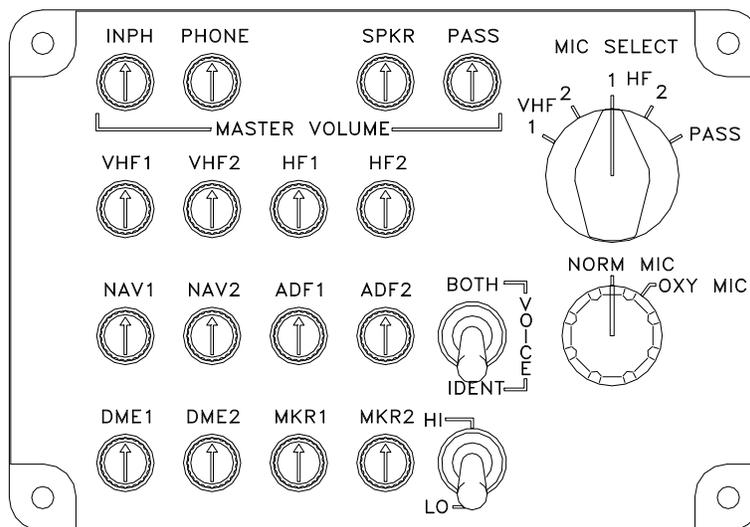




# Installation and Operation Manual

## 802-009 Switch Panel



**SM802**

**ISSUE 4.12**

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**802-009 Switch Panel**  
**SM802 Installation and Operation Manual**

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### Section 1 Description

---

#### 1.1 Introduction

---

Information in this section consists of product description, design features and specifications for the 802-009 Switch Panel. All derivative product information shall be contained in the applicable manual supplement, which may be obtained from NAT as required.

Review all notes, warnings and cautions.

#### 1.2 Product Description

---

The 802-009 Switch Panel is designed to control a single Model 700-xxx Digital Audio Control Amplifier. It also provides microphone audio switching and keying operations for four radio transmitters in addition to features such as antenna switching unit control, marker (MKR) receiver sensitivity control and public address (PA) amplifier control. The 802-009 Switch Panel continuously reads the status of its own audio control switches and volume control potentiometers and compiles this information into the form of a digital signal. The digital signal is sent to the Model 700 from the switch panel in RS422 serial format via a twisted, shielded wire pair. The Model 700 receives, demultiplexes and converts this digital signal into audio control information.

#### 1.3 Design Features

---

The 802-009 Switch Panel is capable of digitally controlling all Model 700 amplifier functions. These include the 12 receiver input switches and individual volume controls, the four sidetone input switches and sidetone volume control, three microphone inputs, the microphone input switch, antenna switching, the interphone switches and volume control, the cockpit speaker switch and volume control, the headphone volume control and the NAV/ADF Voice/Ident filter switching functions.

The 802 Switch Panel is a customizable unit capable of providing control for up to four transceivers, eight receivers and a public address. For information on other configurations, contact the Product Support Department at NAT Ltd.

Panel nomenclature and knob illumination is provided on the 802-009 Switch Panel. The power supply inputs for the panel overlay and knob internal light plate are independent of each other and may be lit at different levels of brightness. The MIC SELECT knob and the NORM MIC/OXY MIC knob are lit with the panel overlay. Neoprene washers are installed around each of the volume control knobs between the overlay and front panel sheet metal to prevent light leakage from being radiated by the knob illuminating light plate into the cockpit. The PHONE and PASS knobs are always in the OUT and lighted position, since there is no switching associated with them.



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### 1.4 Specifications

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#### 1.4.1 Electrical Specifications

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##### Power

Input	+28 Vdc at 0.30 A max. 1 A circuit breaker recommended.
Lighting	0 to 115 Vac, 400 Hz. Independent from knob lighting.
Knobs	0 to 5 Vdc. Independent from faceplate lighting. Knobs light in OUT or ON position only.

##### Mic Inputs

NORM MIC	35 $\pm$ 5 mA microphone bias current.
OXY MIC	35 $\pm$ 5 mA microphone bias current.

##### Outputs

HOT MIC	A direct connection from the selected mic input to the HOT MIC output, which is connected to the Model 700 amplifier HOT MIC input.
Transmitter & PA MIC's	A direct connection from the selected mic input to the selected transmitter or PA mic output.
MUX Data	RS422

##### Volume Controls

PASS	Impedance 10 k $\Omega$ Power 0.5 W
BRIEFER	Impedance 10 k $\Omega$ Power 0.5 W

#### 1.4.2 Physical Specifications

---

Height	3.93" (99.8 mm) max.
Depth	6.03" (153.2 mm) max. behind panel, excluding connector
Width	5.67" (144.0 mm) max.
Weight	3.0 lbs (1.4 kg) max.
Mounting	Panel mount with four 8-32 screws



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Connector	55 pin circular
Faceplate	Grey with white text

### 1.4.3 Environmental Specifications

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Temperature	-55 to +70°C
Altitude	70,000 feet

Qualification of the 802-009 Switch Panel was completed in accordance with DO-160C Env. Cat. [A2F2]-BA[CL]XXXXXXXXZ[BZ]AZZUZLXX.

**Note:** Refer to Environmental Qualification Form located in Section 2 of this Manual for complete details of the environmental categories.

### 1.4.4 Product Approval

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FAA: TSO-C50c (RTCA/DO-170, RTCA/DO-160C, RTCA/DO-178A Level 2)

**Section 1 ends**

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## 802-009 Switch Panel SM802 Installation and Operation Manual

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### Section 2 Installation

---

#### 2.1 Introduction

---

Information in this section consists of unpacking and inspection procedures, installation procedures, post-installation checks and installation drawings for the 802-009 Switch Panel.

Review all notes, warnings and cautions.

#### 2.2 Unpacking and Inspection

---

Unpack the equipment carefully and locate the warranty card. Inspect the unit visually for damage due to shipping and report all such claims immediately to the carrier involved. Check that all items listed below are present before proceeding and report any shortage immediately to your supplier:

- Warranty Card
- Operators Manual
- Certificate of Conformity or Release Certification

#### 2.2.1 Warranty

---

All Northern Airborne Technology Ltd. products are warranted for 2 years from date of installation by an authorized Northern Airborne Technology Ltd. dealer, to be free of defects in workmanship or performance. This warranty covers all materials and labour, but is exclusive of any transport to deliver the defective unit to and from Northern Airborne Technology Ltd. or its designated warranty repair center, or any labour to remove or re-install the defective unit in the aircraft. Contact Northern Airborne Technology Ltd. for any questions regarding this warranty, its applicability to your units and/or for return authorization. Northern Airborne Technology Ltd. is the final arbitrator concerning warranty administration. Units which have been physically damaged, burned, immersed in water or otherwise abused beyond the scope of normal use will not be considered for warranty. **WARRANTY IS VOID UNLESS THE PRODUCT IS INSTALLED BY AN AUTHORIZED NORTHERN AIRBORNE TECHNOLOGY LTD. DEALER.** Product for which a warranty card is not returned shall be warranted from date of manufacture.

#### 2.3 Continued Airworthiness

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Maintenance of the 802-009 Switch Panel is 'on condition' only. Periodic maintenance of this product is not required.

#### 2.4 Installation Procedures

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#### 2.4.1 Warnings

---

**WARNING:**  
High volume settings can cause hearing damage.  
Set the headset volume control to the minimum volume setting prior to conducting tests, and slowly increase the headset volume to a comfortable listening level.



## 802-009 Switch Panel SM802 Installation and Operation Manual

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### 2.4.2 Cautions

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**CAUTION:**

Do not bundle any lines from this unit with transmitter coax lines. Do not bundle any audio or DC power lines from this unit with 400 Hz synchro wiring or AC power lines. Do not position this unit or wiring from this unit next to any device with a strong alternating magnetic field such as an inverter, or significant audio interference will result.

**CAUTION:**

In all installations, use shielded cable exactly as shown and ground as indicated. Significant ground loop and noise problems may result from not following these guidelines. Ensure that the chassis is grounded to provide proper shield terminations.

Ensure the microphone and headphone jacks are isolated from the airframe ground. Use caution when routing microphone wiring, as it carries low-level signals prone to coupling from other sources.

Do not take a ground from the instrument panel or similar location that shares a ground return with a turn and bank, horizon or other motor driven instrument. This may cause the unit to pick up the sound of the motor as ground loop interference.

### 2.4.3 Cabling and Wiring

---

All wire shall be selected in accordance with the original aircraft manufacturer's Maintenance Instructions or AC43.13-1B Change 1, Paragraphs 11-76 through 11-78. Unshielded wire types shall qualify to MIL-W-22759 as specified in AC43.13-1B Change 1, Paragraphs 11-85, 11-86, and listed in Table 11-11. For shielded wire applications, use Tefzel MIL-C-27500 shielded wire with solder sleeves (for shield terminations) to make the most compact and easily terminated interconnect. Follow the wiring diagrams in Section 2.6 as required.

Allow 3" from the end of the shielded wiring to the shield termination. Reference the interconnect drawing in Section 2.6 for shield termination details. Aircraft harnessing shall permit the unit to be lowered from the panel for easy access to all side adjustments. Do NOT mount the unit until all adjustments have been performed.

Maintain wire segregation and route wiring in accordance with the original aircraft manufacturers Maintenance Instructions. Coaxial cables shall be routed separately from existing wire bundles in the aircraft to minimize electromagnetic coupling effects.

Unless otherwise noted, all wiring shall be a minimum of 24 AWG, except power and ground lines, which shall be a minimum of 20 AWG. Reference the Interconnect drawing for additional specifications. Check that the ground connection is clean and well secured, and that it shares no path with any electrically noisy aircraft accessories such as blowers, turn and bank instruments or similar loads. Power to this unit must be supplied from a separate circuit breaker or fuse (fast blow), and not attached to any other circuit breaker without additional protection. Verify that the selected circuit breaker size and wire gauge are adequate for the installation using the techniques specified in AC43.13-1B Change 1, Paragraphs 11-47 through 11-51 and 11-66 through 11-69.



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#### 2.4.4 Mechanical Mounting

---

Installation dimensions are shown on the **Outline drawing** 802-009 listed in Section 2.6. No shock or vibration isolators are required for mounting.

The 802-009 Switch Panel may be mounted to a metal, plastic or composite surface however, it is absolutely necessary to ground the enclosure to the metal aircraft ground structure. When mounting to a plastic or composite surface, use a grounding strap. An 8-32" x 1/2" grounding stud is provided on the rear of the enclosure for chassis grounding. The switch panel enclosure and mounting surface is finished with an electrically conductive film. It is not necessary to remove the film for electrical bonding to any metal aircraft ground structure.

If replacement of the front panel overlay is necessary, it may be removed by first loosening the set screws on the MIC SELECT and NORM MIC/OXY MIC knobs and removing the knobs. Then the four 4-40 flush socket head screws on the backside of the mounting flanges may be removed and the overlay may be pulled off straight forward. Installing a new overlay requires the same steps in reverse order however, care should be taken to align the overlay before tightening the four 4-40 socket head screws so that the lighting power connector mates properly and the lighted knobs do not rub on their through holes in the overlay.

#### 2.4.5 Installation Notes

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Connecting P1-8 of the pilot's 802-009 to P1-7 of the copilot's 802-009 provides relay switching of the 802-009 PASS volume control to the paging amplifier. When the PA volume relay internal to the 802-009 is in the relaxed position, the BRIEFER preset volume potentiometer in the rear of the copilot 802-009 is connected to the paging amplifier. When the TRANSMIT SELECTOR switch is placed in the PASS position and PTT is keyed, the PA VOLUME relay is energized, connecting the PASS volume control on the 802-009 front panel to the paging amplifier. The PA volume interconnect line allows this logic to function for both pilot and copilot positions.

If the INPH LISTEN input on the 802-009 is grounded, then interphone audio may be heard on the headphones at all times however, the INPH switch must still be turned ON in order to talk on the interphone with the normal boom or oxygen mask mics. In addition to the HOT MIC microphone output, there are six other microphone outputs provided, one each for the selected transmitter or PA amplifier.

##### 2.4.5.1 MIC INPUTS

- |          |   |
|----------|---|
| NORM MIC | The NORM MIC input, intended for the normal boom or headset microphone, is compatible with carbon and amplified dynamic microphones. This input may be used for both interphone communications and transmitting. A transmitter is keyed for this mic input using the yoke mounted PTT switch. |
| OXY MIC  | The OXY MIC input, intended for the oxygen mask microphone, is compatible with carbon and amplified dynamic microphones. This input may be used for both interphone communications and transmitting. A transmitter is keyed for this mic input using the yoke mounted PTT switch.             |



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**HAND MIC** The HAND MIC input, intended for the hand held microphone, is compatible with carbon and amplified dynamic microphones. It receives its bias current from the Model 700 amplifier through the 802-009 to Model 700 HOT MIC connection. This input may be used for transmitting only and not for interphone communications. A transmitter is keyed for this mic input using the PTT switch on the hand held microphone.

#### **2.4.5.2 OUTPUTS**

**HOT MIC** A HOT MIC microphone output is provided on the 802-009 to make this connection to the Model 700 HOT MIC input. This connects any one selected microphone input (NORM, OXY, or HAND) directly to the Model 700 HOT MIC input, which channels the microphone audio to the Model 700 cockpit voice recorder (CVR) output for hot microphone recording purposes. The HOT MIC input of the Model 700 Amplifier is also used for interphone communication with the NORM and OXY MIC inputs when the INPH switch on the 802-009 is turned ON. The HAND MIC input is used for transmitting or PA only and not for interphone communications.

**TX & PA MICs** During a transmit PTT, these outputs are simply a direct connection from the microphone input being used to the selected transmitter or PA mic output. The mic audio input is connected to the output selected by the MIC SELECT switch on the switch panel. These outputs are intended for connection to respective transmitter and PA amplifier mic inputs.

**MUX DATA** This output is a RS422 differential data transmission line driver intended for connection to the Model 700 amplifier MUX DATA input. It transfers all of the digital data necessary to control Model 700 functions via a shielded twisted-pair wire cable up to 4,000 feet long.

#### **2.4.5.3 VOLUME CONTROLS**

**RECEIVERS** These volume controls are linear taper potentiometers connected internally to the digital multiplexing circuitry. Volume control range and curve are defined in Model 700 amplifier software.

**INPH** Same as RECEIVERS volume.

**PHONE** Same as RECEIVERS volume.

**SPKR** Same as RECEIVERS volume.

**PASS/  
BRIEFER** The PASS volume knob controls the level of the PA amplifier output only when the MIC SELECT Switch is in the PASS position. This is a 10 k $\Omega$ , 0.5 W, linear taper potentiometer connected through relay switching logic to pin P1-14 of the Model 802. Maximum volume position (fully clockwise) provides maximum resistance. Volume control range and curve are determined by PA amplifier circuitry. Refer to Section 2.4.5 for more details.

#### **2.4.5.4 ANTENNA SWITCHING**

P1-32 should be connected to 28 VDC or ground to suit the requirements of the Antenna Switching Unit. When the MIC SELECT switch is in the HF1 position, P1-32 and P1-6 are connected internally. When the MIC SELECT switch is in the HF2 position, P1-32 and P1-16 are connected internally.



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### 2.4.6 Post-Installation Checks

---

#### 2.4.6.1 Voltage/Resistance Checks

**Do not attach the 802-009 until the following conditions are met.**

Check the following:

- a) Check P1, pin 55 for +28 Vdc relative to ground.
- b) Check P1 pin 54 for continuity to power ground (less than  $0.5\Omega$ ).
- c) Check P1 pin 52 and P1 pin 53 for 115 Vac 400 Hz.
- d) Check P1 pin 51 for continuity to chassis ground (less than  $0.5\Omega$ ).
- e) Check P1 pin 18 for continuity to ground when the PTT key switch is activated (less than  $0.5\Omega$ ).
- f) Check all shielded cable grounds for continuity to ground (less than  $0.5\Omega$ ).
- g) Check all speaker and mic inputs and outputs for correct HI/LO orientation.

#### 2.4.6.2 Power On Checks

Power up the aircraft's systems and confirm normal operation of all functions of the 802-009. Refer to Section 3 (Operation) for specific operational details.

- a) Begin with only the Pilot's headset installed, no hand mic. Confirm correct radio operation, both receive and transmit and Interphone operation. Check yoke (or cyclic) switch action.
- b) Plug in the Copilot's headset. Check for correct radio and Interphone operation. Check pilot's transmit priority. Check yoke (or cyclic) switch functions.
- c) Check Interphone operation between Pilot and Copilot positions.
- d) Plug in the hand mic, if installed, and test for correct operation in all modes.
- e) Plug in any remaining headsets, and check for correct Interphone operation.

**Note:** Incorrect jack wiring is a common fault for rear passenger stations, and may cause a wide range of problems.

- f) To verify proper operation, all functions and levels shall be checked in-flight.
- g) Check preset adjustments are completed before aircraft departure.

Upon satisfactory completion of all performance checks, make all required log book entries, electrical load, weight and balance amendments and other documentation as required by your local regulatory agency before releasing the aircraft for service.

### 2.5 Adjustments and Connections

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#### 2.5.1 Adjustments

---

There are three screwdriver potentiometer adjustments on the 802-009 accessible through access holes in the rear of the unit. These are for OXY MODE INPH VOL, BRIEFER VOL, and SDTN VOL.



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The OXY MODE INPH VOL is used to adjust the preset interphone volume when the NORM MIC/OXY MIC selector switch is in the OXY MIC position and the oxygen mask microphone is in use.

The SDTN VOL is used to adjust the volume of all sidetone inputs together, including PA sidetone.

For BRIEFER VOL description see PASS/BRIEFER in Section 2.4.5.3.

When the potentiometer is rotated fully clockwise, the selected volume will be at maximum and when it is fully counterclockwise, it will be at its minimum.

#### 2.5.2 Electrical Connections

---

Connections to the 802-009 are made through a single 55 pin MIL-C-26500 cylindrical bayonet coupling type connector. The mating connector to be installed on the aircraft wire harness comes with a coupling nut. A cable support is recommended for strain relief of wires exiting the mating connector.

Description	Military Part Number
Cylindrical bayonet coupling type connector	MS24264R22B55PN
Mating connector (with coupling nut)	MS24266R22B55SN
Cable support	MS27291-6

Numerical pin identification is shown in section 2.5.3.

#### 2.5.3 Numerical Pin Identification List

---

The following table identifies the pins for 55-pin connector P1.

Pin	Name	Pin	Name	Pin	Name
1	No connection (n/c)	20	TEST MODE JUMPER	39	HF-2 MIC
2	N/C	21	TEST MODE JUMPER	40	PA MIC
3	HOT MIC LO	22	N/C	41	HF-1 MIC
4	N/C	23	HAND MIC HI	42	VHF-2 MIC
5	N/C	24	NORM MIC HI	43	VHF-1 MIC
6	HF-1 ANTENNA SWITCHING	25	OXY MIC HI	44	XCVR-5 KEY
7	PA/Briefer Interconnect	26	OXY MIC LO	45	HF-2 KEY
8	PA/Briefer Interconnect	27	HF-1 KEY	46	PA KEY
9	HOT MIC HI	28	VHF-2 KEY	47	VHF-1 KEY
10	HAND MIC LO	29	N/C	48	MUX DATA HI
11	NORM MIC LO	30	N/C	49	MUX DATA LO
12	MIC AUDIO COMMON	31	MKR HI control	50	NORM discrete output
13	N/C	32	HF-1 & 2 ANTENNA SWITCHING	51	Chassis ground
14	PA VOLUME	33	N/C	52	115 VAC, 400 Hz Hot
15	OXY MIC MODE INTERCONNECT	34	N/C	53	115 VAC, 400 Hz common
16	HF-2 ANTENNA SWITCHING	35	Ground	54	Power ground
17	INPH LISTEN (to GND)	36	GND FROM NORM/OXY MIC TIPS	55	28 VDC
18	GND FROM PTT	37	+5 Vdc		
19	GND FROM HAND MIC TIP	38	XCVR-5 MIC		



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**2.6 Installation Drawings**

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<b>DOCUMENT</b>	<b>REV.</b>	<b>DESCRIPTION</b>	<b>TYPE</b>
802\009\403-0	1.00	Switch Panel	Interconnect
802\009\403-1	1.00	Switch Panel	Interconnect
802	1.81	Switch Panel	Outline
802-009	1.50	Switch Panel	Outline
802\521-0	1.01	Switch Panel	Environmental Qualification Form

**Section 2 ends following the above documents**

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802-009 INSTALLATION NOTES

NOTES:

1. ALL WIRES SHOULD BE 24 AWG UNLESS OTHERWISE SPECIFIED. ALL UNSHIELDED WIRE SHALL BE SELECTED IN ACCORDANCE WITH AC43.13-1B CHANGE 1, PARAGRAPHS 11-76 THROUGH 11-78. WIRE TYPES SHOULD BE TO MIL-W-22759 AS SPECIFIED IN AC43.13-1B CHANGE 1, PARAGRAPHS 11-85, 11-86 AND LISTED IN TABLE 11-11. ALL SHIELDED WIRE/CABLE SHOULD BE IN ACCORDANCE WITH MIL-C-27500.



PIN 50 IS CONNECTED TO GROUND WHEN NORM MIC/OXY MIC SWITCH IS SELECTED TO NORMAL MIC POSITION.

DEFINITIONS:

N/C: NO CONNECTION. THE PIN IS NOT CONNECTED TO ANYTHING INTERNALLY, AND THEREFORE SHALL HAVE NO CONNECTION EXTERNALLY.

N/C SPARE: NO CONNECTION INTERNALLY, BUT A SPARE WIRE SHALL BE INSTALLED IN THE WIRE HARNESS.

RESERVED: MAY BE CONNECTED AND USED IN THE FUTURE. THE CIRCUITRY MAY BE PRESENT OR ADDED TO ACTIVATE THE FUNCTION. THE PIN MAY BE USED FOR TEST PURPOSES. THERE IS NO EXTERNAL CONNECTION.

RESERVED SPARE: (RSV SP) RESERVED, BUT INSTRUCTIONS SHALL BE FOLLOWED TO ACTIVATE THE CIRCUITRY. A SPARE WIRE SHALL BE INSTALLED IN THE WIRE HARNESS.

LEGEND

POWER GROUND

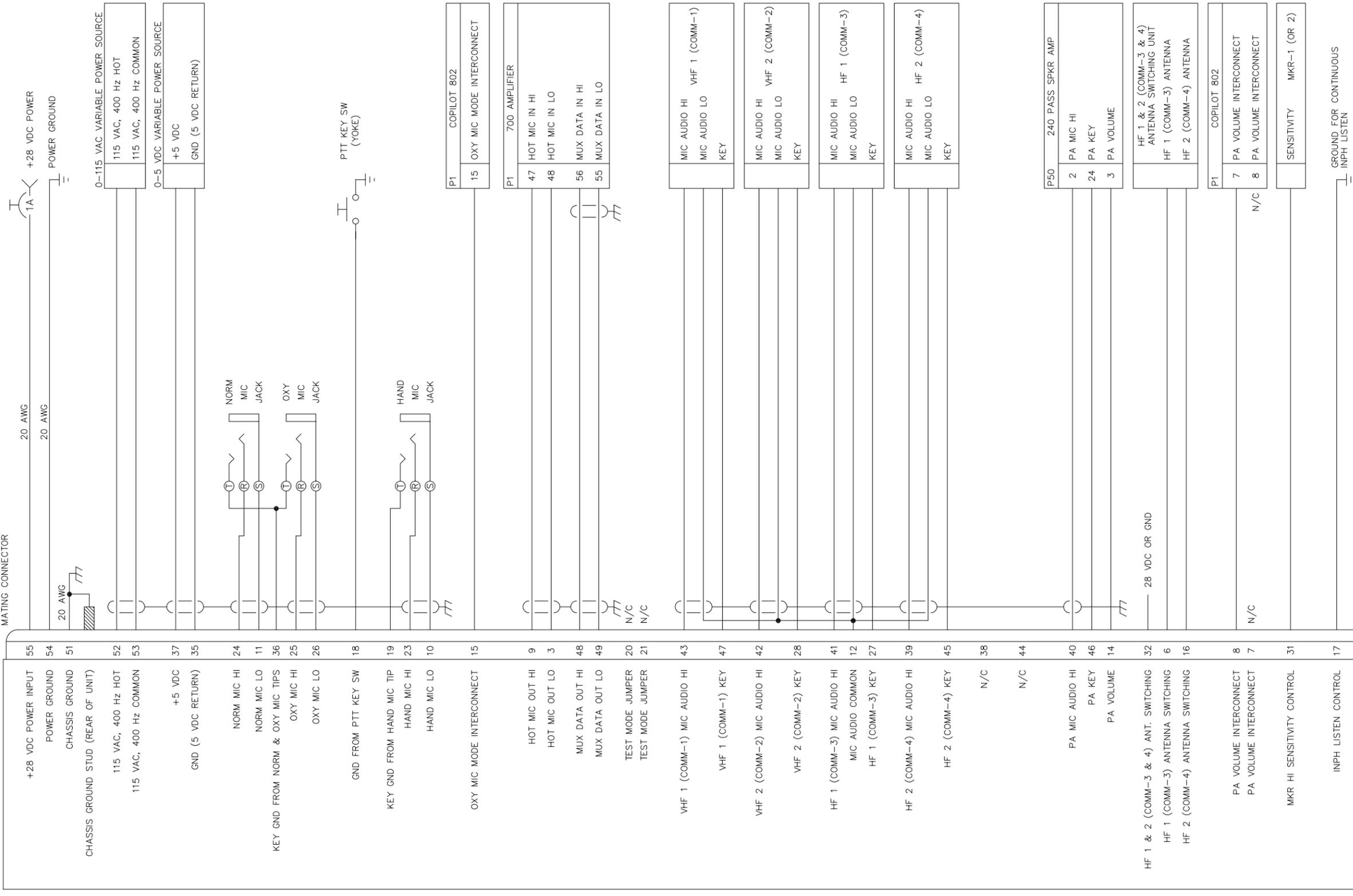
CHASSIS GROUND

CONFIDENTIAL AND PROPRIETARY TO NAT LTD.

DESIGNED	AP	 <b>NAT</b> NORTHERN AIRBORNE TECHNOLOGY LTD.					
DRAWN	TAT						
DATE	DEC 21/05	TITLE					SWITCH PANEL
CHECKED	 						
APPROVED		SIZE	CAGE CODE	PART NO.	REV.	SHEET	
		A	3AB01	802-009	1.00	1/2	
FILE	403-0.DWG	DWG. TYPE	INTERCONNECT	DWG. NO.	802\009\403-0		

802-009  
PILOT

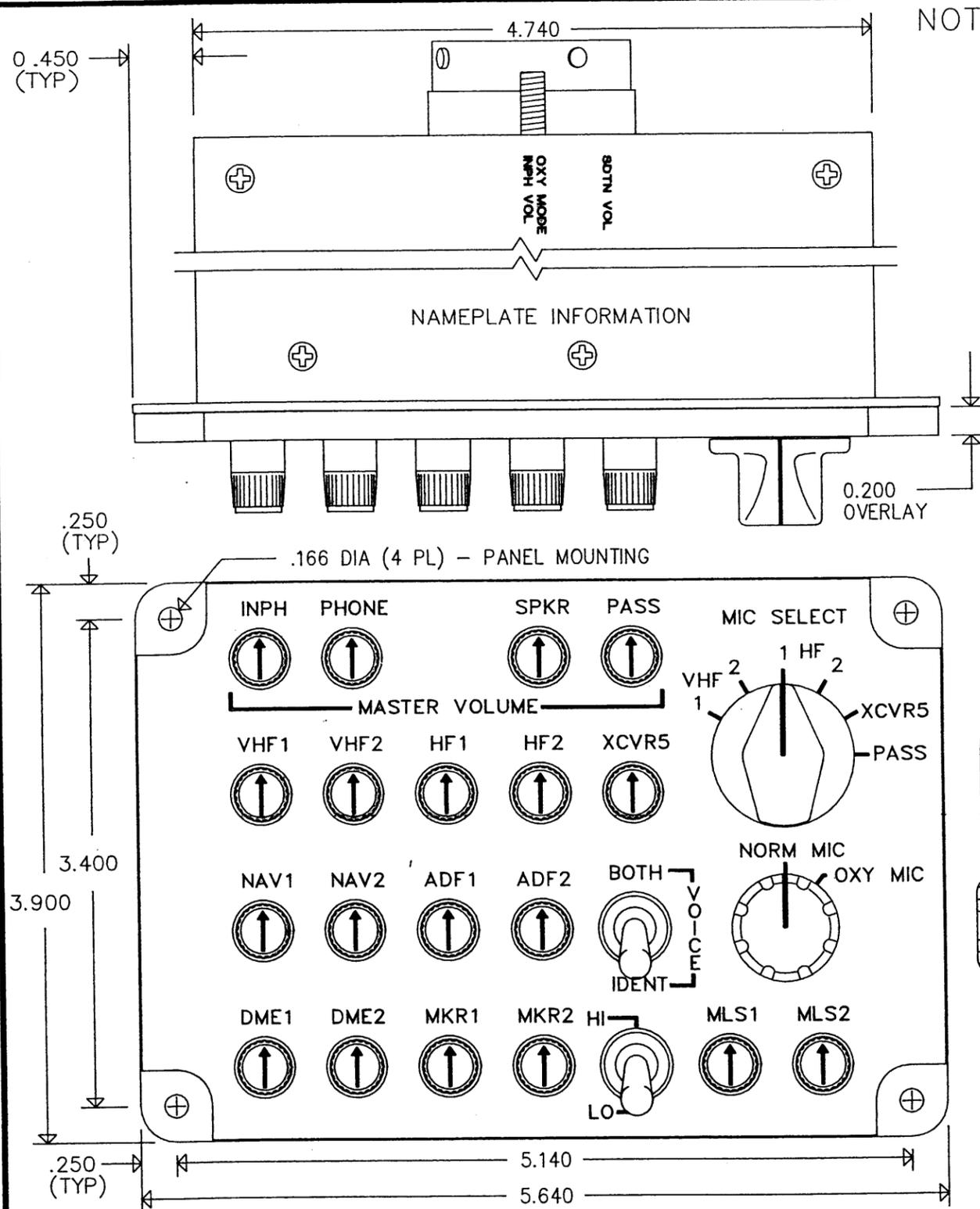
55 PIN FEMALE  
MATING CONNECTOR



CONFIDENTIAL AND PROPRIETARY TO NAT LTD.

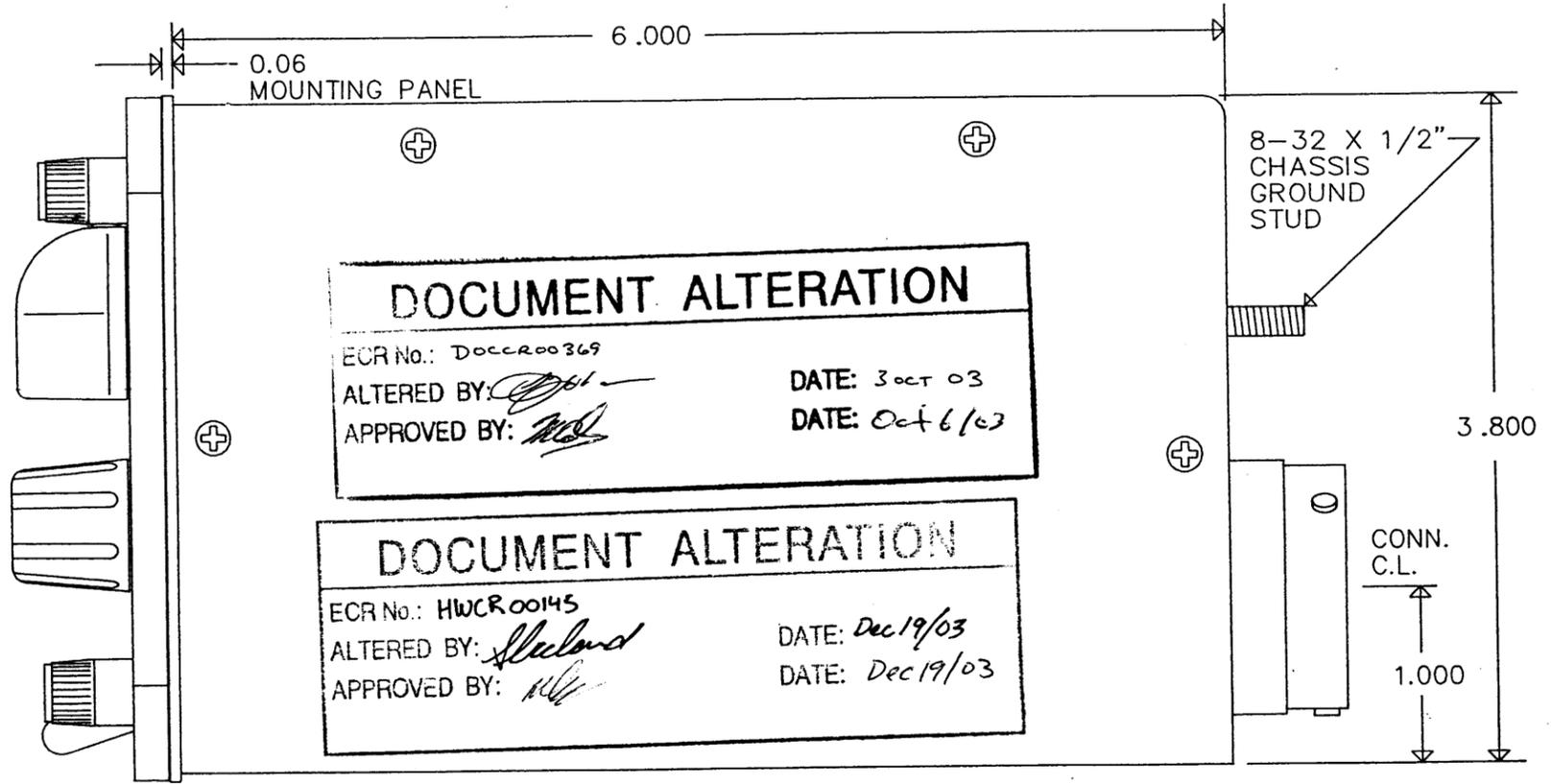
DESIGNED	AP			
DRAWN	TAT			
DATE	DEC 21/05	TITLE		
CHECKED	NAT 278	NAT 255		
APPROVED	NAT 114	SIZE	CAGE CODE	PART NO.
FILE	403-0.DWG	B	3AB01	802-009
		DWG. TYPE	INTERCONNECT	DWG. NO. 802\009\403-1

**nat** NORTHERN AIRBORNE TECHNOLOGY LTD.  
SWITCH PANEL  
REV. 1.00 SHEET 2/2



NOTES:

1. THE MODEL 802 SWITCH PANEL IS DESIGNED TO CONTROL THE MODEL 700-[ ] DIGITAL AUDIO CONTROL AMPLIFIER.
2. WEIGHT: ~~2.0 POUNDS~~ 2.7 POUNDS
3. UNIT POWER: +28 VDC; 0.19 AMP NOMINAL, 0.30 AMP MAX. OVERLAY LIGHTING POWER: 115 VAC, 400 Hz; 0.02 AMP NOMINAL KNOB LIGHTING POWER: +5 VDC; 0.22 AMP NOMINAL
4. OPERATING TEMPERATURE: -55 TO +70 DEGREES C.
5. NAMEPLATE INFORMATION AND OTHER MARKINGS ARE PERMANENTLY PRINTED USING BLACK EPOXY INK. IS DISPLAYED ON NAT LABEL.
6. SURFACE VISIBLE WHEN MOUNTED IS GREY PER FED-STD-595-36118.
7. DIMENSIONAL TOLERANCE: .030
8. CONNECTOR IS 55 PIN MS24264R22B55PN, MATES WITH MS24266R22B55SN.
9. ELECTROLUMINESCENT OVERLAY IS MANUFACTURED PER DB SYSTEMS, INC. DRAWING NO. 802-21. LETTERING IS WHITE, 10 pt. FUTURA DEMBOLD, ALL CAPITALS, CENTERED ABOVE, BELOW AND TO THE SIDE OF CUTOUTS AS SHOWN. LIGHT COLOR AND BRIGHTNESS ARE CERTIFIED BY THE OVERLAY MANUFACTURER AND DATA IS RETAINED AT DB SYSTEMS W/MANUFACTURING RECORDS.
10. OVERLAY IS REMOVED BY REMOVING MIC SELECT AND NORM/OXY MIC KNOBS, THEN REMOVING 4 FLUSH SCREWS (DB SYSTEMS, INC. P/N 802-101) ON REAR OF MOUNTING PANEL FLANGES.
11. SWITCH/VOLUME CONTROL KNOBS LIGHT WHEN "ON" (OUT POSITION). INTERNAL INCANDESCENT KNOB LIGHT PLATE IS MANUFACTURED PER DB SYSTEMS, INC. DRAWING NO. 802-23. LIGHT COLOR AND BRIGHTNESS EMITTED FROM END OF KNOB ARE CERTIFIED BY THE LIGHT PLATE MANUFACTURER AND DATA IS RETAINED W/MANUFACTURING RECORDS.
12. "SIDETONE VOL" AND "OXY MODE INPH VOL" ADJUSTMENTS ARE ACCESSIBLE THROUGH HOLES ON REAR SIDE OF ENCLOSURE.
13. TEST SPECIFICATIONS: ISO-C50c, DO-160C ENV. CAT. [A2F2]-BA(CL)XXXXXX(BZ)AZZUZLXX
14. MODIFICATION STATUS: A

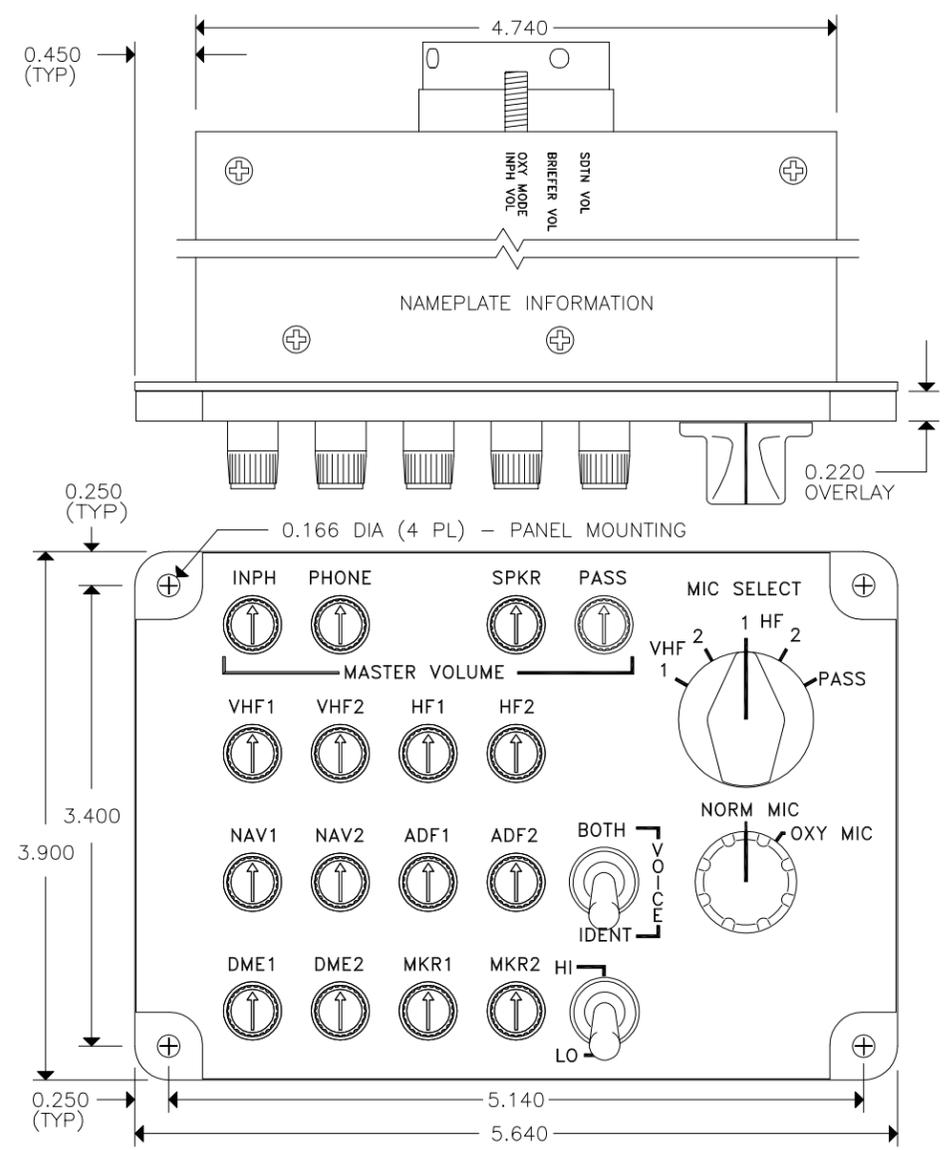


REV	DESCRIPTION	DATE	BY
G	ADDED NOTE 14 (TYPE IV)	10-7-92	dd
F	ADDED POWER INFO NOTE 3; ADDED NOTES 11, 12 AND 13 (TYPE IV)	9-14-92	SS
E	NOTE 9: DB DWG. 802-21 WAS LJ SPEC. 7608019. NOTE 10: 4 FLUSH OVERLAY MOUNTING SCREWS (P/N 802-101) WERE PAN HEAD. (TYPE I)	8-11-92	SS
D	NORM/OXY KNOB CHGD TO RD240A1B1 PER LJ REQUEST; WAS K1333-2MA (TYPE I)	5-20-92	SS
C	NOTE 2 WAS 3.0 lbs, NOTE 3 WAS 0.13A NOM. (TYPE IV)	11-25-91	SS
B	REDRAWN, ADDED FONT TO NOTE 9, ADDED NOTE 10 (TYPE IV)	9-4-91	SS
A	REVISED AND REDRAWN	7-29-91	SS

**DB SYSTEMS, INC.** (206) 883-9910  
 2847 152nd AVE. NE.  
 REDMOND, WA 98052

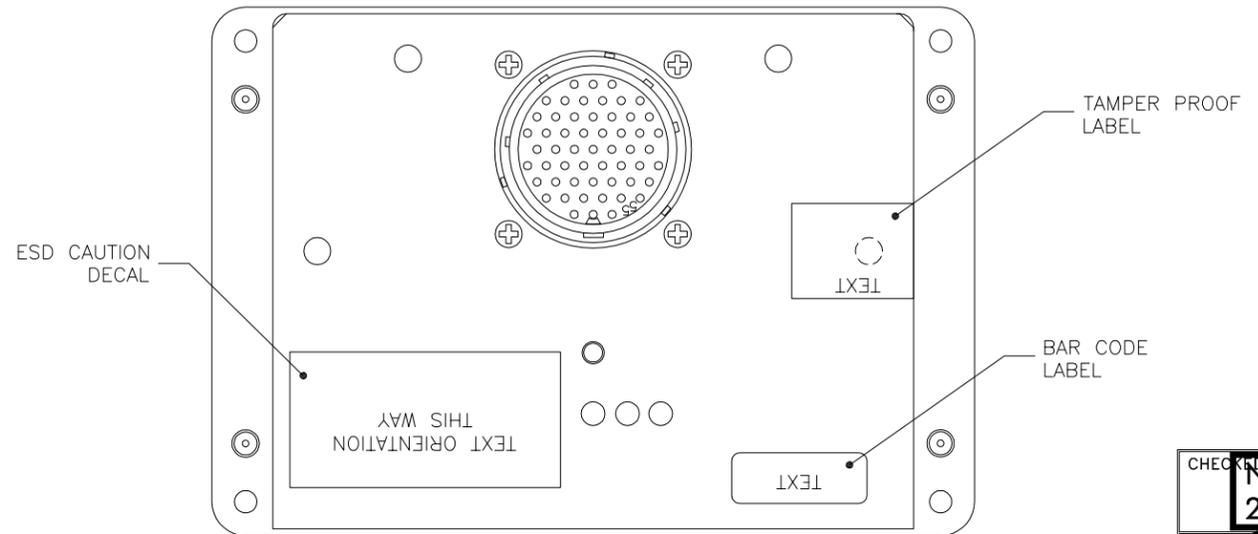
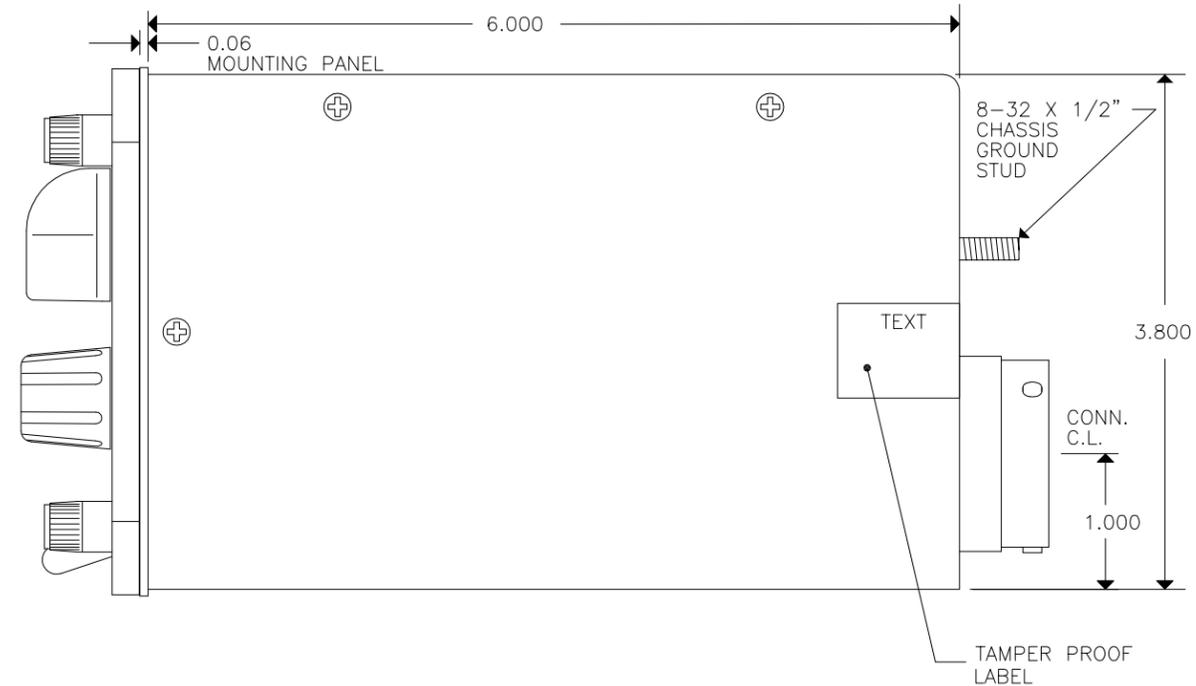
OUTLINE, SWITCH PANEL  
 MODEL 802

SCALE	DRAWN	CHECK	APPROVED
FULL	SS 6-18-91	SS 6-18-91	SS 6-18-91
USED ON	DRAWING NO.	SHEET	REV
60 LEARJET	802	1 OF 1	1.81



NOTES:

1. THE MODEL 802-009 SWITCH PANEL IS DESIGNED TO CONTROL THE MODEL 700-[ ] DIGITAL AUDIO CONTROL AMPLIFIER.
2. WEIGHT: 2.7 POUNDS.
3. UNIT POWER: +28 VDC; 0.19 AMP NOMINAL, 0.30 AMP MAX. FACEPLATE LIGHTING POWER: 115 VAC, 400 Hz; 0.02 AMP NOMINAL KNOB LIGHTING POWER: +5 VDC; 0.22 AMP NOMINAL
4. OPERATING TEMPERATURE: -55 TO +70 DEGREES C.
5. NAMEPLATE INFORMATION IS DISPLAYED ON THE LABEL.
6. SURFACE VISIBLE WHEN MOUNTED IS GREY PER FED-STD-595-36118.
7. DIMENSIONAL TOLERANCE: 0.030
8. CONNECTOR IS 55 PIN MS24264R22B55PN, MATES WITH MS24266R22B55SN.
9. EL COMPATIBLE L.E.D. FACEPLATE IS MANUFACTURED PER NAT, INC. DRAWING NO. 5535024\721-3. LETTERING IS WHITE, 10 pt. FUTURA DEMIBOLD, ALL CAPITALS, CENTERED ABOVE, BELOW AND TO THE SIDE OF CUTOUTS AS SHOWN. LIGHT COLOR AND BRIGHTNESS ARE CERTIFIED BY THE FACEPLATE MANUFACTURER AND DATA IS RETAINED AT DB SYSTEMS W/MANUFACTURING RECORDS.
10. FACEPLATE IS REMOVED BY REMOVING MIC SELECT AND NORM/OXY MIC KNOBS, THEN REMOVING 4 FLUSH SCREWS (DB SYSTEMS, INC. P/N 802-101) ON REAR OF MOUNTING PANEL FLANGES.
11. SWITCH/VOLUME CONTROL KNOBS LIGHT WHEN "ON" (OUT POSITION). INTERNAL INCANDESCENT KNOB LIGHT PLATE IS MANUFACTURED PER NAT, INC. DRAWING NO. 5540006\721-2. LIGHT COLOR AND BRIGHTNESS EMITTED FROM END OF KNOB ARE CERTIFIED BY THE LIGHT PLATE MANUFACTURER AND DATA IS RETAINED W/MANUFACTURING RECORDS.
12. "SIDETONE VOL", "BRIEFER VOL", AND "OXY MODE INPH VOL" ADJUSTMENTS ARE ACCESSIBLE THROUGH HOLES ON REAR SIDE OF ENCLOSURE.
13. TEST SPECIFICATIONS: TSO-C50c, D0-160C ENV. CAT. [A2F2]-BA(CL)XXXXXXZ(BZ)AZZUZLXX
14. MODIFICATION STATUS: REFER TO dB SYSTEMS DRAWING NUMBER 802-009-1 FOR CURRENT MOD STATUS.



CHECKED  
NAT  
255  
APPROVED  
NAT  
131

REV	DESCRIPTION	DATE	BY
1.50	ECO10456 - ADDED WED LABELS.	JUL 7/10	MWS
1.40	DOCCR00953 - ADDED FACEPLATE.	DEC 24/04	AJ
1.31	DOCCR00549 - CORRECTED WEIGHT.	DEC 19/03	SI
1.30	DOCCR00369 - ADDED NAT LABELS.	OCT 3/03	LJ
B	CHANGED "802-009-21" TO "802-001-21" IN NOTE 9 (TYPE IV).	6-10-02	AP
A	CORRECTED TYPOGRAPHICAL ERROR ON OVERLAY DIMENSION, WAS 0.200 (TYPE IV) NOTE 14 WAS "MODIFICATION STATUS: NONE" ADDED "BRIEFER VOL" TO NOTE 12 (TYPE IV)	5-10-02	AP

**dB SYSTEMS, Inc.**

**OUTLINE, SWITCH PANEL  
MODEL 802-009**

SCALE FULL	DRAWN AP 5-24-01	CHECK AP 5-24-01	APPROVED AP 5-24-01
FILE: 802-009.DWG	DRAWING NO. 802-009	SHEET 1 OF 1	REV 1.50



# ENVIRONMENTAL QUALIFICATION FORM

Description:	<b>Switch Panel</b>	Document No.:	<b>802521-0</b>
NAT Part No.:	<b>802-xxx</b>	TSO Authorization:	<b>TSO-C50c</b>
Manufacturer's Specification and/or Other Applicable Specification:		<b>RTCA DO-160C</b>	
Manufacturer:	<b>Wulfsberg Electronics Division</b>		
Address:	<b>6400 Wilkinson Drive, Prescott, AZ 86301-6164, USA</b>		

Prepared By:	<b>NAT 281</b>	Checked By:	<b>NAT 220</b>	Approved By:	<b>NAT 149</b>
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CONDITIONS	DO-160C SECTION/ PARAGRAPH	DESCRIPTION OF CONDUCTED TESTS
Temperature and altitude	4.0	Equipment tested to Category [(A2)(F2)-], except as noted.
Low temperature	4.5.1	-55°C (operating and ground survival)
High temperature	4.5.2	+85°C (ground survival)
	4.5.3	+70°C (short time operating)
	4.5.3	+70°C (operating)
In-flight loss of cooling	4.5.4	N/A. No forced air cooling.
Altitude	4.6.1	+70,000 ft.
Decompression	4.6.2	8,000 ft to +70,000 ft.
Overpressure	4.6.3	-15,000 ft
Temperature variation	5.0	Equipment tested to Category B.
Humidity	6.0	Equipment tested to Category A.
Operational shocks and Crash safety	7.0	Equipment tested without shock mounts per DO-160C, paragraphs 7.2.1, 7.3.1, 7.3.2, and 7.3.2.2.
Operational shocks	7.2	
Crash safety	7.3	
Vibration	8.0	Equipment tested without shock mounts to Category L, except extended curve 150-2,000 Hz 3g pk. No change in critical frequencies during test. Equipment tested without shock mounts to Category C. Change in critical frequency in Z-axis from 150.2 Hz to 118.1 Hz.
Explosion proofness	9.0	Equipment identified as Category X, no test performed.
Waterproofness	10.0	Equipment identified as Category X, no test performed.
Fluids susceptibility	11.0	Equipment identified as Category X, no test performed.
Sand and dust	12.0	Equipment identified as Category X, no test performed.

CONDITIONS	DO-160C SECTION/ PARAGRAPH	DESCRIPTION OF CONDUCTED TESTS
Salt spray	14.0	Equipment identified as Category X, no test performed.
Magnetic effect	15.0	Equipment is Class Z.
Power input	16.0	Equipment tested to Categories B and Z, including: <ul style="list-style-type: none"> <li>• Subparagraph 16.5.1.4b requirement for equipment with digital circuits.</li> <li>• Emergency operating voltage.</li> </ul>
Voltage spike	17.0	Equipment tested to Category A.
Fungus resistance	13.0	Equipment identified as Category X, no test performed.
Audio frequency conducted susceptibility	18.0	Equipment tested to Category Z.
Induced signal susceptibility	19.0	Equipment tested to Category Z.
Radio frequency susceptibility	20.0 Pre Change no. 3	Equipment tested to Category U.
Emission of radio frequency energy	21.0	Equipment tested to Category Z.
Lightning induced transient susceptibility	22.0 Pre Change no. 2	Equipment tested to Category L.
Lightning direct effects	23.0	Equipment identified as Category X, no test performed.
Icing	24.0	Equipment identified as Category X, no test performed.
Remarks: <ul style="list-style-type: none"> <li>• Tests of DO-160C, sections 4.0 (paragraphs 4.5.1, 4.5.2, and 4.5.3), 5.0, 16.0 (except subparagraph 16.5.2.3b), and 18.0 were conducted on both the 902-21 Digital Multiplexing Unit subassembly and the Model 802-001 Switch Panel at dB Systems, Inc. in Redmond, Washington.</li> <li>• Tests of DO-160C, sections 16.0 (subparagraph 16.5.2.3 b), 17.0, 19.0, and 21.0 were conducted on the 902-21 Digital Multiplexing Unit subassembly at Sundstrand Data Control, Inc. in Redmond, Washington.</li> <li>• Tests of DO-160C, sections 4.0 (paragraphs 4.6.1, 4.6.2, and 4.6.3), 6.0, 7.0, 8.0, 15.0, 19.0, 20.0, and 22.0 were conducted on the Model 802-001 Switch Panel at Sundstrand Data Control, Inc. in Redmond, Washington.</li> <li>• The Model 802-xxx is qualified by similarity (with respect to the 902-21 Digital Multiplexing Unit subassembly) to TSO-C50c for the tests of DO-160C, sections 16.0 (subparagraph 16.5.2.3b), 17.0, and 21.0.</li> </ul>		

End of Environmental Qualification Form



# 802-009 Switch Panel

## SM802 Installation and Operation Manual

### Section 3 Operation

#### 3.1 Introduction

Information in this section consists of functional and operational procedures for the 802-009 Switch Panel.

#### 3.2 General Information

The 802-009 Switch Panel shown in Figure 1 is designed to control a single Model 700-xxx Digital Audio Control Amplifier. It also provides microphone audio switching and keying operations for four radio transmitters in addition to features such as antenna switching unit control, marker (MKR) receiver sensitivity control and public address (PA) amplifier control. The 802-009 Switch Panel continuously reads the status of its own audio control switches and volume control potentiometers and compiles this information into the form of a digital signal. The digital signal is sent to the Model 700 from the switch panel in RS422 serial format via a twisted, shielded wire pair. The Model 700 receives, demultiplexes and converts this digital signal into useful audio control information.

The 802-009 Switch Panel is capable of digitally controlling all Model 700 amplifier functions. These include the 12 receiver input switches and individual volume controls, the four sidetone input switches and sidetone volume control, the three microphone input switches, the interphone switches and volume control, the cockpit speaker switch and volume control, the headphone volume control and the NAV/ADF Voice/Ident filter switching functions. Refer to the Model 700 Digital Audio Control Amplifier Equipment Manual (NAT Seattle Document 700-16) for more specific information on Model 700 functions.

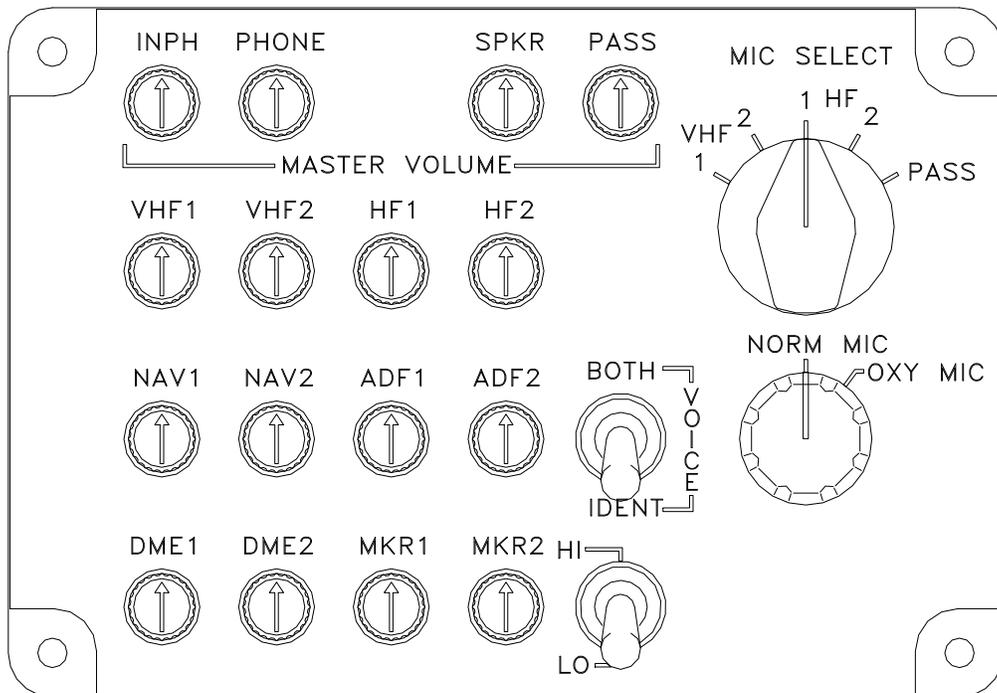


Figure 1: 802-009 Switch Panel



# 802-009 Switch Panel SM802 Installation and Operation Manual

## 3.3 Controls and Indicators

### 3.3.1 Master Volume, Transceiver and Receiver Controls



These controls are alternate action press-on/press-off rotary switches that control various functions of the Model 700. All knobs, except PHONE and PASS, control both switching and volume control of the respective audio.

When the knob is in the OUT position, the relevant function is selected (on), and the knob is illuminated to indicate that the control has been selected.

When the knob is in the IN position, the relevant function is deselected (off), and the knob is not illuminated.

The rotary function of the switch adjusts the relevant volume.

The different functions controlled by the press-on/press-off (switch) and rotary portions of the control will be outlined in the appropriate sections below.

The PHONE and PASS volume control knobs remain in the OUT and lighted position at all times.

#### 3.3.1.1 Master Volume Controls

The Master Volume control functions are outlined in Table 1 below.

Control Name	Switch Function	Rotary Function
INPH (Interphone)	Selects the INPH Hot switch function	Interphone volume control
PHONE	No function	Headphone volume control
SPKR (Speaker)	Speaker switch function volume	Speaker volume control
PASS	No function	PA amplifier output volume

Table 1  
Master Volume Control Functions

#### 3.3.1.2 Transceiver Controls

The receiver and sidetone functions of the VHF1, VHF2, HF1 and HF2 transceivers are selected and deselected using the press-on/press-off functions of the appropriate controls and the rotary function adjusts the respective volumes.

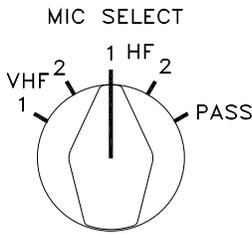
#### 3.3.1.3 Receiver Controls

The receiver controls - NAV1, NAV2, ADF1, ADF2, DME1, DME2, MKR1 and MKR2 - function in the same way as the transceiver controls (see section 3.3.1.2).



## 802-009 Switch Panel SM802 Installation and Operation Manual

### 3.3.2 MIC SELECT Switch



The MIC SELECT switch is a 5-position rotary control (VHF1, VHF2, HF1, HF2, and PASS) used to select the transceiver for transmission.

During PTT key, it connects the mic input to the selected transmitter or PA mic output. In transmitter positions, it turns on the PTT Mute function of the Model 700, and in the PASS position, it turns on the PA Key (sidetone) function of Model 700 and enables PASS volume control to the PA amplifier. In the HF1 and HF2 positions it allows for antenna switching unit control.

### 3.3.3 BOTH/VOICE/IDENT Switch



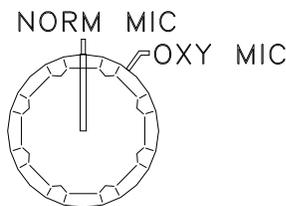
The BOTH/VOICE/IDENT switch is a three-position switch used for selecting the navigation filter modes.

**BOTH position:** No filtering, both identifier and voice filtering functions are switched off.

**VOICE position:** Voice filtering is switched on.

**IDENT position:** Identifier filtering is switched on.

### 3.3.4 NORM MIC/OXY MIC Switch

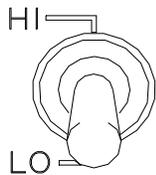


The NORM MIC/OXY MIC switch is a two-position rotary control used to select the mic for transmission/PA use. During PTT, the selected Mic is connected to the HOT MIC output and to the selected transmitter mic output.

**NORM MIC:** Connects the normal mic input to the HOT MIC output.

**OXY MIC:** Connects the Oxygen mic input to HOT MIC output. Also turns ON the following Model 700 functions: INPH Hot switch, INPH to SPKR switch and Speaker switch.

### 3.3.5 HI/LO MKR Sensitivity Switch



The HI/LO MKR Sensitivity switch is a two-position switch used to select the Marker receiver sensitivity.

### 3.3.6 Transmission Functions

#### 3.3.6.1 Keyed Transmission

To key a selected transmitter, the pilot may either use the yoke mounted Push-To-Talk (PTT) key switch with the NORM or OXY microphones or the PTT key switch on a hand-held microphone. The MIC SELECT rotary switch on the 802-009 Switch Panel determines which transmitter is to be keyed and



## 802-009 Switch Panel

### SM802 Installation and Operation Manual

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connected to the microphone input being used. If the MIC SELECT switch is in any of the four transmitter positions and the SPKR switch is ON, then during a transmit PTT the cockpit speaker volume will be muted to a preset level determined by the SPKR MUTE adjustment on the Model 700 Amplifier. If the INPH switch is ON, then the HOT MIC interphone volume will be completely muted during a transmit PTT as defined in Model 700 software logic.

#### **3.3.6.2 PA Transmission**

To key the passenger address amplifier and adjust its volume, the MIC SELECT switch must be placed in the PASS position. The PA amplifier may then be keyed by either hand mic or yoke PTT key switches and a passenger address announcement may be made to the cabin. The PASS volume controls the volume of the PA amplifier output. The cockpit speaker and interphone volumes are not muted during transmit PTT when the MIC SELECT switch is in the PASS position. PA sidetone will be switched ON during PASS transmit PTT through Model 700 amplifier control, but only if the Model 700 PA sidetone input has audio connected to it. Examples of PA amplifiers compatible with the 802-009 PASS key and volume controls are the NAT Models 205, 240, 250, or 251 Passenger Speaker Amplifiers.

#### **3.3.6.3 Mic Selection**

The NORM MIC/OXY MIC rotary switch on the 802-009 selects either the normal boom mic or oxygen mask mic, depending on its position.

In the NORM MIC position, the NORM mic input is connected to the HOT MIC output and during a transmit PTT it is connected to the selected transmitter or PA amplifier.

In the OXY MIC position, the OXY mic input is connected to the HOT MIC output and during a transmit PTT it is connected to the selected transmitter or PA amplifier. In addition, the INPH and SPKR switches are automatically turned ON, the interphone to speaker function of the Model 700 is initialized and the interphone volume is set to a preset level determined by the OXY MODE INPH VOL adjustment, which is accessible through a hole in the rear of the 802-009 enclosure. All selected receiver audio, interphone audio and transmit sidetone audio will be heard over the cockpit speaker in the OXY MIC mode of operation. If the OXY MIC MODE INTERCONNECT connection is wired between pilot and copilot 802-009 Switch Panels, then both audio systems will go into this operating mode when either one or the other selects the OXY MIC position on the NORM MIC/OXY MIC selector switch and only the switch panel(s) with OXY MIC selected must use the oxygen mask microphone. In either position, the hand mic with its transmit PTT will override the selected NORM or OXY mic for transmitting only.

**Section 3 ends**

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