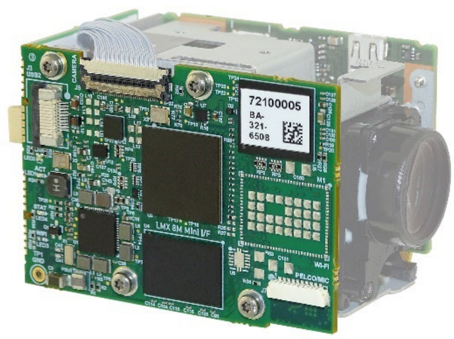
HARRIER IP
CAMERA INTERFACE BOARD

For LVDS AF-Zoom Block Cameras

- IP interface board for Tamron, Sony and Harrier AF-Zoom cameras
- Low latency H.264 1080p60 video over IP
- Supports ONVIF/RTSP/RTP/VISCA/Pelco-D
- Options for wireless IP and PoE support for reduced cabling

FEATURES

- Supports Tamron, Sony FCB-EV-series, Harrier 10x, 36x, 40x and 55x AF-Zoom cameras and other LVDS cameras.
- LVDS to H.264 compressed video over IP (RTSP stream).
- 1080p60/30 video support, with 1080p30 low latency mode.
- ONVIF Profile S for control of video stream and camera.
- Direct (VISCA) camera control over RS-485 or IP (Software API).
- RS-485 serial port for interfacing to other devices (e.g. camera pan & tilt).
- Built-in website for setup and configuration.
- Supports addition of text and graphics (overlays) to video.
- Support for mono audio input.
- Evaluation kit for fast set-up and evaluation.



OVERVIEW

The **Harrier IP Camera Interface Board** (AS-CIB-IP-SOC-001-A or AS-CIB-IP-SOC-002-A) is an interface solution from Active Silicon's Harrier series of camera interface boards; it provides IP (Ethernet) output for Tamron, Sony FCB-EV-series and Harrier 10x/36x/40x/55x AF-Zoom cameras, as well as other LVDS compatible autofocus-zoom (AFZ) block cameras. The interface board is based on a powerful SoC processor that delivers a low latency H.264 video stream over RTP; the board is connected to an Ethernet connection board using an FFC/FPC cable. Both boards can be compactly mounted onto a block camera. The camera and SoC board are connected via a KEL 30-way cable. The LVDS video signal is compressed (H.264) on the SoC board and streamed over RTP to the Ethernet connection board. The Ethernet connection board carries magnetics that enable physical connection to external Gigabit Ethernet systems using CAT5/6 Ethernet cables. A version of the Ethernet connection board that supports Power over Ethernet (PoE) is also available. The SoC board implements ONVIF (Profile S) based control; application examples of how to display text and graphical overlays to the live video stream and send VISCA commands to the camera (enabling full camera control via the ONVIF interface) are available on request.

Board System Options

A Harrier IP camera interface system is usually composed of two boards – a processing/SoC board (**AS-CIB-IP-SOC-001-A**) and an Ethernet connection board (**AS-CIB-IP-IFETH-001-A**). These two boards are connected by an FFC cable (see figure 1) and can be mounted directly on to a block camera or stacked on top of each other. The boards are available as a set (figure 2) or mounted on a camera (figure 3).

A version of the SoC board that supports wireless connectivity is available (**AS-CIB-IP-SOC-002-A**). There are also two versions of the connection board, the Ethernet connection board (**AS-CIB-IP-IFETH-001-A**) and a Power over Ethernet enabled version (**AS-CIB-IP-IFPOE-001-A**). The PoE connection board has a PoE power converter and heatsink stacked on top of the connection board (see figure 3 d); it also has a different type of Ethernet connector socket to the non-PoE version.

For the specifications of the Ethernet connection boards, please refer to the Harrier PoE/Ethernet Connection Board datasheets on the Active Silicon website (download section of the Harrier IP Camera Interface Board page).

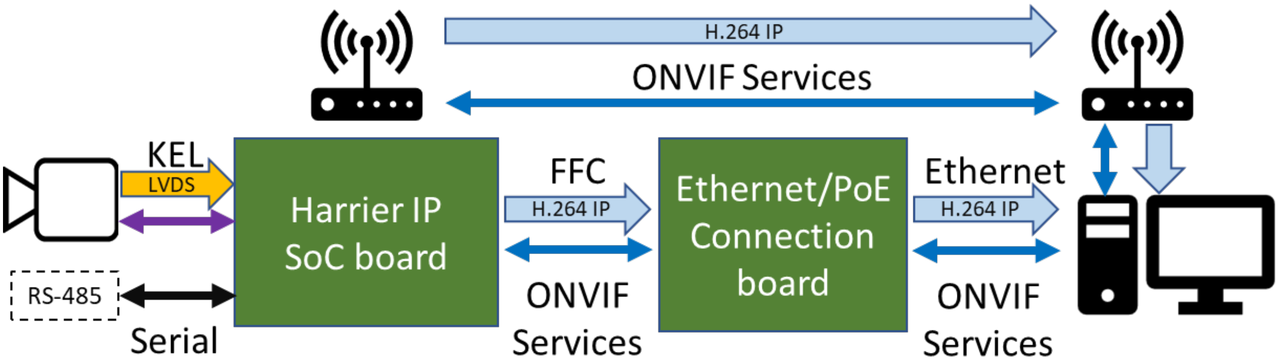


Figure 1. Harrier IP camera system functional block diagram (wireless/PoE features are optional)

The processor/SoC and connection boards are ordered together as a pre-assembled module using the part numbers shown below:

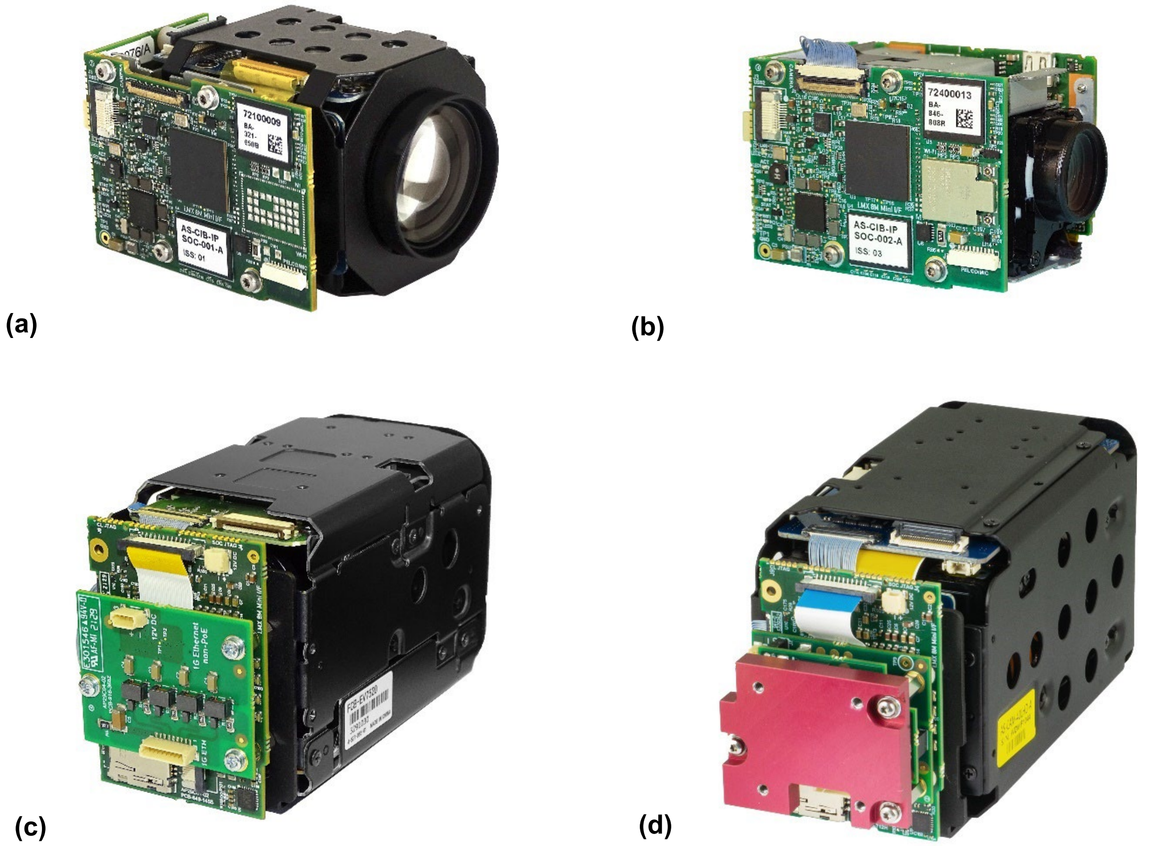
PART NUMBER	WIRELESS	ETHERNET	COMPONENT BOARDS
AS-CIB-IP-001-A	-	Ethernet	AS-CIB-IP-SOC-001-A + AS-CIB-IP-IFETH-001-A + FFC
AS-CIB-IP-002-A	Yes	Ethernet	AS-CIB-IP-SOC-002-A + AS-CIB-IP-IFETH-001-A + FFC
AS-CIB-IP-003-A	-	PoE	AS-CIB-IP-SOC-001-A + AS-CIB-IP-IFPOE-001-A + FFC
AS-CIB-IP-004-A	Yes	PoE	AS-CIB-IP-SOC-002-A + AS-CIB-IP-IFPOE-001-A + FFC

Camera System Options

Each of these Harrier IP camera interface systems can be purchased ready assembled on any LVDS autofocus-zoom block camera in Active Silicon's camera product range. In this case, a code for the model of the camera is added to the system part number (see table below).

The Harrier IP boards can be mounted separately on the camera/bracket (see figure 3 a and b) or stacked on top of each other and mounted on the back of the camera (see figure 2 and figure 3 c, d).

Figure 2. Harrier IP camera interface system (AS-CIB-IP-001-A)



(a) (b) (c) (d)

Figure 3. Harrier IP Camera Interface Board (SoC) and Harrier Ethernet or PoE Connection Board on cameras.
(a) AS-CIB-IP-001-10LHD-A – Ethernet system with Harrier 10x AF-Zoom Camera
(b) AS-CIB-IP-002-3010-A – Wi-Fi system with 10x Tamron MP3010M-EV camera
(c) AS-CIB-IP-001-9520L-A – Ethernet system with 30x Sony EV-FCB9520L camera
(d) AS-CIB-IP-003-55LHD-A – PoE system with Harrier 55x AF-Zoom Camera

PART NUMBER	SYSTEM+CAMERA
AS-CIB-IP-001-10LHD-A	AS-CIB-IP-001-A + Harrier 10x AF-Zoom Camera
AS-CIB-IP-001-36GLHD-A	AS-CIB-IP-001-A + Harrier 36x AF-Zoom Camera
AS-CIB-IP-001-40LHD-A	AS-CIB-IP-001-A + Harrier 40x AF-Zoom Camera
AS-CIB-IP-001-55LHD-A	AS-CIB-IP-001-A + Harrier 55x AF-Zoom Camera
AS-CIB-IP-001-3010-A	AS-CIB-IP-001-A + Tamron MP3010M-EV camera
AS-CIB-IP-001-9520L-A	AS-CIB-IP-001-A + Sony FCB-EV9520L camera
AS-CIB-IP-001-9500L-A	AS-CIB-IP-001-A + Sony FCB-EV9500L camera

OPERATION

When connected to a suitable power supply the Harrier IP Camera Interface Board will boot and then power-up the camera. Once the camera has initialized it will start transmitting a video stream; the camera interface board will compress the video (H.264), convert it to RTP format, and stream it to the Ethernet port. Any RTP/ONVIF compatible application (e.g. VLC media player or GStreamer) can then receive and display the video. ONVIF services can be used to control the camera and video stream settings.
When the interface board is connected to the network, any ONVIF compatible application, such as the ONVIF Device Manager (https://sourceforge.net/projects/onvifdm/), can be used to discover the IP address of the board/camera and control the camera/video settings.

IP Address

By default, the Harrier IP Camera Interface Board is automatically assigned an IP address by the DHCP server, but it can be set to a fixed IP address using the Harrier IP Website (the Camera Interface Board administration web pages) or the ONVIF Device Management Service.

When setting fixed IP addresses please ensure that the address is correct and that you make a record of the new address before making the changes as it can be very difficult to locate a device at an unknown/incorrect IP address.

On the very first power up the Harrier IP board will also have an additional fixed IP address of 192.168.189.100. This is a temporary additional IP address used to program/configure the board during manufacture. Once you have selected a network configuration for the board (DHCP or fixed) this additional address will not be used unless you set it manually as a fixed IP address.

ONVIF and RTSP Services

The Harrier IP Camera Interface Board platform supports an RTSP server for streaming video and the ONVIF profile S standard for camera control (https://www.onvif.org/). The RTSP/ONVIF servers enable connected host devices to receive and control the H.264 video stream.

ONVIF is a SOAP webservice that standardizes the network interface for network video products. The ONVIF services include the following areas:

- IP configuration
- Device discovery
- Device management
- H.264 encoder configuration
- Camera control

The ONVIF and RTSP services can be consumed from many programming languages and several software frameworks already exist to use those services.

For example:

- ONVIF can be readily used from C# using Visual Studio's 'Add Service Reference' utility.
- There are several Python modules available to consume ONVIF services
  - Valkka – "Python Media Streaming Framework for Linux" – supports both ONVIF and RTSP https://elsampsa.github.io/valkka-examples/_build/html/onvif.html
  - Zeep is a SOAP client for Python, which can be used to consume the ONVIF WSDL files. https://docs.python-zeep.org/en/master/client.html
- The GStreamer library includes an RTSP client and can be used to decode and display the live video. GStreamer is a C library with C# and Python bindings.

Visual Studio can load the WSDL files that describe the various ONVIF SOAP services and generate a C# class with methods for the various ONVIF functions.

The ONVIF services supported are listed below:

- Device Management service: allows control of the platform (e.g. set time and date, etc.).
- Media service: Media configurations are used to determine the streaming properties of requested media streams; this enables control of the H.264 encoder and on-screen displays (OSD).
- Imaging service: provides configuration and control data for imaging specific properties.
- DeviceIO service: provides direct communication to the camera serial ports (this enables VISCA communication with an attached camera to allow full control of the camera and all its features).

For detailed information on these services please refer to the ONVIF documentation at https://www.onvif.org/profiles/specifications/ .

Harrier IP basic settings

A useful summary of the ONVIF API 2.0 can be found here:

ONVIF 2.0 Service Operation Index: https://www.onvif.org/onvif/ver20/util/operationIndex.html

The ONVIF properties of Harrier IP can be queried using the ONVIF API (DeviceMgmt::GetCapabilities).

Parameters/settings that cannot be changed include:

- ONVIF URI port: the port is fixed to 8000.
  The server is found at http://<IP address >:8000/onvif/device_service
- RTSP URI port: the port is fixed to 8554.
  For example: rtsp://<IP address>:8554/quality_h264
- Only H.264 encoding is supported (MJPEG and H.265 encoding are not supported)
- ONVIF discovery mode (on – cannot be disabled)
- RTSP Session timeout (55sec).
- H.264 profile settings (profile internal parameter values cannot be changed)

Video Mode – Media::SetVideoSourceConfiguration()

The x, y, width, height parameters set the resolution of the encoder. Harrier IP only supports progressive video resolutions that are native to the camera, hence valid values for this depend on the block camera connected. Values for 720p/1080p at 25/30/50/60 frames per second are supported by Harrier IP. The parameters set in the SetVideoSourceConfiguration must match the native video output of the camera. Operations like cropping and rescaling are not supported (x, y must match width, height).

Encoding interval – Media::SetVideoEncoderConfiguration

The RateControl:EncodingInterval value sets the interval at which single frames are encoded and transmitted, effectively dividing the transmitted frame rate by the interval value set. Supported values are 1 and 2 (a value of 1 means that every frame is encoded, a value of 2 means that every 2nd frame is encoded). See next section.

Bitrate kbps: – Media::SetVideoEncoderConfiguration

The RateControl:BitrateLimit parameter sets the maximum bandwidth limit used by the video encoder, the encoder will compress the video data to match this setting.
Valid setting values are: 0=variable bit rate or 100->39000 kbps.

Quality - Media::SetVideoEncoderConfiguration

The Quality parameter sets relative value used by the video quantizers and hence the quality of the decoded video. A higher value means higher quality. A value of 0 means that the Quality is set to automatic, otherwise setting values of 1 ->52 are supported.

Group of Video frames length (group of pictures) - Media::SetVideoEncoderConfiguration

The GovLength (Group of Video frames length) parameter determines the interval at which the video I-Frames (intra-coded picture: a complete independent image) will be encoded and transmitted. When set to a value of 1, I-Frames are continuously generated (every 1 frame). A value of 2 means that every 2nd image is an I-Frame, and a value of 3 every 3rd frame is an I-Frame, etc. The frames in between I-frames are encoded as P or B Frames and are heavily compressed.
Valid values for GovLength are 1 -> infinity.

Encoding Interval – Low Latency 1080p30

Typically, AF-Zoom cameras have a latency of a fixed number of video frames, making the latency frame rate dependent. This means that the latency of a 60Hz video is lower than that of a 30Hz video. Using the ONVIF 'Encoding Interval' element the Harrier IP camera interface board can be configured to receive a low latency 60Hz video and convert it to a 30Hz video, reducing the latency, network bandwidth and recording space required. The 'Encoding Interval' value can be set in ONVIF Device Manager as shown below.

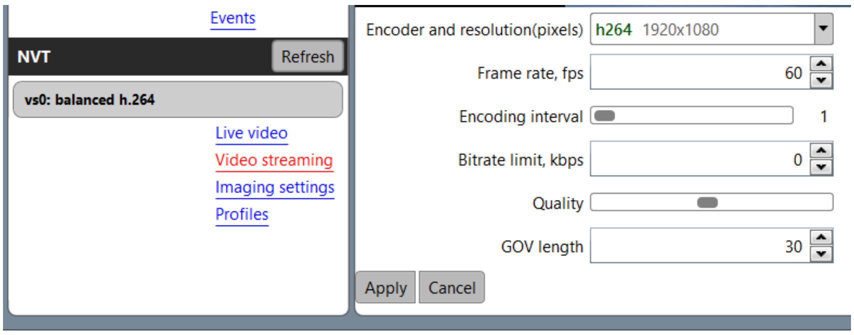


Figure 4. ONVIF Device Manager control for Encoding Interval

By default, the Encoding Interval is set to 1 and every video frame from the AF-Zoom camera is sent to the H.264 encoder; but if it is set to 2, then only every other frame is sent to the encoder. Hence, when the camera is set to 60Hz frame rate and the Encoding Interval is set to 2, the encoder/interface board will generate a 30Hz IP video but with the lower latency of a 60Hz camera video.
For a camera with a 3 frame latency, a change from 30Hz to 60Hz video means a reduction in latency of:

(30Hz latency) - (60Hz latency) = (3x33.3ms) - (3x16.6ms) = <u>50ms latency reduction</u>

Encoding Interval is a standard ONVIF feature in `VideoEncoderConfiguration:: RateControl`.

```
<xs:complexType name="VideoRateControl"/>
<xs:element name="FrameRateLimit" type="xs:int"/>
<xs:element name="EncodingInterval" type="xs:int"/>
<xs:element name="BitrateLimit" type="xs:int"/>
</xs:complexType>
```

Harrier IP Website

The Harrier IP Camera Interface Board hosts an administration website, the Harrier IP Website. There are various pages on this website that can be used to control the board and camera.

When the board is connected, the website can be accessed by connecting to the IP Address of the camera using a web browser.

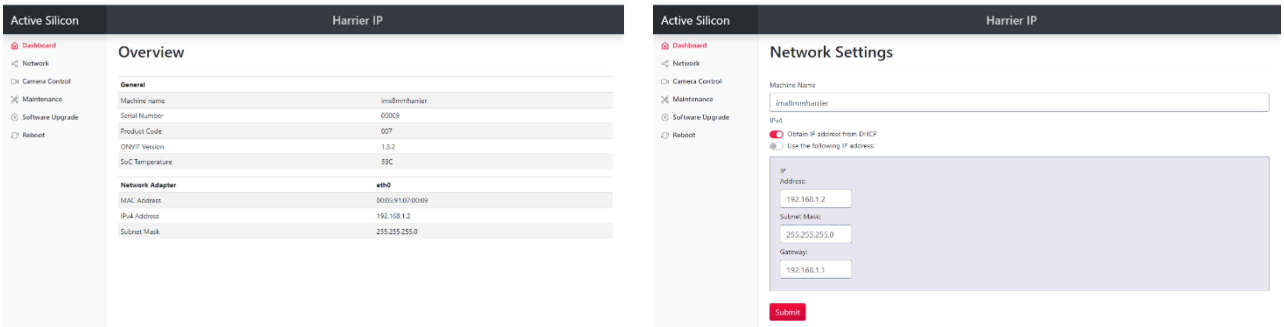


Figure 5. Harrier IP Website - Dashboard and Network settings pages

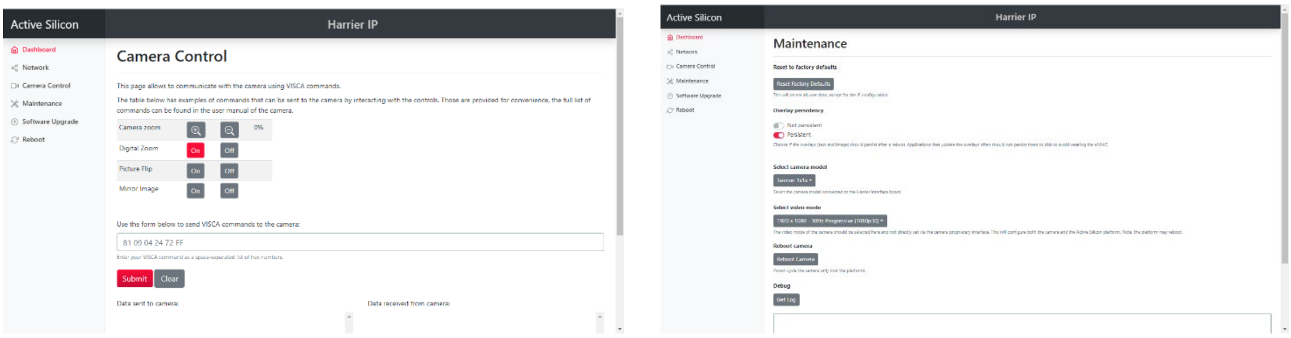


Figure 6. Harrier IP Website: Camera Control and Maintenance pages

Block Camera Control Over Ethernet

The camera video mode and H.264 compression parameters can be managed using the ONVIF media service. The ONVIF Imaging service enables any ONVIF-compliant third-party software/application to control the camera settings.

However, most AF-zoom block cameras have many more settings than those available through the ONVIF Imaging service. These additional settings are usually managed using VISCA commands sent over a serial interface. The Harrier IP Camera Interface Board supports direct serial communication with cameras; applications can access this serial interface via the ONVIF DeviceIO service.

Function *GetSerialPorts()* is used to query the list of available serial ports. The Harrier IP has two ports.

- SERIAL_PORT_000: this port is connected to the block camera (VISCA communication).
- SERIAL_PORT_001: this port is connected to the RS-485 port on connector J7.

Function *SendReceiveSerialCommand()* is used to send and receive data to the ports.

This function allows applications to send, and optionally receive, data to/from the camera. Please refer to the ONVIF DeviceIO specification for the complete documentation of this function. This means that all camera features supported by the VISCA protocol can be controlled by the end application over the Ethernet interface. For examples, please refer to the Harrier IP Example Software. (https://www.activesilicon.com/products/ip-sdk/)

For more information on VISCA control and camera features, please refer to the documentation for your camera.

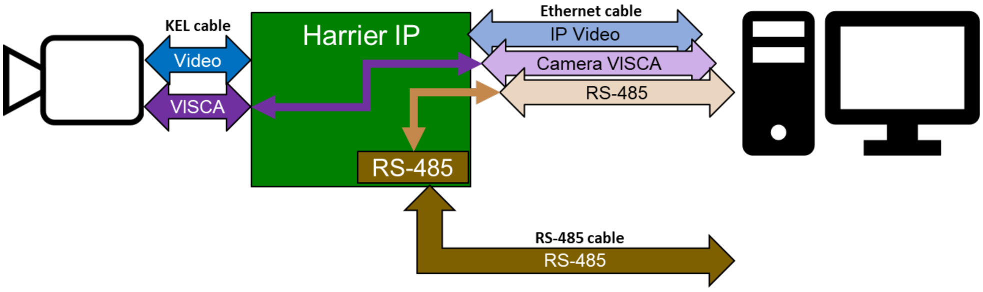


Figure 7. Camera and RS-485 port connectivity using the ONVIF DeviceIO service.

Brief Overview of the VISCA Protocol

A VISCA message includes a destination device address in the first byte; it can be an inquiry (of a setting/feature value), or a command (to change a setting value).

A camera will respond to a VISCA inquiry (e.g. 81,09,04,…,FF) with a VISCA message that contains the result of the inquiry (e.g. 90,50,…,FF).

A block camera will normally respond to a VISCA command (e.g. 81,01,04,…,FF) with two VISCA response messages, one that acknowledges receipt of the command (ACK - 90,41,FF) and then one that indicates completion of the operation requested (COMP - 90,51,FF). If the VISCA command is invalid or cannot be executed, then a VISCA error message is returned instead of the acknowledge message. These will be in the format 90 60 0X FF (X specifies the type of error).

VISCA responses also include the source device address in the first byte.

Typically, cameras will send a response to a command within a frame period, but some responses (e.g. zoom completion, or zoom position location) may take significantly longer.

For more information, please consult your block camera documentation.

RS-485 Interface Control Over Ethernet

The Harrier IP Camera Interface Board supports direct RS-485 serial communication with external devices. Host applications can access the RS-485 serial port via the ONVIF DeviceIO service.

The same ONVIF DeviceIO service can also be used to exchange VISCA messages between the block camera and the host application. (see previous section)

Function *GetSerialPorts()* is used to query the list of available serial ports. The Harrier IP has two ports.

- SERIAL_PORT_000: this port is connected to the block camera (VISCA communication).
- SERIAL_PORT_001: this port is connected to the RS-485 port on connector J7.

Function *SendReceiveSerialCommand()* is used to send and receive data to the port.

This function allows host applications connected to the Ethernet port to send, and optionally receive, data to/from RS-485 devices attached to the RS-485 port (using SERIAL_PORT_001 parameter setting). If the SERIAL_PORT_000 parameter is used then the data is sent/received from the block camera.

Please refer to the ONVIF DeviceIO specification for the complete documentation of this function. For ONVIF DeviceIO serial port examples, please refer to the

Harrier IP Example Software. (https://www.activesilicon.com/products/ip-sdk/)

RS-485 VISCA Service for Camera Control

The RS-485 VISCA service enables direct control/VISCA communication with the block camera from an external host attached to the RS-485 port of the Harrier IP board.

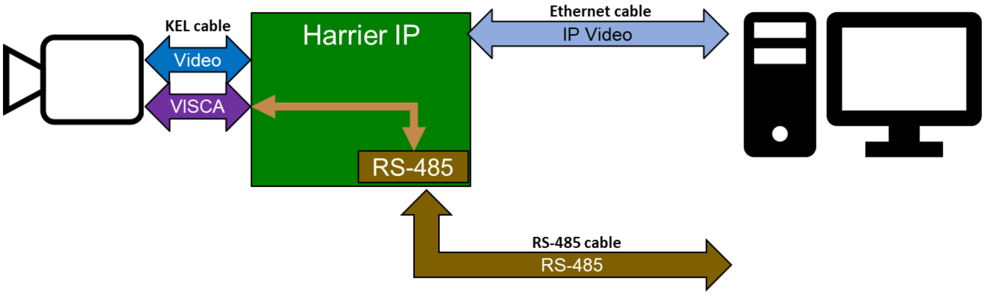


Figure 8. VISCA service is running and set to support VISCA communication between the block camera and the RS-485 port.

The RS-485 VISCA service runs at start-up; when connected it receives data from the RS-485 port and will forward valid VISCA messages to the block camera (VISCA address 0x81), or to the Harrier IP board (VISCA address 0x82). When running, the RS-485 VISCA service has full ownership of the RS-485 port; this means that other services (e.g. ONVIF DeviceIO calls) cannot use the RS-485 port while the service is active.

The RS-485 VISCA service stops when an RS-485 ONVIF DeviceIO serial port request (*SetSerialPortConfiguration()* or *SendReceiveSerialCommand()* @SERIAL_PORT_001) is received over the Ethernet connection.

Once stopped, the RS-485 VISCA service cannot be restarted; it can only be re-started by re-booting the Harrier IP Camera Interface Board.

When the RS-485 VISCA service has stopped, the RS-485 port can be opened and used by a remote host using the ONVIF DeviceIO service (see previous section).

RS-485 VISCA Service - Quick Start Instructions

Please ensure that the firmware version of the Harrier IP Camera Interface Board is 3.8 or more.

1. Connect the RS-485 cable to the J7 - PELCO/Mic connector on the SoC Board.
2. Connect the Ethernet cable to the J2 -1G ETH connector on the Ethernet Connection Board.
3. Connect the power cable to the J3 -12V DC connector on the Ethernet Connection Board (not required if you are using PoE).
4. Power up the camera (installed firmware version must be v.3.8 or more).
5. Wait for the Harrier IP board software platform to start (a couple of seconds after the green STAT LED illuminates).
6. Send the Connect VISCA command to the RS-485 port: 82 01 0A 06 11 FF.
7. You should receive an Acknowledge/Complete response: A0 41 FF, A0 51 FF within 100ms.
8. The RS-485 port is now connected to the block camera and VISCA commands sent to the RS-485 port (with address 81) will be routed to the block camera. Camera responses will be sent to the RS-485 port.

If you do not receive the Acknowledge/Complete response, the platform is not ready, or the RS-485 connection is not working.

If the Harrier IP board is not ready yet, the VISCA command can be continuously sent every 100ms until there is a response.

If you still do not receive a response the RS-485 connection could be reversed. Try swapping the A/B cables or testing the RS-485 port by sending RS-485 messages from the Ethernet host connection using the ONVIF DeviceIO command.

Note: if you test the RS-485 port from the Ethernet connection the platform will need to be re-booted before the VISCA service can be started.

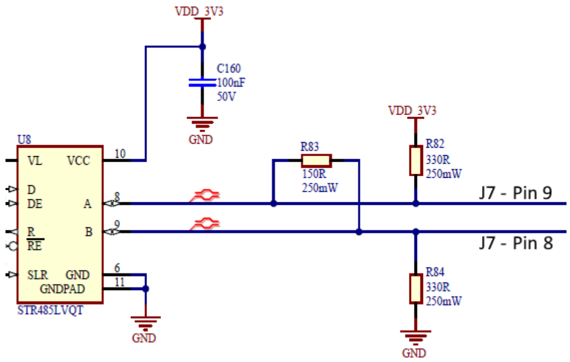


Figure 9. RS-485 circuit for J7 PELCO/Microphone Connector

RS-485 VISCA Service Functionality

VISCA Devices

The RS-485 VISCA service supports two VISCA devices:

- The block camera at address 0x81.
- The Harrier IP Camera Interface Board at address 0x82.

VISCA messages at address 0x81 are forwarded to the block camera and the block camera replies are sent back to the RS-485 port.

VISCA messages at address 0x82 are received (and processed) by the Harrier IP Camera Interface Board. VISCA response messages from the interface board are sent back to the RS-485 port. Harrier IP board VISCA inquiries for board firmware version and board ID are supported.

RS-485 VISCA Service Commands and Inquiries

VISCA messages sent to the RS-485 port by an external host are received by the RS-485 VISCA service.

On start-up, the service opens the RS-485 port and listens for the ***Connect*** VISCA command addressed to the Harrier IP Camera Interface Board (see below). Any other data received is discarded until the ***Connect*** command is received. When the ***Connect*** command is received the service will send messages at address 0x81 to the camera, and messages at address 0x82 to the Harrier IP Camera Interface Board.

VISCA messages are intended to be processed one at a time so the external host should wait for a response message from the target device before sending another VISCA message to the RS-485 port.

The table below shows the VISCA commands and inquiries supported by the RS-485 VISCA service. The service responds within 100ms to Harrier IP VISCA Commands and Inquiries, either with the expected response or an error; block camera VISCA command response times will depend on the camera and the function requested.

COMMAND	COMMAND STRING	RESPONSE	DESCRIPTION
Connect (RS-485 to block camera/board)	82 01 0A 06 11 FF	A0 41 FF A0 51 FF	After receiving this command, the service will enable VISCA communication between the RS-485 port and the camera/board.
Disconnect (RS-485 from the block camera/board)	82 01 0A 06 10 FF	A0 41 FF A0 51 FF	After receiving this command, the service ignores all data received on the RS-485 port.

INQUIRY STRING	INQUIRY STRING	RESPONSE	DESCRIPTION
Query Interface Board Firmware Version	82 09 0A 00 FF	A0 50 r1 r2 r3 FF	r1 = Major Version r2 = Minor Version r3 = Always 0
Query Enhanced Hardware ID / Board Rev	82 09 0A 04 FF	A0 50 r1 r2 r3 r4 FF	r1 = project code (0x1D) r2 = project board (2) r3 = board issue (e.g. 3) r4 = build MSB (02) r5 = build LSB (38=no Wi-Fi, 42=Wi-Fi)

Harrier IP VISCA Response Error Codes

ERROR	ERROR STRING	DESCRIPTION
Invalid Message	A0 61 0E 0F	An invalid VISCA message was received (and discarded).
Forbidden Command	A0 61 0D 0F	The VISCA command is not allowed (e.g. changing the BAUD rate of the block camera).
Internal Error	A0 61 0C 0F	An internal error occurred. Contact Tech Support for assistance.
Unknown Request	A0 61 0B 0F	The VISCA request is unknown and has been ignored.
Timeout waiting for camera response	A0 61 0A 0F	The block camera has not sent the ACK + COMP for a command, or a response to an inquiry. Inquiries are expected to complete within 500ms. For commands the service expects the ACK within 500ms and the COMP within 10s.

Camera Power-up / Network Change VISCA Message

On power-up/reset block cameras send a Network Change VISCA message. This message is received by the Harrier IP but, as the RS-485 service cannot be guaranteed to be active at this point, the message will not be sent out to the RS-485 port when the system starts up.

After sending the command to ***Connect*** the RS-485 to the camera, the user application should check that the block camera is ready. This is done by sending a VISCA Inquiry to the block camera; if the block camera is ready, an appropriate VISCA response will be received from the block camera.

Special Block Camera VISCA Commands

Block camera settings such as the BAUD rate, video mode and LVDS setting are under the control of the Harrier IP board/platform as these are required to generate the correct IP video output and control the camera. If VISCA commands of this type are sent to the RS-485 port they are blocked by the RS-485 VISCA service so that the video stream and board camera control are not disrupted.

Camera commands that cause the camera to send asynchronous messages in response to events (e.g. motion alarms, ContinuousZoomReply commands, power cycle/reset) are not supported.

RS-485 Port Settings

The default settings of the Harrier IP UART/RS-485 port are fixed at:

- 9600 BAUD
- Start bit: 1
- stop bit: 1
- parity: none
- data size: 8 bit

RS-485 Port Timing

The Harrier IP board receives the RS-485 data and parses it to identify VISCA messages directed at the camera or Harrier IP board. This means that the whole VISCA message must be read before it can be processed and forwarded to the camera; this effective doubles the transmission time. The same will apply to camera command responses sent to the Harrier IP board.

Time to send a VISCA message of length **n** bytes to the camera
= time to send **n** bytes to Harrier IP+ Harrier IP latency +time to send **n** bytes to camera
= 2 x **n** x time to send a byte + Harrier IP latency

@ 9600 Baud 1 byte ~ 1 ms, Harrier IP latency is ~0, if **n**=6,
send time = (2 x 6) + latency=~12ms

Time to receive a VISCA message response of length **n** to the camera
= camera processing time + time to send **n** bytes + Harrier IP latency + time to send **n** bytes
= camera processing time + 2 x **n** x time to send a byte + Harrier IP latency

@ 9600 Baud 1 byte ~ ms, Harrier IP latency is ~0, if **n**=6 and camera processing time =16ms
Response time = 16 + (2 x 6) + latency ~ 28ms

Note: camera response times can vary significantly depending on the VISCA command sent.

Video Graphical Overlay Control

The Harrier IP Camera Interface Board is able to superimpose graphics and text on the live video stream. This includes graphics with transparent/alpha blended pixels. The application manages these overlays using an API from the ONVIF Media service. The overlays can be stored in system memory (volatile) or in the flash on the platform (non-volatile). The flash has a high but limited number of guaranteed writes, hence in applications where the overlays are frequently changed it is recommended that the volatile setting be used. The functions *CreateOSD()* and *SetOSD()* of the media profile have had an optional boolean element added to select if the OSD should be volatile (saved to memory) or not (saved to flash).

This element goes in the 'any' element listed in media.wsdl for those functions and takes this form:

```
<xs:element name="IsPersistent" type="xs:boolean"/>
```

Below, an example of the SOAP envelope containing the element.

```
<s:Envelope
      xmlns:s=http://www.w3.org/2003/05/soap-envelope>
    <s:Header>
    </s:Header>
    <s:Body
          xmlns:xsi=http://www.w3.org/2001/XMLSchema-instance
          xmlns:xsd=http://www.w3.org/2001/XMLSchema>
         <CreateOSD
              xmlns=http://www.onvif.org/ver10/media/wsdl>
               <OSD>
                     <Type
                      xmlns=http://www.onvif.org/ver10/schema>
                      Text
                     </Type>
                     <Position
                      xmlns=http://www.onvif.org/ver10/schema>
                          <Type>
                          UpperRight
                          </Type>
                     </Position>
                     <TextString
                      xmlns=http://www.onvif.org/ver10/schema>
                          <Type>
                          Plain
                          </Type>
                           <PlainText>
                          Hello
                           </PlainText>
                     </TextString>
               </OSD>
               <IsPersistent
                  xmlns=http://www.onvif.org/ver10/schema>
                  1
               </IsPersistent>
         </CreateOSD>
    </s:Body>
</s:Envelope>
```

SD Card interface

The SD card interface supports all standard micro SD cards (up to 512GB) and operates them in SDR25 mode. High data rates that come with UHS II cards are not supported and UHS II cards will operate in UHS I modes (lower data rate).

The SD card can be used to store recordings of the camera video. [To be implemented.]

Harrier IP Example Software

The Harrier IP Example Software from Active Silicon contains sample application code that shows how to use the ONVIF services for adding text and graphical overlays to the live video stream and sending VISCA commands (over IP) to the camera to enable full camera control.

Status LEDs (“LED1/2/3/4”)

The Harrier IP Camera Interface Board is fitted with several multi-color LEDs that indicate board status.

- LED1 – ACT
  - indicates activity on the Ethernet link (flashing=activity, steady on=no activity).
- LED2 – LNK- indicates the state of the Ethernet link (Green=1G link OK, Red= 100 M link OK, Off=no link).
  [for issue 03 boards this is Green=100M link OK, Red= 1M link OK, Off=no link)
- LED3 – Wi-Fi
  - [To be implemented].
- LED4 – STAT
  - indicates the status of the board system (steady green=board has booted successfully).

Wireless/Wi-Fi Interface Option

If your Harrier IP Camera Interface Board supports Wi-Fi it will have a wireless module fitted and will have a serial number that starts with 724. The title of the Harrier IP Website will also indicate that the board has Wireless/Wi-Fi support.

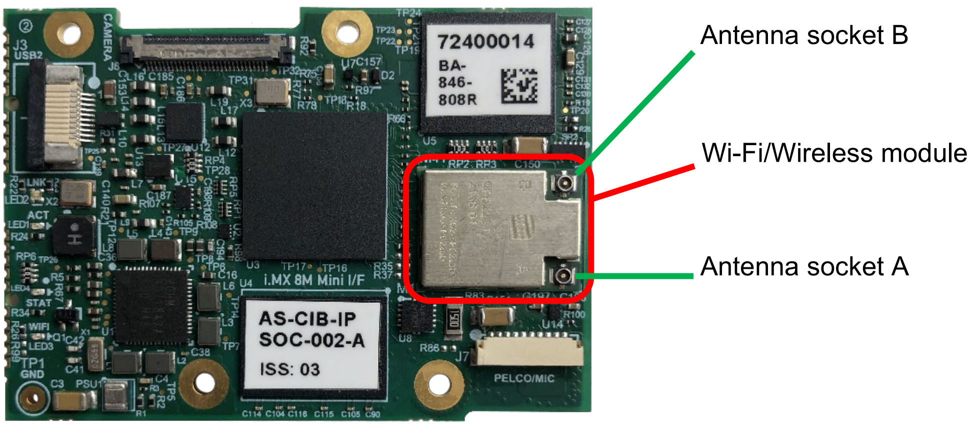


Figure 10. Harrier IP Camera Interface Board with Wi-Fi/wireless communications module fitted

To receive Wi-Fi signals there must be at least one antenna fitted to the wireless module (data bandwidth is much higher with two antennae). The antennae fit to the small microcoaxial MHF4 connectors (A and B) on the module. The connection to a wireless network is achieved using the Wireless page on the Harrier IP Website. On the Wireless page you can scan for available wireless networks, select a suitable network/SSID and enter the password. The Harrier IP will then connect to the network and update the Wi-Fi status on the page. The network SSID and password will be stored and used next time the Harrier IP is powered up. Only one SSID and password is stored.

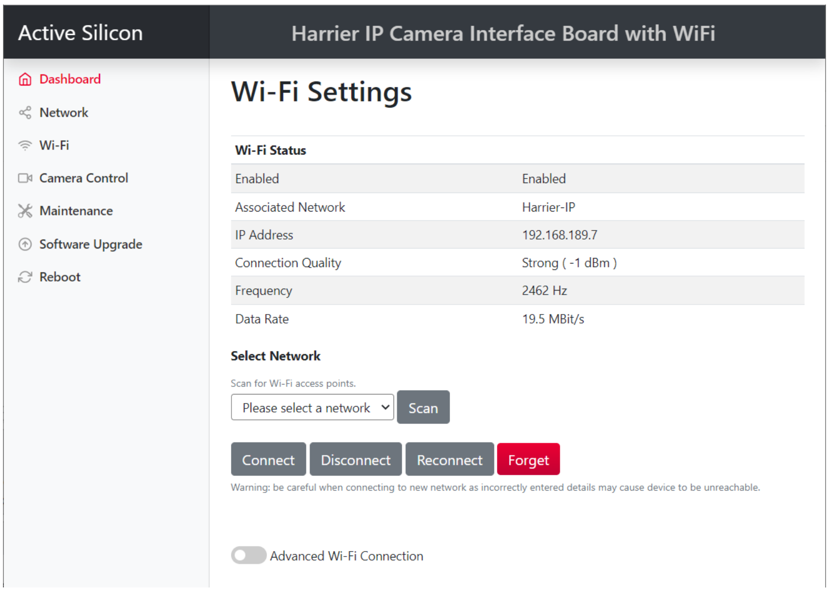


Figure 11. Harrier IP Wi-Fi Settings web page

The wireless network you connect to must be running a DHCP server as, by default, the Harrier IP wireless connection is set to obtain its IP address from a DHCP server. This can be changed by accessing the Harrier IP Website, opening the 'Network Setting' web page, selecting the wireless interface, changing the appropriate settings and then clicking on Select. When setting fixed IP addresses please ensure that the address is correct, and that you have a note of it before changing it, as it can be very difficult to locate a device at an unknown/incorrect IP address.

Note: when you click on 'Submit' the IP address will change, and you will need to use the new address to access steaming video and the Harrier IP Website.

The connectivity and performance of the video at the host will be dependent on the quality/performance of the wireless network connection so it is recommended that a dedicated Wi-Fi network and high-quality router be used for the host-camera connection.

CONNECTOR SPECIFICATION

Power Connector: 2-way (J1)

The Harrier IP Camera Interface Board is fitted with a 2-way JST connector for connection to an external power supply. When the camera interface board is connected to an Ethernet Connection Board the J1 connector is not used, as the J2 connector on the Harrier Ethernet/PoE Connection Board is used to power the camera.

Connector type: JST – BM02B-SRSS-TB(LF)(SN)

Mating cable: JST – A02SR02SR30KW152A (SHR-02V-S-B – ASSHSSH28K152)

PIN	SIGNAL	PIN	SIGNAL
1	Power (9V to 16.5V)	2	GND

Ethernet Connection Board Connector: 24-way (J2)

The Harrier IP Camera Interface Board is fitted with a 24-way 0.5mm pitch vertical FFC connector (with clamp) for connection to a Harrier Ethernet Connection Board or a Harrier PoE Connection Board.

Connector type: Valcon – FFC5-24-VSM-TR

Mating cable: 24-way 0.5mm pitch FFC with same side connection

PIN	SIGNAL	PIN	SIGNAL
1	GND	13	GND
2	ETH_TRX0_P	14	I2C2_SDA
3	ETH_TRX0_N	15	I2C2_SCL
4	GND	16	GND
5	ETH_TRX1_P	17	GND
6	ETH_TRX1_N	18	GND
7	GND	19	GND
8	ETH_TRX2_P	20	NC
9	ETH_TRX2_N	21	Power (9V to 16.5V)
10	GND	22	Power (9V to 16.5V)
11	ETH_TRX3_P	23	Power (9V to 16.5V)
12	ETH_TRX3_N	24	Power (9V to 16.5V)

Note: Power from the Harrier IP Camera Interface Board is also connected to the attached block camera, please ensure you do not exceed the maximum voltage specification of the attached camera.

USB Connector: 10-way (J3)

The Harrier IP Camera Interface Board is fitted with a 10-way 0.5mm pitch FFC connector for connection to external devices. Support for this interface is in development.

Connector type: Samtec – ZF5S-10-01-T-WT

Mating cable: 10-way 0.5mm pitch FFC

PIN	SIGNAL	PIN	SIGNAL
1	GND	6	GND
2	USB VBUS	7	USB Data +
3	USB VBUS	8	GND
4	GND	9	USD ID
5	USB Data -	10	GND

Micro SD socket (J5)

The Harrier IP Camera Interface Board is fitted with a standard micro SD socket.

External Micro SD extension socket (J6)

The Harrier IP Camera Interface Board is fitted with a 12-way 0.5mm pitch FFC connector to enable connection to external/remote SD card sockets.

Connector type: Samtec – ZF5S-12-01-T-WT

Mating cable: 12-way 0.5mm pitch FFC

PIN	SIGNAL	PIN	SIGNAL
1	SD2_DATA2	7	VDD
2	GND	8	SD2_DATA0
3	SD2_DATA3	9	GND
4	SD2_CMD	10	SD2_DATA1
5	VDD	11	SD2_DET
6	SD2_CLK	12	GND

PELCO/Microphone Connector: 10-way (J7)

The Harrier IP Camera Interface Board is fitted with a 10-way 0.8mm pitch connector to enable connection to a PELCO controller and microphone. Support for this interface is in development.

Connector type: JST – SM10B-SURS-TF(LF)(SN)

Mating cable: JST – A10SUR10SUR32W102A

PIN	SIGNAL	LEVEL	NOTES
1	Analog GND (Mic)		
2	Microphone Input +		With bias voltage (3mA max.) suitable for electret type microphones
3	Microphone Input -		
4	Analog GND (Mic)		
5	GPIO 1	3v3	
6	GPIO 2	3v3	
7	GND		
8	RS-485 B	ISO-IEC 8482	
9	RS-485 A	ISO-IEC 8482	
10	Reserved		

KEL30 Connector (“CAMERA”): 30-way (J8)

The Harrier IP Camera Interface Board is fitted with a 30-way miniature connector that is used to connect to compatible LVDS cameras.

Connector type: KEL USL00-30L

Mating cable: KEL USL20-30SS-010-C (100mm length) 30-way micro coaxial cable.
Actual length supplied will vary depending on the camera model/assembly.
Other lengths also available (subject to minimum order quantities).

Note: never pull on the blue wires, they are delicate and can be easily damaged. Remove the plugs carefully using a suitable extraction tool.

SPECIFICATION

Video resolution/rate:	1080p 60/30 fps	**Video Compression:**	H.264
Protocols:	ONVIF, Ipv4/v6, HTTP, HTTPS, RTSP, RTP, TCP, UDP, RTCP, ICMP, DHCP	**Wireless Protocols:**	802.11 a b g n and ac Dual 2.4 and 5GHz bands
Camera control:	ONVIF profile S, VISCA (via Ethernet connection/ONVIF DeviceIO service or RS-485)	**Audio:**	Mono microphone

CONFORMANCE

Ethernet IEEE802.11, PoE, RT

Approvals: Active Silicon makes the following approval statements:

CE In accordance with the CE Marking regulations, the **Harrier IP Camera Interface Board** is not a finished product and is supplied for further integration into a finished product that will be CE marked by the final manufacturer/integrator. Therefore, no CE marking or Declaration of Conformity is required or allowed.

RoHS3 This product is compliant with the RoHS3 requirements (Directive 2015/863/EU).

REACH Please contact Active Silicon for the latest formal REACH declaration (EC 1907/2006).

EMC This product is designed to be compliant with the following requirements when housed in a suitable enclosure:

- EN 55022:2010 (Class A) and EN 55024:2010 (EU Directive 2014/30/EU Electromagnetic Compatibility
- FCC Rules for Class A digital devices

UL All printed circuit boards used in this product are manufactured by UL recognized manufacturers and have a flammability rating of 94-V0.

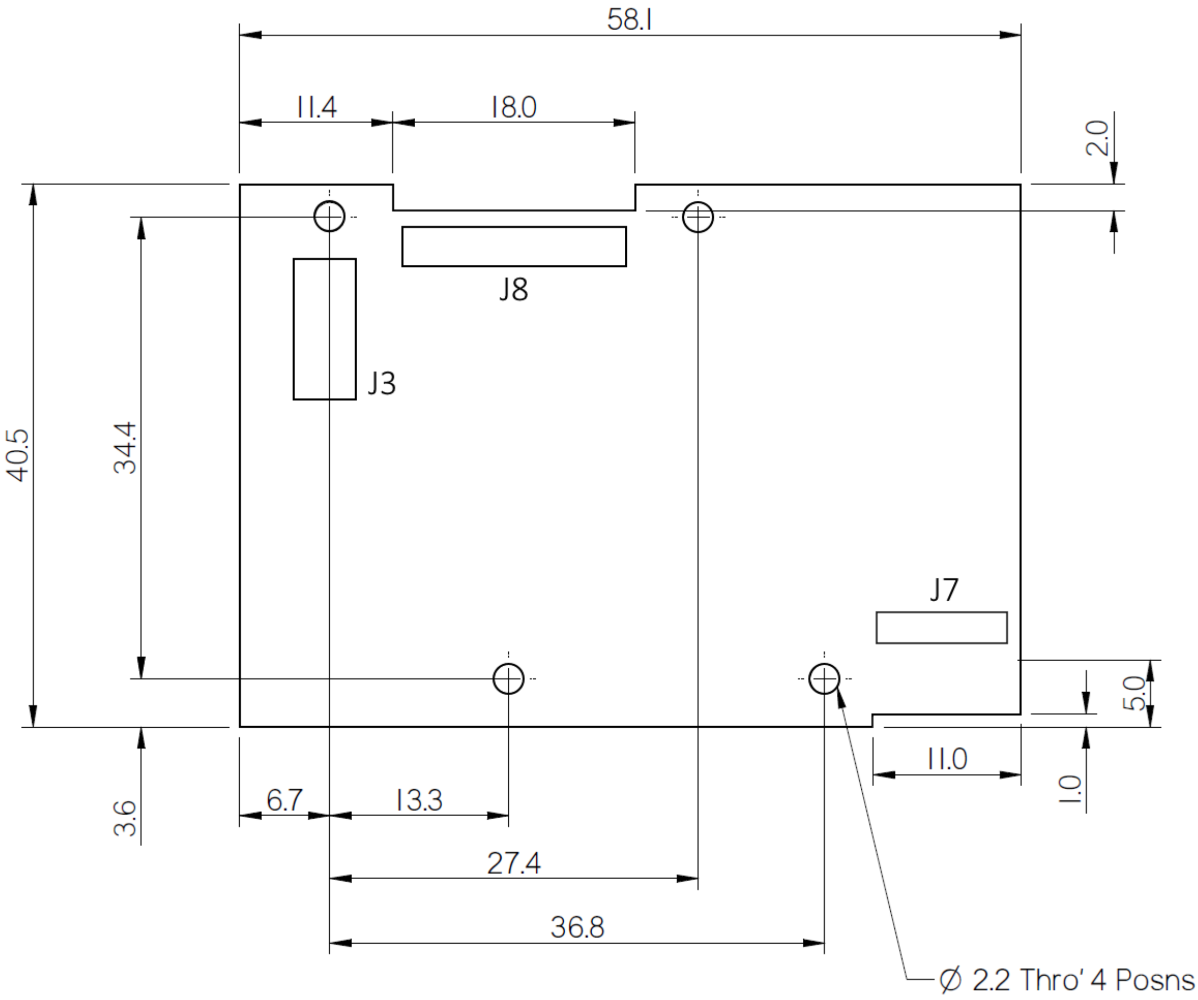


Figure 12. Mechanical overview of the Harrier IP Camera Interface Board; dimensions in mm. (Note – when mounted on a camera, this side usually faces away from the camera)

PHYSICAL AND ENVIRONMENTAL DETAILS

Dimensions:	58.1mm x 40.5mm.
Weight:	12g (interface board and SD card only, no cables).
Power Supply:	9V to 16.5V
Power Consumption:	1.9 – 2.1W (typical 1080p30) 2.6 – 2.8W (typical 1080p60) (Note: does not include camera power).
Storage Temperature:	-20°C to +70°C
Operating Temperature:	0°C to +60°C (ambient environment).
Relative Humidity:	10% to 90% non-condensing (operating and storage).

ORDERING INFORMATION

PART NUMBER	DESCRIPTION
AS-CIB-IP-SOC-001-A	Harrier IP Camera Interface Board.
AS-CIB-IP-SOC-002-A	Harrier IP Camera Interface Board (with Wi-Fi module, wireless option).
AS-CIB-IP-IFPOE-001-A	Harrier PoE Connection Board.
AS-CIB-IP-IFETH-001-A	Harrier Ethernet Connection Board.
AS-CIB-IP-001-A	AS-CIB-IP-SOC-001-A, AS-CIB-IP-IFETH-001-A and FFC cable.
AS-CIB-IP-002-A	AS-CIB-IP-SOC-002-A, AS-CIB-IP-IFETH-001-A and FFC cable.
AS-CIB-IP-003-A	AS-CIB-IP-SOC-001-A, AS-CIB-IP-IFPOE-001-A and FFC cable.
AS-CIB-IP-004-A	AS-CIB-IP-SOC-002-A, AS-CIB-IP-IFPOE-001-A and FFC cable.
AS-CIB-IP-001-55LHD-A	Harrier 55x AF-Zoom IP Camera (AS-CIB-IP-001-A mounted onto the camera AS-CAM-55LHD-A) Note: a range of cameras on offer for Harrier IP
AS-CIB-IP-001-EVAL-A	Evaluation kit for Harrier IP (does not include interface or connection board).
AS-CBL-935-153S	Ethernet interface adapter cable, JST to RJ45 socket.
AS-CBL-020-731U	Ethernet interface adapter cable, Molex to RJ45 socket (PoE).
AS-CBL-549-503Y	Power adapter cable, barrel socket to 4-way JST connector.
AS-CIB-USL30-100MM	30-way micro-coax cable for connecting the interface board to the camera. Length 100mm; manufacturer: KEL.

More camera options and custom builds are available, please contact Active Silicon for more information.

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