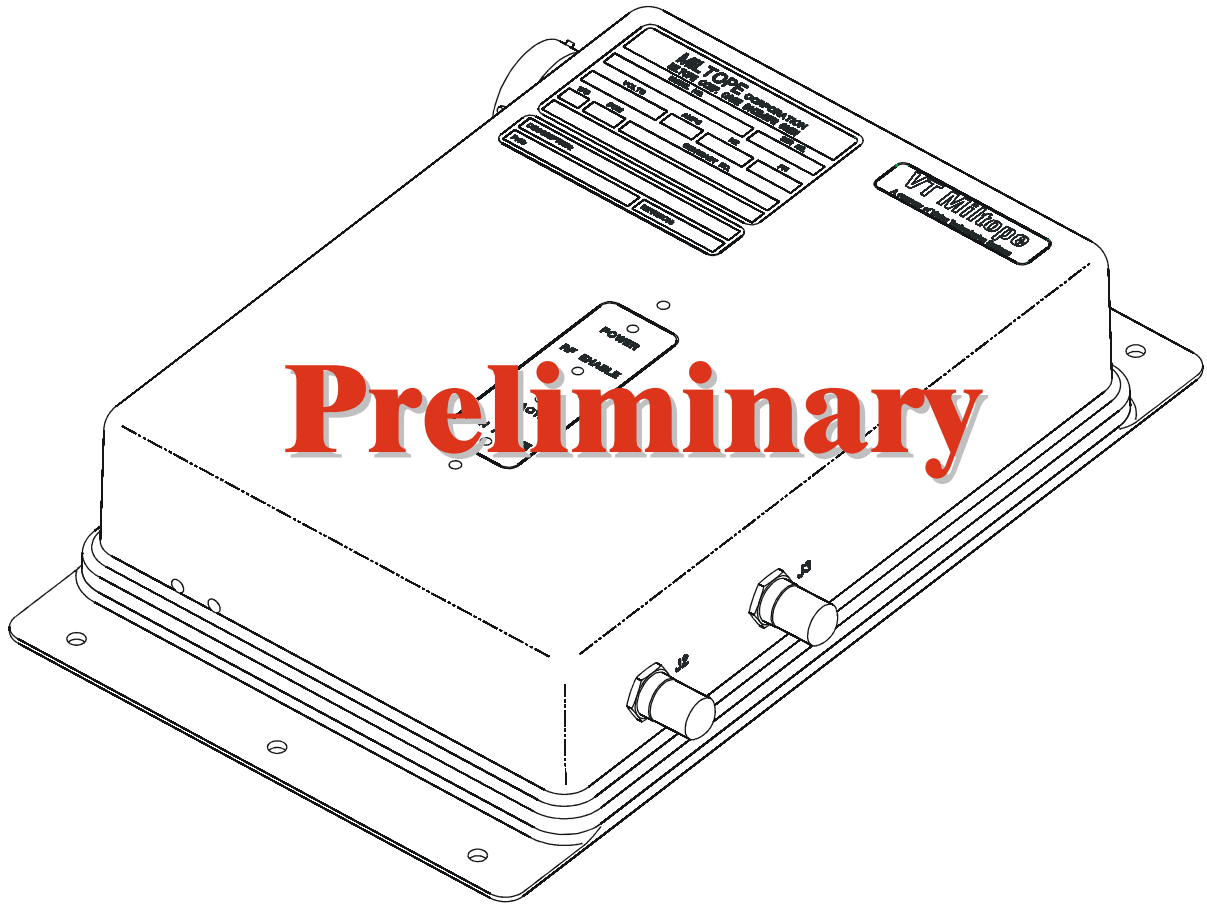# Operator's Manual

Preliminary

Cabin Access Point (CAP)

Part Numbers 901164-1 and 901164-2

Vision Technologies Systems

VT Miltope

A company of Vision Technologies Systems

M365-491

Operator's Manual

Cabin Access Point (CAP)
Part Numbers 901164-1 and 901164-2

Preliminary 6 January 2005

Vision Technologies Systems

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CHAPTER 1

GENERAL INFORMATION

1-1   INTRODUCTION

This manual provides instructions for setup, installation, operation, and operator maintenance of Cabin Access Point (CAP), part numbers 901164-1 and 901164-2, hereinafter referred to as the CAP. Configuration instructions for the operating software are provided in the operator's manual for your software. This manual is divided into seven chapters as follows:

a. **Chapter 1, General Information.** This chapter provides a description and specifications for the CAP. Included is a description of the typographic conventions used to present information in this manual.

b. **Chapter 2, Equipment Setup.** This chapter provides instructions for unpacking, inspecting, and initial setup of your CAP.

c. **Chapter 3, Installation.** This chapter provides instructions for installation. CAP mounting and connection instructions are provided in this chapter.

d. **Chapter 4, Operation.** This chapter provides the information you need to become familiar with your CAP. Included are descriptions of indicators along with instructions to operate your CAP.

e. **Chapter 5, Operator Maintenance.** This chapter provides instructions for the periodic tasks the operator should perform to maintain the CAP in proper working condition.

f. **Chapter 6, Troubleshooting.** This chapter provides instructions for troubleshooting that can be performed by the operator.

g. **Chapter 7, Regulatory, Wireless Interoperability, and Health Information.** This chapter provides information on international regulations, wireless interoperability standards, and radio frequency (RF) health issues.

1-2   TYPOGRAPHIC CONVENTIONS

Various type styles are used in this manual to present instructions and indicate responses. The following paragraphs define the conventions used.

1-2.1   <u>Keyboard Entries and Software Commands</u>

Keyboard entries and software commands are presented in boldface type. Instructions to press a key that performs a function have the name of the key enclosed in < > symbols. For example, instructions to type the command "DIR" followed by pressing the Enter key are presented as follows:

          Type **DIR <Enter>**

1-2.2   Variables

Variable expressions or terms that are user defined are presented in italic type. For example, an instruction to enter a path followed by a backslash, followed by a filename, followed by pressing the Enter key is presented as follows:

> Type *path\filename* **<Enter>**

1-2.3   Screen Display

Responses that are displayed on a computer screen are presented in a sans-serif typeface. For example, if the word "READY" is to be displayed on the screen, it is presented as follows:

> The display will read READY.

1-3   TERMINOLOGY

The following terms are used frequently throughout this manual:

- Client Station: Any computer that uses the services provided by the CAP. This can be a computer with a wireless Local Area Network (LAN) card accessing the CAP directly, or a computer on a wired LAN that is connected to the CAP.

- Management Station: Any computer that can access the CAP management tool.

- Wireless Cell: The area in which the CAP provides a wireless signal.

1-4   EQUIPMENT DESCRIPTION

The Cabin Access Point (CAP) (Figure 1-1) is a wireless communication device designed for use in airborne environments. The CAP utilizes Direct Sequence Spread Spectrum (DSSS) radio technology in the 2.4-GHz Industrial, Scientific and Medical (ISM) radio frequency spectrum to communicate with IEEE 802.11b compliant wireless devices. The CAP utilizes Orthogonal Frequency Division Multiplexing (OFDM) radio technology in the 2.4-GHz ISM radio frequency spectrum to communicate with IEEE 802.11g compliant wireless devices and in the 5-GHz ISM frequency spectrum to communicate with IEEE 802.11a compliant wireless devices. The CAP provides a bridge between the aircraft IEEE 802.3 compliant wired Ethernet LAN and wireless devices. Two aircraft level discrete inputs are provided for remote on/off control and RF enable/disable. Two discrete outputs provide operational status. Operation of the CAP is controlled by operating software. The CAP can be configured with CAP operating software to configure the CAP as a cabin wireless LAN unit (CWLU) to create a wireless local area network (WLAN) aboard the aircraft, or with wireless access bridge (WAB) operating software to configure the CAP as a terminal wireless LAN unit (TWLU) to establish a wireless bridge between the aircraft network and a ground-based network. The part number for the software installed in your CAP is indicated on the software label located on the top of the CAP unit.
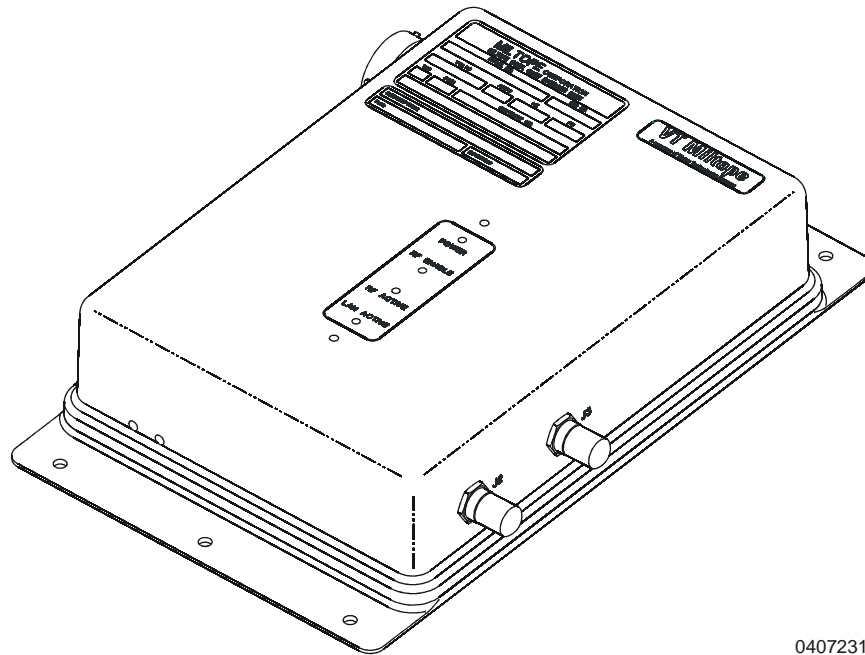
0407231-

Figure 1-1. Cabin Access Point (CAP)

1-5   BUILDING A WIRELESS LOCAL AREA NETWORK (WLAN)

Configured as a CWLU, the CAP enables you to create a WLAN to link all your computers so that they can share data and resources.

The CAP contains two radio frequency (RF) transmitter/receivers (tranceivers). One tranceiver uses radio waves in the 2.4 GHz band to communicate with IEEE 802.11b and IEEE 802.11g compliant client stations. The second transceiver uses radio waves in the 5 GHz band to communicate with IEEE 802.11a compliant client stations. Radio waves cannot penetrate metal, instead they are reflected. This means that the CAP is able to transmit through wood or plaster walls, and closed windows. However, the metal skin of the aircraft or metal partitions may block transmissions, or reduce signal quality by creating reflections. To serve users separated by metal partitions will require a separate CAP unit in each area.

The CAP provides IEEE 802.11b and IEEE 802.11g wireless network coverage in a radius of up to 100 meters (300 feet) and IEEE 802.11a wireless network coverage in a radius of 30 meters (100 feet), regardless of the orientation of the device. This is called a wireless cell.

To maximize coverage of the cell, the CAP is best installed in an open area with as few obstructions as possible. Try to choose a location that is central to the area being served.

The following paragraphs provide an overview of the different types of connections you can make using the CAP.

1-5.1   Connecting to a Wired Local Area Network (LAN)

By attaching the CAP to an Ethernet hub as shown in Figure 1-2, you can interconnect your wireless network with a traditional wired local area network (LAN). This enables all users to share data and resources.
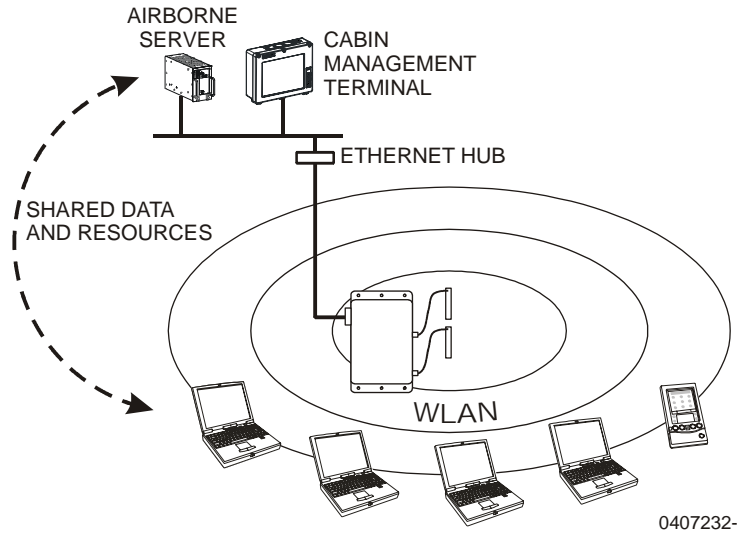
Figure 1-2. Connecting to a Wired LAN

1-5.2   Connecting to a Wired Server

As shown in Figure 1-3, the CAP can be connected to a single server that has a traditional wired Ethernet card. This allows the wired server to share data and resources with the computers on the WLAN.
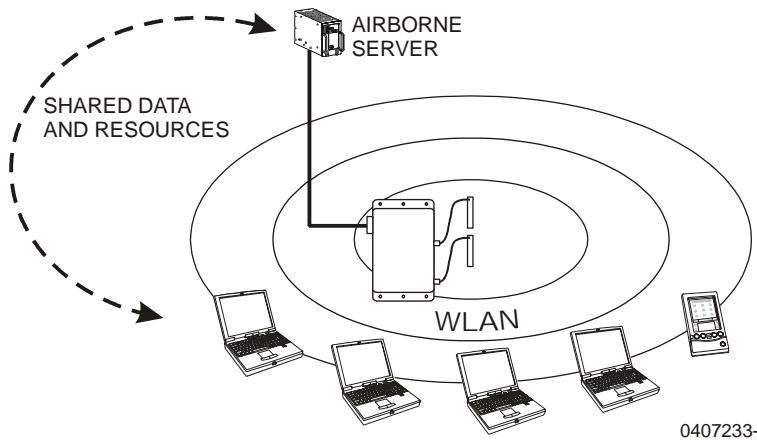
Figure 1-3. Connecting to a Wired Server

1-5.3   Instant Infrastructure

The CAP features an integrated two-port 100 Mbps Ethernet switch allowing you to quickly create a complete networking infrastructure. Connect stand alone computers or link to an Ethernet hub to interconnect your wireless network with a traditional wired local area network (LAN). (See Figure 1-4.) This enables all users to share data and resources.

Unlike a hub which shares bandwidth between all connected stations, the CAP's switch enables each connected station to use the full 100 Mbps. Both ports on the CAP are auto-sensing, enabling direct connection to a hub without a crossover cable.
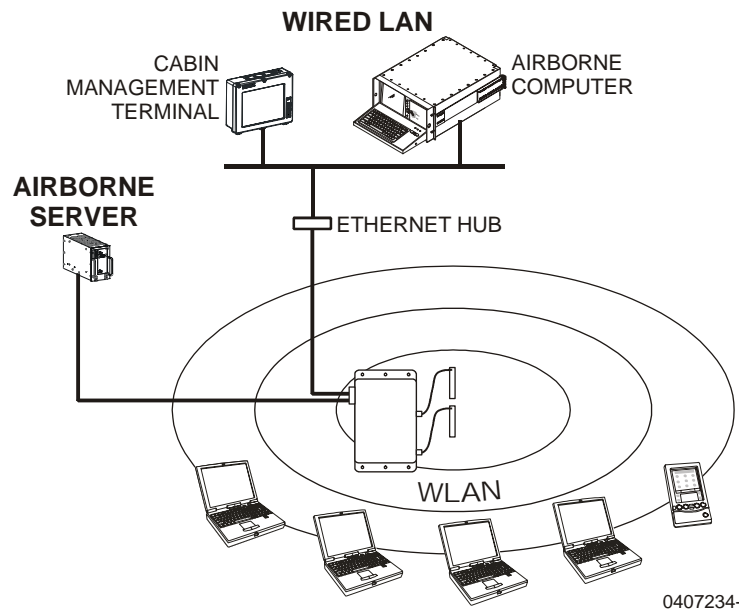
Figure 1-4. Creating an Instant Infrastructure

1-5.4   Building A Multi-Cell Wireless Network

As shown in Figure 1-5, several CAP units can be installed to provide multiple wireless cells for coverage of large locations. Client computers are able to move between cells (called roaming), without losing contact with the network. This is possible because the wireless network adapters in the client computers automatically switch to the best available signal.

1-6   BUILDING A WIRELESS BRIDGE

Configured as a TWLU, the CAP provides a wireless link between the LAN aboard the aircraft and a ground-based LAN deployed in an airport terminal, hanger, fixed-based operation (FBO) facility, or flight operations facility. (See Figure 1-6.) The CAP has a range of 100 meters (300 feet) using the IEEE 802.11b or IEEE 802.11g wireless network interface.
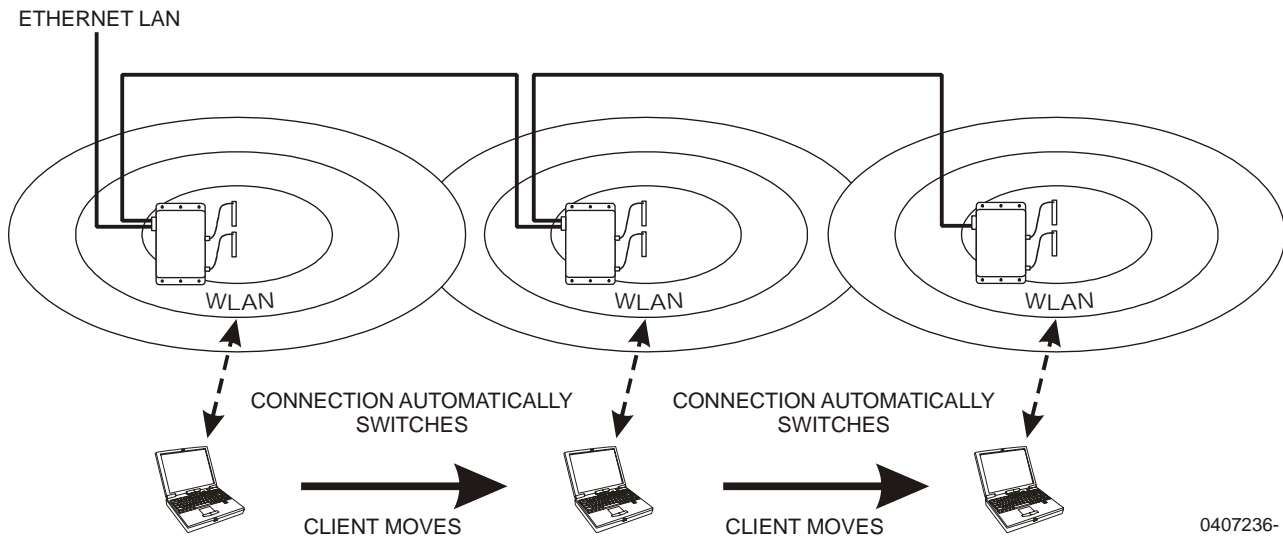
Figure 1-5. Multi-Cell Wireless Network
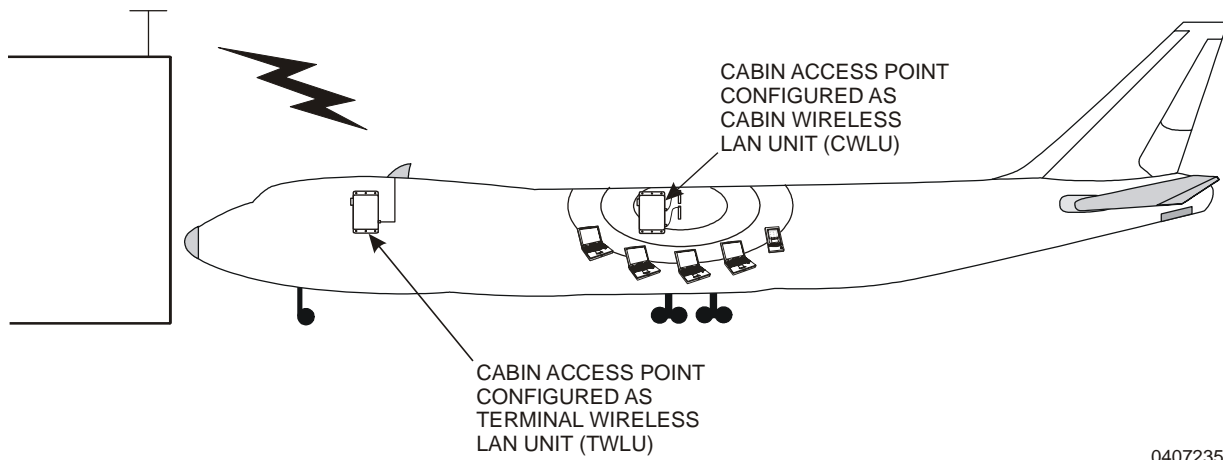
Figure 1-6. Aircraft-to-Ground Wireless Bridge

1-7 SECURITY

Security features available depend on the operationg software installed. Refer to the applicable software operator's manual for security information

1-8   SPECIFICATIONS

The technical specifications for the CAP unit are provided in Table 1-1. Technical specifications for antenna part number 901167-1 recommended for the CWLU configuration are provided in Table 1-2. Technical specifications for antenna part number 901058-1 recommended for the TWLU configuration are provided in Table 1-3. The CAP has been qualified for airborne installation in accordance with Radio Technical Commission for Aeronautics (RTCA) specification DO-160D and The Boeing Company document D6-36440, Standard Cabin Systems Requirements Document as specified in Table 1-4.

Table 1-1. CAP Unit Specifications

Characteristic	Specification

Wireless LAN Interface	IEEE 802.11a compliant OFDM 5 GHz, 54 Mbits/second wireless LAN
	    12 non-overlapping channels in North America
	    19 non-overlapping channels in Europe
	    4 non-overlapping channels in Japan

	IEEE 802.11b compliant DSSS 2.4 GHz, 11 Mbits/second 14-channel wireless LAN
	IEEE 802.11g compliant OFDM, 54 Mbit/second 14-channel wireless LAN
Wireless Range	100 meters (300 feet) for IEEE 802.11b/g
	30 meters (100 feet) for IEEE 802.11a
Wired Interfaces	Two IEEE 802.3 compliant Ethernet 10/100BaseTx channels, 100 Mbits/second (autoranging)
	Two discrete inputs (on/off control and RF enable)
	Two discrete outputs (on/off status and RF status)
Power Interruption	200 ms holdup capability
Input Power	97 – 134 VAC, 360 – 800 Hz, or 18 – 32 VDC, 15 W maximum (DC input available on part number 901164-2 only)
Size	2.4 inches x 8.23 inches x 11.5 inches
Weight	Less than 5 pounds

Temperature Range
    Operating
    Non-operating
	
	-15°C to +55°C
	-55°C to +85°C

Altitude
    Operating
    Non-operating
	
	Atmospheric pressure equivalent to –15,000 to +15,000 feet
	Atmospheric pressure equivalent to –15,000 to +40,000 feet

Humidity (operating)	5% to 95% relative humidity, non-condensing

Table 1-2. Antenna Part Number 901167-1 Specifications

Characteristic	Specification
Frequency Range	2.39 GHz – 2.49 GHz and 4.9 – 5.9 GHz
Typical Gain	2.5 dBi at 2.45 GHz, 2 dBi at 5.0 GHz, 3.0 dBi at 5.25 GHz and 5.8 GHz
Peak Gain	3.5 dBi at 2.45 GHz, 2.5 dBi at 5.0 GHz, 3.5 dBi at 5.25 GHz and 5.8 GHz
VSWR	<4.0:1
Nominal Impedance	50 ohms
Radome Material	Ultem 1000 Thermoplastic
Cable	7.25-inch Plenum, RG-316U coaxial
Polarization	Horizontal
Grounding Protection	DC Grounded
Connector Type	Male TNC
Size	0.48 inch x 4.7 inches x 0.5 inch
Weight	1 ounce
Operating Temperature Range	-40°C to +71°C

Table 1-3. Antenna Part Number 901058-1 Specifications

Characteristic	Specification
Frequency Range	2.2 GHz – 2.5 GHz
Radiation Pattern	Omni-directional
Input Power	1000 Watts peak, 50 Watts continuous
VSWR	≤ 1.5:1
Nominal Impedance	50 ohms
Material	A-356 Aluminum Alloy Casting
Finish	Skydrol Resistant Enamel
Polarization	Vertical
Grounding Protection	DC Grounded
Lightning Protection	DC Grounded per MIL-A-9094, B-5087
Connector Type	Female TNC
Size	1.3 inches x 5.17 inches x 1.75 inches
Weight	3 ounces
Operating Temperature Range	-53°C to +85°C
Altitude	-1,800 feet to +70,000 feet

Table 1-4. Specification Compliance

Characteristic	D6-36440 Section	Specification DO-160D Section	Specification DO-160D Category
Temperature	7.2.1.1	4.5	A1 modified
Loss of Cooling	7.2.1.2	4.5.4	B
Altitude	7.2.1.3	4.6.1	A1
Decompression	7.2.1.3	4.6.2	45,100 feet
Overpressure	7.2.1.3	4.6.3	A1
Touch Temperature	7.2.2		<15°C rise
Temperature Variation	7.2.3	5.0	C
Humidity	7.2.4	6.3.2	A
Waterproofness	7.2.5	10.3.1	W
Vibration	7.2.7	8.7.2	C/C1
Operational Shock	7.2.8	7.2	B
Magnetic Effect (Designed to Meet)		15.0	C
Power Input	7.3.2.1a	16.0	A/E
Power Input, Power Failure	7.3.2.1f		>0.85 lagging
Power Input, Input Capacitance	7.3.2.1g		<2.5μF/kVA line-to-line
Voltage Spikes	7.3.2.2	17.0	A
Grounding and Bonding	7.3.2.4		
Induced Signal Susceptibility	7.3.3.2	19.0	C
Audio Frequency Conducted Susceptibility	7.3.3.3	18.3.2	Z modified
Audio Frequency Emissions	7.3.3.5	8.3	
Radio Frequency Susceptibility, Conducted	7.3.3.4.1	20.4	T
Radio Frequency Susceptibility, Radiated	7.3.3.4.2	20.5	T
Radio Frequency Emissions, Conducted	7.3.3.6.1	21.3	M
Radio Frequency Emissions, Radiated	7.3.3.6.2	21.4	M plus Boeing HF notch
Lightning Induced Transient Susceptibility (Designed to Meet)		22.0	XXE1
Electrostatic Discharge	7.3.3.8	25.5	A (3kV – 15 kV)

1-9   AVAILABLE SOFTWARE AND MANUALS

In addition to this operator's manual, an Air Transport Association (ATA) Specification 2200 compliant component maintenance manual (CMM) 44-30-07 (Miltope part number M365-493) is available. Software operator's manuals are available to support the operating software installed. Miltope standard software operator's manuals are listed in Table 1-5. Operating software and manuals for custom configurations are available upon request.

Table 1-5. Available Software and Manuals

Software		Operator's Manual Part Number
Description	**Part Number**	
Cabin Access Point (CAP)	999057	M365-506
Wireless Access Bridge (WAB)	999041-1	M365-503

1-10   TOOLS AND TEST EQUIPMENT REQUIRED

Equipment required for setup of your CAP is listed in the applicable operating software operator's manual. Tools and material required for maintenance of the CAP are listed in Chapter 5.

CHAPTER 2

EQUIPMENT SETUP

2-1   INTRODUCTION

This chapter provides instructions for unpacking, inspection, and setup of the Cabin Access Point (CAP). Procedures for configuring the CAP operating software depend on the software installed. Refer to the operator's manual for your software for configuration instructions. The CAP must be configured as described in the operating software operator's manual prior to installation on the aircraft.

2-2   UNPACKING AND INSPECTION

The CAP is packed in a cardboard carton lined with cushioning material to protect the unit during shipment. The packing material should be saved for reuse in the event shipment of the unit is necessary. A packing list is enclosed in or attached to the carton. Use the packing list to check the contents of the carton during unpacking. Inspect the CAP before, during, and after unpacking for any sign of shipping damage. Check for dents, breaks, water (moisture) damage, or any evidence of mishandling. If any damage is discovered, file a complaint with the carrier, noting all damage and notify Miltope Corporation of the action taken. To unpack the CAP, refer to Figure 2-1 and proceed as follows:

a. Position carton so that arrows on shipping label point upward.

b. Cut sealing tape on top of carton and open carton.

c. Remove upper foam cushion.

d. Remove CAP from carton.

e. Remove CAP from polybag.

f. Inspect CAP for any sign of shipping damage.

2-3   INITIAL SETUP

Prior to installing your CAP, the unit should be connected in a simple network configuration in the laboratory environment.

Once the CAP is operating in the simple network, it can be configured for your specific installation. Refer to the operating software operator's manual for instructions on setting up your CAP unit in the laboratory environment.

2-4   CONFIGURATION

Prior to installation of the CAP, the unit must be configured for your specific application as described in the operator's manual for your operating software.
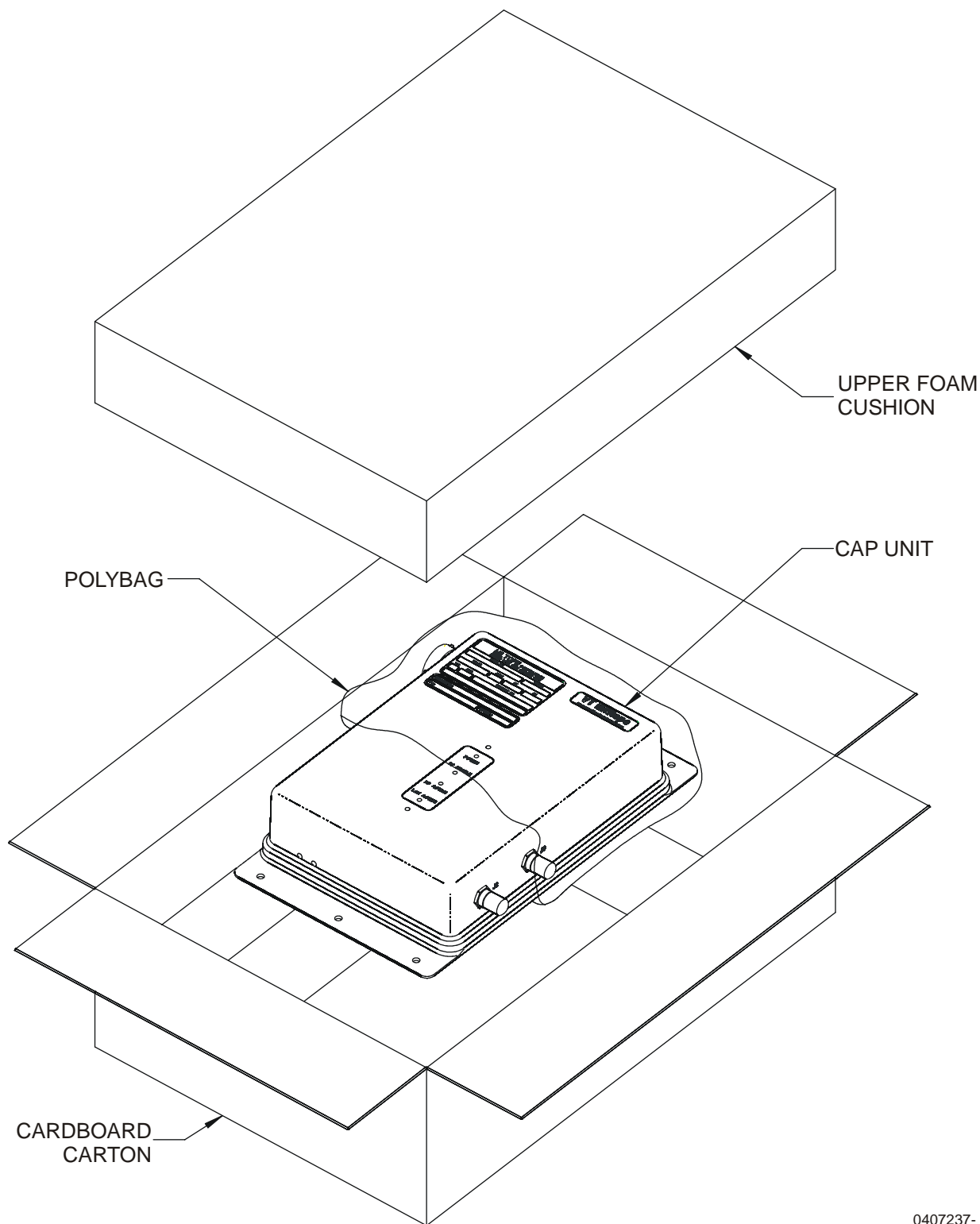
0407237-

Figure 2-1. CAP Packaging

CHAPTER 3

INSTALLATION

3-1   INTRODUCTION

This chapter provides instructions for installation of the Cabin Access Point (CAP). After configuring the CAP as described in the operating software operator's manual, use the instructions provided in this chapter to install the CAP. Installation of the CAP must be performed by personnel authorized to perform maintenance on the aircraft.

3-2   MOUNTING

3-2.1   CAP Unit

Six mounting holes are provided on the CAP. Figure 3-1 shows the CAP outline dimensions and mounting-hole locations. Mount the CAP using number 10 mounting hardware. Although not mandatory for specification compliance, it is recommended that the CAP unit be mounted to a grounded surface within the aircraft. An unpainted area around each mounting hole provides ground connection to the mounting surface.

3-2.2   Indoor Cabin Antenna

Two antennas are required for each CAP unit configured as a cabin wireless LAN unit (CWLU). Two mounting holes are provided on antenna part number 901167-1. The antenna is fitted with a 7.25-inch cable that connects to the CAP RF output connector. Figure 3-2 shows the outline dimensions and mounting-hole locations for the antenna. The radiation pattern for the antenna is shown in Figure 3-3. Mount the antenna using number 6 mounting hardware. It is recommended that the antennas be mounted a minimum of six inches apart.

3-2.3   Outdoor Antenna

An antenna mounted on the exterior of the aircraft is required for a CAP unit configured as a terminal wireless LAN unit (TWLU). Four mounting holes are provided on antenna part number 901058-1. The antenna is fitted with a TNC female connector. Use a TNC Male-to-TNC Male 50-ohm coaxial cable to connect the antenna to the CAP unit. Figure 3-4 shows the outline dimensions and mounting hole locations for the antenna. The radiation pattern for the antenna is shown in Figure 3-5. Antenna part number 901058-1 is designed for use in the 2.4-GHz ISM radio frequency spectrum (IEEE 802.11b/g). Mount the antenna using number 10 mounting hardware.

Figure 3-1. CAP Outline Dimensions
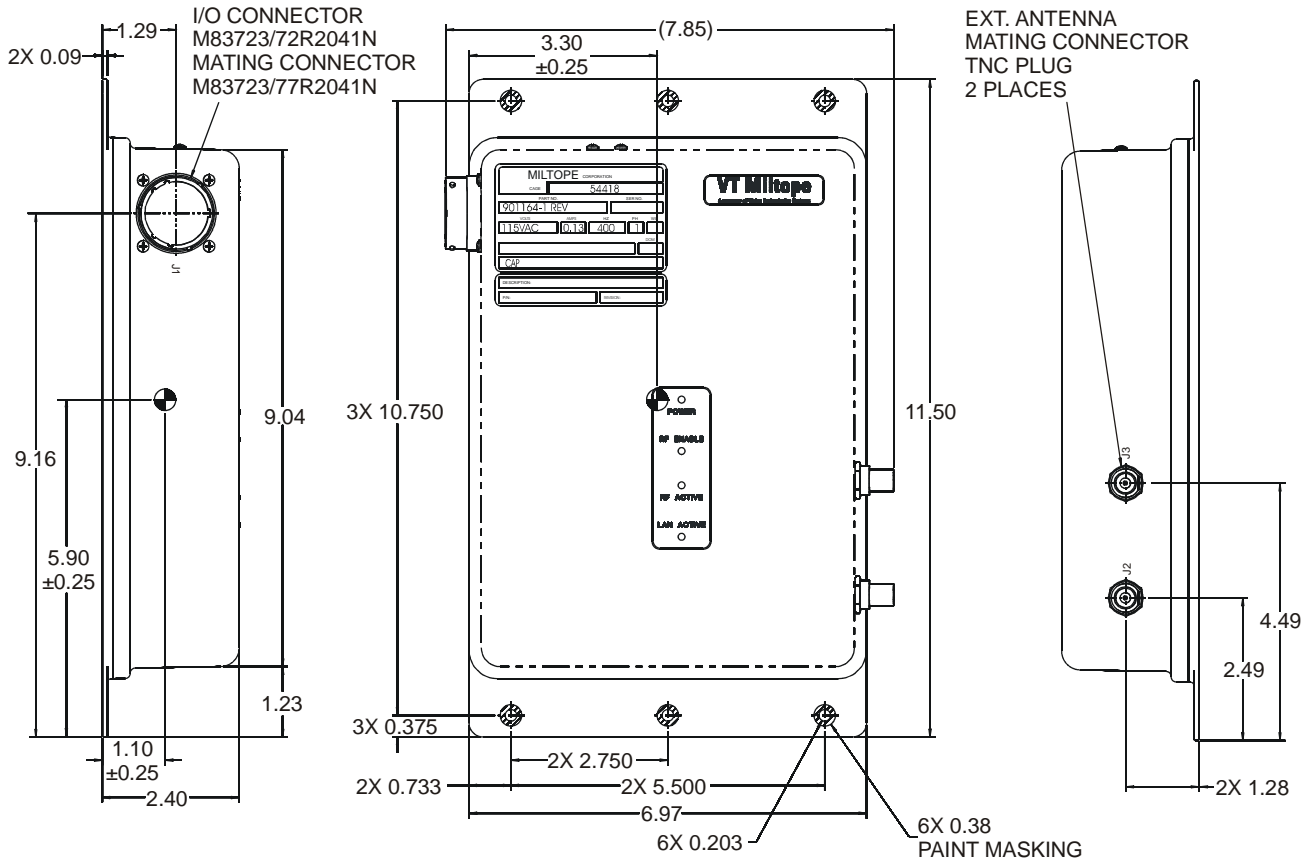
NOTES: 1. All dimensions are in inches.
2. Dimensions in parenthesis are for reference only.

3. Tolerances:
   X.XX (2 Places) = ±0.03
   X.XXX (3 Places) = ±0.010
4. ◕ denotes center of gravity.

0407238-
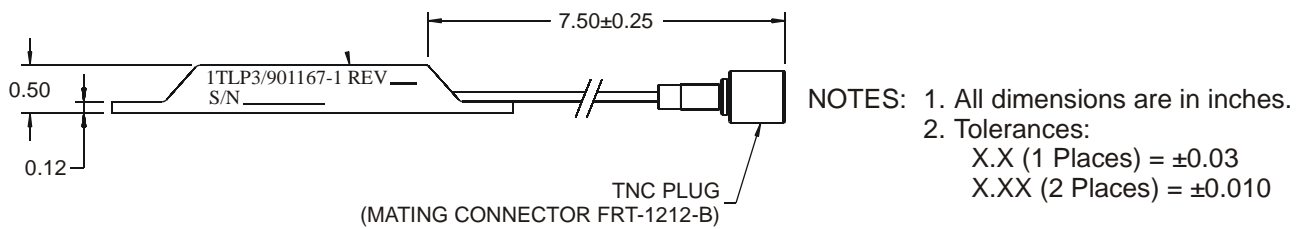
NOTES: 1. All dimensions are in inches.
2. Tolerances:
   X.X (1 Places) = ±0.03
   X.XX (2 Places) = ±0.010
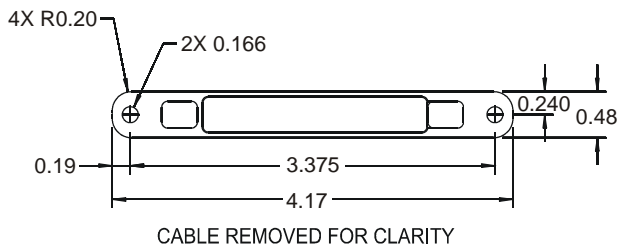
WARNING

THE ANTENNA RADIATES RADIO FREQUENCY (RF) POWER. TO AVOID EXCEEDING FEDERAL COMMUNICATIONS COMMISSION (FCC) RADIO FREQUENCY EXPOSURE LIMITS, HUMAN PROXIMITY TO THE ANTENNA SHALL BE NO LESS THAN EIGHT INCHES (20 CENTIMETERS) WHILE RF IS ENABLED.

0407261-

Figure 3-2. Indoor Cabin Antenna Part Number 901167-1 Outline Dimensions
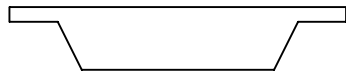
ANTENNA ORIENTATION, Y CUT
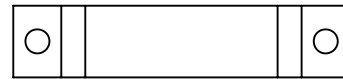
ANTENNA ORIENTATION, X CUT
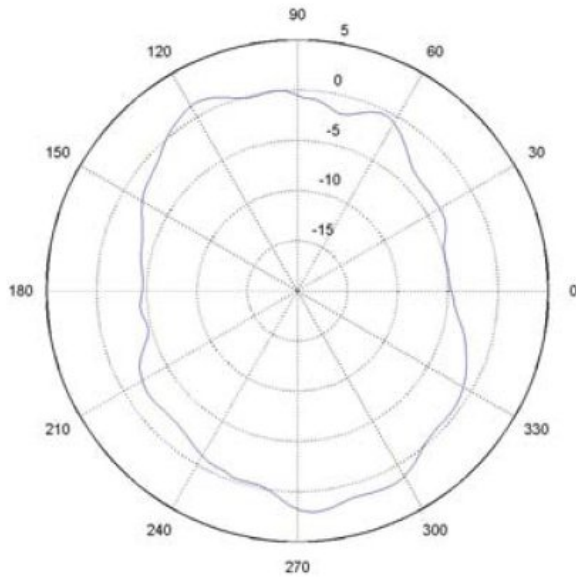
2.45GHz, Y Cut
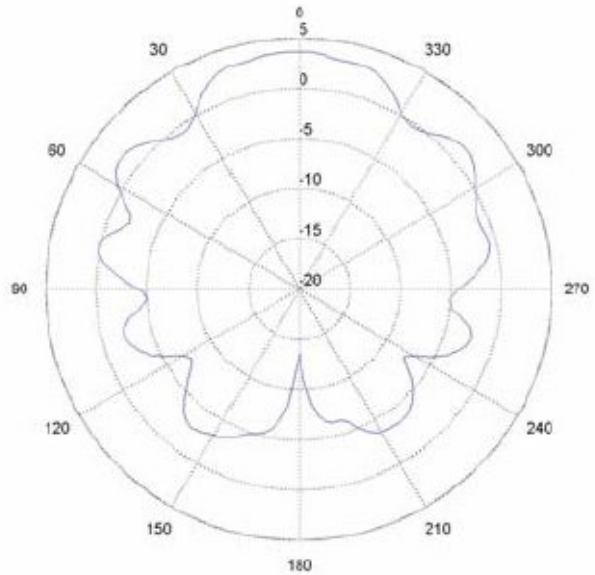
2.45GHz, X Cut
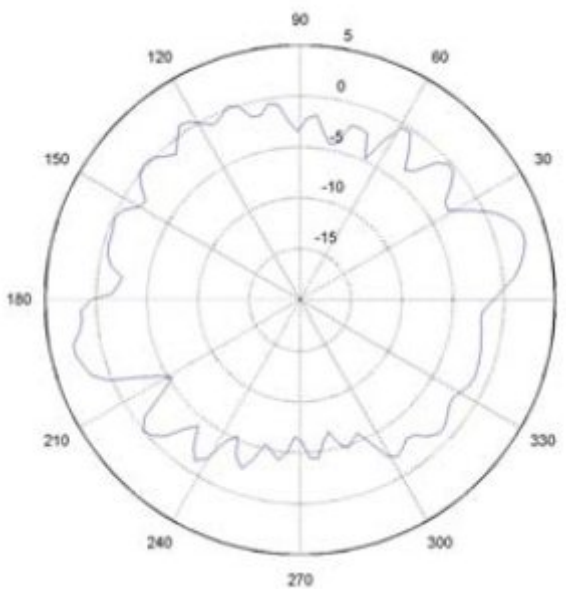
5.0GHz, Y Cut
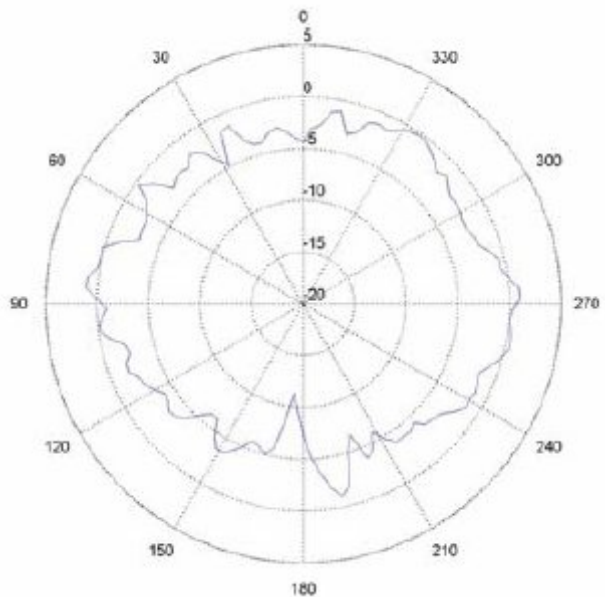
5.0GHz, X Cut

Figure 3-3. Antenna Part Number 901167-1 Radiation Pattern (Sheet 1 of 2)
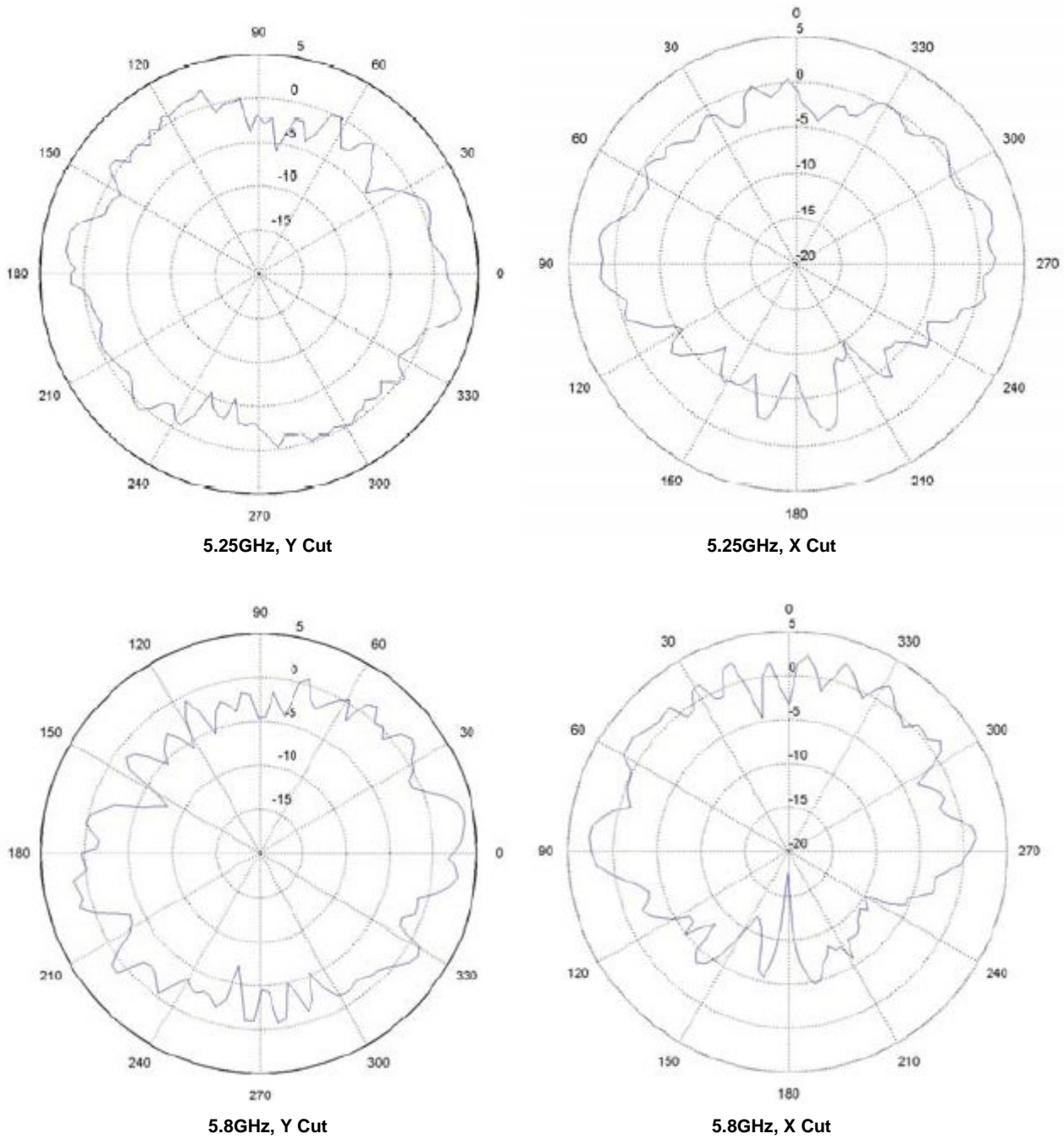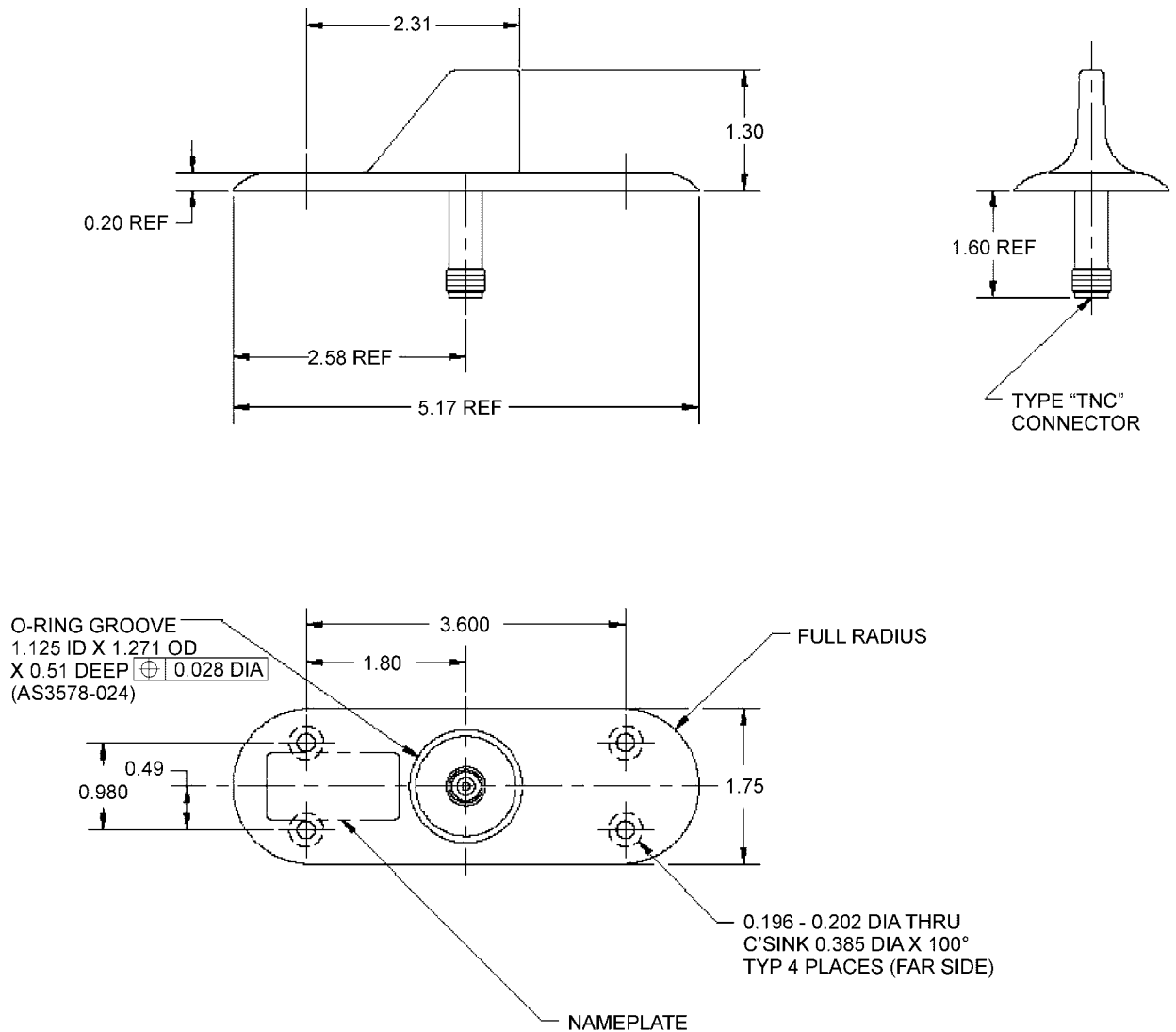
5.25GHz, Y Cut   **5.25GHz, X Cut**

5.8GHz, Y Cut   **5.8GHz, X Cut**

Figure 3-3. Antenna Part Number 901167-1 Radiation Pattern (Sheet 2 of 2)

O-RING GROOVE
1.125 ID X 1.271 OD
X 0.51 DEEP $\boxed{\oplus}$ 0.028 DIA
(AS3578-024)

3.600
1.80
FULL RADIUS

0.49
0.980
1.75

0.196 - 0.202 DIA THRU
C'SINK 0.385 DIA X 100°
TYP 4 PLACES (FAR SIDE)

NAMEPLATE

2.31
1.30
0.20 REF
2.58 REF
5.17 REF

1.60 REF

TYPE "TNC"
CONNECTOR

<u>WARNING</u>
THE ANTENNA RADIATES RADIO FREQUENCY (RF) POWER. TO AVOID EXCEEDING FEDERAL COMMUNICATIONS COMMISSION (FCC) RADIO FREQUENCY EXPOSURE LIMITS, HUMAN PROXIMITY TO THE ANTENNA SHALL BE NO LESS THAN EIGHT INCHES (20 CENTIMETERS) WHILE RF IS ENABLED.

NOTES: 1. All dimensions are in inches.
        2. Tolerances:
            X.XX (2 Places) = ±0.030
            X.XXX (3 Places) = ±0.010

0408241-

Figure 3-4. Outdoor Antenna Part Number 901058-1 Outline Dimensions
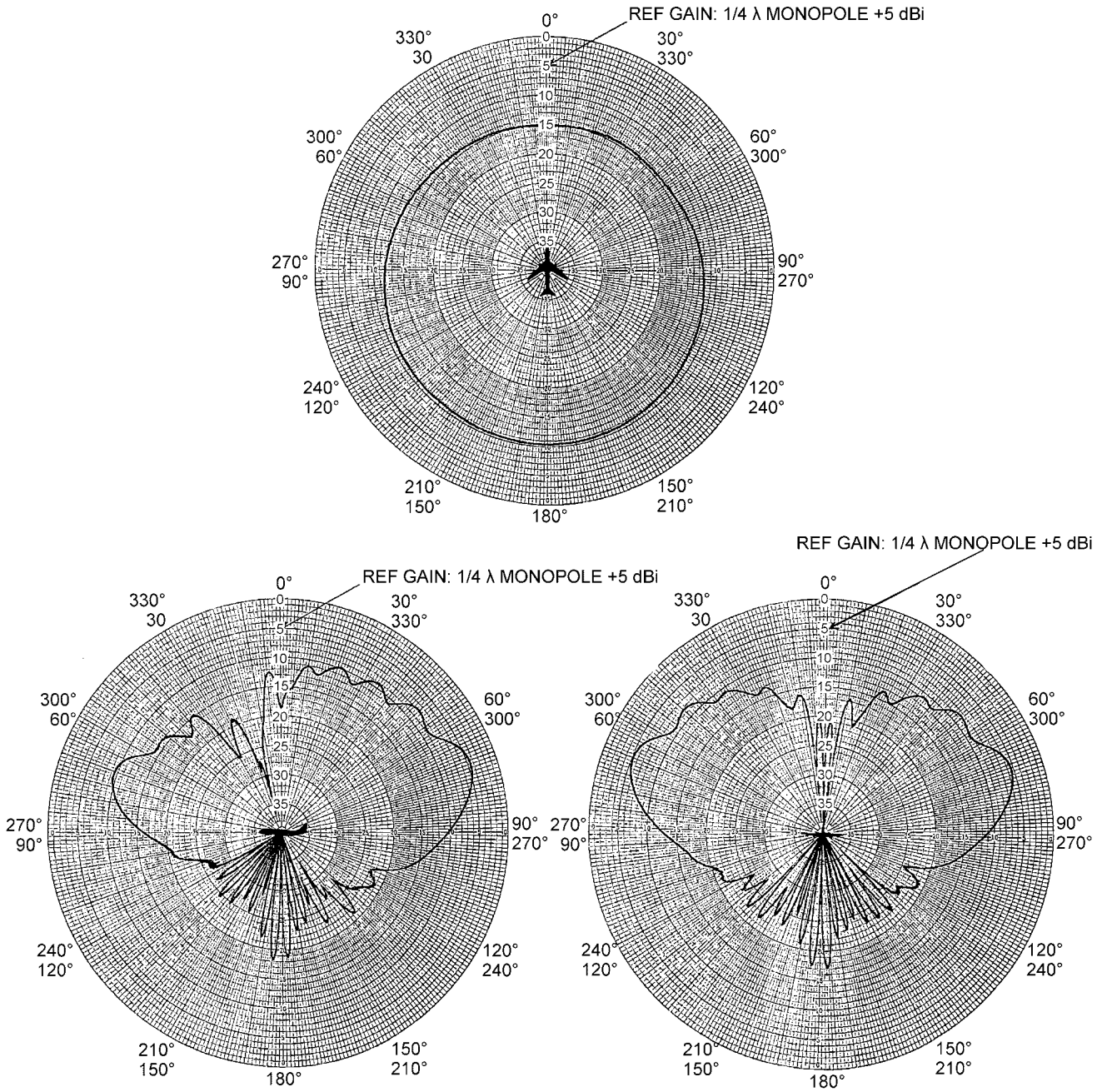
Figure 3-5. Antenna Part Number 901058-1 Radiation Pattern

3-3   CONNECTING THE CAP

All power and interface connections except the RF (antenna) output are provided at input/output (I/O) connector J1 shown in Figure 3-6. Table 3-1 provides the pin assignments for I/O connector J1. To ensure specification compliance, use of double-shielded cables is recommended. RF (antenna) output connections are provided at connectors J2 and J3. Connector J2 is the RF output for radio card 2 and connector J3 is the RF output for radio card 1. Refer to the applicable operating software operator's manual for radio card configuration instructions. The following paragraphs describe the input power requirements and available interfaces.

3-3.1   <u>Input Power Requirements</u>

CAP part number 901164-2 operates from an external 97 to 134 volt AC, 360 to 800 Hz or 18 to 32 volt DC, 15 W external power source. The CAP can be connected to both AC and DC power sources simultaneously. If the DC input voltage is greater than 24 volts, the CAP will operate from the DC source. If the DC input is 24 volts or less, the CAP will operate from the AC source. CAP part number 901164-1 operates from 97 to 134 volts AC, 360 to 800 Hz input power only.

3-3.2   <u>10/100BaseT Ethernet Local Area Network (LAN) Ports</u>

Two IEEE 802.3 compliant 10/100BaseT Ethernet LAN ports are provided at I/O connector J1. One port can be connected to an existing on-board LAN or wired server, while the other port can be used to connect additional computers to the LAN via an Ethernet hub or to enable the connection of a second CAP unit.
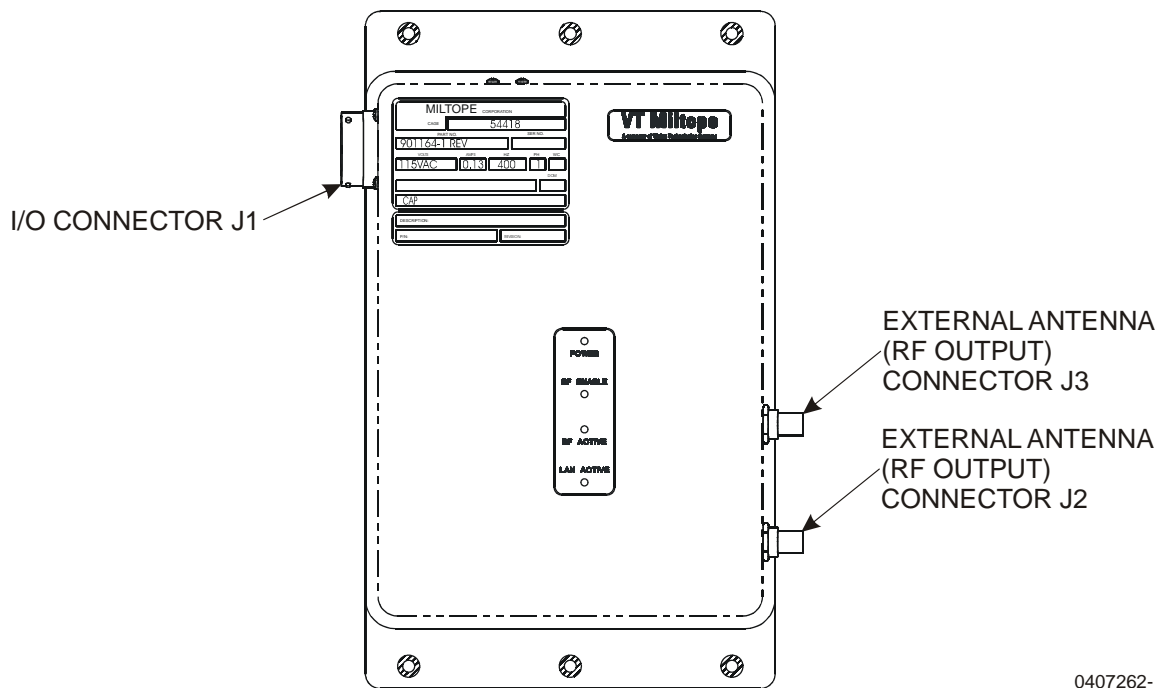
Figure 3-6. Connector Locations

Table 3-1. I/O Connector J1 Pin Assignments

Pin*	Signal	Pin*	Signal
1	Chassis Ground	22	Chassis Ground (Shield)
2	Reset	23	Ethernet LAN Port 2 Rx+
3	Reset Ground	24	Ethernet LAN Port 2 Tx+
4	No connection	25	Ethernet LAN Port 2 Tx-
5	No connection	26	Ethernet LAN Port 1 Rx-
6	No connection	27	Ethernet LAN Port 1 Tx-
7	No connection	28	Chassis Ground
8	Chassis Ground	29	Reserved
9	Ethernet LAN Port 2 Rx-	30	Reserved
10	Ethernet LAN Port 1 Rx+	31	Reserved
11	Ethernet LAN Port 1 Tx+	32	No connection
12	Chassis Ground	33	Digital Ground
13	Chassis Ground	34	Reserved
14	Discrete Input 1 (on/off control)	35	Reserved
15	Discrete Input 2 (RF enable/disable)	36	No connection
16	Reserved	37	28 VDC Return (901164-2 only)
17	No connection	38	28 VDC Positive (901164-2 only)
18	115 VAC Phase (hot)	39	Chassis Ground
19	115 VAC Neutral	40	Chassis Ground
20	Discrete Output 1 (on/off status)	41	Chassis Ground
21	Discrete Output 2 (RF status)		

* Use M83723/77R2041N for mating connector.

3-3.3   __RF (Antenna) Output__

WARNING

The CAP antenna radiates radio frequency (RF) power. To avoid exceeding federal communications commission (FCC) radio frequency exposure limits, human proximity to the antenna shall be no less than eight inches (20 centimeters) while RF is enabled.

The CAP is designed to be used with two indoor antennas, Miltope part number 901167-1, when configured as a CWLU (using CAP operating software) or one outdoor antenna, Miltope part number 901058-1, when configured as a TWLU (using WAB operating software). The two indoor antennas connect to the two RF output connectors shown in Figure 3-6. Connector J2 is the RF output for radio 2 and connector J3 is the RF output for radio 1. The outdoor antenna connects to RF output connector J3 shown in Figure 3-6. Table 3-2 provides the pin assignments for the RF output connectors.

To comply with Federal Communications Commission (FCC) requirements, attenuation is required between the CAP and the antenna for IEEE 802.11b and/or IEEE 802.11g operation at maximum transmit power. This attenuation is typically accomplished by connecting a minimum of six feet of RG-58 coaxial cable (or alternate coaxial cable with equivalent attenuation characteristics) between the CAP and the antenna. If no extension cable is connected between the CAP and the antenna, the applicable radio transmit power must be set to a maximum value of 15 dBm. Refer to the applicable operating software operator's manual for instructions for setting radio transmit power.

Table 3-2. RF Output Connectors J2 and J3 Pin Assignments

Connector Component*	Signal
Center Conductor	RF Signal
Shield	RF Return

* Use TNC Plug for mating connector.

3-3.4   __Discrete Inputs__

Two ground/open type discrete inputs as defined by ARINC 763-2 are provided via I/O connector J1 to enable external control of CAP operation. An external controller or switch panel can be used to power up the CAP and enable wireless operation. Connecting a ground to on/off control (pin 14) causes the CAP to power up. When the ground is disconnected, the CAP will power down. Connecting a ground to RF enable/disable (pin 15) will enable wireless operation. When the ground is disconnected, wireless operation is disabled. The wired LAN remains operational when wireless operation is disabled.

3-3.5 <u>Discrete Outputs</u>

Two ground/open type discrete outputs as defined by ARINC 763-2 are provided via I/O connector J1. Discrete output 1 (on/off status) is low when the CAP is powered up. Discrete output 2 (RF status) is low when wireless operation is enabled.

3-3.6 <u>Reset Input</u>

The CAP reset function is accessible via I/O connector J1 pins 2 and 3. Connecting pins 2 and 3 together will cause the CAP to reset as follows:

- Momentary (less than five seconds) connection causes the CAP to restart;
- Connection for more than five seconds and less than ten seconds (LAN ACTIVE and RF ACTIVE indicators flash slowly, one flash per second) causes the CAP to reset all configuration parameters to the factory default settings;
- Connection for more than ten seconds (LAN ACTIVE and RF ACTIVE indicators flash rapidly, two flashes per second) causes the CAP to enter Trivial File Transfer Protocol (TFTP) mode for loading new firmware.

The reset input is not intended for connection in normal operation. The reset input is for maintenance operation only. Compliance with specifications is not guaranteed when the reset input is connected.

3-4 CONFIGURING WIRELESS CLIENT STATIONS (CWLU CONFIGURATION)

Computers used as wireless client stations must be equipped with a wireless LAN card compliant with IEEE standard 802.11a, b, or g and Wireless Fidelity (WiFi) certification as defined by the Wireless Ethernet Compatibility Alliance (WECA).

Configure the wireless LAN card as follows:

- Wireless network name (ESSID) set to be compatible with operating software configuration.
- Encryption disabled
- TCP/IP installed and configured to use the wireless adapter
- IP address set in accordance with operating software configuration.

3-5 CONFIGURING THE GROUND-BASED NETWORK (TWLU CONFIGURATION)

The ground-based network must be connected to a wireless access point compliant with IEEE 802.11 a, b, or g and WiFi certification as defined by WECA.

Configure the wireless access point as follows:

- Wireless network name (ESSID) set to be compatible with operating software configuration.
- Encryption disabled.
- IP address compatible with operating software configuration.

CHAPTER 4

OPERATION

4-1   INTRODUCTION

The Cabin Access Point (CAP) does not require day-to-day management for successful, efficient operation. The most you will want to do is inquire about status and statistics.

4-2   INDICATORS

Figure 4-1 illustrates the CAP indicators. Table 4-1 describes the function of each indicator.

4-3   OPERATING INSTRUCTIONS

The CAP is designed for unattended operation. Avionics level discrete inputs enable remote control of CAP operation. Discrete inputs are provided to enable or disable CAP operation, and to enable or disable RF transceiver operation. Chapter 3 of this manual provides information on use of the discrete inputs.

4-4   POWER UP

The CAP powers up automatically when power is applied provided that ground signals are applied at the on/off control and the RF enable/disable discrete inputs. When the POWER and RF ENABLE indicators are lit green, the CAP is fully operational. If either indicator is lit amber, CAP operation is disabled. Refer to Chapter 3 of this manual for information on use of the discrete inputs.

NOTE

> The CAP takes approximately ten seconds to power up and approximately 30 seconds to enable the RF.

4-5   CHECKING THE STATUS OF YOUR CAP

Checking the operational status of the CAP requires access to the management tool. Refer to the applicable operating software operator's manual for instructions on accessing the management tool and checking CAP operational status.
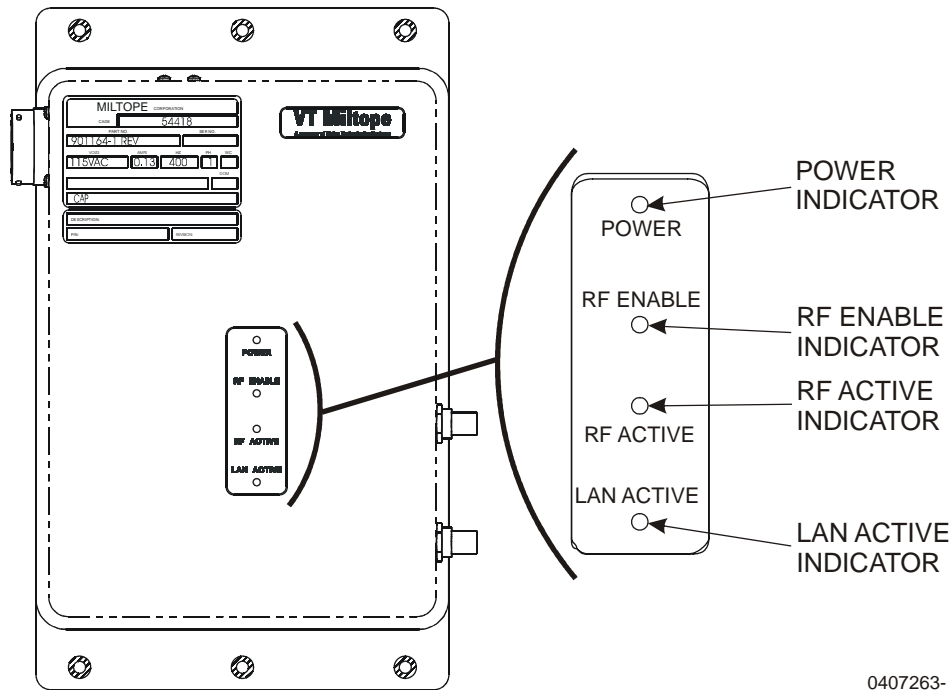
Figure 4-1. CAP Indicators

Table 4-1. CAP Indicators

Figure 3-1 Index No.	Indicator	Function
1	POWER Indicator	Lit green to indicate CAP is powered up and enabled for operation. Lit amber to indicated CAP is powered up, but operation is disabled (standby mode).
2	RF ENABLE Indicator	Lit green to indicate RF output is enabled. Lit amber to indicated RF output is disabled.
3	RF ACTIVE Indicator	Flashes green to indicated RF data transfers are occurring.
4	LAN ACTIVE Indicator	Flashes green to indicate LAN data transfers are occurring.

CHAPTER 5

OPERATOR MAINTENANCE

5-1   INTRODUCTION

This chapter contains instructions for the routine preventive maintenance the operator should perform to maintain the Cabin Access Point (CAP) in proper working condition. Operator maintenance consists of inspection for signs of damage and cleaning the exterior surfaces. Information is also provided for installing the operating software. Any unauthorized repair or modification of your CAP will void your warranty. Breaking the Miltope quality seal on the CAP will void the warranty. Inspection and cleaning should be performed as dictated by environmental conditions.

5-2   INSPECTION

Regular inspection will help ensure proper operation of your CAP. Inspect the exterior of the unit for any loose or missing hardware, or damage that would prevent proper operation.

5-3   CLEANING EXTERIOR SURFACES

5-3.1   Materials Required

- Lint-Free Cloth
- Soft-Bristle Brush
- Mild Detergent

5-3.2   Cleaning Procedure

Remove dust or dirt from external surfaces of the CAP with a lint-free cloth or soft-bristle brush. If necessary, moisten cloth with a solution of mild detergent and water.

5-4   INSTALLING OPERATING SOFTWARE

CAP operation is controlled by the operating software. Operating software can be installed or updated via the management tool. Instructions for installing or updating software are provided in the applicable operating software operator's manual. Equipment required to install operating software is listed in Table 5-1. To install operating software, connect the CAP as shown in Figure 5-3 and follow the instructions provided in the operating software operator's manual.

Table 5-1. Equipment Required for Software Installation

Item	Manufacturer	Model/Part Number
Personal Computer with Pentium Processor, 64 MB RAM, and 10/100 Base TX Network Capability	Commercially available	
JavaScript Enabled Web Browser	Microsoft Netscape	Internet Explorer 5.0 Netscape 4.04
Test Cable	Locally manufactured (See Figure 5-1.)	
Test Box	Locally Manufactured (See Figure 5-2.)	
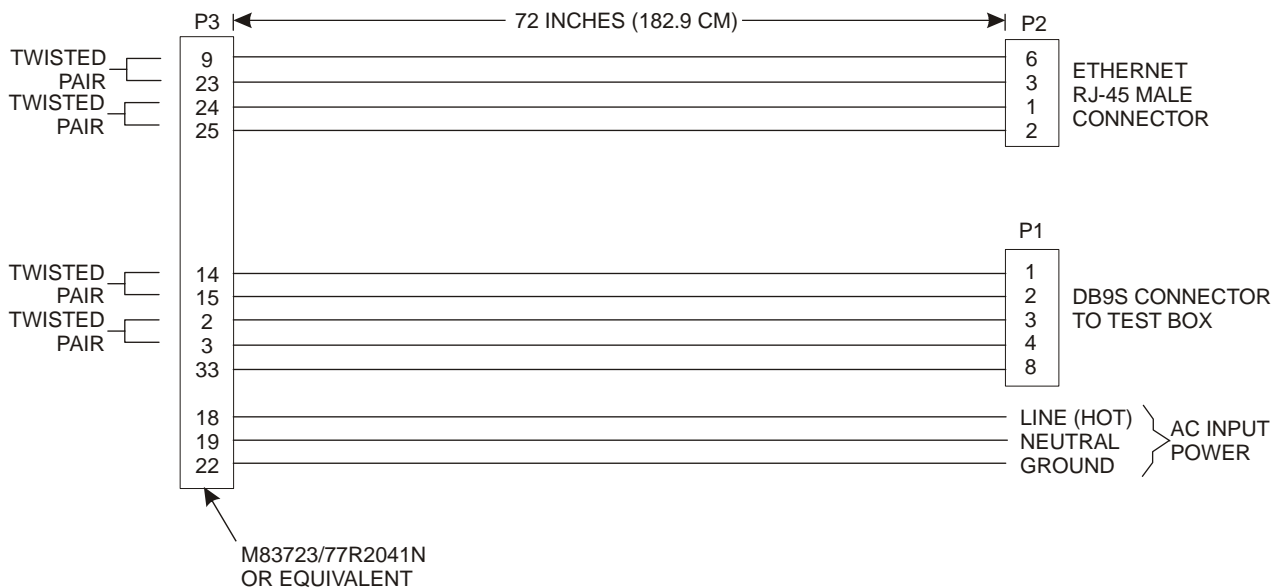
NOTE: Use 24 gauge 4-conductor category 5 twisted pair cable where indicated. For all other wires, use 22 gauge.

0407264-

Figure 5-1. Test Cable

PARTS LIST: J1   DB9P Panel Mount Connector
              S1 and S2   SPST Toggle Switches, 28 VDC, 0.1 A Min.
              S3   SPST Momentary pushbutton switch, 28 VDC, 0.1 A Min.
              All wires are 22 gauge.

0310242-
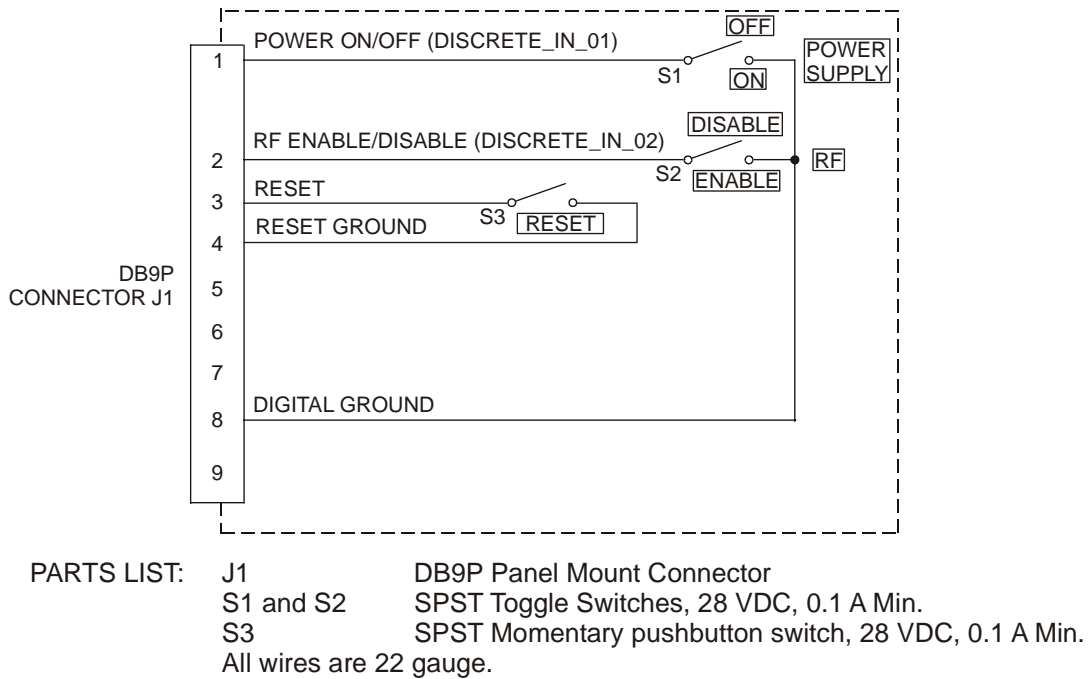
Figure 5-2. Test Box Schematic Diagram

NOTE

Units are configured at the factory for cabin
wireless LAN unit (CWLU) operation using
CAP operating software or for terminal
wireless LAN unit (TWLU) operation using
wireless access bridge (WAB) operating
software. This configuration cannot be
changed in the field.

NOTES: 1. Do not apply input power to test equipment or CAP unit until instructed to do so in test procedure.
2. Set test box POWER SUPPLY switch to OFF (open) position and set RF switch to DISABLE (open) position.
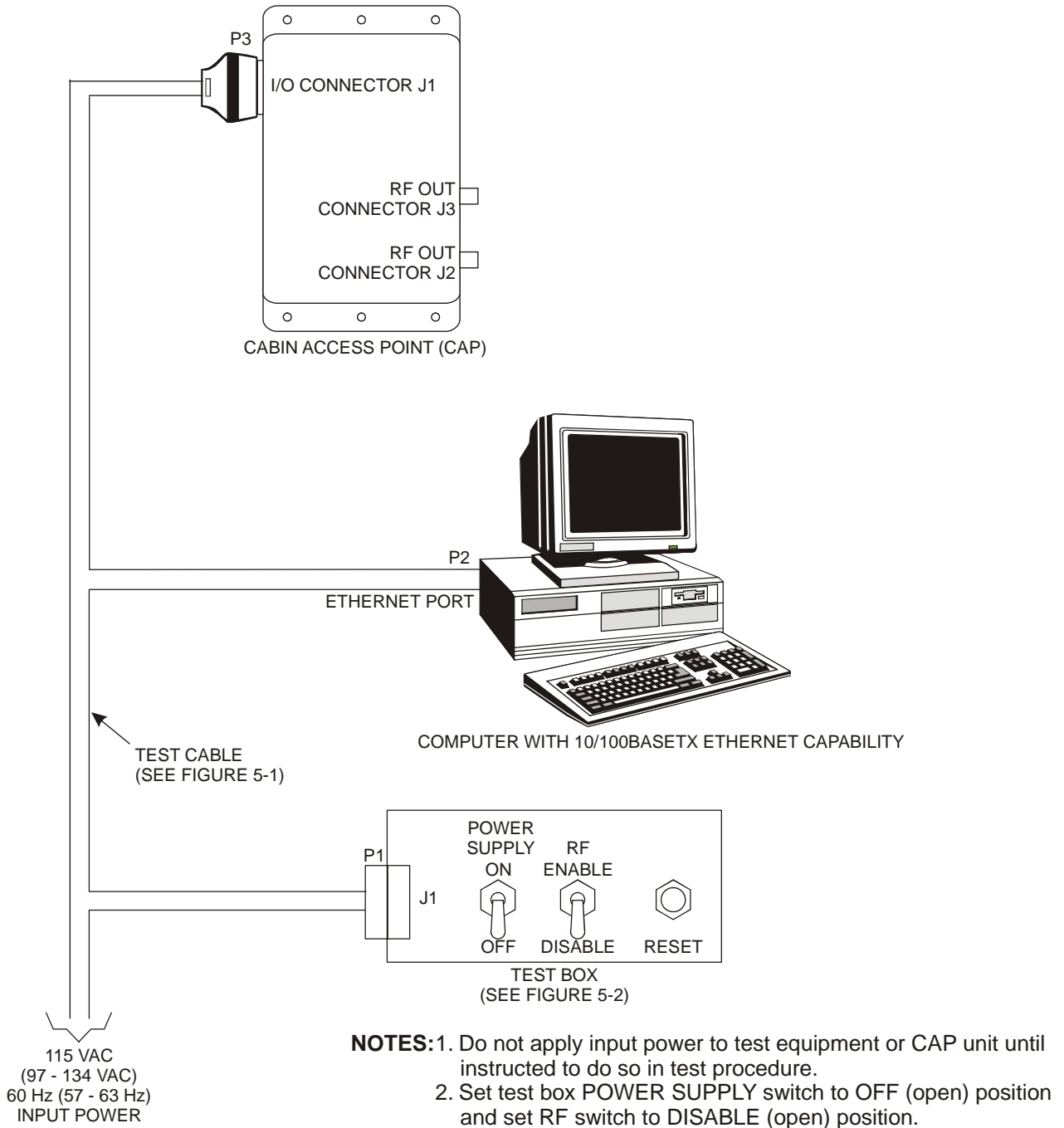
0407265-

Figure 5-3. Test Setup

CHAPTER 6

TROUBLESHOOTING

6-1   INTRODUCTION

This chapter provides instructions for isolating and correcting faults in the cabin access point (CAP). Operator level troubleshooting and repair are limited to correcting errors in the configuration. This chapter provides troubleshooting information related to the CAP unit hardware. Refer to the applicable operating software operator's manual for troubleshooting procedures related to software configuration issues. If a fault cannot be corrected using the procedures provided in this chapter or in the operating software operator's manual, contact Miltope Corporation for authorization to return your CAP for factory repair or refer to component maintenance manual (CMM) 44-30-07 (Miltope part number M365-493). Any unauthorized repair or modification of your CAP will void your warranty.

6-2   CLIENT STATION PROBLEMS

6-2.1   Wireless Client Station Cannot Establish a Wireless Link With the CAP

Symptoms

The wireless client or ground-based access point software cannot find the CAP. If your wireless software has a status display, the CAP is not visible in it.

Causes on the CAP

- Power not applied to the CAP (POWER indicator not lit).
- CAP is disabled by no input to on/off discrete input (POWER indicator lit amber).
- CAP transceiver disabled by no input to RF enable discrete input (RF ENABLE indicator lit amber).
- WEP encryption is enabled on CAP, but not on the client station. (Refer to operating software operator's manual.)
- Security filters are enabled.

Causes on the client station or ground-based access point

- Wireless adapter is not properly installed or configured (wrong drivers, conflicts with other cards in the system).
- Wireless adapter software is not active.
- Two wireless adapters are installed, and are creating a configuration conflict.
- Incorrect network name (ESSID). Make sure it matches the setting on the CAP. (Refer to operating software operator's manual.)
- Incorrect WEP keys. Make sure that the keys match those set on the CaP. (Refer to operating software operator's manual.)

6-2.2   IP Address Mismatch

Before you troubleshoot this problem, make sure that problem described in paragraph 6-2.1 does not exist.

Symptoms

- The client station is unable to access network resources, Web, or e-mail, or aircraft network is unable to access ground-based network resources.
- The client station is unable to renew its IP address.

Cause on the CAP

- IP address configuration on CAP is not compatible with network and/or client stations. (Refer to operating software operator's manual.)

Causes on the client station

- TCP/IP is not installed or not properly configured.

6-2.3   Wireless Client Stations Cannot Connect to the Internet Via the CAP

Before you troubleshoot this problem, make sure that problem described in paragraph 6-2.2 does not exist.

Symptoms

- Web pages time out.
- E-mail cannot be retrieved from external e-mail servers.

Causes on the CAP

- Network Address Translation (NAT) and/or Virtual Private Network (VPN) is not compatible with network and/or client stations. (Refer to operating software operator's manual.).
- Security filters are enabled.

Causes on the client station

- Browser not installed or configured properly (set to use a proxy server, set to use dial-up connection instead of LAN).
- Client station may not be on the same subnet as the CAP.
- No VPN client software is installed.
- VPN client software installed but not started.
- VPN client software has wrong username, password, or IP address set.

Other cause

- DHCP server on LAN is not returning the IP address of the CAP as gateway.
- ISP is down.

6-2.4   <u>**Computers Cannot Share Data or Resources With Other Computers**</u>

Before you troubleshoot this problem, make sure that problem described in paragraph 6-2.2 does not exist.

Symptoms

Network neighborhood does not show other computers on the wireless or wired network (Windows) or cannot ping other computers from a computer using the Linux operating system.

Causes on the client station

- Wrong workgroup names being used.
- NetBIOS not enabled.

6-2.5   <u>**Web Browser Cannot Connect to Management Tool**</u>

Before you troubleshoot this problem, make sure that problem described in paragraph 6-2.2 does not exist.

Symptoms

Management tool home page does not open.

Causes on the CAP

- Local access
    - o Web port was changed in the management tool from default setting. (Refer to operating software operator's manual.)
- Remote access
    - o Management tool security settings are set to block access on the VPN. (Refer to operating software operator's manual.)
    - o CAP is not powered up (POWER indicator not lit).
    - o CAP is disabled by no input at on/off discrete input (POWER indicator is lit amber).
    - o Another client station is currently logged in.
    - o A web server is running on the internal network using a static mapping for HTTPS port 443.

Causes on a local client station

- Wrong IP address was specified. If VPN security is being used, you must specify the starting address of the VPN server address range. (Refer to operating software operator's manual.)

Causes on a remote client station (via Internet)

- Wrong IP address was specified. Use the address visible on the home page. This address may change if you restart the CAP.

6-2.6 <u>Low Throughput</u>

Symptoms

Client computers are experiencing delays when transmitting. One or more of following statistics on the wireless status page are excessively high: Tx multiple retry frames, Tx single retry frames, Tx deferred transmissions

Causes

- Too many client stations are using the network, or one or more clients is monopolizing the bandwidth with excessively large transfers.
- Signal quality to one or more stations is poor or being subject to interference (interference caused by cordless phone or microwave oven for example). This can cause excessive retransmissions of data and collisions. Both create overhead that will slow down overall throughput.
- Antenna installation not optimized for adequate coverage area.
- One or more CAP units are sharing the same operating frequency. This can cause excessive retransmissions to occur, especially if the units are close together.
- The CAP is sharing the same operating frequency with third-party wireless device nearby. This can cause excessive retransmissions to occur, especially if the units are close together.

6-3 CAP PROBLEMS

6-3.1 <u>CAP Allows Any Station to Connect, Regardless of Network Name Being Used</u>

This problem occurs when accept any network name is enabled on the wireless configuration page. (Refer to operating software operator's manual.)

6-3.2 <u>Lost Administrator Password</u>

Refer to operating software operator's manual.

CHAPTER 7

REGULATORY, WIRELESS INTEROPERABILITY, AND HEALTH INFORMATION

7-1   **REGULATORY INFORMATION**

The CAP complies with the following radio frequency and safety standards.

Canada - Industry Canada (IC)

This Class B digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulations. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Cet appareillage numérique de la classe B répond à toutes les exigences de l'interférence canadienne causant des règlements d'équipement. L'opération est sujette aux deux conditions suivantes: (1) ce dispositif peut ne pas causer l'interférence nocive, et (2) ce dispositif doit accepter n'importe quelle interférence reçue, y compris l'interférence qui peut causer l'opération peu désirée.

This device has been designed to operate with antennas having a maximum gain of 3 dB for units configured with Cabin Access Point (CAP) operating software or 5 dB for units configured with Wireless Access Bridge (WAB) operating software. Antennas having a higher gain are strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms.

Europe - EU Declaration of Conformity

Users must select wireless operational settings that conform to local regulations. If more than one unit is deployed, users must ensure that frequencies are spread among different channels according to channel availability.

USA - Federal Communications Commission (FCC)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment also complies with RTCA specification DO-160D section 21.3 (conducted emissions) and section 21.4 (radiated emissions), category M (modified for 2.4 GHz transmission frequency). RTCA specification DO-160D applies to equipment installed and operated aboard aircraft. This equipment generates, uses and can radiate radio frequency energy. If not installed and used in accordance with the instructions provided in this manual and the applicable operating software operator's manual, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user/installer is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment on a circuit different from that to which the receiver is connected.

WARNING

Changes or modifications to this device not
expressly approved by Miltope Corporation
could void the user's authority to operate the
equipment.

Miltope Corporation is not responsible for any interference caused by unauthorized modification of
the CAP, or the substitution or attachment of connecting cables and equipment (antennas) other than
that specified by Miltope Corporation.

The correction of interference caused by such unauthorized modification, substitution or attachment
is the responsibility of the user/installer.

WARNING

Exposure to Radio Frequency (RF) Radiation
In accordance with FCC requirements of human
exposure to radio frequency fields, the radiating
element shall be installed such that a minimum
separation distance of 20 cm (8 inches) is
maintained between it and the user or general
population.

Declaration of Conformity

Miltope Corporation's declaration of conformity with FCC rules and regulations is provided on the
last sheet of this manual.

7-2   WIRELESS INTEROPERABILITY

The WASP is designed to be interoperable with any wireless LAN product that is compliant to:

- The IEEE 802.11a, b, or g standard on wireless LANs, as defined and approved by the Institute
  of Electrical and Electronics Engineers.
- The Wireless Fidelity (WiFi) certification as defined by the Wireless Ethernet Compatibility
  Alliance (WECA).

7-3   **HEALTH INFORMATION**

The CAP, like other radio devices, emits radio frequency electromagnetic energy. The level of energy emitted by the CAP is much less than the electromagnetic energy emitted by other wireless devices, such as mobile phones.

Because the CAP operates within the guidelines found in radio frequency safety standards and recommendations, Miltope Corporation believes that the CAP is safe for use by consumers. These standards and recommendations reflect the consensus of the scientific community and result from deliberations of panels and committees of scientists who continually review and interpret the extensive research literature.

GLOSSARY

Term	*Definition*
3DES	Triple Data Encryption Standard (168 Bit)
ARINC	Aeronautical Radio, Incorporated
CAP	Cabin Access Point
CRC	Cyclic Redundancy Check
CWLU	Cabin Wireless LAN Unit
DHCP	Dynamic Host Configuration Protocol
Diffie-Hellman	Key Cryptography Algorithm/Technique
DN	Distinguished Name
DNS	Domain Name Server/Service
DSSS	Direct Sequence Spread Spectrum
ESSID	Extended Service Set Identifier (Wireless Network Name)
FTP	File Transfer Protocol
HTTPS	Hyper Text Transfer Protocol Secure
IEEE	Institute of Electrical and Electronic Engineers
IKE	Internet Key Exchange
IP	Internet Protocol
IPSec	Secure Internet Protocol
ISAKMP	Internet Security Association and Key Management Protocol
L2TP	Layer 2 Tunneling Protocol
LAN	Local Area Network
LDAP	Lightweight Directory Access Protocol
MAC	Media Access Control
MD5	Message Digest 5
MPDU	MAC Protocol Data Unit
MSCHAP v.2	Microsoft Challenge Handshake Authentication Protocol
MSDU	MAC Service Data Unit
NAT	Network Address Translation
Oakley Group	Key Cryptography Algorithm/Technique
OFDM	Orthogonal Frequency Division Multiplexing
PFS	Perfect Forward Secrecy
PLCP	Physical Layer Convergence Procedure
PPTP	Point-to-Pont Tunneling Protocol
RADIUS	Remote Authentication Dial-In User Server/Service
RFC 2865	Request For Comments - RADIUS
RFC 2866	Request For Comments - RADIUS Accounting
RIP	Routing Information Protocol
RTCA	Radio Technical Commission for Aeronautics
SA	Security Association
SHA-1	Secure Hashing Algorithm 1
SNMP	Simple Network Management Protocol
SSL	Secure Sockets Layer

GLOSSARY (Cont'd.)

Term	*Definition*
TCP/IP	Transmission Control Protocol/Internet Protocol
TFTP	Trivial File Transfer Protocol
TWLU	Terminal Wireless LAN Unit
VPN	Virtual Private Network
WAB	Wireless Access Bridge
WECA	Wireless Ethernet Compatibility Alliance
WEP	Wired Equivalency Privacy
WiFi	Wireless Fidelity
WINS	Windows Internal Naming Service
WLAN	Wireless Local Area Network
X.509	Authentication Framework Implementation – Digital Certificate

VT Miltope

A company of Vision Technologies Systems

<u>DECLARATION OF CONFORMITY</u>

Miltope Corporation hereby declares that this CAP product fully complies with the intent of the Federal Communications Commission (FCC) as specified in Part 15 of the FCC rules and regulations.

With regard to unintentional radiation, the CAP is designed exclusively for operation in an aircraft environment and is therefore exempt from FCC EMC requirements as stated in Title 47, Part 15, Subpart B, Section 15.103a of the FCC regulations. Even so, this product has been tested to Federal Aviation Administration (FAA) EMC requirements, which are considered more stringent than either Class A or Class B FCC EMC requirements. Results of these EMC tests are available upon request.

With regard to intentional radiation, this product is a ruggedized version of a standard commercial product and has been assembled with tested components that have been certified by the FCC. The FCC ID number for the radio frequency transmitter/receiver used in this product is XXXXXXXXXXX. No design modifications have been made to the radio frequency transmitter or receiver that would in any way change its RF characteristics.

Important! Changes or modifications not expressly approved by Miltope Corporation could void this Declaration of Conformity.

_____   _____

Authorized by   Date

VT Miltope

A company of Vision Technologies Systems

DECLARATION OF CONFORMITY WITH FCC RULES FOR ELECTROMAGNETIC COMPATIBILITY

We, Miltope Corporation, of 3800 Richardson Road South, Hope Hull, Alabama 36043, USA, declare under our sole responsibility that the product:

Cabin Access Point (CAP), part nos. 901164-1 and 901164-2

to which this declaration relates:
Complies with the intent of Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.