CHAPTER

44

Cabin Systems

CHAPTER 44
CABIN SYSTEMS

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A = Added, R = Revised, D = Deleted, O = Overflow, C = Customer Originated Change

44-EFFECTIVE PAGES

CHAPTER 44
CABIN SYSTEMS

44-CONTENTS

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PASSENGER ENTERTAINMENT INTRODUCTION

General

The Passenger Entertainment System (IFES) or Multiplexed Entertainment System (MPES) give high-quality digital programs for the passengers.

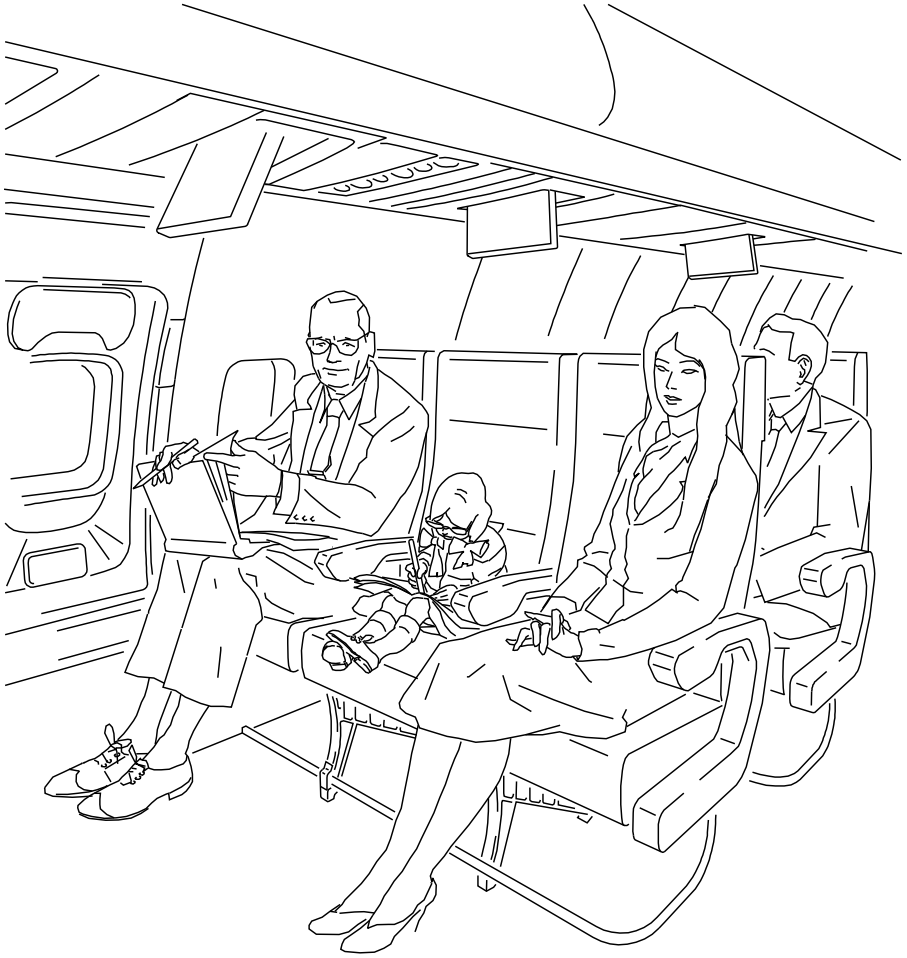
The programs have video and audio. The video and audio signal goes to the monitors throughout the cabin through a standard 100 Mbps fast Ethernet Local Area Network (LAN). Passengers receive this audio through headsets attached to the passenger service units in the seats. The audio can go through the passenger address system. Passengers receive this audio through speakers in the passenger service units.

The IFES or MPES also supply an interface to the Passenger Service System (PSS). The system lets the passengers turn on the reading light and the attendant call function.

Abbreviations and Acronyms

- AC - alternating current
- ADIRU - air data inertial reference unit
- AMUX - Audio Multiplexer
- BITE - built-in test equipment
- CB - circuit breaker
- CONT - control
- CP - crew panel
- DC - direct current
- PCU - passenger control unit
- RJU - remote jack unit
- VSEB - video seat electronics box
- LED - light emitting diode
- OU - outlet unit
- RJM - remote jack module
- PED - personal electronic device
- SC-A - system controller - audio

PASSENGER ENTERTAINMENT INTRODUCTION



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PASSENGER ENTERTAINMENT SYSTEM - INTRODUCTION

GENERAL DESCRIPTION

General

The passenger entertainment system provides digital audio, audio/video on demand (AVOD), video games and PC power system to the passengers, if available.

The IFES or MPES control component is located on the E8 rack in the EE Bay. Audio and Video signals and system control signals are sent from the E8 rack to the IFES or MPES power and network distribution components through a standard 100 Mbps fast Ethernet Local Area Network (LAN). Power and network signals are then distributed as streamed data throughout the aircraft cabin to the passenger seat and cabin crew interface components.

In the emergency stowage box, located in the Aft face of Lav A is the Crew Panel (CP). The CP has a cabin interface to control and monitor the IFES or MPES while in-flight and on the ground. The CP also has an interface for maintenance personnel to perform maintenance on the IFES or MPES.

Components

These are the major components of the server based entertainment system:

- Crew Panel
- Passenger Control Unit (PCU)
- Seat Electronics Box (SEB)
- System Controller - Audio (SC-A)
- Video Monitor

Control

The In-seat audio and video channels and volume can be selected and adjusted by the passenger using a PCU. The passengers can listen to the selected audio and video channels by connecting a headset to the RJU.

The IFES or MPES control components send and receive data on an Ethernet network. The SC-A and CP controls the IFES or MPES. The SC-A is the primary interface between the entertainment system and the aircraft avionics equipment. The CP controls the IFES or MPES BITE and stores and applies audio and video media for broadcasting.

The CP is the primary control interface between the entertainment system and cabin and maintenance crews. Configuration and commands are done at the CP for the IPES or MPES.

Decompression

The oxygen indicator relay supplies a discrete to the SC if the cabin loses cabin pressure. This sends a pre-recorded emergency message announcement to the PA amplifier.

Fasten Seat Belt Audio Message

When the crew turns on the Fasten Seats Belt sign, a discrete signal is sent to the SC. This sends a pre-recorded fasten seat belt announcement to the PA amplifier. The passenger signs panel also sends the discrete to the PA amplifier to generate a chime.

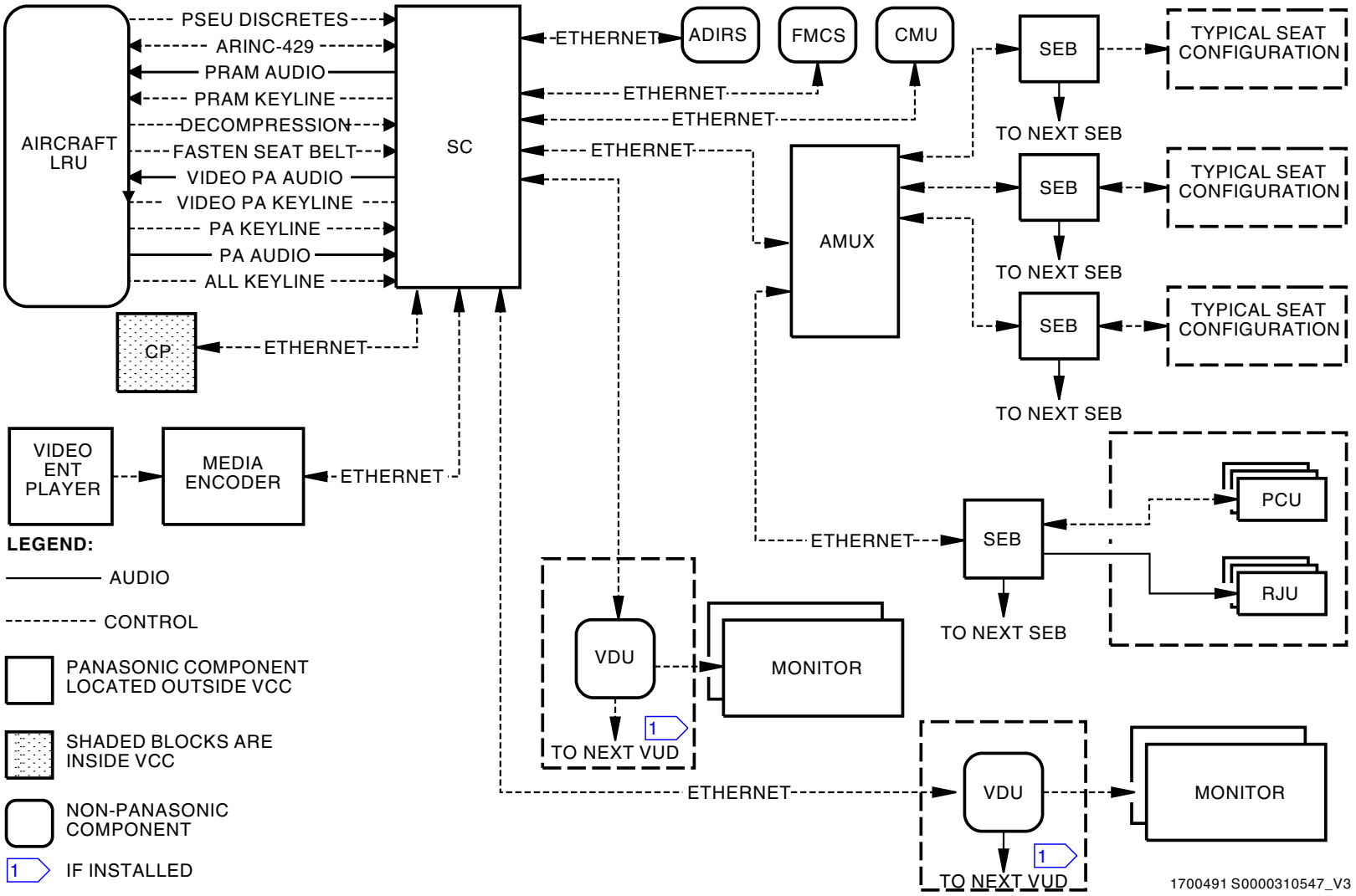
Ethernet Network

The IFES or MPES Ethernet network have a set of units serially connected by two balanced and twisted pair wire. All units attached to an Ethernet but are connected to a shared signalling system. The Ethernet signals are transmitted serially, one bit at a time, over the shared signal channel to every attached unit. To send data a unit first listens to the channel and when the channel is idle the unit transmits its data in the form of an Ethernet frame or packets, thereby preventing data collisions on the data bus. If the channel is busy, the unit continues to listen until the channel is idle.

The Ethernet data frame consist of a set of bits organized into several fields. These includes address field, a variable size data field that carries from 46 to 1500 bytes of data and an error checking field that checks the integrity of the bits in the frame to make sure that the frame has arrived.

The first two fields in the frame carry 48-bit addresses, called the destination and source addresses. All units connected on the network look at the destination address. The unit with the same address as the destination address in the frame reads in the entire frames. All other units stop reading the frame when the destination address does not match their own address.

GENERAL DESCRIPTION



PASSENGER ENTERTAINMENT SYSTEM - BLOCK DIAGRAM

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COMPONENT DESCRIPTION

General

The In-Flight Entertainment System (IFES) or Multiplexed Entertainment System (MPES) consist of these Line Replaceable Units (LRUs):

- Audio BITE Panel (BP)
- Crew Panel (CP)
- Passenger Control Unit (PCU)
- Proximity Switch Electronics Unit (PSEU)
- Remote Jack Unit (RJU)
- Seat Electronics Box (SEB)
- System Controller - Audio (SC-A)

Audio BITE Panel (BP)

The Audio BITE panel (BP) is a component of the Audio Entertainment System, which provides passenger audio entertainment on aircraft.

The BP is connected to the main multiplexer (MM) and is used for the following purposes:

- Initiation of a BITE (built-in test equipment) mode
- Display of the BITE result data
- Preparation and editing of CCS data
- Loading of the CCS data to and from a personal computer via its serial communications port

Crew Panel (CP)

The Crew Panel (CP) gives the aircraft crew access to configuration and maintenance control of the IFES or MPES. The CP has a color TFT - LCD display with optional built-in function keys for user interface. There is also a touchscreen user interface available.

The CP has the capability of multiple CP installations in a single aircraft and provides the capability of storing data and cabin zone control. The CP uses an Ethernet interface to communicate with other components of the IFES or MPES. The CP provides these functions, all of which are controlled through the CP software screens. The functions are control of cabin zone to video source mapping, control of the entertainment and passenger address cabin zone configuration, initiation of Built-in Test Equipment (BITE) requests to all peripherals and storage of resulting BITE data for fault isolation, and control of all peripherals, including preview of video and audio programs. The CP also provides two USB ports for connecting peripherals devices (keyboard, floppy drive or smart card reader) and two mono audio outputs for previewing audio or video.

The CP is also equipped with an external RJ-45 jack, a noise canceling audio jack and updated USB 2.0 jacks. The CP also has a handset interface and a DSP feature for processing audio (telephone, entertainment, PA) and video functions.

Passenger Control Unit

The Passenger Control Unit (PCU) is one system for passengers to interface the IFES or MPES. The PCU can be installed in a top-mount or side-mount position.

The basic function of the PCUs are audio volume control, and audio and video channel selection. Each PCU is equipped with a 2 digit, 7 segment LCD display to indicated the PCU status. The PCU display provides status indication such as audio channel selection status and video channel selection status.

Proximity Switch Electronics Unit

The Proximity Switch Electronics Unit (PSEU) gathers information from proximity sensors to determine the flight phase. The PSEU then sends discretes to the System Controller (SC) to provide it with flight phase information. The SC can start or stop the video programs when the airplane gets to a specific flight phase.

COMPONENT DESCRIPTION

The Proximity Switch Electronics Unit (PSEU) gathers information from proximity sensors to determine the flight phase. The PSEU then sends discretes to the System Controller - Audio (SC-A) to provide it with flight phase information. The SC-A can start or stop the video programs with the airplane gets to a specific flight phase.

The PSEU provides these discretes to the SC or SC-A:

- Air/Ground discrete - set when the airplane is on the ground.
- Engine On/Off discrete - set when the engines are on.
- Parking Brake discrete - set when the parking brake is set and the airplane is on the ground.
- Nose Landing Gear discrete - set when the nose landing gear is down and locked.

Remote Jack Unit

The Remote Jack Unit (RJU) is a headset jack for connection of an audio headset to allow the passengers to listen to entertainment audio at each seat.

Seat Electronics Box

The Seat Electronics Box (SEB) provides distribution of data, audio and video entertainment, telephone, and passenger service functions to the passenger seats. The basic functions of the SEB are to support Ethernet connection to the Area Distribution Box and to adjacent SEBs, support for Ethernet interfaces to laptop, support for interfaces to USB passenger control units, support for interfaces to USB peripherals, support for an interface to one USB telephone, support for PA override functionality, and support for Ethernet interface to the Smart Display Unit (SDU).

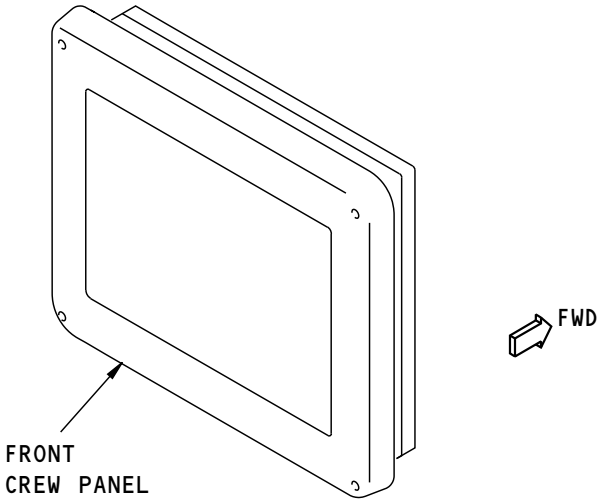
System Controller - Audio

The System Controller - Audio (SC-A) gives a stable, high-performance platform for software applications and cabin management data to configure the functions and features of the IFES or MPES. It provides a fully digital server with 160 GB of usable storage for storing digital media, system operational software, usage statistics, maintenance data, configuration data, and many other items as required by the customer. The SC-A interfaces with the aircraft systems and broadcasts audio, video and moving map media to the overhead distribution system and legacy audio entertainment system.

The basic functions of the SC-A is to act as a network router between the seat network and the head-end equipment using a 100 Mbps Ethernet, The SC-A can support transmission and reception of passenger service data and commands, provide 100 Mbps Ethernet to communicate with the crew panel, provided ARINC-429 interfaces to aircraft systems, support PA audio zones and overriding entertainment audio during PA announcements, support keyline inputs and outputs from aircraft systems, and provide baseband video and audio outputs to aircraft systems.

In addition to storing digital media the SC-A can also send and receive information to and from analog sources. The SC-A can receive up to three analog video sources from the cameras. The SC-A also provides ports to receive information from up to two audio entertainment sources. These sources may include standard passenger flight information system products, landscape cameras, CD players, satellite or terrestrial systems, etc.

COMPONENT DESCRIPTION



CREW PANEL

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SYSTEM COMPONENTS

CONTROL INTERFACES

General

The IFES or MPES control components send and receive data on an Ethernet LAN or data bus. The system control functions for the IFES or MPES are done by the following:

- Audio BITE Panel
- Attendant Control Panel (ACP)
- Crew Panel (CP)
- System Controller (SC)

Audio BITE Panel

The Audio BITE panel sets the configuration of the passenger seats and starts the test of the PES-audio. The BITE panel also shows the result of the test.

Attendant Control Panel

The Attendant Control Panel (ACP) is used by the crew to control the IFE power functions for the following system:

- IFE/Entertainment

SIA 703-714, 716-999; SIA 702 POST SB 737-44-1011

- External Communication System

SIA ALL

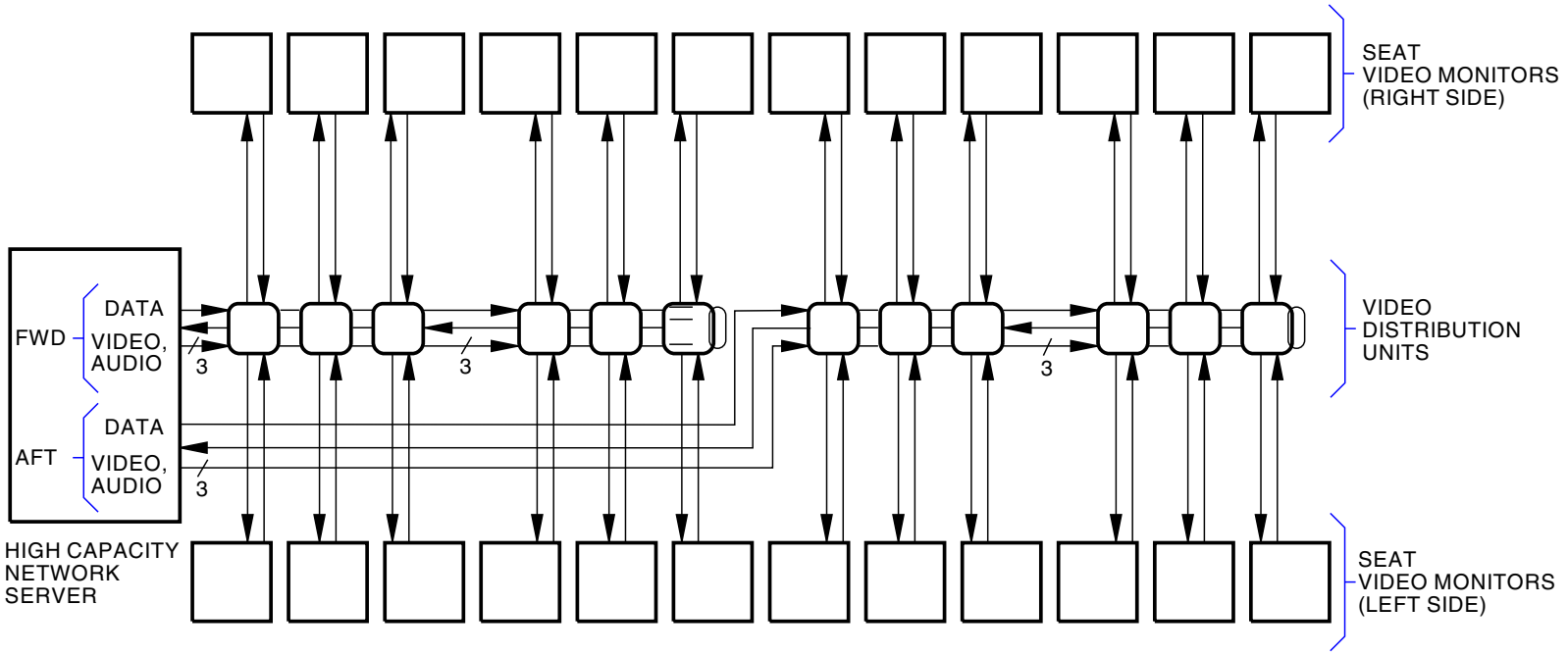
Crew Panel

The Crew Panel (CP) is the primary interface between the IFES or MPES and cabin and maintenance crews. IFES or MPES configuration and commands are accomplished at the CP.

System Controller - Audio

The System Controller - Audio (SC-A) is the primary interface between the IFES or MPES and the aircraft avionics equipment. The SC-A controls the IFES or MPES Built-In Test Equipment (BITE). The SC-A keeps and supplies audio and video media for broadcast.

CONTROL INTERFACES



PES - BLOCK DIAGRAM (EXAMPLE)

LEGEND:

NON-PANASONIC COMPONENT

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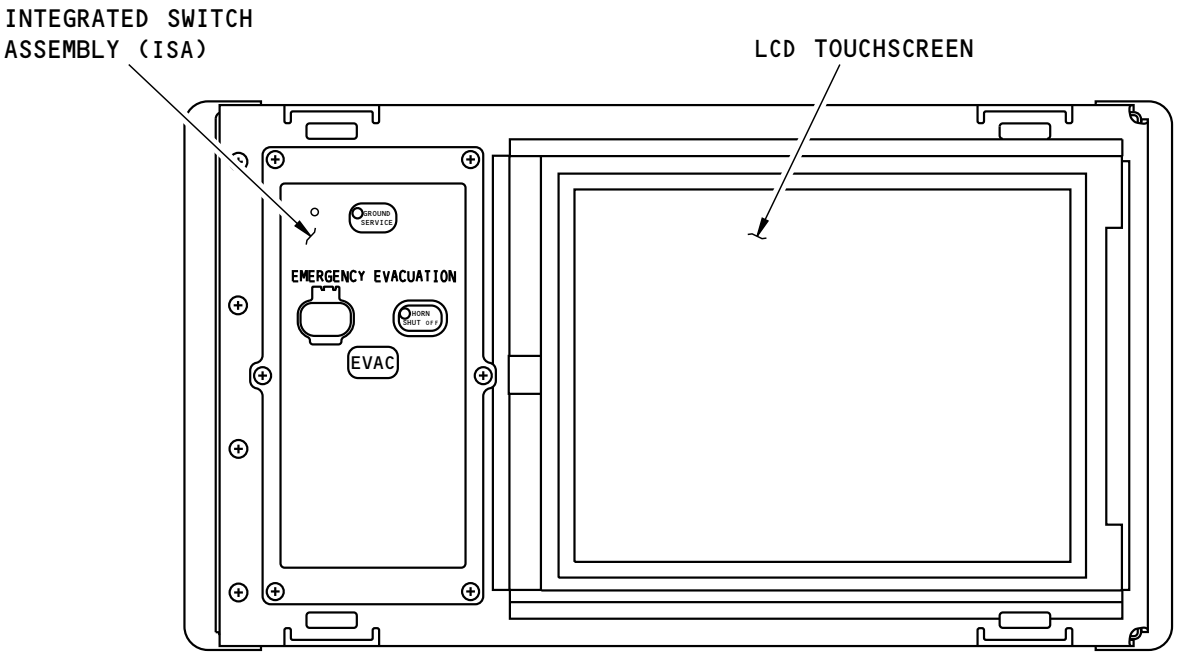
VIDEO AND CONTROL INTERFACES

CONTROL INTERFACES



ATTENDANT CONTROL PANEL
(EXAMPLE)

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ATTENDANT CONTROL PANEL

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EXTERNAL COMMUNICATION SYSTEM INTRODUCTION

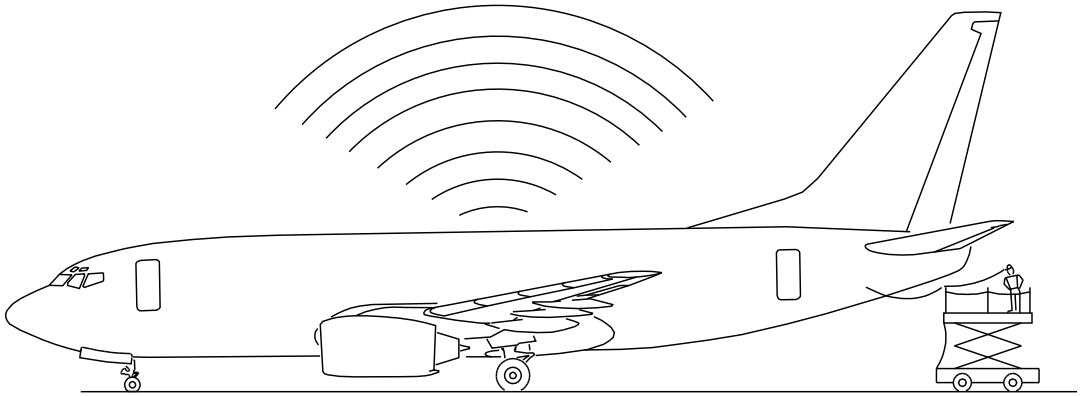
General

The external communication system provides reliable means of communicating with the aircraft while grounded. Through the use of the GSM Cell Data Mode (CDM), also referred to as Cell Modem (CM), data can be transferred wirelessly from the In-Flight Entertainment (IFE) system on the aircraft to a terminal receiving station.

Abbreviations and Acronyms

- ADB - Area distribution box
- CMD/CM - Cell Data Modem/Cell Modem
- CP - Crew Panel
- IFE - In-Flight Entertainment
- SC - System Controller

EXTERNAL COMMUNICATION SYSTEM INTRODUCTION



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EXTERNAL COMMUNICATION SYSTEM INTRODUCTION

COMPONENT DESCRIPTION

General

The following components are part of the external communication system:

- GSM Cell Modem

The following components are part of the In-Flight Entertainment system but work in conjunction with the external communication system components:

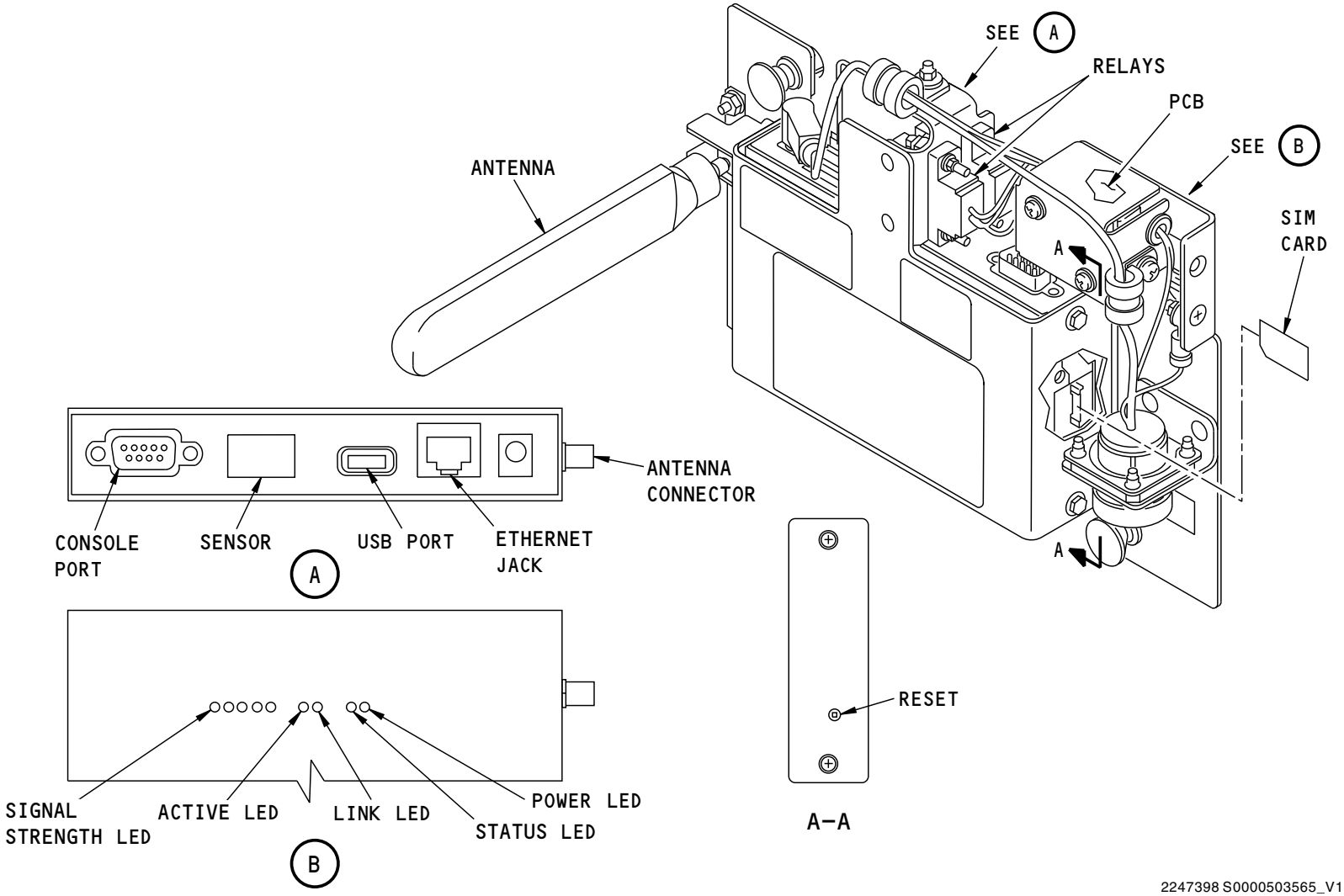
- Area Distribution Box
- Crew Panel
- System Controller

GSM Cell Modem

The Global System for Mobile Communications (GSM) Cellular Data Modem (CM) is a component of the IFE system that provides a private Internet Protocol (IP) networking connection with the Panasonic Network Operations Center (NOC) using GSM Wireless packet Data Services. The CM has an integrated antenna that can automatically and securely transmit and receive data (i.e. BITE, software configuration files, OneMedia, crew manuals) from the aircraft while it is on the ground.

The CM communicates with the IFE system through an RJ-45 connection and the existing Ethernet data bus between the System Controller and the Area Distribution Box. Any data received from the CM, media files for example, can then be distributed to on board passengers. The crew panel is used to preform operational and functional test of the CM.

COMPONENT DESCRIPTION



CELL MODEM COMPONENT DESCRIPTION

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GLOBAL COMMUNICATIONS SUITE INTRODUCTION

General

Global Communications Suite is comprised of the following:

The eXConnect (also called eXW) provides two-way broadband connectivity to an aircraft. It supports a wide range of passenger and crew applications, including Internet access, voice, data, and the ability to monitor and transmit airline operational data in real time.

Abbreviations and Acronyms

- BITE - Built-In-Test Equipment
- CMI - Cabin Management Interface
- CP - Crew Panel
- DSSS - Direct Sequence Spread Spectrum
- FS - File Server
- GHz - Gigahertz
- GPRS - General Packet Radio Service
- IEEE - Institute of Electrical and Electronics Engineers, Inc.
- IFES - In-Flight Entertainment System
- MPEG - Moving Picture Experts Group
- PA - Passenger Address
- PED - Portable Electronic Device
- SMS - Short Message Service
- SNR - Signal-to-Noise Ratio
- TNC - Threaded Neill–Concelman
- USB - Universal Serial Bus
- WAP - Wireless Access Point
- WLAN - Wireless Local Area Network

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Media and Data Communication

- Media Streaming

  The eXW IFES supports the delivery of media content and services to passenger devices over an IEEE 802.11 wireless network at 2.4 GHz and 5 GHz frequencies in the cabin.

  The eXW IFES supports streaming MPEG4 format H.264 encoded video at a bit rate of 600 kbps. The bit rate increases to approximately 850 kbps when audio and overhead files are added.

- Pause Function

  Upon receipt of a Passenger Address (PA), or Video PA, all applicable media passenger media pauses. A pop-up message is shown on the passenger devices, and all media player controls are unavailable.

- Load Balancing

  eXConnect supports streaming media at a bit rate of 1 Mbps. The audio and video media is streamed from a WAP to a PED.

  eXConnect dynamically assigns PEDs to WAP radios based upon the number of PED connections per WAP radio and Signal Strength (SNR).

- Media Content and Software Loading

  eXConnect media content and software are loaded at the Ethernet port. A light media content or software load can be done from the USB port.

- BITE/Maintenance Function

  The CMI allows the operator to command built-in test equipment, to check software configuration and do various maintenance activities.

- Security Function

  eXConnect includes a public network. The PEDs do not have access to the Aircraft system network.

Wireless Communication

eXConnect allows supported passenger devices to connect to the system and supports wireless protocol of IEEE 802.11 for the devices' wireless connection.

Portal Access Methods

eXConnect supports six WAP allocation using six 5 GHz channels and three to four 2.4 GHz channels.

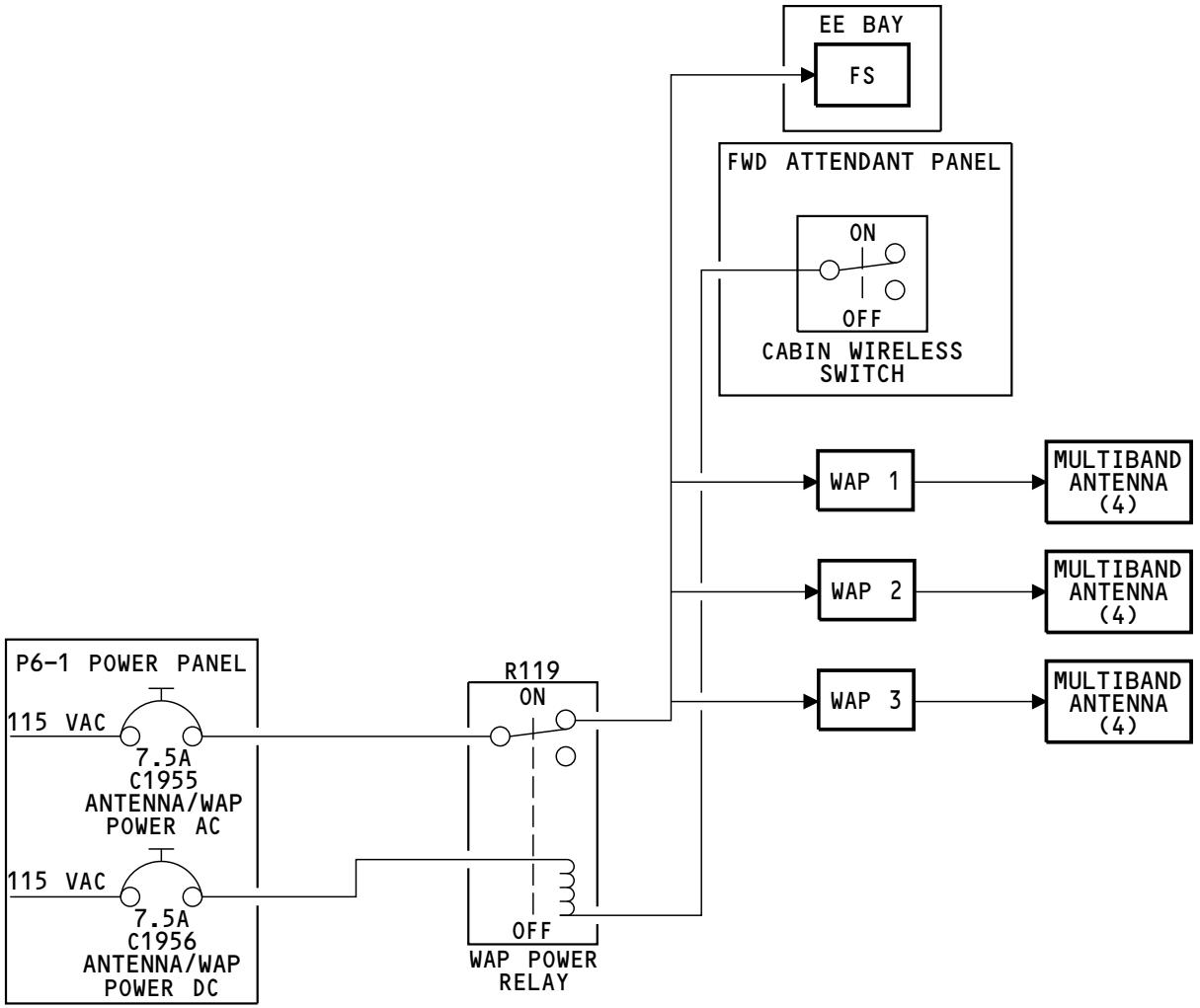
The eXConnect Portal and public network can be accessed wirelessly via the WAPs.

Control

The CP is the primary control interface between the Global Communication Suite and cabin or maintenance crews. Global Communication Suite configuration and commands are done at the CP.

The eXConnect power supply is controlled through CABIN WIRELESS switch.

GENERAL DESCRIPTION



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GLOBAL COMMUNICATION SUITE - INTRODUCTION

COMPONENT DESCRIPTION

General

The following components are part of the Global Communication Suite system:

- Wireless Access Point (WAP)
- Wireless Access Point (WAP) Antenna
- File Server (FS)

The following components are part of the In-Flight Entertainment system but work in conjunction with the Global Communication Suite system components:

- Crew Panel

Wireless Access Point (WAP) Antenna

The Multiband Antenna is a horizontally polarized antenna that is designed to provide worldwide IEEE 802.11 Wireless Local Area Network (WLAN) coverage. The Multiband Antenna operates in the lower (2.39 - 2.49 GHz) and upper (4.9 - 5.9 GHz) WLAN bands.

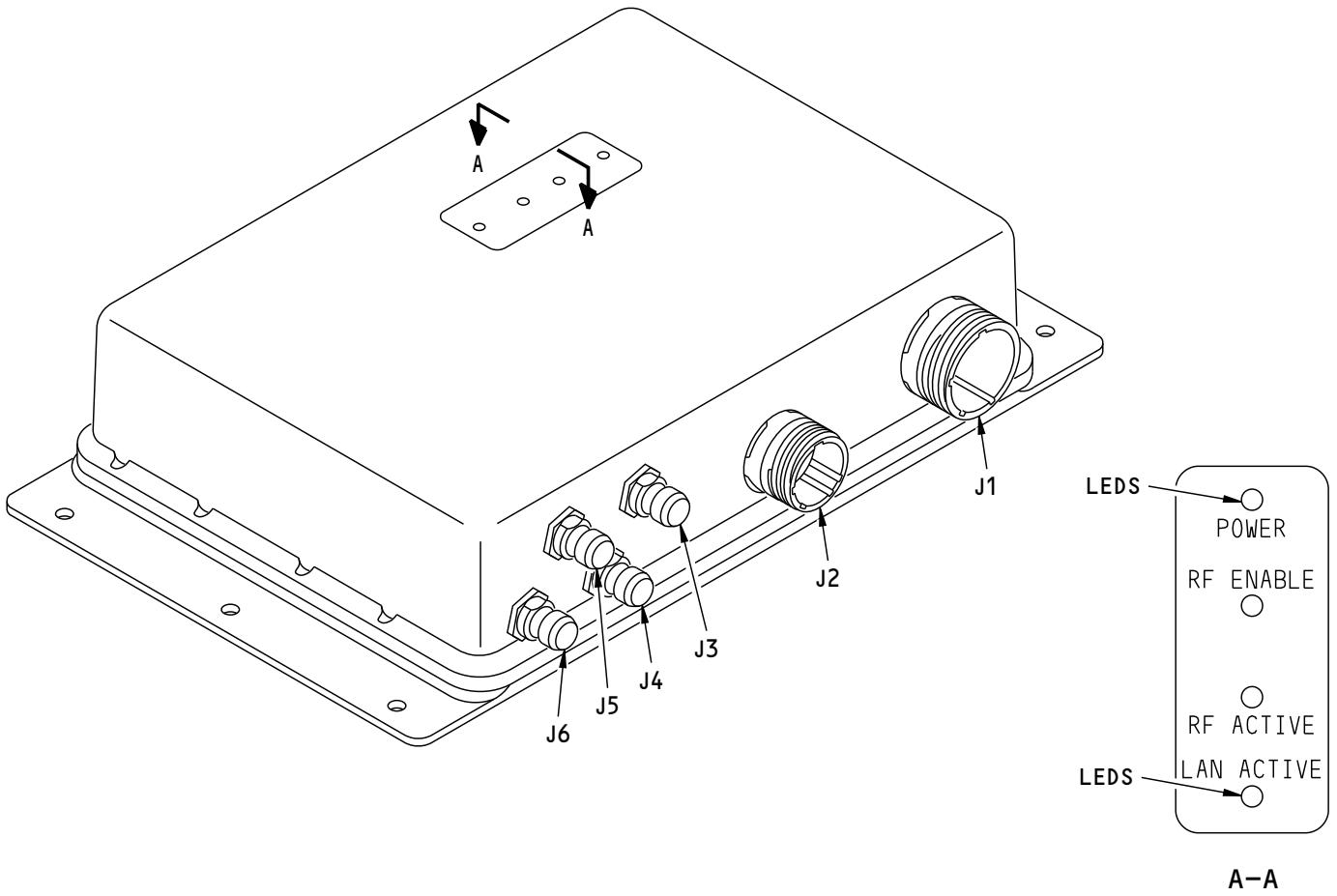
Wireless Access Point (WAP)

The Wireless Access Point (WAP) is a wireless communication device. The WAP uses DSSS radio technology in the 2.4-GHz ISM radio frequency spectrum to communicate with IEEE 802.11 compliant wireless devices.

The WAP can be configured as follows:

- For operation as a Cabin Wireless LAN Unit (CWLU) to create a Wireless Local Area Network (WLAN) on an aircraft
- For operation as a CWLU with access control capability such as a firewall, full-featured router, or captive portal redirection
- For operation as a Terminal Wireless LAN Unit (TWLU) to establish a wireless bridge between the aircraft network and a ground-based network

COMPONENT DESCRIPTION



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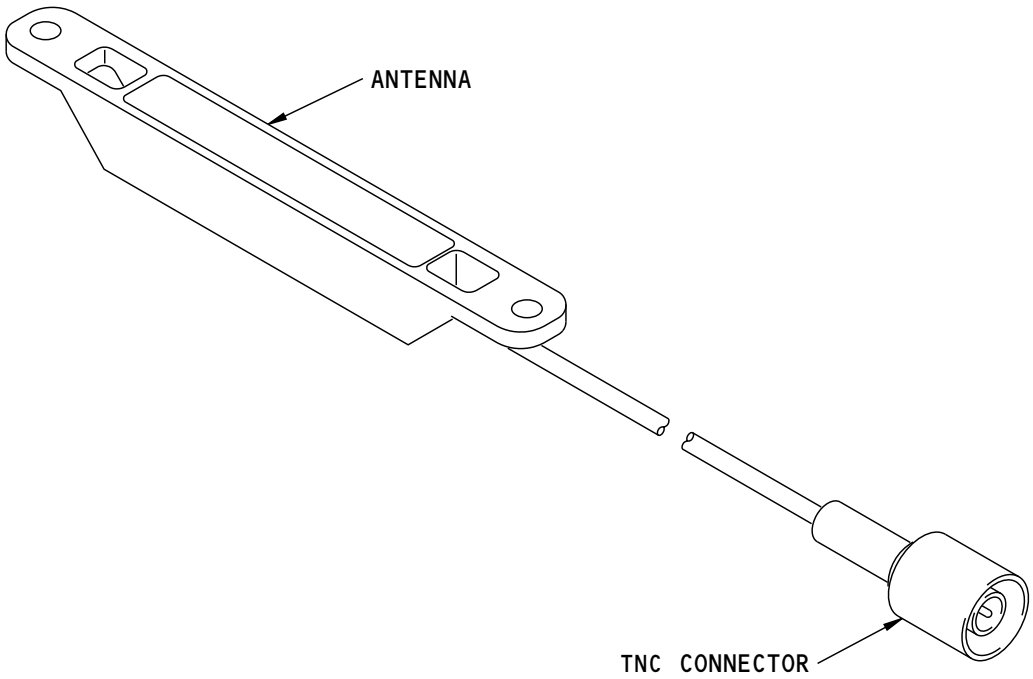
WIRELESS ACCESS POINT (WAP)

COMPONENT DESCRIPTION



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WIRELESS ACCESS POINT (WAP) ANTENNA