

Aircraft Video Camera (CAM-AIR) Instrument Handbook

A Matthews

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Acronyms and Abbreviations

AAF	ARM Aerial Facility
ACE-ENA	Aerosol and Cloud Experiments in the Eastern North Atlantic
ARM	Atmospheric Radiation Measurement
CACTI	Cloud, Aerosol, and Complex Terrain Interactions
CAM-AIR	aircraft video camera
DC	direct current
IP	internet protocol

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1.0 Instrument Title

AXIS video camera P1344 and P1347



Figure 1. Forward AXIS camera (P-1344).

2.0 Mentor Contact Information

Alyssa Matthews
Pacific Northwest National Laboratory
P.O. Box 999, MSIN K9-24
Richland, Washington 99354

Albert Mendoza
Pacific Northwest National Laboratory
P.O. Box 999, MSIN K5-25
Richland, Washington 99354

3.0 Vendor/Developer Contact Information

Vendor:

AXIS Communications

Corporate Headquarters:

Lund Sweden
AXIS Communications AB
Emdalavagen 14
SE-223 69 Lund
Tel: +46 46 272 18 00
Fax: +46 46 13 61 30

United States Sales Office:

AXIS Communications Inc.
300 Apollo Drive
Chelmsford, Massachusetts 01824
+1 978 614 2000
+1 978 614 2100

Please refer to the AXIS website for a listing of more sales offices around the world.

4.0 Instrument Description

The U.S. Department of Energy Atmospheric Radiation Measurement (ARM) Aerial Facility (AAF) video cameras are installed in the cockpit of ARM's research aircraft looking forward and in the belly of the plane looking down at the ground. Prior to the Aerosol and Cloud Experiments in the Eastern North Atlantic (ACE-ENA) field campaign in the Azores during 2017, the P1344 camera was flown in the forward (cockpit) position and the P1347 camera was flown in the nadir (belly) position. Since only the forward camera was flown for ACE-ENA and the Cloud, Aerosol, and Complex Terrain Interactions (CACTI) field campaign in Argentina during 2018–2019, the camera with the higher resolution (P1347) was moved to the cockpit.



Figure 2. Nadir video camera P1347.

5.0 Measurements Taken

The forward and nadir video camera images, taken every minute during flight and combined into a video, provide context for the measurements taken by other instruments on board the aircraft. The forward camera shows if the plane is in cloud or clear air, as well as provide an overall context of the cloud field that day. The nadir camera shows the surface the aircraft is flying over, such as land, water, or cloud, which can provide insight into factors affecting the on-board nadir radiometers. Additionally, the nadir camera images are useful for determining vegetation cover.



Figure 3. Sample still image from the forward video camera during CACTI.

6.0 Links to Definitions and Relevant Information

6.1 Data Object Description

The two video camera image sets are combined into a forward and a nadir MP4 video of images taken every minute from the respective camera.

6.2 Data Ordering

The data are available for download on the ARM Data Discovery website <https://adc.arm.gov/discovery/> under the instrument name ‘cam-air’ and Data Discovery will re-direct you to the download location. An ARM user account is required to access the data.

6.3 Data Plots

Data plots are not created for this instrument.

6.4 Data Quality

Data quality is reported through ARM’s Data Quality Reports and will document missing or bad data. The download link also contains a read-me file that contains a table of data quality.

6.5 Calibration Database

There is no calibration database for this instrument.

7.0 Technical Specification

From the online user manual provided by the vendor:

P1344

Function/group	Item	Specifications
Camera	Model	AXIS P1344
	Image sensor	Progressive scan RGB CMOS 1/4"
	Lens	Varifocal f=3 – 8 mm, F1.2, DC-Iris, CS mount Horizontal angle of view: 66° – 27° Vertical angle of view: 44° – 18° Diagonal angle of view: 84° – 32°
	Day and night functionality	Automatically removable infrared-cut filter
	Minimum illumination	Color: 0.3 lux, F1.2 B/W: 0.05 lux, F1.2
	Shutter time	1/24500 s to 1/6 s
Video	Video compression	H.264 (MPEG-4 Part 10/AVC, Baseline profile) Motion JPEG
	Resolutions	1440x900 (1.3 MP) scaled resolution available via VAPIX® 1280x800 (1 MP) to 160x90
	Frame rate H.264	30 fps in all resolutions
	Frame rate Motion JPEG	30 fps in all resolutions
	Video streaming	Multiple, individually configurable streams in H.264 and Motion JPEG Controllable frame rate and bandwidth VBR/CBR H.264
	Pan/Tilt/Zoom	Digital PTZ, preset positions, guard tour
	Image settings	Compression, color, brightness, sharpness, contrast, white balance, exposure control, exposure zones, backlight compensation, fine tuning of behavior at low light Rotation: 0°, 90°, 180°, 270° Mirroring of images Text and image overlay Privacy mask Corridor Format™ Wide dynamic range – dynamic contrast
Audio	Audio streaming	Two-way, full duplex
	Audio compression	AAC LC 8 kHz 32 kbit/s, 16 kHz 64 kbit/s G.711 PCM 8 kHz 64 kbit/s G.726 ADPCM 8 kHz 32 kbit/s or 24 kbit/s Configurable bit rate
	Audio input	3.5 mm jack for mic/line in, max 80 mVpp for microphone/max 6.2 Vpp for line signal Impedance: Min 1 kΩ, Mic-Power activated; Min 4 kΩ line Tip: Signal/Bias Ring: Bias Sleeve: Ground Power to external electret microphone: 1.3 V – 2.6 V (DC) SNR: > 40dB
	Audio output	3.5 mm jack for line out. max 2.8 Vpp Impedance: max 100 Ω, normal < 1 Ω SNR: > 40dB

Function/group	Item	Specifications
	Built-in microphone specification	Sensitivity: -36 dB \pm 2 dB (0 dB = 1 V/Pa, 1 kHz) Max input (SPL): 100 dB
Network	Security	Password protection, IP address filtering, HTTPS encryption*, IEEE 802.1X network access control*, digest authentication, user access log *This product includes software developed by the Open SSL Project for use in the Open SSL Toolkit (www.openssl.org)
	Supported protocols	IPv4/v6, HTTP, HTTPS*, SSL/TLS*, QoS Layer 3 DiffServ, FTP, SMTP, Bonjour, UPnP, SNMPv1/v2c/v3(MIB-II), DNS, DynDNS, NTP, RTSP, RTP, TCP, UDP, IGMP, RTCP, ICMP, DHCP, ARP, SOCKS *This product includes software developed by the Open SSL Project for use in the Open SSL Toolkit (www.openssl.org)
System Integration	Application Programming Interface	Open API for software integration, including VAPIX® and AXIS Camera Application Platform from Axis Communications; specifications available at www.axis.com Includes the ONVIF specification available at www.onvif.org Support for AXIS Video Hosting System (AVHS) with One-Click Camera Connection
	Intelligent video	Video motion detection, active tampering alarm, audio detection, Support for AXIS Camera Application Platform enabling installation of additional applications
	Triggers	Intelligent video, day/night mode, digital I/O, manual trigger, PTZ preset, PTZ moving, network lost, storage status, system initializing
	Actions	File upload via FTP, HTTP and email Notification via email, HTTP and TCP Video and audio recording to edge storage Pre- and post-alarm video buffering External output activation PTZ preset Guard tour Play audio clip Status LED Day/night vision mode
	Video access from web browser	Camera live view Video recording to file (ASF) Customizable HTML pages Windows 7, Windows Vista, Windows XP, Windows Server 2008, Windows Server 2003 DirectX 9c or higher For other operating systems and browsers, see www.axis.com/techsup
	Management and maintenance	AXIS Camera Management tool on CD and web-based configuration Firmware upgrades over HTTP or FTP, firmware available on www.axis.com
	Installation aids	Focus assistant, pixel counter Remote back focus

P1347

Function/group	Item	Specifications
Audio	Audio streaming	Two-way, full duplex
	Audio compression	AAC LC 8 kHz 32 kbit/s, 16 kHz 64 kbit/s G.711 PCM 8 kHz 64 kbit/s G.726 ADPCM 8 kHz 32 kbit/s or 24 kbit/s Configurable bit rate
	Audio input	3.5 mm jack for mic/line in, max 80 mVpp for microphone/max 6.2 Vpp for line signal Impedance: Min 1 k Ω , Mic-Power activated; Min 4 k Ω line Tip: Signal/Bias Ring: Bias Sleeve: Ground Power to external electret microphone: 1.3 V – 2.6 V (DC) SNR: > 40dB
	Audio output	3.5 mm jack for line out, max 2.8 Vpp Impedance: max 100 Ω , normal < 1 Ω SNR: > 40dB
	Built-in microphone specification	Sensitivity: -36 dB \pm 2 dB (0 dB = 1 V/Pa, 1 kHz) Max input (SPL): 100 dB
Network	Security	Password protection, IP address filtering, HTTPS encryption*, IEEE 802.1X network access control*, digest authentication, user access log *This product includes software developed by the Open SSL Project for use in the Open SSL Toolkit (www.openssl.org)
	Supported protocols	IPv4/v6, HTTP, HTTPS*, SSL/TLS*, QoS Layer 3 DiffServ, FTP, SMTP, Bonjour, UPnP, SNMPv1/v2c/v3(MIB-II), DNS, DynDNS, NTP, RTSP, RTP, TCP, UDP, IGMP, RTCP, ICMP, DHCP, ARP, SOCKS *This product includes software developed by the Open SSL Project for use in the Open SSL Toolkit (www.openssl.org)
System Integration	Application Programming Interface	Open API for software integration, including VAPIX® and AXIS Camera Application Platform from Axis Communications; specifications available at www.axis.com Includes the ONVIF specification available at www.onvif.org Support for AXIS Video Hosting System (AVHS) with One-Click Camera Connection
	Intelligent video	Video motion detection, active tampering alarm, audio detection, Support for AXIS Camera Application Platform enabling installation of additional applications
	Triggers	Intelligent video, day/night mode, digital I/O, manual trigger, PTZ preset, PTZ moving, network lost, storage status, system initializing
	Actions	File upload via FTP, HTTP and email Notification via email, HTTP and TCP Video and audio recording to edge storage Pre- and post-alarm video buffering External output activation PTZ preset Guard tour Play audio clip Status LED Day/night vision mode
	Video access from web browser	Camera live view Video recording to file (ASF) Customizable HTML pages Windows 7, Windows Vista, Windows XP, Windows Server 2008, Windows Server 2003 DirectX 9c or higher For other operating systems and browsers, see www.axis.com/techsup

Function/group	Item	Specifications
	Management and maintenance	AXIS Camera Management tool on CD and web-based configuration Firmware upgrades over HTTP or FTP, firmware available on www.axis.com
	Installation aids	Focus assistant, pixel counter Remote back focus
General	Casing	Metal (zinc)
	Processor, memory	256 MB RAM, 128 MB Flash
	Power	8-20 V DC or Power over Ethernet (PoE) IEEE 802.3af, max. 9.0 W, PoE Class 3
	Connectors	RJ-45 10BASE-T/100BASE-TX PoE Terminal blocks with power output, 1 alarm input and 1 output 3.5 mm mic/line in, 3.5 mm line out
	Edge storage	SD/SDHC memory card slot (card not included) Support for recording to network share (Network Attached Storage or file server).
	Operating conditions	Temperature: 0 °C to 50 °C (32 °F to 122 °F) Humidity 20-80% RH (non-condensing)
	Approvals	EN 55022 Class B, EN 55024, EN 60950-1, EN 61000-3-2, EN 61000-3-3, EN 61000-6-1, EN 61000-6-2 FCC Part 15 Subpart B Class B ICES-003 Class B VCCI Class B C-tick AS/NZS CISPR 22
	Dimensions (HxWxD)	46 x 78 x 206 mm (1.8" x 3.1" x 8.2")
	Weight	0.6 kg (1.3 lb.)
	Included accessories	Stand, connector kit, Installation Guide, CD with installation tools and recording software, Windows decoder 1-user license
	Video management software (not included)	AXIS Camera Station – Video management software for viewing and recording up to 100 cameras See www.axis.com/products/video/software/ for more software applications via partners
	Optional accessories	Various housings, lenses AXIS T90A Illuminators AXIS T8412 Installation Display Axis PoE Midspans AXIS Camera Station and video management software from Axis' Application Development Partners Axis' Application Development Partners. For more software information, see www.axis.com/products/video/software/

8.0 Instrument System Functional Diagram

N/A

9.0 Instrument/Masurement Theory

N/A

10.0 Setup and Operation of Instrument

Full installation instructions and requirements may be found in the [P1344](#) and [P1347](#) user manuals and [installation guide](#) provided by the vendor.

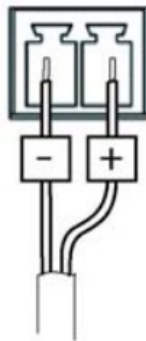
10.1 Hardware Requirements and Installation Instructions

Before installing the cameras, ensure they are running properly and have an assigned, working IP address before completing the hardware installation, as the nadir install location can be difficult to access.

The forward camera is mounted on a small, custom stand in the aircraft cockpit, near the center of the cockpit looking forward out the window. The nadir camera is mounted in a custom hatch on the belly of the aircraft, co-located with the nadir radiometers. All installations on the aircraft must be examined by one of the aircraft mechanics prior to flight.

Both versions of this camera require an RJ-45 ethernet cable running from the instrument to the shuttle computer and a 2-pin terminal block for DC power input.

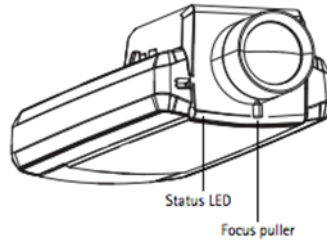
DC power input



To install the cameras, first connect the power and ethernet cables. Next, assign or check the IP address using the AXIS IP Utility or AXIS Camera Management software. A password may be set if needed. Once you have ensured that the camera can be accessed and the video feed viewed live, you can install the camera to the mount or hatch. Once installed, the focus can be adjusted by loosening the focus puller at the front of the camera and turning the lens while checking the live view. Tighten the focus puller when complete.

10.2 Operating the AXIS Cameras

The camera feed can be viewed in real time by navigating to the camera IP via an internet browser. This will only allow the user to view the feed, and not make any changes to the camera itself. To change the camera, you must use the AXIS Camera Management program. Prior to flight, the cameras must be accessed by the camera management program and recording started. If the record button is not pressed, then no data will be recorded for that flight. After the flight has ended, the files must be exported prior to download.



11.0 Calibration

There are no calibration procedures for the AXIS cameras.

12.0 Maintenance

The AXIS cameras require little maintenance. When needed, they may be refocused using the instructions above and in the manual.

13.0 Safety

Always ensure the power is disconnected before opening the camera housing.

14.0 Citable References

AXIS Communications AB. 2012. "User Manual AXIS P1344 Network Camera."
https://www.axis.com/files/manuals/um_p1344_48168_en_1208.pdf, accessed on October 11, 2019.

AXIS Communications AB. 2012. "User Manual AXIS P1347 Network Camera."
https://www.axis.com/files/manuals/um_p1347_45969r2_en_1212.pdf, accessed on October 11, 2019.

AXIS Communications AB. 2010. "Installation Guide AXIS P13 Network Camera Series."
https://www.axis.com/files/manuals/ig_p13Series_38731_en_1006.pdf, accessed on October 11, 2019.



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