NARCO AVIONICS
NAV122D, NAV122D/GPS
TSO'd NAVIGATION SYSTEM

Installation Manual

03128-0620

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PRINTED IN USA MARCH 2007 Rev 1.2

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1. INTRODUCTION

1.1 GENERAL

In support of the NARCO Avionics NAV122D, NAV122D/GPS navigation systems, this manual provides detailed installation procedures.

"This manual is intended for use only by persons who are qualified to service the equipment described in this manual pursuant to current regulatory requirements."

1.1.1 Manual Organization

Organized into two major sections, the manual provides the following:

Section 1	Introduction	-general information required in planning the installation.
Section 2	Installation	-detailed procedures for performing the mechanical and electrical installation.

1.2 PRODUCTION DESCRIPTION

Functions of the system covered within this manual are shown in Table 1.1.

TABLE 1.1 NAV SYSTEM CHARACTERISTICS

FUNCTION \ NAV SYSTEM	***NAV122D***	***NAV122D/ GPS***	***NAV122D/ GPS***
UNIT PART NUMBER	03128-0300	03128-0301	03128-0302
VOR/LOC Receiver	X	X	X
Glide Slope Receiver	X	X	X
VOR/LOC and GS Converters	X	X	X
VOR/LOC and GS Displays	X	X	X
ARINC 2/5 Channeling	X	X	X
GPS Interface (L/R, T/F, Nav Flag, SIN/COS)	-	-	X
GPS Interface (L/R, T/F, Nav Flag, Resolver)	-	X	-

1.3 DESIGN FEATURES

Multiple functions to simplify installation.

ARINC Panel cutout, 3" instrument hole.

Direct replacement of existing NAV122 (minus marker RCVR)

Easily replaces NAV111/NAV112 receivers (cable modification required)

The NAV122D/GPS can be used as the external CDI display required in a IFR certified GPS installation

Meets the following TSO's:

C-40c	VOR TSO
C-36e	Localizer TSO
C-34e	Glide Slope TSO

1.4 PRODUCT SPECIFICATIONS

TABLE 1.2 GENERAL SPECIFICATIONS

GENERAL		***NAV122D***
Mechanical		
Physical Dimensions		Figure 2-3
Weight	NAV122D	2.5 Lbs.
Weight	NAV122D/GPS	2.6 Lbs.
Electrical		
Supply Voltage (see note 1)		13.75VDC
Current, less pilot lamps, 14V		350mA
Current, less pilot lamps, 28V (see note 2)		400mA
Pilot lamp current	14V	250mA
	28V	250mA

Notes: 1. Voltage Converter required for 28VDC installations.
2. With MP 10, 28 to 14Vdc Voltage Converter - 0.60 Ampere.

1.4 Continued

TABLE 1.3 VOR/LOC RECEIVER

VOR/LOC RECEIVER	*NAV122D*
Frequency Range (in MHz)	108.00 to 117.95 200 channels
Sensitivity (6dB S + N/N)	2.0μV
(Full VOR Flag)	2.0μV
Spurious and Image Rejection	80dB min
Selectivity 6dB	±19kHz
60dB	±42kHz
AGC Flatness (10μV to 10kμV)	1.0dB max
Audio Output (500ohm load)	50mW
VOR Accuracy	2.7°
LOC Accuracy	±5μa
DME Channeling Code	ARINC 2 out of 5

TABLE 1.4 GLIDE SLOPE RECEIVER

GLIDE SLOPE RECEIVER	*NAV122D*
Frequency Range (in MHz)	329.150 to 335.00
Sensitivity (Full GS Flag)	20μV
Spurious and Image Rejection	60dB
Selectivity 6dB	±19kHz
60dB	±42kHz
AGC Flatness (20μV to 10kμV)	3dB
GS Accuracy	±5μa

1.4 Continued

TABLE 1.5 EXTERNAL INDICATOR AND AUTOPILOT LOADS

AUTOPILOT INDICATOR		*NAV122D* *NAV122D/GPS*
Loading		
VOR-LOC:	Left-Right	one, 1k ohm load
	To-From Flag	one, 1k ohm load
GS:	Up-Down	one, 1k ohm load
	Warning Flag	one, 1k ohm load
Output		
VOR-LOC:	Left-Right LOC	90mV for .093 ddm *
	VOR	150mV for 10° course change
	To-From Flag	250mV
GS:	Up-Down	78mV for .091 ddm *
	Warning Flag	250mV

* ddm- Difference in depth of modulation

TABLE 1.6 INDICATOR IMPEDANCE AND DEFLECTION CHARACTERISTICS

MOVEMENT	IMPEDANCE	DEFLECTION CHARACTERISTIC
LEFT/RIGHT	1000 OHMS	150mV full scale
TO/FROM	200 OHMS	250mV full scale
UP/DOWN	1000 OHMS	150mV full scale
GS FLAG	1000 OHMS	250mV full scale

ENVIRONMENTAL

The NAV122D and NAV122D/GPS are designed and tested to meet the appropriate categories of RTCA DO-160C. The environmental qualification form can be found in appendix A

Operating temperature -20°C to +55°C

1.4.1 Explanation

The NAV122D and NAV122D/GPS are designed to be instrument panel mounted within the cabin environment of fixed and rotary wing aircraft using piston or turbine engines, in single and multiengine configurations. It is designed for non-pressurized aircraft operating up to 35,000 feet as well as for pressurized aircraft. This equipment requires direct current, but may be installed in aircraft having additional on-board alternating current sources.

1.5 UNITS AND ACCESSORIES SUPPLIED

The following listings may be used to: 1.) check the contents of your order
2.) to order additional Units or components.

Table 1.7 is used for ordering Units, refer to the Units Part Number and its Description.

Additional Installation Kits or detail parts of a Kit may be ordered from the Installation Kit Parts List. Item Part Numbers are provided for service replacement purposes and are not used when ordering a complete Installation Kit.

Table 1.8 Lists the contents of the installation kits which can be used for ordering parts for a bench test harness.

Refer to Section 1.6, Optional Accessories, for additional items to complete the avionics system.

TABLE 1.7 UNITS AND ACCESSORIES SUPPLIED

UNIT PART NUMBER	***UNIT AND DESCRIPTION****	***SUPPLIED WITH INSTALLATION KIT PART NUMBER***
01535-0101	NAV122D VOR, LOC/GS	03128-0500
01535-0102	NAV122D/GPS VOR, LOC/GS, (GPS Interface)	03128-0501
01535-0103	NAV122D/GPS VOR, LOC/GS, (GPS Interface, no resolver)	03128-0502
*NAV's are 14V only. Refer to Section 1.6 for 28Vdc to 14Vdc Voltage Converter.		

TABLE 1.8 INSTALLATION KIT PARTS LIST

ITEM	*PART NUMBER*	*DESCRIPTION*	*QUANTITY 03128*		
			0500	**0501**	**0502**
1	41364-0008	Connector, J810, 37 Pin	1	1	1
2	41307-0008	Hood, J810, Right Angle	1	1	1
3	41308-0004	Locking Assembly, J810	1	1	1
4	41152-0003	Connector, BNC	2	2	2
5	41372-0004	Contacts, Socket, Qty. 37	1	1	1
6	41444-0002	Connector, circular, J811	-	1	1
7	41445-0002	Contacts, J811	-	28	12
8	41446-0001	Cable clamp	-	1	1
9	41444-0102	Jumper Plug Assembly *	-	1	-

* Included with and to be used with Chassis level BACBCED and later only.

1.6 OPTIONAL ACCESSORIES

a) Power Converter...required only for 28V installations:

Narco Voltage Converter

MP 10 Voltage Converter, P/N 03710-0500, or equivalent.

b) Headphones - low impedance type, 300 to 1000ohms.

c) Audio Control Panel - NARCO CP 136M.

d) Circuit Breaker - Supplied by installing agency.

e) Straight, J810, Connector Hood - Order part number – 41307-0004.

f) Annunciator/Relay panel as required by the GPS / Annunciator panel manufacturer (NAV122D/GPS only)

1.6.1 Miscellaneous Items NOT Supplied

a) Number 24 AWG stranded wire, as required.

b) Number 20 AWG stranded wire, as required.

c) Coaxial cable RG 58 C/U, as required.

d) Mounting hardware; refer to Section 2.

1.7 OPERATION LICENSE REQUIREMENT

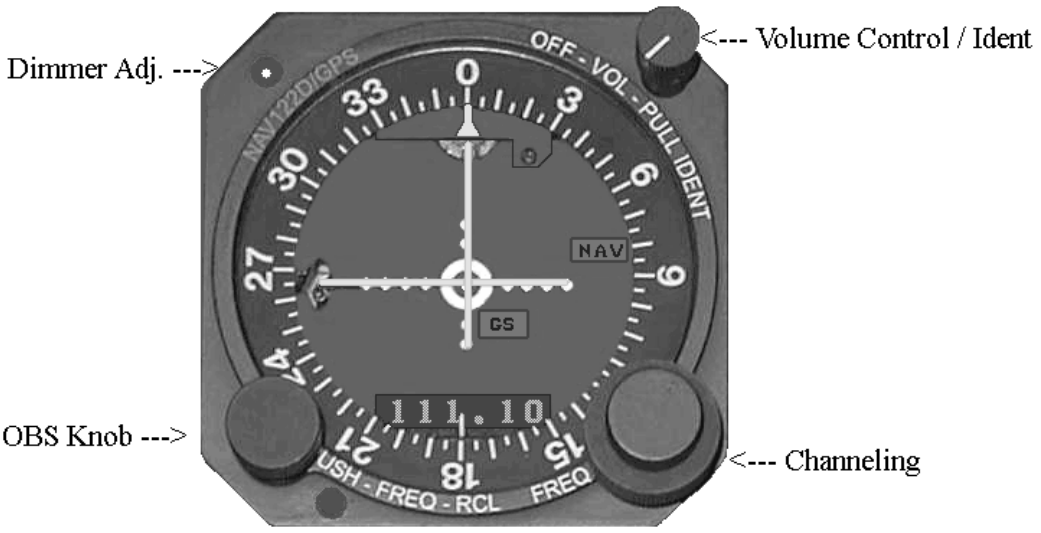
There are no operator license requirements for this type of equipment.

1.8 OPERATION

Rotating the Volume Control/Ident clockwise, past the "click", applies power to the NAV circuits; continued clockwise rotation increases audio volume. Pulling this knob allows the 1020Hz Ident code to be heard.

Receive Frequency Channeling

Receive frequency is selected by the concentric knobs at the Units lower right corner. Whole megahertz frequencies are selected by the large knob while fractional megahertz frequencies are selected by the small knob. Clockwise rotation of either knob increases selected frequency. Continuous tuning is permitted with both knobs.



Omni Bearing Selection

A desired omni bearing is obtained by turning the OBS knob to set that bearing, shown on the Omni Bearing Card, under the yellow Selected Bearing Indicator.

VOR/LOC Deviation Indicator

In VOR mode, the vertically oriented Indicator moves left or right to indicate location of selected VOR bearing relative to actual aircraft heading. When centered, the Indicator shows on-course condition.
In Loc mode, the Indicator moves left or right to locate the center of the horizontal component of a ILS glide path relative to actual aircraft heading.

GS Deviation Indicator

The Horizontal Deviation Indicator moves up or down to locate the center of the vertical component of an ILS glide path relative to actual aircraft position. Acquisition of the ILS glide path will be shown when the GS and LOC Deviation Indicators cross and center within the circle.

Warning Flags

TO-FROM Flag - Red NAV Flag alerts the pilot to either loss of signal or inadequate signal level. A TO or FROM Flag shows whether the selected course will take the aircraft TO or FROM the station.
GS Flag - Red GS Flag alerts the pilot to either loss of signal or inadequate signal level.

NAV122D/GPS ADDITIONAL FUNCTIONS

When the NAV122D/GPS is being used as the CDI for an IFR certified GPS and the appropriate GPS mode pin on P811 is active (frequency display now showing 'GPS'), the following operations apply:

Frequency Recall

Pressing on the OBS knob will momentarily display the current NAV frequency. Additionally turning the channeling knobs will cause the NAV frequency to be changed and the new frequency to be displayed for 2 seconds before 'GPS' returns to the display.

Left/Right deviation indicator, To/From indicator

When installed properly the Left/Right information and the To/From information presented when 'GPS' is in the frequency window will be the information generated by the GPS receiver.

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2.1 INTRODUCTION

This section provides all the electrical and mechanical installation information. Electrical Installation and Mechanical Installation Sections are independent and self-supporting. This permits their removal from the manual allowing the electrical and mechanical installation efforts to proceed in parallel.

Interconnect cables are to be constructed by the installing agency. Refer to Section 2.4 for details.

2.2 PRELIMINARY PROCEDURES

2.2.1 Preliminary Inspection

Carefully unpack the equipment noting any damage to shipping cartons or avionics. If damage is noted, retain the carton to corroborate damage claims.

Inventory received items against the lists in Section 1.5 to assure a complete order.

2.2.2 Pre Installation Bench Test

The purpose of this sub-section is to determine that the Unit meets factory performance specifications.

2.2.2.1 Test Equipment Required

TYPE	*CHARACTERISTIC*	*EXAMPLE*
Regulated DC Power Supply	Voltage Range: 0 to 30Vdc Current Range: 0 to 1Ampere	Power Designs Model 5015
VHF Signal Generator	Frequency Range: 10MHz to 400MHz Modulation: AM, 0 to 95%	Hewlett Packard Model 608D
VOR/LOC Generator		IFR Model N-750
Glideslope Generator		IFR Model N-750
Audio Generator	Frequency Range: 400Hz to 3000Hz	Hewlett Packard Model 200CD
Volt-Ohmmeter	DC Ranges: Input Impedance: 10megohms min. Ranges: 0.1V to 100V Accuracy: 2% of range AC Ranges: Input Impedance: 1megohm min. Ranges: 0.01V to 100V rms Frequency Range: 10Hz to 1MHz Accuracy: 2% of range Ohmmeter: Range: 1ohm to 10megohms Accuracy: 5% of reading	Hewlett Packard Model 427A
Audio Wattmeter	Load Range: 100 to 1000ohms min. Power Range: 0 to 100milliwatts min.	General Radio Model 1840-A
Attenuator	6dB, 50ohms	

2.2.2.2 Bench Test Wiring Harness

The harness shown in Figure 2-1 will permit bench testing of a NAV122D. Alternatively, the cable to be installed in the aircraft may be used, providing in addition, a checkout of avionics and cabling. Additionally a second connector and harness shown in figure 2-2 will be needed to test the NAV122D/GPS.

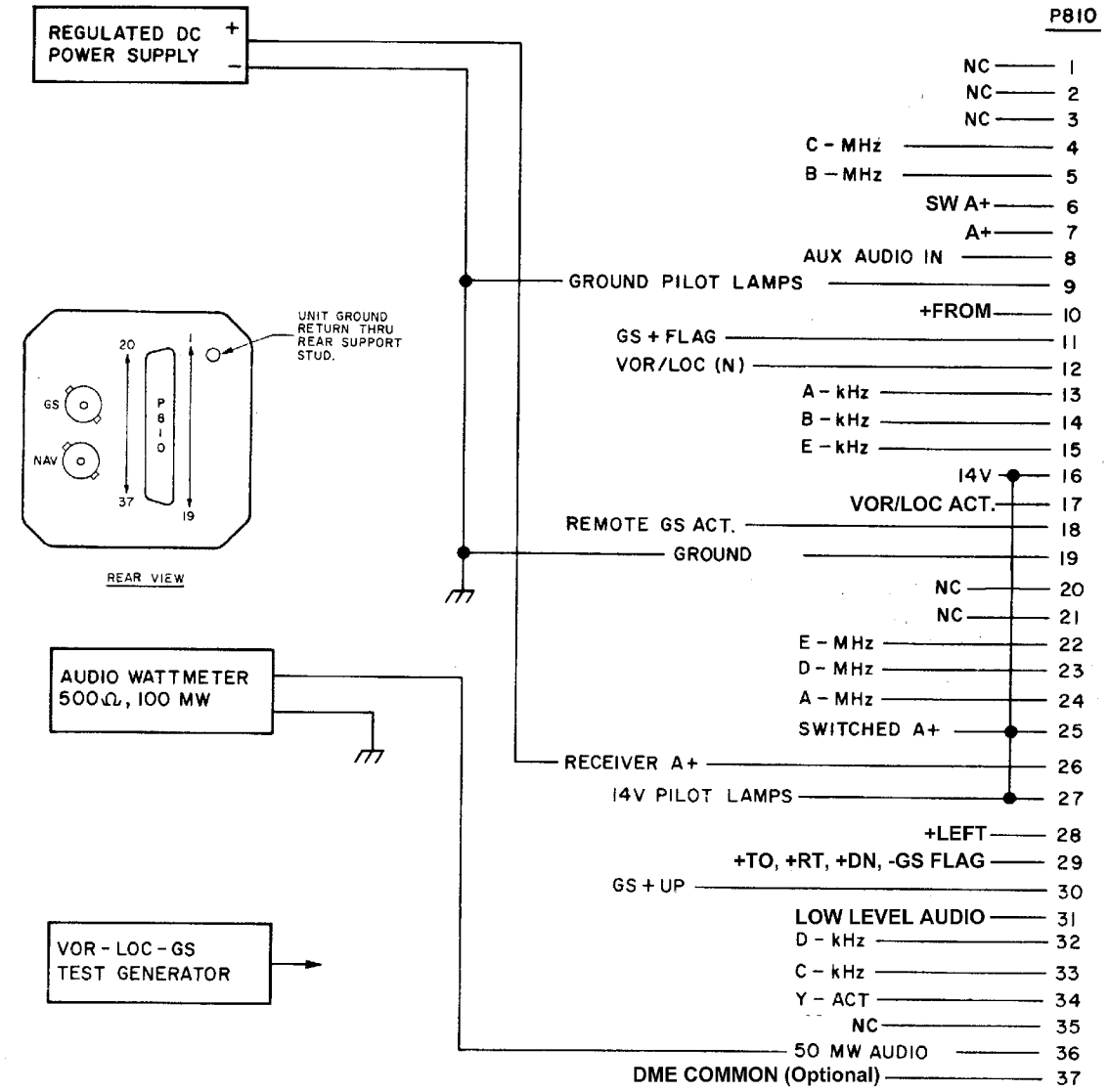


FIGURE 2-1. BENCH TEST HARNESS

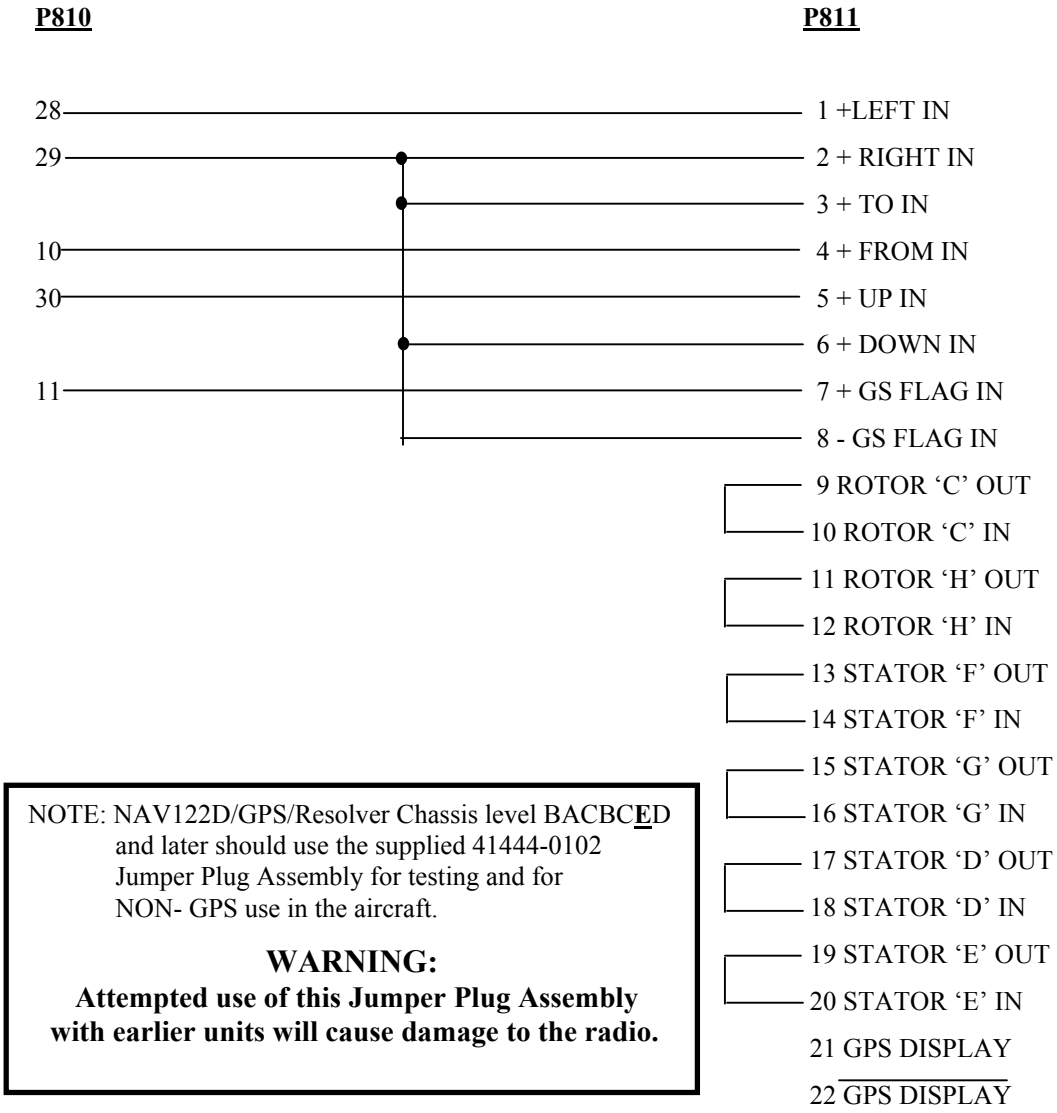


FIGURE 2-2 ADDITIONAL BENCH TEST HARNESS FOR NAV122D/GPS

2.2.2.3 Test Procedure

Bench tests are conducted in the following sequence: A) VOR/LOC receiver and audio circuits; B) VOR converter; C) LOC converter; D) GS receiver and converter; E) 2/5 channeling, and F) GPS display mode.

A. VOR/LOC Receiver

1) Connect the test equipment (Section 2.2.2.1) as shown in Figure 2-1.
2) Connect the VOR generator's RF output to the Nav connector at the rear of the NAV Receiver.

   Generator Settings: RF output to 4μV; Modulation to 30% @ 1020Hz

3) Set generator and receiver to a desired frequency.

4) Turn receiver volume control to maximum CW and pull to "IDENT" position; note audio output.

Audio: 50mW minimum across 300ohms.

5) Reduce generator RF attenuator to 2μV.

6) In "IDENT" mode, reduce audio power output to 2mW (or a convenient reference); remove modulation from generator and observe decrease in audio output.

S+N/N: 6dB minimum

7) Set generator RF attenuator to 10μV; modulation to 30% @ 1020Hz.

8) In "IDENT" mode, reduce audio power output to 2mW (or a convenient reference); increase generator RF attenuator to 10kμV; note increase in audio power output.

AGC: +1dB maximum

9) Set generator attenuator to 500μV.

10) In "IDENT" mode, set power output to 20mW; depress NAV Receiver VOL-IDENT knob and note decrease in audio output.

Ident Filter: 18dB minimum

B. VOR Converter

1) Modulate generator with a composite VOR signal; set RF attenuator to 500μV.

2) Check VOR accuracy at the four cardinal points (0°, 90°, 180°, 270°).

VOR Accuracy: Error shall not exceed ±1.5°

3) Rotate OBS +10° then -10°.

Course Width: full-scale deflection ±1/2 dot.

4) Decrease generator RF attenuator to less than 0.2μV; increase RF attenuator slowly and note appearance of a full TO or FROM indication.

VOR Flag Sensitivity: 2.0μV maximum

C) LOC Converter

1) Set generator and receiver to a LOC frequency.

2) Modulate generator with a composite LOC signal; set RF attenuator to 500μV.

LOC Accuracy Centering: ±1 needle width

.093 DDM : 3dots ±1 needle width

3) Apply centering LOC signal; decrease RF attenuator to less than 0.2μV; increase attenuator slowly and note appearance of a full TO indication.

LOC Flag Sensitivity: 2.0μV maximum

D) Glide Slope Receiver and Converter

1) Connect GS generator's RF output to the GS connector at the rear of the NAV.

2) Modulate generator with a composite GS signal; set RF attenuator to 500μV.

GS Accuracy, Centering: ±1 needle width

GS Accuracy, .091 ddm: 1.5 dots ±1 needle width

3) Apply centering GS signal; decrease RF attenuator to less that 0.2μV; increase attenuator slowly and note appearance of a full retract of G/S flag.

GS Flag Sensitivity: 20μV maximum

E) 2 out of 5 Channeling (All outputs are active low. An external pullup will need to be used to check for correct channeling)

1) Refer to Table 2.1 for channel coding.

2) With power applied to the NAV, connect a voltmeter between P810 pin 18 and ground.

VOR Channel: Pullup Voltage

LOC/GS Channel: +1V maximum

**** NAV122D/GPS ONLY**

F) GPS DISPLAY MODE

1) Connect a ground to pin 22 of P811
2) Verify that the frequency display now shows ‘GPS’
3) Press the OBS knob and verify that the frequency is recalled.
4) Channel the unit and verify that the frequency changes and is displayed for 2 seconds.
5) Remove the ground from pin 22 and apply 14V to pin 21 of P811. Repeat steps 2 thru 4

TABLE 2.1 DME/GS 2-Out-Of-5 CHANNEL CODE

MHz Channels

MHz ARINC	P810 PIN	108	109	110	111	112	113	114	115	116	117
A	24	X	X		X	X					
B	5			X	X		X	X			
C	4					X	X		X	X	
D	23	X						X	X		X
E	22		X	X						X	X

2-Out-Of-5 Channel code cont.

KHz Channels

KHz ARINC	P810 PIN	.00	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70	.75	.80	.85	.90	.95
A	13			X	X	X	X											X	X	X	X
B	14	X	X	X	X			X	X	X	X										
C	33					X	X	X	X			X	X	X	X						
D	32									X	X	X	X			X	X	X	X		
E	15	X	X											X	X	X	X			X	X
Y	34		X		X		X		X		X		X		X		X		X		X

NOTE: “X” Indicates active low condition.

2.3 MECHANICAL INSTALLATION

The NAV122D is intended to be instrument panel mounted. When mounted from behind the panel, two screws (6-32x 7/16) and the NAV's VOL-IDENT bushing secure the Unit (see Figure 2-3). Mounting through the front panel requires the use of a Marman Clamp (see Figure 2-5). In either case, rear support should be supplied using the stud extending from the rear of the Unit.

Connector P810 incorporates a slide lock mechanism. Before installing the connector, move the slide to position the slide's longer tab away from the connector, mate J810 and P810, then push slide to lock connector to the NAV Unit. To remove P810 from the NAV Receiver, by feel, determine which end of the slide extends beyond the connector body, press this end toward the connector until it is flush, then remove the connector.

BNC connectors are located on the rear of the NAV. When attaching antenna cables, refer to Figure 2-6 for connector identification.

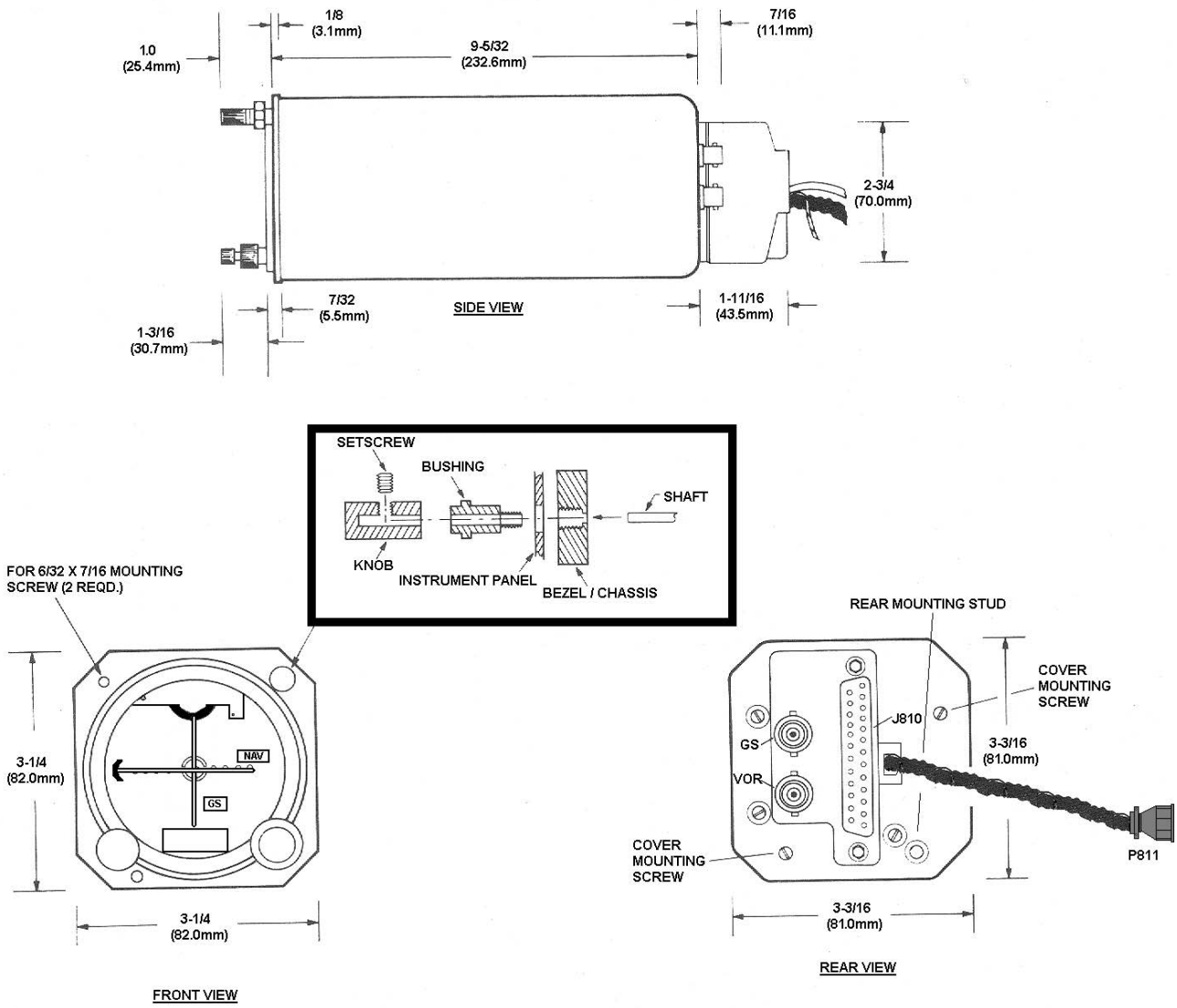


FIGURE 2-3. MECHANICAL INSTALLATION

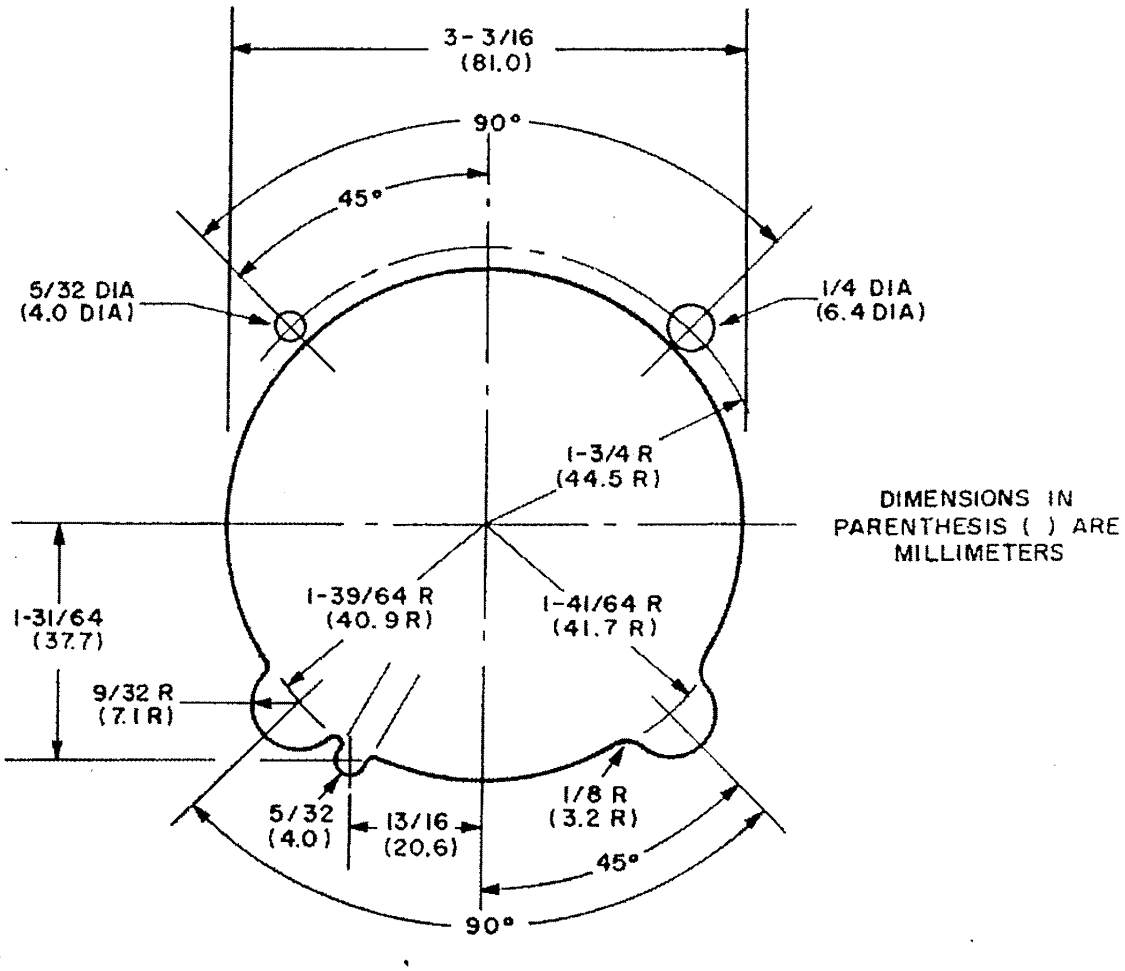
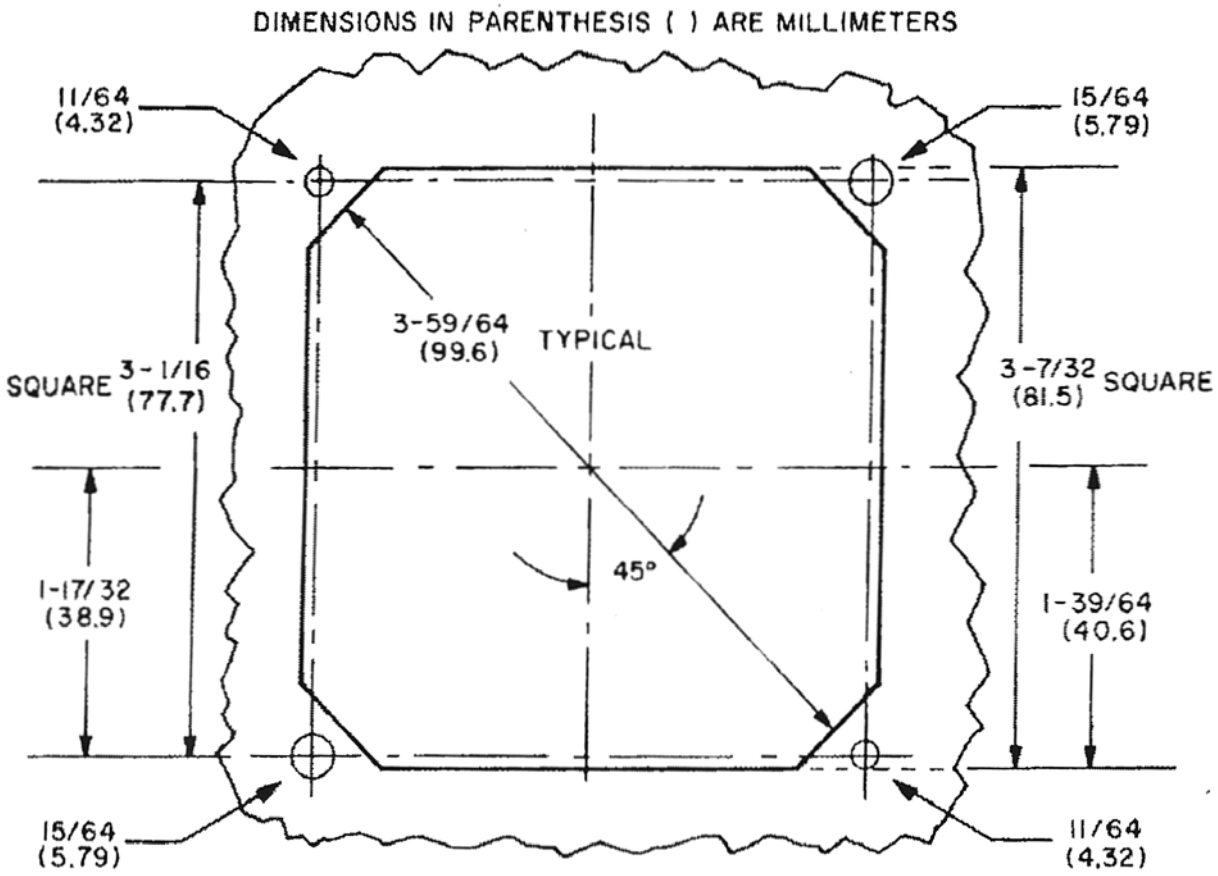


FIGURE 2-4. MOUNTING TEMPLATE, REAR MOUNT
(Not drawn to size, for reference only)

FIGURE 2-5. MOUNTING TEMPLATE, FRONT REMOVAL

FOR USE WITH MARMAN CLAMP
(Not drawn to size, for reference only)



Installation:
The clamp is installed from behind the panel.

1. Install the two #6 "fixed" corner screws but do not tighten.
2. Install, by only several threads, the two #8 "clamping" screws.
3. Slide the NAV Unit into position.
4. Tighten the "fixed" corner screws.
5. Tighten the "clamping" screws.

Removal:
Loosen the two larger (#8) screws until the NAV Unit may be pulled through the clamp.

1. Be sure cables attached to rear of Unit are either disconnected or are of sufficient length to accompany Unit through the clamp.
2. In some cases it will be necessary to loosen the two #6 fixed corner screws.

NOTES:
1. FRONT MTG. USE MARMAN DIV. AERO-QUIP CORP. CLAMP PART NO. 54621, OR USE ADAPTER PLATE AND MOORING PLATE IN ACCORDANCE WITH ARINC SPECIFICATION NO. 408, ATTACHMENT 386.

2.4 ELECTRICAL INSTALLATION

Interconnect cables must be constructed by the installing agency. Table 2.2 shows the rear panel connections for the NAV 122D unit described in this manual. Before building the cable, peruse section **2.4** Determine required cable length, and note wire gauge. Tables 2.3 and 2.3A show the connections for P811. P811 is used only on the NAV122D/GPS

TABLE 2.2 NAV122D REAR PANEL CONNECTIONS

CONNECTION	FUNCTION
NAV Power	
Refer to Section 2.4.2.1	
6 and 25	Switched 14/28V Output
7 and 26	14/28Vdc Input From Circuit Breaker
9	Pilot Lights, 28V
16	14V Input
19	Ground **(REAR SUPPORT STUD)**
27	Pilot Lights, 14V
Audio	
Refer to Section 2.4.2.2	
8	Auxiliary Audio Input
31	30mW Audio Output
36	50mW Audio Output
ARINC Channeling	
Refer to Section 2.4.2.3	
4	C MHz
5	B MHz
13	A kHz
14	B kHz
15	E kHz
22	E MHz
23	D MHz
24	A MHz
32	D kHz
33	C kHz
34	Y Channel
Autopilot and Indicators	
Refer to Section 2.4.2.5	
10	+FROM OUT
11	+GS Flag OUT
28	+LEFT OUT
29	+TO, +RIGHT, +DOWN, -GS FLAG OUT
30	+GS UP OUT
Miscellaneous	
Refer to Section 2.4.2.4	
17	VOR/LOC (ARINC)
18	GS/LOC Activate

2.4 ELECTRICAL INSTALLATION (cont.)

TABLE 2.3 NAV122D/GPS P811 CONNECTIONS

(Chassis level BACBC**D**D **and earlier**)

CONNECTION	FUNCTION
External meter functions	
Refer to Section 2.4.2.7	
1	+ LEFT IN
2	+ RIGHT IN
3	+ TO IN
4	+ FROM IN
5	+ UP IN
6	+ DOWN IN
7	+ GS FLAG IN
8	– GS GLAG IN
23	+ NAV FLAG IN
Arinc Resolver	
Refer to section 2.4.2.8	
9	ROTOR ‘C’ OUT
10	ROTOR ‘C’ IN
11	ROTOR ‘H’ OUT
12	ROTOR ‘H’ IN
13	STATOR ‘F’ OUT
14	STATOR ‘F’ IN
15	STATOR ‘G’ OUT
16	STATOR ‘G’ IN
17	STATOR ‘D’ OUT
18	STATOR ‘D’ IN
19	STATOR ‘E’ OUT
20	STATOR ‘E’ IN
24	GROUND
Unit Mode	
Refer to section 2.4.2.9	
21	GPS DISPLAYED
22	$\overline{\text{GPS DISPLAYED}}$

2.4 ELECTRICAL INSTALLATION (cont.)

TABLE 2.3A NAV122D/GPS P811 CONNECTIONS

(Chassis level BACBCED **and later**)

CONNECTION	FUNCTION
External meter functions - Refer to Section 2.4.2.7	
1	+ LEFT IN
2	+ RIGHT IN
3	+ TO IN
4	+ FROM IN
5	+ UP IN
6	+ DOWN IN
7	+ GS FLAG IN
8	– GS GLAG IN
23	+ NAV FLAG IN
24	+TO +RIGHT +DOWN -GS FLAG OUT
25	+ UP OUT
26	+ GS FLAG OUT
27	+ FROM OUT
28	+ LEFT OUT
Arinc Resolver - Refer to section 2.4.2.8	
9	ROTOR ‘C’ OUT
10	ROTOR ‘C’ IN
11	ROTOR ‘H’ OUT
12	ROTOR ‘H’ IN
13	STATOR ‘F’ OUT
14	STATOR ‘F’ IN
15	STATOR ‘G’ OUT
16	STATOR ‘G’ IN
17	STATOR ‘D’ OUT
18	STATOR ‘D’ IN
19	STATOR ‘E’ OUT
20	STATOR ‘E’ IN
Unit Mode - Refer to section 2.4.2.9	
21	GPS DISPLAYED
22	$\overline{\text{GPS DISPLAYED}}$

2.4.1 Antenna Connections

Antenna connections to the NAV122D Receiver are shown in Figure 2-6.

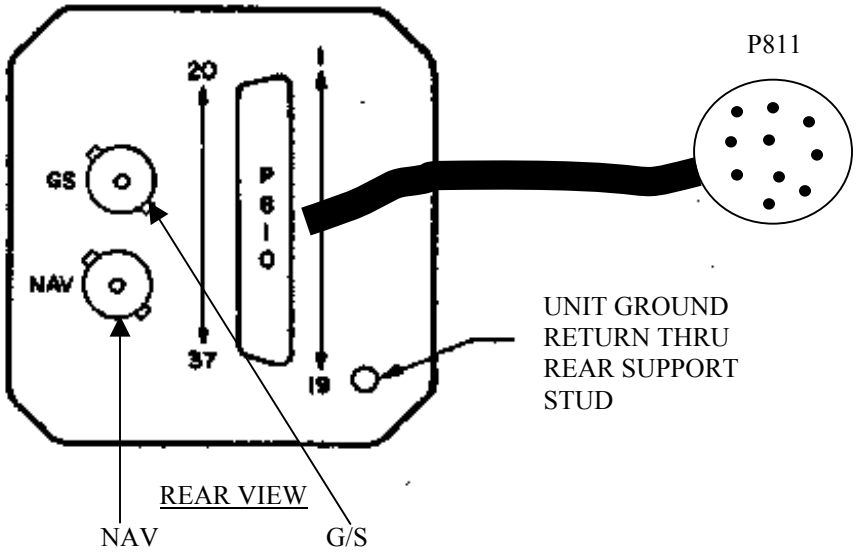


FIGURE 2-6. BNC CONNECTOR IDENTIFICATION

2.4.2 Interconnect Cable (P810)

Table 2.2 lists rear panel connections to a NAV Receiver. Connector P810 may be considered to carry the following groups of interconnections.

2. Power - DC input, ground and pilot lamps.
3. Audio - Receiver.
4. Channeling – DME

2.4.2 Continued

P810 is assembled as shown in Figure 2-7. While constructing the cable, be sure to pass wires through the hood before inserting pins into the connector.

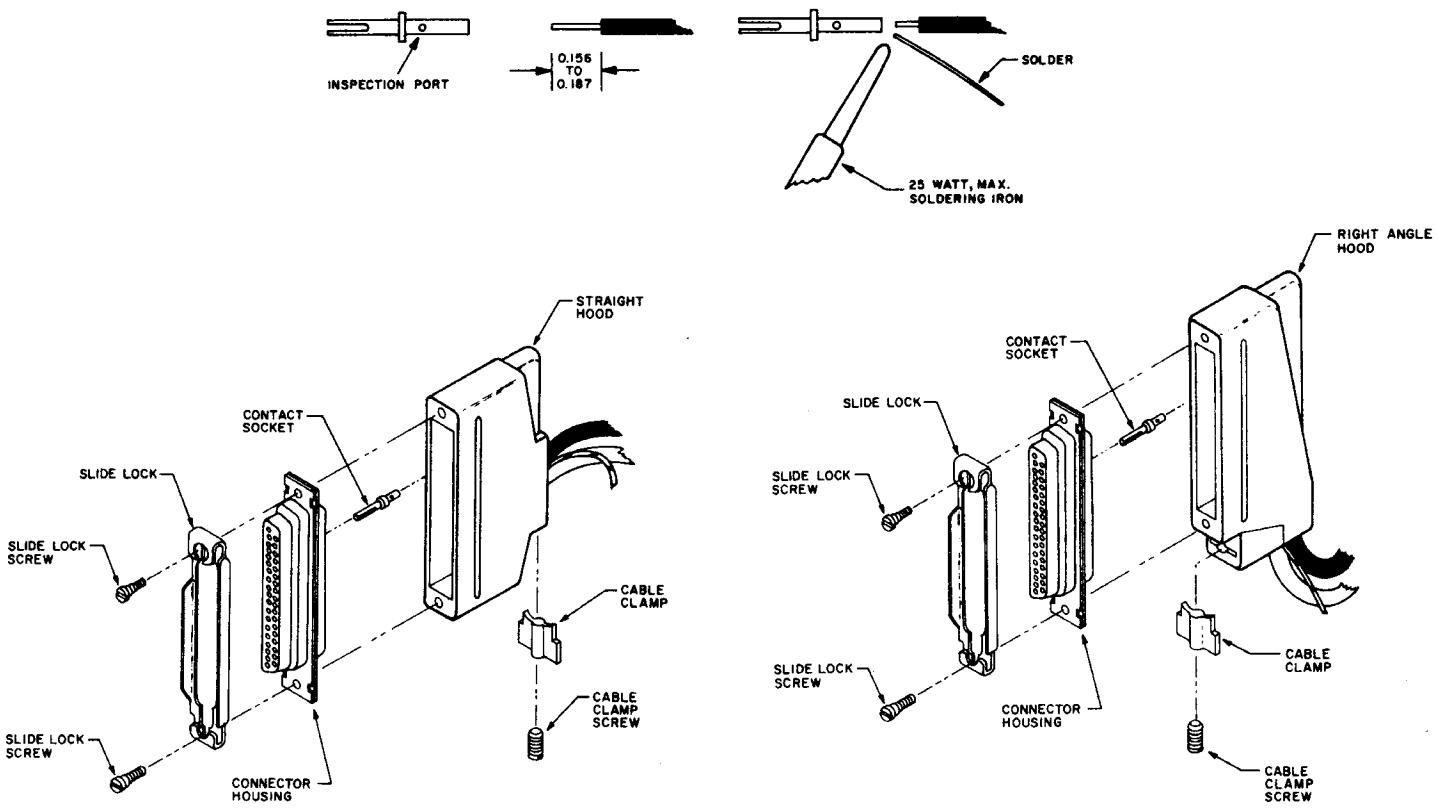


FIGURE 2-7. P810 ASSEMBLY

Connector Assembly Procedure (Solder)

Note: Crimping tools are available from ITT Cannon, if desired.

1. Strip wire as shown in Figure 2-7. Maximum wire size is No. 20AWG.
2. Tin exposed lead. Be sure no individual wire strands are free to cause shorts when connector is assembled.
3. Insert lead in connector pin until lead is visible at inspection port.
4. Heat pin and apply solder as shown until solder wicks into pin cavity and becomes visible through inspection port. Be careful not to overheat pin or melt insulation on wire.
5. Pass pin through hood and insert pin in connector until a “click” is heard or felt; exert a slight pull on the wire to assure pin seating.
6. During final assembly:
    a. Inspect all wires for individual strands of wire shorting to adjacent terminals.
    b. Ease hood into place, do not force.

Connector P810 incorporates a “slide lock” mechanism. Before installing the connector, move the slide to position the slide’s longer tab away from the connector, mate J810 and P810, then push slide to lock connector to NAV Unit. To remove P810 from the NAV Receiver, by feel, determine which end of the slide extends beyond the connector body, press this end toward the connector until it is flush, then remove the connector.

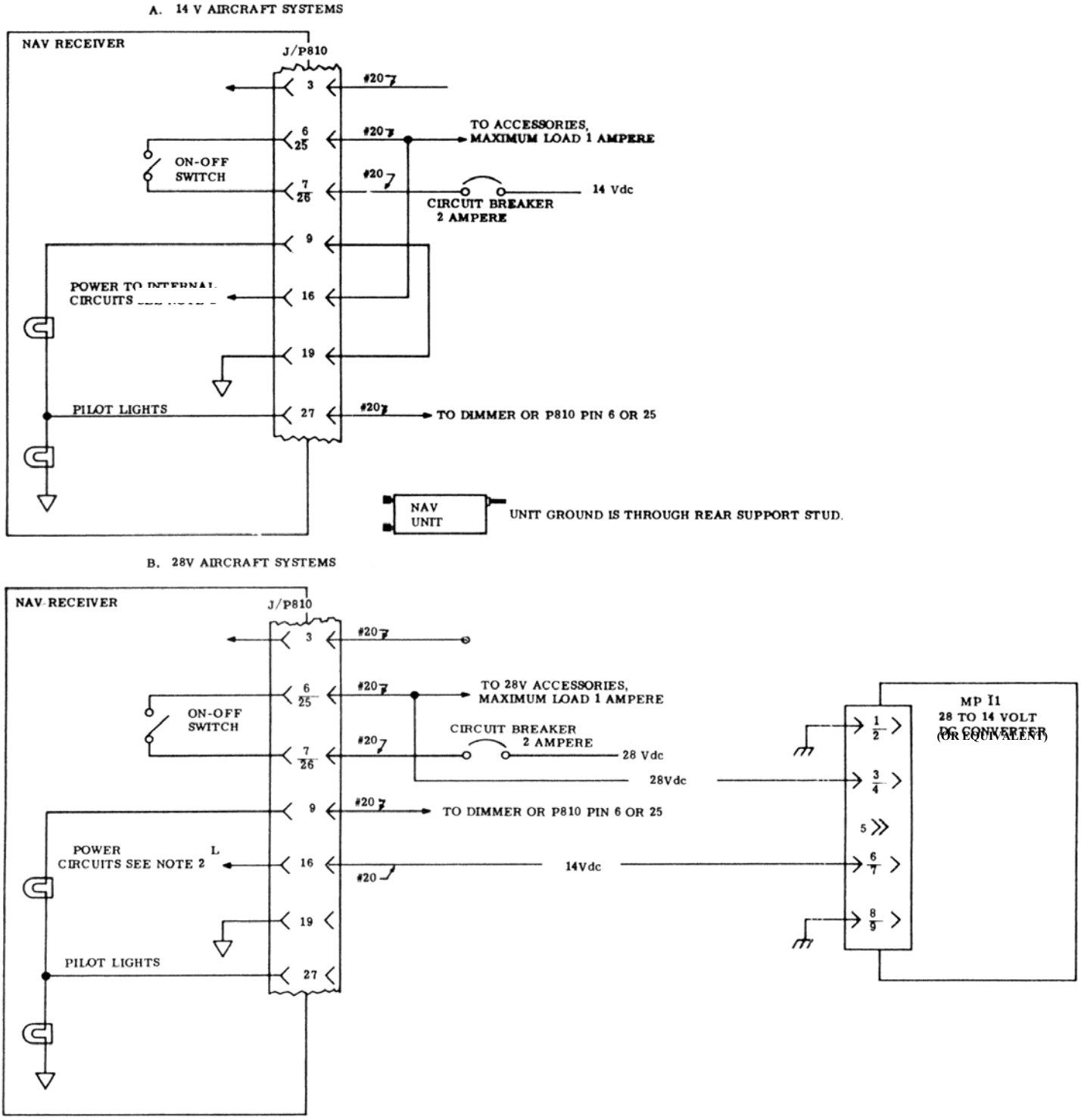


FIGURE 2-8 POWER INPUT CONNECTIONS

2.4.2.1 Power Input Wiring

Figure 2-8 illustrates the connections to P810 for 14 and 28V aircraft systems. Circuit protection, fuse or circuit breaker, must be supplied by the installing agency. Please read all notes on Figure 2-8.
Ground return from the NAV Unit is completed through the rear support stud. Normally a metal rear support strap, connected to the airframe, will provide a good ground path. If the support strap does not furnish a satisfactory ground, add a ground wire from the airframe to a solder lug and additional nut on the NAV's rear support stud.

2.4.2.2 Audio Interconnections

Pin 31 - 30mW to COM Aux Audio - when an audio panel is NOT used, Pin 31 is connected COM Aux Audio input. VOR/LOC audio is present at Pin 31. Output impedance is approximately 3K ohms.

Pin 36 - 50mW audio - same audio as Pin 31 but intended for audio panel use. Output impedance is approximately 500ohms.

2.4.2.3 DME Channeling and LOC/GS Activate

DME Channeling

ARINC 2-out-of-5 channel coding is provided by the NAV units. Table 2.1 furnishes the connector pin numbers for cable construction.
Channel line isolation is not required with the DME 190, DME 190 TSO, DME 195 or DME 890. When channeling avionics not produced by NARCO, an isolation diode must be used in series with each channeling line. If isolation diodes are not within the equipment being channeled, diodes must be added externally.

LOC/GS Activate (EXT)

The LOC/GS Activate signal is generated by an active device . Interconnecting the NAV unit with a Glide Slope or Localizer not produced by NARCO will require observance of the following:

1) VOR mode – V_i maximum is 30Vdc.
2) LOC/GS mode - I maximum is 100ma; value of R must limit I.

Reactivate loads (relay coils) must be shunted with transient suppression.

2.4.2.4 Dual Channeling

The NAV122D is sent from the factory with the remote channeling active. The NAV122D has dual channeling capabilities. To activate dual channeling capabilities remove jumper JP802 from the bottom interconnect board (see figure 2- 9). Pin 37 of J810 will now be referred to as DME common.

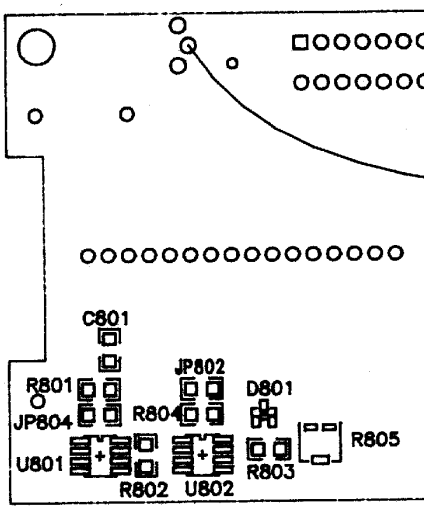


Figure 2-9

2.4.2.5 Autopilot and Additional Indicator Loads

NAV units autopilot output characteristics are shown in Table 2.4.

All autopilot and indicator drives from a NAV are referenced to the +4V REFERENCE line (Pin 29). Therefore, do not ground any of the connector pins in Table 2.4.

TABLE 2.4 AUTOPILOT OUTPUT CHARACTERISTICS

MODE	*FUNCTION*	*PINS*	*LOADING*	*OUTPUT*
VOR	Left-Right To-From	28 and 29 10 and 19	One, 1K ohm One, 1K ohm	150mV for 10° course change 250mV at full TO or FROM
LOC	Left-Right Warning-TO	28 and 29 10 and 29	One, 1K ohm One, 1K ohm	90mV for .093 ddm* 250mV at full TO
GS	Up-Down Warning-GS	29 and 30 11 and 29	One, 1K ohm One, 1K ohm	78mV for .091 ddm* 250mV at no GS Flag

* ddm - Difference in depth of modulation.

2.4.2.6 Dimmer Control Adjustment

The NAV122D has a two step dimming circuit. This dimming compares the balance of the pilot lights to the display. As pilot lights are dimmed by means of aircraft dimmer this diplay will dim. The display's intensity can be adjusted by varying R103 located on top left hand control behind mounting screw.

2.4.2.7 External Meter Functions

These connections are used in conjunction with a GPS Annunciation Control Unit to allow the NAV122D/GPS front panel indicators to either display CDI information from the internal converters or from an IFR approved GPS (see figure 2-10A or 2-10C).

2.4.2.8 Arinc Resolver Connections

These connections are used in conjunction with a GPS Annunciation Control Unit to allow the NAV122D/GPS (P/N 03128-0301) internal resolver to be used by the internal VOR converter or by an IFR certified GPS (see figure 2-10B).

2.4.2.9 Display GPS Mode

These connections are used to control the digital display on the front of the NAV122D/GPS. When one or the other of these lines is at it's active level, the display of the NAV122D/GPS will be 'GPS' instead of frequency. (see figure 2-10A or 2-10C).

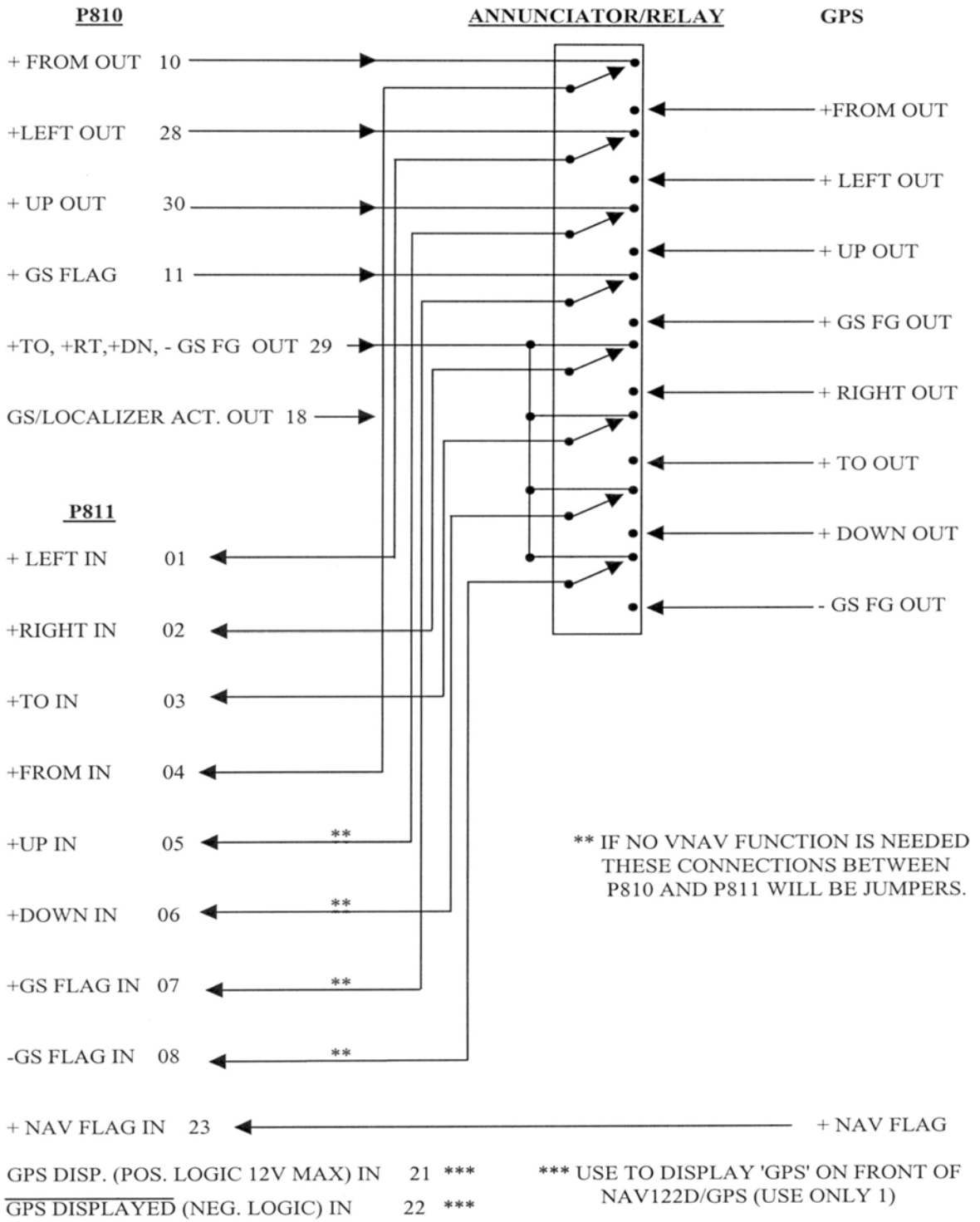
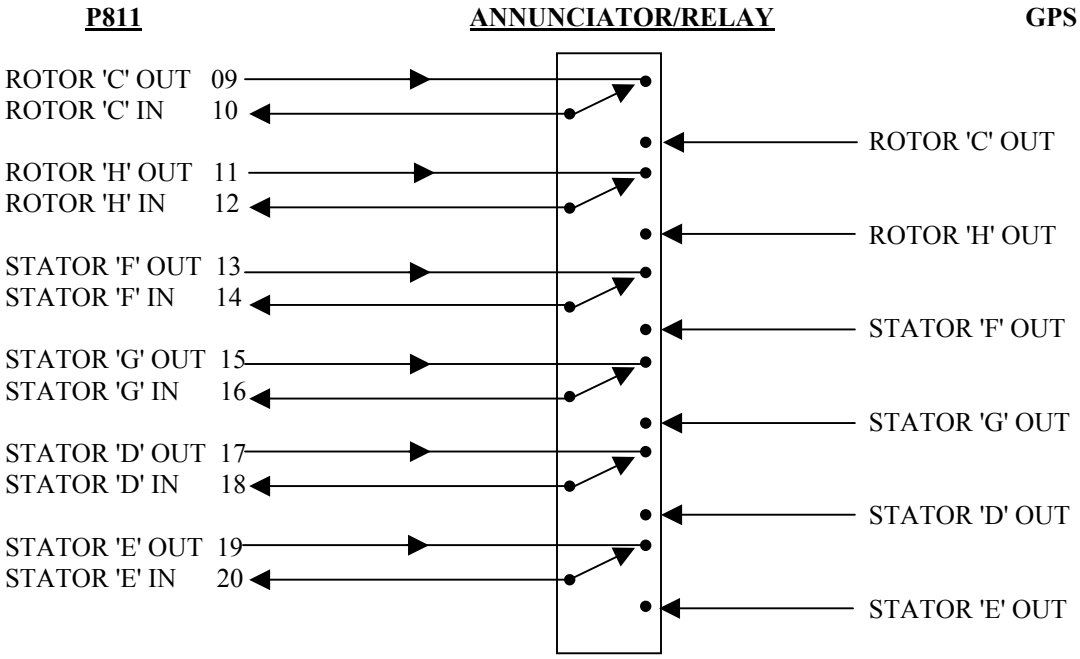


FIGURE 2-10A
NAV122D/GPS, IFR GPS, and GPS annunciator relay diagram (Chassis BACBC**D**D **and earlier**)
(see Figure 2-10C for later Chassis level information)



GROUND 24 - **WARNING**: Chassis level BACBC**D**D **and earlier ONLY**.
Do not ground P811 Pin 24 in later units.

P810

GROUND 19 – Recommended ground for Chassis Level BACBC**E**D **and later only**.

FIGURE 2-10B
NAV122D/GPS, IFR GPS, and GPS annunciator relay diagram

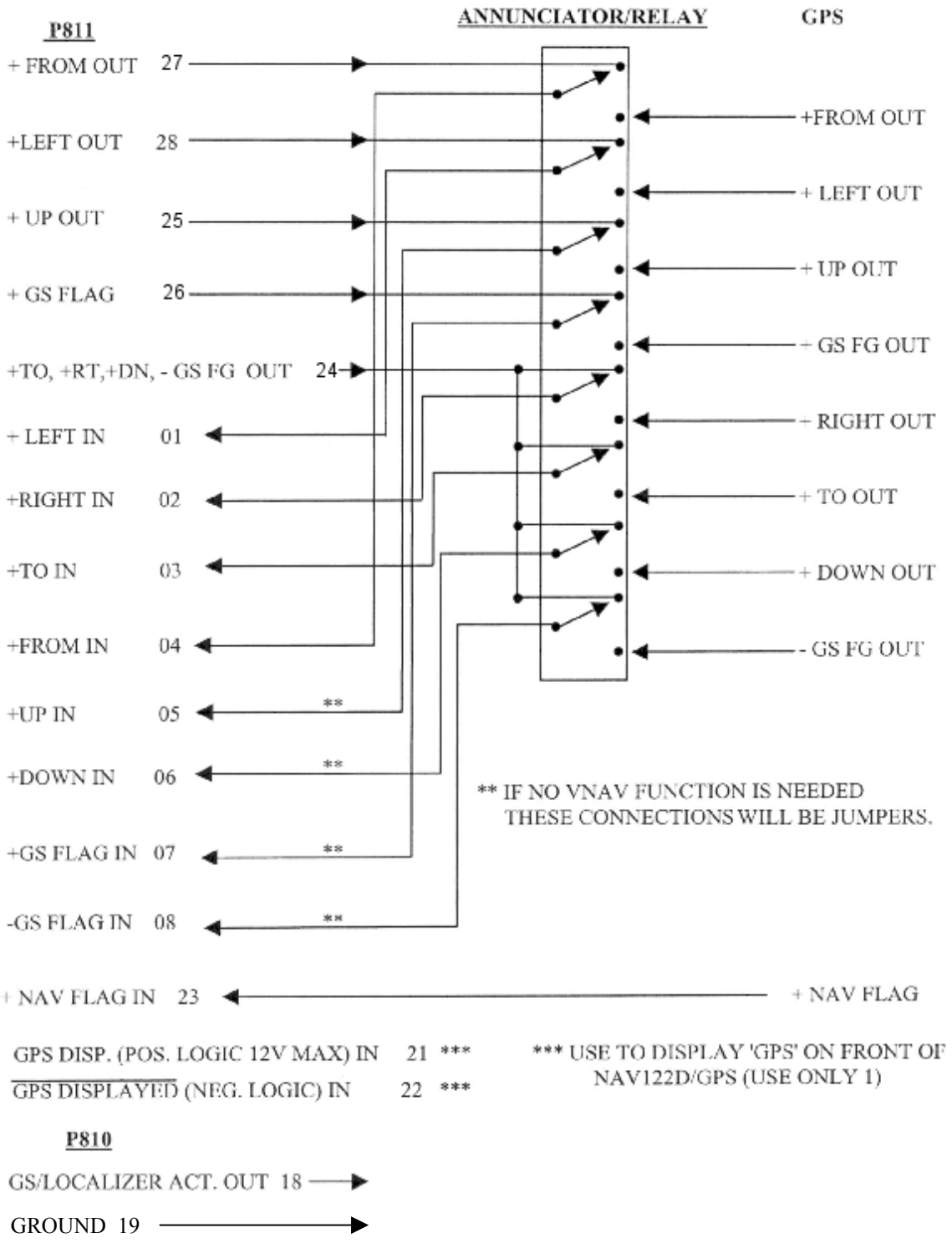
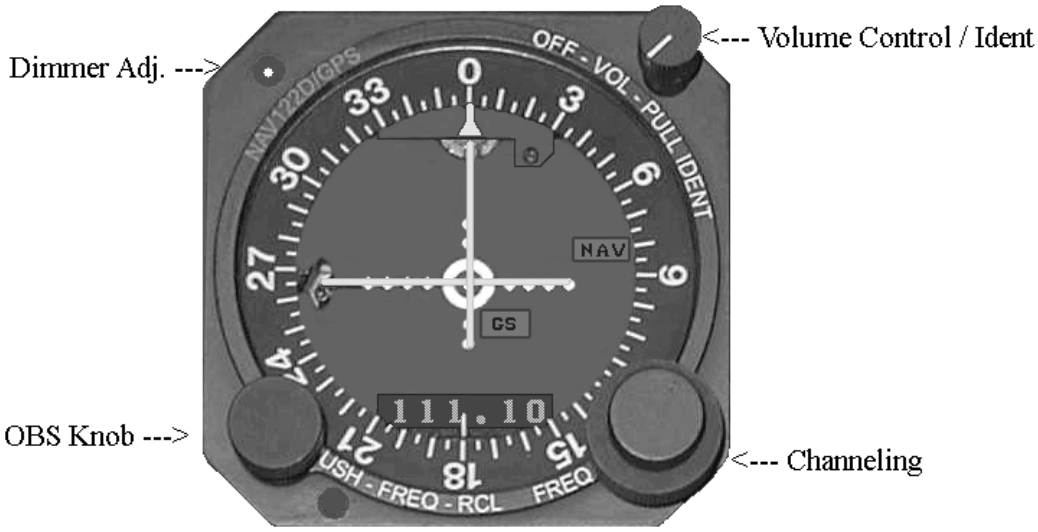


FIGURE 2-10C
NAV122D/GPS, IFR GPS, and GPS annunciator relay diagram
(Chassis BACBC**E**D **and later**)

2.5 POST INSTALLATION TESTS

The purpose of this series of tests is to assure proper operation of the installed avionics equipment. First, and most important, is complete inspection of the installation to be sure that all aircraft flight controls operate freely and correctly.



2.5.1 Pre Flight Tests

For this series of in-aircraft tests, the aircraft's engines, rotating beacon, electrical and avionics equipment should be operating. Note any abnormal interaction or interference (ignition or rotating beacon noise, abnormal deflection, compass deviation, etc.) observed during these tests. The following procedure requires ramp type test equipment such as that offered by Tel-Instrument Corporation or IFR Incorporated

A. General

1. Set NAV Receiver to a VOR frequency.
2. Rotate the VOL-IDENT control clockwise until the NAV Receiver noise is heard in the speaker and headphones. Note presence of NAV and GS warning flags and centered Left-Right.
3. Modulate the test equipment 30% with 1020Hz.
4. Pull VOL-IDENT knob and note presence of adequate volume level. Depress VOL-IDENT knob and note decrease in volume level.

B. VOR

1. Set test equipment and NAV Receiver to a VOR frequency. Modulation should be a composite VOR signal.
2. Set test equipment and NAV Receiver OBS to 0° course.

   Spec: Left-Right needle must center within ±1.5° with a TO flag.
3. Turn NAV Receiver OBS knob to first 10° then 350°.

   Spec: Left-Right needle should deflect full scale (5 dots).
4. Check the remaining three cardinal points (90°, 180°, and 270°).

   Spec: Left-Right needle must center within 1.5° with a TO flag.

C. LOC

1. Set test equipment and NAV Receiver to a LOC frequency. Modulation should be a standard LOC centering signal.

   Spec: Centering, ±1 needle width with a TO flag.
2. Change modulation to .093 ddm left then right.

   Spec: deflection, 3 dots, ±1 needle width
3. Remove modulation or decrease test equipment RF output to minimum.

   Spec: LOC warning flag shall be full.

2.5.1 Continued

D. Glide Slope

1. Set test equipment and NAV Receiver to a GS frequency. Modulation should be a standard GS centering signal.

   Spec: Centering, ±1 needle width with no GS flag. visible

2. Change modulation to .091 ddm Up then Down.

   Spec: Deflection, 1.5 dots, ±1 needle width with a no GS flag visible.

3. Remove modulation or decrease test equipment RF output to minimum.

   Spec: GS warning flag shall be in full view.

2.5.2 Flight Test

A flight test is recommended to perform the following checks and adjustments.

A. Check all avionics under actual operating conditions for abnormal indications (ignition noise, audio distortion at in-flight volume settings, rotating beacon noise, interference between avionics equipment etc.).

B. Proportion audio volume levels.

C. Look for variations in performance due to various landing gear and flight control surface configurations.

D. Good excuse to go flying.

All of these tests must be performed at an ILS facility, on an airway, or in an area where the ground station signal quality and strength has been verified.

A. Flying at an altitude of 6000ft above ground level (AGL) channel the NAV Receiver to a VOR facility 50nm away.

1. Check course accuracy, warning flag indication, and left-right needle sensing.
2. Check the antenna pattern by flying the aircraft at a 10° bank completing a 360° turn: the warning flag should remain out of view throughout the turn and audio should remain intelligible.

B. Flying at an altitude of 6000ft AGL, channel the NAV Receiver to a VOR facility 10nm away and fly inbound.

1. Check course width (±10° of selected radial).
2. Observe the VOR warning flag while approaching, passing over, and flying outbound: TO-FROM indicator shall indicate correctly and the warning flag must not be observed except when passing directly over the station.

2.5.2 Continued

C. Flying at an altitude of 6000ft AGL, channel the NAV Receiver to a VOR facility 25nm away and fly inbound.

1. Operate the communication transceiver: VOR left-right indicator transient deviations should not exceed 2 dots and steady state errors should not exceed 0.5 dot.

D. Engage autopilot and couple to VOR. Check tracking and intercept performance.

LOC and GS

Flying at an altitude of 3000ft AGL, channel the NAV Receiver to a LOC frequency and fly inbound to intercept ILS.

1. From point of interception to termination of test neither LOC or GS warning flags should appear.
2. Establish glide path and fly the ILS approach: request ground control confirmation of on-glide path condition.
3. While on-glide path, maneuver aircraft through normal pitch and roll altitudes: Left-right and up-down indicators should perform normally and a warning flag should not be visible at any time.
4. Engage autopilot and fly a coupled ILS approach.

2.6 AIRCRAFT LICENSE REQUIREMENTS

A. Form 337

NAV122D or NAV122D/GPS was installed in accordance with NARCO Avionics Manual part number 03128-0620. Enter electrical load as specified in Table 2.5. Enter actual circuit breaker or fuse values used.

B. Log Book

Calculate weight and balance using values from Table 2.5 plus cable and accessory weights.

TABLE 2.5 GENERAL SPECIFICATIONS

GENERAL	***NAV122D***	***NAV122D/GPS***
A. Mechanical		
Physical Dimensions	Figure 2-3	Figure 2-3
Weight	2.5 lbs.	2.6 lbs.
B. Electrical		
NAV, P810, pins 7 and 26		
Supply Voltage	13.75 VDC	13.75 VDC
Current, less pilot lamps, 14V	350 MA	350 MA
Current, less pilot lamps, 28V	400 MA	400 MA
Pilot lamp current 14V	250 MA	250 MA
28V	250 MA	250 MA
Circuit Breaker Rating	2 AMPS	2 AMPS

APPENDIX A
ENVIRONMENTAL QUALIFICATION FORM

NOTE : THIS FORM IS TO BE FILED WITH THE OWNER'S AVIONICS RECORDS.

NOMENCLATURE : Navigation system
MODEL : NAV122D, NAV122D/GPS
MANUFACTURER : NARCO Avionics Inc.
ADDRESS : 270 Commerce Drive
Fort Washington, PA 19034
USA

CONDITIONS	DO-160C SECTION, PARAGRAPH#	DESCRIPTION OF CONDUCTED TESTS
Temperature and Altitude	4.0	Equipment tested to category "C1"
Ground Survival Low Temperature	4.5.1	-55°C
Operating Low Temperature	4.5.1	-20°C
Ground Survival High Temperature	4.5.2	+85°C
Short-Time High Operating Temperature	4.5.2	+75°C
Operating High Temperature	4.5.3	+55°C
In Flight Loss of Cooling	4.5.4	Equipment tested to category "V", Greater than 30 Minutes
Altitude	4.6.1	35,000 feet (10,668 meters)
Decompression	4.6.2	8,000 feet to 35,000 feet Δ within 15 seconds, then maintained for 10 minute minimum duration.
Overpressure	4.6.3	-15,000 feet for 10 minutes
Temperature Variation	5.0	Equipment tested to category "C".
Humidity	6.0	Equipment tested to category "A".
Operational Shocks and Crash Safety	7.0	Equipment tested to operational and crash safety tests.
Operational	7.2	
Crash Safety	7.3	
Vibration	8.0	Equipment tested without shock mounts to Categories M, N and B (DO-160C Table 8-1)
Explosion	9.0	Equipment identified as Category "X", no test required.
Waterproofness	10.0	Equipment identified as Category "X", no test required.
Fluids Susceptibility	11.0	Equipment identified as Category "X", no test required.
Sand and Dust	12.0	Equipment identified as Category "X", no test required.
Fungus	13.0	Equipment identified as Category "X", no test required.
Salt Spray	14.0	Equipment tested to Category "A"
Magnetic Effect	15.0	Equipment tested to Category "Z"
Power Input	16.0	Equipment tested to Category "B"
Voltage Spike	17.0	Equipment tested to Category "B"
Audio Frequency Susceptibility	18.0	Equipment tested to Category "B"
Induced Signal Susceptibility	19.0	Equipment tested to Category "A"
Radio Frequency Susceptibility	20.0	Equipment tested to Category "V"
Radio Frequency Emission	21.0	Equipment tested to Category "A"
Lightning Induced Transient Susceptibility	22.0	Equipment identified as Category "X", no test required.
Lightning Direct Effects Test	23.0	Equipment identified as Category "X", no test required.
Icing	24.0	
Other Test		Fire resistance tests were conducted in accordance with Federal Aviation Regulations Part 15, Appendix F.