### 1. ADF Memory

As with the other radio types, the radio tuning function supports 12 ADF memories displayed on two pages. In addition to entering or dialing-in frequencies for each memory, a text label of up to 8 characters may be entered for each stored frequency. The default label for each memory is "MEMORY", a dash, and the memory number, with the memory number always on the outboard edge of the display. The ADF Memory page is described below.

Labels are entered by typing into the scratchpad and pushing the LSK adjacent to the desired frequency. If the radio tuning function determines that the entry is a valid frequency for the radio, the entry is accepted into the frequency field. If not, the entry is considered a label and is entered into the label field above the frequency. A label can be replaced by making another scratchpad entry into a memory field, or by pushing the DEL key. Pushing the DEL key places the text "DELETE" in the scratchpad and, when entered on a memory field, deletes the associated text label, returning it to the default. If the DEL key is used on a memory where there is no user-entered label, the frequency is deleted from memory.

Access to the ADF MEMORY 2/2 page is via the NEXT and PREV function keys.

These sections display the ADF memories 1–3 (7–9 on ADF MEMORY 2/2).

This section displays and controls the Active ADF frequency on the selected radio (the field title will reflect which radio was selected). Pushing LSK 1L copies the field containing the format cursor into the active frequency and moves the previously active frequency into the preset field (not shown on this page). A scratchpad entry into the field replaces the preset frequency with the previous active frequency.

These sections display the ADF memories 4-6 (10-12 on ADF MEMORY 2/2).

```
            ADF MEMORY      1/2
  ADF1
→ 1092.0
  1-MEMORY          MEMORY-4
  1123.0↵
  2-MEMORY          MEMORY-5
   960.0
  3-SDL NDB         MEMORY-6
   224.0
                        ADF1▶

                    RADIO 1/2▶
```

PERF NAV PREV FPL PROG DIR CB BRT DIM

MENU DLK NEXT RADIO

ID-115207

Pushing this LSK displays the RADIO 2/2 page.

Pushing this LSK displays ADF detail page.

**2B-09-70:  MLS1 PAGE**

The MLS page, shown in Figure 43, shows the currently tuned procedure and a preset, azimuth and back-azimuth, and glidepath angle, and allows setting of the operating mode (automatic/manual) and azimuth selection (azimuth or back-azimuth). It also provides access to the MLS memory pages.



**Figure 43**

Unlike the detail pages for the other radios, the MLS page does not support the fast memory tuning operation in field 3L.

**1. MLS Memory Pages**

The MLS memory pages, FINISH THIS SECTION

**Figure 44**

**DIGITAL AUTOMATIC FLIGHT CONTROL SYSTEMS**

**2B-09-80: RADIO INTERACTIONS**

The MCDU radio tuning function communicates with the radio units using a bi-directional protocol. The radio tuning function expects to receive an acknowledgement when the radio is successful in completing each tuning command.

A typical interaction begins with the user entering or dialing in a new frequency for a radio. The MCDU sends the appropriate tuning command to the specified radio and awaits confirmation. If no confirmation is received within the timeout period, the frequency display on the page is changed to amber and a scratchpad message is issued as shown in Figure 45).



**Figure 45**

The pilot can attempt to tune the radio again, in the event that the fault was transient or has been cleared by crew action. This is also important in the event that the radio is receiving the command and is, in fact, tuning the radio, but is unable to respond to the MCDU.

2B-09-90:  ANNUNCIATION MESSAGES

   1.  RADIO 1/2 Annunciations

A variety of annunciations appear on the radio tuning pages, many of which are shown in Figure 46.



**Figure 46**

Table 33 describes the annunciators on RADIO 1/2.

| Annunciator | Description |
|---|---|
| **25K** | Indicates that the associated VHF COM radio is set to 25KHz frequency spacing. When not present, the radio is tuning with 8.33KHz frequency spacing. |
| **DME H xxx** | This alert Indicates that the VHF navigation radio is tuning the corresponding DME receiver independently of the primary navigation frequency. |
| **IHBT** | This annunciator Indicates that tuning of the radio is inhibited, usually from a remote source (such as an emergency tuning function). |
| **MICSTK** | Indicates that the microphone button on the radio has been down long enough that the radio has identified it as "stuck" in the transmit position. |
| **SQ** | This annunciator Indicates that the squelch feature for the radio is active. |
| **TX** | This annunciator Indicates that the radio is currently transmitting. |

**RADIO 1/2 Annunciator Descriptions**
**Table 33**

# Gulfstream V
**OPERATING MANUAL**

## 2. RADIO 2/2 Annunciations

A variety of annunciations appear on the radio tuning pages, many of which are shown in in Figure 46.



**Figure 47**

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Table 34 describes the annunciators on RADIO 2/2.

| Annunciator | Description |
| --- | --- |
| ANT | The ADF radio is in antenna mode. |
| ARM | An MLS procedure is armed. |
| BFO | The ADF radio is operating in BFO mode. |
| CW | This annunciator Indicates that the radio is currently transmitting. |
| IHBT | Indicates that tuning of the radio is inhibited, usually from a remote source (such as an emergency tuning function). In the case of two HF radios sharing a single antenna, transmitting and/or receiving may be inhibited periodically when the other HF radio has recently performed a transmit operation. |
| ITU | This annunciator Indicates that the radio is currently transmitting. |
| LO | The radio is set to low squelch. |
| M | An MLS parameter has been set manually. |
| MED | The radio is set to medium squelch. |
| RX | Indicates that the radio is currently receiving. |
| SQ | This annunciator Indicates that the squelch feature for the radio is active. |
| TX | This annunciator Indicates that the radio is currently transmitting. |
| TX LO | The radio is transmitting with low power. |
| TX MED | The radio is transmitting with medium power. |
| VOICE | The ADF radio is in voice mode. |
| WARN | There is a problem with the azimuth, back-azimuth, or glidepath data for the MLS procedure. |

**RADIO 2/2 Annunciator Descriptions**
**Table 34**

**3. Scratchpad Messages**

The scratchpad messages described in table , may be generated by the radio tuning function. In the process of implementing this function, other required messages may come to light.

Table 34 describes the annunciators on RADIO 2/2.

| Annunciator | Description |
|---|---|
| **DELETE** | This annunciator Indicates that the value in the scratchpad is deleted. |
| **INVALID ENTRY** | This annunciator Indicates that the entry in the scratchpad is invalid. |
| **SQNO RESPONSE FROM RADIO** | This annunciator Indicates that the squelch noise is coming from the radio. |
| **STUCK MICROPHONE** | This annunciator Indicates that the microphone key is stuck. |

**RADIO 2/2 Annunciator Descriptions**
**Table 35**

## 2B-09-100: DIGITAL AUDIO PANEL

The digital audio panel controls the audio levels and switching for communication between the aircraft and ground, between the cockpit and cabin, and among the flight crew in the cockpit.



The Digital Audio Panel is an audio panel that operates off the radio system's digital audio bus. Each crew audio panel station can be equipped with a stereo headset including boom microphone, an oxygen mask microphone, a push to talk (PTT) switch, a hand-held microphone with PTT and dedicated stereo cockpit speakers.

The audio panel works with the Primus EPIC Modular Radio Cabinet (MRC) system and network interface module. Radio audio output digitization occurs within the NI-900 in the remote mounted modular radio cabinet (MRC), even for radios such as the HF and SATCOM which are not inherently part of the MRC system. There is no separate remote mounted audio integrating line repair unit (LRU) required. Audio is transmitted digitally from each side's cabinet on a shielded twisted wire pair to all audio panels in the system. There are two audio buses from each cabinet and audio buss configuration (single bus or dual bus) is program dependent. All audio from an MRC is contained on both digital audio busses.

The audio panel is used for microphone switching to the selected radio over a pair of redundant digital microphone audio buses to the NI-900. The NI-900 converts the microphone digital audio data back to analog audio to apply to the selected radio's MIC input. Digital encoding of the microphone signals near the source reduces the installation criticality in avoiding noise and hum pick-up in the audio system.

The audio panel is used to operate intercoms in the cockpit, cabin or maintenance personnel digitally over the microphone buses. Aural Warning signals can be input into the NI-900 or audio panel for output on the cockpit speakers or headphones. A cockpit voice recorder (CVR) output and an option for CVR control is included on the audio panel.

### 1. Audio Panel's Role Within The Cockpit

The audio panel interfaces between the pilot's microphone, cockpit speakers, and headphones to the respective audio systems in the aircraft such as communication transceivers, navigation receivers, and intercom systems. In addition to the above, the audio panel has an intercom function that allows the crew to communicate between themselves. It also supports the Selective Calling (SELCAL) function, interfaces with the Cockpit Voice Recorder (CVR), and directs the aural warning audio to the headphones and speakers.

To interface with the communication transceivers (VHF COMM radios, HF radios, SATCOM, etc) the audio panel is used to to select the transmitting radio , the listening radio, and adjust the volume of the received audio and side tone. When communicating using the SATCOM system, the audio panel has annunciations that indicate an incoming call, a call on hold, and when a call is being connected. SATCOM can also be used to make a call.

To interface with the navigation receivers (VOR, DME, Marker Beacon, ADF, etc) the audio panel can select the listening receiver and adjust the audio volume of the received audio. Additionally, the audio panel can apply filters to the received audio to only allow the NAVAID IDENTs or Voice to be heard over the receiver.

To interface with the intercom systems such as the cabin communication system, the audio panel can be used to adjust the cabin audio volume, initiate a call to the cabin and to announce that a call to the cockpit is being made. The audio panel has two channels for cabin intercom communications. The first is the normal intercom channel that is designed to handle routine dialogue. The second is an emergency channel is that is designed to indicate and handle emergency dialogues. The emergency channel has priority over the normal intercom channel, so it can interrupt conversations already in progress. However, a normal intercom call cannot interrupt an emergency call.

In addition to interfacing with the cabin communication system, the audio panel has four intercom channels and two maintenance (MAINT) channels that are used to communicate among the flight crew or with the maintenance personnel. This function is performed without the use of a system, external to the audio panel. This intercom feature allows the flight crew to use their respective PTT switches, or their VOX levels to initiate the conversation. With the audio panel, the pilots can select which channel to use and can adjust the volume of the audio heard in their respective headset.

Miscellaneous features of the audio panel include the ability to select between the oxygen mask microphone or the boom microphone, the ability to select a backup mode which allows the flight crew to communicate with a transceiver directly, bypassing the audio panel digital electronics altogether. Additionally, the audio being directed to the headphones and speakers is output directly to the CVR for recording and subsequent accident investigation and aural warnings output by the Aural Warning system are directed, by the audio panel, to the headphones and cockpit speakers.

## 2. System LRU Description

The audio panel Digital Audio Panel hardware can switch microphones to various radios, allow intercom communication, and control the cabin and maintenance intercoms. Amplifiers drive headphones, cockpit/cabin speakers and CVR audio outputs. A single side audio system block diagram for Primus EPIC is shown in Figure 48.
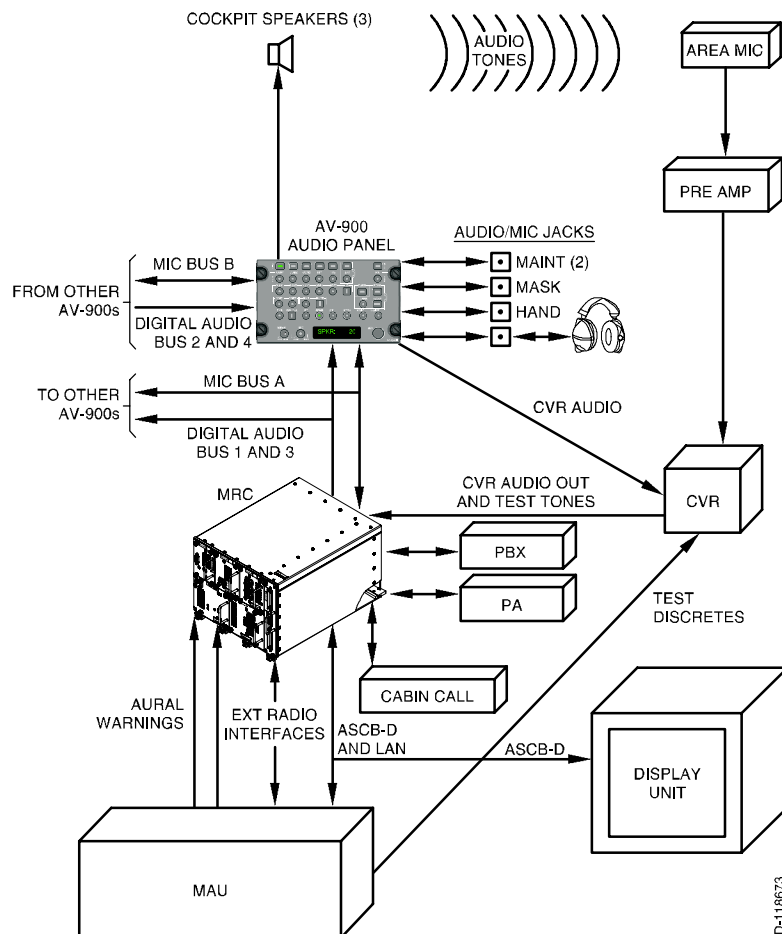
**Figure 48**

The primary interfaces for the audio panel are the two pairs of Digital Audio Buses from the MRCs (One pair from each MRC) and the two redundant Digital Microphone (MIC) buses. Both MIC buses are connected to each audio panel and each MRC in the system. They contain identical data.

The MRC includes the Primus II EPIC radio modules and a NI‑900 Network Interface Module (NIM). The NIM contains the audio to digital converters and multiplexing capability to convert the internal and external radio audio outputs to digital signals on its Digital Audio Bus Output. The Digital Audio Bus output from each MRC (NI‑900) goes to all audio panels in the system.

The Digital Audio Buses from each MRC contain identical multiplexed digital audio samples from the radios internal and external to the MRC. The audio panel de‑multiplexes audio data, sets levels and converts the selected digital audio samples to analog signals to be applied to the headphone, speaker and CVR outputs.

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The MIC buses contain multiplexed digital audio samples and control data sent between audio panels and the Audio Processing Card (APC) inside the NIM. Each unit on the bus transmits in a pre-determined sequence.

In addition to source and destination addresses, data on each MIC bus consists of the following:

Data from audio panel to APC

- Selected microphone audio
- PTT status
- Commands/Responses to Commands to/from NIMs
- Data from APC to audio panel
- Command data from ASCB-D

Aural Warning audio from the MAU or other sources

- SELCAL incoming data
- Commands/Responses to Commands to/from audio panel
- Data from audio panel to other audio panels
- Intercom channel audio
- PTT status
- Commands/Responses to Commands to/from other audio panels

The NIM contains data interfaces from the audio panel MIC buses to the ASCB-D bus and from the ASCB-D bus to the Digital Audio Bus, to control and display data to and from the MAU and Display units.

The NIM also contains audio system interfaces to the following equipment:

- External radio equipment such as HF, a 3rd COM, NAVCOM, Radio telephone and SATCOM.
- Aural Warnings from the MAU, or other equipment such as TCAS.
- Cabin Call interface to the flight attendant stations.
- External Passenger Address System.
- PBX interface for Radio-Telephones such as the Magna-Star system
- CVR Interface

### 3. General System Requirements

The primary functional requirement for the Digital Audio Panel audio panel is to provide gain control for numerous communication and navigation audio signals by reading switches, pots and the encoder on the front of the audio panel and providing attenuation of selected audio signals proportional to the settings. The audio panel also contains hardware for switching microphones to various radios and for producing fire bell warning audio. Amplifiers are provided for driving headphones, speakers, and the cockpit voice recorder. The audio panel has the ability to route critical signals to the headphones without power.

#### A. Operation Description

The audio panel receives digitized audio from the remote radio units through one, or optionally two, pairs of Digital Audio Buses (DABs). Each bus carries data from one Modular Radio Cabinet (MRC). Digitized audio is routed to the Audio DSP's serial port where it is decoded. The Audio DSP modifies the gain (volume) of the various channels, sums the channels together and performs various filter functions on the audio. The audio then leaves the Audio DSP and is amplified and routed to the speakers, headphones and CVR . The audio panel also provides for warning tone amplification.

The audio panel us used to select microphones (Boom/Hand or MASK mic) and to connect the desired radio to the selected microphone. The audio panel interfaces with the MRC over two bi-directional multiplexed Digital MIC busses (both busses contain identical data for system redundancy). These busses are used for intercom communication in the aircraft, exchanging status information, communicating configuration changes, sounding warning tones and providing SELCAL functionality.

The audio panel can route critical signals to the backup COM without power.

The audio panel consists of three types of buttons:

- Rectangular buttons for transceivers
- Round buttons for audio
- Square buttons for discretes.

The controls include the following:

- Nine microphone selection buttons with **green** LED (light emitting diode) annunciators which indicate the state of the function controlled by the button (MIC - rectangular)

  - Rectangular and ridged rectangular buttons are used for microphone selection of associated transceivers such as VHF1 (COM1), VHF2 (COM2), HF1, HF2, SATCOM, and PA.

  - Ridged rectangular buttons are used for frequently used transceivers which may need to be used in emergency situations such as VHF1, VHF2, and PA. These ridged rectangular buttons are the same size as the rectangular microphone button selections but have a ridge on the perimeter of the button so that the button can be found by feel in low visibility situations.

  - Buttons assigned to VHF COM1, and VHF COM2 are designated as SELCAL channels. This means that when the respective SELCAL channel is enabled the transceiver annunciates to the pilot that a SELCAL call has been detected. These buttons support three annunciator states; steady illumination, flashing, and OFF. Incoming SELCAL calls are indicated with a flashing LED.

  - When any of these channels are not SELCAL enabled they operate in the standard fashion whereby the annunciator toggles between OFF and ON for every respective button push. Additionally, the annunciator is extinguished should another rectangular button be pushed.

  - Depending on configuration and if SELCAL is enabled, on VHF COM 1 and 2 and MIC buttons, the annunciator toggles OFF and ON with a short button push (push and hold for less than one second). When a long button push (push and hold for one second or longer) is detected the response is slightly different. If the annunciator is OFF and a long button push is detected on the respective button the annunciator turns ON. However, if it is ON and long button push is detected the annunciator remains ON (the purpose is to bring up the display of a feature already selected without turning it off).

  When any of the channels are not SELCAL enabled they operate in the standard fashion whereby the annunciator toggles between ON and OFF for every respective button push. Additionally, the annunciator is turned off when another rectangular button is pushed.

### 4. Audio Control Panel Switches and Controls

The controls and indicators on the audiot panel are described below.

**EMER (Emergency) Microphone Switch** - When the EMER switch is pushed the following occurs:

- The on-side microphone is connected directly to the emergency VHF COM.

- The emergency VHF COM received audio is connected directly to the on-side headphone.

- The emergency VOR/ILS audio is also connected directly to the on-side headphone (provided it has been selected by the NAV AUDIO switch on the backup control head).

**NOTES:** 1. The specification of COM 1, 2, or 3 and VHF NAV 1, 2, or 3 as the emergency radios is dependent on aircraft wiring.

2. Audio warnings are broadcast through the cockpit speaker.

3. Microphone audio, emergency phone audio, and warning audio are broadcast to the cockpit voice recorder output.

4. Panel lighting remains lit if power is lost to the audio panel.

**COM 1, 2, 3 and HF1, 2 Buttons** - The audio feedback to the pilot is controlled by the audio selector button immediately below the microphone button for that radio. When a radio microphone is selected, the audio feedback is limited to a minimum level even if the volume set by the audio selector button is zero. This assures that a transmission does not occur before listening.Normally, the display shows the radio ID and a number between 0 and 100 showing the relative volume level for that audio channel.If another audio panel is talking on that radio, the display shows BUSY and that radio transmit function is temporarily disabled.When a radio is selected and PTT is pushed, the display shows the characters representing that radio and TX (for transmitting).If PTT is enabled for longer than the time-out time (two minutes), the radio transmit function is disabled and the display shows Stuck Mic (STK MIC).When a microphone selector button is deselected by pushing it when it is on, or by selecting another microphone button, both the microphone annunciator and the audio selector annunciator below it and the audio from that channel go off.
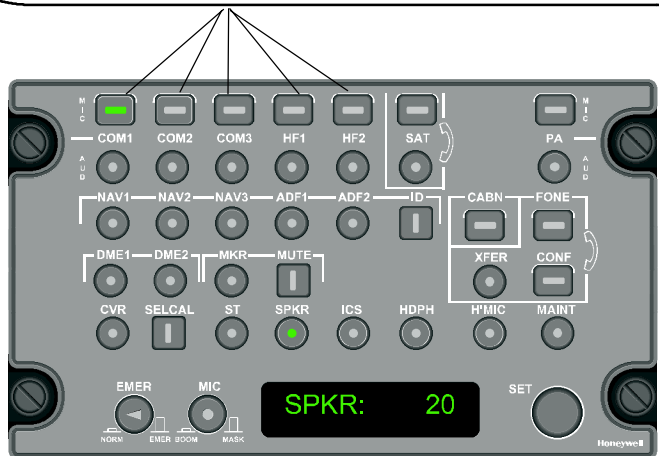
**MIC Switch** - The oxygen mask microphone is selected when this switch is latched out. When it is latched in, the boom microphone is selected.

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**SET Window Display** - The display, which is referred to as the **SET window**, is the primary means with which the audio panel provides feedback to the pilot. One of the major uses of the display is to present volume levels of selected audio channels and visual feedback of volume level adjustments. For example, when the COM1 audio selector button is pushed, the display may show the text, **COM1: 47**.The text **COM1** indicates the button's function and the text **47** is the variable volume setting for the COM1 channel.

The display, showing **SPKR: 2O**, is an eight character display used to indicate the selected radio (**COM1**, **NAV2**, etc.) master headphone (**HDPH**), or master speaker (**SPKR**) volume, which is controlled with the **SET** knob, and its current relative volume setting (1--99).

The primary action that defines the text displayed in the **SET window** is the pushing of the rectangular microphone buttons, round audio buttons, square discrete selector buttons, the turning of the SET knob, and the pushing of the push--to--talk buttons. In addition to these actions, many of the displays in the SET window are timed, reverting to a default display after a timeout period has expired.

The display can also indicate other status, setup, and test information. The logic for the text displayed in the **SET window** is captured in the state machine which is made up of eight display states; NO SOUND, ACTIVE AUDIO, DEFAULT HDPH, DEFAULT SPKR, TRANSMIT, and NO TRANSMIT. Table 36 lists the states and includes a description of these states.

| State | Description |
|---|---|
| NO SOUND<br>(STUCK MICROPHONE) | **NO SOUND** is displayed in the SET window<br>(**STUCK MICROPHONE** replaces the NO SOUND state) |
| ACTIVE AUDIO | SET window displays the nomenclature for the active audio channel and the corresponding volume control |
| DEFAULT HDPH | SET window displays the nomenclature for the button assigned to headphone and the corresponding level |
| DEFAULT SPKR | SET window displays the nomenclature for speaker and the corresponding volume level |
| TRANSMIT | SET window displays the nomenclature for the button assigned to the active radio with the text **TX** in place of the volume indication. This annunciates that this radio is transmitting |
| NO TRANSMIT | SET window displays the text **NO TX** to indicate to the pilot that no radio is currently selected for transmission |
| ACTIVE DISCRETE | SET window displays the nomenclature for the active discrete nomenclature that corresponds to the square button pushed |
| SPECIAL | SET window display is controlled by requirements due to the special nature of the display needs |

**SET Window Annunciations**
**Table 36**

When an audio button is pushed the **SET window** displays the nomenclature for the button pushed. This display exists for the display time which is set in the configuration database. When this time is exceeded the SET window reverts to the default display which is either the nomenclature/volume of the headphone or the speaker provided these buttons have been selected.

After the display has reverted to the default display or another audio button has been pushed, the **SET window** can be returned to a previous selection by using a long button push. This brings up the display of a feature already selected without turning it off.

Headphone (HDPH) and speaker (SPKR) buttons are special forms of audio buttons. Their uniqueness is due to the fact that their **SET window** display is the default display. For example, if the ADF 1 button is pushed the nomenclature for the ADF 1 is displayed in the SET window. However, if the display time limit in the configuration database is exceeded the SET window reverts to the default display, either the nomenclature for the speaker or headphone. Additionally, there is a priority between the two default displays. Headphone has priority over speaker since this is the most likely to be used by the flight crew.

The SET window display logic adjusts slightly when a stuck microphone condition is detected. Under this circumstance the default displays of headphone and speaker go away, the **NO SOUND** display goes away being replaced by **STUCK MICROPHONE** text. This provides a reminder to the flight crew that the microphone PTT is defective and another means of communication with the radios should be found.

The SET window **special state** is used for various functions such as FONE and STUCK MICROPHONE which have special display needs to support the function. The SET window display can be entered from any state and returns to the state as previously described.
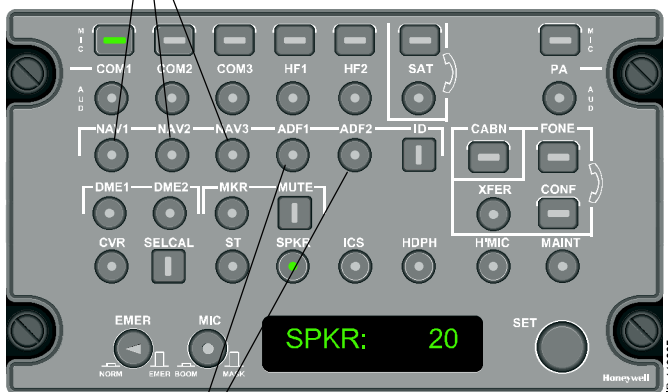
**NAV 1,2,3** - If the audio panel is in receive mode and the NAV selector is selected, the audio panel amplifies the NAV signal by the gain value set by the pilot before outputting it to the headphones or speakers.

If the audio panel is on-side transmit, the audio panel mutes the NAV audio to the speaker and headphone.

If the NAV volume setting is set to zero, the audio panel closes the squelch bit of the NAV channel. Otherwise, the audio panel opens the squelch bit of the NAV channel.

**ADF 1, 2** - When the ADF audio selector is selected, the audio panel amplifies the ADF signal by the gain value set by the pilot before outputting it to the headphones or speakers.

If the audio panel is on-side transmit, the audio panel mutes the ADF audio to the speaker and headphone.

If the ADF volume setting is set to zero, the audio panel closes the squelch bit of the ADF channel. Otherwise, the audio panel opens the squelch bit of the ADF channel.

**MKR (Marker)** /**MUTE Buttons** - The audio panel provides one control interface for the louder marker of the two incoming marker tones. The audio panel mutes the weaker marker.

If the audio panel is in the receive operation and the marker volume control is set below the minimum gain, the marker audio is set to the minimum gain value. If the marker selector is selected, the audio panel amplifies the marker signal by the gain value set by the pilot before outputting it to the headphones or speakers.

If the audio panel is on-side transmit, the audio panel mutes the marker audio to the speaker and headphone.

If the marker volume setting is set to zero, the audio panel closes the squelch bit of the marker channel. Otherwise, the audio panel opens the squelch bit of the marker channel.

The marker tones are muted when the pilot pushes the **MUTE** button. The marker audio remains muted as long as the marker audio level is above the mute level preset in the configuration. When marker audio drops below mute level, the marker audio remains muted for five seconds. If the mute button is pushed during this five second window, the marker audio is muted for 20 seconds. If the marker audio goes above the mute level during this 20-second period, the marker audio remains muted as long as the marker audio is above the mute level.

**DME** - If the audio panel is in receive mode and the DME selector is selected, the audio panel amplifies the DME signal by the gain value set by the pilot before outputting it to the headphones or speakers.

If the audio panel is on-side transmit, the audio panel mutes the DME audio to the speaker and headphone.

If the DME volume setting is set to zero, the audio panel closes the squelch bit of the DME channel. Otherwise, the audio panel opens the squelch bit of the DME channel.

**Emergency (EMER) Microphone Switch** – When the EMER button is pushed, the following occurs:

- The on-side microphone is connected directly to the emergency VHF COM.

- The emergency VHF COM received audio is connected directly to the on-side headphone.

- The emergency VOR/ILS audio is also connected directly to the on-side headphone (provided it has been selected by the NAV AUDIO button on the backup control head).

In addition to the above emergency operations, the Audio Panel EMER switch does the following:

- Audio warnings are broadcast through the cockpit speaker.

- Microphone audio, emergency phone audio, and warning audio are broadcast to the cockpit voice recorder output.

- Panel lighting remains lit if power is lost to the audio panel.

When EMER is selected, headphone volume is controlled by the on-side headphone volume control. The EMER button disables all other audio panel controls.

**ID Button** – When the ident filter (ID) is enabled by pushing the ID button, a filter is activated that eliminates the voice on VOR and ADF audio. The annunciator on the button is on when the filter is active. When the ident filter is deselected, voice and ident are available. The annunciator is off.

**Emergency (EMER) Microphone Switch** - When the EMER button is pushed, the following occurs:

- The on-side microphone is connected directly to the emergency VHF COM.

- The emergency VHF COM received audio is connected directly to the on-side headphone.

- The emergency VOR/ILS audio is also connected directly to the on-side headphone (provided it has been selected by the NAV AUDIO button on the backup control head).

In addition to the above emergency operations, the Audio Panel EMER switch does the following:

- Audio warnings are broadcast through the cockpit speaker.

- Microphone audio, emergency phone audio, and warning audio are broadcast to the cockpit voice recorder output.

- Panel lighting remains lit if power is lost to the audio panel.

When EMER is selected, headphone volume is controlled by the on-side headphone volume control. The EMER button disables all other audio panel controls.



**ID Button** - When the ident filter (ID) is enabled by pushing the ID button, a filter is activated that eliminates the voice on VOR and ADF audio. The annunciator on the button is on when the filter is active. When the ident filter is deselected, voice and ident are available. The annunciator is off.

**SELCAL Button** - An incoming call is displayed when the SELCAL annunciator flashes. Also the microphone and the audio button for the called radio flashes. Resetting to turn off the flashing annunciators is done by pushing the SELCAL button. The SELCAL button, when pressed, shows the SELCAL code on the audio panel display.To attend the call, the microphone button for the called radio is selected and PTT enabled.



**CVR (Cockpit Voice Recorder) Button** – When this button is pushed, the audio is output to the CVR. The output comes from the following sources:

- Unsquelch audio signals from each boom, mask,or hand microphone in use

- Audio sent to the cockpit speaker

- Audio sent to the pilot's headphone

**SET Knob -** The common volume control knob adjusts the volume of the most recently selected audio or the one that is displayed in the display window. Adjusting the knob clockwise increases the volume. The relative volume is shown on as a number between 01 an 99 on the SET display.

**ICS (Intercom System) Button** – Pushing the ICS button lights the button and ICS is displayed in the SET display with a relative volume level number. This enables the intercom system so the crew can talk with each other. Adjusting the SET knob sets the headset volume level for all audio inputs.

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**SPKR (Speaker)** – Pushing the SPKR button, lights the button and SPKR is displayed in the display with a relative volume level number. Adjusting the volume control sets the speaker volume level for all audio inputs. Each one can still be individually controlled when its audio button is pusheded and its ID displayed.

**HDPH (Headphone)** – Pushing the HDPH button lights the button and HDPH is displayed in the SET display with a relative volume level number. Adjusting the SET knob sets the headset volume level for all audio inputs. Each one can still be individually controlled when its audio button is pressed and its ID displayed.

**H'MIC Switch** – Pushing the H'MIC button lights the button and H'MIC is displayed in the SET display with a relative volume level number. When the H'MIC switch is latched out, the on'side microphone acts as the hot mike for intercome. In the latched in position, the on–side mike is connected to the intercom PTT switch. Adjusting the SET knob sets the headset volume level for all audio inputs.

SPKR: 20

**ST (Side Tone)** – Pushing the ST button, lights the button . With sidetone active, the sidetones in the crew's headsets can be adjusted by turning the ST button.

**MAINT Button** – Pushing a button on the pilot's left console sounds a horn in the nose wheel well to summon maintenance personnel. When MAINT is selected on the audio panel, and hot microphone is enabled, the pilot microphone signal is routed to the headset in the nose wheel. There are provisions for three maintenance interphone connections.When MAINT is selected, the display shows MAINT CALL, and the annunciator button flashes until the call is picked up by the ground crew. At this time, the display shows the characters denoting RAMP and a number between 0 and 100 representing the volume level.If another audio panel is talking on the ramp, the display shows BUSY and the ramp function is disabled.

**SAT Buttons** - The two SAT buttons are used to control the SATCOM telephone system. The rectangular button flashes and a chime sounds to indicate an incoming SATCOM call. Both the round and rectangular buttons go on steadily when the line is in use. The rectangular button is used to connect and disconnect the SATCOM calls. The pilot disconnects SATCOM by pushing the rectangular button again. At this time, all SATCOM annunciator lights go off.

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**PA (Passeger Address) Buttons** – The two PA buttons are used to control the aircraft's passenger address system.When the rectangular button is pushed, the button lights, and the round button also lights to indicate that the PA is in use. The pilot's current mike is connected to the PA system and announcments to the passenger compartment can be made. PA volume is controlled by the round PA button. The pilot pushes to unlatch the rectangular button to turn off the PA system. Both button annunciators go off.

**CABN Button** – When CABN is pushed, the SET display shows CABN CALL, and the annunciator button flashes until the call is picked up by the flight attendant. At this time, the display shows the characters denoting CABN and a number between 0 and 100 denoting the volume.The Digital Audio System interfaces with the Passenger Address System in order to allow the flight crew in the cockpit to perform passenger announcements, to communicate with the flight attendants and to provide call chimes. The call chimes are annunciated at the beginning of the call from the cockpit to the flight attendants and vice-versa. The chimes are also annunciated before the pilots or flight attendants make announcements to the passengers.If another audio panel is talking to the cabin, the display shows "BUSY" and the cabin function is disabled.

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**FONE, XFER and CONF Buttons** – These buttons are associated with the MAGNASTAR phone system. Their functions are TBD.

**5. Operational Modes**

The audio panel operates in one of five of modes:

- Normal Operational Mode.
- Software Loading Mode
- Backup (BKUP) Mode.
- Configuration Mode
- APC Test Mode

A. Normal Operational

During normal operation, the audio panel consists of 30 audio channels some of which are dedicated and others which can be customized by the pilot. The 30 channels are used to support the following functions during Normal mode operations:

- Radio Receiver
- Radio Transceiver
- Intercom
- CVR
- PA
- Telephony
- SELCAL

The aural warning function is supported by the audio panel based upon inputs from the NIM.

The audio panel controls audio and transmission to the following:

- Two dedicated VHF channels
- Eight auxiliary transceiver channels
- Five intercom channels
- One maintenance intercom channel
- Dedicated navigation audio channels
- Four auxiliary navigation audio channels
- A single CVR channel.

The dedicated navigation receivers are the VOR, VIDL, ADF, Marker (MKR), DME, and MLS.

B. Radio Receiver

Radio receiver audio channels support radio reception only (i.e. VHF NAV, ADF, MKR, MLS and DME). These channels receive digitized, multiplexed audio data from the MRC over the digital audio busses. The audio panel decodes, filters, applies gain to the selected digitized channels, converts the samples to analog audio, and outputs the analog audio to the Headphones, Speakers, and CVR.

C. Radio Transceiver

Radio transceiver audio channels support reception and transmission of audio on both the dedicated and auxiliary transceiver channels. The received audio from these transceivers is received on the digital audio buses from the MRC radio cabinet. The audio panel decodes, filters and amplifies/attenuates, convert the samples to analog audio, and outputs the analog audio on the Headphones, Speakers and CVR output ports.

The transmitted audio is sent to the MRC radio cabinet over the MIC bus. The audio originating from the selected microphone is sampled, digitized, filtered, amplified/attenuated, and multiplexed onto the MIC bus. Additionally, a sidetone is created for feedback to the crewman either through the headset or through the speakers on the flight deck or both.

D. Intercom

The Intercom function is used so crew memebers can talk to each other on the selected cockpit intercom, cabin intercom, or maintenance intercom, when they are not using a COM radio. Transmission on the intercom is enabled by either selecting intercom PTT or enabling a hot mic function. An Intercom volume control is provided to attenuate audio from the intercom. It operates in the same manner as the transceiver volume controls, except that the intercom output is sent to the headphones only if the mask microphone is not being used. If the mask microphone is being used, the intercom output is sent to the speakers.

E. Cockpit Voice Recorder (CVR)

The audio panel sums and outputs the following signals to the CVR:

- Audio output from the cockpit speakers including warnings.
- Audio output from the headphone outputs including warnings.
- Audio input from the selected microphone.

In addition to the summing and outputting of audio to the CVR, the audio panel also contains CVR control features. From the audio panel the crew can initiate the CVR erase and test functions which are hosted by the CVR equipment.

F. Passenger Address (PA)

The audio panel can be used to provide an internal Passenger Address (PA) function or it may be used to select and support an external PA function. Internal selection allows the flight crew to make an announcement to the cabin. A crew member is able to transmit on the PA output by selecting and keying the PA microphone button.

The audio panel external PA function is initiated by assigning an auxiliary transceiver to this feature and connecting it to an external PA system via the MRC radio cabinet.

G. Telephony

The audio panel interfaces with all telephonic equipment on board the aircraft through the MRC and provides the necessary telephonic functions through this interface. The telephonic functions contained in the audio panel are call pick-up, call hang-up, call transfer, and call hold. These are done using the front panel buttons.

H. Selective Call (SELCAL)

Using the Selective Call (SELCAL) function, the crew can receive calls from a ground station designated to the aircraft. The audio panel is the interface for the pilot to set the aircraft-unique SELCAL code designated for the aircraft. Selecting the code is possible only when the aircraft is on the ground. The SELCAL code selection can also be performed using the CCD and displays and transmitting to the MRC NIMs via ASCB. The NIMs encode the SELCAL code on the DIGITAL MIC Bus.

The SELCAL code is displayed on the audio panel by selecting the SELCAL button.

I. Aural Warnings

The audio panel sums and outputs the following audio signals to speakers, headphones and CVR output:

- Warning Audio from the analog warning inputs.
- Warning Audio from the MIC bus inputs.

J. Software Loading

Software is loaded (by manufacturing or authorized Honeywell support centers) into the audio panel before the audio panel is installed aboard an aircraft, or it is loaded by executing an on-aircraft software loading sequence. The on-aircraft loading sequence requires the audio panel to be in the software loading mode.

K. APC Test Mode

An APC test mode is is used to validate nominal autio panel operation. While in this test mode the audio panel continuously echoes back a test pattern to the requesting NIM. When the NIM stops requesting, the testing stops and the audio panel returns to normal operation. <span style="color:red">(I don't see a TEST button.)</span>