

# Avionics

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

APM-424(V)4

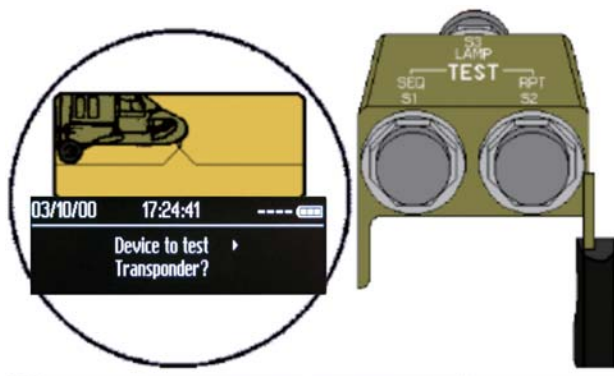


Easily accommodates a variety of aircraft, ground and ship platforms to test Transponder and Interrogator performance including Mode S Elementary and Enhanced Surveillance

- 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 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 APM-424(V)4 Test Set is a performance and capability upgrade to the popular APM-424(V)3 Test Set. The test set exceeds U.S. Military requirements for safety and environmental conditions.*



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## SPECIFICATIONS

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### USER INTERFACE

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#### Displays

Internal: 20 character by 4 line alpha-numeric OLED, 0.197" 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

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#### 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), 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, 1.7, 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 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),UF0 (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

Group 12 targets 2 nmi apart, starting at 4 nmi

### ANTENNA

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(End-fire antenna with sum and difference feeds)

#### Interrogation Beamwidth

Approximately  $\pm 5^\circ$

#### Polarization

Vertical

### DIRECT CONNECTION PORT

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#### Impedance

50  $\Omega$

#### SWR

1.3:1 max.

#### Connector

TNC

### POWER SUPPLY

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#### 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

Battery fuel gauge indicates battery status.

### Discharge Protection

Test set automatically shuts off to prevent excessive battery discharge.

## SIGNAL GENERATOR

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### Generator Frequency

1030 or 1090  $\pm 0.01$  MHz

### Generator Power

+4 to -44 dBm, 1 dB resolution,  $\pm 1.5$  dB accuracy at antenna connector

$\pm 2$  dB radiated antenna field strength -40 to -88 dBm, 1 dB resolution,  $\pm 1.5$  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 $\pm 5$ Hz
Mode S	50 $\pm 5$ 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

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### 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  $\mu$ 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,  $\pm 1.5$  dB accuracy at antenna port,  $\pm 1.5$  dB at direct port,  $\pm 2$  dB antenna field strength

#### Method

Peak power of pulse obtained using 100 ns averaging period

#### Frequency

0.01 MHz resolution  $\pm 0.10$  MHz accuracy with >400 ns pulse width (transponder mode)

$\pm 0.05$  MHz accuracy with >750 ns pulse width (interrogator mode)

#### Method

Average frequency between 90% points

#### Frequency Range

Within  $\pm 5$  MHz of nominal for specified accuracy of amplitude and frequency measurements

#### Pulse Spacing

$\pm 25$  ns measured between leading edges for pulses with rise times <100 ns

#### Pulse Width

$\pm 25$  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 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  $\pm 0.75$  V DC at 200 mA max. (provided by the test set)

## TEST PARAMETERS

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#### Reply Code

Indicates reply code

M1/M2/M3A: 4096 code

MC: Altitude in ft.

MS: 4096 code

#### Pulse Spacing (Interrogator)

Displays  $\mu$ s

M1/M2/M3A/MC: P1, P3

MS: P1, B56

M4: P1, P4

#### Pulse Width (Interrogator)

Displays  $\mu$ s

M1/M2/M3A/MC: P1, P3

MS: P1, P6

M4: P1, P4

#### Pulse Spacing (Transponder)

Displays  $\mu$ s

M1/M2/M3A/MC: F1, F2

MS: P1, B56

M4: R1, R3

#### **Pulse Width (Transponder)**

Displays  $\mu$ 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  $\mu$ 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**

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### **AC POWER ADAPTER**

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#### **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**

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### **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**

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### **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**

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### **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**

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### **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**

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### **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**

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### **Connectors**

9 pin D sub-male/female

### **Length**

5 ft./1.5 m

### **Weight**

0.22 lb./0.1 kg

## **AUTOMOTIVE DC ADAPTER CABLE**

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### **Length**

10 ft./3 m

### **Compatibility**

21 mm or 22.2 mm sockets

### **Fuse**

3 AG 250 V 3 A

## **KIV-6 ADAPTER**

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### **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

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**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

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**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

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**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

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**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

**Splash Proof**

Rain at 1.8 inches per hour and wind velocity at least 20 miles per hour for a period of no less than 60 minutes

**Altitude**

4,600 meters operating, 50,000 feet storage

**Relative Humidity**

To 100%, for at least 6 hours

**Shock**

12 inch drop without protection, 1 m drop in transit case

**Random Vibration**

10 Hz to 2000 Hz, 60 minutes 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 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**

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When ordering, please include the Order Number listed below:

<b>Order Number</b>	<b>Versions</b>
87866	APM-424(V)4 Interrogator/Transponder Test Set w/ ELS/EHS

### **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:**

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-M0)
58080	DC power cable (55-1045-14)
905	External battery charger (01-1045-10)
47621	Battery sticks (2) (43-0012-00)
88470	Operator manual CD-ROM
67468	Bench utility CD-ROM
	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)
86633	Bench utility with field maintenance CD-ROM
88568	Maintenance manual CD-ROM
58084	Automotive DC adapter cable (55-1045-18)

### **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.