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P139-HD Digital Audio System

UG-GA182/GA212-01

Troubleshooting Guide

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1. INTRODUCTION

1.1. Purpose

This document describes troubleshooting steps that can be performed at the aircraft for determining the causes of faults on or surrounding the P139-HD Digital Audio System.

1.2. Description

The P139-HD is capable of connecting to almost any audio source or destination that may be installed in an aircraft, including aircraft radios, crew headsets and mission equipment.

The router also connects to the audio control panels that control the system via a proprietary interconnect protocol named Gnet.

Pilot and copilot control panels also control the system's Emergency Mode, which permits direct connection of flight crew to COM radios and warning tones in event of power or system failure.

Should an issue occur there are troubleshooting steps that can be performed at the aircraft to narrow down the issue to a particular component of the system.

1.3. Scope

This document is designed to assist troubleshooting to the Line Replaceable Unit (LRU) level. It does not provide troubleshooting information for the internal components of the Audio Router or Control Panels. There are no user serviceable parts inside the LRUs and they should never be opened, but should be returned to Eagle Copters for repair.

This document assumes the technician is familiar with Eagle Audio wiring drawings (G13004/G13162) and has access to the as-built drawings of the aircraft. Some troubleshooting steps may be performed without knowledge of the aircraft wiring.

1.4. Definitions

Configuration Mode...	System is serving the Configuration Web Page to allow settings changes. System runs slower than Flight Mode, and MMC card is required to serve the web page
Emergency Mode	Direct connection of Pilot Headset to COM1 and Warnings, and Copilot Headset to COM2 and Warnings, for use when power fails or other issues occur
Flight Mode.....	System is operating for flight, using internal configuration storage. MMC card not required in this mode
Gnet.....	Eagle Proprietary interconnect for control panels and other devices
Normal Mode.....	Pilot and Copilot headsets are connected to the main router electronics and controllable through their respective control panels

1.5. Abbreviations

COM	Communication Radio
ICS.....	Intercom System
LRU	Line Replaceable Unit
MMC.....	MultiMedia Card
PTT.....	Push To Talk

1.6. Eagle References

The following Eagle Copter documents are referenced in this document:

- a) GA063-3 P139-HD Audio System User Guide
- b) G13004 P139-HD Audio System Wiring Diagrams
- c) G13162 P139-HD (T) Audio System Wiring Diagrams

2. System Power Checks

If the system does not appear to be receiving any power (No lights on router or control panels) check the following:

1. Confirm 28VDC at D15 connector (J5/P5 for G13000 and J7/P7 for G13160) pins 1 and 9 and 8 and 15. Note that 19 and 9 are powered from a separate breaker to 8 and 15.
 - a. Note: If voltage drops below 14V (e.g. when cranking the engine) the router will power down.
2. Confirm airframe ground at D15 connector pins 4 and 5.

3. Emergency Mode Tests

If the system has entered Emergency mode and cannot be commanded to enter Normal mode, check the following:

1. Check the J3/P3 connector on the control panel for damage, corrosion, or pins pushed back. If any defect is noted, repair and retest.
2. Check the COMxDIR pins on the D15 connector at the router (J5/P5 for G13000 and J7/P7 for G13160) for damage, corrosion, or pins pushed back. If any defect is noted, repair and retest.
3. Remove the P3 connector from the back of the control panel and check the continuity of the COM ISO line from P3 pin 6 to the appropriate COMxDIR pin on the D15 power connector at the router. If the line is open-circuit, repair continuity and retest.
4. Disconnect the P3 connector from the back of the control panel, and confirm that when the router has power and is operating normally, P3 pin 6 is at 24VDC. If power is not present return the router to Eagle for repair.
5. Remove the control panel and check that when the switch is in the NORMAL position, there is continuity between J3 pin 6 and J3 pin 7 on the control panel connector, and that these pins are open-circuit when the switch is in the EMERG position. If the switch does not operate correctly, return the panel to Eagle for repair.

4. Control Panel Troubleshooting

4.1. Control Panel Power

Control panel power should **only** go to Pin 4 on the control panel Gnet connector (J1 or J2). If power is on any other pin of any connector on the control panel, damage to the panel may occur.

Note: The COM ISO and PTT lines on the J3/P3 connector are weak pull-ups to 24VDC inside the router, not power connections. Damage to the router could occur if attempts were made to use these as power supplies.

For aircraft with more than 6 control panels, some panels will be powered through a separate circuit breaker. Confirm 28VDC power at these panels when the AUDIO PANEL breaker is in.

4.2. Control Panel Failure Modes

Failure Mode	Cause / Resolution
Control panel dark	No power to control panel. Check continuity of power and ground from router connector to control panel connector and power is present when the audio system is powered If control panels are powered from an external breaker, confirm that the breaker is in and power is present at the connector
Control panel backlights on, but no radios can be selected	1. No Gnet data connection. Check continuity of the Data Hi and Data Low lines from router connector to control panel connector and ensure polarity is correct 2. Gnet ID set incorrectly. Ensure correct Gnet ID set on control panel connector
Selections on one panel affect another panel on same Gnet bus	Control panel IDs not set / Set incorrectly. Ensure each panel has a unique Gnet ID set by jumpers on the panel connector

4.3. Control Head Swap Testing

If the above failure mode tests do not resolve the problem, swap the malfunctioning panel with a working panel, and put the malfunctioning panel in place of the working one.

The panels do not need to have the same button labels in order to function, and G13115 panels and G13116 panels may be interchanged for testing, with the qualifiers that the second row of controls on a G13115 are all off when a G13116 is swapped in, and the second LED on the multi-purpose buttons on a G13116 is not visible on a G13115, although the second function if programmed will still operate.

The following table shows the possible results from swapping a working panel with a malfunctioning panel:

Result	Conclusion
Working panel malfunctions. Malfunctioning panel starts working	Gnet wiring issue or Gnet port on router malfunctioning. 1. Check wiring continuity from panel to router
Working panel continues working Malfunctioning panel continues malfunctioning	Control panel is damaged.
Working panel continues working Malfunctioning panel starts working	Connectors damaged, corroded or not fully inserted: 1. Inspect connectors for damage, corrosion, pins pushed back etc. 2. Swap control panels back and confirm correct operation
Working panel malfunctions. Malfunctioning panel continues malfunctioning	Aircraft wiring is damaging control panels. Confirm power is not on any pin except control panel J1/P1 pin 4

5. Headsets and Intercom

5.1. For All Headset Issues Check the Following

5.1.1. Confirm System is in Normal Mode

1. Power is on.
2. Control panels are active and functioning.
3. System is not in Emergency Mode.

5.1.2. Confirm headsets are set up correctly:

1. Confirm headset is securely connected to the headset jack.
2. If a dropcord is used, confirm headset is securely connected to dropcord and dropcord securely connected to aircraft connector.
3. Ensure volume controls on headset and dropcord are at maximum.
4. If noise-cancelling headsets are used, ensure headset has power from a fresh battery pack or aircraft power. This is usually a separate breaker to the audio system.
5. Try using other headsets and dropcords.

5.2. No Earphone Audio of any kind at Headset

1. If the system has an "Earphone Disable" switch or other mechanism for disabling audio to the headsets through the system configuration, ensure all such mechanisms are deselected.
2. Ensure all Transmit PTTs on aircraft controls and dropcords are deselected, as transmit may be programmed to mute receivers and ICS.
3. Confirm continuity of Earphone Audio from headset jack to router headset connector. Check connectors at both ends and any disconnects for damage, corrosion, or pins pushed back.
4. If continuity is confirmed, then the router may have a configuration issue or a fault. Contact Eagle Technical Support for further on-aircraft tests before returning the router for servicing.

5.3. No Mic Audio of any kind from Headset

1. Ensure no mic disconnect on the dropcord or aircraft controls is selected, as this will prevent ICS and transmit sidetone from working correctly.
2. Confirm continuity of Mic Audio from headset jack to router headset connector. Check connectors at both ends and any disconnects for damage, corrosion, or pins pushed back.
3. If continuity is confirmed, then the router may have a configuration issue or a fault. Contact Eagle Technical Support for further on-aircraft tests before returning the router for servicing.

5.4. Radio Receive / Transmit OK, but no ICS at Headset

5.4.1. Check for All ICS Issues

1. Confirm the ICS knob on the control panel responsible for that headset is OUT.
2. Confirm ICS volume is at midpoint.
3. Confirm ICS Isolate is off and ICS Private functions are disabled.
4. Key intercom through ICS Keyline or turning VOX pot fully clockwise.

5.4.2. Cannot Transmit on ICS

1. Set the controls as described in Section 4.4.1.
2. Confirm the mic you are attempting to key ICS on is not also keying a radio. ICS is disabled when transmitting on a radio.
3. If the ICS works when the drop-cord ICS keyline is keyed, but not on VOX, then the drop cord may disconnect the mic line except when a keyline is pressed. Confirm continuity of the mic hi and lo when the drop-cord is unkeyed.

4. Check if ICS can hot-mic by turning the ICS volume knob fully clockwise. If ICS can hot-mic but not be keyed by the keyline, check continuity between ICS PTT keyline and ground. The keyline should be open-circuit when unkeyed, and grounded when keyed.
5. If the ICS cannot be keyed by hot-mic VOX or keyline, then the router might not be configured for ICS on that channel. Contact Eagle Technical Support for further on-aircraft tests before returning the router for servicing.

5.4.3. Cannot Receive on ICS

1. Set the controls as described in Section 4.4.1.
2. First confirm the ICS is transmitting correctly at the station keying their ICS.
3. If receiving other audio except ICS is possible, then the router is possibly not configured for ICS on that channel. Contact Eagle Technical Support for further on-aircraft tests before returning the router for servicing.

6. Radio Issues

Radios include VHF COM radios, mission radios, Navigation receivers, cellphones and satphones, PA controllers and other devices that are connected to a radio port on the router for either transmit, receive or two way audio communication.

6.1. No Radio Receive at Headset

1. Confirm audio sources that are expected to be received are switched on and the volume level of the devices themselves has been set to midpoint.
2. For radios, confirm that they are tuned to a channel that is receiving audio (e.g. ATIS or a weather advisory channel). If the device has a 'receiving' indicator, confirm that it is active as expected.
3. Confirm devices are selected for receive on the Eagle control panels:
 - a. Confirm system is not in Emergency Mode.
 - b. Either the grey receive knob is OUT or the device is selected through a rectangular button.
 - c. That the volume control for the receiving device (if present), and Master Volume are at midpoint.
 - d. Confirm no other audio devices are selected for transmit or receive. Some audio inputs (such as aux audio jacks) may be set to mute when audio is received on a higher priority input, or when transmitting.
4. Confirm continuity of receive wiring between radio and router unit. Check connectors at both ends and any disconnects for damage, corrosion, or pins pushed back.
5. If possible confirm audio is present at the router connector using an oscilloscope or a headset and a pair of probe wires.
6. If all the above is correct, the fault is likely in the router. Return to Eagle Copters for servicing.

6.2. Unable To Transmit

6.2.1. Troubleshooting Procedure

1. Confirm crew headset is working by communicating on ICS inside the aircraft. This will check microphone and earphone operation
2. Confirm radio is switched on and tuned to an appropriate frequency
3. Confirm receive audio can be heard. If not troubleshoot "No Radio Receive at Headset"
4. Select the radio on the control panel and confirm the indicator above the TX select button illuminates
5. Key the radio for transmit and confirm the TX light to the left of the ICS/TX toggle switch illuminates
 - a. If the light does not illuminate, investigate disconnected Transmit PTT Keyline
6. Confirm the TX indicator on the radio signals that it was keyed

- a. If the radio does not signal that it was keyed, investigate disconnected Radio TX Keyline
7. Talk into the radio and confirm sidetone. If no sidetone is heard:
 - a. If the internal sidetone generator is used, confirm again that ICS is operational. If it is, then a configuration issue is likely.
 - b. If sidetone comes from the radio AND radio receive works AND the TX indicator on the radio illuminates, then:
 - i. Confirm the keylines between different headset ports is not swapped. If keylines are swapped, then the wrong mic lines will be enabled, leading to a keyed radio, but no audio unless one speaks into the other microphone.
 - ii. Confirm continuity of transmit wiring between radio and router unit. Check connectors at both ends and any disconnects for damage, corrosion, or pins pushed back
 - iii. If all above is correct, the fault is likely in the router. Return to Eagle Copters for servicing
8. If sidetone is heard, but no transmission outside the aircraft, an antenna or transmitter issue is likely

6.2.2. Disconnected Transmit PTT Keyline

1. With the audio system powered and no PTT keyed, measure the voltage at the PTT switch, it should be approximately 24VDC.
 - a. If there is no voltage present then check continuity from the PTT switch to the headset port keyline pin on the router unit. Check connectors at both ends and any disconnects for damage, corrosion, or pins pushed back
 - b. If continuity is good, disconnect the headset port connector from the router and measure the voltage on the router connector. If it is not 24VDC, then the unit has a fault. Return to Eagle Copters for servicing
2. If voltage is present, check the other side of the switch is connected to airframe ground
3. Confirm switch functions correctly and has continuity when keyed, and is open circuit when unkeyed
4. If all the above is good, then the Router is not responding to the keyline input. This could be a configuration issue that can be fixed by an emailed update, or could be a fault in the router. Contact Eagle Technical Support for further on-aircraft tests before returning the router for servicing

6.2.3. Disconnected Radio TX Keyline

1. Disconnect the Radio Port connector from the router and confirm the keyline pin is pulled up to the expected voltage from the radio (e.g. 12VDC or 28VDC)
 - a. If the keyline voltage is not present at the connector then check continuity from the radio to the TX keyline pin on the router unit. Check connectors at both ends and any disconnects for damage, corrosion, or pins pushed back
 - b. If the continuity for the keyline pin is good, check the pull-up voltage at the radio if possible
2. If pull-up voltage is present, with the radio port connector disconnected, measure the continuity to ground of the radio port keyline on the router. Pin should be open-circuit when not keyed, and shorted to ground when keyed
3. If the router does not ground the keyline when keyed, then the router is either not configured to key the radio or is faulty. Contact Eagle Technical Support for further on-aircraft tests before returning the router for servicing

7. Special Functions

Each P139-HD system is custom configured and may contain a number of special features such as multicast/simulcast, repeater/retransmit mode, private ICS buses, and more. Some of these features may be controlled through control panel buttons, others through external switches connected to unused input keylines on the router. Unused transmit keylines on the router may be repurposed to control devices or light indicators.

Given the unparalleled customisability it is not possible to give troubleshooting information for all possible features in the system. If general transmit/receive and intercom functions are working, but a special feature appears inoperative, please contact Eagle Copters for on-aircraft testing before returning the router or control panels for service.

Most issues not due to system setup can be resolved through emailing configuration updates to be installed on the router in the field and do not require servicing at the Eagle Copters facility.

8. Configuration Web Page Troubleshooting

8.1.1. Entering Configuration Mode

To enter configuration mode, all the following must be true:

1. The MMC card must have all 13 required files for operation
2. The MMC card must be inserted correctly into the router and fully seated
3. A computer must be connected to the Ethernet port
 - a. The computer **MUST** be connected when the power to the router is off
 - b. The computer **MUST** be powered on before the router
 - c. The computer must be directly connected to the router, not through a router or switch
 - d. Wi-Fi should be disabled, as a Wi-Fi router often has the same address as the Audio System
 - e. The Ethernet cable may be straight-through or crossover
 - f. The computer must be set to auto-negotiate speed and duplex and must be capable of operating at 100Mbps Ethernet
 - g. The computer must be set to automatically detect IP address (DHCP) and should not be set to a static IP address
4. The router will enter configuration mode if it sees an Ethernet connection to the computer when power is applied, and can also access the files on the MMC card.

If all the above are true, when power is applied, the A LED on the router will flash red briefly, then go solid green until configuration mode is entered.

Entering Configuration mode takes approximately 3 minutes. The system will not display any indication that it is processing apart from the A LED on the router being green.

If the A LED starts flashing green within 10-15 seconds of power being applied, then one of the conditions above was not valid, and the system has automatically entered flight mode.

The A LED will begin flashing green when Configuration Mode is being entered. The LED will flash slowly for about 30s as the system initialises, then begin flashing rapidly. At this point the web page is ready for use.

Enter the web page by opening any web browser and typing 192.168.0.1 in the address bar of the browser.

Note that the web pages are slow to load. Do not repeatedly click on buttons or refresh the page, but wait for the page to fully load before beginning configuration.

8.1.2. Saving and loading

Enter the save comment into the text box before pressing Save to MMC. If no comment is entered, the save time is displayed in the dropdown box of archived files.

Important Note: When restoring a configuration, the file is stored in temporary memory when loaded. In order to make the change permanent it must be saved to the MMC card again. Only the most recently saved file is loaded into internal memory for Flight Mode.