pressure altitude for the altitude reporting verification.)

ANTENNA

(End-fire antenna with sum and difference feeds)

Interrogation Beamwidth

Approximately ± 5 degrees

Polarization

Vertical

DIRECT CONNECTION PORT

Impedance

50 Ω

SWR

1.3:1 max.

Connector

TNC

SIGNAL GENERATOR

Generator Frequency

1030 or 1090 ± 0.01 MHz

Generator Power

+4 to -44 dBm, 1 dB resolution, ± 1.5 dB accuracy at antenna connector,

± 2 dB radiated antenna field strength -40 to -88 dBm, 1 dB resolution, ± 1.5 dB accuracy at direct port

Pulse Shape and Timing

Modes 3/A, C, S comply with RTCA/DO-181C, mode 1, 2, 4 comply with DOD AIMS 97-1000

ISLS Amplitude

Equal to P1 on difference or sum ports when enabled

Interrogation Rate (transponder test mode)

Modes 1,2,3/A,C,4	235 ± 5 Hz
Mode S	50 ± 5 Hz

Harmonics

2nd and 3rd harmonic >30 dBc

Spurious

Applies at greater than 60 MHz from TX center frequency; -50 dBm max. in standby ; 50 dBc or -50 dBm max. in transmit when measured at the antenna connection

MEASUREMENT RECEIVER

GENERAL

Frequency Range

1090 or 1030 MHz

Amplitude Range

+68 to +20 dBm at direct port, +24 to -24 dBm at antenna port

Input Protection

1 μ s pulse width, 1% max duty cycle

Direct Input

+68 dBm

Antenna Input

+30 dBm at antenna connection

RECEIVER MEASUREMENTS

Received Power

1 dB resolution, ± 1.5 dB accuracy at antenna port, ± 1.5 dB at direct port, ± 2 dB antenna field strength

Method

Peak power of pulse obtained using 100 ns averaging period

Frequency

0.01 MHz resolution ± 0.10 MHz accuracy with >400 ns pulse width (transponder mode)

± 0.05 MHz accuracy with >750 ns pulse width (interrogator mode)

Method

Average frequency between 90% points

Frequency Range

Within ± 5 MHz of nominal for specified accuracy of amplitude and frequency measurements

Pulse Spacing

± 25 ns measured between leading edges for pulses with rise times <100 ns

Pulse Width

± 25 ns for pulses with rise times of 50 to 100 ns, fall times of 50 to 200 ns

Receiver Bandwidth

>10 MHz at 3 dB points

Oscillator Leakage

-50 dBm max. at antenna connection

Image Rejection

>40 dBc

ENVIRONMENTAL

Physical Dimensions: (Test set without accessories)

Length 14.1"/358 mm
Height 7.5"/190 mm
Width 11.5"/292 mm
Weight 10 lbs./4.55 kg (with battery)

Temperature

-40 °C to +55 °C operating, -55°C to + 85°C storage

Humidity

To 100%, rain exposure acceptable

Altitude

Less than 15,000 ft operating, 50,000 ft. storage

Shock

1 ft. drop without protection, 3 ft. drop in transit case

Vibration

5 g, 5 Hz to 55 Hz in transit case

EMI / RFI MIL-STD-461E

CE101 Power Leads, 30 Hz to 10 kHz

CE102 Power Leads, 10 kHz to 10 MHz

CS101 Power Leads, 30 Hz to 150 kHz

CS114 Bulk Cable Injection, 10 kHz to 200 MHz

CS115 Bulk Cable Injection, Impulse

CS116 Cables & Power Leads, Damped Sinusoidal Transients

RE101 Magnetic, 30 Hz to 100 kHz

RE102 Electric, 10 kHz to 18 GHz (RX and TX standby)

RE103 Antenna Spurious and Harmonics, 10 kHz to 40 GHz (TX active)

EXCEPTION: -50 dBc spurious limit, transmit harmonic levels are not required to be lower than 10 dB above the RE102 transmit standby limits.

RS101 Magnetic, 30 Hz to 100 kHz

RS103 Electric, 2 MHz to 18 GHz, 50 V/m

EXCEPTION: does not apply within 10% of RX and TX operating frequency

POWER SUPPLY

Operating Modes

Unit operates either from external DC input power or internal batteries

External DC Input

11.5 to 28 V DC input, 25 W max.

Surge Protection

MIL-STD-704E figure 9 (50 volts peak for 12.5 ms, then reducing linearly to 29 V over 70 ms)

Reverse Polarity

-30 volts max.

Battery Compatibility

Replaceable internal batteries, disassembly of unit is not required.
Reverse polarity protected
NiCAD re-chargeable battery assy, 7.2 volt DC nominal
Compatible with commercial 'C' size NiCAD, NiMH or alkaline batteries

Internal Battery Charger

Operates from external DC input

Full re-charge time within 8 hours from fully discharged state (actual charge time depends on level of discharge). Battery will charge with unit operating unless an external COMSEC is connected.

Automatic charge termination when fully charged

Automatic charge restriction to 0 to +40°C nominal battery temperature range

Safety charge termination at +85°C nominal battery temperature range

Low Battery Indication

Display indicates "BATTERY" when less than 20% capacity remains, flashes "BATTERY" at slow rate when less than 5% capacity remains, flashes at high rate when battery is too low to run tests.

Discharge Protection

Test set automatically shuts off to prevent excessive battery discharge.

COMSEC INTERFACE

Connector

Accessory interface cable or adapter provides the required interface connector.

Compatibility

KIR-1A /1C, KIT-1A/1C, KIV-3 /6 with appropriate cable or adapter

Power for COMSEC

KIT-1A / KIR-1A External 115 V AC provided through KIT/KIR-1A interface cable (JPN: 55-1045-16)

KIT-1C / KIR-1C 22 to 29 V DC at 3 W max. (provided by the test set)

KIV-6 15 ± 0.75 V DC at 200 mA max. (provided by the test set)

ACCESSORY SPECIFICATIONS

EXTERNAL POWER SUPPLY

Temperature

0 to +40°C

Altitude

Less than 2,000 m operating

Humidity

10 to 80% non-condensing, indoor operation only

Weight

1 lbs./0.45 kg

Input Voltage

100 to 240 V AC ± 10%

Input Current

1.0 A AC max.

Frequency

47 to 63 Hz

Input Connector

IEC 320 3 pin receptacle, 6 ft (USA standard line cord provided)

Output Connector

6 ft./1.8 m cable with 5.5 x 2.5 x 9.5 mm barrel connector

Output Voltage

+12 V DC nominal

Output Current

2.0 ADC nominal

EMC

FCC class B, CISPR 22 class B

Approvals

UL, CE

EXTERNAL BATTERY CHARGER

Temperature

0 to +40°C

Altitude

Less than 2,000 m operating

Humidity

10 to 80% non-condensing, indoor operation only

Weight

1 lbs./0.45 kg

Size

12.2" L x 2" H x 3.3" W

Functions

Charges or discharges one battery stick

Power Source

Requires connection to supplied AC Adapter, 12 V DC ±0.5 V, 2 A min, 4 A max.

Input Connector

Accepts 5.5 x 2.5 x 9.5 mm barrel connector

Charge Time

3 hours max. for 3 AH battery, dependent on battery charge state
Automatic shut off when fully charged

Discharge Rate

700 mA typical, automatic shut off when discharged

EXTERNAL DC CABLE

Supply Connector

Banana plugs

Unit Connector

5.5 x 2.5 x 9.5 mm barrel connector

Length

6 ft./1.8 m

Weight

0.22 lb./0.1 kg

BATTERY STICK

Type

High capacity rapid charge NiCad

Voltage

7.2 volts DC nominal

Capacity

3 amp hour at +25°C nominal

Temperature

Operating -20 to +55°C recommended. Will operate at -40°C with 25% of +25°C capacity and degraded cycle lifetime

Storage -55 to +85°C

Re-charging 0 to +40°C

Weight

1.5 lbs./0.7 kg

UMBILICAL RF CABLE

Length

12 ft./3.6 m

Connectors

TNC male right angle, TNC male straight
TNC female to N male adapter included

Weight

0.5 lb./0.25 kg

RS-232 CABLE

Connectors

9 pin D sub-male / female

Length

5 ft./1.5 m

Weight

0.22 lb./0.1 kg

AUTOMOTIVE DC ADAPTER CABLE

Length

10 ft./3 m

Compatibility

21 mm or 22.2 mm sockets

Fuse

3 AG 250 V 3 A

TRANSIT CASE

Type

Watertight sealed enclosure with pressure release valve

Size

Length 26.8"/681 mm
Height 12.25"/312 mm
Width 13.25"/337 mm

Weight

Empty: 16 lbs./7.3 kg
Full: 36 lbs./16.4 kg

BENCH UTILITY SOFTWARE

Function

Allows download, viewing, and saving test data from test set.

Compatibility

Microsoft Windows 95, 98, 2000, XP, NT 4.x

Format

CD ROM

KIT/KIR-1A CABLE (PN: 55-1045-16 OPTIONAL)

Supported COMSEC

KIT-1A/TSEC, KIR-1A/TSEC

Length

4 ft./1.2 m

Weight

2 lbs./0.9 kg

RS-232 Connector

9 pin D sub female

External DC Connector

Accepts 5.5 x 2.5 x 9.5 mm barrel connector

KIT/KIR Power

115 V AC, 400 Hz supplied externally

KIT/KIR-1C CABLE (PN: 55-1045-10)

Supported COMSEC

KIT-1C / TSEC, KIR-1C / TSEC

Length

4 ft./1.2 m

Weight

2 lbs./0.9 kg

RS-232 Connector

9 pin D sub-female

External DC Connector

Accepts 5.5 x 2.5 x 9.5 mm barrel connector

KIT/KIR Power

28 volt nominal at 3 W max. supplied from test set

KIV-6 ADAPTER (OPTIONAL)

The KIV-6 adapter can be used with a KIV-6 crypto appliqué to test both transponders and interrogators. For transponder testing with the APM-424(V)3 Radar Test Set, the KIV-6 adapter is used to connect the KIV-6 COMSEC to the test set during code load programming. The adapter provides the following:

- Interface between the test set and KIV-6 during Mode 4 interrogator testing
- 15 V DC to power the KIV-6
- A connector for external DC power to operate the test set and charge the batteries
- An RS-232 connector to allow an external PC to be connected to the test set

The APM-424(V)3 Test Set supplies power through the KIV-6 adapter to the COMSEC for code loading. This eliminates the need for a 15 V DC or 115 V AC source during code loading. The power supply is enabled by the test set during code loading and supplies 15 V DC at up to 5 W. In addition, the supply provides power to the KIV-6 COMSEC when attached during interrogator testing.

**Mounting**

Attaches to handle and circular connector

Size

7" L x 5" H x 5" W/175 x 125 x 125 mm max.

Weight

1.5 lb./0.7 kg max. without KIV-6

Humidity

To 100%, rain exposure acceptable

RS-232 Connector

9 pin D sub-female

External DC Connector

Accepts 5.5 x 2.5 x 9.5 mm barrel connector

VERSIONS, OPTIONS AND ACCESSORIES

When ordering, please include the Order Number listed below:

Order Number	Part Number	
AN/APM-424(V)3-00	50-1045-00	INTER/XPDR Kit w/ KIT/KIR-1C DC Power COMSEC Cable (US Only)
AN/APM-424(V)3-02	50-1045-02	INTER/XPDR Kit w/ KIT/KIR-1A AC Power COMSEC Cable (Intl)
AN/APM-424(V)3-03	50-1045-03	INTER/XPDR Kit w/ KIT/KIR-1C DC Power COMSEC Cable (Intl)
AN/APM-424(V)3-05	50-1045-05	INTER/XPDR Kit w/ KIT/KIR-1A and Tornado Power Interface
TS-4530/UPM	TS-4530/UPM	INTER/XPDR Kit w/KIT/KIR-1C DC Power COMSEC Cable (US Military) (NSN 6625-01-483-7194)

Standard Accessories:

- Test set labeled "APM-424(V)3" or "TS-4530/UPM"
- COMSEC cable for either KIT/KIR-1A or KIT/KIR-1C
- Transit case with pressure release valve
- External battery charger
- Automotive DC adapter cable (included with AN/APM-424(V)3-02, -03 and -05 only)
- AC power adapter, 115 V to 230 V, 50 Hz to 400 Hz
- (2) Battery sticks
- Operator Manual CD-ROM
- Bench Utility CD-ROM
- RF direct connect cable
- RF adapter
- Calibration certificate, calibration interval (5) years
- DC power cable
- Serial data cable



Optional

AC55104513	55-1045-13	Adapter KIV 6
AC55104514	55-1045-14	Cable DC POWER
AC55104515	55-1045-15	Cable Serial Data
AC55104516	55-1045-16	Cable KIT/KIR-1A
AC55104510	55-1045-10	Cable KIT/KIR-1C
AC50104573	50-1045-73	Maintenance Kit (TS-4530 users only)
AC6006946C	60-0694-6C	Program Bench Utility w/ Field Maintenance (Included w/ APM-424(V)3)
AC600694B2	60-0694-B2	Program Bench Utility w/ Field Maintenance (TS-4530 users only)
AC600694C0	60-0694-C0	TIBS Transponder/Interrogator Bench Software
ACE6104500	E6-1045-00	Maintenance Manual (APM424(V)3-00,-02,-03,-05)
ACKIV6CASE	ACKIV6CASE	Transit Case for KIV 6

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.

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