

Airplane Flight Manual Supplement

II Morrow Inc. **for II Morrow GX50 GPS and GX60/65 VHF Comm/GPS**
2345 Turner Rd. SE
Salem, OR 97302

June 11, 1999

Part #: 560-1015-02 Rev -

**FAA Approved Supplementary Airplane Flight Manual
II Morrow Apollo GX50 GPS and GX60/65 VHF Comm/GPS**

Airplane Make: Partenavia
Airplane Model: P68 Series
Airplane Serial No.: _____
Registration No.: _____

This Supplementary Flight Manual must be attached to the Registro Aeronautica Italiano (R.A.I.) approved Flight Manual when the Apollo GX50 GPS or GX60/65 GPS/Comm is installed for IFR use in accordance with STC **SA00504SE**.

The information contained herein supplements the basic Registro Aeronautica Italiano (R.A.I.) approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this document, consult the basic Airplane Flight Manual.

FAA Approved: *Nesta H. Bever*
for Manager, Seattle Aircraft Certification Office
Northwest Mountain Region
21 June 99

FAA Approved
Date: _____

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Revision Log

Rev	Date	Description	EN	By	Auth	Chk
00 -	1/28/98	Initial Release	5716	RAS	-	-
00 A	3/18/98	Minor Corrections	5773	RDG		
01 -	6/30/98	Added GX65. Reworded Altitude Assist limitation.	5809	RDG		
02 -	3/03/99	Modified for navigation software version 3.0. Added references to RNP-5 qualifications as defined for European B-RNAV (AC 90-96 & JAA TGL No. 2)	6068	RDG		

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1. GENERAL

1.1 APOLLO GX50/GX60/GX65 DESCRIPTION

The Apollo GX50 and GX60 are TSO-C129a Class A1 GPS supplemental navigation systems with a built-in moving map graphics display. The Apollo GX65 is a TSO-C129a Class A2 GPS supplemental navigation system. The GX50/60/65 provides interfaces to a CDI/HSI, autopilot, and annunciators. The GX50/60 is capable of being authorized for IFR/VFR enroute oceanic and remote, enroute domestic, terminal, and non-precision approach operation. The GX65 is capable of being authorized for IFR/VFR enroute oceanic and remote, enroute domestic, and terminal operation.

Apollo GX Systems meet all requirements for RNP-5/B-RNAV operations in accordance with FAA AC 90-96 and JAA TGL No. 2 revision 1 (or later).

1.1.1 Apollo GX50 GPS

The Apollo GX50 is a GPS only unit and is powered by a single circuit breaker from the avionics bus.

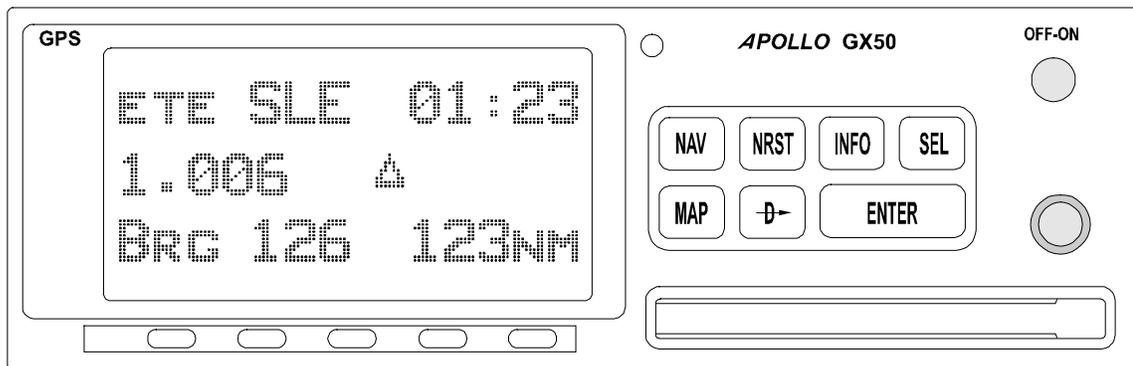


Figure 1: Apollo GX50

1.1.2 Apollo GX60/65 GPS/Comm

The Apollo GX60/65 includes a 760 channel VHF communications transceiver in addition to the GPS navigation functions. The comm provides a minimum of 8 watts transmit power and has an MTBF (mean time between failure) predicted far in excess of 1000 hours. If operated in the Americas, the comm receives the standard NOAA weather channels.

The GX60/65 GPS/Comm is powered by separate circuit breakers for the GPS and comm functions from the avionics bus. The GX60/65 control panel interface (for both the navigation and communication functions) is powered by the GX60/65 navigation breaker.

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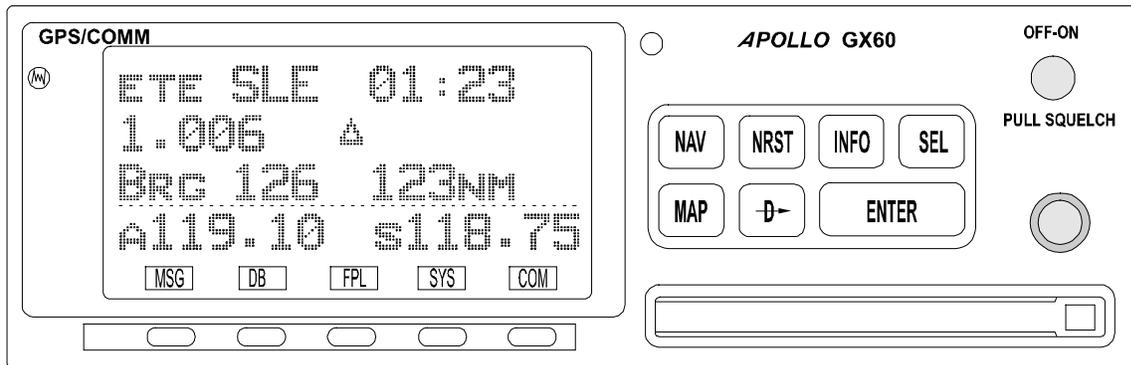


Figure 2: Apollo GX60/65

1.2 OPERATION

Provided the Apollo GX50/60 is receiving adequate usable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications of:

- IFR/VFR enroute oceanic and remote, enroute domestic, terminal, and non-precision approach operation using GPS within the U.S. National Airspace System and the North Atlantic Minimum Navigation Performance Specification (MNPS) Airspace using the WGS-84 (or NAD 83) coordinate reference datum in accordance with the criteria of AC 20-138, AC 91-49, and AC 120-33.
- RNP-5/B-RNAV Operations as defined in AC 90-96 & JAA TGL 2.

Provided the Apollo GX65 is receiving adequate usable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications of:

- IFR/VFR enroute oceanic and remote, enroute domestic, and terminal operation using GPS within the U.S. National Airspace System and the North Atlantic Minimum Navigation Performance Specification (MNPS) Airspace using the WGS-84 (or NAD 83) coordinate reference datum in accordance with the criteria of AC 20-138, AC 91-49, and AC 120-33.
- RNP-5/B-RNAV Operations as defined in AC 90-96 & JAA TGL 2.

The GX60 and GX65 also include VHF communications capability meeting the requirements of AC 20-67b for airborne VHF communications installations.

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2. LIMITATIONS

2.1 USER MANUAL

The manuals, or the information contained in the manuals listed below (or later approved revisions), must be immediately available to the flight crew whenever navigation is predicated on the Apollo GX50, GX60, or GX65 system.

Nav Software Version 2.1

- Apollo GX Models 50, 55, & 60 User's Guide P/N 560-0961-00
- Apollo GX50/60 Approach User's Guide Insert P/N 560-0928-00 (GX50/60 Only)
- Apollo GX60 Comm User's Guide Insert P/N 560-0963-00 (GX60 Only)

Nav Software Version 2.2

- Apollo GX Models 50, 55, 60, & 65 User's Guide ... P/N 560-0961-01
- Apollo GX50/60 Approach User's Guide Insert P/N 560-0928-00 (GX50/60 Only)
- Apollo GX60/65 Comm User's Guide Insert P/N 560-0963-01 (GX60/65 Only)

Nav Software Version 3.0

- Apollo GX Models 50, 55, 60, & 65 User's Guide ... P/N 560-0961-02
- Apollo GX50/60 Approach User's Guide Insert P/N 560-0928-01 (GX50/60 Only)
- Apollo GX60/65 Comm User's Guide Insert P/N 560-0963-02 (GX60/65 Only)

2.2 SYSTEM SOFTWARE

The system must utilize the software versions listed below (or later FAA approved versions). The software versions can be displayed in the system mode on the GX50/60/65 display.

- GX Series Nav Software..... Ver 2.1, 2.2, or 3.0 (139-0235-030)
- GPS Sensor Software Ver 2.3
- VHF Comm Radio Software Ver 1.2 or 2.0 (GX60/65 only)

2.3 DATA BASE (IFR)

IFR enroute and terminal navigation is prohibited unless the pilot verifies the currency of the data base or verifies each selected waypoint for accuracy by reference to current approved data.

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2.4 ALTERNATE NAVIGATION SYSTEM

The aircraft must have other approved navigation equipment installed and operational appropriate to the route of flight.

2.5 GPS APPROACHES (GX50/60 ONLY)

Instrument approaches must be accomplished in accordance with approved instrument approach procedures that are loaded from the GX data base. Approach data must be current. The pilot or crew must verify that the GX approach data is current.

- a) Instrument approaches must be conducted with the approach enabled. The approach ACTIVE annunciator must be on at the FAF. (Note: The approach ACTIVE annunciator will not go on if RAIM is not available at the FAF.)
- b) Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, and MLS approaches are not authorized.
- c) When an alternate airport is required by the applicable operating rules, it must be served by an approach based on other than GPS or Loran C navigation, the aircraft must have operational equipment capable of using that navigation aid, and the required navigation aid must be operational.
- d) When conducting approaches referenced to true North, a manual magnetic variation setting of zero degrees must be used.

2.6 MAGNETIC VARIATION

- a) The automatic magnetic variation (MagVar) correction is not available in the Apollo GX50/60/65 GPS above 73° North or below 73° South latitude. All bearing and track information is computed and displayed relative to true north in these polar regions.
- b) If the “USING MANUAL MAGVAR” message is generated by the Apollo GX50/60/65, the pilot/crew must verify or set manual magnetic variation to the appropriate value.

2.7 ANNUNCIATED MESSAGES (IFR)

All annunciated messages, indicated by the MSG annunciator, must be viewed and acknowledged by the pilot or crew.

2.8 DISPLAY/ANNUNCIATORS/INDICATORS (IFR)

Prior to IFR flight, the GX50/60/65 display and all external annunciators and CDI/HSI indicators must be checked for proper operation. (**Note:** The GX50/60/65 automatically sequences through a series of start-up tests that include checks of the display, annunciators, flags, and CDI/HSI indicators.)

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2.9 NON-NAVIGATION INFORMATION

All non-navigation information displayed by the GX50/60/65, such as timer/clock and waypoint information (frequencies, runways, approach plates, etc.) is advisory information only.

2.10 VNAV - ALTITUDE ASSIST

The GX50/60/65 VNAV altitude assist functions are limited as follows:

- a) Altitude assist is valid for Oceanic, Remote, Enroute, and Terminal operations only; it is not valid for non-precision approach operation.
- b) The VDI (vertical deviation indicator) is accurate only when on course or route to the active waypoint for which the descent profile was established.
- c) The autopilot must not be used for VNAV or altitude assist aided altitude changes.

2.11 FOREIGN AIRSPACE

FAA approval of the Apollo GX50/60/65 does not necessarily constitute approval for use in foreign airspace.

2.12 ALTERNATE COMMUNICATION SYSTEM (GX60/65)

When the GX60/65 is installed for IFR communications, the aircraft must have another independent communication system having a minimum MTBF (mean time between failure) of 1000 hours.

2.13 RNP-5/B-RNAV OPERATIONS

If 22 or fewer GPS satellites are projected to be operational for the flight, then RAIM detection availability for the flight must be confirmed using II Morrow Mission Planning Software, P/N 139-0240-012 and Mission Planning for Windows User's Guide 560-0177-00 (or later FAA approved revisions).

3. EMERGENCY / ABNORMAL PROCEDURES

3.1 EMERGENCY PROCEDURES

No change. Refer to approved Airplane Flight Manual.

3.2 ABNORMAL PROCEDURES

3.2.1 Invalid Nav Data

If the Apollo GX50/60/65 GPS navigation information is not available or is invalid (flagged), utilize remaining operational navigation equipment.

3.2.2 RAIM Not Available

If a “RAIM NOT AVAILABLE” message is displayed, continue to navigate using the GPS equipment or revert to an alternate means of navigation appropriate to the route and phase of flight. When continuing to use GPS navigation, position must be verified every 15 minutes using visual reference or cross checking with another IFR approved navigation system.

4. NORMAL PROCEDURES

4.1 GENERAL

The normal operating procedures for the Apollo GX50/60/65 are included in the Apollo GX Models 50, 55, 60, & 65 User’s Guide listed in the Limitations section on page 7.

4.2 SYSTEM ANNUNCIATORS

The Apollo GX50/60/65 is connected to five annunciators in an array of six annunciators located in the upper left of the aircraft instrument panel. The annunciators are illustrated in Figure 3. The annunciator brightness is controlled by a toggle switch labeled “Day/Night” located directly above the annunciators. These annunciators are shared by the Apollo 2001.

The annunciators are:

a) MSG

The MSG annunciator is illuminated to indicate messages are active. The annunciator flashes to indicate a new message that has not been viewed.

b) PTK

The PTK annunciator is illuminated when parallel track offset is in use.

c) OBS/HLD

The OBS/HLD annunciator is illuminated to indicate waypoint sequencing is on hold. Waypoint sequencing hold can be enabled/disabled by pressing the waypoint sequencing hold annunciator button.

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d) APPRCH

The APPRCH annunciator is illuminated to indicate that the approach has been enabled. CDI scale is 1.0 nm full scale deflection (unless ACTIVE is also lit). The APPRCH annunciator is not used by the GX65.

e) ACTIVE

The approach ACTIVE annunciator is illuminated:

- flashing slowly to indicate the aircraft is within 3 nm of the FAF. The CDI scale will decrease to 0.3 nm prior to the FAF.
- on steady to indicate the approach is enabled and the aircraft has reached the FAF (CDI scale is at 0.3 nm).

The ACTIVE annunciator is not used by the GX65.

f) GPS (NA)

Not used with the Apollo GX50/60/65.

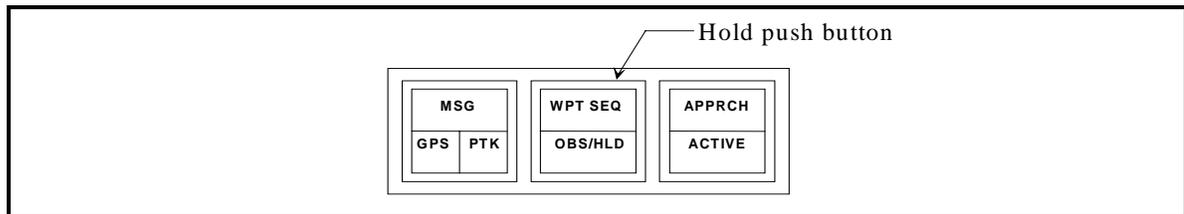


Figure 3: Annunciators

4.3 SYSTEM SWITCHES / CONTROLS

- a) The switches and controls for the GX50/60/65 system include the navigation source selector switches (described in section 4.5), the waypoint sequencing hold (WPT SEQ) button, and the controls on the front panel of the GX50/60/65 (described in the Apollo GX User's Manual).
- b) Note that automatic waypoint sequencing is suspended (and OBS/HLD illuminates) anytime the SEL key is pressed while viewing the FROM/TO/NEXT page, even if changes have not yet been entered.

4.4 PILOT'S DISPLAY

- a) The primary navigation display for the GX50/60/65 is the HSI located in the pilot's primary instrument scan area as are the system annunciators. Cross track deviation, to/from indication, and validity are displayed on the HSI.

- b) The primary display for navigating DME arcs may be the HSI, the DME arc assist page available on the GX50/60/65 front panel, and/or the moving map.
- c) Messages and all other available information as described in the Apollo GX User's Manual, such as distance to waypoint, groundspeed, time to waypoint, and waypoint and flight plan information, are available on the Apollo GX50/60/65 front panel display.

4.5 HSI / AUTOPILOT COUPLED OPERATION - NAV SOURCE SELECTION

The installation allows for pilot selection of the navigation source for coupling to the HSI and autopilot. The available sources are:

- NAV1
- GX_GPS
- 2001

The procedure for selecting the navigation source is as follows:

a) to select NAV1

Press the switch labeled NAV1 / Aux Nav so that "NAV1" is illuminated.

b) to select GX_GPS

Press the switch labeled NAV1 / Aux Nav so that "Aux Nav" is illuminated and press the switch labeled GX_GPS / 2001 so that "GX_GPS" is illuminated.

When the GX_GPS is selected as the navigation source, the HSI course pointer must be manually turned to the desired track as indicated by the GX50/60/65. Utilize the "NAV1" button for enroute tracking, and "APR" for approaches. For other autopilot operation, refer to the autopilot operator's manual.

c) to select 2001

Press the switch labeled NAV1 / Aux Nav so that "Aux Nav" is illuminated and press the switch labeled GX_GPS / 2001 so that "2001" is illuminated.

4.6 APPROACH OPERATION

The complete instructions for the approach operation are in the Apollo GX Models 50, 55, 60, & 65 User's Guide (for Models GX50 and GX60 only).

Note: Familiarity with the approach section of the User's Guide and FAA AC 90-94 and proficiency with the GX50/60 operation should be achieved prior to conducting an approach in IMC conditions.

4.7 AIRSPACE ALERTS

Airspace alerts (set using the Airspace Setup in the Map mode) should be set to "OFF" for IFR operation to prevent unnecessary airspace alert messages. While an approach is enabled, Airspace alerts are automatically turned off.

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5. PERFORMANCE

No change. Refer to the approved Airplane Flight Manual.

6. WEIGHT AND BALANCE

Refer to the current aircraft weight and balance information.

7. SYSTEM DESCRIPTION

7.1 APOLLO GX50/60/65

The Apollo GX50 GPS and GX60 GPS/Comm units are TSO-C129a class A1 supplemental navigation units. The Apollo GX65 GPS/Comm unit is a TSO-C129a class A2 supplemental navigation unit. The GX50/60/65 is installed in the aircraft using the guidelines of AC 20-138 for the GPS functions and AC 20-67b for the GX60/65 communication functions. The system block diagrams are included in Figure 4 and Figure 5.

The GX50/60/65 unit provides for user controls for the navigation and communication functions including selecting waypoints, setting up flight plans, and displaying navigation information.

The Apollo GX50 is a GPS only unit.

The Apollo GX60/65 is a GPS unit with a built in 760 channel VHF communication transceiver.

Illustrations of the GX50 and GX60/65 front panels are included on pages 4 and 5.

7.1.1 Data Base Cards

The GX50/60/65 data base is included on a user-replaceable data card that slides into the unit through a slot in the front panel. This feature is used for data base updates.

7.1.2 Circuit Protection

Circuit breakers for the GX50/60/65 are located in the circuit breaker panel to the left of the pilot and can be pulled or reset during flight. Separate circuit breakers are used for the navigation and communication functions. The circuit breaker for the GPS navigation function is labeled "GX NAV," and "GX COMM" for the GX60/65 communication function. The HSI annunciator and selector switches are powered by a fuse labeled "HSI ANN SEL."

Note: The control panel interface, common to both the GPS and comm functions, is powered by the GPS navigation breaker.

7.2 NAVIGATION SOURCE SELECTION

The Apollo GX50/60/65 is connected to the aircraft HSI and autopilot systems using switching relays and source selection switches. The navigation source selection is illustrated in Figure 4. The procedure for selecting the navigation source is included in 4.5.

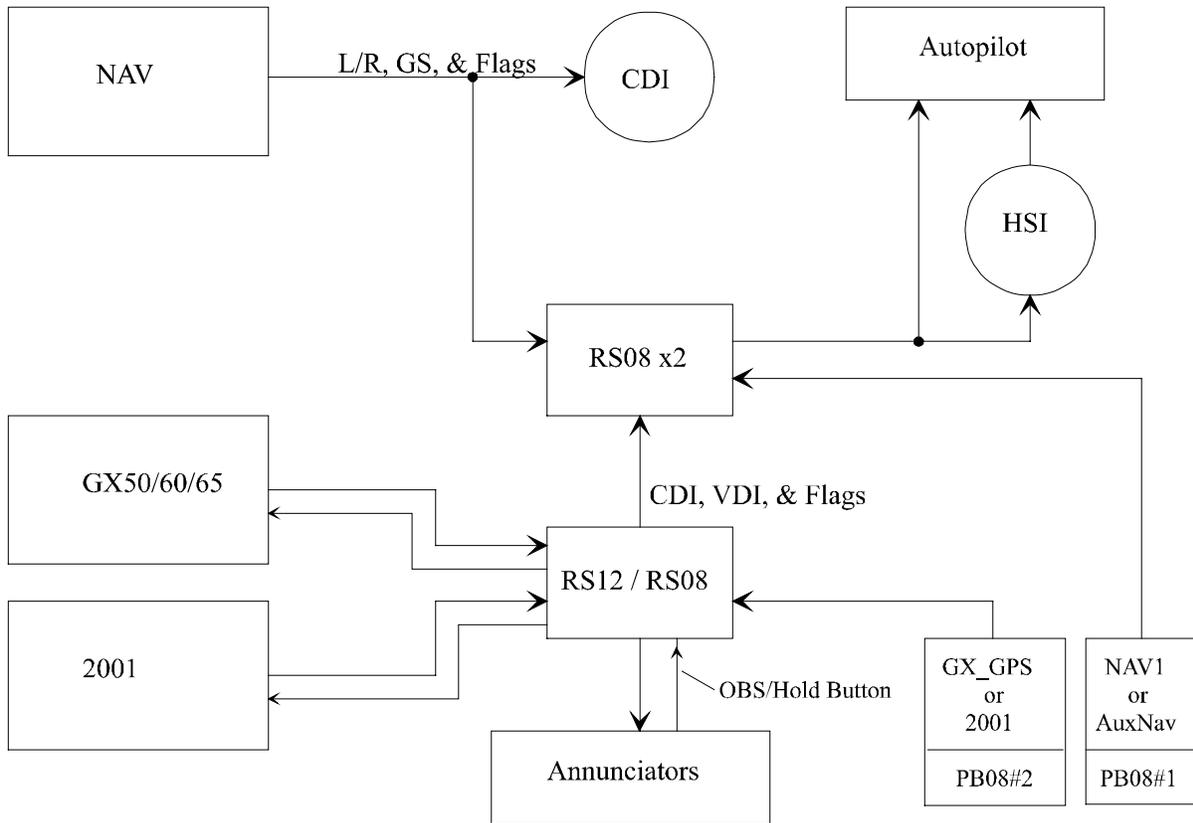


Figure 4: Navigation System Block Diagram

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7.3 COMM SOURCE SELECTION

The GX60/65 comm audio inputs and outputs are connected to the aircraft microphones, headphones, and speaker through the audio panel. The GX60/65 is selected as the in use comm by selecting “GX” on the audio panel.

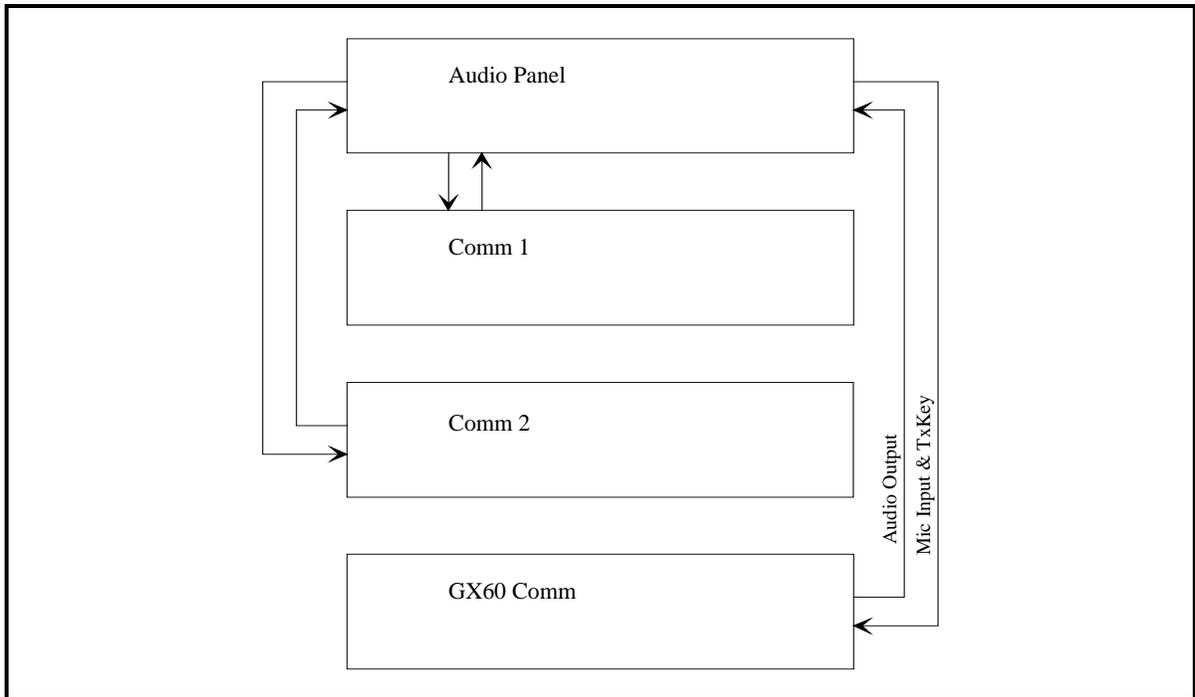


Figure 5: Audio System Block Diagram

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