

Avionics

APM-424(V)4

Interrogator/Transponder Test Set (Including Mode S ELS/EHS)

(NSN: 6625-01-600-6784)

AEROFLEX
A passion for performance.



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
- DO-260B compliant; ADS-B Out test capability
- 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
- TS-4542 shipboard interrogator test capability

The APM-424(V)4 is a performance and capability upgrade to the TS-4530 and APM-424 test sets. The APM-424(V)4 is fully compliant with DoD AIMS standards for testing Mark XIIIA performance of Mode 4 equipment, DO-260B ADS-B Out performance, and ICAO Annex 10 international standards for Mode S ELS/EHS performance.

The APM-424(V)4 closely replicates legacy operation for utilization of existing procedures, making the APM-424(V)4 a cost effective, highly accurate upgrade to fielded test sets.



The 20-character 4-line display provides for easily viewable data and parametric measurements as required for Mode S Elementary and Enhanced Surveillance testing. For legacy test modes, the menu structure and displayed data format have been retained so that minimal changes are required of fielded procedures.

GENERAL SPECIFICATIONS

USER INTERFACE

Displays

Internal: 20 character by 4 line alpha-numeric OLED, 0.197" font height with green Accept, red Reject and battery status 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.

Test Capability

- 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. Requires KIR or KIV with adapter to operate.
- 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 DAP's

BDS 1,0 Data Link Capability Report: Subnet Version, DTE, GICB Report, SI Capability, Specific Services Capability, Squitter Capability, Cont Flag, Aircraft ID Capability, UELM Capability, DELM Capability.

BDS 1,7 Common Usage GICB Report
BDS 1,8-1,C Specific Services Report
BDS 2,0 Aircraft Identification
Flight ID

BDS 3,0 ACAS Resolution Advisory: RAT, RAC, ARA & EHS DAP's

BDS 4,0 Vertical intention: MCP/FCU Alt
BDS 5,0 Track and Turn: True Track Angle, Ground Speed, Track Angle Rate, Roll Angle

BDS 6,0 Heading & Speed: Mach Nbr, Baro Alt Rate, Magnetic Heading, Indicated Air Speed

ADS-B

DO-260B compliant, ADS-B Out

INTERROGATOR TESTING (INCLUDING TCAS)

Test Range 30 to 200 ft.

Static Targets

- 1 - responds with 1200
- 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

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
- Group 12 targets 2 nmi apart, starting at 4 nmi

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

Note: All over-the-air and direct connection port testing use identical test criteria to allow easy data comparison when evaluating or testing an installation.

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

Battery fuel gauge indicates battery status

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-181D, 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-6 with appropriate cable or adapter

Power for COMSEC

KIT-1A/KIR-1A - External 115 VAC provided through KIT/KIR-1A interface cable

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

KIV-6: 15 ±0.75 VDC at 200 mA max. (provided by 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, P6

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-181D 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

AC POWER ADAPTER

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 VAC \pm 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 \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

DC POWER 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 COMSEC 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 COMSEC 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

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

AUTOMOTIVE DC ADAPTER CABLE

Length

10 ft./3 m

Compatibility

21 mm or 22.2 mm sockets

Fuse

3 AG 250 V 3 A

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

Watertight sealed enclosure with pressure release valve

Size

Length	26.25"/667 mm
Height	16.75"/425 mm
Width	16.00"/406 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"/358 mm

Height 7.5"/190 mm

Width 11.5"/292 mm

Weight 12.25 lbs./5.6 kg (with battery)

Temperature

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

Relative Humidity

To 100% for at least 6 hours

Splash Proof

Rain at 1.8 inches per hour and the wind velocity is at least 20 miles per hour (mph), for a period of no less than 60 minutes

Altitude

4,600 meters operating, 50,000 ft. storage

Shock Transit

36 inch drop in transit case

Shock High Impact

36 inch drop

Shock Functional

30 G 11 ms half sine

Random Vibration

10 Hz to 2000 Hz/60 mins per axis

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

VERSIONS, OPTIONS AND ACCESSORIES

Order Number	Description
87866	APM-424(V)4 Interrogator/Transponder Test Set w/ ELS/EHS (NSN: 6625-01-600-6784)
Factory upgrade kits for existing units (COMSEC adapters sold separately)	
67197	Kit, upgrade TS-4530 or AN/APM-424(V)3 to APM-424(V)4
86738	Kit, upgrade TS-4530 or APM-424(V)3 to APM-424(V)5
88573	Kit, upgrade APM-424(V)4 to APM-424(V)5
88572	Kit, upgrade TS-4530-1 to APM-424(V)5

Standard Accessories

12028	Transit case with pressure release valve
58077	COMSEC cable - KIT/KIR-1C (55-1045-10)
58078	RF direct connect cable (55-1045-11)
58081	RS-232 serial data cable (55-1045-15)
38589	RF adapter (30-0225-01)
11492	AC power adapter (15-0360-MO)
58080	DC power cable (55-1045-14)
905	External battery charger (01-1045-10)
47621	Battery sticks (2) (43-0012-00)
88974	Getting Started manual
88470	Operators manual (CD)
67468	Bench utility software (CD)
6154	Battery instruction sheet
	Calibration certificate
	Standard 2-year warranty

Optional Accessories

58079	Adapter, KIV-6 (55-1045-13)
58082	Cable, KIT/KIR-1A (55-1045-16)
11958	Transit case for KIV-6 (ACKIV6CASE)
67474	Tripod
138331	Tripod, heavy duty
58084	Automotive DC adapter cable (55-1045-18)
86633	Bench utility with field maintenance (CD)
88568	Maintenance manual (CD)
84357	Extended warranty 36 mo w/ scheduled calibration
84358	Extended warranty 60 mo w/ 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.

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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.