

Avionics

INTERROGATOR/TRANSPONDER TEST SET (INCLUDING MODE S ELS/EHS)

APM-424(V)4

TS-4530-1/UPM (NSN: 6625-01-570-7091)

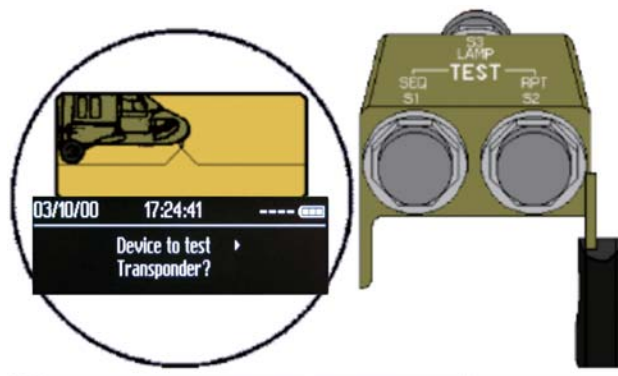


Easily accommodates a variety of aircraft, ground and ship platforms to test Transponder and Interrogator performance including Mode S Elementary and Enhanced Surveillance

- Transponder Test Set Modes 1, 2, 3/A, C, 4, S (including ELS and EHS)
- Interrogator Test Set Modes 1, 2, 3/A, C, 4, S, TCAS, ETCAS
- Mode 5 upgradable
- Hand-held, battery powered and lightweight (<11 lbs)
- One piece, 3-button point and shoot Go/No-Go operation
- Self-diagnostic
- Automated MTL measurement
- Parametric test results can be stored for downloading to a PC for review or maintenance logging

Aeroflex's new generation APM-424(V)4/TS-4530-1/UPM Test Set maintains the preferred point and shoot design for ease and speed of operation. New digital architecture not only increases performance and reliability, but also allows for easy upgrade to Mode 5 and beyond. Two rechargeable battery sticks are included for hours of continuous operation. An OLED 20-character by 4-line alpha-numeric display provides for easily viewable data and parametric measurements. An optical sight is utilized to align the monopulse antenna while the transmitter power and receiver sensitivity are automatically adjusted to the test environment. All of this adds up to quick high performance air-to-air testing of critical requirements.

The AIMS certified APM-424(V)4 Test Set is a performance and capability upgrade to the popular APM-424(V)3 Test Set. The U.S. Military version is designated the TS-4530-1/UPM and is assigned NSN 6625-01-570-7091. The test set exceeds U.S. Military requirements for safety and environmental conditions.



SPECIFICATIONS

USER INTERFACE

Displays

Internal: 20 character by 4 line alpha-numeric OLED, 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. External Display 4 buttons: screen select, field/data select

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: UFO, UF11 (all call), UF4 (altitude), UF5 (identity), UF4 asking for DF20 (altitude), UF5 asking for DF21 (identity), containing datalink capability report, DF16 (long TCAS surveillance). Decodes and displays Mode S ELS BDS 1.0, 1-8 to 1.C, 2.0 and 3.0, EHS BDS 4.0, 5.0 and 6.0 as well as BDS 0.8.

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), UFO (short TCAS surveillance), UF16 (long TCAS surveillance), UF4 (altitude), UF5 (Identity), UF20 (long altitude), UF21 (long identity)

Measures interrogation rate

Reply Data - M1 code, M2 code, M3A code, Altitude ft., Emergency and Pilotless as per Target Simulation

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, pilotless

ANTENNA

(End-fire antenna with sum and difference feeds)

Interrogation Beamwidth

Approximately $\pm 5^\circ$

Polarization

Vertical

DIRECT CONNECTION PORT

Impedance

50 Ω

SWR

1.3:1 max.

Connector

TNC

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 from 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.

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, Modes 1, 2, 4 comply with NATO STANAG 4193 Part V & DOD AIMS 03-1000A

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

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)

TEST PARAMETERS

Reply Code

Indicates reply code

M1/M2/M3A: 4096 code

MC: Altitude in ft.

MS: 4096 code

Pulse Spacing (Interrogator)

Displays μ s

M1/M2/M3A/MC: P1, P3

MS: P1, B56

M4: P1, P4

Pulse Width (Interrogator)

Displays μ s

M1/M2/M3A/MC: P1, P3

MS: P1, B56

M4: P1, P4

Pulse Spacing (Transponder)

Displays μ s

M1/M2/M3A/MC: F1, F2

MS: P1, B56

M4: R1, R3

Pulse Width (Transponder)

Displays μ s

M1/M2/M3A/MC: F1, F2

MS: P1, B56

M4: R1, R3

Percent Reply

Indicates % reply

Receiver Sensitivity (Transponder)

Displays MTL in dBm

Receiver Sensitivity (Interrogator)

Tests MDL Margin 0 to -12 dB

Interrogation Rate

Displays Hz

Transmitter Power (Interrogator)

Displays dBm

M1/M2/M3A/MC: P1, P3

MS: P1, B56

M4: P1, P4

Transmitter Power (Transponder)

Displays dBm

M1/M2/M3A/MC: F1, F2

MS: P1, B56

M4: R1, R3

Transmitter Frequency (Interrogator)

Displays MHz

M1/M2/M3A/MC: P1, P3

MS: P1, B56

M4: P1, P4

Transmitter Frequency (Transponder)

Displays MHz

M1/M2/M3A/MC: F1, F2

MS: P1, B56

M4: R1, R3

Squitter

Displays

MS: DF11 Acquisition (sec)

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

Pilotless 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.) Decodes and displays ELS and EHS data.

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

90 to 264 V AC

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 \pm 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

RF DIRECT CONNECT 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

KIT/KIR-1C CABLE

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

KIT/KIR-1A CABLE

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

RS-232 SERIAL DATA 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

KIV-6 ADAPTER

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

BATTERY STICK

Type

High capacity rapid charge NiCad

Voltage

7.2 V 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

TRANSIT CASE

Type

Water-tight sealed enclosure with pressure release valve

Size

Length 26.8 in./681 mm

Height 12.25 in./312 mm

Width 13.25 in./337 mm

Weight

Empty: 16 lbs./7.3 kg

Full: 38 lbs./17.3 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

ENVIRONMENTAL

Physical Dimensions: (Test set without accessories)

Length 14.1 in./358 mm

Height 7.5 in./190 mm

Width 11.5 in./292 mm

Weight 12 lbs./5.46 kg (with battery)

Temperature

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

Humidity

To 100%, rain exposure acceptable

Shock

12 inch drop without protection, 1 m 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 and 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)

RS101 Magnetic, 30 Hz to 100 kHz

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

VERSIONS, OPTIONS AND ACCESSORIES

When ordering, please include the Order Number listed below:

Ordering Numbers

TS-4530-1

APM-424(V)4

Versions

INTER/XPDR Kit
(NSN: 6625-01-570-7091)

INTER/XPDR Kit

Standard Accessories:

COMSEC cable - KIT/KIR-1C (55-1045-10)

Transit case with pressure release valve

External battery charger (01-1045-10)

Automotive DC adapter cable (55-1045-18)

AC power adapter (15-0360-M0)

(2) Battery sticks (43-0012-00)

Operator manual CD-ROM

Bench utility CD-ROM

RF direct connect cable (55-1045-11)

RF adapter (30-0225-01)

DC power cable (55-1014-14)

RS-232 serial data cable (55-1045-15)

Calibration certificate

Standard 2-year warranty

Optional Accessories

AC55104513 Adapter, KIV-6

AC55104516 Cable, KIT/KIR-1A

ACKIV6CASE Transit case for KIV-6

TBD	Program bench utility with field maintenance
TBD	Maintenance manual

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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Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.