VIAVI Solutions

Data Sheet

VIAVI

APM-424(V)5

MK XIIA Flight Line Test Set

User Interface

Displays	Internal: 20 character by 4 line alphanumeric OLED, 0.197" character height with green Accept, red Reject, and battery status indicators
Controls	3 buttons: test sequence advance, test sequence repeat, and test result data
Remote	Windows Based Remote Interface GUI

Modes of Operation

Transponder Testing	
Test Range	10 to 150 ft
Test Capability	
1,2,3A	Display 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
5	Housing for 04-900A Option A and B; Requires Mode 5 crypto appliqué 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

Modes of Operation (continued)

Test Capability (continued)	
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 Mode 4 crypto appliqué to operate
5	Requires Mode 5 crypto appliqué to operate. Replies to Mode 5 Level 1 Formats 0-9 and Level 2 Formats 16-23
S	Replies to: UF11(all call),UF0 (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 UUT, ends at approximately 0nmi	
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' Dimensions 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 µs pulse width, 1% max duty cycle
Direct Input	+68 dBm
Antenna Input	+30 dBm at antenna connection
Receiver Measurements	
Power[1]	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
Frequency[1]	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:
	04-900A Option A (KIV-78/KIV-6/QRTK6 NG Adapter)
	04-900A Option B (KIV-77/SIT-2010 Adapter)
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 W[2]
	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 µs
	M1/M2/M3A/MC: P1, P3
	MS: P1, P6
	M4: P1, P4
	M5: P1, P4 & P4, D11
Pulse Width (Interrogator)	Displays µs
	M1/M2/M3A/MC: P1, P3
	MS: P1, P6
	M4: P1, P4
Pulse Spacing (Transponder)	Displays µs
	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 µs
	M1/M2/M3A/MC: F1, F2
	MS: P1, B56
	M4: R1, R3

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

2 - Power provided by the test set

Test Parameters (continued)

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 µs	
ISLS Operation	Indicates % reply	
Identify Response	Indicates presence	
Emergency Response	Indicates presence	
Pilotless 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	
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 and 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 lb (0.45 kg)
Input Voltage	100 to 240 VAC ±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	5.0 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)
Dimensions (H x W x D)	12.2 x 2 x 3.3 in
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.
External Battery Charger	
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)

Accessory Specifications (continued)

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

Option A (KIV-78/KIV-6/QRTK6 NG Adapter)	
Mounting	Attaches to the 78 pin D sub female crypto interface adapter
Dimensions	
Length	8.85 in (22.48 cm)
Height	4.49 in (11.40 cm)
Width	2.93 in (7.44 cm)
Weight	2 lb (0.91 kg max.)
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

Option B (KIV-77/SIT-2010 Adapter)	
Mounting	Attaches to the 78 pin D sub female crypto interface adapter
Dimensions	
Length	7.75 in (19.68 cm)
Height	4.2 in (10.67 cm)
Width	1.76 in (4.47 cm)
Weight	1 lb (0.45 kg max.)
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

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
Dimensions	7" L x 5" H x 5" W/ 17.78 x 12.7 x 12.7 cm 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 (77°F) nominal
Temperature	Operating -20° to +55°C (-4° to 131°F) recommended. Will operate at -40°C with 25% of +25°C capacity and degraded cycle lifetime
	Storage -55° to +85°C (-67° to 185°F)
	Re-charging 0° to +40°C (32° to 104°F)
Weight	1.5 lb (0.7 kg)

Transit Case	
Type	Watertight sealed enclosure with pressure release valve
Dimensions	
Length	26.25 in (66.75 cm)
Height	16.75 in (42.54 cm)
Width	16.00 in (40.64 cm)
Weight	Empty 16 lbs (7.3 kg)
	Full 41 lb (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

Physical Characteristics

Size: Test Set Only	7.5"H x 11.5"W x 14.1"D 19.05 cm x 29.21 cm x 35.81 cm
with Transit Case	20.4"H x 31.3"W x 15.5"D 51.82 cm x 79.50 cm x 39.37 cm
Weight	12.25 lbs. (test set with battery) 50 lbs. (22.7kg) (shipping weight)

Environmental

MIL-PRF-28800, Class 1	
Operational Temp.	-40° to + 55°C (-40° to + 131° F)
Storage Temp.	-55° to + 85°C (-67° to + 185° F)
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 stand-by)
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

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