CONNEX HD VIDEO YOU CAN FLY WITH

CONNEX™ User Guide



Simply Plug-and-Fly!

CONNEX

Version 1.0

www.amimon.com

About This Guide

This user guide describes how to setup and use the CONNEX wireless video link in order to start streaming video transmissions from an aircraft. This user guide consists of the following chapters:

- **Chapter 1, Introducing CONNEX,** page 9, introduces the CONNEX system, its components, its connectors, buttons and cables.
- **Chapter 2, Setting Up CONNEX,** page 19, describes how to setup and connect the CONNEX Air unit and Ground unit.
- **Chapter 3, Using CONNEX,** page 25, describes how to get started using the Air unit and the Ground unit. This chapter also describes the Ground unit's On Screen Display (OSD), how to set up multicasting and how to set up control of the aircraft's camera gimbal from a gimbal remote control.
- **Chapter 4, CONNEX Management Application,** page 35, describes how to configure and upgrade the CONNEX Air unit and Ground unit.

For a quick summary of the essential steps for setting up quickly, you may refer to the *CONNEX Quick Start Guide*.

Support and Contacting Information

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IS THIS CORRECT? GGG

When contacting a support representative, make sure to have the Air unit's and Ground unit's serial number available. This number appears on the label on the bottom of each device.

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Revision History

Version	Date	Description
1.0	February 2015	Initial Release

Safety Instructions and Maintenance

All the instructions in this user guide must be adhered to when operating this equipment. Keep these instructions in a safe and accessible place for future use.

Safety Symbols

**High Voltage Sign:** Warns the user of the presence of uninsulated *dangerous voltage* within the product enclosure, which may be of sufficient magnitude to constitute a risk.

**General Warning Sign:** Warns the user of the presence of important operating and maintenance (servicing) instructions in the product manual.

Safety Instructions

- Do not open the Air unit or Ground unit enclosures. There are no user-serviceable parts inside. Refer servicing to qualified service personnel only. The use of controls, adjustments or procedures other than those specified in this user guide may result in exposure to shock and/or electrical or mechanical hazards.
- Do not immerse the units in water.
- Do not block the air ventilation openings.
- Always disconnect a unit's power by pulling the mains plug.
- Only clean with a dry cloth.
- Keep powered on units at least 20 cm from your body.
- Do not expose the units to moisture or excessive heat. Unit operating temperature is 0−40ºC.
- Unplug the units during lightning storms or when not using them for long periods of time.
- Only use the originally approved power supply adapter.
- Only use the supplied accessories or those recommended on the Amimon website. Accessories (including cables) must not be replaced, as they may affect performance or functionality or damage the unit.
- Do not use the product if there is any physical damage to the enclosure.
- It is normal for the product to become slightly hot during use. However, if the enclosure's temperature becomes unbearable to touch, turn the product off and contact support. The internal fan of the transmitter should work at all times when the power is on.
- Do not let the product come into contact with corrosive materials.
- Do not let the product come into contact with explosives, corrosive gas or nuclear weapons.
- Do not let the product come into contact with fire.

Potential Hazards

The CONNEX Air unit and Ground unit contain HD wireless video modules devices that should be operated according to the same rules and limitations as expected from normal HD wireless video modules devices. Do not operate the units in an environment that may be susceptible to radio interference resulting in danger, specifically:

- **Areas where prohibited by the law:** Follow any special rules and regulations and obey all signs and notices. Always ensure that the enclosure is turned off (the power switch is not lit) when instructed to do so or whenever it may cause interference or danger.
- **Where explosive atmospheres may be present:** Do not operate the CONNEX units in any area where a potentially explosive atmosphere may exist. Sparks in such areas could cause an explosion or fire, resulting in bodily injury or even death. Be aware and comply with all signs and instructions.
- **It is not advisable to operate the CONNEX units while at a refueling point or service station:** Users are reminded to observe restrictions on the use of radio equipment in fuel depots (fuel storage and distribution areas), chemical plants or where blasting operations are in progress.
- **Areas with a potentially explosive atmosphere are often, but not always, clearly marked:** Potential locations can include gas stations, below deck on boats, chemical transfer or storage facilities, vehicles using liquefied petroleum gas (such as propane or butane), areas where the air contains chemicals or particles, such as grain, dust or metal powders and any other area where it would normally be advisable to turn off a vehicle's engine.
- **Near medical and life support equipment:** Do not operate the CONNEX units in any area where medical equipment, life support equipment or near any equipment that may be susceptible to any form of radio interference. In such areas, the host communications device must be turned off. The CONNEX unit may transmit signals that could interfere with this equipment.

For more information, visit www.amimon.com.

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Chapter 1, Introducing CONNEX

This chapter introduces the CONNEX system, its components, its connectors, buttons and cables.

About CONNEX

Amimon's CONNEX™ provides a high-end, high-performance wireless HD connection that can operate in challenging unmanned air or ground platforms under harsh conditions, such as UAV/UGV. The small and lightweight CONNEX system transmits commercial, industrial, inspection and monitoring video in real time to its Ground unit, which can be located up to 1,000 meters away.

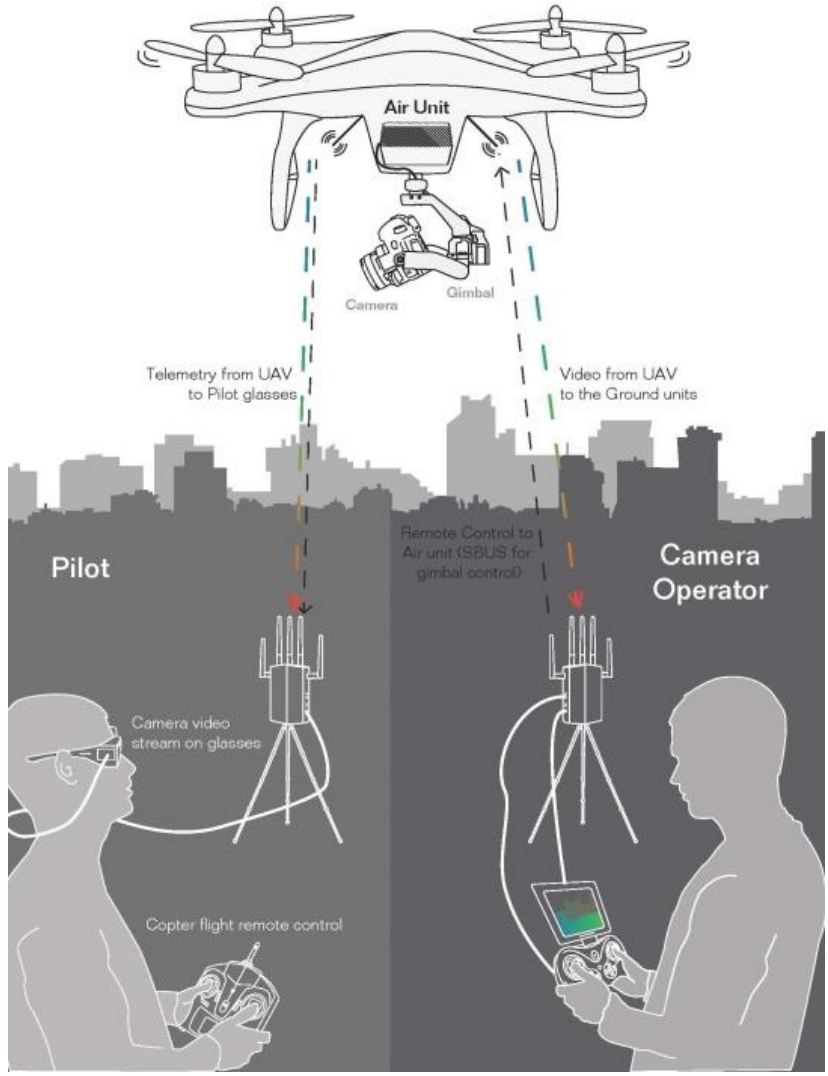


Figure 1: How CONNEX Works

- **Air Unit:** The Air unit is connected to an aircraft in order to capture video from the aircraft camera and to transmit it to up to four Ground units simultaneously (multicast), thus creating a wireless video link.
- **Ground Unit:** The Ground unit connects to various types of monitors, video goggles or a portable video stream monitor) via the HDMI port. This enables the pilot and/or camera operator to monitor the video transmitted from the Air unit.
- **Pilot:** The pilot can wear video goggles that are attached to the Ground unit on which the video stream can be viewed or look at the Ground unit monitor. The video goggles connected to a Ground unit receive and display flight control (telemetry) information from the aircraft, which is displayed overlaid on the video. The pilot uses a remote flight controller to control the aircraft.
- **Camera Operator:** The camera operator can hold a portable or PC video stream monitor on which the video stream can be viewed. The camera operator can use a gimbal remote control to control the aircraft camera's gimbal through the SBUS port of the Air unit.

Key Features

- True full HD 1080P at 60fps
- Up to 1,000 meter range (LOS)
- Zero latency, real-time video
- Extremely resilient 5GHz. digital link with AFS
- Automatic frequency selection that fully complies with regulations and automatically selects the best free frequency available
- Encrypted and secured
- Sturdy design for harsh conditions
- Built-in OSD view (MAVLInk based telemetry)
- Gimbal control over Futaba® SBUS
- Plug-and-Fly, out of the box setup and operation

In the Box

CONNEX is comprised of the following components:

- **Air Unit (Transmitter),** page 11
- **Ground Unit (Receiver),** page 15

Air Unit (Transmitter)

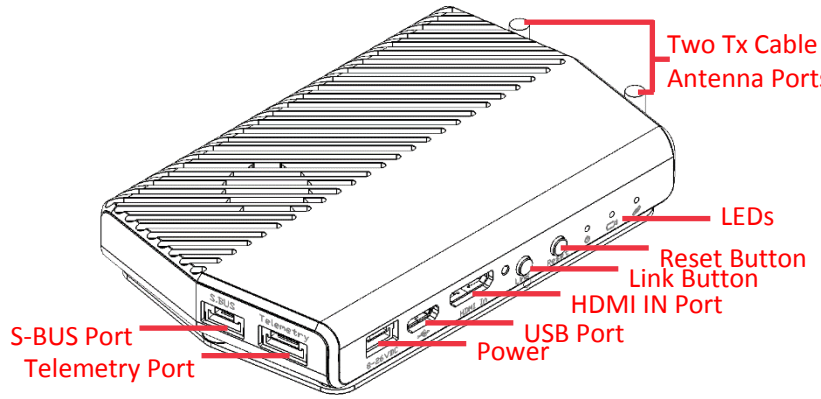


Figure 2: Air Unit (Transmitter)

Table 1: Air Unit Components

SBUS: Control port for the gimbal, which can be connected to a flight controller compatible with the SBUS protocol or directly to an Air unit receiver for the purpose of controlling the camera gimbal. This port should not be used as a flight control port and must be connected to the SBUS port. SBUS properties can be configured using the CONNEX Management application, which runs on the computer monitor connected to the Ground unit, as described in *Chapter 4, CONNEX Management Application* on page 35. Do not use the SBUS signal for controlling the drone's flight.
Telemetry: Enables the display of flight control data (OSD) from an aircraft that has a MAVLink-supported flight controller. OSD information includes flight mode, number of connected GPS satellite, speed, height and more. For telemetry, the Air unit should be connected to the aircraft's telemetry port. You may refer to *Appendix B* on page 46 for more information.
Power Connector: 8-26-VDC voltage (3−6 cells).
Micro USB Port: This port enables configuration and upgrade of the Air unit software using the CONNEX Management application, as described in the *Chapter 4, CONNEX Management Application* section on page 35.
Mini HDMI IN: For receiving video streaming from the camera.
HDMI Connector Screw: For stabilizing the HDMI cable to the Air unit.
Link Button: The Air unit is preregistered to the Ground unit that comes in the box. The **Link** button can be used to register up to three additional Ground units to the same Air unit. You may refer to the *Multicasting to Multiple Ground Units* section on page 31 for a description of how to register additional Ground units.
Reset Button: Resets the Air unit.
Tx Cable Antenna Ports: Two lightweight 2dbi cable antenna ports.

For a description of the Air unit LEDs, you may refer to:

- *Table 3:* *Air Unit* – Power LED
- *Table 4:* *Air Unit* – Video LED
- *Table 5:* *Air Unit – Network* LED

Note: For information about additional accessories, go to www.amimon.com.

Air Unit Cables and Mounting Plate

The number of the box in which each cable is provided is indicated below.

Tx Cable Antennas

Two lightweight 2dbi cable antennas. Box 1B.

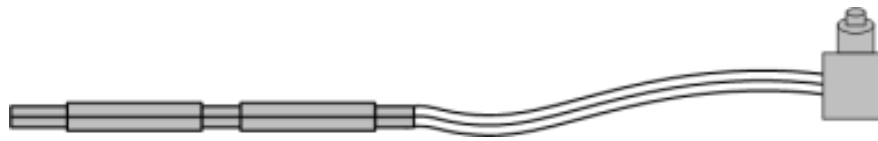


Figure 3: Tx Cable Antennas

Micro to Mini HDMI Cable

Mini to Micro (Right Angled) – 50cm length. Box 1A.



Figure 4: Micro to Mini HDMI Cable

S-BUS Cable

5-pin JST to S-BUS female – 50cm length. Box 6.



Figure 5: S-BUS Cable

Telemetry Cable

6-pin JST female to 6-pin DF13 – 50cm length. Box 6.



Figure 6: Telemetry Cable

Air Unit Power Cable

4-pin JST to XT-60 Male – 50cm length. Box 1B.



Figure 7: Air Unit Power Cable

Micro USB Cable

Standard Micro USB cable for upgrading the Air unit software. The same cable can be used for both the Air and Ground units. Box 6.



Figure 8: USB Cable

Mounting Plate

For connecting the Air unit to the aircraft. This item consists of two parts. Box 3.



Figure 9: Mounting Plate

Ground Unit (Receiver)

The following shows both sides of the Ground unit.

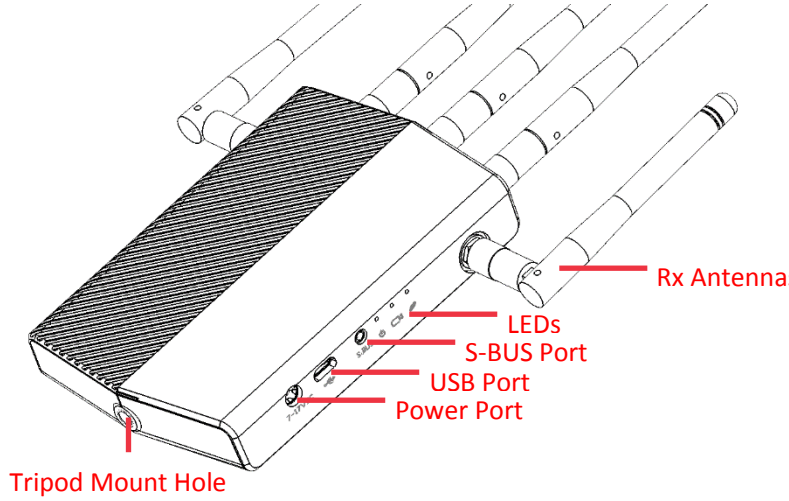


Figure 10: Ground Unit (Receiver) – 1

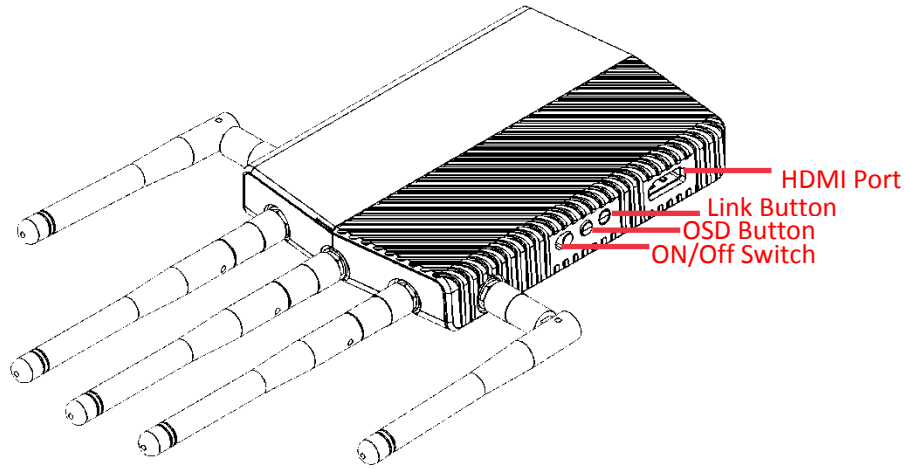


Figure 11: Ground Unit (Receiver) – 2

Table 2: Ground Unit Components

Tripod Mount Hole: Enables you to connect the Ground unit to a tripod. Connection to a tripod is optional.
Power Port: 7-17VDC voltage.
USB Port: For software upgrade and direct connection to the CONNEX Management application. This application can be downloaded to your own computer monitor connected to the Ground unit, as described in *Chapter 4, CONNEX Management Application* section on page 35.
SBUS: This port can be connected to the Futaba Remote Control trainer port. This port enables

you to remotely control the gimbal on the Air unit using the link between the Ground unit and the Air unit. The bit rate of this control can be configured in the **SBUS Rate** field using the CONNEX Management application, as described in the *Configuring the Link* section on page 40.
Five Rx Antennas Connectors: The five provided antennas must be screwed onto these connectors.
On/Off Switch: Set this switch to On to power on the Ground unit.
OSD Button: Enables/disables the OSD display. The OSD display presents a screen of MAVLink-based information collected by the CONNEX system on the monitor connected to the Ground unit, such as Air unit flight parameters, height, direction, signal strength and so on. You may refer to the *Ground Unit – On Screen Display (OSD)* section on page 26 for more information. By default, OSD is enabled (displayed). Pressing this button disables OSD and pressing this button again enables OSD again.
Link Button: The CONNEX system supports up to four Ground units per Air unit. The Ground unit is provided out-of-the-box to automatically search for and connect to the Air unit that is provided in the same box. The **Link** button enables you to connect additional Ground units to the same Air unit. You may refer to the *Multicasting to Multiple Ground Units* section on page 31 for a description of this procedure.
HDMI Port: Enables the display of the received video. Connect this port to the monitor's HDMI port using the provided Standard HDMI cable.
Battery Plate Screws: Four screws are provided on the bottom of the Ground unit for connecting a battery plate. The battery plate is an optional accessory and is not provided. It can be ordered from Amimon's website.

For a description of the Air unit LEDs, you may refer to:

- *Table 6:*  *Ground Unit* – Power LED
- *Table 7:*  *Ground Unit* – Video LED
- *Table 8:*  *Ground Unit – Network* LED

Ground Unit Cables

The number of the box in which each cable is provided is indicated below.

Standard HDMI Cable

1.2 meters. Box 2.

AC Power Adapter and Cable

Box 5.

SBUS Cable

3-pin to Futaba – 1meter cable. Box 6.



Figure 12: SBUS Cable

Rx Antennas

Five 2dbi screw-on antennas. Box 4.

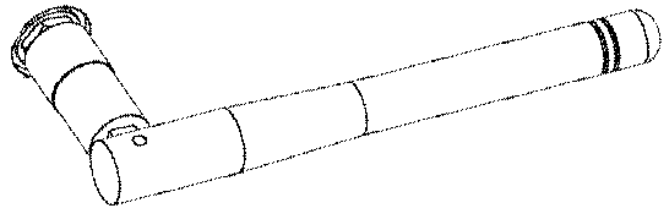


Figure 13: Rx Antennas

Micro USB Cable

Standard Micro USB cable for upgrading the Ground unit software.

The Micro USB connector connects to the USB port on the Ground unit.

The Mini USB connector connects to the computer connected to the Ground unit. Box 6.



Figure 14: Micro USB Cable

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Chapter 2, Setting Up CONNEX

This chapter describes how to setup and connect the CONNEX Air unit (below) and the CONNEX Ground unit (page 23).

Unpacking the CONNEX Box

Open up the CONNEX box and take out the Ground unit, the Air unit and their antennas/cables. The package contents of the CONNEX system are described in the *In the Box* section on page 10.

Note: For information about additional accessories, go to www.amimon.com.

Setting Up the CONNEX Air Unit

Set up the CONNEX Air unit (transmitter) and connect it to the aircraft, as described below. You can also view the XXX movie for reference. PLEASE PROVIDE LINK TO MOVIE AND THE NAME OF THE MOVIE. GGG

▶ **To set up the CONNEX Air unit:**

1 **If attaching the Air unit to a flat surface on the aircraft,** then perform the following:

- Place the Air unit in the center of the provided mounting plate on the side with the bumps protruding.
- Use the provided plastic ties to hold the Air unit to the mounting plate. You can thread the plastic ties through any of the holes on the mounting plate.

If attaching the Air unit to a bar on the aircraft, then perform the following:

- A clear plastic holder is provided to help attach the mounting plate to a bar on the aircraft.
- Insert the plastic holder into the opening in the square center of the mounting plate, as shown below:

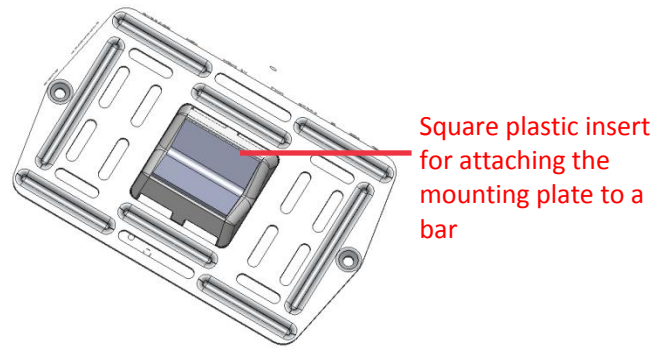


Figure 15: Connecting the Mounting Plate to a Bar on the Aircraft – 2

The square plastic insert can be placed in the opening in the center of the mounting plate either horizontally or vertically according to how you want to position the mounting plate relative to the bar to which you are attaching it.

Make sure that the Air unit's ventilation openings are not obstructed.

2 Connect the two provided **cable antennas** (page 12) to the two Air unit **cable antenna ports** (Figure 2). The right side of each of the two cable antennas (as shown in Figure 3) goes into the Air unit connector.

You may refer to the *Connecting the Air Unit Cable Antennas* section on page 22 for more detailed explanations and a list of the best practices for connecting the antenna.

S Connect the provided **Micro to Mini HDMI cable** (Figure 4) from the **HDMI IN** port on the Air unit to the camera.

The right side of this cable (as shown in Figure 16) goes into the Air unit **HDMI IN** port (Figure 2).

The left side of this cable (as shown in Figure 16) goes into the aircraft's camera.



Figure 16: Connecting the Air Unit HDMI Cable – Box 1A Micro to Mini HDMI

Close the **HDMI Connector Screw** (which is to the right of the HDMI IN port) to stabilize the connected HDMI cable to the Air unit.

4 Connect the provided Air unit **Power cable** (Figure 7) to the power port on the Air unit.

The right side of this cable (as shown in Figure 17) goes into the Air unit power port labeled **8-26-VDC** (Figure 2).

The left side of this cable (as shown in Figure 17) goes to the battery.



Figure 17: Connecting the Air Unit Power Cable – Box 1B

5 Connect the other end of the provided Air unit power cable to the power source (battery). Use an 8-26-VDC voltage battery.

Take note that the Air Unit Power LED ⏻ lights up. The following describes the various states of the Air unit Power LED:

Table 3: ⏻ Air Unit – Power LED

On (White)	The Air unit is powered on.
Off	No power is being supplied to the Air unit.
Blinks Quickly	Indicates a system error.

6 The Air unit automatically connects with the powered on Ground units that are registered with this Air unit.

This connection is created regardless of whether video is streaming or not, as follows:

- If video is streaming, then the Ground units display the video.
- If video is not streaming, then the Ground units display the message: *Please check your video source* upon linking to the Air unit.

The Air unit's video and transmission status is indicated by its LEDs, as described below:

Table 4: Air Unit – Video LED

On (Blue)	The video signal from the camera is locked, meaning that it is being correctly received by the Air unit from the camera.
Off	The video from the camera is not locked, meaning that the Air unit is not receiving the video from the camera.
Blinks Quickly	The camera is streaming a video resolution that is not supported by the Air unit.

Table 5: Air Unit – Network LED

On (Blue)	A link has been established to the Ground unit, meaning that video is being transmitted to it.
Off	The Air unit is not broadcasting because it has not recognized any Ground units with which it registered previously.
Blinks Quickly	The Air unit is registering with a Ground unit or the Air unit has gone out of range of the Ground unit and is searching for it.
Blinks Slowly	The Air unit is establishing a link with a Ground unit.
Blinks Very Slowly	The Air unit is searching for an available frequency on which to transmit. **Note:** This may take up to 70 seconds when working outdoors in Japan.

Connecting the Air Unit Cable Antennas

The following is a list of the best practices for optional placement and connection of the air unit cable antennas:

PLEASE PROVIDE INFORMATION AND PICTURES GGG

Connecting the Telemetry Port

The following describes how to connect the Air unit Telemetry port to the aircraft's flight controller so that the Ground unit monitor can display information received from the aircraft's flight controller overlaid on the video, such as flight mode, number of connected GPS satellite, speed, height, orientation and more.

▶ **To connect the Telemetry port:**

1 Connect the Air unit **Telemetry** port to the aircraft using the provided Air unit **Telemetry cable** (Figure 6).

The right side of this cable goes into the Air unit **Telemetry** port (Figure 2).

The left side of this cable goes into the Telemetry port of the fight controller on the aircraft.



Figure 18: Connecting the Air Unit Telemetry Cable – Box 6

Setting Up the CONNEX Ground Unit

▶ **To set up the CONNEX Ground unit:**

1 Screw on the five provided antennas to the five Ground unit antenna connectors, as shown below:

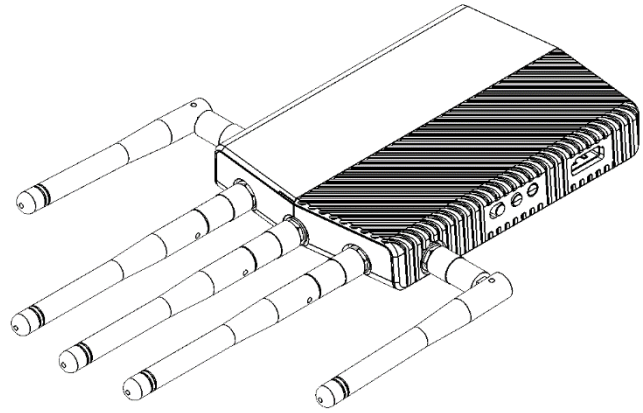


Figure 19: Connecting the Ground Unit Antennas – Box 4

2 In order to enable the display of the received video, connect the provided **Standard HDMI cable** (Box 2) from the Ground unit **HDMI port** to the monitor's **HDMI** port (Figure 10).

3 Connect the provided power AC adapter (Box 5) to the power port on the Ground unit labeled **7-17-VDC** (Figure 10) and connect the other end to a power source.

The objective is to see all three LEDs on the Ground unit light up (On), as described below.

Table 6: Ground Unit – Power LED

On (White)	The Ground unit is powered on and the unit's On/Off switch (Figure 10) is on.
Off	No power is being supplied to the Ground unit.
Blinks Quickly	Indicates a system error.

Table 7: Ground Unit – Video LED

On (Blue)	The video signal from the Ground unit is locked, meaning that it is being received from the Air unit.
Off	The Ground unit is powered down.

Table 8: Ground Unit – Network LED

On (Blue)	A link has been established to the Air unit, meaning that the Ground unit is receiving video transmission from the Air unit. The Network LED displays one of three colors to indicate the link quality, as follows: • **Red:** Poor (-16dBm) • **Green:** Fair (16dBm – 22dBm) • **Blue:** Excellent (+22dBm)
Off	No registered devices, meaning that the Ground unit has not detected any Air units.
Blinks Quickly	The Ground unit is registering with an Air unit or the Air unit has gone out of range of the Ground unit, which is searching for it.
Blinks Slowly	The Ground unit is searching for an Air unit in order to establish a link.

Chapter 3, Using CONNEX

This chapter describes how to get started using the Air unit and the Ground unit. This chapter also describes the Ground unit's On Screen Display (OSD), how to set up multicasting and how to set up control of the aircraft's camera gimbal from a gimbal remote control.

Getting Started – Air Unit

The Air unit is provided out-of-the-box to automatically search for and connect to the Ground unit that is provided in the same box, thus creating a wireless video link.

▶ **To get started with the Air unit:**

1. Set up the Air unit, as described in the *Setting Up the CONNEX Air Unit* section on page 19.
2. The Air unit can be configured to transmit perfect video downlink to up to three additional Ground units, as described in the *Multicasting to Multiple Ground Units* section on page 31.

Getting Started – Ground Unit

The Ground unit is provided out-of-the-box to automatically search for and connect to the Air unit that is provided in the same box, thus creating a wireless video link.

▶ **To get started with the Ground unit:**

1. Set up the Ground unit, as described in the *Setting Up the CONNEX Ground Unit* section on page 23.

   The Ground unit monitor then automatically displays video and an overlay of information received from the Air unit, as described in the *Ground Unit – On Screen Display (OSD)* section on page 26.

Ground Unit – On Screen Display (OSD)

The Ground unit monitor displays information collected by the CONNEX system overlaid on the video received from the Air unit. The following kinds of information can be displayed overlaid on the video:

- **Default,** below
- **Telemetry [Optional],** page 27
- **Alerts and System Messages,** page 30

Default Information Overlaid on Video

By default, the Ground unit displays the following information overlaid on the bottom of the video in a black strip:

- D:500M: Distance of Air unit from Ground unit
- 720P60: Video resolution captured by the aircraft camera
- : Air unit power voltage level
- 12V: Ground unit from Air unit signal strength indicator



Figure 20: OSD ON – Default View

By default, this OSD information is enabled (displayed). Pressing the **OSD** button (shown in Table 2) on the Ground unit disables (hides) this OSD information. Pressing this button again displays it again.

Additional Telemetry Information Overlaid on Video

Additional telemetry information can be overlaid on the video received from the aircraft's flight controller in a black strip on the top of the video, such as flight mode, number of connected GPS satellite, speed, height, orientation and more.



Figure 21: OSD View – With Additional Telemetry Information

This additional information is displayed when:

- The aircraft has a MAVLink-based flight controller.
- The Air unit Telemetry port is connected to the aircraft's flight controller, as described in the *Connecting the Telemetry Port* section on page 22.
- The **OSD** button (shown in Table 2) on the Ground unit is set to enable the display of flight control (Telemetry) information.

When the Air unit receives valid MAVLink messages from the aircraft flight control, these messages are transmitted to the Ground unit, which displays the additional Telemetry information on the OSD. This may require a few seconds to take effect.

You may refer to *Appendix B* on page 45 for a list of the supported flight controllers.

▶ To display OSD information:

- While all three LEDs on the Ground unit are lit, press the **OSD** button on the Ground unit (Figure 10). The following is an example of the OSD View:



Figure 22: OSD View – with Telemetry Information

The following OSD information is displayed on the Ground unit monitor.

Table 9: OSD Telemetry Information

Data	Data Source
Vertical Speed	Aircraft Telemetry Unit
Horizontal Speed	Aircraft Telemetry Unit
Height	Aircraft Telemetry Unit
Battery Status	Aircraft Telemetry Unit
RC Signal Quality	Aircraft Telemetry Unit
Number of Connected GPS Satellites	Aircraft Telemetry Unit

<table>
<tr><th>Data</th><th>Data Source</th></tr>
<tr><td>Flight Mode</td><td>Aircraft Telemetry Unit. The following standard 4-character Arducopter flight modes may be displayed:
<table>
<tr><th>Flight Mode</th><th>Description</th></tr>
<tr><td>STBL</td><td>Stabilize</td></tr>
<tr><td>ARCO</td><td>Arco</td></tr>
<tr><td>ALTH</td><td>Alt Hold</td></tr>
<tr><td>AUTO</td><td>Auto</td></tr>
<tr><td>GUID</td><td>Guided</td></tr>
<tr><td>LOIT</td><td>Loiter</td></tr>
<tr><td>RTL</td><td>RTL</td></tr>
<tr><td>CIRC</td><td>Circle</td></tr>
<tr><td>POS</td><td>Position</td></tr>
<tr><td>LAND</td><td>Land</td></tr>
<tr><td>DRFT</td><td>Drift</td></tr>
<tr><td>SPRT</td><td>Sport</td></tr>
</table></td></tr>
</table>

Alert and System Messages

The following describes the messages that may appear on the monitor connected to the Ground unit via its HDMI port.

Alert Messages – Overlaid in Video during Link

These alert messages may be displayed on top of the live video.

Table 10: Alert Messages

Out of Range	A link still exists but the video signal has been lost. This message is displayed regardless of the **OSD** button position.
Approached Range Limit	Is displayed for 30 seconds, from the moment the Air unit has been detected as out of range until the **Out of Range** warning is displayed. This message represents a warning that the video signal is about to be lost. We recommend flying the aircraft back within the range of the Ground unit. When the aircraft is within range, the video signal is automatically renewed. This message is only displayed if the OSD button enables OSD display.
Please Check Video Source	A link has been established between the Air unit and the Ground unit, but no video signal has been detected. This message is displayed regardless of the Ground unit's OSD button position.

System Messages – No Link

These system messages may be displayed when no live video is displayed.

Table 11: System Messages (in Link)

Searching for Air Unit	This message is displayed until a link is established. This may occur when the Air unit is unavailable or has removed the Ground unit from its list of registered devices.
Starting Registration process	Press **OK** to continue.
Adding Air Unit	Is displayed while the Air unit is registering a Ground unit.

Multicasting to Multiple Ground Units

Overview

A single Air unit can transmit perfect video downlink to up to four Ground units. This is called *multicasting*. The following procedure describes how to register an additional Ground unit to the same Air unit.

Note: The Ground unit is provided out-of-the-box to automatically search for and connect to the Air unit that is provided in the same box. Therefore, there is no need to perform this procedure on the Air unit / Ground unit provided in the same box.

Note: The gimbal control on the Air unit's camera is not supported when multicasting to multiple Ground units.

Registering Additional Ground Units to an Air Unit

▶ **To register an additional Ground unit to an Air unit:**

1. Set up the additional Ground unit to an Air unit, as described in the *Setting Up the CONNEX Ground Unit* section on page 23. Each Ground unit must be placed at least a few meters apart in order to enable optimal reception.

   The following message is then displayed on the monitor connected to the Ground unit's **HDMI port** (Figure 10).

   Ground unit not registered to Air unit

2. Press and hold the **Link** button (Figure 10) on the Ground unit (for approximately five seconds) until its **Network** LED starts blinking. The following message is displayed on the monitor connected to the Ground unit:

   Please activate registration on Air unit

3. Power on the Air unit to which to register this Ground unit. This step assumes that the Air unit has already been set up, as described in the *Setting Up the CONNEX Air Unit* section on page 19.

   Press the Air unit's **Link** button for five seconds until the Network LED starts blinking. After the LED begins blinking, the following message is displayed on the monitor connected to the Ground unit.

   Air unit detected. Please press the Link button.

4 Press and hold the **Link** button on the Ground unit. The following message is then displayed:

Pairing in progress

After a while, the monitor connected to the Ground unit should display the video received from the Air unit, as described in the *Ground Unit – On Screen Display (OSD)* section on page 26.

Note: If a black screen is displayed (as shown below), then check that the camera on the aircraft is operating.

▶ **To see a list of Ground units to which an Air unit is registered:**

You may refer to the *Checking the Ground Units Registered to an Air Unit* section on page 42.

▶ **To clear all the Ground units to which an Air unit is registered:**

You may refer to the *Unregistering All Ground Units* section on page 43.

Controlling the Aircraft Camera Gimbal

The CONNEX Gimbal Control feature enables an operator on the ground to control the aircraft's camera gimbal using a Futaba remote control over the video uplink channel. Only gimbals that can input SBUS are supported. Gimbal control is supported for up to 1 Km.

This feature can only be used when an Air unit is registered to a single Ground unit. Check that this is the case , as described in the *Checking the Ground Units Registered to an Air Unit* section on page 42 before proceeding with the instructions below.

▶ To enable the CONNEX Gimbal Control feature:

1. Connect the Air unit **SBUS** port to the SDBUS port on the camera's gimbal using the provided **SBUS cable** (Figure 5).

   The right side of this cable goes into the Air unit **SBUS** port (Figure 2).

   The left side of this cable goes into the gimbal controller (GCU) on the aircraft.



Figure 23: Connecting the Air Unit S-BUS Cable – Box 6

2. Ensure that the Futaba remote control is configured to output SBUS on its trainer port. Configuration is usually performed by setting the number of output channels to 16.
3. Connect the Futaba gimbal remote control's trainer port to the Ground unit's SBUS (Figure 12) port using the trainer port cable.
4. The default gimbal command transmission bit rate is 15 mSec. If this bit rate is not supported by the gimbal controller, then use the CONNEX Management application to configure the SBUS Bit Rate manually, as described in the *Configuring the Link* section on page 40.

The Ground unit automatically detects the SBUS and transmits the gimbal commands over the wireless return channel to the Air unit's SBUS port.

You may refer to *Appendix C, Supported Remote Controls Gimbals* on page 45 for a list of supported remote controls and gimbals.

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Chapter 4, CONNEX Management Application

This chapter describes how to configure and upgrade the CONNEX Air unit and Ground unit.

Overview

The Air unit and the Ground unit come preconfigured to communicate with each other. If needed, you can reconfigure the wireless video datalink by connecting the Air unit to a PC and using the CONNEX Management application, as described in the *Configuring the Link* section on page 40.

The Air unit and the Ground unit come preinstalled with the latest firmware version. If needed, you can upgrade the firmware of each, as described in the *Upgrading the Air Unit or Ground Unit Firmware* section on page 38.

▶ **To use the CONNEX Management application:**

1. Install the CONNEX Management Application, as described in the *Installing the CONNEX Management Application* section on page 36.
2. Connect the Air Unit or Ground Unit to a computer, as described in the *Connecting the Air Unit or Ground Unit to a Computer* section on page 37.

Note: Only a single CONNEX Air unit or CONNEX Ground unit can be connected to the CONNEX Management application at a time.

Installing the CONNEX Management Application

This application can run on a standard computer running Windows 7 and up.

▶ To install the CONNEX Management application:

1. Simply download the latest version from the Amimon website www.amimon.com to a computer connected to a Ground unit.
2. Run the installation file and follow the displayed instructions to install the CONNEX Management application.
3. Launch the application by double-clicking its desktop icon. The following window displays:



Figure 24: Installing the Air Unit (shown on left) or Ground Unit (shown on right)

The current version of the CONNEX Management application is displayed in the top left corner of the window.

▶ To upgrade the CONNEX Management application:

- Simply download the latest version from the Amimon website and reinstall it, as described above.

Connecting the Air Unit or Ground Unit to a Computer

The Air unit or Ground unit must be connected to a computer on which the CONNEX Management application is installed in order to configure or upgrade that unit.

▶ To connect the Air unit or Ground unit to a computer:

- Connect the Micro USB cable (Box 6) to the Air unit's or Ground unit's USB port (Figure 10).



Figure 25: Connecting the Ground Unit to PC USB Cable – Box 6

If you launch the CONNEX Management application before connecting an Air unit or Ground unit to the computer, then the following message is displayed. Simply connect the unit, as described above.



Figure 26: Connect the Unit Using a USB Cable

Upgrading the Air Unit or Ground Unit Firmware

Upgrading the Air unit or Ground unit firmware does not affect the settings of the wireless video downlink.

▶ To upgrade the Air Unit or Ground unit firmware:

1. Make sure that the computer on which the CONNEX Management application is installed is connected to the Internet and is connected to the Air unit/Ground unit via a Micro USB cable.
2. Launch the CONNEX Management application by double-clicking its desktop icon. The following shows the window displayed on the Air unit (on the left) and on the Ground unit (on the right). The **Software Upgrade** tab is selected by default. This is the only tab that appears for the Ground unit.



Figure 27: Upgrading the Air Unit (shown on left) or Ground Unit (shown on right)

The following describes the options in this window:

- **Module:** Specifies whether the connected unit is an Air unit (Tx) or a Ground unit (Rx).
- **SW Version:** Specifies the version of the firmware currently installed on the unit.
- **SN / MAC ID:** Specifies the unique identifiers of this unit: Serial number and MAC ID.
- **Upgrade Button:** The application automatically verifies with Amimon whether the latest firmware version of the connected unit is already installed. If the latest version is not installed, then the **Upgrade** button is active.

3 Click the **Upgrade** button. The latest software version is automatically downloaded from the Amimon website and installed on the connected unit. The bottom of the window displays the progress of the upgrade and lists the processes as they are performed, as shown below:



Figure 28: Upgrading a Unit

4 If you upgrade an Air unit, then you must upgrade all the Ground units registered to it. We highly recommend that you only start the upgrade process after the Air unit and its Ground units have been collected and are placed next to the computer.

General Warning Sign: An Air unit and a Ground unit that have different software versions may not communicate with each other.

PLEASE PROVIDE NEW SCREENSHOTS THAT SAY **FIRMWARE** INSTEAD OF **SOFTWARE.** GGG

Configuring the Link

The following describes how to configure the link between an Air unit and the Ground units. This procedure is performed on an Air unit only.



Figure 29: Link Configuration

▶ To configure the link:

1. Make sure that the computer on which the CONNEX Management application is installed is connected to the Air unit via a Micro USB cable and is connected to the Internet.
2. Launch the CONNEX Management application by double-clicking its desktop icon.
3. Select the **Link Configuration** tab.
4. In the **Link Mode** field, select the bandwidth channel mode, as follows:
   - **Optimized Quality (40 MHz):** This is the default option. It provides the best quality. This is the only option that can be used with 1080P60 video resolution.
   - **Optimized Range (20 MHz):** Provides a more robust channel, with a longer range and with lower quality.
   - **Auto:** Automatically selects **Optimized Quality (40 MHz)** if the camera is operating with 1080P60 video resolution. Otherwise, it automatically selects **Optimized Range (20 MHz)**.

3 The **SBUS Rate** field specifies the data rate of the SBUS link between the Ground unit and the Air unit that controls the Air unit's camera gimbal. CONNEX automatically configures the data rate of the SBUS remote control to be similar to the SBUS rate received from the remote control trainer port. However, if the remote control requires a different data rate, in the **SBUS Rate** field, select **15** mSec or **6.3** mSec.

4 The **Spectrum per Region** dropdown menu is an optional field that appears in Europe and Japan. This field enables you to select the frequency spectrum suitable for each region according to its local regulations. This dropdown menu provides different options for your selection, as follows:

- In Europe, select either **Indoor** or **Air to Ground**.
- In Japan, select either **Indoor** or **Outdoor**.

5 Click the **Update** button to apply the configured changes to the Air unit. This affects how the Air unit communicates with all the Ground units with which it is registered, meaning those that are listed in the **Registered Receivers** list on the bottom right of the window.

Checking the Ground Units Registered to an Air Unit

▶ **To see which Ground units are registered to an Air unit:**

1. Make sure that the computer on which the CONNEX Management application is installed is connected to the Internet and is connected to the Air unit via a Micro USB cable.
2. Launch the CONNEX Management application by double-clicking its desktop icon.
3. Click the **Link Configuration** tab.
4. The bottom right of the window displays a list of the MAC IDs of the Ground units registered with this Air unit, as shown below:



Figure 30: Registered Receivers

The MAC ID of a specific Ground unit can be seen using the CONNEX Management application as described on page 38.

Unregistering All Ground Units

Note: There is no option to unregister one Ground unit at a time.

▶ **To unregister all Ground units from a specific Air unit:**

1. Make sure that the computer on which the CONNEX Management application is installed is connected to the Internet and is connected to the Air unit via a Micro USB cable.
2. Launch the CONNEX Management application by double-clicking its desktop icon.
3. Click the **Link Configuration** tab. The bottom right of the window displays a list of Ground units registered with this Air unit, as shown below:



Figure 31: Unregistering Ground Units

5. Click the **Unregister all receivers** button.

Appendix A, Technical Specifications

Table 14: Technical Specifications

Transmission Distance Outdoor	Up to 1,000m/3,000 ft. (LoS)	
Transmission Delay	Zero [Less than 1 msec.]	
Radio Frequency	5.1-5.8 GHz, 17 channels	
Channel Selection	Automatic frequency selection [AFS]	
Video Formats	60/59.94, 1080p/50, 1080i/60, 1080i/50, 30/29.97, 24/23.98, 60/59.94, 720p/50, 480i/60, 576i/50	
Multicast Mode	Up to 4 receivers with no delay or quality degradation. [Requiring extra ground unit/s]	
OSD Support	MAVLink Telemetry based	
Encryption	AES-128 & RSA 1024 for key exchange	
Operating Temperature	0-45^{o} Celsius	
Regulation	CT, FCC, MIC	
	Air Unit	**Ground Unit**
Video Interface	Mini HDMI	HDMI (Type A)
Antenna Connectors	MMCX (x2)	SMA (x5)
Power Connector	4-pins	DC round
Power Input	8-26V (3S-6S)	7-19V
Dimensions (mm)	103 x 63.6 x 15.6	129 x 89 x 20
Weight	130 grams	260 grams

Appendix B, Supported Remote Controls, Gimbals and Telemetry Flight Controllers

The following lists the Air unit camera gimbals and the remote controls that are supported by CONNEX.

Supported Air Unit Camera Gimbals

DJI – Zenmuse Z15

- Zenmuse Z15-GH4 (HD) –, support SBUS 6.3ms mode only
- Zenmuse Z15-GH3
- Zenmuse Z15-BMPCC
- Zenmuse Z15-5D
- Zenmuse Z15-5D III (HD)
- Zenmuse Z15 Features

Tarot Gimbal

- Tarot T-2D

Supported Gimbal Remote Controls

Futaba

- 14GS
- FX22
- 18MZ
- FX32

Supported Flight Controllers for Telemetry

PLEASE PROVIDE. GGG

Appendix C, Supported Resolutions

This appendix lists the video resolutions supported by CONNEX.

Table 12: Supported Resolutions

Video Format Timings	Format Name	40MHZ Supported	20MHz Supported
	Primary CEA Video Formats	Yes	Yes
720(1440) x 480i @ 59.94Hz	480i	Yes	Yes
720(1440) x 480i @ 60Hz		Yes	Yes
640 x 480p @ 59.94/60Hz	480p	Yes	Yes
720 x 480p @ 59.94Hz		Yes	Yes
720 x 480p @ 60Hz		Yes	Yes
720(1440) x 576i @ 50Hz	576i	Yes	Yes
720 x 576p @ 50Hz	576p	Yes	Yes
1280 x 720p @ 50Hz	720p	Yes	Yes
1280 x 720p @ 59.94/60Hz		Yes	Yes
1920 x 1080i @ 50Hz	1080i	Yes	Yes
1920 x 1080i @ 59.94/60Hz		Yes	Yes
	Secondary CEA Video Formats	Yes	Yes
1920 x 1080p @ 23.98/24Hz	1080p	Yes	Yes
1920 x 1080p @ 50Hz		Yes	No
1920 x 1080p @ 60Hz		Yes	No
PsF		No	No

Appendix D, Limitation of Liability and Warranty

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Appendix E, FCC Caution

Any changes or modifications not expressly approved by Amimon may void the user's authority to operate this equipment.

Note: This equipment has been tested and found to comply with the limitations 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 generates, uses and can radiate radio frequency energy. If this equipment is not installed and used in accordance with the instructions, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

FCC Radiation Exposure Statement

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

The antenna used for transmission must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

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About Amimon

AMIMON develops and manufactures HD wireless video systems recognized as the standard solution of realtime wireless video for the pro-Camera, unmanned, medical, A/V installation and other markets. Its highly disruptive digital and RF semiconductor video modem technology addresses the stringent requirements of *realtime HD video connectivity* augmented by multicast and control capabilities.

Established in 2004, AMIMON is a privately held company with offices in Santa Clara, California, Tokyo, Taipei and Shenzhen.

CONNEX

by

AMIMON

Ordering Information:

CONNEX Set: AMN0811MS

CONNEX Extra Ground Unit: AMN0833