

Avionics

APM-424(V)5

Transponder/Interrogator MKXIIA Mode 5 Test Set

(NSN: 6625-01-583-2774)



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

- DoD AIMS 03-1000A Mark XIIA certified
- Transponder Test Modes 1, 2, 3/A, C, S (EHS/ELS), 4, Mode 5
- Interrogator Test Modes 1, 2, 3/A, C, S, 4, Mode 5, TCAS, ETCAS
- Accurate GPS time/date acquisition (via GPS antenna, crypto or manually)
- Mode 5 TX/RX pulse measurement
- Mode 5 squitter data displayed
- Mode 5 data acquisition formats 0 - 23 displayed
- Hand-held, battery powered and light-weight (12.25 lbs with battery)
- One piece, 3-button point and shoot Go/No-Go operation
- Self-diagnostic
- Parametric test results can be stored for downloading to a PC for review or maintenance logging
- TS-4542 Shipboard Interrogator test capability
- ADS-B test capability (planned)

The APM-424(V)5 Test Set is a performance and capability upgrade to the popular TS-4530 and APM-424 Test Sets with the addition of Mode 5 testing. The APM-424(V)5 is in full compliance with DoD AIMS 03-1000A standards for Mark XIIA performance and ICAO Annex 10 international standards for Mode S ELS/EHS performance for ramp testing of IFF transponders and interrogators. The test set meets or exceeds U.S. Military requirements for safety and environmental conditions.

Aeroflex's new generation Mode 5 test set maintains the preferred point and shoot design for ease and speed of operation. Modulation is performed in the digital domain resulting in a highly accurate and flexible ramp or bench test platform.



The 20-character 4-line display provides for easily viewable data and parametric measurements as required for Mode 5 and Mode S testing. For legacy test modes, the menu structure and displayed data format have been retained so that no changes are required of fielded procedures.

SPECIFICATIONS

USER INTERFACE

Displays

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

5 - Housing and interface for KIV-77 Type B Mode 4/5 Applique Crypto (required to operate).

Interrogates with Mode 5 Level 1 Formats 0-9, decodes and displays:

M1/M2 Reply Data: M1 Code, M2 Code, X pulse, Emerg/Ident

M3/MC Reply Data: M3 Code, MC Altitude in ft., X pulse, Emerg/Ident

PIN Reply Data: PIN, National Origin, X pulse, Emerg/Ident

Interrogates with Mode 5 Level 2 Formats 16-23, decodes and displays:

M1/M2 Report Data: M1 Code, M2 Code, X pulse, Emerg/Ident, Latitude, Longitude, Altitude in ft.

M3/MC Report Data: M3 Code, MC Altitude in ft., X pulse, Emerg/Ident, Latitude, Longitude, Altitude in ft.

PIN Report Format(0000): PIN, National Origin, X pulse, Emerg/Ident, Latitude, Longitude, Altitude in ft.

PIN Report Format(0011): PIN, National Origin, Platform Type, FOM, X pulse, Emerg/Ident, Latitude, Longitude

PIN Report Format(0100): PIN, GNSS/Baro Altitude in ft., National Origin, FOM, X pulse, Emerg/Ident, Latitude, Longitude, Altitude in ft.

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 & 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

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

5 - Requires KIV-77 to operate. Replies to Mode 5 Level 1 Formats 0-9 and Level 2 Formats 16-23.

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

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

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, 5 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, 5	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

Power¹

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

Peak power of pulse obtained using 100 ns averaging period

Frequency¹

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)

Average frequency between 90% points

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

Applique Housing/Interface

Interchangeable side mounted housings to support the following Cryptographic computers.

Standard

KIV-77 Type B Mode 4/5 Crypto

Optional

KIV-78 Type A Mode 4/5 and KIV-6 Crypto

Note: 1 - Within ± 5 MHz of nominal for specified accuracy of amplitude and frequency measurements

Circular Connector Interface

Supports KIR-1A/1C, KIT-1A/1C and 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.²

KIV-6: 15 ±0.75 VDC at 200 mA max.²

KIV-77: +5 VDC, 2.2 W²

KIV-78: 15 ±1.0 VDC at 200 mA max.²

Timekeeping

Internal Real Time Clock, ±3.5 ppm accuracy

Internal GPS receiver for UTC synchronization of Real Time Clock

TEST PARAMETERS

Reply Code

Indicates reply code

M1/M2/M3A: 4096 code

MC: Altitude in ft

MS: 4096 code

M5 (M1/M2/M3A/MC): 4096 code

Pulse Spacing (Interrogator)

Displays μ s

M1/M2/M3A/MC: P1, P3

MS: P1, P6

M4: P1, P4

M5: P1, P4 & P4, D11

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

M5: Level 1: P1, P2 and P1, P4

Level 2: P1, P4 and P4, D33

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, P6

M4: P1, P4

M5: P1, D11

Transmitter Power (Transponder)

Displays dBm

M1/M2/M3A/MC: F1, F2

MS: P1, B56

M4: R1, R3

M5: Level 1: P1, D9

Level 2: P1, D33

Transmitter Frequency (Interrogator)

Displays MHz

M1/M2/M3A/MC: P1, P3

MS: P1, P6

M4: P1, P4

M5: P1, D11

Transmitter Frequency (Transponder)

Displays MHz

M1/M2/M3A/MC: F1, F2

MS: P1, B56

M4: R1, R3

Squitter

Displays

M5: Level 2 squitter period (ms)

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

Note: 2 - Power provided by the test set.

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 & displays ELS and EHS data.

Mode 5 Testing

Indicates correct reply format as defined in NATO STANAG 4193 Part V and AIMS 03-1000A. Decodes, displays Level 1 ID & DATA reply types & Level 2 PIN, M1/M2 & M3/Altitude report types.

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 V AC \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

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

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: 41 lbs./18.6 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 onto concrete, in transit case

Shock High Impact

36 inch drop onto concrete

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

When ordering, please include the Order Number listed below:

Ordering Numbers

Versions

86335 APM-424(V)5 Mode 5 Test Set Kit

Factory upgrade kits for existing units

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

63679 Transit case with pressure release valve

64647 KIV-77 adapter

58077 KIT/KIR-1C COMSEC cable (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-M0)

58080 DC power cable (55-1045-14)

905 External battery charger (01-1045-10)

47621 Battery sticks (2) (43-0012-00)

86805 Operators manual (CD)

67468 Bench utility software (CD)

Calibration certificate

Standard 2-year warranty

Optional Accessories

86769 KIV-78/KIV-6 adapter

58079 KIV-6 adapter (55-1045-13)

58082 KIT/KIR-1A COMSEC cable (55-1045-16)

11958 KIV-6 transit case (ACKIV6CASE)

58084 Automotive DC adapter cable (55-1045-18)

86633 Bench utility software with field maintenance

86421 Maintenance manual

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.