NARCO

NARCO
CP 125/126 AUDIO PANELS
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SERVICE

ATP COPY

NARCO AVIONICS DIVISION OF NARCO SCIENTIFIC INDUSTRIES, Fort Washington, Pa. 19034

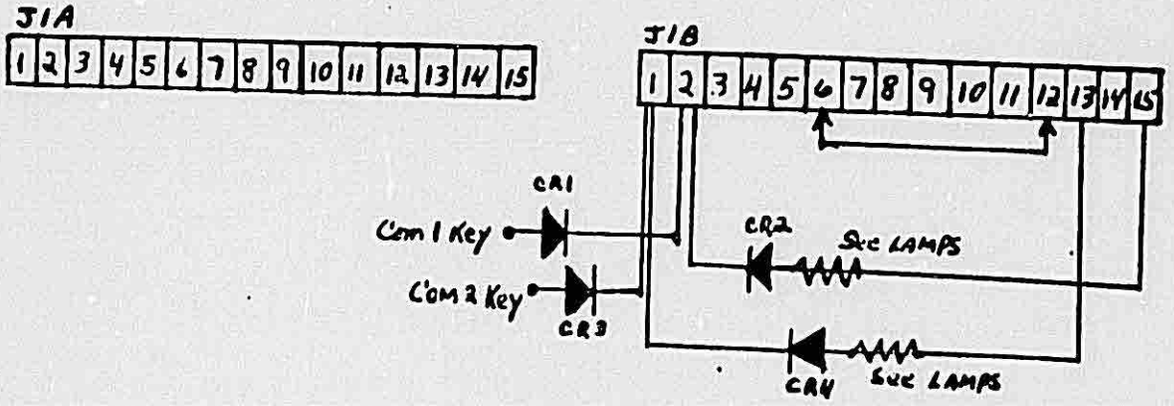
February 20, 1974

NARCO SERVICE BULLETIN NO. CP 125/126 No. 1

TO: ALL NARCO AVIONICS CENTERS
ALL NARCO WHOLESALE DISTRIBUTORS

SUBJECT: TRANSMIT MONITOR (Applicable Immediately)

Modify the transmitter monitor wiring figure on page 2-10 of the CP-125 installation manual as shown.



Diodes CR1 through CR4 should be added to eliminate the following:

1. CR1 and CR3 prevent keying in dual Com installations when one Com is off and the off Com selected.

2. CR2 and CR4 prevent possible hang-up in keyed mode when one Com and toggle are "off". Also prevents transmitters keying when toggle is in test position.

Yours truly,

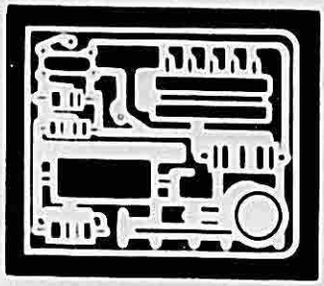
NARCO AVIONICS

Don Snyder
Technical Representative

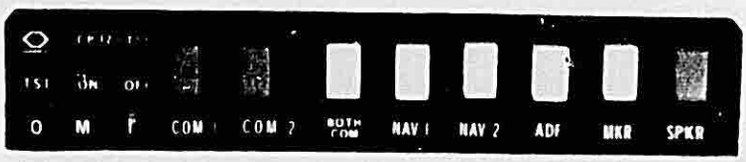
SEE PAGE 2-11 for this Wiring Figure

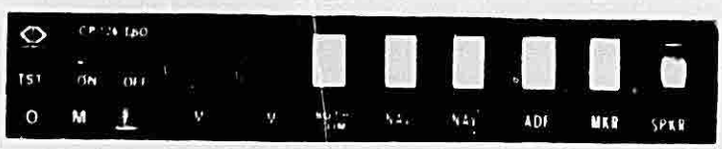
NARCO AVIONICS

TSO'd SPECTRUM LINE



CP 125 and CP 126 Audio Panels





MAINTENANCE MANUAL

NARCO AVIONICS
DIVISION OF NARCO SCIENTIFIC INDUSTRIES
FORT WASHINGTON, PENNSYLVANIA, 19034 U.S.A.

Printed in U.S.A. 03718-0600 January 1974

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ATP
RECORD OF REVISIONS

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1.1 GENERAL

The CP 125 and CP 126 are TSO'd Audio Panels that provide instant pushbutton selection of on board NAV/COM avionics.

The CP 125 is identical to the CP 126 except that the CP 126 has, as an integral part, a 10 watt cabin speaker amplifier.

Both the CP 125 and CP 126 are similar to the non-TSO'd CP 25s, especially the CP 25B. (See Section 2.11)

Though the circuits vary between models, by reference to the particular models schematic and wiring diagrams (for CP 25s refer to their Installation Manual) along with this manual's Section 3, Circuit Description, one should have no difficulty in servicing any model CP 125/CP 126 or the CP 25s.

1.2 MANUAL ORGANIZATION

This manual is subdivided into six sections. The number and section title is shown on the top of the page and the section number and page number within the section is shown on the bottom of the page.

Section 1	Introduction
Section 2	Installation
Section 3	Circuit Description
Section 4	Maintenance
Section 5	Replacement Parts List
Section 6	Schematics

The A page, on back of the cover sheet, is provided to allow you to record added pages and changed pages. It also can serve to check that all the pages of the manual are in their proper sequence and intact.

2.1 INTRODUCTION

The TSO'd versions of the CP 25B Audio Panel are the CP 125 and the CP 126.

All the Spectrum Line Audio Panels ("CP's") provide a central control for all on board aircraft navigation and communications audio. These units were designed specifically for use with the TSO'd and Non-TSO'd Spectrum Line of radios.

A failsafe redundant circuit enables either audio panel to continue to function as a speaker isolation amplifier in the event that the DC input voltage to the audio panel is lost.

The CP 125 failsafe circuit operates by stealing a small amount of current from the COM receiver's transmit relay coil to continue to operate the speaker isolation amplifier independently of the headphone isolation and audio amplifiers.

The CP 126 failsafe circuit has two independently fused DC inputs with its isolation amplifier able to operate from either. Switching between DC inputs is completely automatic.

In addition, speaker and headphone amplifiers operate independently of one another in both receive and transmit modes.

These audio panels process the low level audio outputs from the Spectrum Line receivers. As many as six of these outputs, pushbutton selected, may be combined within the audio panel for routing to the cabin speaker amplifier.

Generally, when using a CP 125 the cabin speaker amplifier will be the COM transceiver's audio power amplifier. In dual Spectrum COM/CP 125 installations, the audio power amplifiers can be connected in parallel, thus providing redundant 10 watt cabin speaker amplifiers.

The CP 126 features, as an integral part, a 10 watt cabin speaker amplifier.

The unique flexibility of the TSO'd Audio Panels is further illustrated by the inclusion of three indicator lamps and a function switch which may be used as any one of the following: marker beacon indicator lamps; key down transmit monitor; RF/modulation transmit monitor, when used with an external detector.

2.1 Continued

The Audio Panels provide these features for the pilot:

- A professional looking pushbutton controlled audio panel providing instant transmitter selection for operations at busy airports.
- Positive selection of COM transmitter and receiver with one button. No guessing as to which COM receiver is being heard.
- Simultaneous listening to both COM receivers, if desired, by depressing the "BOTH COM" pushbutton.
- No discernible audio level change in speaker or phone as radios are switched in and out of the system.
- An integral 50 mw phones audio amplifier that provides headphone audio output for those audio inputs selected. Headphone audio is always available - independent of the speaker pushbutton.
- Provides transmitter sidetone from selected transmitter during transmit function.
- Easy front panel removal.
- Trim panel contains three lamps and a toggle switch with TEST-ON-OFF functions for use as:

    A. Marker receiver indicator lamps, for use with separate marker receiver such as NARCO's MBT-R. (Standard)
    B. Transmit Monitor lamps indicating mike key is depressed and transmitter is activated, C1 or C2. (Special labels are provided.)
    C. Transmit Monitor lamps indicating the presence of a transmit RF signal in the C1 or C2 antenna coax line when an RF/Modulation transmission indicator is part of the installation.

- Both Audio Panels have alternate A+ sources for speaker isolation amplifier for automatic emergency audio.
- CP 125 has 10 watt cabin speaker amplifier via the associated Spectrum COM transceiver.
- CP 126 has 10 watt cabin speaker amplifier as an integral part of the unit.

2.2 SPECIFICATIONS

All specifications apply to the CP 125 and CP 126 except where noted.

2.2.1 Mechanical

Size: 6-1/4 x 1-3/32 x 8-3/8" overall (7-7/16" behind panel) see Fig. 2-15
158.8 x 27.8 x 212.7 MM overall (188.9 MM behind panel) see Fig. 2-15

Weight:
CP 125 ..... 1.5 lbs. (680 grams) including case
CP 126 ..... 1.9 lbs. (860 grams) including case

2.2.2 Electrical

Voltage: 13.75 or 27.5v

Current:
CP 125 ..... 0.15 amp - not including pilot lamps
CP 126 ..... 14V 2.0 amp at rated output - not including pilot lamps
CP 126 ..... 28V 1.0 amp at rated output - not including pilot lamps

Breaker or Fuse Requirements:
CP 125 ..... 0.5 amps at J1A-13
CP 126 ..... 0.5 amp at J1A-13 and 4.0 amp at J1A-12

Pilot Lamps:
0.26 amp - 13.75 v
0.13 amp - 27.5 v

Audio Input Requirements:

Audio inputs to J1A terminals 6, 7, 8, 14, 15, and J1B-10 shall be capable of producing 3.5 vrms when terminated with a 470 ohm resistor. This level corresponds to the 30 mw low level audio capability of the Spectrum Line radios.

50 mw audio as well as properly terminated 5-10 watt speaker audio sources may be used.

2.2.2 Continued

Audio Output Levels:

Terminals J1A-1 and -2:

a) provides 0.5 vrms across 600 ohms.

b) directly compatible with Spectrum COM transceivers aux audio input to J401A, Pin 7.

Terminal J1A-4:

Headphone output: 50 mw into 600 ohm phones.

CP 126

Terminal J1A-9 Speaker output:	10 watts into 4 ohms, 28v operation
Terminal J1B-3 Speaker output:	10 watts into 4 ohms, 14v operation

Isolation-Combining Network:

The isolation-combining network in the Audio Panel provides at least 40 db of isolation between the connected units, no "cross-talk or leak-thru" will be heard and no change in audio level will be experienced as units are switched in and out of the system.

2.3 TSO

The CP 125 and the CP 126 meet the following TSO categories: TSO-C50b, ENVIRONMENTAL CATEGORY GAPAAAXXXXXX.

2.3.1 TSO Explanation

The CP 125 and the CP 126 are approved to be instrument panel mounted within the cabin environment of fixed and rotary wing aircraft using piston or turbine single and multiengines. It is designed for non-pressurized aircraft operating up to 30,000 feet as well as for pressurized aircraft. This equipment requires direct current power but is approved to be installed in aircraft that have additional on board alternating current power sources.

There are twelve Environmental Test Procedures established in RTCA Document DO-138. These are identified on the TSO Nameplate. The explanation of Environmental Limits for each of these categories for the CP 125 and the CP 126 Audio Panels are as follows:

Ambient Temperature-Altitude ..... Ⓖ APAAAXXXXXX

Temperature Range:

Non-operating	Low	−54°C	(−65°F)
	High	+71°C	(+160°F)
Continuous operation	Low	−15°C	(+5°F)
	High	+71°C	(+160°F)

Altitude:

30,000 Ft. Non-pressured

15,000 Ft. Pressurized; is not affected by decompression to 40,000 Ft.

Humidity ..... G Ⓐ PAAAXXXXXX

Standard humidity for equipment intended for installation in Civil Aircraft.

The Audio Panel has been tested under the following humidity conditions:

+50°C (+122°F) at 95% RH, reduced to +38°C (+100°F) with humidity maintained as high as possible. This cycle was repeated twice for a total of 48 hours of exposure. Within 15 minutes* after exposure the units were operated and met all specifications.

(*TSO requires that all specifications be met within 4 hours after exposure.)

2.3.1 Continued

Vibration ..... GA Ⓟ AAAXXXXXX

Approved when mounted in the instrument panel of any type of piston or turbine, single engine or multiengine fixed wing or rotary wing aircraft. The maximum vibration limits are 0.10 inch double amplitude from 5 to 17 Hz, 1.5G constant acceleration from 17 to 55 Hz, 0.25G from 55 to 2000 Hz.

Audio Frequency Magnetic Field Susceptibility* ..... GAP Ⓐ AAXXXXXX

This equipment is approved for installation in aircraft which have alternating current power sources, including those rated at more than 250 volt amps.
(*It is not susceptible to alternating current power source pick up.)

Radio Frequency Susceptibility ..... GAPA Ⓐ AXXXXXX

This equipment has been tested and is not affected by interference from other on board electronic equipment which meet Category A, Radio Frequency Spurious Emission requirements of the TSO (RTCA Document DO-138).

Radio Frequency Spurious Emission ..... GAPAA Ⓐ XXXXXX

This equipment has been tested and does not emit RF in excess of that which would interfere with other on board electronic equipment which meet the requirements of Category A, Radio Frequency Susceptibility of the TSO (RTCA Document DO-138).

Other Environmental Conditions ..... GAPAAA (XXXXXX)

The letter "X" denotes that recognized installation practices in Civil Aircraft normally do not encounter these Environmental Conditions and are therefore not tested.

These remaining six categories which are shown X'ed from Left to Right refer to:
Explosion . . . Waterproofness . . . Hydraulic Fluid . . . Sand and Dust . . . Fungus . . . Salt Spray.

2.4 UNITS AND ACCESSORIES SUPPLIED

CP 125

A. CP 125 TSO Audio Panel (01184-0101)
B. Mounting Tray (57599-0102)
C. Installation Kit (03718-0500)

CP 126

A. CP 126 TSO Audio Panel (01184-0102)
B. Mounting Tray (57599-0102)
C. Installation Kit (03718-0501)

2.5 OPTIONAL ACCESSORIES AVAILABLE

A. NARCO VP 22C

2.6 LICENSE REQUIREMENTS

No license is required.

2.7 MECHANICAL INSTALLATION

These Audio Panels are designed for installation in the aircraft instrument panel. A mounting tray is provided to simplify the initial installation and to facilitate removal for servicing. Refer to the Installation Drawing as it provides all dimensional data required to install the mounting tray. The recommended installation is one where the tray is secured at the front corners, using the holes provided in the tray. It is also recommended that the rear support hardware be installed and used. No. 6-32 hardware is provided for these three points. Suitable mounting brackets may be fabricated from ordinary metal sheet or angle stock.

The Tray must be provided with a good electrical ground. Normally, contact through the mounting hardware is sufficient, but in cases where this is unreliable, a ground wire from the rear support stud to the airframe should be used.

The Audio Panels are secured to the tray by an Allen head screw running from the front panel to the rear of the tray. The screw is held in the tray by a self-locking nut. Do not over-tighten.

2.8 ELECTRICAL INSTALLATION

2.8.1 COM Unit Power Restriction

The CP 125 was designed with an emergency "failsafe" feature to allow for continued operation of the speaker isolation amplifier should the panel unit loose its power. Under normal conditions the speaker isolation amplifier obtains a small amount of current from the COM transceiver transmit/receive relay for its operation instead of its own voltage regulator. Should the particular COM unit loose power or be turned OFF, the CP 125 speaker isolation amplifier will automatically, via diode switching, change over to its own voltage regulator. This feature does require that only 14 volt COM units, such as those of the Spectrum Line, be utilized with the CP 125. For 28 volt installations COM units requiring a 28 to 14 volt power converter, such as the NARCO MP 10 or MP 16, may be used since the transceiver is effectively a 14 volt unit. COM units operating directly from a 28 volt line may NOT be used. The CP 125 itself will operate in either 14 or 28 volt installations without the need of a power converter.

The CP 126, unlike the CP 125, will accept 14 or 28 volt COM transceivers. The "failsafe" operation of the speaker isolation amplifier is retained thru internal circuitry and the separately used DC inputs (J1A-12 and J1A-13) rather than via the COM transceiver as in the CP 125 installation.

2.8.2 Installation, Electrical Connections

Two 15 pin connectors are supplied for mounting to the tray. These connectors mate with the corresponding connectors on the rear of the unit's PC board. It is suggested that before any cabling or lead crimping is begun the installation and all connections be reviewed. Unlike a soldered connection, a wire crimp cannot be undone to add or remove a wire without cutting the wire and discarding the crimped pin. The pin however may be removed, without damage, from the connector housing using a Molex pin ejector. Because of the variety of equipments that use the Molex connector, some are installed so that the contacts will mate the top of the PC board whereas others are installed to mate the bottom. To avoid improper wiring and installation, it is suggested that each connector with 1 or 2 pins installed be positioned on the PC board. Check that the contact is making contact with the proper solder run (s), then mark the connector in the appropriate corner, TOP, J1A-1, or TOP, J1B-1 with a felt tip ink pen.

14 and 28v General Installation Wiring diagrams are provided for non-Spectrum System installations. Separate, 14 and 28v, wiring diagrams are also provided for both "CPs" featuring a common Spectrum Line System. Refer to these diagrams starting with Fig. 2-8.

Table 2.1 relates pin number and front panel switch to a function along with pertinent notes about that function. The front view drawing of the Audio Panel shown in the table identifies each switch symbol number. During the planning stage of the installation, the related function of each switch should be written in, by the switch symbol number, to allow accurate panel labeling.

TABLE 2.1 FUNCTION/PIN/SWITCH RELATIONSHIP

OMI	SW 1	SW 2	SW 3 BOTH COM	SW 4	SW 5	SW 6	SW 7	SW 8 SPKR
	———	———		———	———	———	———	

FUNCTION	SWITCH NO.	PIN NO.	NOTES
Power Connections:			
Ground	-----	J1A-5	
14/28 VDC Input	-----	J1A-13	From audio panel circuit breaker. Min. Req. 0.5 amp
Pilot Lamp	-----	J1A-10	14V input - connect to ground / 28V input - connect to dimmer buss or J1A-13
Pilot Lamp	-----	J1A-11	14V input - connect to dimmer or J1A-13 / 28V input - no connection
Rec. Audio Connections:			
Audio Inputs for NAV, ADF, DME, and MKR receivers.	SW 5	J1A-6	Low level inputs, 30 mw (3 v rms) nominal. Speaker level audio must be externally terminated before being applied to these inputs. Internal level controls provided to equalize audio output levels.
	SW 6	J1A-7	
	SW 4	J1A-8	
	SW 7	J1B-10	
COM 2 Audio Input	SW 2	J1A-14	
COM 1 Audio Input	SW 1	J1A-15	
Audio Output Connections:			
Low level 0.5 v rms	SW 8	J1A-1	Connect to COM aux audio input or other high level amplifier. For dual Spectrum COM installation aux audio inputs may be connected in parallel.
	SW 8	J1A-2	
Headphone level	-----	J1A-4	50 mw across 600 ohms
Transmit Connections:			
Mike Key, Tip	-----	J1A-3	
Mike Ground, Jack	-----	J1A-5	
Mike Audio, Ring	-----	J1B-9	
COM 2 Mike Audio Output	SW 2	J1B-7	To COM 2 mike audio input
COM 1 Mike Audio Output	SW 1	J1B-8	To COM 1 mike audio input
COM 2 Transmit Key	SW 2	J1B-1	See Section 2.8.1
COM 1 Transmit Key	SW 1	J1B-2	See Section 2.8.1
COM 2 Sidetone Input	SW 2	J1B-4	
COM 1 Sidetone Input	SW 1	J1B-5	
Marker Receiver Connections*:			
Ground	-----	J1A-5	
14/28 VDC Input	-----	J1B-11	From MKR Rec. circuit breaker.
Jumper	-----	J1B-6	14V, connect to J1B12 / 28V, no connection
A+ to MKR Receiver	-----	J1B-12	*For 28V MBT-R installation check that the following components are in the MBT-R: R234 (1K), R235 (1.2K) and R236 remains a jumper (this is a change from the MBT manual instruction).
White Lamp	-----	J1B-13	
Amber Lamp	-----	J1B-14	
Blue Lamp	-----	J1B-15	
CP 125	----	J1A-9, J1A-12, and J1B-3 have no connections.	
CP 126 Connections:			
Speaker Output, 28V	----	J1A-9	10 watts across 4 ohms. 28 V installations only
14/28 VDC Input	----	J1A-12	From cabin amplifier circuit breaker, recommended breaker, 4 amp.
Speaker output, 14V	----	J1B-3	10 watts across 4 ohms. 14 V installations only

2.8.3 Input Level Controls

CP 125 and CP 126

Internal audio input level controls, R1 thru R6, are provided for all receive audio inputs. Initially the controls are set for use with the Spectrum Line equipments. Therefore an audio input of 3.5 vrms will produce 0.5 vrms at J1A-1 and J1A-2 outputs; at least 50 mw of headphone level audio at J1A-4; and in the case of a CP 126 at least 10 watts of speaker audio at J1A-9 or J1B-3.

If a receiver producing 4.0 vrms or greater is used, the input level control should be rotated clockwise until the level at J1A-1 and -2 is reduced to 0.5 vrms. Audio input levels in excess of 4 vrms may cause distortion to be present in the low level output at J1A-1 and -2.

CP 125 Only

The input level controls may also be used to reduce the low level output, at J1A-1 and -2, when a cabin amplifier is used which requires less than 0.5 vrms for full audio output. Since rotating the input control reduces not only the low level output but also the headphone output, at J1A-4, it may be desirable to add a series resistor or voltage divider between the output of the CP 125 and the input of the cabin amplifier rather than utilizing the level controls, thus maintaining the headphone output level.

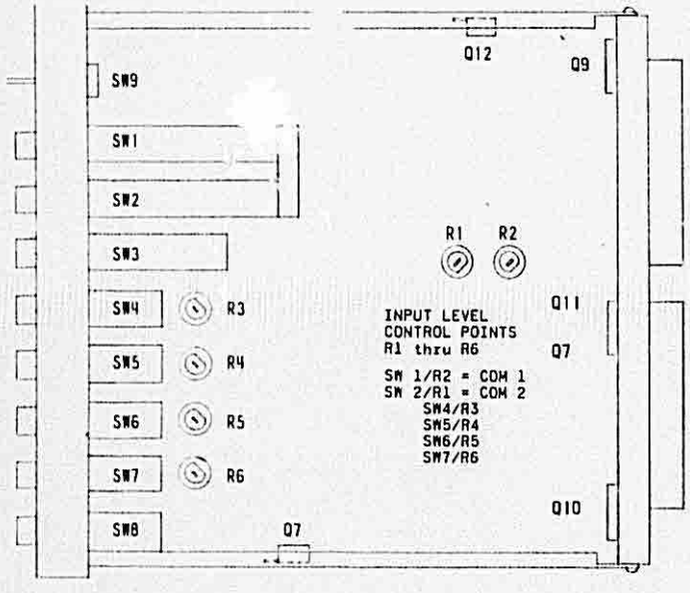


FIGURE 2-1. INPUT LEVEL CONTROLS

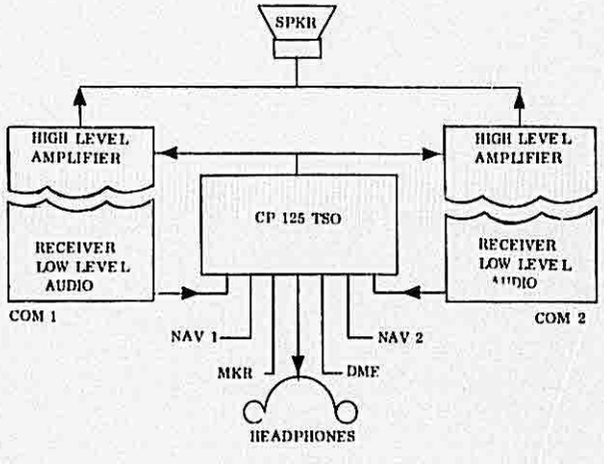


FIGURE 2-2. CABIN AMPLIFIER, CP 125 ONLY

SEE BLOW-UP

2.8.4 Cabin Amplifier

CP 125

Normally the Spectrum COM Unit's audio amplifier/modulator will also perform as the cabin speaker amplifier; the CP 125 low level output, at J1A-1 or -2 will be connected to the COM's aux audio input. Where dual COM receivers are utilized, the aux audio inputs may be paralleled and directly connected to the CP 125 low level output.

The DC supply voltage to the cabin speaker amplifier (COM Unit audio amplifer/modulator) may be routed so as to bypass the COM receiver's ON-OFF switch. Reference should be made to the Spectrum Nav-Com Installation Manual for the modification procedure.

Alternatively an external cabin amplifier may be installed, such as the NARCO VP 22C. Direct connection between the CP 125 low level output and pin D of the VP 22C may be made with VP 22C chassis numbers CNC170B and later. Chassis numbers prior to this must have either: a) an 8.2K resistor installed between the CP 125 low level output and the VP 22C's pin D (audio input) or b) a direct connection may be made from the CP 125 to the VP 22C and each of the Audio Panels input level controls adjusted to produce 0.1 vrms at the low level output, J1A-1 and -2, of the CP 125. Method "a" is preferred since the input level controls reduce headphone output level as well as low level output.

CP 126

The CP 126 contains an integral 10 watt cabin amplifier.
Two speaker outputs are provided, one at J1B-3 for 14v installations and the other at J1A-9 for 28v installations.

IT IS IMPORTANT THAT THE PROPER CONNECTION BE MADE! Improper connection will result in early failure and/or high distortion.

The CP 126 also allows for, if desired, an optional redundant cabin amplifier hook-up that utilizes the COM 1 high level amplifier. See Fig. 2-3 for this wiring.

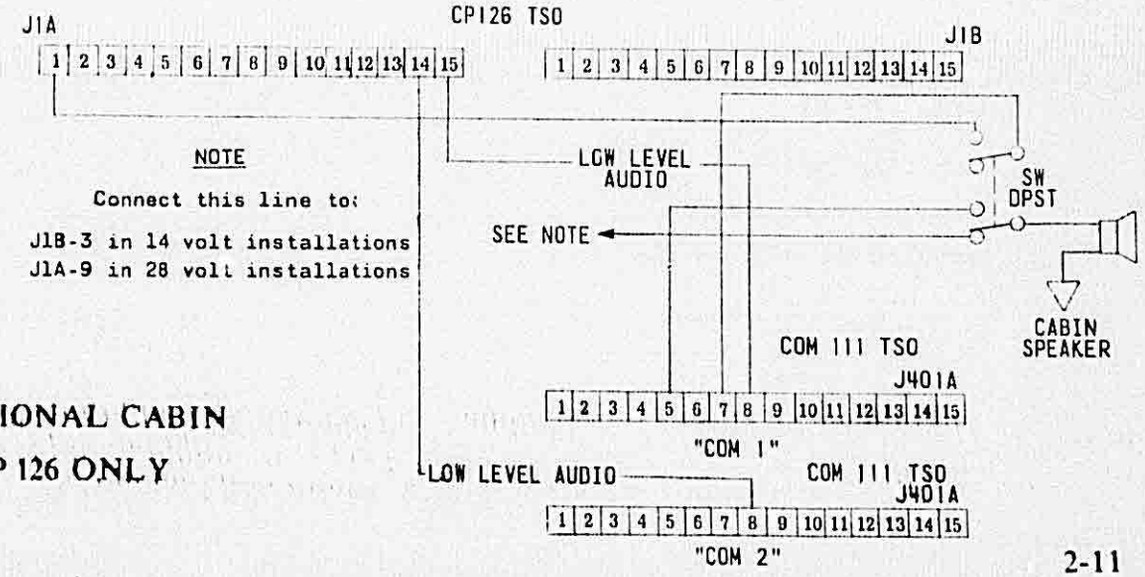


FIGURE 2-3. OPTIONAL CABIN AMPLIFIER, CP 126 ONLY

2.8.5 Spectrum Line COM Transceiver Modification, CP 125 ONLY

When the CP 125 is used with a COM 10, COM 10A, COM 11, or COM 11A with chassis numbers CN (A/B) 171C10 or later, or COM 110 TSO or COM 111 TSO with chassis numbers CN (A/B) 219B2 or later, no modification is required.

Chassis numbers prior to these require the following modification to prevent the mike audio during transmit from being amplified by the unkeyed COM transceiver's high level audio amplifier and faintly heard in the cabin speaker. This will occur only in dual COM installations where the aux audio inputs are paralleled.

Refer to the appropriate Spectrum Line Maintenance Manual for lead and component location in the transmitter module.

Modify the COM unit as follows:

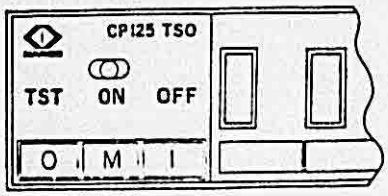
1. Remove R432
2. Remove all ground leads from K401, pin 13
3. Remove coaxial lead from K401, pin 12 and connect it to K401, pin 13
4. Connect all ground leads removed in step 2 to K401, pin 12
5. Install a new R432, 560 ohm, 1/2w carbon resistor, from K401, pin 11 to the hole in the printed circuit board that R432 was inserted into which connects to P401A, pin 7 and R433 (hole nearest P401A).

2.8.6 Transmit Monitor Wiring

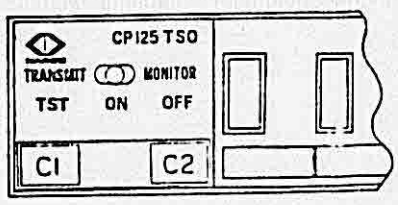
In installations where there is no need for the audio panel marker lights, the lights can be utilized as a transmitter monitor that will indicate which COM transmitter is in operation when the mike key is depressed.

The standard audio panel features marker light identification, therefore, the trim panel must be slightly modified by applying two self-adhering labels, packaged in the Installation Kit. The "Transmit Monitor" label should be applied **over** the existing label.

The "C1 C2" label should be applied **after** the existing O M I label is **removed** so that the "C1" is over the "O" lamp.



STANDARD
CP 125/126
WITH
MARKER LIGHTS

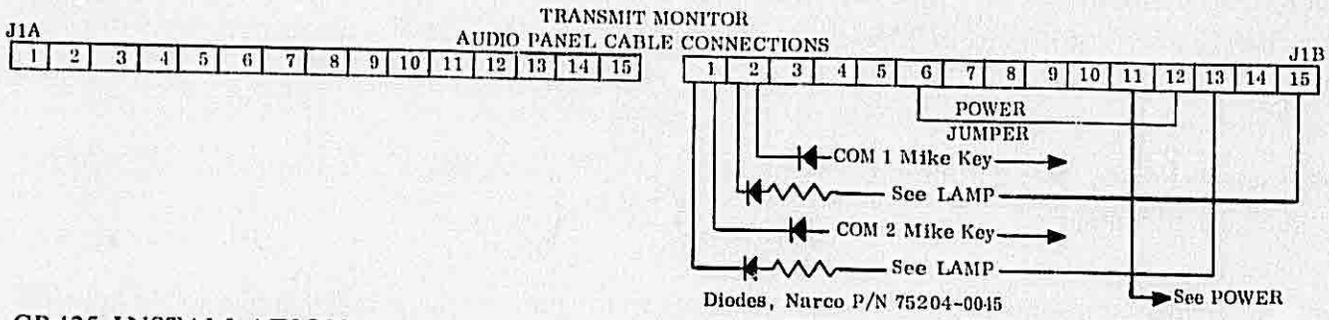


MODIFIED
CP 125/126
WITH
TRANSMIT MONITOR LIGHTS

FIGURE 2-4. TRANSMIT MONITOR LABELING

2.8.6 Continued

The electrical connections are shown in Fig. 2-5. Pin 14 of J1B (middle lamp power source) will not be wired in. There are only two differences between the CP 125 and the 126 wiring.



CP 125 INSTALLATION

LAMP brilliance should be reduced by jumpering a 1 watt resistor of approximately 68 ohms* across pins 1-13 and 2-15 of J1B.

POWER connection at J1B-11.

The CP 125 utilizes ONLY 14v power sources, from aircraft buss or via a 28 to 14v converter. Install the POWER JUMPER between J1B-6 and -12.

CP 126 INSTALLATION

LAMP brilliance should be reduced by jumpering a 2 watt resistor of approximately 150 ohms* across pins 1-13 and 2-15 of J1B.

POWER connection at J1B-11.

14v installations and 28v installations with transceivers utilizing 28 to 14v converter(s) apply 14v to J1B-11. Install the POWER JUMPER between J1B-6 and -12. 28v installations with 28v transceivers, apply 28v directly to J1B-11. DO NOT INSTALL THE POWER TRANSISTOR.

*It should be noted that depending upon the selected value, when the switch is in the TST position, the COM transmitter may be key'd. This should be of little concern as this position is spring loaded to return to the ON position, thus keying is only momentary. (Both C1 and C2 lamps should light in the TST position.)

FIGURE 2-5. TRANSMIT MONITOR LIGHTING AND POWER

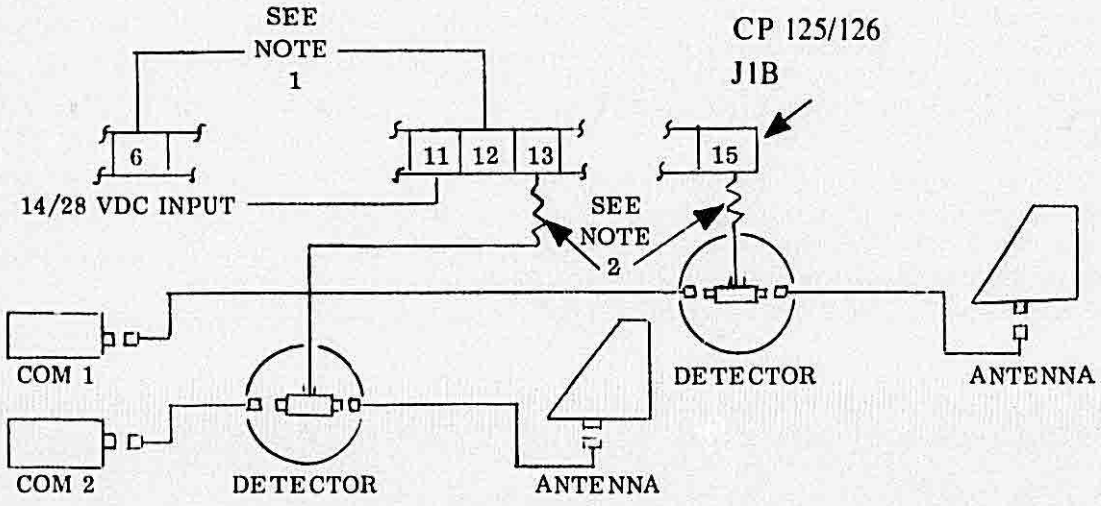
2.8.6.1 Other Monitors

Another way to utilize the CP 125/126 transmit monitor function is that of adding an RF/Modulation detector to the installation. There are many sources for such detectors. One such unit is the Transmission Detector/Indicator, R363615 from Melpar Radio, Falls Church, Va. Such a unit would illuminate the audio panel monitor when there is a transmit signal in the antenna coax line.

If this assembly is used, only the detector and its wiring would be installed as the audio panel indicator will take the place of Melpar's Indicator. One detector is required for each COM transmitter.

Follow the Melpar instructions (mainly mechanical) up to the point of installing the indicator. From this point, use the following wiring diagram to connect the detector to the CP 125/126 Transmit Monitor circuit.

Apply the NARCO supplied labels as outlined in Section 2.8.6.



Notes: 1. Jumper required on 14 volt installations only.
Notes: 2. Select value of resistor to provide desired lamp brilliance.

FIGURE 2-6. TRANSMIT DETECTOR WIRING

2.8.7 Cable Connector Fabrication

Lead Termination

1. Strip wire 5/32" for PIN Terminal No. 1917-T.
2. Open tool (engraved side toward you), from the opposite side place the conductor tab section of the pin on Anvil B. Close tool slightly (until the tabs touch the female jaw).
3. Insert stripped conductor until insulation is level with outside of jaw. Crimp by squeezing handles together until jaws are fully closed or sufficient crimp is made.
4. Move lead and pin to Anvil A. Crimp again until jaws are closed or sufficient crimp is made.
5. If necessary, straighten pin while still being held in the jaw.

Insertion

1. The PIN terminal may now be inserted into the desired pin location in the translucent connector housing. The pin cannot be inserted upside down. Right-side-up it slides in effortlessly. Be sure to push it all the way in, until a "click" can be felt, heard, or even seen (by turning the translucent housing over).
2. There is no necessity to pull back on the lead itself except to test for the "locking feature", and then only with a moderate pull.

Extraction

1. If a pin is erroneously inserted into the wrong housing position, or if at some later time a circuit change is desired, the pin can be removed easily. Slip the flat narrow blade portion of the tool into the mating side of the housing, under the pin. By holding the housing upside down one can see the blade slide in, up to the stop. This action picks up the locking key and allows the lead and pin to slip out of its position using a light pulling action on the lead. Neither pin nor position has been damaged allowing reinsertion in the same or another position.

Crimping with Pliers

The lead PIN Terminal connection using the Molex hand crimper provides a superior connection than with pliers. However, with care, a satisfactory connection can be made without the crimper.

1. Strip wire 5/32" for PIN Terminal 1917-T.
2. Tin exposed conductor.
3. Using needle nose pliers fold over conductor tabs firmly onto the conductor, one side then the other.
4. Repeat step 3 for the insulator tabs.

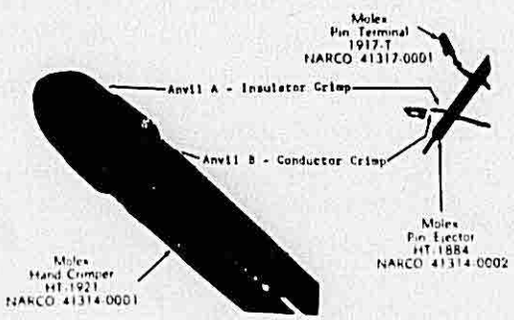
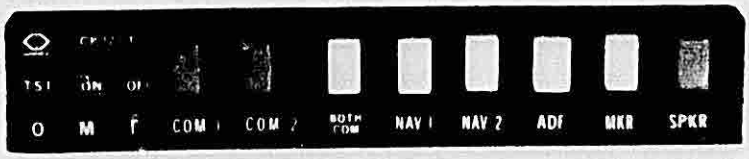
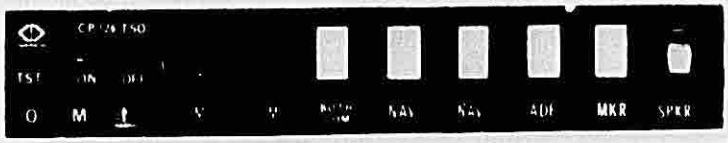


FIGURE 2-7. CRIMPING TOOL

SEE BLOW-UP





2.9 OPERATION

The Indicator Lights

The left side of the front panel contains a 3 position toggle switch and 3 indicator lamps, their operation is dependent upon auxiliary equipment and/or how the cable connector is wired. The most likely set-ups are: (A) unused, (B) marker beacon receiver indicator lights, or (C) as a transmit monitor indicator.

(A) **When unused**

This area will bear a label indicating only, **CP 125 TSO** or **CP 126 TSO.** The lamps will be blanked out as they are not wired in. This switch will not function as it too is not wired in.

(B) **Marker Beacon Lights and Test-On-Off Switch**

This area will bear labels indicating **CP 125 TSO** or **CP 126 TSO** and **TST-ON-OFF.** The lamps will indicate O M I.

For this area to function as a marker beacon identifier it must be connected to a remote marker beacon receiver such as NARCO's MBT-R or similar unit. When so connected, the appropriate O M I lamp will light upon receiving a signal from the marker receiver. The toggle switch turns this function ON and OFF and in the TST position allows power to go to the lamps, to check that the lamps do work.

(C) **Transmit Monitor Lights and Test-On-Off Switch**

This area will bear labels indicating **CP 126 TSO** or **CP 126 TSO,** the words **TRANSMIT MONITOR,** and **TST-ON-OFF.** The lamps will indicate C1 and C2, the middle lamp will be blanked out.

When utilized for this function each COM unit's transmit key line is connected to a lamp, C1 or C2. When the mike is key'd, the appropriate lamp lights.

Should the installation contain transmit detectors, the wiring would be such that when a transmit signal was present, its associated C1 or C2 lamp would light.

The toggle switch turns this function ON and OFF and in the TST position allows power to go to the lamps, to check that the lamps do work.

2.9 Continued

The Pushbuttons

Pushing a button IN closes that circuit. The button is held in the IN position by a lock. A second push releases the lock allowing the button to extend and open the circuit. Only the two COM red pushbuttons are interlocked so that when the extended button is pushed in, the other button is released, thus switching circuits. A slight push will release the lock and open the two COM circuits.

COM transceiver Selection (COM 1/COM 2)

The two side-by-side red pushbuttons labeled COM 1 and COM 2 provide interlocked transceiver selection. Pushing one button IN causes the other to be released. The depressed button allows that particular COM transceiver to be used for receive and transmit modes of operation. Thus receive audio, transmitter keying, mike audio, and sidetone are all simultaneously selected via one pushbutton.

BOTH COM

Depressing the BOTH COM button allows the audio from both COM receivers to be heard in the speaker and/or headphone at the same time. It does not void the selection of the COM transmitter by the COM 1 or COM 2 pushbuttons.

Navigation Receiver Selection

Four buttons are provided for navigation receiver selection. Depressing one or more buttons allows the low level audio signal from the selected unit (NAV rec., ADF, MKR, etc.) to be routed through the isolation-combining circuits of the audio panel. The combined audio output from all the selected units, COM and NAV, will be used to drive a speaker amplifier. The individual buttons must be depressed if either speaker or headphone output is desired. (The Installation Kit has a Label Set for pushbutton identification.)

SPKR (Speaker)

CP 125 ONLY

Depressing the SPKR button connects the combined audio signals from all the selected units to a terminal on the Audio Panel Plug J1A. This output is designed to feed into the aux audio input of a Spectrum Line COM unit, used as a cabin speaker amplifier. When a transmitter is keyed, all the receive audios at this terminal will be automatically muted. The SPKR button has no effect on headphone output, which is available from another terminal on the rear of the unit. The headphone output is automatically switched to sidetone audio whenever a COM transmitter is keyed.

CP 126 ONLY

Depressing the SPKR button connects the combined audio signal from all the selected units to the input of the internal cabin speaker amplifier. The output of this amplifier is 10 watts across a 4 ohm speaker.

2.10 POST INSTALLATION CHECK-OUT

NOTE

As this Post Installation Check-Out is being made, check that the proper label inserts have been attached to the Audio Panel as well as to the companion units. If a marker beacon receiver is NOT part of the system and the Transmit Monitor function is not desired, all marker identification may be blanked out by using Items 15 and 16 of the Installation Kit. Do NOT remove the toggle switch!

1. Turn all avionics, controlled via an On-Off switch, OFF.
2. Depress the SPKR button.
3. Depress the COM 1 button. Turn the companion COM 1 transceiver ON. Channel the transceiver to a frequency available at the airport. Transmit and receive. Check for sidetone audio in headphones during transmit. Turn COM 1 transceiver OFF.
4. Depress the COM 2 button. Turn COM 2 transceiver ON. Channel the transceiver to an available frequency. Transmit and receive. Listen for sidetone audio in headphones during transmit.
5. With COM 2 audio or receiver noise present in the cabin speaker, depress the SPKR button to release the lock. Speaker audio should no longer be audible. Listen for COM 2 audio in headphones.
6. Depress the SPKR button to activate the speaker.
7. Depress the BOTH COM button. Turn COM 1 ON. Vary both COM transceiver's volume controls to determine that both are audible at the speaker and headphones.
8. With the two COM units ON, for cabin speaker audio, check the NAV units (one at a time) by depressing the appropriate front panel pushbutton. Turn ON that companion receiver and listen for a received signal when available or for receiver noise. Turn the COM transceiver's volume down as necessary.
9. Push the MKR toggle switch to the TST position, all three lamps should come ON. Release the switch and the toggle will spring back to its original position.
10. If a marker beacon generator is available, verify the illumination sequence of the lamps. Depress the MKR button and listen on the speaker/headphones for the marker tone and watch the panel marker lamps change as frequency is changed.

Blue	O (outer)	400 Hz frequency
Amber	M (middle)	1300 Hz frequency
White	I (inner)	3000 Hz frequency

11. Start engine(s) and listen for alternator noise or any other interference. Energize all pulse equipment.
12. Check operation of the panel lamps.

FLIGHT TEST

A flight test of the audio panel should not be necessary if the Post Installation Check-out has been completed.

2.11 COMPATIBILITY

It is felt that under certain circumstances it is conceivable that, should a "CP" fail and the pilot require to be airborn quickly, the avionics shop may desire to install a loaner. It is with this consideration, that only those "CP" units which can be quickly interchanged are discussed along with the necessary adjustments, if any. It is also presumed that the interconnect cable was fabricated in accordance with Narco "Standard" CP 125 or CP 126 wiring diagram.

CP 25 and CP 25A models are not compatible with other CP units for temporary replacement as many connector lead connections would require change.

Instrument in aircraft	The following loaner may be installed after:
CP 125	CP 25B . . All CP 25B's were manufactured with a R47 (33 ohm, 3 watt) that allowed for immediate 14v installation. In 28v installations, the resistor is removed by the installer. Before installing a CP 25B, check the unit for the presence of R47 and adjust the unit as appropriate for THIS installation. If the installation is 28v, reposition the A+ from J1A-13 to J1A-12.
CP 125	CP 126 . . No changes are necessary, HOWEVER, there will be no emergency audio.
CP 126	CP 125 . . This unit can be installed ONLY when the System's COM transceivers are 14v units. Do NOT install if either COM transceiver is a 28v unit. Also, unless provision has been made for an external cabin speaker amplifier, see Fig. 2-3, there will be no speaker level audio.
CP 126	CP 25B . . DO NOT USE!

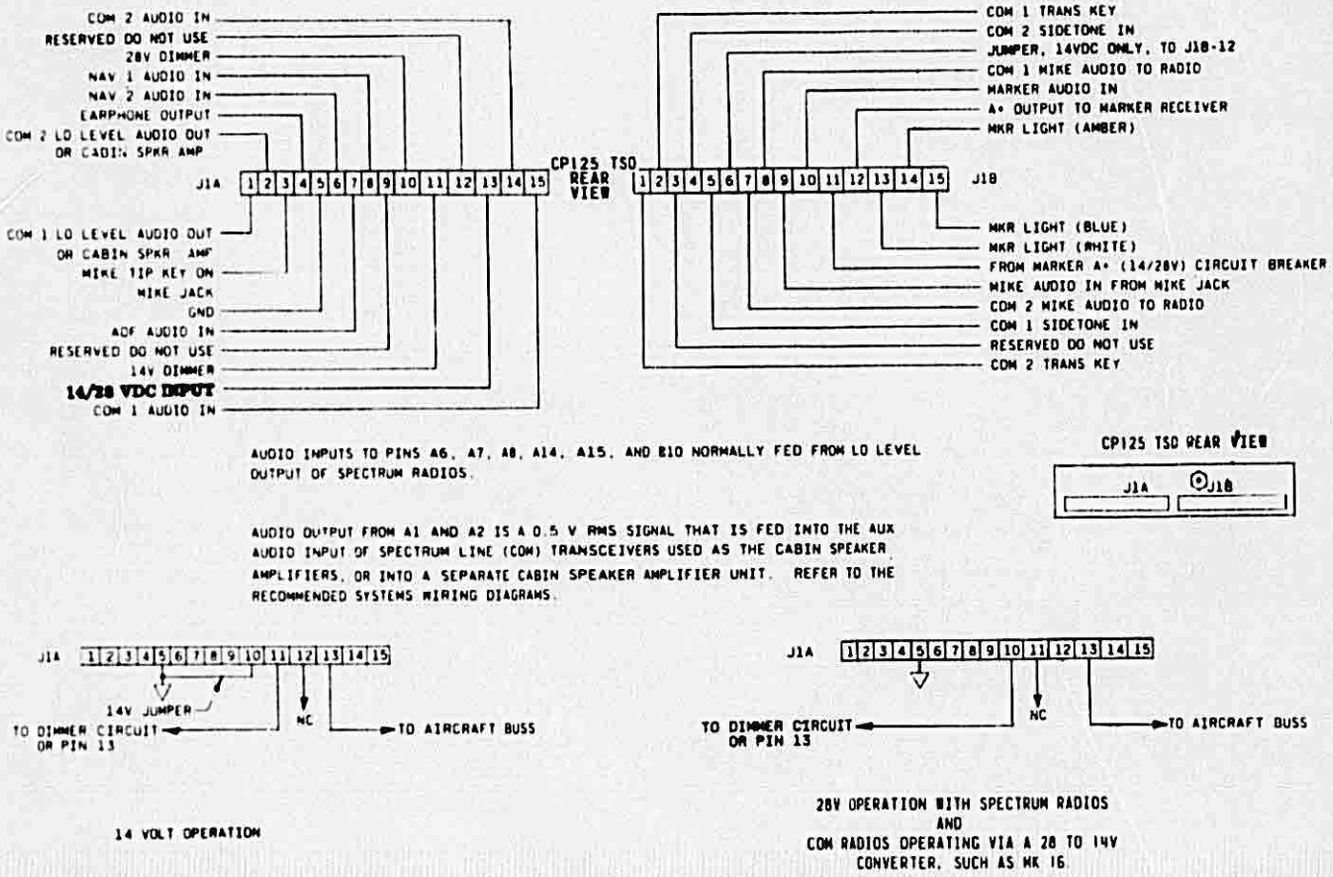


FIGURE 2-8. CP 125 GENERAL INSTALLATION WIRING

SEE BLOW-UP

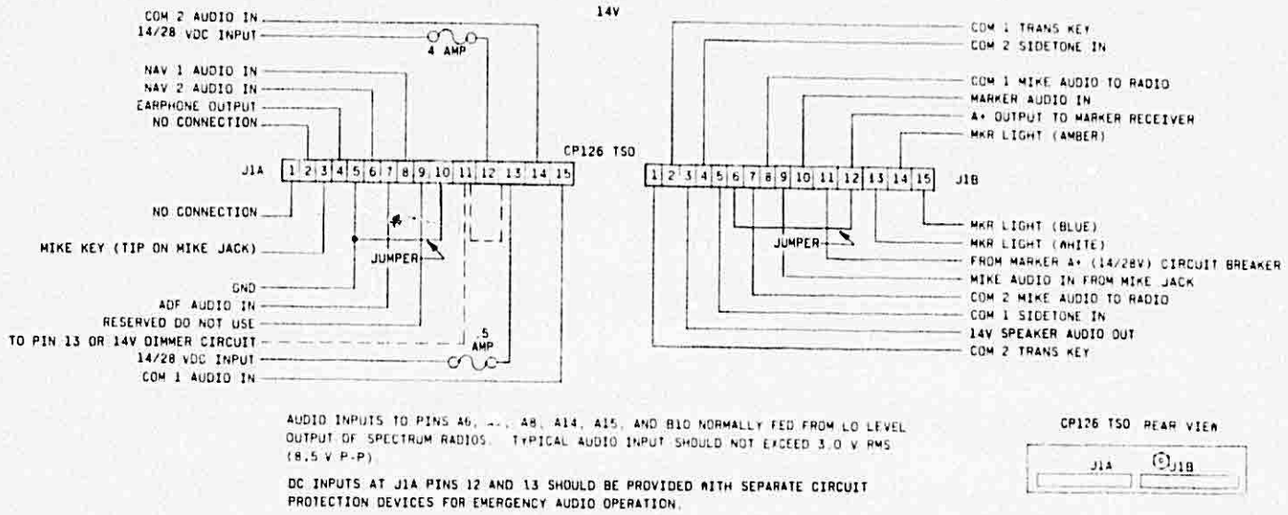


FIGURE 2-9. 14V CP 126 GENERAL INSTALLATION WIRING

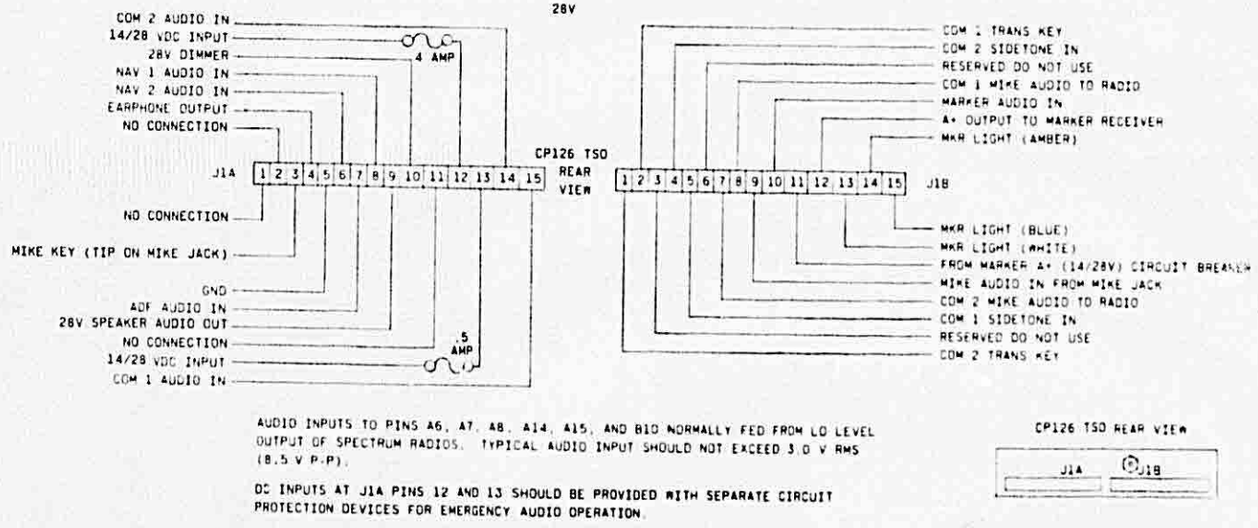


FIGURE 2-10. 28V CP 126 GENERAL INSTALLATION WIRING

SEE BLOW-UP

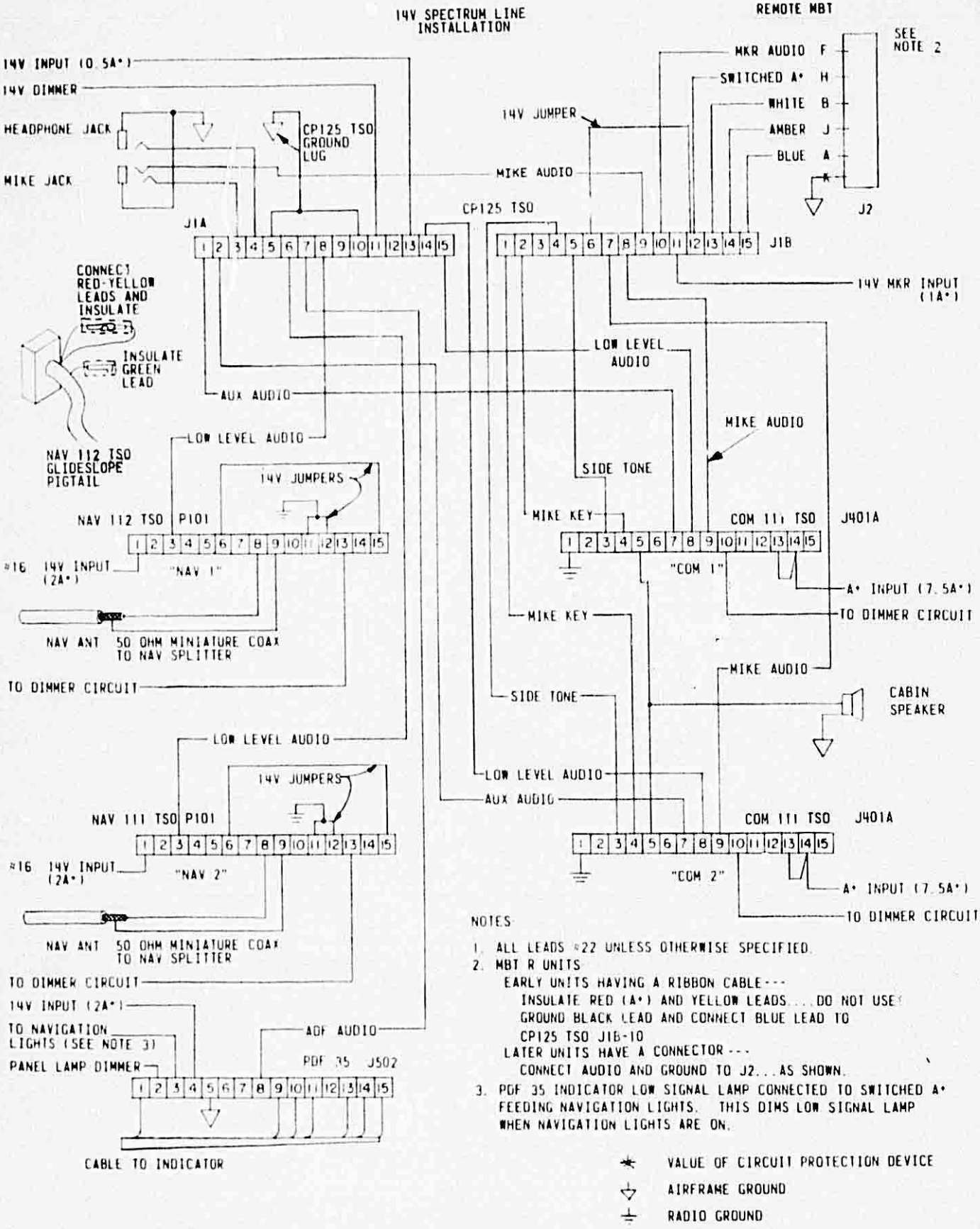
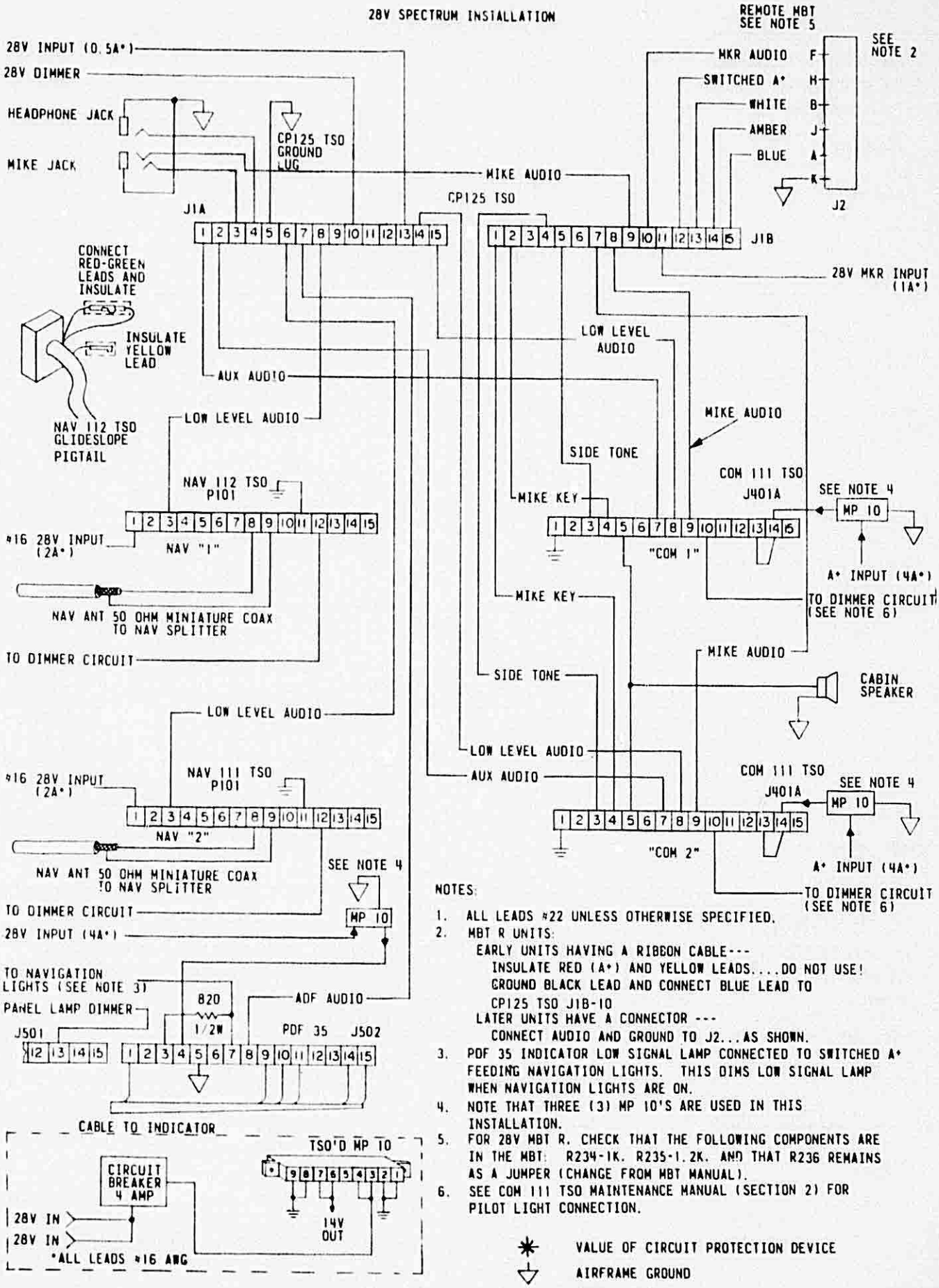


FIGURE 2-11. 14V CP 125 SPECTRUM LINE INSTALLATION WIRING

SEE BLOW-UP



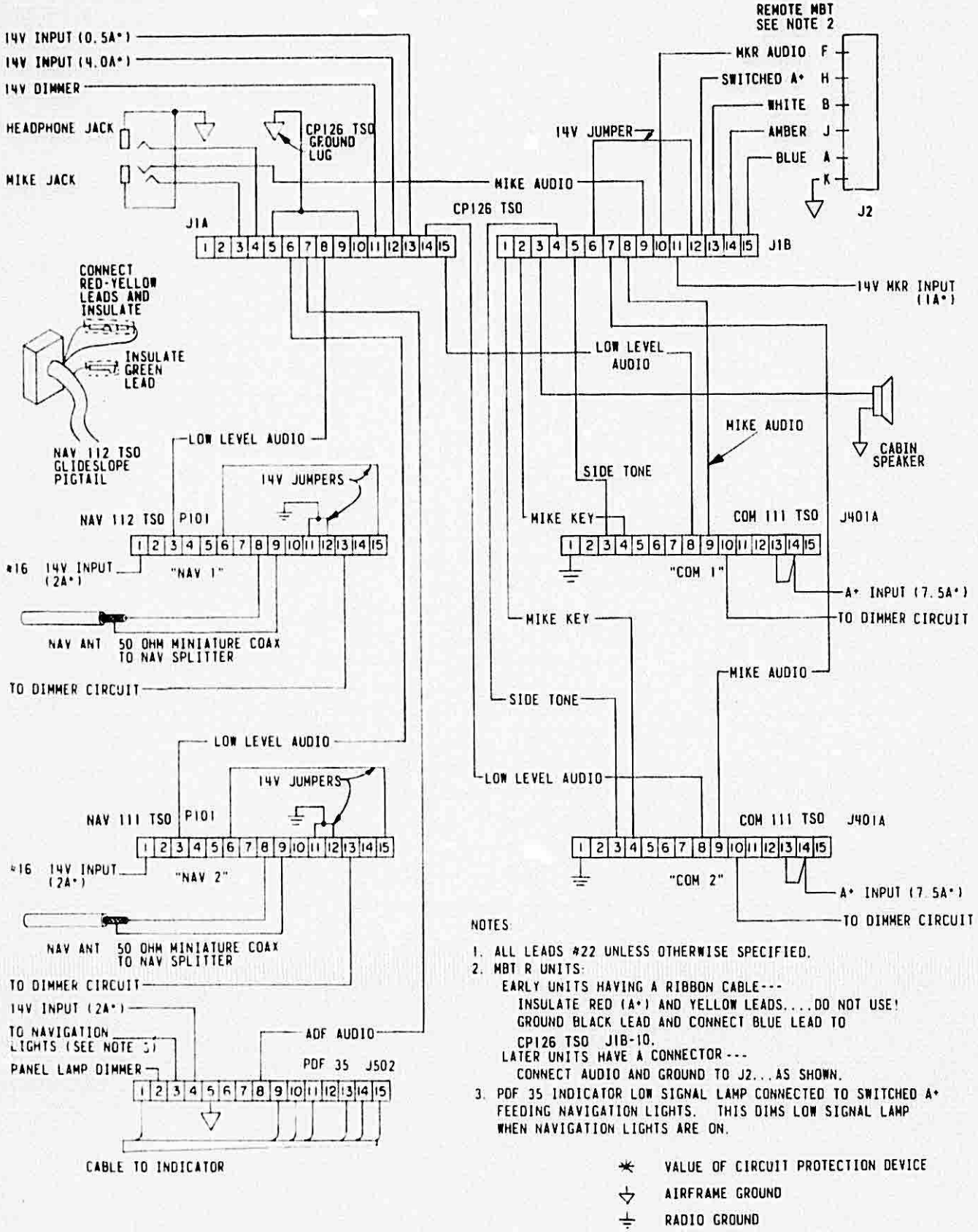
NOTES:

1. ALL LEADS #22 UNLESS OTHERWISE SPECIFIED.
2. MBT R UNITS:
   EARLY UNITS HAVING A RIBBON CABLE---
   INSULATE RED (A*) AND YELLOW LEADS....DO NOT USE!
   GROUND BLACK LEAD AND CONNECT BLUE LEAD TO
   CP125 TSO J1B-10
   LATER UNITS HAVE A CONNECTOR ---
   CONNECT AUDIO AND GROUND TO J2...AS SHOWN.
3. PDF 35 INDICATOR LOW SIGNAL LAMP CONNECTED TO SWITCHED A* FEEDING NAVIGATION LIGHTS. THIS DIMS LOW SIGNAL LAMP WHEN NAVIGATION LIGHTS ARE ON.
4. NOTE THAT THREE (3) MP 10'S ARE USED IN THIS INSTALLATION.
5. FOR 28V MBT R, CHECK THAT THE FOLLOWING COMPONENTS ARE IN THE MBT: R234-1K, R235-1.2K, AND THAT R236 REMAINS AS A JUMPER (CHANGE FROM MBT MANUAL).
6. SEE COM 111 TSO MAINTENANCE MANUAL (SECTION 2) FOR PILOT LIGHT CONNECTION.

✱ VALUE OF CIRCUIT PROTECTION DEVICE
▽ AIRFRAME GROUND
⏚ RADIO GROUND

SEE BLOW-UP

FIGURE 2-12. 28V CP 125 SPECTRUM LINE INSTALLATION WIRING



NOTES:

1. ALL LEADS #22 UNLESS OTHERWISE SPECIFIED.
2. MBT R UNITS:
   EARLY UNITS HAVING A RIBBON CABLE---
   INSULATE RED (A*) AND YELLOW LEADS....DO NOT USE!
   GROUND BLACK LEAD AND CONNECT BLUE LEAD TO CP126 TSO J1B-10.
   LATER UNITS HAVE A CONNECTOR---
   CONNECT AUDIO AND GROUND TO J2...AS SHOWN.
3. PDF 35 INDICATOR LOW SIGNAL LAMP CONNECTED TO SWITCHED A* FEEDING NAVIGATION LIGHTS. THIS DIMS LOW SIGNAL LAMP WHEN NAVIGATION LIGHTS ARE ON.

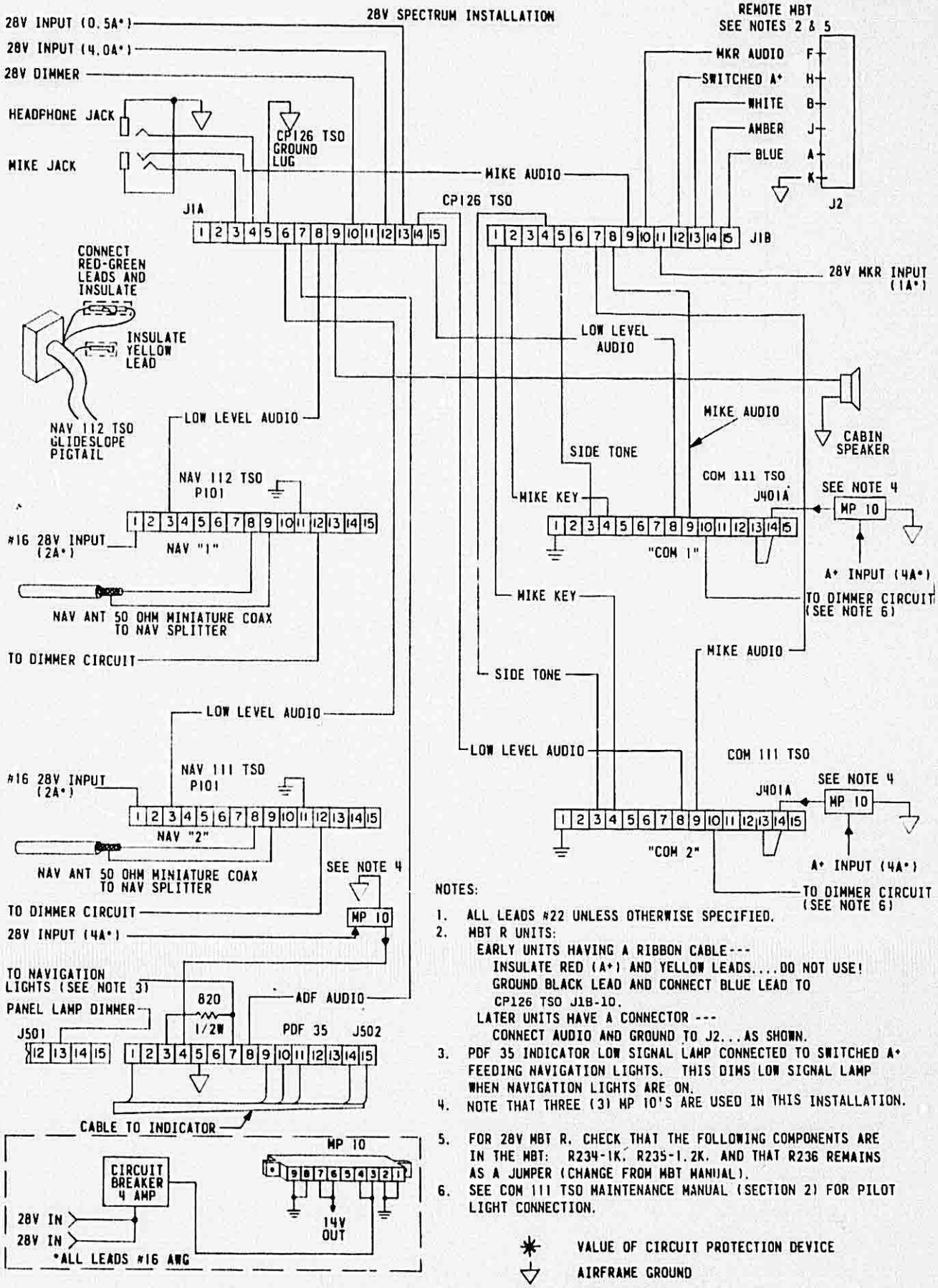
* VALUE OF CIRCUIT PROTECTION DEVICE

⏚ AIRFRAME GROUND

⏚ RADIO GROUND

FIGURE 2-13. 14V CP 126 SPECTRUM LINE INSTALLATION WIRING

SEE BLOW-UP



NOTES:

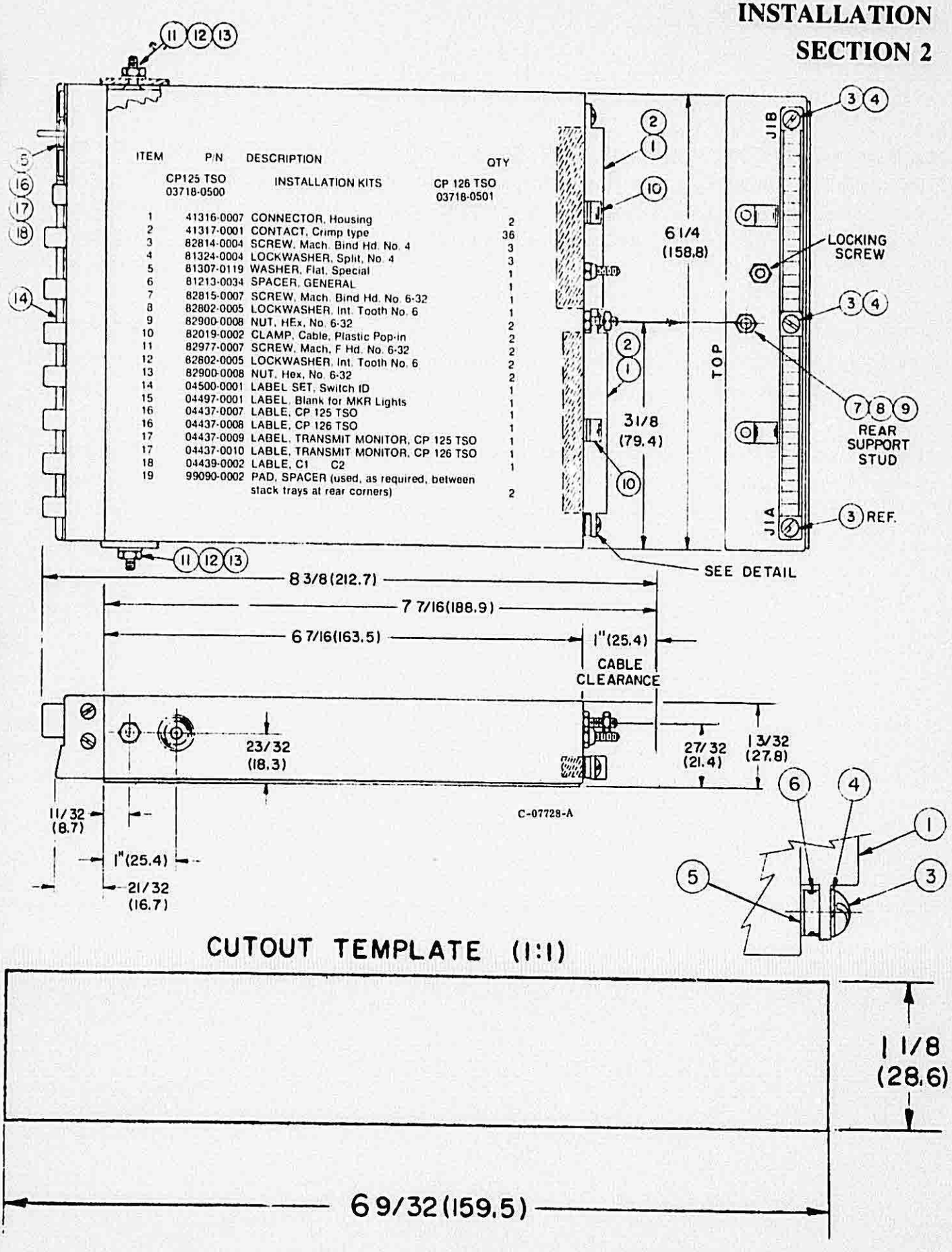
1. ALL LEADS #22 UNLESS OTHERWISE SPECIFIED.
2. MBT R UNITS:
   EARLY UNITS HAVING A RIBBON CABLE---
   INSULATE RED (A+) AND YELLOW LEADS....DO NOT USE!
   GROUND BLACK LEAD AND CONNECT BLUE LEAD TO CP126 TSO J1B-10.
   LATER UNITS HAVE A CONNECTOR ---
   CONNECT AUDIO AND GROUND TO J2...AS SHOWN.
3. PDF 35 INDICATOR LOW SIGNAL LAMP CONNECTED TO SWITCHED A+ FEEDING NAVIGATION LIGHTS. THIS DIMS LOW SIGNAL LAMP WHEN NAVIGATION LIGHTS ARE ON.
4. NOTE THAT THREE (3) MP 10'S ARE USED IN THIS INSTALLATION.
5. FOR 28V MBT R, CHECK THAT THE FOLLOWING COMPONENTS ARE IN THE MBT: R234-1K, R235-1.2K, AND THAT R236 REMAINS AS A JUMPER (CHANGE FROM MBT MANUAL).
6. SEE COM 111 TSO MAINTENANCE MANUAL (SECTION 2) FOR PILOT LIGHT CONNECTION.

✱ VALUE OF CIRCUIT PROTECTION DEVICE
AIRFRAME GROUND
RADIO GROUND

FIGURE 2-14. 28V CP 126 SPECTRUM LINE INSTALLATION WIRING

SEE BLOW-UP

ITEM	P/N	DESCRIPTION	QTY (CP125 TSO 03718-0500)	QTY (CP 126 TSO 03718-0501)
		INSTALLATION KITS		
1	41316-0007	CONNECTOR, Housing	2	
2	41317-0001	CONTACT, Crimp type	36	
3	82814-0004	SCREW, Mach. Bind Hd. No. 4	3	
4	81324-0004	LOCKWASHER, Split, No. 4	3	
5	81307-0119	WASHER, Flat, Special	1	
6	81213-0034	SPACER, GENERAL	1	
7	82815-0007	SCREW, Mach. Bind Hd. No. 6-32	1	
8	82802-0005	LOCKWASHER, Int. Tooth No. 6	1	
9	82900-0008	NUT, HEx, No. 6-32	2	
10	82019-0002	CLAMP, Cable, Plastic Pop-in	2	
11	82977-0007	SCREW, Mach, F Hd. No. 6-32	2	
12	82802-0005	LOCKWASHER, Int. Tooth No. 6	2	
13	82900-0008	NUT, Hex, No. 6-32	2	
14	04500-0001	LABEL SET, Switch ID	1	
15	04497-0001	LABEL, Blank for MKR Lights	1	
16	04437-0007	LABLE, CP 125 TSO	1	
16	04437-0008	LABLE, CP 126 TSO		1
17	04437-0009	LABEL, TRANSMIT MONITOR, CP 125 TSO	1	
17	04437-0010	LABLE, TRANSMIT MONITOR, CP 126 TSO		1
18	04439-0002	LABLE, C1 C2	1	
19	99090-0002	PAD, SPACER (used, as required, between stack trays at rear corners)	2	



CUTOUT TEMPLATE (1:1)

FIGURE 2-15. CP 125/126 INSTALLATION DRAWING

SEE BLOW-UP

3.1 GENERAL

The CP 125 and the CP 126 are fundamentally TSO'd CP 25B's. Referring to the Block Diagram, Figure 3-1, receiver audio inputs, selected by front panel pushbuttons, are combined, amplified, and channeled to the appropriate output terminal. With an input of 3.5 vrms at any receive input, the output levels are: low level output of 0.5 vrms, and a headphone audio of 50 milliwatts. The CP 126 has, in addition, a 10 watt output for speaker audio.

A transmit mute line, activated when the mike is key'd, mutes the speaker and phones isolation amplifiers and turns ON the sidetone isolation amplifier in the transmit mode. In receive, the sidetone isolation amplifier is turned OFF and the speaker and phones isolation amplifiers are turned ON.

In the CP 126, the low level output of the speaker isolation amplifier is used to drive the integral cabin speaker amplifier. The cabin speaker amplifier has two output terminals, one for 14v and one for 28v DC input voltage. It is most important that the **proper** output terminal be used!

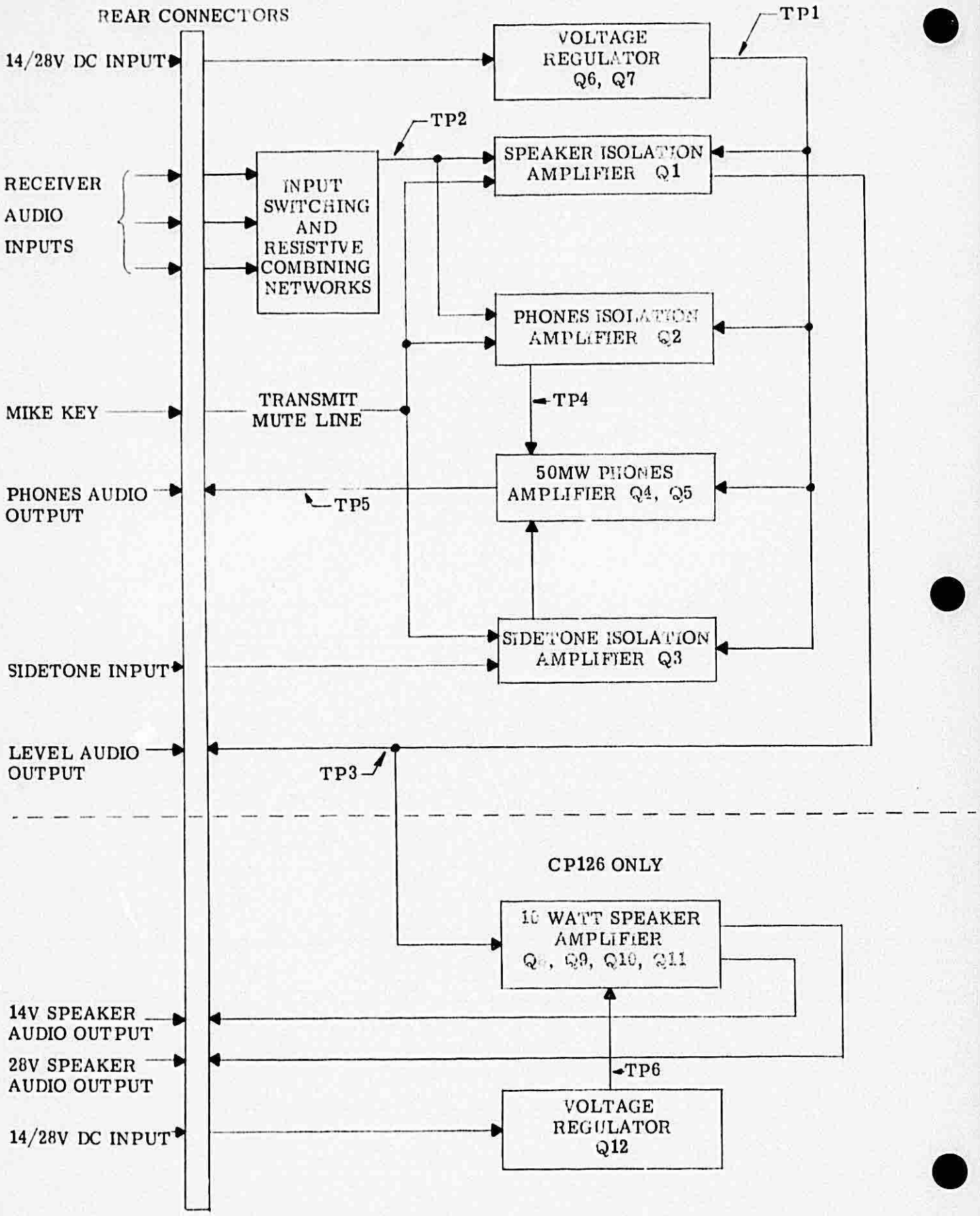


FIGURE 3-1. BLOCK DIAGRAM, CP 125/CP 126

3.2 SPEAKER ISOLATION AMPLIFIER, Q1

The speaker isolation amplifier provides isolation between the combined receive audio line, TP 2, and the low level output at TP 3 by virtue of its emitter-follower configuration. In the receive mode Q1 is forward biased; when the mike is key'd bias is removed from its base and the emitter-base diode is reverse biased, due to the resistive driver R47-R48 connected to the emitter, muting the amplifier.

CP 125 ONLY

Automatic emergency receive audio is obtained by providing two independent DC voltage sources either of which may be used to operate and bias the speaker isolation amplifier.

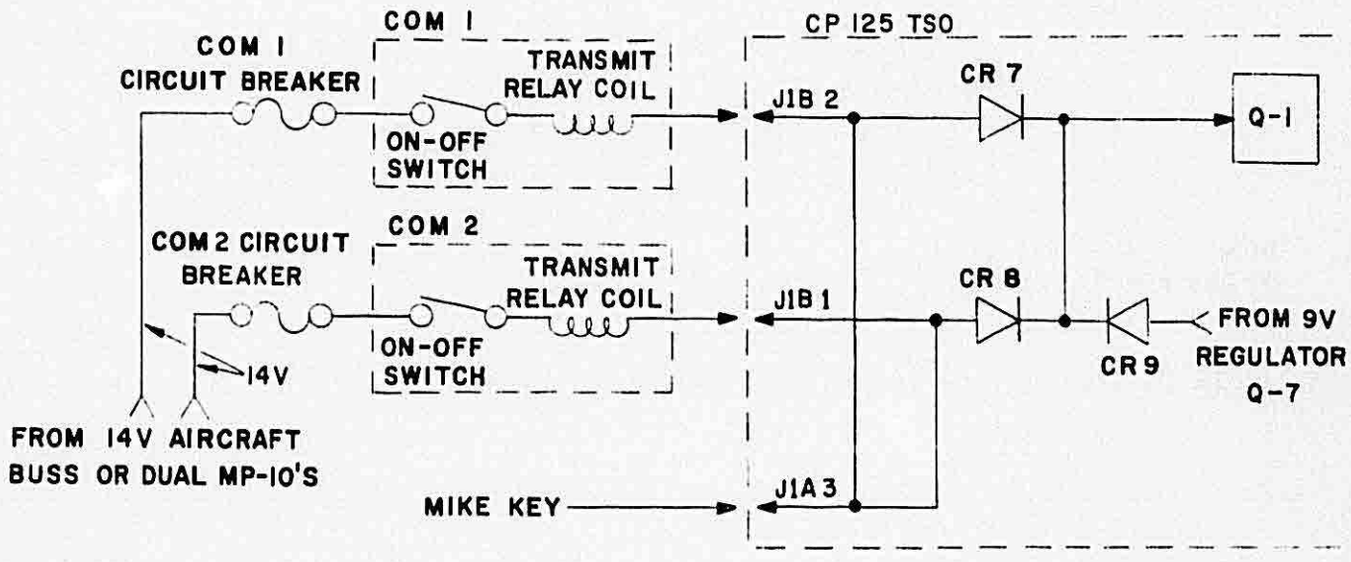


FIGURE 3-2. CP 125 SIMPLIFIED SPEAKER ISOLATION AMPLIFIER VOLTAGE SOURCE DIAGRAM

From Figure 3-2 it can be seen that when a COM unit is turned ON, Q1 is operated and biased from the "key'd" side of the transmit relay coil and CR9 is reverse biased. If both COM units are turned OFF, Q1 operates from the internal voltage regulator since CR9 is no longer reversed biased.

3.2 Continued

CP 126 ONLY

The DC source voltage for the automatic emergency receive audio is derived from either internal voltage regulator. Thus if either circuit breaker opens or either voltage regulator fails, voltage will be available to operate the speaker isolation amplifier.

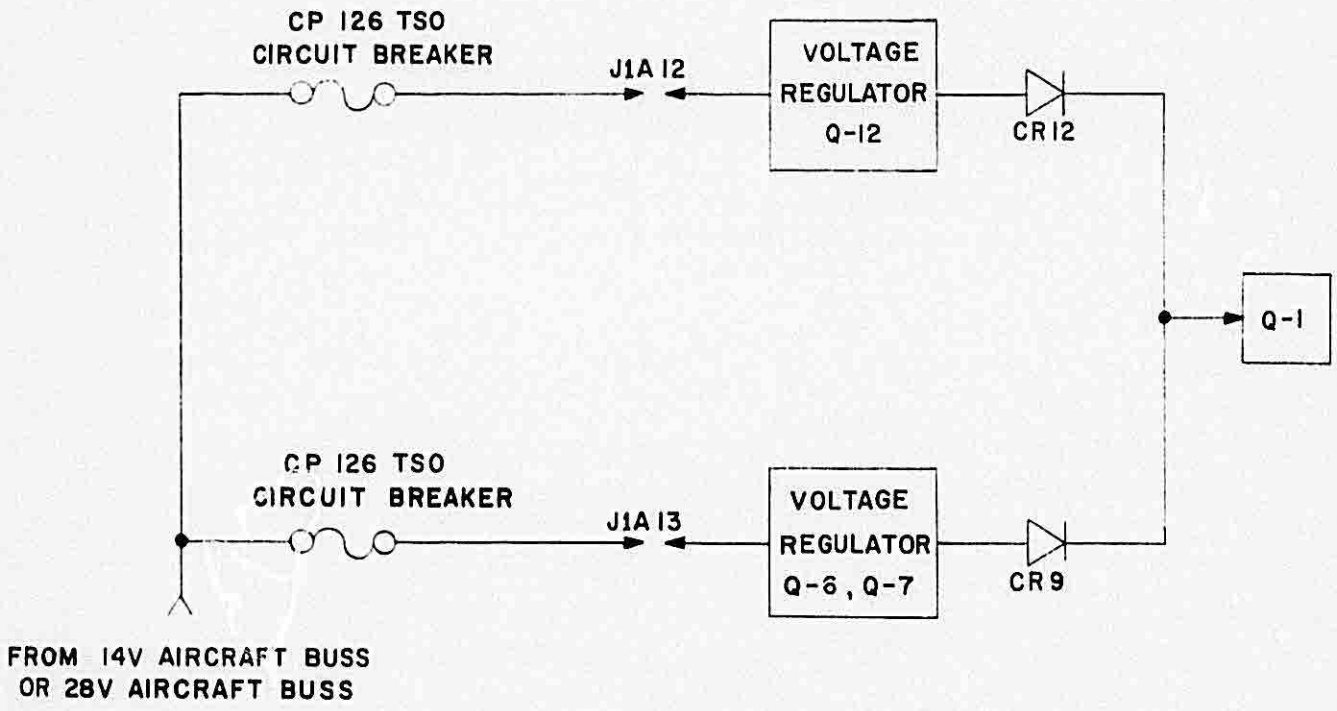


FIGURE 3-3. CP 126 SIMPLIFIED SPEAKER ISOLATION AMPLIFIER VOLTAGE SOURCE DIAGRAM

3.3 PHONES ISOLATION AMPLIFIER, Q2

The phones isolation amplifier is an emitter-follower providing isolation between the combined receive audio line, TP 2, and the 50 milliwatt phones amplifier, Q4 and Q5. In the receive mode Q2 is forward biased and through C4 and R25 drives Q4 and Q5; when the mike is key'd bias is removed from the base and the emitter-base diode is reverse biased due to the resistive divider, R17 and R18, connected to the emitter muting the isolation amplifier.

3.4 SIDETONE ISOLATION AMPLIFIER, Q3

The sidetone isolation amplifier provides isolation between the COM 1 or COM 2 sidetone inputs and the 50 milliwatt headphone amplifier. In the receive mode Q3's emitter-base junction is reverse biased due to the positive voltage applied to its base, from the mike key line, and the resistive divider, R23 and R24, at its emitter. Thus, audio at the sidetone inputs is blocked from the headphone amplifier. When the mike is key'd, Q3 is forward biased channeling sidetone audio to the headphone amplifier through C5 and R26.

3.5 HEADPHONE AMPLIFIER, Q4, Q5

The headphone amplifier is capable of producing 50 milliwatts across a 600 ohm load. In the receive mode its audio input is from the phones isolation amplifier; in transmit mode audio input is from the sidetone isolation amplifier. The headphone amplifier is temperature stabilized by CR15, feedback is provided by C14 and R34 with degeneration developed across R33.

3.6 VOLTAGE REGULATOR, Q6, Q7

The voltage regulator is of the series pass configuration with: CR2 the reference zener diode, Q6 the error amplifier, and Q7 the series pass transistor. The output voltage, at the emitter of Q7, is set through selection of R53 which nominally is 4.7K ohms. Constant voltage line regulation for a DC input variation of from 11 to 30V is 5%, which is approximately a one volt change in output voltage.

3.7 SPEAKER AMPLIFIER, Q8, Q9, Q10, Q11 (CP 126 ONLY)

The speaker amplifier is capable of producing 10 watts rms across a 4 ohm load with the standard 3.5 vrms at any receive input terminal.

The first stage, Q8, is a voltage amplifier which is temperature stabilized by CR14. The output of Q8 is developed across the primary of T2 whose secondary feeds Q9 and Q10. Darlington power transistors, Q9 and Q10 are biased to class AB by R64 and Q11. Diode connected Q11 is also a Darlington transistor mounted to a common heat sink with Q9 and Q10 to provide a temperature stabilized bias. Transformer T3 couples the output of Q9 and Q10 to the external load. Feedback is provided from the secondary of T3, terminal 4, to the emitter of Q8. In 14 volt installations the feedback voltage is determined by a resistive divider consisting of R58, R59, R60, and R61. In 28v installations CR16 is turned ON by the DC input voltage through R61 and R62. The AC feedback voltage is then determined by R58, R59, and R60. Thus, in 28 volt installations, R61 is effectively removed from the feedback voltage divider.

3.8 VOLTAGE REGULATOR, Q12 (CP 126 ONLY)

This series pass voltage regulator is voltage referenced by zener diode CR13 and provides a stable voltage to Q8 and the bias network for Darlingtons, Q9 and Q10.

4.1 GENERAL

The electrical maintenance is relatively simple: all components are located on the component drawing that is opposite the schematic that contains test points and test voltages. A troubleshooting chart allows a quick check of symptoms versus the most likely component failure.

The mechanical maintenance is primarily that of, if necessary, the removal and replacement of a switch or lamp.

TROUBLESHOOTING CHART

Symptom	CP 125 or CP 126 Failure	Also check, in CP 126
No speaker or phones audio	Q6 or Q7	
Phones audio but no speaker audio	Q1	Q8 thru Q12, T2 or T3
Speaker audio but no phones audio	Q2, Q4, Q5, or T1	
Phones muting but no speaker muting	Q1	CR17 open
Speaker muting but no phones muting	Q2, CR3 open	
Phones audio but no sidetone audio	Q3	

*This chart is with the presumption that:

1. an audio signal of the proper level is available at the selected input.
2. the proper loads are connected to the amplifier outputs.
3. dc input voltage is supplied to the unit in question.

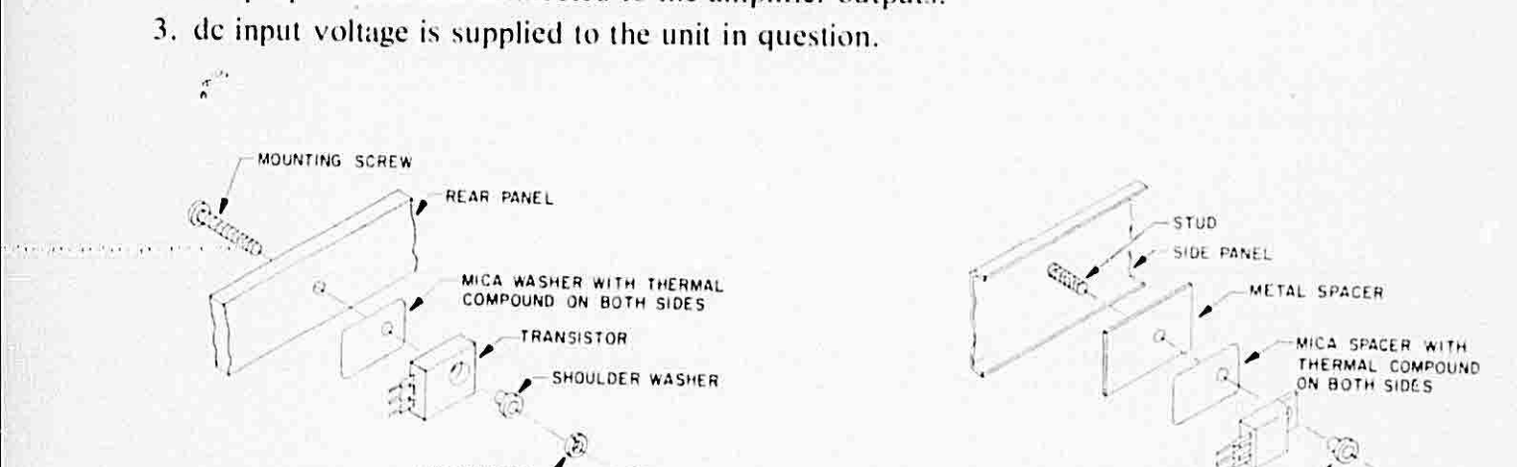


FIGURE 4-1. POWER TRANSISTOR MOUNTING

SEE BLOW-UP

4.2 SWITCH REPLACEMENT

4.2.1 SW1 and SW2

This switch is an interlocked switch assembly. Should either section fail, both sections must be removed and a new assembly installed. Pull the pushbuttons off the shaft.

Care should be taken when desoldering the connections from the PC board. Use minimum heat and a solder sipper to remove all the solder from each pin. Save and reuse the spacers under the switch as they allow for better alignment.

Installation of the new switch is the reverse of the above.

4.2.2 SW3 thru SW8

These switches are basically identical to SW1 and SW2 as far as replacement is concerned. Use the same procedure as above.

4.2.3 SW9

This switch is a toggle switch and it is secured to the panel by a nut and washer that must be removed from the front of the panel. To remove the nut and washer the label must be removed. Carefully lift one corner of the label with a sharp pointed knife and peel off the label. Do not discard it.

Transfer the wires from the defective switch to its replacement, then remove the defective switch. Slip the new switch in place and secure it. Replace the label.

4.3 LAMP REPLACEMENT

The lamps straddle the forward edge of the PC board. When replacing a lamp desolder using minimum heat to avoid damage to the PC runs. Access and replacement of a lamp is as follows:

1. Pull off all the pushbuttons.
2. Remove the four screws that attach the trim panel to the side rails.
3. Carefully pull the trim panel forward to clear the lamps. Note that toggle switch leads need not be removed as there is sufficient lead length to allow work clearance.
4. With the trim panel removed, lamps DS1, DS2, and DS3 are fully accessible.
5. The remaining lamps, DS4 thru DS7, are reflector backed. The reflector is held in position with black silicon rubber that also stops the rearward flow of light. When removing the lamp leads, save the insulating sleeves to allow better positioning of the replaced lamp and prevent shorts.
6. The silicon must be removed to extract the lamp. Carefully, using a sharp pointed knife, cut away the silicon.
7. Install the new lamp, keep the leads short and use the sleeving.
8. Carefully reassemble the lamps, lamp reflectors, and the locking screw into their trim panel recesses. Apply a new dab of black silicon rubber over the rear of the lamp.
9. Replace the four screws and the eight pushbuttons.

CP 125 — CP 126

USED ONLY IN	PART NUMBER	DESCRIPTION
CP 126	57596-0002	SCREW, LOCK
CP 126	57719-0001	PANEL, REAR
CP 126	81221-0001	SPACER, TRANSISTOR
	57598-0001	PANEL, TRIM
	57597-0001	PANEL, SIDE
CP 125	57595-0001	PANEL, REAR
CP 125	57596-0001	SCREW, LOCK
	57593-0001	SPACER, SWITCHES, SPECIAL
	04439-0001	LABEL, MARKER LIGHTS, O M I
	04499-0001	LABEL, PUSHBUTTON STRIP
	83011-0015	INSULATOR, TRAY
	57594-0001	HEATSINK, LAMP, ALUM. STRIP, 3/16" x 3/8"
	57594-0002	HEATSINK, LAMP, ALUM. STRIP, 1/4" x 3/8"
	82819-0103	SCREW, MACH, F. HD SL (BLACK) No. 4-40 x 1/4
	82813-0002	SCREW, MACH, BIND HD SL, No. 2-56 x 3/16
	57619-0001	REFLECTOR AND HEATSINK
	81290-0003	NUT, "U", No. 4
CP 125	82814-0003	SCREW, MACH, BIND HD SL, No. 4-40 x 1/4
	84088-0102	STUD, No. 4-40
	81307-0124	WASHER (SCREW LOCK)
	81192-0007	RETAINING RING, TRUARC
	61577-001	BUTTON, SWITCH, WHITE
	61577-0002	BUTTON, SWITCH, RED
	82802-0001	WASHER, INT. TOOTH
	81329-0002	WASHER, FLAT
	84149-0003	RIVET, FLATHEAD
CP 125	04437-0005	LABEL (TST-ON-OFF)
CP 125	04707-0003	LABEL, TSO, TRAY
CP 125	04707-0001	LABEL, TSO
CP 125	81335-0013	INSULATOR, SHOULDER
	52726-0001	PAD, TRANSISTOR
	82900-0003	NUT, No. 4
	81324-0004	LOCKWASHER, No. 4
CP 126	04437-0006	LABEL (TST-ON-OFF)
CP 126	04707-0003	LABEL, TSO, TRAY
CP 126	04707-0002	LABEL, TSO
CP 126	82814-0008	SCREW, MACH, BIND HD SL, No. 4-40 x 5/8

CP 125 — CP 126

SYMBOL NUMBER	USED ONLY IN	PART NUMBER	DESCRIPTION
C1		23094-0184	CAPACITOR, METALIZED MYLAR, 0.56 MF P/M10%, 200V
C2		23094-0184	CAPACITOR, METALIZED MYLAR, 0.56 MF P/M10%, 200V
C3		23094-0187	CAPACITOR, METALIZED MYLAR, 1.0 MF P/M10%, 200V
C4		23094-0184	CAPACITOR, METALIZED MYLAR, 0.56 MF P/M10%, 200V
C5		23094-0184	CAPACITOR, METALIZED MYLAR, 0.56 MF P/M10%, 200V
C6		23094-0187	CAPACITOR, METALIZED, MYLAR 1.0 MF P/M10%, 200V
C7		21554-0044	CAPACITOR, ELECTROLYTIC, 500 MF, 15V
C8		23094-0184	CAPACITOR, METALIZED MYLAR, 0.56 MF P/M10%, 200V
C9		21554-0044	CAPACITOR, ELECTROLYTIC, 500 MF, 15V
C11		23094-0187	CAPACITOR, METALIZED MYLAR, 1.0 MF P/M10%, 200V
C12		23094-0075	CAPACITOR, METALIZED MYLAR, 0.1 MF P/M10%, 100V
C13		21555-0026	CAPACITOR, SOLID TANTALUM, 10 MF P/M10%, 20V
C14		21555-0054	CAPACITOR, SOLID TANTALUM, 3.3 MF P/M10%, 35V
C15		21291-0025	CAPACITOR, DISC CERAMIC, 430 PF P/M 10%, 500
C16		21291-0025	CAPACITOR, DISC CERAMIC, 430 PF P/M10%, 500V
C18		21291-0025	CAPACITOR, DISC CERAMIC, 430 PF P/M10%, 500V
C19		21291-0025	CAPACITOR, DISC CERAMIC, 430 PF P/M 10%, 500V
C20		21555-0028	CAPACITOR, SOLID TANTALUM, 15 MF P/M10%, 20V
C21		21555-0056	CAPACITOR, SOLID TANTALUM, 4.7 MF P/M 10%, 35V
C23		21554-0019	CAPACITOR, ELECTROLYTIC, 100 MF, 18V
C24	CP 126	23094-0075	CAPACITOR, METALIZED MYLAR, 0.1 MF P/M10%, 100V
C25	CP 126	21555-0048	CAPACITOR, SOLID TANTALUM, 1.0 MF P/M10%, 35V
C26	CP 126	23094-0075	CAPACITOR, METALIZED MYLAR, 0.1 MF P/M 10%, 100V
C27	CP 126	21554-0010	CAPACITOR, ELECTROLYTIC, 20 MF, 35V
C28	CP 126	21554-0034	CAPACITOR, ELECTROLYTIC, 100 MF, 35V
CR1		75204-0045	DIODE, SILICON
CR2		75027-0004	DIODE, SILICON, ZENER, 5.6V
CR3		75204-0045	DIODE, SILICON
CR4		75204-0045	DIODE, SILICON
CR5		75204-0045	DIODE, SILICON
CR6		75204-0045	DIODE, SILICON
CR7	CP125	75204-0045	DIODE, SILICON
CR8	CP 125	75204-0045	DIODE, SILICON
CR9		75204-0045	DIODE, SILICON
CR10		75204-0045	DIODE, SILICON
CR11		75204-0045	DIODE, SILICON
CR12	CP 126	75204-0045	DIODE, SILICON
CR13	CP 126	75025-0003	DIODE, SILICON, ZENER, 11V
CR14	CP 126	75019-0004	DIODE, SILICON

P/M means Plus or Minus

CP 125 — CP 126

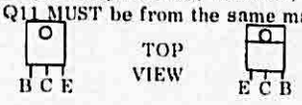
SYMBOL NUMBER	USED ONLY IN	PART NUMBER	DESCRIPTION
CR15		75028-0001	DIODE, SILICON
CR16	CP 126	75025-0009	DIODE, SILICON, ZENER, 18V
CR17	CP 126	75204-0045	DIODE, SILICON
DS1		12000-0014	LAMP, MARKER, 5.0V .115 AMPS
DS2		12000-0014	LAMP, MARKER, 5.0V .115 AMPS
DS3		12000-0014	LAMP, MARKER, 5.0V .115 AMPS
DS4		12000-0027	LAMP, PILOT, 14.0V .065 AMPS
DS5		12000-0027	LAMP, PILOT, 14.0V .065 AMPS
DS6		12000-0027	LAMP, PILOT, 14.0V .065 AMPS
DS7		12000-0027	LAMP, PILOT, 14.0V .065 AMPS
L1		11487-0001	CHOKE
Q1		75550-0007	TRANSISTOR, SILICON, NPN
Q2		75550-0007	TRANSISTOR, SILICON, NPN
Q3		75565-0003	TRANSISTOR, SILICON, PNP
Q4		75550-0007	TRANSISTOR, SILICON, NPN
Q5		75536-0001	TRANSISTOR, SILICON, NPN
Q6		75536-0001	TRANSISTOR, SILICON, NPN
Q7		75576-0001	TRANSISTOR, SILICON, NPN
Q8	CP 126	75561-0020	TRANSISTOR, SILICON, NPN
Q9	CP 126	75638-0002	TRANSISTOR, SILICON, NPN
Q10	CP 126	75638-0002	TRANSISTOR, SILICON, NPN
Q11	CP 126	75638-0002	TRANSISTOR, SILICON, NPN
Q12	CP 126	75576-0001	TRANSISTOR, SILICON, NPN

CAUTION

Q9, Q10, Q11.....P/N 75638-0002

This part now supplied by two manufacturers.
Motorola..... 2N6044
Texas Instrument... TIP 121

Either part may be used, however, Q9, Q10, and Q11 MUST be from the same manufacturer.



Motorola Texas Inst.
Note lead differences!

R1		32054-0002	RESISTOR, VARIABLE, 470 OHMS
R2		32054-0002	RESISTOR, VARIABLE, 470 OHMS
R3		32054-0002	RESISTOR, VARIABLE, 470 OHMS
R4		32054-0002	RESISTOR, VARIABLE, 470 OHMS
R5		32054-0002	RESISTOR, VARIABLE, 470 OHMS

P/M means Plus or Minus

CP 125 — CP 126

SYMBOL NUMBER	USED ONLY IN	PART NUMBER	DESCRIPTION
R6		32054-0002	RESISTOR, VARIABLE, 470 OHMS
R7		31192-0472	RESISTOR, FIXED COMPOSITION, 4.7K P/M10%, ¼W
R8		31192-0472	RESISTOR, FIXED COMPOSITION, 4.7K P/M10%, ¼W
R9		31192-0472	RESISTOR, FIXED COMPOSITION, 4.7K P/M10%, ¼W
R10		31192-0472	RESISTOR, FIXED COMPOSITION, 4.7K P/M10%, ¼W
R11		31192-0472	RESISTOR, FIXED COMPOSITION, 4.7K P/M10%, ¼W
R12		31192-0472	RESISTOR, FIXED COMPOSITION, 4.7K P/M10%, ¼W
R13		31192-0472	RESISTOR, FIXED COMPOSITION, 4.7K P/M10%, ¼W
R14		31192-0472	RESISTOR, FIXED COMPOSITION, 4.7K P/M10%, ¼W
R16		31192-0103	RESISTOR, FIXED COMPOSITION, 10K P/M10%, ¼W
R17		31192-0182	RESISTOR, FIXED COMPOSITION, 1.8K P/M10%, ¼W
R18		31192-0102	RESISTOR, FIXED COMPOSITION, 1K P/M10%, ¼W
R19		31192-0103	RESISTOR, FIXED COMPOSITION, 10K P/M10%, ¼W
R20		31192-0102	RESISTOR, FIXED COMPOSITION, 1K P/M10%, ¼W
R21		31192-0103	RESISTOR, FIXED COMPOSITION, 10K P/M10%, ¼W
R22		31192-0103	RESISTOR, FIXED COMPOSITION, 10K P/M10%, ¼W
R23		31192-0102	RESISTOR, FIXED COMPOSITION, 1K P/M10%, ¼W
R24		31192-0182	RESISTOR, FIXED COMPOSITION, 1.8K P/M10%, ¼W
R25		31192-0471	RESISTOR, FIXED COMPOSITION, 470 P/M10%, ¼W
R26		31192-0471	RESISTOR, FIXED COMPOSITION, 470 P/M10%, ¼W
R27		31192-0333	RESISTOR, FIXED COMPOSITION, 33K P/M10%, ¼W
R28		31192-0103	RESISTOR, FIXED COMPOSITION, 10K P/M10%, ¼W
R29		31192-0220	RESISTOR, FIXED COMPOSITION, 22 P/M10%, ¼W
R30		31161-0009	RESISTOR, FIXED WIREWOUND, 500 P/M5%, 3W
R32		31192-0471	RESISTOR, FIXED COMPOSITION, 470 P/M10%, ¼W
R33		31141-0569	RESISTOR, FIXED COMPOSITION, 5.5 P/M10%, ½W
R34		31192-0153	RESISTOR, FIXED COMPOSITION, 15K P/M10%, ¼W
R35		31141-0331	RESISTOR, FIXED COMPOSITION, 330 P/M10%, ½W
R36		31192-0470	RESISTOR, FIXED COMPOSITION, 47 P/M10%, ¼W
R37		31141-0331	RESISTOR, FIXED COMPOSITION, 330 P/M10%, ½W
R38		31192-0470	RESISTOR, FIXED COMPOSITION, 47 P/M10%, ¼W
R39		31141-0151	RESISTOR, FIXED COMPOSITION, 150 P/M10%, ½W
R40		31141-0151	RESISTOR, FIXED COMPOSITION, 150 P/M10%, ½W

P/M means Plus or Minus

CP 125 — CP 126

SYMBOL NUMBER	USED ONLY IN	PART NUMBER	DESCRIPTION
R41		31141-0151	RESISTOR, FIXED COMPOSITION, 150 P/M10%, ½W
R42		31192-0392	RESISTOR, FIXED COMPOSITION, 3.9K P/M10%, ¼W
R43		31192-0331	RESISTOR, FIXED COMPOSITION, 330 P/M10%, ¼W
R44		31192-0123	RESISTOR, FIXED COMPOSITION, 12K P/M10%, ¼W
R45		31192-0223	RESISTOR, FIXED COMPOSITION, 22K P/M10%, ¼W
R46		31192-0103	RESISTOR, FIXED COMPOSITION, 10K P/M10%, ¼W
R47		31192-0182	RESISTOR, FIXED COMPOSITION, 1.8K P/M10%, ¼W
R48		31192-0102	RESISTOR, FIXED COMPOSITION, 1.0K P/M10%, ¼W
R49		31162-0001	RESISTOR, FIXED WIREWOUND, 75 P/M5%, 5W
R50		31161-0019	RESISTOR, FIXED WIREWOUND, 33 P/M5%, 3W
R51		31192-0122	RESISTOR, FIXED COMPOSITION, 1.2K P/M10%, ¼W
R52		31192-0472	RESISTOR, FIXED COMPOSITION, 4.7K P/M10%, ¼W
R53		31192-SEL	RESISTOR, FIXED COMPOSITION, SEL P/M10%, ¼W
R55	CP 126	31195-0103	RESISTOR, FIXED COMPOSITION, 10K P/M5%, ¼W
R56	CP 126	31195-0471	RESISTOR, FIXED COMPOSITION, 470 P/M5%, ¼W
R57	CP 126	31192-0101	RESISTOR, FIXED COMPOSITION, 100 P/M10%, ¼W
R58	CP 126	31195-0391	RESISTOR, FIXED COMPOSITION, 390 P/M5%, ¼W
R59	CP 126	31192-0221	RESISTOR, FIXED COMPOSITION, 220 P/M10%, ¼W
R60	CP 126	31192-0182	RESISTOR, FIXED COMPOSITION, 1.8K P/M10%, ¼W
R61	CP 126	31192-0471	RESISTOR, FIXED COMPOSITION, 470 P/M10%, ¼W
R62	CP 126	31192-0101	RESISTOR, FIXED COMPOSITION, 100 P/M10%, ¼W
R63	CP 126	31161-0009	RESISTOR, FIXED WIREWOUND, 500 P/M5%, 3W
R64	CP 126	31141-0471	RESISTOR, FIXED COMPOSITION, 470 P/M10%, ½W
S1		61574-0003	SWITCH, SLIDE, PUSHBUTTON
S2		PART OF S-1	
S3		61574-0002	SWITCH, SLIDE PUSHBUTTON
S4		61574-0001	SWITCH, SLIDE, PUSHBUTTON
S5		61574-0001	SWITCH, SLIDE, PUSHBUTTON
S6		61574-0001	SWITCH, SLIDE, PUSHBUTTON
S7		61574-0001	SWITCH, SLIDE, PUSHBUTTON
S8		61574-0001	SWITCH, SLIDE, PUSHBUTTON
S9		61575-0001	SWITCH, TOGGLE
T1		11785-0001	TRANSFORMER, TRANSISTOR DRIVER
T2	CP 126	11745-0001	TRANSFORMER, DRIVER
T3	CP 126	11848-0001	TRANSFORMER, OUTPUT

P/M means Plus or Minus

The following data pertains to all the schematics of the CP 125/126 TSO, unless otherwise noted.

DC VOLTAGES:

1. No AC input.
2. A+ input is 13.75 vdc.
3. No connection to J1B-1 or J1B-2.
4. Voltage regulator output,
   a) absolute DC voltage output of Q7 will depend upon selection of R53.
   b) 27.5 vdc input will increase regulators output voltage by approximately 0.5 vdc.
5. Measurement tolerance is ±10%.

RECEIVE AC VOLTAGES:

1. All voltages are in Vrms.
2. Audio input of 3.5 vrms at 1KHz to COM 1, J1A15.
3. Input level controls set for maximum sensitivity, max. CCW.

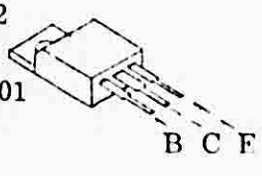
TRANSMIT AC VOLTAGES:

1. All voltages are in Vrms.
2. Audio input of 3.5 vrms at 1KHz to COM 1 sidetone, J1B5.
3. Terminal J1A3 grounded.

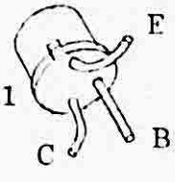
DC Volts REC.
DC Volts TRANS.

AC Volts REC. 14/28V
AC Volts Trans.

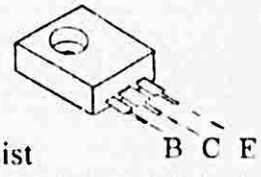
Q7, Q12
2N5494
75576-0001



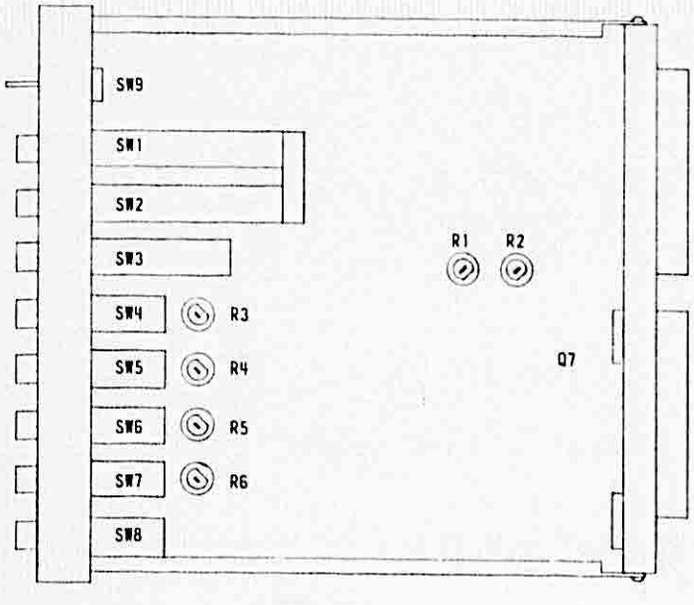
Q5, Q6
2N3053
75536-0001



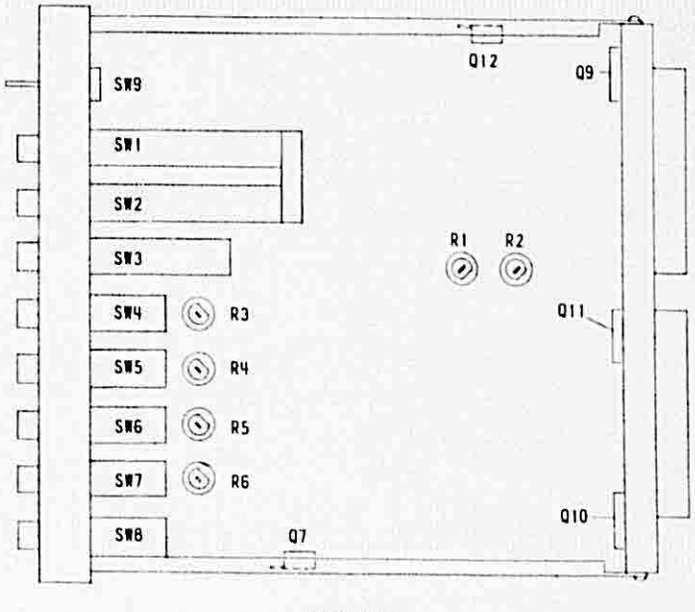
Q9, Q10, Q11
2N6044
75638-0002



*See Parts List

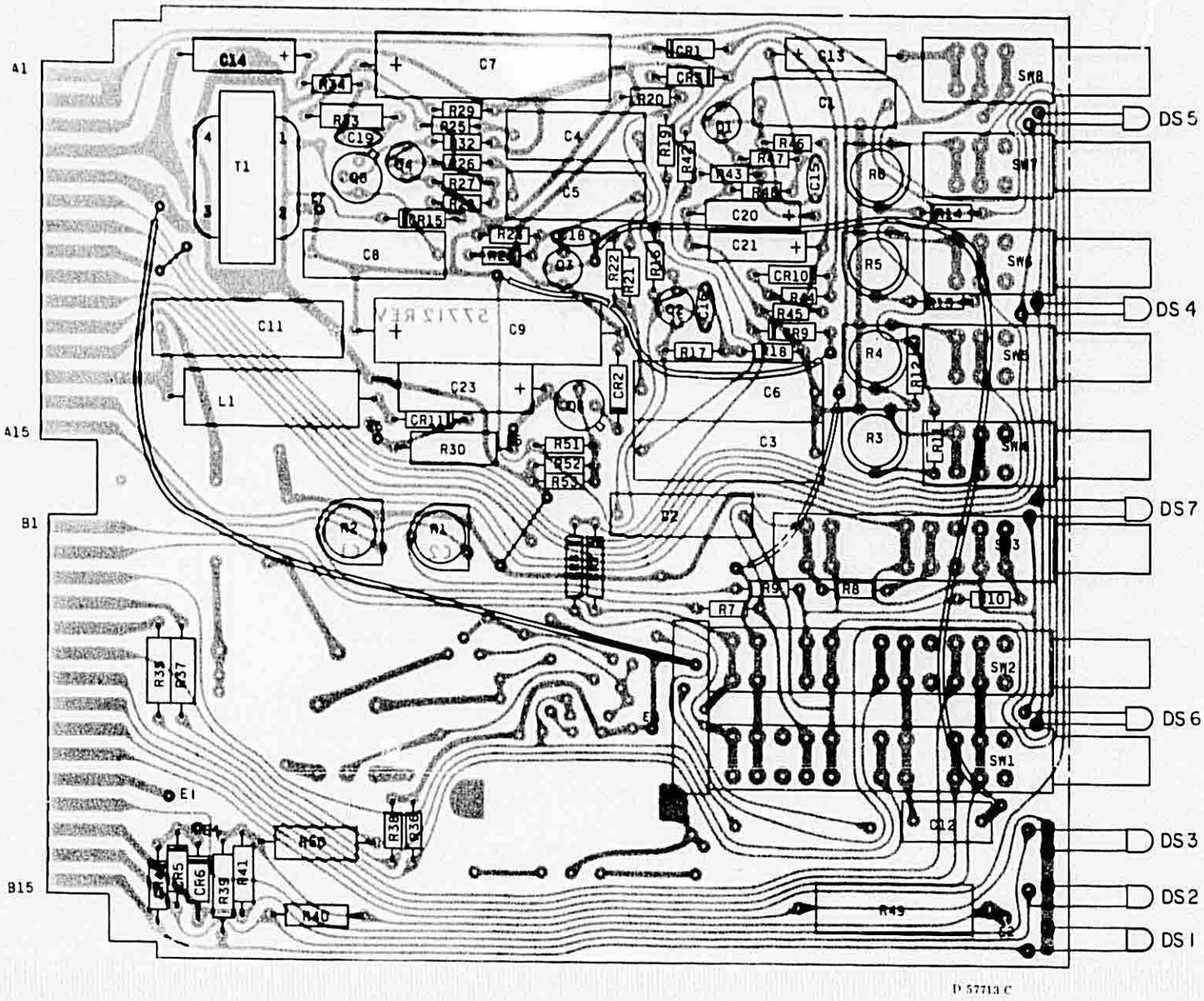


CP 125



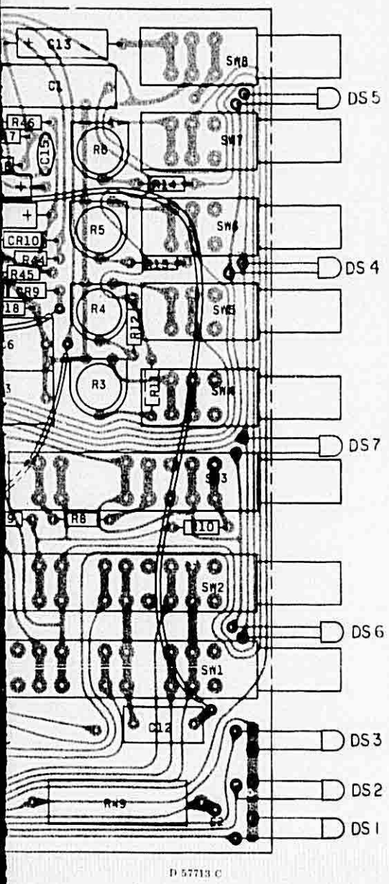
CP 126

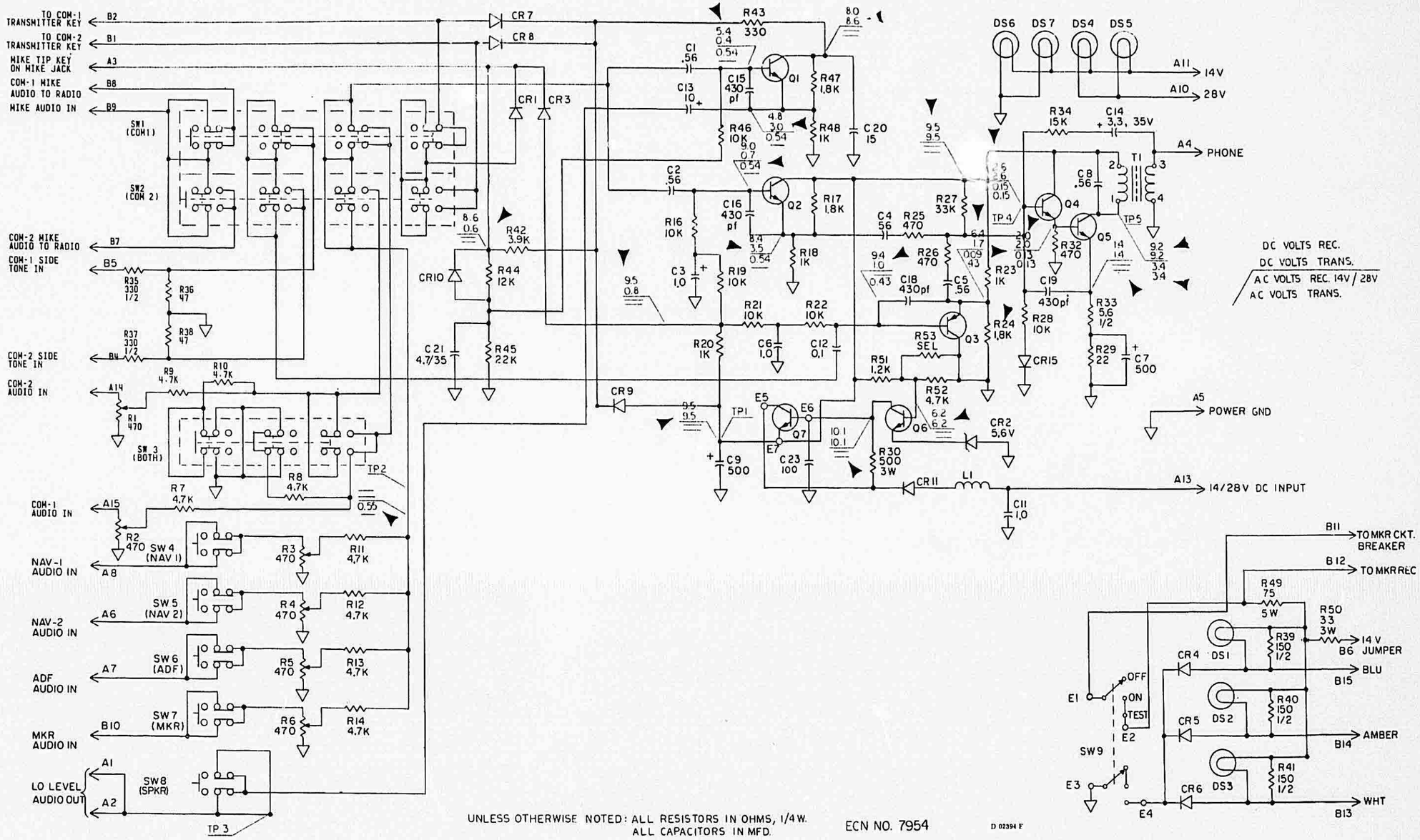
FIGURE 6-1. TRANSISTORS



CP 125

SEE BLOW-UP





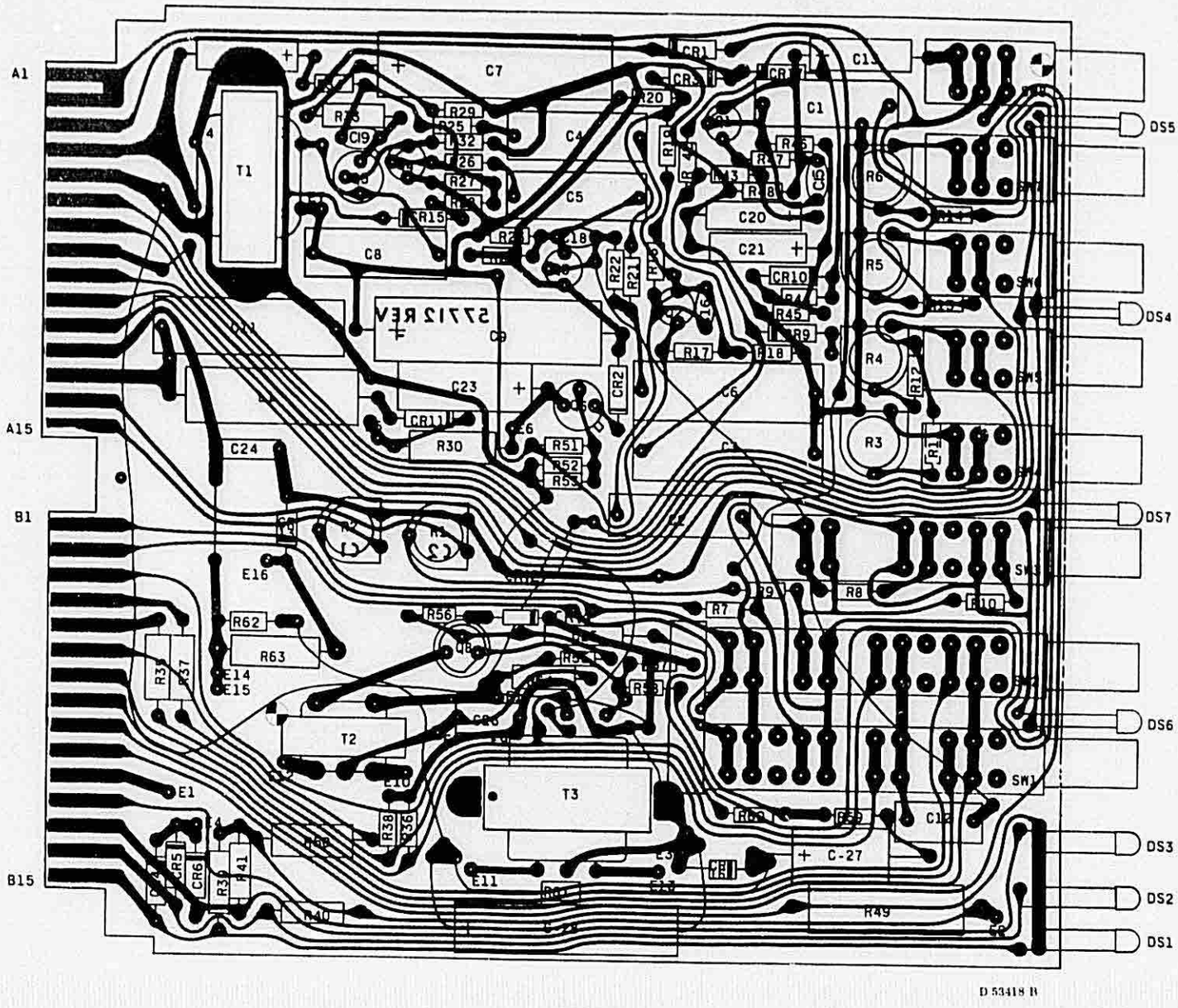
UNLESS OTHERWISE NOTED: ALL RESISTORS IN OHMS, 1/4 W.
ALL CAPACITORS IN MFD.

ECN NO. 7954

D 02394 F

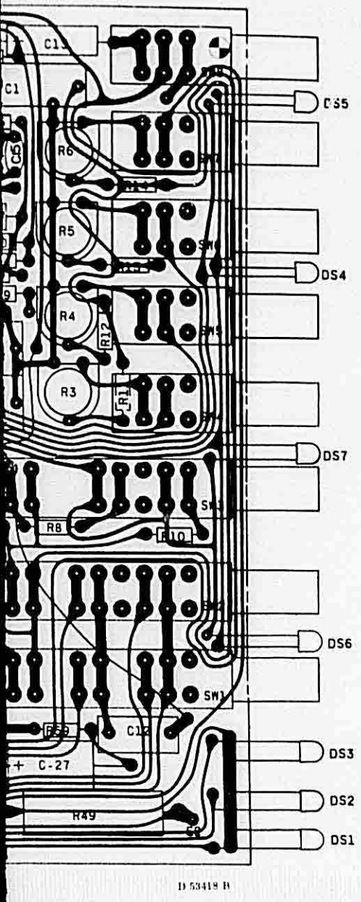
FIGURE 6-2. CP 125 SCHEMATIC

SEE BLOW-UP



CP 126

SEE BLOW-UP



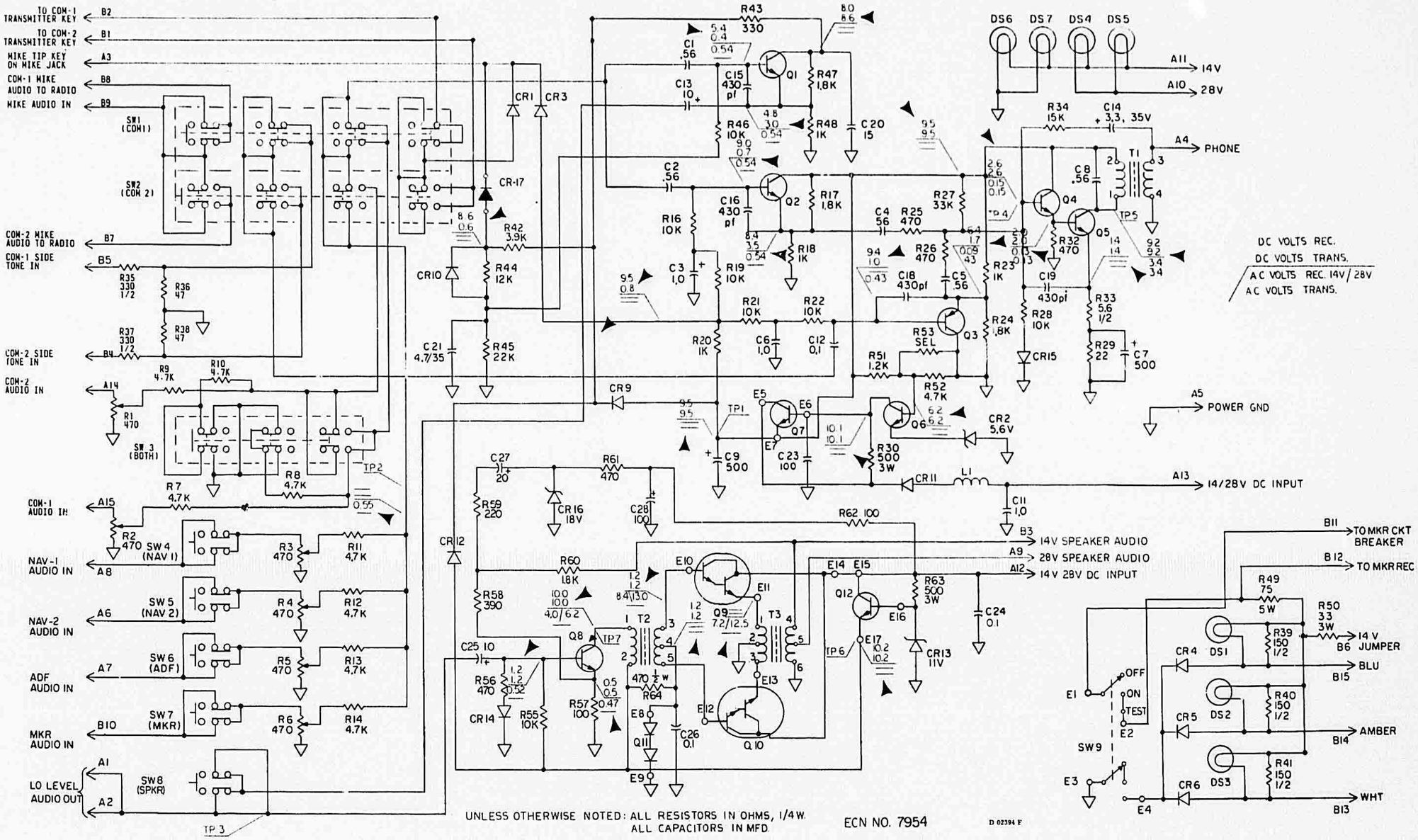


FIGURE 6-3. CP 126 SCHEMATIC

SEE BLOW-UP

7.1 PURPOSE OF EQUIPMENT

The CP125A and CP126A Audio Panels differ from the CP125 and CP126 only in their marker beacon circuits. These Units are designed to compliment the Narco MKR101R Remote Mounted Marker Beacon Receiver by providing marker beacon lamps and selection of LO or HI sensitivity or lamp test. Audio circuitry and component location remain as in the CP125 and CP126.

7.2 ORDERING INFORMATION

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

The top listing is used for ordering Units, refer to the Units Part Number and its Unit Description. There is no need to order an Installation Kit as it is automatically included with its associated Unit.

The bottom listing may be used for ordering additional Kits or detail parts of the Kit. The quantity column lists the quantity of each part in the Kit.

Unit Part Number	Unit and Description	Supplied with Installation Kit Part Number
03718-0302	CP125A, Audio Panel (TST-HI-LO)	03718-0500
03718-0303	CP126A, Audio Panel (TST-HI-LO)	03718-0501

Installation Kit Parts List 03718

Description	Item Part No.	0500 Quantity	0501 Quantity	0502 Quantity
Connector, PC, Housing	41316-0007	2	2	-
Contact, Crimp Type	41317-0001	36	36	-
Clamp, Cable	82019-0002	2	2	-
Screw, Mach., Bd., Hd., Sl. #6-32	82815-0007	1	1	-
Washer, Lock, Int. Tooth, #6	82802-0005	3	3	-
Nut, Hex, #6-32	82900-0008	4	4	-
Screw, Mach., Bd., Hd., Sl., #4-40	82814-0004	3	3	-
Screw, Mach., Fl., Hd., Sl., #6-32	82977-0007	2	2	-
Washer, Flat, Special	81307-0119	1	1	-
Spacer, General	81213-0034	1	1	-
Washer, Lock, Split, #4	81324-0004	3	3	-
Label, Logo (Blank)	04437-0007	1	-	-
Label, Marker Lights (Blank)	04497-0001	1	1	-
Label, Set (Switch Ident)	04500-0001	1	1	-
Spacer, Pad	99090-0002	2	2	-
Label, Logo, Transmit Monitor	04437-0009	1	-	-
Label, Transmit Monitor Lamps	04439-0002	1	1	-
Label, Logo (Blank)	04437-0008	-	1	-
Label, Logo Transmit Monitor	04437-0010	-	1	-
Lug, Solder	81702-0004	1	1	-
Label, CP125, TST-ON-OFF	04437-0015	-	-	1
Label, CP126, TST-ON-OFF	04437-0016	-	-	1
Label, Modification Statement	04810-0002	-	-	1
Resistor, 75 ohms ± 5%, 5w	31162-0001	-	-	1
Resistor, 33 ohms ± 5%, 3w	31161-0019	-	-	1
Label, Tray, CP125	04727-0001	-	-	1
Label, Tray, CP126	04727-0002	-	-	1

7.3 INSTALLATION OF CP125A or CP126A

7.3.1 Mechanical:

External dimensions, mounting requirements, and procedures are identical to those of the CP125 and CP126; see Section 2.

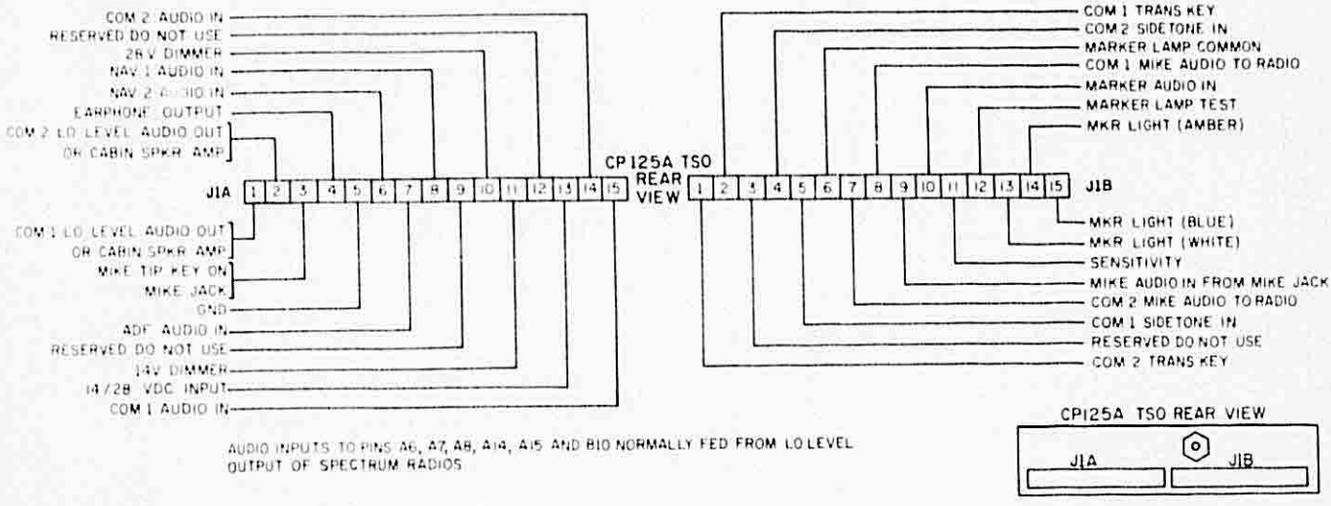
7.3.2 Electrical

Except for the following, all external electrical connections are as shown in Section 2.

Connector	CP 125/126	CP 125A/126A
J1B-6	14V Jumper	Lamp Common
J1B-11	A+ Input	Sensitivity
J1B-12	A+ To Marker	Marker Lamp Test

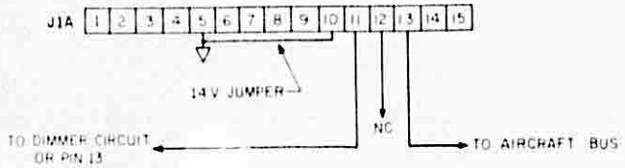
Refer to Figures 7-1, 7-2, and 7-3 for general installation wiring and Figure 7-4 for wiring to a MKR101R.

Caution: Do not insert a CP125A or CP126A into an installation wired for a CP125 or CP126, with marker TST-ON-OFF, without modifying the "A" per Section 7.8.

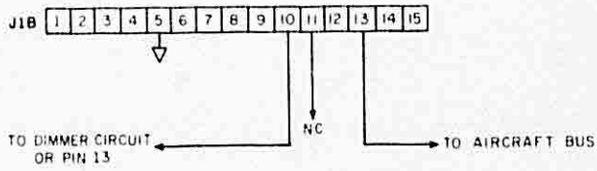


AUDIO INPUTS TO PINS A6, A7, A8, A14, A15 AND B10 NORMALLY FED FROM LO LEVEL OUTPUT OF SPECTRUM RADIOS.

AUDIO OUTPUT FROM A1 AND A2 IS A 0.5 V RMS SIGNAL THAT IS FED INTO THE AUX AUDIO INPUT OF SPECTRUM LINE (COM) TRANSCEIVERS USED AS THE CABIN SPEAKER AMPLIFIERS, OR INTO A SEPERATE CABIN SPEAKER AMPLIFIER UNIT. REFER TO THE RECOMMENDED SYSTEMS WIRING DIAGRAMS.



14 VOLT OPERATOR



28 V OPERATION WITH SPECTRUM RADIOS AND COM RADIOS OPERATING VIA A 28 TO 14V CONVERTER, SUCH AS MK 16

Figure 7-1, CP125A General Installation Wiring

SEE BLOW-UP

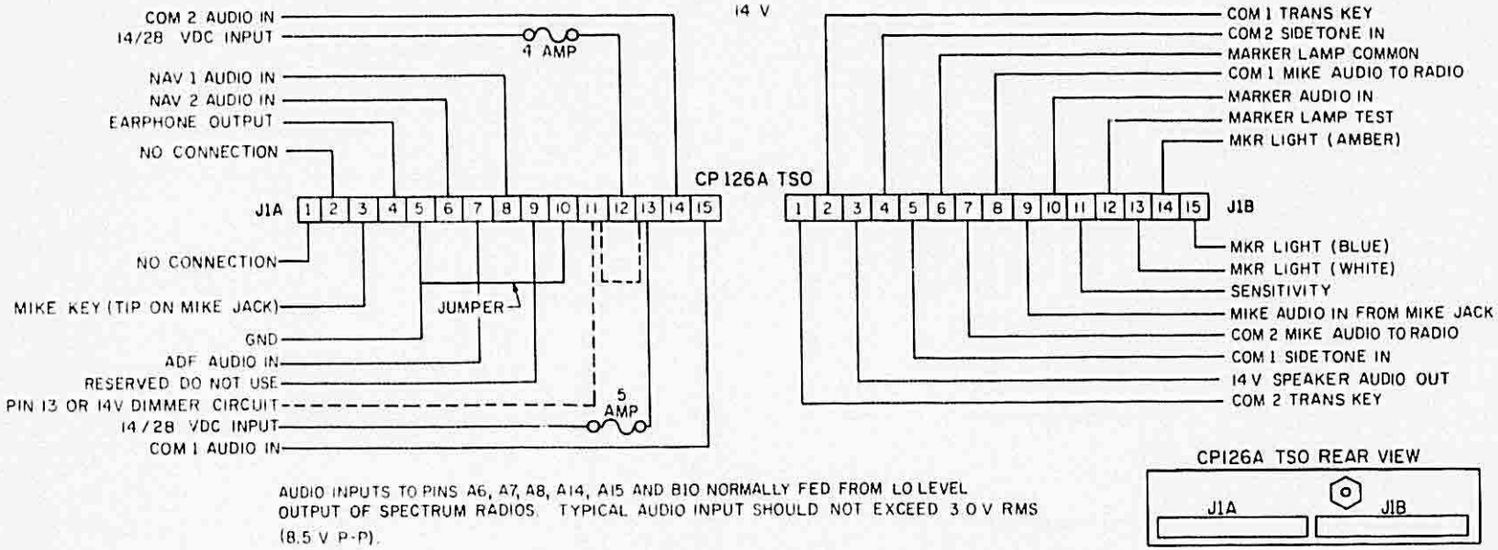


Figure 7-2, 14V CP126A General Installation Wiring

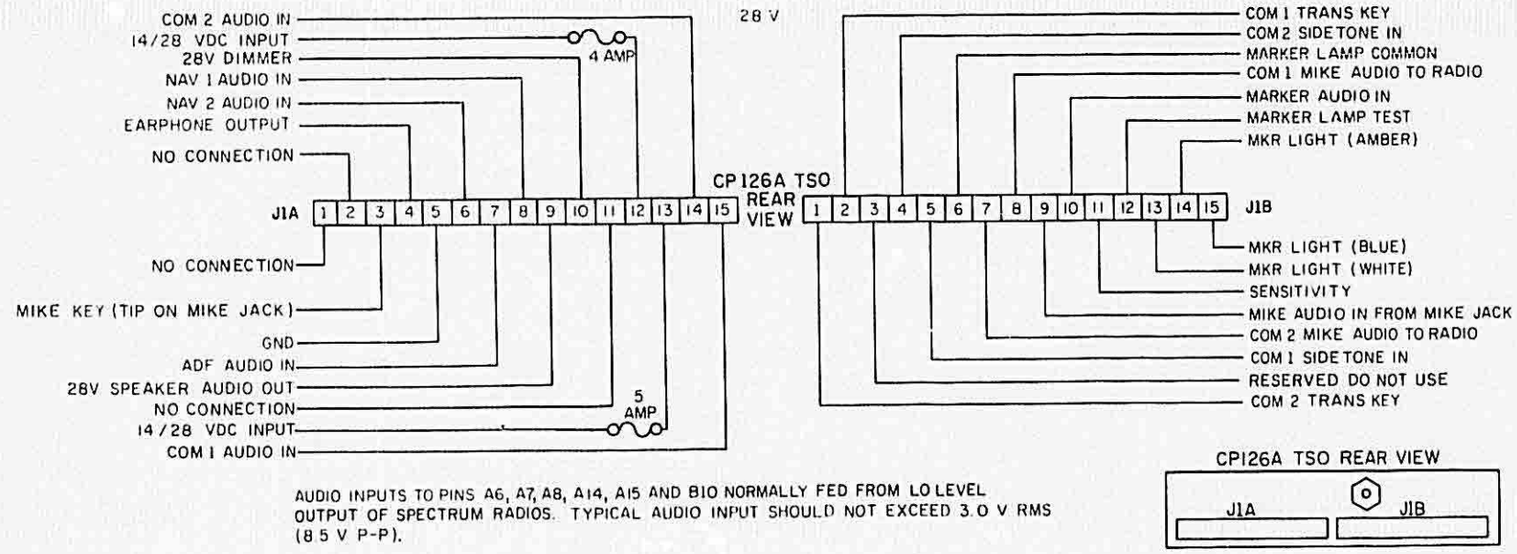
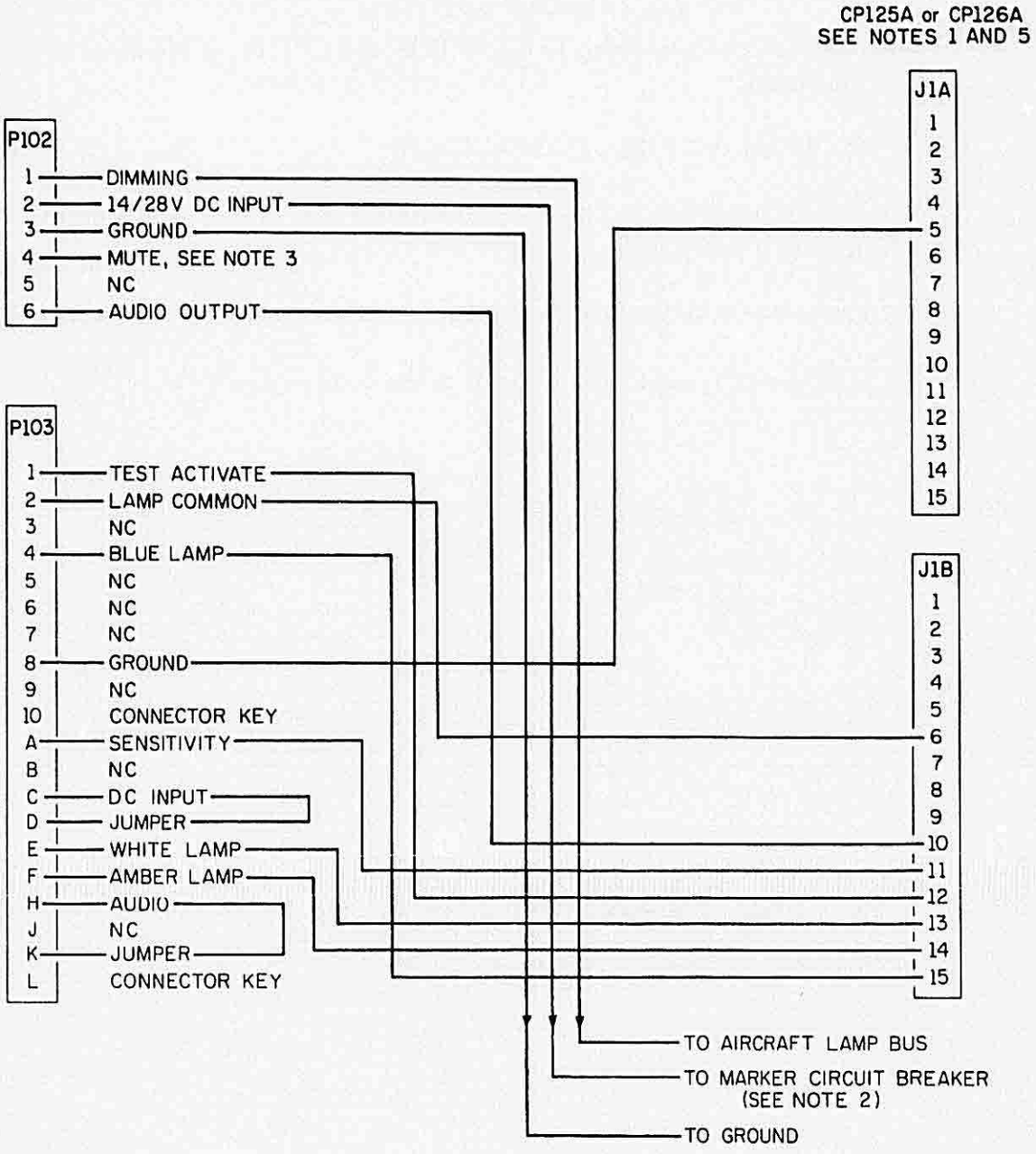


Figure 7-3, 28V CP126A General Installation Wiring

SEE BLOW-UP

MKR101R

P101 ANTENNA COAX CABLE (RG58A/U) TO MARKER BEACON ANTENNA.
TO BE SUPPLIED BY INSTALLING AGENCY.



NOTES:

1. REFER TO CP125/CP126 INSTALLATION MANUAL FOR REMAINING J1A AND J1B CONNECTIONS.
2. MKR101R CIRCUIT BREAKER SHOULD BE 1 AMPERE.
3. IF MARKER AUDIO MUTING IS DESIRED REFER TO SECTION 2.5.3. OF THE MKR101 MAINTENANCE MANUAL.
4. MARKER AUDIO VOLUME SET BY R142; USE A JEWELERS STRAIGHT SLOT SCREWDRIVER WITH A BLADE WIDTH OF 3/32".

Figure 7-4, Wiring Diagram MKR101R to CP125A or CP126A

7.4 REPLACEMENT PARTS LIST

For part replacement, refer to Section 5.

7.5 MAINTENANCE

All maintenance data pertaining to the CP125A and CP126A is identical to that found in Section 4.

7.6 MBT-R TO CP125A or CP126A COMPATABILITY

The "A" version audio panels may be used with the MBT-R Marker Beacon Receiver if the following is performed:

A. Order-Modification Kit, Audio Panel Marker Beacon Circuit 03718-0502

B. From the Kit, install two resistors as shown in Figure 7-5.

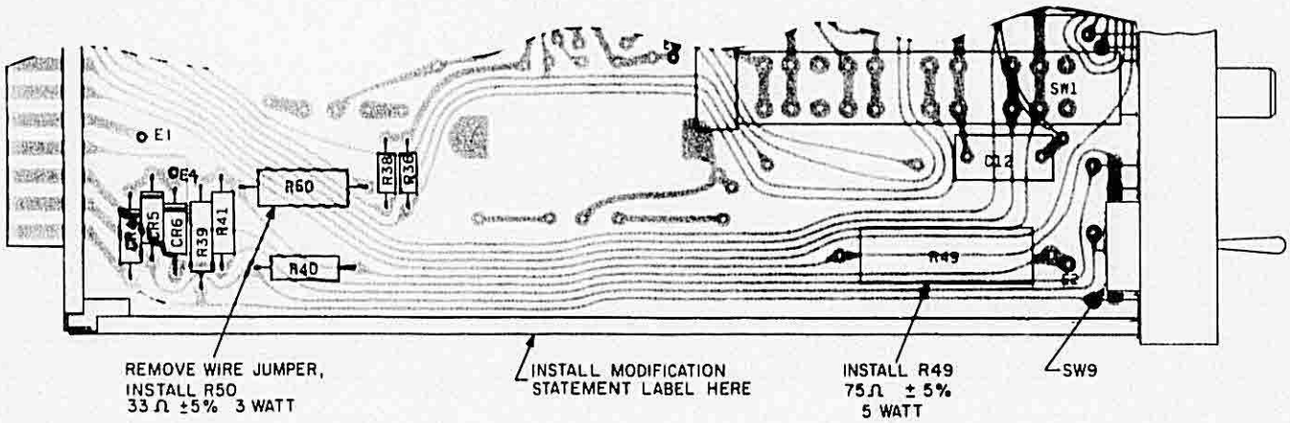


Figure 7-5 CP125A of CP126A Top View

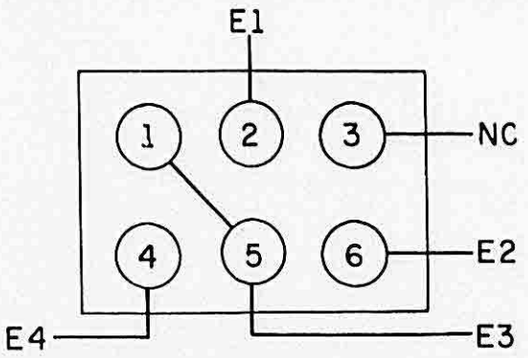
SEE BLOW-UP

7.6 Continued

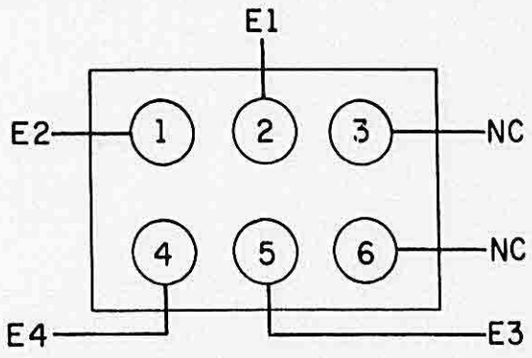
C. Modify the wiring of SW9 as follows:

1) Remove wire jumper between 1 and 5.

2) Move wire from 6 to 1.



SW9 REAR VIEW
CP125A OR CP126A
TST–HI–LO



SW9 REAR VIEW
CP125 OR CP126
TRANSMIT MONITOR

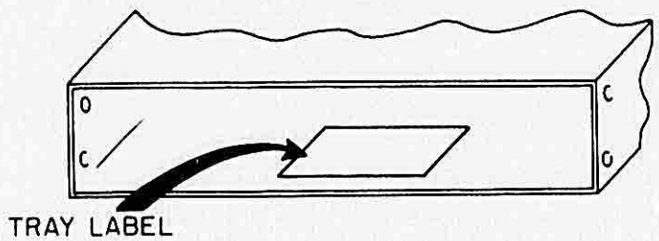
D. Label Changes

From the Kit:

1) Install the CP125 or CP 126 TST-ON-OFF label over the existing "A" label.

2) Install Modification Statement label as shown in Figure 7-5.

3) On the lower inside lip of the mounting tray, install a white paper CP125 or CP126 tray label.



TRAY LABEL

7.6 Continued

E. Installation wiring of the MBT-R to Audio Panel connector J1B will be that shown in Section 2. Note that the audio panel now controls Marker Beacon Receiver OFF-ON-TST.

7.7 Transmit Monitor Modifications

The "A" version audio panel marker lamps may be used as transmit monitor lamps if the following is performed.

A. Order-Modification Kit, Audio Panel Marker Beacon Circuit 03718-0502.

B. From the Kit, install two resistors as shown in Figure 7-6.

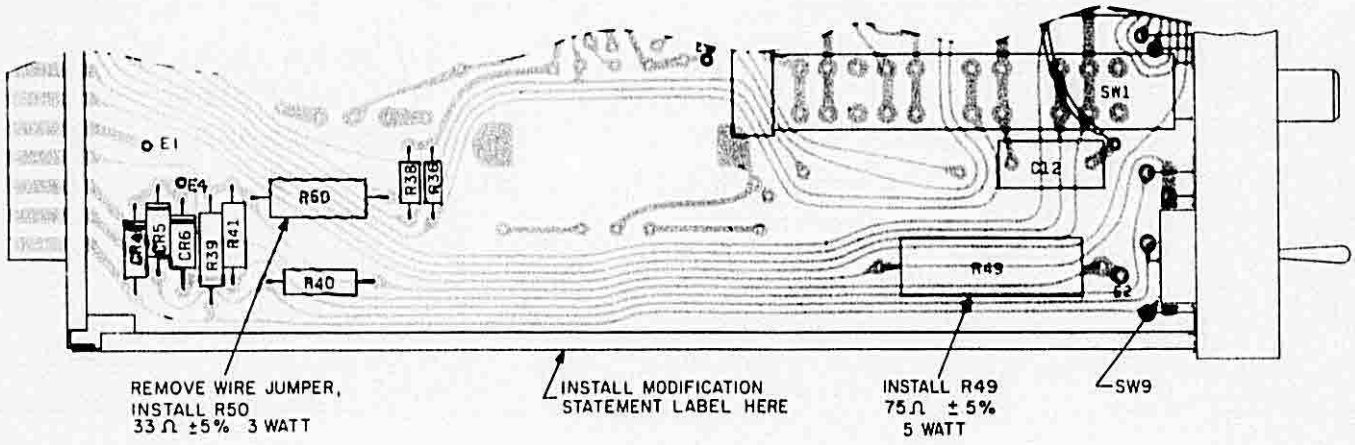


Figure 7-6, CP125A or CP126A Top View

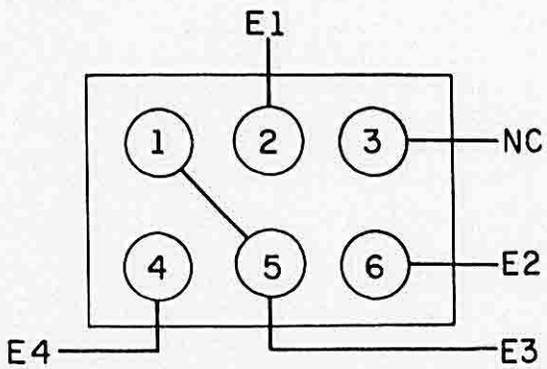
SEE BLOW-UP

7.7 Continued

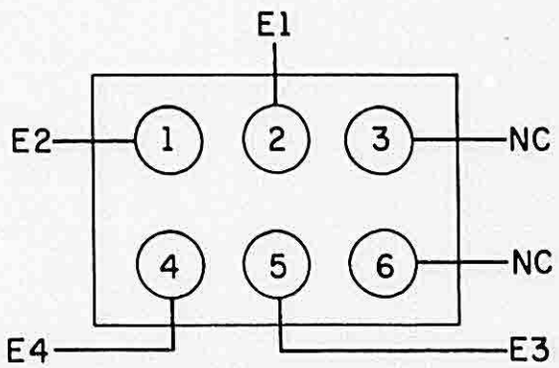
C. Modify the wiring of SW9 as follows:

1) Remove wire jumper from 1 to 5.

2) Move wire from 6 to 1.



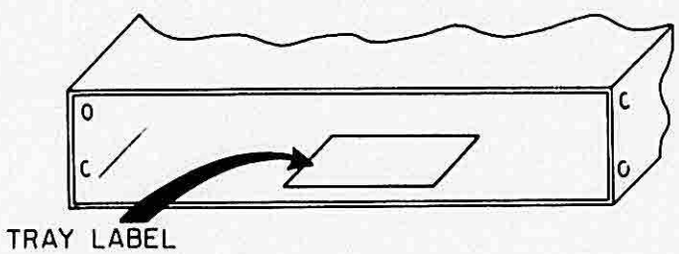
SW9 REAR VIEW
CP125A OR CP126A
TST – HI – LO



SW9 REAR VIEW
CP125 OR CP126
TST – ON – OFF

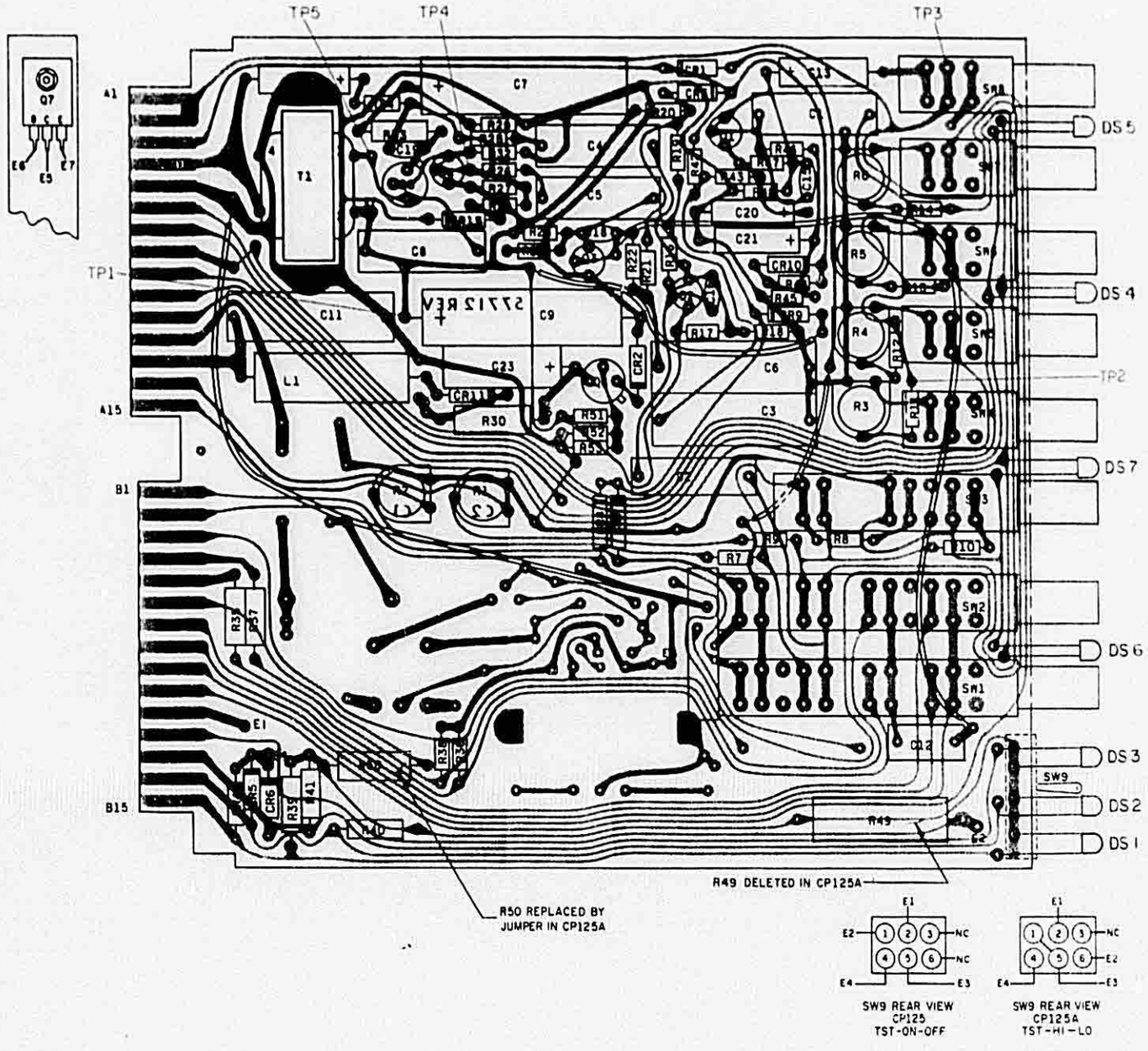
D. Label Changes

On the lower inside lip of the mounting tray, install a white paper CP125 or CP126 tray label.



TRAY LABEL

E. Refer to Section 2 for correct labeling and external wiring.


TP5
TP4
TP3
TP1
TP2
A1
A15
B1
B15
E1
Q7
E6
E5
E7
T1
L1
C7
C4
C5
C8
C9
C11
C23
C6
C3
C20
C21
C13
R30
R49
R50
SW9
SW1
SW2
SW3
SW4
SW5
SW8
DS5
DS4
DS7
DS6
DS3
DS2
DS1
R49 DELETED IN CP125A
R50 REPLACED BY JUMPER IN CP125A
E1
E2
E3
E4
NC
NC
SW9 REAR VIEW CP125 TST-ON-OFF
SW9 REAR VIEW CP125A TST-HI-LO

SEE BLOW-UP

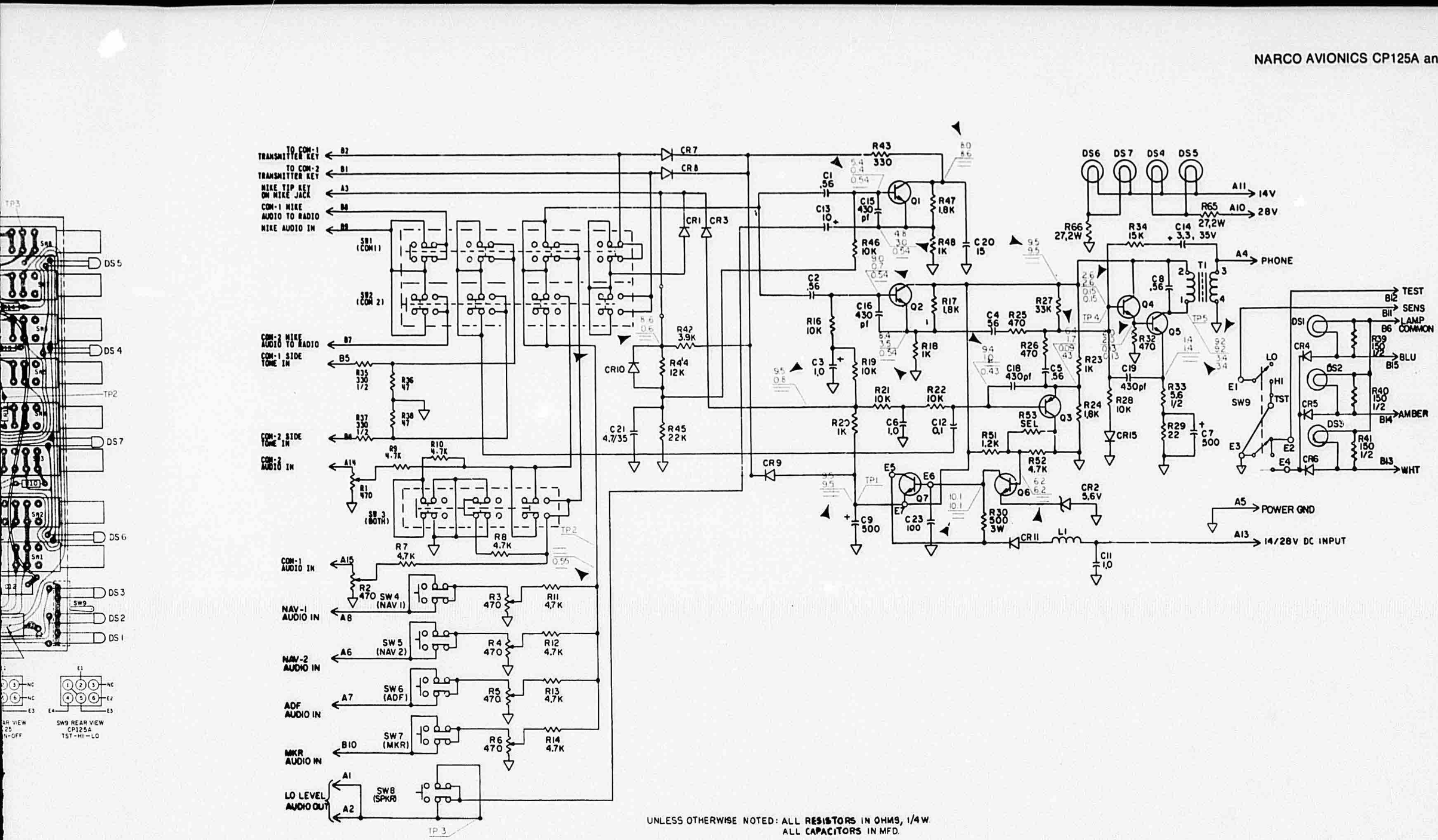
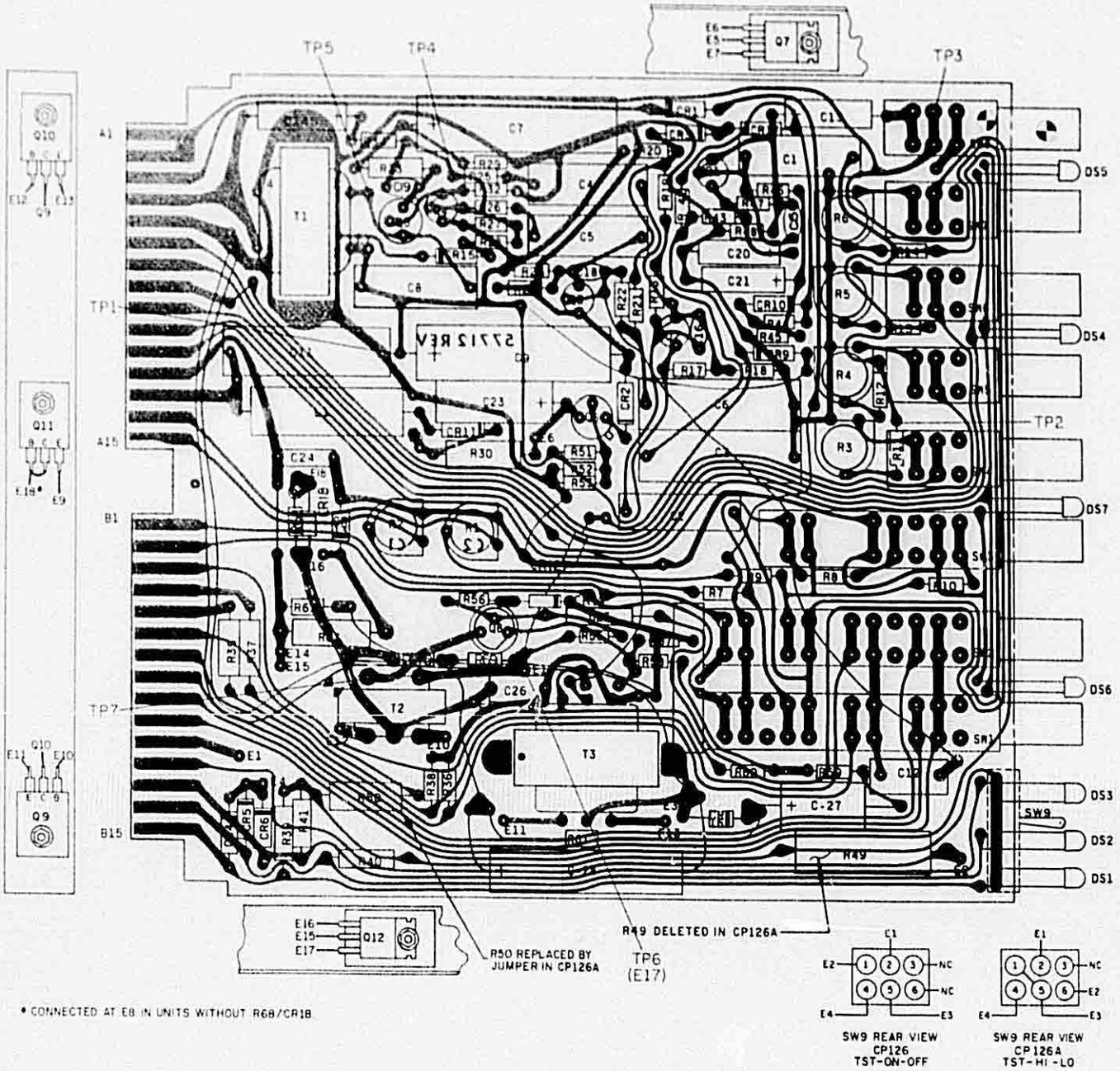


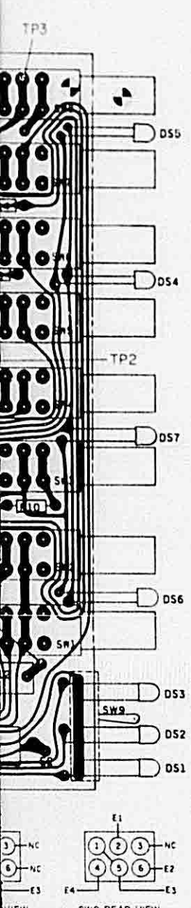
Figure 7-7, CP125A Schematic

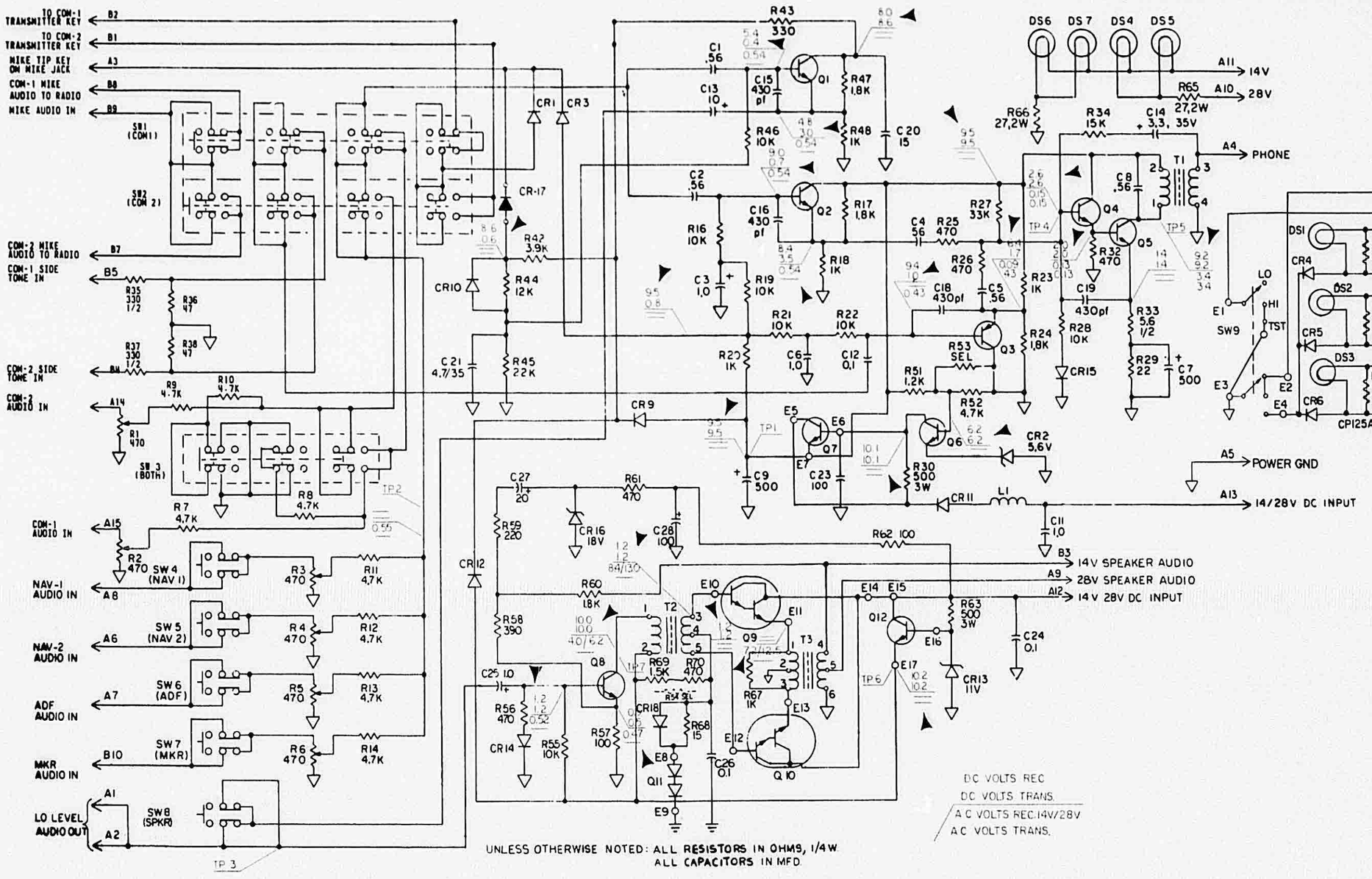
SEE BLOW-UP



* CONNECTED AT E8 IN UNITS WITHOUT R68/CR18

SEE BLOW-UP





D-02394-J

Figure 7-8, CP126A Schematic

SEE BLOW-UP

How are we doing?

We at Narco welcome your comments and suggestions about the manuals, both good and bad. These are the best indicators of how informative the manual is to you, the ultimate user.

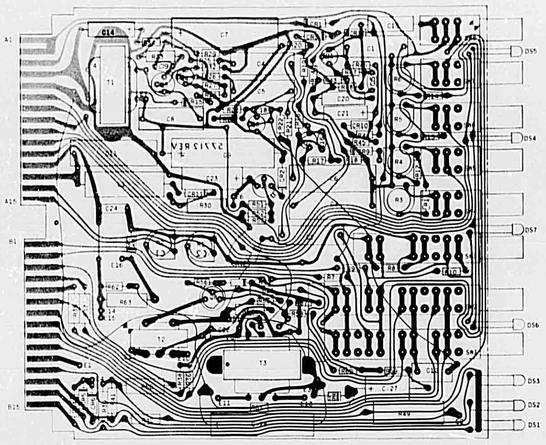
Should you have a helpful addition or find something that appears to be an error — fill in this slip and mail it right to the Technical Pubs Dept. and upon evaluation, we'll adjust the manual to include it.

All actions must include the following:

Manual Name .....

Manual No. ..... — ..... Supplement No. ..... (if any)

Page No. ....



CP 126

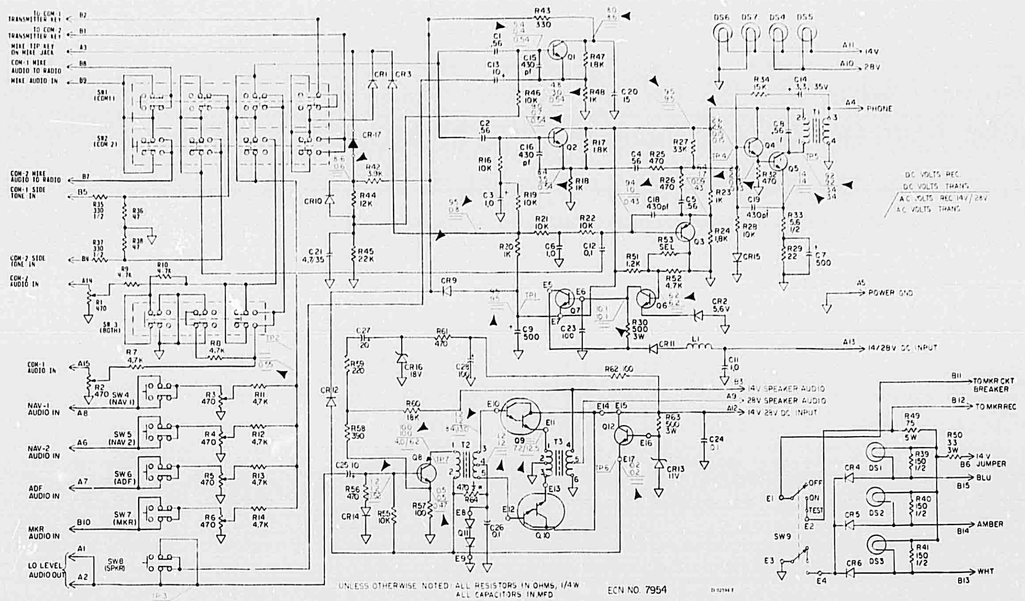


FIGURE 6-3. CP 126 SCHEMATIC

7.6 Continued

E. Installation wiring of the MBT-R to Audio Panel connector J1B will be that shown in Section 2. Note that the audio panel now controls Marker Beacon Receiver OFF-ON-TST.

7.7 Transmit Monitor Modifications

The "A" version audio panel marker lamps may be used as transmit monitor lamps if the following is performed.

A. Order-Modification Kit, Audio Panel Marker Beacon Circuit 03718-0502.

B. From the Kit, install two resistors as shown in Figure 7-6.

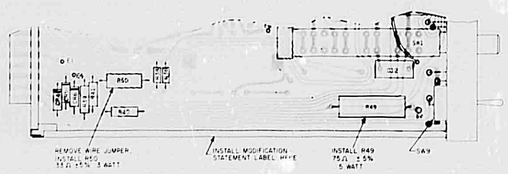


Figure 7-6, CP125A or CP126A Top View

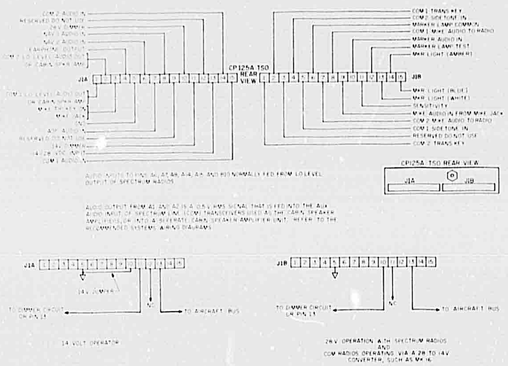
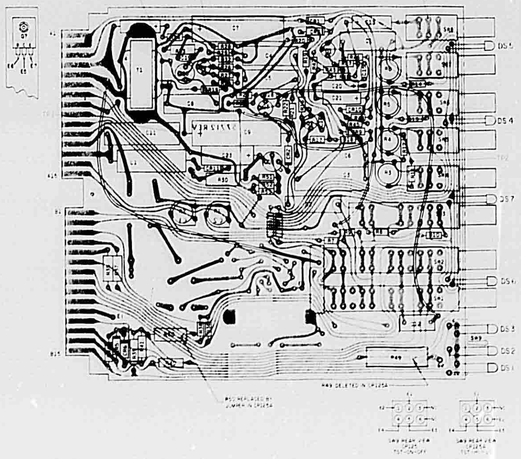


Figure 7-1, CP125A General Installation Wiring



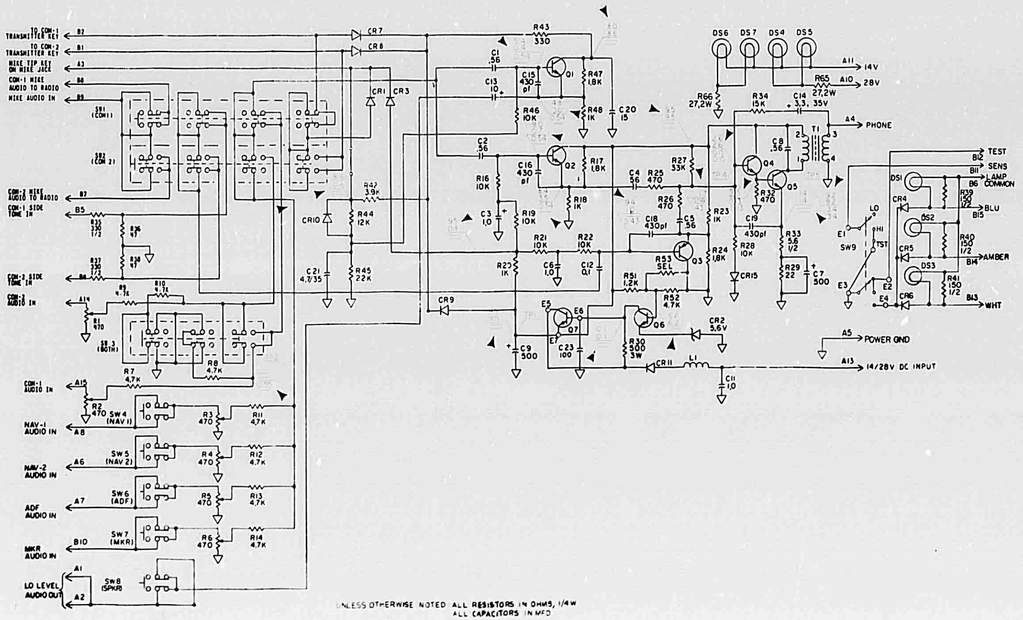


Figure 7-7, CP125A Schematic

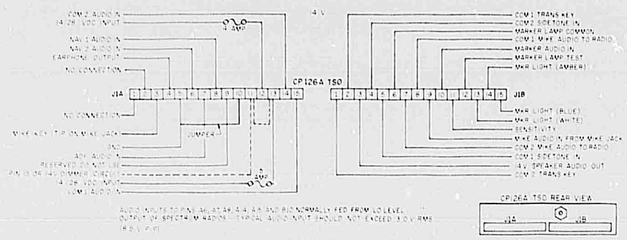


Figure 7-2, 14V CP126A General Installation Wiring

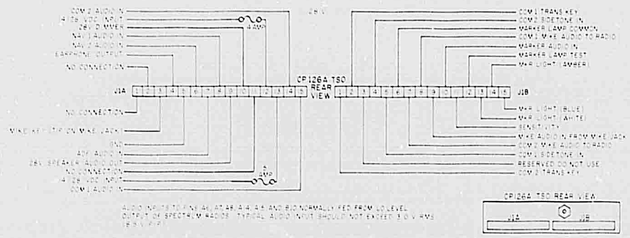


Figure 7-3, 28V CP126A General Installation Wiring

7.4 REPLACEMENT PARTS LIST

For part replacement, refer to Section 5.

7.5 MAINTENANCE

All maintenance data pertaining to the CP125A and CP126A is identical to that found in Section 4.

7.6 MBT-R TO CP125A or CP126A COMPATABILITY

The "A" version audio panels may be used with the MBT-R Marker Beacon Receiver if the following is performed:

A. Order-Modification Kit, Audio Panel Marker Beacon Circuit 03718-0502

B. From the Kit, install two resistors as shown in Figure 7-5.

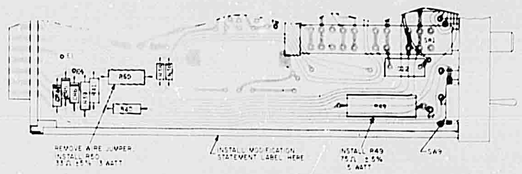
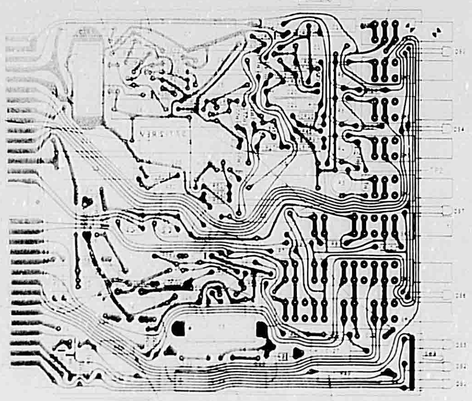


Figure 7-5 CP125A of CP126A Top View



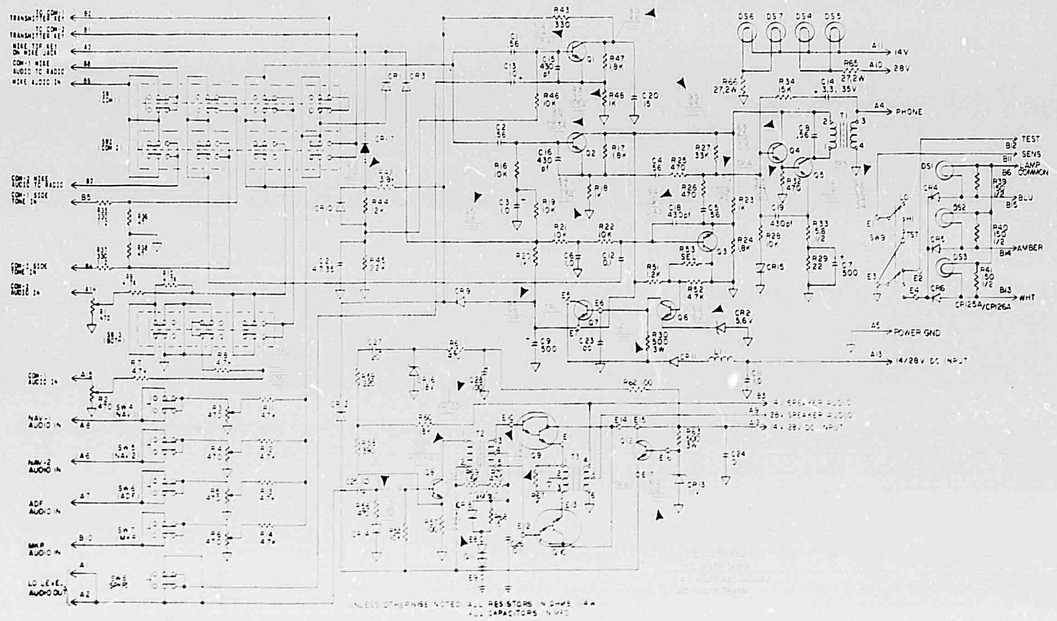


Figure 7-3 CP126A Schematic

2.8.3 Input Level Controls

CP 125 and CP 126

Internal audio input level controls, R1 thru R6, are provided for all receive audio inputs. Initially the controls are set for use with the Spectrum Line equipments. Therefore an audio input of 3.5 vrms will produce 0.5 vrms at J1A-1 and J1A-2 outputs; at least 50 mw of headphone level audio at J1A-4; and in the case of a CP 126 at least 10 watts of speaker audio at J1A-9 or J1B-3.

If a receiver producing 4.0 vrms or greater is used, the input level control should be rotated clockwise until the level at J1A-1 and -2 is reduced to 0.5 vrms. Audio input levels in excess of 4 vrms may cause distortion to be present in the low level output at J1A-1 and -2.

CP 125 Only

The input level controls may also be used to reduce the low level output, at J1A-1 and -2, when a cabin amplifier is used which requires less than 0.5 vrms for full audio output. Since rotating the input control reduces not only the low level output but also the headphone output, at J1A-4, it may be desirable to add a series resistor or voltage divider between the output of the CP 125 and the input of the cabin amplifier rather than utilizing the level controls, thus maintaining the headphone output level.

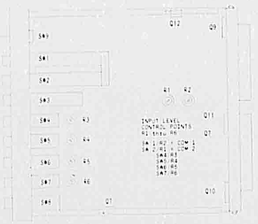


FIGURE 2-1. INPUT LEVEL CONTROLS

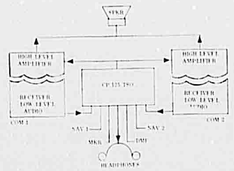


FIGURE 2-2. CABIN AMPLIFIER, CP 125 ONLY

2.8.7 Cable Connector Fabrication

Lead Termination

1. Strip wire 5/32" for PIN Terminal No. 1917-T.
2. Open tool (engraved side toward you), from the opposite side place the conductor tab section (.) the pin on Anvil B. Close tool slightly (until the tabs touch the female jaw).
3. Insert stripped conductor until insulation is level with outside of jaw. Crimp by squeezing handles together until jaws are fully closed or sufficient crimp is made.
4. Move lead and pin to Anvil A. Crimp again until jaws are closed or sufficient crimp is made.
5. If necessary, straighten pin while still being held in the jaw.

Insertion

1. The PIN terminal may now be inserted into the desired pin location in the translucent connector housing. The pin cannot be inserted upside down. Right-side-up it slides in effortlessly. Be sure to push it all the way in, until a "click" can be felt, heard, or even seen (by turning the translucent housing over).
2. There is no necessity to pull back on the lead itself except to test for the "locking feature", and then only with a moderate pull.

Extraction

1. If a pin is erroneously inserted into the wrong housing position, or if at some later time a circuit change is desired, the pin can be removed easily. Slip the flat narrow blade portion of the tool into the mating side of the housing, under the pin. By holding the housing upside down one can see the blade slide in, up to the stop. This action picks up the locking key and allows the lead and pin to slip out of its position using a light pulling action on the lead. Neither pin nor position has been damaged allowing reinsertion in the same or another position.

Crimping with Pliers

The lead PIN Terminal connection using the Molex hand crimper provides a superior connection than with pliers. However, with care, a satisfactory connection can be made without the crimper.

1. Strip wire 5/32" for PIN Terminal 1917-T.
2. Tin exposed conductor.
3. Using needle nose pliers fold over conductor tabs firmly onto the conductor, one side then the other.
4. Repeat step 3 for the insulator tabs.



FIGURE 2-7. CRIMPING TOOL

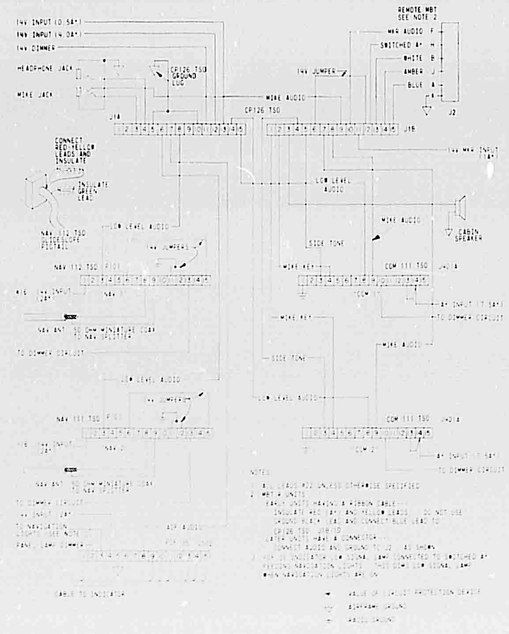


FIGURE 2-13. 14V CP 126 SPECTRUM LINE INSTALLATION WIRING

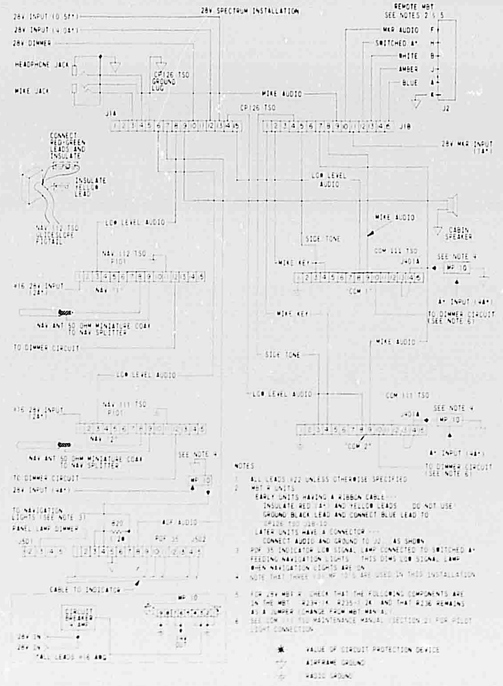


FIGURE 2-14. 28V CP 126 SPECTRUM LINE INSTALLATION WIRING

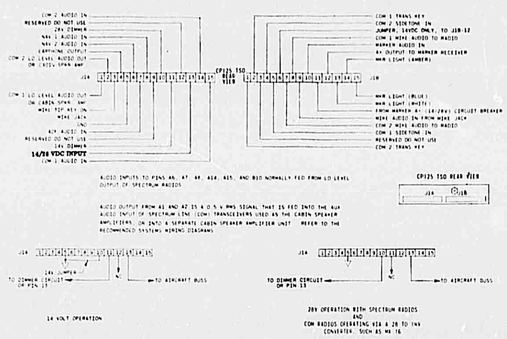


FIGURE 2-8. CP 125 GENERAL INSTALLATION WIRING

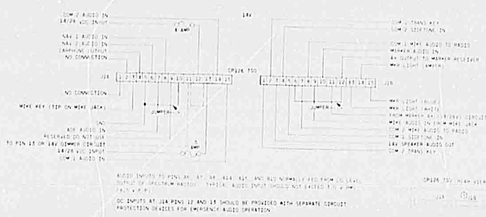


FIGURE 2-9. 14V CP 126 GENERAL INSTALLATION WIRING

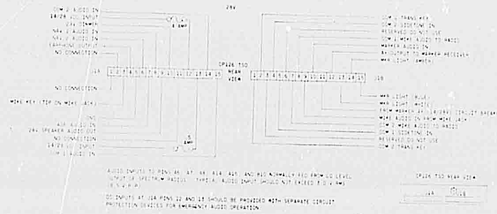


FIGURE 2-10. 28V CP 126 GENERAL INSTALLATION WIRING

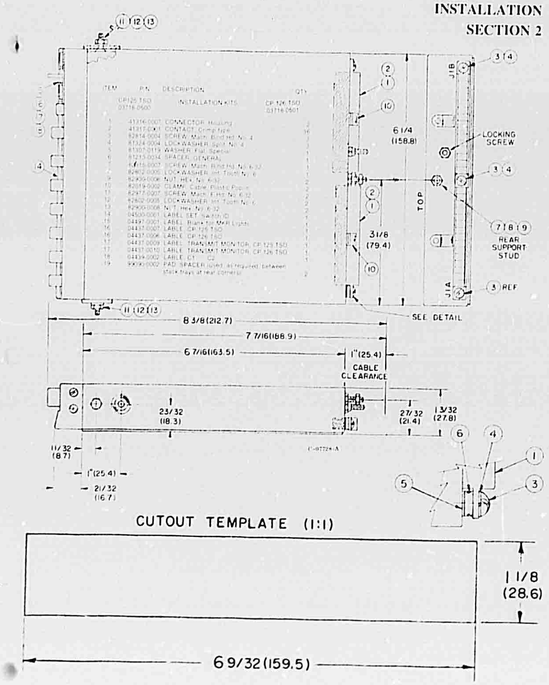


FIGURE 2-15. CP 125/126 INSTALLATION DRAWING

4.1 GENERAL

The electrical maintenance is relatively simple; all components are located on the component drawing that is opposite the schematic that contains test points and test voltages. A troubleshooting chart allows a quick check of symptoms versus the most likely component failure.

The mechanical maintenance is primarily that of, if necessary, the removal and replacement of a switch or lamp.

TROUBLESHOOTING CHART

Symptom	CP 125 or CP 126 Failure	Also check, in CP 126
No speaker or phones audio	Q6 or Q7	
Phones audio but no speaker audio	Q1	Q8 thru Q12, T2 or T3
Speaker audio but no phones audio	Q2, Q4, Q5, or T1	
Phones muting but no speaker muting	Q1	CR17 open
Speaker muting but no phones muting	Q2, CR3 open	
Phones audio but no sidetone audio	Q3	

*This chart is with the presumption that:
1. an audio signal of the proper level is available at the selected input.
2. the proper loads are connected to the amplifier outputs.
3. dc input voltage is supplied to the unit in question.



FIGURE 4-1. POWER TRANSISTOR MOUNTING

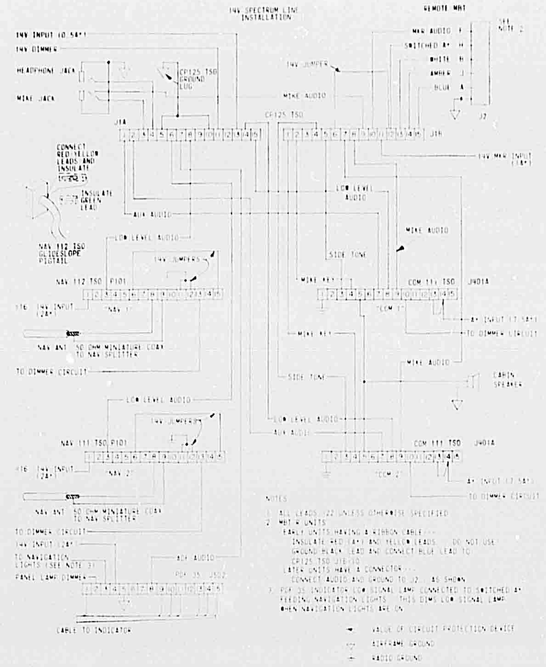


FIGURE 2-11. 14V CP 125 SPECTRUM LINE INSTALLATION WIRING

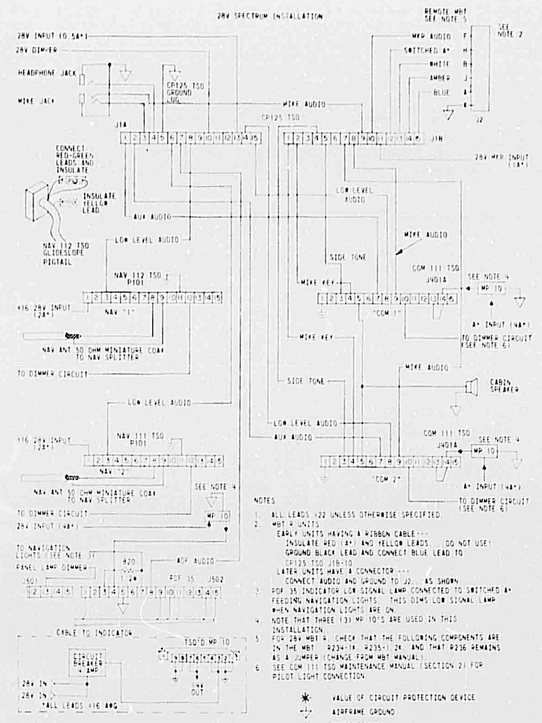
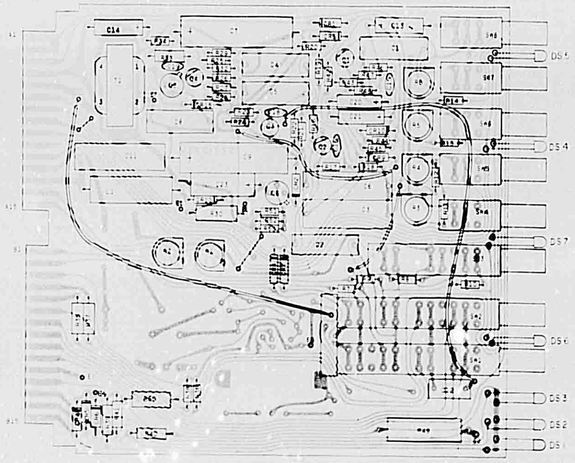


FIGURE 2-12. 28V CP 125 SPECTRUM LINE INSTALLATION WIRING



CP 125

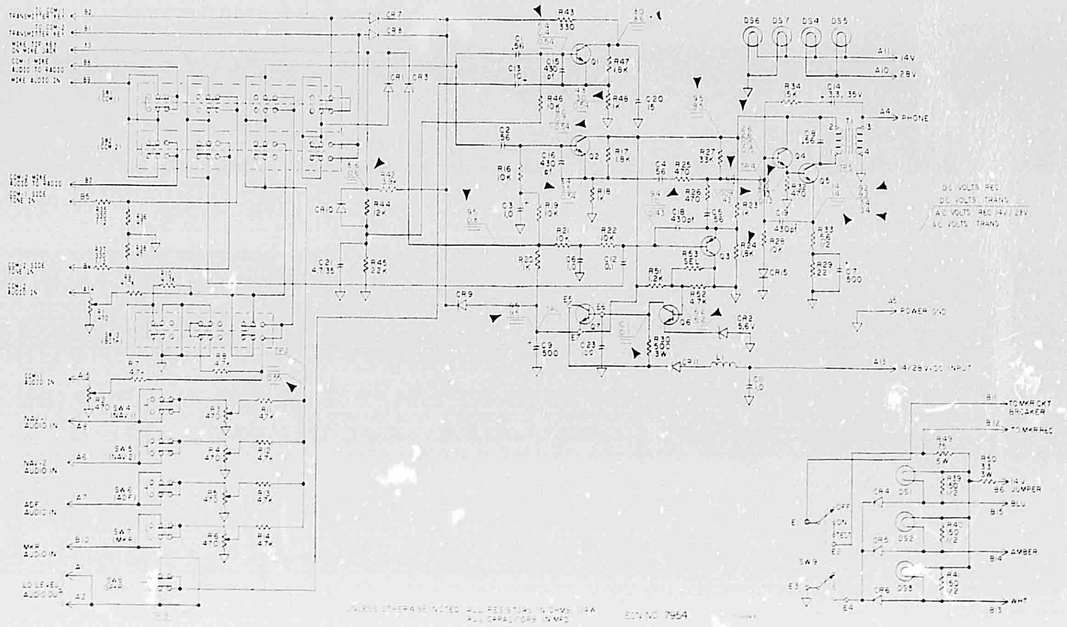


FIGURE 6-2. CP 125 SCHEMATIC

NARCO
CP 127 TSO'D
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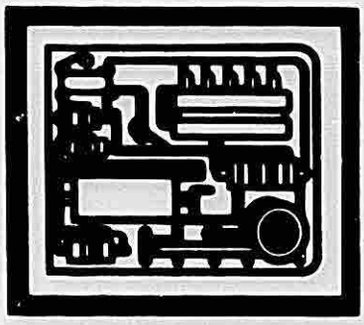
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NARCO AVIONICS

SPECTRUM LINE



TSO'd CP-127



MAINTENANCE MANUAL

03722-0600

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ATP
RECORD OF REVISIONS

REV. NO.	SECTIONS COVERED IN REVISION	REV. DATE	INSERTION DATE	BY	NOTES

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1.1 GENERAL

The NARCO AVIONICS CP127 Master Avionics Control Panel is a TSO'd audio switch panel containing two completely independent amplifiers, a 100 milliwatt headphone amplifier, and a 10 watt speaker amplifier. All circuits are housed in a single unit which is to be instrument panel mounted.

1.2 DESIGN FEATURES

- Positive pushbutton selection of all receive and transmit functions with integral color dots or bars to indicate a selected function.
- Nine receive audio inputs. Three Com and five Nav inputs or two Com and six Nav inputs, all pushbutton selected, plus one unswitched input for decision height or proximity warning audio.
- All switched receive audio inputs have separate and independent speaker and phones pushbuttons. Unswitched audio inputs are applied to both speaker and phones circuits.
- Interlocked pushbuttons allow selection of one of up to three transmitters, VHF or HF. The interlock feature provides automatic cancellation of a previous selection. Many business, citizen band, police, fire, and other emergency transceivers are compatible with the CP 127 switching circuits.
- In AUTO mode the interlocked transmit pushbuttons automatically select Com receiver as well as transmitter.
- Accessory Paging Functions (APF) such as Ramp Hail, Passenger Cabin Address, and Interphone are pushbutton selected.
- Custom labeling of all pushbuttons by means of labels supplied with every CP 127.
- Safety and reliability assured through:
  a. FAA TSO'd performance
  b. Completely independent speaker and headphone circuits, from the pushbutton switches to separately fused DC power inputs. A failure in one channel will not disable the remaining channel.
  c. All pushbutton switches feature redundant contacts for maximum reliability.
- No discernible audio level change in speaker or phones as radios are switched in and out of the system.
- Receive audio leveling provided for both speaker and phones outputs.
- CP 127 Speaker and Phones Audio Level Controls replace most individual Com and Nav receiver volume controls to simplify avionics management.
- Tone controls, front panel adjustable, for both speaker and phones channels.
- Easy front panel removal.
- Optional Avionics Bus Relay assembly eliminates necessity of turning ON and OFF each individual piece of avionics. The Bus Relay is controlled by the CP 127's POWER pushbutton.

1.3 OPERATION

The trim panels shown in Fig. 1-1 thru 1-3 show some of the typical installations utilizing the capabilities of the CP 127. Of course it is not necessary to duplicate these panels as a large degree of flexibility has been designed into the CP 127. All utilized pushbuttons may be identified with the nomenclated labels provided with every CP 127. When your avionics system is expanded, only the labels are changed, not the entire trim panel. Where a pushbutton is not utilized "blank" labels are provided.

Receive Audio

Selection of receive audio is by the two horizontal rows of round pushbuttons. The top row selects speaker audio, the bottom row headphone audio. When a pushbutton is depressed the color dot becomes visible indicating a selected audio source. It is not necessary to select between speaker and headphone audio, as in many systems. Simultaneous speaker and phones audio output, for any receive input, may be selected by simply depressing the speaker and phones pushbuttons for the desired input. A pilot monitoring headphone audio and a copilot monitoring speaker audio will therefore not interface with one another in their selection of receive audios.

Cockpit speaker receive audio is muted whenever the mike key is depressed. Therefore cockpit speaker receive audio is muted during transmit and accessory paging functions. Receive headphone audio is muted only during transmit. During any Accessory Paging Function, all selected phones receive audios as well as the APF audio will be heard in the headphone.

Transmit and Accessory Paging Functions

Selection of a Com or HF transmitter or an Accessory Paging Function (APF) such as: ramp hail, passenger cabin address, or interphone is by the vertical row of four rectangular pushbuttons. Because these pushbuttons control transmitter keying and the routing of microphone audio, all four pushbuttons are interlocked. Therefore when a transmitter or APF is selected, by depressing its pushbutton, the previously selected pushbutton will automatically disengage. Integral color bars indicate a depressed pushbutton.

AUTO Mode for Com Receive Audio

Depressing the AUTO pushbutton allows the transmitter selector pushbuttons to also select communications receive audio. Thus, in the AUTO mode, the C1 transmitter pushbutton selects Com 1 transmitter and Com 1 receive audio. The C2 and C3 or HF selectors operate in like manner. However, any Com audio selected by a receive audio pushbutton will not be defeated by a transmitter selection. When the AUTO mode is engaged all receive audio pushbuttons continue to operate as previously described.

1.3 Continued

Receive Audio Level Controls

At the lower edge of the CP 127 trim panel are located the Speaker and Phones Audio Level Controls. These controls are intended to function as the audio volume controls for the entire avionics system. One example of an exception may of course be the ADF audio where retention of the ADF's independent volume control is often desirable.

Audio Tone Controls

Audio tone controls are located in-line with the receive pushbuttons they are associated with. The speaker tone control, see Fig. 1-1, is between the Com 1 and Com 2 speaker audio pushbuttons. The headphone tone control is between the HF and Nav 1 headphone audio pushbuttons. A small straight slot screwdriver is required for adjustment of the tone controls.

Power Pushbutton

The CP 127 does not have an ON/OFF switch of its own. It receives its power directly from the aircraft's bus. When an Avionics Bus Relay is installed all power to the avionics, including the CP 127, is routed thru the ABR.

When the optional Avionics Bus Relay (ABR) is part of the installation the "POWER" pushbutton is utilized. This relay eliminates having to turn ON each individual radio at the start of a flight, then turn OFF each individual radio at the end of the flight. Instead, depressing the CP 127 "POWER" pushbutton applies power to the entire avionics system. To turn all avionics OFF, again depress the "POWER" pushbutton. The "POWER" pushbutton has an integral color bar to indicate the ON condition.



FIGURE 1-1. TRIM PANEL, INTERNATIONAL



FIGURE 1-2. TRIM PANEL, DOMESTIC (2 COM's)



FIGURE 1-3. TRIM PANEL, DOMESTIC (3 COM's)

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2.1 INTRODUCTION

This section contains detailed instructions for the installation of the CP 127 Master Avionics Control Panel together with typical system installation diagrams.

Careful planning is required and before the actual installation is begun: schematically diagram the entire installation, resolve equipment location, and cable routing, all before any nonreversible action is taken.

2.1.1 Preliminary Inspection

Carefully unpack the equipment and visually inspect the equipment for damage caused by shipment. If damage is noted the shipping carton should be retained to corroborate any claims.

2.1.2 Installation Sequence

The following is provided as an aid in visualizing the steps necessary for an installation that will meet and, hopefully, exceed the customer's expectations.

1. Define the system's requirements
    a. Number of Com and HF transceivers required.
    b. Number of VOR/LOC receivers required (converter display, RNAV, Glide Slope, etc.).
    c. Dual or single ADF receivers.
    d. DME
    e. MKR
    f. Accessory Paging Functions (APF) - Ramp Hail, Cabin Address, and Interphone (pilot to copilot and/or to FM 1200 Com interrupt or remote headphones).
    g. Radar altimeter or proximity warning indicator to drive the CP 127 unswitched audio input.
    h. Avionics Bus Relay
2. Specify the function assigned to each CP 127 pushbutton. Refer to Fig. 2-1.

2.1.2 Continued

3. Select leveled or standard audio for Com receive inputs and most Nav receive inputs. Refer to Section 2.8.3.
4. Determine equipment location in aircraft and check equipment mounting dimensions for proper fit.
5. Schematically diagram the installation.
6. Fabricate cable(s) for installation.
7. Modify the Com and Nav receivers to: (1) bypass their individual volume controls, if desired, (2; set receiver audio output to a level compatible with the CP 127.
8. Bench test the avionics and cables before installation. Most installation adjustments are made at this point. See Section 2.9.
9. Install mounting trays and cables in aircraft.
10. Perform post installation checkout. Make in-aircraft installation adjustments. (See Section 2.10.)

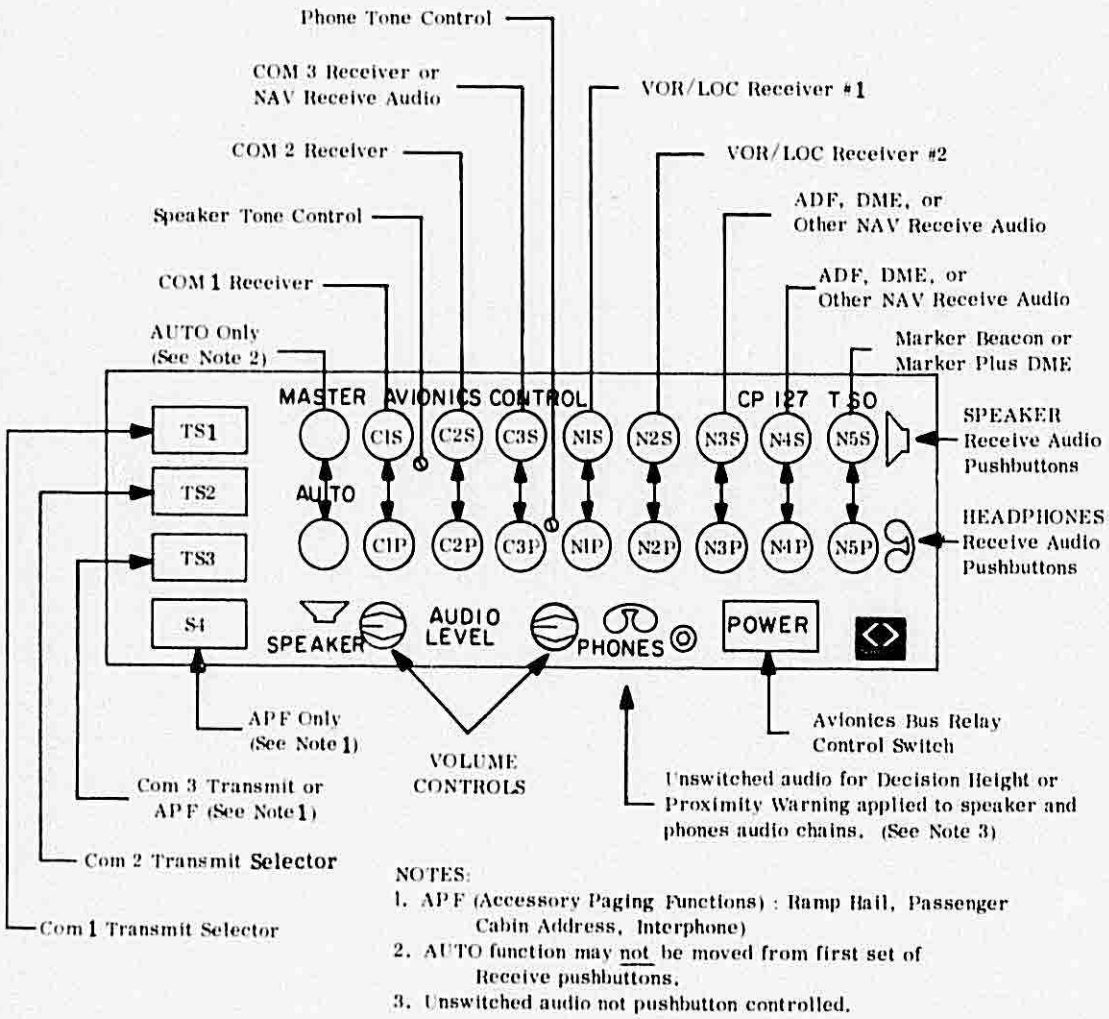


FIGURE 2-1. CP 127 TRIM PANEL CONTROLS

2.2 THE CP 127's TRIM PANEL CONTROLS

The CP 127's panel has three areas for selecting various equipments within the avionics system.

The first area contains rectangular transmit pushbuttons. These buttons are interlocked, thus only one of the four can be depressed at any one time. The top two are designed for transmitter selection. The third can be used for a third transmitter or for Accessory Paging Functions (APF). The fourth (bottom) is designed to be used only for APF (ie: ramp hail, interphone, cabin address).

The second area contains the Com and Nav receive audio pushbuttons. The top horizontal row routes audio to the speaker, the bottom row routes audio to the headphones. Since each pushbutton operates independently it allows monitoring more than one receiver and/or more than one channel at a time. This can be especially useful as the copilot can monitor the speaker channel while the pilot monitors the headphone channel, or the other way around.

Special attention should be given to the AUTO pushbuttons. These are the first round pair, next to the transmit pushbuttons. When the AUTO pushbuttons are depressed they allow selection of Com receive audio by the transmit pushbuttons. Thus when C1 (TS1) transmit pushbutton is depressed, Com 1 receive audio is automatically selected. Receive audio sources selected by the receive audio pushbuttons are not affected by the AUTO function.

The third area of the panel contains the POWER pushbutton and the Audio Level Controls for both speaker and phones. The POWER pushbutton applies and removes all power to the avionics bus, however, an Avionics Bus Relay must be installed to utilize this function. The Audio Level Controls are the avionics system master volume controls, one knob for speaker, one knob for headphones.

To deactivate any pushbutton that was active, just depress that pushbutton. Deactive pushbuttons appear black, active pushbuttons appear with a colored dot or dash.

2.3 SPECIFICATIONS

DC Input Voltage: J1-13 nominal 13.75 or 27.5 Vdc (no voltage changeover required)
J3-15 nominal 13.75 or 27.5 Vdc (no voltage changeover required)

DC Input Current: J1-13, 0.15 amps, less pilot lamps
J3-15, 14V . . . 2.2 amps at rated audio out, less pilot lamps
28V . . . 1.2 amps at rated audio out, less pilot lamps

Breaker Requirements: J1-13, 2.0 amps
J3-15, 5.0 amps

Pilot Lamps: 14V, . . . 0.5 amps
28V, . . . 0.25 amps

Transmit Sidetone:
An input of 4.5 Vrms, across 500 ohms, for 10 milliwatts of headphone audio and 100 milliwatts, adjustable downward, of speaker audio.

Receive Audio Input Requirements:
Switched Audio — input factory set for 1.0 Vrms across 500 ohms for rated audio panel power output
Unswitched Audio — input factory set for 2.5 Vrms across 500 ohms for rated audio panel power output
Range of adjustment — 0.5 Vrms to 10 Vrms.
All receive input ports are 500 ohms.

Receive Audio Output Levels:
Speaker - 10 watts into 4 ohms
Phones - 100 mw into 600 ohms
Speaker Sidetone - 0.1 watt into 4 ohms, adjustable downward.

Ramp Hail, Cabin Address, and Interphone Requirements:
Mike Audio Voltage — Factory set for 0.15 Vrms for rated audio panel power output, compatible with Narco M700A microphone.
External Speaker Impedance — 4 ohms to 8 ohms recommended, 16 ohms with matching transformer
Speaker Audio Output - 10 watts into 4 ohms
Phones Audio Output - 100 mw into 600 ohms

Isolation-Combining Network:
Isolation between input ports greater than 50 db.
Isolation between output ports greater than 40 db.

Mechanical: Weight: 2.8 lbs.
Size: 2½" high x 6¼" wide x 8-$^{19}/_{32}$" deep overall

TSO Categories: GAPAAAXXXXXX

2.3.1 TSO Explanation

The CP 127 is approved to be instrument panel mounted within the cabin environment of fixed and rotary wing aircraft using piston or turbine single and multiengines. It is designed for nonpressurized aircraft operating up to 30,000 feet as well as for pressurized aircraft. This equipment requires direct current power but is approved to be installed in aircraft that have additional on board alternating current power sources.

There are twelve Environmental Test Procedures established in RTCA Document DO-138. These are identified on the TSO Nameplate. The explanation of Environmental Limits for each of these categories for the CP 127 are as follows:

Ambient Temperature-Altitude ..... Ⓖ APAAAXXXXXX

Temperature Range:

Non-operating	Low	−54°C (−65°F)
	High	+71°C (+160°F)
Continuous operation	Low	−15°C (+5°F)
	High	+71°C (+160°F)

Altitude:

30,000 Ft. Nonpressurized

15,000 Ft. Pressurized; is not affected by decompression to 40,000 Ft.

Humidity ..... G Ⓐ PAAAXXXXXX

Standard humidity for equipment intended for installation in Civil Aircraft.

The Audio Panel has been tested under the following humidity conditions:

+50°C (+122°F) at 95% RH, reduced to +38°C (+100°F) with humidity maintained as high as possible. This cycle was repeated twice for a total of 48 hours of exposure. Within 15 minutes* after exposure the units were operated and met all specifications.

(*TSO requires that all specifications be met within 4 hours after exposure.)

2.3.1 Continued

Vibration ..... GA Ⓟ AAAXXXXXX

Approved when mounted in the instrument panel of any type of piston or turbine, single engine or multiengine fixed wing or rotary wing aircraft. The maximum vibration limits are 0.10 inch double amplitude from 5 to 17 Hz, 1.5G constant acceleration from 17 to 55 Hz, 0.25G from 55 to 2000 Hz.

Audio Frequency Magnetic Field Susceptibility* ..... GAP Ⓐ AAXXXXXX

This equipment is approved for installation in aircraft which have alternating current power sources, including those rated at more than 250 volt amps.
(*It is not susceptible to alternating current power source pick up.)

Radio Frequency Susceptibility ..... GAPA Ⓐ AXXXXXX

This equipment has been tested and is not affected by interference from other on board electronic equipment which meet Category A, Radio Frequency Spurious Emission requirements of the TSO (RTCA Document DO-138).

Radio Frequency Spurious Emission ..... GAPAA Ⓐ XXXXXX

This equipment has been tested and does not emit RF in excess of that which would interfere with other on board electronic equipment which meet the requirements of Category A, Radio Frequency Susceptibility of the TSO (RTCA Document DO-138).

Other Environmental Conditions ..... GAPAAA (XXXXXX)

The letter "X" denotes that recognized installation practices in Civil Aircraft normally do not encounter these Environmental Conditions and are therefore not tested.

These remaining six categories which are shown X'ed from Left to Right refer to:
Explosion . . . Waterproofness . . . Hydraulic Fluid . . . Sand and Dust . . . Fungus . . . Salt Spray.

2.4 UNITS AND ACCESSORIES SUPPLIED

a. CP 127
b. Mounting Tray
c. Installation Kit, 03722-0500

2.5 OPTIONAL ACCESSORIES AVAILABLE

a. Avionics Bus Relay: 14 volt installation - 03722-0501
28 volt installation - 03722-0502
b. Narco VP 22C, P/N 03702-0303
c. Cooling Kit (refer to the last paragraph of Section 2.7)

2.6 LICENSE REQUIREMENTS

No license is required.

2.7 MECHANICAL INSTALLATION

The CP 127 is designed for installation in the aircraft instrument panel. A mounting tray is provided to simplify the initial installation and facilitate removal for "Growth" rewiring.

Refer to the Installation Drawing. It provides all the necessary installation data for mounting the tray. The recommended installation is one where the tray is secured at both front corners and at least one of the rear tabs. Suitable mounting brackets may be fabricated from ordinary sheet metal or angle stock. The tray must be provided with a good electrical ground. Hardware is supplied to provide a ground connection to the Tray from the connectors and airframe.

The CP 127 is secured to the tray by an Allen head ramping screw running from the front panel to the rear of the tray. The screw is held in the tray by a self-locking nut.

As the audio panel is inserted into the tray the guide pin on the rear of the CP 127 will engage the tray first, next the printed board card edge will engage the connectors, and finally the ramping screw will enter the self-locking nut on the rear of the tray. The screw is rotated CW to pull the unit into the tray. DO NOT RAM UNIT INTO TRAY OR OVERTIGHTEN RAMPING SCREW.

Cooling air directed to the avionics equipments will serve to markedly extend their useful life and reduce frequency of failure. This is especially true for audio switch panels which generally are located at the top of the avionics stack. Air heated by the avionics is trapped by the aircraft glare shield, surrounding the audio switch panel in a pool of stagnant hot air. The installation of a NARCO cooling kit will alleviate the problem and in the long run pay for itself.

CP 127
INSTALLATION KIT
03722-0500
SEE FIGURE 2-2

ITEM	PART NO.	SYMBOL NO.	DESCRIPTION	QTY
1	41342-0010	J3	CONNECTOR, 44 PINS	1
2	54894-0001		COVER, CONNECTOR	1
			(ATTACHING PARTS)	
3	82814-0008		SCREW, MACH, BIND HD, 4-40 x 5/8	2
4	81324-004		WASHER, LOCK, SPLIT, # 4	2
5	81329-0004		WASHER, FLAT, #4	2
			———*———	
6	41317-0001		CONTACT, CRIMP TYPE	36
7	41333-0001	J1 & J2	CONNECTOR, HOUSING	2
			(ATTACHING PARTS)	
8	82814-0004		SCREW, MACH, BIND HD, 4-40 x 5/16	3
9	81324-0004		WASHER, LOCK, SPLIT, #4	3
10	81329-0004		WASHER, FLAT, #4	3
11	81213-0034		SPACER, GENERAL	1
12	81307-0119		WASHER, FLAT, FIBRE	1
			———*———	
13	82019-0002		CLAMP, CABLE	2
14	82010-0014		CLIP, CABLE	1
			(ATTACHING PARTS)	
15	82815-0007		SCREW, MACH, BIND HD, 6-32 x 1/2	1
16	81702-0014		LUG, SOLDER	1
17	82802-0005		WASHER, LOCK, INT TOOTH, #6	1
			———*———	
18	04718-0001		FUNCTION LABEL SET	1
19	04717-0001	SEE	TRANSMIT LABEL SET	1
20	04711-0001	} SECTION	LABEL, MASTER AUDIO (for COM 111B)	3
21	04711-0002	2.7.1	LABEL, BLANK (for COM 111B)	3
22	04741-0001		DOT, MARKING (Volume Control)	1
23	99090-0002	NOT SHOWN	PAD, SPACER	3
24	81423-0005	NOT SHOWN	STANDOFF, TERMINAL INSULATOR (for COM 111B)	3

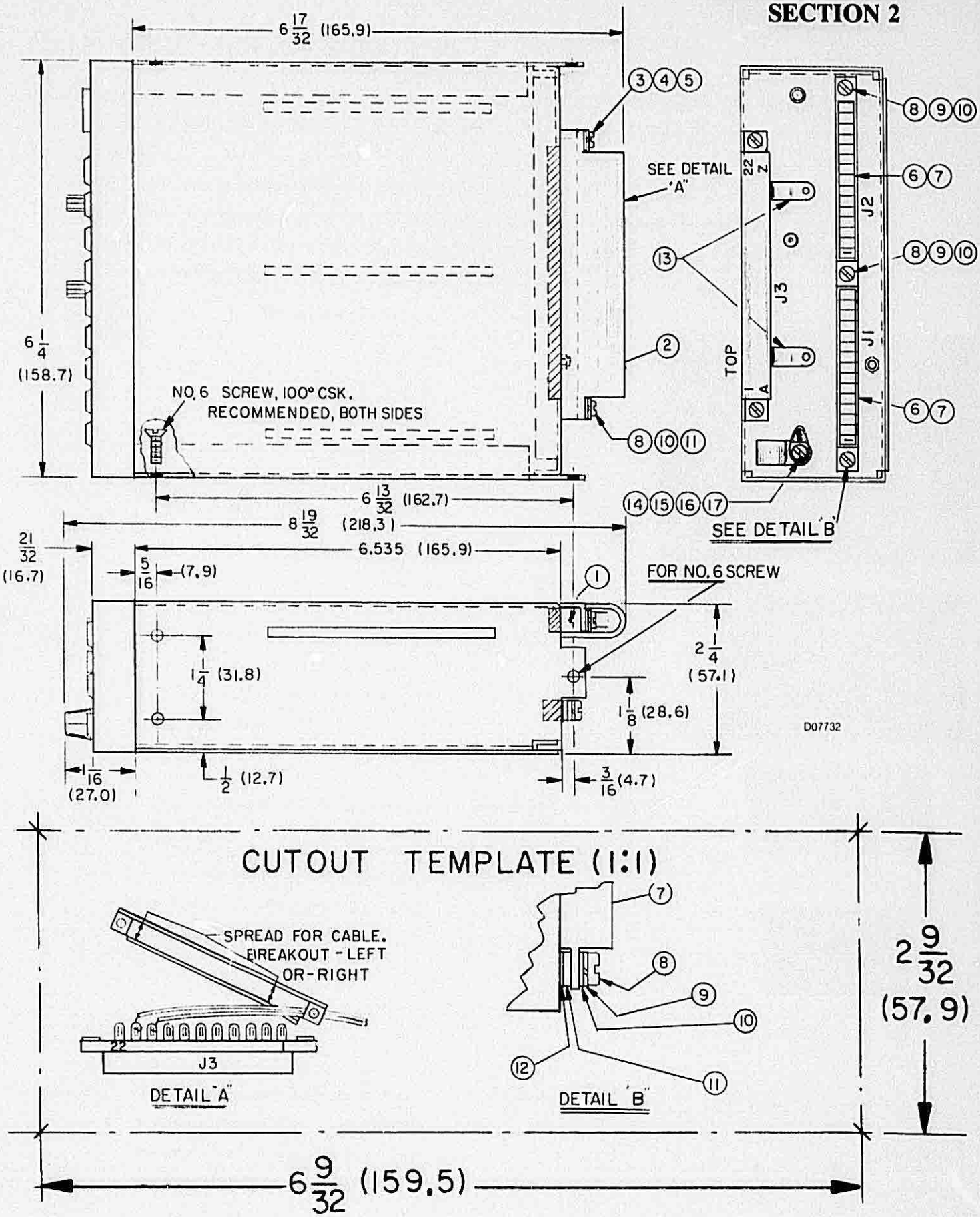
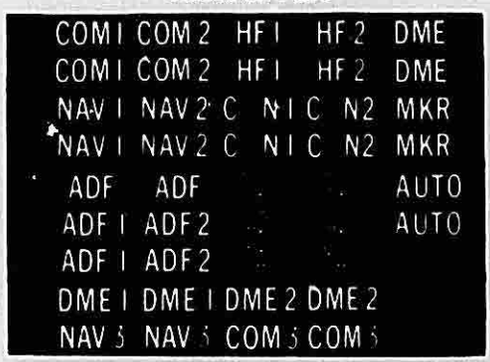
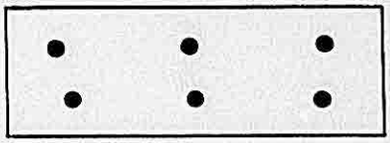


FIGURE 2-2. CP 127 INSTALLATION DRAWING

SECTION 2.7.1 Installation Kit Labels

The following details the labels contained in the CP 127 Installation Kit, their function and method of installation. The Installation diagrams illustrate the locations for the transmit, receive, and accessory paging labels.

All labels on a common liner are die cut and an individual label may be removed without disturbing the remaining labels. Installation of the Receive and Transmit/Accessory Paging Function (APF) labels is facilitated by use of a small sharp instrument, such as a scribe or hobby knife to locate and align the label before it is pressed in place.

Kit Item No.	Discussions	Part No.	Photo of Part
Item 18	Receive labels to be inserted in the recess between the speaker and phones pushbuttons.	04718-0001	
Item 19	Transmit and Accessory Paging labels to be applied over the clear inserts which are adjacent to the four interlocked vertical pushbuttons.	04717-0001	
Item 20	To be applied to the trim panel of the NARCO	04711-0001	
Item 21	COM 11B or COM 111B transceivers to cover the opening which remains when the volume control shaft and knob are removed. Two label styles are supplied, the choice is yours.	04711-0002	
Item 22	Yellow marking dots for use on receiver trim panels and volume controls to mark the proper set-point for system operation.	04741-0001	

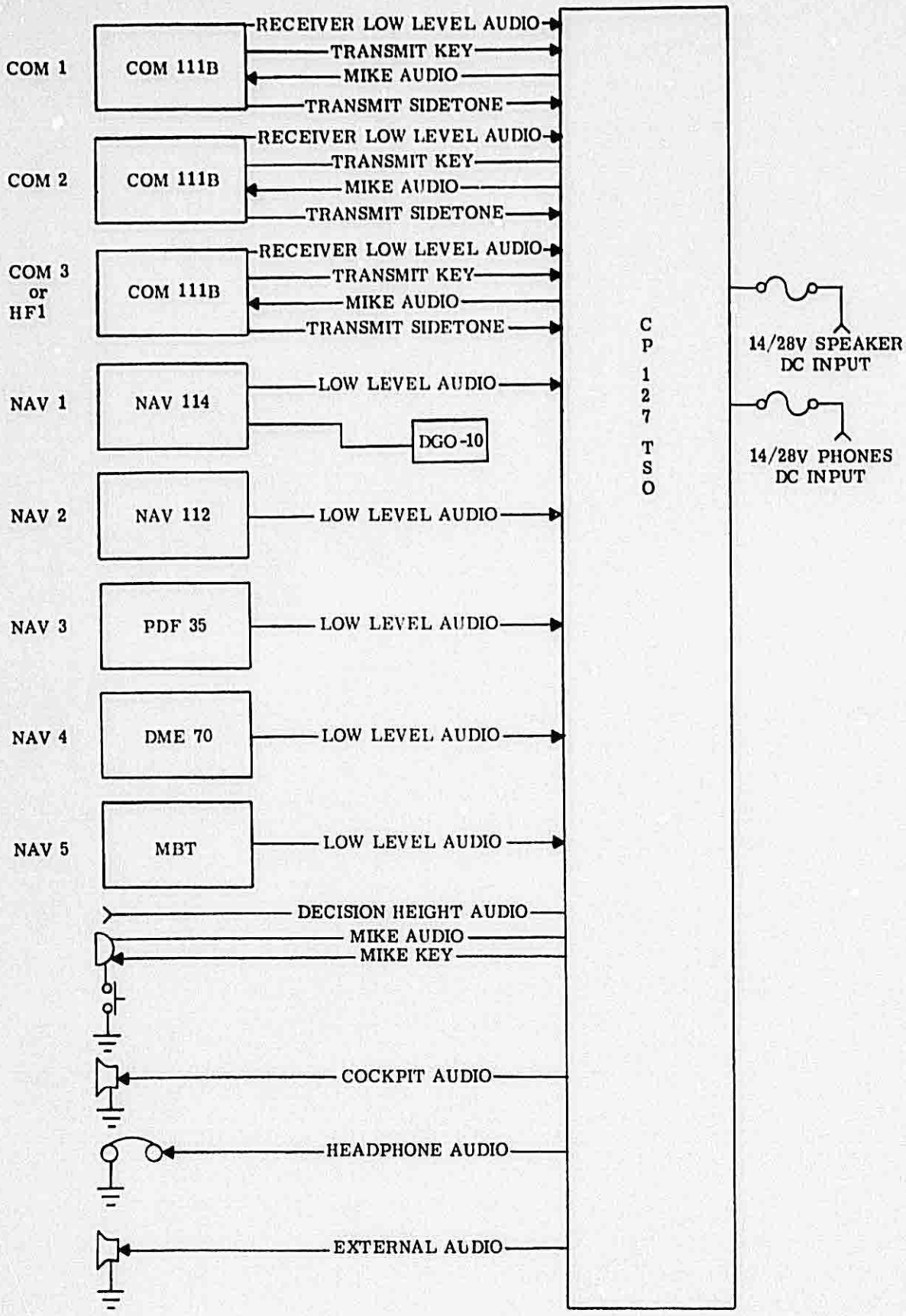


FIGURE 2-3. TYPICAL BLOCK DIAGRAM FOR SPECTRUM LINE AVIONICS INSTALLATION

2.8 ELECTRICAL INSTALLATION

A. General

Figure 2-3 is a block diagram of a Spectrum Line NAV-COM installation utilizing some of the capabilities of the CP 127. A complex installation such as this one requires careful planning. A perusal of this entire section plus Section 2.9, Preinstallation Bench Test could prevent unnecessary and time consuming troubleshooting.

All connections, leads and jumpers to the CP 127 are made at the tray mounted cable connectors J1, J2, and J3.

Figure 2-23 is a general installation wiring diagram.

Figures 2-24 thru 2-34 show 14 and 28 volt installations highlighting Narco equipments: the Spectrum Line, the Executive Line, Mk 12 and Mk 16.

Figure 2-35 is a general wiring diagram for helicopter installations.

Figures 2-36 thru 2-39 show how to connect your Accessory Paging Functions into any of the above wiring diagrams (2-23 thru 2-35).

An installation is formulated by selecting a Nav-Com diagram (Fig. 2-24 thru 2-35) PLUS an Accessory Paging Function (APF) diagram (Fig. 2-36 thru 2-39). Where deviation from these diagrams is required, Fig. 2-23 should be used as it identifies each CP 127 cable connector pin and its use.

An internal wiring diagram is presented in Fig. 2-40. It should be noted that when this figure is unfolded its J3 connector may be aligned with the J3 connectors in most other installation drawings to simplify relating the cable connector pin and programming jumper to function for installation planning and troubleshooting.

B. System Volume Adjustments

System audio volume, speaker and phones, is intended to be controlled by the CP 127's Audio Level Controls. Toward this end three methods are herewith presented for dealing with the volume controls of individual avionics equipments. Each receiver type should be individually considered in determining which method of modification is to be used; to the point that a complex installation may include all three methods.

2.8 Continued

Method 1.

The most desirable method is to bypass or disable individual volume controls. The receivers audio voltage gain is then adjusted to produce the output level to drive the CP 127. This method has the advantage of reducing the number of volume controls in the avionics system and therefore reduces or eliminates the likelihood of mis-setting a volume control. The end result is good, consistent performance. Detailed information is provided in this manual for modifying NARCO receivers.

Method 2.

A somewhat less desirable method is to internally adjust the receivers audio gain such that when the receiver's volume control is rotated maximum clockwise the proper level to drive the CP 127 is produced. The advantages of this method are reduced modification to the receiver and the fact that maximum CW rotation, to the pot stop, is the proper setting. Potential problems of this method are: accidentally rotating the volume control while channeling to a new frequency, and inadvertently using the receivers volume control to set audio volume.

Method 3.

The least desirable method is to not modify a receiver at all but merely, by electrical test, determine the volume control setting which produces the voltage level to drive the CP 127. To reset this level, either mark the trim panel at this point or loosen and rotate the knob to a particular easily identifiable position, such as vertical and then secure the knob.

A placard should be installed near the receiver indicating the proper position of the knob. i.e.:

All receiver volume control knobs to be positioned to the Mark, or All receiver volume control knobs to be positioned vertically, etc.

While this method eliminates receiver modification the probability of mis-setting a volume control, accidentally or otherwise, is rather high. For Com units the result of a mis-set control can range from increased audio distortion to missed ATC transmissions. However non-aircraft transceivers, DME Ident and ADF receivers may be handled by this method. For this reason a label with 1/16'' yellow dots is provided in the installation kit for marking the trim panels.

In all three methods the receiver audio output was maintained at a level below its maximum rated capability. This is due to the fact that with a strong input signal and the volume control set for maximum audio output, audio distortion in the form of clipping occurs in most receivers. For this reason the sensitivity of the CP 127 is sufficient to allow almost any receiver to be used without approaching the receivers maximum audio power output capability.

NOTE:

Where a receiver output or other audio source can not be adjusted to the CP 127 input voltage specification, input potentiometers are provided within the CP 127 for each input port. A generalized procedure is provided in Section 2.9.2 for setting of a CP 127 input potentiometer.

2.8 Continued

Upon deciding which Volume Control Adjustment Method you will use for the installation, proceed to the specific unit modification instruction. Depending upon your decision of method, not all steps of the unit modification need be accomplished. Listed below are those Spectrum units which have detailed instructions. Opposite each, and listed under the applicable method desired, are those steps necessary to accomplish the task.

SECTION	UNIT	METHOD 1 (Volume controlled via the CP 127)	METHOD 2 (Set Volume Control full CW)	METHOD 3 (Set Volume Control to a mark)
2.8.1.1	COM 11B and COM 111B Option 1 Option 2	 1 thru 8 1 thru 11	 1, 2, 5, 6, and 7 1, 2, 7 thru 10	 1, 5, and 6 1 and 9
2.8.1.2	COM 111 TSO	1 thru 10	1, 2, 4 thru 10	1, 5, and 6
2.8.1.3	COM 11 and COM 11A	1 thru 10	1, 2, 4 thru 10	1, 5, and 6
2.8.1.4	NAV 14	1 thru 10	1, 2, 4 thru 10	1, 5, and 6
2.8.1.5	NAV 14 and NAV 114	1 thru 10	1, 2, 4 thru 10	1, 5, and 6
2.8.1.6	NAV 11, 12, 111, and 112	1 thru 7	1 thru 7	1, 4, and 5

2.8.1 Modification to Spectrum Line Receivers

This section deals with the mechanics of modifying a NARCO Spectrum Line receiver to operate with the CP 127. As discussed in Section 2.8.B, System Volume Adjustments, three methods of modification are available. These procedures are written to cover the most extensive of these modifications (Method 1 of Section 2.8.B). Less comprehensive modifications will also be accomplished by performing only those steps of the procedure necessary.

The overall modification sequence is as follows:

1. Bench test the receiver to assure proper operation
2. Bypass the volume control
3. Select value of R-CP, to set receiver audio gain.

As produced, Spectrum Line receivers have a 470 ohm resistor (hereafter known as R-CP) in series with the volume control arm. To bypass the volume control the resistor is moved from the control arm to the top or hot terminal of the control and increased in value to set the receiver low level audio output voltage to the level required by the CP 127.

2.8.1.1 COM 11B and COM 111B

Option 1 Refer to Fig. 2-4.

1. Bench test the transceiver. Refer to Section 2 of the COM 11B/COM 111B Maintenance Manual.
2. Remove the four screws that secure the top dust cover. Remove the cover.
3. Locate the volume control shaft collar (item 1) and remove the two forward setscrews (item 2).
4. Pull the volume knob and shaft (item 3) forward from the trim panel. Do not remove the collar.
5. Remove from the COM bench test cable harness the 1.5K resistor found at P401A, pins 7 and 8. Connect a 470 ohm resistor from pin 8 of P401A to ground. Connect an AC VTVM across the 470 ohm resistor.
6. Apply to the antenna connector a 5 uv RF signal, modulated 60% by 1 KHz on any selected Com frequency: Rotate the volume control shaft for 1.0 Vrms ± 1 db as read on the AC VTVM.
7. Apply silicon rubber or glyptal to the collar (item 1) and spring (item 5) junction to hold this setting.
8. Install an appropriate label over the volume control shaft hole. Refer to Section 2.7.1 Installation Kit Labels.

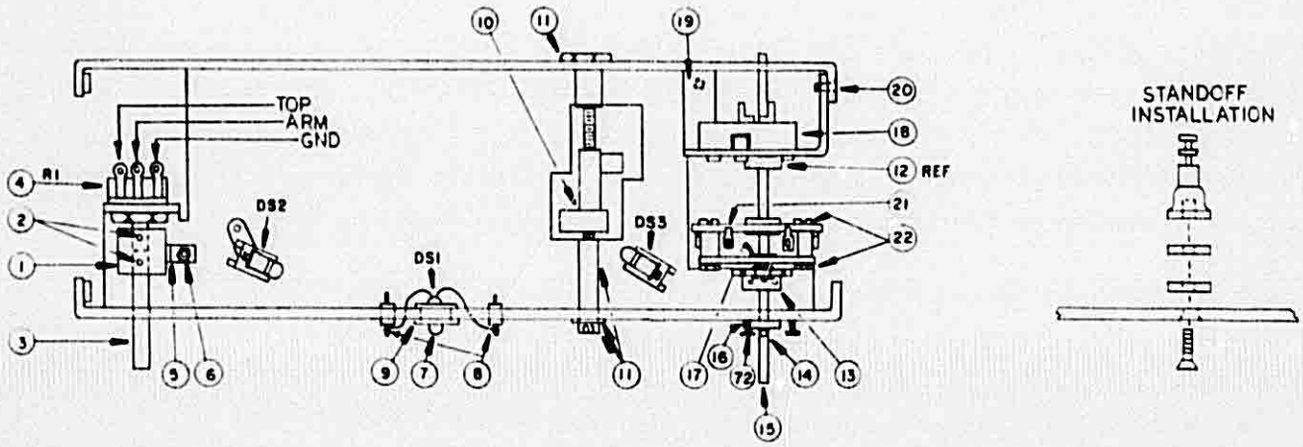


Figure 2-4. COM 11B/COM 111B VOLUME CONTROL MODIFICATION

SEE BLOW-UP

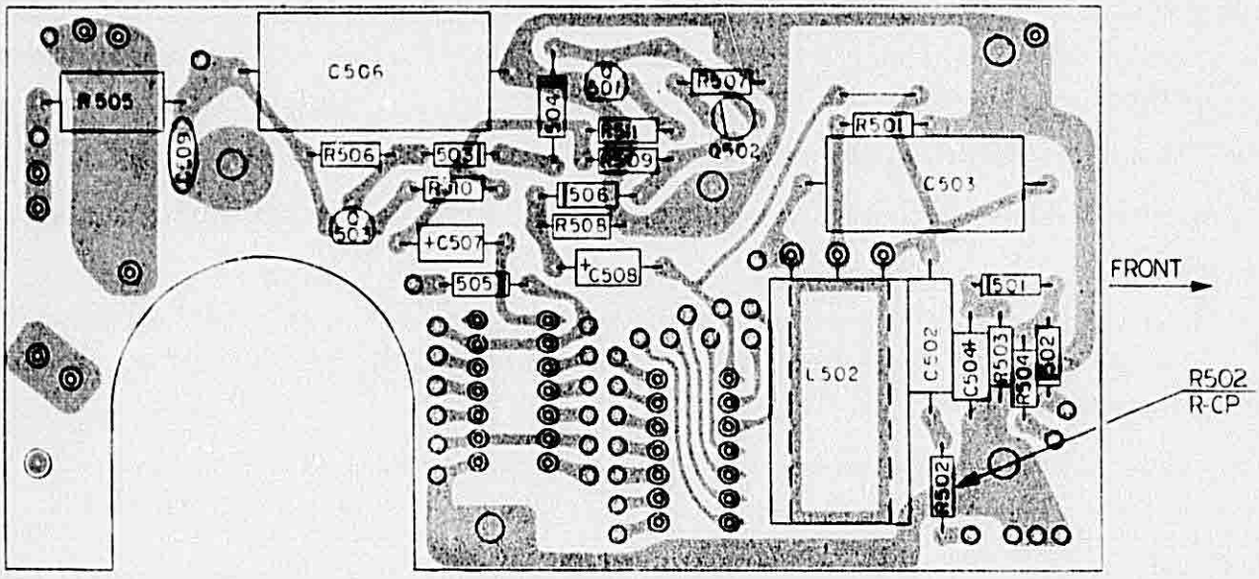
2.8.1.1 Continued

Option 2 Refer to Fig. 2-4.

1. Bench test the transceiver. Refer to Section 2 of the COM 11B/COM 111B Maintenance Manual.
2. Remove the four screws that secure the top dust cover. Remove the cover.
3. Locate the volume control shaft collar (item 1) and loosen the four setscrews (item 2).
4. Pull the volume knob and shaft (item 3) forward from the trim panel; remove the shaft collar (item 1).
5. Remove the volume control spring (item 5) and its hardware (items 6) and replace it with the standoff terminal and hardware supplied in Kit 3722-0500. The lock washer should be positioned between the standoff and the spacer.
6. Relocate the wire on the arm of the volume control to the newly installed standoff.
7. For R-CP selection connect a resistance decade box between Top of the volume control and the standoff.
8. Remove from the COM bench test cable harness the 1.5K resistor found at P401A, pins 7 and 8. Connect a 470 ohm resistor from pin 8 of P401A to ground. Connect an AC VTVM across the 470 ohm resistor.
9. Apply to the antenna connector a 5 uv RF signal, modulated 60% by 1 KHz on any selected Com frequency: Select a value of resistance for 1.0 Vrms ± 1 db as read on the AC VTVM.
10. Install the selected value resistor (R-CP). Replace the dust cover and secure it.
11. Install an appropriate label over the volume control shaft hole. Refer to Section 2.7.1 Installation Kit Labels.

2.8.1.2 COM 111 TSO

1. Bench test the transceiver. Refer to Section 2 of the COM 111 TSO Maintenance Manual.
2. Remove the top dust cover (six screws).
3. At the volume control, relocate the wire on the arm (the center lug) of the control to the adjacent lug where the coax center conductor is connected.
4. Cut out **only the body** of R502. For R-CP selection connect a resistance decade box across the remaining leads of R502.



LEFT SIDE-TOP VIEW

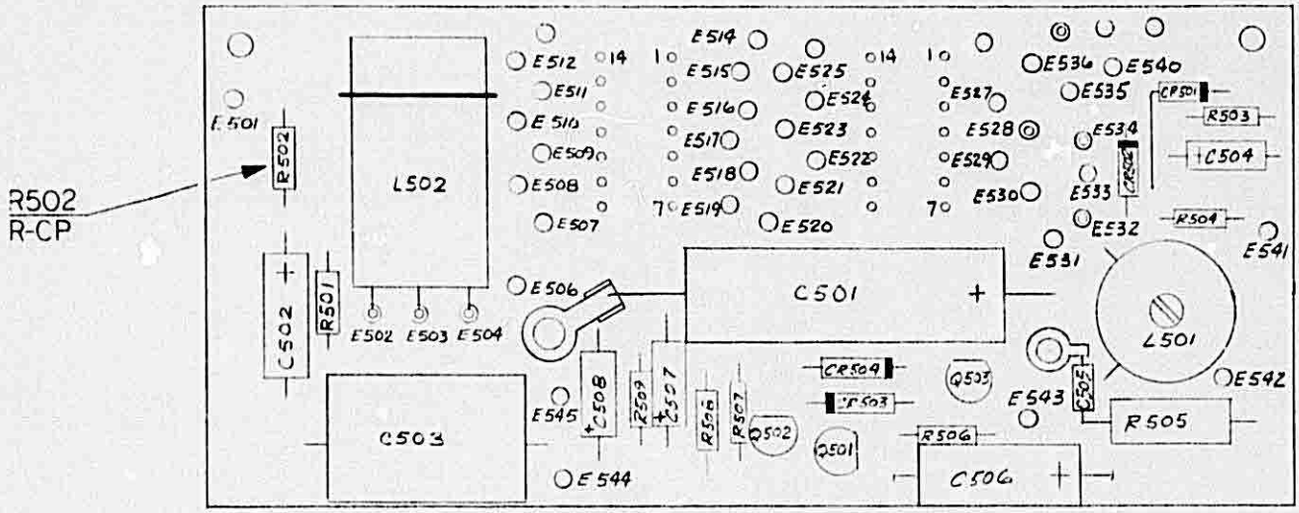
FIGURE 2-5. COM 111 TSO INTERCONNECT BOARD

5. Remove the 1.5K ohm resistor from the COM bench test cable harness connector, P401A, Pins 7 and 8. Connect a 470 ohm resistor from P401A, Pin 8 to ground. Connect an AC VTVM across the 470 ohm resistor.
6. Apply to the antenna connector a 5 uv RF signal modulated 60% by 1 KHz on any selected Com frequency. Select a value of resistance for 1.0 Vrms ± 1db as read on the AC VTVM.
7. Remove the Interconnect Board's attaching hardware (4 screws) so that the solder side is accessible to unsolder R502's leads. Remove the leads.
8. Install the selected value resistor (R-CP) in place of R502.
9. Replace the Interconnect Board and secure it.
10. Replace the dust cover and secure it.

SEE BLOW-UP

2.8.1.3 COM 11 and COM 11A

1. Bench test the transceiver. Refer to Section 2 of the COM 11/COM 11A Maintenance Manual.
2. Remove the top dust cover (six screws).
3. At the volume control, relocate the wire on the arm (the center lug) of the control to the adjacent lug where the coax conductor is connected.
4. Cut out **only the body** of R502. For R-CP selection connect a resistance decade box across the remaining leads of R502.



LEFT SIDE-TOP VIEW

FIGURE 2-6. COM 11/COM 11A INTERCONNECT BOARD

5. Remove the 1.5K ohm resistor from the COM bench test cable harness connector, P401A, Pins 7 and 8. Connect a 470 ohm resistor from P401A, Pin 8 to ground. Connect an AC VTVM across the 470 ohm resistor.
6. Apply to the antenna connector a 5 uv RF signal modulated 60% by 1 KHz on any selected Com frequency. Select a value of resistance for 1.0 Vrms ±1 db as read on the AC VTVM.
7. Remove the Interconnect Board's attaching hardware (4 screws) so that the solder side is accessible to unsolder R502's leads. Remove the leads.
8. Install the selected value resistor (R-CP) in place of R502.
9. Replace the Interconnect Board and secure it.
10. Replace the dust cover and secure it.

SEE BLOW-UP

2.8.1.4 NAV 14

1. Bench test the receiver. Refer to Section 2 of the NAV 14 Maintenance Manual.
2. Remove the top dust cover (six screws).
3. At the volume control, relocate the wire on the arm (the center lug) of the control to the adjacent lug where the coax conductor is connected.
4. Cut out **only the body** of R502. For R-CP selection connect a resistance decade box across the remaining leads of R502.

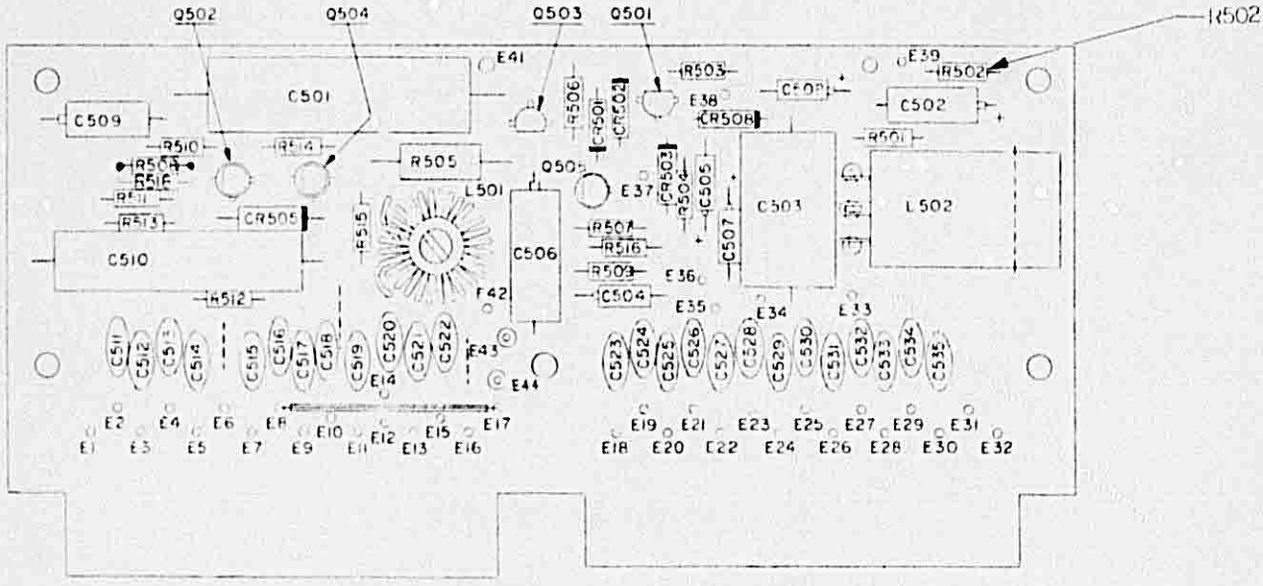


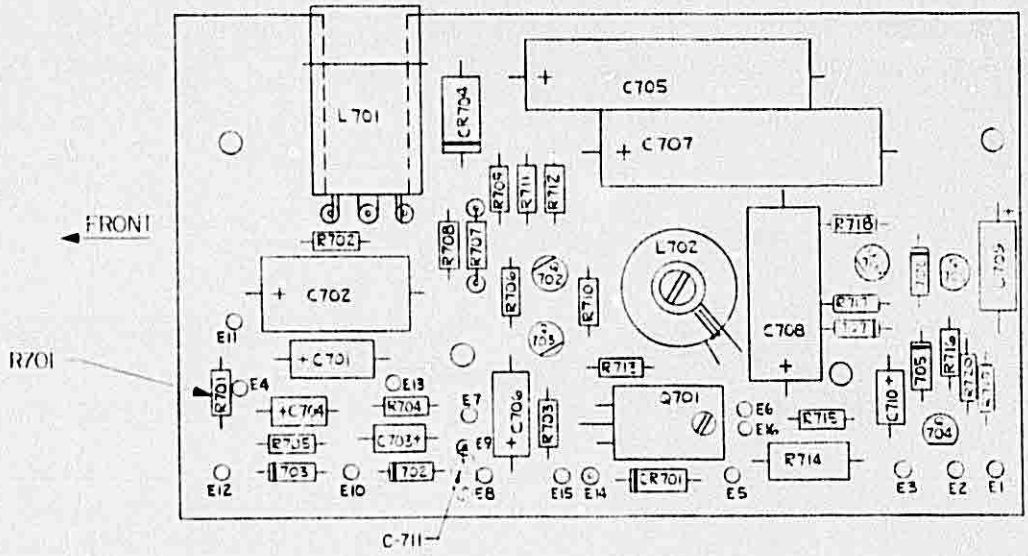
FIGURE 2-7. NAV 14 CONNECTOR BOARD

5. Connect a 470 ohm resistor from J1A, Pin 8 to ground. Connect an AC VTVM across the 470 ohm resistor.
6. Apply to the antenna connector a 5 uv RF signal modulated 15% by 1 KHz on any selected Nav frequency. Select a value of resistance for 1.0 Vrms ±1 db as read on the AC VTVM.
7. Remove the Connector Board's attaching hardware (four screws) so that the solder side is accessible to unsolder R701's leads. Remove the leads.
8. Install the selected value resistor (R-CP) in place of R502.
9. Replace the Connector Board and secure it.
10. Replace the dust cover and secure it.

SEE BLOW-UP

2.8.1.5 NAV 14/DME and NAV 114

1. Bench test the receiver. Refer to Section 2 of either the NAV 14/DME or the NAV 114 Maintenance Manual.
2. Remove the top dust cover (six screws).
3. At the volume control, relocate the wire on the arm (the center lug) of the control to the adjacent lug where the coax conductor is connected.
4. Cut out **only the body** of R701. For R-CP selection connect a resistance decade box across the remaining leads of R701.



TOP VIEW

FIGURE 2-8. NAV 14/DME and NAV 114 CONNECTOR BOARD

5. Connect a 470 ohm resistor from J1A, Pin 8 to ground. Connect an AC VTVM across the 470 ohm resistor.
6. Apply to the antenna connector a 5 uv RF signal modulated 15% by 1 KHz on any selected Nav frequency. Select a value of resistance for 1.0 Vrms ±1 db as read on the AC VTVM.
7. Remove the Connector Board's attaching hardware (four screws) so that the solder side is accessable to unsolder R701's leads. Remove the leads.
8. Install the selected value resistor (R-CP) in place of R701.
9. Replace the Connector Board and secure it.
10. Replace the dust cover and secure it.

SEE BLOW-UP

2.8.1.6 NAV 11, NAV 12, NAV 111, and NAV112

1. Bench test the receiver. Refer to Section 2 of the appropriate Maintenance Manual.
2. Remove the dust cover by removing five phillips head screws.
3. Perform either A or B
   A. to bypass volume control:
      1) unsolder and remove R802
      2) for R-CP selection connect a resistance decade box between the positive lead of C802 and the coax center conductor on the volume control lug.
   B. to retain volume control:
      1) unsolder and remove R802.
      2) for R-CP selection connect a resistance decade box in place of R802.
4. Connect a 470 ohm resistor from J101, Pin 3 to ground. Connect an AC VTVM across the 470 ohm resistor.

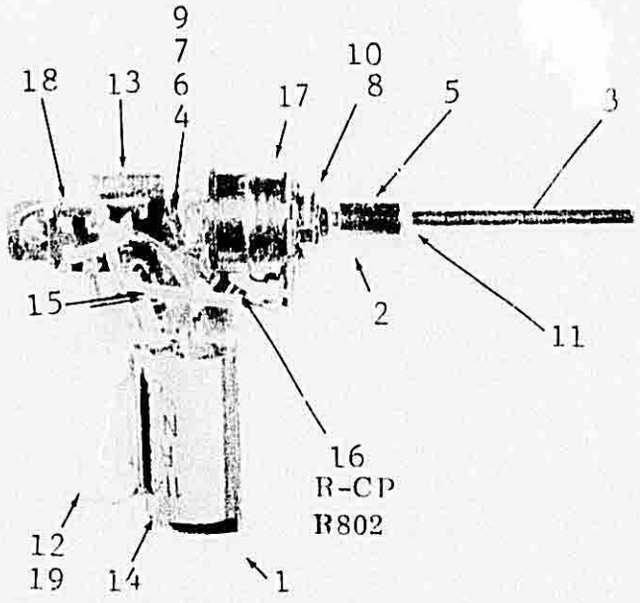


FIGURE 2-9. NAV 11/12/111, and 112 FILTER ASSEMBLY

5. Apply to the antenna connector a 5 uv RF signal modulated 15% by 1 KHz on any selected Nav frequency. Select a value of resistance for 1.0 Vrms ±1 db as read on the AC VTVM.
6. Install the selected value resistor (R-CP) in place of R802.
7. Replace the dust cover and secure it.

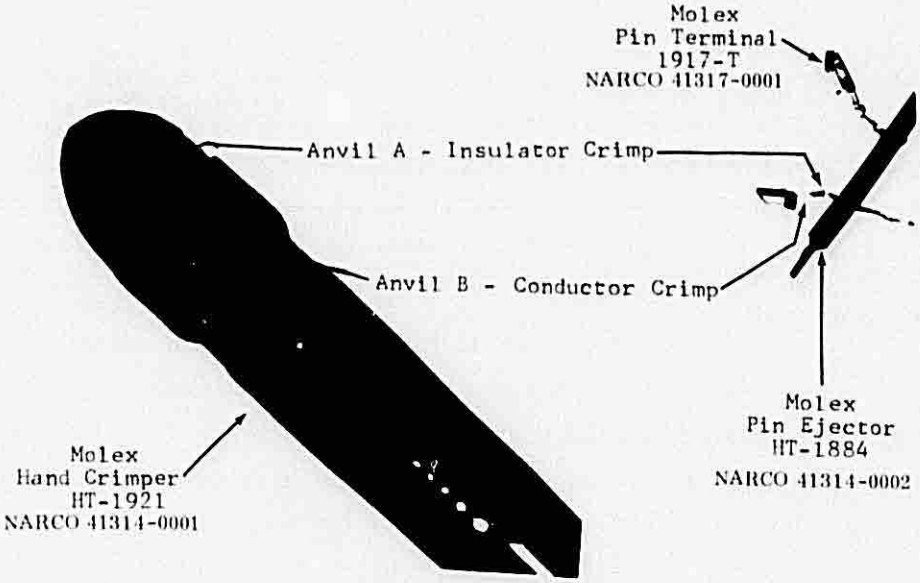


FIGURE 2-10. CRIMPING TOOL

2.8.2 Cable Connector Fabrication

Crimping and ejector tools for the connector connections are available from Narco or Molex.

Molex Products Co.
Downers Grove, Ill. 60515

Hand Crimper HT-1921 (NARCO 41314-0001)
Ejector Tool HT-1184 (NARCO 41314-0002)

The connector mounting tabs should be placed on the inside of the tray.

Lead Termination

1. Strip wire 5/32" for PIN Terminal No. 1917-T.
2. Open tool (engraved side toward you), from the opposite side place the conductor tab section of a pin on Anvil B. Close tool slightly (until the tabs touch the female jaw).
3. Insert stripped conductor until insulation is level with outside of jaw. Crimp by squeezing handles together until jaws are fully closed or sufficient crimp is made.
4. Move lead and pin to Anvil A. Rest the insulating tab section on Anvil A. Crimp again until jaw is closed or sufficient crimp is made.
5. If necessary, straighten pin while still being held in the jaw.

Insertion

1. The PIN Terminal may now be inserted into the desired pin location in the translucent connector housing. The pin cannot be inserted upside-down. Right-side-up it slides in effortlessly. Be sure to push it all the way in, until a "click" can be felt, heard, or even seen (by turning the translucent housing over).
2. There is no necessity to pull back on the lead itself except to test for the "locking feature", and then only with a moderate pull.

Extraction

1. If a pin is erroneously inserted into the wrong housing position, or if at some later time a circuit change is desired, the pin can be removed easily. Slip the flat narrow blade portion of the tool into the mating side of the housing, under the pin. By holding the housing upside-down one can see the blade slide in, up to the stop. This action picks up the locking key and allows the lead and pin to slip out of its position using a light pulling action on the lead. Neither pin nor position has been damaged thus allowing reinsertion in the same or another position.

Crimping with Pliers

The lead PIN Terminal connection using the Molex hand crimper provides a superior connection than with pliers. However, with care a satisfactory connection can be made.

1. Strip lead 5/32" for PIN Terminal 1917-T.
2. Tin exposed conductor.
3. Using needle nose pliers fold over conductor tabs firmly onto the conductor, one side then the other.
4. Repeat step 3 for the insulator tabs.
5. Apply a drop of solder (using minimum heat) to the conductor connection to assure a good electromechanical joint.

2.8.3 Leveled/Standard Receive Audio Selection

By reference to Fig. 2-40, it will be observed that the speaker amplifier chain and the phones amplifier chain each contain an audio leveling amplifier and a standard (unleveled) audio amplifier.

Receive audio inputs may be individually directed to either a leveling OR a standard amplifier by means of jumpers at P4. Furthermore, at P4, separate jumpers are provided for the speaker chain and the phones chain. Therefore a receive audio input may be leveled in the speaker chain yet standard, unleveled, in the phones chain.

As supplied the following receive audio inputs are leveled in phones and speaker: C1, C2, C3, N1, and N2. The following receive audio inputs are standard in phones and speaker: N3 and N4 At P4 these seven inputs may be individually rerouted to leveled or standard audio, as desired.

The remaining two inputs, N5 and the unswitched audio, may not be rerouted. The N5 input bypasses these audio amplifiers and the tone control circuitry. Since the N5 input is intended for Marker Beacon audio the tone control in the "cut" mode would roll-off the 3 KHz INNER marker tone, thus standard audio response is provided for the N5 input. The unswitched audio input is directly connected to the inputs of the phones and speaker audio leveling amplifiers.

2.8.3 Continued

Modification to the standard wiring is accomplished as follows:

1. Remove the CP 127 from its mounting tray.
2. Remove P4 from the Transmit Switch PC Assembly by carefully pushing the connector towards the rear of the unit.
3. Refer to Fig. 2-11 and modify the P4 jumpers (for each receiver) to direct the speaker and phones audio inputs to the desired outputs.

   example: COM 3 from leveled audio to standard audio.

   Speaker { a) remove speaker jumper from pin 3 to pin 4.
   b) install a new speaker jumper from pin 4 to pin E.

   Phones { c) remove phones jumper from pin 7 to pin 8.
   d) install a new phones jumper from pin 7 to pin F.
4. Reinstall connector P4.

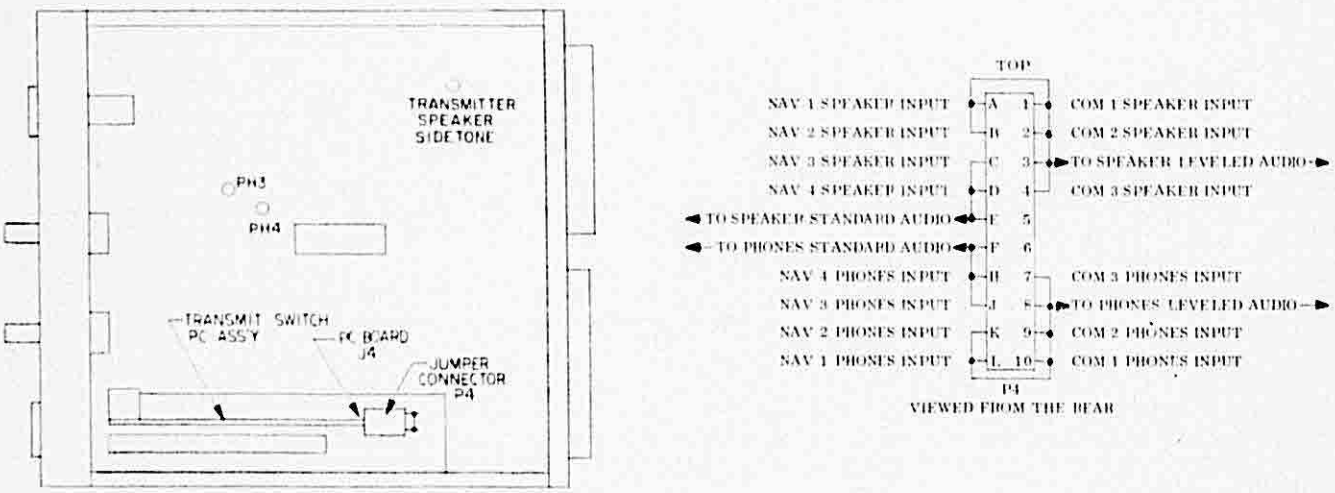


FIGURE 2-11. CP 127's CONNECTOR, P4, WITH FACTORY INSTALLED JUMPERS

SEE BLOW-UP

2.8.4 System Variations

TS3 and S4 Assignment

Along the left edge of the trim panel there are four rectangular pushbuttons switches of which the lower two are usually assigned to accessory paging functions (APF). These switches are interlocked and identified schematically as TS-3 and S-4, S-4 being the bottom switch. The choice of which of these two switches does what is the installers choice. Once programmed, they can be easily reprogrammed to allow for a change in the aircraft's operating requirements or the updating of the avionics system. All APF programming is accomplished at the top center tray cable connector, J3. Table 2.1 correlates switch/function to the appropriate APF wiring diagram.

Figure 2-23, the General Installation Wiring Diagram provides an overall view of the CP 127 connections. Sheet 2 of Figure 2-23 shows all the jumpers used. The left side, or column, lists all the jumpers used when TS3 is used for the third transceiver and S4 is used for Accessory Paging Function. The right side, or column, lists all the jumpers used when TS3 and S4 are used for Accessory Paging Function. All entries centered between these two columns are common to both left and right column installations.

Other notes pertaining to each installation are found within each installation wiring diagram.

TABLE 2.1 ASSIGNMENT OF TS3 and S4

System	TS-3	S-4	APF Figure No.
1	Cabin Address or Ramp Hail	Interphone	2-36
2	Cabin Address	Ramp Hail	2-37
3	Interphone 1	Interphone 2	2-38
4	COM 3 or HF	Cabin Address or Ramp Hail or Interphone	2-39

2.8.4.1 Helicopter Installations With Interphone

Normally either TS3 or S4 will be assigned as the Interphone switch. However many times in helicopters it is desirable to activate the Interphone function without the need for removing hands from the controls. Figure 2-35 is not an all inclusive wiring diagram but is intended to illustrate one approach to the problems involved in helicopter installations. This figure provides a means of activating Interphone without the CP 127 Interlocked selectors; thus CP 127 transmit selector pushbutton TS1, TS2, or TS3 may remain depressed during Interphone without activating a transmitter. TS1 and TS2 operate otherwise normally, TS3 may be used for a third transceiver or for an accessory paging function, and S4 may be utilized for Ramp Hail or a pushbutton activated Interphone (example: driving the FM 1200 Com Interrupt).

Jumpered R675 is found in all CP 127s. In helicopter installations the jumper should be cut out thus allowing R675 to operate as intended; as an isolation resistor to maintain the interphone volume and level regardless of the CP 127's volume control setting.

For additional wiring information refer to Figure 2-23, the General Installation Wiring Diagram.

2.8.4.2 Dual Headphone Channels

Refer to Figures 2-23, 2-35, or 2-38.

Where a cockpit speaker is not desired, the speaker amplifier may drive a headphone load. The speaker output at J3-V is jumpered to J3-16 a 4 ohm internal terminating resistor, and the headphone load is connected to J3-V. The headphone output at J1-4 remains unaffected.

Receive audio selection for the headphone output at J3-V is by the top (SPEAKER) row of pushbuttons. The headphone receive audio output at J1-4 continues to be selected by the bottom (PHONES) row of pushbuttons.

Since pilot and copilot are using headphones the necessity for interphone communications is apparent. During interphone operation the receive audio selected by the PHONES row of pushbuttons is not muted. For this reason the headphone output at J1-4 is generally used by the pilot. The J3-V receive audio is muted during interphone and thus is assigned to the copilot. During a transmission both audio channels will be muted.

2.8.4.3 Dual Speaker Channels

Where cockpit headphones are not desired the CP 127 headphone output, at J1-4, may drive a VP-22C Speaker Amplifier to provide a second speaker channel. The receive audio selection for this second speaker channel will be via the bottom (PHONES) row of pushbuttons. The standard speaker output at J3-V is unaffected by the addition of the second speaker amplifier and its receive audio is selected via the top (SPEAKER) row of pushbuttons.

Refer to the VP-22C Maintenance Manual for details concerning its electrical characteristics plus electrical and mechanical installation. Figure 2-12 shows a block diagram of a CP 127/VP-22C installation.

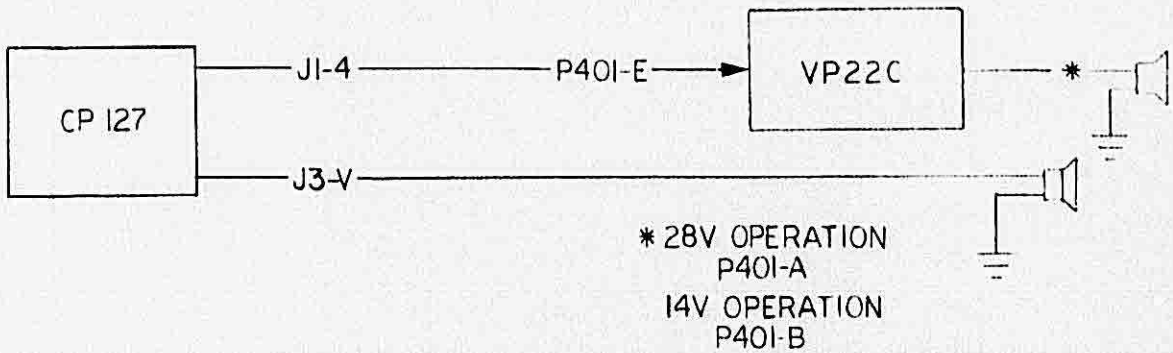


FIGURE 2-12. VP-22C and the CP 127

2.8.5 MK 16 or MK 12/CP 127 Installation

The Narco MK 12 and MK 16 do not possess low level outputs to drive the CP 127 as do the Spectrum Line transceivers. Therefore, the Nav/Com speaker output is utilized as the source for the CP 127 receiver inputs. The CP 127 contains 4 ohm power resistors, to properly terminate the speaker outputs of these receivers, and isolation resistors to prevent placing the 4 ohm load resistor directly across one of the receive input pots. Refer to Fig. 2-34 for installation details.

The use of speaker output to drive the CP 127 does preclude the separating of Nav and Com audio. Therefore the individual Nav and Com volume controls generally are retained for those situations where, for instance, the Nav receiver noise or Ident must be removed to make a weak Com signal readable.

The CP 127 Com 1 receive input will become the C/N 1 receive input and in dual installations the Com 2 receive input will become C/N 2 receive input.

It is recommended that the CP 127 standard audio be utilized. Use of the leveled audio may result in excessive background noise. Refer to Section 2.8.3 Leveled/Standard Receive Audio Selection for the procedure to reroute receive audio from leveled to standard audio.

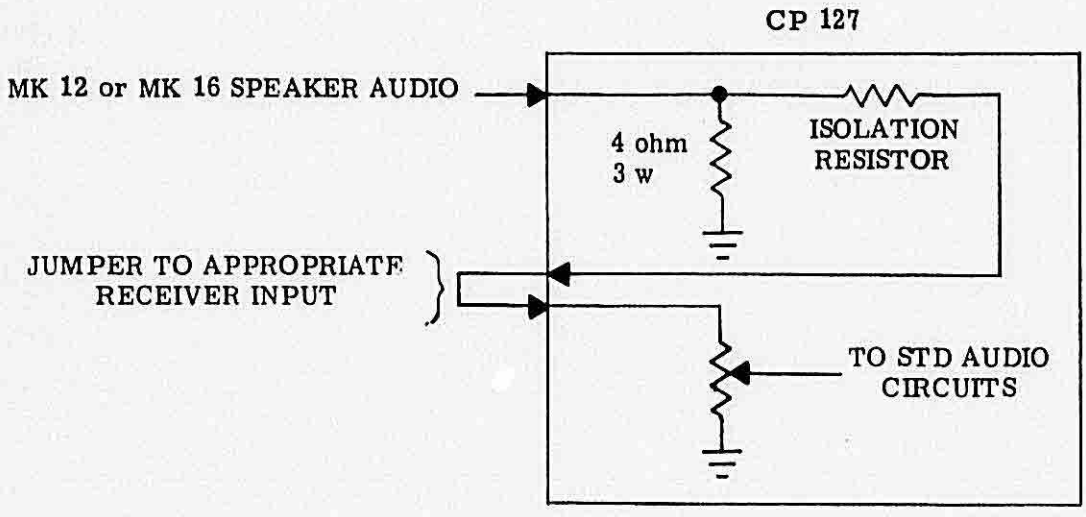


FIGURE 2-13. MK 16/MK 12

2.8.5.1 MK 16 Modification Procedure

This procedure will reduce the gain of the MK 16 Nav and Com audio amplifiers to the degree necessary to properly drive the CP 127 with the MK 16 volume controls set for maximum CW rotation.

1. Bench test all functions of the MK 16. Refer to the unit's Maintenance Manual for method of test, test equipment required, and specifications.
2. Remove top and bottom dust covers.
3. Com Receiver.
   A. Locate R46 and remove it.
   B. Connect resistance decade box in place of R46.
   C. Connect AC VTVM across the 4 ohm speaker load.
   D. Turn the MK 16 ON, channel to 127.50 and rotate Com volume and squelch controls maximum clockwise.
   E. Set the RF signal generator to 127.50 MHz, 5 uv, modulated 60% by 1 KHz audio.
   F. Select value of resistance for 1.5 Vrms (approximately 650 milliwatts) on the AC VTVM. Nominal value 4.7K ohms.
   G. Install selected value of resistance.

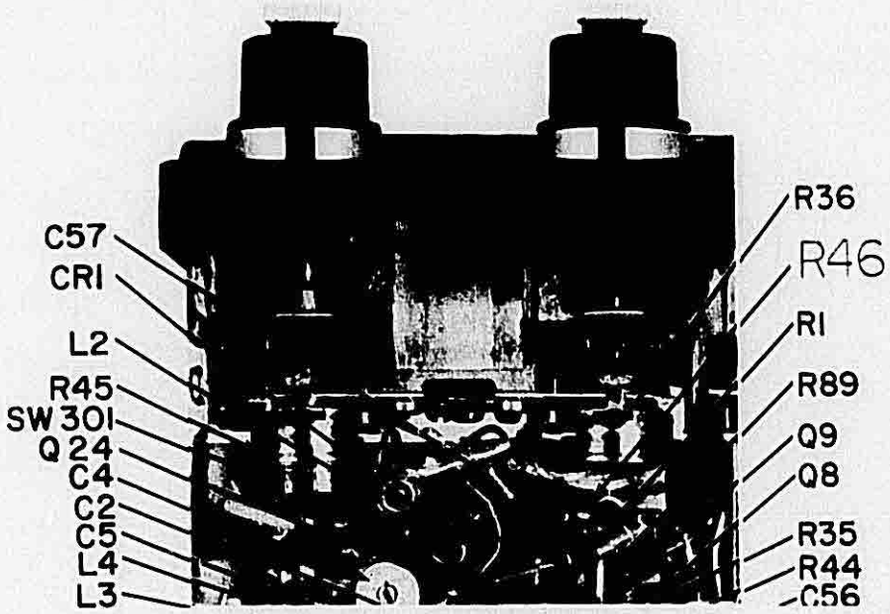


FIGURE 2-14. MK 16's R46

2.8.5.1 Continued

4. Nav Receiver

   A. Free Nav Receiver Audio Preamp Module by:
      1. Straightening the metal tabs securing the module.
      2. Straightening the metal tabs securing the cable adjacent to the module.
      3. Gently pull the module straight up.

   B. Locate the jumper wire adjacent to C257. Cut the jumper in half and connect a resistance decade box to the free ends of the jumper.

   C. Turn the MK 16 ON, channel to 114.9 MHz and rotate the volume and ident controls maximum clockwise.

   D. Set the RF signal generator to 114.9 MHz, 5 uv, modulated 15% by 1 KHz audio.

   E. Select value of resistance from 1.5 Vrms (approximately 650 milliwatts) on the AC VTVM connected across the 4 ohm speaker load. Nominal value is 1.5K ohms.

   F. Remove the decade box and both halves of the jumper. Install the selected value of resistance in place of the jumper wire.

   G. Reinstall the module.

5. Install top and bottom dust covers.

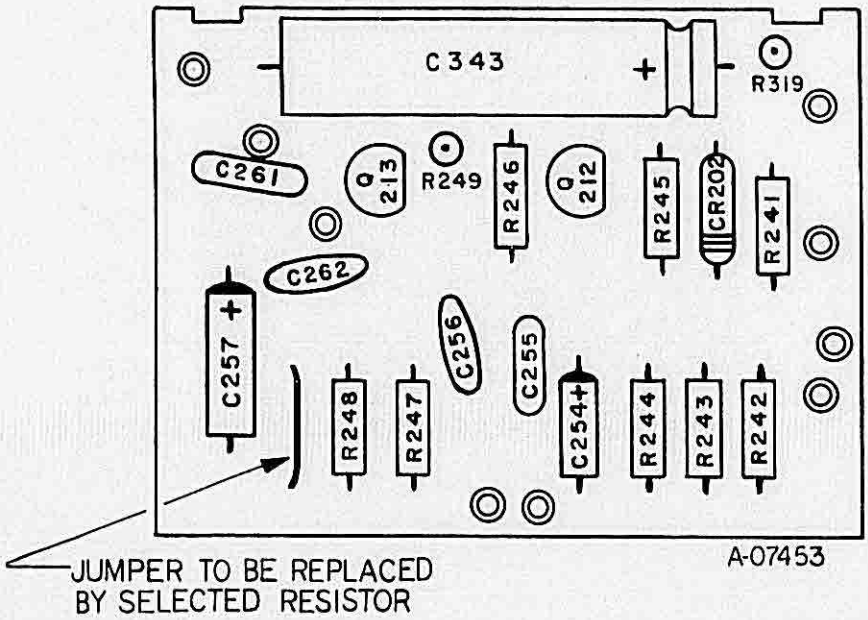


FIGURE 2-15. MK 16 NAV RECEIVER AUDIO PREAMP MODULE

2.8.5.2 MK 12 Series Modification Procedures

In the following procedures the MK 12 is treated first and then the MK 12A and MK 12B. These procedures are general since over the long production span of the MK 12 Series numerous improvements were incorporated. The Maintenance Manual for the particular MK 12 to be modified should be referred to for the proper method of test, schematics, and specifications. Before any modifications are begun all performance characteristics should be confirmed.

2.8.5.2.1 MK 12

Two methods are presented for mating a MK 12 to a CP 127.

The first method reduces the Nav and Com audio voltage to the degree necessary to properly drive the CP 127 with the MK 12's volume controls set for maximum CW rotation. This procedure requires the addition of one selected resistor and the changing of an existing resistor's value.

The second method is simply an electrical test .o determine the degree of Nav and Com volume control rotation which produces the proper voltage level to drive the CP 127. The trim panel and volume knobs are then marked to retain this setting. Yellow dot labels are provided in the installation kit for this purpose.

The first method is the more desirable of the two since the proper MK 12 volume control setting is maximum clockwise, without the necessity for matching dots as in method two.

Method 1

1. From the cathode of V305B (pin 8) remove the coax center conductor.
2. Connect a resistance decade box between pin 8 and the coax center conductor.
3. Connect an AC VTVM across the 4 ohm speaker load.
4. Turn the MK 12 ON, channel the Nav receiver to 114.9 and rotate the Nav volume control maximum clockwise.
5. Set the RF signal generator to 114.9 MHz, 5 uv, modulated 15% by 1 KHz audio.
6. Select a value of resistance to produce 1.5 Vrms ± 1 db on the AC VTVM. Do not solder in the selected value resistor at this time but do not remove the decade box.
7. Turn the unit OFF.

2.8.5.2.1 Continued

8. Locate and remove R319.
9. Connect a resistance decade box to replace R319.
10. Turn the MK 12 ON, channel the Com receiver to 127.50 and rotate the Com volume control maximum clockwise.
11. Set the RF signal generator to 127.50 MHz, 5 uv, modulated 60% by 1 KHz audio.
12. Select a value of resistance to produce 1.5 Vrms ±1 db on the AC VTVM at the speaker load.
13. Perform steps 4, 5, and 6 to confirm the selected value obtained in step 6. Once confirmed, the selected value resistor may be installed.
14. Perform steps 10, 11, and 12 to confirm the selected value obtained in step 12. Once confirmed, the selected value resistor may be installed.

Method 2

1. Connect an AC VTVM across the 4 ohm speaker load.
2. Turn the MK 12 ON, channel the Nav receiver to 114.9 and rotate the Nav volume control approximately 50% clockwise.
3. Set the RF signal generator to 114.9 MHz, 5 uv, modulated 15% by 1 KHz.
4. Adjust the Nav volume control to produce 1.5 Vrms ±1 db on the AC VTVM. Mark the trim panel and volume control, in a position easily seen by the pilot, with the yellow dots from the installation kit to permit resetting the control to this calibrated position.
5. Channel the Com receiver to 127.50 and Com volume control to approximately 50% clockwise.
6. Set the RF signal generator to 127.50 MHz, 5 uv, modulated 60% by 1 KHz.
7. Adjust the Com volume control to produce 1.5 Vrms ±1 db on the AC VTVM and mark the controls as in step 4 of this method.

2.8.5.2.2 MK 12A and MK 12B

The MK 12A or MK 12B may be mated to the CP 127 by electronically adjusting the Nav and Com receivers audio voltage to produce the proper level to drive the CP 127. This procedure will result in having these unit's Nav and Com volume controls at their maximum clockwise positions when driving the CP 127.

NOTE 1:

It is desirable to bypass the MK 12's Com volume control to prevent it from being inadvertently mis-set while adjusting the squelch.

To bypass the MK 12's Com volume control disconnect the wire from the arm (the center lug) of the Com volume control and connect it to the "hot" terminal (the left hand lug, as viewed from the rear). An ohmmeter may be used to locate the grounded (third) terminal of the volume control.

NOTE 2:

If it is felt that one shouldn't modify the MK 12A or MK 12B, **Method 2** of the MK 12's procedure may be followed.

Gain Procedure for both the MK 12A and the MK 12B:

1. Locate and remove R322.
2. Connect a resistance decade box in place of R322.
3. Connect an AC VTVM across the 4 ohm speaker load.
4. Turn the unit ON, channel the Nav receiver to 114.9 and set the Nav volume control to maximum clockwise rotation.
5. Set the RF signal generator to 114.9 MHz, 5 uv, modulated 15% by 1 KHz.
6. Select a value of resistance to produce 1.5 Vrms on the AC VTVM. Do not solder in the selected value resistor at this time but do not remove the decade box.
7. Turn the unit OFF.
8. Locate C157 and the wire from the Com volume control. Disconnect the wire from the Com volume control at C157.
9. Connect a resistance decade box between the free end of the wire and C157.
10. Turn the unit ON, channel the Com receiver to 127.5 and, where the Com volume control has been retained, rotate the Com volume control maximum clockwise.
11. Set the RF signal generator to 127.50 MHz, 5 uv, modulated 60% by 1 KHz.
12. Select a value of resistance to produce 1.5 Vrms on the AC VTVM at the speaker load.
13. Perform steps 4, 5, and 6 to confirm selected value in step 6. Once confirmed, the selected value resistor may be installed.
14. Perform steps 10, 11, and 12 to confirm selected value in step 12. Once confirmed, the selected value resistor may be installed.

2.8.6 Avionics Bus Relay

2.8.6.1 General

The Avionics Bus Relay, when connected with the CP 127 POWER pushbutton, applies DC power to the entire avionic system.

The purpose of the Avionics Bus Relay (ABR) is to eliminate the necessity of turning each unit ON and OFF. When the two position POWER pushbutton is depressed an orange bar appears in view (in the pushbutton) indicating that ALL the avionics are ON. Depressing the pushbutton a second time cuts off the power thereby turning all the avionics OFF. When OFF the POWER pushbutton appears black.

With all avionics ON, specific equipments or systems are immediately available just by pushing the desired equipment/system pushbutton on the face of the CP 127.

Two versions of the ABR are available, 14 and 28 volt. The ABR voltage must be equal to that of the particular aircraft's bus voltage.

The CP 127 does not have an ON/OFF switch of its own. It receives its power directly from the aircraft's bus. When an Avionics Bus Relay is installed all power to the avionics, including the CP 127, is routed thru the ABR.

2.8.6.2 Theory of Operation

The Avionics Bus Relay is a single-pole-single-throw, normally closed, high current, DC contactor. Refer to the schematic shown in Figure 2-18. In the avionics "ON" mode the relay coil is not energized, the contacts are closed applying voltage to the avionics bus. This system has the advantage of avoiding loss of avionics bus voltage due to a relay coil open circuit or low aircraft bus voltage.

When the relay coil is energized the relay contacts are opened and voltage is removed from the avionics bus.

Control of the relay coil is by the CP 127 POWER pushbutton switch. In the avionics "OFF" mode the POWER switch provides a ground to energize the relay coil and remove avionics bus voltage. Depressing the POWER pushbutton removes the coil ground, deenergizing the coil, closing the relay contacts and applying voltage to the avionics bus.

2.8.6.3 Mechanical Installation

A mounting template is given in Figure 2-16. The bus relay is secured with two No. 8 screws which, due to variations between installations, are not supplied. Access to the mounting holes is by removing the two cover screws and the top cover.

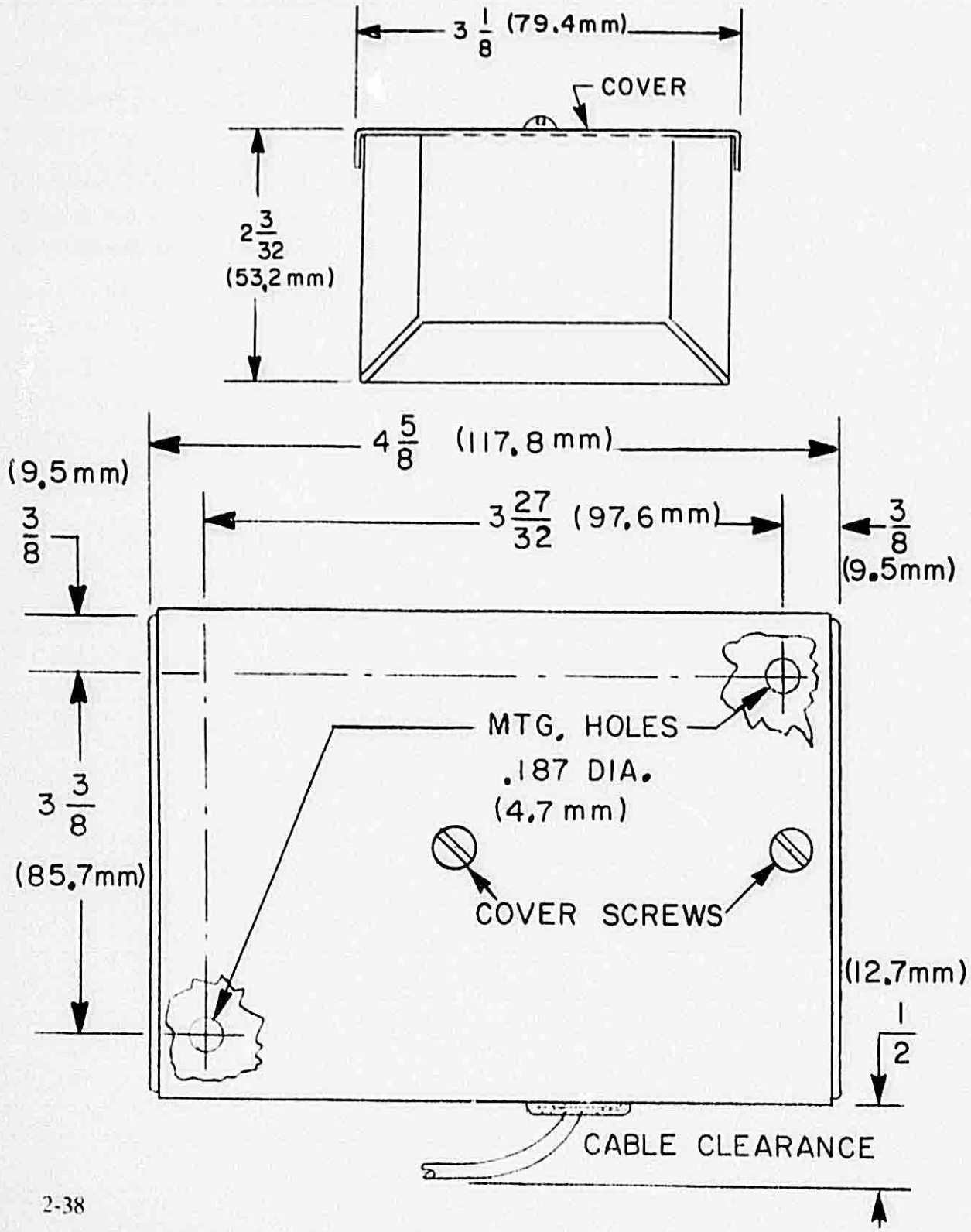
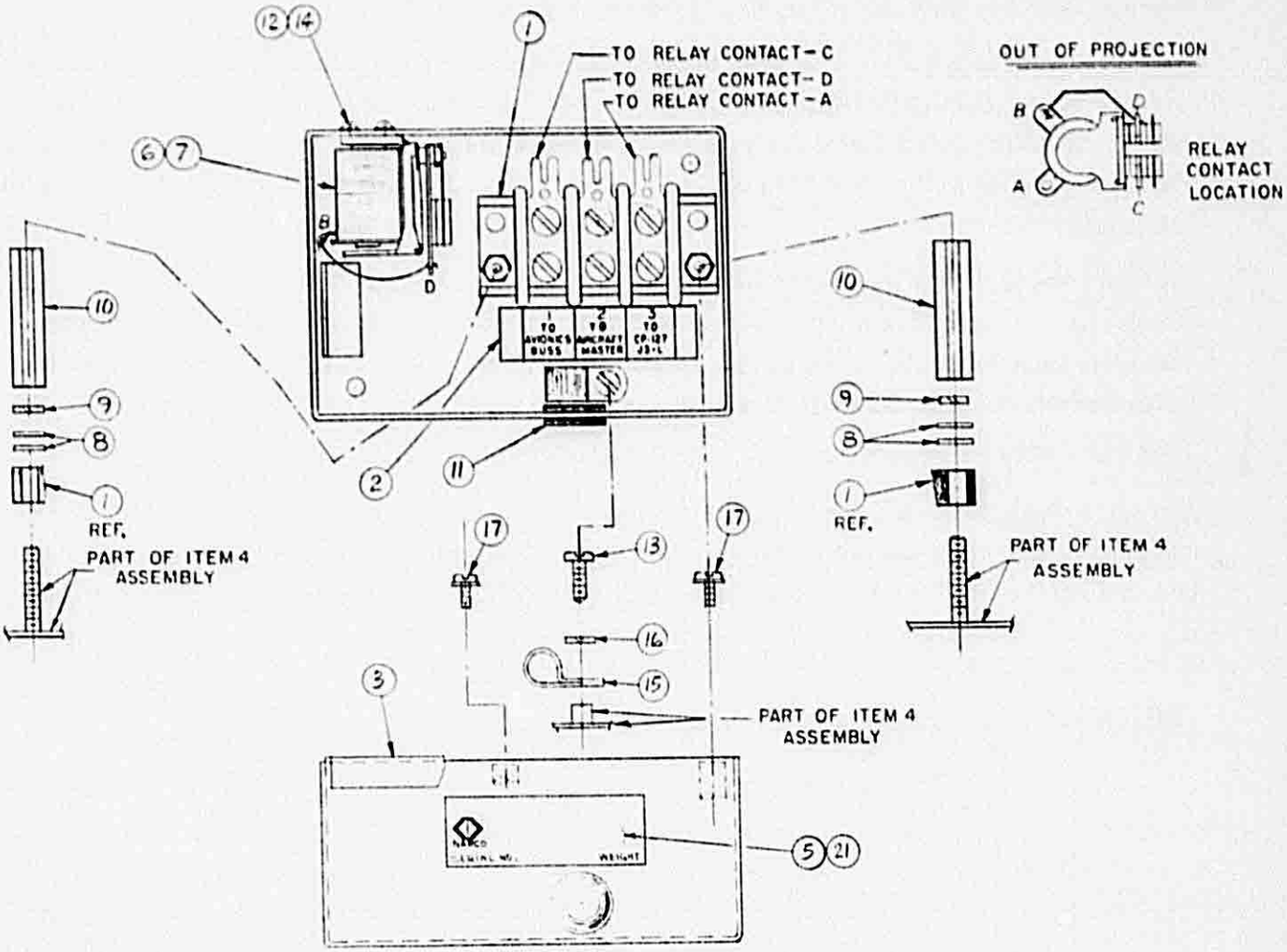
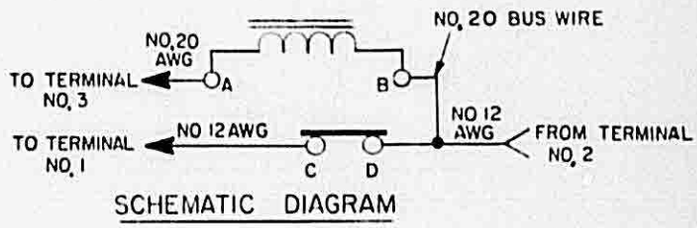


FIGURE 2-16. AVIONICS BUS RELAY INSTALLATION DRAWING



ITEM	PART NUMBER	DESCRIPTION	QUANTITY 14V	QUANTITY 28V
1	81503-0001	TERMINAL BLOCK	1	1
2	01736-0001	LABEL, BUS RELAY CONNECTIONS	1	1
3	55171-0001	COVER, BUS RELAY	1	1
4	55172-0101	CHASSIS ASSY	1	1
5	01710-0001	LABEL, AVIONICS BUS RELAY	1	0
6	65145-0001	RELAY, BUS, 14V	1	0
7	65145-0002	RELAY, BUS, 28V	0	1
8	81329-0008	WASHER, FLAT, NO. 8	4	4
9	81324-0008	WASHER, LOCK, SPLIT, NO. 8	2	2
10	81212-0009	SPACER, HEX, THREADED	2	2
11	81160-0002	GROMMET, RUBBER	1	1
12	81324-0003	WASHER, LOCK, SPLIT, NO. 3	1	1
13	82817-0003	SCREW, MACH, PD HD, SL, 6-32 x 1/4	1	1
14	82826-0002	SCREW, MACH, RD HD, SL, 3-48 x 3/16	1	1
15	82010-0028	CLIP, CABLE	1	1
16	81324-0006	WASHER, LOCK, SPLIT, NO. 6	1	1
17	82962-0003	SCREW, MACH, PAN HD, SL, NO. 4-40	2	2
18	90100-0002	WIRE, RED (Not Shown)	AR	AR
19	90090-0004	WIRE, YELLOW (Not Shown)	AR	AR
20	55176-0001	INSTALLATION DRAWING (See Fig. 2-16)	X	X
21	01710-0002	LABEL, AVIONICS BUS RELAY	0	1
22	90019-0020	BUS, NO. 20 (Not Shown)	AR	AR
23	91022-0004	SLEEVING, TEFLON (Not Shown)	AR	AR



SCHEMATIC DIAGRAM

SPECIFICATIONS

current ..... 40 amps, maximum
weight ..... 0.55 lbs.

FIGURE 2-17. AVIONICS BUS RELAY ASSY DRAWING AND PARTS LIST

SEE BLOW-UP

2.8.6.4 Electrical Installation

Figure 2-18 schematically locates the ABR in the aircraft electrical system. As shown the ABR is inserted between the aircraft bus and the avionics bus.

Switch S1 (not supplied) is a **required** high current bypass for the ABR in the event that, due to some system failure, the ABR is held in the avionics OFF position. S1 is a 40 ampere, minimum, circuit breaker or switch which normally remains in the open circuit position. Closing S1 connects the avionics bus directly to the aircraft bus. Connections to S1 should be directly to the concerned buses and not the ABR assembly.

Connections to the ABR assembly are by means of a terminal block, within the assembly, reached by removing two straight slot drive screws and the top cover. A label adjacent to the terminal block identifies each connection. The terminal block contains No. 8 screws intended for use with crimp-on solderless connectors. **DO NOT** make any connections directly to the relay terminals.

Pass cable thru grommet (Fig. 2-17, Item 11) **THEN** crimp on solderless connectors.

Due to the high currents a wire gauge of not less than No. 12 AWG is recommended for those leads carrying avionics bus current (connections to terminals 1 and 2 of the ABR). The connection from terminal 3 of the ABR to CP 127 J3-L should be No. 20 AWG. A wire clamp is provided for strain relief.

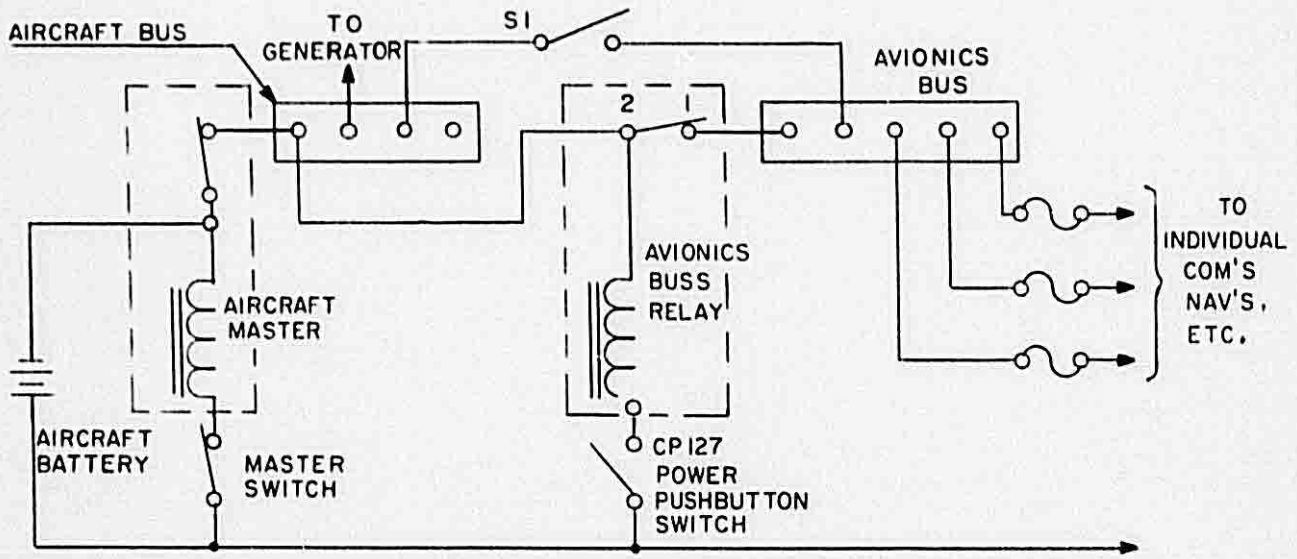


FIGURE 2-18. AVIONICS BUS RELAY LOCATION SCHEMATIC

2.8.7 Installation of Non-Aircraft Type Transceivers

Many citizen band, business, police, fire, and other emergency transceivers are compatible with the CP 127. Due to the variety of such equipments this manual will not delve into specifics concerning their mechanical and electrical installation, refer to the transceiver's Maintenance Manual.

Only general electrical installation information is given in this section and it should be perused carefully to determine compatibility with the selected transceiver. It is recommended that the third Com (COM 3) inputs and pushbuttons be utilized for these transceivers, leaving free the COM 1 and COM 2 positions for aircraft communication transceivers. The CP 127 General Installation Wiring Diagram, Figure 2-23, indicates the proper connections for third Com (COM 3) operation. In addition the Non-Aircraft Transceiver Installation Diagram, Figure 2-20, illustrates the necessary connections and audio input voltages.

When the CP 127 is to process the receive audio it is desirable to bypass the transceiver's volume control. This is done to properly drive the CP 127's input circuits. A careful assessment of the transceiver's internal circuitry is required by the installing agency to assure a successful modification. In general the connection to the wiper arm of the volume control should be disconnected and reconnected to the top, or hot lug, of the volume control through a fixed resistor. The selection of a value for the fixed resistor is as outlined in the following two steps:

1. apply to the transceiver antenna terminals a receive signal representing a moderately strong transmission, i.e.: a signal of sufficient strength to produce rated audio output and an intelligible S+N/N ratio.
2. modify the transceiver to bypass the volume control and select a value of "R" resistance to produce 1.0 Vrms at J3-F. (See Figure 2-19)

A less desirable alternative is to perform step 1 above and place a mark on the transceiver's trim panel to indicate the degree of volume control rotation which produces the voltage level specified in step 2. Yellow dot labels are provided in the installation kit for such markings. With either procedure the transceiver's internal speaker should be disabled.

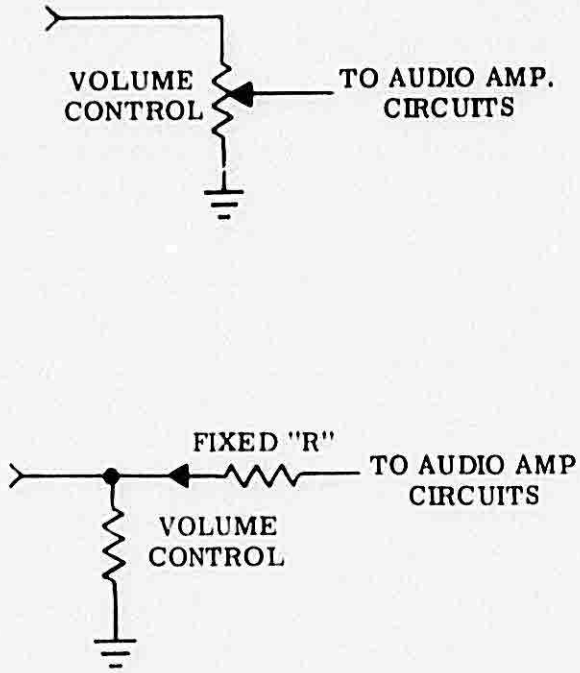
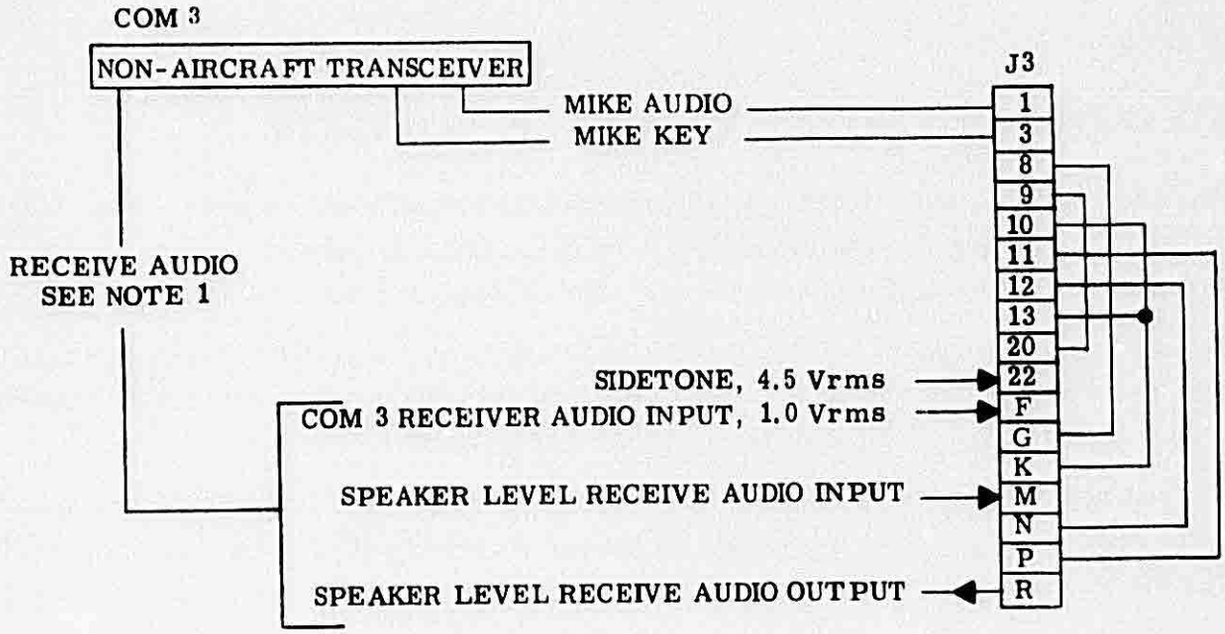


FIGURE 2-19. NON-AIRCRAFT TRANSCEIVER VOLUME CONTROL BYPASS



NOTES:

1. Receive Audio
   A. Where transceiver **speaker** audio output is to drive the CP 127's receive audio output: Connect the transceiver speaker audio to J3-M and add a jumper from J3-R to J3-F for third Com receive input. Disconnect the transceiver's internal speaker.

   B. Where transceiver **headphone** audio output is to drive the CP 127's receive audio output:

      Connect the transceiver headphone audio directly to J3-F for third Com receive input.

   C. Where both speaker and phones audio are available, the headphone audio generally is used for side tone and the speaker audio is used for receive audio.

2. Jumpers for COM 3 AUTO function are shown to the right of J3.

FIGURE 2-20. NON-AIRCRAFT TRANSCEIVER INSTALLATION DIAGRAM

2.9 RECOMMENDED PREINSTALLATION BENCH TESTS

Since the CP 127 is the heart of the audio system a preinstallation bench test can prevent many hours of in aircraft problem solving. In addition this period should be utilized to make any necessary audio level adjustments to the receive audio inputs, transmit sidetone input, and mike audio input.

This section details two separate bench tests. The first is a bench test of the CP 127 only, using a signal generator as an audio source. The second test is a total system bench test with all the receivers, transceivers, microphones, and the fabricated cable to be installed with the CP 127.

Table 2.2 outlines the available installation adjustments and Figure 2-21 shows their physical location. This information should be most valuable during these preinstallation tests and during Section 2.10's post installation tests.

NOTE:

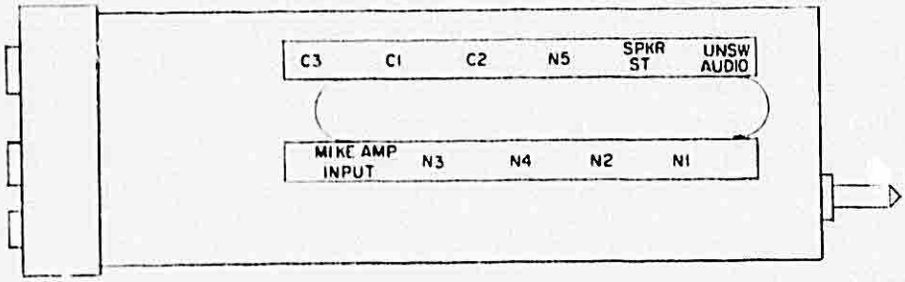
To reduce costly downtime in the event a receiver or the CP 127 were to fail:

1) set receive outputs to the levels specified in Section 2.8.1 etc.
2) retain the CP 127's standard, factory set, 1 Vrms receive input sensitivity.

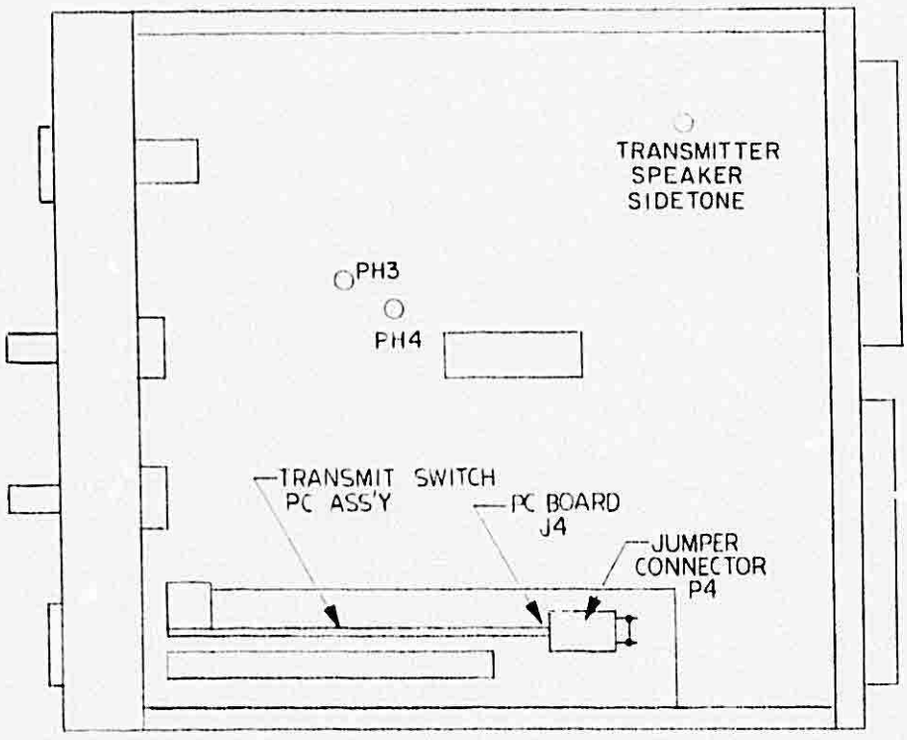
If a receiver were to fail at some future date, it would be repaired and then only its output voltage need be checked for possible R-CP reselection for the standard 1 Vrms output (See Section 2.8.1). If the CP 127 were to fail it would be repaired and its receive inputs readily set to the standard levels and the system would remain in calibration. Had the CP 127's receive input pots been adjusted to accommodate random receiver output voltages, it could be necessary to recalibrate the complete system.

TABLE 2.2 INSTALLATION POT FUNCTIONS

Schematic Symbol No.	Labeled	Function	When and How
R525	C1	Receive Audio Input Level Set	Should only be adjusted during an electrical bench test. The audio input from receivers connected to the CP 127 **Leveled** audio should not be adjusted in the aircraft. The audio input from receivers connected to the CP 127 **Standard** audio may be carefully adjusted in the aircraft to proportion output levels.
R526	C2		
R524	C3		
R224	N1		
R223	N2		
R221	N3		
R222	N4		
R527	N5		
R529	Unsw. Audio		
R417	Mike Amp Input Level Set	Mike Amp Input for Accessory Paging Functions only	Should only be adjusted during an electrical bench test with the microphone to be used in the installation. Set for just below clipping at speaker terminals with cockpit level speech.
R364	PH3	Accessory Paging Function Headphone Level Set for Switch TS3	Should be set in the aircraft for a comfortable listening level while speaking into the microphone with cockpit level speech.
R365	PH4	Accessory Paging Function Headphone Level Set for Switch S4	Should be set in the aircraft for a comfortable listening level while speaking into the microphone with cockpit level speech.
R528	SPKR ST	Accessory Paging Function Speaker Sidetone Set	Should be set in the aircraft for a just audible speaker volume, with engines running, while speaking into the microphone with cockpit level speech. Audio feedback between speaker and microphone will occur if the speaker volume is set to high.
R410	TRANSMIT SPKR ST	Transmit Speaker Sidetone Set	Should be set in the aircraft for a just audible speaker volume, with engines running, while speaking into the microphone with cockpit level speech. Audio feedback between speaker and microphone will occur if the speaker volume is set too high.



Side View of the CP 127



Bottom View of the CP 127

FIGURE 2-21. INSTALLATION POT LOCATIONS

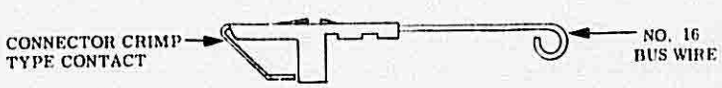
2.9.1 CP 127 Bench Test

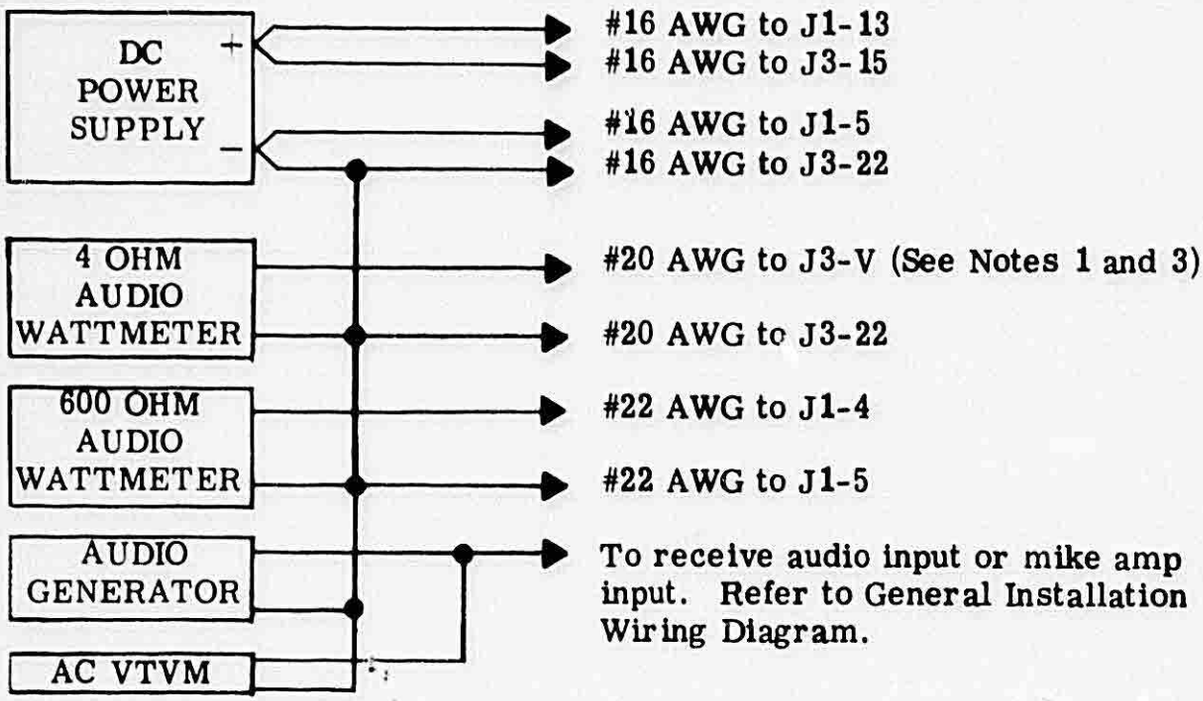
The purpose of this section is to assure the proper functioning of the CP 127. This can be accomplished with a few simple measurements. Should a problem be encountered refer to Section 4, Maintenance of the CP 127 Maintenance Manual. It should be noted that in the following procedure the audio inputs and pushbuttons utilized are as shown in Figure 2-22 and not in accordance with any trim panel labels which have previously been installed.

2.9.1.1 Test Equipment Required

1. Regulated DC Power Supply — 0 to 30 Volts at 5 amperes
   Power Designs, Model 3650 or equivalent
2. Audio Power Meter — 0 to 10 watts at 4 ohms
   General Radio, Model 1840-A or equivalent
3. Audio Power Meter — 0 to 100 milliwatts at 600 ohms
   General Radio, Model 583A or equivalent
4. Audio Frequency Generator — 0 to 5.0 Vrms into 500 ohms
   Hewlett-Packard, Model 200CD or equivalent
5. AC Voltmeter — Ballantine Laboratories, Model 300D or equivalent
6. VTVM — RCA Voltohmyst, Model WV-93C or equivalent
7. Field fabricated test cable-

A versatile test cable between the CP 127 and the test equipment may be quickly fabricated by hand wiring. See Figure 2-22. Only the DC power, the speaker, and the phones output need be part of the cable. The remaining inputs and outputs to connectors J1 and J2 may be made by crimping a length of No. 16 bus wire to a contact, forming a loop at the free end, and inserting the contact into the proper connector locations. Thus connections can be quickly made to the loop by use of miniature alligator clips or similar test clips. Connector J3 has fixed terminals. Additional connectors and contacts to construct a test cable may be purchased from the factory. Part numbers may be obtained by referring to the CP 127 Installation Kit parts list shown adjacent to Figure 2-2.





NOTES

1. Audio Jumpers

   14 Volt Installation: Jumper J3-5 to J3-7
   28 Volt Installation: Jumper J3-6 to J3-7 and J3-5 to J3-E

2. TS 3 associated Jumpers, select either a) or b):
   a) Com 3 or HF jumpers:

J3-8 to J3-G	J3-9 to J3-20
J3-10 to J3-K	J3-11 to J3-P
J3-12 to J3-N	J3-13 to J3-K
J3-S to J3-T	

   b) Accessory Paging Function (APF) Jumpers:

J3-1 to J3-2	J3-2 to J3-10
J3-3 to J3-4	J3-9 to J3-14

3. As shown, with specified audio input, wattmeter will indicate:
   a) in receive mode, rated power output
   b) in transmit mode, transmit speaker sidetone, if jumper J3-18 to J3-C is installed.
   c) in APF mode, APF speaker sidetone, if jumper J3-18 to J3-19 is installed.

   For Accessory Paging Function Power Output at a) or b):
   a) TS 3 selected, connect wattmeter to J3-U
   b) S 4 selected, connect wattmeter to J3-W

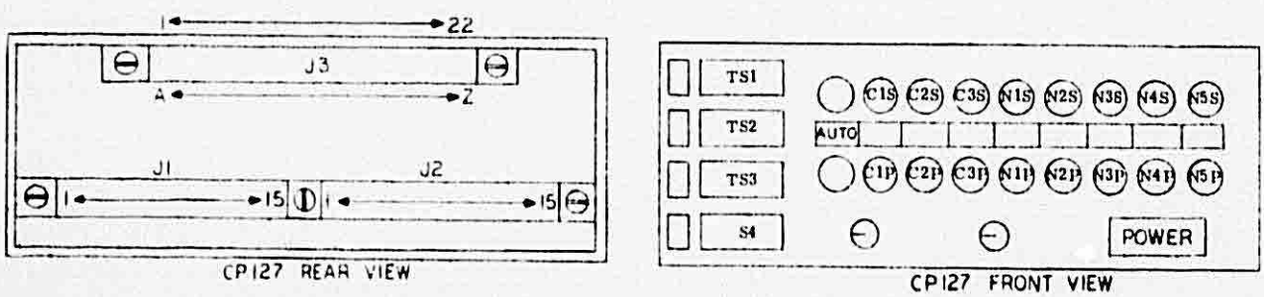


FIGURE 2-22. PREINSTALLATION BENCH TEST SET-UP

2.9.1.2 CP 127 Only, Bench Test Procedure

The procedure outlined below assumes that all pushbuttons are in the unswitched or open position, where the pushbutton's colored inserts are not visible, and the test set-up in Figure 2-22 has been adhered to. Please note the requirements of the "audio jumpers" Note 1 of Figure 2-22. It also assumes that the CP 127 receive audio input and internal adjustments have not been changed from the factory settings.

A. Receive Audio Inputs

1. Apply DC power (14 or 28 volts) and rotate the volume controls maximum clockwise.
2. Connect the audio generator to the COM 1 receiver audio input (J1-15). Set the generator to 1.0 Vrms at 1 KHz.
3. Depress COM 1 speaker and phones receive pushbuttons (C1S and C1P).

   Spec: Speaker output to be 10 watts, minimum.
   Phones output to be 100 milliwatts, minimum.
4. Check remaining receive audio inputs in a like manner. Unswitched input voltage is 2.5 Vrms for rated power output.
5. Connect the audio generator to COM 1 receive audio input (J1-15). Change the generator Frequency to 2.0 KHz.
6. Note speaker power output. Rotate speaker channel tone control maximum CCW.
   Spec: Output should decrease 6.0 db, minimum.
   Return tone control to maximum CW setting.
7. Note phones power output. Rotate speaker channel tone control maximum CCW.
   Spec: Output should decrease 6.0 db, minimum.
   Return tone control to maximum CW setting.
8. Return the generator frequency to 1 KHz.
9. Disengage all receive pushbuttons. Depress speaker and phones AUTO pushbutton. Depress COM 1 transmit selector (TS1).
   Spec: Speaker output to be 10 watts, minimum.
   Phones output to be 100 milliwatts, minimum.
   Do not disengage pushbuttons.
10. Connect the generator to COM 2 input. Depress COM 2 transmit selector (TS2).
    Spec: Rated audio output.
    Note: If it is desired to check COM 3 AUTO it will be necessary to add to J3 the required jumpers. Refer to Figure 2-22, NOTE 2.

2.9.1.2 Continued

B. Transmit Functions

1. Mike Key and Audio Circuits

   a. Connect an ohmmeter probe to J2-2 (transmit key for COM 1) and its negative probe to ground. Meter should indicate an "open circuit".

   b. Connect the audio generator to J2-9 (mike audio input). Set generator output to 1 Vrms at 1 KHz.

   c. Connect an AC VTVM to J2-8 (COM 1 mike audio output). Connect J1-3 to ground (simulates a key'd mike).

   d. Depress COM 1 transmit selector (TS1). The ohmmeter should indicate a resistance of approximately 100 to 1,000 ohms depending upon the individual ohmmeter and scale in use. The measured resistance is the forward junction resistance of isolation diodes. The AC VTVM should indicate 1 Vrms.

   e. Check COM 2 and COM 3 functions in a like manner.

   f. Remove the ground from J1-3.

2. Sidetone Circuits

   a. Connect the audio generator to J2-5 (COM 1 sidetone input).
   b. Set the generator to 4.5 Vrms at 1 KHz.

   c. Depress COM 1 transmit selector (TS1).
   Spec: No audio power output should be noted at either speaker or phones outputs.

   d. Connect J1-3 to ground simulating a key'd mike.
   Spec: Speaker output to be 100 milliwatts, minimum.
   Phones output to be 10 milliwatts, minimum.

   e. Check COM 2 and COM 3 functions in a like manner.

   f. Remove the ground from J1-3.

3. Muting

   a. Connect the audio generator to J1-15 (COM 1 receive audio input). Set the generator to 1 Vrms at 1 KHz.

   b. Depress COM 1 transmit select pushbutton (TS1). Depress speaker and phones AUTO pushbutton. Set phones and speaker audio level controls to maximum CW rotation. Note the presence of rated audio output.

   c. Connect J1-3 to ground.
   Spec: Speaker and phones audio outputs should decrease −60db.

   d. Remove the ground from J1-3.

Another note of caution, not related to the above, but important in regards to selecting ground references when troubleshooting the CP-127 is as follows:

> For speaker board measurements always use the large ground area near J3-1 on the circuit side of the board, or the negative lead of C-607 on the component side. For phones board measurement always use the ground area at J1-5 on the circuit side of the board, or the negative lead of C-356 on the component side. This will guarantee repeatable field measurements and corroboration with factory data.

Please make the following correction in the CP-127 Installation Manual:

On page 2-51, under 2.9.1.2 section D, the 28 volt pilot lamp connection should read: 28 volt -- apply 28VDC to J1-10. No connection to J1-11.

Very truly yours,

NARCO AVIONICS
A Division of Narco Scientific Industries

Gene Salzmann
Technical Representative

GS/pk

2.9.1.2 Continued

C. Accessory Paging Functions (APF)

1. Connect the audio generator to J2-9 (mike audio input). Set the generator output to 0.15 Vrms at 1 KHz.
2. Depress S4.
   Spec: APF speaker audio (J3-W) to be 10 watts, minimum.
   Phones audio output to be 100 milliwatts, minimum.
   APF speaker sidetone (J3-V) to be 200 milliwatts, minimum.
3. Switch TS3, when used for APF, may be checked if jumpers specified in Fig. 2-22. Note 2b, were installed.

D. Miscellaneous

1. Pilot Lamps

   14 Volt — ground J1-10. Apply 14 vdc to J1-11.
   28 Volt — apply 28 vdc to J1-11. No connection to J1-10.

   All lamps should be lighted.

1. POWER Pushbutton (ABR activate)

   a. Connect the ohmmeter between J3-L and ground. Meter will indicate a "short circuit".

   b. Depress the POWER pushbutton. Meter will indicate an "open circuit".

2.9.2 System Bench Test

The purpose of this section is to assure the proper functioning of the total system. Receive signals are to be simulated, transmit sidetone levels are checked, mike audio input levels are set for the Accessory Paging Functions, and the cable fabricated for this installation checked.

Due to the variations in installations and equipments this section will not provide a detailed step by step procedure. However, a recommended, generalized procedure will be outlined.

Where a receiver output or other audio source can not be adjusted to the CP 127 input voltage specification of 1.0 Vrms, input potentiometers are provided for each input port. The maximum sensitivity of a receive input port is 0.5 Vrms for rated phones and speaker power output. The procedure outlined here results in a somewhat approximate setting which may require fine adjustment to proportion audio levels.

Procedure

This procedure should be carried out following, for example: after Section 2.9.2.2A for a COM Receiver or after Section 2.9.2.2.D for a NAV receiver.

1. Set up receiver to operate with the CP 127. Choose CP 127 receive input port.
2. Simulate a moderate receive RF input signal with a signal generator, paying attention to percent modulation and RF signal level.
3. Locate receive input potentiometer. (See Figure 2-21)
4. Clip AC VTVM probe to slotted screw driver shaft. Insert blade into potentiometer slot. Adjust potentiometer for 0.5 Vrms.
5. Rotate the CP 127's Phones and Speaker volume controls CW, rated power output will be obtained.

2.9.2.1 Test Equipment Required

1. Regulated DC Power Supply — 0 to 30 Volt. Current handling capability must be determined by the equipment(s) to be tested.
2. Audio Power Meter — 0 to 10 watts at 4 ohms.
   General Radio, Model - 1840-A or equivalent.
3. Audio Power Meter — 0 to 100 milliwatts at 600 ohms.
   General Radio, Model 583A or equivalent.
4. Signal Generators:
   a. RF — Hewlett-Packard, Models 606 and 608 or equivalent.
   b. AF — Hewlett-Packard, Model 200CD or equivalent.
   c. DME — Instrument Flight Research, Model ATC-1200Y3 or equivalent.
5. RF Wattmeter — Bird Termaline or equivalent.
6. Microphones to be used in aircraft.
7. AC VTVM — Balantine Laboratories, Model 300D, or equivalent.

2.9.2.2. Test Procedure

Since at this stage the system devised for a specific installation is well known to the installer, a wiring diagram is not supplied and only a generalized procedure outlined.

For this series of tests: the CP 127 speaker and phones outputs should be terminated by the appropriate power meters, all avionics units are interconnected by the cable to be installed in the aircraft, the CP 127 has been bench tested per Section 2.9.1. Where more than one of the specific type of avionics is present (i.e.: dual Com's) repeat the procedure for each unit of a type.

A. Com Receivers

1. Connect a VHF signal generator to the Com units receive antenna connector.
2. Tune the receiver and the generator to the same Com frequency.
3. Set the generator to 5 uv, modulated 60% by 1 KHz.
4. Check the appropriate Com receive audio input.

   Spec: 1 Vrms ± 2 db, if level is out of specification, select value of R-CP. See Section 2.8.

   NOTE: If the receiver's volume control is **not** to be bypassed, the receiver's trim panel should be marked to provide a reference for positioning of the volume control. The reference mark should provide the specification level.
5. Depress the selected Com receive audio pushbuttons, speaker and phones.
6. Rotate the CP 127's speaker and phone audio level controls clockwise to produce:

   Spec: Speaker output to be 10 watts, minimum.
   Phones output to be 100 milliwatts, minimum.

   Leave the audio level controls at these settings.

B. Com Transmitters

1. Connect an RF power wattmeter to the Com units transmit antenna connector.
2. Insert the microphone to be used in the aircraft into the mike jack.
3. Depress the selected COM transmit pushbutton (TS1, TS2, or TS3) and key the mike.
   Spec: Rated transmitter power output should be observed.
4. Speak into the microphone and note the presence of sidetone at the headphones, and if desired, the speaker.

   Note: Transmit speaker sidetone level must be adjusted in the aircraft.

C. Non-Aircraft transceivers should follow the same basic procedures as in A and B above.

2.9.2.2 Continued

D. VOR/LOC

1. Connect a VHF signal generator to the Nav unit's receive antenna connector.
2. Switch the receiver's IDENT switch to ON.
3. Tune the receiver and the generator to a Nav frequency.
4. Set the generator output to 5 uv, modulated 15% by 1 KHz audio.
5. Check the appropriate Nav receive audio input.

   Spec: 1 Vrms ± 1 db. If level is out of specification, select value of R-CP. See Section 2.8.

   NOTE: If the receiver's volume control is **not** to be bypassed, the receiver's trim panel should be marked to provide a reference for positioning of the volume control. The reference mark should provide the specification level.
6. Depress the selected Nav receive audio pushbutton, speaker and phones.
7. Adjust the CP 127's speaker and phone audio level controls to produce:
   Spec: Speaker output to be 10 watts, minimum.
   Phones output to be 100 milliwatts, minimum.
   Leave the audio level controls at these settings.

E. ADF Receivers

1. Refer to the particular ADF's Maintenance Manual for proper test set-up and test procedure.

   NOTE: In general, the ADF's volume control will be used to set the ADF's audio volume **after** the CP 127 audio level controls have been set for a comfortable listening level of the Com and Nav signals. For this reason, and because of the wide variation in percent modulation of typical signals received by an ADF, an in-aircraft final adjustment of the CP 127's receive input potentiometer may be required.
2. Set the RF signal generator and the ADF to a common frequency.
3. Set the generator to 100 uv, modulated 30% by 1 KHz.
4. Rotate the ADF's volume control to a convenient reference for the control indexing mark or 1 Vrms ± 1 db at the input to the CP 127.
5. Depress the receive audio pushbuttons to select the ADF audio.
6. Adjust the receive audio input potentiometer to set the CP 127 audio output to:
   Spec: Speaker output to be 10 watts, minimum.
   Phones output to be 100 milliwatts, minimum.

2.9.2.2 Continued

F. DME Ident

1. Refer to the particular DME's Maintenance Manual for proper test set-up and test procedure.
2. Apply a -70 dbm test signal to the DME.
3. Depress the receive audio pushbuttons to select DME audio.

4a. If the DME contains an ident volume control or internal ident level adjust, set it to produce the rated audio output from the CP 127.

4b. If the DME ident is a fixed level, adjust the CP 127's receive audio input potentiometer for the rated audio output from the CP 127.

NOTE: A final in-aircraft adjustment of the CP 127's DME receive input potentiometer may be necessary to proportion Com-Nav versus DME ident volume control setting.

G. Marker Beacon Receivers

1. Connect a marker test signal generator to the receive antenna connector.
2. Set the generator to 1 millivolt, modulated 90% by 1.3 KHz.
3. Depress the receive audio pushbuttons to select MKR audio.
4. Adjust the receive audio input potentiometer for the rated audio output from the CP 127.

H. Accessory Paging Functions (APF)

1. Connect the necessary loads simulating speaker or phones, as required by the installation, to the CP 127 APF outputs J3-U and J3-W.
2. Insert the microphone to be used in the aircraft into the mike jack.
3. Depress the interlocked pushbutton to select the desired APF.
4. Key and speak into the microphone.

NOTE: The CP 127's APF output levels generally required to be set in the aircraft, with the engines running, and in the following sequence.

a. Mike amp input potentiometer is adjusted to set output from speaker amplifier for all APF. Potentiometer is factory set for Narco's M700A microphone.

b. PH3 and PH4 potentiometers are adjusted for the output from J1-4, phones amplifier for all APF. PH3 is adjusted when TS3 is used to select the APF. PH4 is adjusted when S4 is used to select the APF.

c. APF speaker sidetone is then adjusted.

2.10 POST INSTALLATION CHECK OUT

This procedure is intended to delineate all final in-aircraft adjustments and check all avionics systems as they relate to the CP 127. Assuming that the Preinstallation Bench Test has been performed the final adjustments consist of:

A. Proportioning the volume levels of the Marker Beacon, DME ident, ADF and unswitched audio's relative to the Com volume level. This step is optional and is only inserted due to the fact that single tone, key'd tone and similar signals will for a given input appear louder than an equivalent voice input. Proportioning, when desired, will need to be done with the particular aircraft pilot's preferences in mind.

B. Setting the speaker sidetone levels. Two speaker sidetones are provided, one for transmit sidetone, the second for Ramp Hail or Passenger Address sidetone. Speaker sidetone must be set with the engines running to assure an intelligible listening level without audio feedback between speaker and microphone.

C. Adjusting accessory paging function levels. These levels extend from Passenger Cabin Address loudness to Interphone volume and may require that the engines be running to assure a proper level is set.

2.10.1 The Avionics Bus Relay Must First Be Checked (if part of the System)

1. Connect a DC voltmeter between the avionics bus and a suitable airframe ground.
2. Turn the aircraft master ON. Voltmeter should indicate zero volts.
3. Depress CP 127 "POWER" pushbutton. Voltmeter should indicate aircraft bus voltage.
4. Again depress CP 127 "POWER" pushbutton, to release lock. Voltmeter should indicate zero volts.
5. Activate Avionics Bus Relay bypass switch. Voltmeter should indicate aircraft bus voltage.
6. Deactivate bypass switch. Voltmeter should indicate zero volts.

The following procedures assume that:

1. All CP 127 pushbuttons are deenergized (colored insert does not show)
2. All transceivers and receivers are set to frequencies which allow a functional test (control tower, VOR station, broadcast radio station, ramp tester, etc.).
3. The Preinstallation Bench Tests have been performed assuring proper operation of all avionics and the fabricated cable.
4. Figure 2-21 is referred to for location of the required adjustments.
5. Voltage is applied to the avionics bus ("POWER ON").

2.10.2 COM and HF Transceivers

Repeat the sequence for each transceiver.

1. Turn the transceiver ON and set, if necessary, its volume control to the calibrated position.
2. Depress CP 127 speaker and phone receive pushbuttons, increase speaker and phone audio level controls, note presence of speaker and phone audio.
3. Again depress speaker and phone receive pushbuttons to deactivate audio.
4. Depress transmit select pushbutton and speaker and phone AUTO pushbuttons, note presence of speaker and phone audio.
5. Check transmitter operation (call tower, etc.), note presence of sidetone audio in headphone (and in speaker if so desired); speaker sidetone level should now be adjusted, see Figure 2-21, too high a level will cause audio feedback between microphone and speaker.
6. Again depress the speaker and phone AUTO pushbuttons to deactivate.

When all transceivers have been tested turn them OFF.

NOTE: If a nonaircraft type transceiver, retaining its volume control, is part of the installation its trim panel should be marked to indicate proper placement of the volume control to drive the CP 127. The CP 127's Audio Level Controls should first be adjusted for VHF Com levels, then the nonaircraft transceivers volume control adjusted to proportion the audio levels.

2.10.3 NAV Receivers

Repeat the sequence for each receiver.

1. Turn the receiver ON.
2. Depress CP 127 speaker and phone receive pushbuttons, note presence of speaker and phone audio.
3. To proportion audio's:
   a. Perform Steps 1 and 2 of Section 2.10.2 to set CP 127 Audio Level control to a comfortable COM listening level. Note level of NAV audio versus COM audio.
   b. Rotate appropriate NAV input pot to adjust NAV audio level relative to the COM audio level. Only the NAV audios applied to the Standard Audio Amplifiers may be set by this method.

2.10.4 Unswitched Audio Source

Generally the unswitched audio source is a radar altimeter for decision height (DH) audio. Refer to the altimeter manufacturers installation manual for the proper method of activating DH audio. The UNSW AUDIO input pot, see Figure 2-21; may be adjusted to set the output level; however, the CP 127 speaker and phone audio level controls must be set to produce a comfortable listening level for COM and NAV audio.

2.10.5 Accessory Paging Functions (APF)

NOTE: The mike audio input level should have been previously set, during the Preinstallation Bench Test, to produce rated audio output from the Speaker and headphone amplfiers.

2.10.5.1 Cabin Address and Ramp Hail

1. Depress interlocked pushbutton to select function.
2. Key and speak into mike.
3. To set cockpit speaker sidetone adjust R528, Speaker Sidetone. Refer to Figure 2-21. Speaker sidetone should be set for the lowest intelligible volume level to reduce the chance of audio feedback between speaker and microphone.
4. To set headphone sidetone level: Refer to Figure 2-21.
   a. If activating switch is TS3 adjust PH3
   b. If activating switch is S4 adjust PH4
5. Passenger Cabin audio level should set by an "L" pad at the Cabin speaker.

2.10.5.2 Interphone

1. Depress interlocked pushbutton to select Interphone
2. Key and speak into mike.

   NOTE: CP 127 Interphone output levels generally required to be set in aircraft, with engines running, in the sequence given below.

   a. Mike Amp Input pot [illegible] only adjusted to set Interphone output from speaker amplifier. Pot is factory set for NARCO M700A microphone.

   b. PH3 and PH4 pots are adjusted for output from J1-4, phones amplifier. PH3 is adjusted when TS3 is used to select Interphone. PH4 is adjusted when S4 is used to select Interphone.

NARCO AVIONICS CP 127

CP 127
CABLE CONNECTOR
J1

1	NO CONNECTION
2	NO CONNECTION
3	PILOT MIKE KEY (TIP)
4	HEADPHONE AUDIO OUTPUT
5	GROUND #16
6	NAV 2 RECEIVE AUDIO INPUT. SEE NOTE 2. [N2S AND N2P]
7	NAV 3 RECEIVE AUDIO INPUT. SEE NOTE 2. [N3S AND N3P]
8	NAV 1 RECEIVE AUDIO INPUT. SEE NOTE 2. [N1S AND N1P]
9	NO CONNECTION
10	PILOT LAMPS. SEE NOTE 7.
11	PILOT LAMPS. SEE NOTE 7.
12	NO CONNECTION
13	PHONES 14/28VDC INPUT. #16 AWG. 2 AMP CIRCUIT BREAKER.
14	COM 2 RECEIVE AUDIO INPUT. SEE NOTE 2. [C2S AND C2P]
15	COM 1 RECEIVE AUDIO INPUT. SEE NOTE 2. [C1S AND C1P]

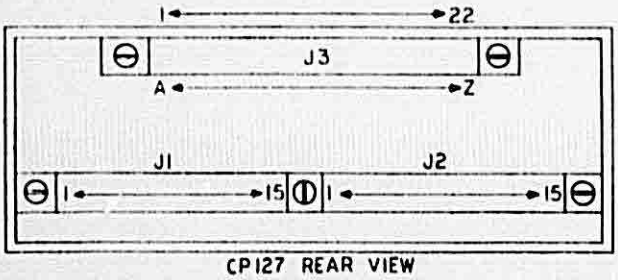
CP 127
CABLE CONNECTOR
J2

1	TRANSMIT KEY FOR COM 2
2	TRANSMIT KEY FOR COM 1
3	NO CONNECTION
4	SIDETONE AUDIO INPUT FROM COM 2. SEE NOTE 3.
5	SIDETONE AUDIO INPUT FROM COM 1. SEE NOTE 3.
6	NO CONNECTION
7	MIKE AUDIO TO COM 2
8	MIKE AUDIO TO COM 1
9	MIKE AUDIO INPUT (RING). SEE NOTE 10
10	NAV 5 MARKER RECEIVE AUDIO INPUT. SEE NOTE 2. [N5S AND N5P]
11	NO CONNECTION
12	NO CONNECTION
13	NO CONNECTION
14	NO CONNECTION
15	NO CONNECTION

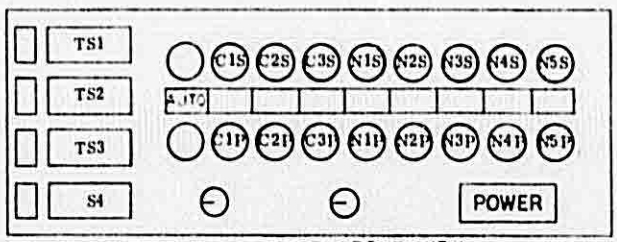
CP 127 General Installation Wiring Diagram

1. (a) Refer to CP 127 Front View for location of Pushbutton Switches TS3 and S4.
   (b) Accessory Paging Functions are Ramp Hail, Passenger Cabin Address and Interphone.
   (c) Where no separation exists, the connector pin function is common
2. Com and Nav receive audio inputs are factory set for 1.0 Vrms. Input potentiometers allow compensation for receivers not providing this level. See Section 2.9 for audio level adjustment. The receiver pushbutton switches for each input are in brackets [ ]. Refer to the CP 127 Front View for location of each pushbutton.
3. Sidetone audio input level is 4.5 Vrms for 25 mws into 600 ohm headphones.
4. Audio jumper connections:
   14 Volt Installation: J3-5 to J3-7
   28 Volt Installation: J3-6 to J3-7 and J3-E to J3-5
5. Mic Amp Audio Output, J3-18, jumpered to J3-19 for Ramp Hail and Passenger Cabin Address as well as for Interphone operation utilizing the speaker amplifier to drive a headphone load.
6. Internal Speaker Load, J3-16, is intended to properly load the speaker amplifier when the amplifier is used to drive a headphone load for either Interphone use or when the speaker channel is to be used as a second headphone channel.
7. Pilot Lamp voltage change over connections:
   14 Volt Installation: J1-10 to ground, J1-11 to dimmer or jumper J1-13
   28 Volt Installation: J1-10 to dimmer or jumper to J1-13, J1-11 - No Connection
8. All wires should be #22 AWG unless otherwise specified.
9. In most installations it is desirable to use shielded wire for the audio interconnections.
10. Mike audio input is factory set for NARCO's M700A microphone.
11. Transmit Speaker Sidetone enabled by jumper from J3-19 to J3-C.

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CP127 REAR VIEW



CP127 FRONT VIEW

FIGURE 2-23. CP 127 GENERAL INSTALLATION WIRING DIAGRAM
Sheet 1 of 2

SEE BLOW-UP

TS3 = THIRD TRANSCEIVER S4 = ACCESSORY PAGING FUNCTION	SEE NOTE 1	TS3 AND S4 = ACCESSORY PAGING FUNCTION	CP 127 CABLE CONNECTOR J3
MIKE AUDIO TO COM 3		JUMPER TO J3-2. MIKE AUDIO SWITCHED BY TS3	1
NO CONNECTION		JUMPER TO J3-1. MIKE AUDIO TO MIKE AMP	2
TRANSMIT KEY FOR COM 3		JUMPER TO J3-4. KEY LINE SWITCHED BY TS3	3
NO CONNECTION		JUMPER TO J3-3. MIKE AMP ACTIVATE. K501 ACTIVATE	4
AUDIO JUMPER. SEE NOTE 4			5, 6, 7
COM 3 SPEAKER AUTO. JUMPER TO J3-B		NO CONNECTION	8
COM 3 SPEAKER AUTO. JUMPER TO J3-20		JUMPER TO J3-14. MIKE VOLTAGE SWITCHED BY TS4	9
COM 3 SPEAKER AUTO. JUMPER TO J3-K		JUMPER TO J3-2. MIKE VOLTAGE SWITCHED BY TS3	10
COM 3 PHONES AUTO. JUMPER TO J3-P		NO CONNECTION	11
COM 3 PHONES AUTO. JUMPER TO J3-N		NO CONNECTION	12
COM 3 PHONES AUTO. JUMPER TO J3-K		NO CONNECTION	13
NO CONNECTION		JUMPER TO J3-9. MIKE VOLTAGE SWITCHED BY TS4	14
SPEAKER 14/28VDC INPUT. #16 AWG. 5 AMP CIRCUIT BREAKER			15
INTERNAL SPEAKER LOAD. JUMPER TO EITHER J3-U, V OR W AS REQUIRED. SEE NOTE 6.			16
#1 SPEAKER LEVEL RECEIVE AUDIO INPUT. SEE INSTALLATION SECTION 2.8			17
MIKE AMP AUDIO OUTPUT. TO DRIVE SPEAKER AMPLIFIER JUMPER TO J3-19. SEE NOTE 5.			18
SPEAKER AMP AUDIO INPUT. FROM MIKE AMP AND SPEAKER SIDETONE SWITCH.			19
COM 3 SPEAKER AUTO. JUMPER TO J3-9		NO CONNECTION	20
#1 SPEAKER LEVEL RECEIVE AUDIO OUTPUT. JUMPER TO APPROPRIATE COM OR NAV RECEIVE ADUIO INPUT			21
SIDETONE AUDIO INPUT FROM COM 3. SEE NOTE 3		NO CONNECTION	22
GROUND #16 AWG			A
COM 3 SPEAKER AUTO. JUMPER TO J3-8		NO CONNECTION	B
TRANSMIT SPEAKER SIDETONE SWITCH OUTPUT. JUMPER TO J3-19. SEE NOTE 11			C
CO-PILOT MIKE KEY			D
AUDIO JUMPER TO J3-5. 28 VOLT INSTALLATIONS ONLY. SEE NOTE 4.			E
COM 3 RECEIVE AUDIO INPUT. SEE NOTE 2. C3S AND C3P		NO CONNECTION	F
NAV 4 RECEIVE AUDIO INPUT. SEE NOTE 2. N4S AND N4P			H
UNSWITCHED AUDIO INPUT. SEE NOTE 2. FOR DH OR PWI AUDIO.			J
COM 3 SPEAKER/PHONES AUTO. JUMPERS TO J3-10 AND J3-13		NO CONNECTION	K
AVIONICS BUS ACTIVATE. SEE INSTALLATION SECTION 2.8			L
#2 SPEAKER LEVEL RECEIVE AUDIO INPUT. SEE INSTALLATION SECTION 2.8.			M
COM 3 PHONES AUTO. JUMPER TO J3-12		NO CONNECTION	N
COM 3 PHONES AUTO. JUMPER TO J3-11		NO CONNECTION	P
#2 SPEAKER LEVEL RECEIVE AUDIO OUTPUT. JUMPER TO APPROPRIATE COM OR NAV RECEIVE AUDIO INPUT			R
COM 3 MUTE. JUMPER TO J3-T		NO CONNECTION	S
COM 3 PHONES MUTE AND SIDETONE ACTIVATE. JUMPER TO J3-S		NO CONNECTION	T
NO CONNECTION		SPEAKER AUDIO OUTPUT SELECTED BY TS-3	U
COCKPIT SPEAKER AUDIO OUTPUT			V
SPEAKER AUDIO OUTPUT SELECTED BY S-4			W
NO CONNECTION			X
NO CONNECTION			Y
NO CONNECTION			Z

FIGURE 2-23. CP 127 GENERAL INSTALLATION WIRING DIAGRAM
Sheet 2 of 2

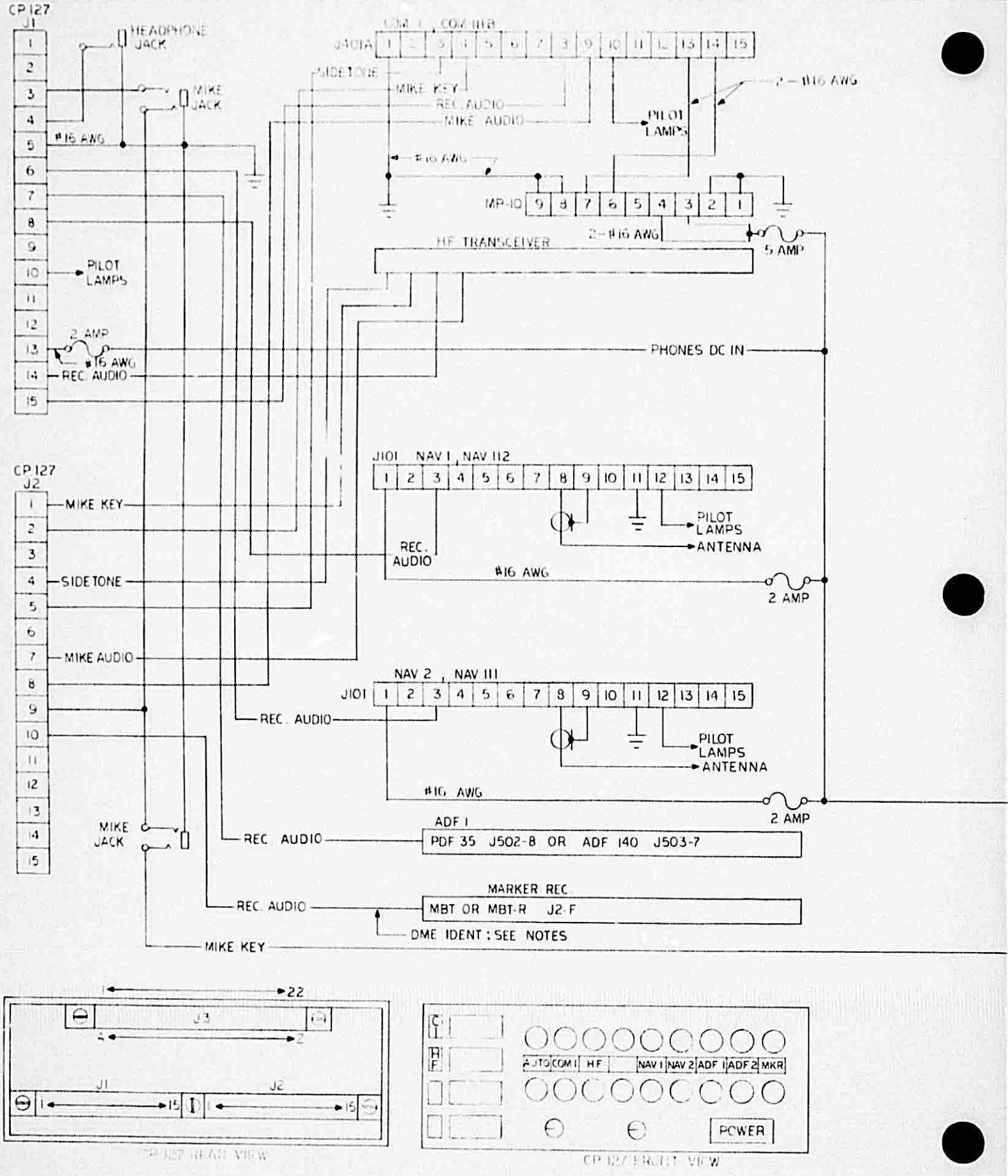
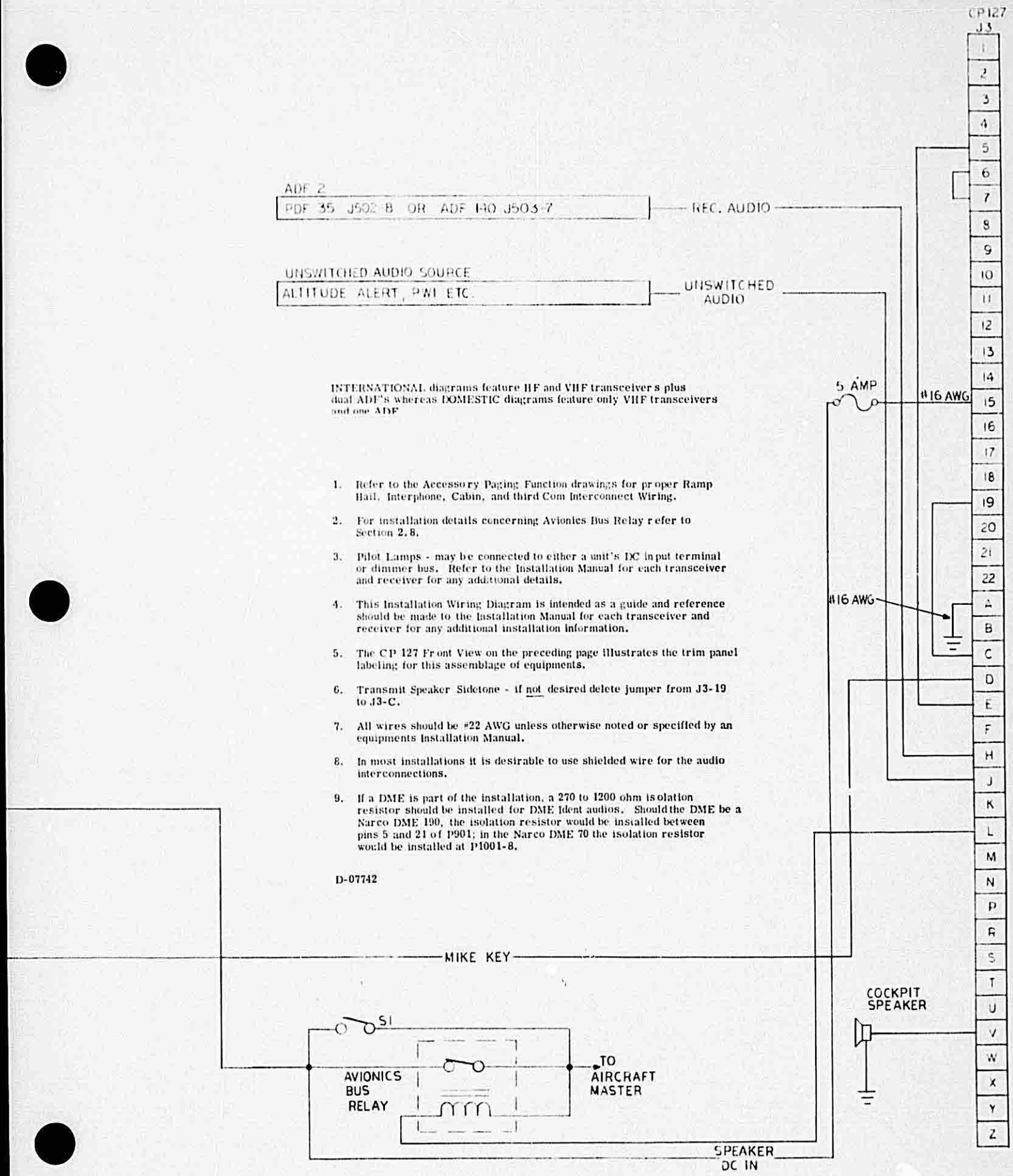


FIGURE 2-24. 28 VOLT INTERNATIONAL SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #1 Sheet 1 of 2



INTERNATIONAL diagrams feature HF and VHF transceivers plus dual ADF's whereas DOMESTIC diagrams feature only VHF transceivers and one ADF.

1. Refer to the Accessory Paging Function drawings for proper Ramp Hail, Interphone, Cabin, and third Com Interconnect Wiring.
2. For installation details concerning Avionics Bus Relay refer to Section 2.8.
3. Pilot Lamps - may be connected to either a unit's DC input terminal or dimmer bus. Refer to the Installation Manual for each transceiver and receiver for any additional details.
4. This Installation Wiring Diagram is intended as a guide and reference should be made to the Installation Manual for each transceiver and receiver for any additional installation information.
5. The CP 127 Front View on the preceding page illustrates the trim panel labeling for this assemblage of equipments.
6. Transmit Speaker Sidetone - if not desired delete jumper from J3-19 to J3-C.
7. All wires should be #22 AWG unless otherwise noted or specified by an equipments Installation Manual.
8. In most installations it is desirable to use shielded wire for the audio interconnections.
9. If a DME is part of the installation, a 270 to 1200 ohm isolation resistor should be installed for DME ident audios. Should the DME be a Narco DME 190, the isolation resistor would be installed between pins 5 and 21 of P901; in the Narco DME 70 the isolation resistor would be installed at P1001-8.

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FIGURE 2-24. 28 VOLT INTERNATIONAL SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #1 Sheet 2 of 2

SEE BLOW-UP

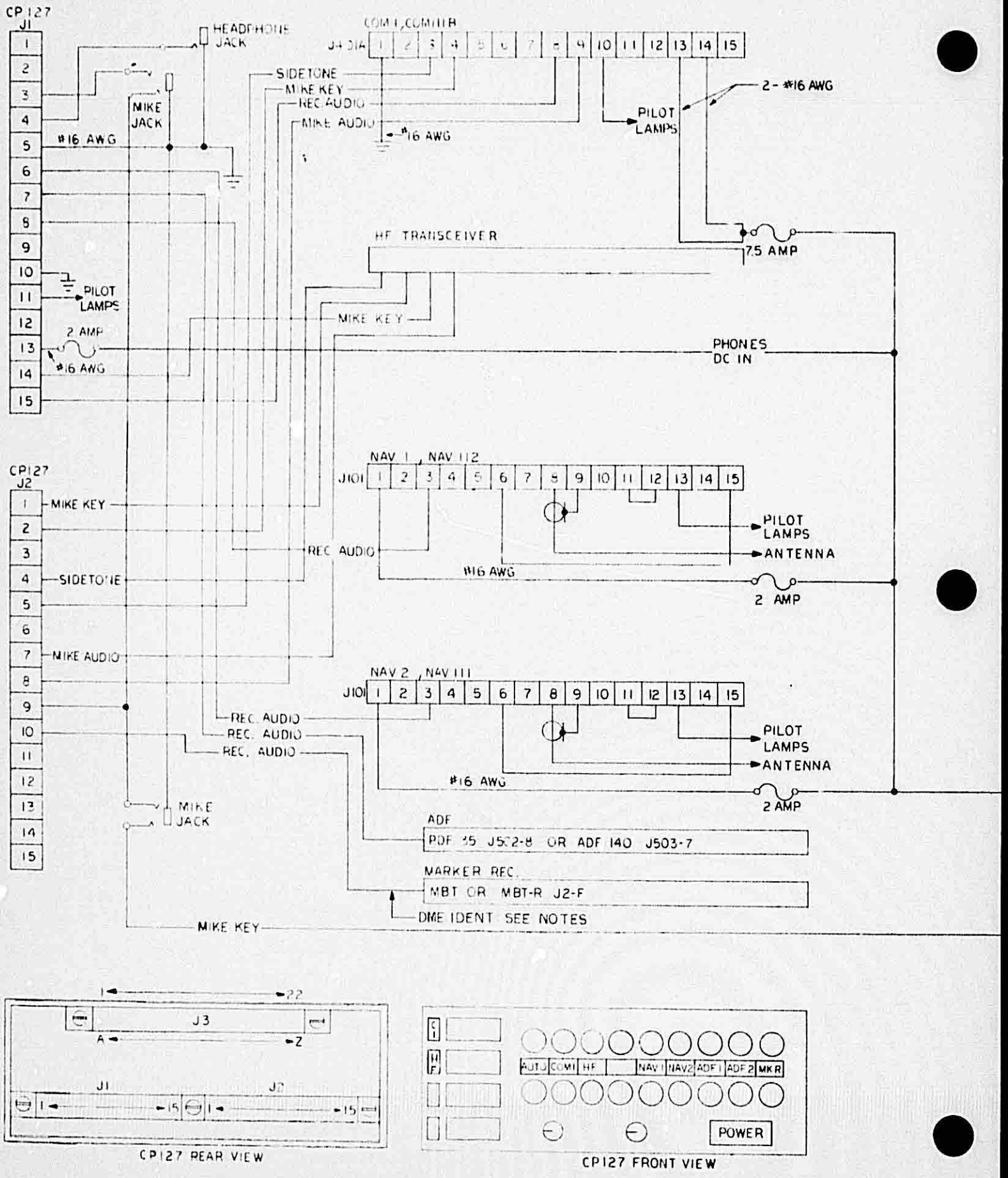
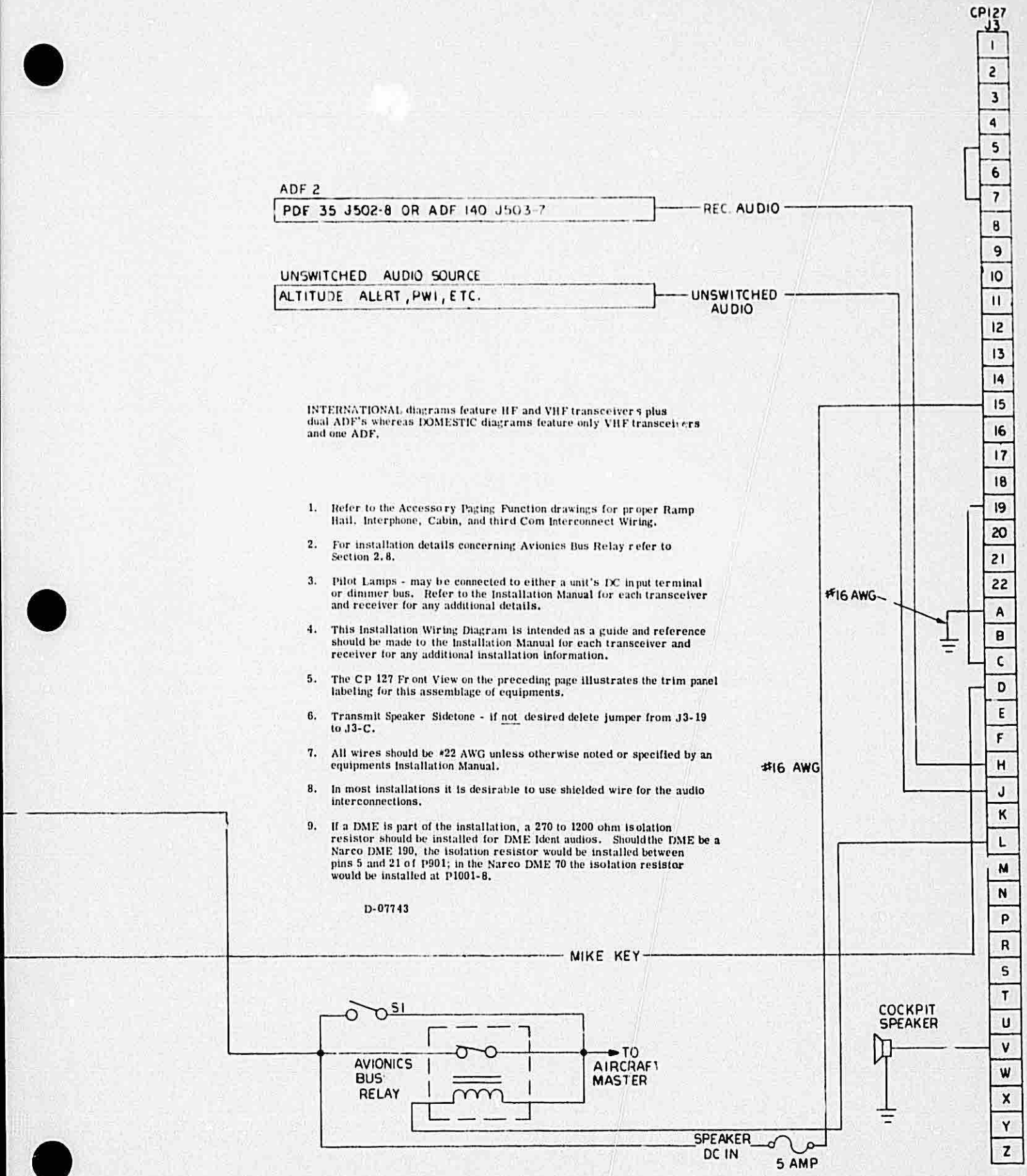


FIGURE 2-25. 14 VOLT INTERNATIONAL SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #1 Sheet 1 of 2



INTERNATIONAL diagrams feature HF and VHF transceivers plus dual ADF's whereas DOMESTIC diagrams feature only VHF transceivers and one ADF.

1. Refer to the Accessory Paging Function drawings for proper Ramp Hail, Interphone, Cabin, and third Com Interconnect Wiring.
2. For installation details concerning Avionics Bus Relay refer to Section 2.8.
3. Pilot Lamps - may be connected to either a unit's DC input terminal or dimmer bus. Refer to the Installation Manual for each transceiver and receiver for any additional details.
4. This Installation Wiring Diagram is intended as a guide and reference should be made to the Installation Manual for each transceiver and receiver for any additional installation information.
5. The CP 127 Front View on the preceding page illustrates the trim panel labeling for this assemblage of equipments.
6. Transmit Speaker Sidetone - if not desired delete jumper from J3-19 to J3-C.
7. All wires should be #22 AWG unless otherwise noted or specified by an equipments Installation Manual.
8. In most installations it is desirable to use shielded wire for the audio interconnections.
9. If a DME is part of the installation, a 270 to 1200 ohm isolation resistor should be installed for DME Ident audios. Should the DME be a Narco DME 190, the isolation resistor would be installed between pins 5 and 21 of P901; in the Narco DME 70 the isolation resistor would be installed at P1001-8.

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FIGURE 2-25. 14 VOLT INTERNATIONAL SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #1 Sheet 2 of 2

SEE BLOW-UP

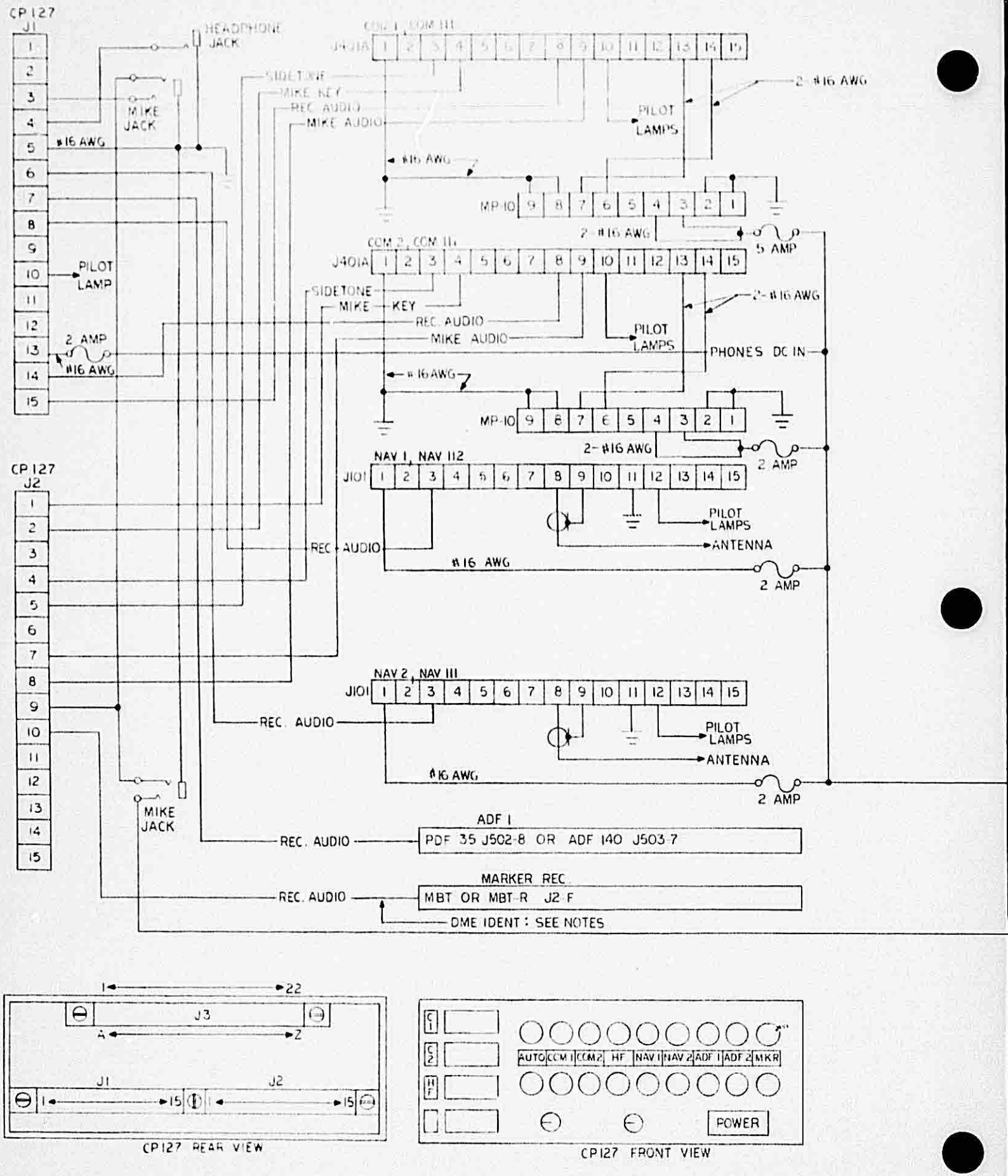
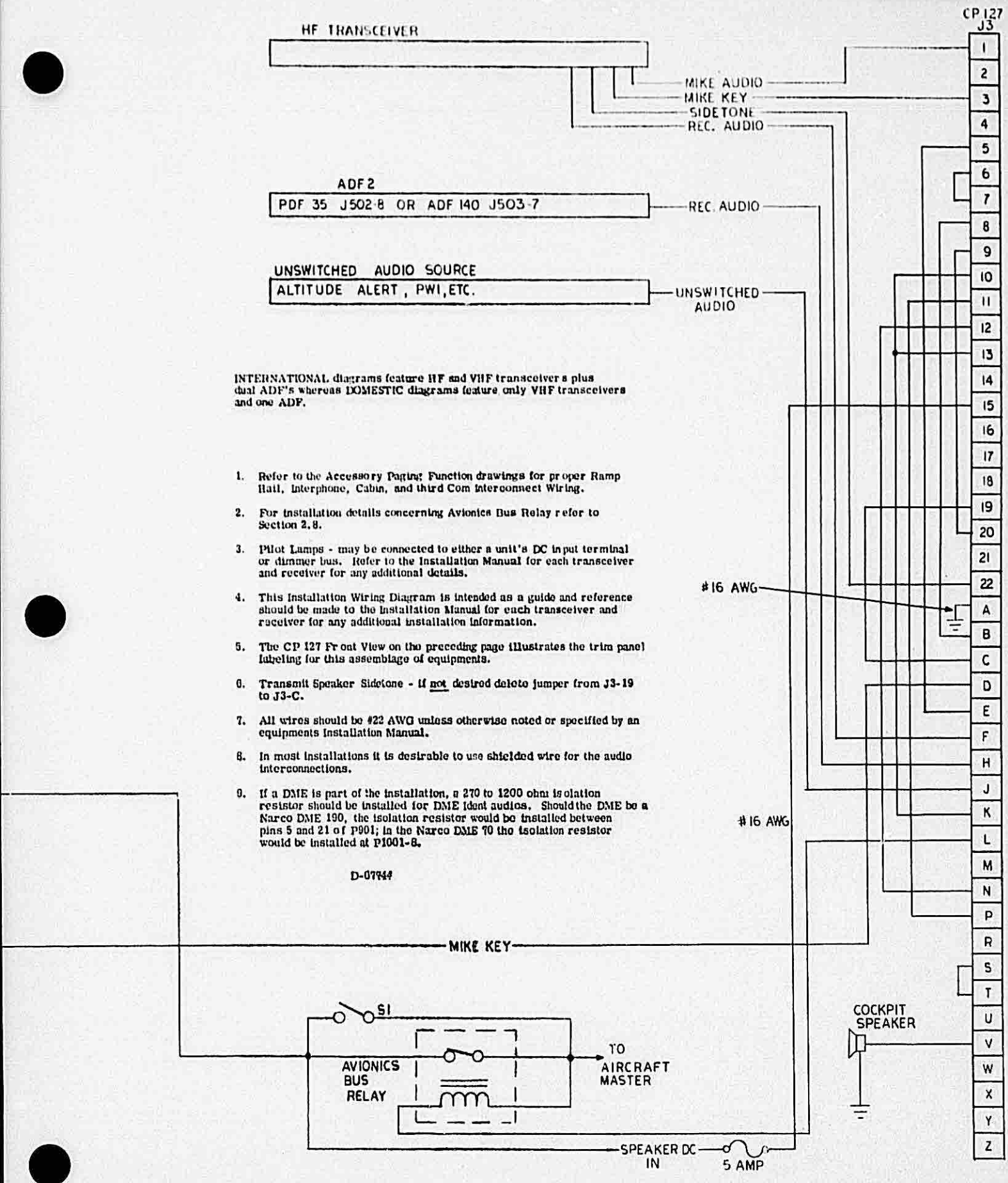


FIGURE 2-26. 28 VOLT INTERNATIONAL DUAL SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #2 Sheet 1 of 2



INTERNATIONAL diagrams feature HF and VHF transceivers plus dual ADF's whereas DOMESTIC diagrams feature only VHF transceivers and one ADF.

1. Refer to the Accessory Paging Function drawings for proper Ramp Hail, Interphone, Cabin, and third Com interconnect Wiring.
2. For installation details concerning Avionics Bus Relay refer to Section 2.8.
3. Pilot Lamps - may be connected to either a unit's DC input terminal or dimmer bus. Refer to the Installation Manual for each transceiver and receiver for any additional details.
4. This Installation Wiring Diagram is intended as a guide and reference should be made to the Installation Manual for each transceiver and receiver for any additional installation information.
5. The CP 127 Front View on the preceding page illustrates the trim panel labeling for this assemblage of equipments.
6. Transmit Speaker Sidetone - if not desired delete jumper from J3-19 to J3-C.
7. All wires should be #22 AWG unless otherwise noted or specified by an equipments Installation Manual.
8. In most installations it is desirable to use shielded wire for the audio interconnections.
9. If a DME is part of the installation, a 270 to 1200 ohm isolation resistor should be installed for DME ident audios. Should the DME be a Narco DME 190, the isolation resistor would be installed between pins 5 and 21 of P901; in the Narco DME 70 the isolation resistor would be installed at P1001-8.

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FIGURE 2-26. 28 VOLT INTERNATIONAL DUAL SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #2 Sheet 2 of 2

SEE BLOW-UP

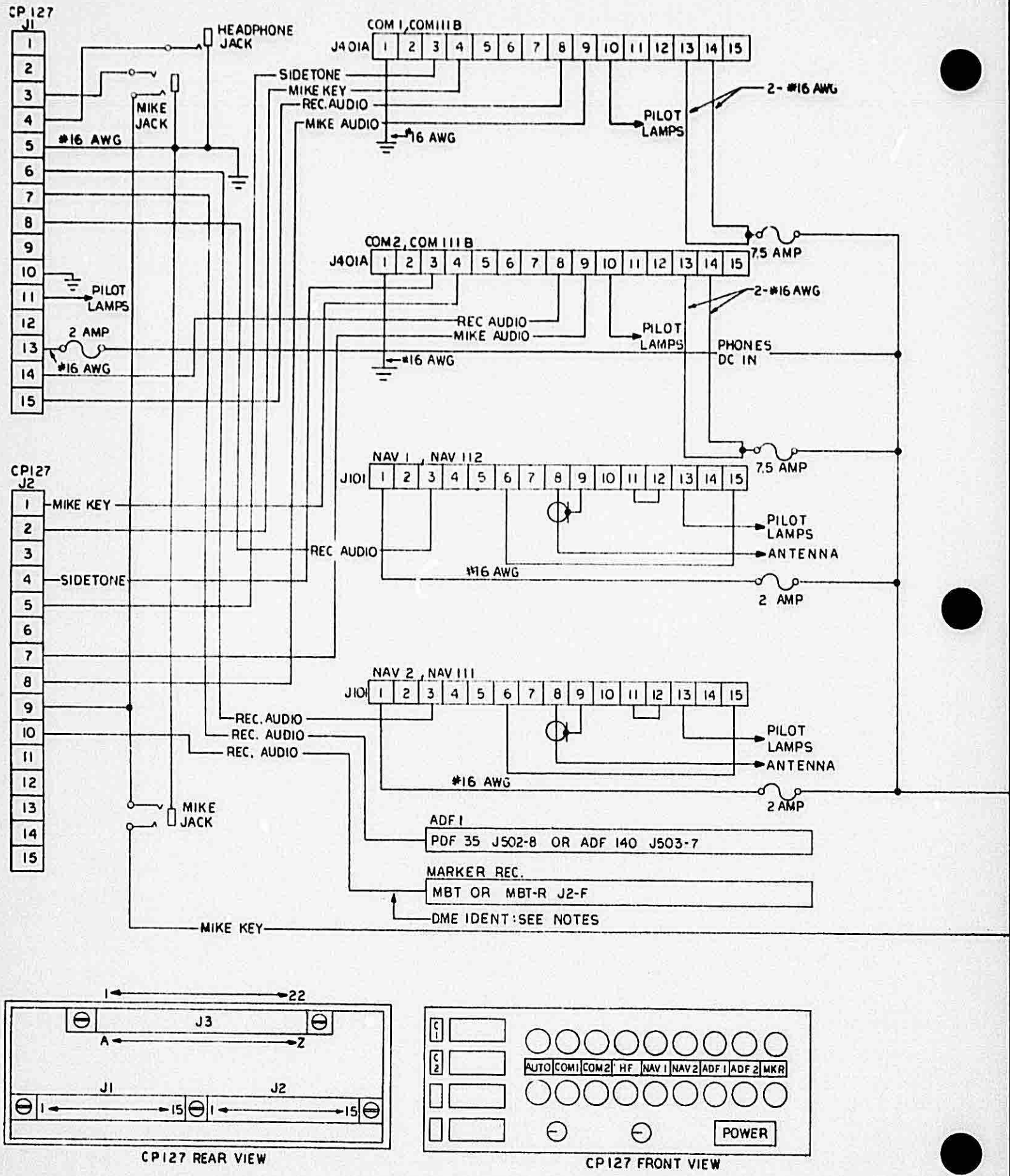
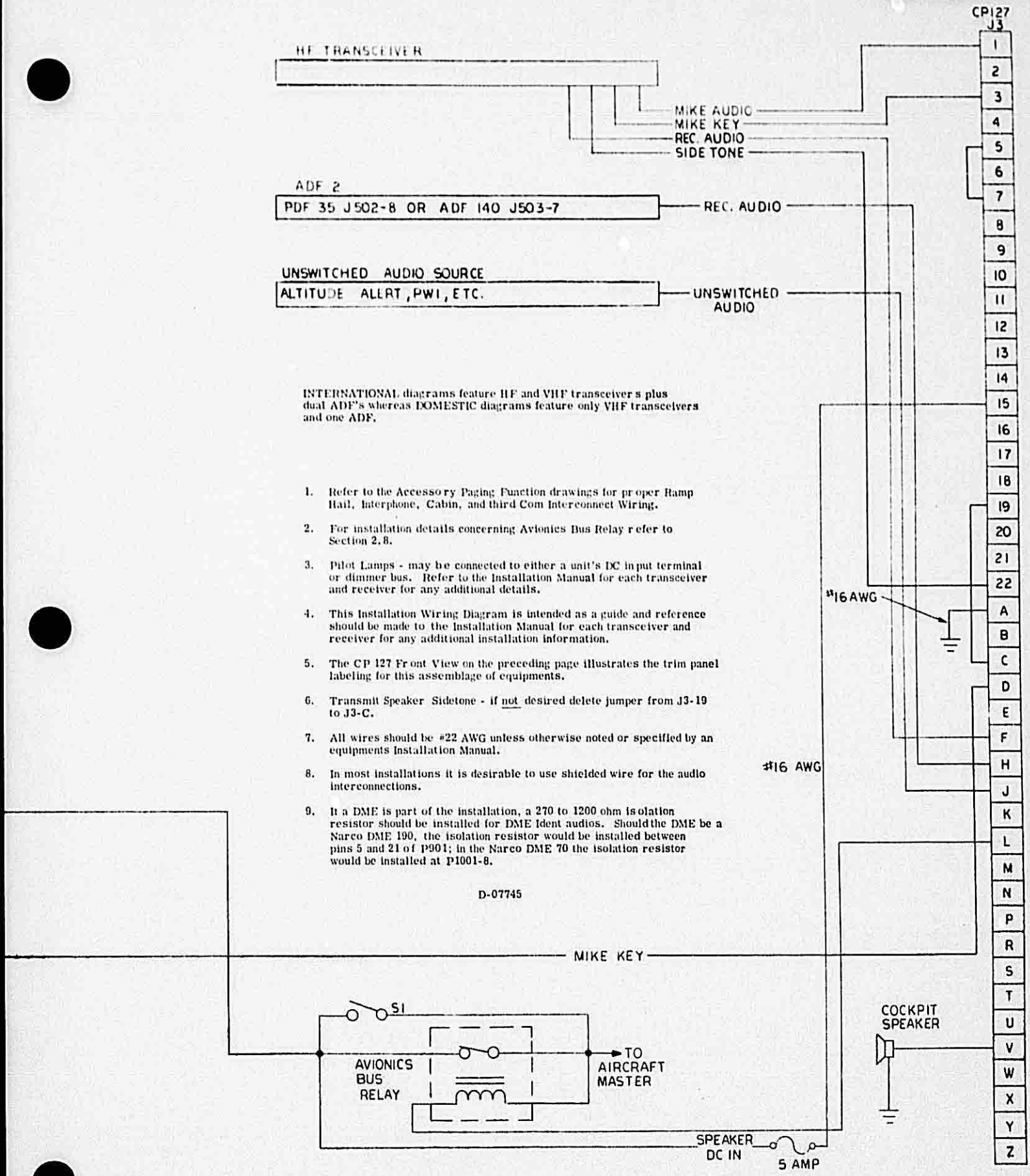


FIGURE 2-27. 14 VOLT INTERNATIONAL DUAL SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #2 Sheet 1 of 2



INTERNATIONAL diagrams feature HF and VHF transceivers plus dual ADF's whereas DOMESTIC diagrams feature only VHF transceivers and one ADF.

1. Refer to the Accessory Paging Function drawings for proper Ramp Hail, Interphone, Cabin, and third Com Interconnect Wiring.
2. For installation details concerning Avionics Bus Relay refer to Section 2.8.
3. Pilot Lamps - may be connected to either a unit's DC input terminal or dimmer bus. Refer to the Installation Manual for each transceiver and receiver for any additional details.
4. This Installation Wiring Diagram is intended as a guide and reference should be made to the Installation Manual for each transceiver and receiver for any additional installation information.
5. The CP 127 Front View on the preceding page illustrates the trim panel labeling for this assemblage of equipments.
6. Transmit Speaker Sidetone - if not desired delete jumper from J3-19 to J3-C.
7. All wires should be #22 AWG unless otherwise noted or specified by an equipments Installation Manual.
8. In most installations it is desirable to use shielded wire for the audio interconnections.
9. If a DME is part of the installation, a 270 to 1200 ohm isolation resistor should be installed for DME Ident audios. Should the DME be a Narco DME 190, the isolation resistor would be installed between pins 5 and 21 of P901; in the Narco DME 70 the isolation resistor would be installed at P1001-8.

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FIGURE 2-27. 14 VOLT INTERNATIONAL DUAL SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #2 Sheet 2 of 2

SEE BLOW-UP

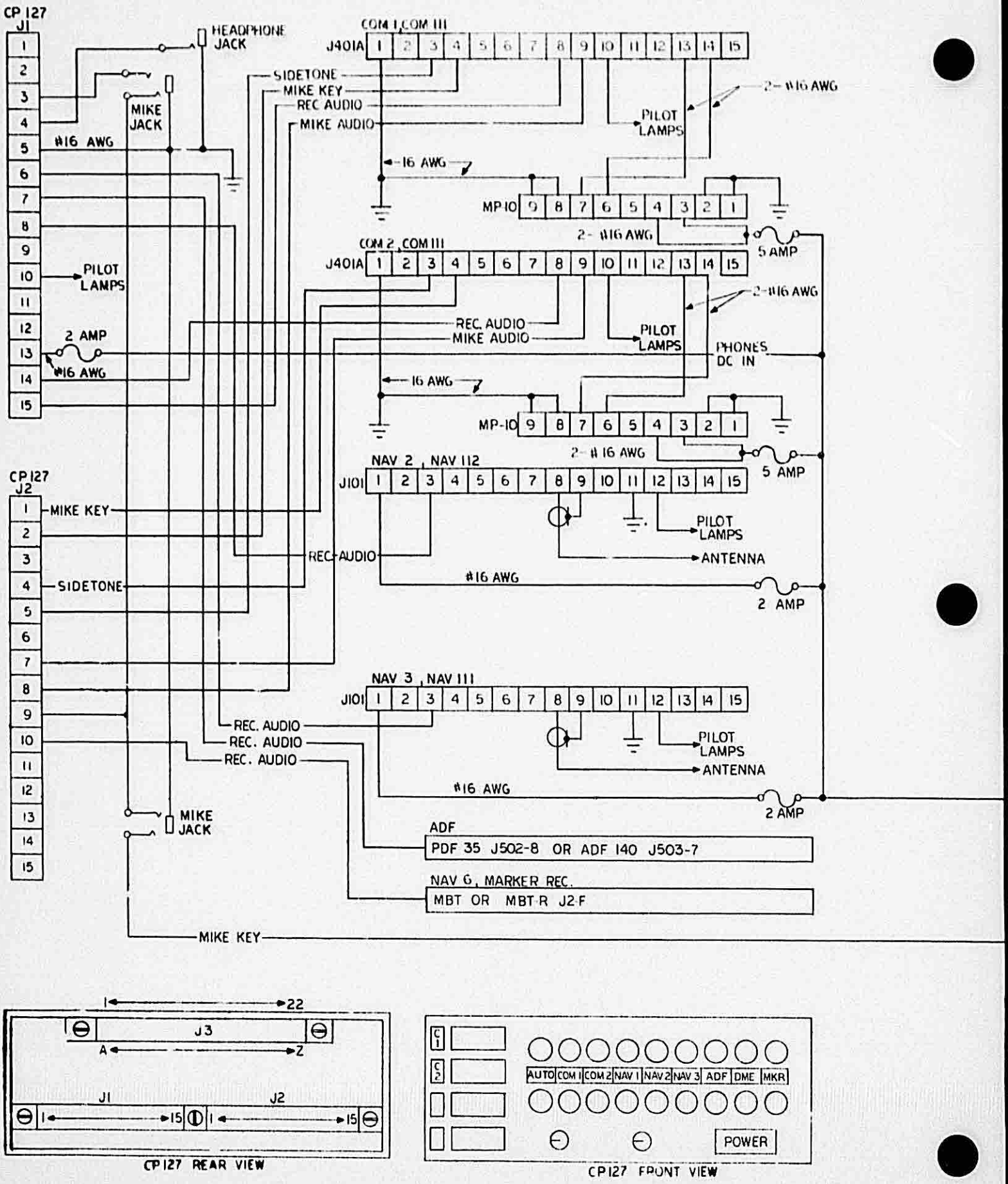
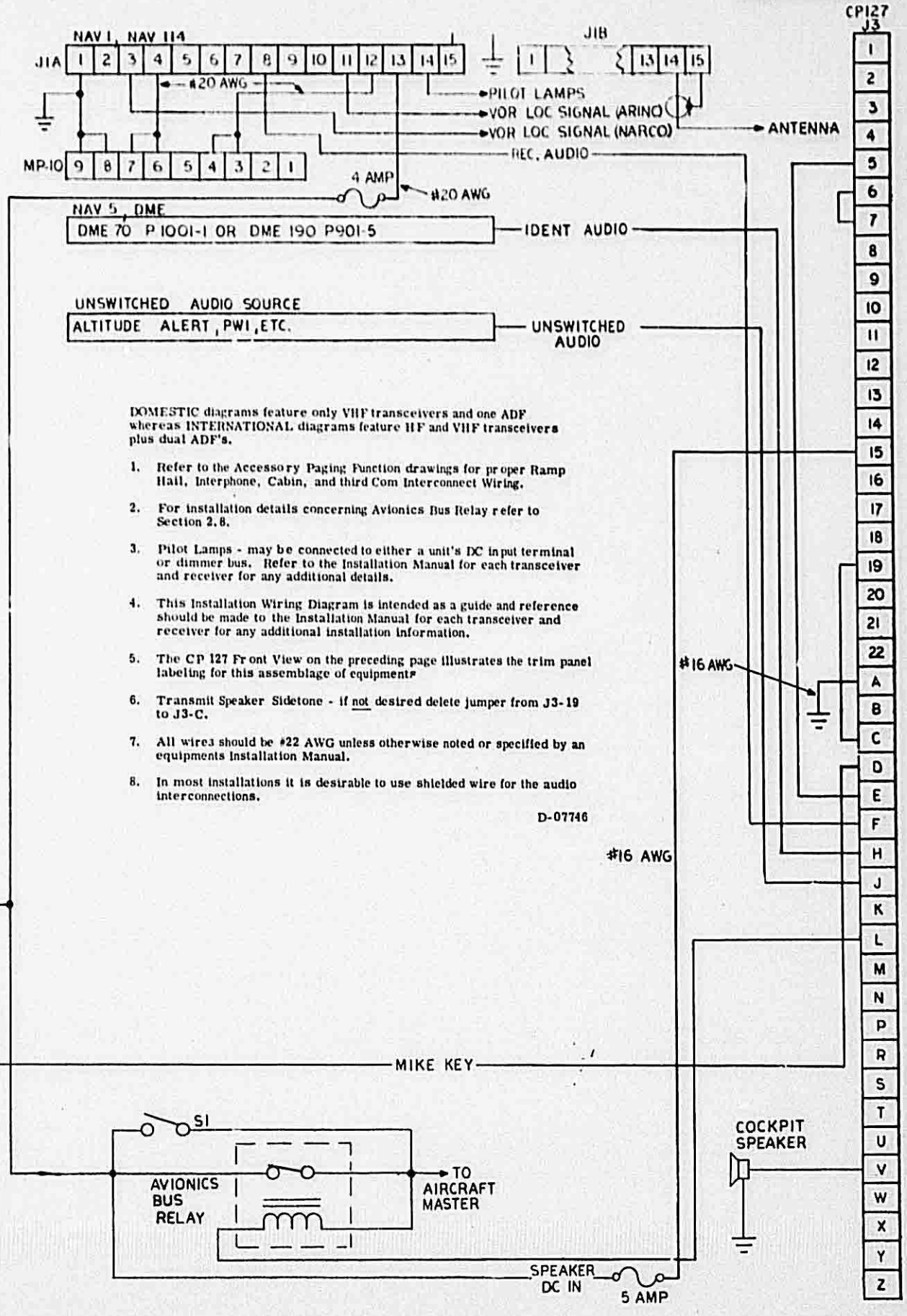


FIGURE 2-28. 28 VOLT DOMESTIC SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #1 Sheet 1 of 2



DOMESTIC diagrams feature only VHF transceivers and one ADF whereas INTERNATIONAL diagrams feature HF and VHF transceivers plus dual ADF's.

1. Refer to the Accessory Paging Function drawings for proper Ramp Hail, Interphone, Cabin, and third Com Interconnect Wiring.
2. For installation details concerning Avionics Bus Relay refer to Section 2.8.
3. Pilot Lamps - may be connected to either a unit's DC input terminal or dimmer bus. Refer to the Installation Manual for each transceiver and receiver for any additional details.
4. This Installation Wiring Diagram is intended as a guide and reference should be made to the Installation Manual for each transceiver and receiver for any additional installation information.
5. The CP 127 Front View on the preceding page illustrates the trim panel labeling for this assemblage of equipment.
6. Transmit Speaker Sidetone - if not desired delete jumper from J3-19 to J3-C.
7. All wires should be #22 AWG unless otherwise noted or specified by an equipments Installation Manual.
8. In most installations it is desirable to use shielded wire for the audio interconnections.

D-07746

FIGURE 2-28. 28 VOLT DOMESTIC SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #1 Sheet 2 of 2

SEE BLOW-UP

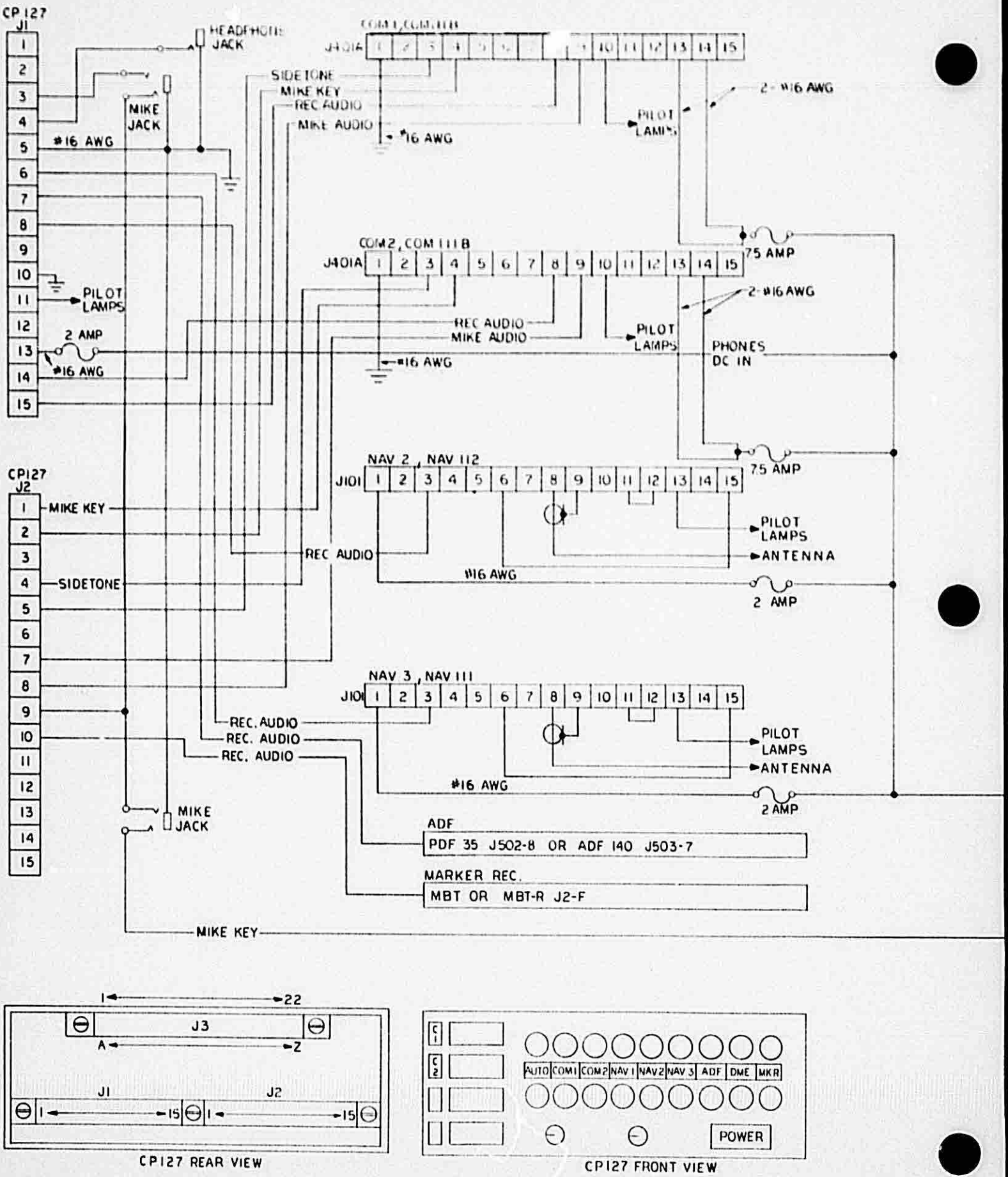
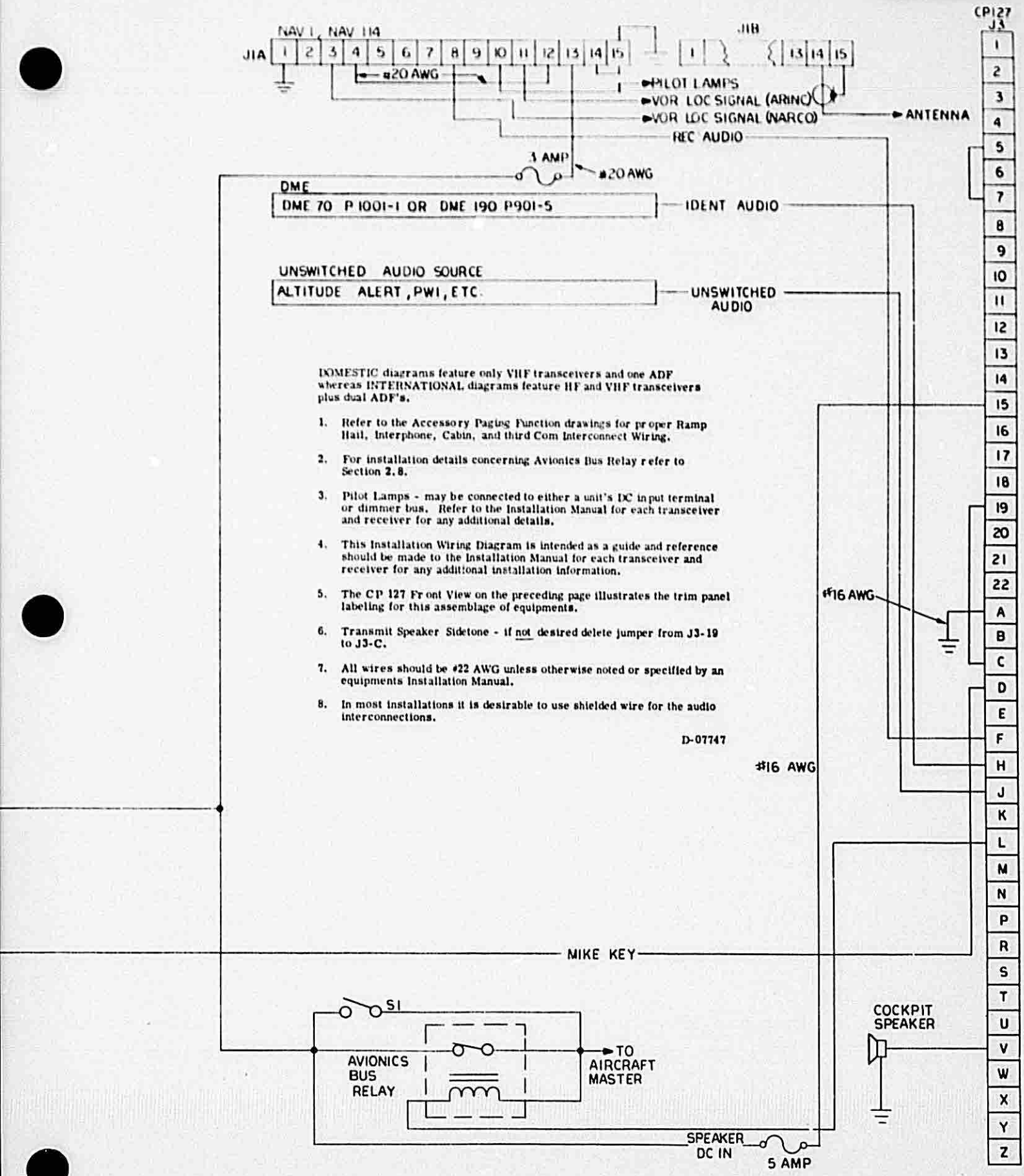


FIGURE 2-29. 14 VOLT DOMESTIC SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #1 Sheet 1 of 2



DOMESTIC diagrams feature only VHF transceivers and one ADF whereas INTERNATIONAL diagrams feature HF and VHF transceivers plus dual ADF's.

1. Refer to the Accessory Paging Function drawings for proper Ramp Hail, Interphone, Cabin, and third Com Interconnect Wiring.
2. For installation details concerning Avionics Bus Relay refer to Section 2.8.
3. Pilot Lamps - may be connected to either a unit's DC input terminal or dimmer bus. Refer to the Installation Manual for each transceiver and receiver for any additional details.
4. This Installation Wiring Diagram is intended as a guide and reference should be made to the Installation Manual for each transceiver and receiver for any additional installation information.
5. The CP 127 Front View on the preceding page illustrates the trim panel labeling for this assemblage of equipments.
6. Transmit Speaker Sidetone - if not desired delete jumper from J3-19 to J3-C.
7. All wires should be #22 AWG unless otherwise noted or specified by an equipments Installation Manual.
8. In most installations it is desirable to use shielded wire for the audio interconnections.

D-07747

FIGURE 2-29. 14 VOLT DOMESTIC SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #1 Sheet 2 of 2

SEE BLOW-UP

NARCO AVIONICS CP 127

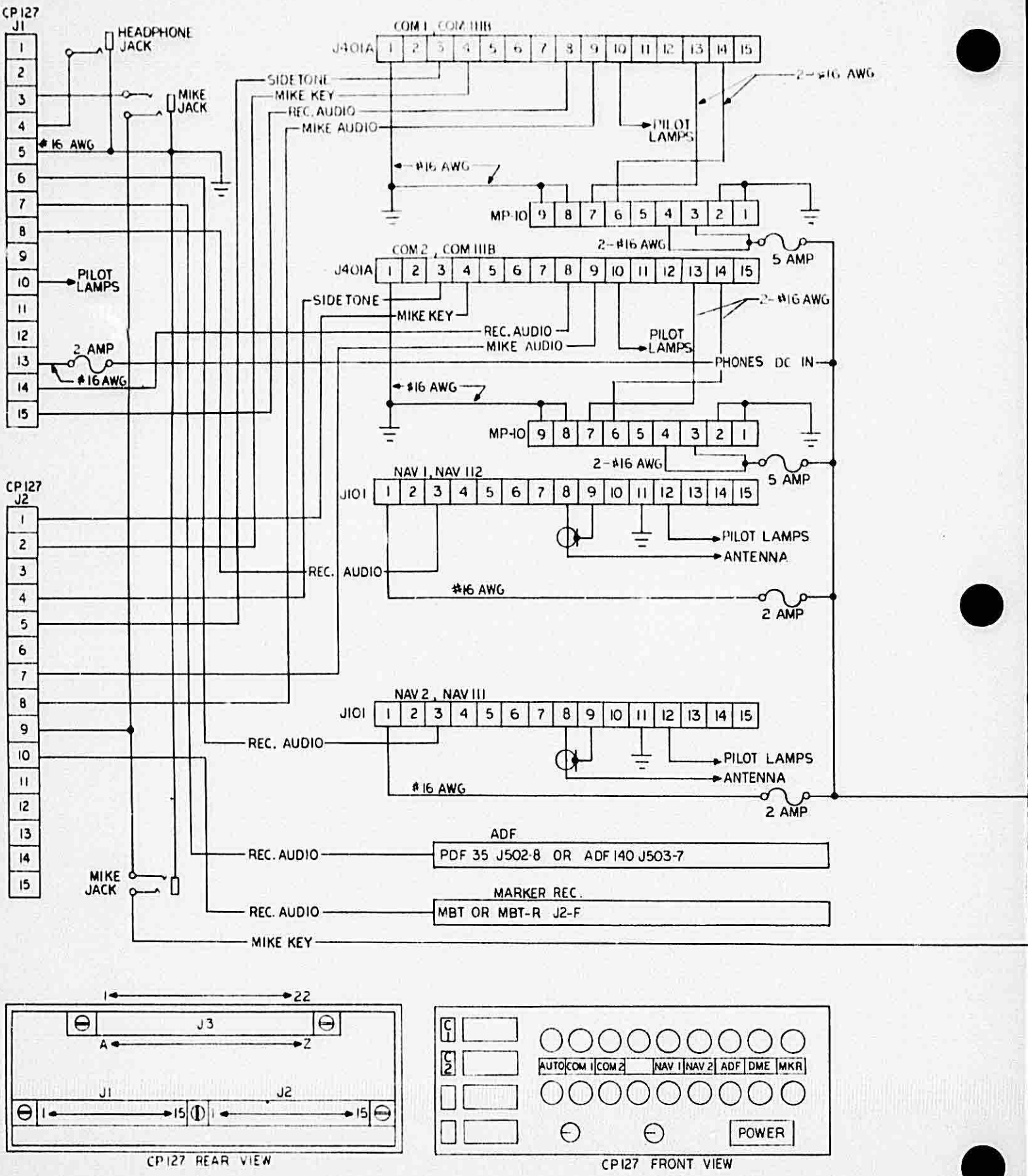
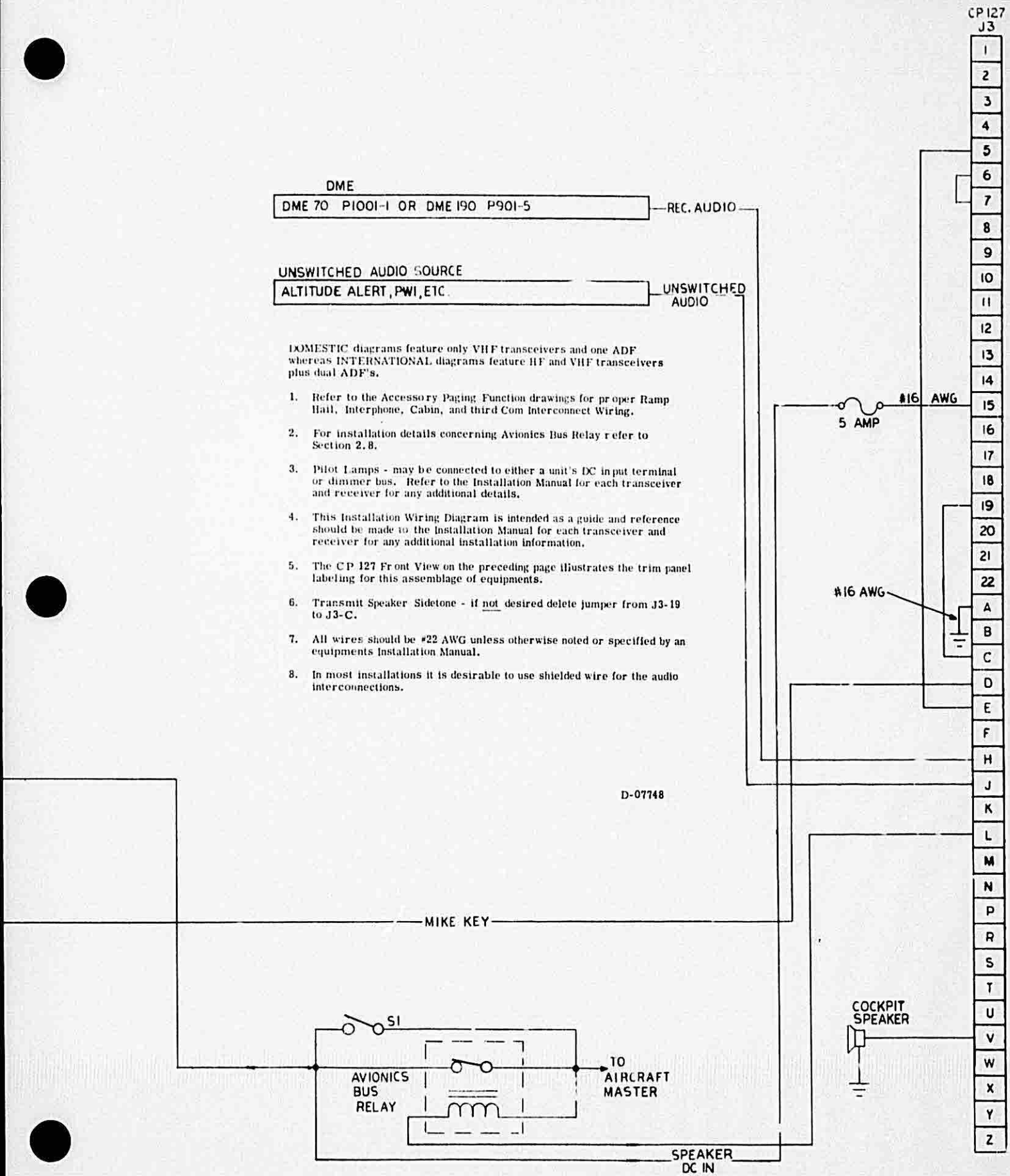


FIGURE 2-30. 28 VOLT DOMESTIC SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #2 Sheet 1 of 2



DOMESTIC diagrams feature only VHF transceivers and one ADF whereas INTERNATIONAL diagrams feature HF and VHF transceivers plus dual ADF's.

1. Refer to the Accessory Paging Function drawings for proper Ramp Hail, Interphone, Cabin, and third Com Interconnect Wiring.
2. For installation details concerning Avionics Bus Relay refer to Section 2.8.
3. Pilot Lamps - may be connected to either a unit's DC input terminal or dimmer bus. Refer to the Installation Manual for each transceiver and receiver for any additional details.
4. This Installation Wiring Diagram is intended as a guide and reference should be made to the Installation Manual for each transceiver and receiver for any additional installation information.
5. The CP 127 Front View on the preceding page illustrates the trim panel labeling for this assemblage of equipments.
6. Transmit Speaker Sidetone - if not desired delete jumper from J3-19 to J3-C.
7. All wires should be #22 AWG unless otherwise noted or specified by an equipments Installation Manual.
8. In most installations it is desirable to use shielded wire for the audio interconnections.

FIGURE 2-30. 28 VOLT DOMESTIC SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #2 Sheet 2 of 2

SEE BLOW-UP

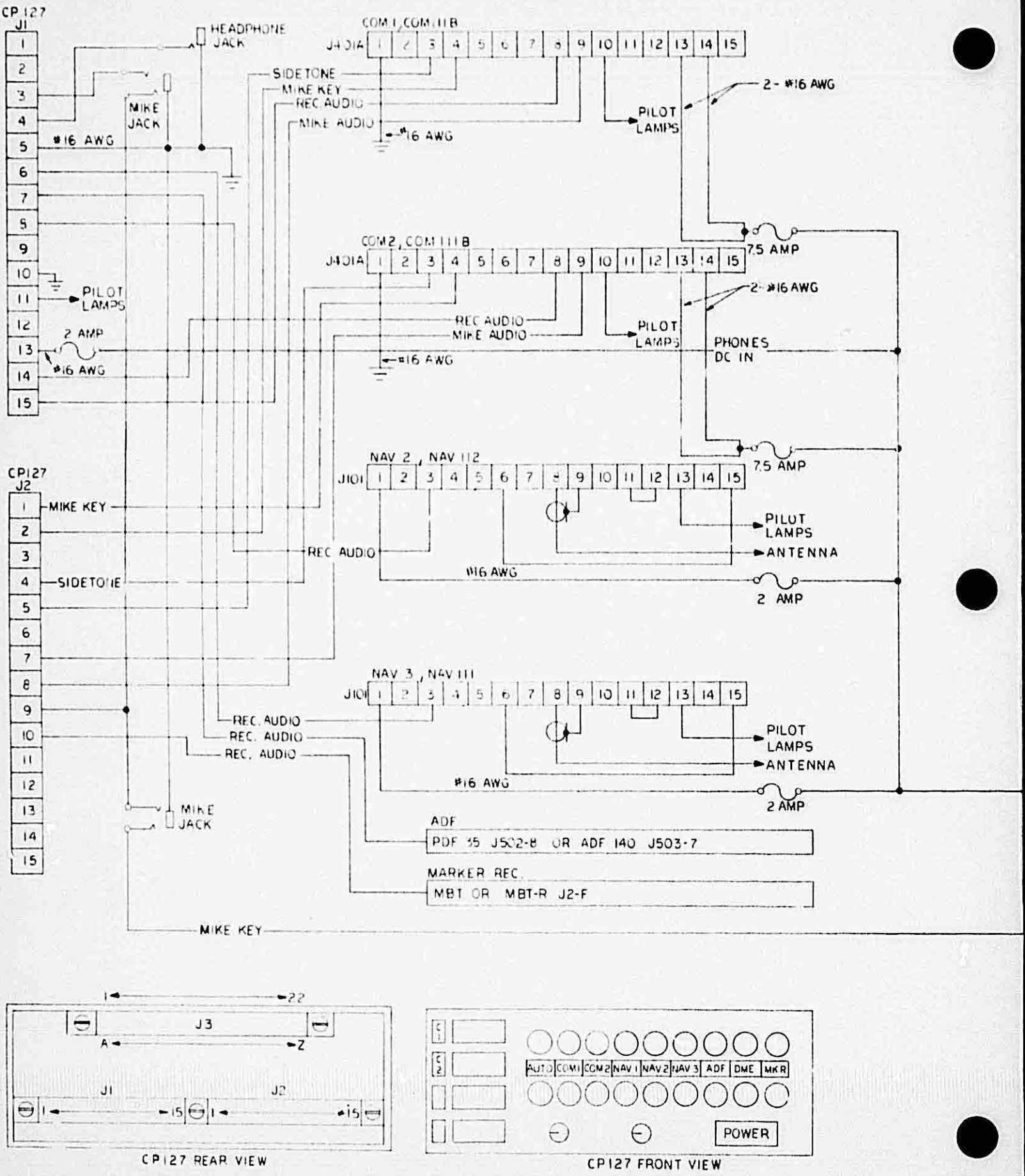


FIGURE 2-31. 14 VOLT DOMESTIC SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #2 Sheet 1 of 2

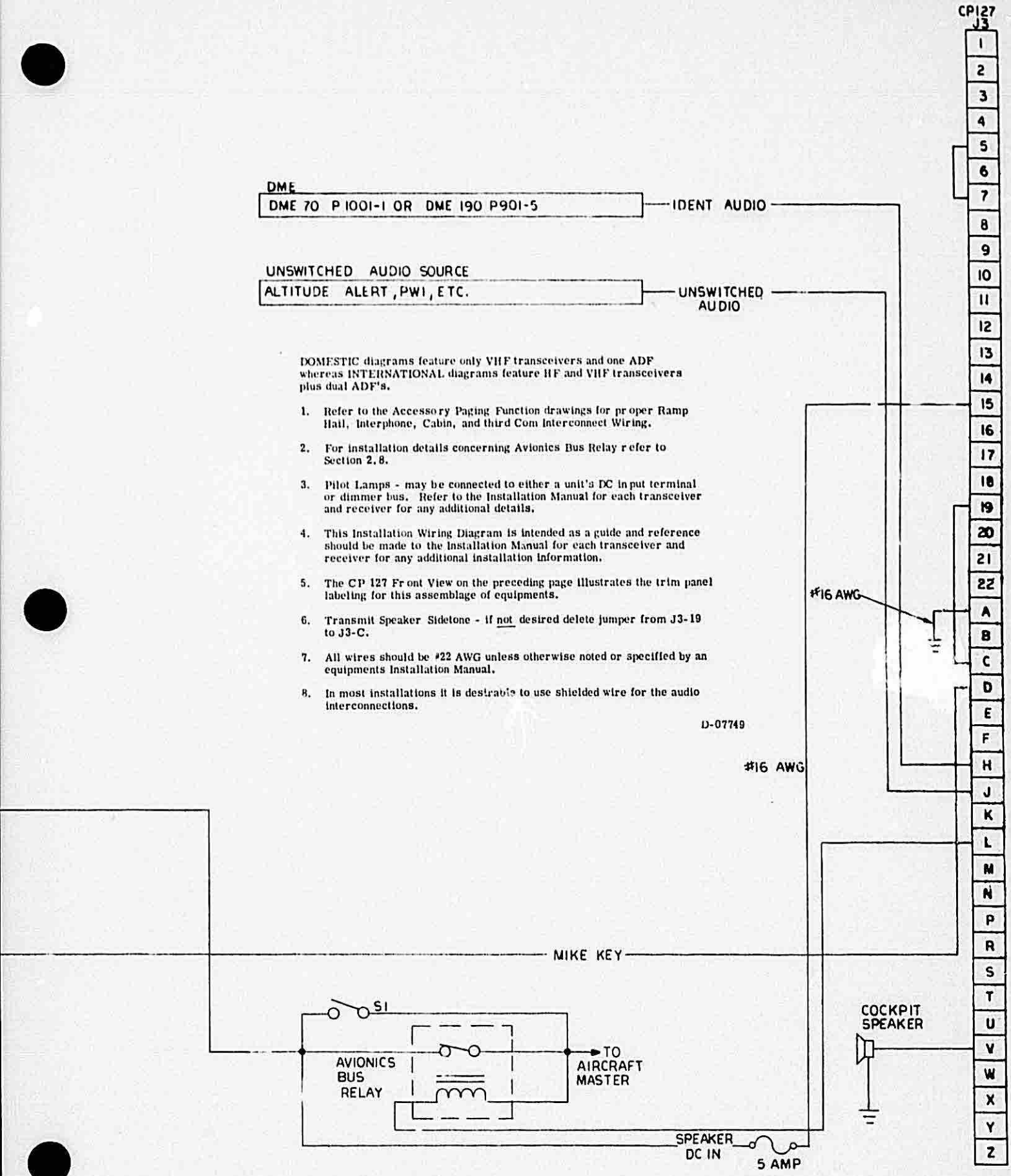


FIGURE 2-31. 14 VOLT DOMESTIC SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #2 Sheet 2 of 2

SEE BLOW-UP

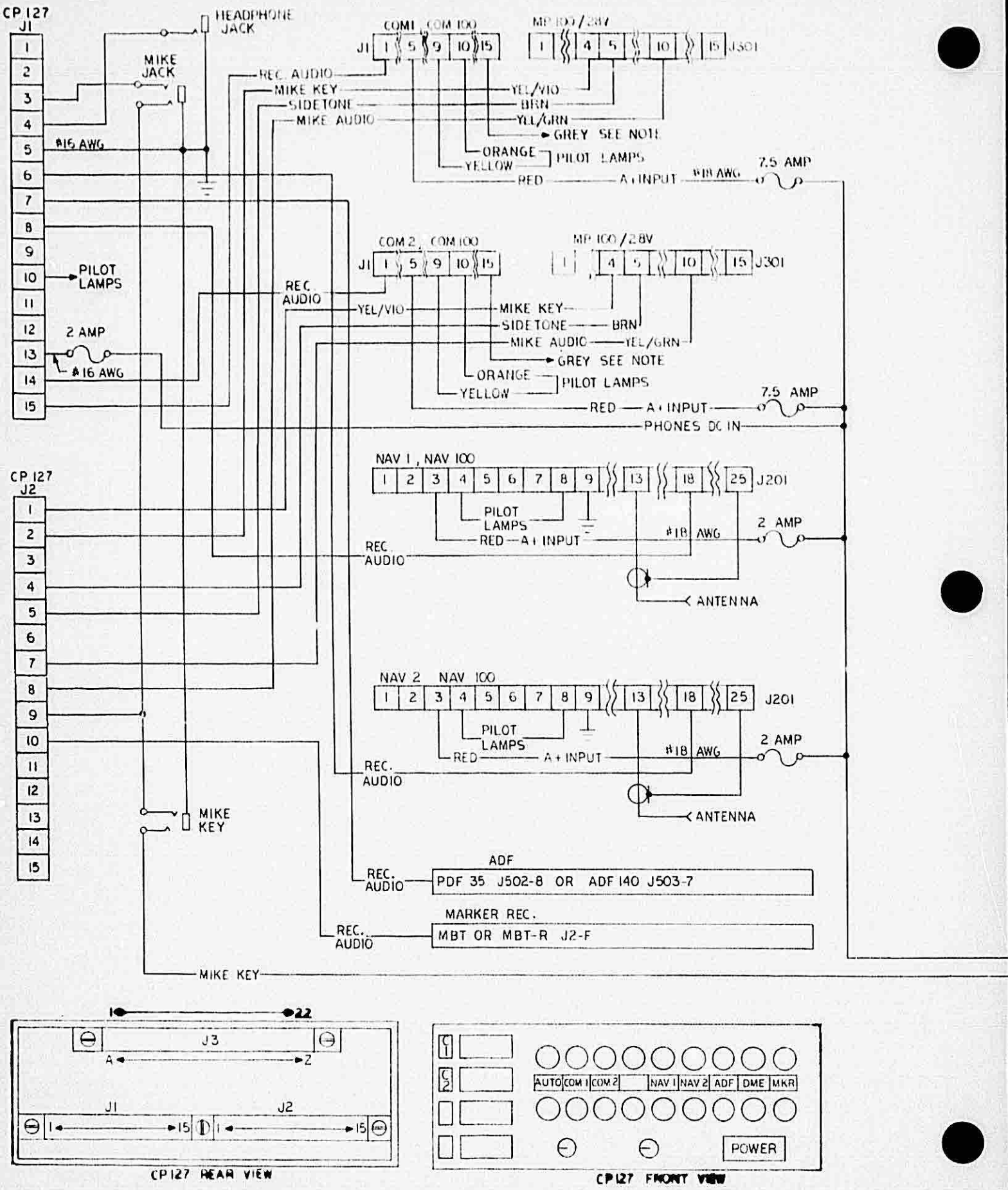


FIGURE 2-32. 28 VOLT EXECUTIVE NAV-COM/CP 127 INSTALLATION WIRING DIAGRAM Sheet 1 of 2

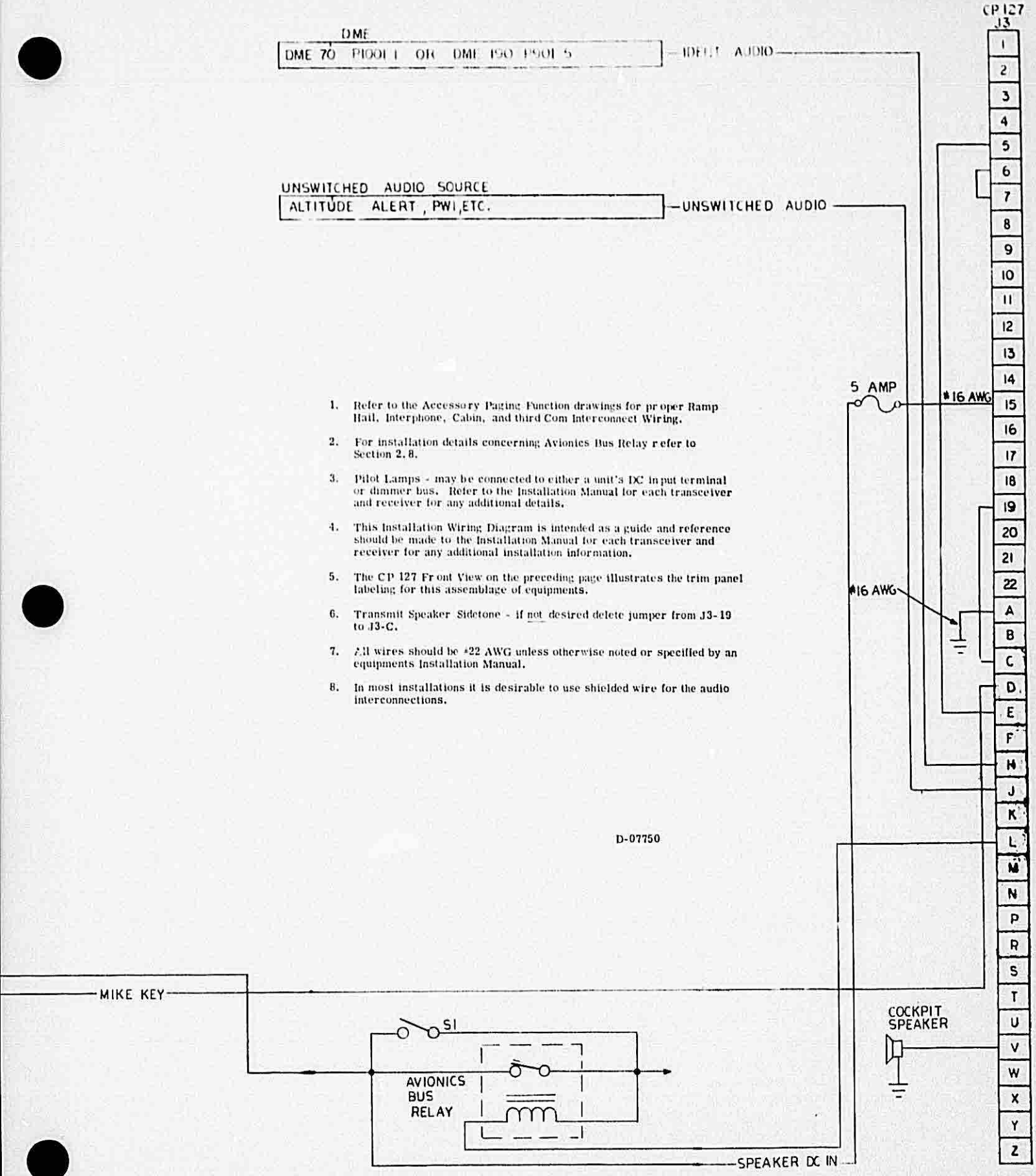


FIGURE 2-32. 28 VOLT EXECUTIVE NAV-COM/CP 127 INSTALLATION WIRING DIAGRAM Sheet 2 of 2

SEE BLOW-UP

NARCO AVIONICS CP 127

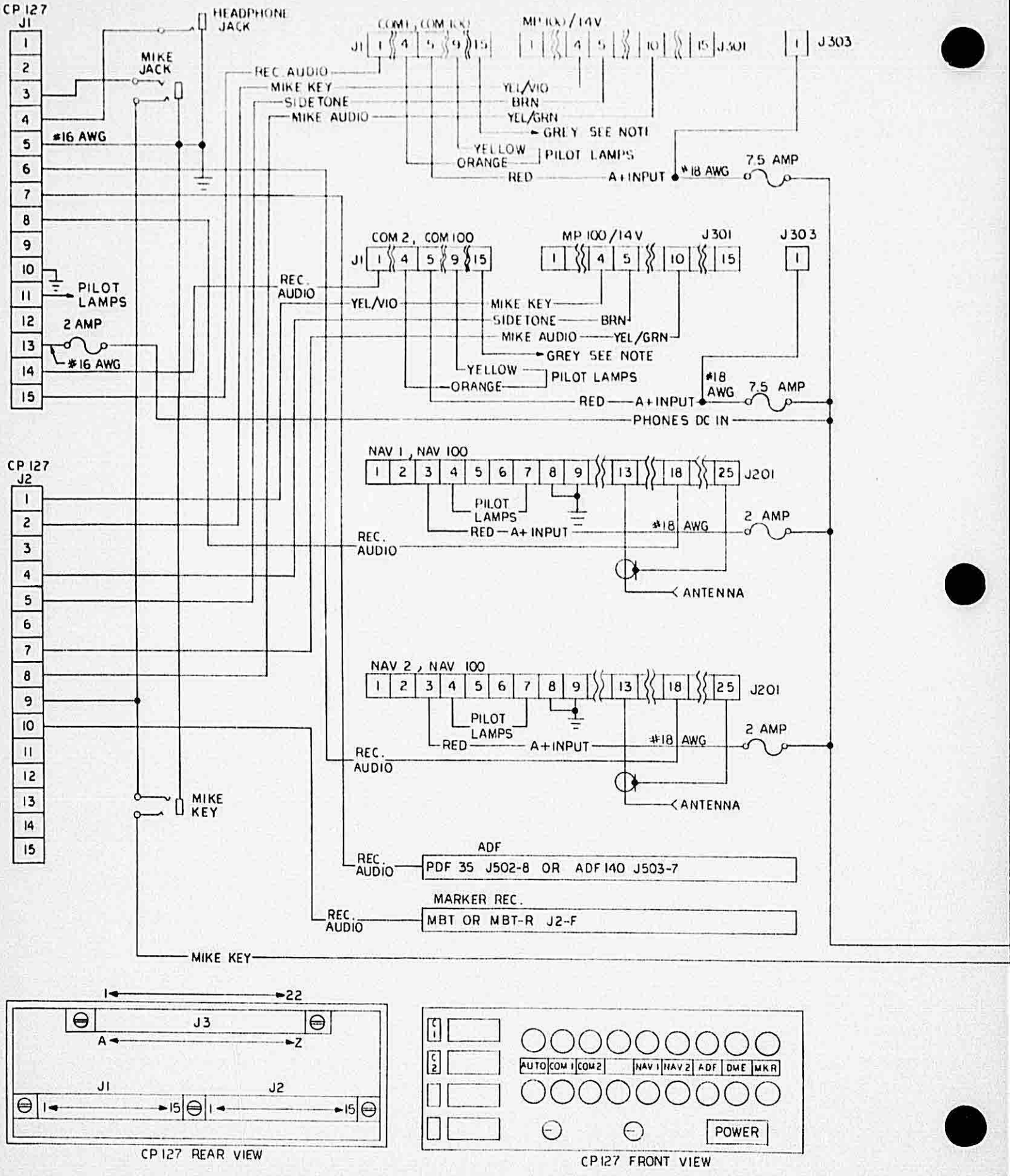


FIGURE 2-33. 14 VOLT EXECUTIVE NAV-COM/CP 127 INSTALLATION WIRING DIAGRAM

Sheet 1 of 2

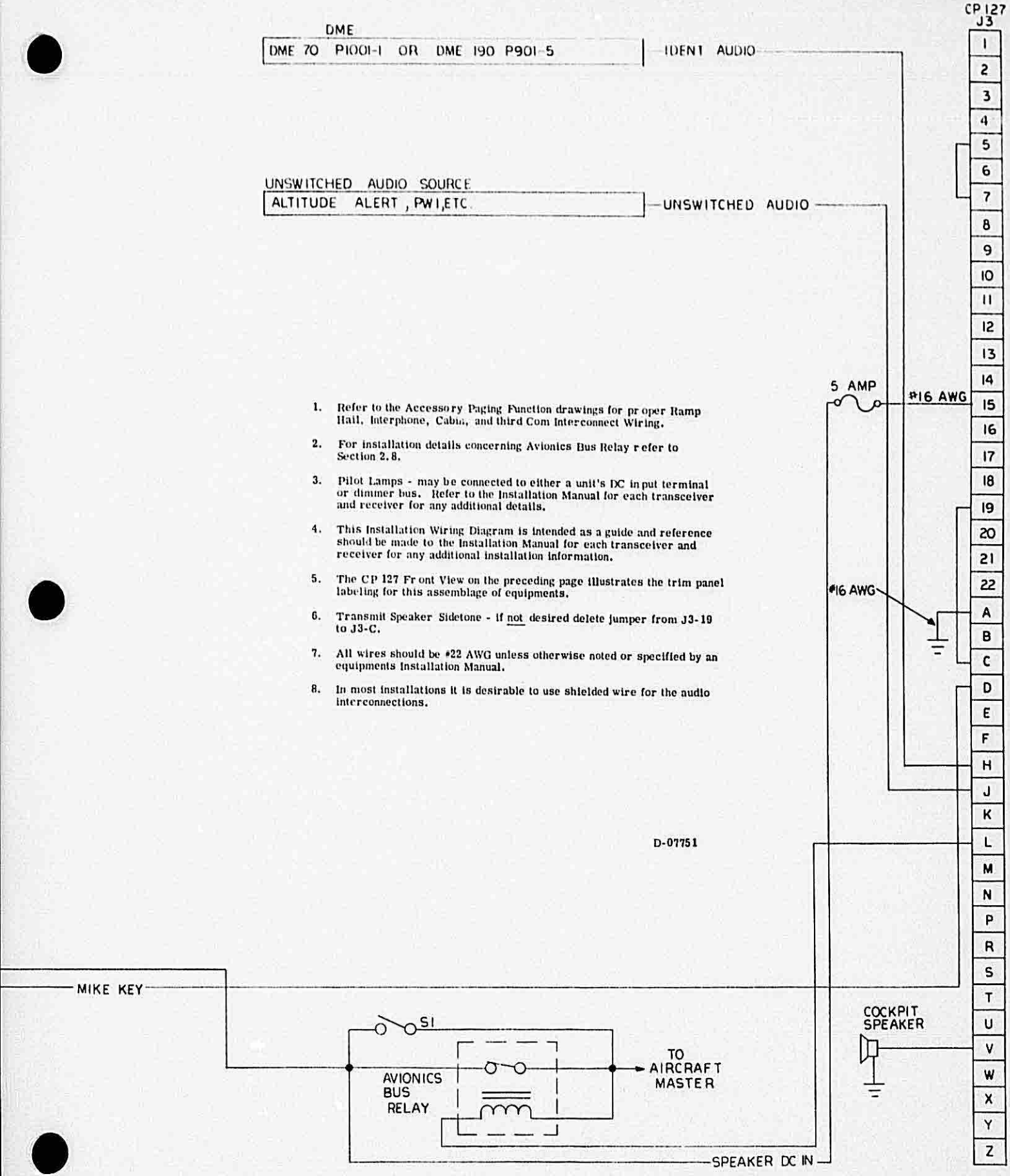


FIGURE 2-33. 14 VOLT EXECUTIVE NAV-COM/CP 127 INSTALLATION WIRING DIAGRAM Sheet 2 of 2

SEE BLOW-UP

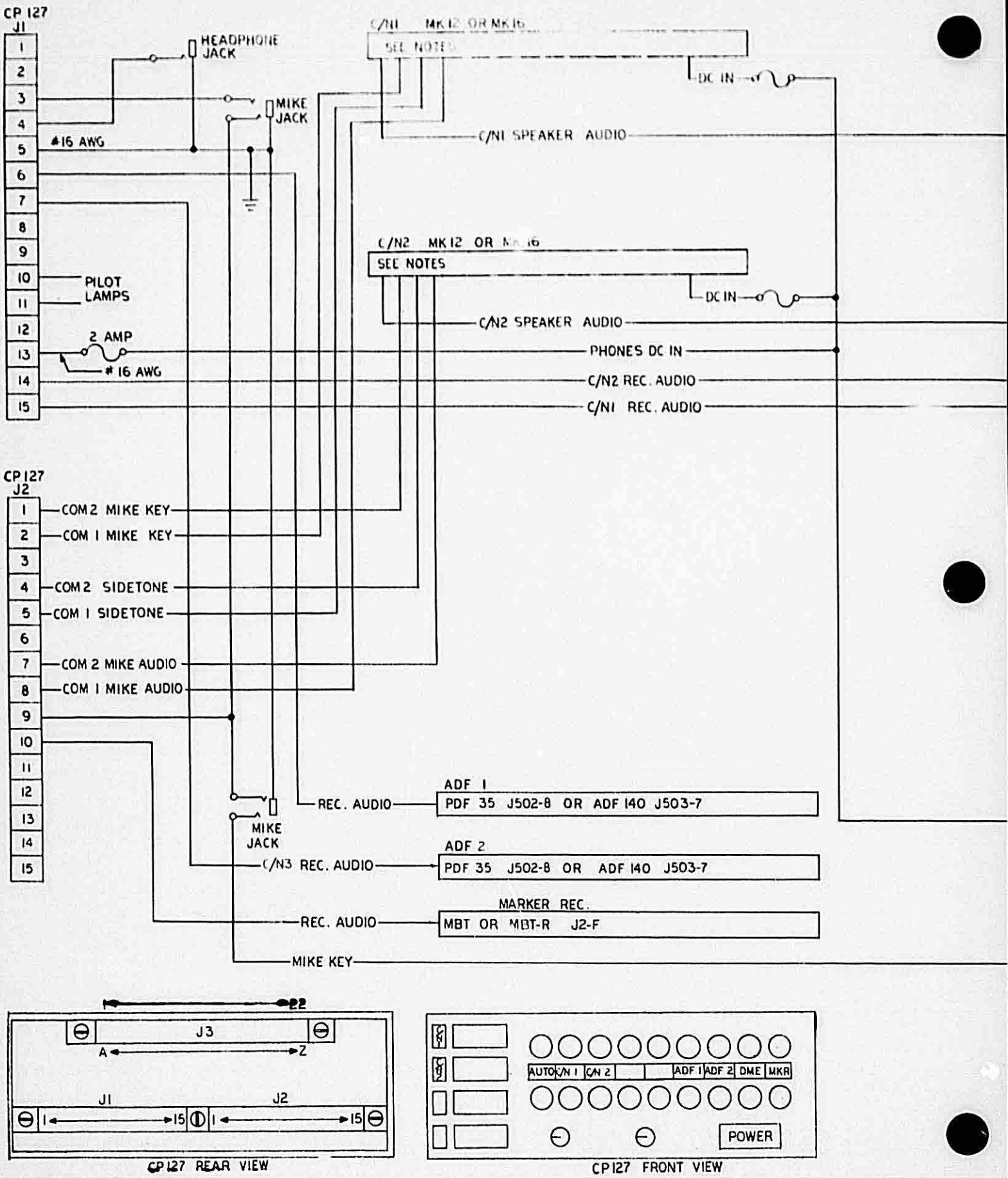
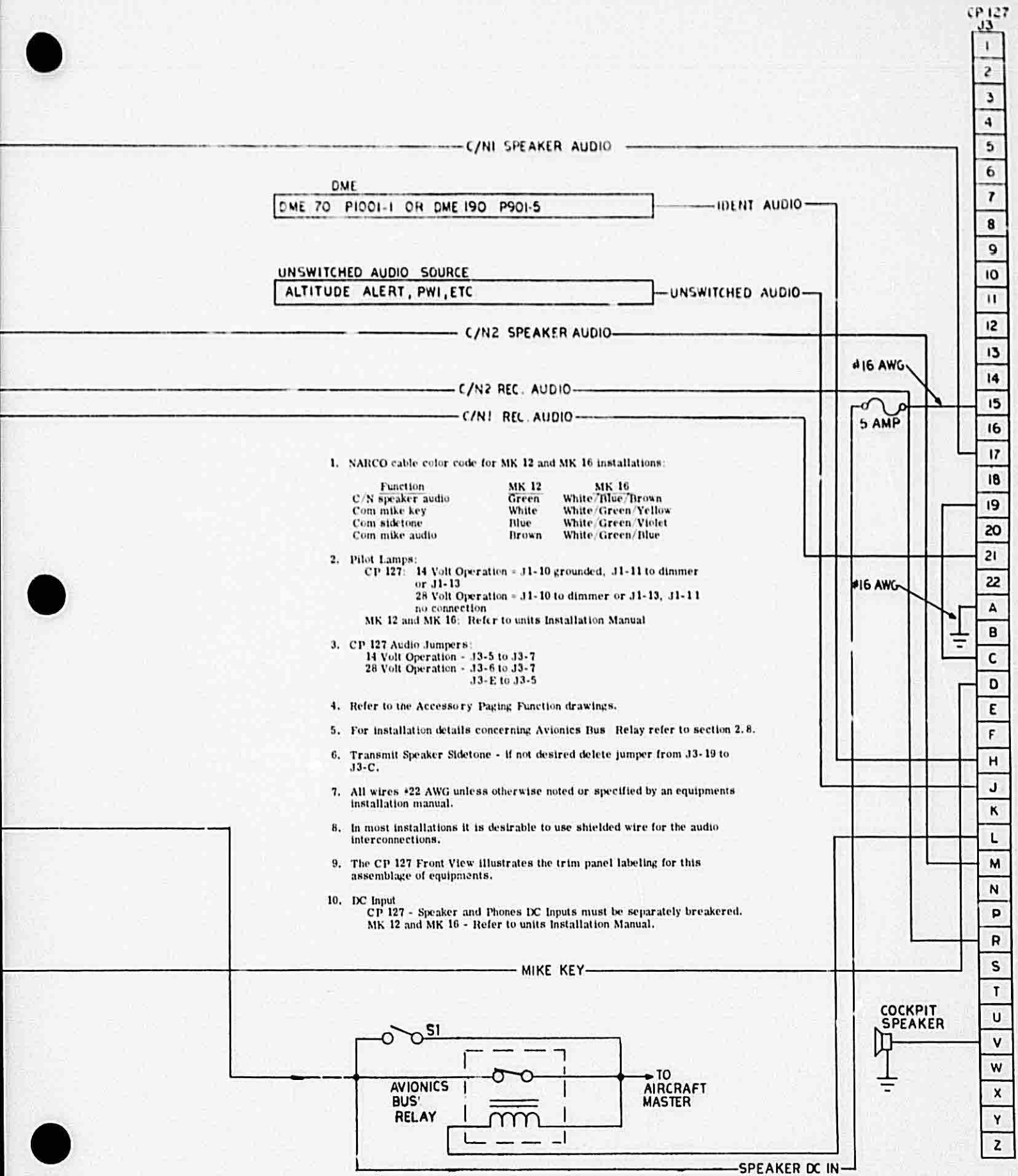


FIGURE 2-34. 14 and 28 VOLT MK 12 and MK 16/CP 127 INSTALLATION WIRING DIAGRAM Sheet 1 of 2



1. NARCO cable color code for MK 12 and MK 16 installations:

Function	MK 12	MK 16
C/N speaker audio	Green	White/Blue/Brown
Com mike key	White	White/Green/Yellow
Com sidetone	Blue	White/Green/Violet
Com mike audio	Brown	White/Green/Blue

2. Pilot Lamps:
   CP 127: 14 Volt Operation = J1-10 grounded, J1-11 to dimmer or J1-13
   28 Volt Operation = J1-10 to dimmer or J1-13, J1-11 no connection
   MK 12 and MK 16: Refer to units Installation Manual

3. CP 127 Audio Jumpers:
   14 Volt Operation - J3-5 to J3-7
   28 Volt Operation - J3-6 to J3-7
   J3-E to J3-5

4. Refer to the Accessory Paging Function drawings.

5. For installation details concerning Avionics Bus Relay refer to section 2.8.

6. Transmit Speaker Sidetone - if not desired delete jumper from J3-19 to J3-C.

7. All wires #22 AWG unless otherwise noted or specified by an equipments installation manual.

8. In most installations it is desirable to use shielded wire for the audio interconnections.

9. The CP 127 Front View illustrates the trim panel labeling for this assemblage of equipments.

10. DC Input
    CP 127 - Speaker and Phones DC Inputs must be separately breakered.
    MK 12 and MK 16 - Refer to units Installation Manual.

FIGURE 2-34. 14 and 28 VOLT MK 12 and MK 16/CP 127 INSTALLATION WIRING DIAGRAM Sheet 2 of 2

SEE BLOW-UP

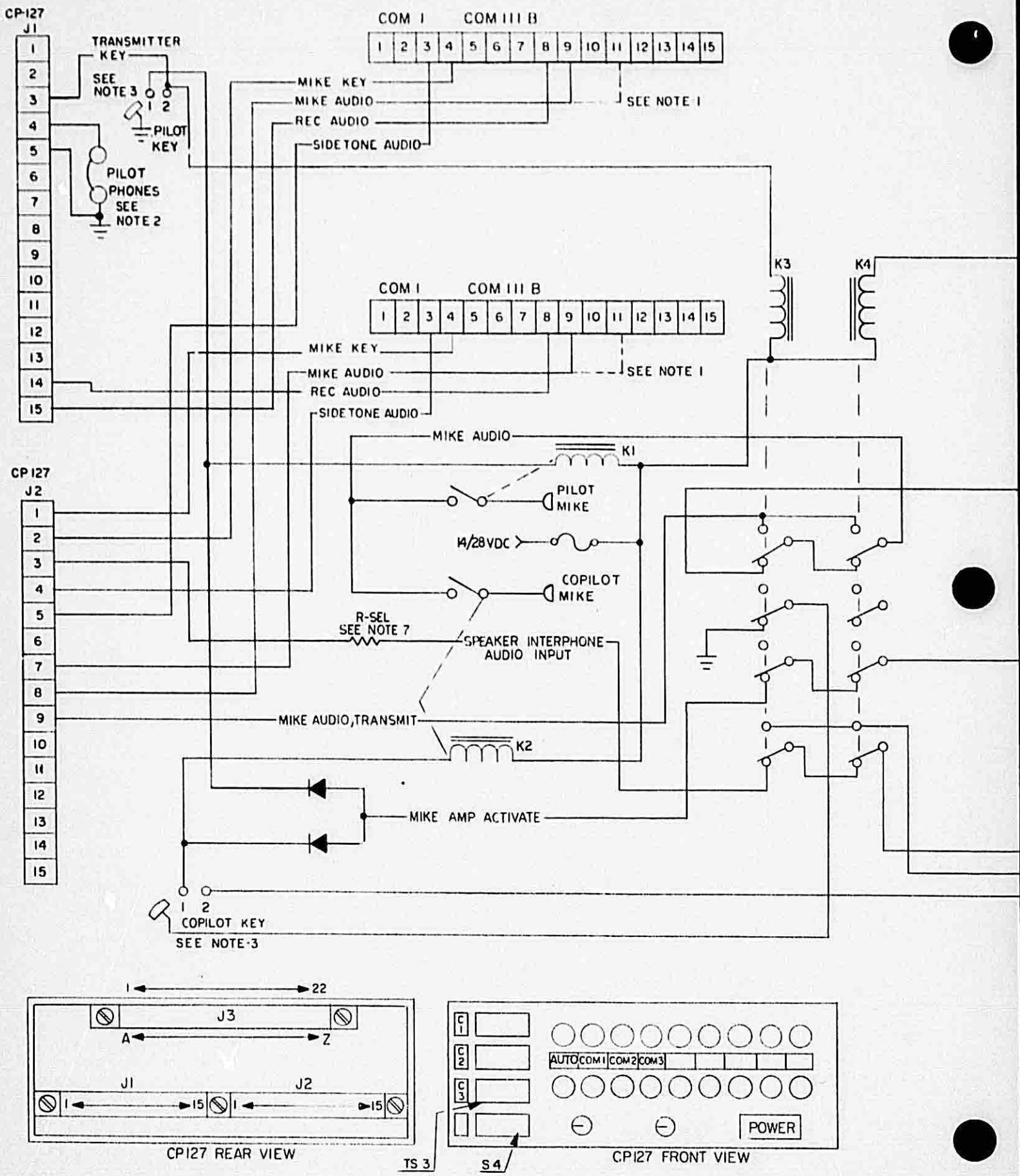


FIGURE 2-35. HELICOPTER INSTALLATION WIRING DIAGRAM
Sheet 1 of 2

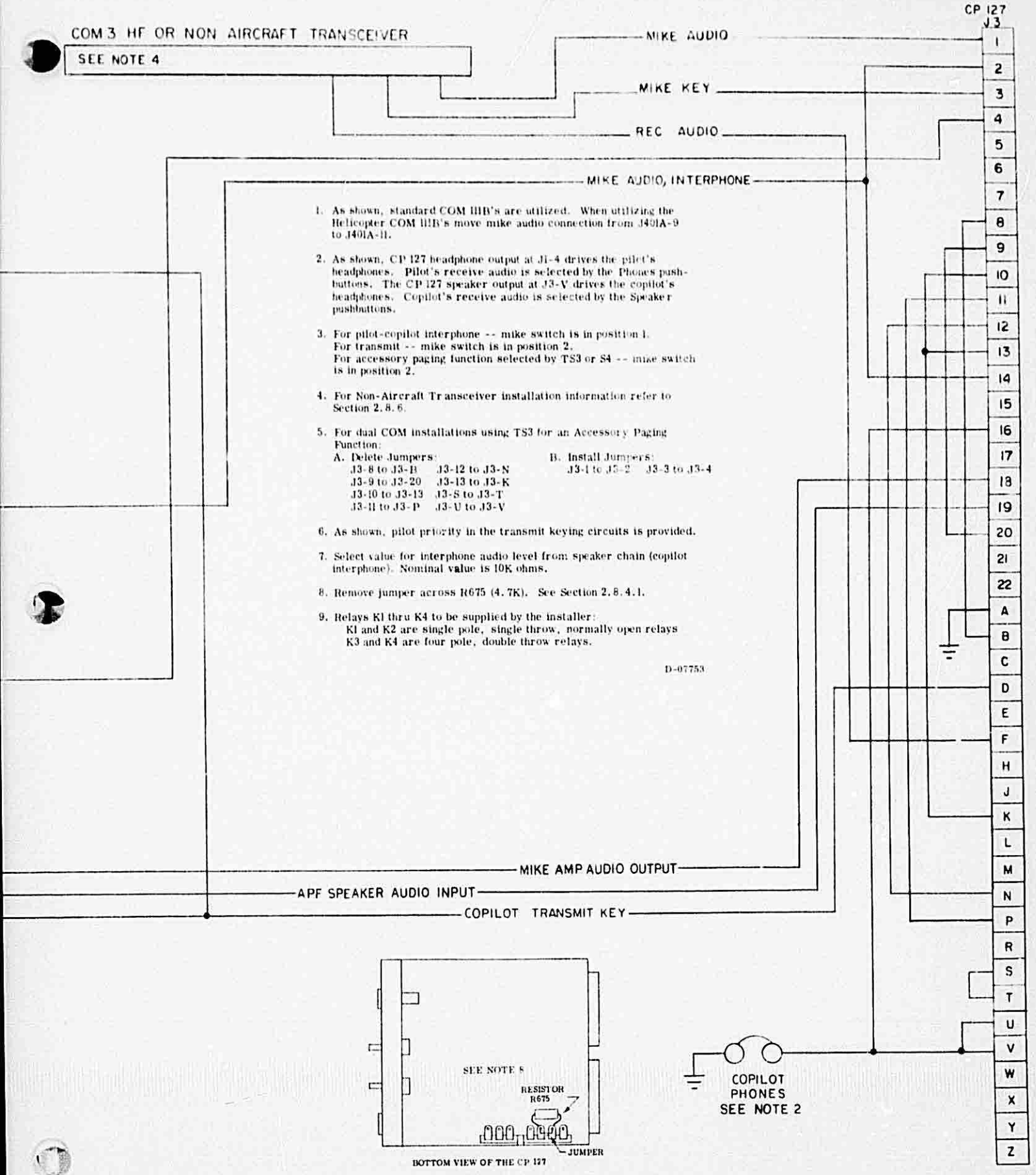


FIGURE 2-35. HELICOPTER INSTALLATION WIRING DIAGRAM
Sheet 2 of 2

SEE BLOW-UP

1. This installation wiring diagram is to be used in conjunction with one of the previous Nav/Com installation wiring diagrams.

2. The CP 127 Front View shown below illustrates the labeling for the functions enabled through the use of this wiring diagram.

3. All wires should be #22 AWG unless otherwise noted.

4. Speaker voice coil impedance should be 3 to 8 ohms. Where a 16 ohm speaker is utilized a 4 ohm to 16 ohm matching transformer is required. Use only high quality speakers capable of handling 10 watts.

5. Adjustment of cabin speaker volume should be by means of an "L" pad mounted at the cabin speaker to allow for in-flight setting of a comfortable listening level.

6. As shown: Interphone audio will be present in the Headphones (J1-4) together with any Nav-Com audio selected by the front panel Phones pushbuttons (receive audio is not muted).
For Interphone audio without Nav-Com audio (receive audio is muted) connect remote headphones to J3 pin W.

C-07754

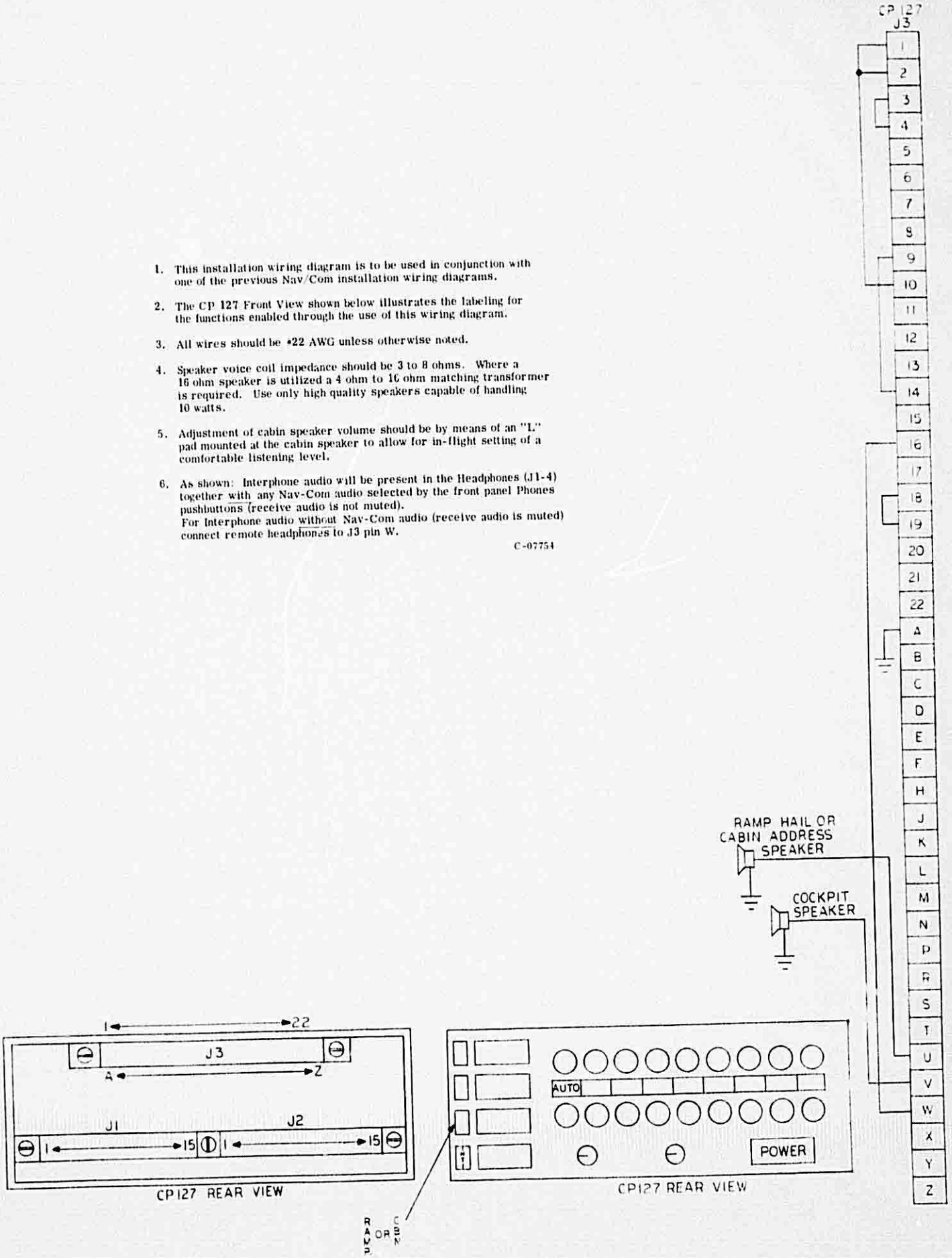


FIGURE 2-36. ACCESSORY PAGING FUNCTION - RAMP CABIN AND INTERPHONE

SEE BLOW-UP

1. This installation wiring diagram is to be used in conjunction with one of the previous Nav/Com installation wiring diagrams.
2. The CP 127 Front View shown below illustrates the labeling for the functions enabled through the use of this wiring diagram.
3. All wires should be #22 AWG unless otherwise noted.
4. Speaker voice coil impedance should be 3 to 8 ohms. Where a 16 ohm speaker is utilized a 4 ohm to 16 ohm matching transformer is required. Use only high quality speakers capable of handling 10 watts.
5. Adjustment of cabin speaker volume should be by means of an "L" pad mounted at the cabin speaker to allow for in-flight setting of a comfortable listening level.

C-07755

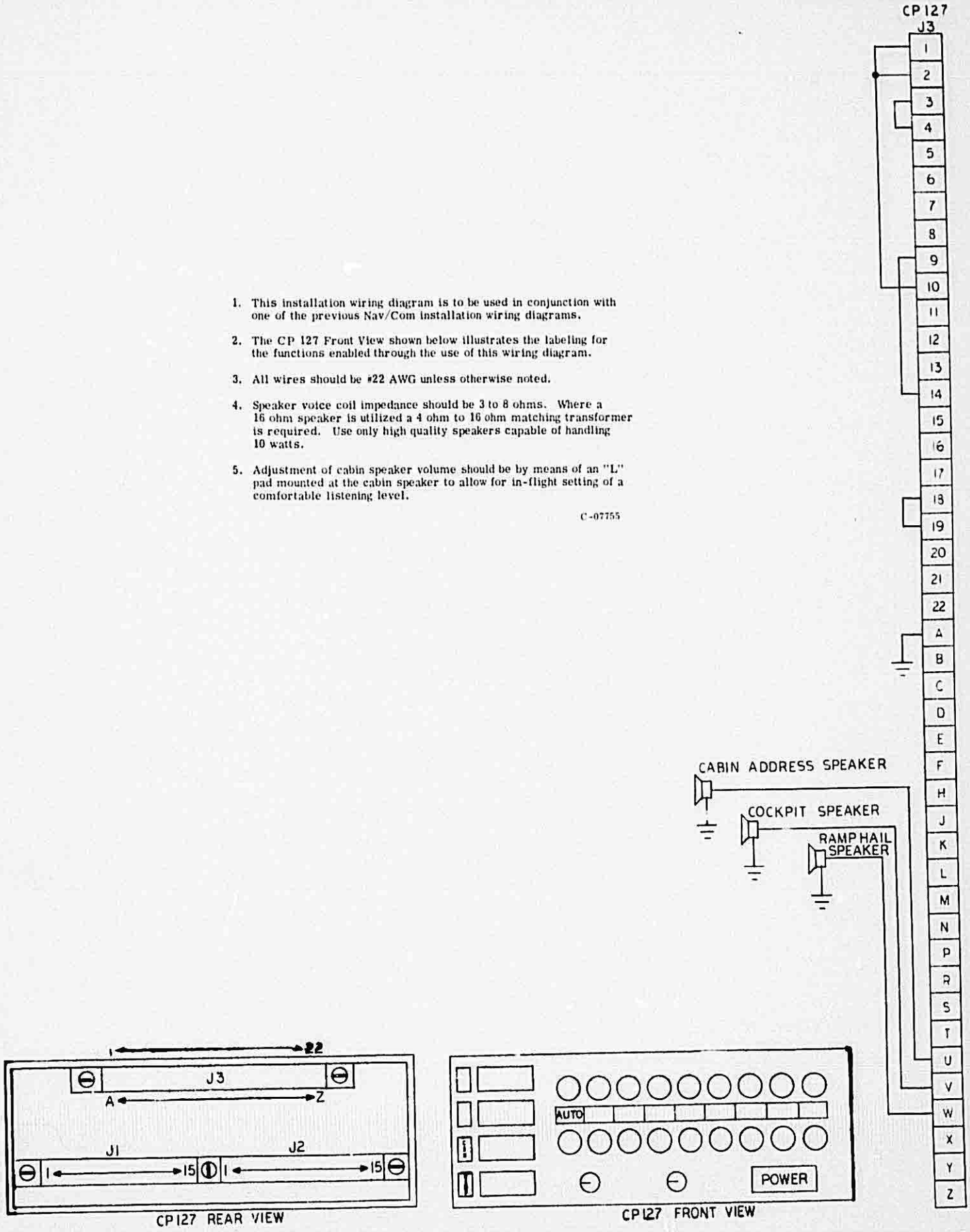


FIGURE 2-37. ACCESSORY PAGING FUNCTION - CABIN AND RAMP

SEE BLOW-UP

1. This diagram to be used in conjunction with one of the previous Nav/Com installation wiring diagrams.

2. The CP 127 Front View illustrates the labeling for the functions enabled through the use of this wiring diagram.

3. All wires are #22 AWG unless otherwise noted.

4. As shown:
   - A. Installation wired for dual headphone amplifiers (no cockpit speaker) where:
     1) phones amplifier chain drives pilot's headphones from J1-4 with receive audio selection by the phones pushbuttons.
     2) speaker amplifier chain drives copilot headphones from J3-V with receive audio selection by the speaker pushbuttons.
   - B. Interphone 1 Characteristics
     1) for pilot/copilot communications
     2) muting during Interphone operation:
        - a. J1-4 output will contain any receive pushbutton selected phones audio as well as Interphone audio (phones receive audio is not muted during Interphone).
        - b. J3-V output will not contain any receive audio during Interphone operation (receive audio is muted during Interphone).
   - C. Interphone 2 Characteristics
     1) for pilot and/or copilot audio to a remote headphone load (ex - FM 1200 Com Interrupt)
     2) muting is as explained in part B.

5. Variations:
   - A. Cockpit speaker:
     1) delete jumper from J3-U to J3-V
     2) connect cockpit speaker to J3-V
   - B. Remote speaker load for Interphone 2.
     1) delete jumper from J3-17 to J3-W
     2) connect remote speaker to J3-W

C-07756

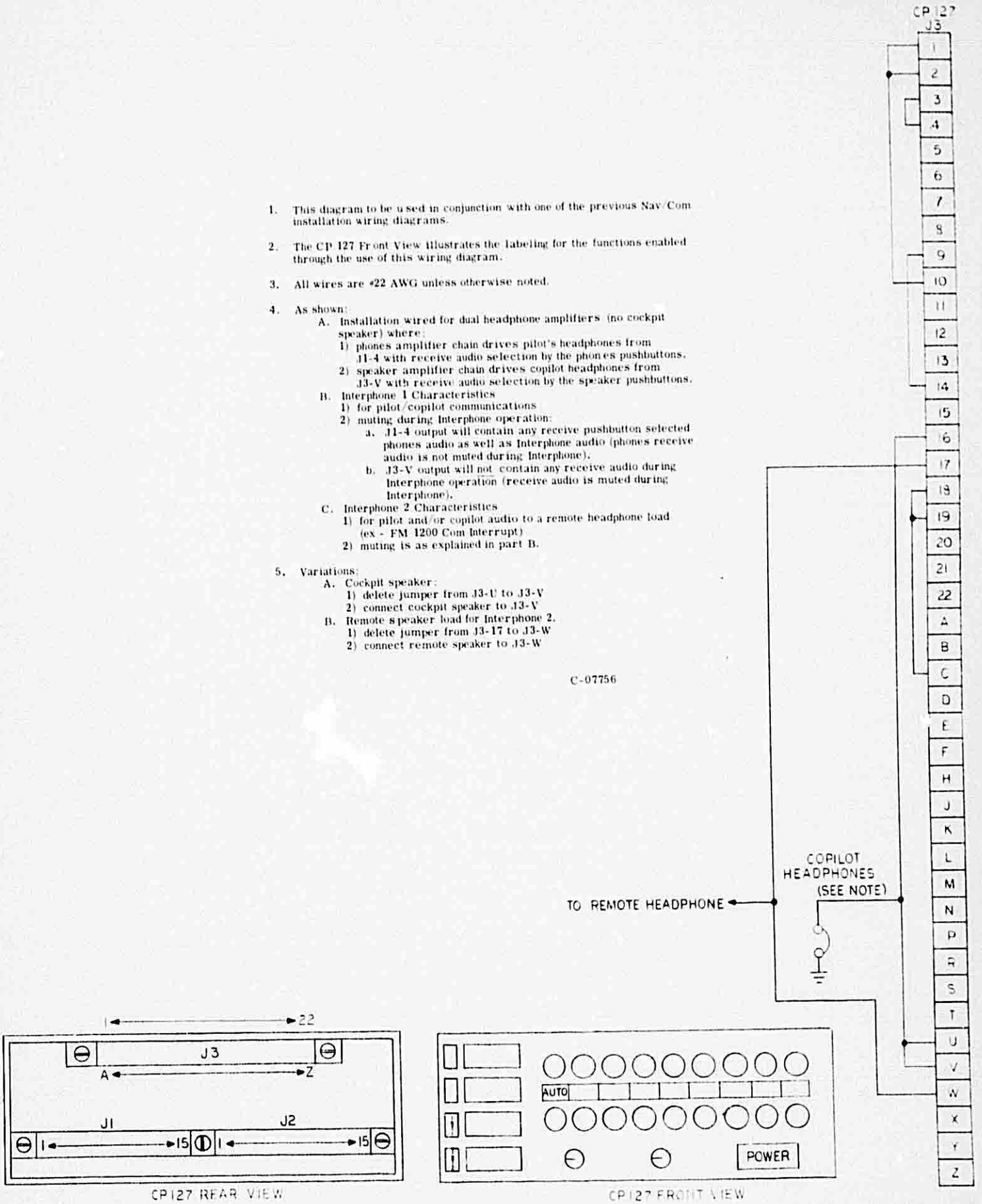
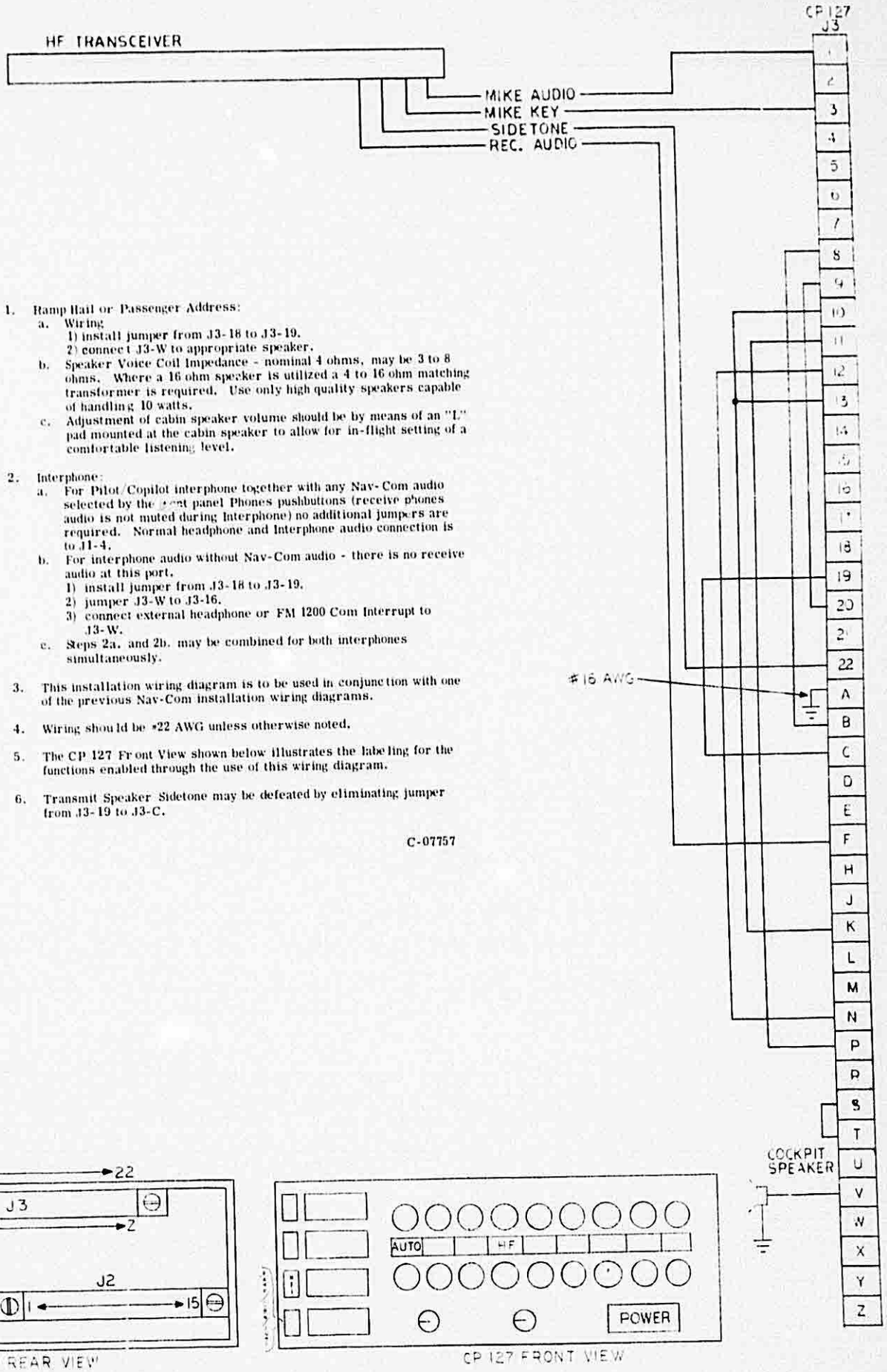


FIGURE 2-38. ACCESSORY PAGING FUNCTION - INTERPHONE 1 AND 2

SEE BLOW-UP



1. Ramp Hail or Passenger Address:
   a. Wiring
      1) install jumper from J3-18 to J3-19.
      2) connect J3-W to appropriate speaker.
   b. Speaker Voice Coil Impedance - nominal 4 ohms, may be 3 to 8 ohms. Where a 16 ohm speaker is utilized a 4 to 16 ohm matching transformer is required. Use only high quality speakers capable of handling 10 watts.
   c. Adjustment of cabin speaker volume should be by means of an "L" pad mounted at the cabin speaker to allow for in-flight setting of a comfortable listening level.

2. Interphone:
   a. For Pilot/Copilot interphone together with any Nav-Com audio selected by the front panel Phones pushbuttons (receive phones audio is not muted during Interphone) no additional jumpers are required. Normal headphone and Interphone audio connection is to J1-4.
   b. For interphone audio without Nav-Com audio - there is no receive audio at this port.
      1) install jumper from J3-18 to J3-19.
      2) jumper J3-W to J3-16.
      3) connect external headphone or FM 1200 Com Interrupt to J3-W.
   c. Steps 2a. and 2b. may be combined for both interphones simultaneously.

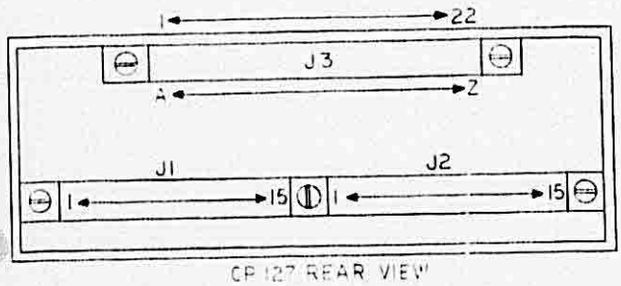
3. This installation wiring diagram is to be used in conjunction with one of the previous Nav-Com installation wiring diagrams.

4. Wiring should be #22 AWG unless otherwise noted.

5. The CP 127 Front View shown below illustrates the labeling for the functions enabled through the use of this wiring diagram.

6. Transmit Speaker Sidetone may be defeated by eliminating jumper from J3-19 to J3-C.

C-07757

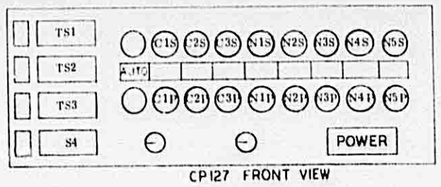


CP 127 REAR VIEW

CP 127 FRONT VIEW

FIGURE 2-39. ACCESSORY PAGING FUNCTION - THIRD COM AND CABIN/RAMP

SEE BLOW-UP



CP127 FRONT VIEW

1. APF - Accessory Paging Function - Ramp Rail; Cabin Address and Interphone.
   ABR - Avionics Bus Relay
2. Pushbutton Switches:
   a) single pole double throw switch symbol: ③ ②┬① --- C1S with sliding contact (┬)
   b) multiple pole switch terminals are sequentially numbered.
   c) all switch contact are paralleled although not shown as such.
   d) as shown the following pushbuttons are depressed:
      1) AUTO speaker
      2) TS1
      3) AUTO phones
3. Unless otherwise noted all resistors are in ohms, 1/4 watt, and all capacitors are in microfarads.
4. Letter/number combinations within ovals indicate wiring connections.
5. P4 jumpers are factory installed.
6. AC signal flow shown by arrowed lines.
7. All receive input pots are 500 ohms.

R02431

J1
PILOT MIKE KEY — CR502 — NIKE KEY LINE
HEADPHONE AUDIO
R223 NAV 2 AUDIO IN — N2S-3 N2P-3
NAV 3 AUDIO IN — R221 — N3S-3 N3P-3
NAV 1 AUDIO IN — R224 — N1S-3 N1P-3
PILOT LAMPS
PILOT LAMPS
PHONES DC INPUT
COM 2 AUDIO IN
COM 1 AUDIO IN — R526 — R525 — C2P-3 — C1P-3

R-701 180, 3W
DS701 DS801 DS802 DS803 DS804

P4 STANDARD JUMPERS
A 1 B 2 C 3 D 4 E 5 F 6 H 7 J 8 K 9 L 10

J2
COM 2 TRANS. KEY — CR206
COM 1 TRANS. KEY — CR207
COM 2 SIDETONE IN
COM 1 SIDETONE IN
COM 2 MIKE AUDIO
COM 1 MIKE AUDIO
MIKE AUDIO IN
NAV 5 AUDIO IN — R527 — N5S-3 N5P-3

J3
COM 3 MIKE AUDIO
COM 3 TRANS. KEY — CR503
14V SPEAKER AUDIO
28V SPEAKER AUDIO
SEL. SPEAKER AUDIO

CR501

J3-5 J3-6 J3-E → SPEAKER AMPLIFIER Q103 Q104 Q105 Q601
J3-19 J2-3 → RECEIVER MUTE Q605
TONE & VOL. CKTS U601
AUDIO LEVELING Q606,Q607 Q608,Q609
INPUT AMPLIFIER Q610
STANDARD AUDIO AMPLIFIER Q602,Q603
REG + DCV
VOLTAGE REGULATOR Q102 Q604
UNREG + DCV

CR205
CR202
J3-20 J3-B J2-9
R513 220

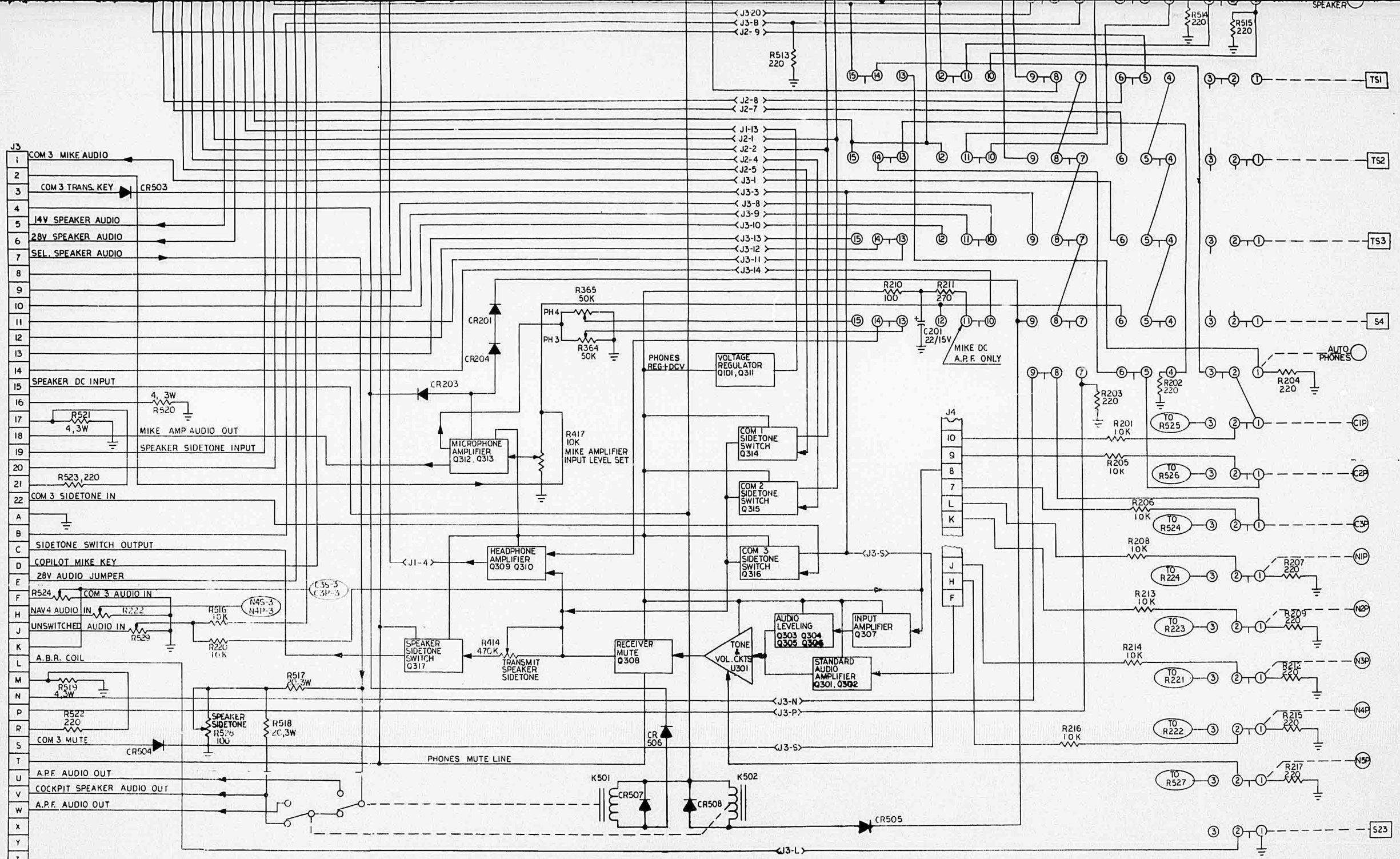
J2-8 J2-7
J1-13 J2-1 J2-2 J2-4 J2-5 J3-1 J3-3 J3-8 J3-9 J3-10 J3-13 J3-12 J3-11 J3-14

J4
E D C B A 4 3 2 1

TO R527 — R501 220 — N5S
R502 10K — TO R222 — R503 220 — N4S
R504 10K — TO R221 — R505 220 — N3S
R506 10K — TO R223 — R507 220 — N2S
R508 10K — TO R224 — R509 220 — N1S
R510 10K — TO R524 — C3S
R511 10K — C2S
R512 10K — C1S
AUTO SPEAKER — R514 220 — R515 220

TS1
TS2
TS3

R210 R211



CP FUNCTIONAL INTERNAL WIRING DIAGRAM

SEE BLOW-UP

SEE BLOW-UP

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3.1 GENERAL

Figure 3–1 is a simplified block diagram of the CP 127. Common inputs, functions, and outputs are shown as groups rather than individually. For example, 5 Nav receive inputs are shown as one input. This block diagram is intended to show audio signal flow, locations of switching functions, blocks of amplification or electronic switching, and basic interconnections. Each of the blocks shown will be discussed in this Section.

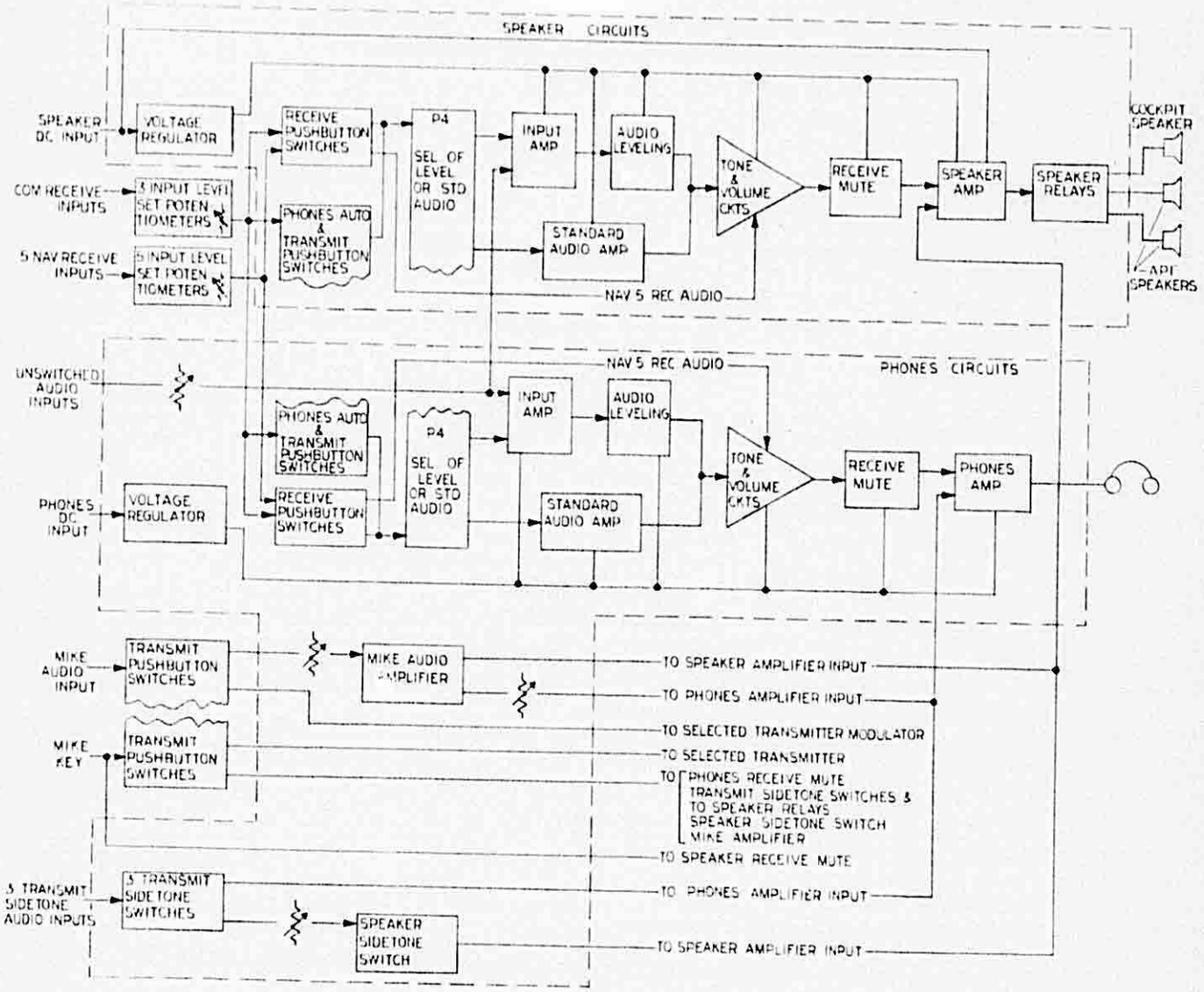


FIGURE 3–1. CP 127 BLOCK DIAGRAM

Figure 2–40, the Functional Internal Wiring Diagram should now be reviewed. This diagram treats the CP 127 circuits from a functional viewpoint and illustrates all of the functional interconnections and in effect extends the block diagram.

SEE BLOW-UP

3.2 PUSHBUTTON SWITCHING

The pushbutton switches in the CP 127 are slide switches and are schematically shown as:

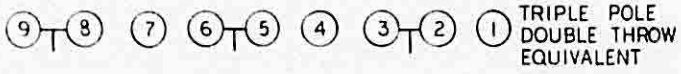
Deenergized 

SPDT EQUIVALENT

Energized
(pushbutton depressed) 

SPDT EQUIVALENT

Where more than one pole per switch is indicated the switch contacts are numbered sequentially:



When **deenergized** the contacts are positioned at the following pins if the switch extends to that number of contacts.	When **energized** the contacts are positioned at the following pins if the switch extends to that number of contacts.
1–2	2–3
4–5	5–6
7–8	8–9
10–11	11–12
13–14	14–15

Although not shown as such, all pushbutton switch contacts are paralled for reliability and long life.

By way of definition of switch and pushbutton function:

EXAMPLES:
N1S = NAV 1, Speaker
N1P = NAV 1, Phones
C2S = COM 2, Speaker
TS1 = Number 1 Transmitter Select
S4 = Switch number 4, no specific meaning

3.3 RECEIVE INPUT SWITCHING

3.3.1 NAV Inputs

A typical NAV receive input and its associated switching are shown in Figure 3–2.

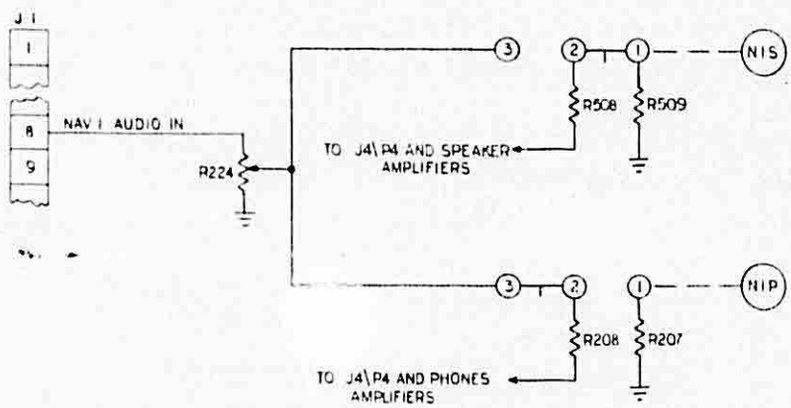


FIGURE 3–2. TYPICAL NAV RECEIVE INPUT

3.3.2 COM Inputs

A typical COM receive input and its associated switching, including the AUTO function are shown in Figure 3–3. The AUTO function permits simultaneous selection of a COM receiver and a COM transmitter by the rectangular transmit select pushbuttons.

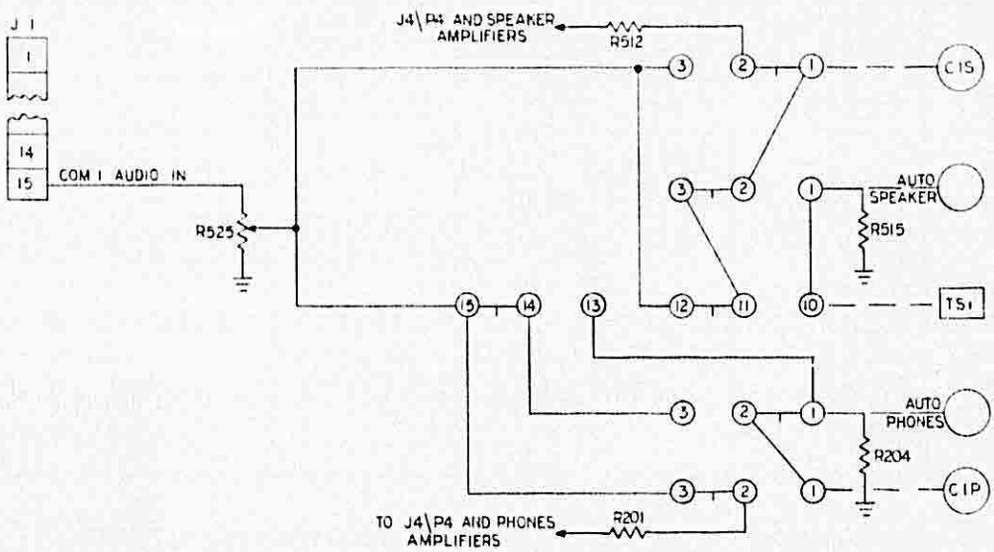


FIGURE 3–3. TYPICAL COM RECEIVE INPUT

As shown, the COM 1 speaker switching is in the Auto mode while the COM 1 phones switching is not.

SEE BLOW-UP

3.3.3 Unswitched Input

The unswitched audio input is provided for decision heigth or proximity warning audio. Consequently this input is connected directly to the speaker and phones audio leveling amplifiers.

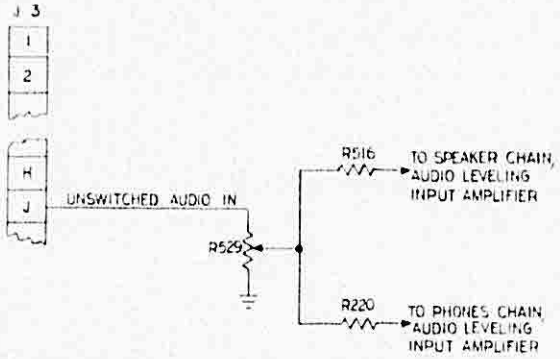


FIGURE 3-4. UNSWITCHED INPUT

3.4 TRANSMIT AND APF SWITCHING

Transmit and Accessory Paging Function (APF) switching is accomplished by pushbutton switches TS1, TS2, TS3, and S4.

SWITCH CONTACTS					PUSHBUTTON
15-14-13	12-11-10	9-8-7	6-5-4	3-2-1	
PHONES AUTO	SPEAKER AUTO	MIKE KEY	MIKE AUDIO	UNUSED	TS1
PHONES AUTO	SPEAKER AUTO	MIKE KEY	MIKE AUDIO	UNUSED	TS2
PHONES AUTO OR APF SWITCHING	SPEAKER AUTO OR APF SWITCHING	MIKE KEY	MIKE AUDIO	UNUSED	TS3
APF PHONES LEVEL	APF MIKE DC	MIKE KEY	MIKE AUDIO	UNUSED	S4

FIGURE 3-5. TRANSMIT SWITCH SECTION FUNCTIONS

Figure 3-5 presents the basic switch functions by switch section. Switch contacts 1, 2, and 3 are presently unused. Contacts 4, 5, and 6 serve to route mike audio to either a transmitter modulator or the internal mike amplifier for an APF. Transmitter keying, phones receive muting, and sidetone switch activate are accomplished with contacts 7, 8, and 9. The remaining contact functions (10 thru 15) are as outlined in Figure 3-5.

3.5 LEVELED/STANDARD AUDIO SELECTION - J4/P4

The CP 127 provides both Leveled Audio and Standard (unleveled) Audio in both the Speaker and Phones chains, as shown in Figure 3-1. Connector P4 permits routing receive audio inputs to either the leveling amplifiers or the standard amplifiers. Routing of headphone audio is performed independent of the speaker audio. As discussed in Section 2.8.3, jumpers applied to P4 do the audio routing. Factory installed jumpers are shown in Figure 2-11 and on the Functional Internal Wiring Diagram (Figure 2-40), however, jumpers may be changed for different combinations of audio sources.

3.6 SPEAKER AND PHONES CIRCUITS OF SIMILAR DESIGN

The following circuits are utilized in both the Phones chain and the Speaker chain. Both chains contain similar circuits. To eliminate repetition the the PHONES circuit will be discussed.

3.6.1 Voltage Regulator

Speaker - Q102 and Q604 Phones - Q101 and Q311

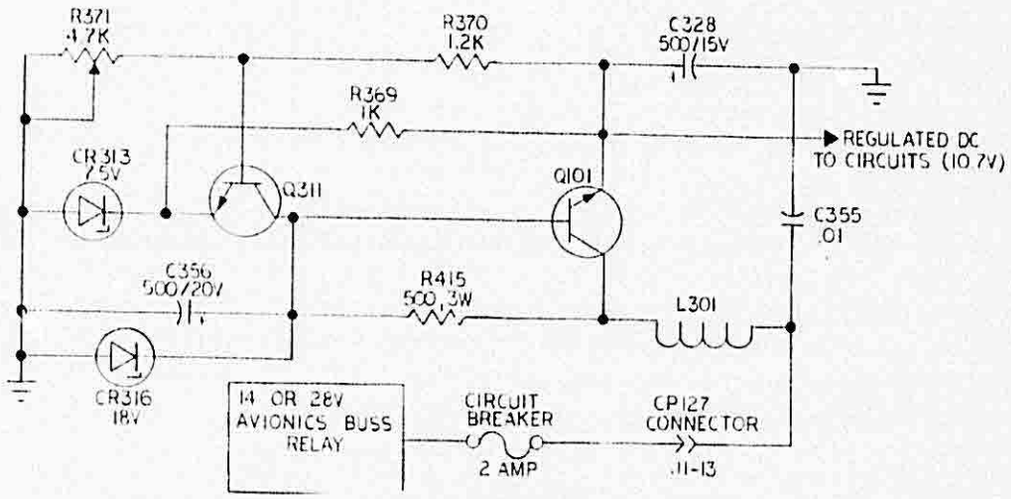


FIGURE 3-6. TYPICAL VOLTAGE REGULATOR (Phones Shown)

The Phones voltage regulator consist of: a series pass transistor Q101, a current driver Q311, and a reference Zener diode CR313. Regulated DC output voltage is set by adjusting R371.

Variations in load are sensed by divider R371/R370. The conduction of Q311 is then varied by comparing the reference Zener voltage to the voltage at the junction of R371 and R370. The series impedance, and resulting output voltage, of the series pass transistor is consequently a function of the collector current of Q311.

3.6.2 Standard Audio Amplifier

Speaker Chain – Q602 and Q603 Phones Chain – Q301 and Q302

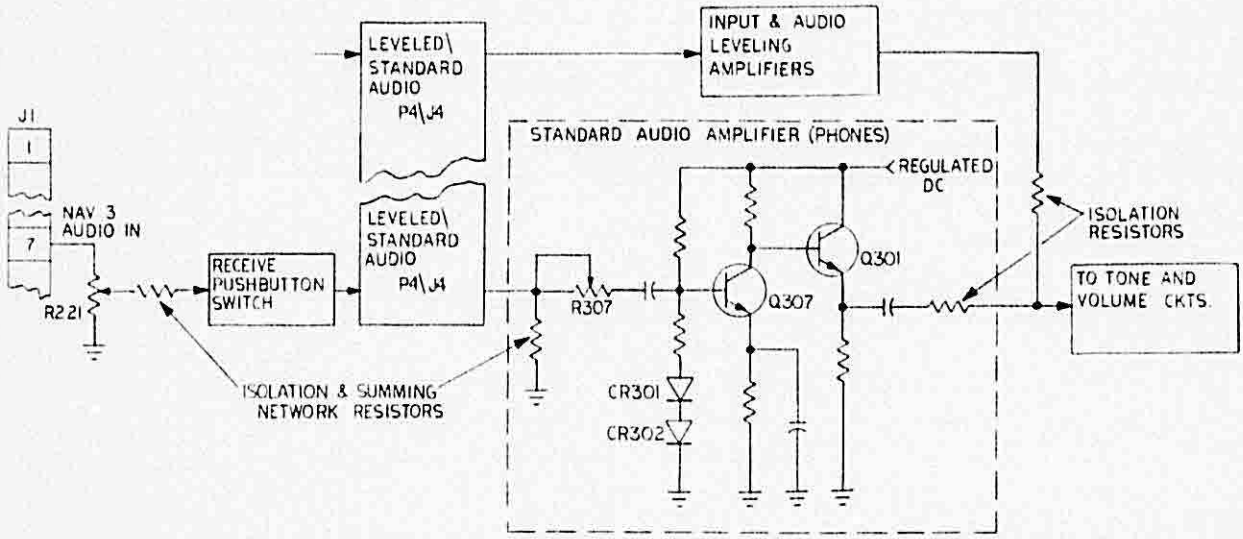


FIGURE 3-7. TYPICAL STANDARD AUDIO CIRCUIT (Phones Shown)

Figure 3-7 details a standard audio amplifier and locates the stage in the flow of receive audio. Potentiometer R307 is used to equalize the gain of the standard audio amplifier and the audio leveling amplifiers. Amplifier Q307 is a Class A voltage amplifier temperature compensated by diodes CR301 and CR302. Emitter follower Q301 is direct coupled to Q307. The output of Q307 is R-C coupled to the tone and volume circuits.

SEE BLOW-UP

3.6.3 Input and Audio Leveling Amplifiers

Speaker Chain – Q608 thru Q610 Phones Chain – Q303 thru Q307

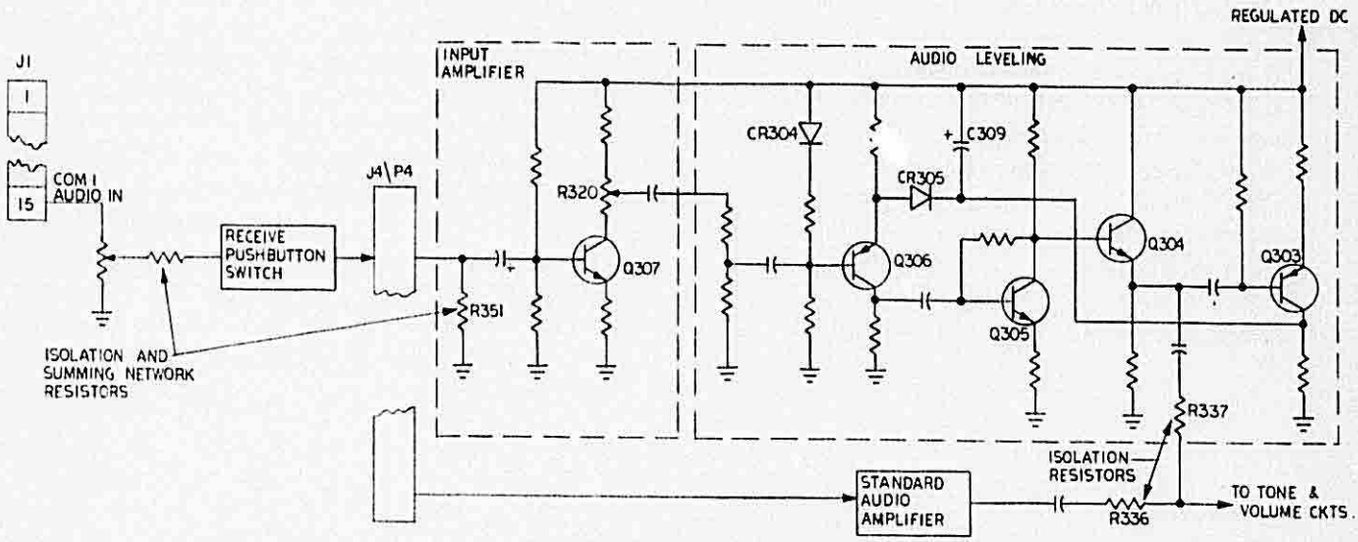


FIGURE 3-8. TYPICAL AUDIO LEVELING CIRCUIT (Phones Shown)

The Phones audio leveling circuit is shown in Figure 3–8. The first stage, Q307, is a Class A voltage amplifier with variable resistor R320 as the major part of its collector load. R320 is adjusted to set the AC drive voltage to the audio leveling circuit such that a typical receive signal will drive the audio leveling about midway through its total leveling range. This set point is somewhat critical since it will determine the degree or amount of audio leveling above and below the set point for receive signals which vary above or below the typical.

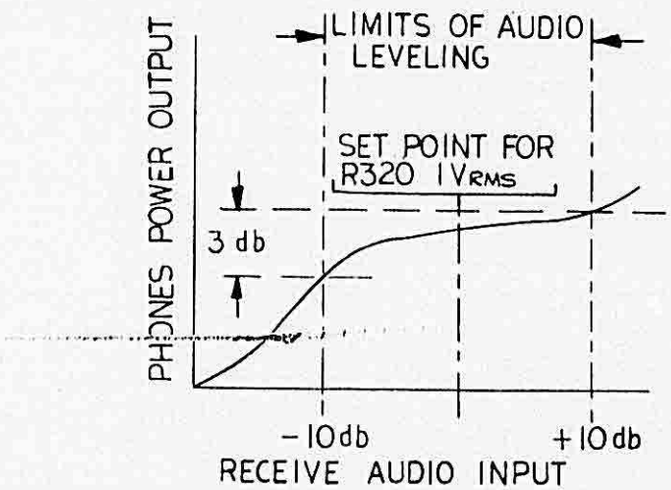


FIGURE 3-9. LEVELING CHARACTERISTICS

SEE BLOW-UP

3.6.3 Continued

The second stage, Q306, is the gain controlled stage. Q306 is a Class A voltage amplifier with diode CR305 placed in series with the emitter bypass capacitor, C309. When there is no signal input CR305 is forward biased permitting C309 to fully bypass Q306's emitter resistor. Q306 therefore is at maximum gain.

A receive signal is amplified by Q307, Q306, Q305, and Q304 with the audio output being from the emitter of Q304. Q303 is a peak detector which is also driven by Q304. The negative peaks of the amplified receive signal drives Q303 into conduction. Since the voltage developed at Q303's collector is proportional to the amplitude of its input signal, the collector voltage then can control the conductivity and dynamic resistance of CR305. As the conductivity of CR305 is reduced, in response to a strong signal condition, the diodes dynamic resistance being in series with C309 degenerates Q306 maintaning a constant output at the emitter of Q304. The output is then R-C coupled to the Tone and Volume Circuits.

3.6.4 Tone and Volume Circuits

Speaker – U601 Phones – U301

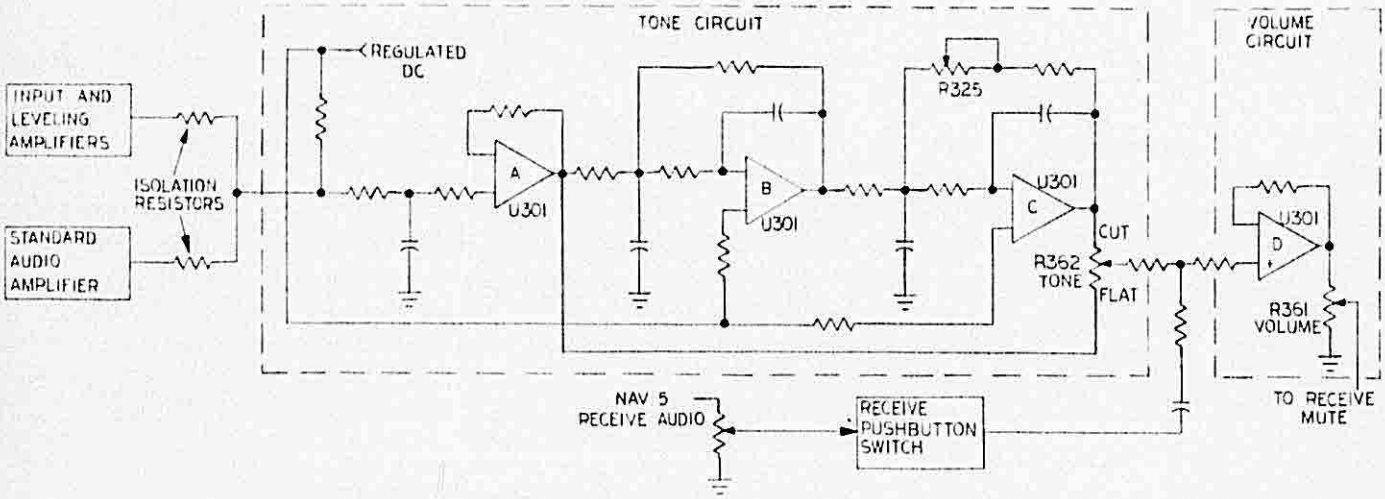


FIGURE 3–10. TYPICAL TONE AND VOLUME CIRCUITS (Phones Shown)

3.6.4 Continued

As shown in Figure 3–10, the tone and volume circuit amplification is provided by a Quad Op Amp. Three sections are used for the tone control functions, the fourth section for the volume control.

In the FLAT RESPONSE mode, with tone control, R362, maximum CW, only IC sections A and D are utilized. The circuit gain is slightly greater than unity from the junction of the input isolation resistors to the output of section D at R361, the volume control.

In the CUT mode, R362, maximum CCW rotation, all four IC sections are utilized. Section A is a unity gain stage, sections B and C are low pass filters, and section D is a unity gain stage.

At settings between the maximums, the outputs of sections A and C are summed at R362. A response is achieved in which the cut off frequency is a function of the feedback components of sections B and C, but the slope of the cut off curve is established by the tone control, R362. Thus as the tone control is rotated in a counter clockwise direction, from its maximum CW position, the slope of the cut off curve increases.

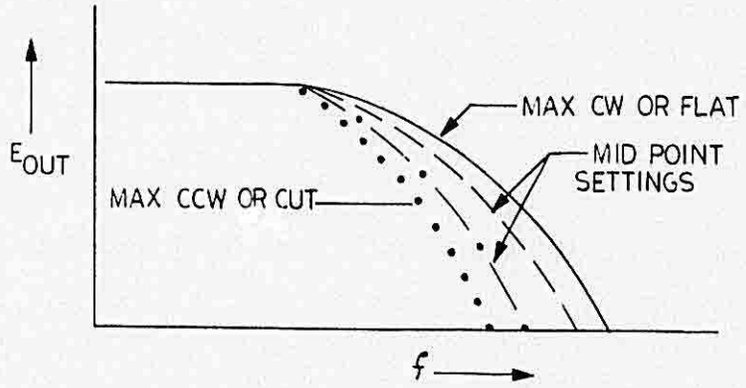


FIGURE 3–11. CUT OFF CURVE WAVEFORM

Section C has in it resistive feedback circuit variable resistor, R325. This resistor is set for a 2 db loss of 1 KHz audio with the tone control in the cut, maximum CCW, position.

The NAV 5 receive audio input is directed to section D of the operational amplifier bypassing the audio leveling amplifiers, the standard audio amplifiers, and the tone control circuit. Since the NAV 5 input is primarily for Marker Beacon audio, these circuits are bypassed to prevent rolling-off the 3 KHz FAN marker audio when the tone control is in the CUT position.

3.6.5 Receive Audio Mute Switch

Speaker – Q605 Phones – Q308

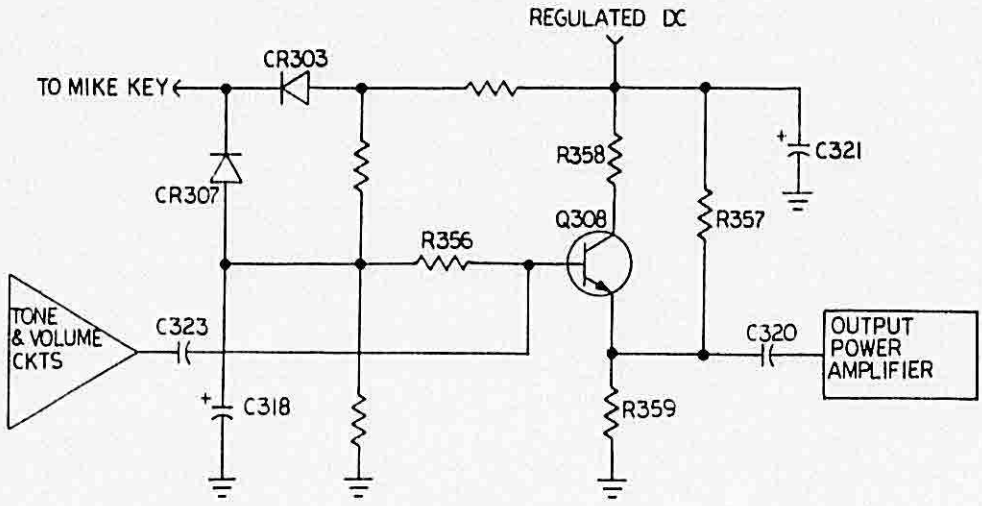


FIGURE 3-12. RECEIVE AUDIO MUTE SWITCH (Phones Shown)

The receive audio at the arm of the volume control is capacitively coupled to the base of the mute switch, Q308. In the receive mode the mute switch operates as an emitter follower providing a low impedance drive source for the output power amplifier. When a microphone is keyed diodes CR303 and CR307 are returned to ground (thru switching circuitry within the CP 127 and the mike key) biasing the receive mute switch OFF. The emitter base junction of Q308 is reversed biased due to;

1) the base of Q308 returned to DC ground thru CR303 and CR307
2) voltage divider consisting of R359, R357, and R358 providing an emitter voltage more positive than the base voltage generated by the diode drop across CR303 and CR307.

3.6.5.1 Speaker Circuit

The cathodes of CR606 and CR607 are returned directly to the mike key line. Muting of receive speaker audio occures whenever the mike is keyed for a transmission or an Accessory Paging Function.

3.6.5.2 Phones Circuit

The cathodes of CR303 and CR307 are returned to the mike key line thru the interlocked transmit selector. Phones receive audio muting will therefore occur only when a tranmitter is selected and the mike keyed. During an Accessory Paging Function, with the mike keyed, phones receive audio is NOT muted.

3.7 SPEAKER CIRCUITS

3.7.1 Speaker Amplifier

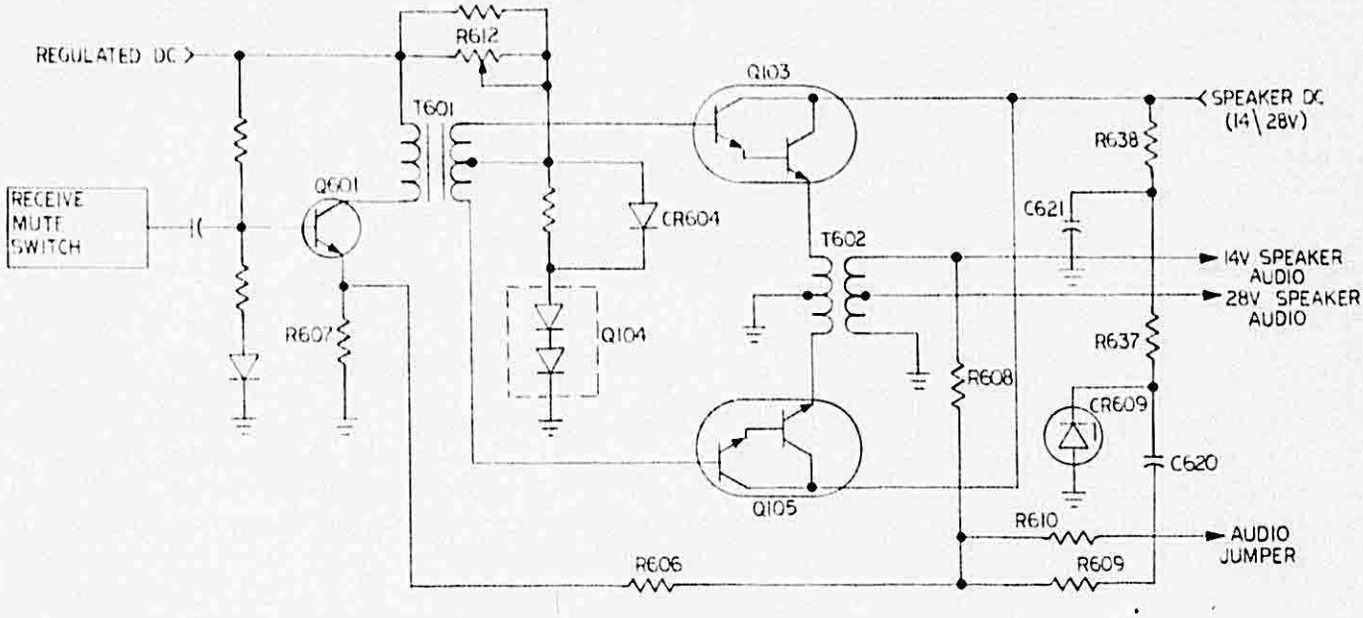


FIGURE 3-13. SPEAKER AMPLIFIER CIRCUIT

Figure 3-13 diagrams the CP 127 Speaker Amplifier. The driver stage, Q601, is a Class A amplifier with negative feedback applied to its emitter, thru R606, and the amplified audio output developed across the primary of T601.

Three Darlington transistors are utilized in the power output stage: Q103 and Q105 are push-pull connected power amplifiers, Q104 is diode connected to provide bias and temperature compensation for the push-pull stage. Variable resistor R612 sets the idling current (no signal input) of the push-pull stage. T602 provides the push-pull output to load matching.

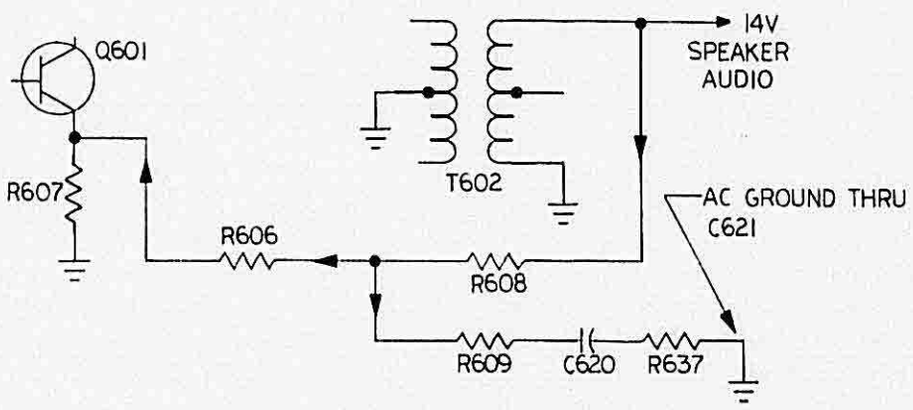


FIGURE 3-14. 14 VOLT FEEDBACK NETWORK

3.7.1 Continued

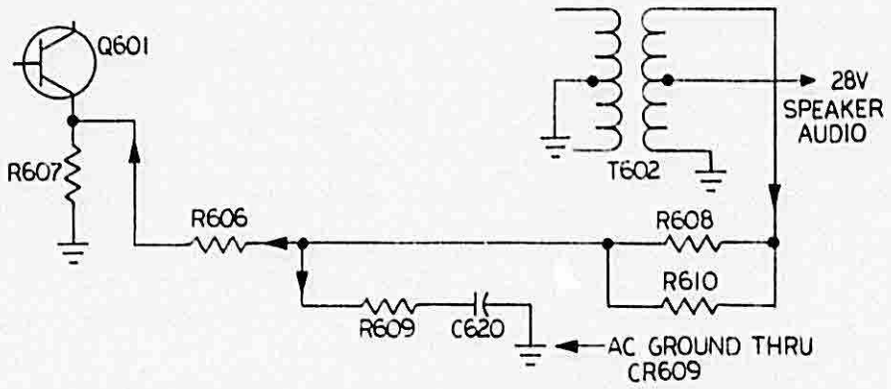


FIGURE 3-15. 28 VOLT FEEDBACK NETWORK

Negative feedback, for both 14 and 28 volt inputs, is from the secondary of T602 to the emitter of Q601. In Figure 3-13, R638 is connected to the speaker DC inpout and together with C621 and R637 forms a filtered bias network for the 18 volt Zener diode, CR609. In 14 volt operation, CR609 is NOT in conduction and the feedback divider is as shown in Figure 3-14. For 28 volt operation, CR609 IS in conduction and the feedback divider is as shown in Figure 3-15.

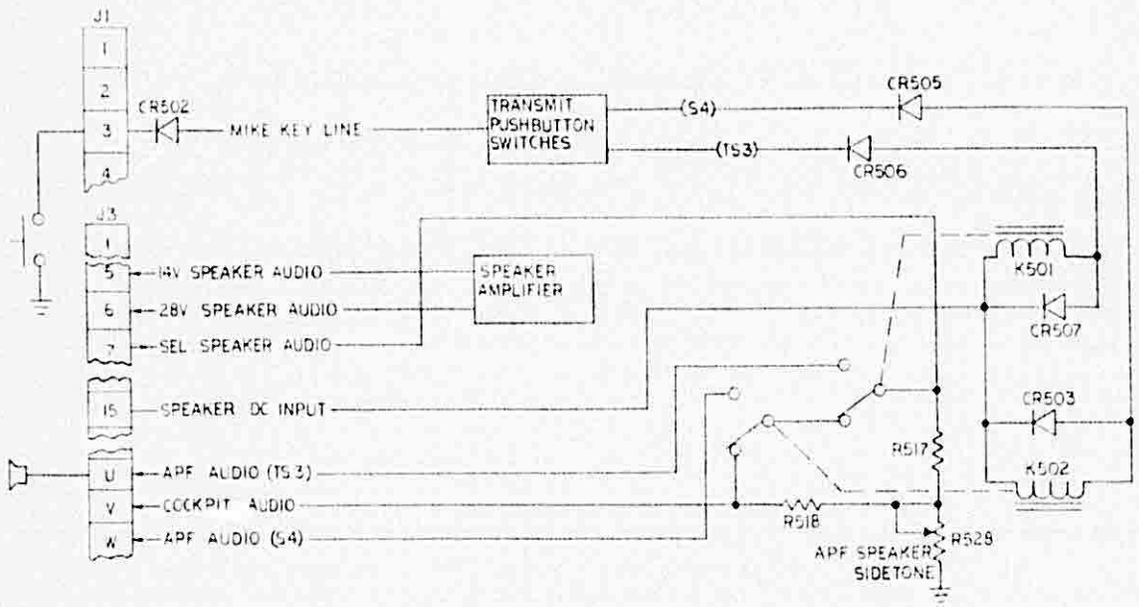


FIGURE 3-16. SPEAKER AMPLIFIER OUTPUT

Figure 3-16 illustrates the output connections of the speaker amplifier. Speaker audio amplifier output , at J3-5 and J3-6, is selected by jumpers at J3 in accordance with Section 2 of this manual. The SEL. SPEAKER AUDIO is then routed to J3-V, COCKPIT SPEAKER AUDIO OUTPUT, thru the normally closed contacts of relays K501 and K502. Accessory Paging relays, K501 and K502, are activated by the cockpit mike key thru the interlocked transmit pushbutton switches. Switch TS3 selects K501, switch S4 selects K502. Thus the Speaker Amplifier output is routed to the proper load (cockpit speaker, ramp hail speaker, cabin address speaker, etc.) by relays K501 and K502. The relays are NOT activated during a Com transmission. Accessory Paging sidetone is achieved by the resistive network connected across the relays. Potentiometer, R528 is used to set the level of the APF sidetone audio in the cockpit speaker.

3.8 PHONES CIRCUITS

3.8.1 Transmit Sidetone Switches, Q314 thru Q317

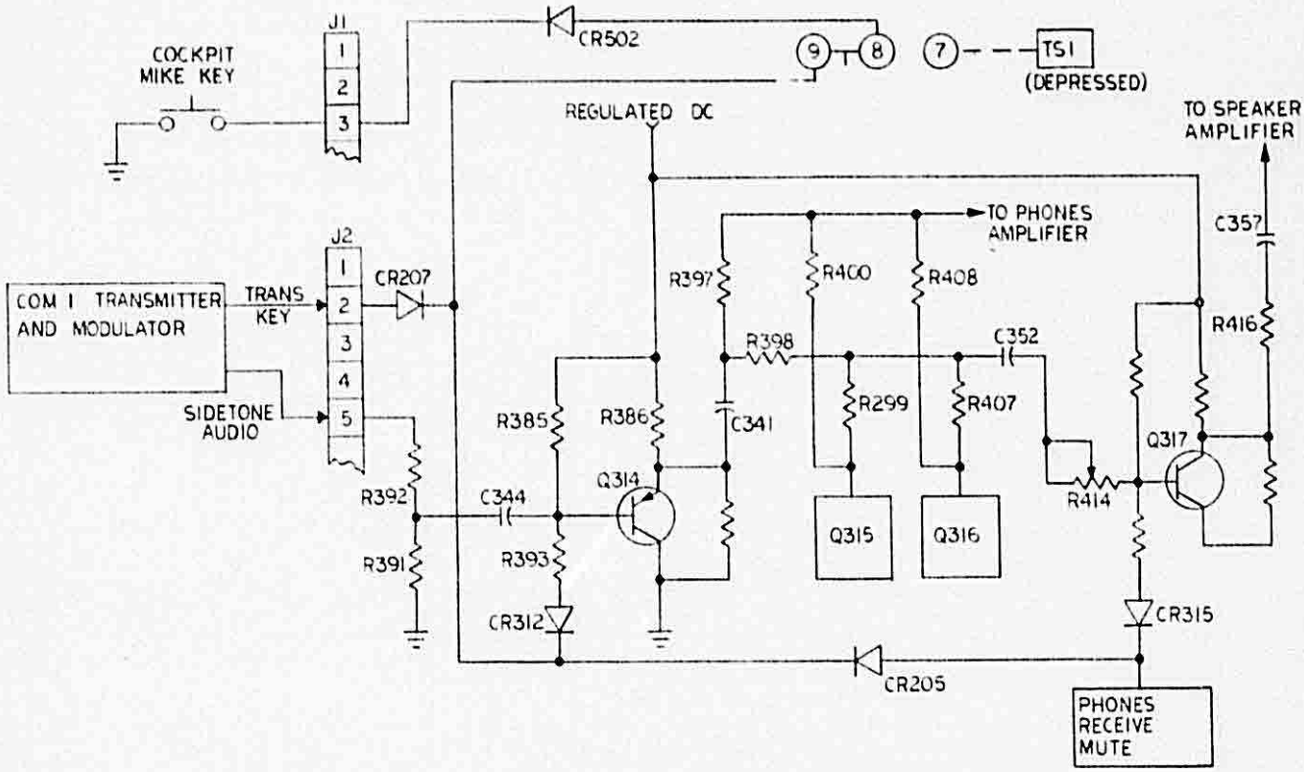


FIGURE 3-17. TRANSMIT SIDETONE

Figure 3-17 shows the COM 1 keying and the sidetone circuits. The following description applies to all sidetone switching and transmitter keying.

With the cockpit mike keyed, providing a ground at J1-3, the following takes place:

1) the COM 1 transmitter is keyed thru steering diode CR207
2) the COM 1 sidetone switch, Q314, is turned ON thru diode CR312
3) the speaker sidetone switch, Q317, is turned ON thru diodes CR205 and CR315
4) the Phones receive mute switch is turned OFF.

When the mike is unkeyed, in the receive mode, these diodes serve to isolate the bias networks of the switching stages. Figure 3-18 details the switch states for each interlocked transmit switch in the receive and mike keyed (transmit and APF) modes.

3.8.1 Continued

In the receive mode Q314 is biased OFF. A reverse voltage is applied to the emitter base junction by:

1) a voltage divider at the emitter, comprised of R386 and R394, sets the emitter at 8.0 Vdc
2) with the mike unkeyed the base terminal is returned to the regulated 10.6 Vdc bus thru R385

The emitter-based junction therefore is reversed biased by 2.5 Vdc.

When the mike is keyed the base voltage divider, R385/R392 and CR312, establishes a voltage which forward biases the emitter-base junction turning the transistor ON.

PUSHBUTTON FUNCTION	PHONES RECEIVER MUTE Q308	MIKE AMP Q312	C1 SIDETONE SWITCH Q314	C2 SIDETONE SWITCH Q315	C3 SIDETONE SWITCH Q316	SPEAKER SIDETONE SWITCH Q317	SPEAKER RECEIVER MUTE Q605
COM 1 TS1	ON / OFF	OFF / OFF	OFF / ON	OFF / OFF	OFF / OFF	OFF / ON	ON / OFF
COM 2 TS2	ON / OFF	OFF / OFF	OFF / OFF	OFF / ON	OFF / OFF	OFF / ON	ON / OFF
COM 3 TS3	ON / OFF	OFF / OFF	OFF / OFF	OFF / OFF	OFF / ON	OFF / ON	ON / OFF
— — — OR — — —							
APF TS3	ON / ON	OFF / ON	OFF / OFF	OFF / OFF	OFF / ON	OFF / OFF	ON / OFF
APF S4	ON / ON	OFF / ON	OFF / OFF	OFF / OFF	OFF / OFF	OFF / OFF	ON / OFF

NOTES:
1. RECEIVE MODE / MIKE KEYED
2. SWITCH STATES INDICATED ARE FOR APPROPRIATE INTERLOCKED PUSHBUTTON DEPRESSED.

FIGURE 3-18. SWITCH STATE vs FUNCTION

3.8.2 Microphone Amplifier

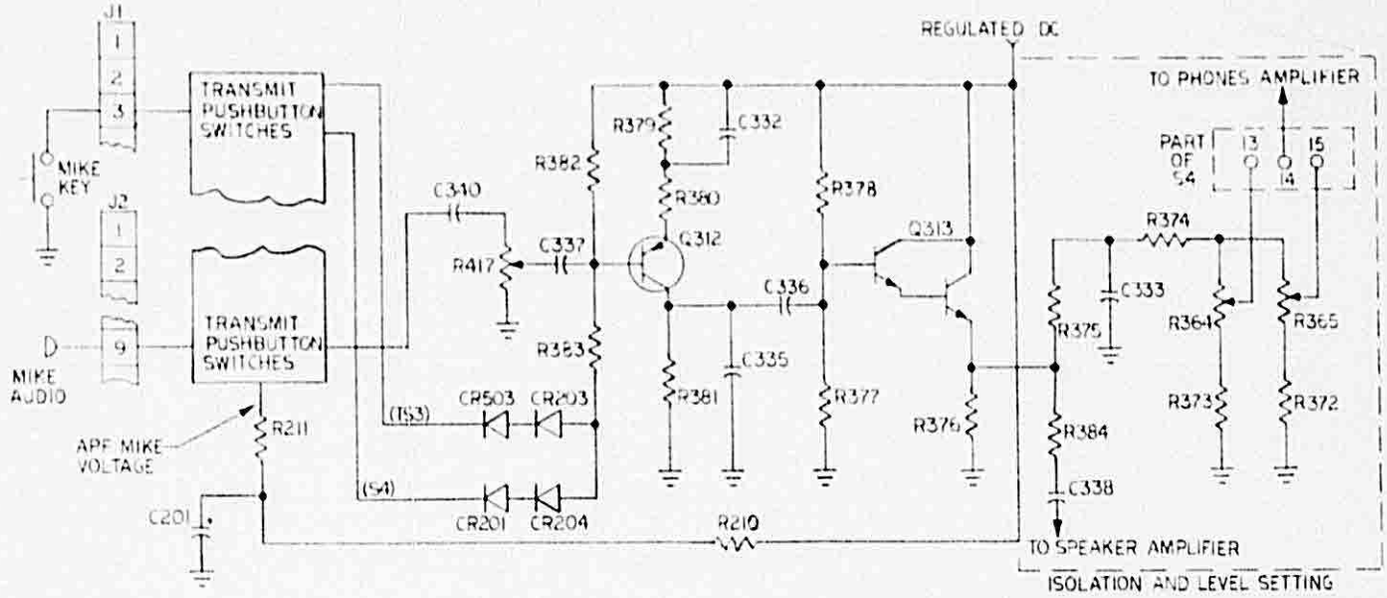


FIGURE 3-19. MICROPHONE AMPLIFIER

The purpose of the microphone amplifier is to increase the mike audio voltage to a level sufficient to drive the Phones and Speaker amplifiers. The mike amp is only activated by selecting an APF and keying the microphone. The mike amp has NO effect on transmitter modulation or sidetone.

The mike amp is turned ON and OFF by the cockpit microphone key. A resistive divider at the base of Q312 is either inserted or removed, thru steering diodes and the interlocked transmit switches, to perform the necessary bias change. When the microphone is not keyed the base of Q312 is returned to the regulated DC line by R382 turning the stage OFF. If S4 is depressed and the mike keyed, the base voltage divider for Q312 is completed thru steering diodes CR201 and CR204 and R383. If TS3 is assigned an Accessory Paging Function and is depressed, the steering diodes are CR503 and CR203. The installation diagrams in Section 2 may be referred to for necessary J3 programming jumpers. When turned ON, Q312 operates as a Class A voltage amplifier with R381 as the collector load. Q313 is a Darlington connected emitter follower to present a low impedance driving source to the resistive network used for isolation and level setting.

DC voltage for a cockpit microphone is obtained from a filter network comprised of R210, R211, and C201. The filtered DC is only available during an APF and is routed by the transmit pushbuton switches.

3.8.3 Phones Amplifier, Q309 and Q310

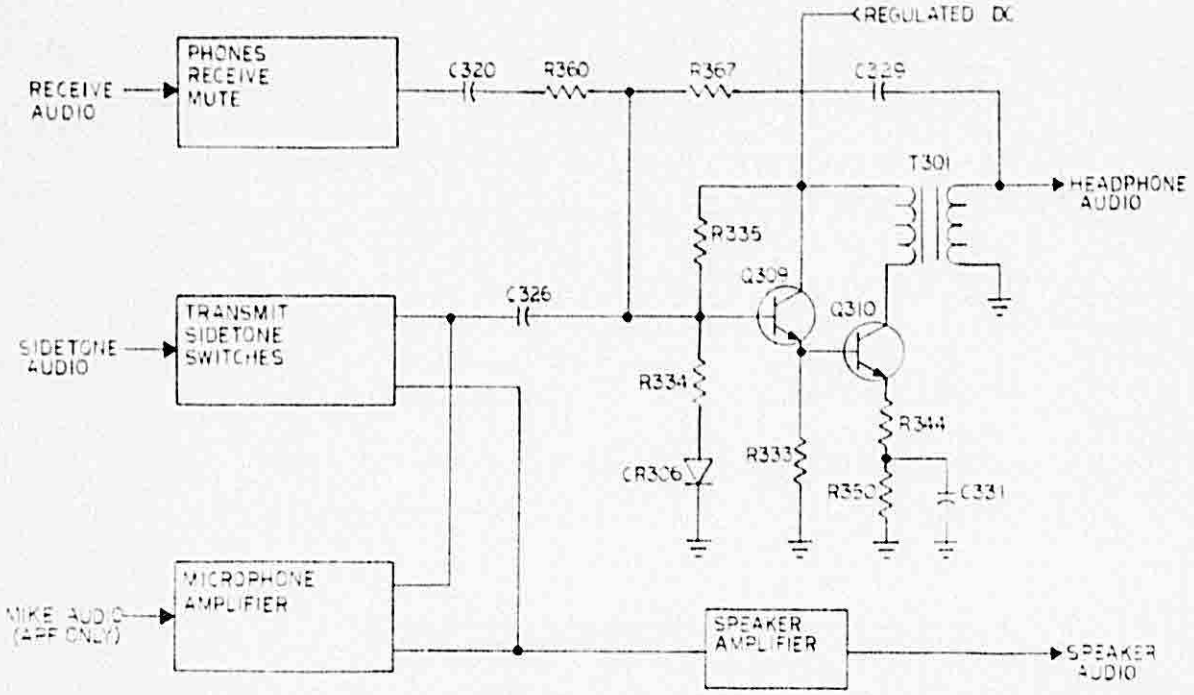


FIGURE 3-20. PHONES AMPLIFIER

The AC input signals to the Phones Amplifier are: in the receive mode, from the phones mute switch, Q308; in an APF mode, from the mike amplifier, Q312 and Q313; in a transmit mode, from one of the sidetone switches, Q314, Q315, or Q316.

Phones amplifier output is developed across matching transformer, T301. Feedback voltage is from the secondary of T301 thru C329/R367 to the base of Q309.

CP 127 SECTION 4, MAINTENANCE

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4.1 CIRCUIT BOARDS

Refer to Figure 4–1 for referenced item numbers.

The Speaker Board (item 1) is the top printed board containing the speaker receive pushbutton switches and connector J3.

The Phones Board (item 2) is the bottom printed board containing the phones receive pushbutton switches and connectors J1 and J2.

The Transmit Select Board (item 3) is vertically mounted adjacent to the left side panel (item 9).

The Front Panel Light Bar Board (item 4) is located just aft of the front panel (item 8) between the Phones and Speaker Boards.

4.2 SCHEMATICS

The Speaker and Phones schematics reflect the circuits situated on their respective printed circuit (PC) boards. Figure 2–40, the CP127 Functional Wiring Diagram serves to connect the Speaker and Phones Schematics to the front panel pushbutton switches and the rear connectors. Figure 2–23, the CP127 General Installation Wiring Diagram, specifies the function of each connector contact.

Table 4.1 is a quick reference guide to show where the various electrical reference symbols are located both physically and schematically.

The Phones and Speaker schematics provide AC and DC voltages as measured in a factory calibrated CP127. Installation adjustments will effect these voltages, see Section 4.4.1.

TABLE 4.1 LOCATION OF SYMBOL NUMBER SERIES

Series	Physical Location	Wiring Diagram or Schematic
100	Left Side Panel Fig.4–1, item 9 Rear Panel Fig.4–1, item 5	Phones and Speaker Schematic Fig.6–1 and Fig.6–2
200	Phones Board Fig.4–1, item 2	Functional Wiring Diagram Fig.6–3
300 & 400	Phones Board Fig.4–1, item 2	Phones Schematic Fig.6–1
500	Speaker Board Fig.4–1, item 1	Functional Wiring Diagram Fig.6–3
600	Speaker Board Fig.4–1, item 1	Speaker Schematic Fig.6–2
700	Transmit Select Board Fig.4–1, item 3	Functional Wiring Diagram Fig.6–3
800	Front Panel Light Bar Fig.4–1, item 4	Functional Wiring Diagram Fig.6–3

4.3 CP127 MECHANICAL DISASSEMBLY FOR SERVICING

NOTE: Refer to Fig. 4–1 for referenced item numbers. Position references, left, right, etc, are with the audio panel positioned as it would be viewed in an aircraft instrument panel.

1. Loosen two setscrews (item 5) in each audio level control knob (item 6) and remove the knobs.
2. Remove the four straight slot screws (item 7) securing the trim panel (item 8).
3. From the left side panel (item 9) remove three Phillips head screws (item 10) located at the extreme rear of the panel.
4. From the right side panel (item 11) remove all five Phillips head screws (item 12).
5. The right side panel (item 11), the locking screw (item 13), and the rear channel lock support (item 14) may now be removed.
6. The top and bottom circuit boards may now be opened to form a right angle hinged along the left side panel (item 9). The rear panel (item 15) **MUST** remain attached to the top circuit board (item 1).

4.3.1 Electrical Insulator

An electrical insulator (item 16) should be formed to prevent the phones circuit board from contacting the tie lug strip at the rear of the left side panel when the CP127 is disassembled.

A 3 x 5" file card, for example, is folded along a 3" side to form a right angle tab 1" deep thus making the cards tab 3 x 1".

The insulator is inserted from the rear to position the tab between the tie lug strip and the bottom of the phones board (the phones board should rest in the file card fold). The larger portion of the insulator should extend vertically between the left side panel and the speaker board, when opened for service.

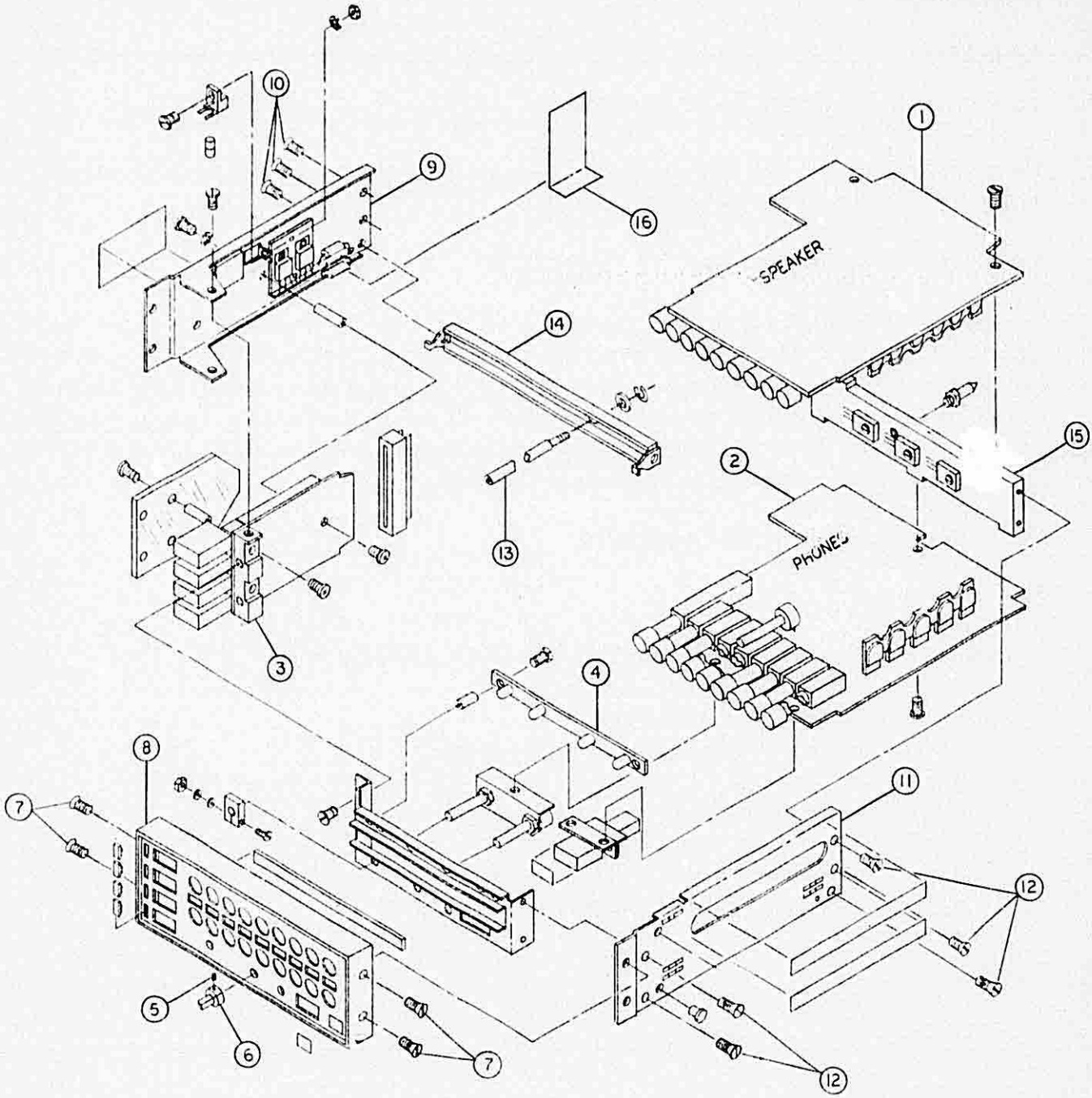


FIGURE 4–1. MECHANICAL DISASSEMBLY FOR SERVICE

4.4 ELECTRICAL SERVICE NOTES

4.4.1 Test Equipment Set-up and Test Procedure

The recommended test equipment set-up and test procedures are provided in Section 2.9. Included in this section is a procedure for fabricating a bench test cable for the CP127.

4.4.2 Performance Specifications

The performance specifications of Section 2 reflect that of a factory calibrated CP127. When the various Receive Input, Mike Input, APF, etc. adjustments are performed at the time of installation, the published performance specifications will be effected. Subsequent servicing of the CP127 should therefore be performed with these variations in mind. For example, adjusting a Receive Input potentiometer will increase or decrease the sensitivity of that input port from the specified 1 Vrms for rated power output. This adjustment will be more apparent for an input to the standard, unleveled, audio chain as opposed to an input to the leveled audio chain.

4.5 POWER TRANSISTOR REPLACEMENT

4.5.1 General

To replace any of the side or rear panel heatsink mounted transistors, note the following:

1. Record the sequence of hardware removal.
2. When reassembling, coat the both side of the insulator with thermal compound.
3. Tighten mounting hardware between 6 and 8 inch pounds.
4. After assembly check for misaligned insulators. An open circuit should be indicated on an ohmmeter when connected to the transistor's collector and the side or rear panel.

4.5.2 Darlington Power Transistors (Q103, Q104, and Q105)

When ordering replacement power transistors be sure to specify color code on the device to be replaced.

Replacement of a Darlington requires checking and if necessary setting the idling current. The setting must be done with "no input signal" and a cool heatsink. Refer to Figure 4–2 for the setting of the idling current.

PROCEDURE

1. Remove jumper across terminals A and B.
2. Connect a 0 to 50 ma meter across terminals as shown in Detail A.
   (Capacitor "C" may be required depending upon the meter's characteristics, lead lengths, etc.)
3. Apply power and adjust R612 for:
   14 Vdc operation – – – 20 to 25 ma
   28 Vdc operation – – – 25 to 30 ma
4. Remove power, the meter, and reinstall the jumper across terminals A and B.

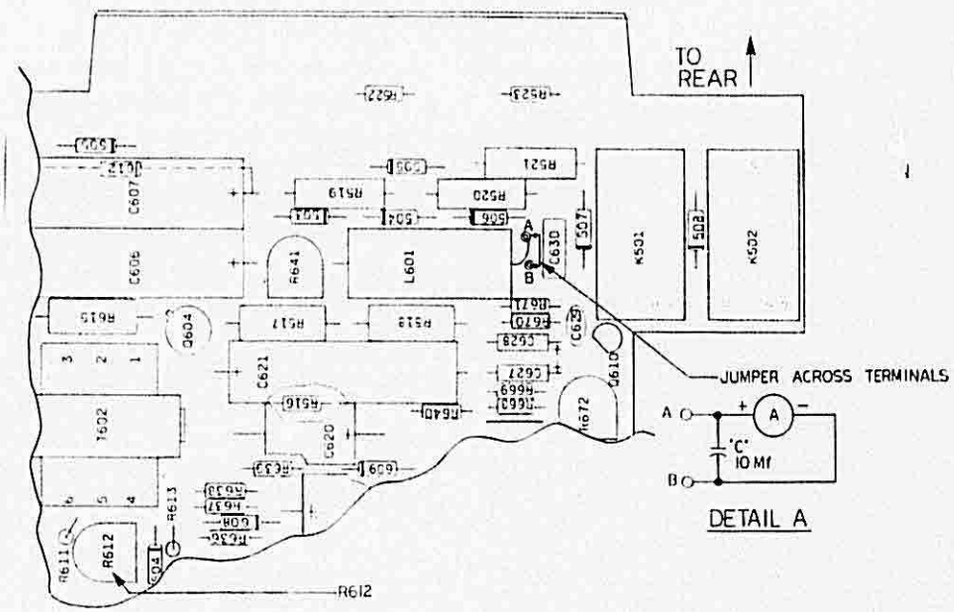


FIGURE 4–2. IDLING CURRENT SETTING

(4–6 Blank)

CP 127 SECTION 5, REPLACEMENT PARTS LIST

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5.1 GENERAL

The Replacement Parts List is subdivided into two sections, the Mechanical Parts List and the Electrical Parts List.

5.1.1 Cross-References

The expression "See Fig.— for breakdown" is self-explanitory, its counterpart "See Fig.—, index — for NHA" relates this breakdown back to where the subassembly was first identified in the parts list.

5.1.2 Application Codes

Where two or more basically identical subassemblies are found in a Unit, the subassemblies may be listed in a common list. In this case the list is preceeded by the heading "Application Codes" and each subassembly is identified with a letter (A, B,C, etc). Where differences occur, the appropriate letter(s) are shown in the Used On column. The word ALL denotes that the part is common to all the subassemblies in that listing.

5.2 MECHANICAL PARTS LIST

The Mechanical Parts List section is intended to locate, identify, and show part relationship to the Unit itself. Only reuseable hardware is shown and listed as Attaching Parts.

The symbol "- - - - * - - - -" is used to indicate the end of that series of Attaching Parts.

Certain electrical parts are shown and listed only to show their relationship to the assembly, attaching parts, or for part location where not necessarily shown elsewhere.

PC board assemblies are listed in the mechanical parts list section only to identify, if any, those replaceable mechanical parts on the board. The blank PC board is listed only to show that it is the last and perhaps the only, mechanical part of the assembly. It is not intended that such a board would be replaced.

5.2.1 Index Numbers v/s Items in the Art

Each item shown in the art is identified by an index number or electrical symbol number (or both). Where a part is attached by more than one piece of hardware, usually one set of hardware is shown and indexed. The total quantity required to be used is shown in the quantity column. In most cases it is obvious where the other sets go. When a part is attached by a variety of types or sizes of attaching parts, sufficient indexing and drawings of these parts is provided to determine what type of hardware goes where.

5.3 ELECTRICAL PARTS LIST

The Electrical Parts List details all the electrical parts in Alpha-Numerical sequence. The location of these parts will be found in the figures of the Schematic Section as well as the Mechanical Parts Section. These parts have no index numbers but are identified by their electrical symbol number.

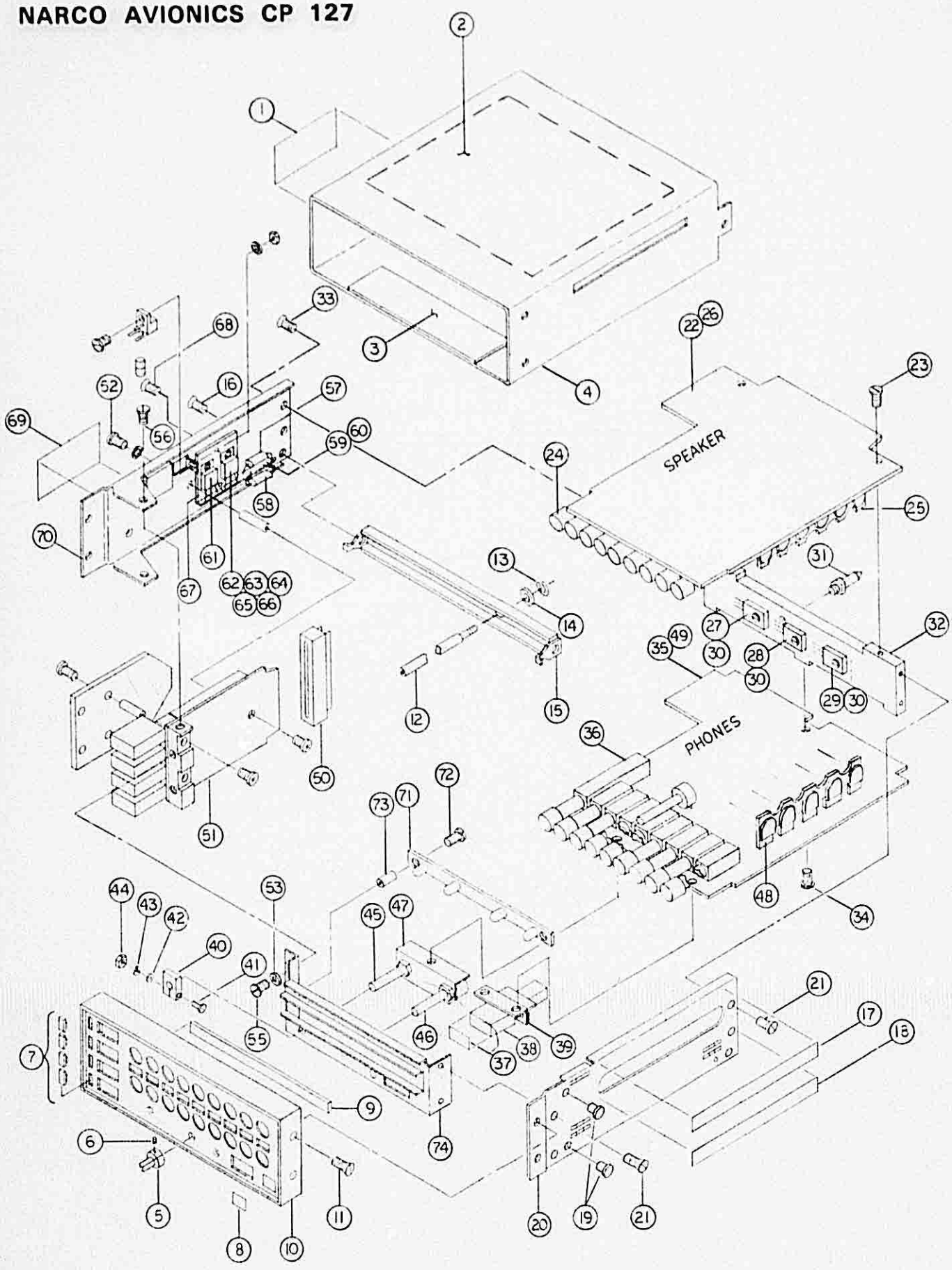


FIGURE 5.1. CP 127 MASTER AVIONICS CONTROL PANEL

SERVICE

NARCO AVIONICS DIVISION OF NARCO SCIENTIFIC INDUSTRIES, Fort Washington, Pa. 19034

NARCO SERVICE BULLETIN CP-127 No. 2 June 9, 1976

TO: ALL NARCO AVIONICS CENTERS
ALL NARCO WHOLESALE DISTRIBUTORS

SUBJECT: CP-127 COMPONENT PART NUMBER CHANGES AND A MANUAL CORRECTION RELATED TO THESE CHANGES (AUDIO PANEL) (APPLICABLE AS NECESSARY)

Due to recent changes, the part numbers of the output transistors listed in the maintenance manual of the CP-127 are no longer correct, and the reference made to device color coding (Page 4-4) is no longer valid. These transistors are now identified by individual numbers as follows: Q103 P/N 75638-5 (stamped 1082-2), Q104 P/N 75638-4 (stamped 1082-1), Q105 P/N 75638-6 (stamped 1082-3).

Please use the new part numbers on any orders for these transistors.

NOTE: Identifying the transistors by the number stamped on them is also relevant to the part number changes in Narco Service Bulletin CP-125/126 No. 2.

Manual Correction:

Refer to the exploded view of the unit on Page 5-2 and the parts list on Page 5-4 for the following:

The rear panel (Index No. 32) shown on Page 5-2 shows the three output transistors mounted correctly, but the symbol numbers on Page 5-4 for index numbers 27 and 29 are reversed. Index number 27 should be Q-105 and index number 29 should be Q-103. Please correct your CP-127 maintenance manual as necessary.

Very truly yours,

NARCO AVIONICS
A Division of Narco Scientific Industries

Gene Salzmann
Technical Representative

MECHANICAL PARTS LIST

FIGURE & INDEX NUMBER	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	QTY
5.1	01682-0101		CP 127 MASTER AVIONICS CONTROL PANEL	1
-1	04719-0002		LABEL, Nameplate, CP 127	1
-2	83020-0007		INSULATOR, Phenolic (4-1/4 x 5-3/4)	1
-3	83020-0006		INSULATOR, Phenolic (4-1/4 x 1-13/16)	1
-4	54882-0101		TRAY ASSY	1
-5	88216-0004		KNOB	2
			(ATTACHING PARTS)	
-6	82889-0004		SETSCREW, Black, 4-40 x 1/8	4
-7	54880-0001		LENS	4
-8	04342-0002		NAMEPLATE (NARCO)	1
-9	54881-0001		LENS	1
-10	54873-0001		TRIM PANEL ASSY	1
			(ATTACHING PARTS)	
-11	82819-0304		SCREW, Mach, Flat Hd, Phillips, 4-40 x 5/16	4
-12	54889-0001		SCREW, Lock	1
			(ATTACHING PARTS)	
-13	81192-0007		RING, Retaining (Truarc)	1
-14	81307-0124		WASHER, Flat	1
-15	54890-0001		SUPPORT, Channel Lock	1
			(ATTACHING PARTS)	
-16	82884-0003		SCREW, Mach, Flat Hd, Undercut, Phillips, 4-40 x 1/4	2
-17	04728-0001		LABEL, Audio Input (Top)	1
-18	04728-0002		LABEL, Audio Input (Bottom)	1
-19	84149-0005		RIVET (Nylon)	2
-20	54875-0001		PANEL, Right Side	1
			(ATTACHING PARTS)	
-21	82884-0003		SCREW, Mach, Flat Hd, Undercut, Phillips, 4-40 x 1/4	4
-22	01682-1112		TOTAL SPEAKER ASSY	REF
			(ATTACHING PARTS)	
-23	82814-0003		SCREW, Mach, Bind Hd, Sl, 4-40 x 1/4	2
-24	61606-0101		SWITCH ASSY, Multiple (Speaker)	-
			(See Figure 5.2 for breakdown)	1
-25	01685-0104		INPUT SUPPORT PC BOARD ASSY (6 pots) (Speaker)	-
			(See Figure 5.3 for breakdown)	1
-26	01683-0101		SPEAKER PC BOARD ASSY	-
			(See Figure 5.4 for breakdown)	1

MECHANICAL PARTS LIST

FIGURE & INDEX NUMBER	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	QTY
-27	75638-0002	Q103	TRANSISTOR, Silicon, NPN (2N6044)	1
-28	75638-0002	Q104	TRANSISTOR, Silicon, NPN (2N6044)	1
-29	75638-0002	Q105	TRANSISTOR, SILICON, NPN (2N6044)	1
			(ATTACHING PARTS)	
-30	82814-0005		SCREW, Mach, Bind Hd, Sl, 4-40 x 3/8	3
	81329-0004		WASHER, Flat, #4	3
	81324-0004		LOCKWASHER, Split, #4	3
-31	55979-0001		PIN, Guide	1
-32	54876-0001		PANEL, Rear	1
			(ATTACHING PARTS)	
-33	82884-0003		SCREW, Mach, Flat Hd, Undercut, Phillips, 4-40 x 1/4	2
-34	82814-0003		SCREW, Mach, Bind Hd, Sl, 4-40 x 1/4	1
-35	54898-0001		BLOCK, Friction, Nylon	2
			(ATTACHING PARTS)	
-36	82880-0007		SCREW, Mach, Rd Hd, Sl, 1-72 x 1/2	1
-37	81307-0130		WASHER, Flat, No.1 (Spl)	4
-38	82969-0001		LOCKWASHER, Split, No.1	2
-39	82900-0429		NUT, Hex, Brass, 1-72	2
-40	01682-1114		TOTAL PHONES ASSY (includes items 71 thru 74)	REF
-41	61606-0102		SWITCH ASSY, Multiple (Phones) (See Figure 5.2 for breakdown)	1
-42	04722-0001		LABEL, Power	1
-43	61605-0101	S23	SWITCH, Power	1
-44	54888-0001		BRACKET, Switch	1
-45	32064-0007	R673	RESISTOR, Variable (Speaker Volume Control)	1
-46	32064-0007	R361	RESISTOR, Variable (Phones Volume Control)	1
-47	54878-0001		BRACKET, Potentiometer	1
-48	01685-0105		INPUT SUPPORT PC BOARD ASSY (5 pots) (Phones) (See Figure 5.5 for breakdown)	1
-49	01684-0101		PHONES PC BOARD ASSY (See Figure 5.6 for breakdown)	1
-50	41342-0021	P4	CONNECTOR, 20 Pin, (Made from Narco 41342-0017)	1

MECHANICAL PARTS LIST

FIGURE & INDEX NUMBER	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	QTY
-51	01685-0101		TRANSMIT LIGHT SWITCH PC BOARD ASSY (See Figure 5.7 for breakdown)	1
			(ATTACHING PARTS)	
-52	82808-0003		SCREW, Mach, Rd Hd, Phillips, 2-56 x 1/4	1
-53	81324-0002		LOCKWASHER, Split, #2	1
-54	xxx			-
-55	82814-0003		SCREW, Mach, Bind Hd, Sl, 4-40 x 1/4	2
-56	82884-0003		SCREW, Mach, Flat Hd, Undercut, Phillips, 4-40 x 1/4	2
-57	31161-0007	R701	RESISTOR, Fixed, Wirewound, 180 ±5%, 3w	1
-58	31192-0472	R675	RESISTOR, Fixed, Composition, 4.7K ±10%, 1/4w	1
-59	81410-0003		STRIP, Tie Lug, Subminiature, 4 lug	1
-60	81462-0003		STRIP, Tie Lug, Subminiature, 8 lug	1
-61	75576-0001	Q101	TRANSISTOR, Silicon, NPN (2N5494)	1
-62	75576-0001	Q102	TRANSISTOR, Silicon, NPN (2N5494)	1
			(ATTACHING PARTS)	
-63	82814-0005		SCREW, Mach, Bind Hd, Sl, 4-40 x 3/8	2
-64	81329-0004		WASHER, Flat, #4	2
-65	81324-0004		LOCKWASHER, Split, #4	2
-66	82900-0003		NUT, Hex, #4	2
-67	54891-0001		HEATSINK	1
			(ATTACHING PARTS)	
-68	82884-0003		SCREW, Mach, Undercut, Flat Hd, Phillips, 4-40 x 1/4	2
-69	04719-0001		LABEL, Nameplate	1
-70	54874-0001		PANEL, Left Side	1
-71	01685-0103		FRONT LIGHT BAR PC BOARD ASSY (See Figure5.8 for breakdown)	- 1
			(ATTACHING PARTS)	
-72	82814-0005		SCREW, Mach, Bind Hd, Sl, 4-40 x 3/8	2
-73	81213-0054		SPACER, 3/16 dia x 3/16 lg	2
-74	54877-0001		PANEL, Front	1

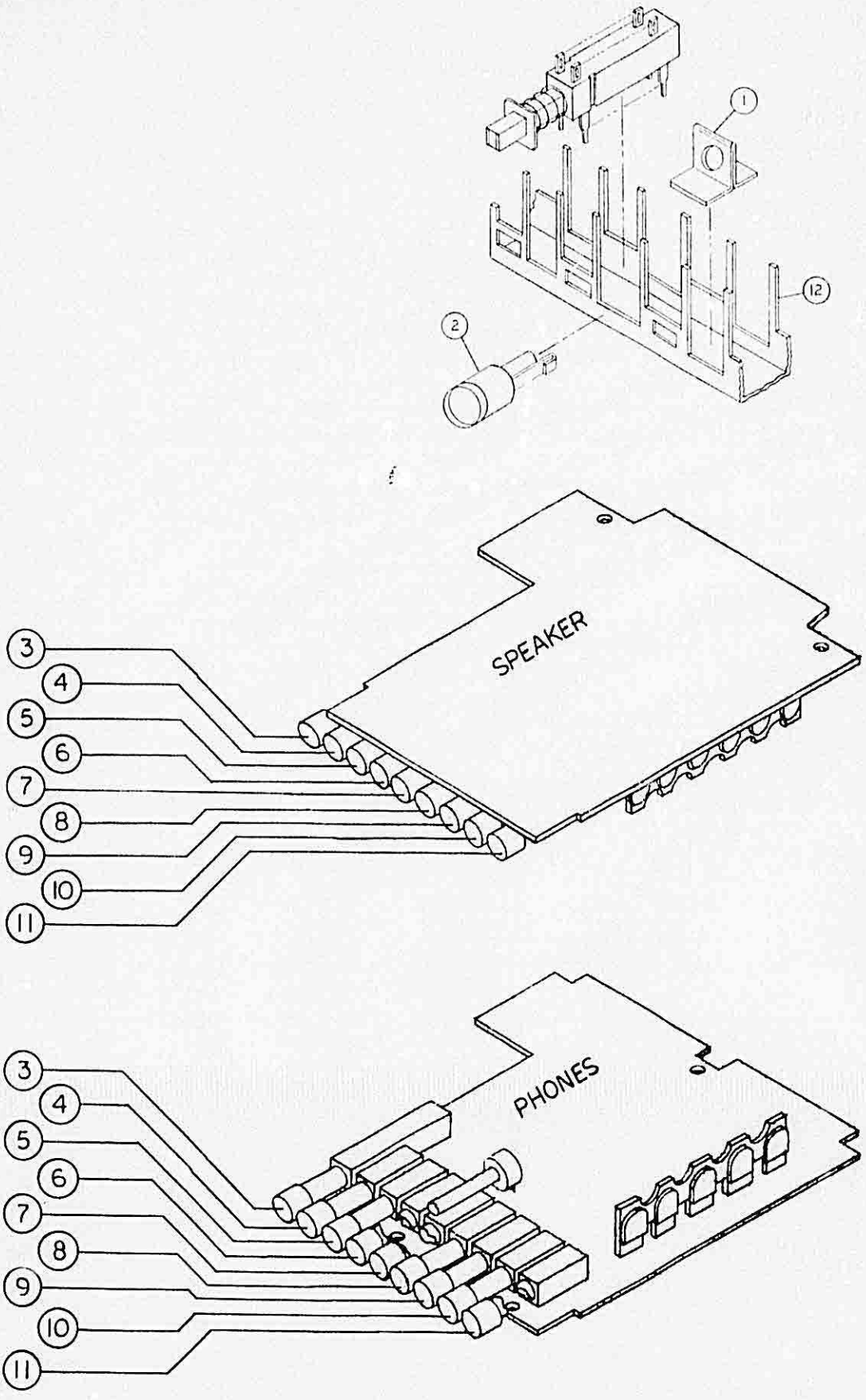


FIGURE 5.2. SPEAKER AND PHONES SWITCH ASSY

MECHANICAL PARTS LIST

FIGURE & INDEX NUMBER	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	QTY	USED ON CODE
			APPLICATION CODE		
			A - 61606-0101		
			B - 61606-0102		
5.2	61606-0101		SWITCH ASSY, Speaker		
			(See Fig. 5.1 Index -24 for NHA)	REF	A
5.2	61606-0102		SWITCH ASSY, Phones		
			(See Fig. 5.1 Index -41 for NHA)	REF	B
-1	54896-0001		CLIP (pot shaft support)	1	ALL
-2	61600-0001		BUTTON, Round	9	ALL
-3	61596-0002	S509	SWITCH, Pushbutton, 6 PDT	1	A
-3	61596-0002	S201	SWITCH, Pushbutton, 6 PDT	1	B
-4	61596-0001	S508	SWITCH, Pushbutton, 2 PDT	1	A
-4	61596-0001	S202	SWITCH, Pushbutton, 2 PDT	1	B
-5	61596-0001	S507	SWITCH, Pushbutton, 2 PDT	1	A
-5	61596-0001	S203	SWITCH, Pushbutton, 2 PDT	1	B
-6	61596-0001	S506	SWITCH, Pushbutton, 2 PDT	1	A
-6	61596-0001	S204	SWITCH, Pushbutton, 2 PDT	1	B
-7	61596-0001	S505	SWITCH, Pushbutton, 2 PDT	1	A
-7	61596-0001	S205	SWITCH, Pushbutton, 2 PDT	1	B
-8	61596-0001	S504	SWITCH, Pushbutton, 2 PDT	1	A
-8	61596-0001	S206	SWITCH, Pushbutton, 2 PDT	1	B
-9	61596-0001	S503	SWITCH, Pushbutton, 2 PDT	1	A
-9	61596-0001	S207	SWITCH, Pushbutton, 2 PDT	1	B
-10	61596-0001	S502	SWITCH, Pushbutton, 2 PDT	1	A
-10	61596-0001	S208	SWITCH, Pushbutton, 2 PDT	1	B
-11	61596-0001	S501	SWITCH, Pushbutton, 2 PDT	1	A
-11	61596-0001	S209	SWITCH, Pushbutton, 2 PDT	1	B
-12	61597-0005		CHASSIS, 9 Switch Positions	1	ALL

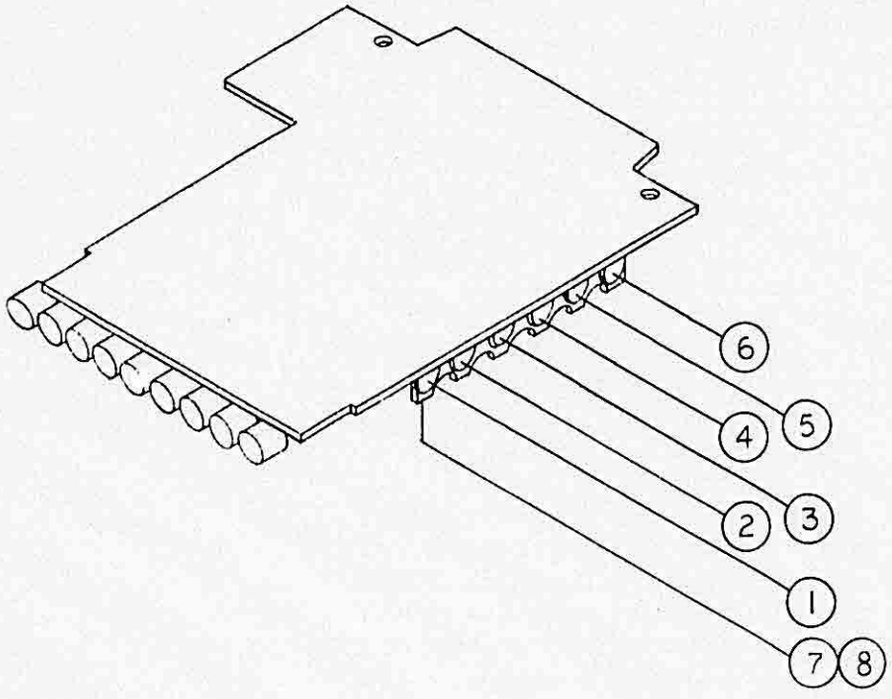


FIGURE 5.3. INPUT SUPPORT PC BOARD ASSY (Speaker)

MECHANICAL PARTS LIST

FIGURE & INDEX NUMBER	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	QTY
5.3	01685-0104		INPUT SUPPORT PC BOARD ASSY (Speaker – 6 Pots) (See Fig. 5.1 Index –25 for NHA)	REF
-1	32075-0003	R524	RESISTOR, Variable, 500 ohms	1
-2	32075-0003	R525	RESISTOR, Variable, 500 ohms	1
-3	32075-0003	R526	RESISTOR, Variable, 500 ohms	1
-4	32075-0003	R527	RESISTOR, Variable, 500 ohms	1
-5	32075-0002	R528	RESISTOR, Variable, 100 ohms	1
-6	32075-0003	R529	RESISTOR, Variable, 500 ohms	1
-7	84170-0001		POST, "F"	18
-8	54897-0001		BOARD, PC, Input Support (4 inches long)	1

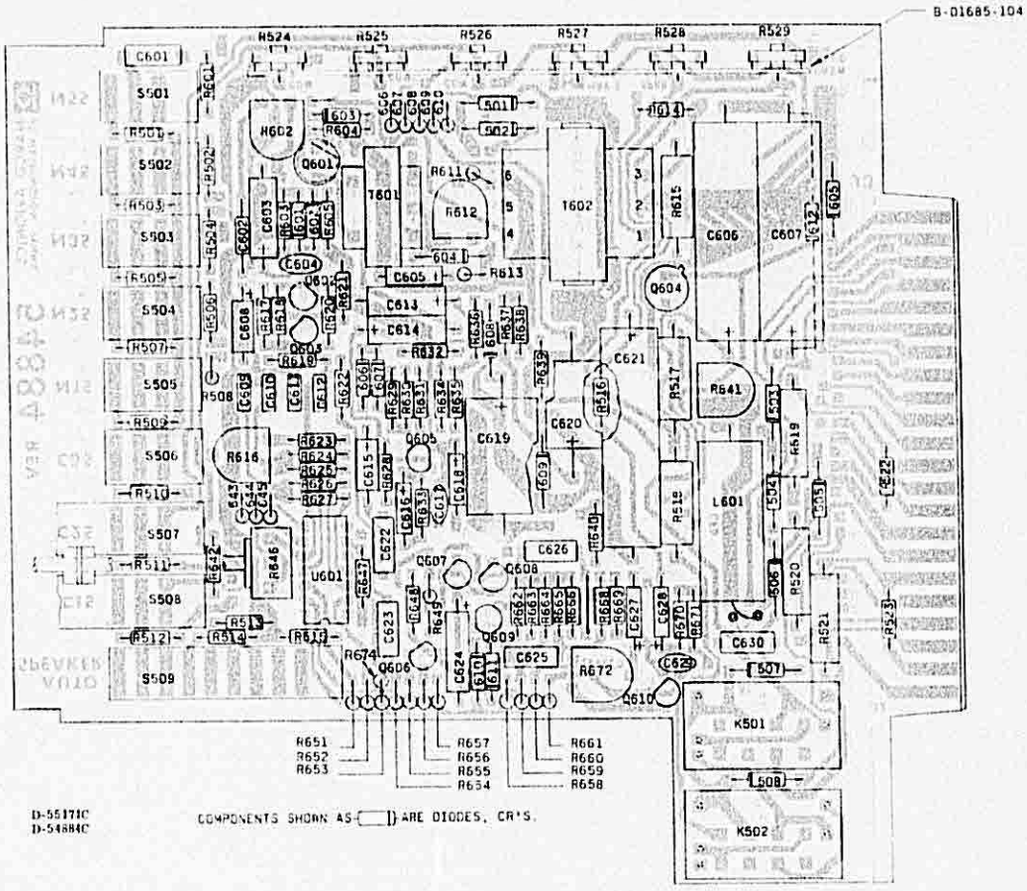


FIGURE 5.4. SPEAKER PC BOARD ASSY

MECHANICAL PARTS LIST

FIGURE & INDEX NUMBER	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	QTY
5.4	01683-0101		SPEAKER PC BOARD ASSY (See Fig. 5.1 Index -26 for NHA)	REF
-1	52726-0001		PAD, Transistor Mounting	3
-2	54897-0001		FRAME, Transformer	1

NOTE: The PC board has no other mechanical parts. For full identification of electrical parts, determine the part's symbol number then refer to the Electrical Parts List section, locate the symbol number. (The symbol numbers are in alpha-numerical sequence.)

SEE BLOW-UP

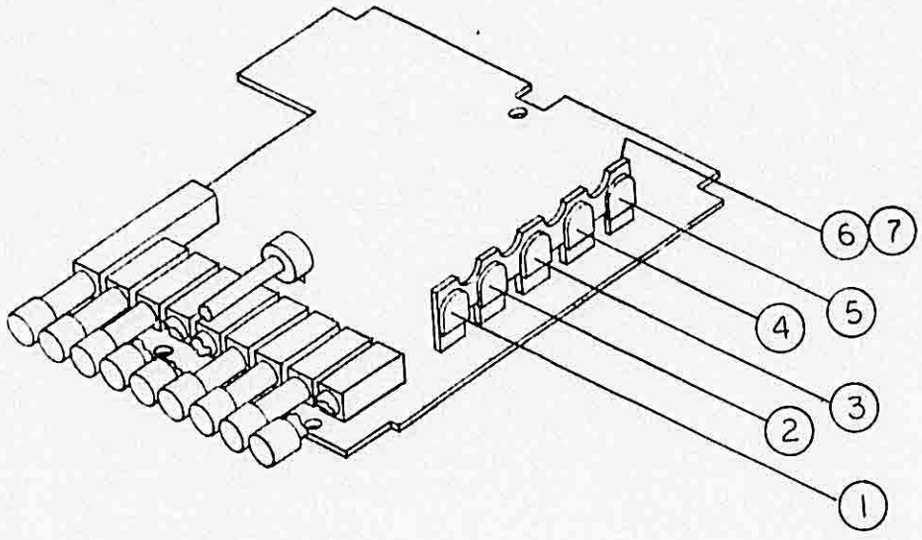


FIGURE 5.5 INPUT SUPPORT PC BOARD ASSY (Phones)

MECHANICAL PARTS LIST

FIGURE & INDEX NUMBER	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	QTY
5.5	01685-0105		INPUT SUPPORT PC BOARD ASSY (Phones - 5 Pots) (See Fig. 5.1 Index -48 for NHA)	REF
-1	32075-0004	R417	RESISTOR, Variable, 10K ohms	1
-2	32075-0003	R221	RESISTOR, Variable, 500 ohms	1
-3	32075-0003	R222	RESISTOR, Variable, 500 ohms	1
-4	32075-0003	R223	RESISTOR, Variable, 500 ohms	1
-5	32075-0003	R224	RESISTOR, Variable, 500 ohms	1
-6	84170-0001		POST, "F"	15
-7	54897-0002		BOARD, PC, Input Support (3.27 inches long)	1

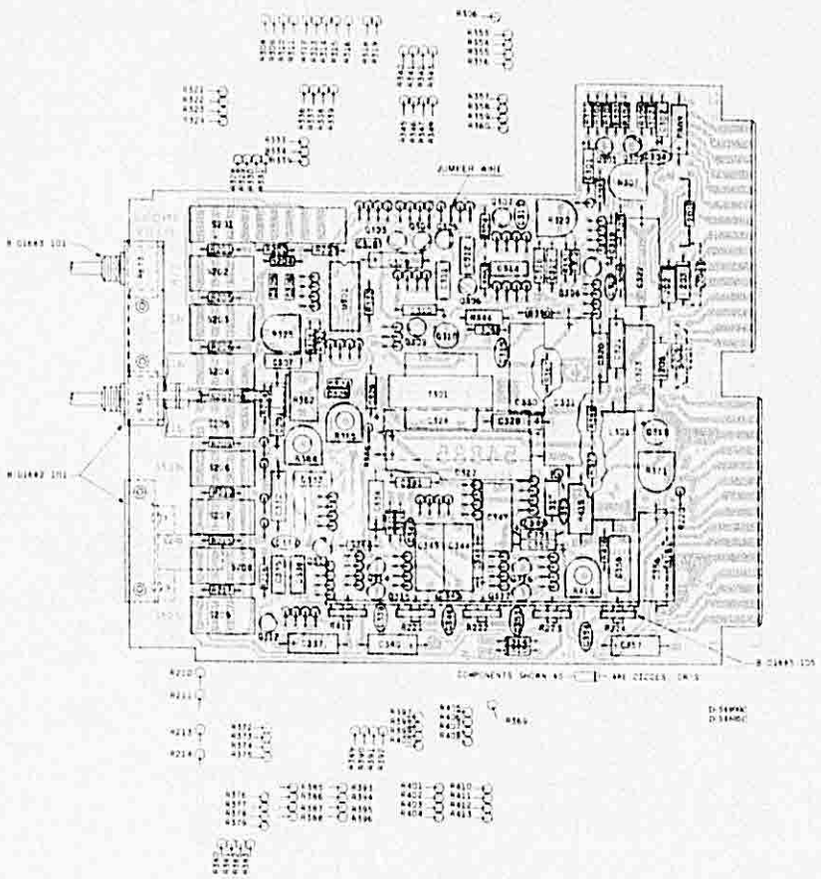


FIGURE 5.6. PHONES PC BOARD ASSY

MECHANICAL PARTS LIST

FIGURE & INDEX NUMBER	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	QTY
5.6	01684–0101		PHONES PC BOARD ASSY (See Fig. 5.1 Index –49 for NHA)	REF
–1	52726–0001		PAD, Transistor Mounting	2

NOTE: The PC board has no other mechanical parts. For full identification of electrical parts, determine the part's symbol number then refer to the Electrical Parts List section, locate the symbol number. (The symbol numbers are in alpha-numerical sequence.)

SEE BLOW-UP

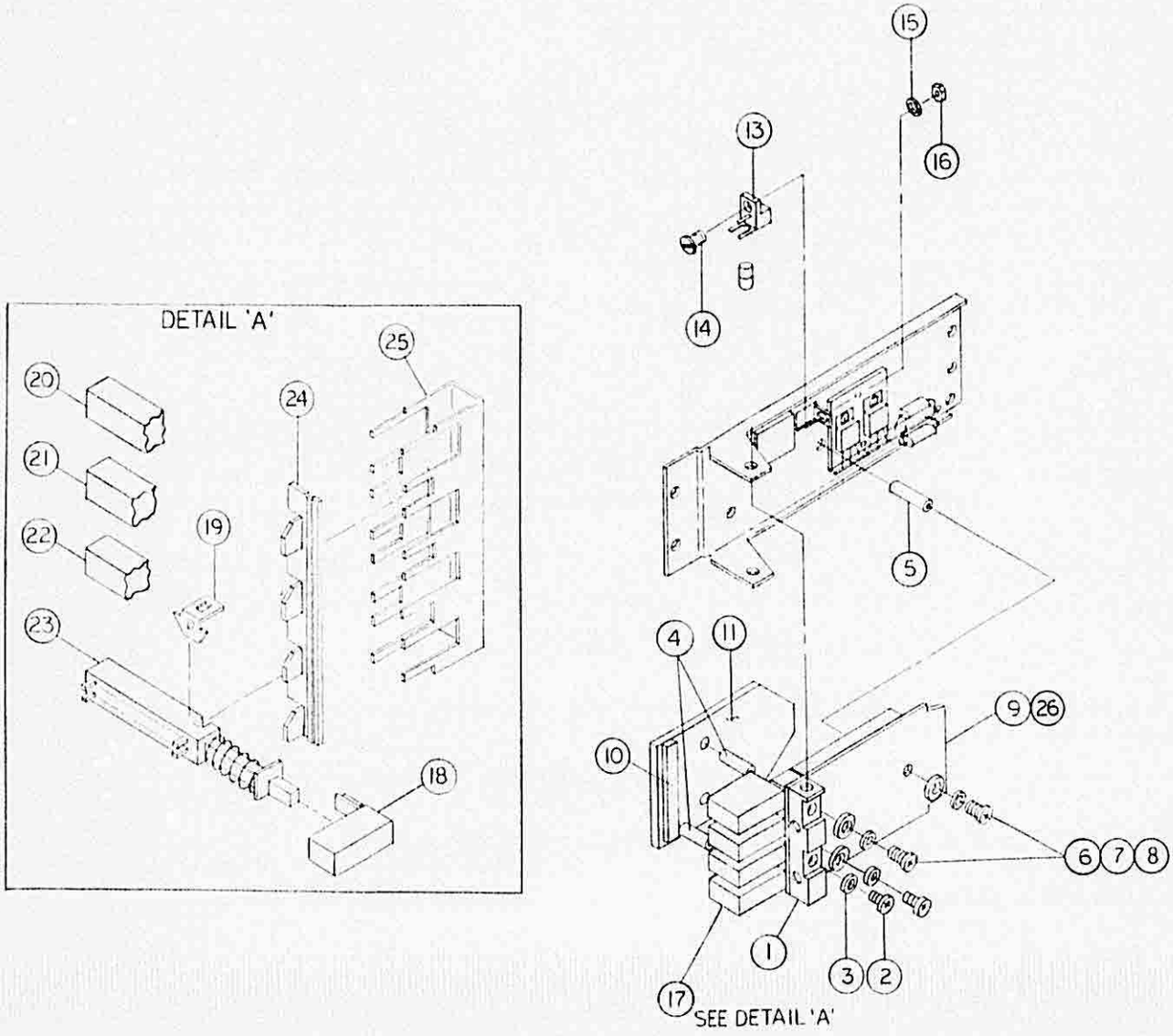


FIGURE 5.7. TRANSMIT LIGHT SWITCH ASSY

MECHANICAL PARTS LIST

FIGURE & INDEX NUMBER	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	QTY
5.7	01685-0101		TRANSMIT LIGHT SWITCH ASSY	
			(See Fig. 5.1 Index -51 for NHA)	REF
-1	54879-0001		BLOCK	1
			(ATTACHING PARTS)	
-2	82808-0003		SCREW, Mach, Rd Hd, Phillips, 2-56 x 3/4	1
-3	81324-0002		WASHER, Lock, Split, #2	2
-4	81207-0047		SPACER, 1/8 dia x .633 inches long)	2
-5	81207-040		SPACER, 1/8 dia x .816 inches long)	1
			(ATTACHING PARTS)	
-6	82808-0003		SCREW, Mach, Rd Hd, Phillips, 2-56 x 3/4	1
-7	81324-0002		WASHER, Lock, Split, #2	3
-8	81336-0002		WASHER, Flat, Nylon (3/16 OD x .096 ID x .031 inch	3
-9	01685-0102		TRANSMIT LIGHT BOARD ASSY	1
-10	57685-0003		GASKET	1
-11	55297-0001		PANEL, LIGHT	1
-12	12000-0009	DS701	LAMP, 14v (T-1-3/4 — 330 clear)	1
-13	41321-0001		SOCKET, Lamp (T-1-3/4 flange base)	1
			(ATTACHING PARTS)	
-14	82/08-0002		SCREW, Mach, Rd Hd, Phllips, 2-56 x 3/16	1
-15	81324-0002		WASHER, Lock, Split, #2	1
-16	82900-0001		NUT, Hex, 2-56	1
-17	61607-0101		SWITCH ASSY	1
-18	61601-0002		BUTTON, Rectangular	4
-19	61599-0001		LATCH, Spring	1
-20	61596-0003	S701	SWITCH, Pushbutton, 10 pole	1
-21	61596-0003	S702	SWITCH, Pushbutton, 10 pole	1
-22	61596-0003	S703	SWITCH, Pushbutton, 10 pole	1
-23	61596-0003	S704	SWITCH, Pushbutton, 10 pole	1
-24	61598-0001		BAR, Latch and Release	1
-25	61597-0004		CHASSIS, Switch, 4 station	1
-26	54887-0001		BOARD, PC, Transmit Light	1

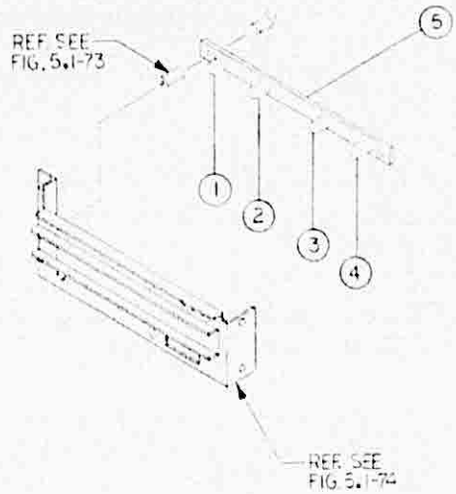


FIGURE 5.8. FRONT LIGHT BAR PC BOARD ASSY

MECHANICAL PARTS LIST

FIGURE & INDEX NUMBER	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	QTY
5.8	01685-0103		FRONT LIGHT BAR PC BOARD ASSY (See Fig. 5.1 Index -71 for NHA)	REF
-1	12000-0029	DS801	LAMP, 14v (T-1-1/4)	1
-2	12000-0029	DS802	LAMP, 14v (T-1-1/4)	1
-3	12000-0029	DS803	LAMP, 14v (T-1-1/4)	1
-4	12000-0029	DS804	LAMP, 14v (T-1-1/4)	1
-5	54886-0001		LIGHT BAR, Front	1

ELECTRICAL PARTS LIST

(per B-01682-J/B-01683-G/B-01684-F/B-01685-G)

SYMBOL NUMBER	PART NUMBER	DESCRIPTION
C201	21555-0018	Capacitor, Solid Tantalum, 22 uf ±10%, 15V
C301	21555-0044	Capacitor, Solid Tantalum, 0.47 uf ±10%, 35V
C302	21555-0044	Capacitor, Solid Tantalum, 0.47 uf ±10%, 35V
C303	21555-0026	Capacitor, Solid Tantalum, 10 uf ±10%, 20V
C304	21291-0025	Capacitor, Ceramic Disc, 430 pf ±10%, 500V
C305	24052-0240	Capacitor, Dipped Mica, 24 pf ±5%, 500V
C306	24052-0240	Capacitor, Dipped Mica, 24 pf ±5%, 500V
C307	23094-0163	Capacitor, Metalized Mylar, 0.01 uf ±10%, 200V
C308	24052-0361	Capacitor, Dipped Mica, 360 pf ±5%, 100V
C309	21555-0011	Capacitor, Solid Tantalum, 39 uf ±10%, 10V
C310	21555-0044	Capacitor, Solid Tantalum, 0.47 uf ±10%, 35V
C311	23094-0175	Capacitor, Metalized Mylar, 0.1 uf ±10%, 200V
C312	23094-0175	Capacitor, Metalized Mylar, 0.1 uf ±10%, 200V
C313	21291-0025	Capacitor, Ceramic Disc, 430 pf ±10%, 500V
C314	23094-0163	Capacitor, Metalized Mylar, 0.01 uf ±10%, 200V
C315	21291-0025	Capacitor, Ceramic Disc, 430 pf ±10%, 500V
C316	21555-0044	Capacitor, Solid Tantalum, 0.47 uf ±10%, 35V
C317	21555-0044	Capacitor, Solid Tantalum, 0.47 uf ±10%, 35V
C318	21555-0016	Capacitor, Solid Tantalum, 3.3 uf ±10%, 15V
C319	21291-0025	Capacitor, Ceramic Disc, 430 pf ±10%, 500V
C320	21555-0054	Capacitor, Solid Tantalum, 3.3 uf ±10%, 35V
C321	21555-0018	Capacitor, Solid Tantalum, 22 uf ±10%, 15V
C322	21554-0051	Capacitor, Electrolytic, 250 uf, 25V
C323	23094-0183	Capacitor, Metalized Mylar, 0.47 uf ±10%, 200V
C324	24052-0240	Capacitor, Dipped Mica, 24 pf ±5%, 500V
C325	24052-0240	Capacitor, Dipped Mica, 24 pf ±5%, 500V
C326	21555-0044	Capacitor, Solid Tantalum, 0.47 uf ±10%, 35V
C327	21554-0044	Capacitor, Electrolytic, 500 uf, 15V
C328	21554-0044	Capacitor, Electrolytic, 500 uf, 15V
C329	21555-0016	Capacitor, Solid Tantalum, 3.3 uf ±10%, 15V
C330	23094-0184	Capacitor, Metalized Mylar, 0.56 uf ±10%, 200V
C331	21554-0044	Capacitor, Electrolytic, 500 uf, 15V
C332	21555-0003	Capacitor, Solid Tantalum, 47 uf ±10%, 6V
C333	23094-0173	Capacitor, Metalized Mylar, 0.068 uf ±10%, 200V
C334	21291-0025	Capacitor, Ceramic Disc, 430 pf ±10%, 500V
C335	23094-0159	Capacitor, Metalized Mylar, 0.0047 uf ±10%, 200V

ELECTRICAL PARTS LIST

SYMBOL NUMBER	PART NUMBER	DESCRIPTION
C336	23094–0157	Capacitor, Metalized Mylar, 0.0033 uf ±10%, 200V
C337	21555–0054	Capacitor, Solid Tantalum, 3.3 uf ±10%, 35V
C338	21555–0056	Capacitor, Solid Tantalum, 4.7 uf ±10%, 35V
C339	21291–0025	Capacitor, Ceramic Disc, 430 pf ±10%, 500V
C340	21555–0018	Capacitor, Solid Tantalum, 22 uf ±10%, 15V
C341	21555–0044	Capacitor, Solid Tantalum, 0.47 uf ±10%, 35V
C342	21291–0025	Capacitor, Ceramic Disc, 430 pf ±10%, 500V
C343	23094–0179	Capacitor, Metalized Mylar, 0.22 uf ±10%, 200V
C344	23094–0179	Capacitor, Metalized Mylar, 0.22 uf ±10%, 200V
C345	21291–0025	Capacitor, Ceramic Disc, 430 pf ±10%, 500V
C346	21291–0025	Capacitor, Ceramic Disc, 430 pf ±10%, 500V
C347	23094–0179	Capacitor, Metalized Mylar, 0.22 uf ±10%, 200V
C348	21555–0044	Capacitor, Solid Tantalum, 0.47 uf ±10%, 35V
C349	21291–0025	Capacitor, Ceramic Disc, 430 pf ±10%, 500V
C350	21291–0025	Capacitor, Ceramic Disc, 430 pf ±10%, 500V
C351	21555–0044	Capacitor, Solid Tantalum, 0.47 uf ±10%, 35V
C352	21555–0044	Capacitor, Solid Tantalum, 0.47 uf ±10%, 35V
C353	21291–0025	Capacitor, Ceramic Disc, 430 pf ±10%, 500V
C354	21291–0025	Capacitor, Ceramic Disc, 430 pf ±10%, 500V
C355	23094–0163	Capacitor, Metalized Mylar, 0.01 uf ±10%, 200V
C356	21554–0052	Capacitor, Electrolytic, 500 uf, 20V
C357	21555–0052	Capacitor, Solid Tantalum, 2.2 uf ±10%, 35V
C601	23094–0163	Capacitor, Metalized Mylar, 0.01 uf ±10%, 200V
C602	23064–0170	Capacitor, Metalized Mylar, 0.039 uf ±10%, 200V
C603	21555–0026	Capacitor, Solid Tantalum, 10 uf ±10%, 20V
C604	21291–0025	Capacitor, Ceramic Disc, 430 pf ±10%, 500V
C605	21555–0016	Capacitor, Solid Tantalum, 3.3 uf ±10%, 15V
C606	21554–0044	Capacitor, Electrolytic, 500 uf, 15V
C607	21554–0044	Capacitor, Electrolytic, 500 uf, 15V
C608	21555–0044	Capacitor, Solid Tantalum, 0.47 uf ±10%, 35V
C609	24052–0240	Capacitor, Dipped Mica, 24 pf ±5%, 500V
C610	24052–0240	Capacitor, Dipped Mica, 24 pf ±5%, 500V
C611	24052–0240	Capacitor, Dipped Mica, 24 pf ±5%, 500V
C612	24052–0240	Capacitor, Dipped Mica, 24 pf ±5%, 500V
C613	21555–0018	Capacitor, Solid Tantalum, 22 uf ±10%, 15V
C614	21555–0054	Capacitor, Solid Tantalum, 3.3 uf ±10%, 35V
C615	21555–0044	Capacitor, Solid Tantalum, 0.47 uf ±10%, 35V

ELECTRICAL PARTS LIST

SYMBOL NUMBER	PART NUMBER	DESCRIPTION
C616	21555-0016	Capacitor, Solid Tantalum, 3.3 uf ±10%, 15V
C617	21291-0025	Capacitor, Ceramic Disc, 430 pf ±10%, 500V
C618	21555-0048	Capacitor, Solid Tantalum, 1.0 uf ±10%, 35V
C619	21554-0051	Capacitor, Electrolytic, 250 uf, 25V
C620	21554-0010	Capacitor, Electrolytic, 20 uf, 35V
C621	21554-0034	Capacitor, Electrolytic, 100 uf, 35V
C622	24049-0301	Capacitor, Dipped Mica, 300 pf ±5%, 500V
C623	23094-0175	Capacitor, Metalized Mylar, 0.1 uf ±10%, 200V
C624	21555-0011	Capacitor, Metalized Mylar, 39 uf ±10%, 10V
C625	23094-0163	Capacitor, Metalized Mylar, 0.01 uf ±10%, 200V
C626	23094-0175	Capacitor, Metalized Mylar, 0.1 uf ±10%, 200V
C627	21555-0044	Capacitor, Solid Tantalum, 0.47 uf ±10%, 35V
C628	21555-0044	Capacitor, Solid Tantalum, 0.47 uf ±10%, 35V
C629	21291-0025	Capacitor, Ceramic Disc, 430 pf ±10%, 500V
C630	23094-0163	Capacitor, Metalized Mylar, 0.01 uf ±10%, 200V
CR201	75204-0045	Diode, Silicon, General Purpose (TA Series)
CR202	75204-0045	Diode, Silicon, General Purpose (TA Series)
CR203	75204-0045	Diode, Silicon, General Purpose (TA Series)
CR204	75204-0045	Diode, Silicon, General Purpose (TA Series)
CR205	75204-0045	Diode, Silicon, General Purpose (TA Series)
CR206	75204-0045	Diode, Silicon, General Purpose (TA Series)
CR207	75204-0045	Diode, Silicon, General Purpose (TA Series)
CR301	75028-0001	Diode, Silicon, General Purpose (1N4154)
CR302	75028-0001	Diode, Silicon, General Purpose (1N4154)
CR303	75028-0001	Diode, Silicon, General Purpose (1N4154)
CR304	75028-0001	Diode, Silicon, General Purpose (1N4154)
CR305	75028-0001	Diode, Silicon, General Purpose (1N4154)
CR306	75028-0001	Diode, Silicon, General Purpose (1N4154)
CR307	75028-0001	Diode, Silicon, General Purpose (1N4154)
CR308	75025-0007	Diode, Silicon, Zener, 9.1V
CR311	75028-0001	Diode, Silicon, General Purpose (1N4154)
CR312	75028-0001	Diode, Silicon, General Purpose (1N4154)

ELECTRICAL PARTS LIST

SYMBOL NUMBER	PART NUMBER	DESCRIPTION
CR313	75025–0006	Diode, Silicon, Zener, 7.5V
CR314	75028–0001	Diode, Silicon, General Purpose (1N4154)
CR315	75028–0001	Diode, Silicon, General Purpose (1N4154)
CR316	75025–0009	Diode, Silicon, Zener, 18V
CR501	75204–0045	Diode, Silicon, General Purpose (TA Series)
CR502	75204–0045	Diode, Silicon, General Purpose (TA Series)
CR503	75204–0045	Diode, Silicon, General Purpose (TA Series)
CR504	75204–0045	Diode, Silicon, General Purpose (TA Series)
CR505	75204–0045	Diode, Silicon, General Purpose (TA Series)
CR506	75204–0045	Diode, Silicon, General Purpose (TA Series)
CR507	75204–0045	Diode, Silicon, General Purpose (TA Series)
CR508	75204–0045	Diode, Silicon, General Purpose (TA Series)
CR601	75028–0001	Diode, Silicon, General Purpose (1N4154)
CR602	75028–0001	Diode, Silicon, General Purpose (1N4154)
CR603	75028–0001	Diode, Silicon, General Purpose (1N4154)
CR604	75014–0001	Diode, Germanium, General Purpose, (1N270)
CR605	75025–0006	Diode, Silicon, Zener, 7.5V
CR606	75028–0001	Diode, Silicon, General Purpose (1N4154)
CR607	75028–0001	Diode, Silicon, General Purpose (1N4154)
CR608	75025–0007	Diode, Silicon, Zener, 9.1V
CR609	75025–0009	Diode, Silicon, Zener, 18V
CR610	75028–0001	Diode, Silicon, General Purpose (1N4154)
CR611	75028–0001	Diode, Silicon, General Purpose (1N4154)
CR612	75025–0009	Diode, Silicon, Zener, 18V
DS701	12000–0009	Lamp, 14V (T-1-3/4 — 330 clear) (SEE Fig.5.7 index 12)
DS801	12000–0029	Lamp, 14V (T-1-1/4) (SEE Fig.5.8 index 1)
DS802	12000–0029	Lamp, 14V (T-1-1/4) (SEE Fig.5.8 index 2)
DS803	12000–0029	Lamp, 14V (T-1-1/4) (SEE Fig.5.8 index 3)
DS804	12000–0029	Lamp, 14V (T-1-1/4) (SEE Fig.5.8 index 4)
K501	65146–0003	Relay
K502	65146–0003	Relay

ELECTRICAL PARTS LIST

SYMBOL NUMBER	PART NUMBER	DESCRIPTION
L301	11487-0001	Coil, Line Choke
L601	11487-0001	Coil, Line Choke
P4	41342-0021	Connector, 20 Pin (Made From Narco 41342-0017) (SEE Fig.5.1 index50)
Q101	75576-0001	Transistor, Silicon, NPN (2N5494) (SEE Fig.5.1 index 61)
Q102	75576-0001	Transistor, Silicon, NPN (2N5494) (SEE Fig.5.1 index 62)
Q103	75638-0002	Transistor, Silicon, NPN (2N6044) (SEE Fig.5.1 index 27)
Q104	75638-0002	Transistor, Silicon, NPN (2N6044) (SEE Fig.5.1 index 28)
Q105	75638-0002	Transistor, Silicon, NPN (2N6044) (SEE Fig.5.1 index 29)
Q301	75550-0007	Transistor, Silicon, NPN (2N3391)
Q302	75550-0007	Transistor, Silicon, NPN (2N3391)
Q303	75561-0021	Transistor, Silicon, PNP (2N4250)
Q304	75550-0007	Transistor, Silicon, NPN (2N3391)
Q305	75550-0007	Transistor, Silicon, NPN (2N3391)
Q306	75561-0021	Transistor, Silicon, PNP (2N4250)
Q307	75550-0007	Transistor, Silicon, NPN (2N3391)
Q308	75550-0007	Transistor, Silicon, NPN (2N3391)
Q309	75550-0007	Transistor, Silicon, NPN (2N3391)
Q310	75536-0001	Transistor, Silicon, NPN (2N3053)
Q311	75536-0001	Transistor, Silicon, NPN (2N3053)
Q312	75561-0021	Transistor, Silicon, PNP (2N4250)
Q313	75587-0004	Transistor, Silicon, NPN (2N5308)
Q314	75561-0021	Transistor, Silicon, PNP (2N4250)
Q315	75561-0021	Transistor, Silicon, PNP (2N4250)
Q316	75561-0021	Transistor, Silicon, PNP (2N4250)
Q317	75561-0021	Transistor, Silicon, PNP (2N4250)
Q601	75561-0020	Transistor, Silicon, NPN (2N3568)
Q602	75550-0007	Transistor, Silicon, NPN (2N3391)
Q603	75550-0007	Transistor, Silicon, NPN (2N3391)
Q604	75536-0001	Transistor, Silicon, NPN (2N3053)
Q605	75550-0007	Transistor, Silicon, NPN (2N3391)

ELECTRICAL PARTS LIST

SYMBOL NUMBER	PART NUMBER	DESCRIPTION
Q606	75561-0021	Transistor, Silicon, PNP (2N4250)
Q607	75550-0007	Transistor, Silicon, NPN (2N3391)
Q608	75550-0007	Transistor, Silicon, NPN (2N3391)
Q609	75561-0021	Transistor, Silicon, PNP (2N4250)
Q610	75550-0007	Transistor, Silicon, NPN (2N3391)
R201	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R202	31192-0221	Resistor, Fixed, Composition, 220 ±10%, 1/4W
R203	31192-0221	Resistor, Fixed, Composition, 220 ±10%, 1/4W
R204	31192-0221	Resistor, Fixed, Composition, 220 ±10%, 1/4W
R205	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R206	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R207	31192-0221	Resistor, Fixed, Composition, 220 ±10%, 1/4W
R208	31195-0103	Rasistor, Fixed, Composition, 10K ±5%, 1/4W
R209	31192-0221	Resistor, Fixed, Composition, 220 ±10%, 1/4W
R210	31192-0101	Resistor, Fixed, Composition, 100 ±10%, 1/4W
R211	31192-0271	Resistor, Fixed, Composition, 270 ±10%, 1/4W
R212	31192-0221	Resistor, Fixed, Composition, 220 ±10%, 1/4W
R213	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R214	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R215	31192-0221	Resistor, Fixed, Composition, 220 ±10%, 1/4W
R216	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R217	31192-0221	Resistor, Fixed, Composition, 220 ±10%, 1/4W
R220	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R221	32075-0003	Resistor, Variable, 500 ohms (SEE Fig.5.5 index 2)
R222	32075-0003	Resistor, Variable, 500 ohms (SEE Fig.5.5 index 3)
R223	32075-0003	Resistor, Variable, 500 ohms (SEE Fig.5.5 index 4)
R224	32075-0003	Resistor, Variable, 500 ohms (SEE Fig.5.5 index 5)
R301	31192-0562	Resistor, Fixed, Composition, 5.6K ±10%, 1/4W
R302	31195-0752	Resistor, Fixed, Composition, 7.5K ±5%, 1/4W
R303	31195-0473	Resistor, Fixed, Composition, 47K ±5%, 1/4W
R304	31195-0333	Resistor, Fixed, Composition, 33K ±5%, 1/4W
R305	31195-0822	Resistor, Fixed, Composition, 8.2K ±5%, 1/4W

ELECTRICAL PARTS LIST

SYMBOL NUMBER	PART NUMBER	DESCRIPTION
R306	31192-0471	Resistor, Fixed, Composition, 470 ±10%, 1/4W
R307	32054-0016	Resistor, Variable, 220K
R308	31195-0475	Resistor, Fixed, Composition, 4.7 Meg ±5%, 1/4W
R309	31195-0565	Resistor, Fixed, Composition, 5.6 Meg ±5%, 1/4W
R310	31195-0184	Resistor, Fixed, Composition, 180K ±5%, 1/4W
R311	31195-0824	Resistor, Fixed, Composition, 820K ±5%, 1/4W
R312	31195-0335	Resistor, Fixed, Composition, 3.3 Meg ±5%, 1/4W
R313	31195-0682	Resistor, Fixed, Composition, 6.8K ±5%, 1/4W
R314	31195-0102	Resistor, Fixed, Composition, 1K ±5%, 1/4W
R315	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R316	31195-0155	Resistor, Fixed, Composition, 1.5 Meg ±5%, 1/4W
R318	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R319	31195-0102	Resistor, Fixed, Composition, 1K ±5%, 1/4W
R320	32054-0008	Resistor, Variable, 10K
R321	31195-0125	Resistor, Fixed, Composition, 1.2 Meg ±5%, 1/4W
R322	31195-0824	Resistor, Fixed, Composition, 820K ±5%, 1/4W
R323	31195-0824	Resistor, Fixed, Composition, 820K ±5%, 1/4W
R324	31195-0185	Resistor, Fixed, Composition, 1.8 Meg ±5%, 1/4W
R325	32054-0016	Resistor, Variable, 220K
R326	31195-0105	Resistor, Fixed, Composition, 1 Meg ±5%, 1/4W
R327	31195-0564	Resistor, Fixed, Composition, 560K ±5%, 1/4W
R328	31195-0824	Resistor, Fixed, Composition, 820K ±5%, 1/4W
R329	31195-0224	Resistor, Fixed, Composition, 220K ±5%, 1/4W
R330	31195-0684	Resistor, Fixed, Composition, 680K ±5%, 1/4W
R331	31195-0125	Resistor, Fixed, Composition, 1.2 Meg ±5%, 1/4W
R332	31195-0125	Resistor, Fixed, Composition, 1.2 Meg ±5%, 1/4W
R333	31195-0471	Resistor, Fixed, Composition, 470 ±5%, 1/4W
R334	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R335	31195-0333	Resistor, Fixed, Composition, 33K ±5%, 1/4W
R336	31195-0242	Resistor, Fixed, Composition, 2.4K ±5%, 1/4W
R337	31195-0563	Resistor, Fixed, Composition, 56K ±5%, 1/4W
R338	31195-0102	Resistor, Fixed, Composition, 1K ±5%, 1/4W
R339	31195-0331	Resistor, Fixed, Composition, 330 ±5%, 1/4W
R340	31195-0122	Resistor, Fixed, Composition, 1.2K ±5%, 1/4W

ELECTRICAL PARTS LIST

SYMBOL NUMBER	PART NUMBER	DESCRIPTION
R341	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R342	31195-0753	Resistor, Fixed, Composition, 75K ±5%, 1/4W
R343	31195-0133	Resistor, Fixed, Composition, 13K ±5%, 1/4W
R344	31149-0109	Resistor, Fixed, Composition, 1.0 ohm ±5%, 1/2W
R345	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R346	31195-0154	Resistor, Fixed, Composition, 150K ±5%, 1/4W
R347	31195-0564	Resistor, Fixed, Composition, 560K ±5%, 1/4W
R349	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R350	31195-0270	Resistor, Fixed, Composition, 27 ±5%, 1/4W
R351	31195-0181	Resistor, Fixed, Composition, 180 ±5%, 1/4W
R352	31195-0222	Resistor, Fixed, Composition, 2.2K ±5%, 1/4W
R353	31192-0392	Resistor, Fixed, Composition, 3.9K ±10%, 1/4W
R354	31192-0123	Resistor, Fixed, Composition, 12K ±10%, 1/4W
R355	31192-0223	Resistor, Fixed, Composition, 22K ±10%, 1/4W
R356	31192-0103	Resistor, Fixed, Composition, 10K ±10%, 1/4W
R357	31192-0332	Resistor, Fixed, Composition, 3.3K ±10%, 1/4W
R358	31192-0331	Resistor, Fixed, Composition, 330 ±10%, 1/4W
R359	31192-0102	Resistor, Fixed, Composition, 1K, ±10%, 1/4W
R360	31195-0621	Resistor, Fixed, Composition, 620 ±5%, 1/4W
R361	32064-0007	Resistor, Variable, 10K (SEE Fig.5.1 index 46)
R362	32073-0001	Resistor, Variable, 5K
R364	32075-0005	Resistor, Variable, 50K
R365	32075-0005	Resistor, Variable, 50K
R366	31195-0100	Resistor, Fixed, Composition, 10 ±5%, 1/4W
R367	31195-0153	Resistor, Fixed, Composition, 15K ±5%, 1/4W
R368	31192-0470	Resistor, Fixed, Composition, 47 ±10%, 1/4W
R369	31192-0102	Resistor, Fixed, Composition, 1K ±10%, 1/4W
R370	31192-0122	Resistor, Fixed, Composition, 1.2K ±10%, 1/4W
R371	32054-0004	Resistor, Variable, 4.7K
R372	31192-0103	Resistor, Fixed, Composition, 10K ±10%, 1/4W
R373	31192-0103	Resistor, Fixed, Composition, 10K ±10%, 1/4W
R374	31195-0471	Resistor, Fixed, Composition, 470 ±5%, 1/4W
R375	31195-0182	Resistor, Fixed, Composition, 1.8K ±5%, 1/4W

ELECTRICAL PARTS LIST

SYMBOL NUMBER	PART NUMBER	DESCRIPTION
R376	31195-0102	Resistor, Fixed, Composition, 1K ±5%, 1/4W
R377	31195-0564	Resistor, Fixed, Composition, 560K ±5%, 1/4W
R378	31195-0274	Resistor, Fixed, Composition, 270K ±5%, 1/4W
R379	31192-0332	Resistor, Fixed, Composition, 3.3K ±10%, 1/4W
R380	31195-0151	Resistor, Fixed, Composition, 150 ±5%, 1/4W
R381	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R382	31195-0822	Resistor, Fixed, Composition, 8.2K ±5%, 1/4W
R383	31195-0273	Resistor, Fixed, Composition, 27K ±5%, 1/4W
R384	31195-0152	Resistor, Fixed, Composition, 1.5K ±5%, 1/4W
R385	31195-0473	Resistor, Fixed, Composition, 47K ±5%, 1/4W
R386	31195-0332	Resistor, Fixed, Composition, 3.3K ±5%, 1/4W
R387	31195-0473	Resistor, Fixed, Composition, 47K ±5%, 1/4W
R388	31195-0332	Resistor, Fixed, Composition, 3.3K ±5%, 1/4W
R389	31192-0391	Resistor, Fixed, Composition, 390 ±10%, 1/4W
R390	31192-0151	Resistor, Fixed, Composition, 150 ±10%, 1/4W
R391	31192-0151	Resistor, Fixed, Composition, 150 ±10%, 1/4W
R392	31192-0391	Resistor, Fixed, Composition, 390 ±10%, 1/4W
R393	31195-0153	Resistor, Fixed, Composition, 15K ±5%, 1/4W
R394	31192-0103	Resistor, Fixed, Composition, 10K ±10%, 1/4W
R395	31195-0153	Resistor, Fixed, Composition, 15K, ±5%, 1/4W
R396	31192-0103	Ressitor, Fixed, Composition, 10K ±10%, 1/4W
R397	31192-0562	Resistor, Fixed, Composition, 5.6K ±10%, 1/4W
R398	31195-0753	Resistor, Fixed, Composition, 75K ±5%, 1/4W
R399	31195-0753	Resistor, Fixed, Composition, 75K ±5%, 1/4W
R400	31192-0562	Resistor, Fixed, Composition, 5.6K ±10%, 1/4W
R401	31195-0473	Resistor, Fixed, Composition, 47K ±5%, 1/4W
R402	31195-0332	Resistor, Fixed, Composition, 3.3K ±5%, 1/4W
R403	31195-0473	Resistor, Fixed, Composition, 47K ±5%, 1/4W
R404	31195-0332	Resistor, Fixed, Composition, 3.3K ±5%, 1/4W
R405	31192-0391	Resistor, Fixed, Composition, 390 ±10%, 1/4W
R406	31192-0151	Resistor, Fixed, Composition, 150 ±10%, 1/4W
R407	31195-0753	Resistor, Fixed, Composition, 75K ±5%, 1/4W
R408	31192-0562	Resistor, Fixed, Composition, 5.6K ±10%, 1/4W
R410	31195-0153	Resistor, Fixed, Composition, 15K ±5%, 1/4W

ELECTRICAL PARTS LIST

SYMBOL NUMBER	PART NUMBER	DESCRIPTION
R411	31192-0103	Resistor, Fixed, Composition, 10K ±10%, 1/4W
R412	31195-0153	Resistor, Fixed, Composition, 15K ±5%, 1/4W
R413	31192-0103	Resistor, Fixed, Composition, 10K ±10%, 1/4W
R414	32054-0018	Resistor, Variable, 470K
R415	31161-0009	Resistor, Fixed, Wirewound, 500 ±5%, 3W
R416	31192-0471	Resistor, Fixed, Composition, 470 ±10%, 1/4W
R417	32075-0004	Resistor, Variable, 10K (SEE Fig.5.5 index 1)
R501	31192-0221	Resistor, Fixed, Composition, 220 ±10%, 1/4W
R502	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R503	31192-0221	Resistor, Fixed, Composition, 220 ±10%, 1/4W
R504	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R505	31192-0221	Resistor, Fixed, Composition, 220 ±10%, 1/4W
R506	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R507	31192-0221	Resistor, Fixed, Composition, 220 ±10%, 1/4W
R508	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R509	31192-0221	Resistor, Fixed, Composition, 220 ±10%, 1/4W
R510	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R511	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R512	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R513	31192-0221	Resistor, Fixed, Composition, 220 ±10%, 1/4W
R514	31192-0221	Resistor, Fixed, Composition, 220 ±10%, 1/4W
R515	31192-0221	Resistor, Fixed, Composition, 220 ±10%, 1/4W
R516	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R517	31161-0012	Resistor, Fixed, Wirewound, 20 ±5%, 3W
R518	31161-0012	Resistor, Fixed, Wirewound, 20 ±5%, 3W
R519	31161-0025	Resistor, Fixed, Wirewound, 4 ±5%, 3W
R520	31161-0025	Resistor, Fixed, Wirewound, 4 ±5%, 3W
R521	31161-0025	Resistor, Fixed, Wirewound, 4 ±5%, 3W
R522	31192-0221	Resistor, Fixed, Composition, 220 ±10%, 1/4W
R523	31192-0221	Resistor, Fixed, Composition, 220 ±10%, 1/4W
R524g	32075-0003	Resistor, Variable, 500 (SEE Fig.5.3 index 1)
R525	32075-0003	Resistor, Variable, 500 (SEE Fig.5.3 index 2)
R526	32075-0003	Resistor, Variable, 500 (SEE Fig.5.3 index 3)
R527	32075-0003	Resistor, Variable, 500 (SEE Fig.5.3 index 4)
R528	32075-0002	Resistor, Variable, 100 (SEE Fig.5.3 index 5)
R529	32075-0003	Resistor, Variable 500 (SEE Fig.5.3 index 6)

ELECTRICAL PARTS LIST

SYMBOL NUMBER	PART NUMBER	DESCRIPTION
R601	31195-0125	Resistor, Fixed, Composition, 1.2 Meg ±5%, 1/4W
R602	32054-0016	Resistor, Variable, 220K
R603	31195-0333	Resistor, Fixed, Composition, 33K ±5%, 1/4W
R604	31195-0561	Resistor, Fixed, Composition, 560 ±5%, 1/4W
R605	31192-0471	Resistor, Fixed, Composition, 470 ±10%, 1/4W
R606	31195-0391	Resistor, Fixed, Composition, 390 ±5%, 1/4W
R607	31195-0101	Resistor, Fixed, Composition, 100 ±5%, 1/4W
R608	31195-0182	Resistor, Fixed, Composition, 1.8K ±5%, 1/4W
R609	31195-0221	Resistor, Fixed, Composition, 220 ±5%, 1/4W
R610	31195-0472	Resistor, Fixed, Composition, 4.7K ±5%, 1/4W
R611	31192-0332	Resistor, Fixed, Composition, 3.3K ±10%, 1/4W
R612	32075-0004	Resistor, Variable, 10K
R613	31192-0150	Resistor, Fixed, Composition, 15 ±10%, 1/4W
R614	31192-0102	Resistor, Fixed, Composition, 1K ±10%, 1/4W
R615	31161-0009	Resistor, Fixed, Wirewound, 500 ±5%, 3W
R616	32054-0016	Resistor, Variable, 220K
R617	31195-0822	Resistor, Fixed, Compositoin, 8.2K ±5%, 1/4W
R618	31195-0473	Resistor, Fixed, Composition, 47K ±5%, 1/4W
R619	31195-0152	Resistor, Fixed, Composition, 1.5K ±5%, 1/4W
R620	31192-0562	Resistor, Fixed, Composition, 5.6K ±10%, 1/4W
R621	31195-0822	Resistor, Fixed, Composition, 8.2K ±5%, 1/4W
R622	31195-0182	Resistor, Fixed, Composition, 1.8K ±5%, 1/4W
R623	31195-0684	Resistor, Fixed, Composition, 680K ±5%, 1/4W
R624	31195-0125	Resistor, Fixed, Composition, 1.2 Meg ±5%, 1/4W
R625	31195-0824	Resistor, Fixed, Composition, 820K ±5%, 1/4W
R626	31195-0125	Resistor, Fixed, Composition, 1.2 Meg ±5%, 1/4W
R627	31195-0824	Resistor, Fixed, Composition, 820K ±5%, 1/4W
R628	31192-0222	Resistor, Fixed, Composition, 2.2K ±10%, 1/4W
R629	31192-0472	Resistor, Fixed, Composition, 4.7K ±10%, 1/4W
R630	31192-0103	Resistor, Fixed, Composition, 10K ±10%, 1/4W
R631	31192-0392	Resistor, Fixed, Composition, 3.9K ±10%, 1/4W
R632	31195-0123	Resistor, Fixed, Composition, 12K ±5%, 1/4W
R633	31192-0223	Resistor, Fixed, Composition, 22K ±10%, 1/4W
R634	31192-0472	Resistor, Fixed, Composition, 4.7K ±10%, 1/4W
R635	31192-0331	Resistor, Fixed, Composition, 330 ±10%, 1/4W

ELECTRICAL PARTS LIST

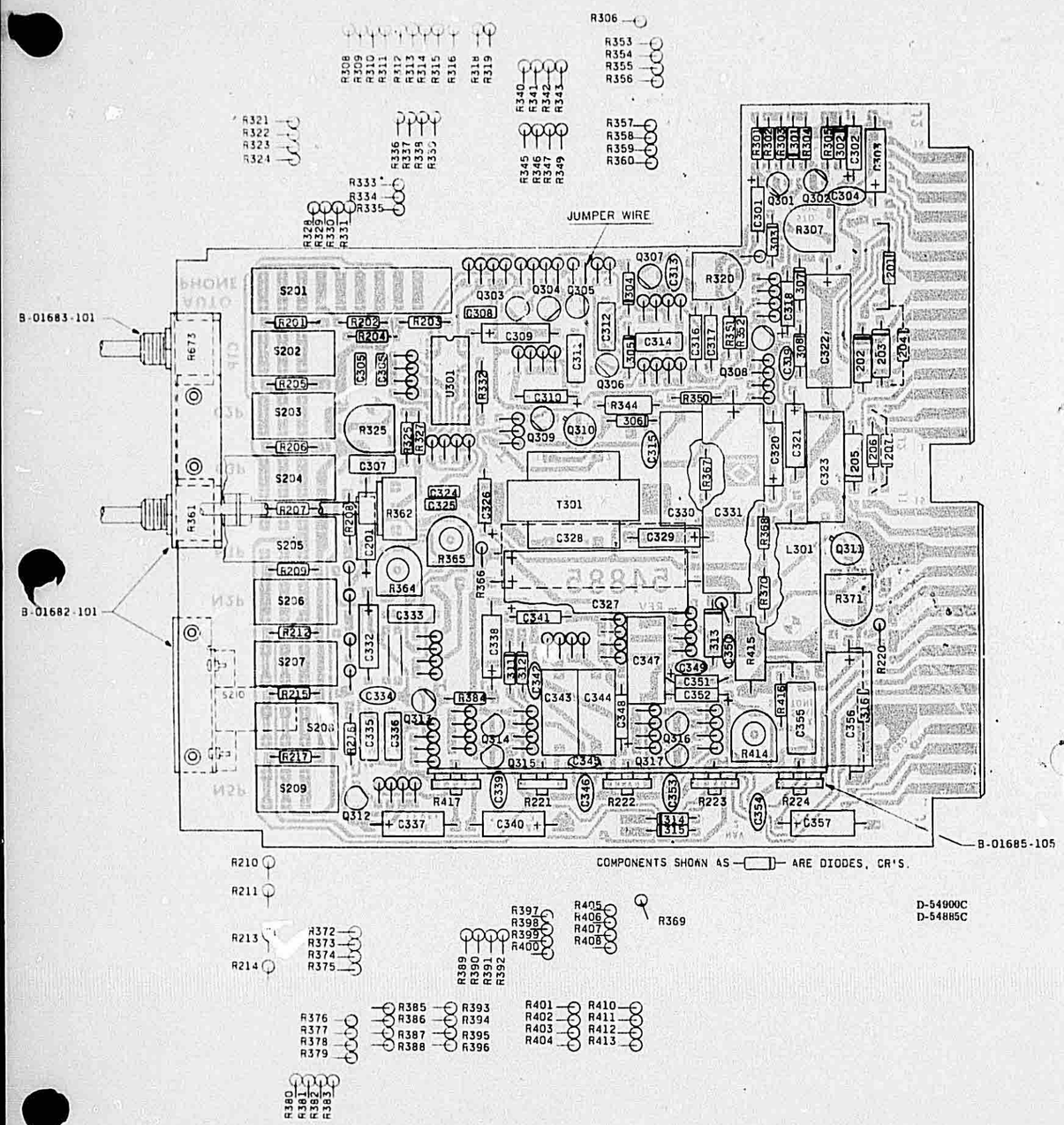
SYMBOL NUMBER	PART NUMBER	DESCRIPTION
R636	31192-0470	Resistor, Fixed, Composition, 47 ±10%, 1/4W
R637	31195-0471	Resistor, Fixed, Composition, 470 ±5%, 1/4W
R638	31192-0101	Resistor, Fixed, Composition, 100 ±10%, 1/4W
R639	31192-0122	Resistor, Fixed, Composition, 1.2K ±10%, 1/4W
R640	31192-0102	Resistor, Fixed, Composition, 1K ±10%, 1/4W
R641	32054-0004	Resistor, Variable, 4.7K
R642	31195-0224	Resistor, Fixed, Composition, 220K ±5%, 1/4W
R643	31195-0684	Resistor, Fixed, Composition, 680K ±5%, 1/4W
R644	31195-0185	Resistor, Fixed, Composition, 1.8 Meg ±5%, 1/4W
R645	31195-0824	Resistor, Fixed, Composition, 820K ±5%, 1/4W
R646	32073-0001	Resistor, Variable, 5K
R647	31195-0155	Resistor, Fixed, Composition, 1.5 Meg ±5%, 1/4W
R648	31195-0683	Resistor, Fixed, Composition, 68K ±5%, 1/4W
R649	31195-0155	Resistor, Fixed, Composition, 1.5 Meg ±5%, 1/4W
R651	31195-0565	Resistor, Fixed, Composition, 5.6 Meg ±5%, 1/4W
R652	31195-0475	Resistor, Fixed, Composition, 4.7 Meg ±5%, 1/4W
R653	31195-0824	Resistor, Fixed, Composition, 820K ±5%, 1/4W
R654	31195-0335	Resistor, Fixed, Composition, 3.3 Meg ±5%, 1/4W
R655	31195-0102	Resistor, Fixed, Composition, 1K ±5%, 1/4W
R656	31195-0682	Resistor, Fixed, Composition, 6.8K ±5%, 1/4W
R657	31195-0153	Resistor, Fixed, Composition, 15K ±5%, 1/4W
R658	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R659	31195-0154	Resistor, Fixed, Composition, 150K ±5%, 1/4W
R660	31195-0102	Resistor, Fixed, Composition, 1K ±5%, 1/4W
R661	31195-0753	Resistor, Fixed, Composition, 75K ±5%, 1/4W
R662	31195-0102	Resistor, Fixed, Composition, 1K ±5%, 1/4W
R663	31195-0331	Resistor, Fixed, Composition, 330 ±5%, 1/4W
R664	31195-0564	Resistor, Fixed, Composition, 560K ±5%, 1/4W
R665	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R666	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W
R668	31195-0133	Resistor, Fixed, Composition, 13K ±5%, 1/4W
R669	31195-0122	Resistor, Fixed, Composition, 1.2K ±5%, 1/4W
R670	31195-0103	Resistor, Fixed, Composition, 10K ±5%, 1/4W

ELECTRICAL PARTS LIST

SYMBOL NUMBER	PART NUMBER	DESCRIPTION
R671	31192-0471	Resistor, Fixed, Composition, 470 ±10%, 1/4W
R672	32054-0008	Resistor, Variable, 10K
R673	32064-0007	Resistor, Variable, 10K (SEE Fig.5.1 index 45)
R674	31195-0184	Resistor, .Fixed, Composition, 180K ±5%, 1/4W
R675	31192-0472	Resistor, Fixed, Composition, 4.7K ±10%, 1/4W (SEE Fig.5.1 index 58)
R701	31161-0007	Resistor, Fixed, Wirewound, 180 ±5%, 3W (SEE Fig.5.1 index 57)
S23	61605-0101	Switch, Power (SEE Fig.5.1 index 43)
S201	61596-0002	Switch, Pushbutton, 6 PDT (SEE Fig.5.2 index 3)
S202	61596-0001	Switch, Pushbutton, 2 PDT (SEE Fig.5.2 index 4)
S203	61596-0001	Switch, Pushbutton, 2 PDT (SEE Fig.5.2 index 5)
S204	61596-0001	Switch, Pushbutton, 2 PDT (SEE Fig.5.2 index 6)
S205	61596-0001	Switch, Pushbutton, 2 PDT (SEE Fig.5.2 index 7)
S206	61596-0001	Switch, Pushbutton, 2 PDT (SEE Fig.5.2 index 8)
S207	61596-0001	Switch, Pushbutton, 2 PDT (SEE Fig.5.2 index 9)
S208	61596-0001	Switch, Pushbutton, 2 PDT (SEE Fig.5.2 index 10)
S209	61596-0001	Switch, Pushbutton, 2 PDT (SEE Fig.5.2 index 11)
S501	61596-0001	Switch, Pushbutton, 2 PDT (SEE Fig.5.2 index 11)
S502	61596-0001	Switch, Pushbutton, 2 PDT (SEE Fig.5.2 index 10)
S503	61596-0001	Switch, Pushbutton, 2 PDT (SEE Fig.5.2 index 9)
S504	61596-0001	Switch, Pushbutton, 2 PDT (SEE Fig.5.2 index 8)
S505	61596-0001	Switch, Pushbutton, 2 PDT (SEE Fig.5.2 index 7)
S506	61596-0001	Switch, Pushbutton, 2 PDT (SEE Fig.5.2 index 6)
S507	61596-0001	Switch, Pushbutton, 2 PDT (SEE Fig.5.2 index 5)
S508	61596-0001	Switch, Pushbutton, 2 PDT (SEE Fig.5.2 index 4)
S509	61596-0002	Switch, Pushbutton, 6 PDT (SEE Fig.5.2 index 3)
S701	61596-0003	Switch, Pushbutton, 10 pole (SEE Fig.5.7 index 20)
S702	61596-0003	Switch, Pushbutton, 10 pole (SEE Fig.5.7 index 21)
S703	61596-0003	Switch, Pushbutton, 10 pole (SEE Fig.5.7 index 22)
S704	61596-0003	Switch, Pushbutton, 10 pole (SEE Fig.5.7 index 23)
T301	11785-0001	Transformer (Output)
T601	11745-0001	Transformer (Driver)
T602	11848-0001	Transformer (Output)
U301	74038-0001	Integrated Circuit, Quad Op Amp (3401)
U601	74038-0001	Integrated Circuit, Quad Op Amp (3401)

List of Illustrations
Section 6

			ATP GRID	BLOW-UP FICHE
6-1	Phones Schematic	6-1	2A05	NC M604
6-2	Speaker Schematic	6-3	2A11	NC M604
6-3	CP 127 Functional Internal Wiring Diagram	6-5	2A15	NC M604


JUMPER WIRE
B-01683-101
B-01682-101
B-01685-105
COMPONENTS SHOWN AS ARE DIODES, CR'S.
D-54900C
D-54885C
SEE BLOW-UP

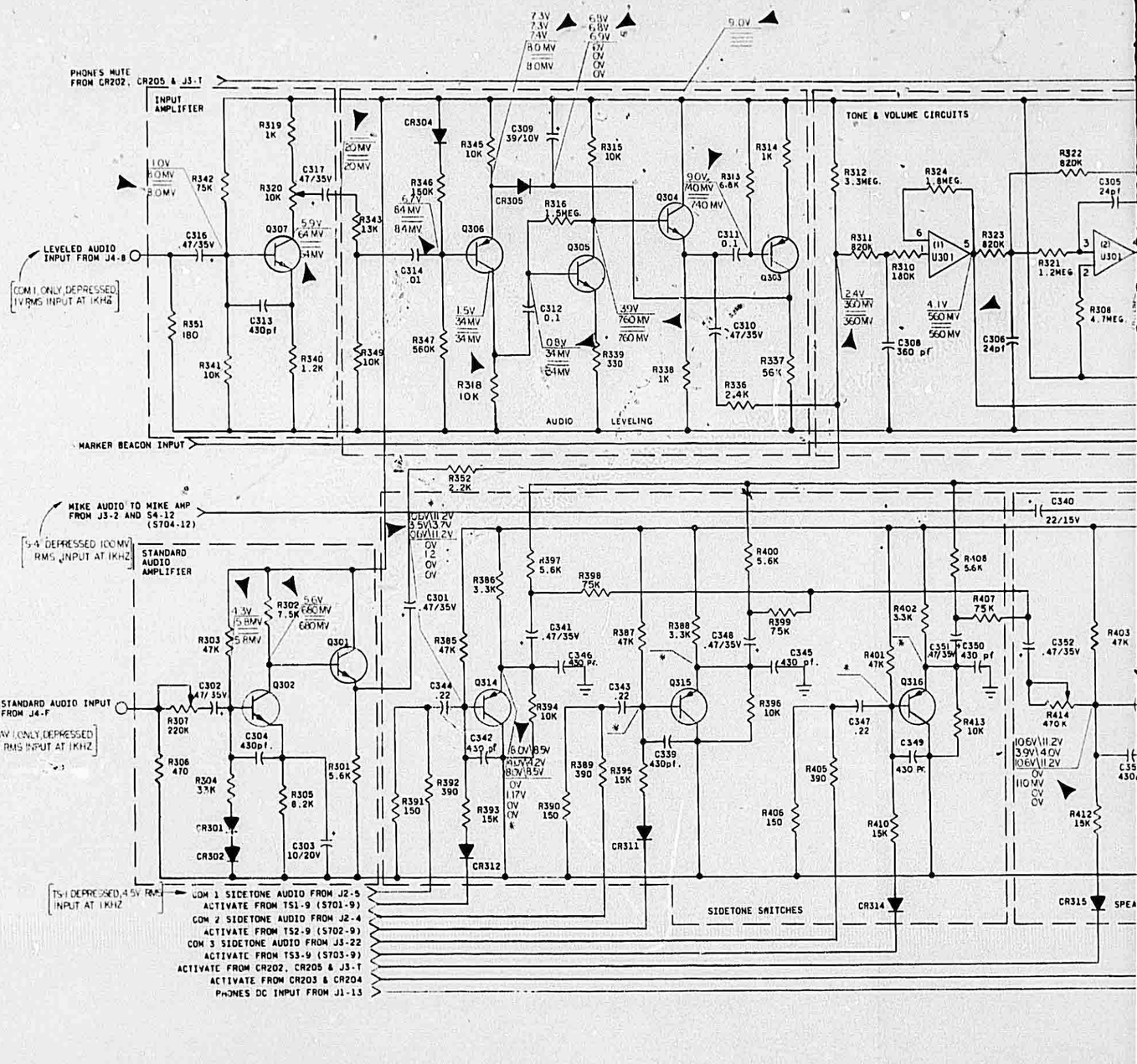

PHONES MUTE FROM CR202, CR205 & J3-T
INPUT AMPLIFIER
LEVELED AUDIO INPUT FROM J4-B
COM 1 ONLY DEPRESSED 1V RMS INPUT AT 1KHZ
MARKER BEACON INPUT
TONE & VOLUME CIRCUITS
AUDIO
LEVELING
MIKE AUDIO TO MIKE AMP FROM J3-2 AND S4-12 (S704-12)
S-4 DEPRESSED (100 MV RMS INPUT AT 1KHZ
STANDARD AUDIO AMPLIFIER
STANDARD AUDIO INPUT FROM J4-F
NAV 1 ONLY DEPRESSED 1V RMS INPUT AT 1KHZ
TS-1 DEPRESSED, 4.5V RMS INPUT AT 1KHZ
COM 1 SIDETONE AUDIO FROM J2-5
ACTIVATE FROM TS1-9 (S701-9)
COM 2 SIDETONE AUDIO FROM J2-4
ACTIVATE FROM TS2-9 (S702-9)
COM 3 SIDETONE AUDIO FROM J3-22
ACTIVATE FROM TS3-9 (S703-9)
ACTIVATE FROM CR202, CR205 & J3-T
ACTIVATE FROM CR203 & CR204
PHONES DC INPUT FROM J1-13
SIDETONE SWITCHES

FIGURE 6-1. P

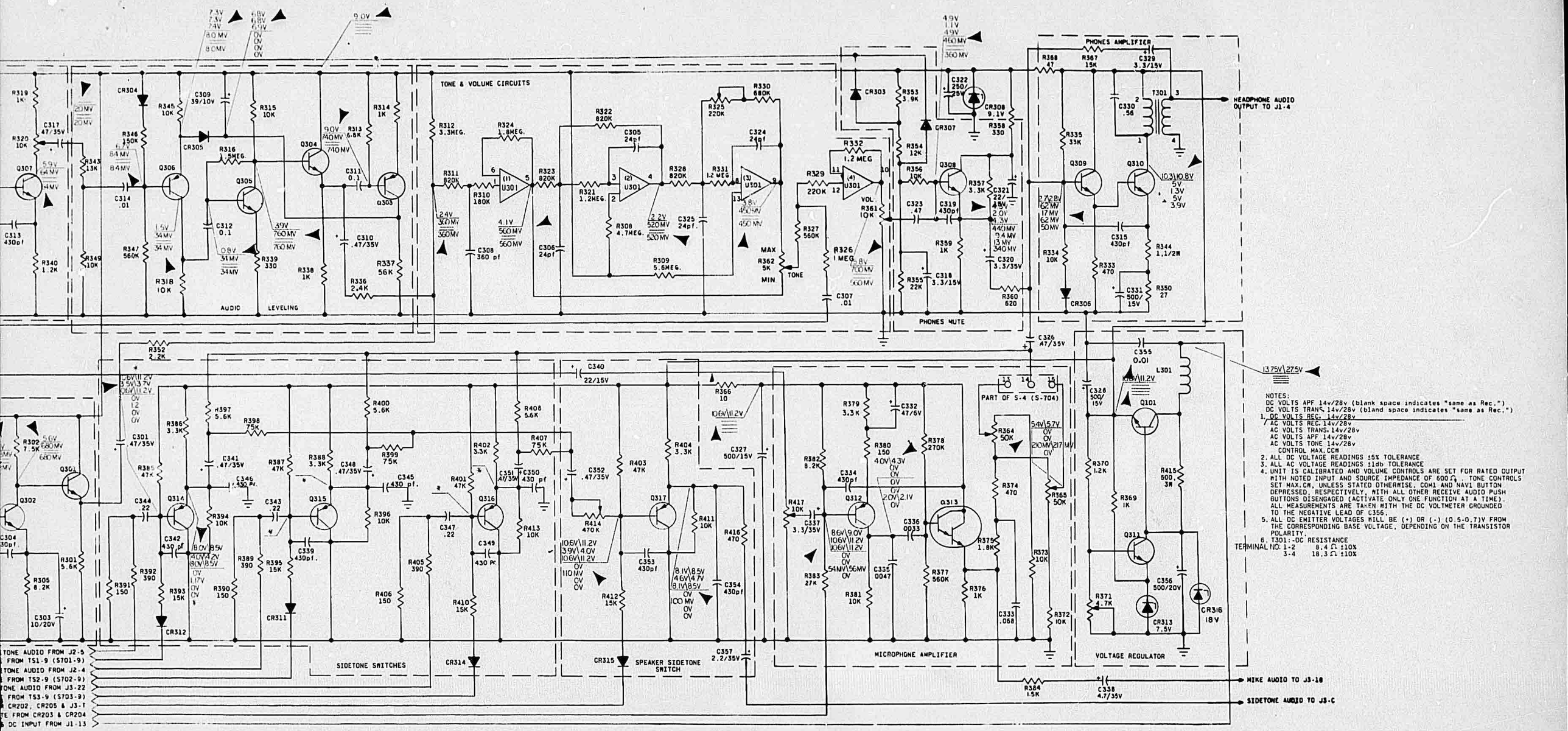
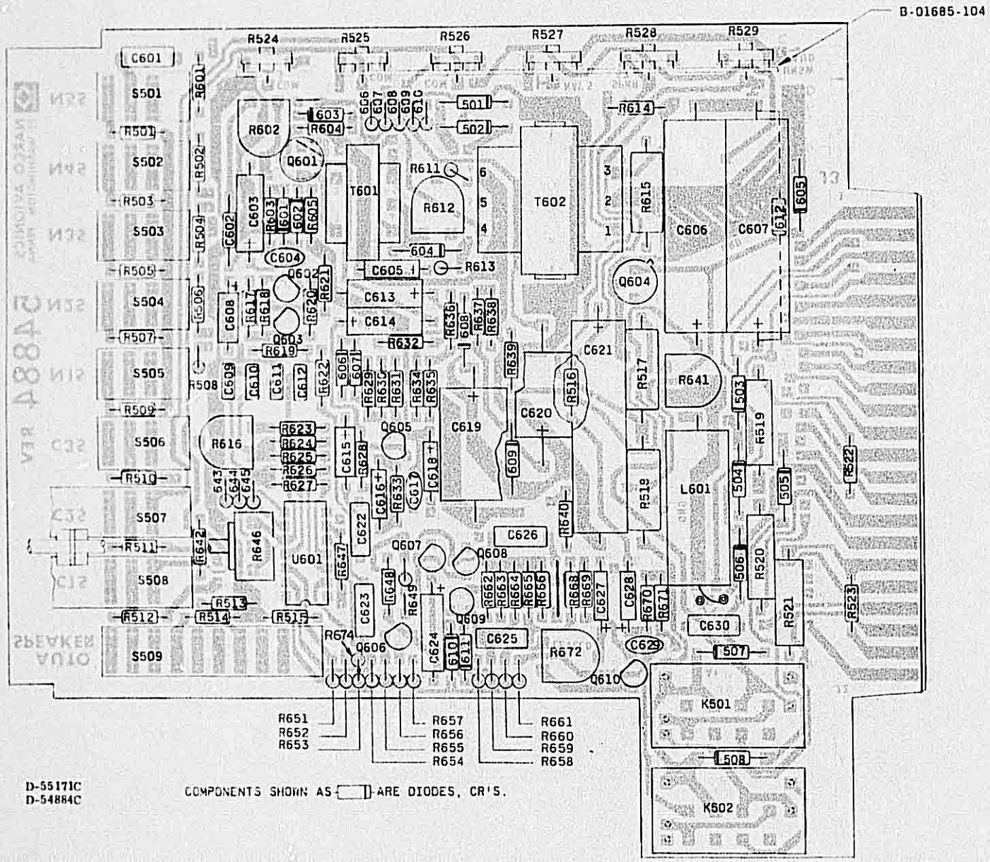
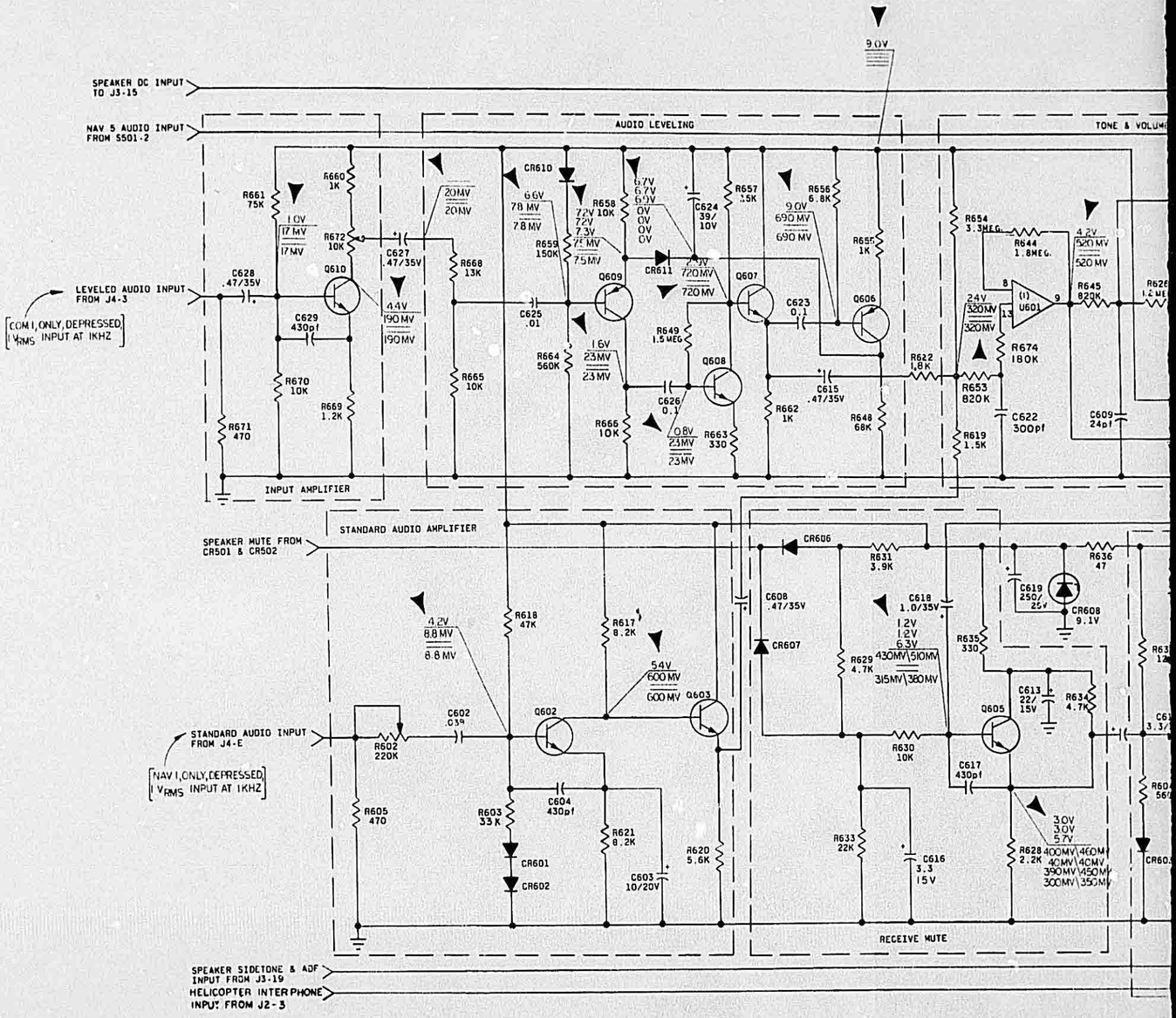


FIGURE 6-1. PHONES SCHEMATIC

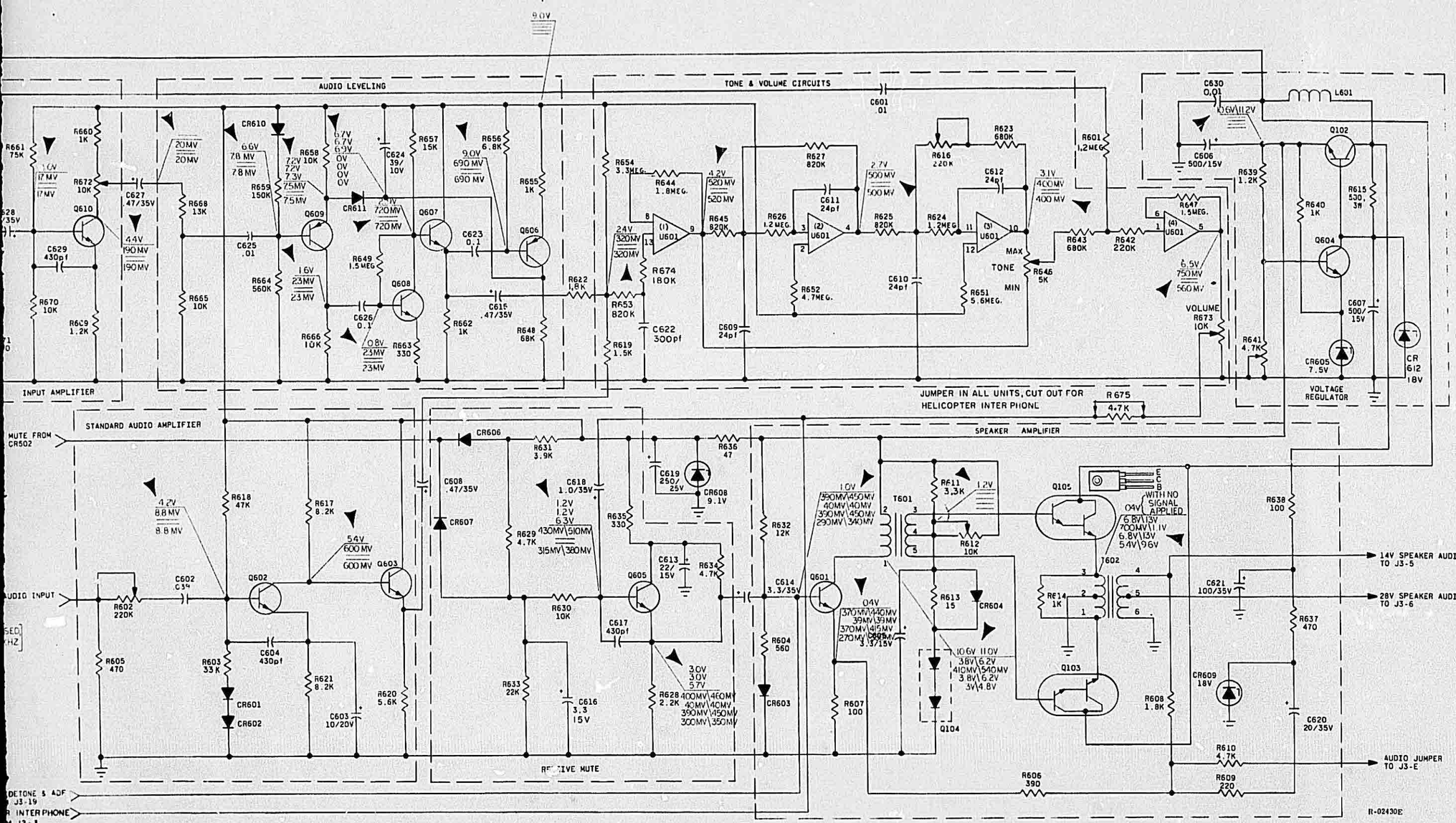
SEE BLOW-UP





SEE BLOW-UP

FIGURE 6-2.



NOTES:
DC VOLTS APF 14v/28v (blank space indicates "same as Rec")
DC VOLTS TRANS. 14v/28v (blank space indicates "same as Rec.")

1. DC VOLTS REC. 14v/28v
   AC VOLTS REC. 14v/28v
   AC VOLTS TRANS. 14v/28v
   AC VOLTS APF 14v/28v
   AC VOLTS TONE 14v/28v
   CONTROL MAX. CCW
2. ALL DC VOLTAGE READINGS ±5% TOLERANCE.
3. ALL AC VOLTAGE READINGS ±1db TOLERANCE EXCEPT WHERE NOTED.
4. AC VOLTAGE READINGS FOR Q605, Q601, Q103 AND Q105 ±2db TOLERANCE.
5. UNIT IS CALIBRATED AND VOLUME CONTROLS ARE SET FOR RATED OUTPUT WITH NOTED INPUT AND SOURCE IMPED. OF 600 Ω. TONE CONTROLS SET FOR MAX. CW, UNLESS STATED OTHERWISE, COM1 AND NAV1 BUTTONS DEPRESSED, RESPECTIVELY, WITH ALL OTHER RECEIVE AUDIO PUSH BUTTONS DISENGAGED (ACTIVATE ONLY ONE FUNCTION AT A TIME). ALL MEASUREMENTS ARE TAKEN WITH THE AC VOLTMETER GROUNDED TO THE NEG. LEAD OF C607.
6. ALL DC EMITTER VOLTAGES WILL BE (+) OR (-) (0.5-0.7)V FROM THE CORRESPONDING BASE VOLTAGE, DEPENDING ON THE TRANSISTOR POLARITY.
7. T601:- DC RESISTANCE
   TERMINAL NOS.
   1-2 30 Ω ±10%
   3-5 765 Ω ±10%
8. T602:- DC RESISTANCE
   TERMINAL NOS.
   1-3 1.18 Ω ±10%
   4-6 0.19 Ω ±10%

FIGURE 6-2. SPEAKER SCHEMATIC

SEE BLOW-UP

1. APT - Accessory Paging Function - Ramp Hall; Cabin Address and Interphone.
   ABR - Avionics Bus Relay
2. Pushbutton Switches:
   a) single pole double throw switch symbol: ⑤ ③ ① --- C1S with sliding contact (T)
   b) multiple pole switch terminals are sequentially numbered,
   c) all switch contact are paralleled although not shown as such,
   d) as shown the following pushbuttons are depressed:
      1) AUTO speaker
      2) TS1
      3) AUTO phones
3. Unless otherwise noted all resistors are in ohms, 1/4 watt, and all capacitors are in microfarads,
4. Letter/number combinations within ovals indicate wiring connections,
5. P4 jumpers are factory installed,
6. AC signal flow shown by arrowed lines,
7. All receive input pots are 500 ohms.

PILOT MIKE KEY — CR502 — MIKE KEY LINE
HEADPHONE AUDIO
R223 NAV 2 AUDIO IN — N2S-3 N2P-3
NAV 3 AUDIO IN — R221 — N3S-3 N3P-3
NAV 1 AUDIO IN — R224 — N1S-3 N1P-3
PILOT LAMPS
PILOT LAMPS
PHONES DC INPUT
COM 2 AUDIO IN
COM 1 AUDIO IN — R526 — R525 — C2P-3 — C1P-3

R-701 180, 3W
DS701 DS801 DS802 DS803 DS804

P4 STANDARD JUMPERS

J2
COM 2 TRANS. KEY — CR206
COM 1 TRANS. KEY — CR207
COM 2 SIDETONE IN
COM 1 SIDETONE IN
COM 2 MIKE AUDIO
COM 1 MIKE AUDIO
MIKE AUDIO IN
NAV 5 AUDIO IN — R527 — N5S-3 N5P-3
CR501

J3
COM 3 MIKE AUDIO
COM 3 TRANS. KEY — CR503
14V SPEAKER AUDIO
28V SPEAKER AUDIO
SEL. SPEAKER AUDIO

J3-5
J3-6
J3-E
J3-19
J2-3

SPEAKER AMPLIFIER Q103 Q104 Q105 Q601
RECEIVER MUTE Q605
TONE & VOL. CKTS U601
AUDIO LEVELING Q606,Q607 Q608,Q609
INPUT AMPLIFIER Q610
STANDARD AUDIO AMPLIFIER Q602,Q603
REG + DCV
VOLTAGE REGULATOR Q102 Q604
UNREG + DCV

J4
E D C B A 4 3 2 1

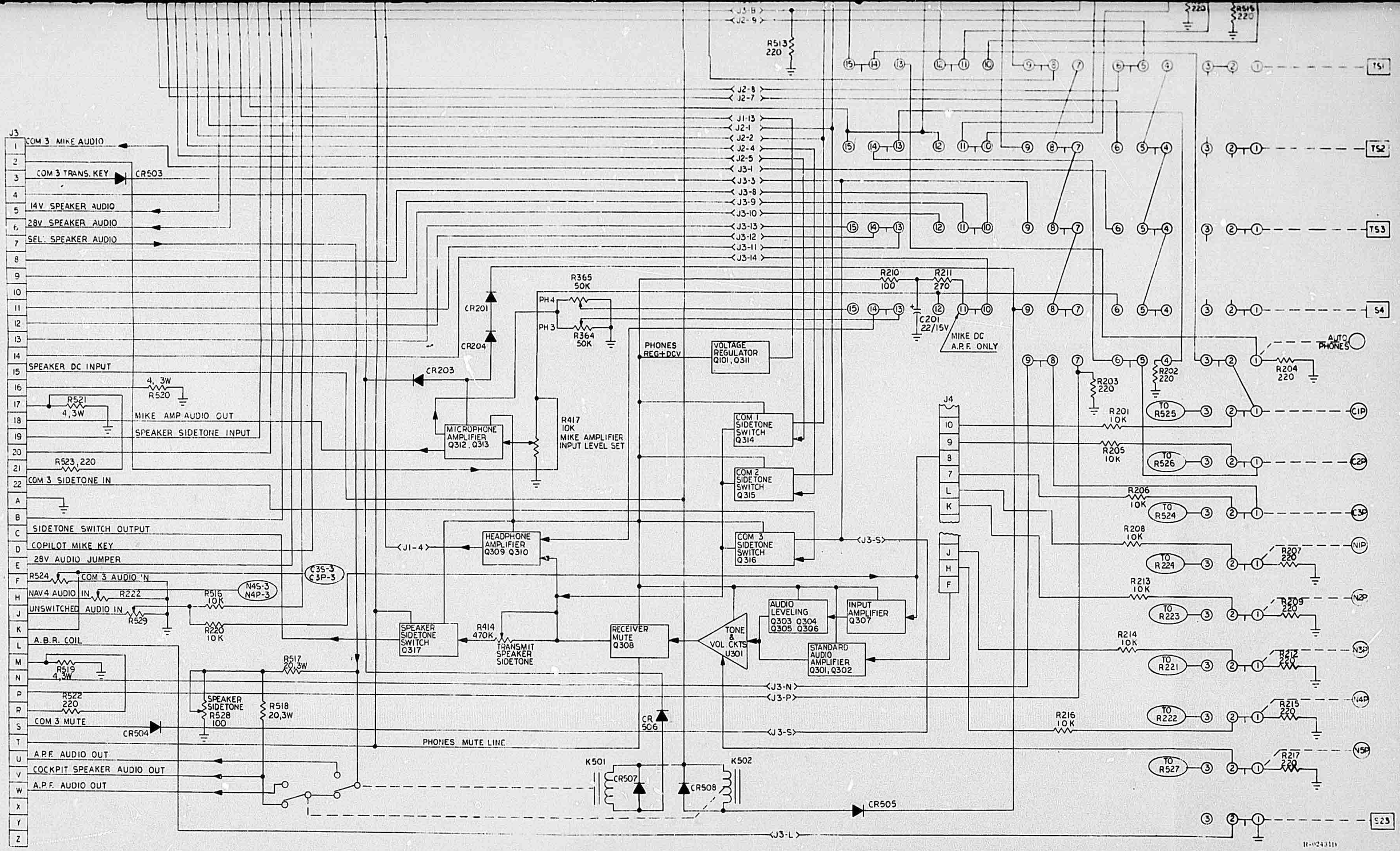
TO R527 — R501 220 — N5S
R502 10K — TO R222 — R503 220 — N4S
R504 10K — TO R221 — R505 220 — N3S
R506 10K — TO R223 — R507 220 — N2S
R508 10K — TO R224 — R509 220 — N1S
R510 10K — TO R524 — C3S
R511 10K — C2S
R512 10K — C1S
AUTO SPEAKER — R514 220 — R515 220

CR205
CR202
J3-20
J3-8
J2-9
R513 220

J2-8
J2-7
J1-13
J2-1
J2-2
J2-4
J2-5
J3-1
J3-3
J3-8
J3-9
J3-10
J3-13
J3-12
J3-11
J3-14

TS1
TS2
TS3
S4
AUTO PHONES

R365 50K — PH 4 — PH 3 — R364
CR201
R210 100
R211 270
C201 22/15V
MIKE DC



SEE BLOW-UP

SEE BLOW-UP

FIGURE 6-3. CP 127 FUNCTIONAL INTERNAL WIRING DIAGRAM

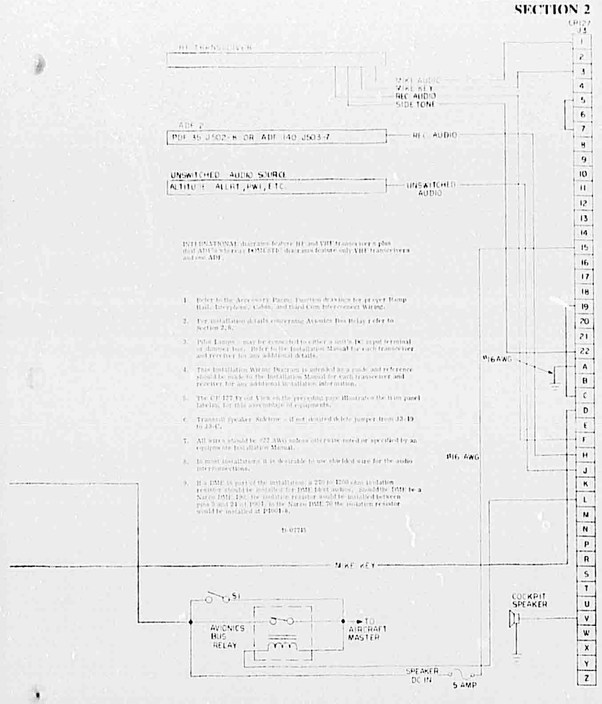


FIGURE 2-27. 14 VOLT INTERNATIONAL DUAL SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #2 Sheet 2 of 2

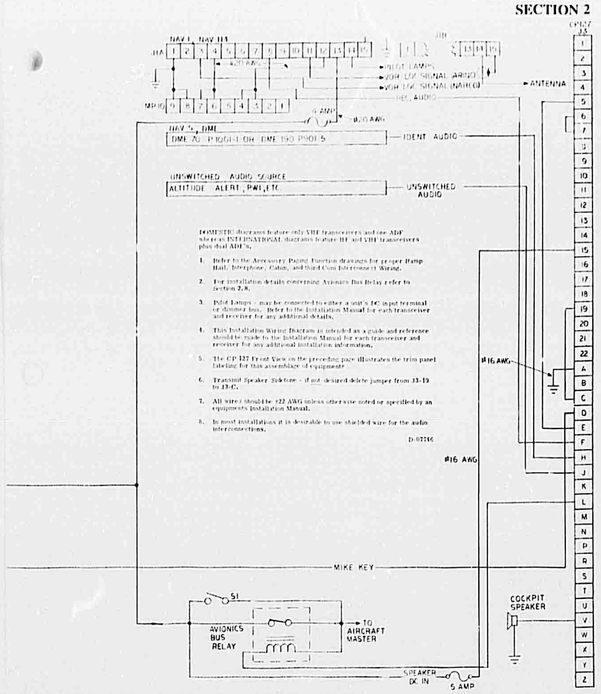


FIGURE 2-28. 28 VOLT DOMESTIC SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #1 Sheet 2 of 2

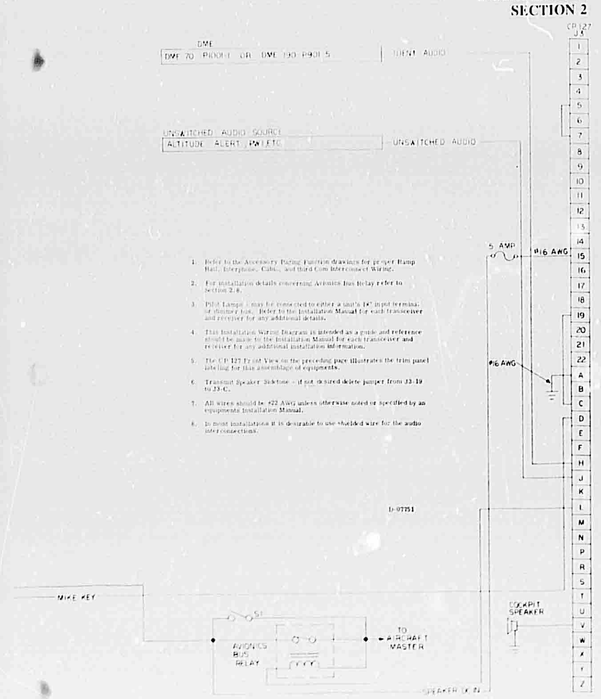


FIGURE 2-33. 14 VOLT EXECUTIVE NAV COM/CP 127 INSTALLATION WIRING DIAGRAM Sheet 2 of 2

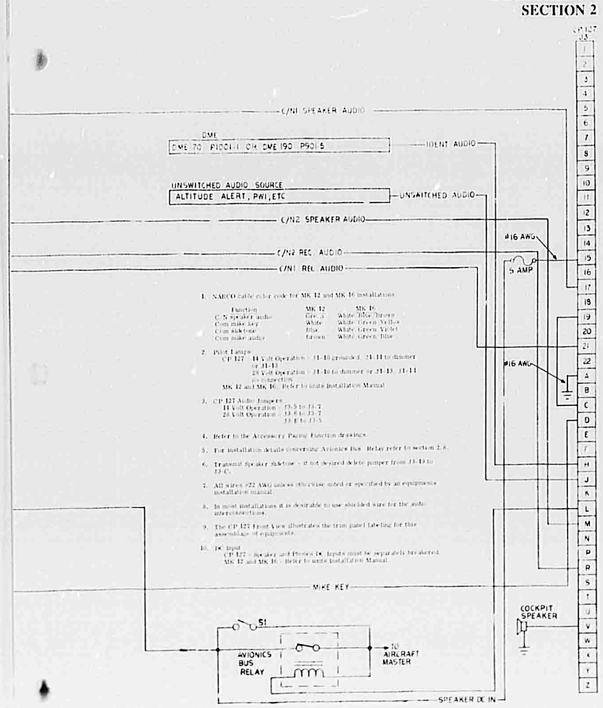


FIGURE 2-34. 14 and 28 VOLT MK 12 and MK 16 CP 127 INSTALLATION WIRING DIAGRAM Sheet 2 of 2

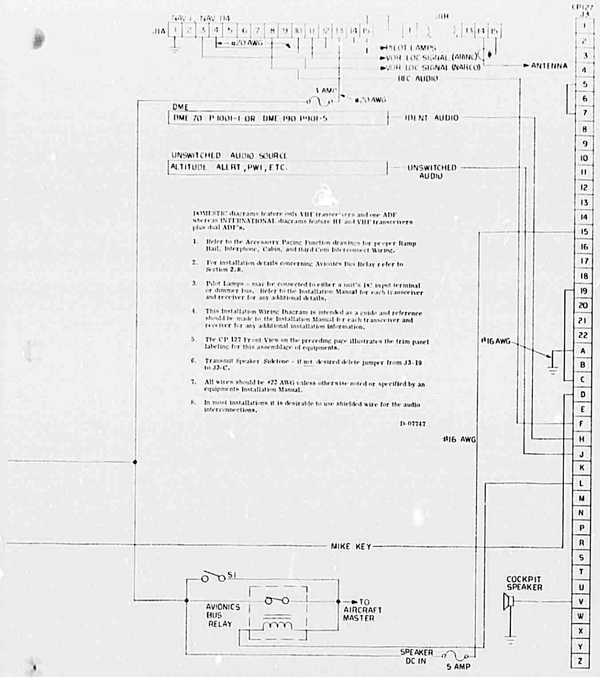


FIGURE 2-29. 14 VOLT DOMESTIC SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #1 Sheet 2 of 2

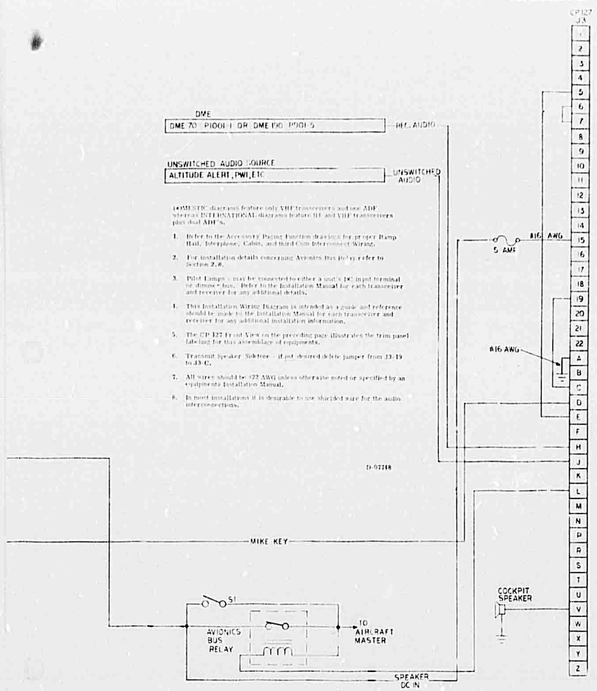


FIGURE 2-30. 28 VOLT DOMESTIC SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #2 Sheet 2 of 2

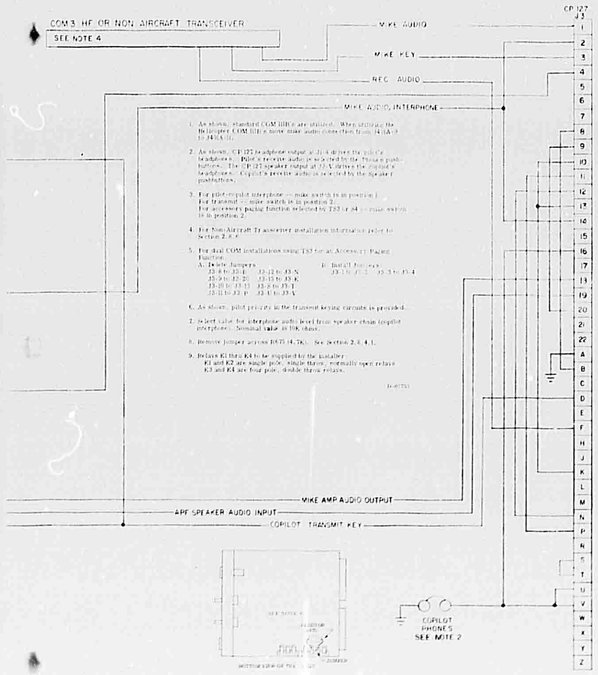


FIGURE 2-35. HELICOPTER INSTALLATION WIRING DIAGRAM Sheet 2 of 2

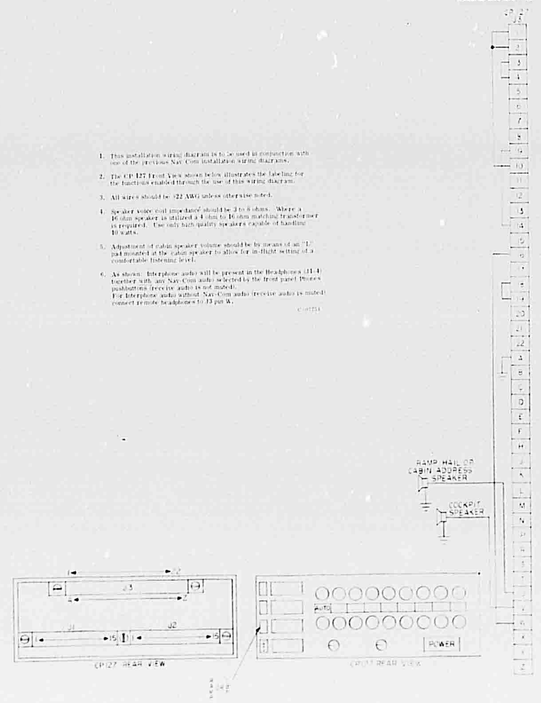


FIGURE 2-36. ACCESSORY PAGING FUNCTION - RAMP CABIN AND INTERPHONE

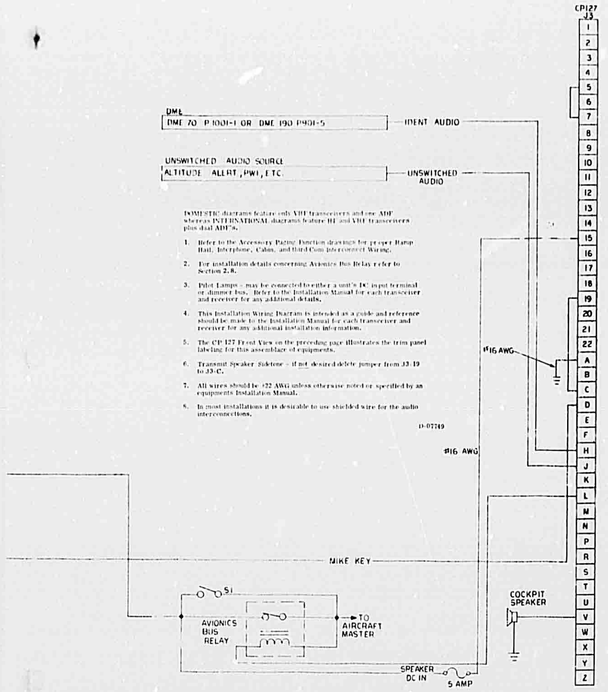


FIGURE 2-31. 14 VOLT DOMESTIC SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #2 Sheet 2 of 2

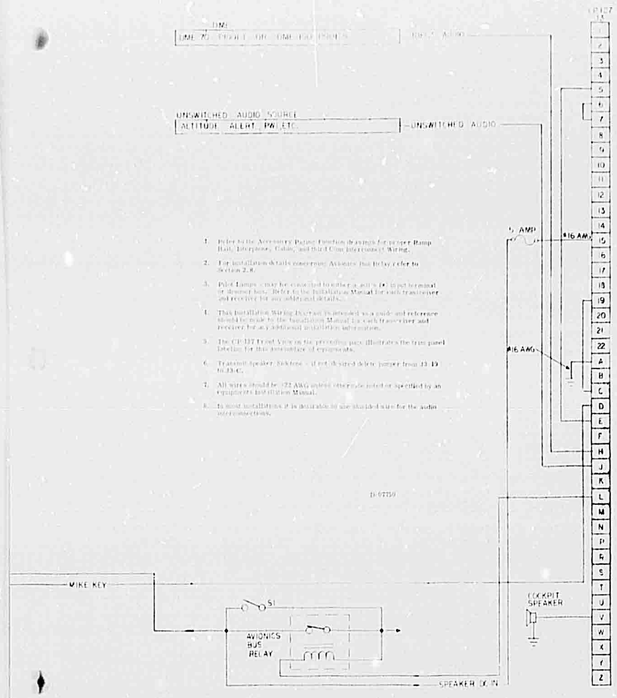


FIGURE 2-32. 28 VOLT EXECUTIVE NAV-COM/CP 127 INSTALLATION WIRING DIAGRAM Sheet 2 of 2

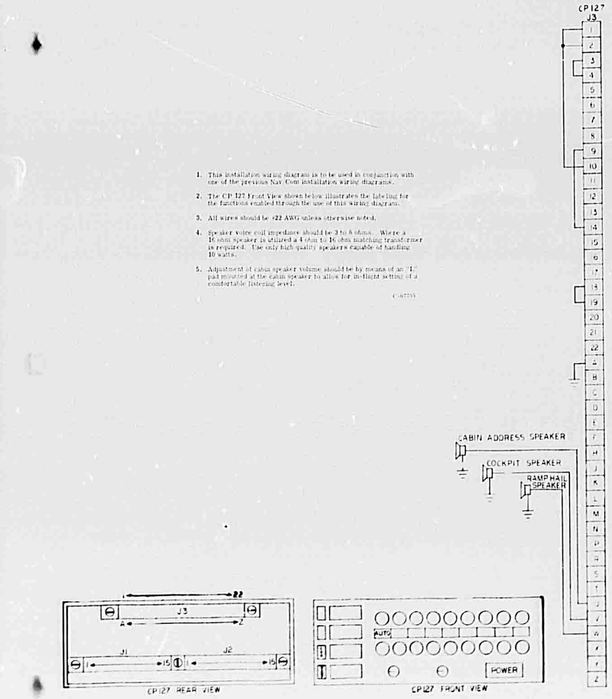


FIGURE 2-37. ACCESSORY PAGING FUNCTION - CABIN AND RAMP

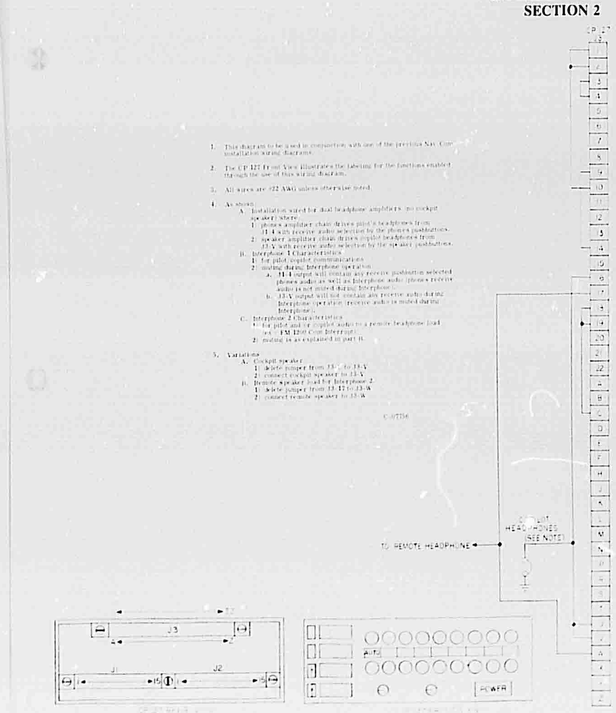


FIGURE 2-38. ACCESSORY PAGING FUNCTION - INTERPHONE 1 AND 2

2.8.1.1 COM 11B and COM 111B

Option 1 Refer to Fig. 2-4.

1. Bench test the transceiver. Refer to Section 2 of the COM 11B/COM 111B Maintenance Manual.
2. Remove the four screws that secure the top dust cover. Remove the cover.
3. Locate the volume control shaft collar (item 1) and remove the two forward setscrews (item 2).
4. Pull the volume knob and shaft (item 3) forward from the trim panel. Do not remove the collar.
5. Remove from the COM bench test cable harness the 1.5K resistor found at P401A, pins 7 and 8. Connect a 470 ohm resistor from pin 8 of P401A to ground. Connect an AC VTVM across the 470 ohm resistor.
6. Apply to the antenna connector a 5 uv RF signal, modulated 60% by 1 KHz on any selected Com frequency: Rotate the volume control shaft for 1.0 Vrms ± 1 db as read on the AC VTVM.
7. Apply silicon rubber or glyptul to the collar (item 1) and spring (item 5) junction to hold this setting.
8. Install an appropriate label over the volume control shaft hole. Refer to Section 2.7.1 Installation Kit Labels.

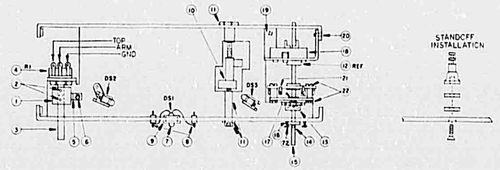
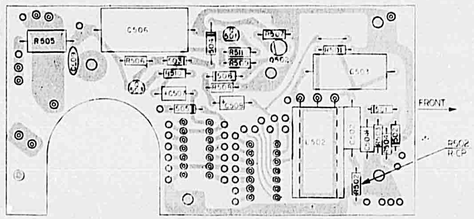


Figure 2-4. COM 11B/COM 111B VOLUME CONTROL MODIFICATION

2.8.1.2 COM 111 TSO

1. Bench test the transceiver. Refer to Section 2 of the COM 111 TSO Maintenance Manual.
2. Remove the top dust cover (six screws).
3. At the volume control, relocate the wire on the arm (the center lug) of the control to the adjacent lug where the coax center conductor is connected.
4. Cut out only the body of R502. For R-CP selection connect a resistance decade box across the remaining leads of R502.



LEFT SIDE TOP VIEW

FIGURE 2-5. COM 111 TSO INTERCONNECT BOARD

5. Remove the 1.5K ohm resistor from the COM bench test cable harness connector, P401A, Pins 7 and 8. Connect a 470 ohm resistor from P401A, Pin 8 to ground. Connect an AC VTVM across the 470 ohm resistor.
6. Apply to the antenna connector a 5 uv RF signal modulated 60% by 1 KHz on any selected Com frequency. Select a value of resistance for 1.0 Vrms ± 1db as read on the AC VTVM.
7. Remove the Interconnect Board's attaching hardware (4 screws) so that the solder side is accessible to unsolder R502's leads. Remove the leads.
8. Install the selected value resistor (R-CP) in place of R502.
9. Replace the Interconnect Board and secure it.
10. Replace the dust cover and secure it.

2.8.3 Continued

Modification to the standard wiring is accomplished as follows:

1. Remove the CP 127 from its mounting tray.
2. Remove P4 from the Transmit Switch PC Assembly by carefully pushing the connector towards the rear of the unit.
3. Refer to Fig. 2-11 and modify the P4 jumpers (for each receiver) to direct the speaker and phones audio inputs to the desired outputs.

   example: COM 3 from leveled audio to standard audio.

   Speaker { (a) remove speaker jumper from pin 3 to pin 4.
   (b) install a new speaker jumper from pin 4 to pin E.
   Phones { (c) remove phones jumper from pin 7 to pin 8.
   (d) install a new phones jumper from pin 7 to pin F.
4. Reinstall connector P4.



FIGURE 2-11. CP 127's CONNECTOR, P4, WITH FACTORY INSTALLED JUMPERS

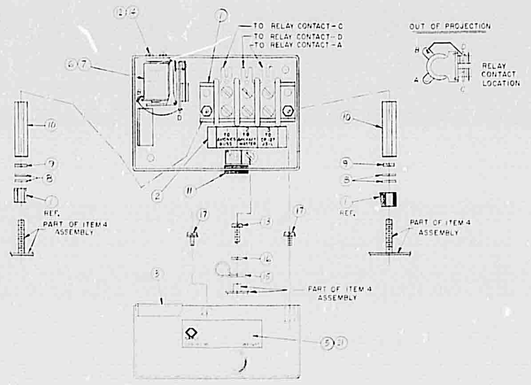
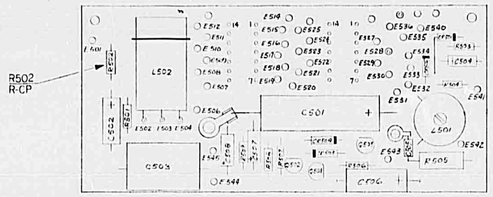


FIGURE 2-17. AVIONICS BUS RELAY ASSY DRAWING AND PARTS LIST

2.8.1.3 COM 11 and COM 11A

1. Bench test the transceiver. Refer to Section 2 of the COM 11/COM 11A Maintenance Manual.
2. Remove the top dust cover (six screws).
3. At the volume control, relocate the wire on the arm (the center lug) of the control to the adjacent lug where the coax conductor is connected.
4. Cut out **only the body** of R502. For R-CP selection connect a resistance decade box across the remaining leads of R502.



LEFT SIDE-TOP VIEW

FIGURE 2-6. COM 11/COM 11A INTERCONNECT BOARD

5. Remove the 1.5K ohm resistor from the COM bench test cable harness connector, P401A, Pins 7 and 8. Connect a 470 ohm resistor from P401A, Pin 8 to ground. Connect an AC VTVM across the 470 ohm resistor.
6. Apply to the antenna connector a 5 uv RF signal modulated 60% by 1 KHz on any selected Com frequency. Select a value of resistance for 1.0 Vrms ±1 db as read on the AC VTVM.
7. Remove the Interconnect Board's attaching hardware (4 screws) so that the solder side is accessible to unsolder R502's leads. Remove the leads.
8. Install the selected value resistor (R-CP) in place of R502.
9. Replace the Interconnect Board and secure it.
10. Replace the dust cover and secure it.

CP 127
CABLE CONNECTOR
J1

1	NO CONNECTION
2	NO CONNECTION
3	PILOT MIKE KEY (TIP)
4	HEADPHONE AUDIO OUTPUT
5	GROUND #16
6	NAV 2 RECEIVE AUDIO INPUT. SEE NOTE 2. (N25 AND N2P)
7	NAV 3 RECEIVE AUDIO INPUT. SEE NOTE 2. (N35 AND N3P)
8	NAV 1 RECEIVE AUDIO INPUT. SEE NOTE 2. (N15 AND N1P)
9	NO CONNECTION
10	PILOT LAMPS. SEE NOTE 7.
11	PILOT LAMPS. SEE NOTE 7.
12	NO CONNECTION
13	PHONES 1W/28VDC INPUT. #16 AWG, 2 AMP CIRCUIT BREAKER.
14	COM 2 RECEIVE AUDIO INPUT. SEE NOTE 2. (C2S AND C2P)
15	COM 1 RECEIVE AUDIO INPUT. SEE NOTE 2. (C1S AND C1P)

CP 127
CABLE CONNECTOR
J2

1	TRANSMIT KEY FOR COM 2
2	TRANSMIT KEY FOR COM 1
3	NO CONNECTION
4	SIDETONE AUDIO INPUT FROM COM 2. SEE NOTE 3.
5	SIDETONE AUDIO INPUT FROM COM 1. SEE NOTE 3.
6	NO CONNECTION
7	MIKE AUDIO TO COM 2
8	MIKE AUDIO TO COM 1
9	MIKE AUDIO INPUT (RING). SEE NOTE 10.
10	NAV 5 MARKER RECEIVE AUDIO INPUT. SEE NOTE 2. (N5S AND N5P)
11	NO CONNECTION
12	NO CONNECTION
13	NO CONNECTION
14	NO CONNECTION
15	NO CONNECTION

CP 127 General Installation Wiring Diagram

1. (a) Refer to CP 127 Front View for location of Pushbutton Switches TS3 and S4.
   (b) Accessory Paging Functions are Ramp Hail, Passenger Cabin Address and Interphone.
   (c) Where no separation exists, the connector pin function is common.
2. Com and Nav receiver audio inputs are factory set for 1.0 Vrms. Input potentiometers allow compensation for receivers not providing this level. See section 2.3 for audio level adjustment. The receiver pushbutton switches for each input are in brackets ( ). Refer to the CP 127 Front View for location of each pushbutton.
3. Sidetone audio input level is 4.5 Vrms for 25 mw into 600 ohm headphones.
4. Audio Jumper connections
   14 Volt Installation: J3-5 to J3-7
   28 Volt Installation: J3-6 to J3-7 and J1-1 to J3-5
5. Mic Amp Audio Output. J3-16, jumpered to J3-19 for Ramp Hail and Passenger Cabin Address as well as for Interphone operation utilizing the speaker amplifier to drive a headphone load.
6. Internal Speaker Load. J3-16, is intended to properly load the speaker amplifier when the amplifier is used to drive a headphone load for either Interphone use or when the speaker channel is to be used as a second headphone channel.
7. Pilot Lamp voltage change-over connections
   14 Volt Installation: J1-10 to ground, J1-11 to dimmer or ... r J1-13
   28 Volt Installation: J1-10 to dimmer or jumper to J1-13, J1-11 - No Connection
8. All wires should be #22 AWG unless otherwise specified.
9. In most installations it is desirable to use shielded wire for the audio interconnections.
10. Mike audio input is factory set for NARCO's MD9A interphone.
11. Transmit Speaker Sidetone enabled by jumper from J1-19 to J1-6.

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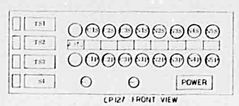


FIGURE 2-23. CP 127 GENERAL INSTALLATION WIRING DIAGRAM
Sheet 1 of 2

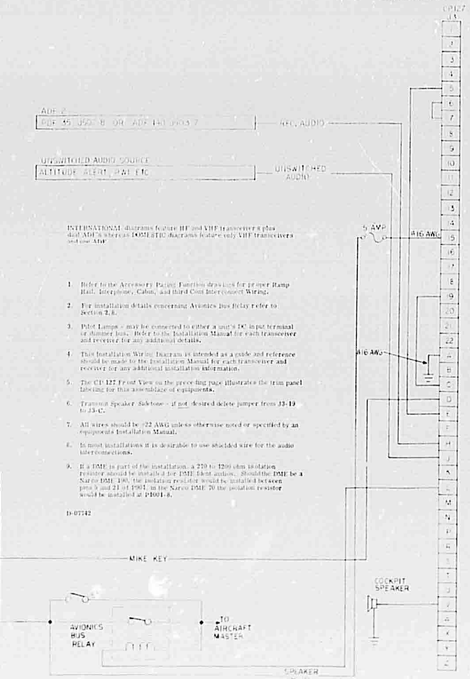


FIGURE 2-24. 28 VOLT INTERNATIONAL SPECTRUM/CP 127 INSTALLATION WIRING DIAGRAM #1
Sheet 2 of 2

2.8.1.4 NAV 14

1. Bench test the receiver. Refer to Section 2 of the NAV 14 Maintenance Manual.
2. Remove the top dust cover (six screws).
3. At the volume control, relocate the wire on the arm (the center lug) of the control to the adjacent lug where the coax conductor is connected.
4. Cut out **only the body** of R502. For R-CP selection connect a resistance decade box across the remaining leads of R502.

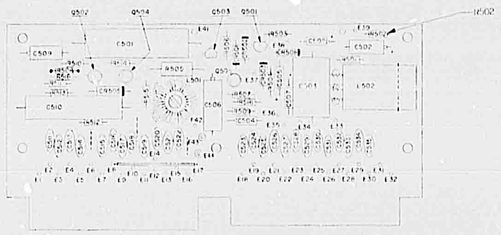
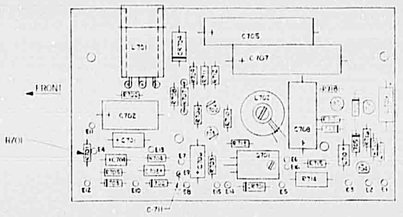


FIGURE 2-7. NAV 14 CONNECTOR BOARD

5. Connect a 470 ohm resistor from J1A, Pin 8 to ground. Connect an AC VTVM across the 470 ohm resistor.
6. Apply to the antenna connector a 5 uv RF signal modulated 15% by 1 KHz on any selected Nav frequency. Select a value of resistance for 1.0 Vrms ±1 db as read on the AC VTVM.
7. Remove the Connector Board's attaching hardware (four screws) so that the solder side is accessible to unsolder R701's leads. Remove the leads.
8. Install the selected value resistor (R-CP) in place of R502.
9. Replace the Connector Board and secure it.
10. Replace the dust cover and secure it.

2.8.1.5 NAV 14/DME and NAV 114

1. Bench test the receiver. Refer to Section 2 of either the NAV 14/DME or the NAV 114 Maintenance Manual.
2. Remove the top dust cover (six screws).
3. At the volume control, relocate the wire on the arm (the center lug) of the control to the adjacent lug where the coax conductor is connected.
4. Cut out **only the body** of R701. For R-CP selection connect a resistance decade box across the remaining leads of R701.



TOP VIEW

FIGURE 2-8. NAV 14/DME and NAV 114 CONNECTOR BOARD

5. Connect a 470 ohm resistor from J1A, Pin 8 to ground. Connect an AC VTVM across the 470 ohm resistor.
6. Apply to the antenna connector a 5 uv RF signal modulated 15% by 1 KHz on any selected Nav frequency. Select a value of resistance for 1.0 Vrms ±1 db as read on the AC VTVM.
7. Remove the Connector Board's attaching hardware (four screws) so that the solder side is accessable to unsolder R701's leads. Remove the leads.
8. Install the selected value resistor (R-CP) in place of R701.
9. Replace the Connector Board and secure it.
10. Replace the dust cover and secure it.

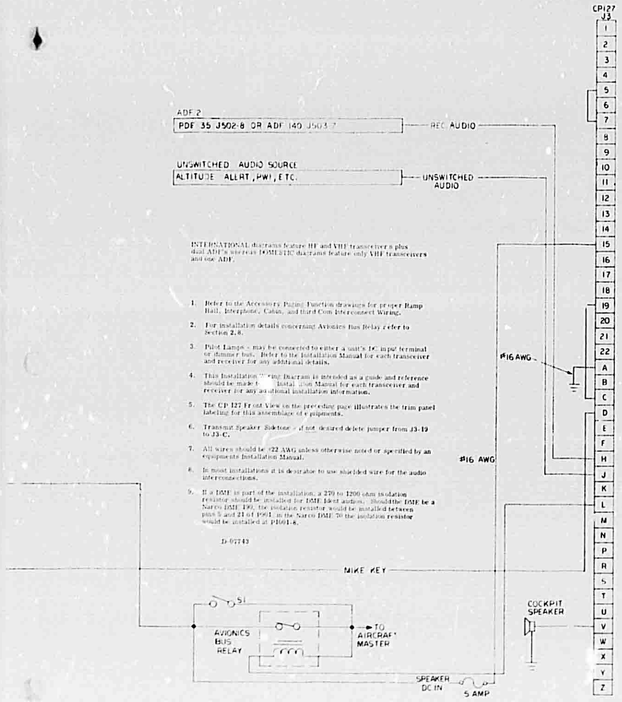


FIGURE 2-25. 14 VOLT INTERNATIONAL SPECTRUM CP 127 INSTALLATION WIRING DIAGRAM #1 Sheet 2 of 2

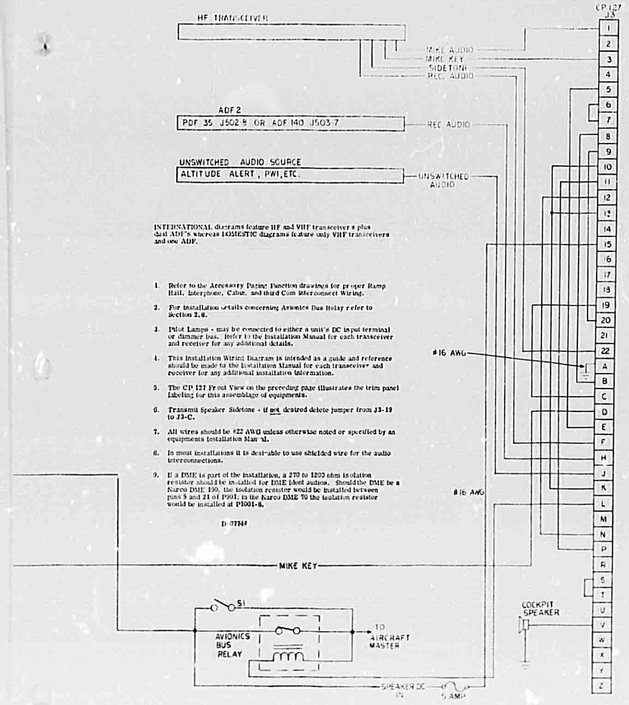
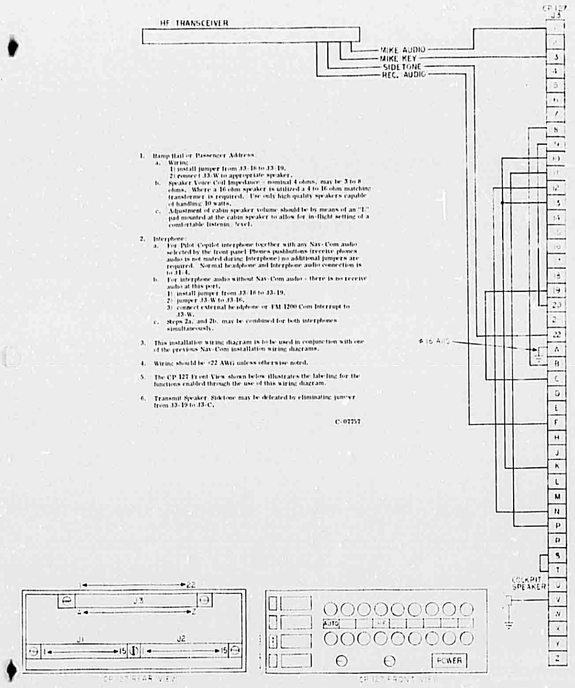


FIGURE 2-26. 28 VOLT INTERNATIONAL DUAL SPECTRUM CP 127 INSTALLATION WIRING DIAGRAM #2 Sheet 2 of 2



1. Ramp Hailer Passenger Address:
   a. Wiring:
      1) install jumper from J3-16 to J3-19.
      2) connect J3-W to appropriate speaker.
   b. Speaker Voice Coil Impedance – nominal 4 ohms, may be 3 to 8 ohms. Where a 16 ohm speaker is utilized a 4 to 16 ohm matching transformer is required. Use only high-quality speakers capable of handling 10 watts.
   c. Adjustment of cabin speaker volume should be by means of an "L" pad mounted at the cabin speaker to allow for in-flight setting of a comfortable listenin 'evel.

2. Interphone:
   a. For Pilot Copilot interphone (together with any Nav-Com audio selected by the front panel Phones pushbuttons (receive phones audio is not muted during Interphone) no additional jumpers are required. Normal headphone and Interphone audio connection is to J1-L.
   b. For interphone audio without Nav-Com audio - there is no receive audio at this port.
      1) install jumper from J3-16 to J3-19.
      2) jumper J3-W to J3-16.
      3) connect external headphone or TSI 1200 Com Interrupt to J3-W.
   c. Steps 2a. and 2b. may be combined for both interphones simultaneously.

3. This installation wiring diagram is to be used in conjunction with one of the previous Nav-Com installation wiring diagrams.

4. Wiring should be #22 AWG unless otherwise noted.

5. The CP 127 Front View shown below illustrates the labeling for the functions enabled through the use of this wiring diagram.

6. Transmit Speaker Disk-one may be defeated by eliminating jumper from J3-19 to J3-C.

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FIGURE 2-39. ACCESSORY PAGING FUNCTION - THIRD COM AND CABIN/RAMP

3.6.2 Standard Audio Amplifier

Speaker Chain – Q602 and Q603 Phones Chain – Q301 and Q302

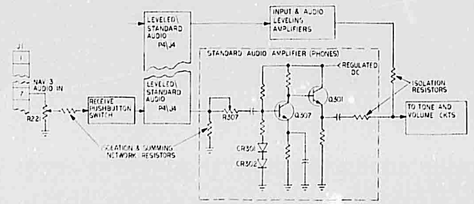


FIGURE 3-7. TYPICAL STANDARD AUDIO CIRCUIT (Phones Shown)

Figure 3-7 details a standard audio amplifier and locates the stage in the flow of receive audio. Potentiometer R307 is used to equalize the gain of the standard audio amplifier and the audio leveling amplifiers. Amplifier Q307 is a Class A voltage amplifier temperature compensated by diodes CR301 and CR302. Emitter follower Q301 is direct coupled to Q307. The output of Q307 is R-C coupled to the tone and volume circuits.

3.6.3 Input and Audio Leveling Amplifiers

Speaker Chain – Q608 thru Q610 Phones Chain – Q303 thru Q307

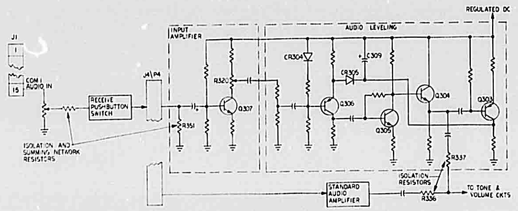


FIGURE 3-8. TYPICAL AUDIO LEVELING CIRCUIT (Phones Shown)

The Phones audio leveling circuit is shown in Figure 3-8. The first stage, Q307, is a Class A voltage amplifier with variable resistor R320 as the major part of its collector load. R320 is adjusted to set the AC drive voltage to the audio leveling circuit such that a typical receive signal will drive the audio leveling about midway through its total leveling range. This set point is somewhat critical since it will determine the degree or amount of audio leveling above and below the set point for receive signals which vary above or below the typical.

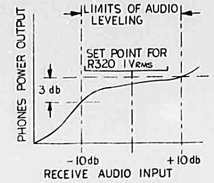
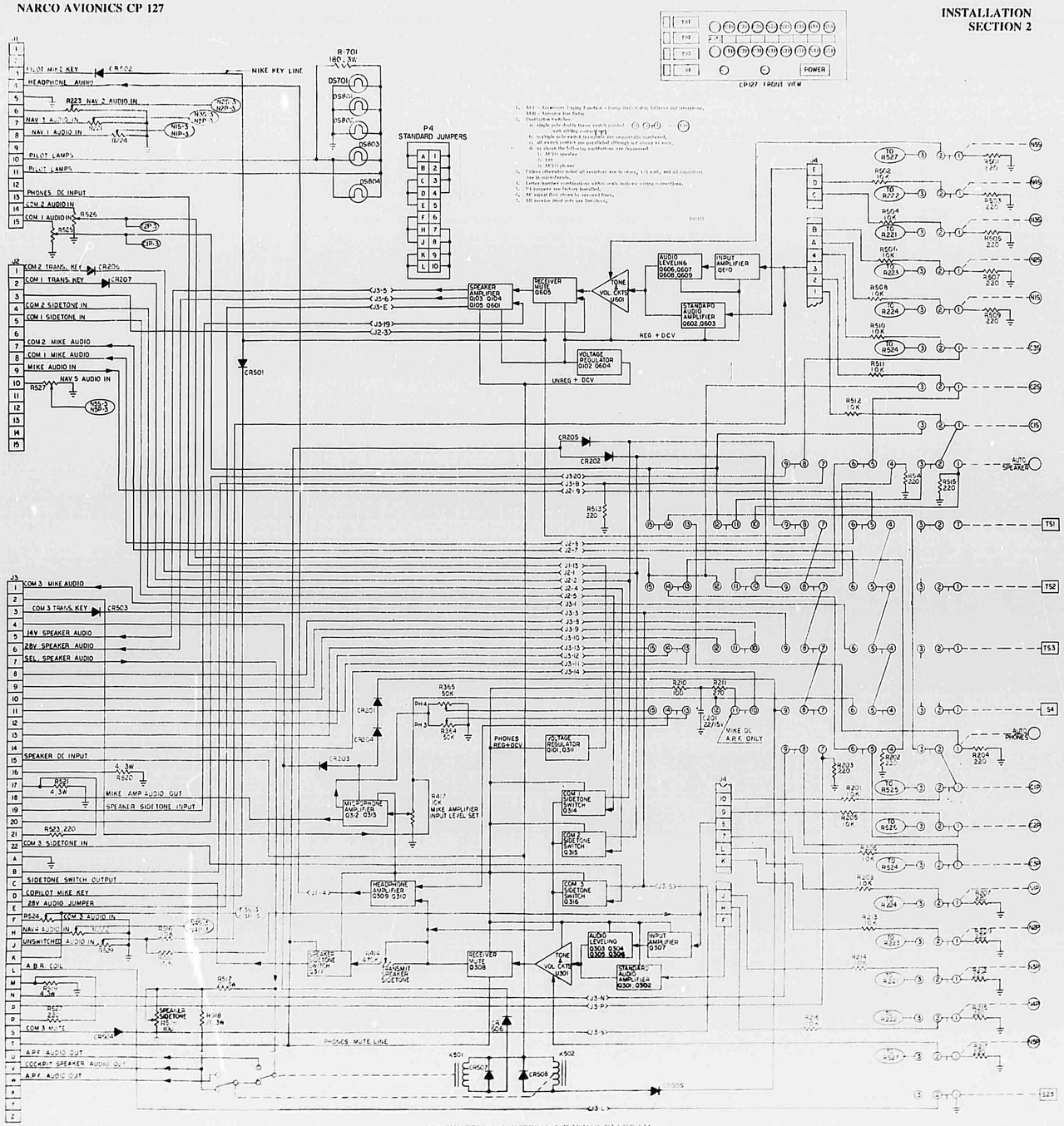


FIGURE 3-9. LEVELING CHARACTERISTICS



CP FUNCTIONAL INTERNAL WIRING DIAGRAM

3.1 GENERAL

Figure 3–1 is a simplified block diagram of the CP 127. Common inputs, functions, and outputs are shown as groups rather than individually. For example, 5 Nav receive inputs are shown as one input. This block diagram is intended to show audio signal flow, locations of switching functions, blocks of amplification or electronic switching, and basic interconnections. Each of the blocks shown will be discussed in this Section.

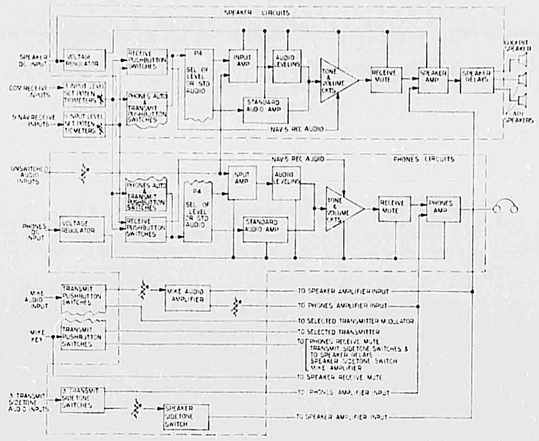


FIGURE 3–1. CP 127 BLOCK DIAGRAM

Figure 2–40, the Functional Internal Wiring Diagram should now be reviewed. This diagram treats the CP 127 circuits from a functional viewpoint and illustrates all of the functional interconnections and in effect extends the block diagram.

3.3 RECEIVE INPUT SWITCHING

3.3.1 NAV Inputs

A typical NAV receive input and its associated switching are shown in Figure 3–2.

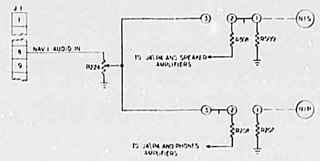


FIGURE 3–2. TYPICAL NAV RECEIVE INPUT

3.3.2 COM Inputs

A typical COM receive input and its associated switching, including the AUTO function are shown in Figure 3–3. The AUTO function permits simultaneous selection of a COM receiver and a COM transmitter by the rectangular transmit select pushbuttons.

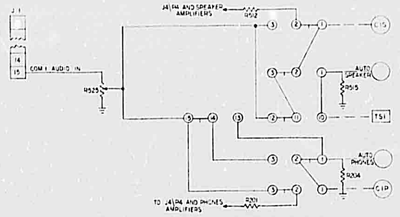


FIGURE 3–3. TYPICAL COM RECEIVE INPUT

As shown, the COM 1 speaker switching is in the Auto mode while the COM 1 phones switching is not.

4.5.2 Darlington Power Transistors (Q103, Q104, and Q105)

When ordering replacement power transistors be sure to specify color code on the device to be replaced.

Replacement of a Darlington requires checking and if necessary setting the idling current. The setting must be done with "no input signal" and a cool heatsink. Refer to Figure 4–2 for the setting of the idling current.

PROCEDURE

1. Remove jumper across terminals A and B.
2. Connect a 0 to 50 ma meter across terminals as shown in Detail A.
   (Capacitor "C" may be required depending upon the meter's characteristics, lead lengths, etc.)
3. Apply power and adjust R612 for:
   14 Vdc operation – – – 20 to 25 ma
   28 Vdc operation – – – 25 to 30 ma
4. Remove power, the meter, and reinstall the jumper across terminals A and B.

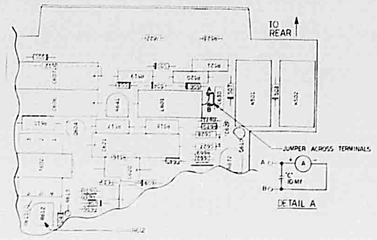


FIGURE 4–2. IDLING CURRENT SETTING

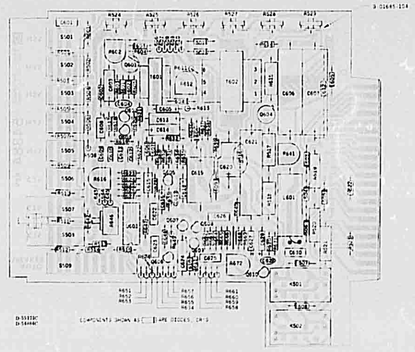


FIGURE 5.4. SPEAKER PC BOARD ASSY

MECHANICAL PARTS LIST

FIGURE & INDEX NUMBER	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	QTY
5.4	01683-0101		SPEAKER PC BOARD ASSY (See Fig. 5.1 Index –26 for NHA)	REF
–1	52726-0001		PAD, Transistor Mounting	3
–2	54897-0001		FRAME, Transformer	1

NOTE: The PC board has no other mechanical parts. For full identification of electrical parts, determine the part's symbol number then refer to the Electrical Parts List section, locate the symbol number. (The symbol numbers are in alpha-numerical sequence.)

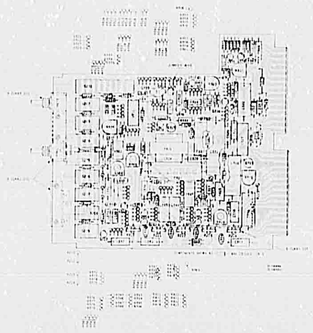


FIGURE 5.6. PHONES PC BOARD ASSY

MECHANICAL PARTS LIST

FIGURE & INDEX NUMBER	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	QTY
5.6	01684-0101		PHONES PC BOARD ASSY (See Fig. 5.1 Index -49 for NHA)	REF
-1	52726-0001		PAD, Transistor Mounting	2

NOTE: The PC board has no other mechanical parts. For full identification of electrical parts, determine the part's symbol number then refer to the Electrical Parts List section, locate the symbol number. (The symbol numbers are in alpha-numerical sequence.)

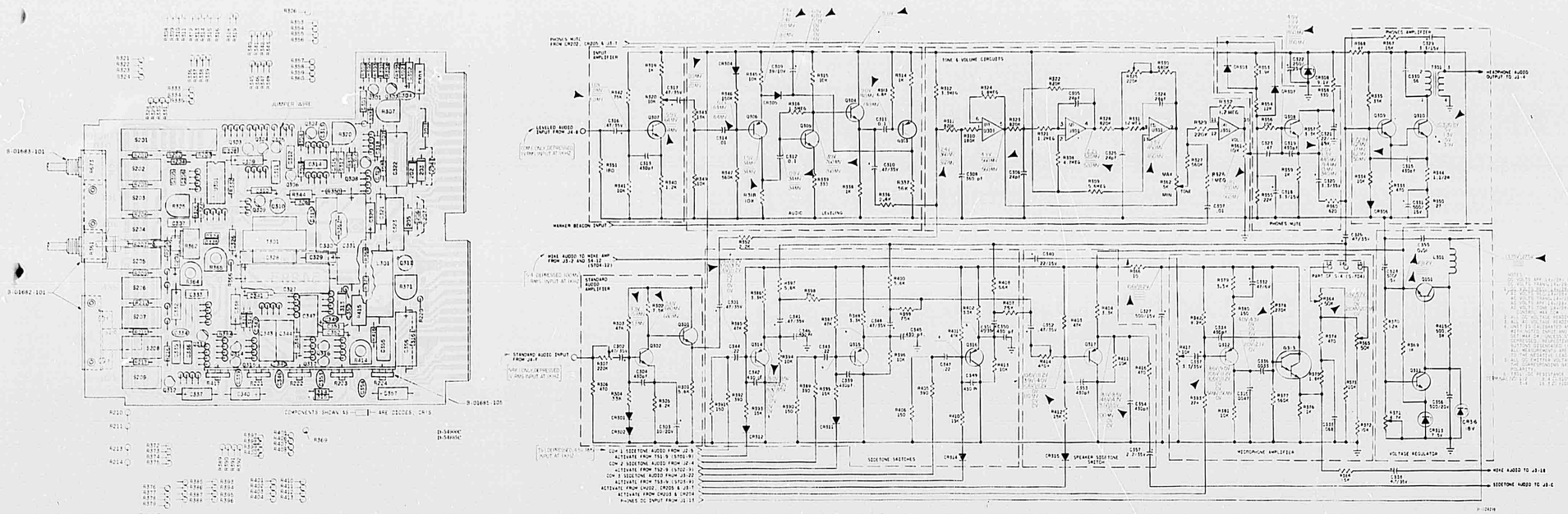


FIGURE 6-1. PHONES SCHEMATIC

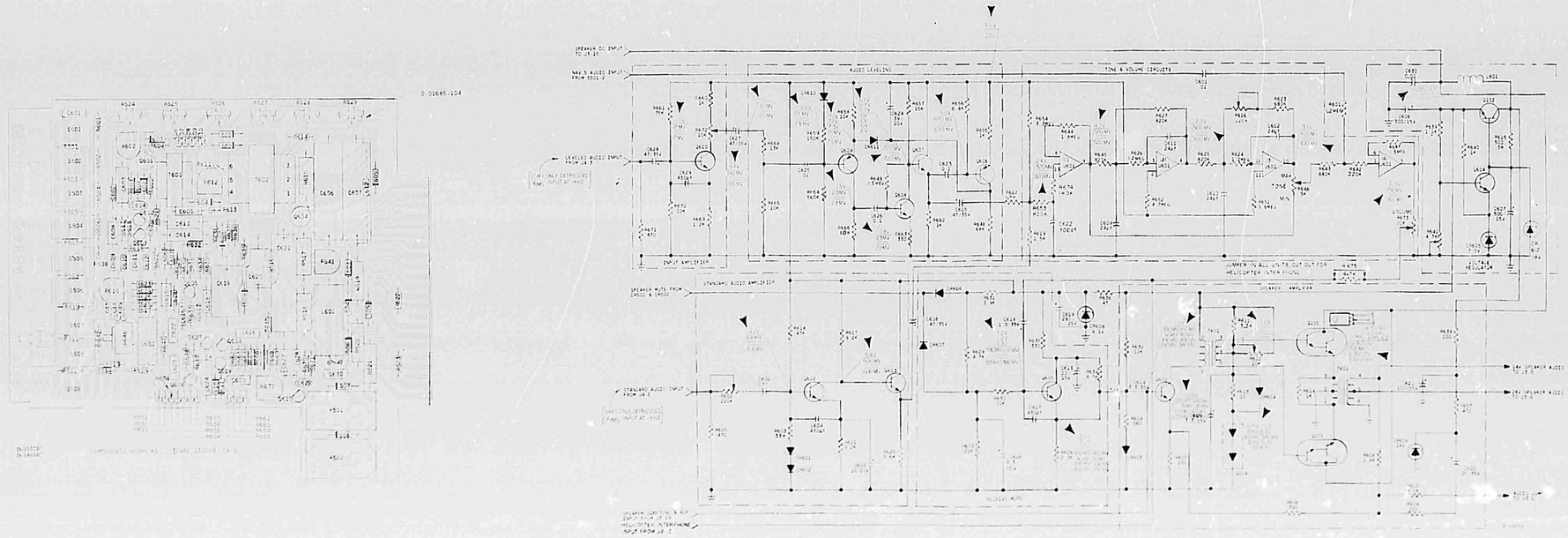
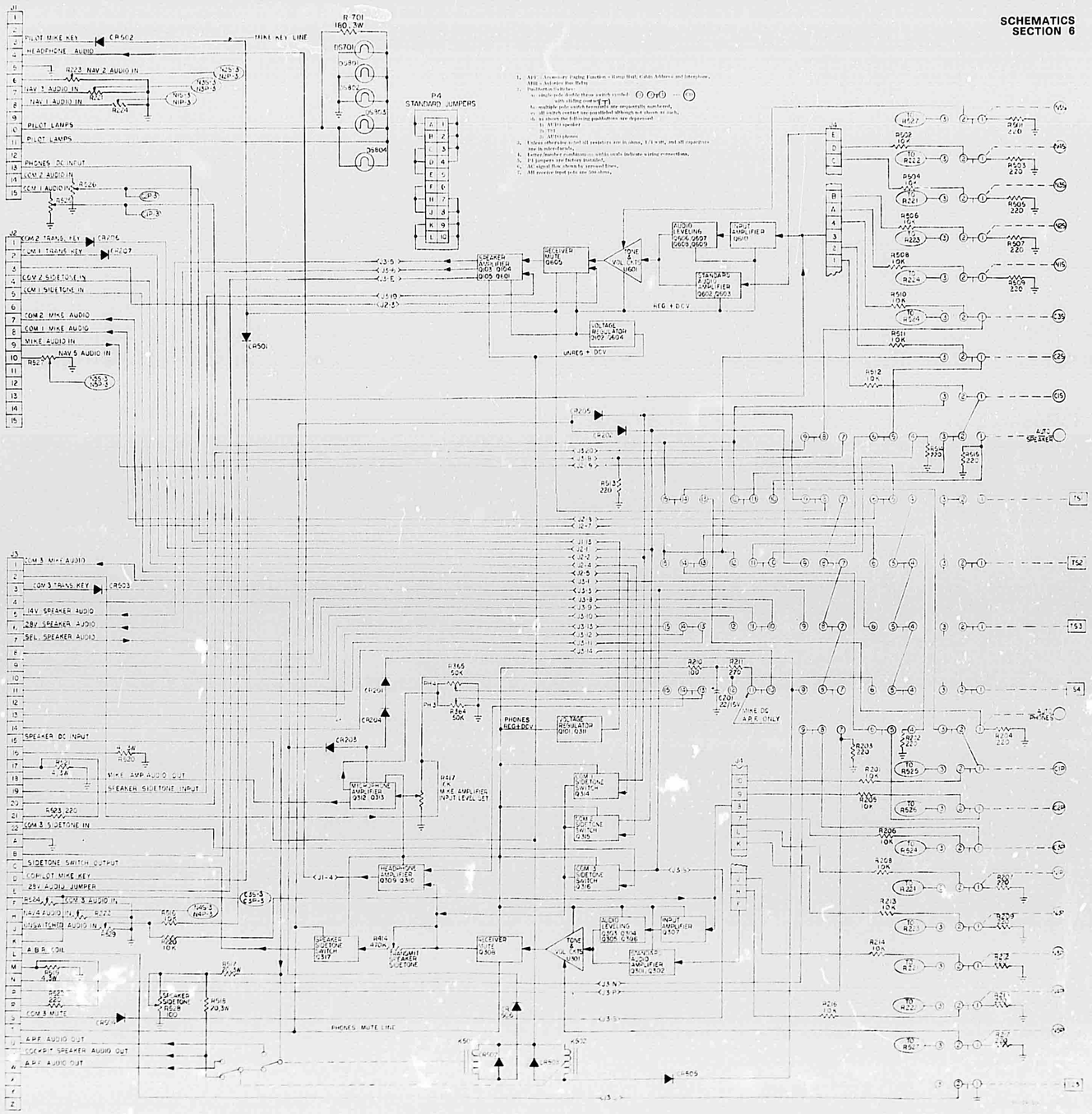


FIGURE 6-2. SPEAKER SCHEMATIC


PILOT MIKE KEY
HEADPHONE AUDIO
R223 NAV 2 AUDIO IN
NAV 2 AUDIO IN
NAV 1 AUDIO IN
PILOT LAMPS
PILOT LAMPS
PHONES DC INPUT
COM 2 AUDIO IN
COM 1 AUDIO IN
COM 2 TRANS KEY
COM 1 TRANS KEY
COM 2 SIDETONE IN
COM 1 SIDETONE IN
COM 2 MIKE AUDIO
COM 1 MIKE AUDIO
MIKE AUDIO IN
NAV 5 AUDIO IN
CR502
MIKE KEY LINE
R-701
150, 3W
P4
STANDARD JUMPERS
CR501
SPEAKER AMPLIFIER Q101 Q104 Q105 Q401
RECEIVER MUTE Q409
TONE VOL CNTL U601
AUDIO LEVELING Q604, Q607 Q609, Q609
INPUT AMPLIFIER Q607
STANDARD AUDIO AMPLIFIER Q602, Q603
VOLTAGE REGULATION Q104, Q604
MIC + DEV
REC + DEV
COM 3 MIKE AUDIO
COM 3 TRANS KEY
CR503
14V SPEAKER AUDIO
28V SPEAKER AUDIO
SEL SPEAKER AUDIO
SPEAKER DC INPUT
MIKE AMP AUDIO OUT
SPEAKER SIDETONE INPUT
COM 3 SIDETONE IN
SIDETONE SWITCH OUTPUT
COPILOT MIKE KEY
28V AUDIO JUMPER
COM 3 AUDIO IN
NAV 4 AUDIO IN
UNSWITCHED AUDIO IN
A B R COIL
COM 3 MUTE
A R F AUDIO OUT
COCKPIT SPEAKER AUDIO OUT
A R F AUDIO OUT
CR201
CR204
CR205
CR206
CR207
CR208
PHONES REG+DEV
VOLTAGE REGULATION Q101, Q311
MIKE DC A R F ONLY
PHONES MUTE LINE
MIKE AMPLIFIER Q312 Q313
R417 1K MIKE AMPLIFIER INPUT LEVEL SET
HEADPHONE AMPLIFIER Q308 Q310
SPEAKER SIDETONE SWITCH Q317
R414 470K 1ST AMP SIDETONE
RECEIVER MUTE Q306
COM SIDETONE SWITCH Q314
COM SIDETONE SWITCH Q315
COM 3 SIDETONE SWITCH Q316
AUDIO LEVELING Q304 Q306 Q308, Q309
INPUT AMPLIFIER Q307
RECEIVER AUDIO AMPLIFIER Q311, Q312
J1-1
J1-2
J1-3
J1-4
J1-5
J1-6
J1-7
J1-8
J1-9
J1-10
J1-11
J1-12
J1-13
J1-14
J1-15
J2-1
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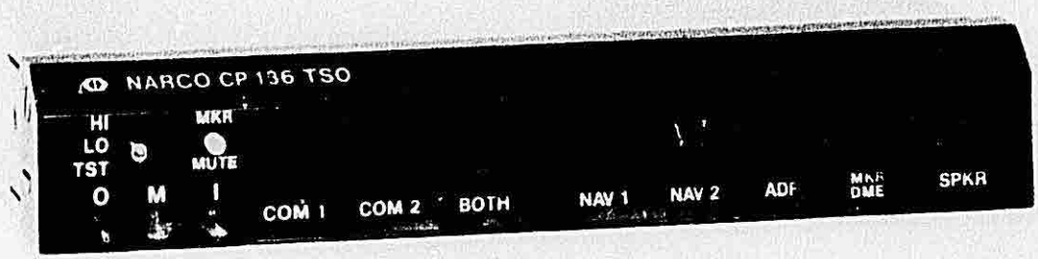
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NARCO AVIONICS

CP 135 TSO
AND
CP 136 TSO
AUDIO PANELS



MAINTENANCE MANUAL

03740-0600

NARCO AVIONICS
DIVISION OF NARCO SCIENTIFIC INDUSTRIES
FORT WASHINGTON, PENNSYLVANIA, 19034 U.S.A.

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Jan. 1977

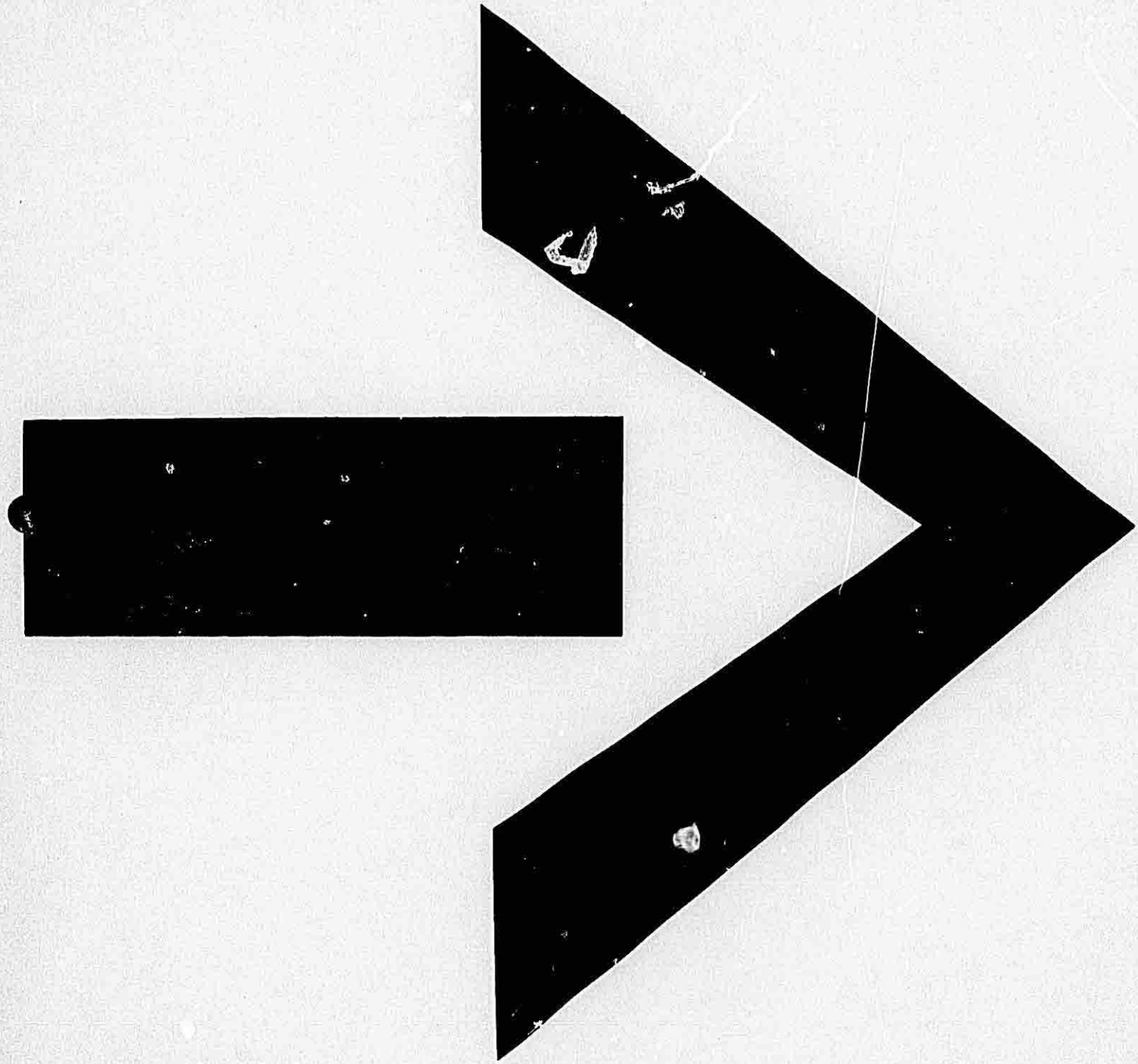
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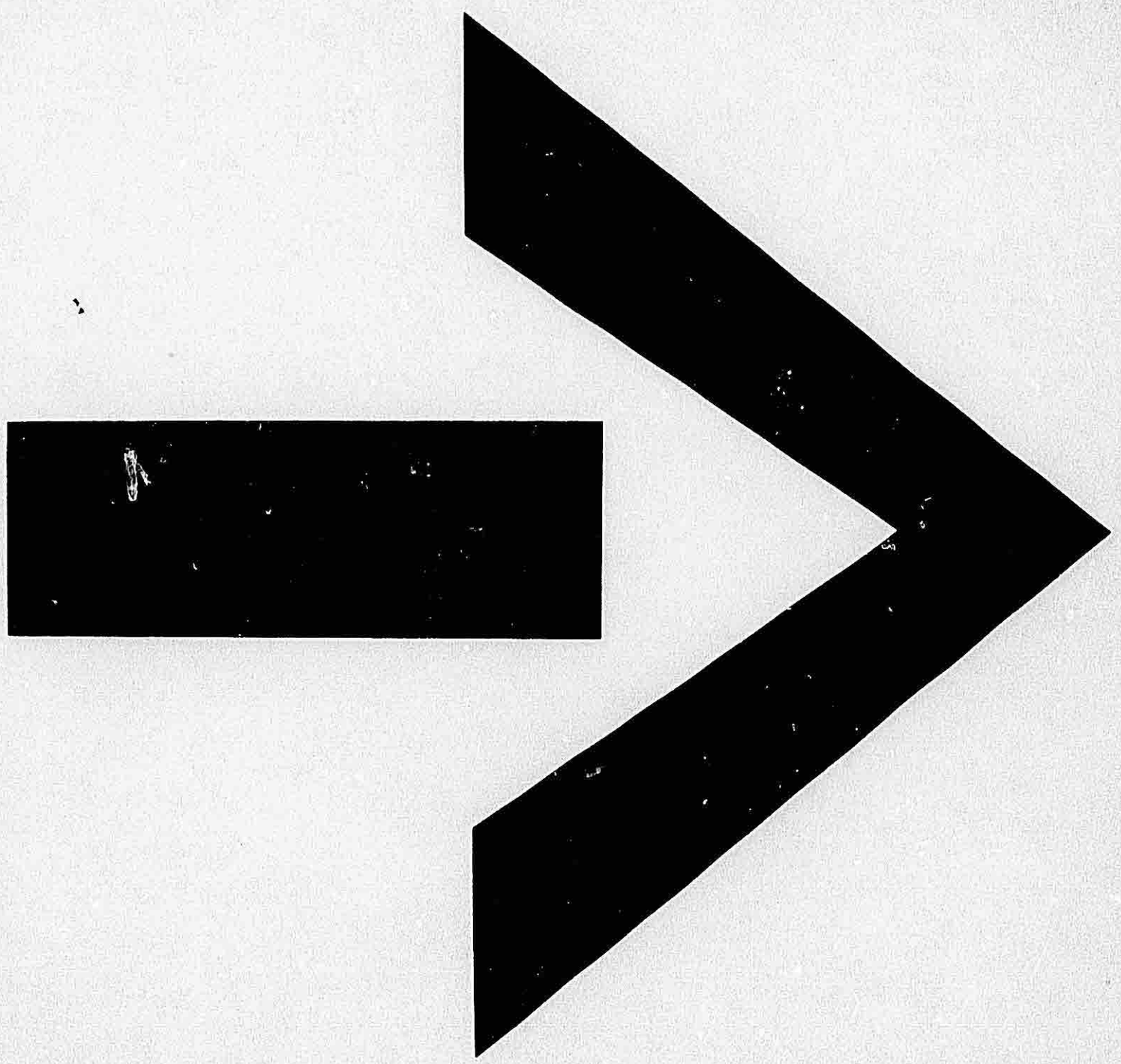
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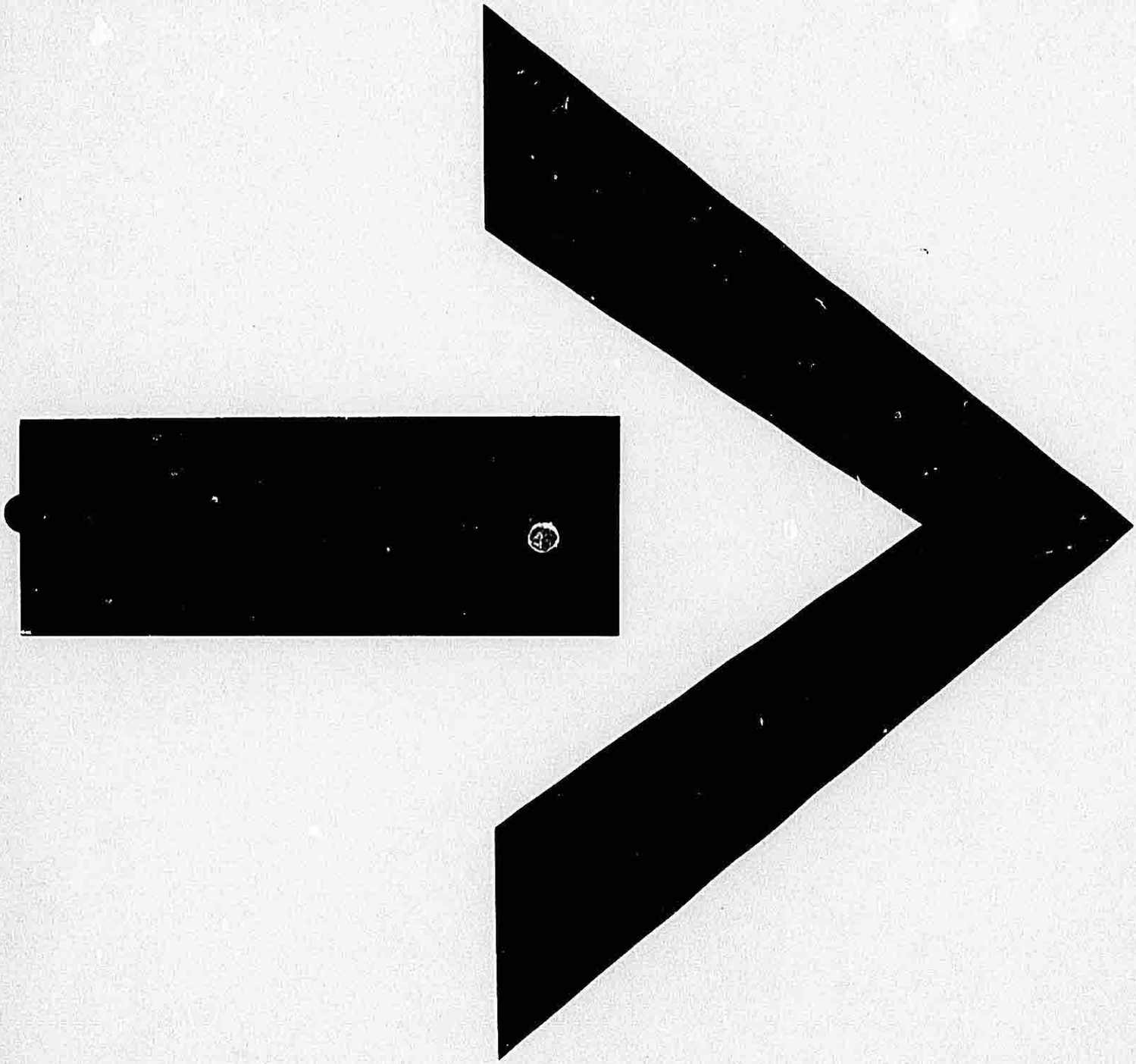
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S-10	UPDATE NO. S-10 SEE HIGHLIGHTS-1A08	1-00-86	7-27-89V	ATP/GM

RECORD OF TEMPORARY REVISIONS

TEMP REV NO	DESCRIPTION	ISSUE DATE	ATP REV DATE	BY	ATP REV REMOVED	REV INCOR	ATP GRID







NARCO AVIONICS INC.

270 COMMERCE DRIVE, FORT WASHINGTON, PA 19034 (215) 643-2900 TELEX 846395

February 7, 1986

TP #28

TO: ALL NARCO AVIONICS CENTERS

SUBJECT: CP135/136 MAINTENANCE MANUAL UPDATE "S-10" DATED 1/86

TOPIC: TRAY CONNECTOR P101

The CP 135/136 50 pin tray connector P101 has been changed to a 50 pin MOLEX type. All CP 136 trays currently being manufactured will have the new type connector installed. This change to a new connector warrants a new connector cover design which features an additional hole to ease wire routing, and an overall length increase of 0.40 inches to provide for jumper wire clearance under the cover.

The new connector will directly interchange on the tray with no modifications required. Should it ever become necessary to replace the older original tray connector with the new type connector, the old original connector cover must be replaced with the new connector cover.

Update "S-10" comprises the following pages:

- A page (with bar S-10): Remove the Manual's existing "A" page and replace with the new one
- Page 1-i : Remove the Manual's existing page 1-i and replace with the new one
- Page 1-6A: Add this Addendum page to the Manual between pages 1-6 and 1-7
- Page 2-ii: Remove the Manual's existing page 2-i /2-ii and replace with the new one
- Page 2-8A: Add this Addendum page to the Manual between pages 2-8 and 2-9

Addendum page 1-6A updates Table 1-2 "Installation Kits" of page 1-7 to a new Table 1-2A.

Addendum page 2-8A updates Figure 2-3 "Installation Diagram" of page 2-8, to a new Figure 2-3A.

Very truly yours,

Allan S. Cox

Allan S. Cox
Technical Publications

ASC:dmc

SERVICE

NARCO AVIONICS DIVISION OF NARCO SCIENTIFIC INDUSTRIES, Fort Washington, Pa. 19034

NARCO SERVICE BULLETIN CP-135/136 NO. 2 OCTOBER 19, 1977

TO: ALL NARCO AVIONICS CENTERS
ALL NARCO WHOLESALE DISTRIBUTORS

SUBJECT: CORRECTION TO INSTALLATION SECTION OF THE CP-135/136 MAINTENANCE MANUAL
(AUDIO PANEL) (APPLICABLE IMMEDIATELY)

Please refer to the corrected Page 2-18 included with this bulletin.

Make the corrections and additions to Page 2-18 of your CP-135/136 Manual.

Very truly yours,

NARCO AVIONICS
A Division of Narco Scientific Industries

Eugene V. Salzmann
Technical Representative

EVS/cab

Attachment

SERVICE

NARCO AVIONICS DIVISION OF NARCO SCIENTIFIC INDUSTRIES, Fort Washington, Pa. 19034

NARCO SERVICE BULLETIN CP-135/136 NO. 6 JUNE 1, 1979

TO: ALL NARCO AVIONICS CENTERS
ALL NARCO WHOLESALE DISTRIBUTORS

SUBJECT: MAINTENANCE MANUAL REVISION
(APPLICABLE IMMEDIATELY)

Included with this bulletin are updated pages for your CP-135/136 maintenance manual, Sections 1 and 2, which are to be replaced in their entirety.

Page "A" should be inserted in the front of the manual, just after the title page. The old page "A" should be removed and destroyed. The new page "A" contains all the changes made to the manual since the original printing.

Very truly yours,

NARCO AVIONICS
A Division of Narco Scientific

Rick De Oreo
Technical Representative

Enc.

jt

CP 135 and CP 136
Manual issue date 1/77
Reprint issue date 8/81

LIST OF EFFECTIVE PAGES

IS YOUR MANUAL COMPLETE?

The following list allows the user to check that the manual on hand is complete and up-to-date, relative to the latest date noted.

A quick check can be made by "eyeing" the bar(s) at the base of this page against the bottom edge of the whole manual. One bar on this page indicates one set of supplemental pages were issued, additional bars.., additional supplements. Generally one will "eye" at least one bar per supplement. Of course a complete page by page check can be made by comparing the page number and date below to that of each page. Note that page numbers prefixed by a "B" are pages that are intentionally blank.

All undated pages are to be considered to have been issued the date noted at the top of this page.

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1.2	INSTALLATION KITS	1-7	

1.1 GENERAL

In support of the Narco Avionics TSO'd CP 135 and CP 136 Audio Panels, this manual provides detailed installation, operation, and maintenance procedures.

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

1.1.1 Manual Organization

Organized into six 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.
Section 3,	Circuit Description	- technical description of all mechanical and electrical circuits.
Section 4,	Maintenance	- provides test procedures and troubleshooting methods.
Section 5,	Replacements Parts List	- provides exploded views of the Unit depicting the mechanical parts and certain electrical components. This Section also provides an alphanumerical listing of all the electrical components of the Unit.
Section 6,	Schematics	- circuit schematics with voltages, test points, and component drawings.

1.2 PRODUCT DESCRIPTION

The CP 135 and CP 136 Audio Panels provide central pushbutton control for all aircraft communications and navigation audio signals. As many as seven audio inputs may be combined for routing to the cabin speaker. The CP 136 contains a 10 watt cabin speaker amplifier while the CP 135 utilizes the COM transceiver audio power amplifier to drive the speaker. Both units contain fail-safe circuitry in that the speaker and phones have separate A+ power so one failure will not disable both channels. Both units may be ordered with an optional Marker Beacon Receiver or with only the switches and lights for a Remote Marker Beacon Receiver.

1.3 DESIGN FEATURES

- LED annunciated pushbutton control provides instant transmitter, microphone, and receive audio selection at busy airports.
- Simultaneous listening to both COM receivers, if desired by depressing the BOTH pushbutton.
- Four intercom inputs connected to an integral 50 mW audio amplifier that provides headphone audio output for those inputs selected.
- Headphone audio is totally independent of Speaker Off pushbutton.

1.3 Continued

- No descernable audio level change in Speaker or Headphone as audio inputs are switched in and out.
- Speaker and phones have separate A+ power.
- Unswitched audio to headphones for such things as helicopter engine out warning.
- Provides transmitter sidetone from selected transmitter during transmit.

1.4 PRODUCT SPECIFICATIONS

Mechanical			
Physical Dimensions and Mounting	Refer to appropriate mechanical installation Diagram in Section 2		
Weights: CP 135 without Marker	0.8 lbs (363 gr)		
CP 135 with Marker	0.9 lbs (408 gr)		
CP 136 without Marker	1.0 lbs (454 gr)		
CP 136 with Marker	1.1 lbs (499 gr)		
Electrical			
Voltage	13.75 or 27.5 Vdc		
Current (not including Pilot Lamps)	P101-F	P101-1	MKR A+
CP 135 at 13.75 Vdc	0.25 amp	0.05 amp	0.20 amp
CP 135 at 27.5 Vdc	0.25 amp	0.05 amp	0.23 amp
CP 136 at 13.75 Vdc	0.25 amp	2.0 amp	0.20 amp
CP 136 at 27.5 Vdc	0.25 amp	1.5 amp	0.23 amp
Circuit Breaker			
CP 135	1A	1A	1A
CP 136	1A	5A	1A
Pilot Lamps			
13.75 Vdc	0.26 amp		
27.5 Vdc	0.13 amp		
Audio Input Levels			
Unswitched audio to Headphones	3.5V for 50 mW		
Intercom (Four Inputs)	0.5V for 50 mW		
Sidetone (COM 1 and COM 2)	3.5V rms across 470 ohms for 50 mW of headphone audio.		
Switched Audio	Factory-set for 3.5V rms across 470 ohms		
Audio Output Levels			
Low Level Audio	350 mV across 600 ohms		
Speaker Audio	10W across 4 ohms		
Headphone Audio	50 mW across 600 ohms (Output Low Z - 150 ohms)		
Isolation/Combining Network			
Isolation between input ports	40 dB		
Optional Marker Beacon Receiver			
Antenna Input Impedance	50 ohms		
Sensitivity			
HI	200 uV for lamp threshold		
LO	1000 uV for lamp threshold		
Selectivity			
6 dB	$\pm$ 10 kHz minimum		
40 dB	$\pm$ 180 kHz minimum		
60 dB	$\pm$ 310 kHz minimum		
AVC Characteristics	Audio output held to within 10 dB for input level changes from 200 uV to 50,000 uV		

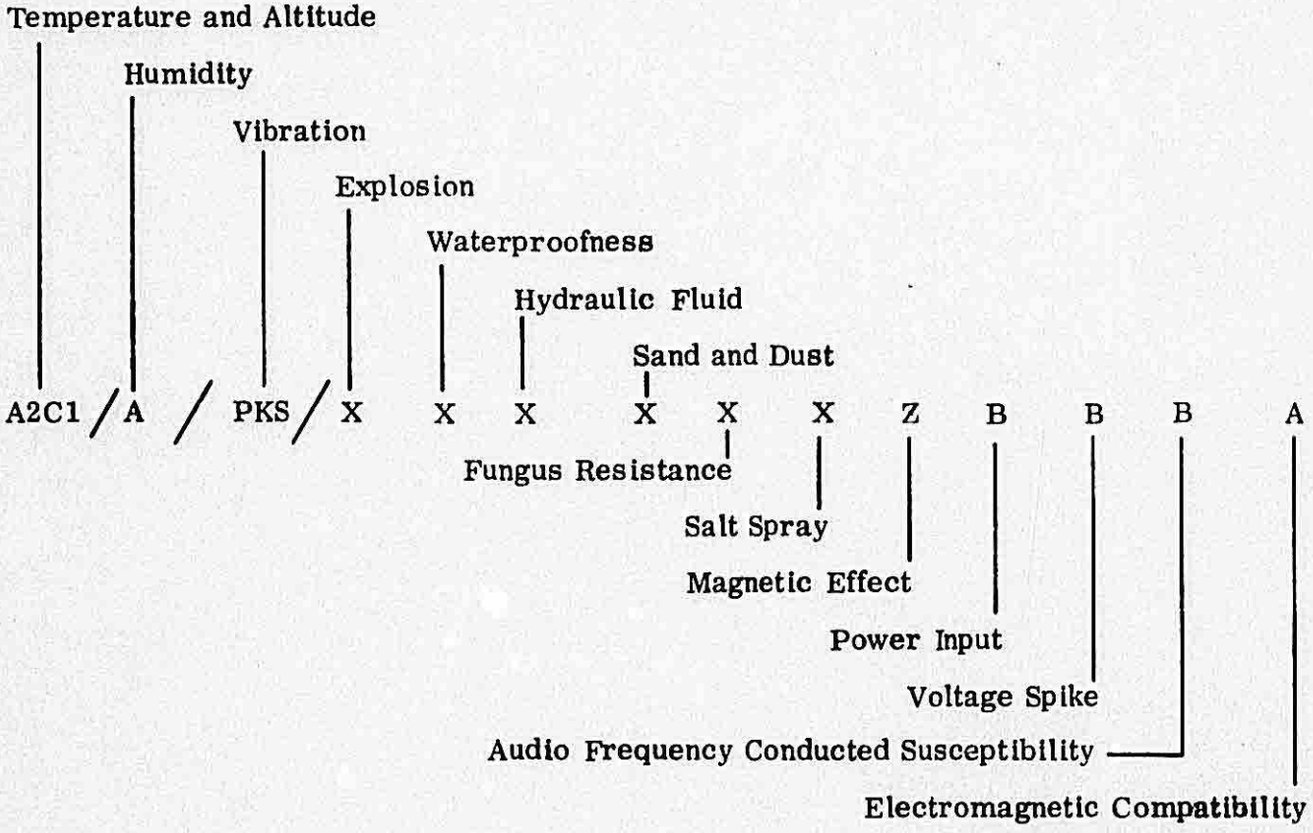
1.5 TSO EXPLANATION

The CP 135 and CP 136 are designed to be instrument panel mounted within the cabin environment of fixed and rotary wing aircraft using piston or turbine, single and multi-engines. They are designed for non-pressurized aircraft operating up to 35,000 feet as well as for pressurized aircraft. This equipment requires direct current power but may be installed in aircraft having additional on-board alternating current sources.

There are fourteen Environmental Test Procedures established in RTCA Document DO 160. These are identified on the TSO Nameplate(s). Following are the Environmental Categories to which the Units are designed and an explanation of each category.

Audio Panel TSO-C50b, Environmental Category A2C1/A/PKS/XXXXXXZBBBA

Marker Beacon TSO-C35d, Class A, Environmental Category A2C1/A/PKS/XXXXXXZBBBA



1.5 Continued

Temperature And Altitude - Category A2C1		
Temperature, Operating:		
Low Operating Temperature	-20°C	(-4° F)
High Operating Temperature	+70°C	(+158° F)
Short Time Operating Temperature, High	+70°C	(+158° F)
Temperature, Non-Operating		
Ground Survival Temperature, Low	-55°C	(-67° F)
Ground Survival Temperature, High	+85°C	(+185° F)
Altitude, Non-Pressurized:		
Maximum Operating Altitude	+35,000 ft.	
Altitude, Pressurized:		
Not affected by decompression to	+40,000 ft.	
Not affected by overpressurization to	-15,000 ft.	

Humidity - Category A

These units have been tested under the Standard Humidity Environment of: +50°C (+122° F) at 95% relative humidity, reduced to +38°C (+100° F) with relative humidity maintained in excess of 85%.

This cycle was repeated twice for a total of 48 hours of exposure. Within 15 minutes* after exposure, the units were operated and met all specifications.

*TSO requires that all specifications be met within 4 hours after exposure.

Vibration - Categories PKS

Maximum vibration limits are:
- 0.08" double amplitude from 5 Hz to 22 Hz
- 2.0G constant acceleration from 22 Hz to 200 Hz
- 1.5G constant acceleration from 200 Hz to 500 Hz
- 0.25G constant acceleration from 500 Hz to 2000 Hz

Not Applicable - Category X

The following six Environmental Conditions do not normally exist in Civil Aircraft, when recognized installation practices are adhered to, and are therefore not tested.

- Explosion - Category X
- Waterproofness - Category X
- Hydraulic Fluid - Category X
- Sand And Dust - Category X
- Fungus Resistance - Category X
- Salt Spray - Category X

1.5 Continued

Magnetic Effect - Category Z
With this equipment operating, it may be placed at a distance less than 0.3 meter from a free magnet with a 1^{o}, or less, deflection of the magnet.

Power Input - Category B

This equipment is designed for use in aircraft electrical systems supplied by an engine driven alternator/rectifiers or DC generator with a battery of significant capacity floating on the DC bus at all times.

		28V System	14V System
Normal Operating Conditions (Vdc) are:	Maximum	30.3	15.1
	Nominal	27.5	13.8
	Minimum	24.8	12.4
	Emergency Operation	20.0	10.0

Voltage Spike - Category B

This equipment has been designed to withstand the transient voltage characteristics specified by RTCA Document DO 160.

Audio Frequency Conducted Susceptibility - Category B

This equipment has been designed and tested to assure compliance with the requirements of RTCA Document DO 160.

Electromagnetic Compatibility - Category A

Note: For this series of tests, equipment Interconnecting Cables and RF transmission lines were constructed in accordance with Section 2 of this manual.

1. Induced Signal Susceptibility - This equipment has been designed to withstand the effects of audio frequency electric and magnetic fields and induced voltage spikes as specified by Category A.
2. Radio Frequency Susceptibility - This equipment has been tested and is not affected by interference from other on board electronic equipment which meet Category A, Emission of Radio Frequency Energy Test of RTCA Document DO 160.
3. Emission of Radio Frequency Energy - This equipment has been tested and does not emit radio frequency energy in excess of that specified.

1.6 UNITS AND ACCESSORIES SUPPLIED

The following tables may be used to:

1. Check the contents of your order and,
2. To order additional components

Table 1.1A is used for ordering Units, refer to the Unit's Part Number and its Unit Description.

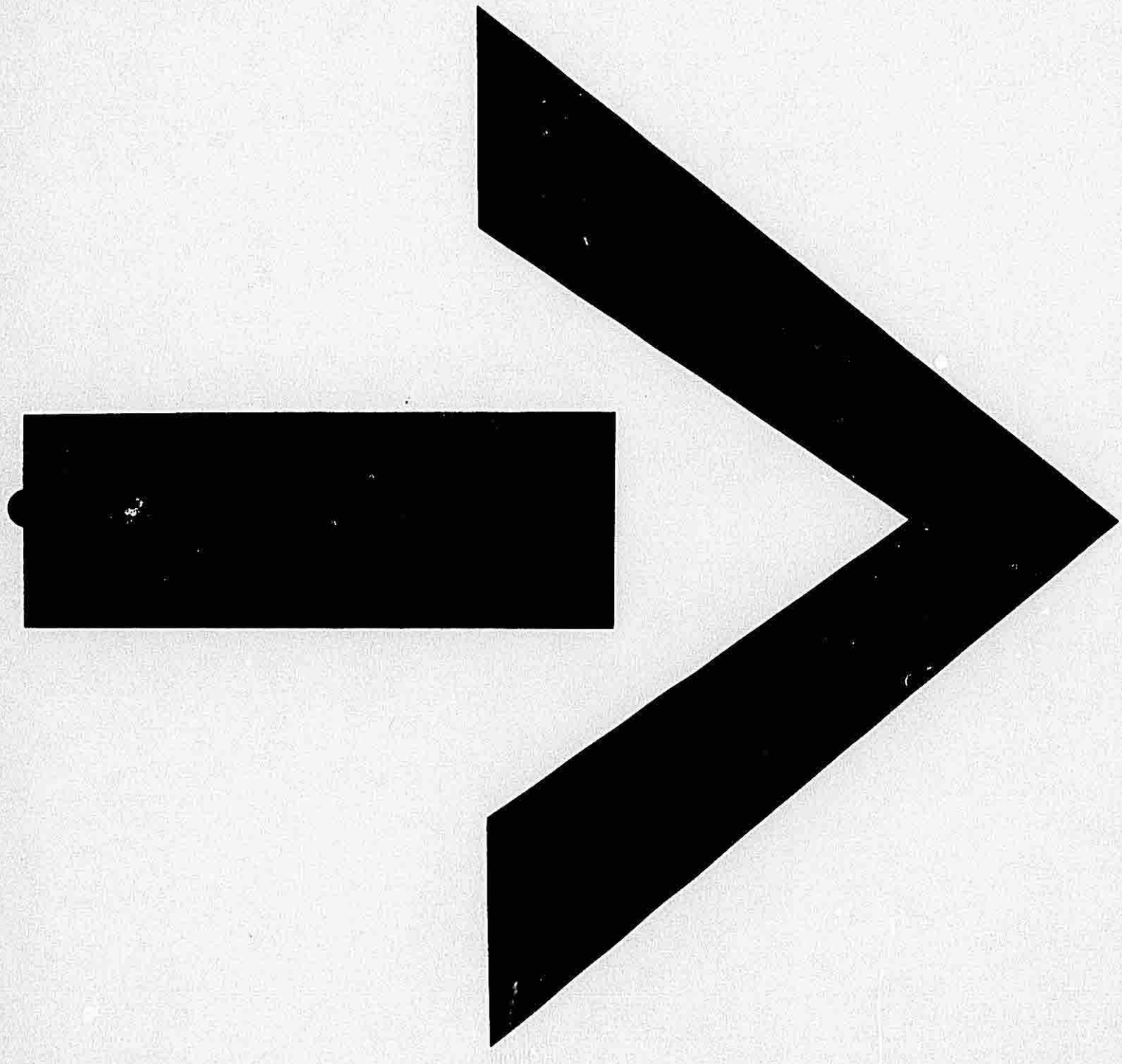
Table 1.2A may be used for ordering additional kits or specific parts of the kit.

TABLE 1.1A UNITS AVAILABLE

Unit Part Number	Unit And Description	Supplied With Installation Kit Part Number
03740-0302	CP 136 TSO with Marker Beacon Receiver Built-in	03740-0500
03740-0303	CP 136 TSO without Marker Beacon Receiver	03740-0501

TABLE 1.2A INSTALLATION KITS 03740-500/501

	ITEM	PART NUMBER	DESCRIPTION	500 QTY	501 QTY
	1	54731-0102	Tray assembly	1	1
	2	41406-0017	Connector, 50 pin	1	1
NEW	3	82814-0007	Screw, Mach, Bind Hd, #4-40x7/16	1	1
	4	41407-0002	Contacts, crimp type	50	50
	5	82017-0001	Miniature cable clamp	2	2
	6	04831-0002	Label, CP-136 push button	1	1
	7	81324-0004	Lockwasher, split #4	2	2
	8	82815-0007	Screw, Mach, Bind Hd #6-32x7/16	1	1
	9	82802-0005	Lockwasher, Int. tooth #6	3	3
	10	82900-0008	Nut, Hex #6	3	3
	11	99090-0002	Pad, Spacer	2	2
	12	82977-0007	Screw, Mach F. Hd #6-32x1/2	2	2
	13	04831-0001	Label, CP 136 push button	1	1
NEW	14	54763-0101	Cover, Connector	1	1
	15	04827-0001	Label, CP 136	1	1
	16	54572-0101	Connector, Marker Ant.	1	-



1.6 UNITS AND ACCESSORIES SUPPLIED

The following tables may be used to:

1. Check the contents of your order and,
2. To order additional components

Table 1.1 is used for ordering Units, refer to the Unit's Part Number and its Unit Description. There is no need to order an Installation Kit as it is automatically included with its associated Unit.

Table 1.2 may be used for ordering additional kits or detail parts of the kit. The quantity column lists the quantity of each part contained in the kit.

TABLE 1.1 UNITS AVAILABLE

Unit Part Number	Unit And Description	Supplied With Installation Kit Part Number
03740-0300	CP 135 TSO with Marker Beacon Receiver Built-In	03740-0500
03740-0301	CP 135 TSO for Remote Marker Beacon Receiver	03740-0501
03740-0302	CP 136 TSO with Marker Beacon Receiver Built-In	03740-0500
03740-0303	CP 136 TSO for Remote Marker Beacon Receiver	03740-0501

TABLE 1.2 INSTALLATION KITS

Item	Part Number	Description	Qty per Kit 03740- 500	501
1	54731-0102	TRAY	1	1
2	54733-0001	CONNECTOR, 50 pin, PC, with Key item 17	1	1
3	82814-0007	SCREW, Mach, Bind Hd, Sl, 4-40 x 7/16	2	2
4	04831-0002	LABEL, Pushbutton	1	1
5	82017-0001	CLAMP, Cable, Miniature, Tie wrap	2	2
6	54572-0101	RF CABLE ASS'Y, MKR Antenna	1	0
7	81324-0004	WASHER, Lock, Split, No. 4	2	2
8	82815-0007	SCREW, Mach, Bind Hd, Sl, 6-32 x 7/16	1	1
9	82802-0005	WASHER, Lock, Int. Tooth, No. 6	3	3
10	82900-0008	NUT, Hex, 6-32	3	3
11	99090-0002	PAD, Spacer, 9/16 square x 3/32 thick	2	2
12	82977-0007	SCREW, Mach, 100° Flat Hd, Sl, 6-32 x 1/2	2	2
13	04831-0001	LABEL, Switch Identification	1	1
14	54730-0101	COVER, Connector	1	1
15	04827-0001	LABEL SET, Switch Identification	1	1
16	04497-0003	LABEL, Marker Lights (Blank)	1	1
17		KEY, Connector Polorization (comes with item 2)	1	1

1.7 ACCESSORIES REQUIRED BUT NOT SUPPLIED

For proper operation of the CP 135 and CP 136 TSO, the following accessories are required.

a. Antenna - Narco Avionics VMA-15 or equivalent (Int. MKR only)
b. Loudspeaker/Headphones
   1. Loudspeaker - voice coil impedance, 4 ohms
   2. Headphones - high impedance type, 300 or 600 ohms
c. Microphone - Narco Avionics M700B or equivalent
d. Narco Avionics NAV 124, NAV 124A, or MKR 101R when Internal MKR is not installed

1.7.1 Miscellanious Items Required But Not Supplied

Refer to Installation Section for additional details.

a. Sufficient length of 22 AWG stranded hookup wire.
b. Sufficient length of RG-58 A/U coaxial cable (Int. MKR only).

1.8 OPERATOR LICENSE REQUIREMENTS

There are no operator license requirements.

1.9 OPERATION

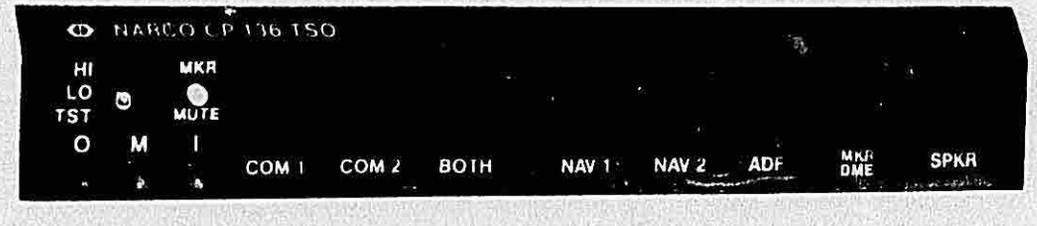


FIGURE 1-1. CP 136 TSO FRONT PANEL

1.9.1 HI-LO-TST Switch

The Marker Beacon Receiver sensitivity is selected by HI or LO sensitivity settings. The momentary TST position lights the OMI lamps for test purposes. When the optional Marker Beacon Receiver is installed and the DME/MKR and SPKR pushbuttons are selected, a steady tone will be heard on the speaker and headphones.

1.9.2 OMI Lamps

These lamps are the Marker Beacon identifiers. The appropriate OMI lamp will light upon receipt of a signal from the Marker Beacon Receiver.

1.9.3 MKR Mute Switch

The MKR MUTE switch allows the pilot to mute or disable the MKR audio output for a period of 10 to 14 seconds. This time duration is long enough to allow the MKR audio to remain muted as the aircraft passes over a marker beacon transmitter, yet short enough to permit reactivation of the MKR audio before the next Marker Beacon is reached. The MKR MUTE switch is spring loaded and requires only momentary contact.

1.9.4 Pushbutton Operation

Pushing a button IN closes that circuit and lights that button. The button is held in the IN position by a lock. A second push releases the lock and allows the button to pop out and open the circuit.

1.9.5 COM 1 and COM 2 Pushbuttons

The COM 1 and COM 2 pushbuttons are the only two pushbuttons that are interlocked. Depressing one button causes the other to release or vice versa. Depressing either the COM 1 or COM 2 button allows that particular COM transceiver to be used for transmit and receive modes of operation. Thus received audio, transmitter keying, microphone audio, and sidetone are all simultaneously selected via one pushbutton.

1.9.6 BOTH Pushbutton

Depressing the BOTH pushbutton permits the audio from both COM receivers to be heard on the speaker and/or headphones simultaneously. It does not void the selection of the COM transmitter selected by the COM 1 or COM 2 pushbutton.

1.9.7 Navigation Receiver Selection Pushbuttons

Four pushbuttons are provided for navigation receiver selection. Depressing one or more of these pushbuttons permits the low level audio signal from the selected unit(s) (NAV 1, NAV 2, ADF and DME/MKR) to be routed to the isolation combining circuits of the audio panel.

1.9.8 SPKR Pushbutton CP 135 Only

Depressing the SPKR pushbutton connects the combined audio signals from all the selected units to an output terminal on the rear panel connector. This output is designed to feed the AUX AUDIO input of a COM unit which is used as a cabin speaker amplifier. When a transmitter is keyed, all the receive audios at this terminal will be automatically muted except UNSWITCHED AUDIO. The SPKR pushbutton has no effect on headphone output which is available from another terminal on the rear panel connector. The headphone audio output is automatically switched to sidetone audio whenever a COM transmitter is keyed.

1.9.9 SPKR Pushbutton CP 136 Only

Depressing the SPKR pushbutton connects the combined audio signals from all the selected units to the input of the internal cabin speaker amplifier. The output of this amplifier is 10 watts across a 4 ohm speaker.

1.10 COMPATIBILITY

The CP 135 and CP 136 are not interchangeable with other Narco Audio Panels. The CP 135 and CP 136 are interchangeable in that they use the same rear panel connector and all the wired system functions, intercom, and headphones will operate. However, if a CP 136 is inserted into a system that has been wired for a CP 135, the internal speaker amplifier of the CP 136 will not operate. If a CP 135 is inserted into a system that has been wired for a CP 136 there will be no speaker audio.

1.11 SYSTEMS

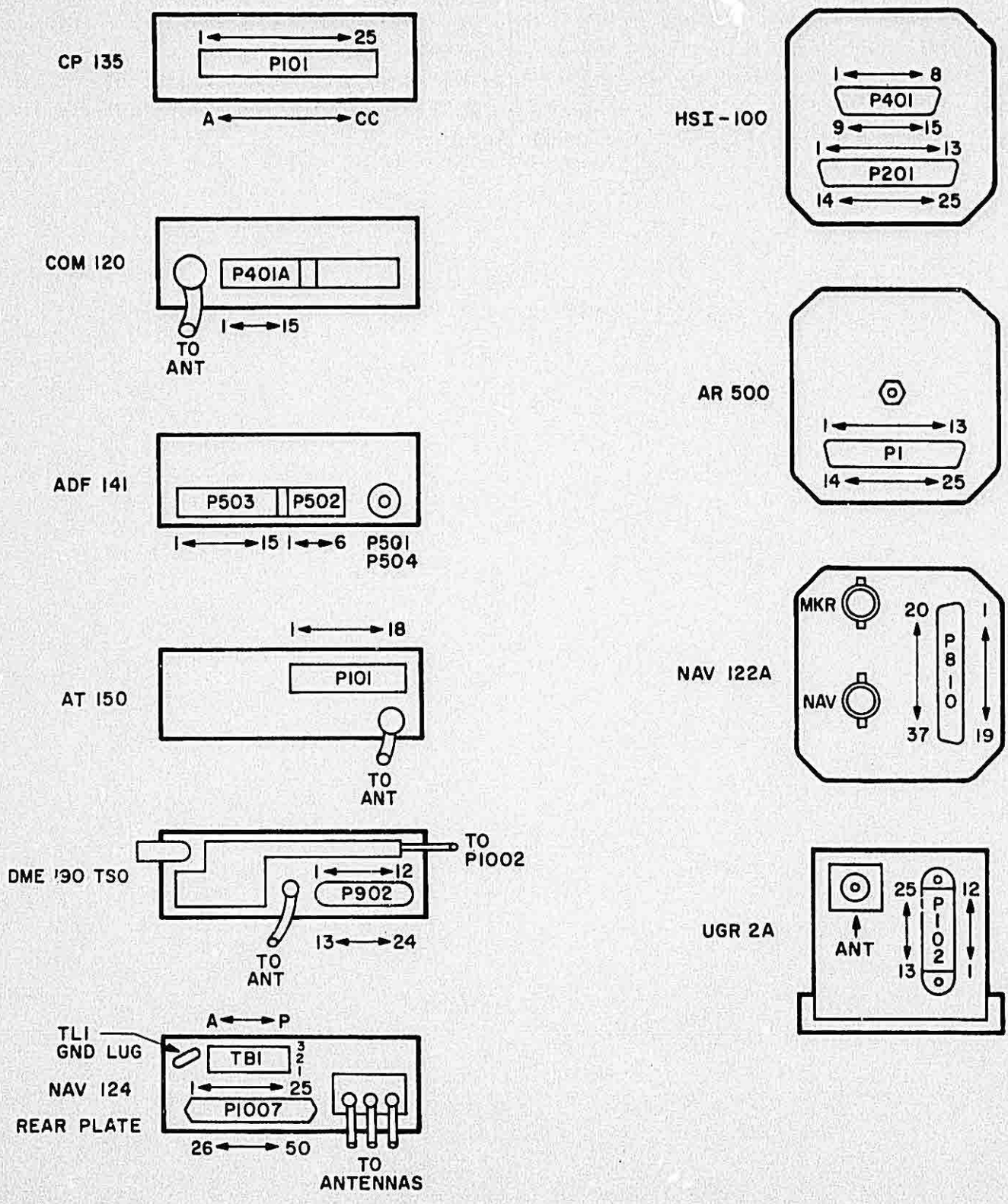
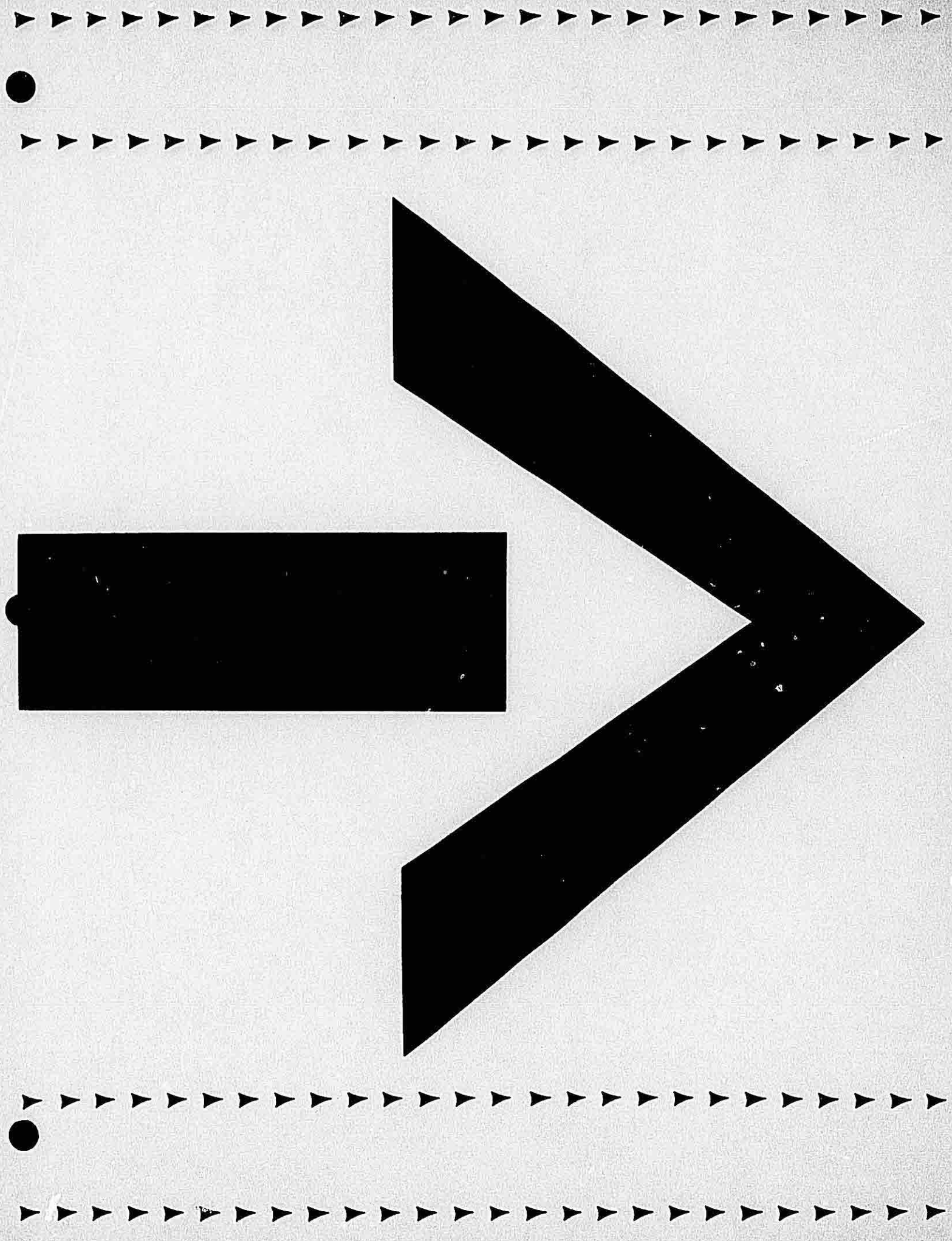
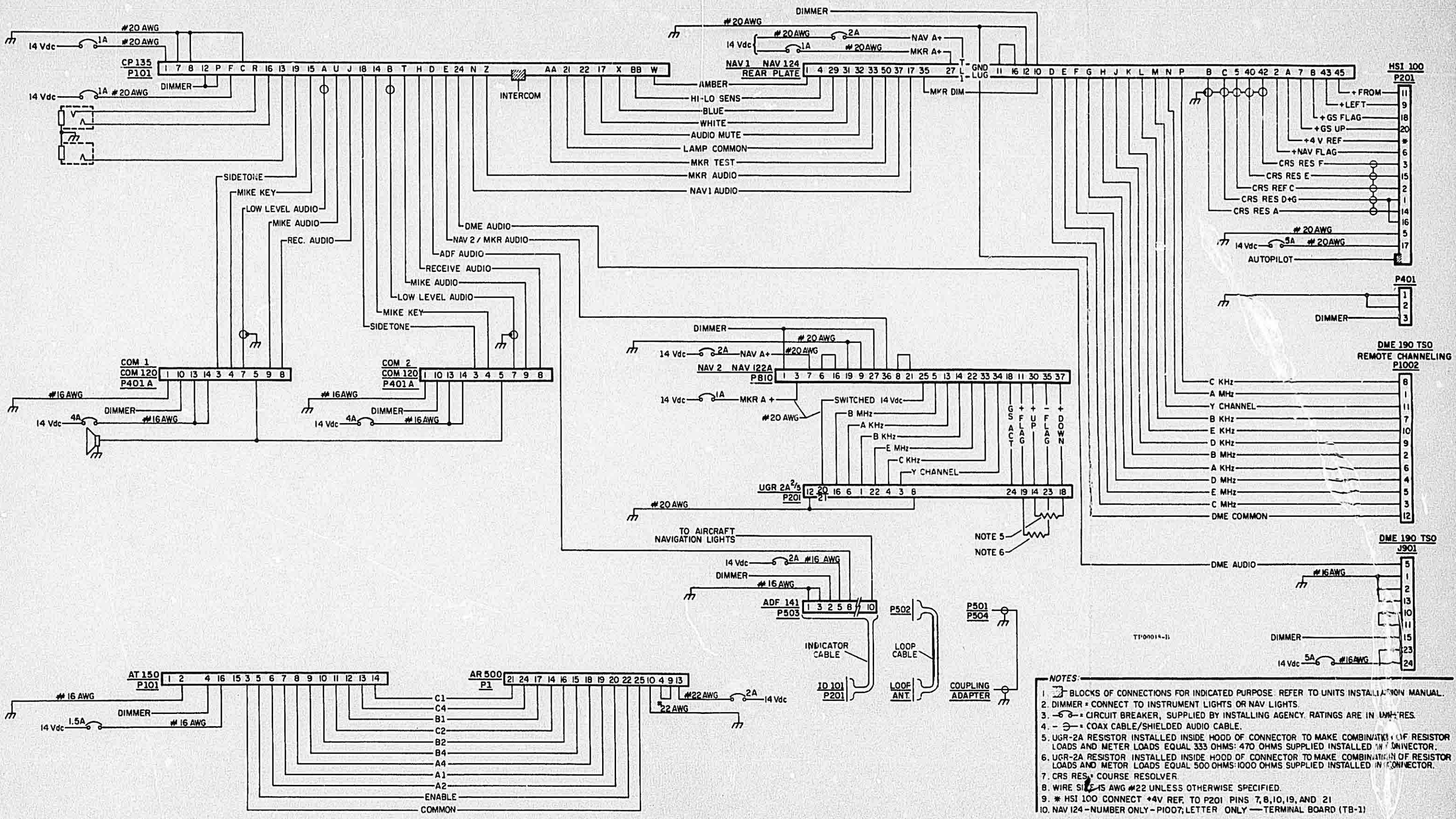


FIGURE 1-2. AVIONICS CONNECTOR IDENTIFICATION AND PIN SEQUENCE

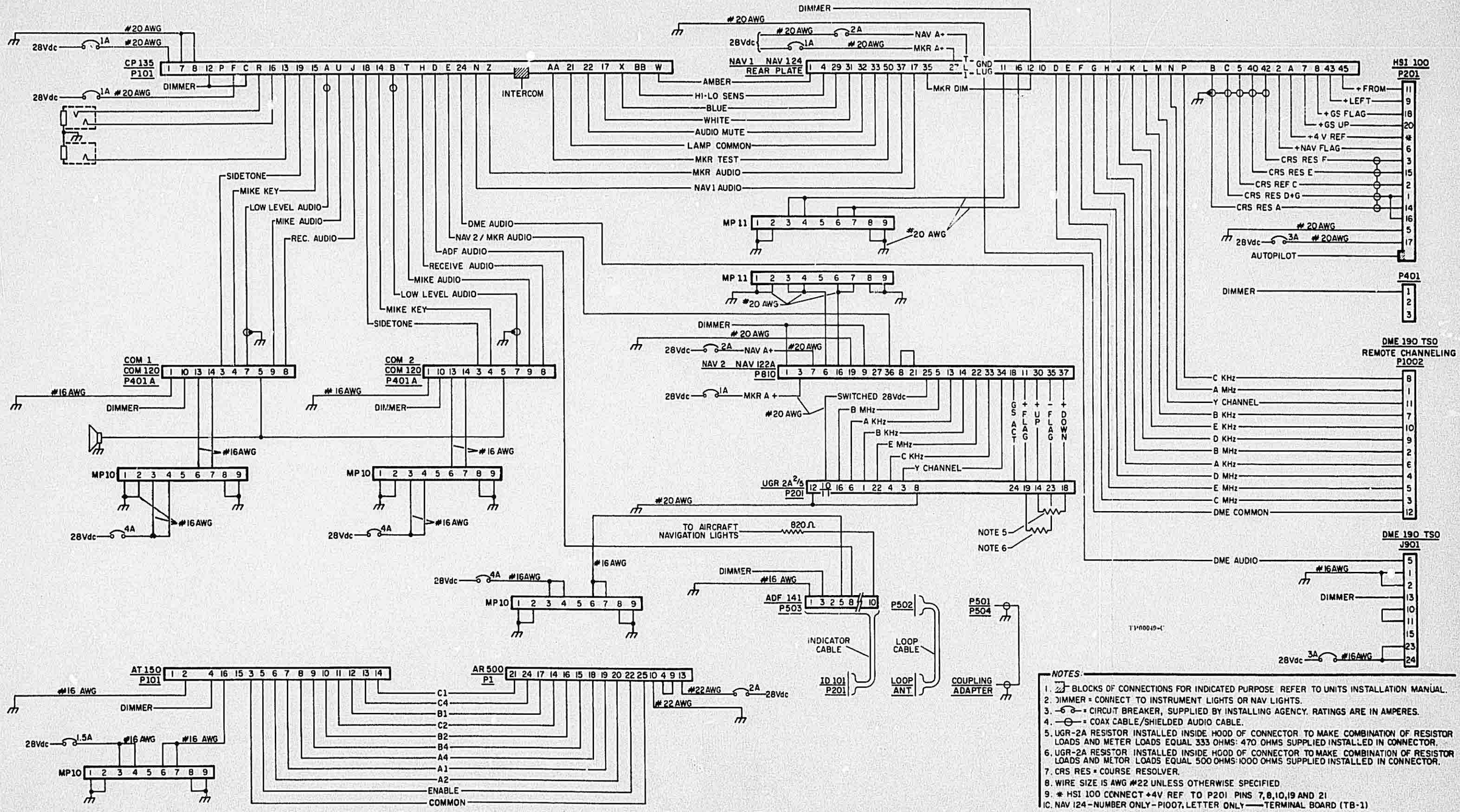




NOTES:
1. ⊐ = BLOCKS OF CONNECTIONS FOR INDICATED PURPOSE. REFER TO UNITS INSTALLATION MANUAL.
2. DIMMER = CONNECT TO INSTRUMENT LIGHTS OR NAV LIGHTS.
3. —6 8— = CIRCUIT BREAKER, SUPPLIED BY INSTALLING AGENCY. RATINGS ARE IN AMPERES.
4. — ∋— = COAX CABLE/SHIELDED AUDIO CABLE.
5. UGR-2A RESISTOR INSTALLED INSIDE HOOD OF CONNECTOR TO MAKE COMBINATION OF RESISTOR LOADS AND METER LOADS EQUAL 333 OHMS: 470 OHMS SUPPLIED INSTALLED IN CONNECTOR.
6. UGR-2A RESISTOR INSTALLED INSIDE HOOD OF CONNECTOR TO MAKE COMBINATION OF RESISTOR LOADS AND METOR LOADS EQUAL 500 OHMS: 1000 OHMS SUPPLIED INSTALLED IN CONNECTOR.
7. CRS RES = COURSE RESOLVER.
8. WIRE SIZE IS AWG #22 UNLESS OTHERWISE SPECIFIED.
9. * HSI 100 CONNECT +4V REF. TO P201 PINS 7, 8, 10, 19, AND 21
10. NAV 124 – NUMBER ONLY – P1007; LETTER ONLY — TERMINAL BOARD (TB-1)

FIGURE 1-3. SYSTEM INTERCONNECT WIRING FOR 14V AIRCRAFT

SEE BLOW-UP FICHE NO. NCM702 ITEM-A



NOTES:
1. ▭ BLOCKS OF CONNECTIONS FOR INDICATED PURPOSE REFER TO UNITS INSTALLATION MANUAL.
2. DIMMER = CONNECT TO INSTRUMENT LIGHTS OR NAV LIGHTS.
3. —6 8— = CIRCUIT BREAKER, SUPPLIED BY INSTALLING AGENCY. RATINGS ARE IN AMPERES.
4. —⊖— = COAX CABLE/SHIELDED AUDIO CABLE.
5. UGR-2A RESISTOR INSTALLED INSIDE HOOD OF CONNECTOR TO MAKE COMBINATION OF RESISTOR LOADS AND METER LOADS EQUAL 333 OHMS: 470 OHMS SUPPLIED INSTALLED IN CONNECTOR.
6. UGR-2A RESISTOR INSTALLED INSIDE HOOD OF CONNECTOR TO MAKE COMBINATION OF RESISTOR LOADS AND METOR LOADS EQUAL 500 OHMS: 1000 OHMS SUPPLIED INSTALLED IN CONNECTOR.
7. CRS RES = COURSE RESOLVER.
8. WIRE SIZE IS AWG #22 UNLESS OTHERWISE SPECIFIED
9. * HSI 100 CONNECT +4V REF TO P201 PINS 7,8,10,19 AND 21
10. NAV 124 – NUMBER ONLY – P1007; LETTER ONLY —— TERMINAL BOARD (TB-1)

FIGURE 1-4. SYSTEM INTERCONNECT WIRING FOR 28V AIRCRAFT

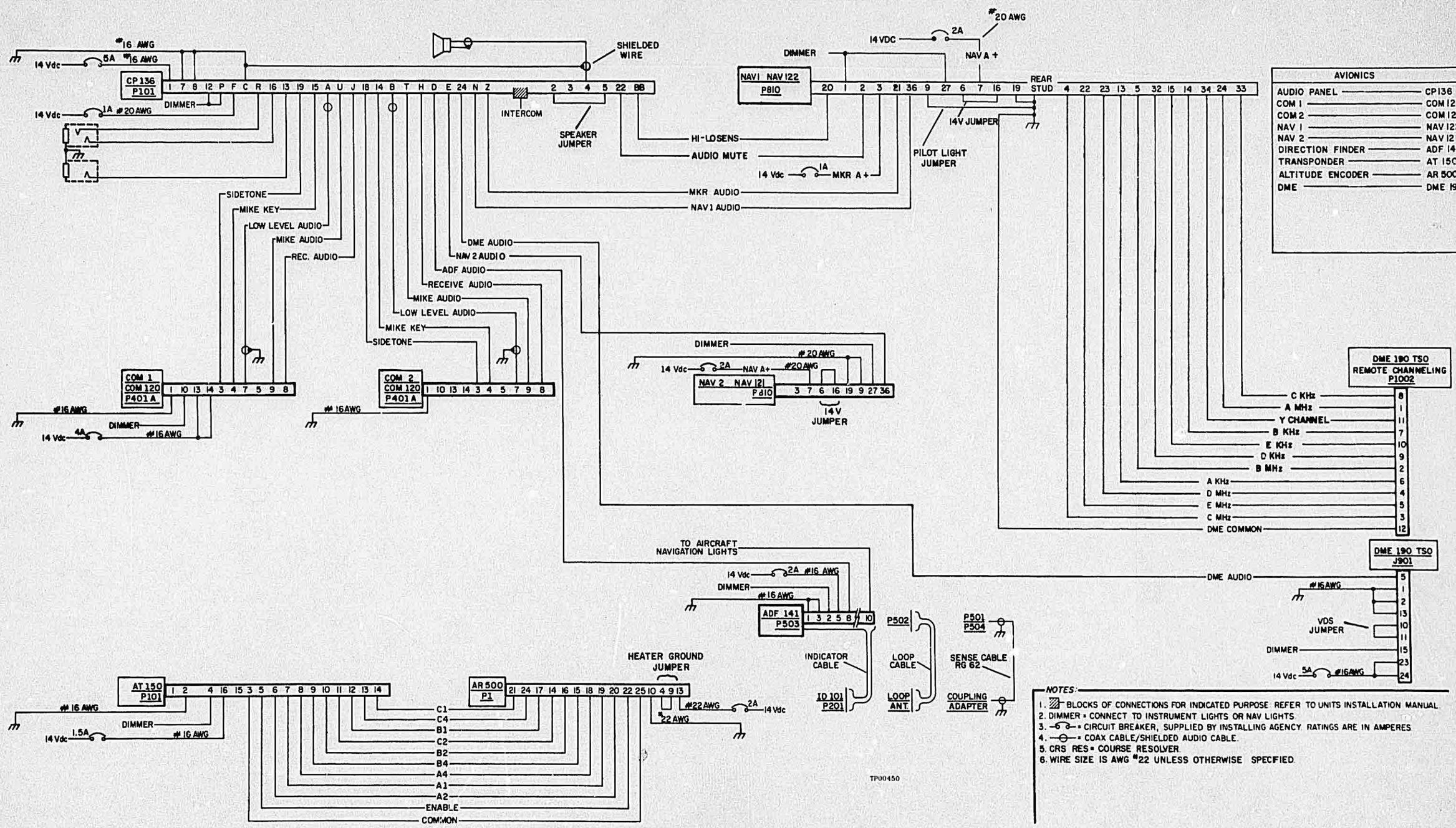


FIGURE 1-5. CENTERLINE WIRING DIAGRAM, 14V AIRCRAFT

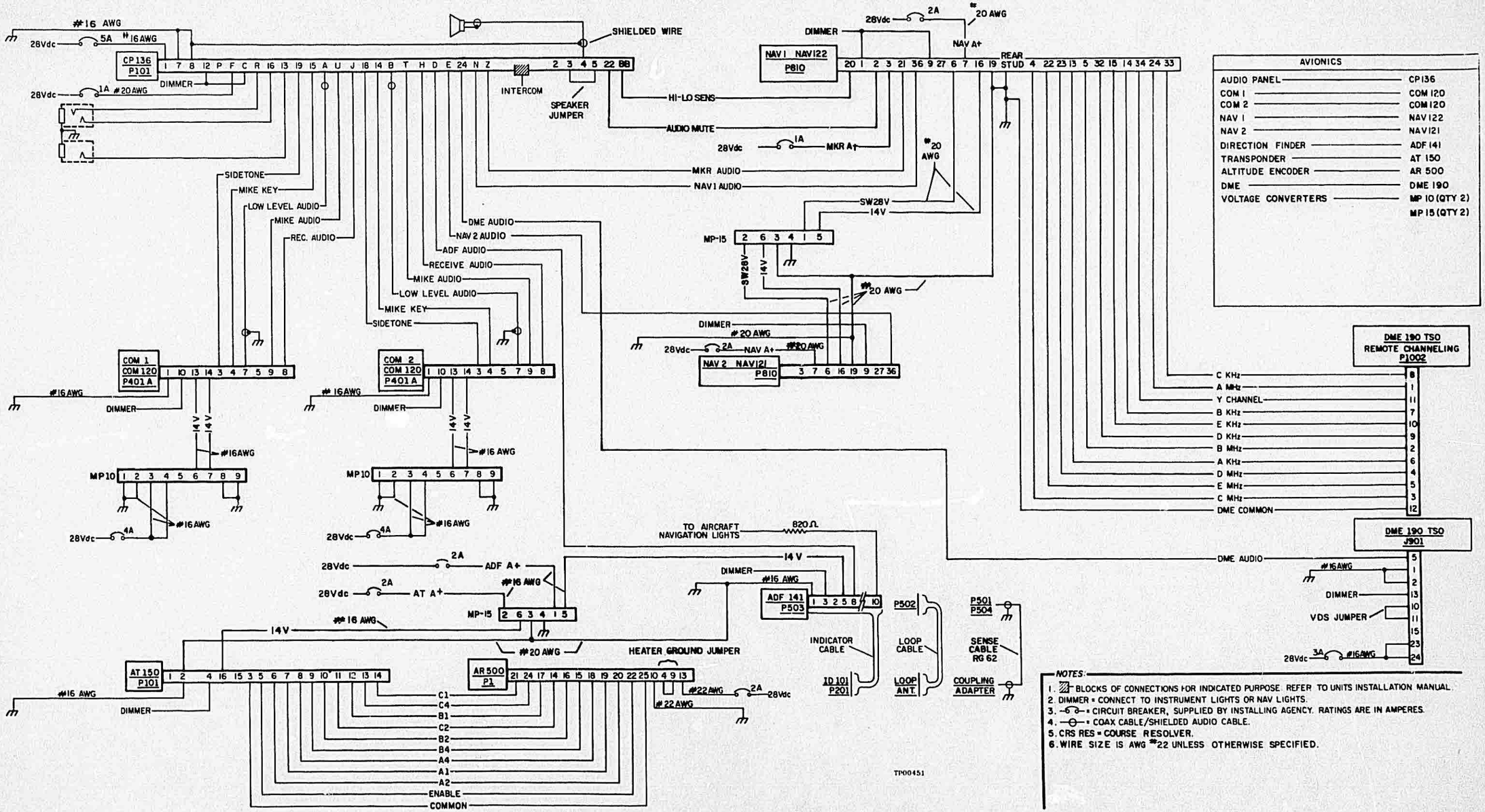


FIGURE 1-6. CENTERLINE WIRING DIAGRAM, 28V AIRCRAFT

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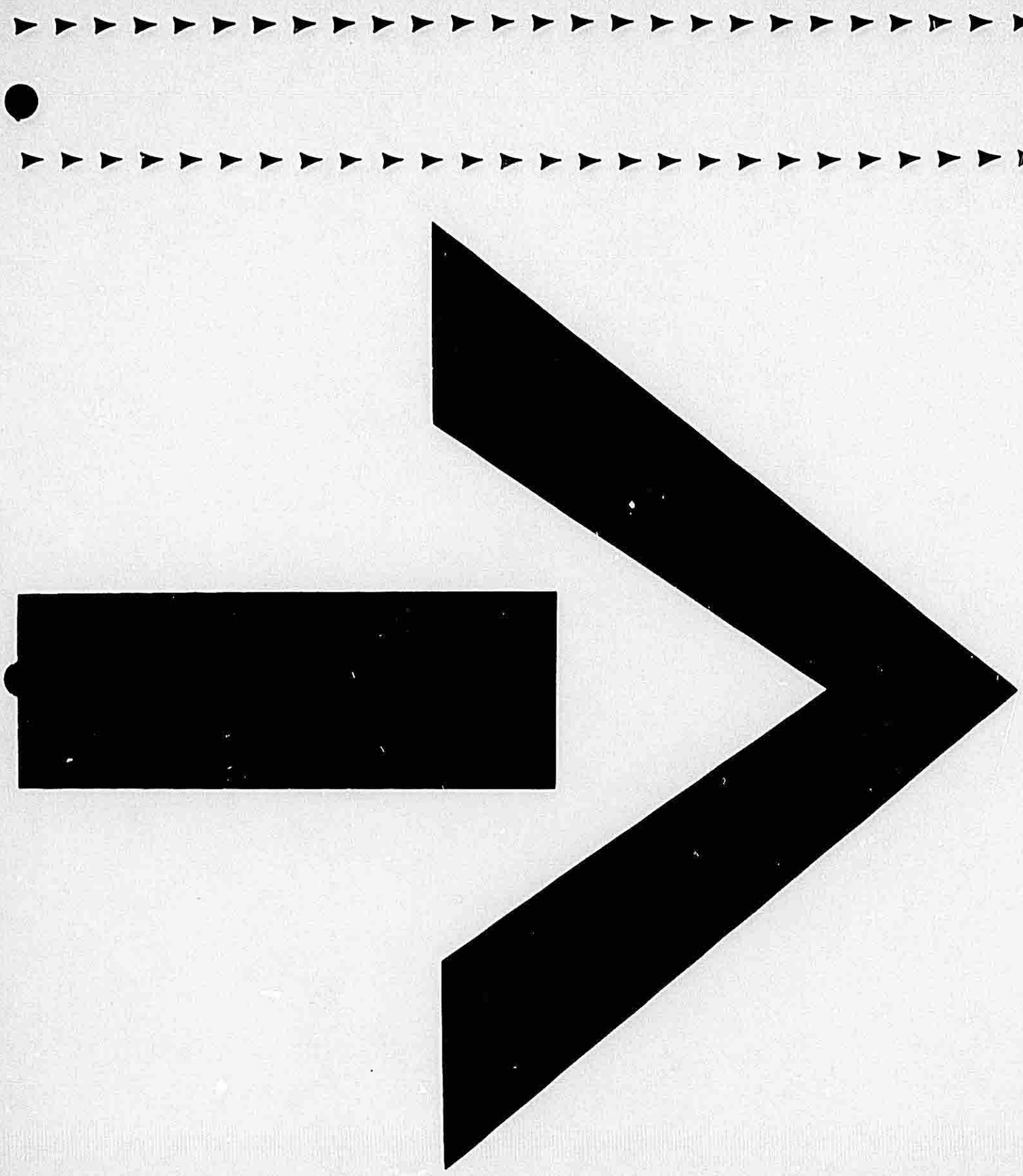
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2.1 INTRODUCTION

This section provides the necessary information for the installation of the CP 135 TSO and CP 136 TSO and, where required, optional accessories. The mechanical and electrical sections are self-supporting and may be removed from the manual to permit the mechanical and electrical installation efforts to proceed simultaneously.

2.2 PRELIMINARY INSPECTION

2.2.1 Unpacking

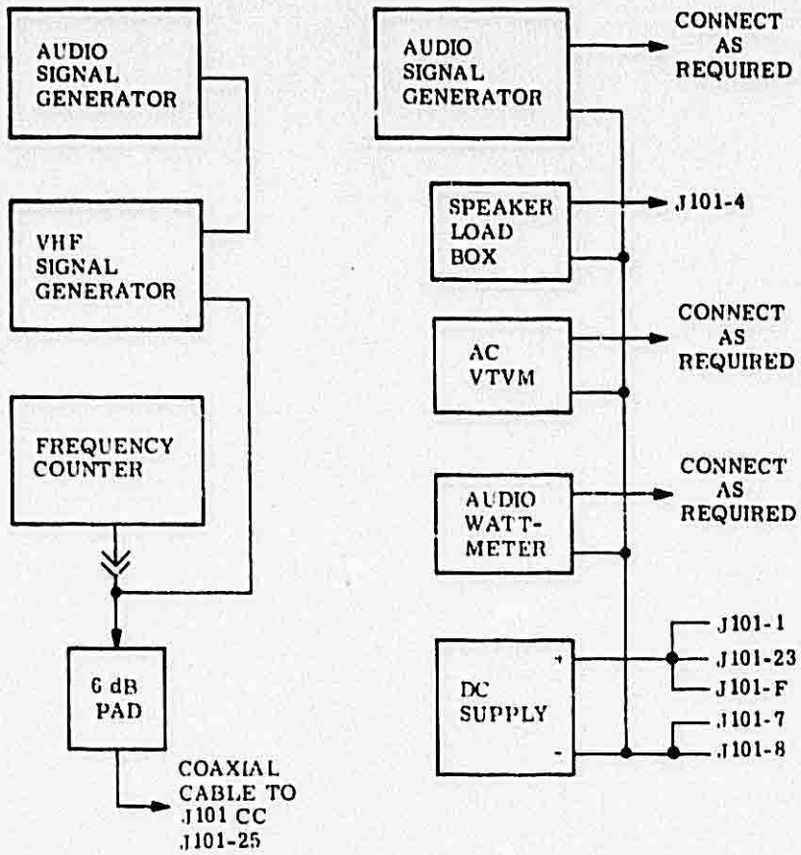
Carefully unpack the unit and inspect it for any damage that may have occured during shipment. Refer to Section 1.6, Units and Accessories Supplied, and inventory the contents of the Installation Kit. Refer to Section 1.7, Accessories Required but NOT Supplied for a listing of items required for proper installation.

2.2.2 Electrical Bench Test

2.2.2.1 Test Equipment Required

a. VHF Signal Generator: HP Model 608D or equivalent.
b. Audio Signal Generator: HP Model 200CD or equivalent.
c. Frequency Counter: HP Model 5246L equipped with Prescaler Plug-In Model 5252A or equivalent.
d. Regulated DC supply with 0 to 30 Vdc at 2 ampere capability: Power Design Model 3650 or equivalent.
e. AC VTVM.
f. Speaker Load Box with 15 watt capability.
g. 6 dB pad.
h. Audio Wattmeter: General Radio Model 583A.
i. Field fabricated test cable.

A versatile test cable for use between the CP 135 or CP 136 and the test equipment may be fabricated by hand wiring. Only the DC power, speaker, and phones outputs need to be part of the cable. The remaining inputs and outputs may be made by soldering a length of number 16 bus wire to a contact and forming a loop at the free end. Thus connections can be quickly made to the loop by use of miniature alligator clips or similar test clips. An additional connector may be purchased from NARCO. The part number is listed in Section 1, Table 1.2 Installations Kits.



P101

MKR GROUND	25 CC	MKR ANTENNA
DME IN	24 BB	MKR SENSITIVITY
MKR 14 28V	23 AA	MKR TEST
MKR MUTE	22 Z	MKR AUDIO IN
MKR LAMP COMMON	21 Y	MKR DIM
SPARE	20 X	MKR LAMP-BLUE
COM 1 SIDETONE	19 W	MKR LAMP-AMBER
COM 2 SIDETONE	18 V	SPARE
MKR LAMP-WHITE	17 U	COM 1 MIKE AUDIO OUT
MIKE JACK KEY	16 T	COM 2 MIKE AUDIO OUT
COM 1 KEYOUT	15 S	SPARE
COM 2 KEYOUT	14 R	MIKE JACK AUDIO
PHONES OUT	13 P	14V DIM
PUSHBUTTON DIM	12 N	NAV 1 IN
INTERCOM 2	11 M	INTERCOM 4
INTERCOM 1	10 L	INTERCOM 3
EXT. SPKR	9 K	SPARE
GROUND	8 J	COM 1 IN
GROUND	7 H	COM 2 IN
UNSWITCHED AUDIO	6 F	14/28VA
*SPKR IN	5 E	NAV 2 IN
CABIN SPKR	4 D	ADF IN
*28V SPKR OUT	3 C	28V DIM
*14V SPKR OUT	2 B	LOW LEVEL OUT
14/28VB	1 A	LOW LEVEL OUT

*JUMPER J101-2 TO J101-5 IN 14V INSTALLATIONS
JUMPER J101-3 TO J101-5 IN 28V INSTALLATIONS
CP 136 ONLY

FIGURE 2-1. BENCH TEST SET-UP

2.2.2.2 Test Procedure

This procedure assumes that the internal audio input level controls have not been changed from the factory settings and the pushbuttons are labeled as in Figure 1-1.

a. Connect the unit into the test set-up diagramed in Figure 2-1. When testing a CP 136 the eventual aircraft bus voltage must be considered with regard to connection of the internal speaker amplifier output. The speaker load box is always connected between CABIN SPKR J101-4 and ground. If the CP 136 is to be installed in an aircraft with a 14 Vdc electrical system, an external jumper must be provided between 14V SPKR OUT J101-2 and SPKR IN J101-5. If the CP 136 is to be installed in an aircraft with a 28 Vdc electrical system, an external jumper must be provided between 28 V SPKR OUT J101-3 and J101-5. Set the DC supply to match the anticipated aircraft bus voltage (14 or 28 Vdc).

b. Intercom and Unswitched Audio
   1. Connect the audio generator through a DC blocking capacitor to J101-10 (INTERCOM 1) set to 0.5V at 1 kHz. Connect the audio wattmeter to J101-3 (PHONES OUT). Monitor 50 mW on the wattmeter.
   2. Disconnect the audio generator and capacitor from J101-10 (INTERCOM 1) and in succession, connect them to J101-11 (INTERCOM 2), J101-L (INTERCOM 3), and J101-M (INTERCOM 4). Monitor 50 mW on the wattmeter for each intercom input tested.
   3. Connect the audio generator to J101-6 (UNSWITCHED AUDIO) and set it for 1 kHz at 3.5V. Monitor 50 mW on the wattmeter.

c. COM 1 and COM 2 Sidetone
   1. Connect the audio generator to J101-19 (COM 1 SIDETONE) and set it for 1 kHz at 3.5V. Depress the COM 1 pushbutton. Ground J101-16 (MIKE KEY). Monitor 50 mW on the wattmeter.
   2. Repeat Step 1 with the audio generator connected to J101-18 (COM 2 SIDETONE) and the COM 2 pushbutton depressed. Monitor 50 mW on the wattmeter.

d. Switched Audio - COM 1, COM 2, BOTH, NAV 1, NAV 2, ADF, and DME/MKR
   1. Connect the audio generator to J101-J (COM 1 IN) set to 3.5V at 1 kHz. Depress the COM 1 pushbutton and the SPKR pushbutton. Connect the AC VTVM to J101-A or J101-B (LOW LEVEL OUT). Monitor 0.35V rms on the VTVM; Monitor 10W on the Speaker Load Box (CP 136).
   2. Repeat Step 1 with the audio generator connected to J101-H (COM 2 IN) and the COM 2 pushbutton depressed. Monitor 0.35V rms on the VTVM. Monitor 10W on the Speaker Load Box (CP 136).
   3. Repeat Steps 1 and 2 with COM 1 and COM 2 pushbuttons out and the BOTH pushbutton depressed.
   4. Connect the audio generator to J101-N (NAV 1) set to 3.5V at 1 kHz. Depress the NAV 1 pushbutton. Monitor 0.35V rms on the VTVM. Monitor 10W on the Speaker Load Box (CP 136).
   5. Connect the audio generator to J101-E (NAV 2). Depress the NAV 2 pushbutton. Monitor 0.35V rms on the VTVM. Monitor 10W on the Speaker Load Box (CP 136).

2.2.2.2 Continued

6. Connect the audio generator to J101-D (ADF IN). Depress the ADF pushbutton. Monitor 0.35V rms on the VTVM. Monitor 10W on the Speaker Load Box (CP 136).
7. Connect the audio generator to J101-24 (DME AUDIO). Depress the DME/MKR pushbutton. Monitor 0.35V rms on the VTVM. Monitor 10W on the Speaker Load Box (CP 136).
8. Connect the audio generator to J101-Z (MKR AUDIO IN). Monitor 0.35V rms on the VTVM. Monitor 10W on the Speaker Load Box (CP 136).
9. Alternately disconnect, then reconnect J101-F, 14/28A and J101-1 14/28VB. Monitor 0.35V rms on the meter even though one of the A+ voltages is disconnected.

c. Optional Marker Beacon Receiver

1. Interconnect the Audio Signal Generator, VHF Signal Generator, Frequency Counter, and 6 dB pad as illustrated in Figure 2-1.
2. Tune the VHF Generator to 75 MHz $\pm$ 1.0 kHz; modulate the generator 95% at 1300 Hz. Set the VHF generator output level to 400 uV.
3. Set the HI-LO-TST switch to the HI position. Connect the test equipment to J101-CC (MKR ANT) and J101-25 (MKR GND). The amber light should come on.
4. Set the HI-LO-TST switch to the LO position. Increase the VHF generator output level to 2000 uV. The amber light should come on.
5. Repeat Step 4 with VHF generator modulated at 400 Hz to light the blue lamp and 3000 Hz to light the white lamp.
6. Connect and set the test equipment as described on Steps 1 and 2. Connect the AC VTVM to J101-A or J101-B (LOW LEVEL OUT). Monitor 0.35V rms on the VTVM. Monitor 10W on the Speaker Load Box (CP 136).
7. Momentarily depress the MKR MUTE button. The VTVM or the Speaker Load Box should read zero then gradually increase to full output in approximately 10 to 14 seconds.
8. Disconnect the Audio Signal Generator, VHF Signal Generator, Frequency Counter, and 6 dB pad. Hold the HI-LO-TST switch in the TST position. Monitor 0.1V rms on the VTVM.

2.2.3 System Audio Levels

The CP 135 and CP 136 internal audio input level controls are factory-set to accept audio input levels produced by the current line of Narco Communications and Navigation Equipment. In the event that a unit contained in the aircraft communication and navigation system produces an audio output level less than 3.0V rms or greater than 4.0V rms, the audio input level control associated with that particular input should be adjusted accordingly, until the CP 135 and CP 136 audio output levels meet specified values. For input levels less than 3.0V rms the control should be turned clockwise; for input levels greater than 4.0V rms, the control should be turned counterclockwise.

2.2.3 Continued

This adjustment may be accomplished by using the particular unit or an audio signal generator set to match the unit's audio output level. Refer to paragraph 2.2.2.2 for set-up procedure and Figure 2-2 for location of the audio input level controls.

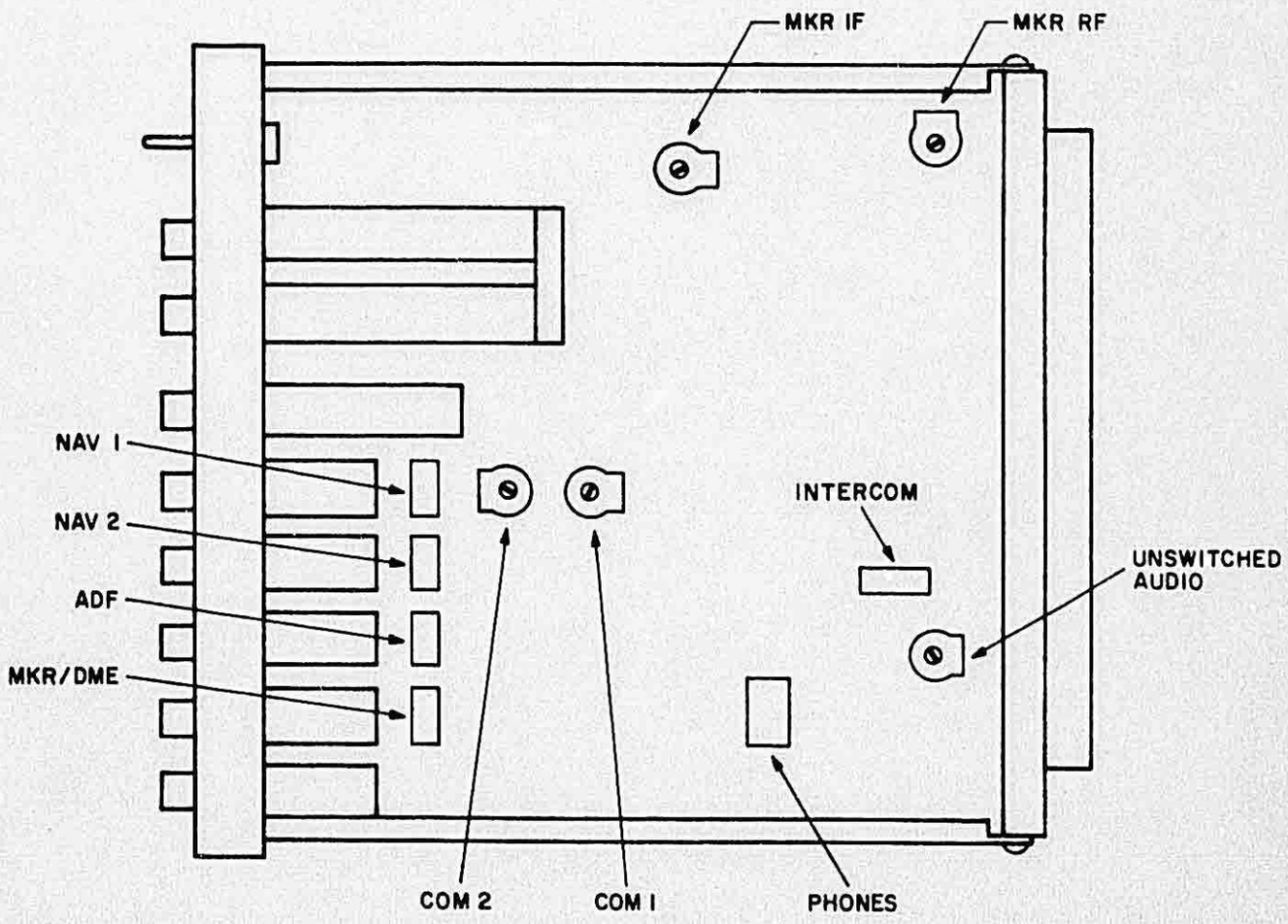
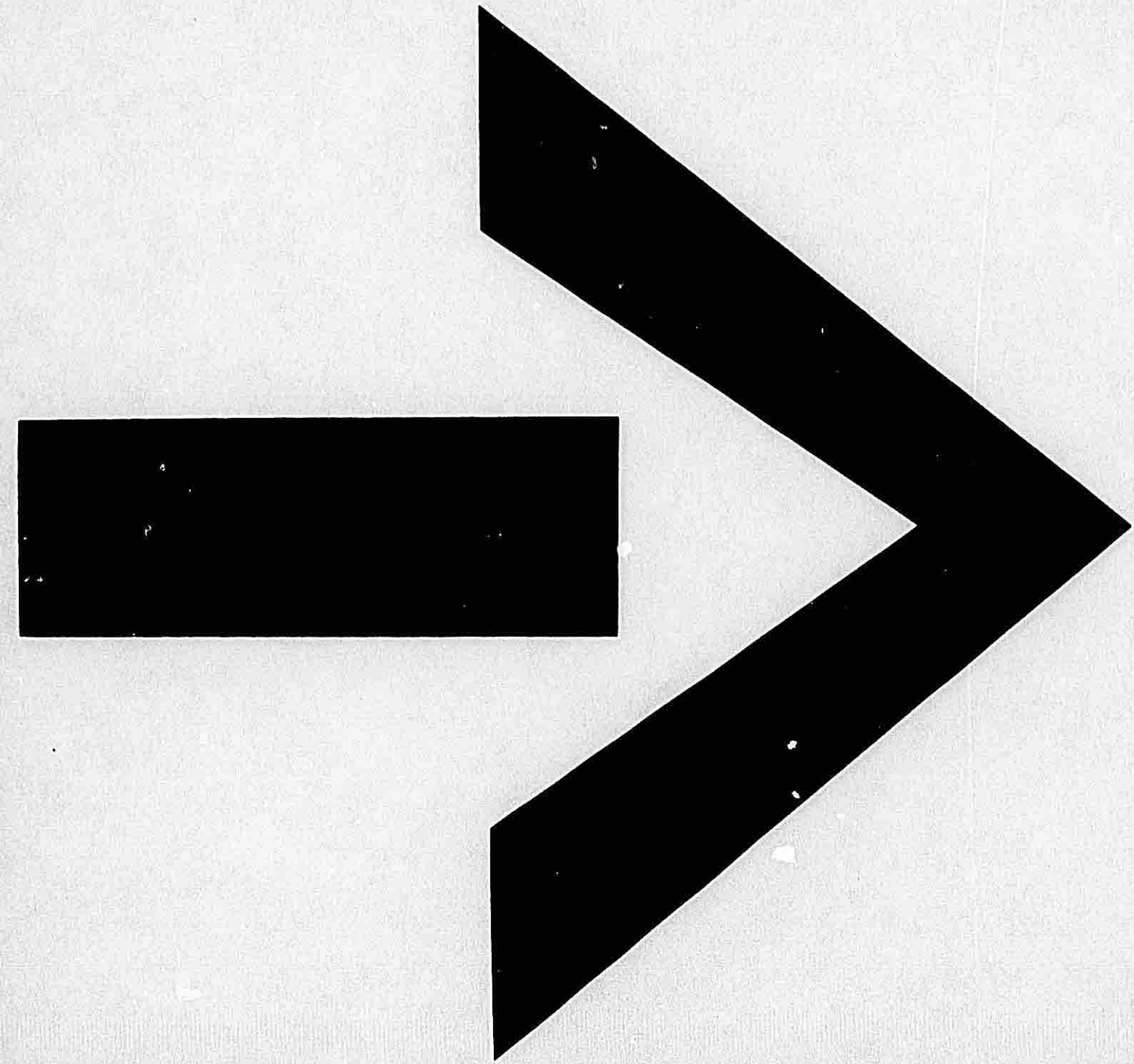


FIGURE 2-2. AUDIO INPUT LEVEL AND MKR SENSITIVITY CONTROLS



2.3 MECHANICAL INSTALLATION

2.3.1 Mounting Tray

The CP 135 and CP 136 are supplied with a mounting tray which is designed to mount behind the aircraft instrument panel using three number 6 screws. Figure 2-3 provides a detailed drawing of the tray and the parts of the Installation Kit. This figure also provides all the necessary dimensions for the panel cutout as well as dimensions for mounting bracket locations. A full scale panel cutout template is also provided.

Mounting brackets (3) are not supplied due to the wide range in mounting requirements. Suitable mounting brackets may be fabricated from ordinary sheet metal or angle stock.

To ensure a sturdy mount, rear support for the unit should be provided.

The tray must be provided with a good electrical ground to the airframe.

2.3.2 Insertion And Removal Of The CP 135 And CP 136

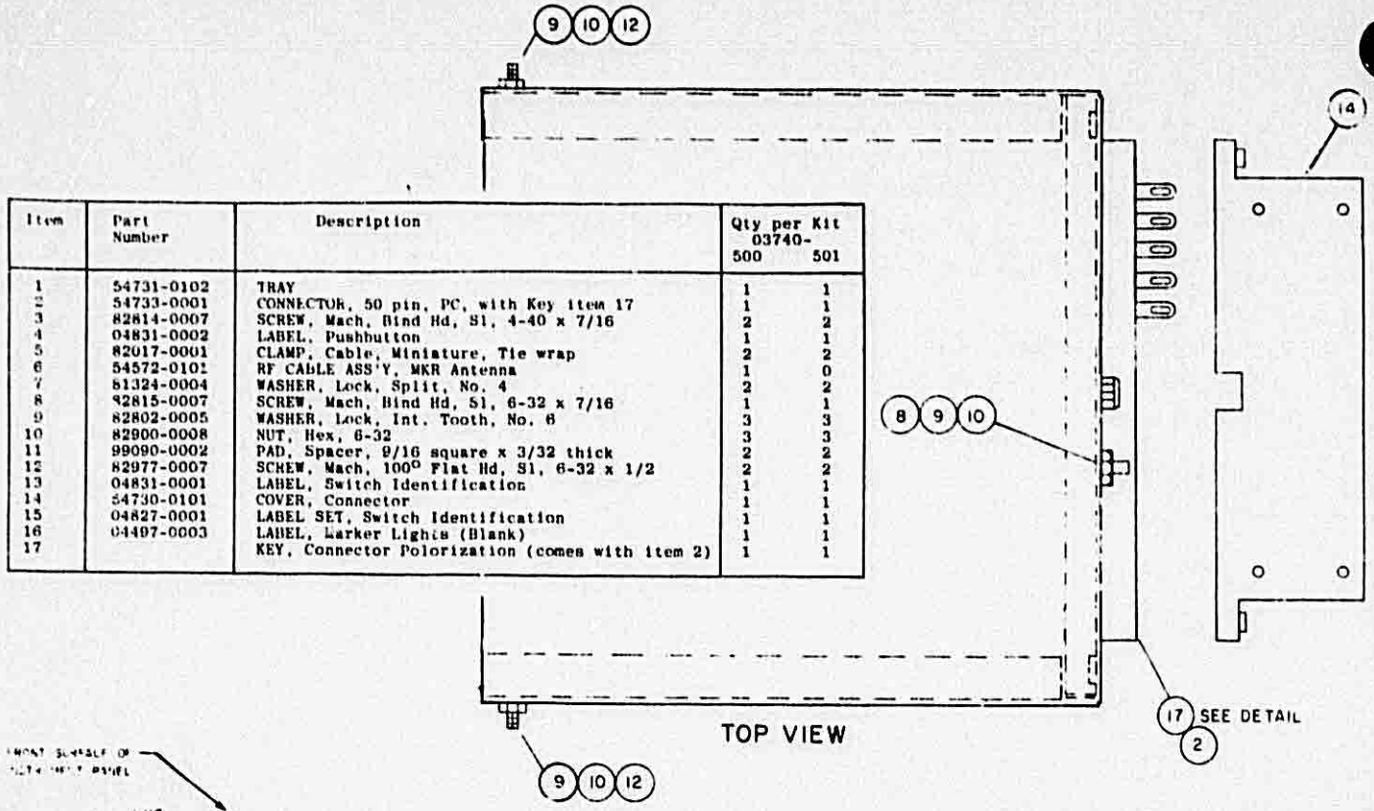
The CP 135 and CP 136 are secured to the mounting tray by a allen head ramping screw running from the front panel to the rear of the unit and a self-locking nut attached to the tray rear panel. The access hole for the ramping screw is located on the front panel between the BOTH and NAV 1 pushbuttons (see Figure 1-1).

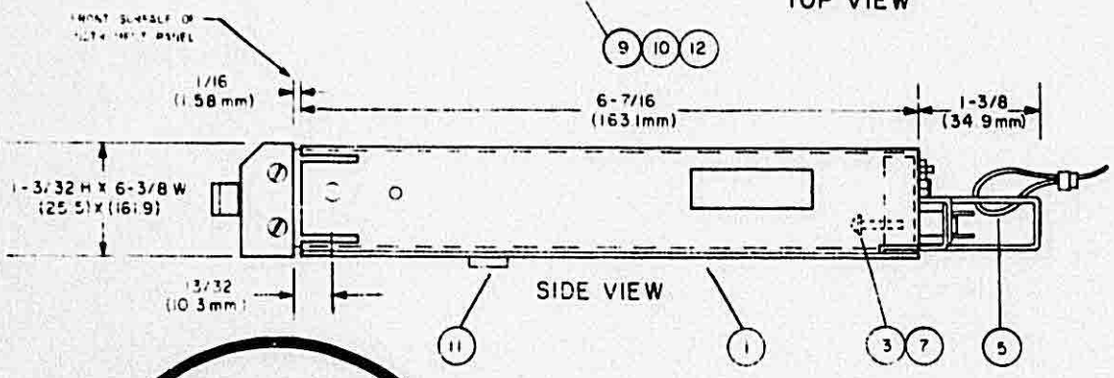
Slide the unit straight into the tray until the ramping screw contacts the self-locking nut. Using a 5/64" Allen wrench, turn the screw clockwise until the mating connector is engaged and the unit is firmly secured in the tray.

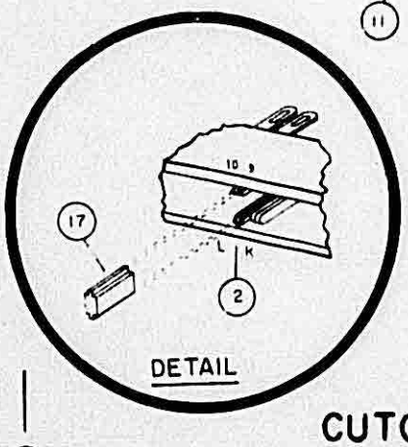
DO NOT RAM THE UNIT INTO THE TRAY OR OVER TIGHTEN THE RAMPING SCREW.

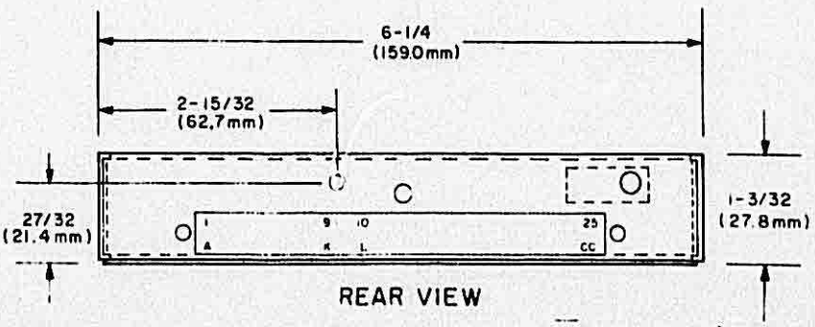
To remove the unit, turn the ramping screw counterclockwise until it is clear of the self-locking nut and then pull the unit straight out.

Item	Part Number	Description	Qty per Kit 03740- 500	501
1	54731-0102	TRAY	1	1
2	54733-0001	CONNECTOR, 50 pin, PC, with Key item 17	1	1
3	82814-0007	SCREW, Mach, Bind Hd, Sl, 4-40 x 7/16	2	2
4	04831-0002	LABEL, Pushbutton	1	1
5	82017-0001	CLAMP, Cable, Miniature, Tie wrap	2	2
6	54572-0101	RF CABLE ASS'Y, MKR Antenna	1	0
7	81324-0004	WASHER, Lock, Split, No. 4	2	2
8	82815-0007	SCREW, Mach, Bind Hd, Sl, 6-32 x 7/16	1	1
9	82802-0005	WASHER, Lock, Int. Tooth, No. 6	3	3
10	82900-0008	NUT, Hex, 6-32	3	3
11	99090-0002	PAD, Spacer, 9/16 square x 3/32 thick	2	2
12	82977-0007	SCREW, Mach, 100° Flat Hd, Sl, 6-32 x 1/2	2	2
13	04831-0001	LABEL, Switch Identification	1	1
14	54730-0101	COVER, Connector	1	1
15	04827-0001	LABEL SET, Switch Identification	1	1
16	04497-0003	LABEL, Marker Lights (Blank)	1	1
17		KEY, Connector Polorization (comes with item 2)	1	1









CUTOUT TEMPLATE (1:1)

DIMENSIONS IN PARENTHESIS ( ) ARE MILLIMETERS

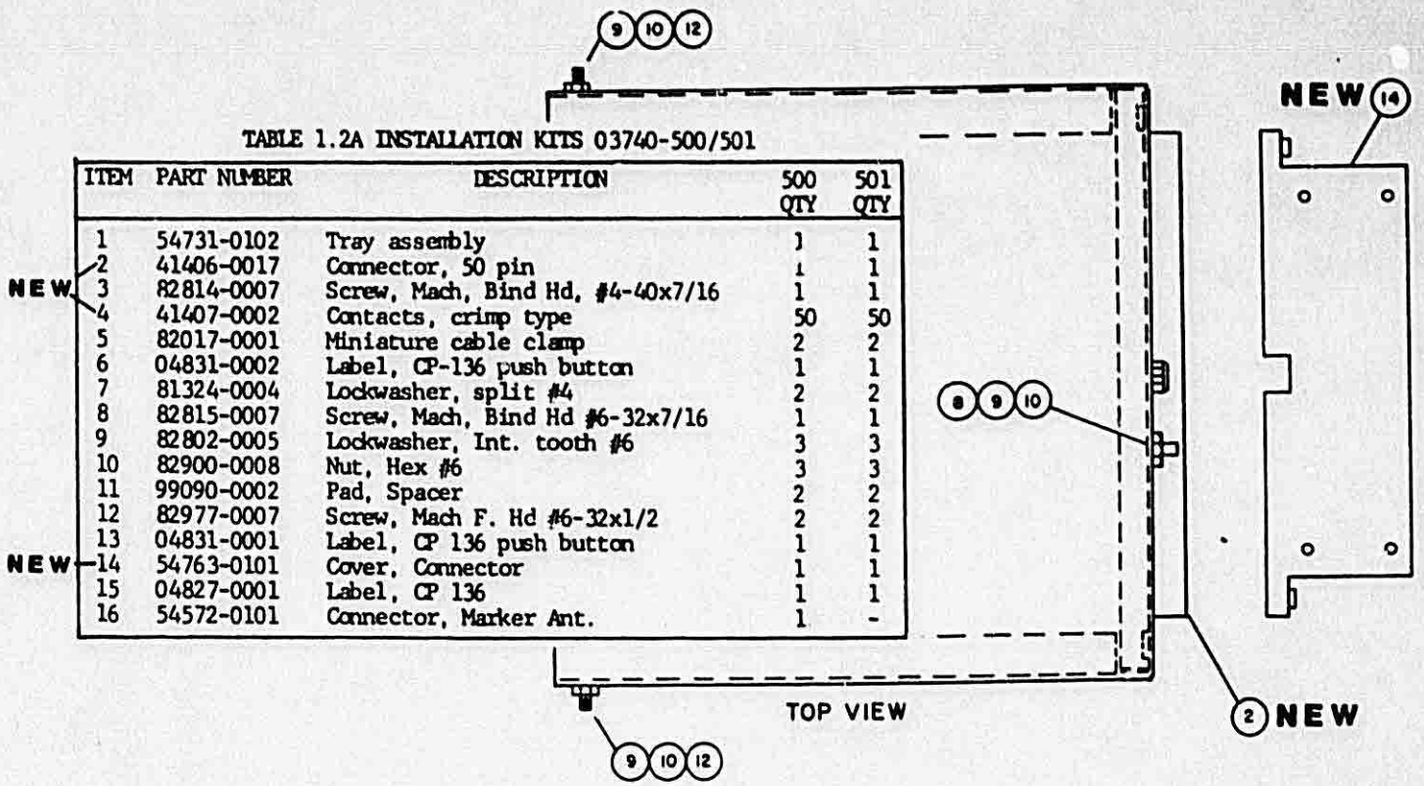
1 1/8
(28.6)

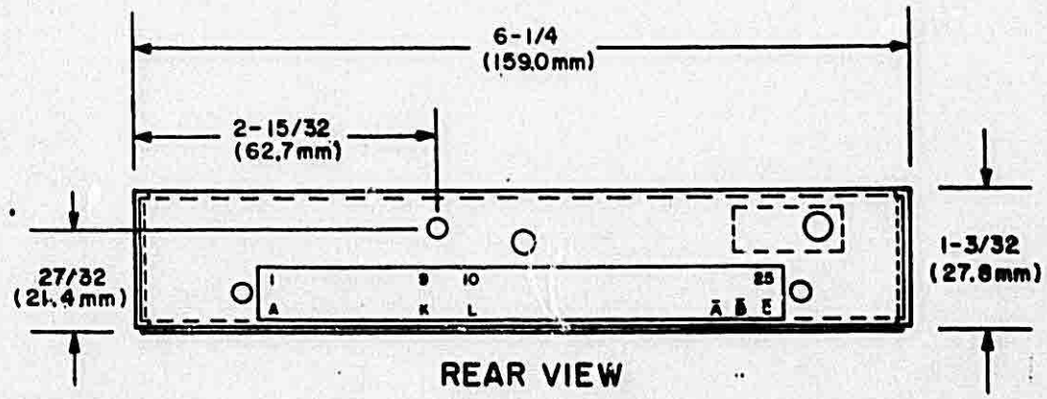
69/32 (159.5)

FIGURE 2-3. INSTALLATION DIAGRAM

TABLE 1.2A INSTALLATION KITS 03740-500/501

	ITEM	PART NUMBER	DESCRIPTION	500 QTY	501 QTY
	1	54731-0102	Tray assembly	1	1
	2	41406-0017	Connector, 50 pin	1	1
NEW	3	82814-0007	Screw, Mach, Bind Hd, #4-40x7/16	1	1
	4	41407-0002	Contacts, crimp type	50	50
	5	82017-0001	Miniature cable clamp	2	2
	6	04831-0002	Label, CP-136 push button	1	1
	7	81324-0004	Lockwasher, split #4	2	2
	8	82815-0007	Screw, Mach, Bind Hd #6-32x7/16	1	1
	9	82802-0005	Lockwasher, Int. tooth #6	3	3
	10	82900-0008	Nut, Hex #6	3	3
	11	99090-0002	Pad, Spacer	2	2
	12	82977-0007	Screw, Mach F. Hd #6-32x1/2	2	2
	13	04831-0001	Label, CP 136 push button	1	1
NEW	14	54763-0101	Cover, Connector	1	1
	15	04827-0001	Label, CP 136	1	1
	16	54572-0101	Connector, Marker Ant.	1	-





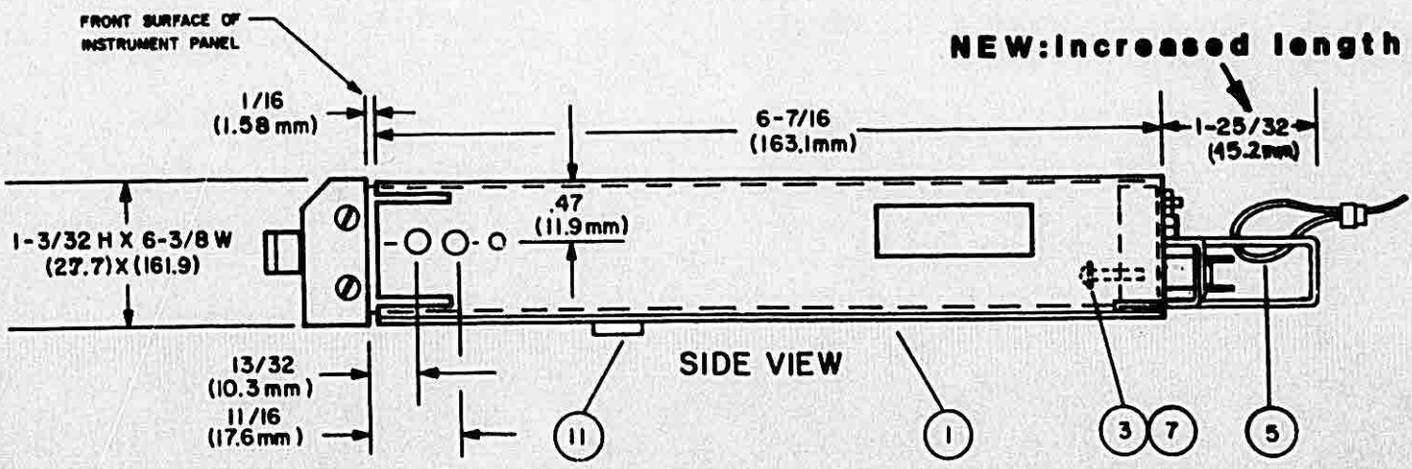
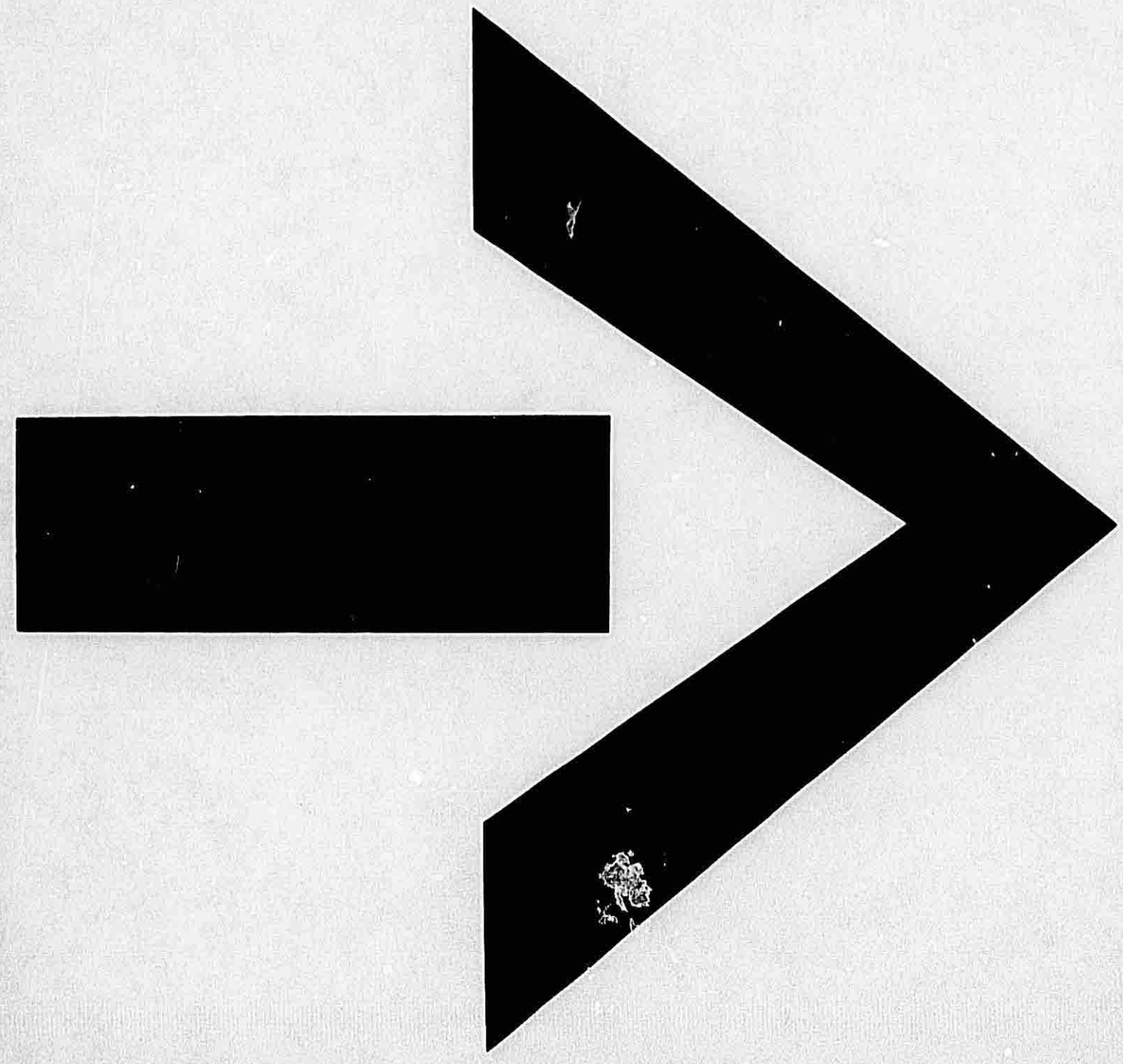


FIGURE 2-3A INSTALLATION DIAGRAM



2.4 ANTENNA INSTALLATION

If the CP 135 or CP 136 is equipped with an optional Marker Beacon Receiver, an antenna is required. Marker Beacon antennas vary widely in form and gain. Narco Avionics markets the VMA-15 Marker Beacon Antenna shown in Figure 2-4. This non-TSO'd, 50 ohm antenna provides 10 dB of gain with a single lobed, downward directed pattern. Rugged enough for use on all sub-sonic aircraft, the electrical elements are sealed by foamed-in-place resin, within a plastic housing. Additional information is presented in the VMA-15 Installation Manual.

Alternate antennas may be the Marker Beacon only type, as shown in Figure 2-5, or a combination ADF Sense/Marker Beacon Antenna. A recommended combination antenna is the Model AD92 marketed by Antenna Developments of Cleveland, Ohio.

Figure 2-5 shows a non-TSO'd off center fed antenna. This antenna should be located under, and spaced about six inches away from the fuselage by a pair of support masts. Note that the point where the lead-in is connected is displaced five inches from the center of the antenna wire. This dimension is important for proper impedance matching.

The Marker Beacon Antenna should be located as far aft as possible to reduce noise pick-up. Past experience has shown that placing the tap forward or aft of the center can make a large difference in the performance, due to capacity unbalances, etc. It is therefore recommended that the tap be moved to that side of center where the best reception occurs.

A shorter (quarter wave) bent-rod, shunt fed antenna mounted on the under surface of the aircraft has been found to be satisfactory if the feed point is adjusted for best reception.

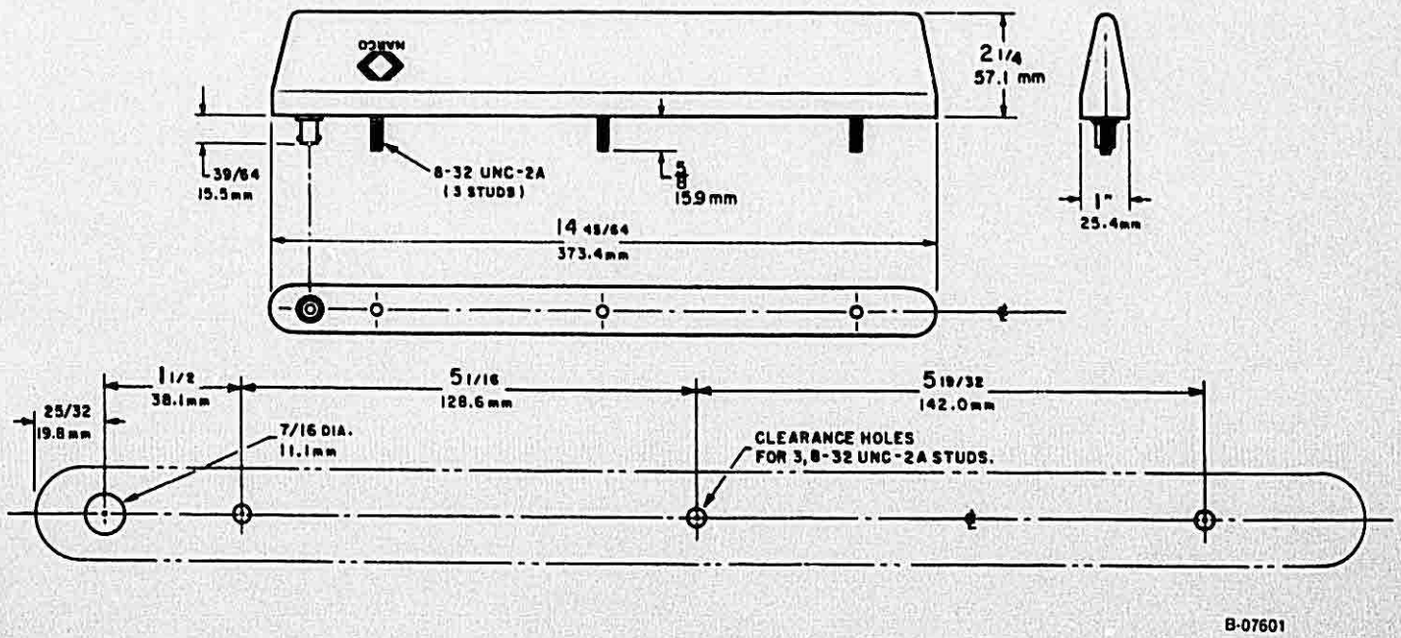


FIGURE 2-4. VMA-15 MARKER BEACON ANTENNA

2.4 Continued

The RG-58A/U antenna cable braid is connected to the metal skin or frame of the aircraft at a point opposite the connection to the antenna wire. The center conductor is connected to a feed-thru insulator, which in turn, is connected to the antenna BNC connector.

The proper method of assembling and soldering a BNC connector to the RG-58A/U cable is shown in Figure 2-6.

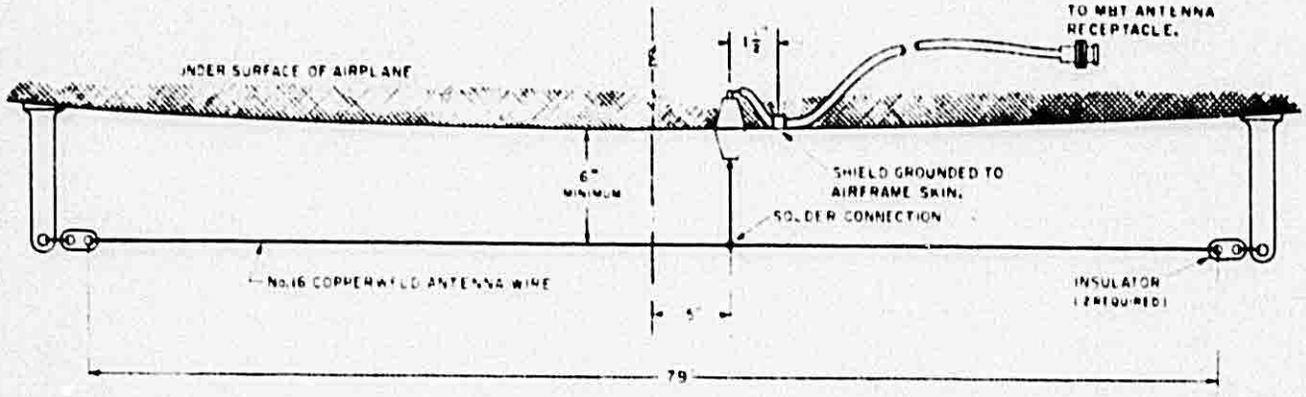
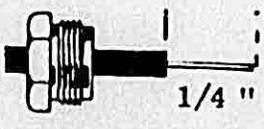
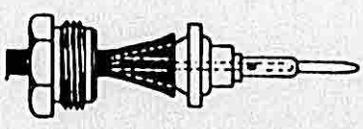


FIGURE 2-5. MARKER BEACON OFF-CENTER FED ANTENNA

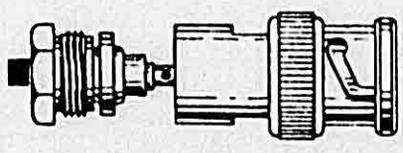


1. Take one clean square cut through cable insulation, braid and dielectric, exposing ¼" of conductor. Slip nut onto cable.

Courtesy of Bendix Corp.



2. Insert conductor into tapered, self-clamping sleeve and contact sub-assembly, force edge of sleeve between dielectric and braid until insulation rides well onto taper. Solder conductor to contact at solder hole.



3. Fit contact sub-assembly into connector body, screw nut into body, binding insulation and braid tightly against tapered sleeve . . . thus forming a strong, weatherproof connection.

All illustrations enlarged for clarity

FIGURE 2-6. RF CONNECTOR ASSEMBLY

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2.5 ELECTRICAL INSTALLATION

Before proceeding with the electrical installation, refer to Table 2.1. This table relates system functions to the CP 135 and CP 136 control switches and rear panel connector J101 along with pertinent notes and references on each system function. Also included in Table 2.1 is a drawing of the audio panel front panel which identifies each control switch by number and the designation assigned on the 9/32" x 4-7/8" Switch Identification Label supplied in the Installation Kit. When planning an installation that requires switch designations in another sequence or different switch designations, the new designations should be written in the provided space to allow accurate panel labeling with the individual Switch Identification Labels provided in the Installation Kit. A check list should be compiled of J101 pin numbers that pertain to the installation. This list will aid in the initial wiring of the connector and in the final check out of the installation.

Figures 2-7 through 2-10 present separate 14 and 28 Volt general wiring diagrams for the CP 135 and CP 136. These diagrams feature the current line of Narco Communications and Navigation equipment.

2.5.1 14/28VA and 14/28VB

Both the CP 135 and CP 136 use separate A+ supplies to drive the cabin speaker and phones circuitry. Internal diode coupling provides that if either the 14/28VA (J101-F) or 14/28VB (J101-1) fails, the low level output will continue to operate.

2.5.2 Grounds

It is important that the audio panel be well grounded. The tray should be provided with a good electrical ground to the airframe. In addition, J101-7 and J101-8 are provided for ground connection. These pins should be grounded to the same point using separate 16 AWG wire.

2.5.3 Dimmer Connections

Four dimmer lead connections are provided:

1. J101-P, 14V DIM
2. J101-C, 28V DIM (connect to ground in 14V installations)
3. J101-Y, MKR DIM
4. J101-12, PUSHBUTTON DIM

The PUSHBUTTON DIM and the MKR DIM may be connected together with either the 14V DIM(14V electrical systems) or the 28V DIM (28V electrical systems) to the aircraft dimmer bus. When connected this way, the pilot lamps will be continuously adjustable; the MKR lamps and pushbutton LED's will dim when the dimmer voltage reaches approximately 2 volts, then maintain the same intensity despite further voltage change.

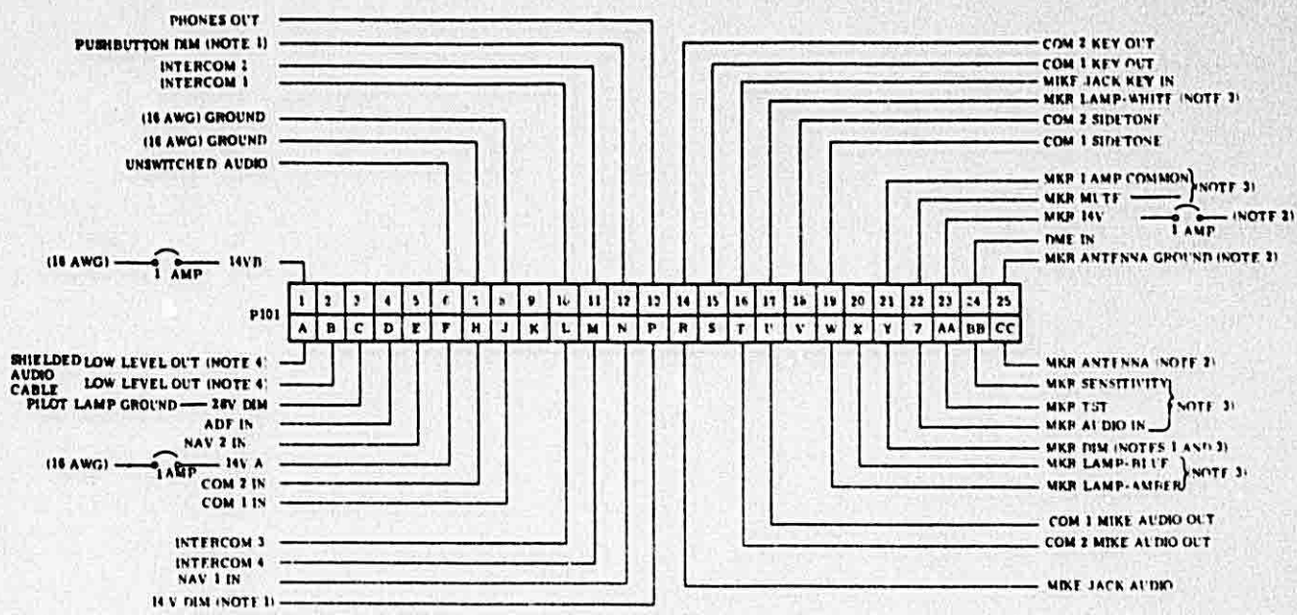
Alternately, the MKR DIM and PUSHBUTTON DIM may be connected to the navigation lights. When the navigation lights are turned on the MKR lamps and pushbutton LED's will come on dimmed.

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TABLE 2.1 SYSTEM FUNCTION/PIN/SWITCH RELATIONSHIP

◎ OMI	SW 1	SW 2	SW 3 Both COM	SW 4	SW 5	SW 6	SW 7	SW 8 SPKR
	COM 1	COM 2		NAV 1	NAV 2	ADF	DME/MKR	

SYSTEM FUNCTION	CONTROL SWITCH	J101 PIN NO.	NOTES
Power Connection:			
Ground	----------	J101-7	Refer to paragraph 2.5.2
Ground	----------	J101-8	
14/28VA	----------	J101-F	Refer to paragraph 2.5.1 and paragraph 1.4 specifications for circuit breaker rating
14/28VB	----------	J101-1	
14V Dim	----------	J101-P	Refer to paragraph 2.5.3
28V Dim	----------	J101-C	
Pushbutton Dim	----------	J101-12	
Rec. Audio Connections:			
COM 1 In	Switch 1	J101-J	Connect to system low level audio outputs
COM 2 In	Switch 2	J101-H	
NAV 1 In	Switch 4	J101-N	
NAV 2 In	Switch 5	J101-E	
ADF In	Switch 6	J101-D	
DME In	Switch 7	J101-24	
Intercom And Unswitched Audio Connections			
Intercom 1 In	----------	J101-10	Refer to paragraph 2.5.7 for various intercom connection diagrams
Intercom 2 In	----------	J101-11	
Intercom 3 In	----------	J101-L	
Intercom 4 In	----------	J101-M	
Unswitched Audio In	----------	J101-6	Connect to emergency warning signals such as helicopter engine off
Audio Output Connections			
Low Level Out	Switch 8 Speaker	J101-A J101-B	Connect to COM aux audio input or other high level amplifier. For dual COM installations aux audio inputs may be connected in parallel. CP 135 installations only. Refer to paragraph 2.5.4.
Phones Out	----------	J101-13	50 mW 600 ohms
14V Speaker Out	Switch 8 Speaker	J101-2	Connect to J101-5 - 14V installations. CP 136 installations only
28V Speaker Out	Switch 8 Speaker	J101-3	Connect to J101-5 - 28V installations. CP 136 installations only
Cabin Speaker	Switch 8	J101-4	10 watts across 4 ohm speaker. CP 136 installations only
Transmit Connections:			
Mike Jack Key	----------	J101-16	Connect to Mike Jack key
COM 1 Key Out	Switch 1	J101-15	Connect to COM 1 mike key
COM 2 Key Out	Switch 2	J101-14	Connect to COM 2 mike key
Mike Jack Audio	----------	J101-R	Connect to Mike Audio
COM 1 Mike Audio Out	Switch 1	J101-U	Connect to COM 1 mike audio
COM 2 Mike Audio Out	Switch 2	J101-T	Connect to COM 2 mike audio
COM 1 Sidetone	Switch 1	J101-19	Connect to COM 1 phones
COM 2 Sidetone	Switch 2	J101-18	Connect to COM 2 phones
Remote Marker Beacon Connections:			
MKR Audio In	Switch 7	J101-Z	Connect to MKR audio out
MKR Sensitivity	HI-LO-TST	J101-BB	Connect to MKR sensitivity
MKR Test	HI-LO-TST	J101-AA	Connect to MKR test activate
White MKR Lamp	----------	J101-17	Connect to MKR white lamp
Amber MKR Lamp	----------	J101-W	Connect to MKR amber lamp
Blue MKR Lamp	----------	J101-X	Connect to MKR blue lamp
MKR Lamp Common	----------	J101-21	Connect to MKR lamp common
MKR Mute	----------	J101-22	Connect to MKR Mute
Optional Marker Beacon Connections:			
MKR Antenna	----------	J101-CC	Refer to paragraph 2.4 for antenna selection and installation
MKR Antenna Ground	----------	J101-25	
MKR 14/28V	----------	J101-23	Refer to Section 1, paragraph 1.4 specifications for circuit breaker ratings
MKR Dim	----------	J101-Y	Refer to paragraph 2.5.3

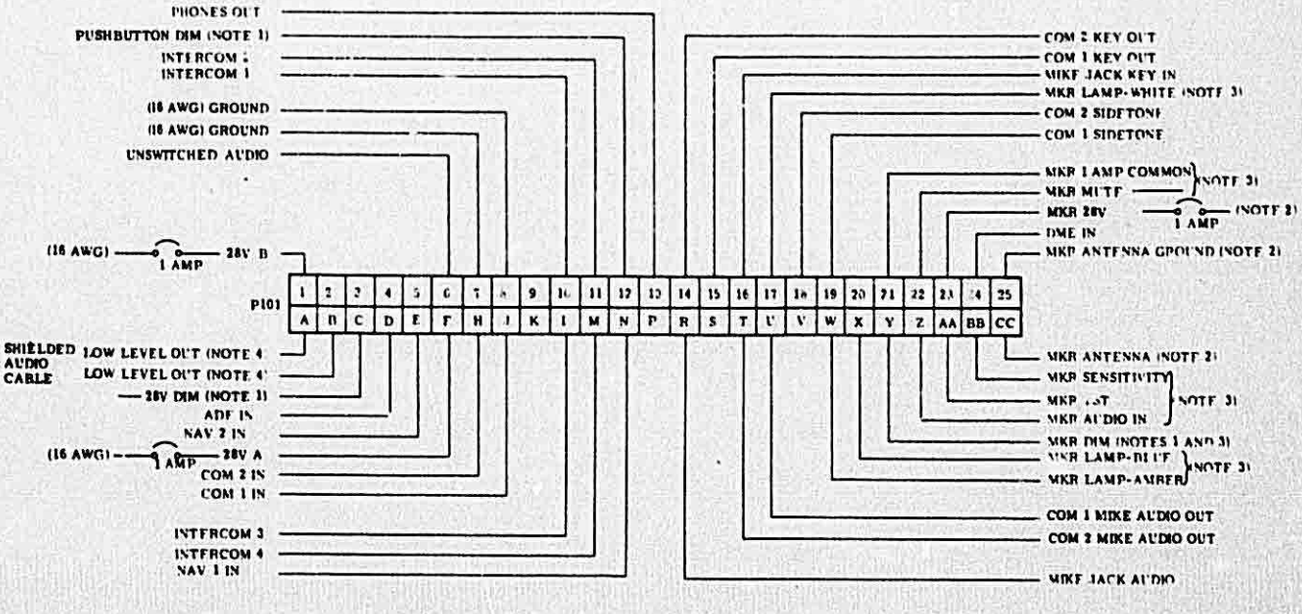


NOTES

1. REFER TO PARAGRAPH 2.5.3 FOR VARIOUS DIMMER CONNECTION METHODS
2. CONNECTION REQUIRED ONLY WHEN OPTIONAL INTERNAL MARKER BEACON RECEIVER IS INSTALLED
3. CONNECTION NOT REQUIRED WHEN OPTIONAL INTERNAL MARKER BEACON RECEIVER IS INSTALLED
4. REFER TO PARAGRAPHS 2.5.4 AND 2.5.5 FOR VARIOUS LOW LEVEL OUT CONNECTION METHODS

(ALL SIGNAL LEADS 22 AWG UNLESS OTHERWISE NOTED.)

FIGURE 2-7. CP 135 14V GENERAL WIRING DIAGRAM



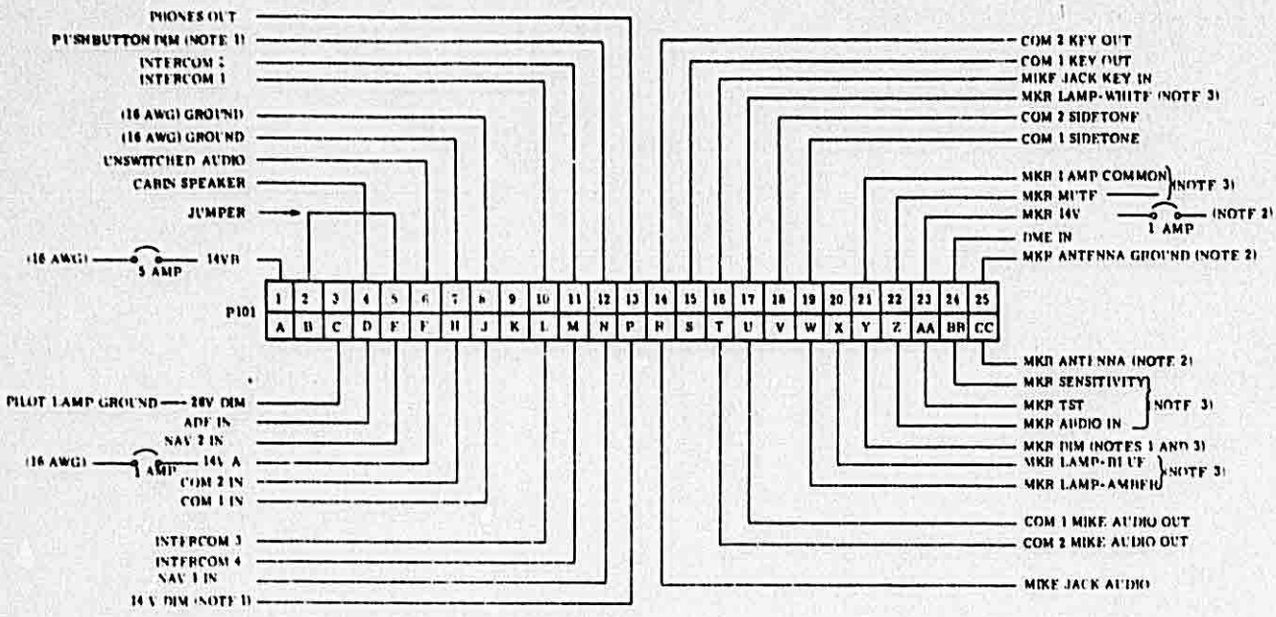
NOTES

1. REFER TO PARAGRAPH 2.5.3 FOR VARIOUS DIMMER CONNECTION METHODS
2. CONNECTION REQUIRED ONLY WHEN OPTIONAL INTERNAL MARKER BEACON RECEIVER IS INSTALLED
3. CONNECTION NOT REQUIRED WHEN OPTIONAL INTERNAL MARKER BEACON RECEIVER IS INSTALLED
4. REFER TO PARAGRAPHS 2.5.4 AND 2.5.5 FOR VARIOUS LOW LEVEL OUT CONNECTION METHODS

(ALL SIGNALS LEADS 22 AWG UNLESS OTHERWISE NOTED.)

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FIGURE 2-8. CP 135 28 V GENERAL WIRING DIAGRAM

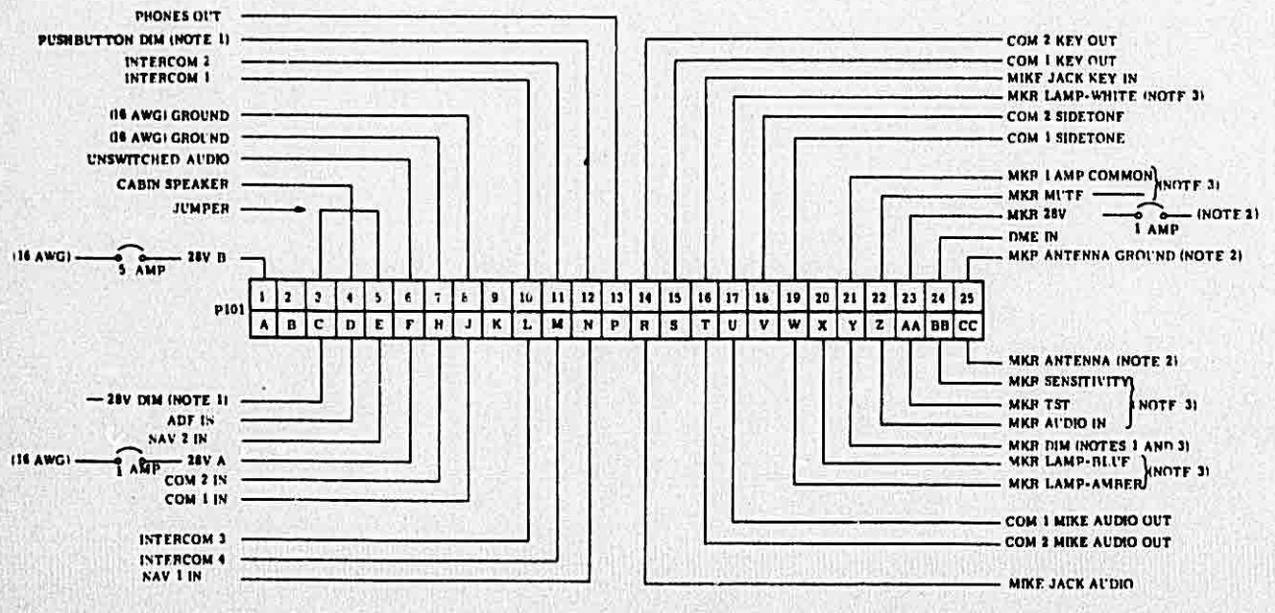


NOTES

1. REFER TO PARAGRAPH 2.5.3 FOR VARIOUS DIMMER CONNECTION METHODS
2. CONNECTION REQUIRED ONLY WHEN OPTIONAL INTERNAL MARKER BEACON RECEIVER IS INSTALLED
3. CONNECTION NOT REQUIRED WHEN OPTIONAL INTERNAL MARKER BEACON RECEIVER IS INSTALLED

(ALL SIGNAL LEADS 22 AWG UNLESS OTHERWISE NOTED.)

FIGURE 2-9. CP 136 14V GENERAL WIRING DIAGRAM



NOTES

1. REFER TO PARAGRAPH 2.5.3 FOR VARIOUS DIMMER CONNECTION METHODS
2. CONNECTION REQUIRED ONLY WHEN OPTIONAL INTERNAL MARKER BEACON RECEIVER IS INSTALLED
3. CONNECTION NOT REQUIRED WHEN OPTIONAL INTERNAL MARKER BEACON RECEIVER IS INSTALLED

(ALL SIGNALS LEADS 22 AWG UNLESS OTHERWISE NOTED.)

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FIGURE 2-10. CP 136 28V GENERAL WIRING DIAGRAM

2.5.3.1 Aircraft Without Dimmer

If the audio panel is to be installed in an aircraft without a dimmer bus, the 14V DIM or 28V DIM may be connected to A+. When connected this way, the panel lamps will come on at full intensity.

If a navigation light lead is not available for the MKR DIM and PUSHBUTTON DIM, the MKR DIM should be left unconnected and the PUSHBUTTON DIM should be connected to A+. When connected this way, the MKR lamps will be at full intensity and the pushbutton LED's will be permanently dimmed.

To permanently dim the MKR lamps and pushbutton LED's, connect both the MKR DIM and PUSHBUTTON DIM to A+.

2.5.4 Low Level Out Connection To Single COM Transceiver, CP 135 Only

In CP 135 installations, the COM audio amplifier/modulator will also perform as the cabin speaker amplifier. Connect LOW LEVEL OUT J101-A or J101-B to the COM AUX AUDIO input.

The DC supply voltage of the COM audio amplifier/modulator may be connected so as to bypass the COM ON-OFF switch. Refer to the COM Installation Manual for modification procedure.

2.5.5 Low Level Out Connection To Dual COM Transceivers, CP 135 Only

Where dual COM transceivers are utilized, their AUX AUDIO inputs may be paralleled and then connected directly to the CP 135 LOW LEVEL outputs. However, early COM transceivers will require modification to prevent the microphone audio during transmit from being amplified by the unkeyed COM transceiver's audio amplifier and being faintly heard on the cabin speaker.

COM 10, COM 10A, COM 11, or COM 11A with chassis serial numbers CN (A/B) 171C10 or higher, or COM 110 TSO or COM 111 TSO with chassis serial numbers CN (A/B) 219B2 or higher will require no modification. COM transceivers with chassis numbers lower than those listed will require modification. Refer to the appropriate COM Maintenance Manual for lead and component location in the transmitter module and modify the COM Unit as follows:

1. Remove R432.
2. Remove all ground leads from K401, pin 13.
3. Remove the coaxial cable from K401, pin 12 and connect it to K401, pin 13.
4. Connect all ground leads removed in Step 2 to K401, pin 12.
5. Install a new R432, 560 ohm, 1/2 watt carbon resistor, from K401, pin 11 to the hole in the printed circuit board that R432 was inserted into which connects to P401A, pin 7 and R433 (hole nearest P401A).

2.5.6 Low Level Out Connection To High Level Amplifier, CP 135 Only

A high level amplifier may be connected to the LOW LEVEL OUT connections and used as a cabin speaker amplifier.

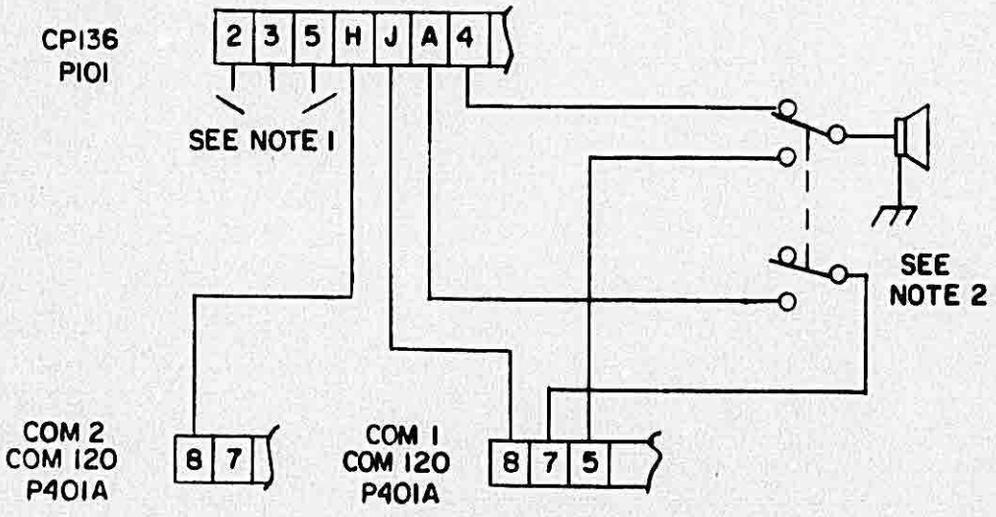
2.5.7 Cabin Speaker Connections, CP 136 Only

The CP 136 contains an integral 10 watt cabin speaker amplifier. The speaker amplifier has two output connections, one at J101-2 for 14V installations, and one at J101-3 for 28V installations.

To preserve the interchangability of pushbutton and toggle switch audio panels, the speaker is always connected to CABIN SPKR J101-4. J101-4 is internally jumpered to SPKR IN J101-5. For 14V installations, an external jumper must be provided between 14V SPKR OUT J101-2 and J101-5. For 28V installations, an external jumper must be provided between 28V SPKR OUT J101-3 and J101-5.

IT IS IMPORTANT THAT THE PROPER CONNECTIONS BE MADE! Improper connection will result in early failure and/or high audio distortion.

The CP 136 also allows for, if desired, an optional redundant cabin amplifier hookup that utilizes the COM 1 high level amplifier. Refer to Figure 2-11 for wiring.



NOTES: 1) 14V INSTALLATIONS - JUMPER P101-2 TO P101-5
28V INSTALLATIONS - JUMPER P101-3 TO P101-5
2) INSTRUMENT PANEL MOUNTED DPDT SWITCH. SHOWN IN NORMAL POSITION, AUDIO PANEL SPEAKER AMPLIFIER IN USE.

FIGURE 2-11. REDUNDANT CABIN AMPLIFIER HOOK UP

2.5.8 Intercom Connections

The CP 135 and CP 136 provide four INTERCOM connections J101-10, J101-11, J101-L, and J101-M which allow for great flexibility in the design of intercom systems.

These four inputs will supply the required microphone current and connect directly to the internal headphone amplifier. They are not muted during transmit or at any other time. An internal INTERCOM level control (see Figure 2-2) sets the input level of all four inputs simultaneously.

Figures 2-12 through 2-14 present a small number of the many types of intercom interconnections that are possible.

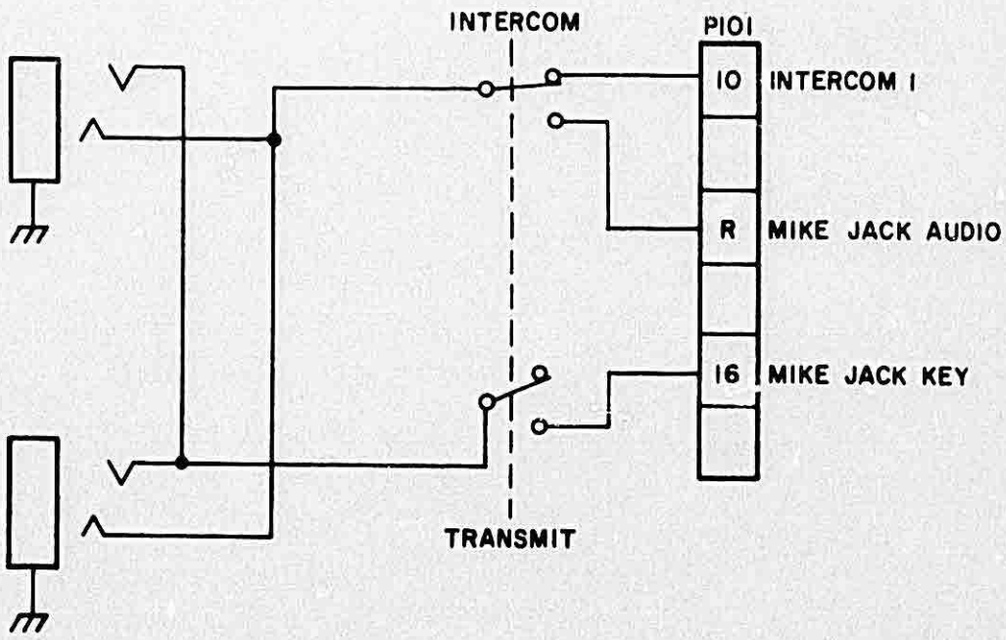
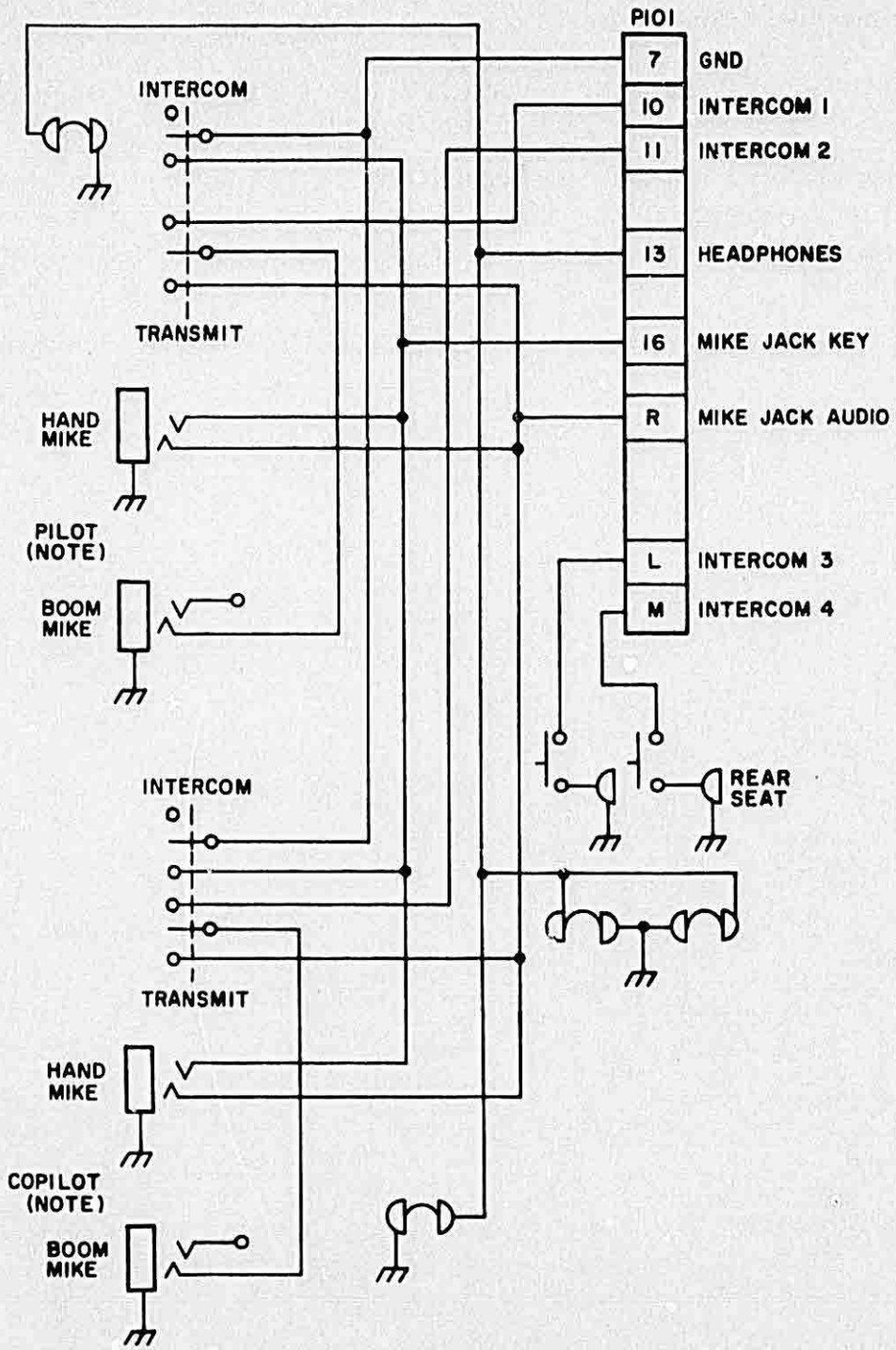


FIGURE 2-12. BASIC INTERCOM SYSTEM WHICH IS ADAPTABLE INTO AIRCRAFT THAT HAVE MICROPHONE JACKS WIRED IN PARALLEL



NOTE: BOOM MICROPHONE OR HAND MICROPHONE CAN BE USED. HOWEVER, THERE WILL BE NO INTERCOM WHEN HAND MICROPHONE IS USED.

FIGURE 2-13. WHEEL PUSH-TO-TALK INTERCOM SYSTEM-FIXED WING

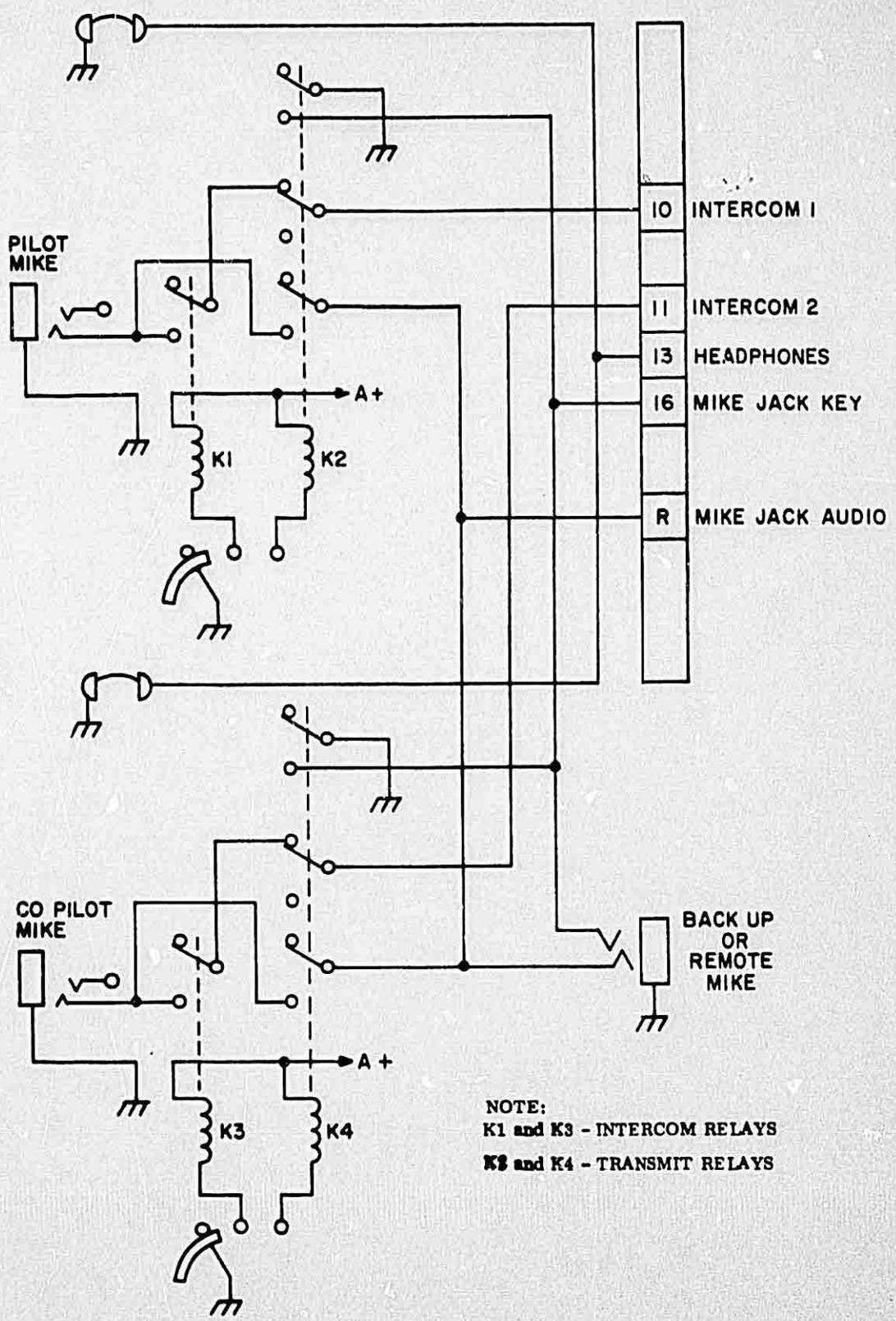
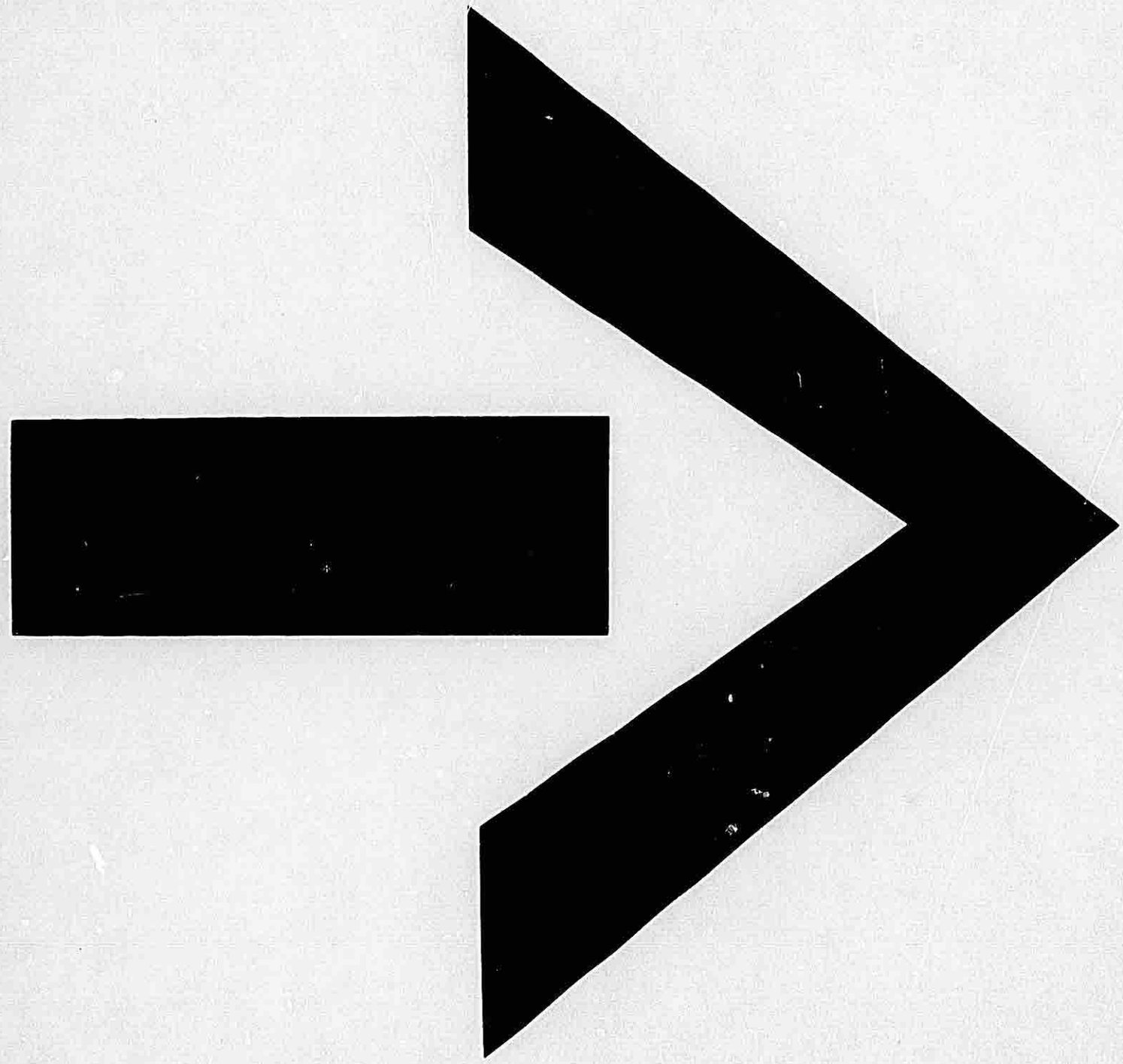


FIGURE 2-14. HELICOPTER BASIC INTERCOM SYSTEM



2.6 POST INSTALLATION TESTS

2.6.1 Pre-Flight Tests (pushbuttons labeled as in Figure 1-1)

1. Turn all system avionics OFF using each unit's ON-OFF switch.
2. Depress the SPKR pushbutton.
3. Depress the COM 1 pushbutton. Turn the COM 1 transceiver ON. Channel the transceiver to a frequency available at the airport. Transmit and receive check for sidetone audio in the headphones during transmit. Turn the COM 1 transceiver OFF.
4. Depress the COM 2 pushbutton. Turn the COM 2 transceiver ON. Channel the transceiver to a frequency available at the airport. Transmit and receive. Check for sidetone audio in the headphones during transmit.
5. With COM 2 audio or noise present on the cabin speaker, release the SPKR push-button. Speaker audio should no longer be present. Listen for COM 2 audio on the headphones.
6. Reactivate the speaker by depressing the SPKR pushbutton.
7. Depress the BOTH pushbutton. Turn COM 1 ON. Vary both COM transceivers volume controls to determine that both are audible on the speaker and headphones.
8. With the two COM units ON, check the NAV units (one at a time) by depressing the appropriate pushbutton. Turn ON that NAV unit and listen for a received signal when available or for receiver noise. Turn the COM transceiver's volume down as necessary.
9. Depress the MKR/DME pushbutton. Hold the HI-LO-TST switch in the TST position. The three marker lamps should come ON. If the CP 135 or CP 136 has a built-in Marker Beacon Receiver, a tone will be heard on the speaker and headphones. Release the HI-LO-TST switch.
10. The following procedure requires a ramp type Marker Beacon test set such as Tel-Instrument Model T18A. Place the HI-LO-TST switch in the LO position. Check that each of the three marker lamps changing the Ramp Test set modulation frequency; each lamp should glow brightly.

Blue	400 Hz modulation
Amber	1300 Hz modulation
White	3000 Hz modulation

The tone on the speaker/headphones should also change as the modulation frequency changes.

11. To check the HI sensitivity, set the HI-LO-TST switch in the LO position. Move the Ramp Test Set away from the aircraft until the marker lamp begins to dim then switch the HI-LO-TST switch to the HI position; observe the increase in lamp brillance.
12. Start the engine(s) and listen for alternator noise or any other interference. Energize all pulse equipment.
13. Check the operation of the pilot lamps.

2.6.2 Flight Test

A flight test of an audio panel without an optional Marker Beacon Receiver should not be necessary if the Post Installation Tests has been completed. When the optional Marker Beacon Receiver is installed, the following flight test is recommended to perform the following checks and adjustments.

a. Adjust receiver sensitivity in LO sensitivity mode.
b. Verify receiver performance in HI sensitivity mode.
c. Look for variations in receiver sensitivity due to various landing gear and flight control surface configurations.
d. Check for sufficient marker audio volume and lamp brillance.

Receiver sensitivity has been factory-set for satisfactory performance with a standard Marker Beacon Antenna. Should further adjustment be required, refer to Figure 2-2 for the location of the RF SENSITIVITY control. Clockwise rotation increases the sensitivity, counterclockwise rotation decreases the sensitivity.

An in-flight Marker Beacon Receiver sensitivity test procedure follows:

a. Set receiver to LO sensitivity.
b. Fly at a known ground speed, 1000 feet AGL.
c. On localizer centerline, measure the time (in seconds) that the marker lamp remained lit.
d. Refer to Table 2.2 for correlation.

TABLE 2.2 LO SENSITIVITY LIGHT TIME AT 1,000 FEET (AGL)

GROUND SPEED, In Knots	LIGHT TIME, In Seconds	
	Minimum	Maximum
90	13	20
110	11	16
130	9	14
150	8	12

To calculate flight time for ground speeds other than those tabled:

$$\text{Minimum Light Time (Seconds)} = \frac{1775}{\text{Ground Speed in Knots}}$$

$$\text{Maximum Light Time (Seconds)} = \frac{1183}{\text{Ground Speed in Knots}}$$

2.7 AIRCRAFT LICENSE REQUIREMENTS

To certify the installation FAA form 337 must be completed. In addition, weight and balance or any operating limitations must be entered into the aircraft logbook. Refer to the current Federal Aviation Regulations for any additional requirements.

Weights:

CP 135 without Marker	0.8 lbs (363 gr)
CP 135 with Marker	0.9 lbs (408 gr)
CP 136 without Marker	1.0 lbs (454 gr)
CP 136 with Marker	1.1 lbs (499 gr)

Power Requirements:

CP 135	0.30 amp at 13.75 Vdc
CP 135 (INT. MKR)	0.50 amp at 13.75 Vdc
CP 135	0.30 amp at 27.50 Vdc
CP 135 (INT. MKR)	0.53 amp at 27.50 Vdc
CP 136	2.25 amp at 13.75 Vdc
CP 136 (INT. MKR)	2.45 amp at 13.75 Vdc
CP 136	1.75 amp at 27.50 Vdc
CP 136 (INT. MKR)	1.98 amp at 27.50 Vdc
Pilot Lamps	0.26 amp at 13.75 Vdc
	0.13 amp at 27.50 Vdc

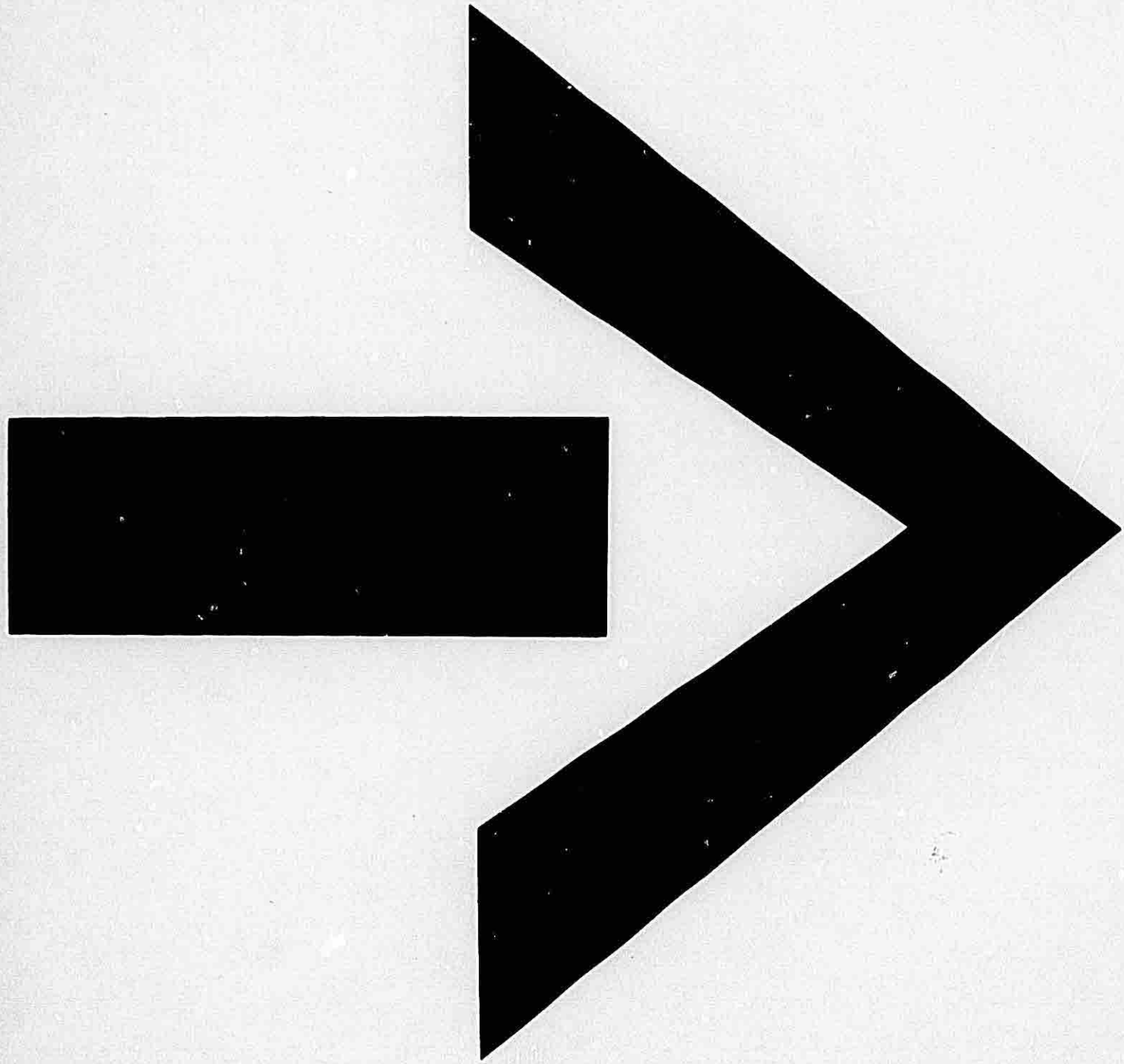


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3.1 AUDIO PANEL, OVERALL DESCRIPTION

The audio panel accepts all aircraft communication and navigation audio signals, and provides switching, combining, and isolation circuits. These circuits produce a phones output and a low-level audio output. The CP 136 equipment also contains a speaker amplifier which produces an output for direct application to a cabin speaker(s).

The block diagram, Figure 3-1, shows the functional relationship of the various switching and amplifier circuits, and several associated circuits. An unswitched alarm audio signal is applied by way of amplifier U103A to the phones amplifier U301B whose output goes to earphones jacks and, in the CP 136, to a speaker amplifier. Up to four intercom inputs can be applied to the same phones amplifier (U301B) by means of an internal combining network.

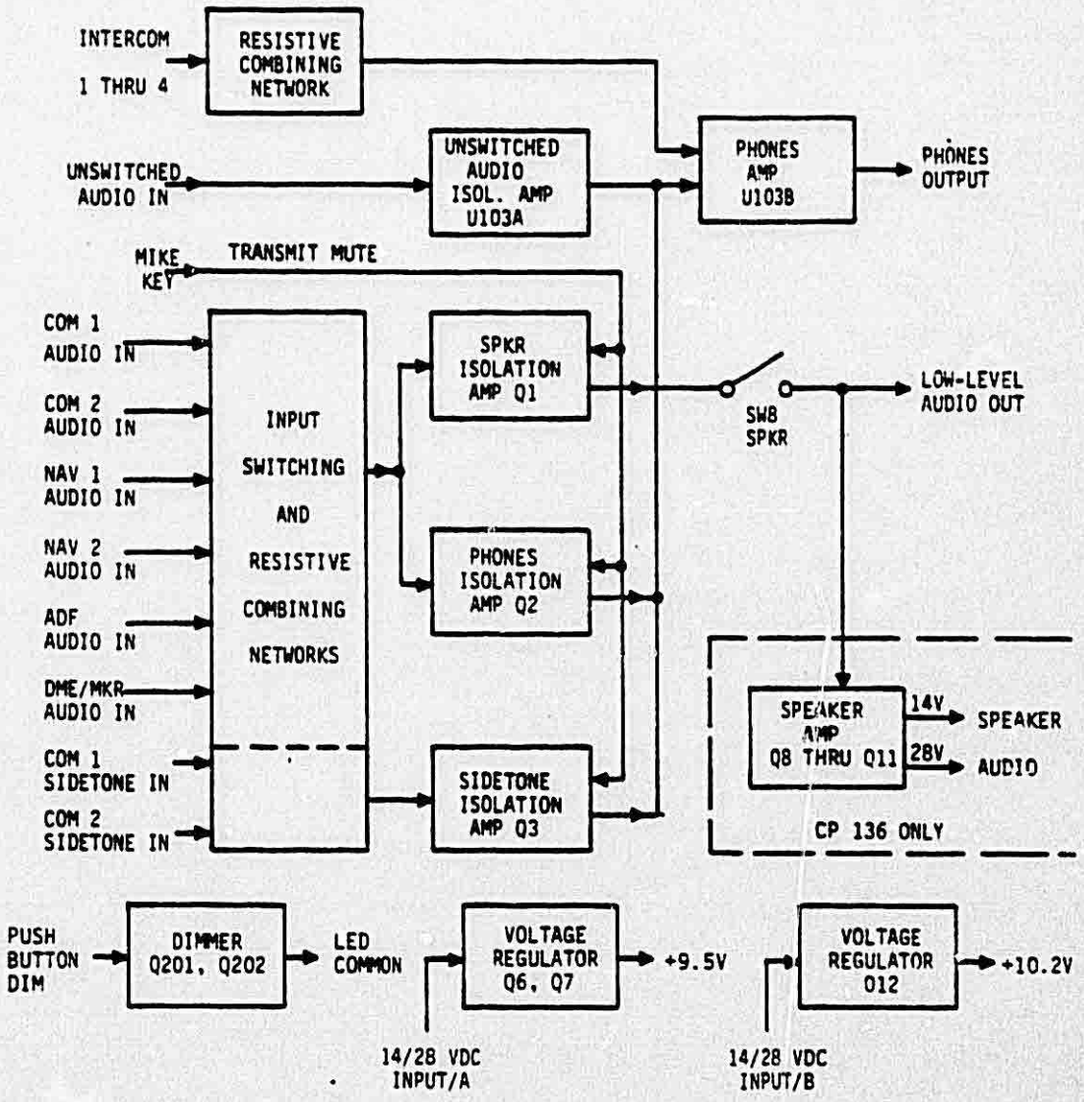


FIGURE 3-1. AUDIO PANEL, BLOCK DIAGRAM

3.1 Continued

Input switching and combining circuits are employed to apply selected input signals to amplifiers Q1 and Q2. Audio from two COM transceivers can be selected, either one or the other or both. Audio from two navigation receivers can be selected. ADF audio can be selected, and a combination of both DME audio and marker beacon audio can be chosen. Any one or a combination of these input signals can be introduced to both the phones isolation amplifier Q2 and the speaker isolation amplifier Q1.

In addition, the sidetone from the two COM transceivers is applied to amplifier Q3 when the equipments are transmittting instead of receiving. Although these inputs are shown separately for functional reasons, the COM 1 receive audio and COM 1 sidetone audio are selected by a single push button switch as are the COM 2 receive audio and COM 2 sidetone audio.

The outputs of both the phones isolation amplifier and the sidetone isolation amplifier are applied to the phones amplifier U103B. The output of speaker isolation amplifier Q1 is applied by way of the SPKR pushbutton switch SW8 to the low-level audio output terminal for application, if desired, to external equipment that contains a speaker amplifier.

In the CP 136 audio panel, a speaker amplifier using transistors Q8, Q9, Q10 and Q11 is self-contained. This amplifier is also fed audio signals by way of SW8. Note that the unswitched alarm signal from amplifier U103A is also applied to the speaker amplifier.

A transmit mute line from the microphone key switches the receive amplifiers Q1 and Q2 on and sidetone amplifier Q3 off when the communication equipment is receiving, and reverses this switching when it is transmitting.

The dimmer circuit, which employs transistors Q201 and Q202, reduces the voltage applied to the LED common line for night-time operation, to reduce the brilliance of the pushbutton indicators.

Two voltage regulators are used to provide regulated A+ voltages to the various transistors and IC's. Note that they are supplied from separate A and B input sources. Internal diode coupling provides that if either the A or B input source fails, the low level outputs will continue to operate.

3.2 AUDIO PANEL, DETAILED CIRCUIT DESCRIPTION

3.2.1 Unswitched Audio Amplifier

Refer to Figure 3-2. The unswitched audio input, which may be an alarm signal such as loss of helicopter rotor power, is applied by way of R210, C204 and R211 to the input pin of U103A. The input level of this signal can be adjusted by means of R210. The amplifier has less than unity voltage gain, but provides a low impedance output to a line which is common to two other output circuits and two input circuits. The output signal of U103A is coupled to U103B by way of C207 and R216, and to the speaker amplifier (CP 136 only) by way of C209 and R215.

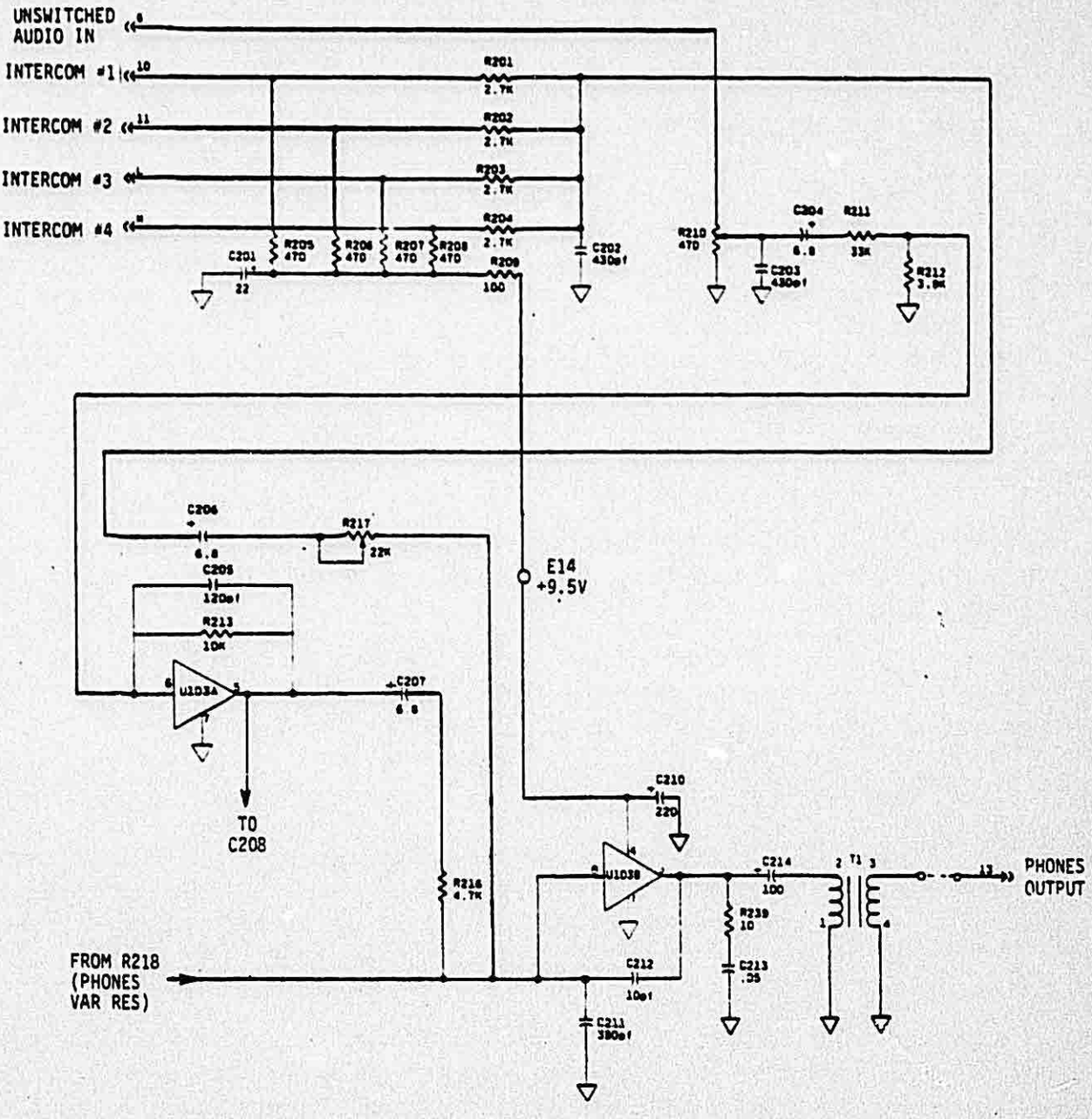


FIGURE 3-2. UNSWITCHED AUDIO AMPLIFIER AND PHONES AMPLIFIER

3.2.2 Phones Amplifier

A number of intercom inputs, from 1 to 4, are combined by means of a resistive network and are applied via C206 and R217 to the input pin of U103B. The intercom input level is adjusted by means of R217. The phones amplifier U103B has a voltage gain of about 10. The output signal is transformer coupled to earphone jacks by way of a phones output terminal. With a receive input level of 3.5 volts rms, the output power is 50 milliwatts.

3.2.3 Input Switching And Combining

Pushbutton switches SW1 through SW7 and associated combining circuits and LED's are shown in Figure 3-3. Switches SW1 and SW2 are mechanically interlocked so that when one is depressed, the other is released. All seven switches, and SW8 which is described later, act like two-position slide switches and are so illustrated. The first section of SW1 and SW2 connects the microphone output to the appropriate COM equipment (1 or 2). The second section completes the side tone input circuit to C12 and the sidetone amplifier Q3. The third section works in conjunction with SW3 to provide both COM-1 and COM-2 inputs to Q1 and Q2 via C1 and C2. The fourth section is associated with the transmit key and muting functions. Diode CR1 blocks the current path to ground when the COM transmitter key is activated (switched to ground).

Potentiometers R1 and R2 provide input level control for COM-1 and COM-2 received audio input signals. Switch SW3 permits parallel connection of these signals for the BOTH COM function.

Switches SW4 through SW7 permit selection of NAV-1, NAV-2, ADF, DME/MKR input signals. A level setting potentiometer (R3 through R6) is provided for each input, and a common line applies the signal(s) to Q1 and Q2 via C1 and C2.

3.2.4 Speaker Isolation Amplifier

Refer to Figure 3-4. Combined input signals are coupled by way of C1 to the base of transistor Q1. Normally, this NPN transistor is forward biased via input resistor R46 and voltage divider R42, R44 and R45. When reception is muted by grounding pin 16 (MIC TIP KEY), the positive forward bias is removed since CR10 and CR17 conduct. In effect, the amplifier is switched off for muting.

The amplifier is an emitter follower whose output signal is applied via C13 to speaker switch SW8. When the switch is actuated, the audio is applied to low-level audio output terminals. With a receive input level of 3.5 volts rms, this output level is 0.5 volts rms. In the CP 136 Audio Panel, this signal is also applied to the input of the speaker amplifier. A compensating circuit consisting of C208 and R214 is provided to maintain the speaker amplifier input level when the switch is activated.

This amplifier Q1, receives dc power from two separate voltage regulators to ensure continued operation in the event that one A+ circuit breaker should trip or one regulator circuit should fail. The voltage regulators are isolated from each other by diodes CR9 and CR12, and the common dc line furnishes collector voltage to Q1 via R43 and base bias via R42 and the resistor network described above.

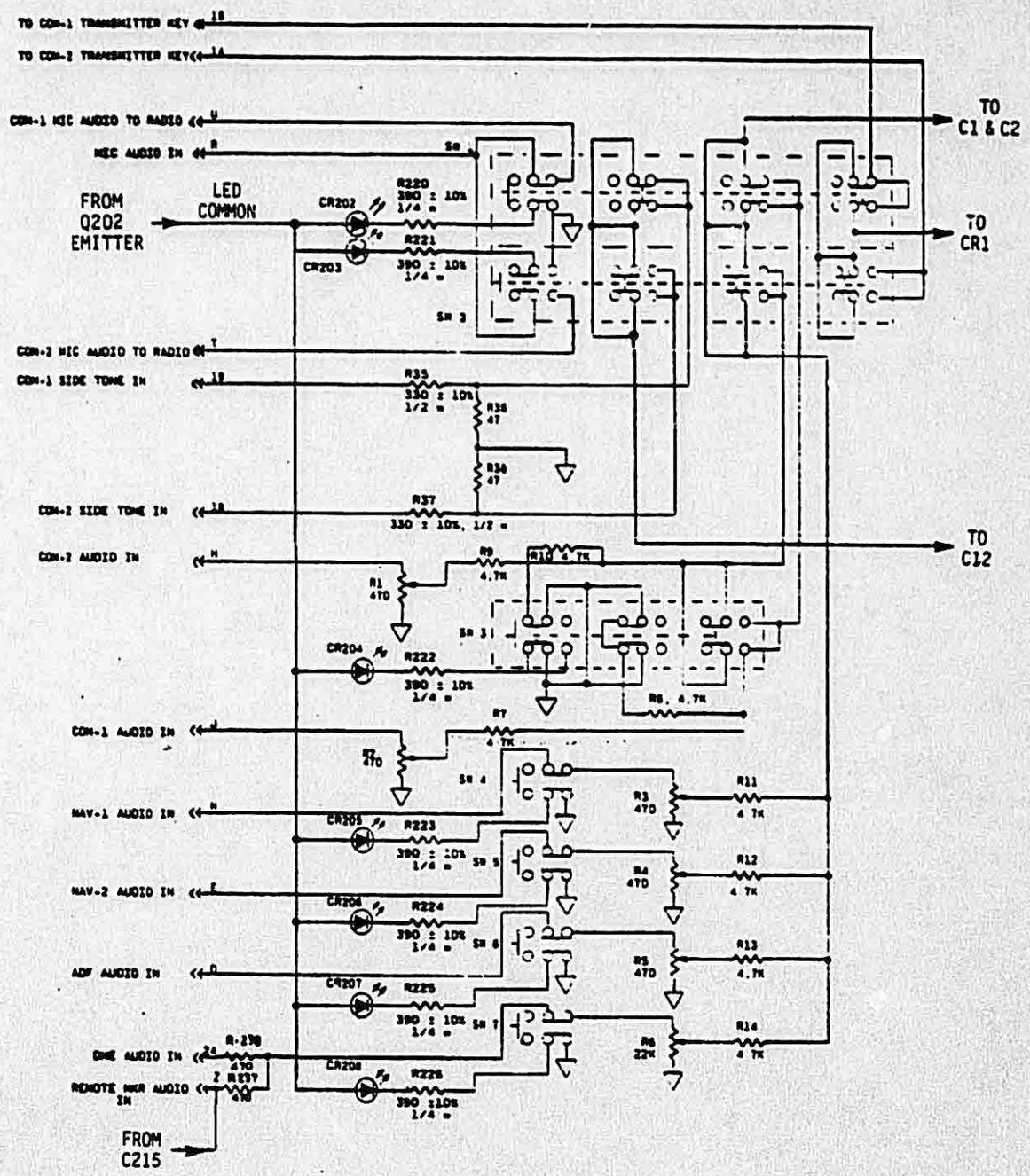


FIGURE 3-3. INPUT SWITCHING AND RESISTIVE COMBINING NETWORKS

SEE BLOW-UP FICHE NO. NCM702 ITEM-I

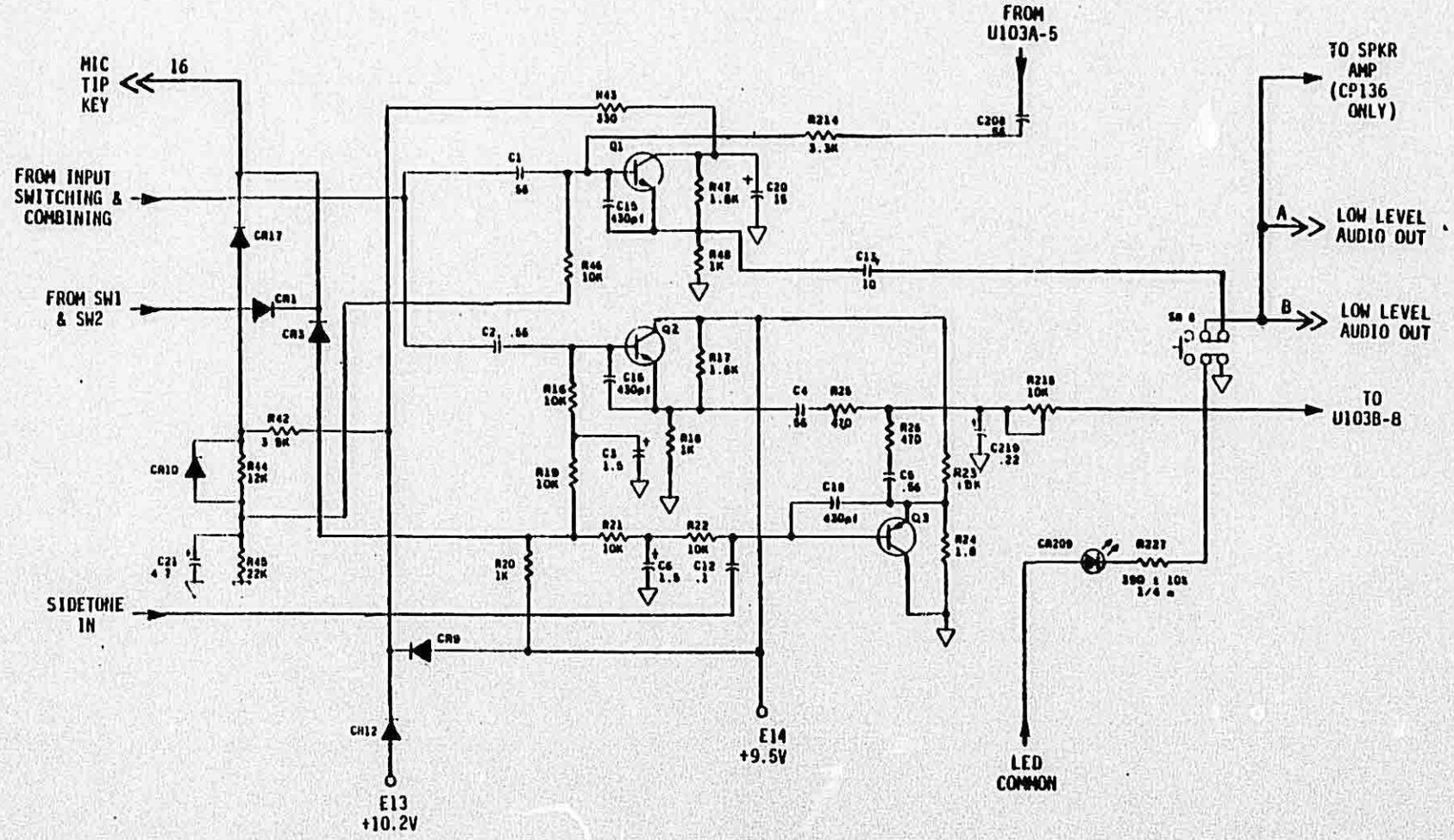
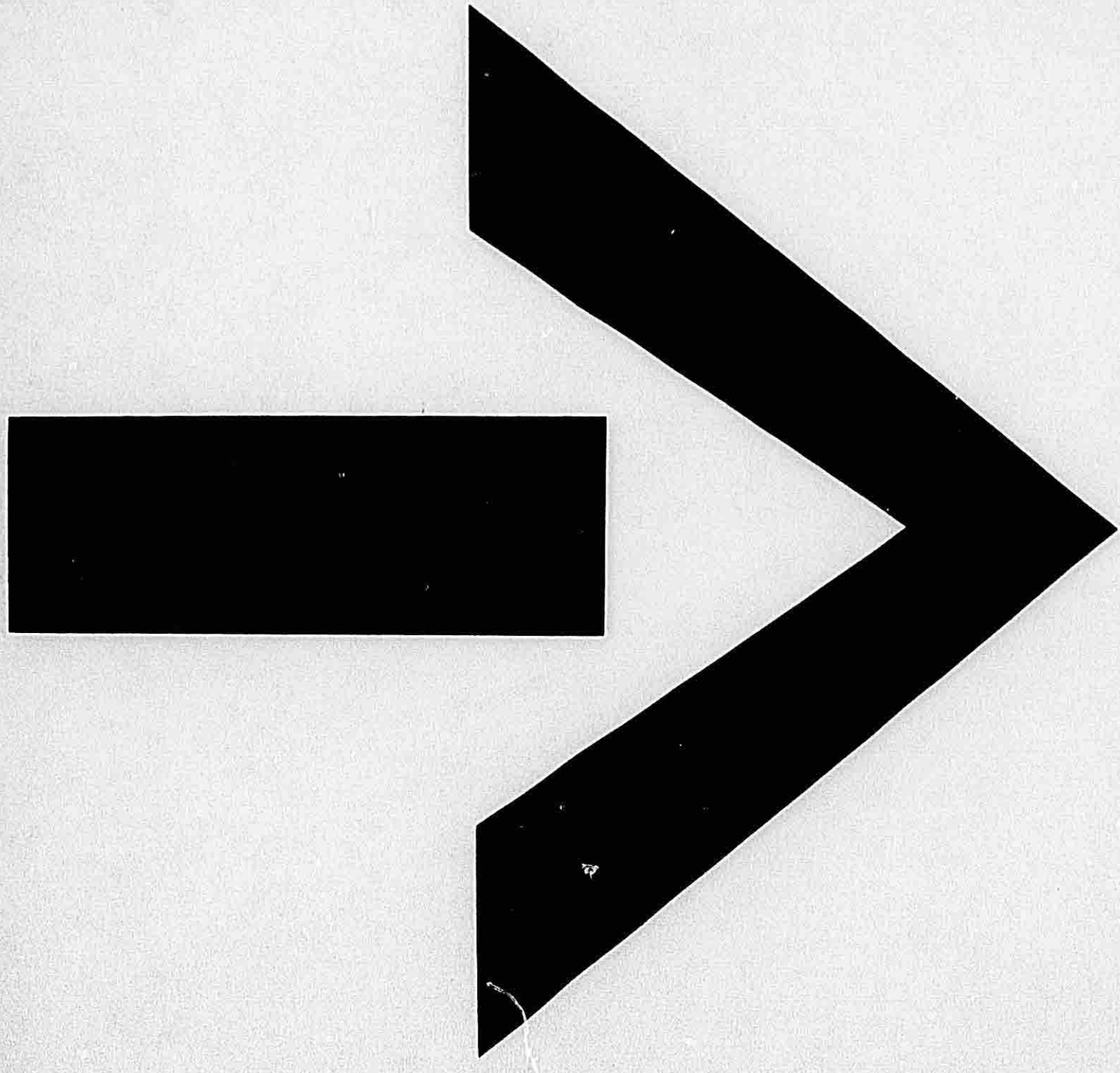


FIGURE 3-4. ISOLATION AMPLIFIERS

SEE BLOW-UP FICHE NO. NCM702 ITEM-J



3.2.5 Phones Isolation Amplifiers

Refer to Figure 3-4. Combined input signals are coupled by way of C2 to the base of transistor Q2. Normally, this NPN transistor is forward biased via input resistor R16 and resistors R19 and R20. When reception is muted, the forward bias is removed since CR3 conducts and considerably reduces the positive bias. This effectively switches the amplifier off to mute it.

The amplifier is an emitter follower whose output signal is applied via C4, R25, and R218 to the input of the phones amplifier U103B. Variable resistor R218 permits adjustment of the phones input level.

3.2.6 Sidetone Isolation Amplifier

Refer to Figure 3-4. When transceivers COM-1 or COM-2 are transmitting, sidetone signals are applied via C12 to the base of PNP transistor Q3. Normally, in the receiving condition, this transistor is cut off because of the positive bias applied to the base via input resistor R22 and resistors R21 and R20. During transmission, the positive bias is removed because of the conduction of CR3, and the sidetone signals are applied by emitter follower Q3 by way of C5 and R26 to the phones line. In other words, while NPN phones and speaker amplifiers Q2 and Q1 are muted by grounding input pin 16, PNP sidetone amplifier Q3 is actuated.

3.2.7 Voltage Regulators and Dimmer (Figure 3-5)

One regulator circuit employs Q7 as a series regulator, Q6 as an error amplifier and zener diode CR2 to establish a reference voltage. This regulator is supplied by dc input A. The output voltage at the emitter of Q7 is set by selecting the value of R53, which is nominally 4.7K. Regulation for a dc input variation of from 11 to 30 volts is 5 percent, which is a change of approximately one volt in the output voltage.

The second regulator circuit uses series regulator Q12 which is supplied by dc input B. This circuit employs diode CR13 to establish a constant base voltage.

The dimmer circuit controls the voltage applied to the common line of the LED indicators used to light and show that a pushbutton switch is actuated. For full brilliance, Q201 is cut off and Q202 is conducting so that approximately 9 volts is applied through Q202 to the LED's. When the panel lights are turned on, that same voltage is applied to the base of Q201 to turn it on, thereby reducing the conduction of Q202 and reducing the voltage to the LED's.

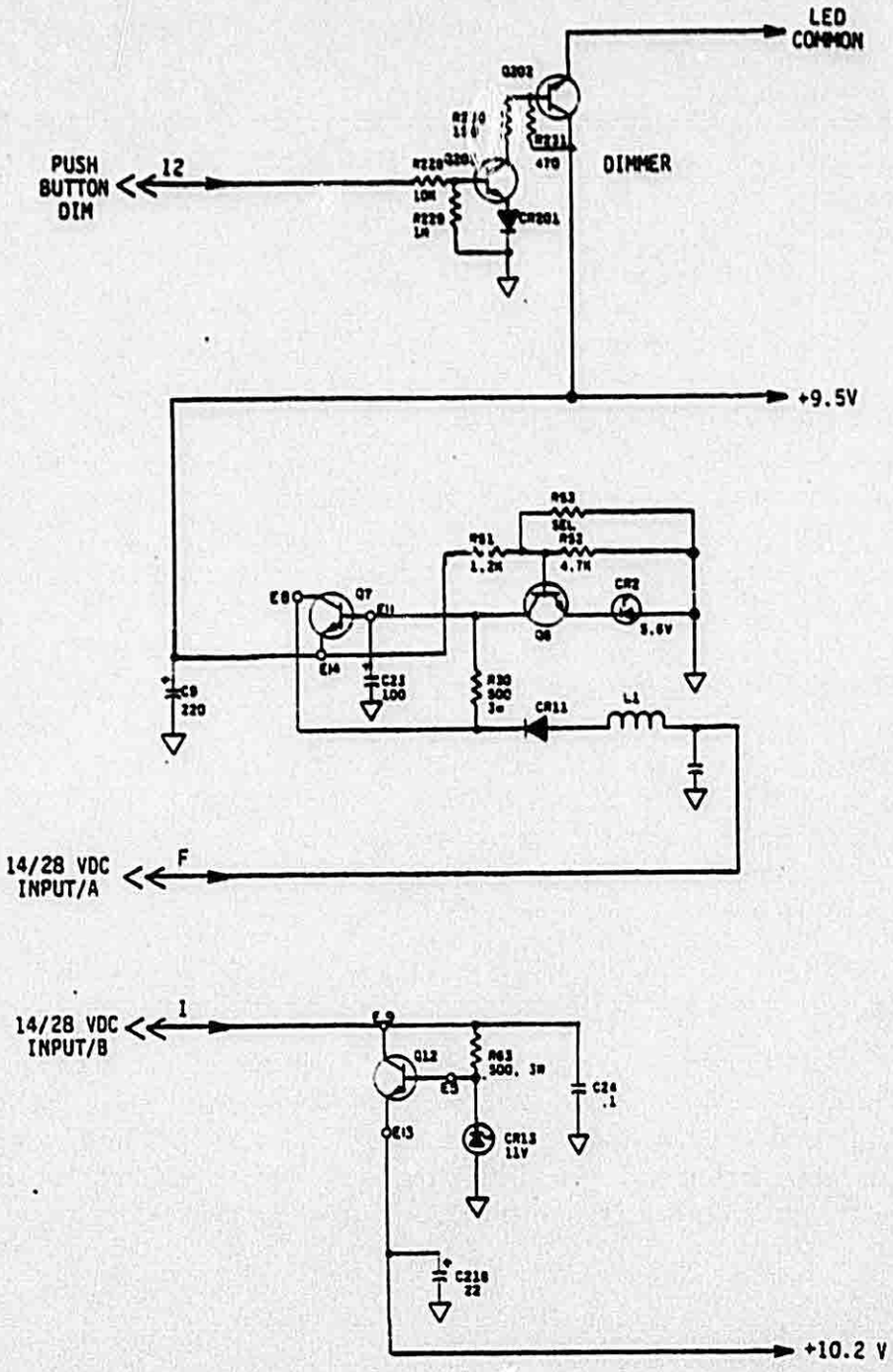


FIGURE 3-5. VOLTAGE REGULATORS AND DIMMER

3.2.8 Speaker Amplifier (CP 136 Only)

The speaker amplifier is capable of producing 10 watts rms across a 4 ohm load with the standard 3.5 volts rms at any receive input terminal. Refer to Figure 3-6. The first stage, Q8, is a voltage amplifier which is temperature stabilized by CR14. The output of Q8 is developed across the primary of T2 whose secondary feeds Q9 and Q10. Darlington power transistors Q9 and Q10 are biased to class AB by R68 and Q11. Diode connected Q11 is also a Darlington transistor mounted to a common heat sink with Q9 and Q10 to provide a temperature stabilized bias. Transformer T3 couples the output of Q9 and Q10 to the external load. Feedback is provided from the secondary of T3, terminal 4, to the emitter of Q8. In 14 volt installations the feedback voltage is determined by a resistive divider consisting of R58, R59, R60 and R61. In 28V installations CR16 is turned ON by the dc input voltage through R61 and R62. The ac feedback voltage is then determined by R58, R59 and R60. Thus, in 28 volt installations, R61 is effectively removed from the feedback voltage divider.

Transformer T3 has two output terminals; one is used when the primary input power is 14 volts, the other when it is 28 volts.

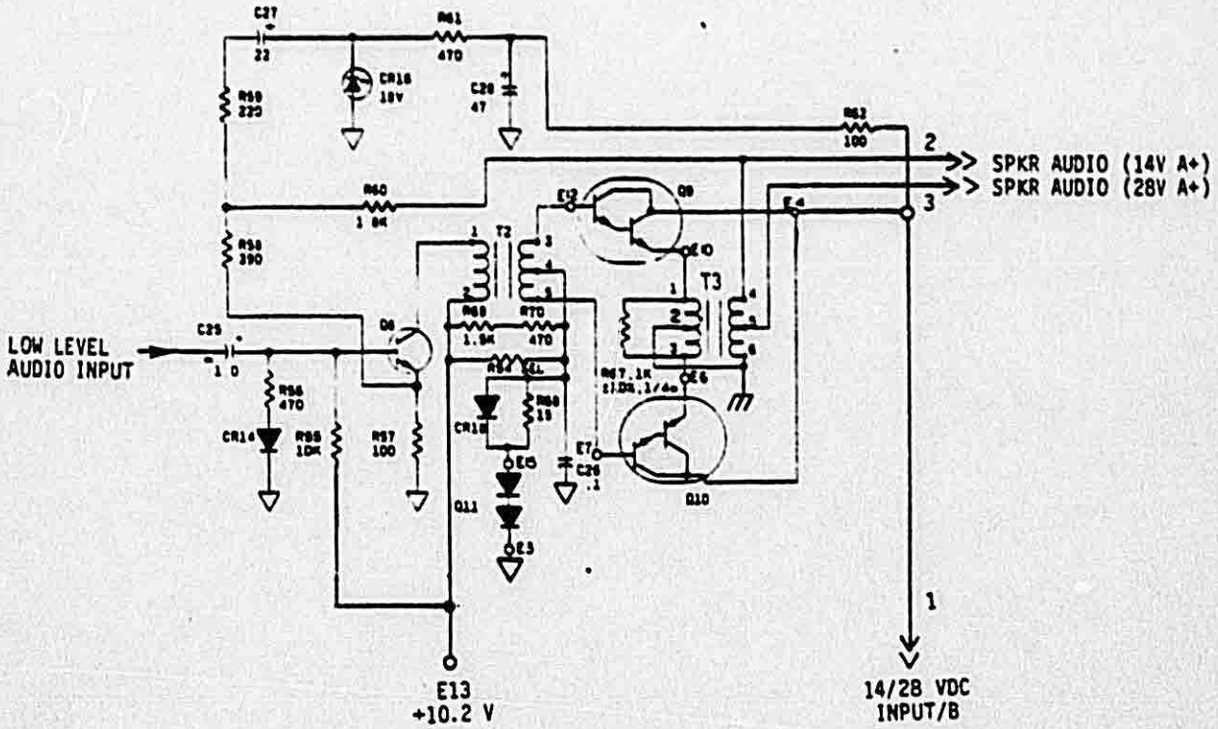


FIGURE 3-6. SPEAKER AMPLIFIER (CP 136 ONLY)

3.3 MARKER BEACON RECEIVER, PURPOSE AND OVERALL DESCRIPTION

3.3.1 Purpose of Marker Beacon

The Instrument Landing System (ILS) requires three separate radio navigation signals to define the glide path a pilot is to follow during his approach to a runway. The glide path is defined vertically by the glide slope signal and horizontally by a localizer signal. At the intersection of the localizer and glide slope signals lies the glide path as shown in Figure 3-7. Specific points along the glide path are located by the marker beacons. Table 3-1 explains some of the marker beacon characteristics.

Marker beacons are also used as Low Frequency Range Station locators as well as Fan Markers for radio range courses and specific points along airways. The marker beacon signal is a 75 MHz rf carrier that is amplitude modulated 95% by either 400, 1300 or 3000 Hz subcarriers. Recognition of outer, middle, and inner markers is by means of the modulation frequency and audio code described in Table 3.1. For further information on Instrument Landing Systems, refer to the Airman's Information Manual, published by the FAA.

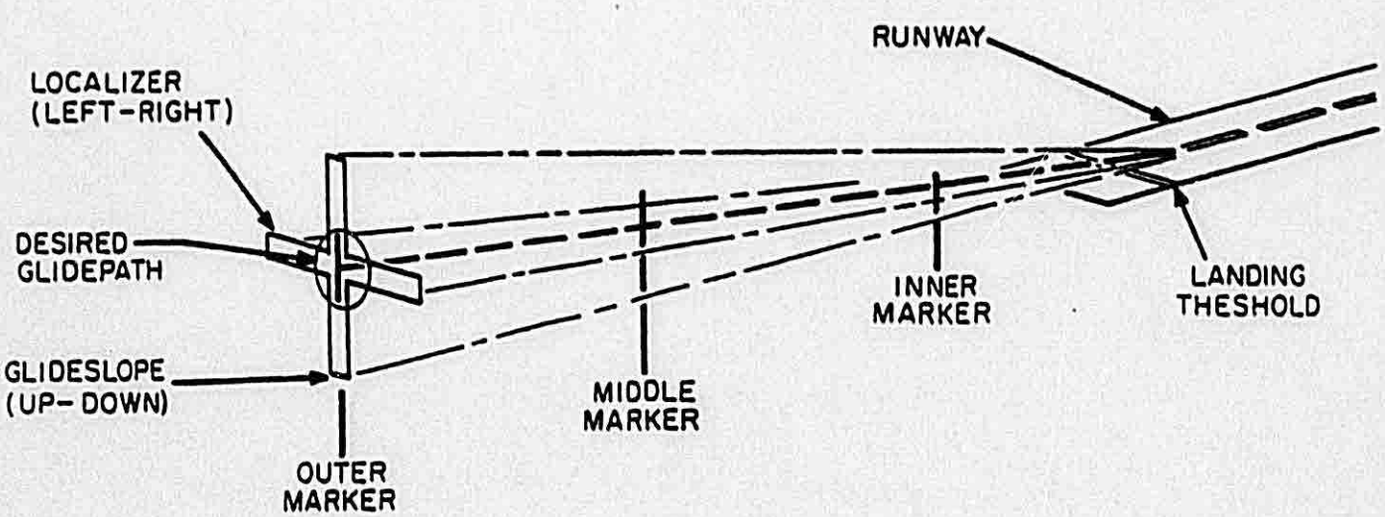


FIGURE 3-7. APPROACH GLIDE PATH

TABLE 3.1 ILS MARKER BEACON CHARACTERISTICS

MARKER	LAMP COLOR	AUDIO TONE	CODE	TRANSMITTER LOCATION
Outer	Blue	400 Hz	2 Dashes/sec	4 to 7 miles from end of runway at glide path intercept
Middle	Amber	1300 Hz	Alternate dots and dashes	Approximately 3500 feet from landing threshold
Inner	White	3000 Hz	Continuous dots	Located to define decision height (DH) point between middle marker and landing threshold

3.3.2 Overall Description

The block diagram, Figure 3-8, shows the functional relationship of the Marker Beacon Receiver circuits and associated test and dimmer circuits. The basic 75 MHz superheterodyne receiver consists of transistor mixer and crystal oscillator circuits, and an IC that includes IF amplifier, detector and audio preamplifier circuits. A three section audio filter provides either 400, 1300 or 3000 Hz signals, when received, to audio amplifiers and lamp drivers to light the appropriate marker indicator. The combined audio is also applied to the Audio Panel for routing to phones and speakers. A test tone of 1000 Hz can also be applied to this audible line. A voltage regulator provides +9.5 volts to all transistor and IC circuits. A dimmer circuit reduces indicator brilliance for use at night.

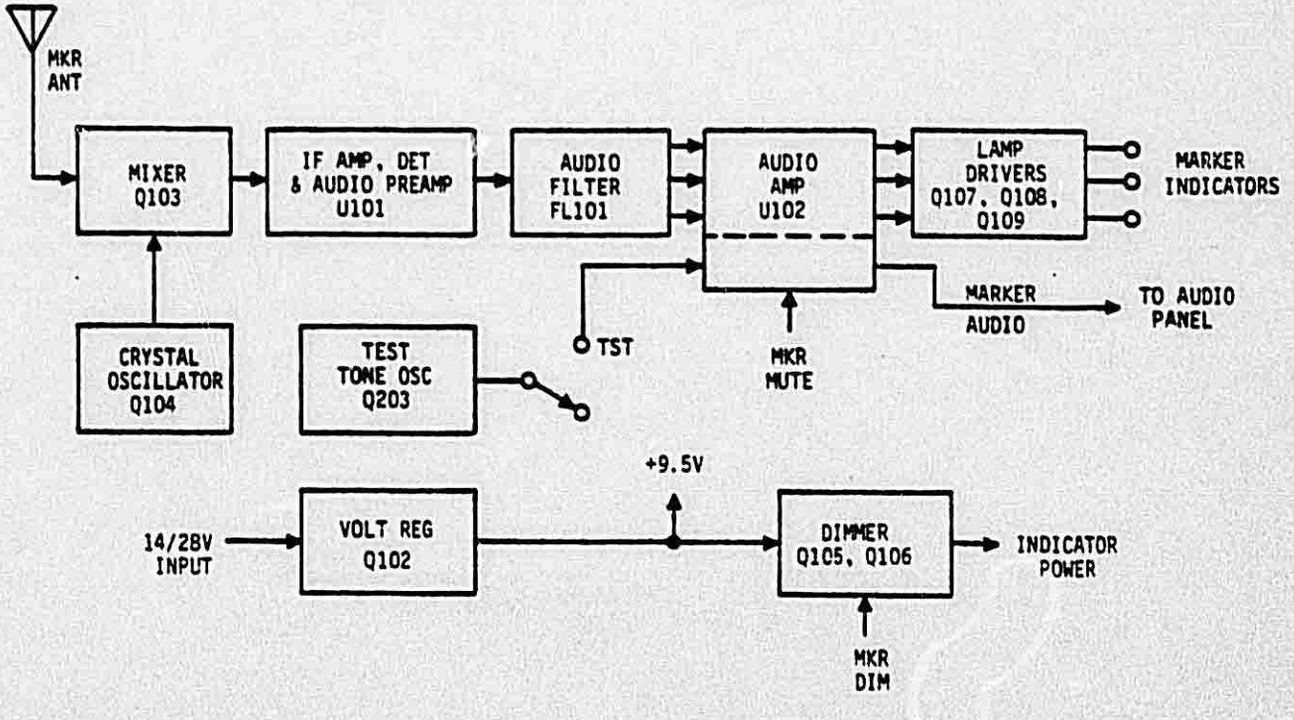


FIGURE 3-8. MARKER BEACON RECEIVER, BLOCK DIAGRAM

3.4 MARKER BEACON RECEIVER, DETAILED DESCRIPTION

3.4.1 Mixer And Crystal Oscillator

The 75 MHz marker signal is fed from the marker antenna through low pass filter L105, which attenuates signals of 100 MHz and above, to resistor R137 as shown in Figure 3-9. Since marker beacon antennas vary widely, R137 is provided to adjust the receiver rf sensitivity. Following R137 is a double tuned, high side coupled, hi Q, 75 MHz filter. RF output from the filter is routed to the mixer, Q103.

The second input to the mixer is from local oscillator, Q104. This crystal controlled 64.3 MHz modified Colpitts oscillator is more commonly known as a Pierce oscillator. Regenerative feedback is established by C122, C123 and C125; output energy is coupled from the Q104 collector through C121 to mixer Q103.

Local oscillator energy from Q104, at 64.3 MHz, is mixed with an incoming 75 MHz signal by Q103 to derive the 10.7 MHz IF signal. Optimum cross modulation and intermodulation performance is obtained by fixed biasing (R123, R124, R127) the mixer.

The mixer output signal is filtered by FL102, then coupled by C113 to U101 pin 2. Monolithic crystal filter FL102 provides most of the IF selectivity with L101 tuned to produce the proper IF bandpass.

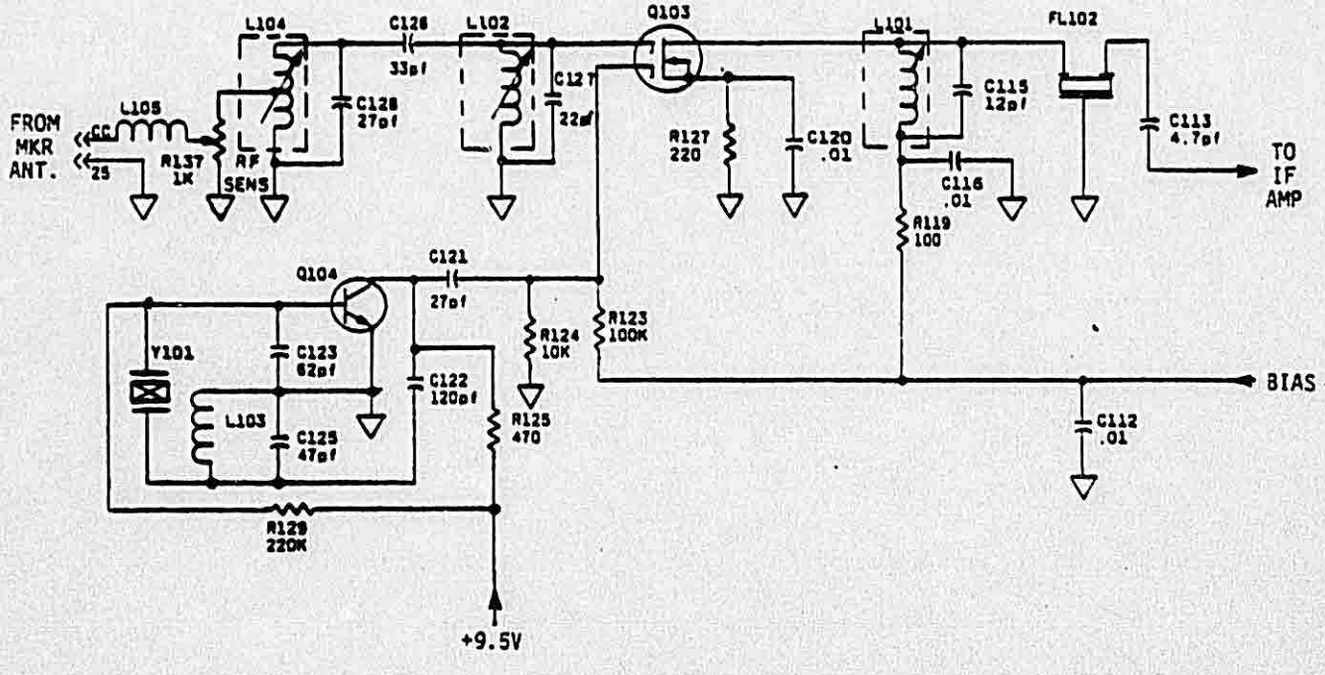


FIGURE 3-9. MIXER AND CRYSTAL OSCILLATOR

3.4.2 If Amplifier, Detector and Audio Preamplifier (Figure 3-10)

U101 is a monolithic integrated circuit supplying the following circuits: two stages of IF amplification (pin 2 to pin 3 and pin 4 to pin 6); one stage of IF amplification and AM detection (pin 8 to pin 9); audio preamplification (pin 14 to pin 15); and a buffer amplifier providing delayed AGC to pin 13. Transformers T101 and T102 increase selectivity, provide impedance matching between IF stages, and are simply tuned for a peak. In the HI sensitivity mode, U101 provides approximately 30 dB of IF gain and 8 dB of audio gain.

Selection of HI or LO sensitivity is through control of the bias on CR106. In the LO sensitivity mode CR106 is forward biased, through R143 and R144, to shunt a portion of the IF signal to ground. LO mode sensitivity is adjusted by R136. Placing the front panel sensitivity switch (HI, LO, TST) in the HI position grounds the junction of R143 and R144 which removes bias from CR106 to open the shunt signal path and increase sensitivity.

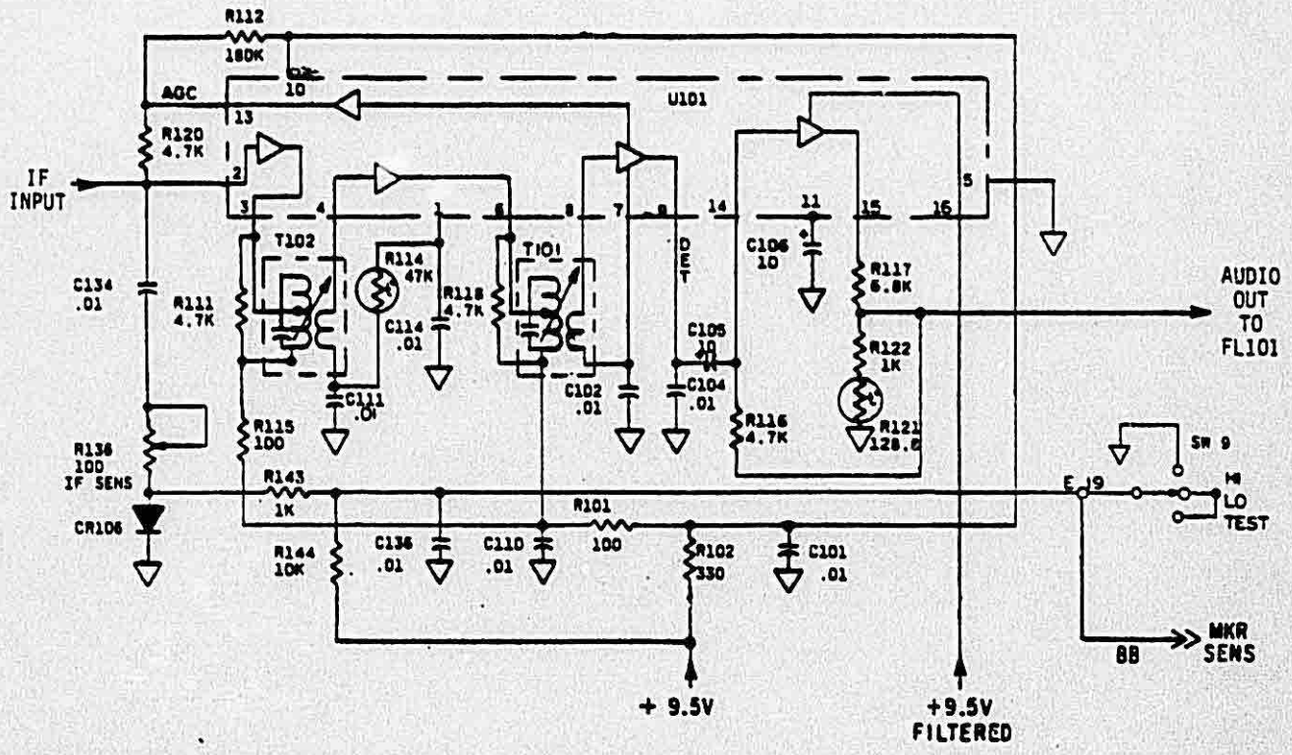


FIGURE 3-10. IF AMPLIFIER, DETECTOR AND AUDIO PREAMPLIFIER

3.4.3 Audio Circuits

Audio from the preamplifier is routed from the junction of R117 and R122 to FL101, which is a three section, bridge T filter. Refer to Figure 3-11. Manufactured with thick film techniques, FL101 contains three filters, one for each of the marker modulation frequencies (400, 1300 and 3000 Hz). FL101 and U102, a quad op amp, provide audio gain only at the marker modulation frequencies, with negative feedback, and consequent attenuation, occuring at all other frequencies.

Marker audio from pin 13 of the audio filters is amplified by one section of U102 and is routed from U102-9 by way of C215 to R237 on the Audio Panel. This is an internal input to the DME/MKR input terminal of the Audio Panel. By placing SW9 in the TST position, test oscillator Q203 is turned on and furnishes a 1000 Hz test tone via C216 and R232 to U102-8 and the Audio Panel.

Muting of the marker audio is accomplished by momentarily depressing the front panel MKR MUTE pushbutton SW10 which discharges C106 through R106, thereby biasing OFF the audio amplifier portion of U102. Before audio can be fully restored, C106 must be charged through R107, which requires 10 to 14 seconds.

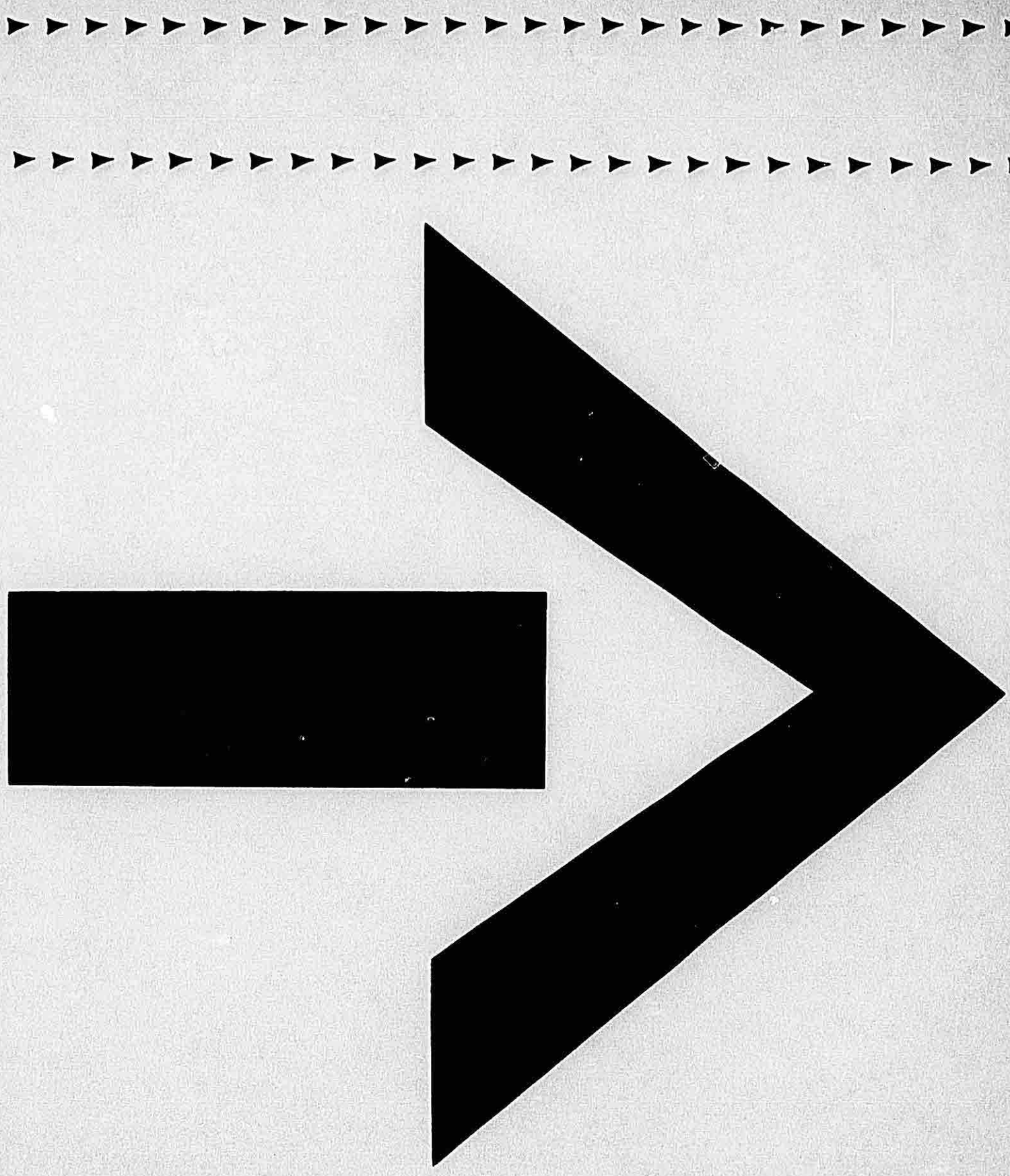
Audio muting serves to remove or turn OFF the marker beacon audio for a period of approximately 10 to 14 seconds. This time period is long enough to allow the MKR audio to remain muted as the aircraft passes over a marker beacon transmitter, yet is short enough to permit reactivation of the MKR audio before the next marker beacon is reached. Thus the audio can serve as an alert, then muted, and the lamps monitored.

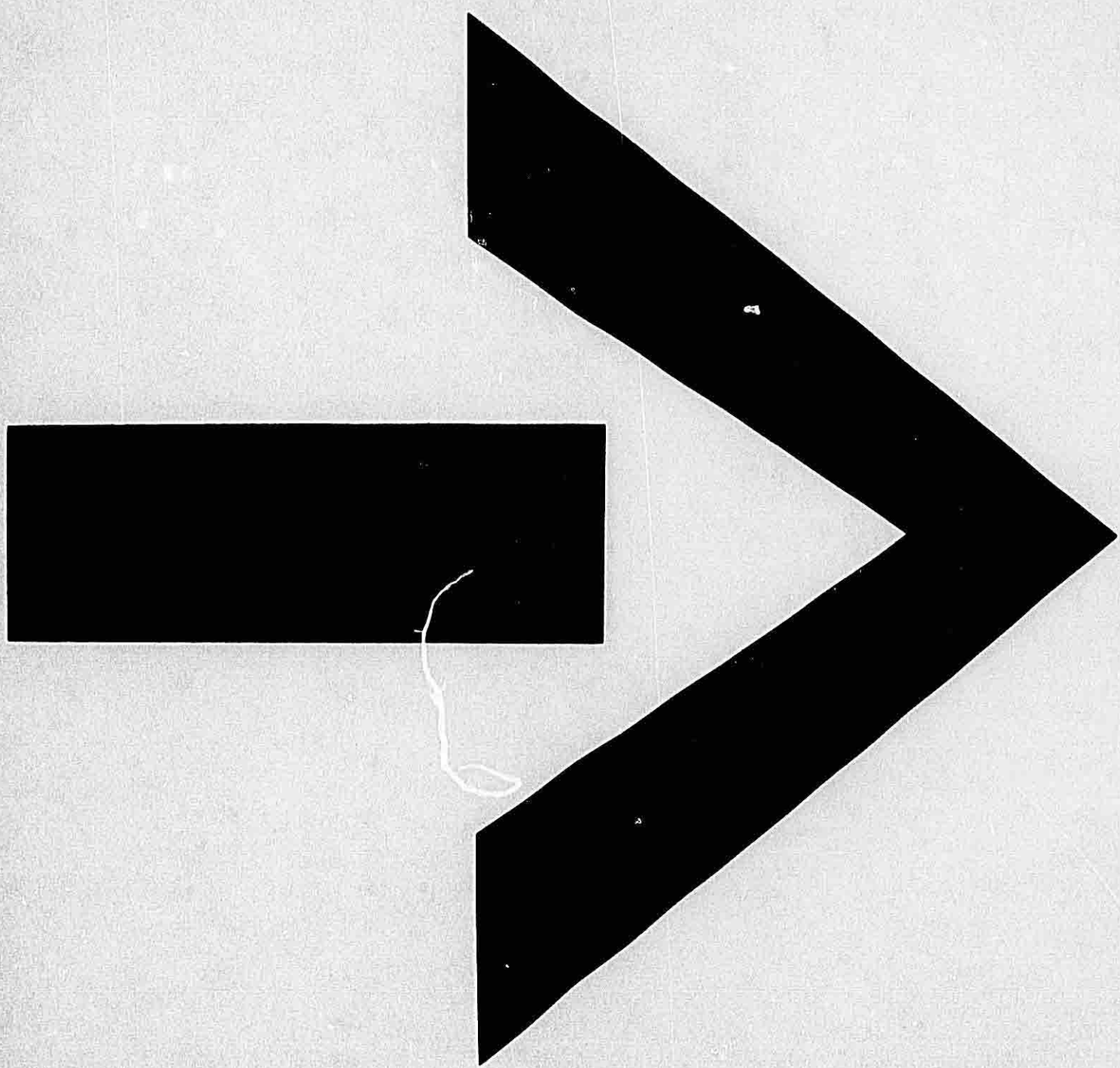
3.4.4 Lamp Drivers

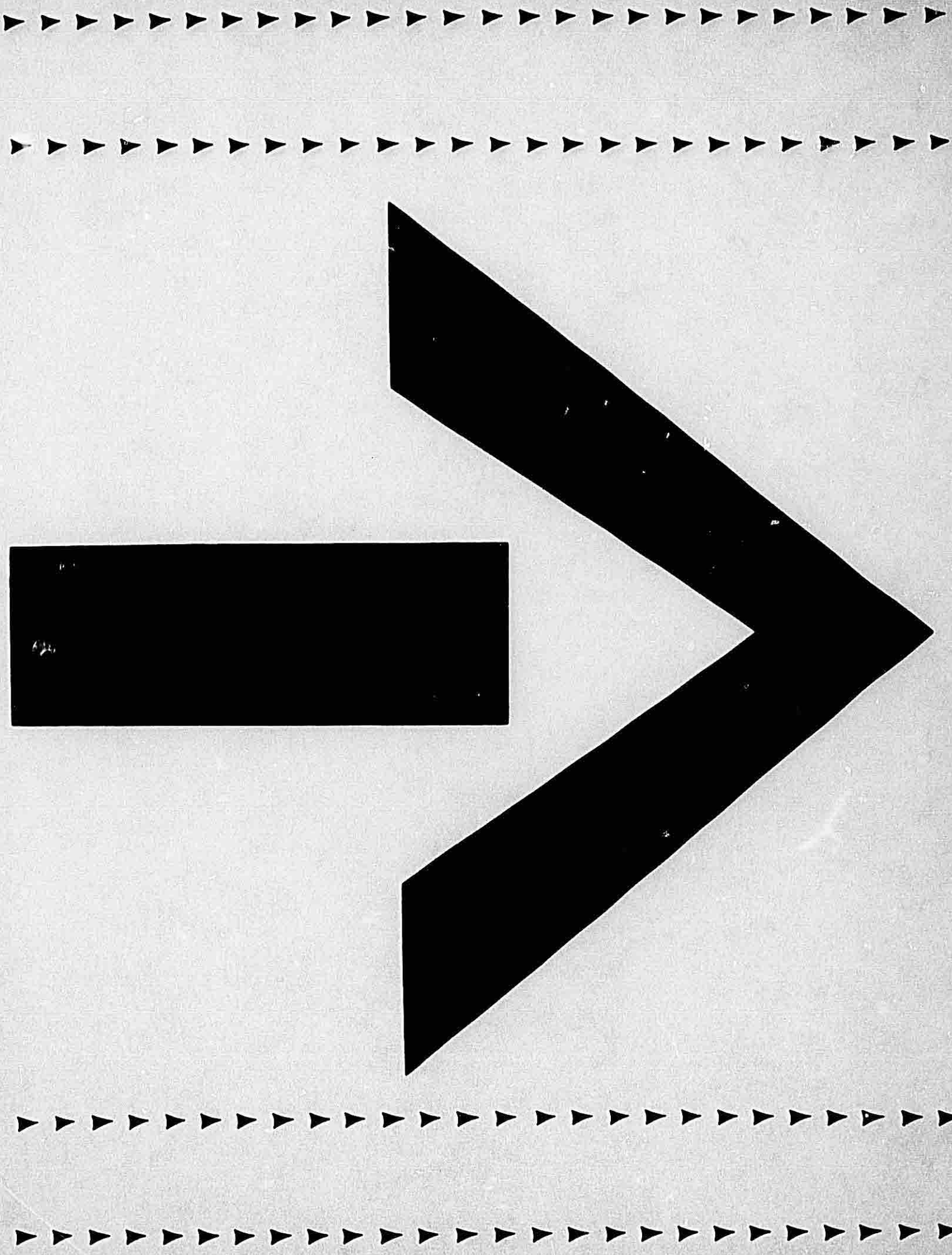
Since the three lamp driver circuits shown in Figure 3-11 are similar, only the amber Q107 driver (1300 Hz) will be discussed. Q107 is a darlington transistor which, when there is no received signal, is biased below cut-off (reverse bias) by R128, diodes CR107 and CR102, and the action of the front panel HI, LO, TST switch (SW9). A receive signal with 1300 Hz modulation results in the audio from U102 pin 4 being rectified by CR105 and then filtered by C129 and R133. The resulting dc voltage is sufficient to turn-on (forward bias) Q107, illuminating the amber indicator DS5.

3.4.4.1 Dimming Control

Lamp dimming is provided by Q105 and Q106. MKR DIM terminal Y is wired to the aircraft's instrument light bus. In the daytime or no dimmed mode, Q105 is cut-off by the absence of a base voltage to forward bias its base-emitter diode and CR102. Since Q105 is cut-off, Q106 is saturated by current flow through R135. The voltage drop across Q106 is now approximately 0.3 volts dc and the marker lamp will be fully lit. When the instrument lights are turned on, Q105 is saturated, cutting off Q106. Supply current for the marker lamps must now flow through R139 and the resulting voltage drop dims the lamp.







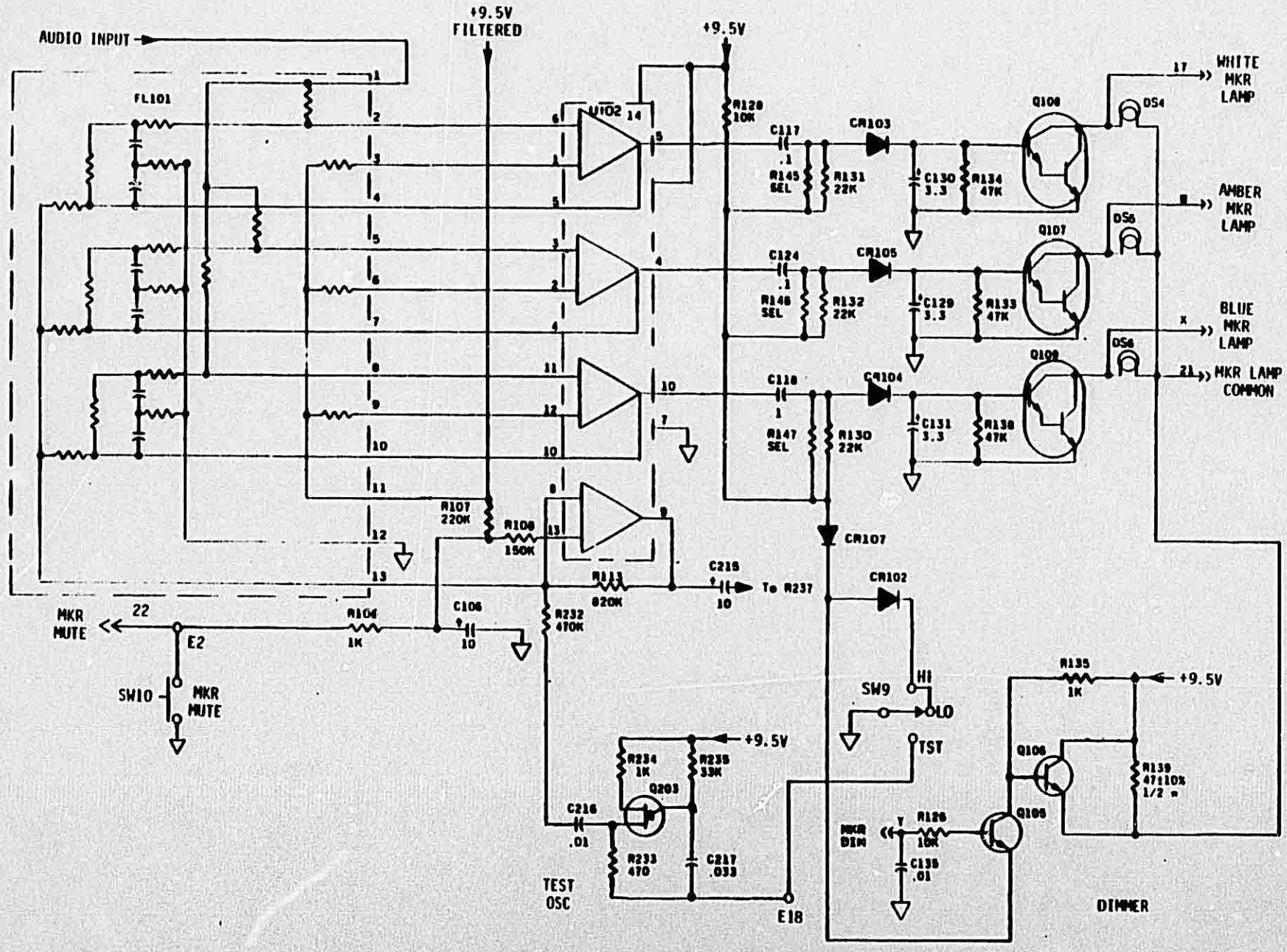


FIGURE 3-11. AUDIO CIRCUITS AND LAMP DRIVERS

SEE BLOW-UP FICHE NO. NCM702 ITEM-D

3.4.4.2 Test Switch Operation

The HI, LO, TST switch SW9 can be set to the TST position to test the lamps. This switch defeats the dimming circuit and also saturates all three lamp driver transistors. Assuming the marker lamps are dimmed, selecting the TST position disconnects CR102 from ground, cutting off Q105 and saturating Q106 to increase the lamp supply voltage. (If the marker lamps were not dimmed, Q105 would simply remain cut off.) Also, the lamp drivers Q107, 108, 109 are saturated since the bias established by R128, CR107, CR102, and SW9 has been removed by opening SW9. For example, the Q107 bias is now established by R128, R132/146, CR105 and R133 and is sufficient to saturate the transistor. Since all three drivers are similarly biased, all three lamps are lit.

3.4.5 Voltage Regulator (Figure 3-12)

An 11 to 30 volts dc input at terminal 23 is routed to series pass voltage regulator, Q102. The voltage reference for the regulator is a 10 volt zener diode which, with the base-emitter drop of Q102, yields a 9.5 volt regulated supply. Most circuits are supplied directly from the emitter of Q102. More critical circuits which require less ripple or additional isolation are supplied from the junction of R109 and C109.

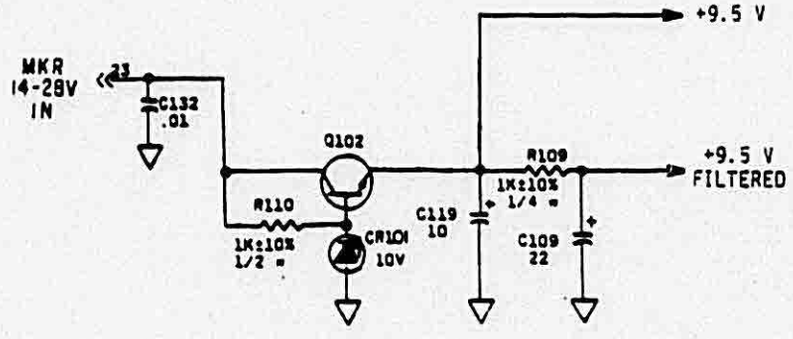


FIGURE 3-12. VOLTAGE REGULATOR

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4.1 INTRODUCTION

This section provides instructions for troubleshooting and corrective maintenance of the CP 135 and CP 136 Audio Panels. The contents of the section include troubleshooting in the aircraft, alignment, and component replacement instructions.

The suggested approach to maintenance through the use of these instructions is as follows. If an apparent fault cannot be corrected by adjustment in the aircraft, the Audio Panel should be removed for bench test. The Electrical Bench Test of section 2.2.2 exercises all the functions of the Audio Panel and Marker Beacon Receiver, and the input and output values given there permit evaluation of the performance of the equipment. If the performance is marginal, the alignment procedures of paragraph 4.3 should be performed.

Failure of a function can be localized to a circuit or group of circuits through the use of the bench test procedure or the troubleshooting charts in section 4.5. Finally, voltmeter and ohmmeter measurements in the faulty circuit, with the aid of the appropriate schematic, can be made to find a faulty component.

4.2 TEST EQUIPMENT AND TOOLS REQUIRED

Test equipment required to perform the troubleshooting, alignment and adjustment procedures in this section is listed in Table 4.1. The characteristics and nomenclature of suggested test equipment is given, but other equipment with equivalent characteristics may be used.

Suggestions for the fabrication of a test cable are given in paragraph 2.2.2.1.

4.3 ALIGNMENT

4.3.1 General

The Audio Panel requires no alignment, but does have audio level adjustments. The replacement of transistors, the IC or associated components may call for readjustment of related potentiometers. All nine audio potentiometers are shown in the lower half of Figure 4-1. Level adjustment can be accomplished by referring to the appropriate part of paragraph 2.2.2.2 which gives audio test procedures and input/output specifications. If the specifications are not met, the related potentiometer is adjusted to obtain the proper results.

The Marker Beacon Receiver may require alignment if the test procedures of paragraph 2.2.2.2 e or troubleshooting tests reveal poor performance, or if IC's, transistors or associated components are replaced. Alignment of RF and IF circuits consists of peaking five resonant circuits, tuning a single inductor for proper IF response, and adjusting the RF and IF sensitivity potentiometers (which are shown in the upper half of Figure 4-1). Step-by-step procedures for performing these tuning adjustments are given immediately below.

TABLE 4.1 TEST EQUIPMENT REQUIRED

TYPE	CHARACTERISTICS	NOMENCLATURE
VHF Signal Generator	Frequency Range: 10 to 400 MHz Modulation: AM, 0 to 95% RF Output: 1 to 500,000 microvolts Output Impedance: 50 ohms	Hewlett Packard Model 608D
Audio Signal Generator	Frequency Range: 400 to 3000 Hz Distortion: 1% maximum	Hewlett Packard Model 200 CD
Frequency Counter		Hewlett Packard Model 5246L with Prescaler Plug-In Model 5252A
Regulated DC Power Supply	Voltage Range: 0 to 30 volts Current Range: 0 to 2 amperes	Power Design Model 3650
AC VTVM		
RF Voltmeter		Booton Model 91 CAR
Speaker Load Box	Power Capability: 15 watts	
6 dB Pad		
Audio Wattmeter		General Radio Model 583A
Ramp Test Set	Frequency: 75 MHz Modulation: 400, 1300 and 3000 Hz	Tel Instrument Model T18A
Ramp Checker		IFR-401L

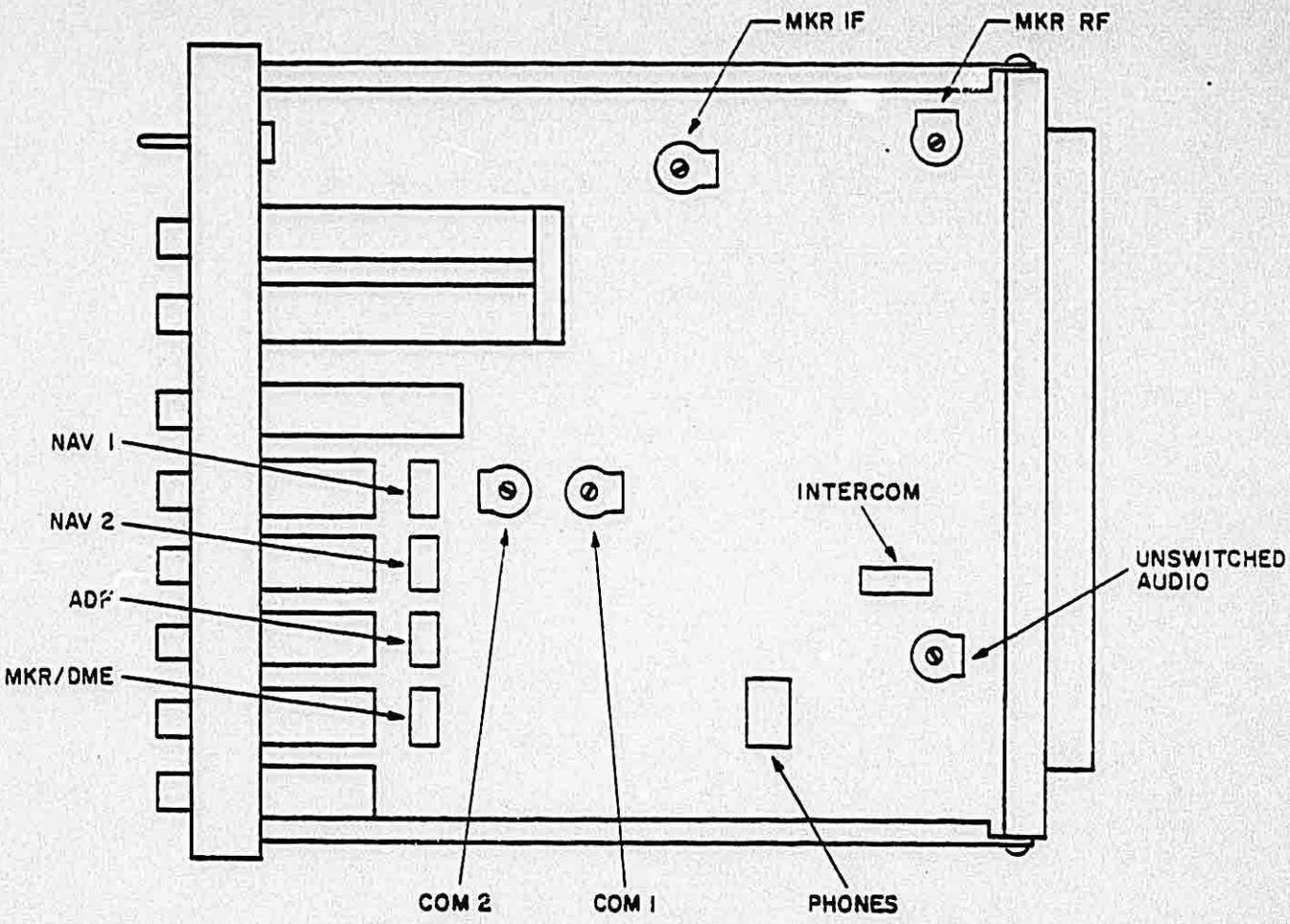


FIGURE 4.1 AUDIO INPUT LEVEL AND MARKER SENSITIVITY CONTROLS

4.3.2 Marker Beacon Receiver Alignment

4.3.2.1 RF and IF Alignment

a. Connect test equipment as shown at the left of Figure 4–2 and apply power.

b. Set the rf signal generator to 75 MHz ±1 kHz; adjust 1.3 kHz modulation to 95%.

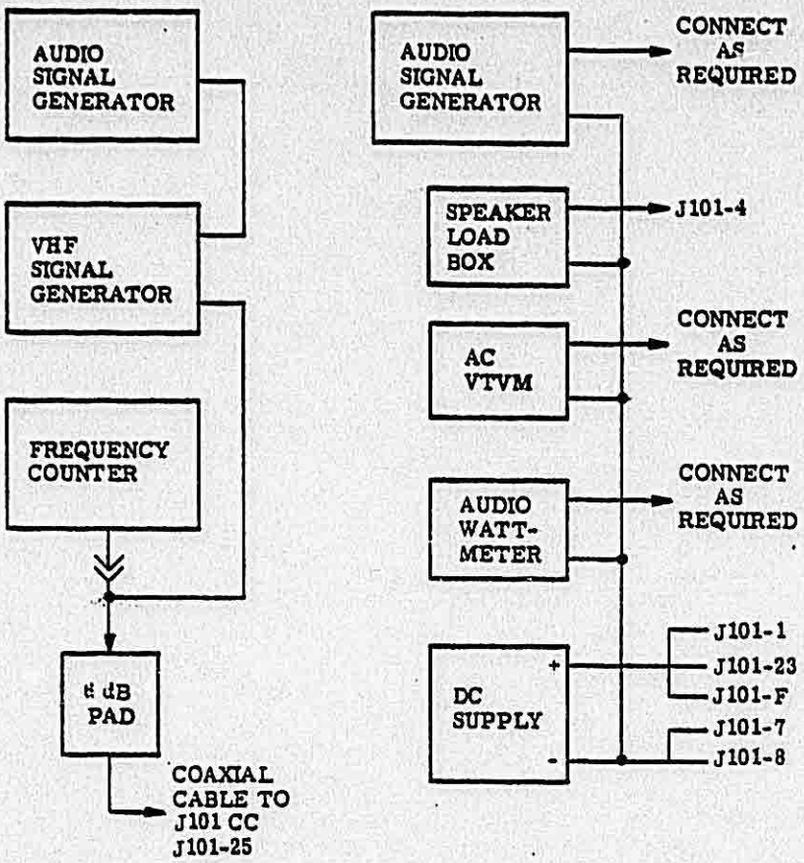
c. Rotate MKR volume control maximum clockwise; set sensitivity to HI.

d. Increase generator rf output level until the audio wattmeter indicates 1.0 milliwatt (0.71 volt rms).

e. Peak L101, L102, L104, T101 and T102 for maximum MKR audio output.

NOTE

As audio output increases, reduce generator rf output to maintain a 1.0 milliwatt audio level.



P101

MKR GROUND	25 CC	MKR ANTENNA
DME IN	24 BB	MKR SENSITIVITY
MKR 14/28V	23 AA	MKR TEST
MKR MUTE	22 Z	MKR AUDIO IN
MKR LAMP COMMON	21 Y	MKR DIM
SPARE	20 X	MKR LAMP-BLUE
COM 1 SIDETONE	19 W	MKR LAMP-AMBER
COM 2 SIDETONE	18 V	SPARE
MKR LAMP-WHITE	17 U	COM 1 MIKE AUDIO OUT
MIKE JACK KEY	16 T	COM 2 MIKE AUDIO OUT
COM 1 KEYOUT	15 S	SPARE
COM 2 KEYOUT	14 R	MIKE JACK AUDIO
PHONES OUT	13 P	14V DIM
PUSHBUTTON DIM	12 N	NAV 1 IN
INTERCOM 2	11 M	INTERCOM 4
INTERCOM 1	10 L	INTERCOM 3
EXT. SPKR	9 K	SPARE
GROUND	8 J	COM 1 IN
GROUND	7 H	COM 2 IN
UNSWITCHED AUDIO	6 F	14/28VA
*SPKR IN	5 E	NAV 2 IN
CABIN SPKR	4 D	ADF IN
*28V SPKR OUT	3 C	28V DIM
*14V SPKR OUT	2 B	LOW LEVEL OUT
14/28VB	1 A	LOW LEVEL OUT

*JUMPER J101-2 TO J101-5 IN 14V INSTALLATIONS
JUMPER J101-3 TO J101-5 IN 28V INSTALLATIONS
CP 136 ONLY

FIGURE 4-2. BENCH TEST SET-UP

4.3.2.2 Bandwidth Check and Adjustment (Figure 4-3)

a. Set the rf generator output level to produce 1.0 milliwatt of MKR audio output. Note the generator attenuator setting.

b. Increase the generator rf output level 6 dB.

c. Carefully reduce rf generator frequency until MKR audio output is 1.0 milliwatt; measure and record this frequency. Return generator rf output to that level in step b.

d. Slowly increase rf generator frequency, crossing center frequency, until MKR audio output is again 1.0 milliwatt; measure and record this frequency.

e. Specification: 6 dB bandwidth/75 MHz : minimum $\pm$10 kHz
typical $\pm$14 kHz
maximum $\pm$18 kHz
peak to valley : 1 dB maximum

NOTE

If specifications are met, delete steps f through h; if not, proceed to step f.

f. Set rf generator frequency to 75 MHz $\pm$1 kHz. Set rf generator output level to produce 1.0 milliwatt of MKR audio output.

g. Rotate L101 core 1/2 turn (180°) clockwise; audio output should decrease approximately 3 dB.

h. Perform steps a through d.

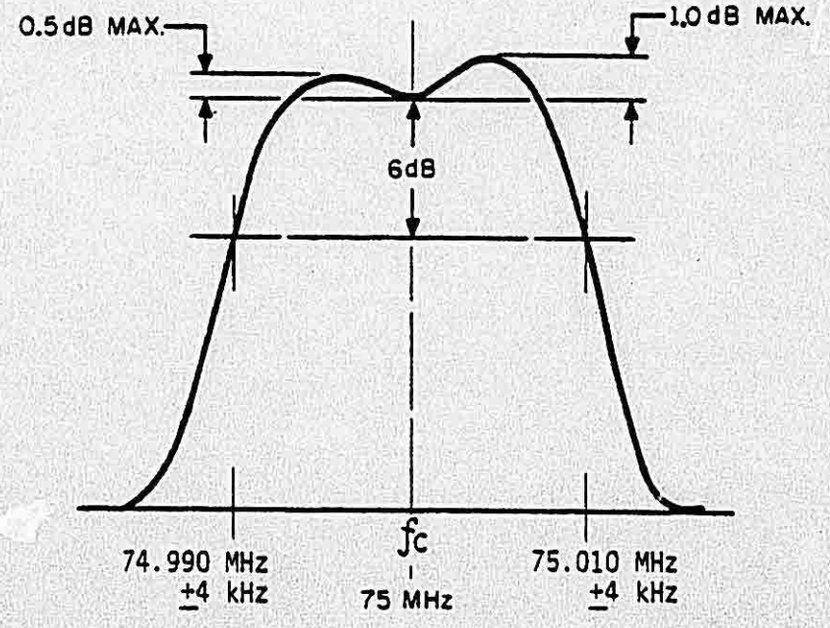


FIGURE 4-3. IF AMPLIFIER BANDPASS CURVE

4.3.2.3 HI Sensitivity Adjustments

a. Set rf generator frequency to 75 MHz $\pm$1 kHz, modulation 1300 Hz at 95%, and rf output level to minimum.

b. Set MKR to HI sensitivity.

c. Using a jewelers straight slot screwdriver with a 1/16 inch blade width, adjust rf sensitivity control R137 fully clockwise for maximum sensitivity.

d. Increase generator rf output to just begin to light the amber lamp; 100 microvolts is typical for lamp threshold.

e. Rotate R137 maximum counterclockwise.

f. Increase generator rf output to 400 microvolts.

g. Rotate R137 clockwise to just begin to light the amber lamp.

4.3.2.4 LO Sensitivity Adjustments

a. Switch MKR to LO sensitivity.

b. Rotate IF sensitivity control R136 counterclockwise for minimum sensitivity.

c. Increase generator output to just begin to light the amber lamp.
Specification: 8,000 microvolts minimum for lamp threshold.

d. Reduce generator output to 2,000 microvolts. Rotate R136 clockwise to just begin to light the amber lamp.

e. Specification: 2,000 microvolts for lamp threshold.

4.4 IN AIRCRAFT TROUBLESHOOTING

The purpose of troubleshooting in the aircraft is to determine whether a fault is in the suspect equipment, in associated equipment, or in connections to or between equipments, including primary power and input/output signal connections.

4.4.1 Audio Panel

Table 4.2 is provided to aid in checking the Audio Panel in the aircraft by means of its front panel controls and associated input and output equipment. If the fault is simply differences in audio levels from associated equipment, adjustment can be performed in the aircraft; refer to paragraph 2.2.3.

4.4.2 Marker Beacon Receiver

Figure 4-4 is provided to aid in checking the Marker Beacon Receiver in the aircraft. A ramp type marker beacon test set such as Tel-Instrument Model T18A may be used as a signal generator. Be sure that the ramp test is close to the marker beacon antenna.

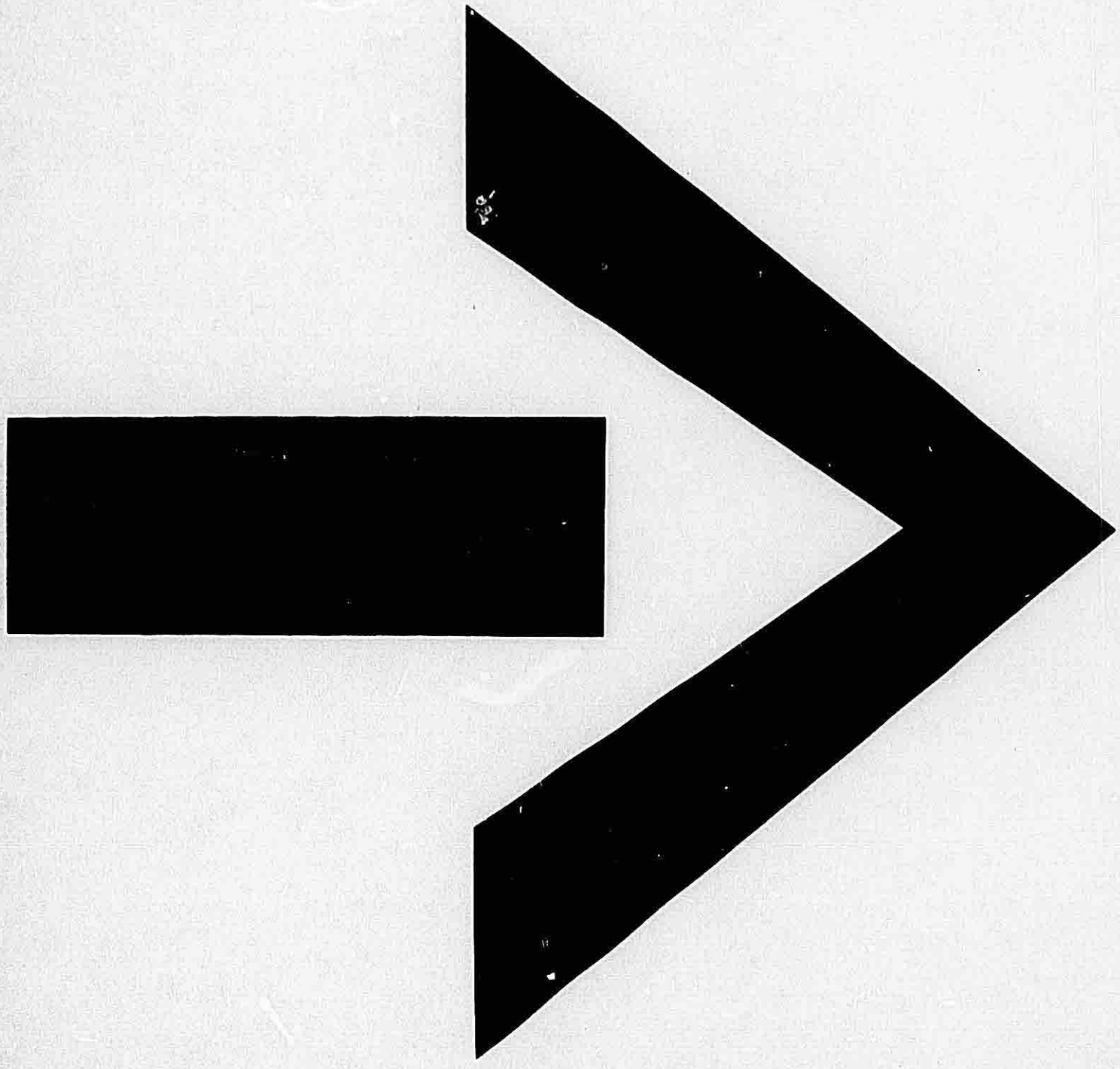


TABLE 4.2 AUDIO PANEL IN AIRCRAFT TROUBLESHOOTING CHART

STEP	TEST PROCEDURE	PROBABLE CAUSE OF MALFUNCTION
	COM UNITS	
1	At COM 1 unit, turn power ON and select TST Mode.	If background noise is heard from either COM 1 or COM 2, but not both, the fault is most likely in the COM unit that did not provide background noise, or in the receive audio connections between that COM and the Audio Panel.
2	At Audio Panel, actuate the COM 1 and SPKR pushbuttons.	
3	Listen for background noise on both the speaker and the headphones.	
4	At COM 2 unit, turn power ON and select TST Mode.	
5	At Audio Panel, actuate the COM 2 pushbutton.	If background noise is not heard from either COM 1 or COM 2, the defect may be in the Audio Panel or in the interconnect wiring such as A+, ground, etc.
6	Listen for background noise on both the speaker and the headphones.	
7	At COM 2, select the ON Mode. Tune in Tower, Unicom or Ground Control.	If either the COM 1 or COM2 transmit light does not come ON or vary in intensity, the fault is most likely in the COM unit that did not activate, or in one of the transmit connections between that COM and the Audio Panel (refer to Section 2, Table 2.1).
8	Key the transmitter. Observe that the transmit light on COM 2 comes ON and then varies in intensity as you talk into the microphone. Also listen for sidetone on the headphones.	
9	Repeat steps 7 and 8 using COM 1.	Similarly, if sidetone is heard on one COM but not the other, the fault is most likely in the COM that did not provide sidetone, or in the transmit connections between that COM and the Audio Panel. If neither COM unit goes into transmit and/or provides sidetone, the fault is most likely in the microphone, the microphone key, or the Audio Panel.

TABLE 4.2 AUDIO PANEL IN AIRCRAFT TROUBLESHOOTING CHART (Continued)

STEP	TEST PROCEDURE	PROBABLE CAUSE OF MALFUNCTION
	COM UNITS (Continued)	
10	At the Audio Panel, release both COM 1 and COM 2 pushbuttons. NOTE: The COM 1 and COM 2 pushbuttons are interlocked. To release both pushbuttons, slightly depress the COM pushbutton that is out.	If background noise or receiver audio is not heard from both COM units, the fault is most likely in the BOTH pushbutton switch.
	Depress the BOTH pushbutton. At the COM units, turn the volume up on one and down on the other, and vice versa. Background noise or receive audio should be heard on the speaker and headphones from both COM units.	If the speaker audio is distorted in a CP 136 installation , check the audio output connections to be sure that they are connected properly (refer to Section 2, Table 2.1).
	NAV UNITS	
11	Set up an IFR-401L Ramp Checker, or equivalent, as described in the Operator's Manual for that equipment.	If either NAV 1 or NAV 2 fails to provide receive audio, the fault is most likely in that NAV unit or in the audio connections between the NAV unit and the Audio Panel.
12	Modulate the Ramp Checker with the 1020 Hz Ident Tone.	
13	At the Audio Panel, depress the NAV 1 and SPKR pushbuttons. Listen for the 1020 Hz tone on the speaker and headphones.	If neither NAV provides receive audio, the fault is most likely in the Audio Panel.
14	Release the NAV 1 pushbutton and depress the NAV 2 pushbutton. Listen for the 1020 Hz tone on the speaker and headphones.	

TABLE 4.2 AUDIO PANEL IN AIRCRAFT TROUBLESHOOTING CHART (Continued)

STEP	TEST PROCEDURE	PROBABLE CAUSE OF MALFUNCTION
	ADF UNIT	
15	Tune the ADF to a local AM broadcast station.	If the ADF fails to provide receive audio, the fault is most likely in the ADF unit or in the audio connections between the ADF and the Audio Panel.
16	At the Audio Panel, depress the ADF and SPKR pushbuttons.	
17	List for receive audio on the speaker and headphones.	
	DME UNIT	
18	At the Audio Panel, depress the DME/MKR and SPKR pushbuttons.	If random audio is not heard, the fault is most likely in the DME unit or in the audio connections between the DME unit and the Audio Panel.
19	List for the random audio signal provided by the DME on the speaker and headphones.	
	UNSWITCHED AUDIO	
20	If the unit providing unswitched audio has a test function and it is actuated, the test tone should be heard on the headphones.	If the tone is not heard, the fault is most likely in the unswitched audio sensor or in the audio connections between the sensor and the Audio Panel.
	INTERCOM	
21	Troubleshooting intercom systems will vary with the type and complexity of the intercom system installed. The best method is to first check the intercom system wiring. All intercom audio inputs (up to four) should be heard on the headphones.	If the headphones have an output on receive audio but not on intercom, the fault is most likely in the intercom system.

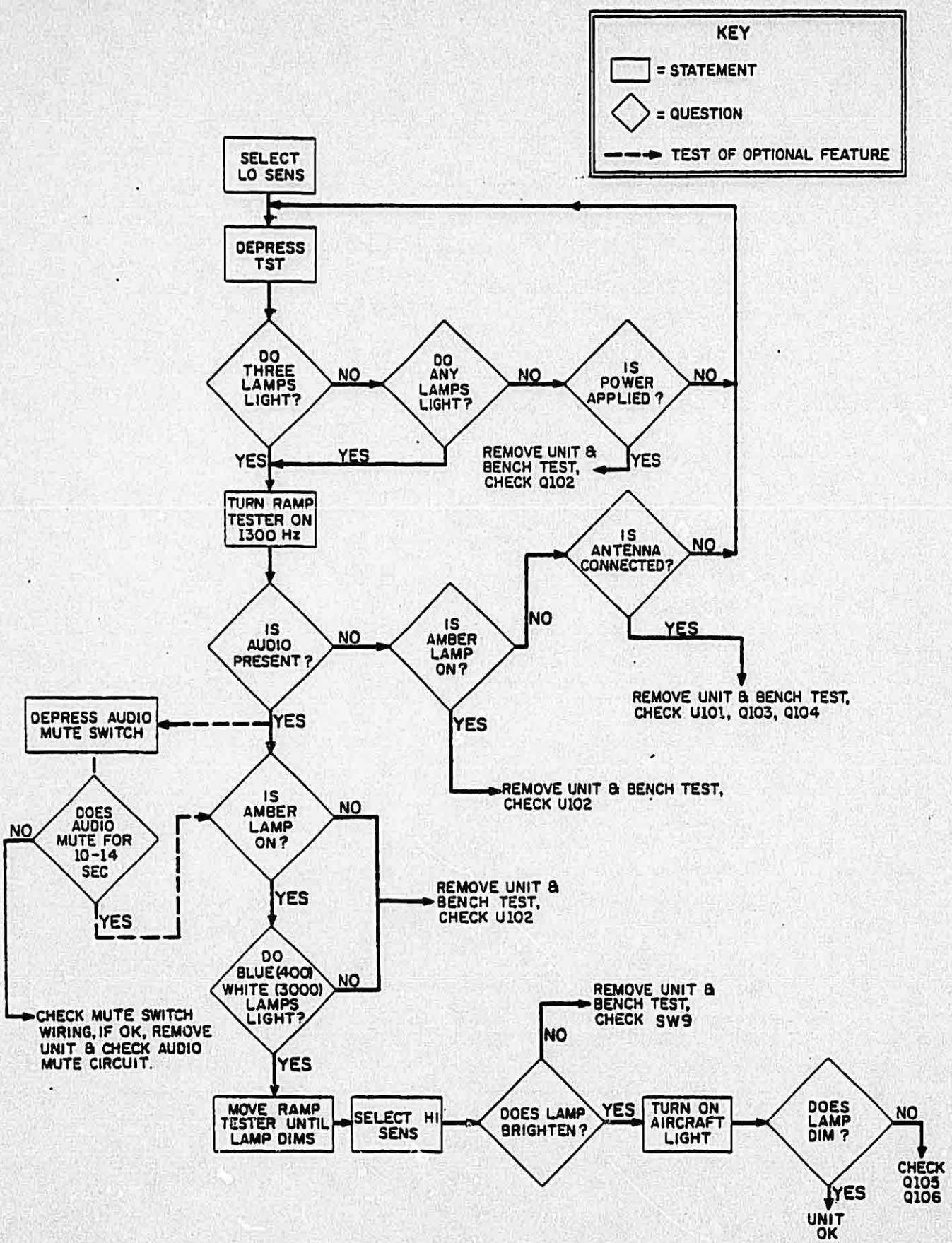


FIGURE 4-4. MARKER BEACON RECEIVER, IN-AIRCRAFT TROUBLESHOOTING FLOW CHART

4.5 UNIT TROUBLESHOOTING

4.5.1 Audio Panel

Faulty circuits in the Audio Panel can be readily located using common troubleshooting techniques. Table 4.3 may be used to check out various symptoms and related circuits. Since only audio signals are handled by the audio panel, signal tracing can be accomplished by using an audio signal generator and speaker, phones, or output meter.

TABLE 4.3 AUDIO PANEL UNIT TROUBLESHOOTING CHART

SYMPTOM	AFFECTED CIRCUIT	
	CP 135 and CP 136	CP 136 ONLY
No interçom or unswitched audio	U103	
No speaker or phones audio	Q6 or Q7	
Phones audio but no speaker audio	Q1 or SW8	Q8 thru Q12, T2 or T3
Speaker audio but no phones audio	Q2, U103 or T1	
Phones muting but no speaker muting	Q1, CR17 open	
Speaker muting but no phones muting	Q2, CR3 open	
Phones audio but no sidetone audio	Q3	

This chart presumes that:

1. An audio signal of the proper level is available at the selected input.
2. The proper loads are connected to the amplifier outputs.
3. DC input voltage is supplied to the unit in question.

4.5.2 Marker Beacon Receiver

To expedite troubleshooting the marker beacon receiver, Table 4.4 is provided.

TABLE 4.4 MARKER BEACON RECEIVER UNIT TROUBLESHOOTING CHART

SYMPTOM	AFFECTED CIRCUIT
1. No lamp TST, audio, or marker light	Q102, CR101
2. Lamp TST OK; no audio and marker light	U101, Q103, or Q104, FL102, Y101
3. Lamp TST and marker light OK; no audio	U102, C215
4. Lamp TST and audio OK; no marker light	U102
5. Lamps will not dim or remain dim	Q105, Q106 or SW10
6. One lamp out in TST mode, others normal	Check appropriate lamp and driver transistor
7. Audio and marker light OK; no lamp TST	SW9

4.5.2.1 Voltage Regulator

Q102 and reference diode CR101 form a series pass voltage regulator. If the regulator has failed, be sure that a short circuit or partial short circuit on the regulated voltage bus did not cause the failure.

MKR Power Requirements:	13.75	Vdc	0.038 Ampere (no signal)
	13.75	Vdc	0.25 Ampere (one lamp illuminated)
	27.5	Vdc	0.29 Ampere (one lamp illuminated)
Regulator Output at Q102 emitter	13.75	Vdc	9.5 Vdc $^{+}_{-}$5%
	27.5	Vdc	9.5 Vdc $^{+}_{-}$5%
Regulation at Q102 emitter	11 to 30	Vdc input	5% or better
Regulated Bus Resistance:	Between Q102 emitter and ground, 1000 ohms typical.		

4.5.2.2 Receiver

Table 4.5 provides a sequence of measurements designed to isolate a failed receiver circuit. Overall receiver gain may differ from the tabled values since R137 may have been adjusted to compensate for variations in marker antenna gain. After repairing a failed receiver, the Flight Test procedure in Section 2 of this manual should be performed to assure proper overall (receiver and antenna) gain.

TABLE 4.5 TYPICAL RECEIVER GAIN, HI SENSITIVITY ‡

INPUT					OUTPUT	
Frequency*	Level	To	Coupling Cap.	6 db Pad	From	Level
75 MHz	1mV	P101-CC	none	yes	FL101-1	0.10V rms
75 MHz	1mV	P101-CC	none	yes	U101-9	0.035V rms
75 MHz	1mV	P101-CC	none	yes	U101-15	0.90V rms
75 MHz	200 uV	Q103-3	0.001uf	no	FL101-1	0.10V rms
10.7 MHz	120uV	Q103-2	0.001uf	no	FL101-1	0.10V rms
10.7 MHz	30uV	U101-2	0.001uf	no	FL101-1	0.10V rms
10.7 MHz	300uV	U101-4	0.001uf	no	FL101-1	0.10V rms
10.7 MHz	1.5uV	U101-8	0.001uf	no	FL101-1	0.10V rms
75 MHz	400uV	P101-CC	none	yes	Lamp threshold	
75 MHz	100uV†	P101-CC	none	yes	Lamp threshold	

† R137 set maximum clockwise; i.e. maximum receiver sensitivity

* Modulated 95% by 1300 Hz.

‡ Table shows typical receiver gains with sensitivity potentiometers R136 and R137 set for 400 uV (HI) and 2,000 uV (LO) sensitivities. Where R137 has been adjusted to compensate for marker antenna gain, overall receiver gain will differ from the tabled value.

4.5.2.3 Oscillator

The low oscillator output voltage and high output impedance make measuring oscillator frequency difficult. To establish that the oscillator is operating, either of the following methods may be used:

a. Connect an rf voltmeter, such as a Boonton model 91 CAR, to Q103-2. The meter indication should be 0.2 to 0.4 volts rms.

b. Connect a high impedance dc voltmeter through a 100 kilohm resistor to the base of Q104; the indication should be 0.55 to 0.65 volts dc. Using a scribe or bus wire, short L103; the voltage at the base of Q104 should increase by 0.05 volts dc.

Oscillator output frequency may be measured at Q103-2 using a frequency counter with a minimum input impedance of 100 kilohms shunted by a maximum of 50 pf and a sensitivity of 50 mV rms. Output frequency is 64.3 MHz ±0.002%.

4.5.2.4 Lamp Circuits

The lamp circuits are composed of three similar parallel networks, so a comparison, good vs bad, method of troubleshooting may be used. Typically, 50mV rms at FL101-1 will just begin to light a lamp.

4.6 COMPONENT REPLACEMENT

Replacement of most components of the Audio Panel is obvious by inspection or, because of previous experience, poses no problem. Since most components are mounted on the PC board, precautions must be taken to avoid damage to the board when making repairs. The use of proper soldering tools, to avoid damage to the board or components, is recommended. Such tools include soldering irons of limited wattage and small or special purpose tips, solder suckers to remove solder, and heat sinks to absorb or divert heat.

Instructions are given here for the replacement of a few unusual components that require special handling.

4.6.1 Power Transistors

Two types of power transistors are employed in the Audio Panel. On one type, the mounting screw passes through the transistor body. The other type has a mounting flange. Both types are illustrated in Figure 4-5 along with associated mounting hardware.

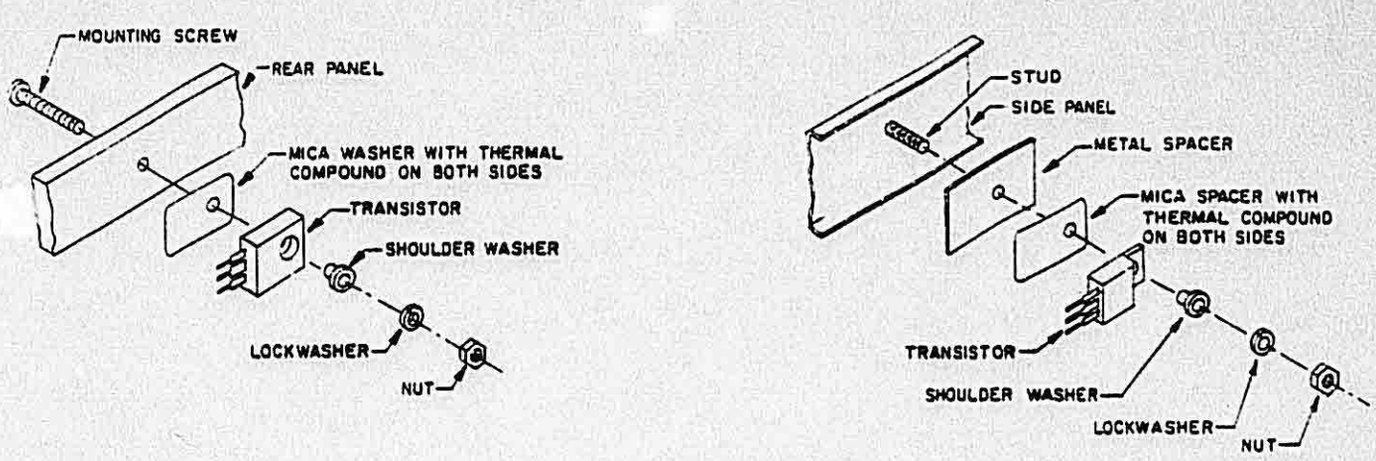
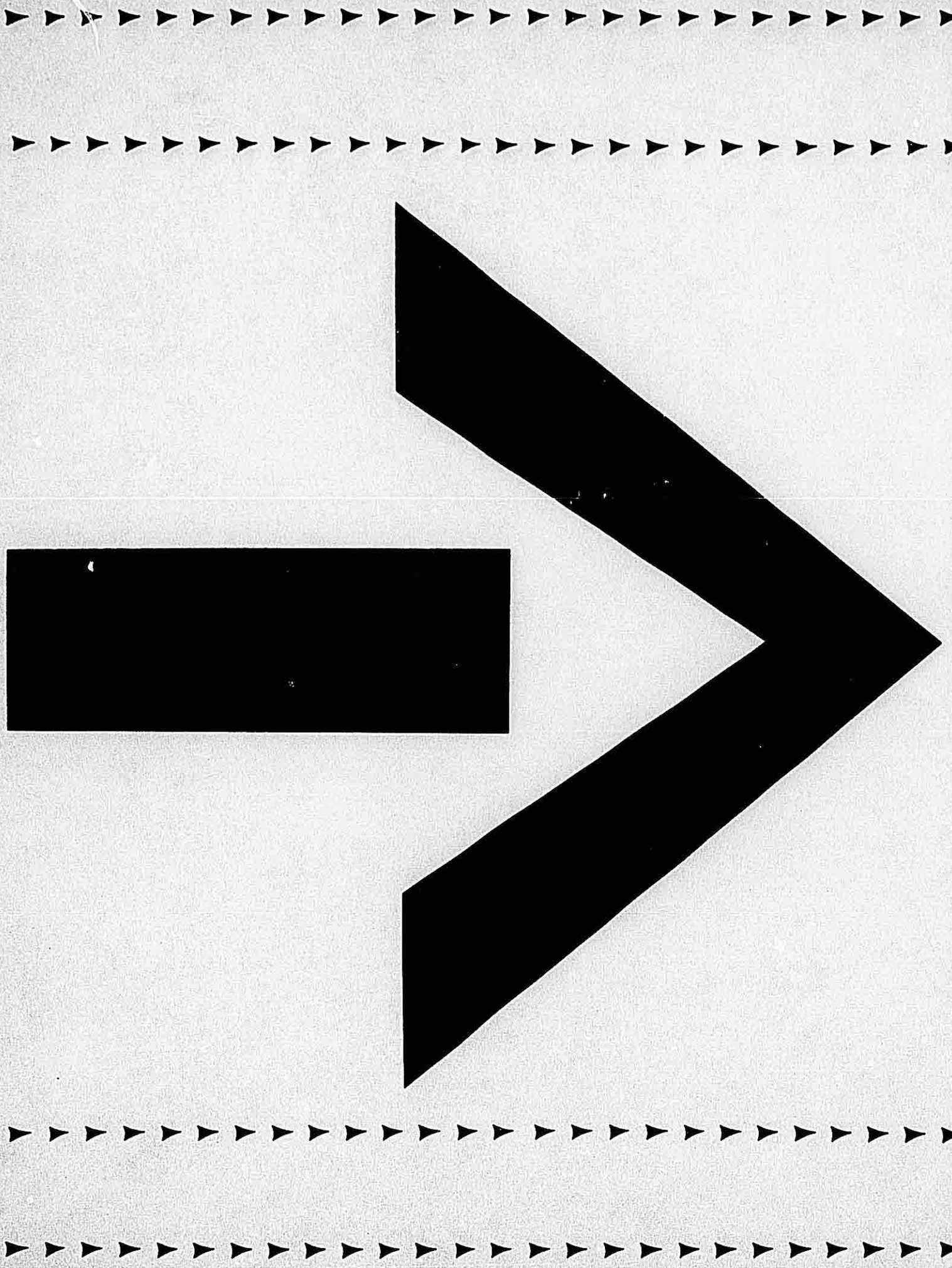
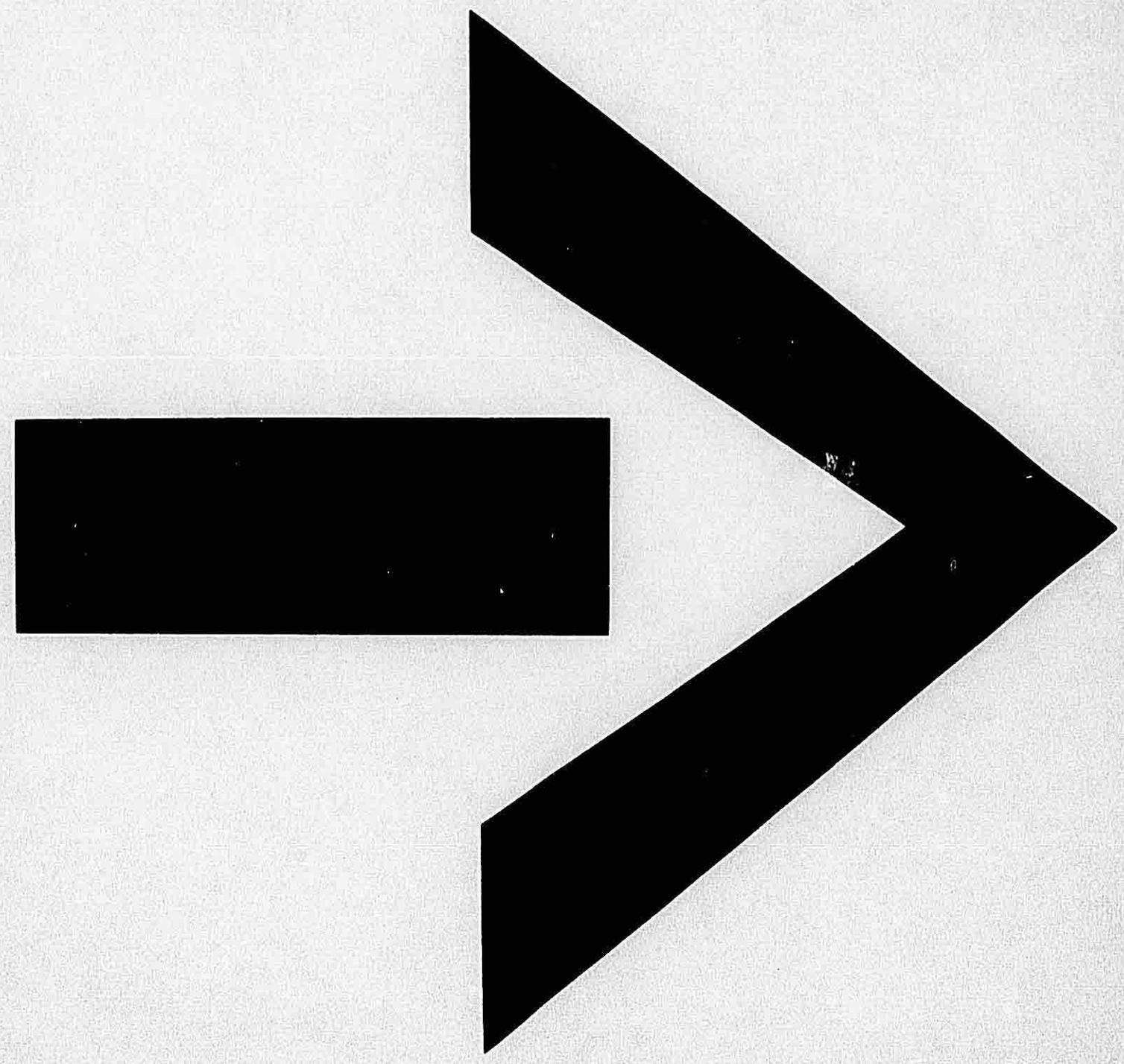


FIGURE 4-5. POWER TRANSISTOR MOUNTING

4.6.2 Pushbutton Switches

Switches SW1 and SW2 are combined in a mechanically interlocked assembly. Care must be taken when desoldering this assembly or the other individual pushbutton switches, SW3 through SW8, to remove them from the PC board. Use minimum heat and a solder sipper to remove all the solder from each pin. Save and reuse the spacers under the switch since they permit better alignment.





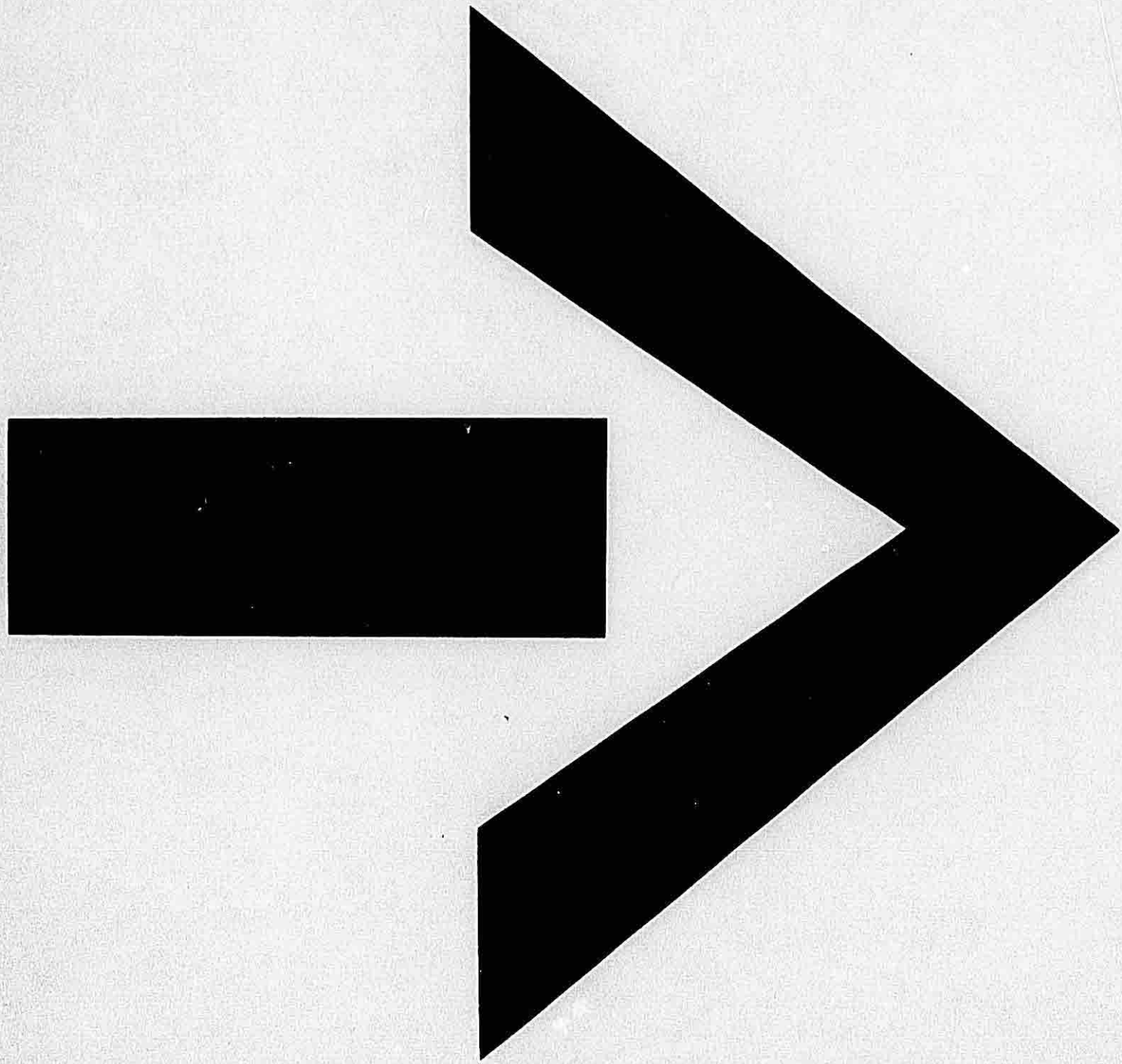
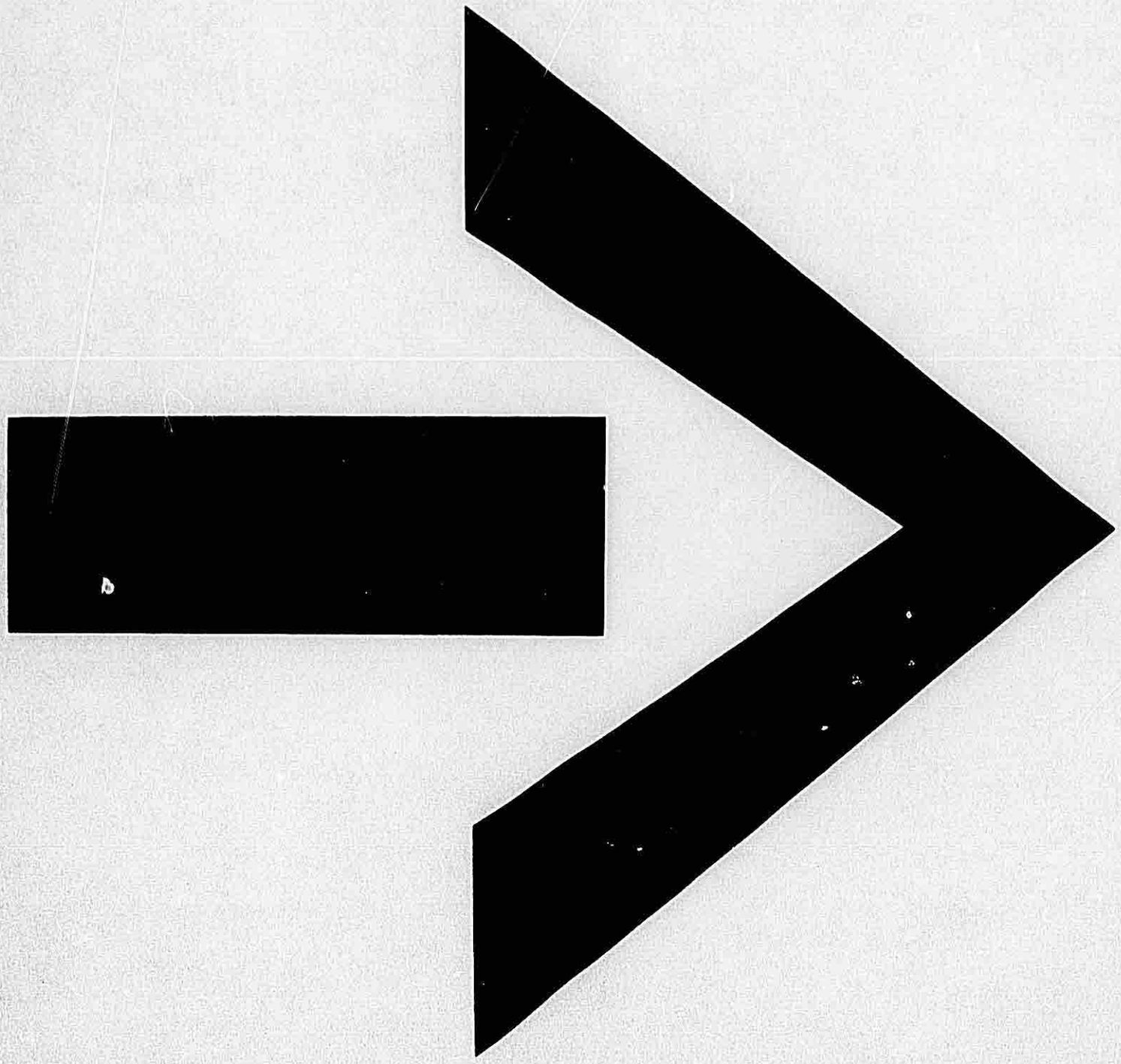


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LIST OF ILLUSTRATIONS

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5.1 GENERAL

The Replacement Parts List is subdivided into two sections, the Mechanical Parts List and the Electrical Parts List.

5.1.1 Cross-References

The expression "See Figure --- for breakdown" is self-explanitory, its counterpart "See Figure ---, index --- for Next Higher Assy" relates this breakdown back to where the subassembly was first identified in the parts list.

5.2 MECHANICAL PARTS LIST

The Mechanical Parts List section is intended to locate, identify, and show part relationship to the Unit itself. Only reuseable hardware is shown and listed as Attaching Parts.

The symbol "----*----" is used to indicate the end of that series of Attaching Parts.

Certain electrical parts are shown and listed only to show their relationship to the assembly, attaching parts, or for part location where not necessarily shown elsewhere.

PC board assemblies are listed in the mechanical parts list section only to identify, if any, those replaceable mechanical parts on the board. The blank PC board is listed only to show that it is the last and perhaps the only, mechanical part of the assembly. It is not intended that such a board would be replaced.

5.2.1 Index Numbers v/s Items in the Art

Each item shown in the art is identified by an index number or electrical symbol number (or both). Where a part is attached by more than one piece of hardware, usually one set of hardware is shown and indexed. The total quantity required to be used is shown in the quantity column. In most cases it is obvious where the other sets go. When a part is attached by a variety of types or sizes of attaching parts, sufficient indexing and drawings of these parts is provided to determine what type of hardware goes where.

5.2.2 Useable on Code Column

When two or more basically identical assemblies are listed in a common breakdown. The subassemblies and/or detail component parts are coded to denote the useage to the assembly. The absence of a code denotes the part is common to all the assemblies is that listing.

5.3 ELECTRICAL PARTS LIST

The Electrical Parts List details all the electrical parts in Alpha-Numerical sequence. The location of these parts will be found in the figures of the Schematic Section as well as the Mechanical Parts Section. These parts have no index numbers but are identified by their electrical symbol number.

5.3 Continued

When the expression "See Figure ---, item ---;" is listed in the description of an item, its usage is to identify and give the part a physical location within a given Figure.

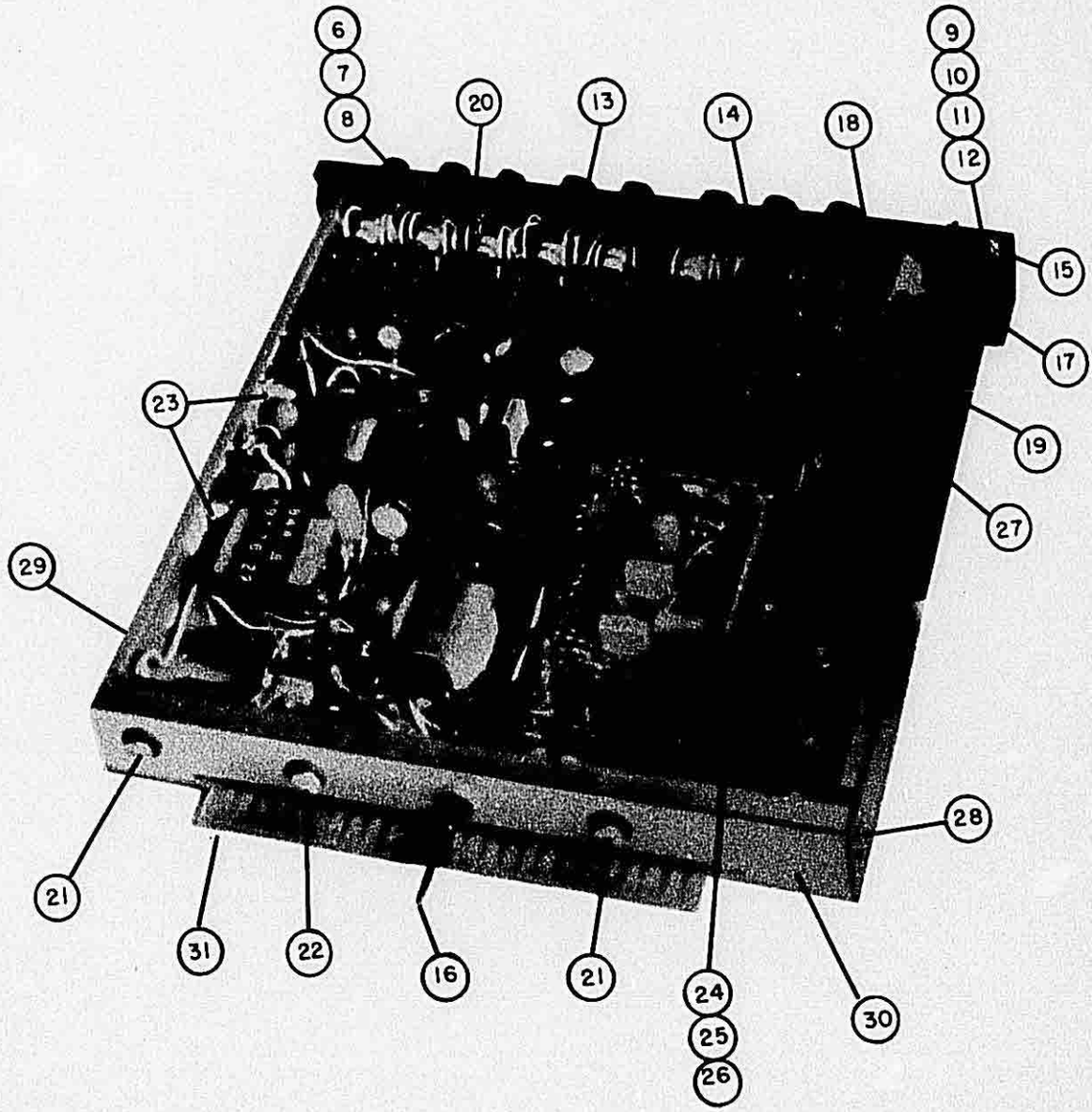
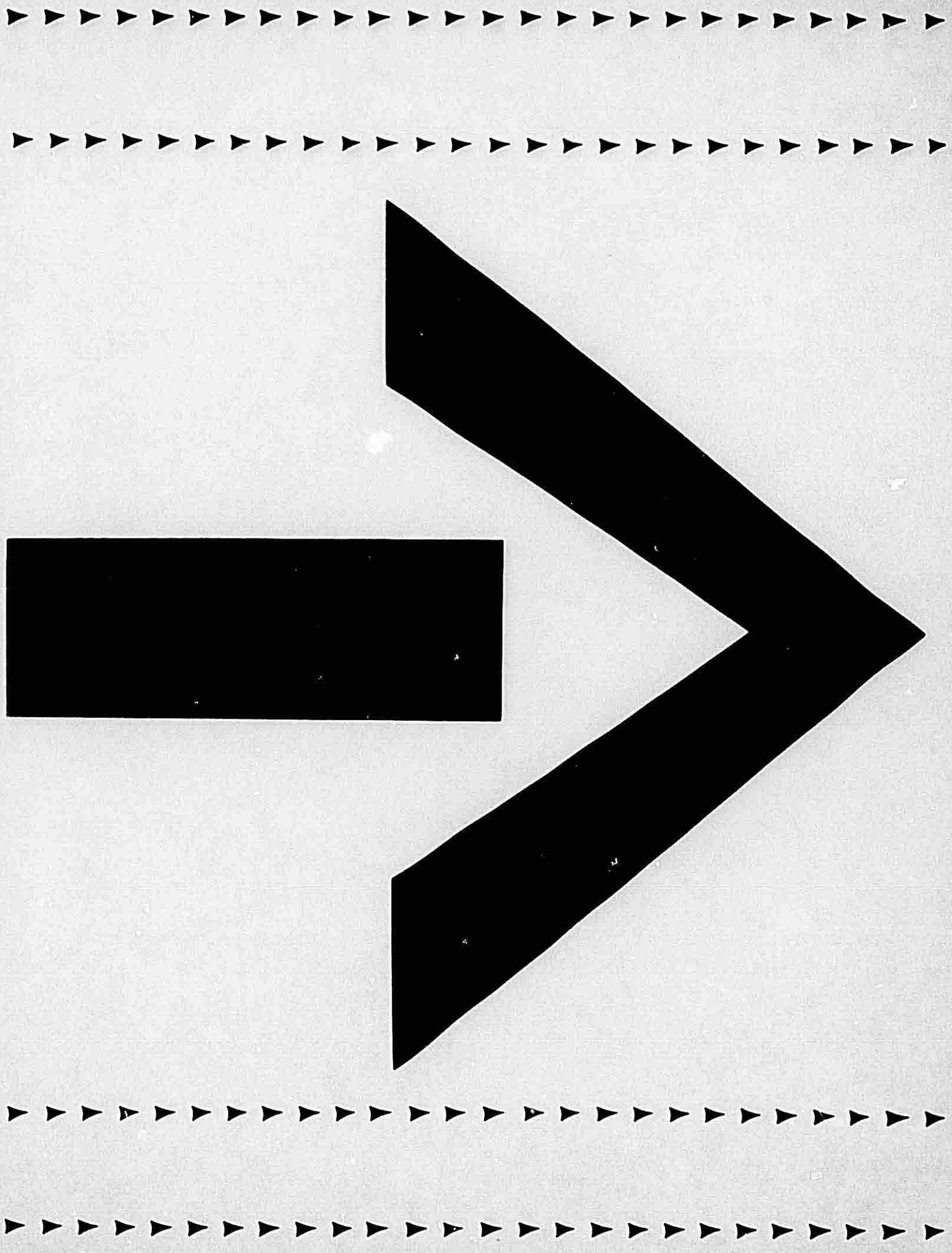


FIGURE 5.1 AUDIO PANEL ASSY, CP 135 AND CP 136

FIG. & ITEM NO.	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	QTY.	USEABLE ON CODE
			MECHANICAL PARTS LIST		
5.1	01254-0101		AUDIO PANEL ASSY, CP 135 W/ MARKER RECEIVER	1	A
	01254-0102		AUDIO PANEL ASSY, CP 135 REMOTE MARKER	1	B
	01254-0103		AUDIO PANEL ASSY, CP 136 W/ MARKER RECEIVER	1	C
	01254-0104		AUDIO PANEL ASSY, CP 136 REMOTE MARKER	1	D
-1	04824-0001		LABEL, Nameplate, CP 135 TSO (not shown)	1	A, B
	04824-0002		LABEL, Nameplate, CP 136 TSO (not shown)	1	C, D
-2	04824-0005		LABEL, Nameplate, Internal Marker Receiver (not shown)	1	A, C
	04824-0006		LABEL, Nameplate, Remote Marker Receiver (not shown)	1	B, D
-3	04824-0007		LABEL, Nameplate, CP 135 CP 136 TSO Tray (not shown)	1	
-4	04825-0001		LABEL, Tray Installation, CP 135 (not shown)	1	A, B
	04825-0002		LABEL, Tray Installation, CP 136 (not shown)	1	C, D
	04825-0005		LABEL, Tray Installation, Internal Marker Receiver (not shown)	1	A, C
	04825-0006		LABEL, Tray Installation, Remote Marker Receiver (not shown)	1	B, D
-5	04783-0001		LABEL, 30,000 FT Operation (not shown)	1	
-6	54591-0001		LENS, Button	8	
-7	54590-0001		HOUSING, Button	8	
-8	54732-0005		DIODE, Light Emitting (CR202 thru CR209)	8	
-9	56539-0008		GUIDE, Light, Clear (used with DS4)	1	
-10	56539-0009		GUIDE, Light, Amber (used with DS5)	1	

FIG. & ITEM NO.	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	QTY.	USEABLE ON CODE
			MECHANICAL PARTS LIST		
5.1-11	56539-0010		GUIDE, Light Blue (used with DS6)	1	
-12	81747-0009		FILTER, Blue (used with DS1 thru DS3, DS5, DS6) ..	5	
-13	12000-0027		LAMP, Pilot, 14V, 0.065 Amp (DS1 thru DS3)	3	
-14	12000-0014		LAMP, Marker, 5V, 0.115 Amp (DS4 thru DS6)	3	
-15	54578-0003		PANEL, Trim	1	A, B
	54578-0004		PANEL, Trim	1	C, D
			(ATTACHING PARTS)		
-16	57596-0003		LOCK SCREW	1	
	81192-0007		RING, Retaining	1	
			----*----		
-17	61575-0001	S9	SWITCH, Toggle	1	
-18	61576-0001	S10	SWITCH, Momentary	1	
-19	54724-0001		BRACKET, Switch	1	
			(ATTACHING PARTS)		
	82819-0105		SCREW, Mach, Flt Hd, Sl, 4-40 x 3/8	2	
			----*----		
-20	57593-0002		SPACER, Switch	11	
-21	75638-0005		TRANSISTOR, Silicon, NPN (Q9, Q10)	2	C, D
-22	75638-0004	Q11	TRANSISTOR, Silicon, NPN .	1	C, D
			(ATTACHING PARTS)		
	82814-0008		SCREW, Machine, Bind. Hd, Sl, 4-40 x 5/8	3	C, D
	81307-0105		WASHER, Flat, No. 4	3	C, D
	81324-0004		LOCKWASHER, Int. Tooth, No. 4	3	C, D
	82900-0003		NUT, Hex, No. 4-40	3	C, D
			----*----		
-23	75576-0001		TRANSISTOR, Silicon, NPN (Q7, Q12)	2	
			(ATTACHING PARTS)		
	84088-0102		STUD, Self Clinching, No. 4-40	2	
	81221-0001		SPACER, Transistor	2	
	56276-0001		INSULATOR	2	
	81307-0105		WASHER, Flat, No. 4	2	

FIG. & ITEM NO.	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	QTY.	USEABLE ON CODE
			MECHANICAL PARTS LIST		
	81324-0005		LOCKWASHER, Int. Tooth, No. 4	2	
	82900-0003		NUT, Hex, No. 4-40	2	
			----*----		
-24	54739-0001		COVER, Shield	1	A, C
-25	54738-0001		SHIELD	1	A, C
-26	54559-0001		INSULATOR (used with Y101) .	1	A, C
-27	56276-0001		INSULATOR (used with Q102) .	1	A, C
-28	84149-0003		RIVET, Flt Hd, Nylon	2	
-29	54728-0001		PANEL, Side	2	
			(ATTACHING PARTS)		
	82813-0002		SCREW, Mach, Bnd. Hd, Sl, 2-56 x 3/16	4	
	81290-0001		NUT, "U"	4	
			----*----		
-30	54726-0001		PANEL, Rear	1	
			(ATTACHING PARTS)		
	82813-0002		SCREW, Mach, Bind. Hd, Sl, 2-56 x 3/16	2	
	81324-0002		LOCKWASHER, Int. Tooth, No. 2	2	
			----*----		
-31	55184-0001		PRINTED CIRCUIT BOARD (less components)	1	
	NO NUMBER		COMPONENT ASSY (See Figure 5. 2 for breakdown) .	Ref	



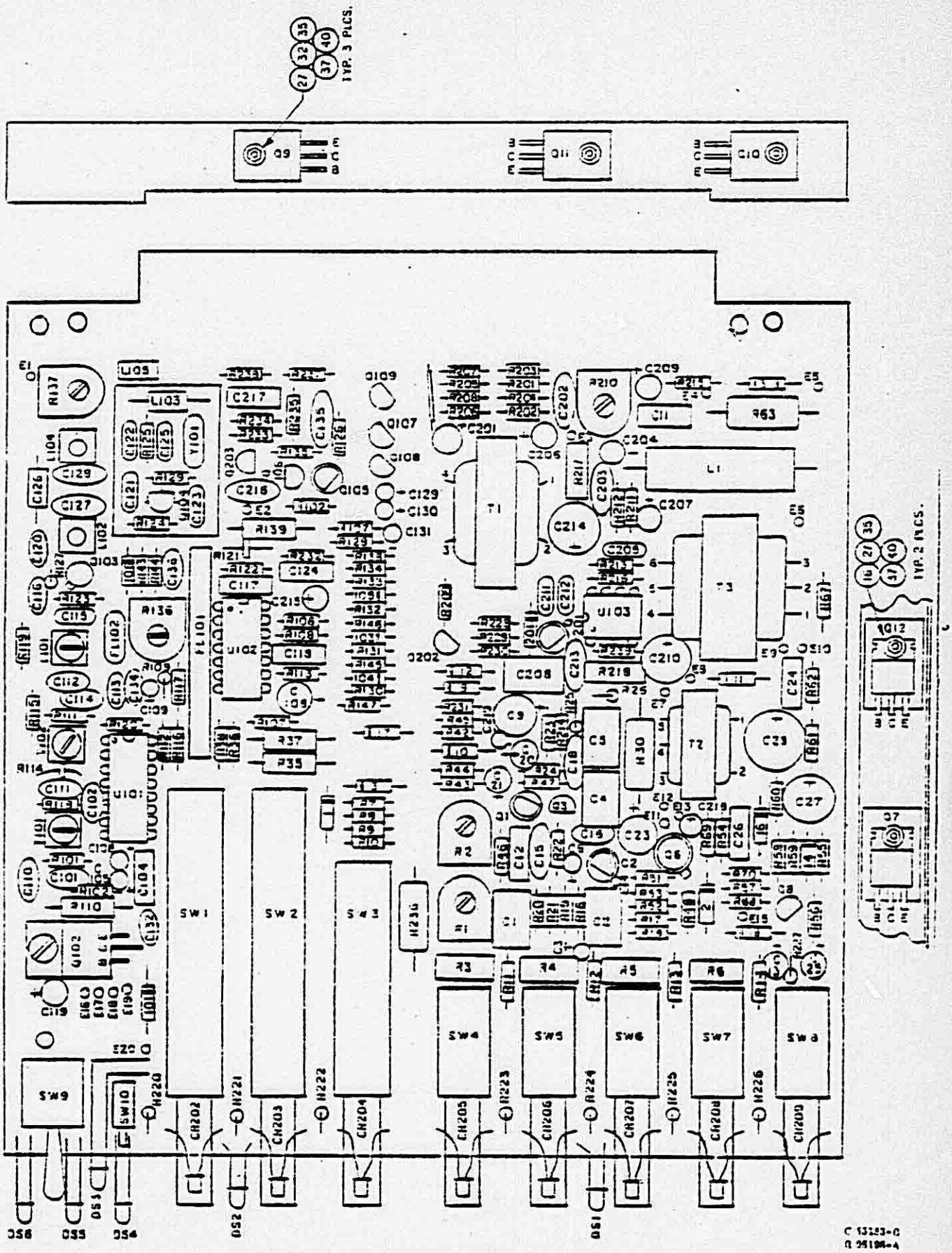


FIGURE 5.2 COMPONENT ASSY

SEE BLOW-UP FICHE NO. NCM702 ITEM-G

FIG. & ITEM NO.	PART NUMBER	SYMBOL NUMBER	DESCRIPTION	QTY.

MECHANICAL PARTS LIST

5.2	NO NUMBER	COMPONENT ASSY (See Figure 5.1, item-31, for Next Higher Assy)	Ref

No mechanical parts are used in this assembly. Refer to the Electrical Parts List for appropriate symbol number and component description.

ELECTRICAL PARTS LIST

SYMBOL NO.	PART NUMBER	DESCRIPTION
C1	23107-0034	CAPACITOR, Polyester, 0.56 uf ±5%, 63v
C2	23107-0034	CAPACITOR, Polyester, 0.56 uf ±5%, 63v
C3	31564-0027	CAPACITOR, Tantalum, 1.5 uf ±20%, 15v
C4	23107-0034	CAPACITOR, Polyester, 0.56 uf ±5%, 63v
C5	23107-0034	CAPACITOR, Polyester, 0.56 uf ±5%, 63v
C6	21564-0027	CAPACITOR, Solid Tantalum, 1.5 uf ±20%, 15v
C9	21564-0026	CAPACITOR, Solid Tantalum, 220 uf ±20%, 10v
C11	23107-0125	CAPACITOR, Polyester, 0.1 uf ±10%, 100v
C12	23107-0125	CAPACITOR, Polyester, 0.1 uf ±10%, 100v
C13	21564-0032	CAPACITOR, Solid Tantalum, 10 uf ±20%, 15v
C15	21291-0025	CAPACITOR, Ceramic Disc, 430 pf ±10%, 500v
C16	21291-0025	CAPACITOR, Ceramic Disc, 430 pf ±10%, 500v
C18	21291-0025	CAPACITOR, Ceramic Disc, 430 pf ±10%, 500v
C20	21564-0033	CAPACITOR, Solid Tantalum, 15 uf ±20%, 15v
C21	21564-0016	CAPACITOR, Solid Tantalum, 4.7 uf ±20%, 10v
C23	21564-0038	CAPACITOR, Solid Tantalum, 100 uf ±20%, 15v
C24	23107-0125	CAPACITOR, Polyester, 0.1 uf ±10%, 100v
C25	21564-0059	CAPACITOR, Solid Tantalum, 1 uf ±20%, 35v
C26	23107-0125	CAPACITOR, Polyester, 0.1 uf ±10%, 100v
C27	21564-0067	CAPACITOR, Solid Tantalum, 22 uf ±20%, 35v
C28	21564-0069	CAPACITOR, Solid Tantalum, 47 uf ±20%, 35v
C101	21291-0030	CAPACITOR, Ceramic Disc, 0.01 uf ±20%, 50v
C102	21291-0030	CAPACITOR, Ceramic Disc, 0.01 uf ±20%, 50v
C104	23107-0113	CAPACITOR, Metalized Mylar, 0.01 uf ±10%, 100v
C105	21564-0032	CAPACITOR, Solid Tantalum, 10 uf ±20%, 15v
C106	21564-0032	CAPACITOR, Solid Tantalum, 10 uf ±20%, 15v
C108	21564-0037	CAPACITOR, Solid Tantalum, 68 uf ±20%, 15v
C109	21564-0034	CAPACITOR, Solid Tantalum, 22 uf ±20%, 15v
C110	21291-0030	CAPACITOR, Ceramic Disc, 0.01 uf ±20%, 50v
C111	21291-0030	CAPACITOR, Ceramic Disc, 0.01 uf ±20%, 50v
C112	21291-0030	CAPACITOR, Ceramic Disc, 0.01 uf ±20%, 50v
C113	24516-0479	CAPACITOR, Ceramic Disc, 4.7 pf ±5%, 500v
C114	21291-0030	CAPACITOR, Ceramic Disc, 0.01 uf ±20%, 50v
C115	24052-0120	CAPACITOR, Dipped Mica, 12 pf ±10%, 100v
C116.	21291-0030	CAPACITOR, Ceramic Disc, 0.01 uf ±20%, 50v
C117	23107-0125	CAPACITOR, Metalized Mylar, 0.10 uf ±10%, 100v

ELECTRICAL PARTS LIST

SYMBOL NO.	PART NUMBER	DESCRIPTION
C118	23107-0125	CAPACITOR, Metalized Mylar, 0.10 uf ±10%, 100v
C119	21564-0032	CAPACITOR, Solid Tantalum, 10 uf ±20%, 15v
C120	21291-0030	CAPACITOR, Ceramic Disc, 0.01 uf ±20%, 50v
C121	24052-0270	CAPACITOR, Dipped Mica, 27 pf ±5%, 100v
C122	24052-0121	CAPACITOR, Dipped Mica, 120 pf ±5%, 100v
C123	24052-0620	CAPACITOR, Dipped Mica, 62 pf ±5%, 100v
C124	23107-0125	CAPACITOR, Metalized Mylar, 0.10 uf ±10%, 100v
C125	24052-0470	CAPACITOR, Dipped Mica, 47 pf ±5%, 100v
C126	24509-0338	CAPACITOR, Ceramic Insulated, 0.33 pf
C127	24516-0220	CAPACITOR, Ceramic Disc, 22 pf ±10%, 500v
C128	24516-0270	CAPACITOR, Ceramic Disc, 27 pf ±10%, 500v
C129	21564-0029	CAPACITOR, Solid Tantalum, 3.3 uf ±20%, 15v
C130	21564-0029	CAPACITOR, Solid Tantalum, 3.3 uf ±20%, 15v
C131	21564-0029	CAPACITOR, Solid Tantalum, 3.3 uf ±20%, 15v
C132	21291-0030	CAPACITOR, Ceramic Disc, 0.01 uf ±20%, 50v
C134	21291-0030	CAPACITOR, Ceramic Disc, 0.01 uf ±20%, 50v
C135	21291-0030	CAPACITOR, Ceramic Disc, 0.01 uf ±20%, 50v
C136	21291-0030	CAPACITOR, Ceramic Disc, 0.01 uf ±20%, 50v
C201	21564-0034	CAPACITOR, Solid Tantalum, 22 uf ±20%, 15v
C202	21291-0025	CAPACITOR, Ceramic Disc, 430 pf ±10%, 500v
C203	21291-0025	CAPACITOR, Ceramic Disc, 430 pf ±10%, 500v
C204	21564-0017	CAPACITOR, Solid Tantalum, 6.8 uf ±20%, 10v
C205	24052-121	CAPACITOR, Dipped Mica, 120 pf ±5%, 300v
C206	21564-0017	CAPACITOR, Solid Tantalum, 6.8 uf ±20%, 10v
C207	21564-0017	CAPACITOR, Solid Tantalum, 6.8 uf ±20%, 10v
C208	23107-0034	CAPACITOR, Polyester, 0.56 uf ±5%, 63v
C210	21564-0026	CAPACITOR, Solid Tantalum, 220 uf ±20%, 10v
C211	24052-391	CAPACITOR, Dipped Mica, 390 pf ±5%, 100v
C212	24052-100	CAPACITOR, Dipped Mica, 10 pf ±0.5 pf, 500v
C213	24515-0005	CAPACITOR, Ceramic Disc, 0.05 uf ±20%, 10v
C214	21564-0024	CAPACITOR, Solid Tantalum, 100 uf ±20%, 10v
C215	21564-0032	CAPACITOR, Solid Tantalum, 10 uf ±20%, 15v
C216	21291-0030	CAPACITOR, Ceramic Disc, 0.01 uf ±20%, 50v
C217	23107-0119	CAPACITOR, Polyester, 0.033 uf ±10%, 100v
C218	21564-0034	CAPACITOR, Solid Tantalum, 22 uf ±20%, 15v
C219	21564-0055	CAPACITOR, Solid Tantalum, 0.22 uf ±20%, 35v

ELECTRICAL PARTS LIST

SYMBOL NO.	PART NUMBER	DESCRIPTION
CR1	75024-0045	DIODE, Silicon
CR2	75027-0004	DIODE, Silicon, Zener 5.6v
CR3	75204-0045	DIODE, Silicon
CR9	75204-0045	DIODE, Silicon
CR10	75204-0045	DIODE, Silicon
CR11	75204-0045	DIODE, Silicon
CR12	75204-0045	DIODE, Silicon
CR13	75025-0003	DIODE, Silicon, Zener 11v
CR14	75019-0004	DIODE, Silicon
CR16	75025-0009	DIODE, Silicon, Zener 18v
CR17	75204-0045	DIODE, Silicon
CR18	75014-0001	DIODE, Germanium
CR101	75025-0005	DIODE, Silicon, Zener, 10v
CR102	75028-0001	DIODE, Silicon
CR103	75028-0001	DIODE, Silicon
CR104	75028-0001	DIODE, Silicon
CR105	75038-0002	DIODE, Silicon
CR106	75038-0002	DIODE, Silicon, RF Switching
CR107	75028-0001	DIODE, Silicon
CR201	75028-0001	DIODE, Silicon
CR202	54732-0005	DIODE, Light Emitting (See Figure 5.1, item - 8)
CR203	54732-0005	DIODE, Light Emitting (See Figure 5.1, item - 8)
CR204	54732-0005	DIODE, Light Emitting (See Figure 5.1, item - 8)
CR205	54732-0005	DIODE, Light Emitting (See Figure 5.1, item - 8)
CR206	54732-0005	DIODE, Light Emitting (See Figure 5.1, item - 8)
CR207	54732-0005	DIODE, Light Emitting (See Figure 5.1, item - 8)
CR208	54732-0005	DIODE, Light Emitting (See Figure 5.1, item - 8)
CR209	54732-0005	DIODE, Light Emitting (See Figure 5.1, item - 8)
DS1	12000-0027	LAMP, Pilot, 14v, 0.065 Amps (See Figure 5.1, item - 13)
DS2	12000-0027	LAMP, Pilot, 14v, 0.065 Amps (See Figure 5.1, item - 13)
DS3	12000-0027	LAMP, Pilot, 14v, 0.065 Amps (See Figure 5.1, item - 13)
DS4	12000-0014	LAMP, Marker, 5v, 0.115 Amps (See Figure 5.1, item - 14)
DS5	12000-0014	LAMP, Marker, 5v, 0.115 Amps (See Figure 5.1, item - 14)
DS6	12000-0014	LAMP, Marker, 5v, 0.115 Amps (See Figure 5.1, item - 14)

ELECTRICAL PARTS LIST

SYMBOL NO.	PART NUMBER	DESCRIPTION
FL101	26001-0101	FILTER, Audio
FL102	43208-0001	CRYSTAL FILTER, Monolithic
L1	11487-0001	CHOKE
L101	11872-0002	COIL, Crystal Filter
L102	11873-0001	COIL, RF
L103	11138-0003	CHOKE, RF Insulated, 0.22 uh
L104	11873-0001	COIL, RF
L105	11713-0005	CHOKE, RF
Q1	75550-0007	TRANSISTOR, Silicon, NPN
Q2	75550-0007	TRANSISTOR, Silicon, NPN
Q3	75565-0003	TRANSISTOR, Silicon, PNP
Q6	75536-0001	TRANSISTOR, Silicon, NPN
Q7	75576-0001	TRANSISTOR, Silicon, NPN (See Figure 5.1, item - 23)
Q8	75561-0020	TRANSISTOR, Silicon, NPN
Q9	75638-0005	TRANSISTOR, Silicon, NPN (See Figure 5.1, item - 21)
Q10	75638-0005	TRANSISTOR, Silicon, NPN (See Figure 5.1, item - 21)
Q11	75638-0004	TRANSISTOR, Silicon, NPN (See Figure 5.1, item - 22)
Q12	75576-0001	TRANSISTOR, Silicon, NPN (See Figure 5.1, item - 23)
Q102	75576-0001	TRANSISTOR, Silicon, NPN, Pwr
Q103	75611-0002	TRANSISTOR, FET
Q104	75592-0002	TRANSISTOR, Silicon, NPN
Q105	75595-0003	TRANSISTOR, Silicon, NPN (2N5172)
Q106	75558-0005	TRANSISTOR, Silicon, NPN (2N5810)
Q107	75587-0014	TRANSISTOR, Darlington, NPN (2N5308)
Q108	75587-0014	TRANSISTOR, Darlington, NPN (2N5308)
Q109	75587-0014	TRANSISTOR, D rlington, NPN (2N5308)
Q201	75595-0003	TRANSISTOR, Silicon, NPN (2N5172)
Q202	75558-0005	TRANSISTOR, Silicon, NPN (2N5810)
Q203	75574-0002	TRANSISTOR, Silicon, UJT (2N4870)
R1	32054-0002	RESISTOR, Variable, 470 $\pm$20%
R2	32054-0002	RESISTOR, Variable, 470 $\pm$20%
R3	32054-0001	RESISTOR, Variable, 470 $\pm$20%
R4	32054-0001	RESISTOR, Variable, 470 $\pm$20%
R5	32054-0001	RESISTOR, Variable, 470 $\pm$20%

ELECTRICAL PARTS LIST

SYMBOL NO.	PART NUMBER	DESCRIPTION
R6	32054-0021	RESISTOR, Variable, 22K ±20%
R7	31216-0472	RESISTOR, Fixed, Comp, 4.7K ±5%, 1/8w
R8	31216-0472	RESISTOR, Fixed, Comp, 4.7K ±5%, 1/8w
R9	31216-0472	RESISTOR, Fixed, Comp, 4.7K ±5%, 1/8w
R10	31216-0472	RESISTOR, Fixed. Comp, 4.7K ±5%, 1/8w
R11	31216-0472	RESISTOR, Fixed, Comp, 4.7K ±5%, 1/8w
R12	31216-0472	RESISTOR, Fixed, Comp, 4.7K ±5%, 1/8w
R13	31216-0472	RESISTOR, Fixed, Comp, 4.7K ±5%, 1/8w
R14	31216-0472	RESISTOR, Fixed, Comp, 4.7K ±5%, 1/8w
R16	31216-0103	RESISTOR, Fixed, Comp, 10K ±5%, 1/8w
R17	31216-0182	RESISTOR, Fixed, Comp, 1.8K ±5%, 1/8w
R18	31216-0102	RESISTOR, Fixed, Comp, 1K ±5%, 1/8w
R19	31216-0103	RESISTOR, Fixed, Comp, 10K ±5%, 1/8w
R20	31216-0102	RESISTOR, Fixed, Comp, 1K ±5%, 1/8w
R21	31216-0103	RESISTOR, Fixed, Comp, 10K ±5%, 1/8w
R22	31216-0103	RESISTOR, Fixed, Comp, 10K ±5%, 1/8w
R23	31216-0102	RESISTOR, Fixed, Comp, 1K ±5%, 1/8w
R24	31216-0182	RESISTOR, Fixed, Comp, 1/8K ±5%, 1/8w
R25	31216-0471	RESISTOR, Fixed, Comp, 470 ±5%, 1/8w
R26	31216-0471	RESISTOR, Fixed, Comp, 470 ±5%, 1/8w
R30	31161-0009	RESISTOR, Fixed, Wire Wound, 500 ±5%, 3w
R35	31141-0331	RESISTOR, Fixed Comp, 330 ±10%, 1/2w
R36	31216-0470	RESISTOR, Fixed, Comp, 47 ±5%, 1/8w
R37	31141-0331	RESISTOR, Fixed, Comp, 330 ±1%, 1/2w
R38	31216-0470	RESISTOR, Fixed, Comp, 47 ±5%, 1/8w
R42	31216-0392	RESISTOR, Fixed, Comp, 3.9K ±5%, 1/8w
R43	31216-0331	RESISTOR, Fixed, Comp, 330 ±5%, 1/8w
R44	31216-0123	RESISTOR, Fixed, Comp, 12K ±5%, 1/8w
R45	31216-0223	RESISTOR, Fixed, Comp, 22K ±5%, 1/8w
R46	31216-0103	RESISTOR, Fixed, Comp, 10K ±5%, 1/8w
R47	31216-0182	RESISTOR, Fixed, Comp, 1.8K ±5%, 1/8w
R48	31216-0102	RESISTOR, Fixed, Comp, 1K ±5%, 1/8w
R51	31216-0122	RESISTOR, Fixed, Comp, 1.2K ±5%, 1/8w
R52	31216-0472	RESISTOR, Fixed, Comp, 4.7K ±5%, 1/8w
R53	31216-SEL	RESISTOR, Fixed, Comp, Sel ±5%, 1/8w

ELECTRICAL PARTS LIST

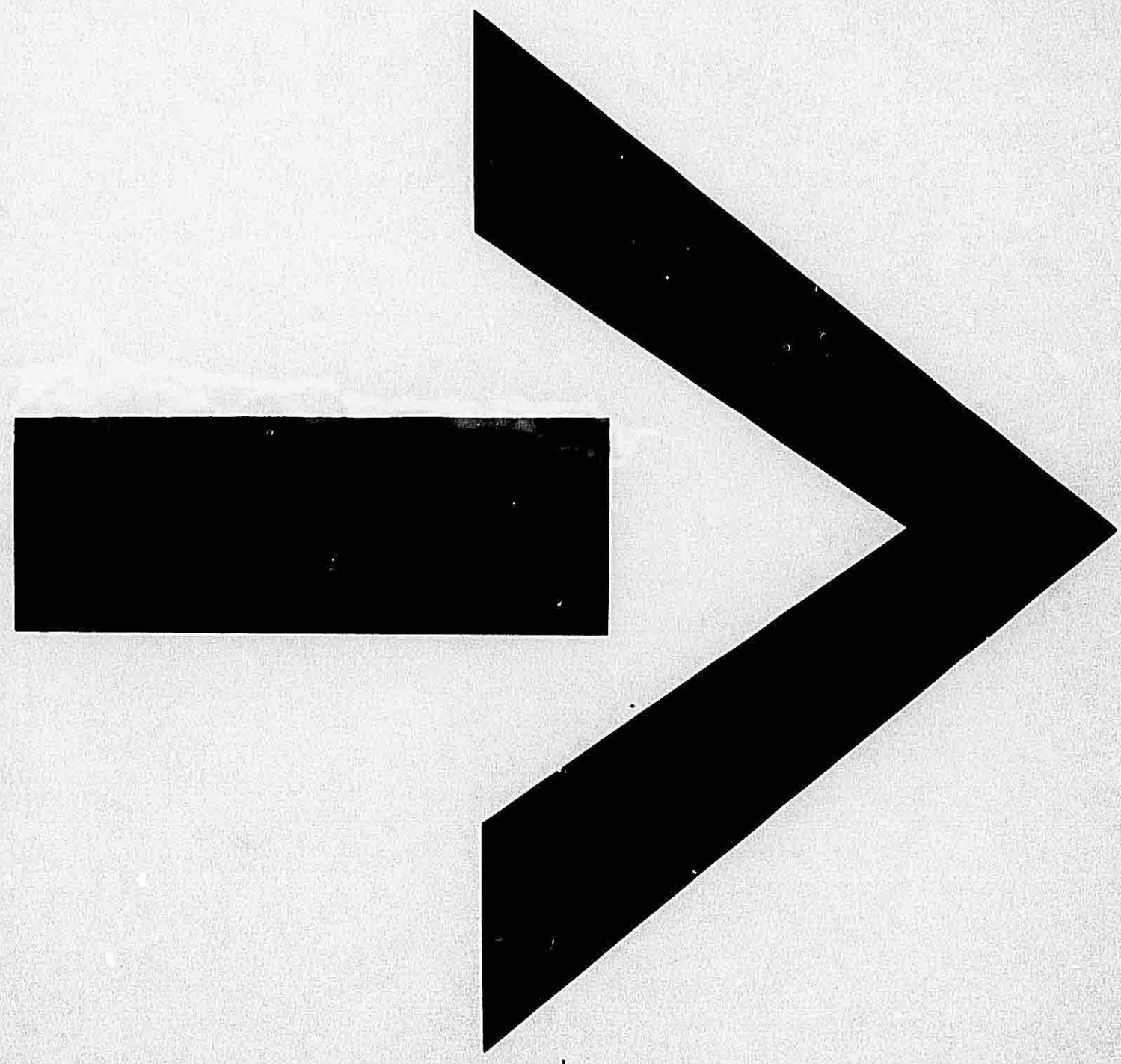
SYMBOL NO.	PART NUMBER	DESCRIPTION
R54	31216-SEL	RESISTOR, Fixed, Comp, Sel ±5%, 1/8w
R55	31216-0103	RESISTOR, Fixed, Comp, 10K ±5%, 1/8w
R56	31216-0471	RESISTOR, Fixed, Comp, 470 ±5%, 1/8w
R57	31216-0101	RESISTOR, Fixed, Comp, 100 ±5%, 1/8w
R58	31216-0391	RESISTOR, Fixed, Comp, 390 ±5%, 1/8w
R59	31216-0221	RESISTOR, Fixed, Comp, 220 ±5%, 1/8w
R60	31216-0182	RESISTOR, Fixed, Comp, 1.8K ±5%, 1/8w
R61	31216-0471	RESISTOR, Fixed, Comp, 470 ±5%, 1/8w
R62	31216-0101	RESISTOR, Fixed, Comp, 100 ±5%, 1/8w
R63	31161-0009	RESISTOR, Fixed, Wire Wound, 500 ±5%, 3w
R67	31192-0102	RESISTOR, Fixed, Comp, 1K ±10%, 1/4w
R68	31216-0150	RESISTOR, Fixed, Comp, 15 ±5%, 1/8w
R69	31213-0152	RESISTOR, Fixed, Comp, 1.5K ±5%, 1/8w
R70	31216-0471	RESISTOR, Fixed, Comp, 470 ±5%, 1/8w
R101	31216-0101	RESISTOR, Fixed, Comp, 100 ±5%, 1/8w
R102	31216-0331	RESISTOR, Fixed, Comp, 330 ±5%, 1/8w
R103	31216-0102	RESISTOR, Fixed, Comp, 1K ±5%, 1/8w
R107	31216-0224	RESISTOR, Fixed, Comp, 220K ±5%, 1/8w
R108	31216-0154	RESISTOR, Fixed, Comp, 250K ±5%, 1/8w
R109	31192-0102	RESISTOR, Fixed, Comp, 1K ±10%, 1/4w
R110	31141-0102	RESISTOR, Fixed, Comp, 1K ±10%, 1/2w
R111	31216-0472	RESISTOR, Fixed, Comp, 4.7K ±5%, 1/8w
R112	31213-0184	RESISTOR, Fixed, Comp, 180K ±5%, 1/8w
R113	31215-0824	RESISTOR, Fixed, Comp, 820K ±10%, 1/8w
R114	31205-0003	RESISTOR, Thermistor, 47K ±10%
R115	31216-0101	RESISTOR, Fixed, Comp, 100 ±5%, 1/8w
R116	31216-0472	RESISTOR, Fixed, Comp, 4.7K ±5%, 1/8w
R117	31216-0682	RESISTOR, Fixed, Comp, 6.8K ±5%, 1/8w
R118	31216-0472	RESISTOR, Fixed, Comp, 4.7K ±5%, 1/8w
R119	31216-0101	RESISTOR, Fixed, Comp, 100 ±5%, 1/8w
R120	31216-0472	RESISTOR, Fixed, Comp, 4.7K ±5%, 1/8w
R121	31205-0004	RESISTOR, Thermistor, 128.8 ±10%
R122	31216-0102	RESISTOR, Fixed, Comp, 1K ±5%, 1/8w
R123	31216-0104	RESISTOR, Fixed, Comp, 100K ±5%, 1/8w

ELECTRICAL PARTS LIST

SYMBOL NO.	PART NUMBER	DESCRIPTION
R124	31216-0103	RESISTOR, Fixed, Comp, 10K ±5%, 1/8w
R125	31216-0471	RESISTOR, Fixed, Comp, 470 ±5%, 1/8w
R126	31216-0103	RESISTOR, Fixed, Comp, 10K ±5%, 1/8w
R127	31216-0221	RESISTOR, Fixed, Comp, 220 ±5%, 1/8w
R128	31216-0103	RESISTOR, Fixed, Comp, 10K ±5%, 1/8w
R129	31216-0224	RESISTOR, Fixed, Comp, 220K ±5%, 1/8w
R130	31216-0223	RESISTOR, Fixed, Comp, 22K ±5%, 1/8w
R131	31216-0223	RESISTOR, Fixed, Comp, 22K ±5%, 1/8w
R132	31216-0223	RESISTOR, Fixed, Comp, 22K ±5%, 1/8w
R133	31216-0473	RESISTOR, Fixed, Comp, 47K ±5%, 1/8w
R134	31216-0473	RESISTOR, Fixed, Comp, 47K ±5%, 1/8w
R135	31216-0102	RESISTOR, Fixed, Comp, 1K ±5%, 1/8w
R136	32054-0024	RESISTOR, Variable, 100 ±20%
R137	32054-0010	RESISTOR, Variable, 1K ±20%
R138	31216-0473	RESISTOR, Fixed, Comp, 47K ±5%, 1/8w
R139	31141-0470	RESISTOR, Fixed, Comp, 47 ±10%, 1/2w
R143	31216-0102	RESISTOR, Fixed, Comp, 1K ±5%, 1/8w
R144	31216-0103	RESISTOR, Fixed, Comp, 10K ±5%, 1/8w
R145	31216-SEL	RESISTOR, Fixed, Comp (27K to 68K) ±5%, 1/8w
R146	31216-SEL	RESISTOR, Fixed, Comp (27K to 68K) ±5%, 1/8w
R147	31216-SEL	RESISTOR, Fixed, Comp (27K to 68K) ±5%, 1/8w
R201	31216-0272	RESISTOR, Fixed, Comp, 2.7K ±5%, 1/8w
R202	31216-0272	RESISTOR, Fixed, Comp, 2.7K ±5%, 1/8w
R203	31216-0272	RESISTOR, Fixed, Comp, 2.7K ±5%, 1/8w
R204	31216-0272	RESISTOR, Fixed, Comp, 2.7K ±5%, 1/8w
R205	31216-0471	RESISTOR, Fixed, Comp, 470 ±5%, 1/8w
R206	31216-0471	RESISTOR, Fixed, Comp, 470 ±5%, 1/8w
R207	31216-0471	RESISTOR, Fixed, Comp, 470 ±5%, 1/8w
R208	31216-0471	RESISTOR, Fixed, Comp, 470 ±5%, 1/8w
R209	31216-0101	RESISTOR, Fixed, Comp, 100 ±5%, 1/8w
R210	32054-0002	RESISTOR, Variable, 470 ±20%

ELECTRICAL PARTS LIST

SYMBOL NO.	PART NUMBER	DESCRIPTION
R211	31216-0333	RESISTOR, Fixed, Comp, 33K ±5%, 1/8w
R212	31216-0392	RESISTOR, Fixed, Comp, 3.9K ±5%, 1/8w
R213	31216-0103	RESISTOR, Fixed, Comp, 10K ±5%, 1/8w
R214	31216-0332	RESISTOR, Fixed, Comp, 3.3K ±5%, 1/8w
R216	31216-0472	RESISTOR, Fixed, Comp, 4.7K ±5%, 1/8w
R217	32054-0021	RESISTOR, Variable, 22K ±20%
R218	32054-0007	RESISTOR, Variable, 10K ±20%
R220	31192-0391	RESISTOR, Fixed, Comp, 390 ±10%, 1/4w
R221	31192-0391	RESISTOR, Fixed, Comp, 390 ±10%, 1/4w
R222	31192-0391	RESISTOR, Fixed, Comp, 390 ±10%, 1/4w
R223	31192-0391	RESISTOR, Fixed, Comp, 390 ±10%, 1/4w
R224	31192-0391	RESISTOR, Fixed, Comp, 390 ±10%, 1/4w
R225	31192-0391	RESISTOR, Fixed, Comp, 390 ±10%, 1/4w
R226	31192-0391	RESISTOR, Fixed, Comp, 390 ±10%, 1/4w
R227	31192-0391	RESISTOR, Fixed, Comp, 390 ±10%, 1/4w
R228	31216-0103	RESISTOR, Fixed, Comp, 10K ±5%, 1/8w
R229	31215-0105	RESISTOR, Fixed, Comp, 1M ±10%, 1/8w
R230	31216-0151	RESISTOR, Fixed, Comp, 150 ±5%, 1/8w
R231	31216-0471	RESISTOR, Fixed, Comp, 470 ±5%, 1/8w
R232	31216-0474	RESISTOR, Fixed, Comp, 470K ±5%, 1/8w
R233	31216-0471	RESISTOR, Fixed, Comp, 470 ±5%, 1/8w
R234	31216-0102	RESISTOR, Fixed, Comp, 1K ±5%, 1/8w
R235	31216-0333	RESISTOR, Fixed, Comp, 33K ±5%, 1/8w
R236	31161-0017	RESISTOR, Fixed, Wire Wound, 220 ±5%, 3w
R237	31216-0471	RESISTOR, Fixed, Comp, 470 ±5%, 1/8w
R238	31216-0471	RESISTOR, Fixed, Comp, 470 ±5%, 1/8w
R239	31216-0100	RESISTOR, Fixed, Comp, 10 ±5%, 1/8w
S1	61574-0003	SWITCH, Slide, Push Button
S2	Part of S1	
S3	61574-0002	SWITCH, Slide, Push Button
S4	61574-0001	SWITCH, Slide, Push Button
S5	61574-0001	SWITCH, Slide, Push Button



In the Parts List on Page 5-17, change the Part Number of U-103 to 74124-0002. Any orders for U-103 should use the new part number. The original part number for U-103 was never used in production units and will not work.

ELECTRICAL PARTS LIST

SYMBOL NO.	PART NUMBER	DESCRIPTION
S6	61574-0001	SWITCH, Slide, Push Button
S7	61574-0001	SWITCH, Slide, Push Button
S8	61574-0001	SWITCH, Slide, Push Button
S9	61575-0001	SWITCH, Toggle (See Figure 5.1, item - 17)
S10	61576-0001	SWITCH, Momentary (See Figure 5.1, item - 18)
T1	11796-0001	TRANSFORMER, Transistor Driver
T2	11745-0001	TRANSFORMER, Driver
T3	11848-0001	TRANSFORMER, Output
T101	11871-0001	TRANSFORMER, 10.7 MHz
T102	11871-0001	TRANSFORMER, 10.7 MHz
U101	74099-0001	I.C. General Purpose Amplifier Array (CA3088)
U102	74038-0001	I.C. Quad Operational Amplifier (MC3401)
U103	74081-0001	I.C. 0.5 Watt Audio Amplifier (MC1306P)
XT101	72044-0001	CRYSTAL, 64.3 MHz

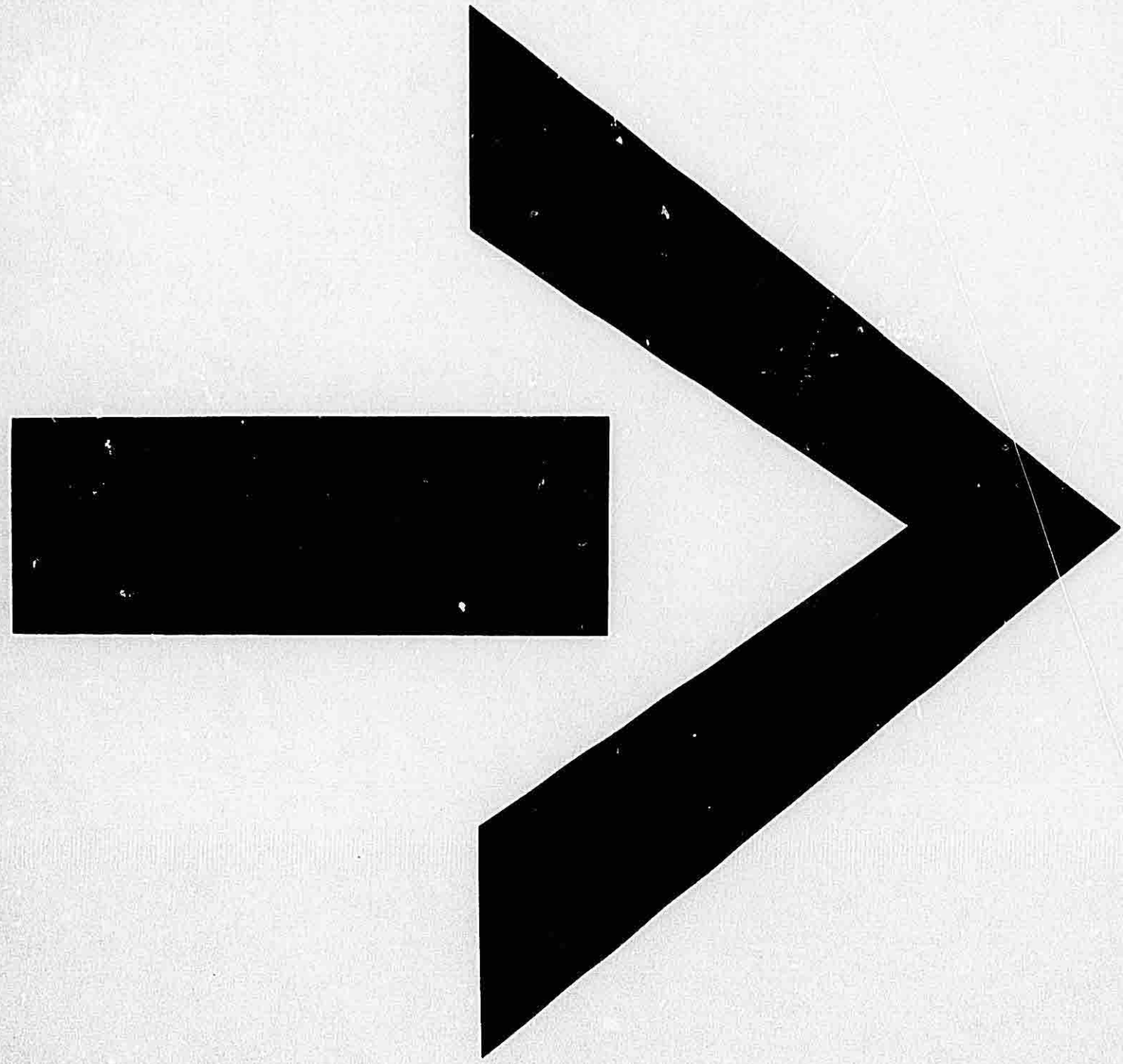
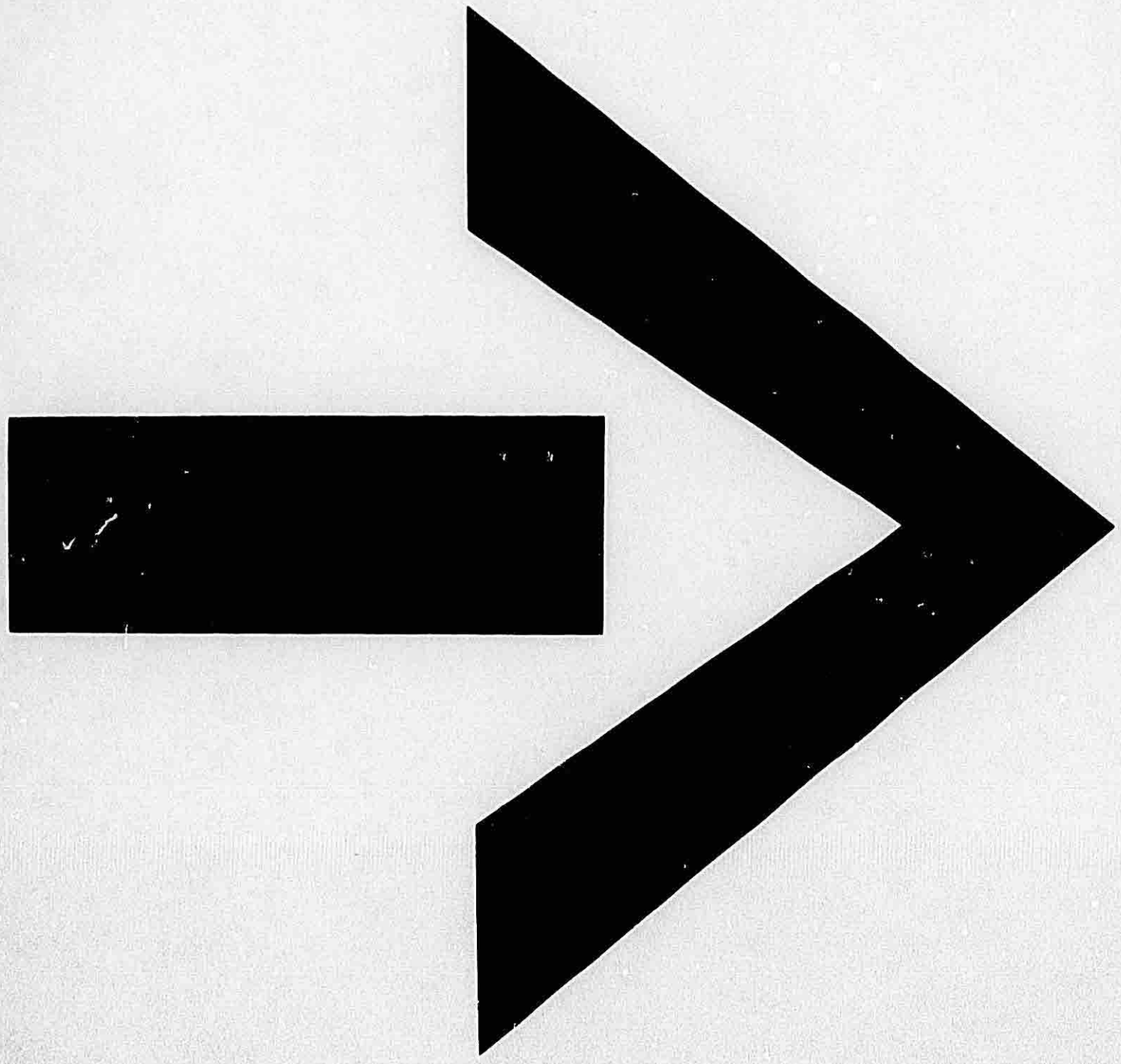


TABLE OF CONTENTS

SECTION NUMBER	TOPIC	PAGE NUMBER	ATP GRID
6.1	GENERAL	6-1	1L04
6.2	CHASSIS LEVEL CONFIGURATION	6-1	

LIST OF ILLUSTRATIONS

FIGURE NUMBER	TITLE	PAGE NUMBER	
6-1	CP 135/136 AUDIO PANEL	6-3	1L09
6-2	CP 135/136 MARKER RECEIVER	6-5	1M05



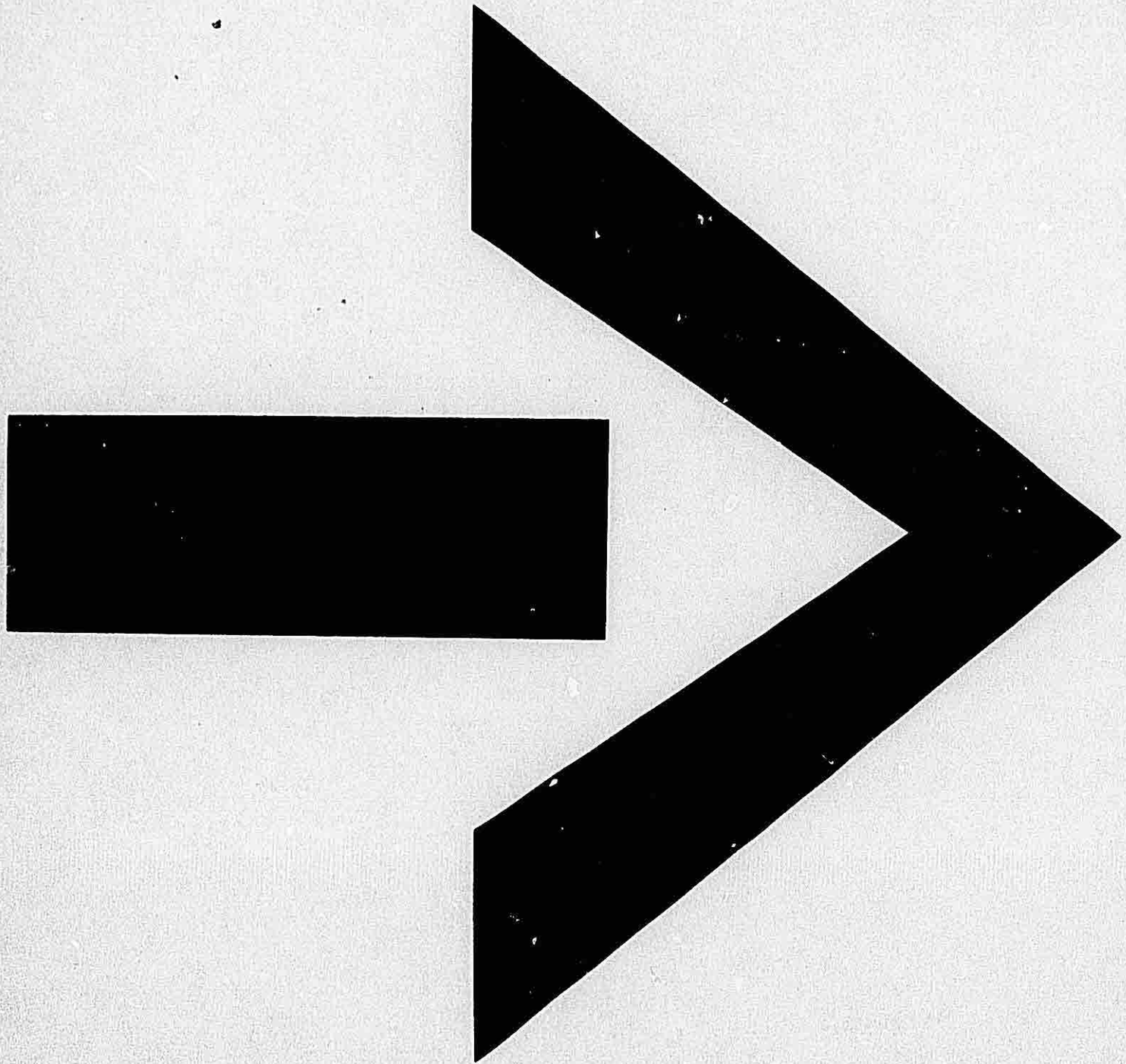
6.1 GENERAL

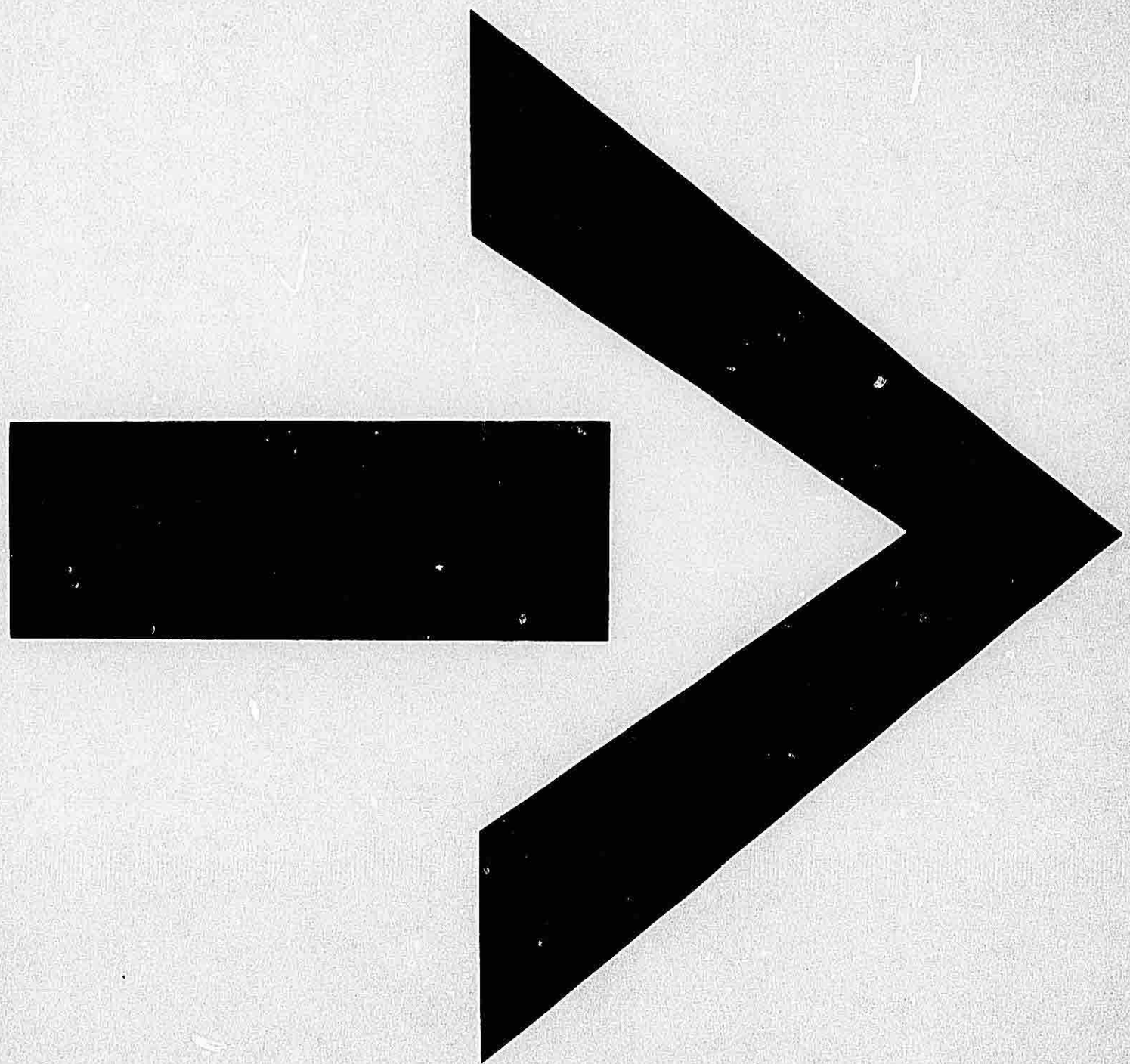
The CP 135/136 schematic section provides; the complete schematic, component drawing including the circuit runs.

6.2 CHASSIS LEVEL CONFIGURATION

As of this printing, Chassis Level Codes have not been assigned.

For replacement parts please note the chassis code letter of the unit (found stamped on the chassis) along with your order.





SERVICE

NARCO AVIONICS DIVISION OF NARCO SCIENTIFIC INDUSTRIES, Fort Washington, Pa. 19034

NARCO SERVICE BULLETIN CP-135/136 NO. 5 MAY 5, 1978

TO: ALL NARCO AVIONICS CENTERS
ALL NARCO WHOLESALE DISTRIBUTORS

SUBJECT: MANUAL CORRECTIONS AND ADDITONAL DRAWING AND SCHEMATICS (AUDIO PANEL) (APPLICABLE IMMEDIATELY)

Included with this bulletin is an updated component assembly (Page 6-3A), and two updated schematics (Page 6-3B, and Page 6-3C).

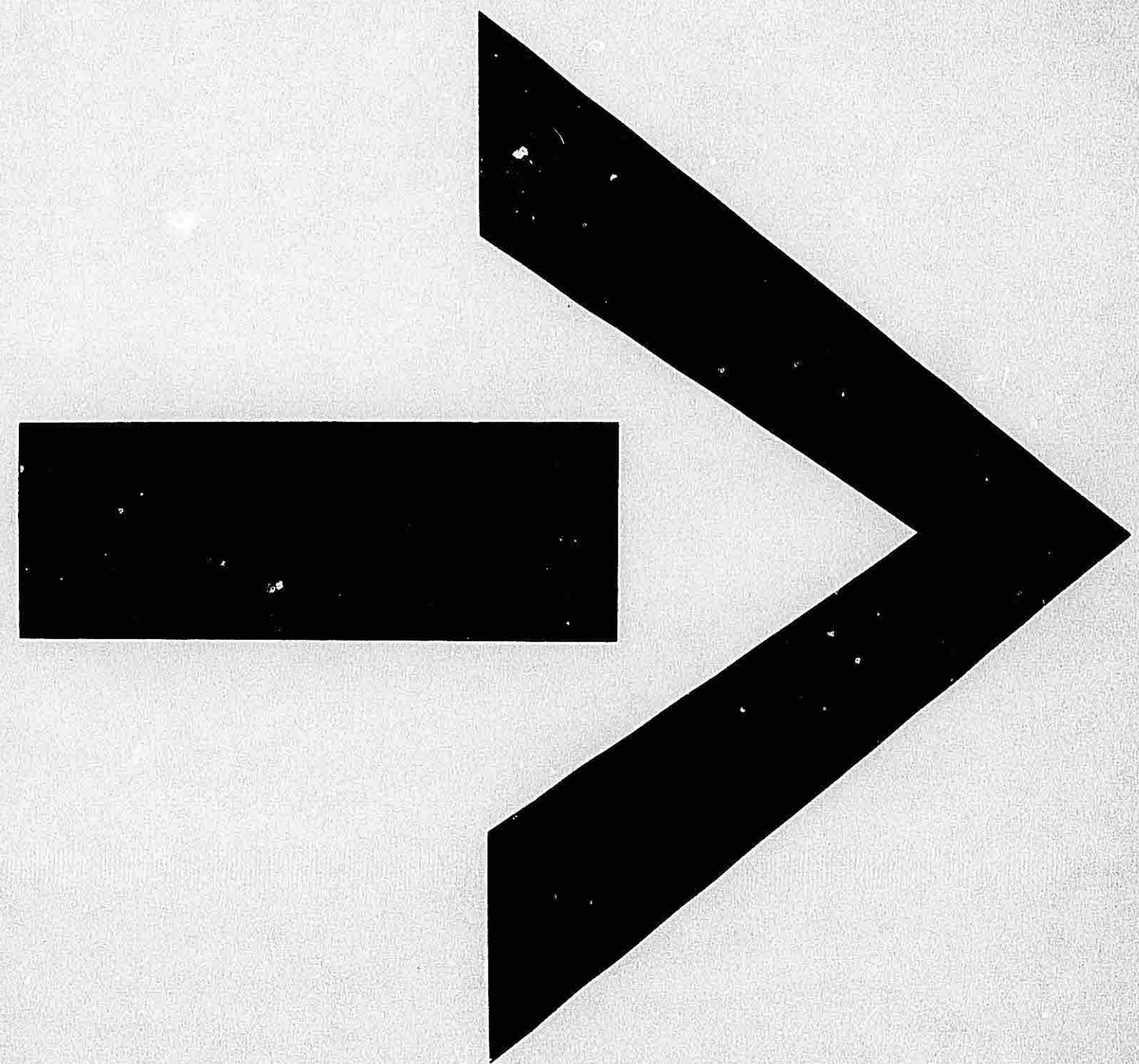
Please add these new pages to the appropriate place in your manual. The last paragraph of this bulletin provides information on a very important change in part number.

On the existing Page 6-3 in your manual, make the following corrections and additions to the text for the illustrated circuit modification as viewed from the non-component side of the board:

* The first resistor (4.7K) is called R-240.
* The second resistor is a 150K and is called R-216.
* The capacitor (.01) is called C-209.

This circuit modification (with the track cut and the jumpers and components added) is done on all the units shipped up until the present time. Recently, the PC Board was redesigned to put R-216, R-240, and C-209 on the component side and eliminate the circuit modification. The redesigned board will be used in the future, and is shown on your new Page 6-3A.

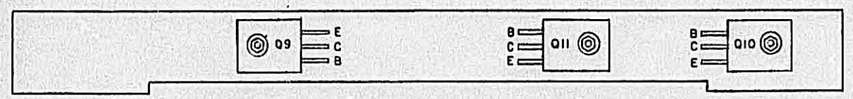
(over)

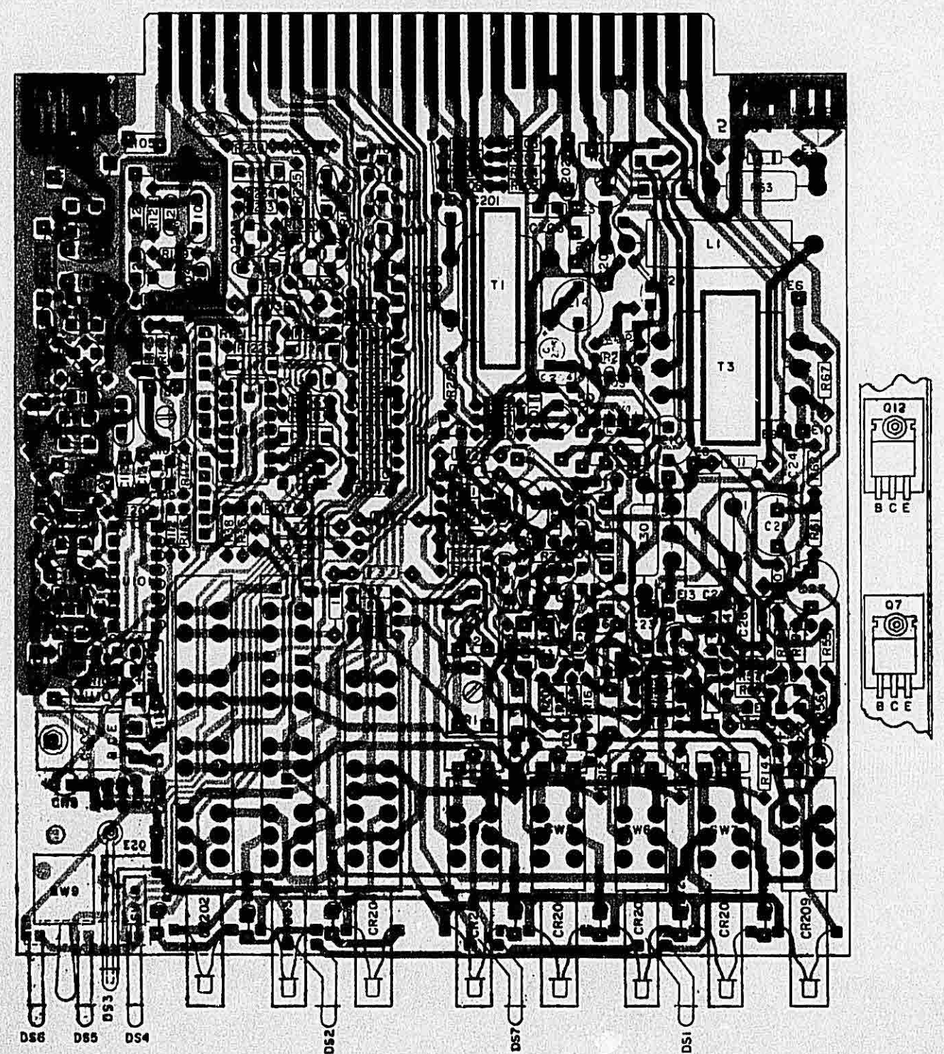


NARCO AVIONICS CP 135 and CP 136

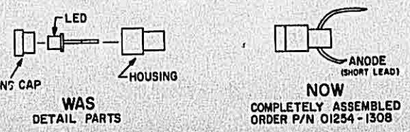
Solder runs shown in GREY
are those on the "BOTTOM" (non-component)
side of the board.

Solder runs shown in PINK
are those on the "TOP" (component)
side of the board.





FRONT PANEL PUSHBUTTONS



WAS
DETAIL PARTS

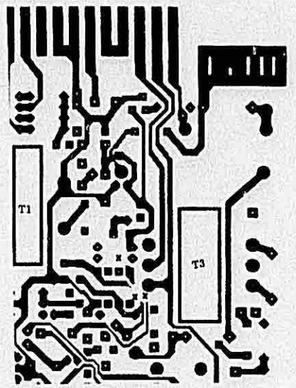
NOW
COMPLETELY ASSEMBLED
ORDER P/N 01254-1308

NOTES —
1. ▭ = DIODE . CR OMITTED FOR CLARITY
BAR INDICATES CATHODE END.

11/77

ORIGINAL AS RECEIVED BY ATP

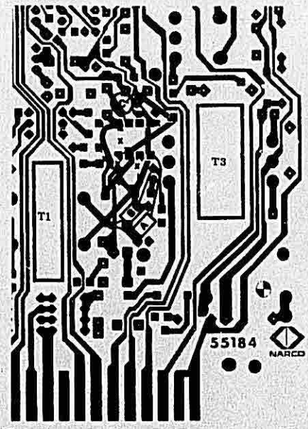
Circuit Modification as viewed from COMPONENT side of board.



X = 3 CUTS
ADDED: 3 JUMPERS

Dwg No. TP00781

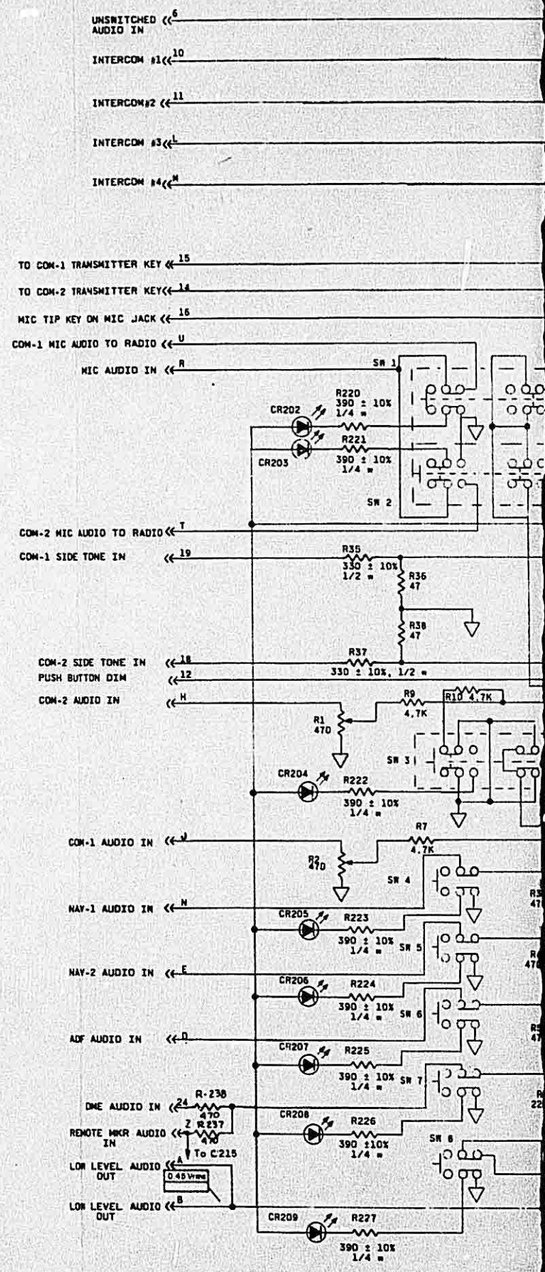
Circuit Modification as viewed from NON-COMPONENT side of board.



X = TRACK CUT (6 PLACES)
ADDED: 6 JUMPERS AND
3 COMPONENTS.
(A) RESISTOR 4.7 K, 1/8 W
(B) RESISTOR 150, 1/8 W
(C) CAPACITOR .01

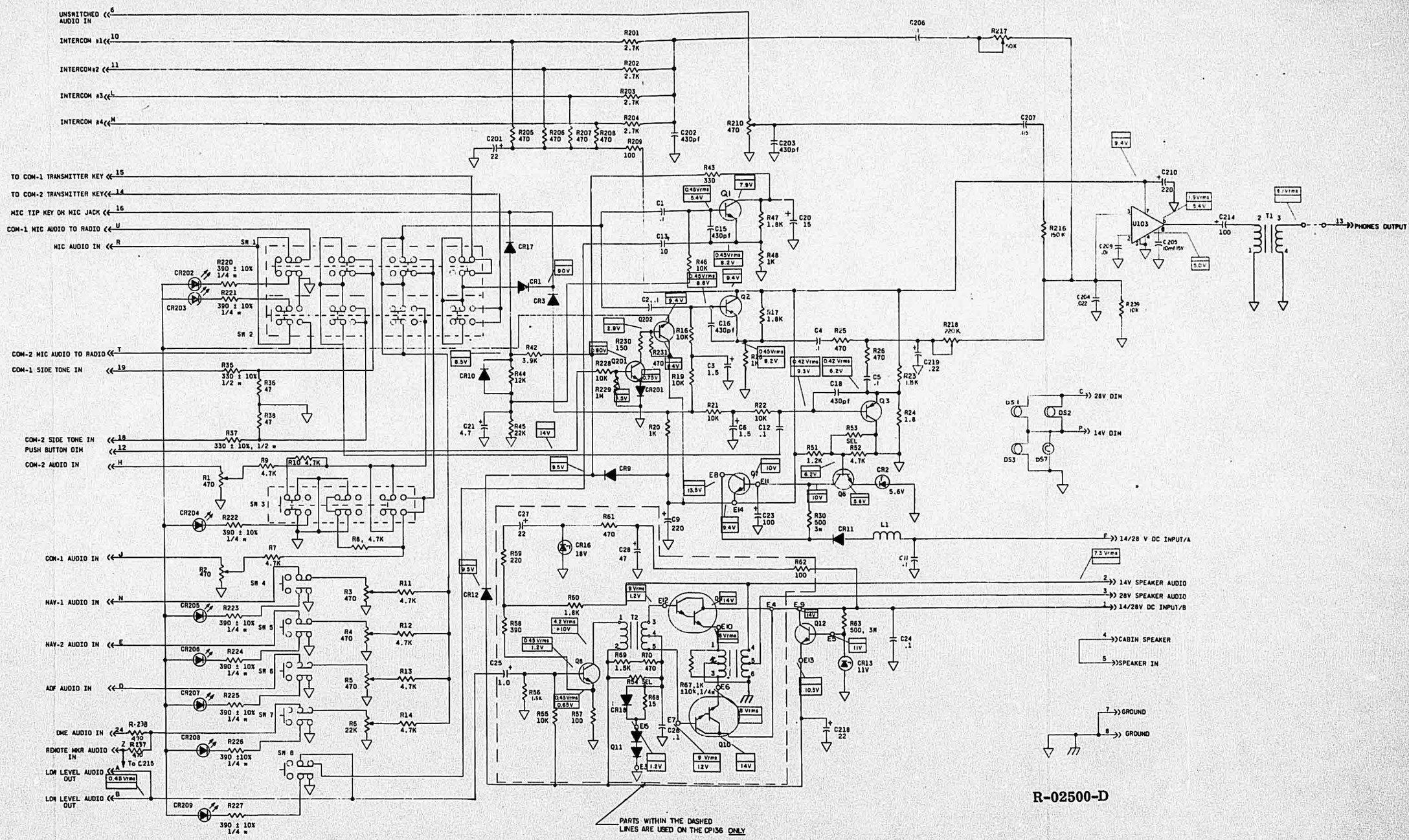
Dwg No. TP00780

C-55183-E
R-95196-B and details of modified circuit.



SEE BLOW-UP FICHE NO. NCM702 ITEM-M

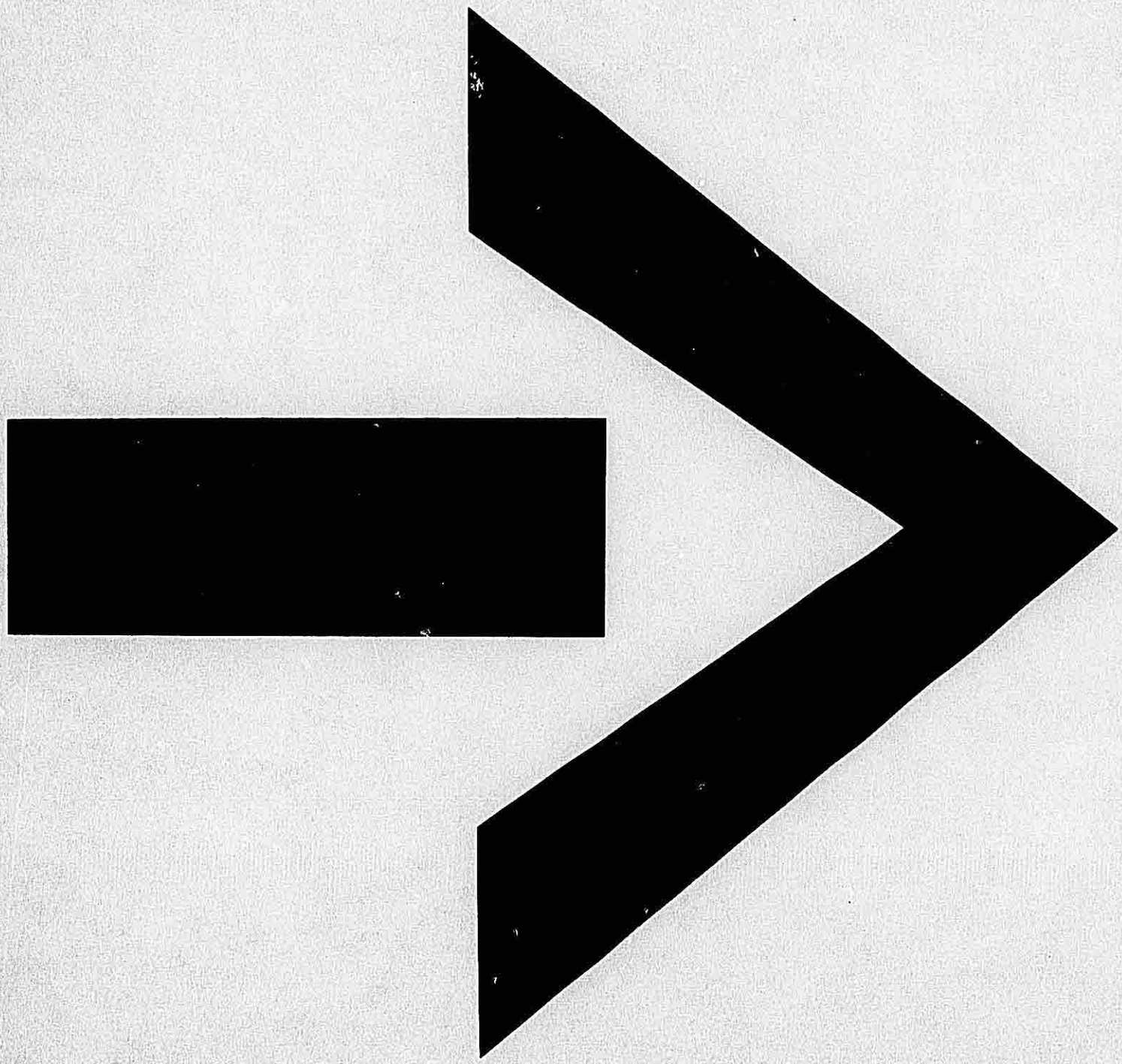
SEE BLOW

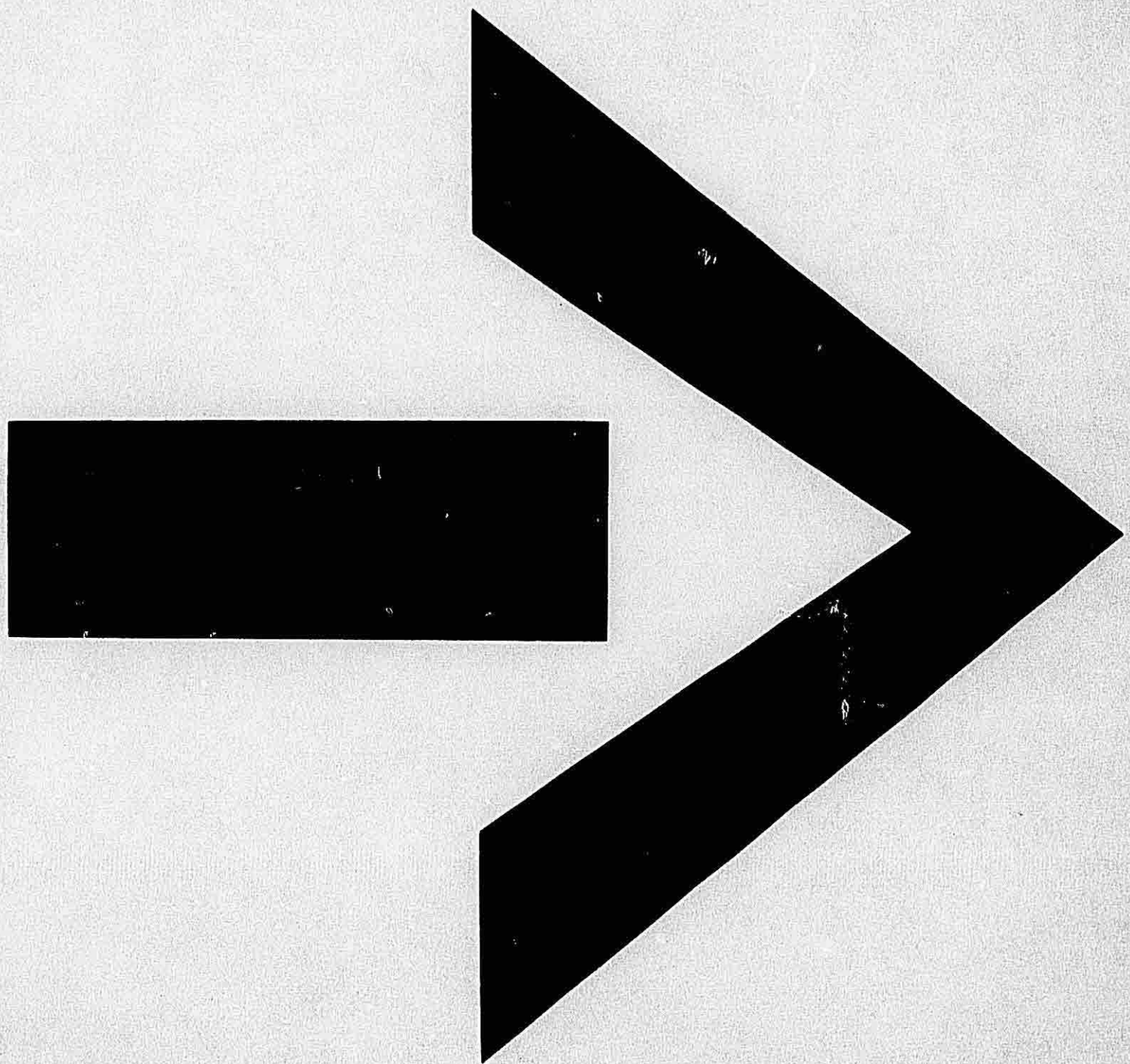


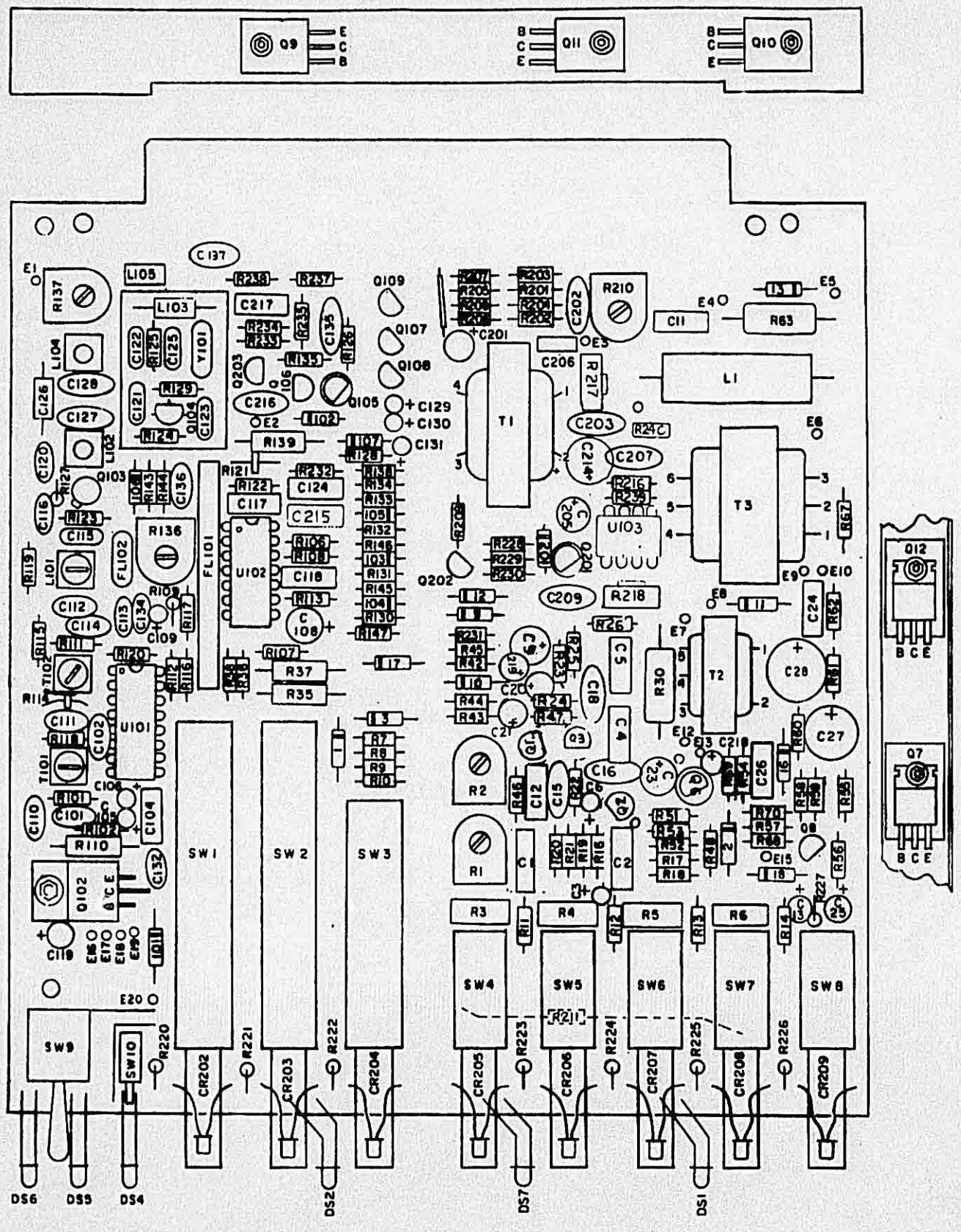
R-02500-D

FIGURE 6-1. CP 135/136 AUDIO PANEL (Chassis Code AA)

SEE BLOW-UP FICHE NO. NCM702 ITEM-M



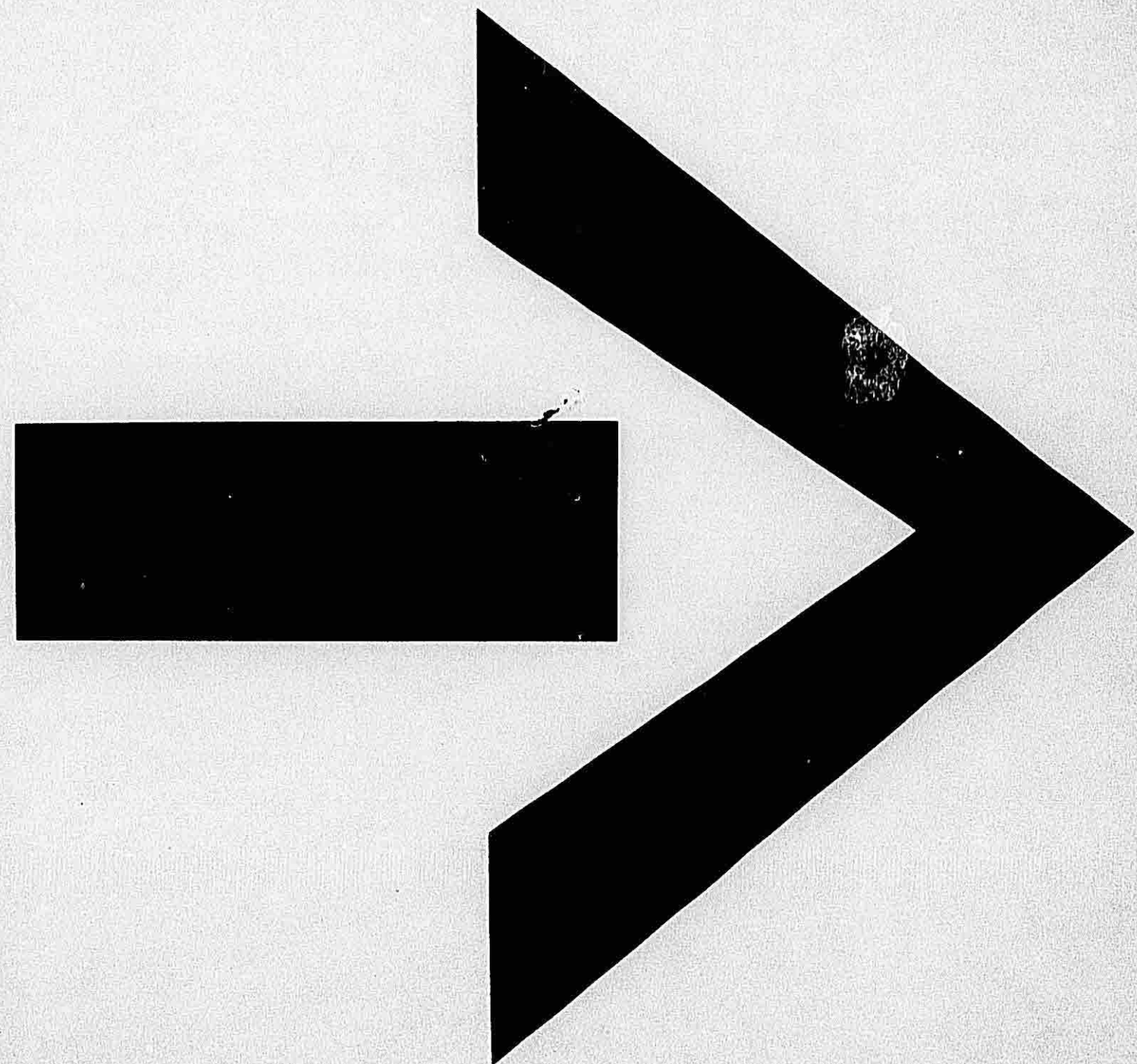


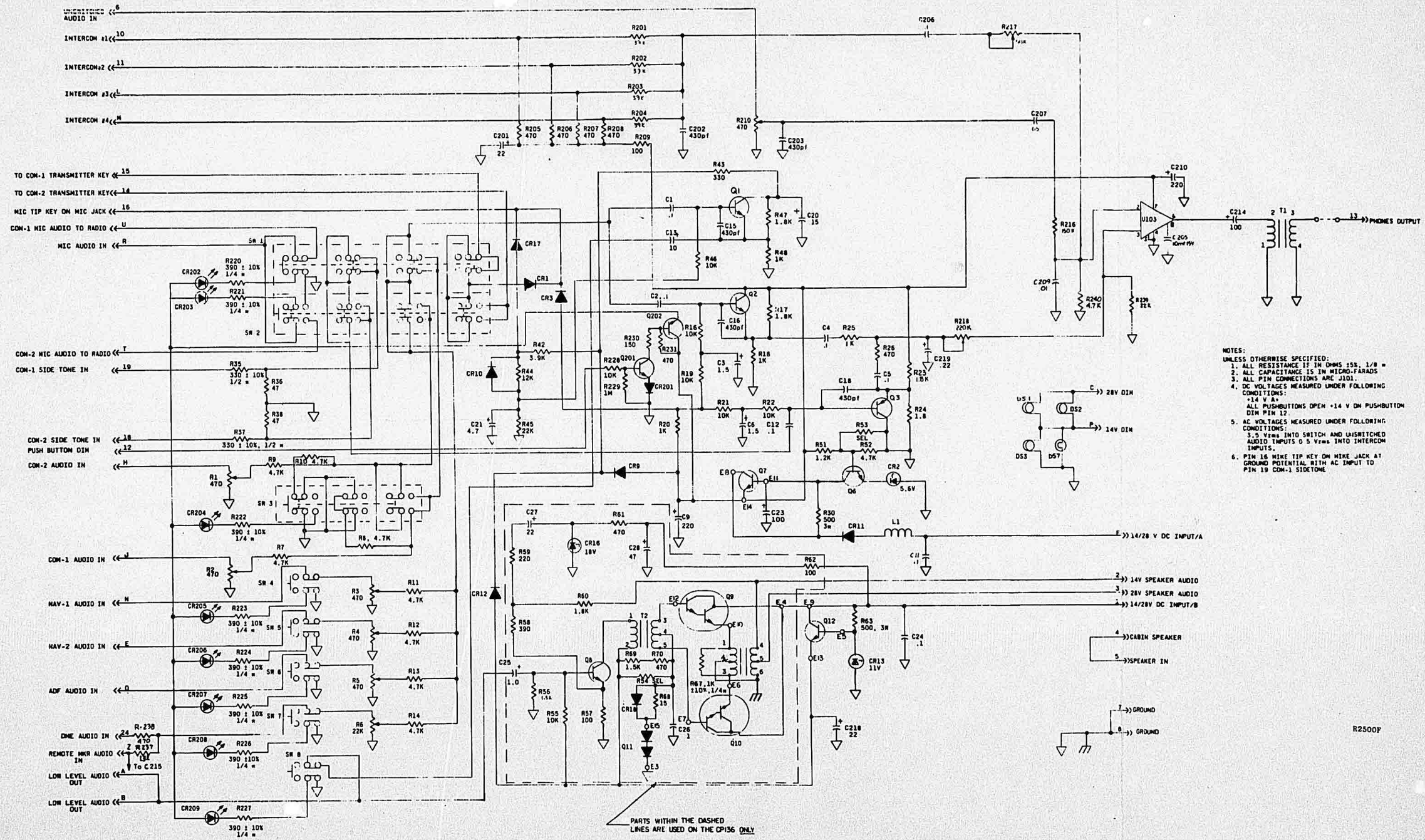


NOTES —
1. ▭ = DIODE. CR OMITTED FOR CLARITY. BAR INDICATES CATHODE END.
2. COMPONENT NO'S FOR CP135 CORRESPOND TO P/L B-01254, 101 & 102.
3. COMPONENT NOS FOR CP136 CORRESPOND TO P/L B-01254, 103 & 104.

C55183L

6-3A FIGURE 6-1A. CP 135/136 COMPONENT ASSEMBLY (CHASSIS CODE AB)

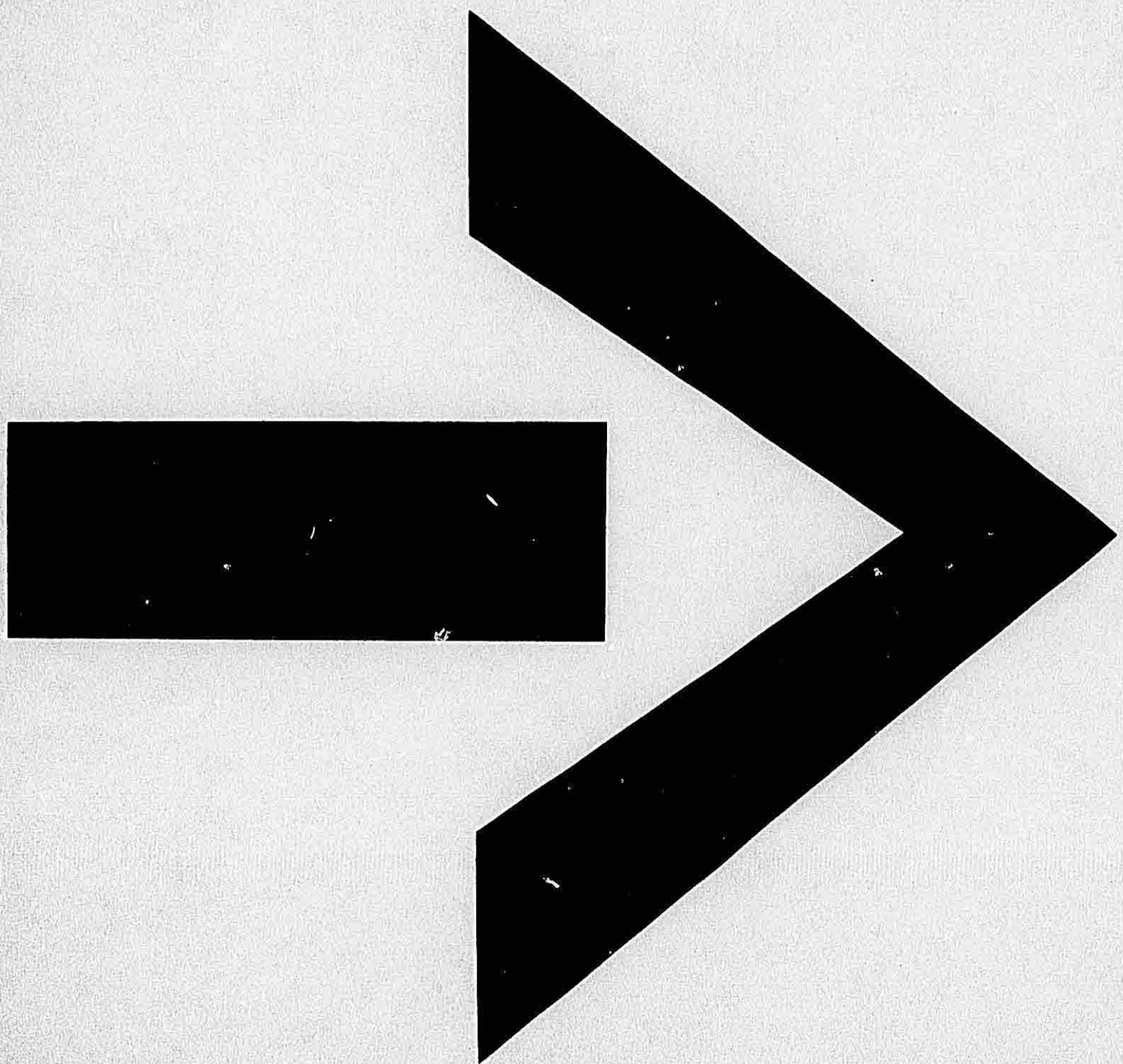


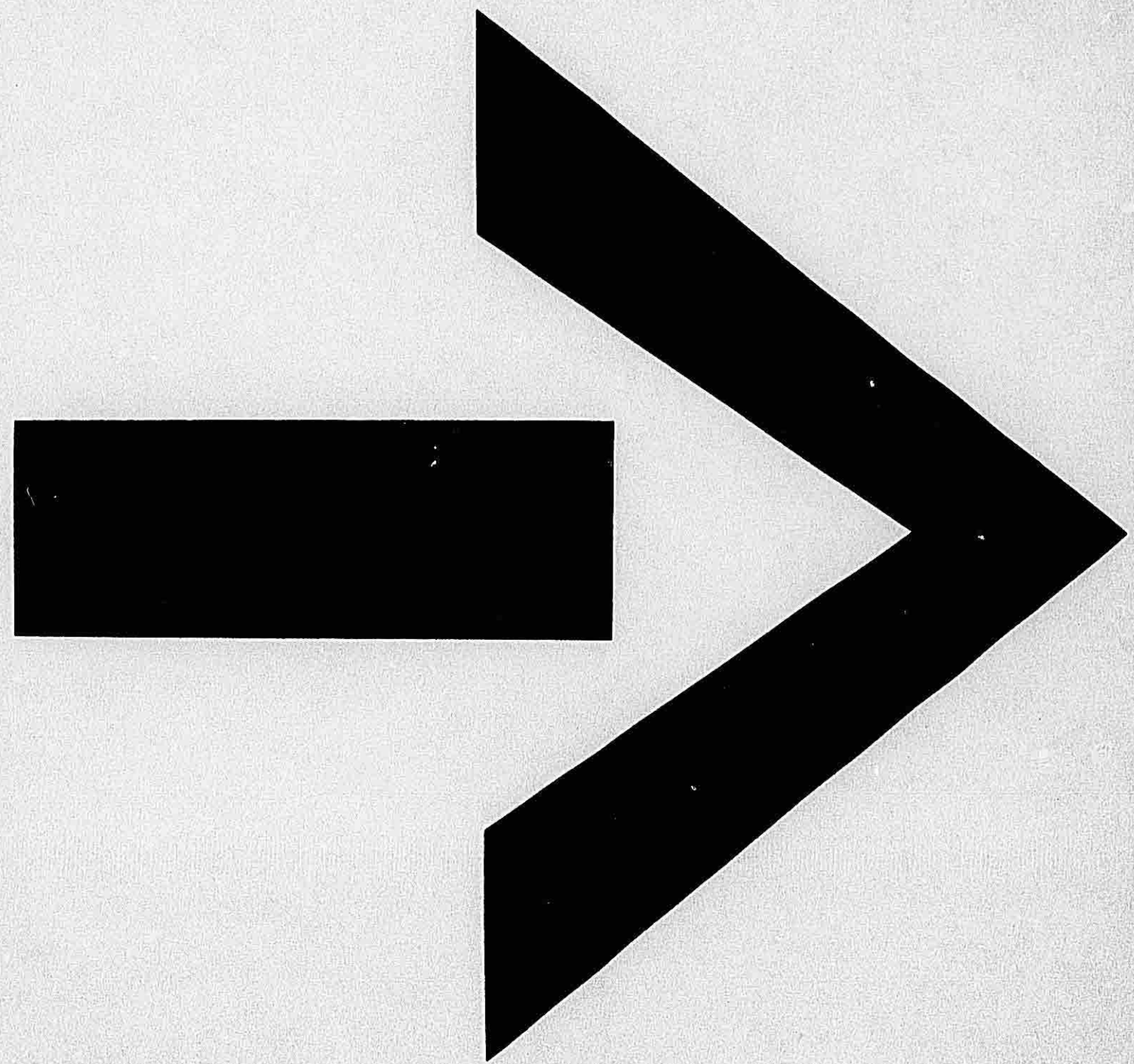


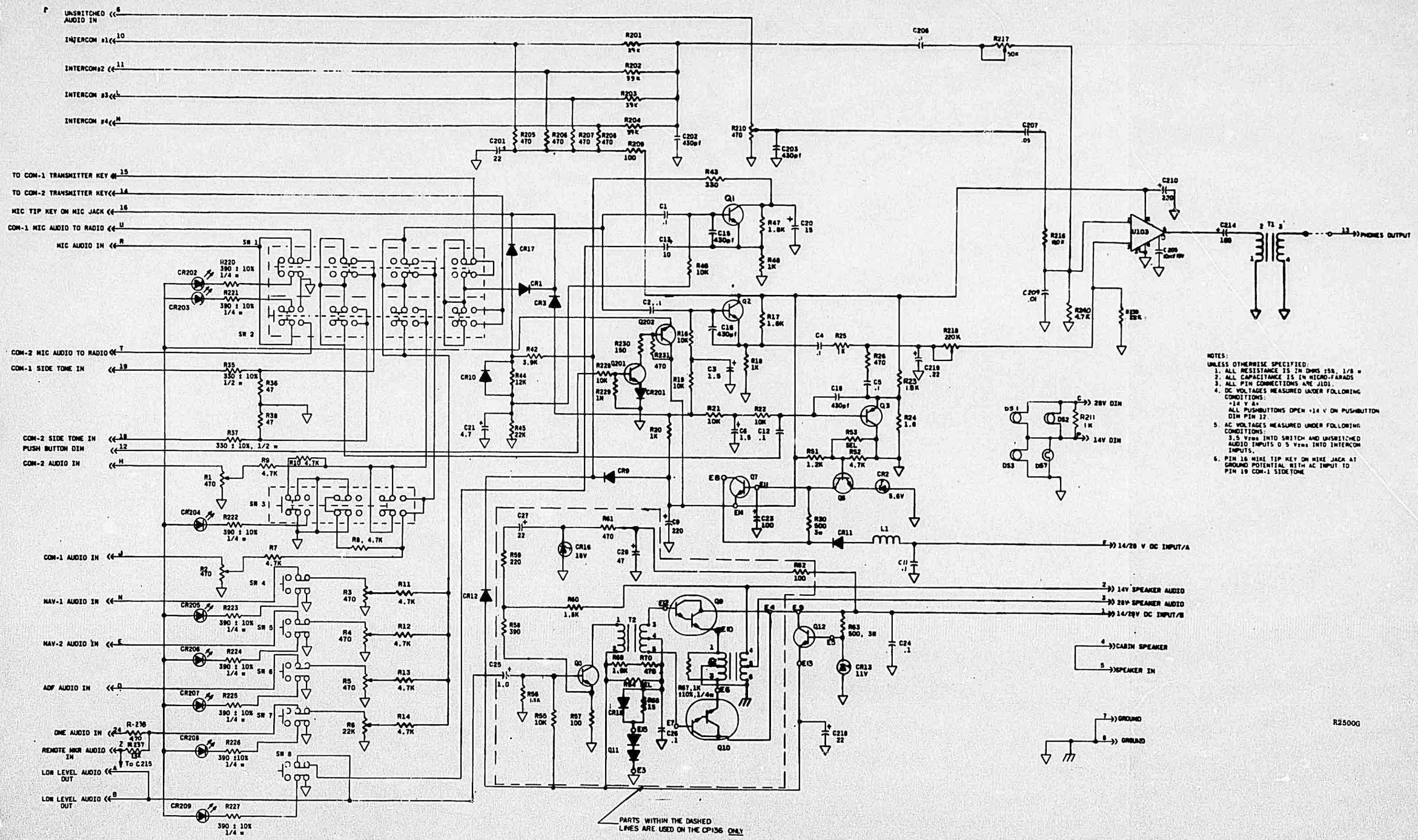
NOTES:
UNLESS OTHERWISE SPECIFIED:
1. ALL RESISTANCE IS IN OHMS ±5%, 1/8 w
2. ALL CAPACITANCE IS IN MICRO-FARADS
3. ALL PIN CONNECTIONS ARE J101.
4. DC VOLTAGES MEASURED UNDER FOLLOWING CONDITIONS:
   +14 V A+
   ALL PUSHBUTTONS OPEN +14 V ON PUSHBUTTON DIM PIN 12.
5. AC VOLTAGES MEASURED UNDER FOLLOWING CONDITIONS:
   3.5 Vrms INTO SWITCH AND UNSWITCHED AUDIO INPUTS 0.5 Vrms INTO INTERCOM INPUTS.
6. PIN 16 MIKE TIP KEY ON MIKE JACK AT GROUND POTENTIAL WITH AC INPUT TO PIN 19 COM-1 SIDETONE

FIGURE 6-1B. CP 135/136 AUDIO PANEL (CHASSIS CODE AA)

SEE BLOW-UP FICHE NO. NCM702 ITEM-R



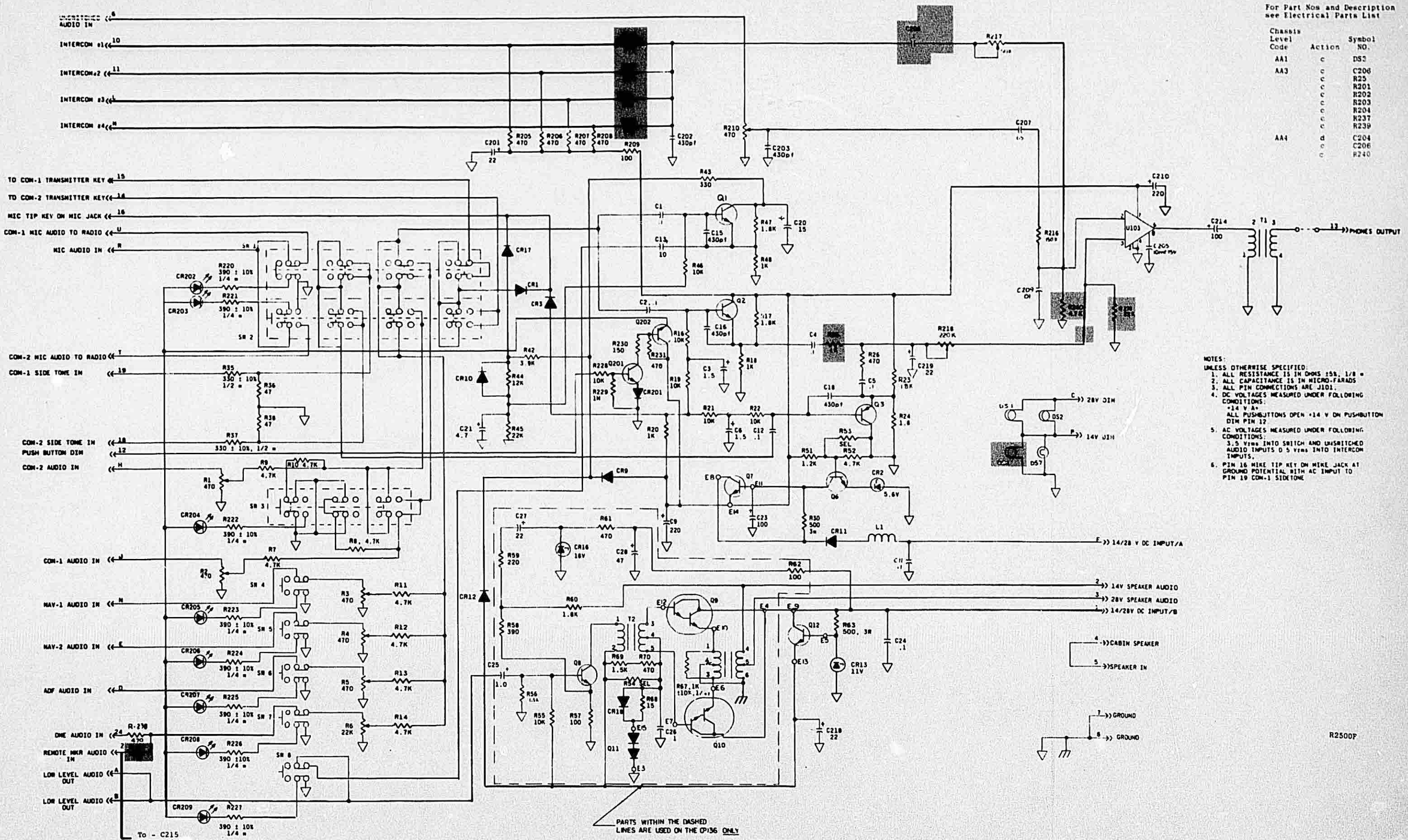




NOTES:
UNLESS OTHERWISE SPECIFIED:
1. ALL RESISTANCE IS IN OHMS ±5%, 1/8 w
2. ALL CAPACITANCE IS IN MICRO-FARADS
3. ALL PIN CONNECTIONS ARE J101.
4. DC VOLTAGES MEASURED UNDER FOLLOWING CONDITIONS:
   +14 V &+
   ALL PUSHBUTTONS OPEN +14 V ON PUSHBUTTON DIM PIN 12.
5. AC VOLTAGES MEASURED UNDER FOLLOWING CONDITIONS:
   3.5 Vrms INTO SWITCH AND UNSWITCHED AUDIO INPUTS 0 5 Vrms INTO INTERCOM INPUTS,
6. PIN 16 MIKE TIP KEY ON MIKE JACK AT GROUND POTENTIAL WITH AC INPUT TO PIN 19 COM-1 SIDETONE

FIGURE 6-1C. CP 135/136 AUDIO PANEL (CHASSIS CODE AB)

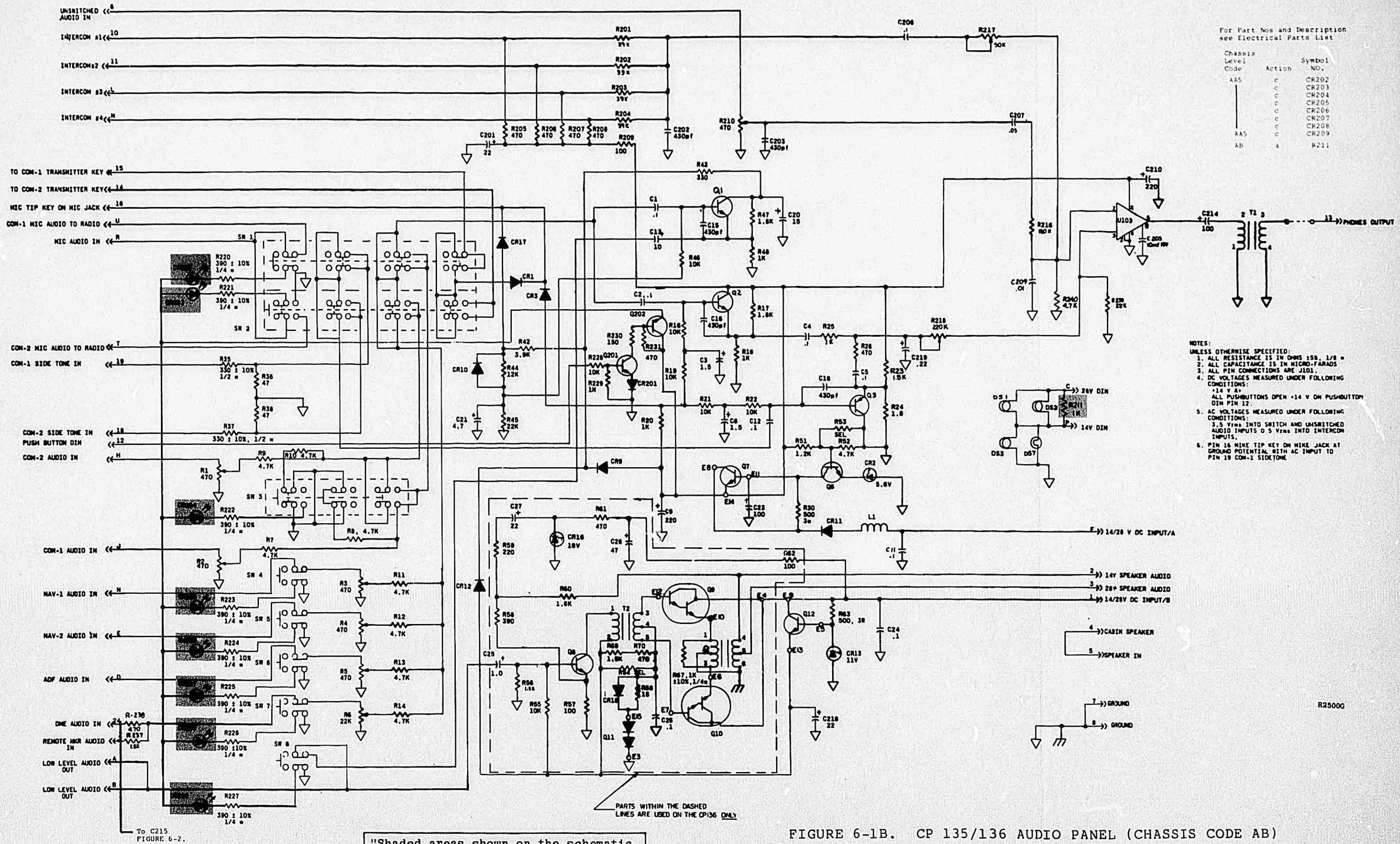
SEE BLOW-UP FICHE NO. NCM702 ITEM-U



"Shaded areas shown on the schematic indicate those points where a change, addition, deletion, or type substitution took place."

FIGURE 6-1A. CP 135/136 AUDIO PANEL (CHASSIS CODE AA)

SEE BLOW-UP FICHE NO. NCM702 ITEM-V



For Part Nos and Description see Electrical Parts List

Chassis Level Code	Action	Symbol NO.
AA5	c	CR202
	c	CR203
	c	CR204
	c	CR205
	c	CR206
	c	CR207
	c	CR208
AA5	c	CR209
AB	a	R211

NOTES:
UNLESS OTHERWISE SPECIFIED:
1. ALL RESISTANCE IS IN OHMS ±5%, 1/8 w
2. ALL CAPACITANCE IS IN MICRO-FARADS
3. ALL PIN CONNECTIONS ARE J101.
4. DC VOLTAGES MEASURED UNDER FOLLOWING CONDITIONS:
   +14 V A+
   ALL PUSHBUTTONS OPEN +14 V ON PUSHBUTTDM DIN PIN 12.
5. AC VOLTAGES MEASURED UNDER FOLLOWING CONDITIONS:
   3.5 Vrms INTO SWITCH AND UNSWITCHED AUDIO INPUTS 0 5 Vrms INTO INTERCOM INPUTS.
6. PIN 16 MIKE TIP KEY ON MIKE JACK AT GROUND POTENTIAL WITH AC INPUT TO PIN 19 CON-1 SIDETONE

FIGURE 6-1B. CP 135/136 AUDIO PANEL (CHASSIS CODE AB)

"Shaded areas shown on the schematic indicate those points where a change, addition, deletion, or type substitution took place."

SEE BLOW-UP FICHE NO. NCM702 ITEM-S

NOTES:
UNLESS OTHERWISE SPECIFIED
1. ALL RESISTANCE IS IN OHMS ±5%, 1/8W
2. ALL CAPACITANCE IS IN MICROFARADS
3. ALL PIN CONNECTIONS ARE J101.
4. DC VOLTAGES MEASURED UNDER FOLLOWING CONDITIONS:
+14 V dc INPUT
ALL PUSHBUTTONS OPEN, +14 V ON PUSHBUTTON DIM PIN 12
5. AC VOLTAGES MEASURED UNDER FOLLOWING CONDITIONS
3.5 Vrms INTO SWITCH AND UNSWITCHED AUDIO INPUTS; 0.5 Vrms INTO INTERCOM INPUTS
6. PIN 16 MIKE TIP KEY ON MIKE JACK AT GROUND POTENTIAL WITH AC INPUT TO PIN 19 COM-1 SIDETONE.

For Part Nos and Description see Electrical Parts List

Chassis Level Code	Action	Symbol NO.
AD2	d	R211
BC1	c	R237
BC1	c	R238
BC4	c	Q11

"Shaded areas shown on the schematic indicate those points where a change, addition, deletion, or type substitution took place."

R02500J

PARTS WITHIN THE DASHED LINES ARE USED ON THE CP136 ONLY

To- C216
Figure 6-2

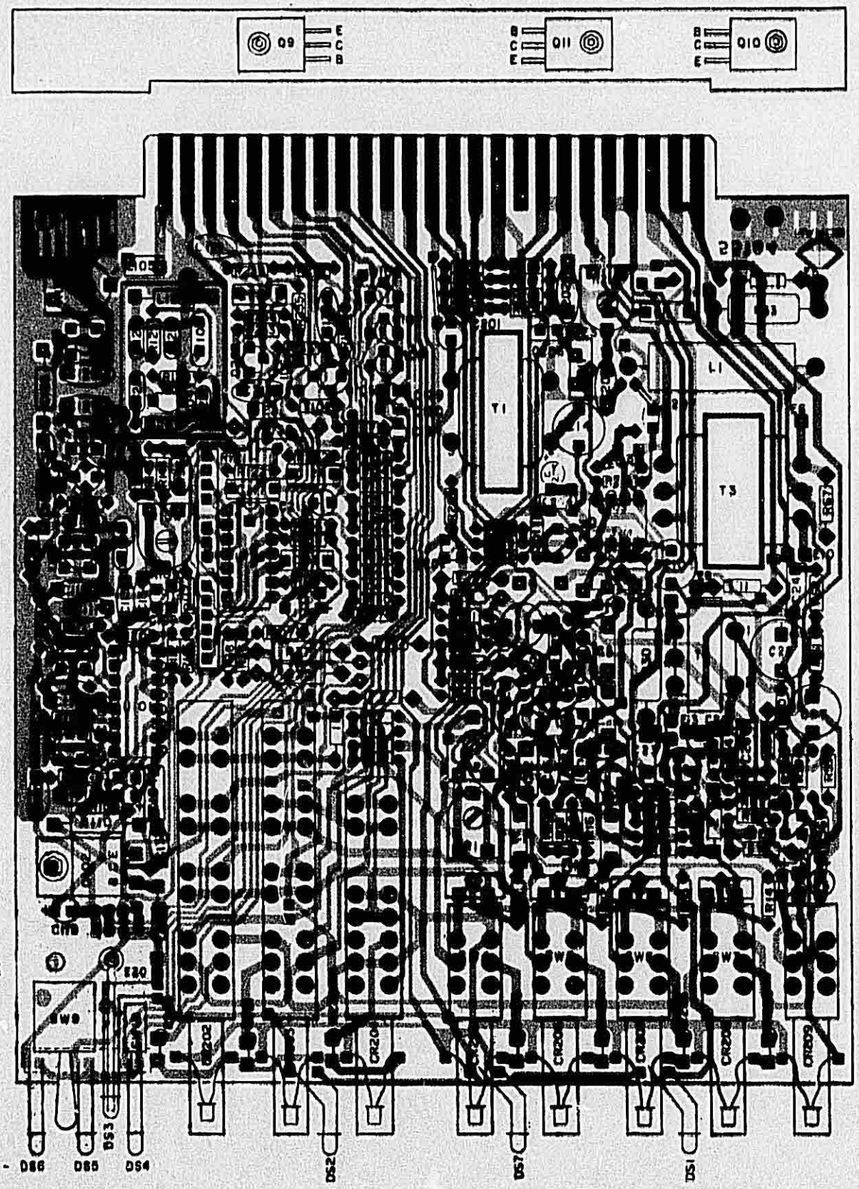
FIGURE 6-1C. CP 135/136 AUDIO PANEL (CHASSIS CODE AB)

SEE BLOW-UP FICHE NO. NCM702 ITEM-T

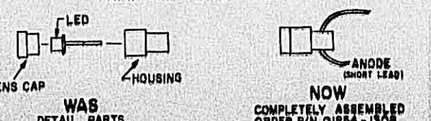
NARCO AVIONICS CP 135 and CP 136

Solder runs shown in GREY
are those on the "BOTTOM" (non-component)
side of the board.

Solder runs shown in PINK
are those on the "TOP" (component)
side of the board.



NOTES—
1. ▭ = DIODE. CR OMITTED FOR CLARITY
BAR INDICATES CATHODE END.



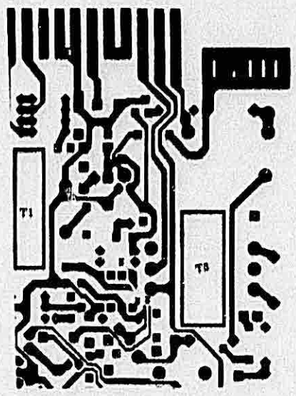
WAS
DETAIL PARTS

NOW
COMPLETELY ASSEMBLED
ORDER P/N 01254-1308

11/77

ORIGINAL AS
RECEIVED BY ATP

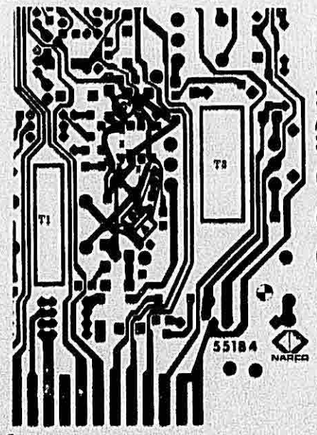
Circuit Modification as viewed from COMPONENT side of board.



X = 3 CUTS
ADDED: 3 JUMPERS

Dwg No. TP00781

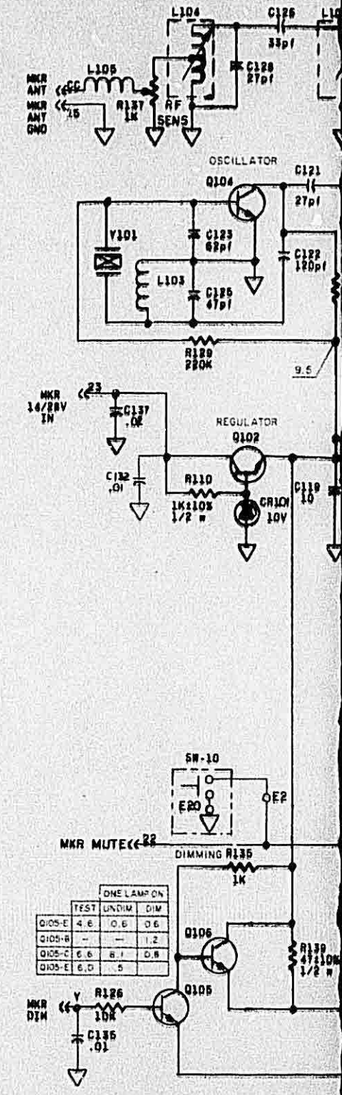
Circuit Modification as viewed from NON-COMPONENT side of board.



X = TRACK CUT (6 PLACES)
ADDED: 6 JUMPERS AND
3 COMPONENTS.
(A) RESISTOR 4.7K, 1/8 W
(B) RESISTOR 150, 1/8 W
(C) CAPACITOR .01

Dwg No. TP00780

**C-55183-E
R-95196-B and details of modified circuit.**



SEE BLOW-UP FICHE

ENT

3 CUTS
DDED: 3 JUMPERS

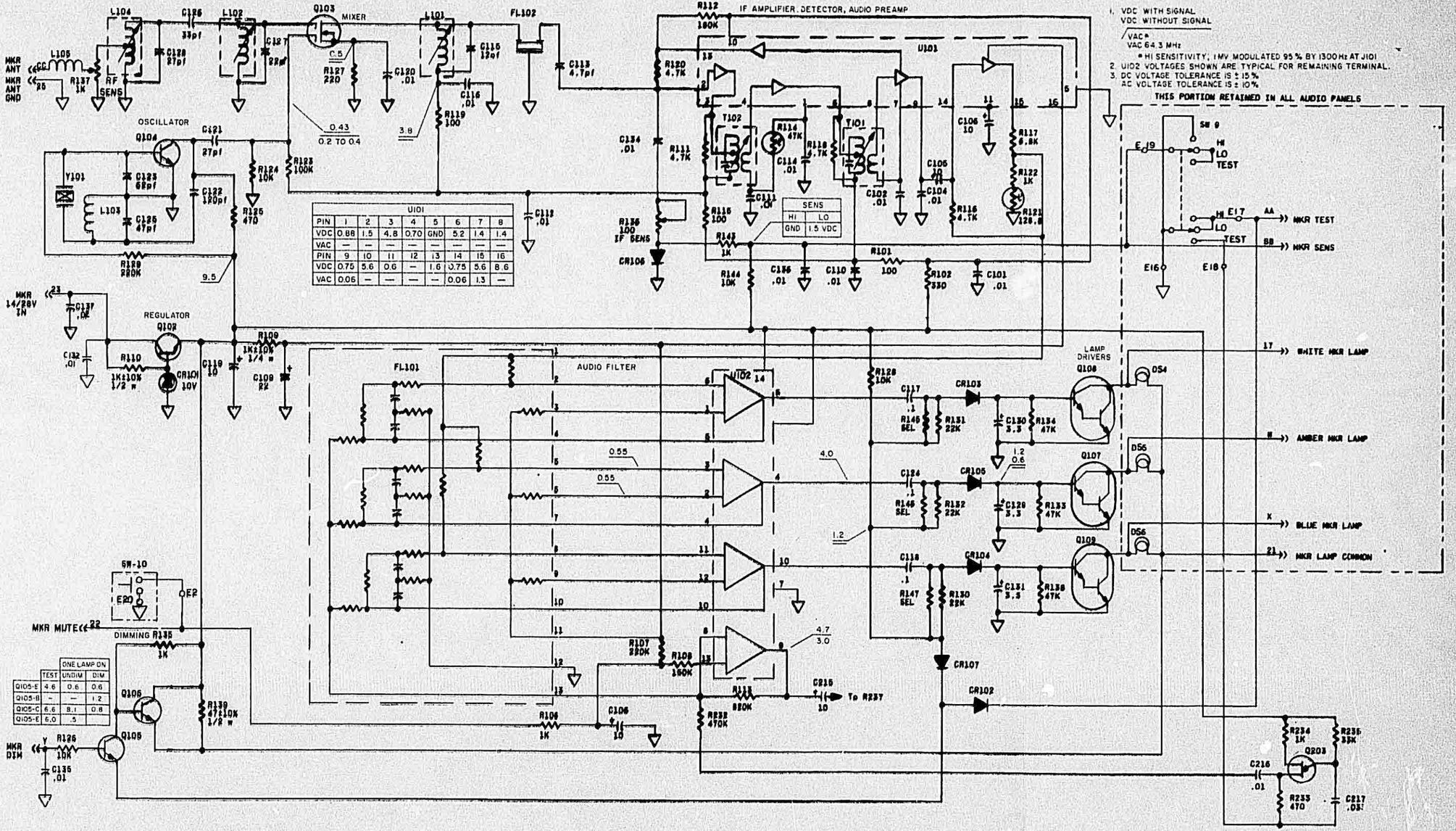
SS
OMPONENT

X = TRACK CUT (6 PLACES)
ADDED: 6 JUMPERS AND
5 COMPONENTS.

(A) RESISTOR 4.7K, 1/8 W

(B) RESISTOR 150, 1/8 W

(C) CAPACITOR .01



U101								
PIN	1	2	3	4	5	6	7	8
VDC	0.88	1.5	4.8	0.70	GND	5.2	1.4	1.4
VAC	—	—	—	—	—	—	—	—
PIN	9	10	11	12	13	14	15	16
VDC	0.75	5.6	0.6	—	1.6	0.75	5.6	8.6
VAC	0.06	—	—	—	—	0.06	1.3	—

SENS	
HI	LO
GND	1.5 VDC

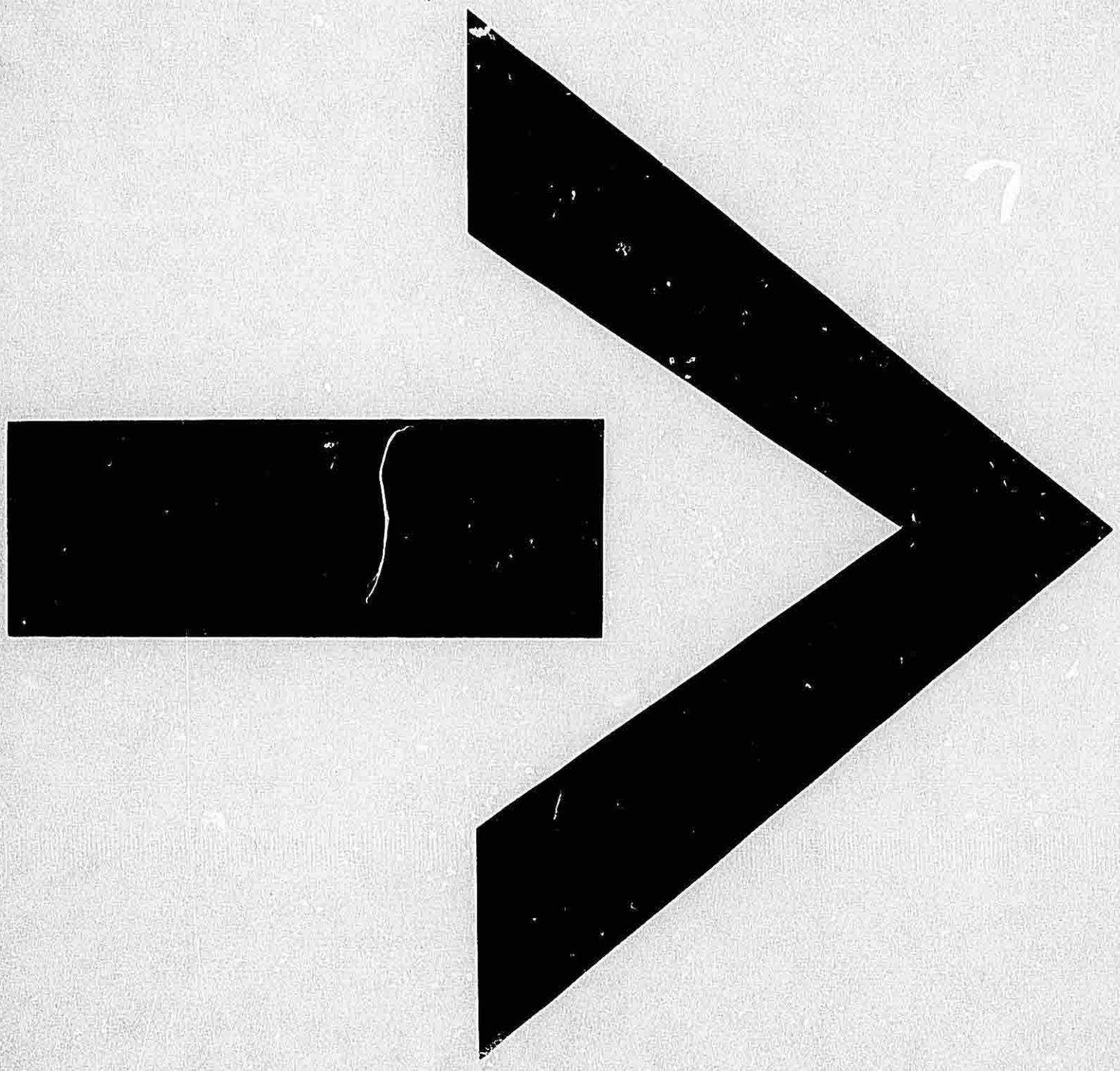
	ONE LAMP ON		
	TEST	UNDIM	DIM
Q105-E	4.6	0.6	0.6
Q105-B	—	—	1.2
Q105-C	6.6	8.1	0.8
Q105-E	6.0	.5	

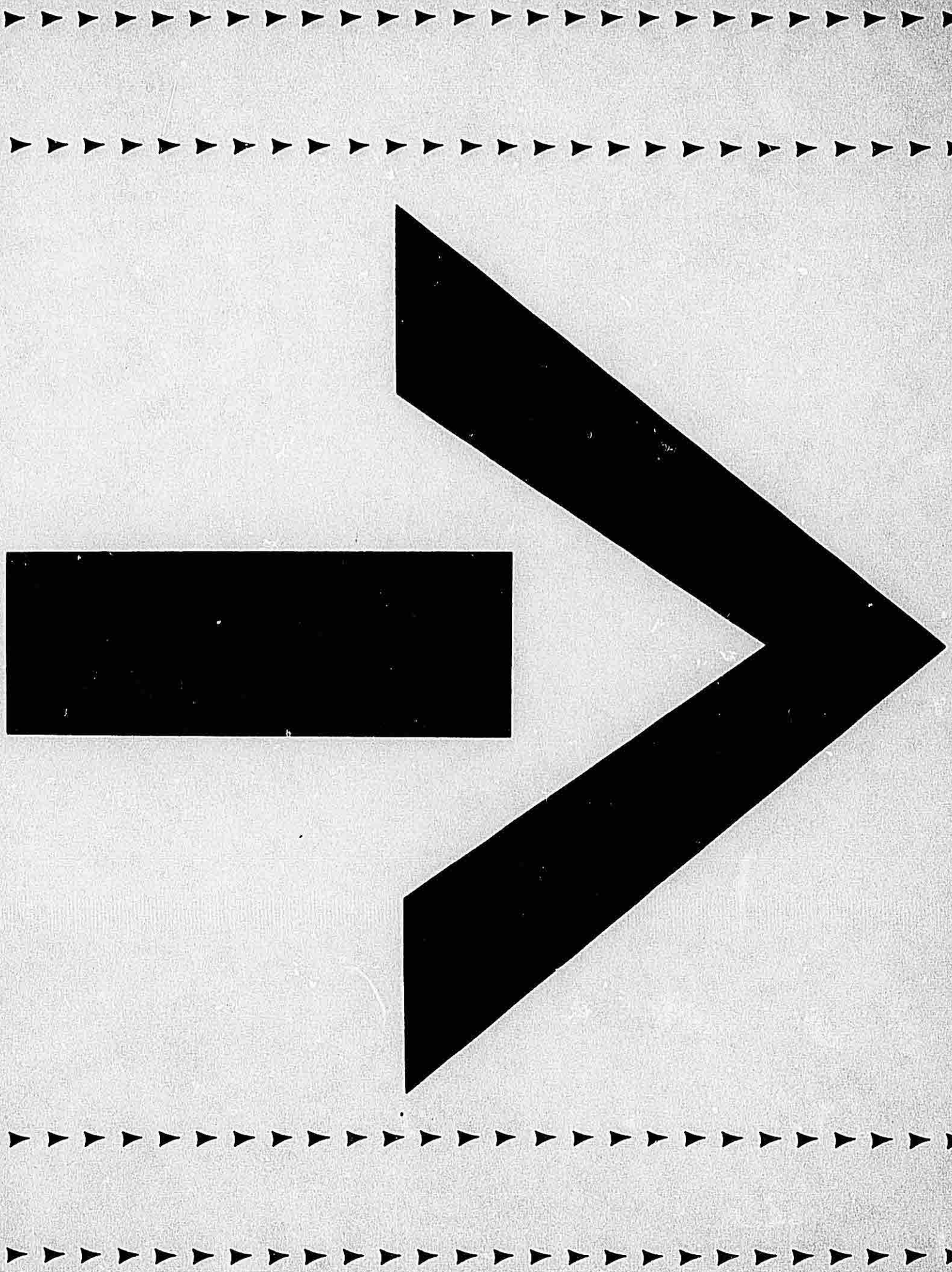
D02501C

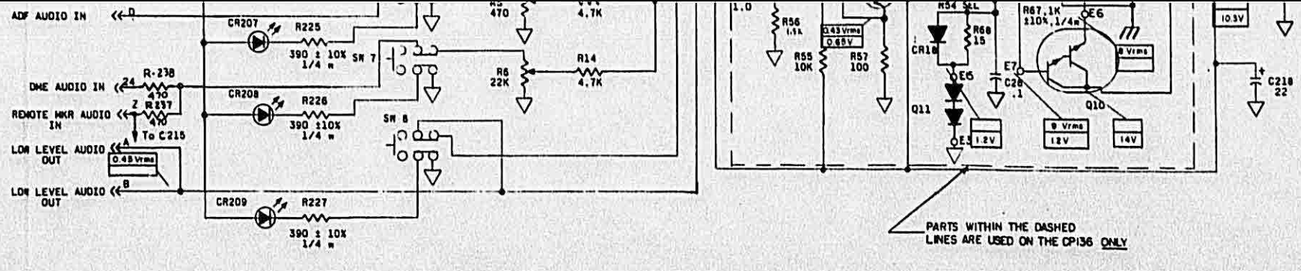
FIGURE 6-2. CP 135/136 MARKER RECEIVER (Chassis Code AA)

SEE BLOW-UP FICHE NO. NCM703 ITEM-A

SEE BLOW-UP FICHE NO. NCM703 ITEM-A







R-02500-D

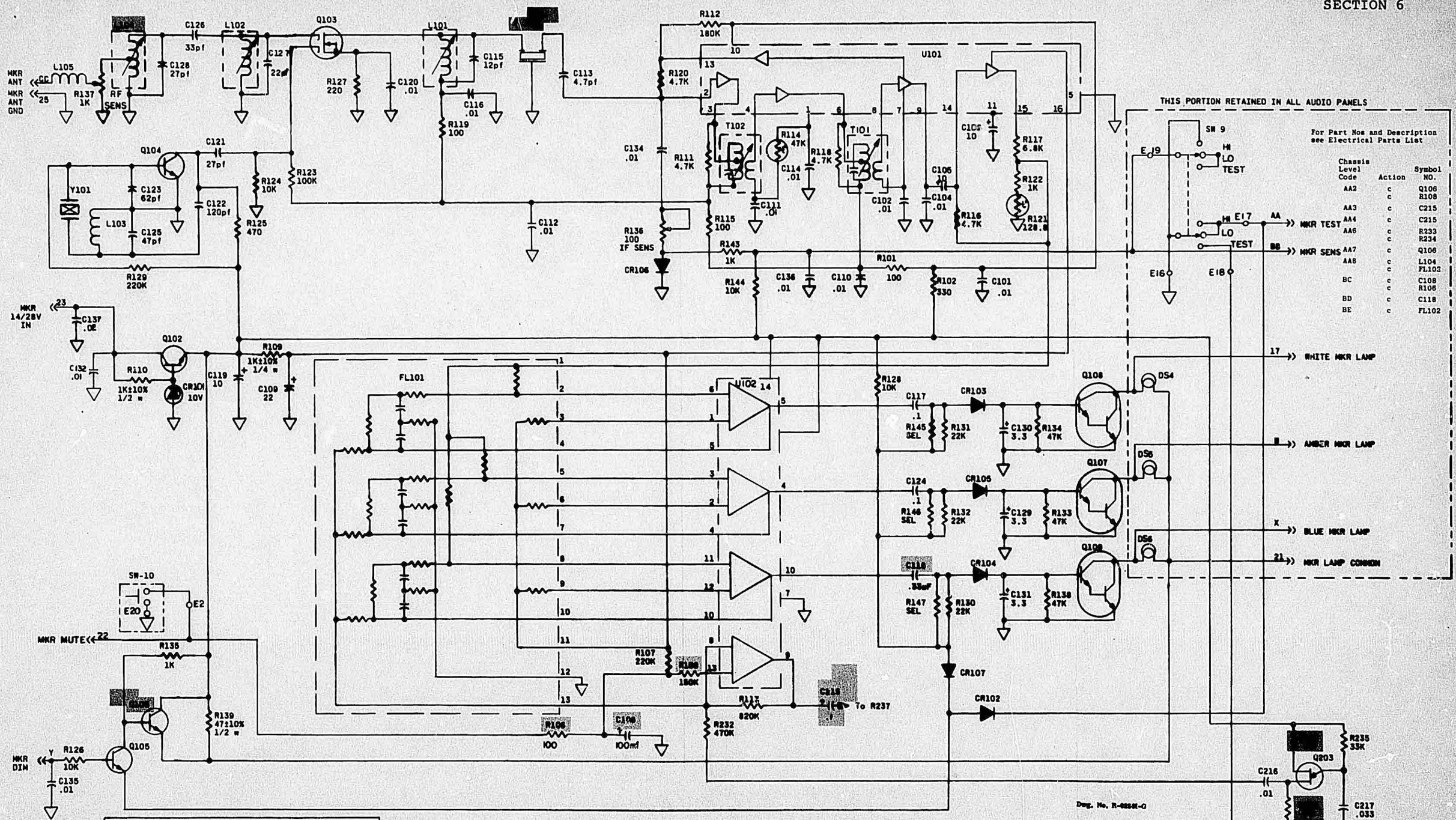
FIGURE 6-1. CP 135/136 AUDIO PANEL (Chassis Code AA)

6-3
(6-4 Blank)

SEE BLOW-UP FICHE NO. NCM702 ITEM-M

L 11

L 12



"Shaded areas shown on the schematic indicate those points where a change, addition, deletion, or type substitution took place."

FIGURE 6-2A. CP 135/136 MARKER RECEIVER (CHASSIS CODE BE)

S-9
8/81

6-6A
(6-6B Blank)

SEE BLOW-UP FICHE NO. NCM703 ITEM-E

M 11

M 12

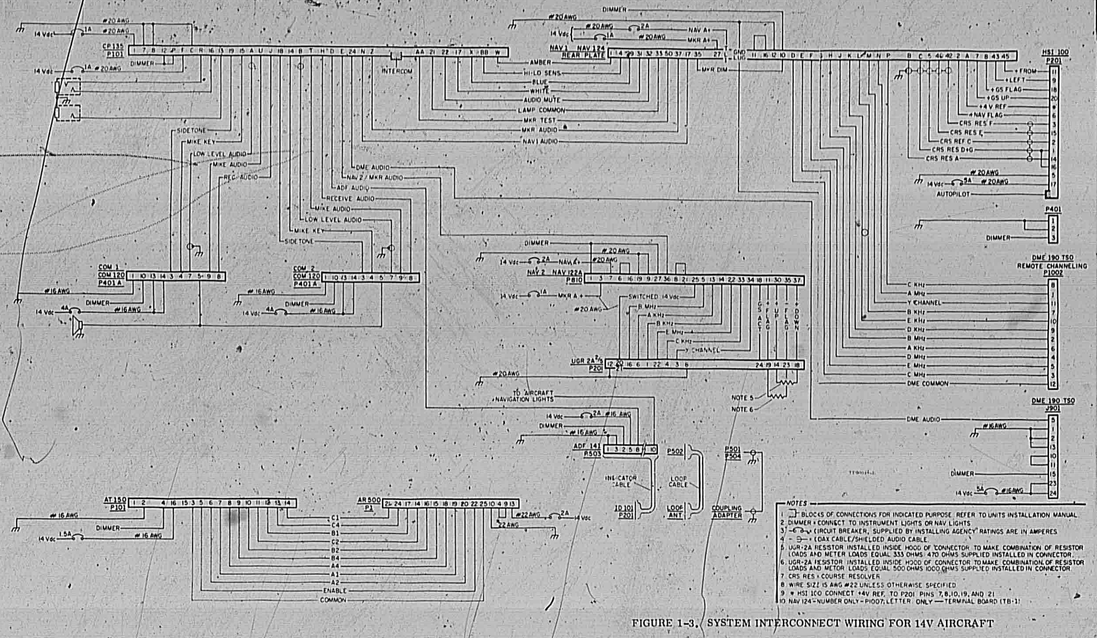


FIGURE 1-3. SYSTEM INTERCONNECT WIRING FOR 14V AIRCRAFT

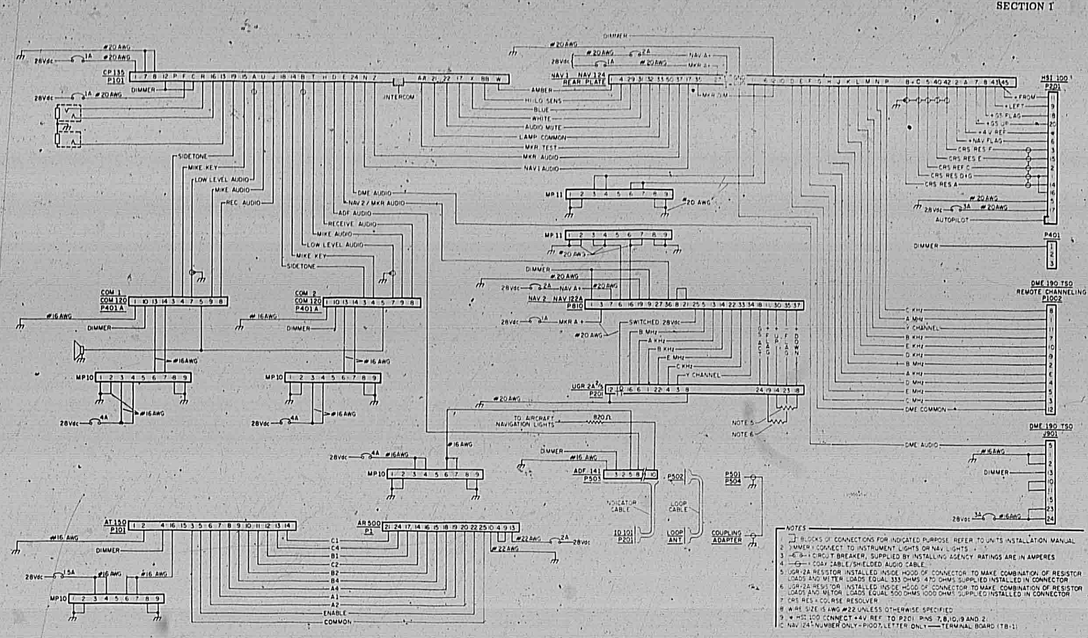


FIGURE 1-4. SYSTEM INTERCONNECT WIRING FOR 28V AIRCRAFT

3.4.2 If Amplifier, Detector and Audio Preamplifier (Figure 3-10)

U101 is a monolithic integrated circuit supplying the following circuits: two stages of IF amplification (pin 2 to pin 3 and pin 4 to pin 6); one stage of IF amplification and AM detection (pin 8 to pin 9); audio preamplification (pin 14 to pin 15); and a buffer amplifier providing delayed AGC to pin 13. Transformers T101 and T102 increase selectivity, provide impedance matching between IF stages, and are simply tuned for a peak. In the HI sensitivity mode, U101 provides approximately 30 dB of IF gain and 8 dB of audio gain.

Selection of HI or LO sensitivity is through control of the bias on CR106. In the LO sensitivity mode CR106 is forward biased, through R143 and R144, to shunt a portion of the IF signal to ground. LO mode sensitivity is adjusted by R136. Placing the front panel sensitivity switch (HI, LO, TST) in the HI position grounds the junction of R143 and R144 which removes bias from CR106 to open the shunt signal path and increase sensitivity.

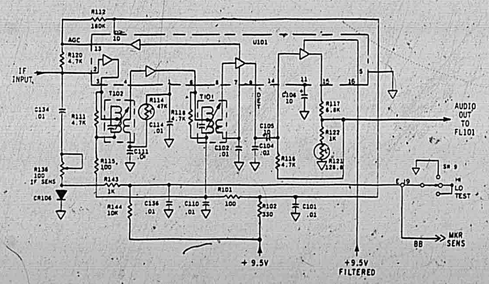


FIGURE 3-10. IF AMPLIFIER, DETECTOR AND AUDIO PREAMPLIFIER

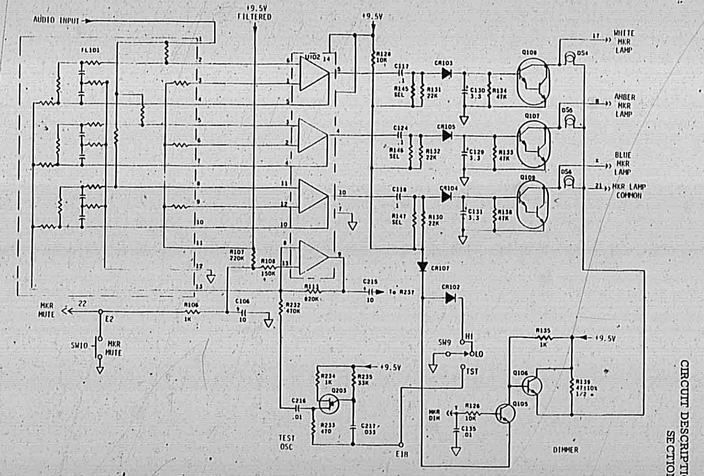


FIGURE 3-11. AUDIO CIRCUITS AND LAMP DRIVERS

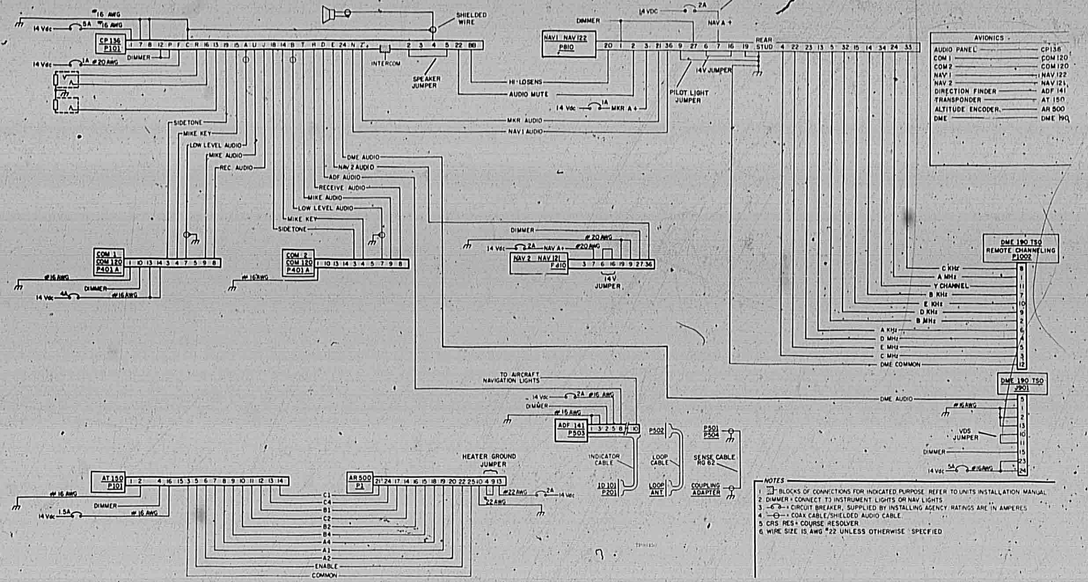


FIGURE 1-5. CENTERLINE WIRING DIAGRAM, 14V AIRCRAFT

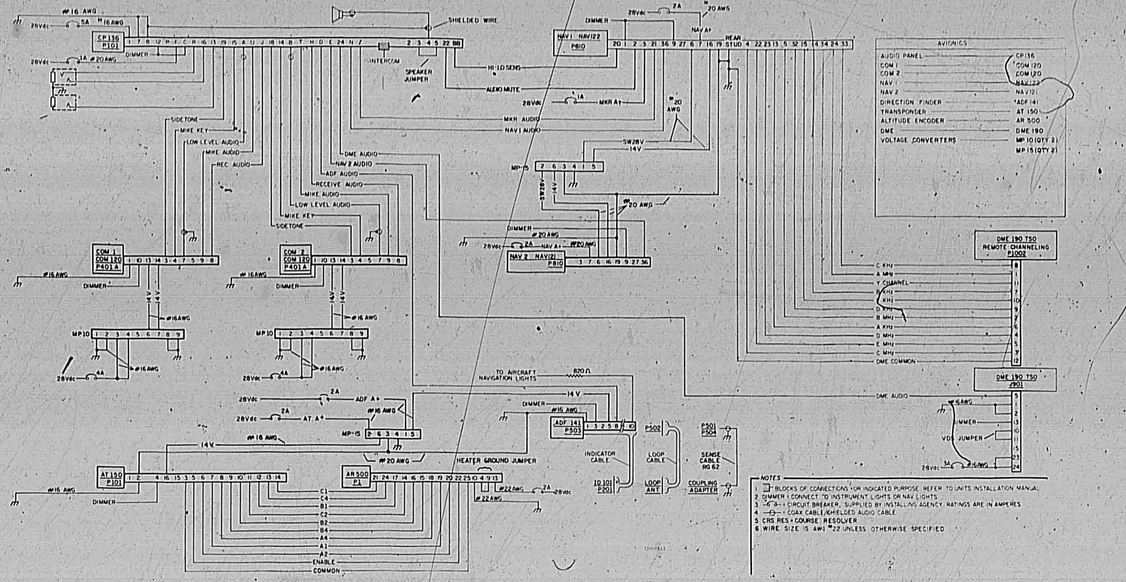


FIGURE 1-6. CENTERLINE WIRING DIAGRAM, 28V AIRCRAFT

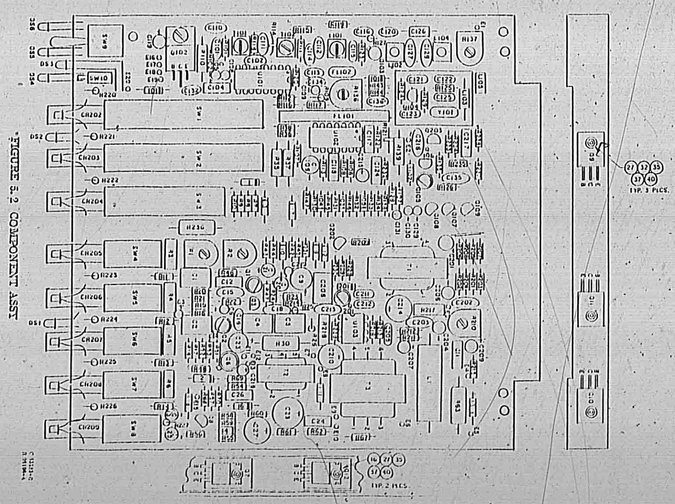
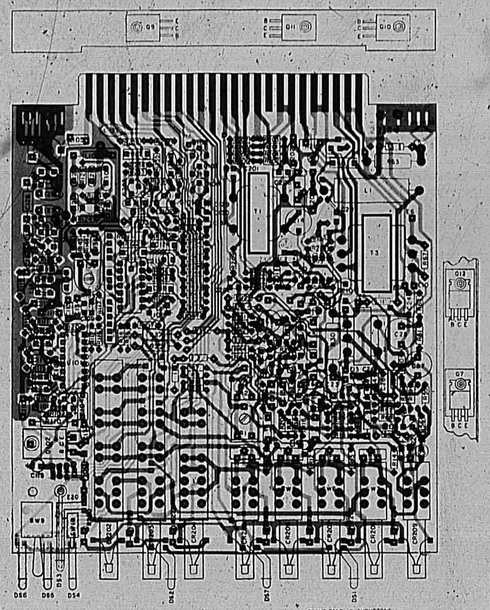


FIGURE 3-3. INPUT SWITCHING AND RESISTIVE COMBINING NETWORKS

FIGURE 3-4. ISOLATION AMPLIFIERS

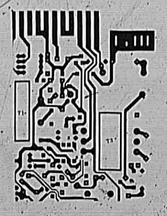


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Solder runs shown in GREY are those on the "BOTTOM" (non-component) side of the board

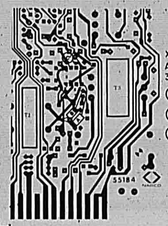
Solder runs shown in PINK are those on the "TOP" (component) side of the board

Circuit Modification as viewed from COMPONENT side of board.



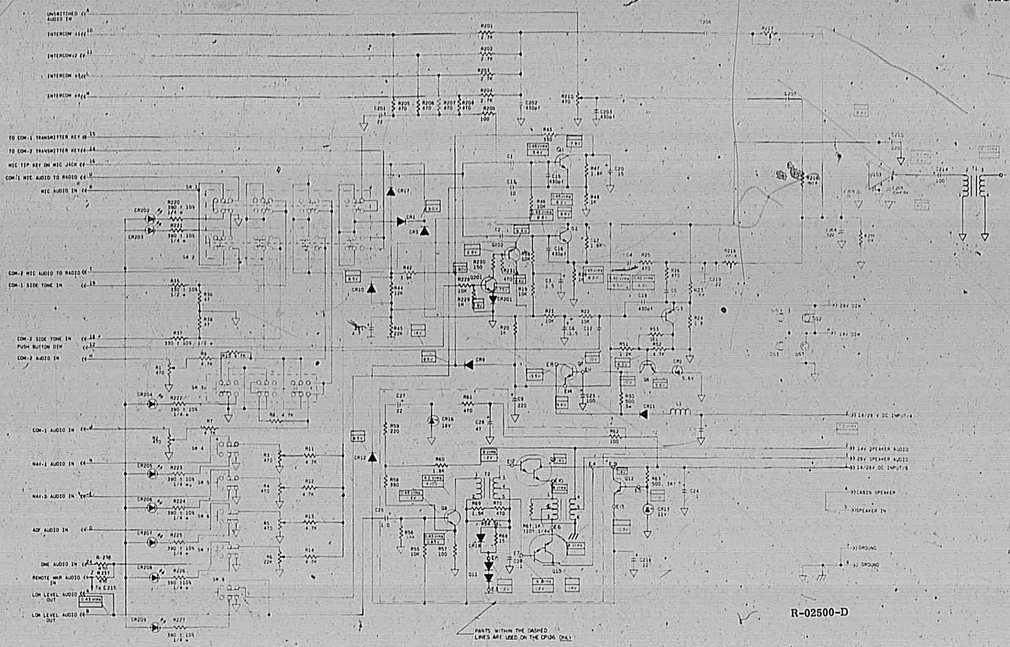
X = 3 CUTS
ADDED 3 JUMPERS

Circuit Modification as viewed from NON-COMPONENT side of board.



X = TRACK CUT (6 PLACES)
ADDED 6 JUMPERS AND 3 COMPONENTS.
(A) RESISTOR 4.7K, 1/8 W
(B) RESISTOR 150, 1/8 W
(C) CAPACITOR .01

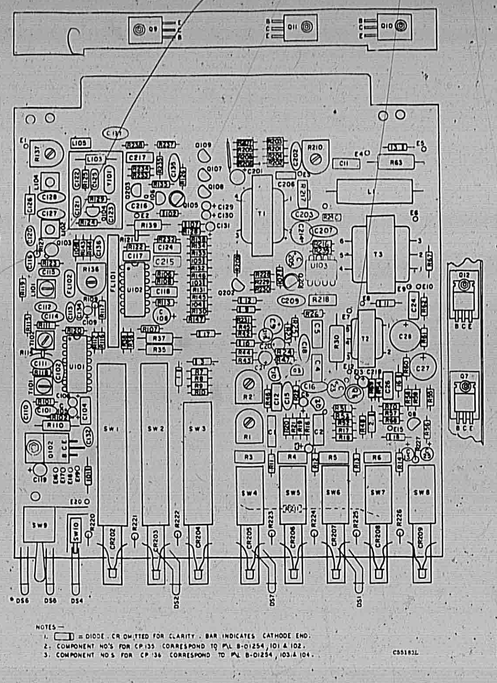
C-55183-E
R-95196-B and details of modified circuit.



R-02500-D

FIGURE 6-1, CP 135/136 AUDIO PANEL (Chassis Code AA)

Q



NOTES—
1. ▭ = DIODE. CR OMITTED FOR CLARITY. BAR INDICATES CATHODE END.
2. COMPONENT NO'S FOR CP 135 CORRESPOND TO PWB 8-01254, 101 & 102.
3. COMPONENT NO'S FOR CP 136 CORRESPOND TO PWB 8-01254, 103 & 104.

C85183L

6-3A FIGURE 6-1A. CP 135/136 COMPONENT ASSEMBLY (CHASSIS CODE AB)

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R

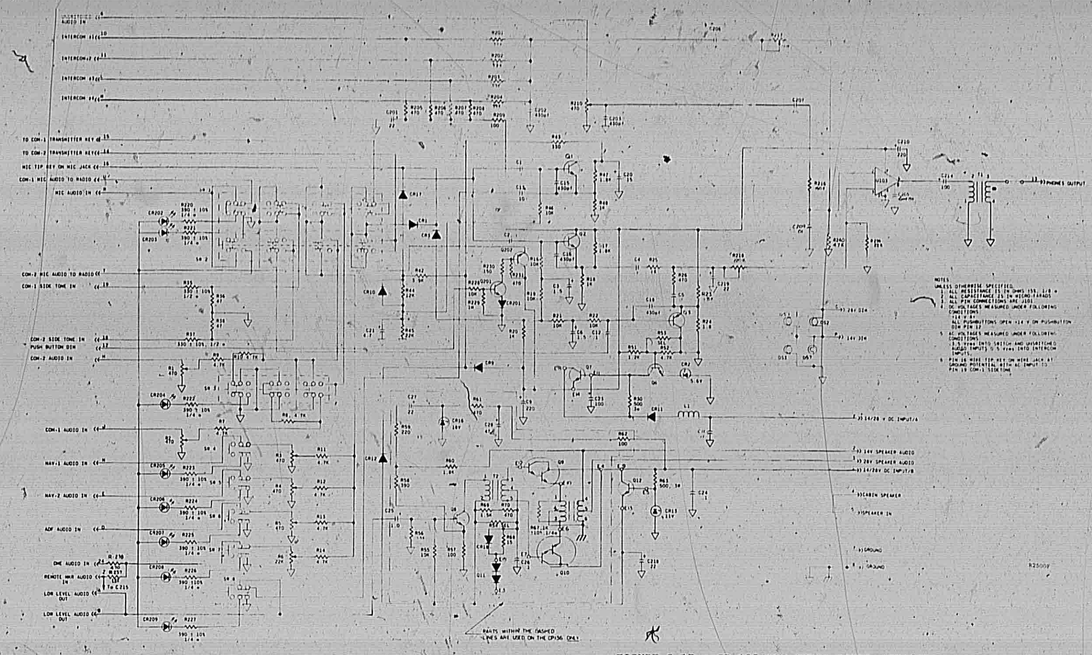
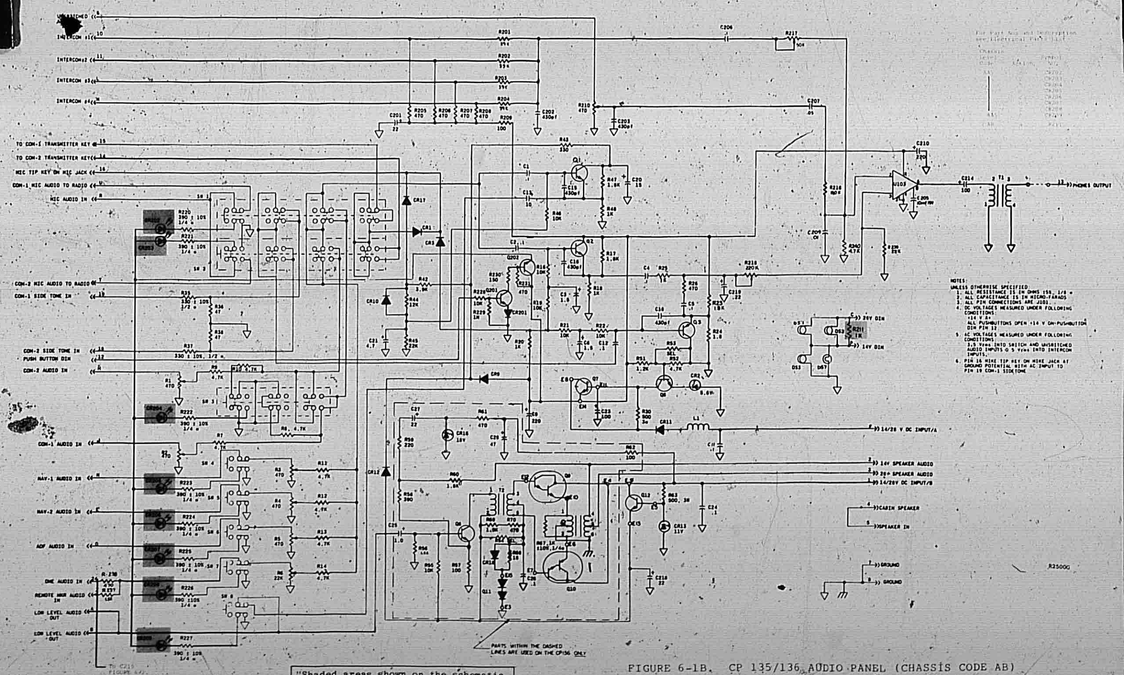


FIGURE 6-1B. CP 135/136 AUDIO PANEL (CHASSIS CODE AA)

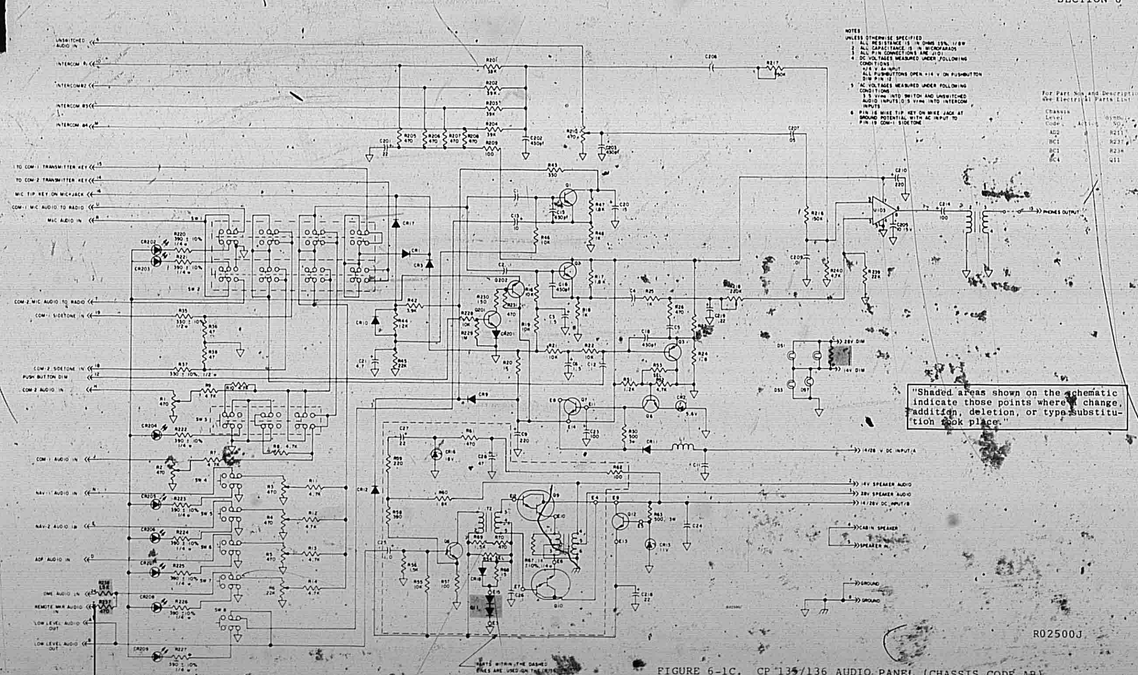
S



"Shaded areas shown on the schematic indicate those points where a change, addition, deletion, or type substitution took place."

FIGURE 6-1B. CP 135/136 AUDIO PANEL (CHASSIS CODE AB)

T



"Shaded areas shown on the schematic indicate those points where a change, addition, deletion, or type substitution took place."

FIGURE 6-1C. CP 135/136 AUDIO PANEL (CHASSIS CODE AB)

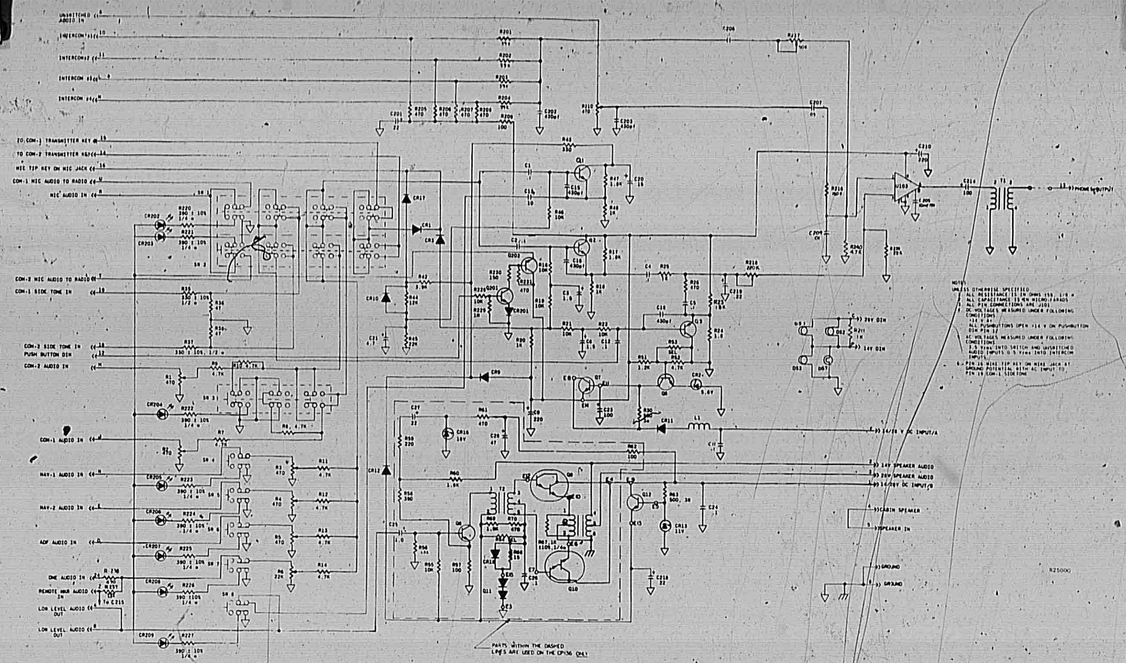


FIGURE 6-1C. CP 135/136 AUDIO PANEL (CHASSIS CODE AB)

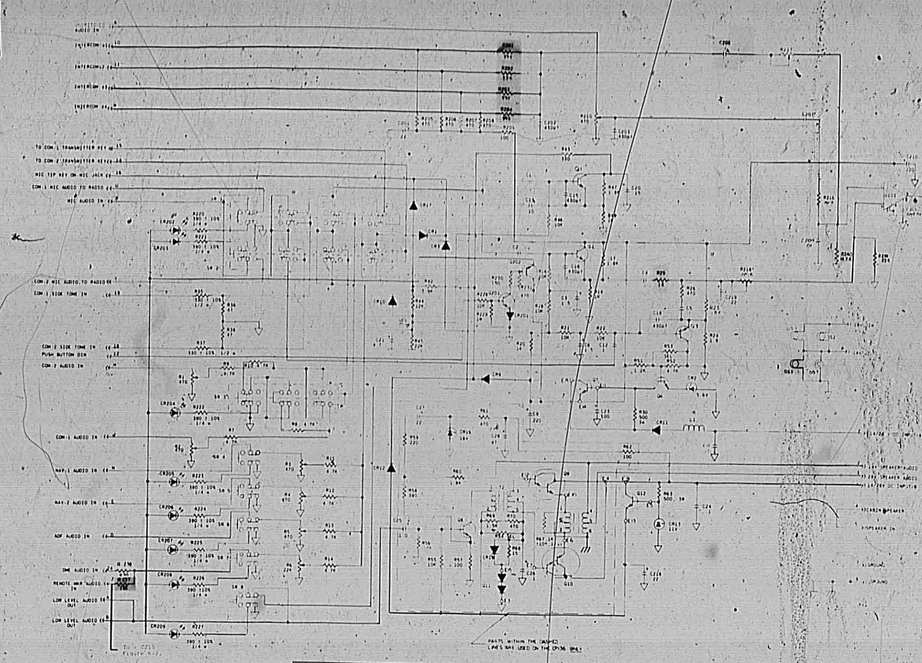
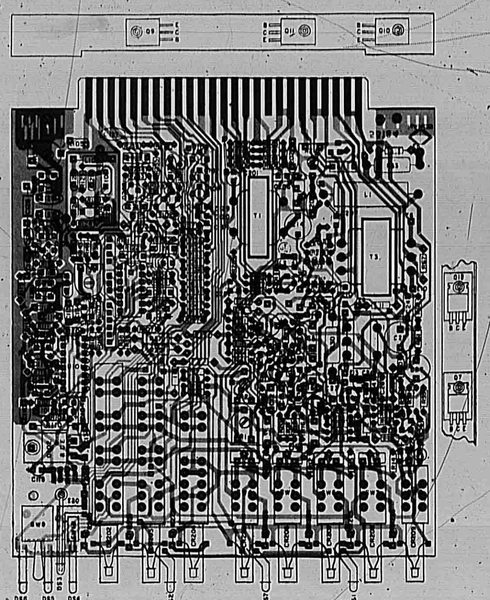


FIGURE 6-1A. CP 135/136 AUDIO PANEL (CHASSIS CODE AA)

"Shaded areas shown on the schematic indicate those points where a change, addition, deletion, or type substitution took place."

4/78



C-55183-E
R-95196-B and
details of modified
circuit.

11/77

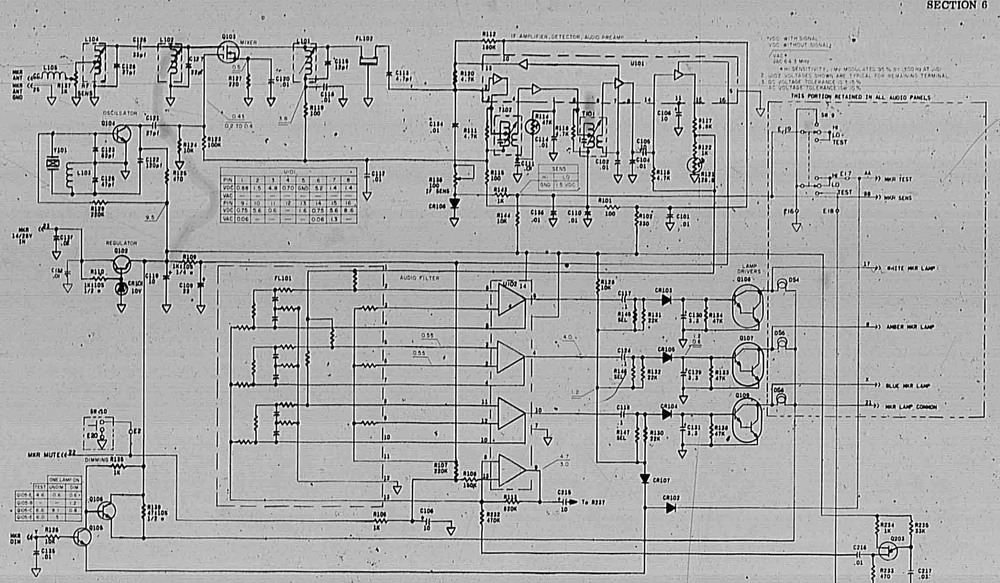
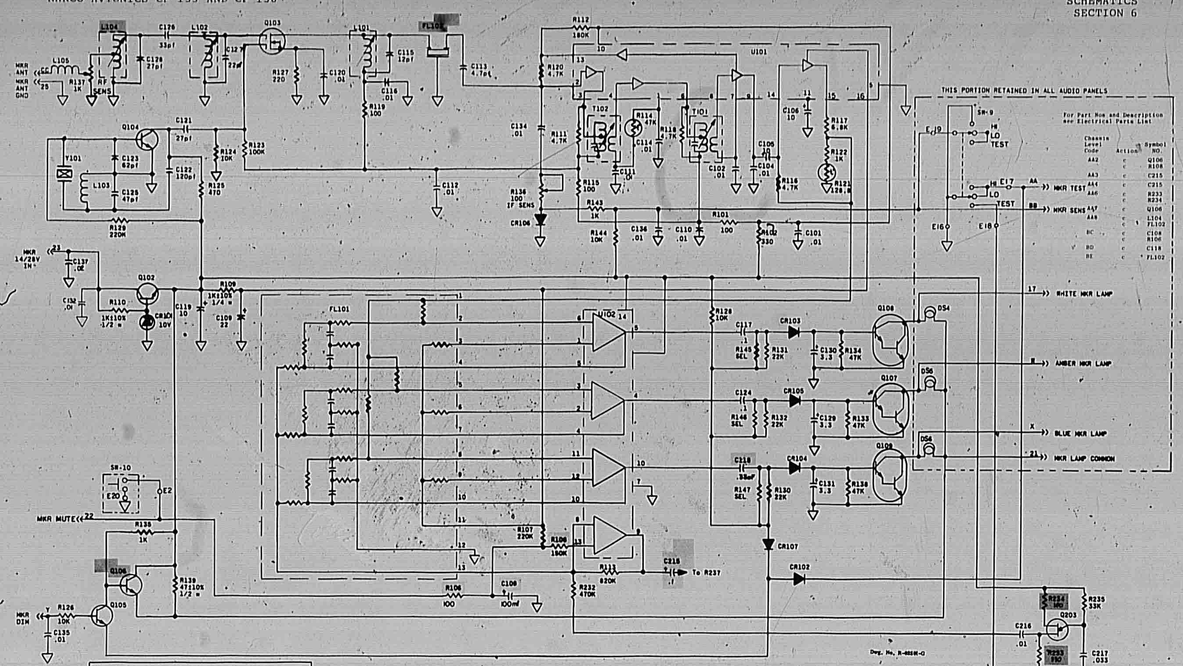


FIGURE 6-2, CP 135/136 MARKER RECEIVER (Chassis Code AA)



"Shaded areas shown on the schematic indicate those points where a change, addition, deletion, or type substitution took place."

FIGURE 6-2A. CP 135/136 MARKER RECEIVER (CHASSIS CODE BE)

NARCO
CP 136T TSO AUDIO PANEL
GENERAL INDEX

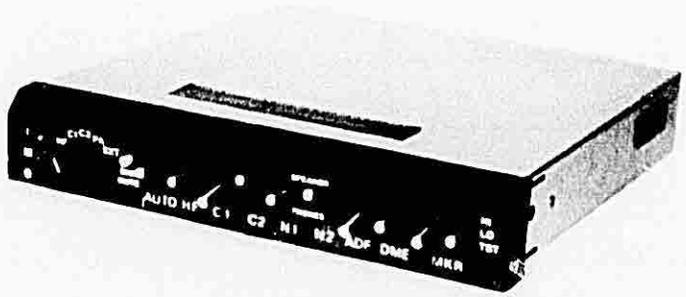
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NARCO AVIONICS

CP 136T TSO
AUDIO PANEL



MAINTENANCE MANUAL

03742-0600

NARCO AVIONICS

FORT WASHINGTON, PENNSYLVANIA, 19034 U.S.A.

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ATP
RECORD OF REVISIONS

REV. NO.	SECTIONS COVERED IN REVISION	REV. DATE	INSERTION DATE	BY	NOTES

NARCO AVIONICS CP 136T TSO'd AUDIO PANEL
(IM - 03742-0620)
(MM - 03742-0600)
JULY 1979

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IS YOUR MANUAL COMPLETE?

This page is provided, and updated as necessary, with each printing and supplement issued. As all pages are dated, it is easy to verify if the manual on hand is complete and current. Page numbers prefixed by a "B" are pages that are intentionally blank.

A complete page by page check can be made by comparing the page number and date below to that of each page. A quick check can be made by viewing the bar(s) at the base of this page against the bottom edge of the whole manual. One bar on this page indicates one set of supplemental pages were issued, additional bars, . . additional supplements. Generally one will eye at least one bar per supplement.

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1.1 GENERAL

In support of the Narco Avionics CP 136T Audio Panel, this manual provides detailed installation, operation, and maintenance procedures.

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

1.1.1 Manual Organization

Organized into six 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.
Section 3, Circuit Description	- technical description of all mechanical and electrical circuits.
Section 4, Maintenance	- provides test procedures and troubleshooting methods.
Section 5, Replacement Parts List	- provides exploded views of the Unit depicting the mechanical parts and certain electrical components. This section also provides an alphanumerical listing of all the electrical components of the Unit.
Section 6, Schematics	- circuit schematics with voltages, test points, and component drawings.

Note: Installation Manuals consist of Sections 1 and 2, Maintenance Manuals contain Sections 1 through 6.

1.2 PRODUCT DESCRIPTION

The CP 136T is a TSO'd audio control panel/marker beacon receiver.

The following features are provided:

- Switches receive audio and microphone connections for up to three transceivers, VHF or HF.
- Switches receiver audio from up to five separate NAV receivers.
- Unswitched audio input provided for decision height or other emergency audio; emergency audio will be heard in both speaker and headphones.
- AUTO switch included to allow simultaneous selection of transmitter microphone connections and receiver audio; eliminates separate selection of transmitter and receiver.

1.2 Continued

- Built-in receive audio muting to prevent acoustical feedback when transmitter is keyed.
- No discernable audio level change as audio inputs are switched in or out.
- Potentiometers on all audio inputs including transmitter sidetone and intercom.
- 10 Watts of low distortion speaker audio: 50 milliwatts of clean headphone audio.
- Ramp Hail (EXT) and Passenger Address (PA) speaker outputs.
- Intercom circuit will accept four microphone audio inputs. Headphone amplifier will supply 50 mW's of audio to four 600 ohm headsets.
- Built-in three light marker beacon receiver with HI-LO-TST switch, audio mute pushbutton, and lamp dimming.
- Designed-in safety:
  Meets or exceeds FAA TSO's C50b and C35d Class A.
  Evenly lighted, easy to read trim panel nomenclature.
  Separate A+ inputs to phones and speaker circuits.

1.3 PRODUCT SPECIFICATIONS

Mechanical

Physical Dimensions and Mounting	Refer to Section 2.3, Mechanical Installation
Weight	1.5 lbs (.68 kgs)

Electrical

	14 Vdc	or	28 Vdc
Input Voltage (nominal)			
Current (less pilot lamp), Amperes			
Speaker Circuit (P101-1)	1.5		0.75
Phones Circuit (P101-F)	0.25		0.25
Marker Beacon (P101-23)	0.20		0.23
Pilot Lamp Current, Amperes	0.26		0.26

Audio Performance

Input for rated audio output	
Unswitched Audio	3.0 Vrms across 470 ohms.
Intercom	0.5 Vrms across 470 ohms.
Switched Receive Audio	3.0 Vrms across 470 ohms.
Sidetone	3.0 Vrms across 1000 ohms.
Output with rated audio input	
Phones	50 mW across 600 ohms.
Speaker	10 watts across 4 ohms.
Low Level Aduio	0.5 Vrms across 300 ohms.

1.3 Continued

Isolation between input ports	40 dB minimum
Frequency Response	within 6 dB from 350 Hz to 3 kHz

Marker Beacon Receiver

Antenna Input Impedance	50 ohms
Sensitivity	
HI	200 μV for lamp threshold
LO	1000 μV for lamp threshold
Selectivity	
6 dB	±14 kHz minimum
40 dB	±195 kHz maximum
60 dB	±310 kHz maximum
AVC Characteristic	Audio output held to within 10 dB for input variations from 200 μV to 50,000 μV.
Image Rejection	60 dB minimum
Lamp Dimming	Any voltage between 2 and 30 Vdc will dim O-M-I lamps.
Audio Muting	10 to 14 seconds from muting to full audio output.

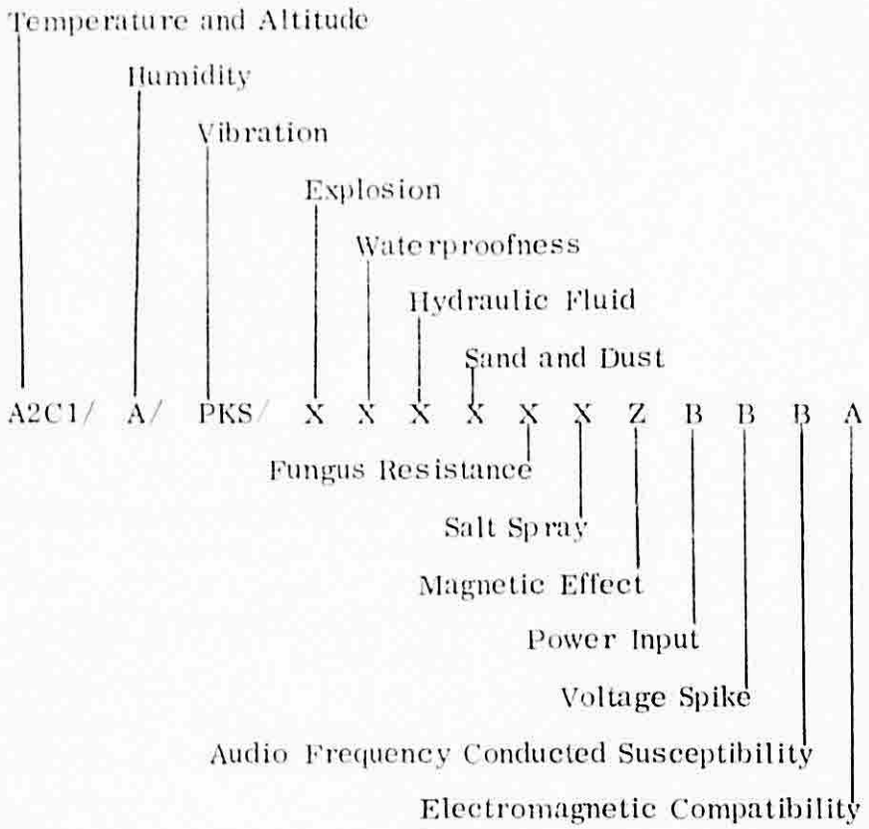
TSO Categories

Audio Control Panel	TSO C50b
Marker Beacon Receiver	TSO C35d, Class A
Environmental (DO-160)	A2C1/A/PKS/XXXXXXZBBBA

1.4 TSO EXPLANATION

The CP 136T is designed to be instrument panel mounted within the cabin environment of fixed and rotary wing aircraft using piston or turbine, single and multi-engines. It is designed for non-pressurized aircraft operating up to 35,000 feet as well as for pressurized aircraft. This equipment requires direct current power, but may be installed in aircraft having additional on-board alternating current sources.

There are fourteen Environmental Test Procedures established in RTCA Document DO-160. These are identified on the TSO Nameplate. Following are the Environmental Categories to which the Unit is designed and an explanation of each category.



Temperature And Altitude - Category A2C1

Low Operating Temperature	-20°C	(-4°F)
High Operating Temperature	+70°C	(+158°F)
Short Time Operating Temperature, High	+70°C	(+158°F)

Temperature, Non-Operating

Ground Survival Temperature, Low	-55°C	(-67°F)
Ground Survival Temperature, High	+85°C	(+185°F)

1.4 Continued

Altitude, Non-Pressurized

Maximum Operating Altitude	+35,000 ft.	(11,000 m)

Altitude, Pressurized:

Not affected by decompression to	+40,000 ft.	(12,000 m)
Not affected by overpressurization to	-15,000 ft.	(-5,000 m)

Humidity - Category A

This unit has been tested under the Standard Humidity Environment of: +50°C (+122°F) at 95% relative humidity, reduced to +38°C (+100°F) with relative humidity maintained in excess of 85%.

This cycle was repeated twice for a total of 48 hours of exposure. Within 15 minutes* after exposure, the unit was operated and met all specifications.

*TSO requires that all specifications be met within 4 hours after exposure.

Vibration - Categories PKS

Maximum vibration limits are: 0.08" double amplitude from 5 Hz to 22 Hz
2.0G constant acceleration from 22 Hz to 200 Hz
1.5G constant acceleration from 200 Hz to 500 Hz
0.25G constant acceleration from 500 Hz to 2000 Hz

The following six Environmental Conditions do not normally exist in Civil Aircraft, when recognized installation practices are adhered to, and are therefore not tested.

Explosion - Category X
Waterproofness - Category X
Hydraulic Fluid - Category X
Sand and Dust - Category X
Fungus Resistance - Category X
Salt Spray - Category X

1.4 Continued

Magnetic Effect - Category Z

With this equipment operating, it may be placed at a distance less than 0.3 meter from a free magnet with a 1^{o}, or less, deflection of the magnet.

Power Input - Category B

This equipment is designed for use in aircraft electrical systems supplied by an engine driven alternator/rectifiers or DC generator with a battery of significant capacity floating on the DC bus at all times.

		28V System	14V System
Normal Operating Conditions (Vdc) are:	Maximum	30.3	15.1
	Nominal	27.5	13.8
	Minimum	24.8	12.4
	Emergency Operation	20.0	10.0

Voltage Spike - Category B

This equipment has been designed to withstand the transient voltage characteristics specified by RTCA Document DO-160.

Audio Frequency Conducted Susceptibility - Category B

This equipment has been designed and tested to assure compliance with the requirements of RTCA Document DO-160.

Electromagnetic Compatibility - Category A

Note: For this series of tests, equipment Interconnecting Cables and RF transmission lines were constructed in accordance with Section 2 of this manual.

1. Induced Signal Susceptibility - This equipment has been designed to withstand the effects of audio frequency electric and magnetic fields and induced voltage spikes as specified by Category A.
2. Radio Frequency Susceptibility - This equipment has been tested and is not affected by interference from other on board electronic equipment which meet Category A.
3. Emission of Radio Frequency Energy - This equipment has been tested and does not emit radio frequency energy in excess of the specified.

1.5 UNITS AND ACCESSORIES SUPPLIED

The following tables may be used to check the contents of your order and to order additional components.

Table 1.1 is used for ordering Units, refer to the Unit's Part Number and its Description. There is no need to order an Installation Kit as it is automatically included with its associated Unit.

Table 1.2 may be used for ordering additional kits or detail parts of the kit. The quantity column lists the quantity of each part contained in the kit.

TABLE 1.1. UNITS AVAILABLE

Unit Part Number	Unit And Description	Supplied With Installation Kit(s) Part Number(s)
03742-0300	CP 136T TSO with Marker Beacon Receiver	03742-0500

TABLE 1.2. INSTALLATION KIT(S)

Item	Part Number	Description	Qty per Kit 03742-0500
1	99090-0002	PAD, Spacer, 9/16 square x 3/32 thick	2
2	82815-0007	SCREW, Mach, Bind Hd, Sl, 6-32 x 7/16 (used as rear support stud)	1
3	82802-0005	WASHER, Lock, Int. Tooth, No. 6	1
4	82900-0008	NUT, Hex, 6-32	1
5	82017-0001	CLAMP, Cable, Miniature (Cable tie)	2
6	----------	KEY, Connector Polarization (Part of Item 7)	1
7	54733-0001	CONNECTOR, PC, 50 pin	1
8	54730-0101	COVER, Connector	1
		(ATTACHING PARTS)	
9	82814-0007	SCREW, Mach, Bind Hd, Sl, 4-40 x 7/16	2
10	81324-0004	WASHER, Lock, Split, No. 4	2
		----*----	
11	54731-0102	TRAY	1
		(ATTACHING PARTS)	
12	82977-0007	SCREW, Mach, 100° Flat Hd, 6-32 x 1/2	2
13	82802-0005	WASHER, Lock, Int. Tooth, No. 6	2
14	82900-0008	NUT, Hex, 6-32	2
		----*----	
15	04832-0001	LABEL, Switch Identification (See Figure 2-2)	1
16	04854-0001	LABEL, Switch Identification (See Figure 2-3)	1
17	54572-0101	MKR Antenna Cable Assy (See Figure 2-6A)	1

Table 1.2's items are located and shown in Figure 2-6 page 2-13, unless otherwise noted.

1.6 ACCESSORIES REQUIRED BUT NOT SUPPLIED

For proper operation of the CP 136T TSO, the following accessories are required.

A. Marker Beacon Antenna - Narco Avionics VMA-15 or equivalent.

B. Loudspeaker/Headphones
   1. Loudspeaker - voice coil, 4 ohms.
   2. Headphones - high impedance type, 300 to 1000 ohms.

C. Microphone - Narco Avionics M700B or equivalent.

1.6.1 Miscellaneous Items Required But Not Supplied

Refer to Installation Section for additional details.

A. Sufficient lengths of 20 and 22 AWG stranded hook-up wire.

B. Sufficient length of RG-58 A/U coaxial cable.

C. Allen Wrench, 5/64".

D. Resetable Thermal Circuit Breakers.

1.7 OPERATOR LICENSE REQUIREMENTS

There are no operator license requirements.

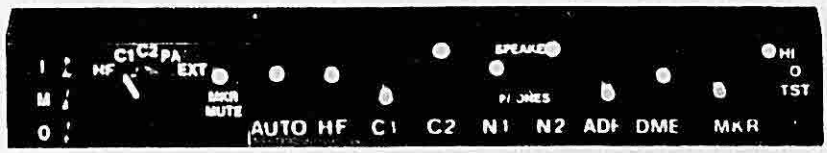


FIGURE 1-1. CP 136T TSO FRONT PANEL

1.8 OPERATION

1.8.1 Transmitter And Paging Selector

A transmitter is chosen by turning this rotary selector to either HF, C1, or C2. Microphone audio, transmitter key, and sidetone audio are all routed by the selector. An internal, resetable stop is provided to lock-out the HF position when the installation does not require it.

Paging functions are chosen by rotating the selector to either PA (Passenger Address) or EXT (Ramp Hail). In these positions the cockpit speaker is disconnected and the appropriate remote speaker becomes active. Selected receive speaker audio will be heard in the remote speaker until the microphone is keyed. To prevent this audio from reaching the remote speaker, deflect all receive audio toggle switches from their speaker positions before selecting PA or EXT. If a frequency must be monitored while in the PA or EXT modes, the cockpit headphones should be used: PA and EXT audio will not be heard in the headphones.

1.8.2 Auto Switch

Placing the AUTO switch in either its Phones or Speaker positions will allow the Transmitter And Paging Selector to select a transmitter and a receiver. For example, with the Transmitter And Paging Selector set to C1 and the AUTO toggle in the Speaker position, Com 1 receive audio will be heard in the cockpit speaker and keying the microphone will activate the Com 1 transmitter. If the AUTO toggle had been in the Phones position, Com 1 audio would have been heard in the headphones. In the center, or OFF position, transceiver audio must be selected with the Transceiver Receive Audio Selectors.

1.8.3 Transceiver Receive Audio Switches (HF-C1-C2)

These three switches serve to route transceiver receive audio to either the cockpit speaker (up position), headphones (down position), or turn off that particular audio source (center position).

1.8.4 Navigation Receive Audio Switches

These five switches operate independently and serve to route navigation receive audio to either the cockpit speaker (up position), headphones (down position), or turn off that particular audio source (center position).

1.8.5 OMI Lamps

These lamps are the Marker Beacon identifiers. The appropriate O-M-I lamp will light upon receipt of a signal from the Marker Beacon transmitter.

1.8.6 MKR Mute Pushbutton

The MKR MUTE Pushbutton allows the pilot to mute or disable the MKR audio output for a period of 10 to 14 seconds. This time duration is long enough to allow the MKR audio to remain muted as the aircraft passes over a marker beacon transmitter, yet short enough to permit reactivation of the MKR audio before the next Marker Beacon is reached. The MKR MUTE Pushbutton is spring loaded and requires only momentary contact.

1.8.7 HI-LO-TST Switch

Marker Beacon Receiver sensitivity is selected by Hi or LO sensitivity settings. LO sensitivity is used for airport approaches and HI sensitivity for enroute navigation. The spring loaded TST position lights the O-M-I lamps, and when the MKR switch is in a SPEAKER or PHONES position, a steady tone will be heard.

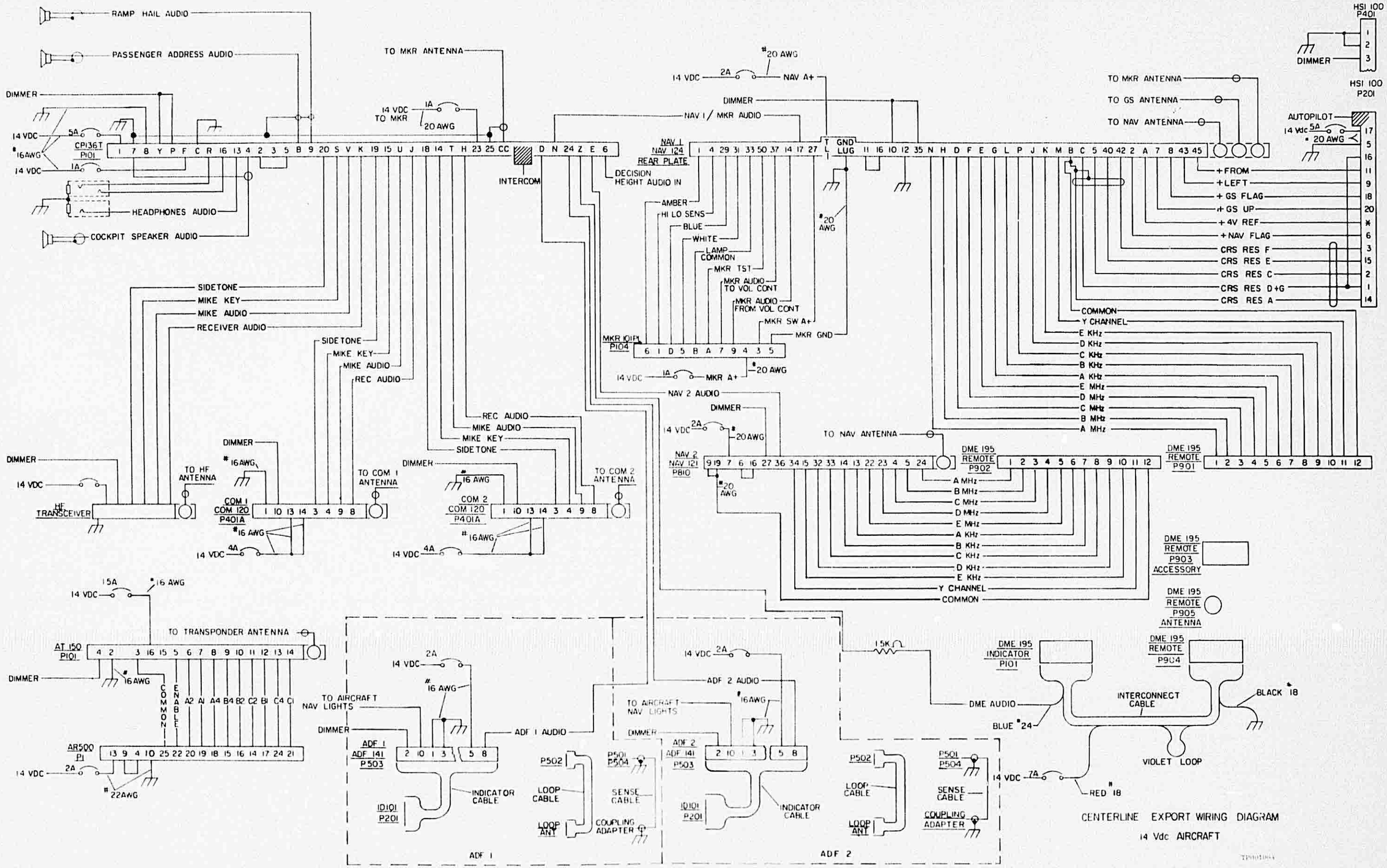


FIGURE 1-2. SYSTEM INTERCONNECT WIRING FOR 14V AIRCRAFT

SEE BLOW-UP

SEE BLOW-UP

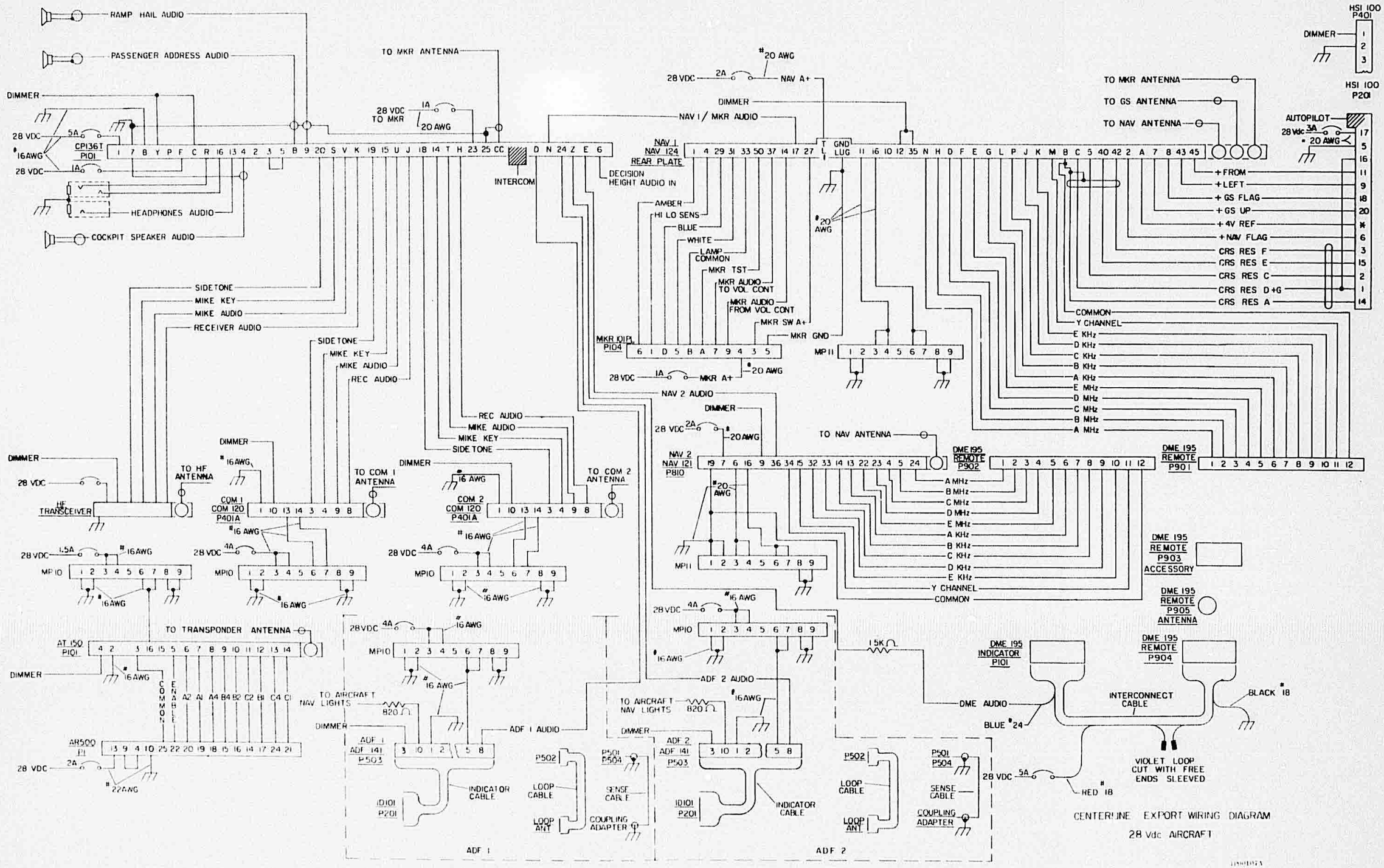


FIGURE 1-3. SYSTEM INTERCONNECT WIRING FOR 28V AIRCRAFT

SEE BLOW-UP

SEE BLOW-UP

2.1 INTRODUCTION

This section provides the information and procedures necessary to perform the electrical and mechanical installation of the CP 136T.

2.1.1 Installation Sequence

The following is provided as an aid in planning an installation that will meet and, hopefully, exceed the customer's expectations.

A. Define system requirements.

1. number of COM or HF transceivers required
2. number of NAV receivers required (type of display, RNAV, Glide Slope, etc.)
3. single or dual ADF receivers
4. transponders
5. distance measuring equipment
6. marker beacon receiver and display
7. pilot/copilot intercom
8. passenger address and/or ramp hail desired
9. radar altimeter (audio to drive CP 136T unswitched audio input)

B. Plan aircraft instrument panel layout and determine location of remote mounted "black boxes."

C. Assign each transceiver, nav receiver, and other audio sources a CP 136T input and switch.

D. Schematically diagram the system wiring.

E. Fabricate cables.

F. Bench test avionics and fabricated cables. Most installation adjustments are made at this time.

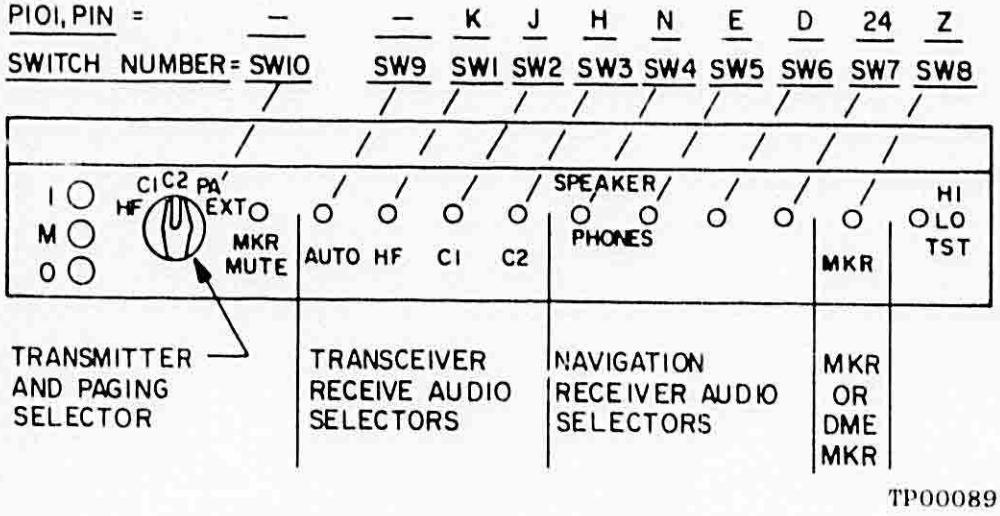
G. Install mounting trays, cables, antennas, and avionics in aircraft.

H. Perform pre-flight test.

I. Perform flight test.

2.1.2 Switch Assignments And Labeling

Each audio source to be controlled by the CP 136T must be assigned to either a front panel switch or unswitched audio. Figure 2-1 locates each switch and identifies its corresponding audio input pin.



TP00089

FIGURE 2-1. FRONT VIEW



04832-0001 TP00090

FIGURE 2-2. STANDARD LABEL

C1	C2	HF1	HF2	DME
C1	C2	HF1	HF2	DME
N1	N2	C/N1	C/N2	MKR
N1	N2	C/N1	C/N2	MKR
ADF	ADF	DF1	DF2	N1/M
AUTO	AUTO	DF1	DF2	N2/M
DME MKR				

04854-0001 TP00091A

FIGURE 2-3. LABEL SET

2.1.2.1 Transceiver, PA, And EXT Selectors (SW1, 2, 3, 9, and 10)

Transceiver Receive Audio Selectors and the Transmitter and Paging Selector must be assigned and nomenclated as shown in Figures 1-1 and 2-1 with the following exceptions:

A. HF Lock-Out. If an HF transceiver is not part of the installation a black, unlettered label should be placed over all HF nomenclature. To lock-out the Transmitter And Paging Selector's HF position a movable detent stop is adjusted as described in Section 2.5.2; the stop may be reset at a later date if an additional transceiver is added.

B. Combined COM/NAV Audio. Installations with a Narco MK 12, MK 16, or MK 24 (or other "1-1/2" systems with combined COM/NAV audio) should use C/N1 and C/N2 labels to nomenclate SW 2 and/or SW 3. These labels are included in the Label Set provided in the Installation Kit and shown in Figure 2-3. Refer to Section 2.5.2 for interconnect wiring information.

C. Sixth NAV Receive Audio Input. Refer to Section 2.1.2.4.

2.1.2.2 NAV Receive Audio Selectors (SW4, 5, 6, and 7)

These four selectors will typically be assigned and labeled as indicated in Figures 1-1 and 2-1. Where this arrangement is unsatisfactory the Label Set should be employed and the revised switch assignment(s) recorded below the appropriate switch(es) in Figure 2-1. NAV, ADF, DME, or MKR inputs may be assigned in any order.

N1/M and N2/M labels are included in the Label Set to accomodate the following:

A. Centerline NAV units, with built in marker beacon receivers, wired to supply combined NAV/MKR audio. This is accomplished by jumpering, AT THE NAV UNIT, "marker audio output" to "auxiliary audio input".

B. Separate and independent NAV and MKR audio resistively summed before application to an audio panel input.

2.1.2.3 Marker Beacon Audio Selector (SW 8)

This switch controls audio from the built-in marker beacon receiver. In addition, the switch controls audio connected to Pin Z of P101, thus the internal MKR audio may be paralleled with an external audio. When paralleling inputs becomes necessary DME and MKR audios are often combined since their audio characteristics are distinctive and not easily confused. A DME/MKR label in included in the Label Set.

Refer to Section 2.5.4 for isolation resistance requirements and additional details.

2.1.2.4 Sixth NAV Receive Audio Selector

When the HF positions are not used to control a transceiver, SW 1 may function as a sixth NAV receive audio selector. Refer to Section 2.5.5 for details.

2.1.3 Audio Input Potentiometers

Potentiometers are provided for all receive, intercom, sidetone, PA, and EXT audio signal inputs.

Audio input potentiometers are factory set to accommodate the current line of NARCO communications and navigation avionics. These levels are detailed in Section 1.3, Product Specifications. Figure 2-5 locates the potentiometers.

Further adjustment of input potentiometers may occur at one of the following times:

A. in the aircraft under actual operating conditions.

B. during the pre-installation bench test with all system avionics.

C. during a pre-installation bench test of the CP 136T using audio signal generators to simulate audio outputs from system avionics.

Potentiometers adjusted using either B or C above may require some in-aircraft adjustment, however, step B provides an accurate pre-set of these controls and is highly recommended.

2.1.4 Speaker Amplifier 14/28 Audio Control

As shipped the Control is set for rated speaker power output for 14V installations. Application of 28 Vdc will produce only one-half normal speaker power output, until the 14/28 Audio Control is adjusted for full rated power output. Refer to the Pre-Installation Bench Test, Section 2.2.2 for the procedure. This adjustment should not be attempted in the aircraft.

2.2 PRELIMINARY INSPECTION

2.2.1 Unpacking

Carefully unpack the unit and inspect for damage that may have occurred during shipment. If damage is apparent, retain the shipping carton to corroborate your claims.

Inventory contents using the tables in Section 1.5 of this manual.

2.2.2 Pre-Installation Bench Test

A pre-installation bench test is highly recommended and should encompass as much of the avionics system as possible, especially the interconnecting cables. Since avionics systems exhibit considerable variation in their composition it is impractical to supply a detailed test procedure. In general all audio panel switches, audio inputs, audio outputs, and key lines should be exercised.

The following comments apply to most system test procedures:

A. RF signal generator output attenuators should be set to allow receiver AGC action.

B. RF signal generator percent modulation controls should be set to simulate the actual radiated signal.

C. Receiver volume controls should be rotated to produce 3.0 Vrms at the audio panel inputs. Alternatively, set volume controls to approximately 75% of their travel, then set the CP 136T input potentiometers for rated power output.

D. Intercom, EXT, and PA levels should be adjusted while speaking in a normal voice into the aircraft's microphones. Set the audio wattmeter's load impedance to simulate in-aircraft speaker impedances. All aircraft microphones should be of a similar type (dynamic, carbon, etc.) producing similar output voltages.

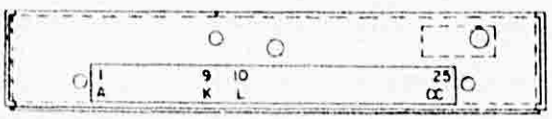
The detailed test procedure Section 2.2.2.2 only tests the CP136T and is designed to assure that the Unit meets factory specifications.

A bench test harness may be quickly constructed by wiring only power input, ground, speaker and phone outputs, and the necessary speaker jumpers. Remaining connections are completed through short lengths of #16 bus wire, soldered to the appropriate connector pins, then the free ends curled into loops. Miniature alligator clips or probe type test clips are then used to grasp the loops. Refer to the Electrical Installation section for wiring connections and details.

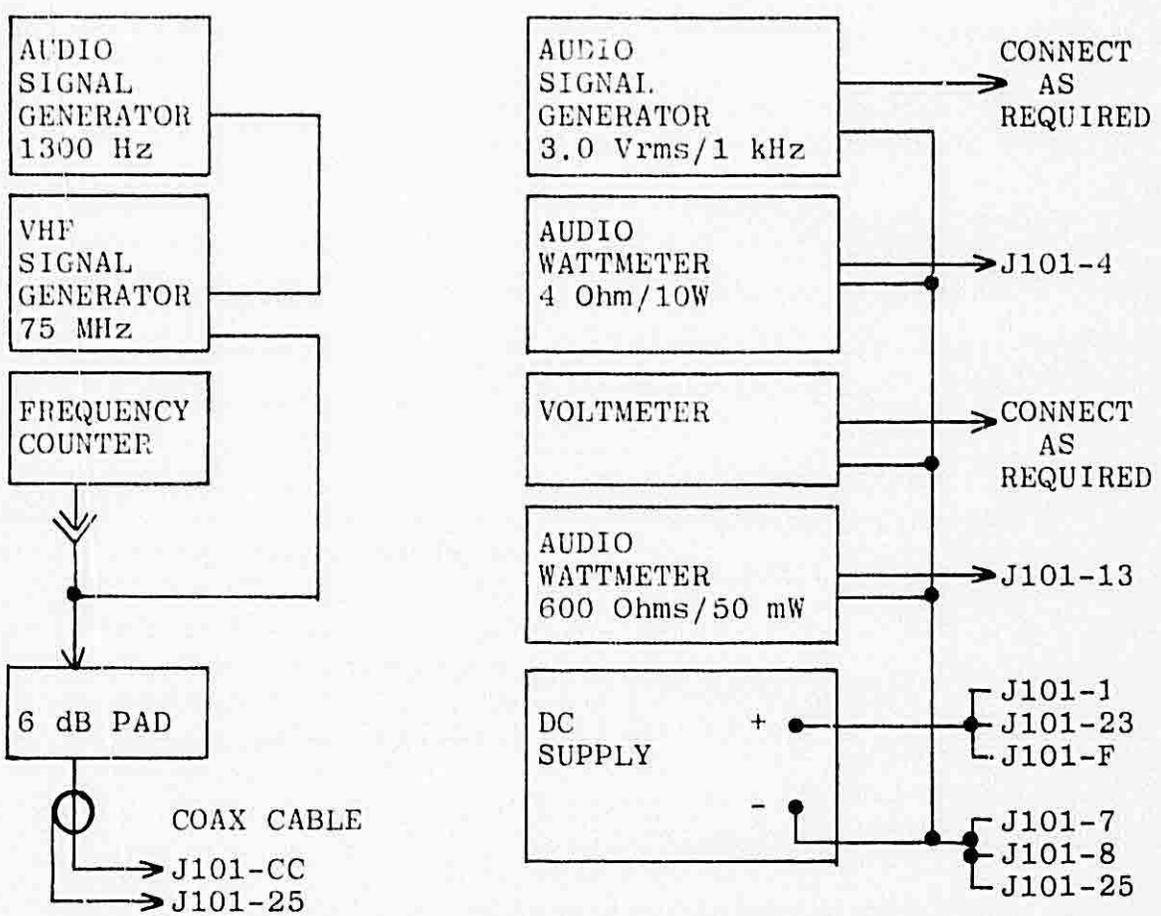
2.2.2.1 Test Equipment Required

Sufficient equipment to test a CP 136T is listed below. A more extensive list of satisfactory test equipment is presented in the Narco Avionics Dealer Information Booklet. Systems tests, including transceivers and various types of navigation receivers, will require specialized test equipment detailed by the manufacturers of the avionics in their installation or maintenance manuals.

TYPE	CHARACTERISTIC	EXAMPLE
VHF Signal Generator	Frequency - 75 MHz Modulation - AM, to 95% RF Range - 1 μV to 100,000 μV	Hewlett-Packard Model 608D
Audio Generator	Freq. Range - 300 to 3,000 Hz Output Voltage - to 10 Vrms	Hewlett Packard Model 200CD
Frequency Counter	Frequency - 75 MHz Accuracy - 0.0001%	Hewlett-Packard Model 5248L with plug-in model 5252A
Voltmeter	DC Ranges: Input Impedance-10 megohms min. Range - 0.1V to 100V Accuracy - 2% of range	Hewlett-Packard Model 427A
	AC Range: Input Impedance - 1 megohm min. Range - 0.1 Vrms to 100 Vrms Frequency - 10 Hz to 1 MHz Accuracy - 2% of range	Hewlett-Packard
	Ohmmeter: Range - 1 ohm to 10 megohms Accuracy - 5% of reading	
Audio Wattmeter	Speaker: Load - 4 ohms Power Range - to 10 Watts	General Radio Model 1840A
	Phones: Load - 150 to 600 ohms Power Range - to 100 milliwatts	General Radio Model 1840A
Power Supply	Output Voltage - 0 to 30 Vdc Output Current - 0 to 4 Amperes	Power Designs Model 3650
RF Attenuator	Attenuation - 6 dB Impedance - 50 ohms	



REAR VIEW



TP00092

FIGURE 2.4. BENCH TEST SET-UP

2.2.2.2 Test Procedure

In the following procedures audio input potentiometers are set for 50 milliwatts of headphone audio, then speaker power output is checked for a minimum of 10 watts. Figure 2-5 locates alignment components. Be careful not to adjust the Bias Control. If this control is inadvertently rotated the procedure in Section 2.2.2.3 MUST be performed.

A. Check wiring harness to be sure the proper wiring connections are made for the supply voltage (i.e., 14 or 28 Vdc). Refer to the Electrical Installation section for wiring information.

B. Place all toggle switches in their center or OFF position; rotate the Transmitter And Paging Selector to HF.

C. Connect test equipment as shown in Figure 2-4.

D. 14/28V Control

1. Connect audio generator to J101-6 (unswitched audio). Set generator output for 3.0 Vrms of 1 kHz audio.

2. Perform either step a) or b).

a) 14V Installations:
Set power supply to 13.75V -phones output (J101-13) shall be 50 milliwatts (unswitched audio potentiometer (R16) may be adjusted).
-speaker output (J101-2) shall be 10 watts minimum (14/28V control (R15) may be adjusted).

b) 28V Installations:
Set power supply to 27.5V -phones output (J101-13) shall be 50 milliwatts (unswitched audio potentiometers (R16) may be adjusted).
-rotate 14/28V control (R15) to increase speaker output from 5 watts to 10 watts.
-speaker output (J101-3) shall be 10 watts minimum (14/28V control may be adjusted).

E. Switched Receive Audio Inputs

Figure 2-1 relates front panel switch to rear panel connector pin. In turn, apply 3.0 Vrms, at 1 kHz, to each input and check speaker and phone output power (10 watts and 50 milliwatts respectively). Set the switch to its off position after each test.

2.2.2.2 Continued

F. AUTO

1. Apply 3.0 Vrms, at 1 kHz, to J101-K. Move AUTO toggle to speaker then phones and note power output (10 watts and 50 milliwatts respectively).

2. Transfer audio input to J101-J and rotate Transmitter And Paging Selector to C1. Check speaker and phones power outputs.

3. Transfer audio input to J101-H and rotate Transmitter And Paging Selector to C2. Check speaker and phones power outputs.

G. Sidetone

NOTE: R16 may be adjusted for comfortable phones level; if 50 mw cannot be achieved in tests below, check setting of R16.

1.a) Connect audio generator to J101-20 (HF sidetone). Set generator for 3.0 Vrms of 1 kHz audio.
b) Rotate Transmitter And Paging Selector to HF.
c) Ground J101-16 (mike key). Phones power output should be 50 milliwatts.

2. Transfer generator to J101-19 and rotate Transmitter And Paging Selector to C1. Phones power output should be 50 milliwatts.

3. Transfer generator to J101-18 and rotate Transmitter And Paging Selector to C2. Phones power output should be 50 milliwatts. Remove ground from J101-16.

H. EXT and PA

1. Connect high power wattmeters to J101-B (PA speaker output) and J101-9 (EXT speaker output).

2.a) Connect audio generator, through a 10 μF coupling capacitor, to J101-R (mike jack audio). Set generator for 0.5 Vrms of 1 kHz audio.
b) Rotate the Transmitter And Paging Selector to PA. Speaker output shall be 10 watts. Passenger Address potentiometer may be adjusted if necessary.

3.a) Rotate the Transmitter And Paging Selector to EXT.
b) Speaker output shall be 10 watts. Ramp Hail potentiometer may be adjusted if necessary.

2.2.2.2 Continued

I. Intercom

1. Connect audio generator, through a 10 μF coupling capacitor, to J101-10 (intercom 1). Set generator for 0.5 Vrms of 1 kHz audio.

   Phones output shall be 50 milliwatts. Intercom potentiometer may be adjusted if necessary.

2. Transfer generator and coupling capacitor to J101-11, then J101-L, then J101-M: 50 milliwatts of phones power output (J101-13) should be obtained.

J. Marker Beacon Receiver

1. Connect marker beacon test equipment as shown in Figure 2-4.

2. Tune VHF generator to 75 MHz ± 1.0 kHz; modulate generator 95% with a 1300 Hz signal.

3. Set Audio Panel HI-LO-TST switch to HI. Increase VHF generator rf output until amber lamp lights: generator rf attenuator should read 400 μV ± 2 dB.

4. Set Audio Panel HI-LO-TST switch to LO. Increase VHF generator rf output until amber lamp lights: generator rf attenuator should read 2000 μV ± 2 dB.

5. Repeat step 4 with VHF generator modulated with 400 Hz to light the blue lamp. Repeat step 4 with VHF generator modulated with 3000 Hz to light the white lamp.

6. Reduce VHF generator output to 400 μV. Connect AC voltmeter to J101-A (low level out).

7. Deflect MKR switch upward to Speaker: AC voltmeter should indicate 0.35 Vrms ± 1 dB and speaker power output should be 10 watts.

8. Momentarily depress the MKR MUTE button. Speaker output should decrease approximately 40 dB, then gradually return to full output in 10 to 14 seconds.

9. Disconnect VHF signal generator from Audio Panel. Hold the HI-LO-TST switch in the TST position: O-M-I lamps shall light and AC voltmeter should read approximately 0.1 Vrms.

Bench Test completed.

2.2.2.3 Bias Potentiometer Adjustment

The bias potentiometer is used to set the idling current of the speaker amplifier's output transistors. This setting is critical and must be performed carefully as improper adjustment will cause either high distortion or early failure of the output transistors.

Adjustment of this potentiometer must be made whenever replacing speaker amplifier output transistors or bias components. Inadvertent adjustment of the potentiometer (while setting audio levels, for instance) will also require the following procedure.

Procedure:

A. Locate wire pad E-21. Refer to Figure 2-5.

B. Unsolder and remove a wire from E-21.

C. Connect the positive terminal of a 100 mA full scale (DC) meter to E-21: Connect the free wire to the meter's negative terminal.

D. Connect DC power supply and audio wattmeter as shown in Figure 2-4. Be sure J101 has the proper jumpers for 14V operation: jumpers are shown in Figure 2-9.

E. Apply 13.75 Vdc to the audio panel. Audio panel heatsink must be cool before proceeding to step F.

F. If milliampmeter current is not between 20 and 25 milliamperes carefully adjust the bias potentiometer to achieve this current. Oscillation of the speaker output indicates that a 10 μF capacitor must be connected across the milliampmeter terminals before adjustment of bias.

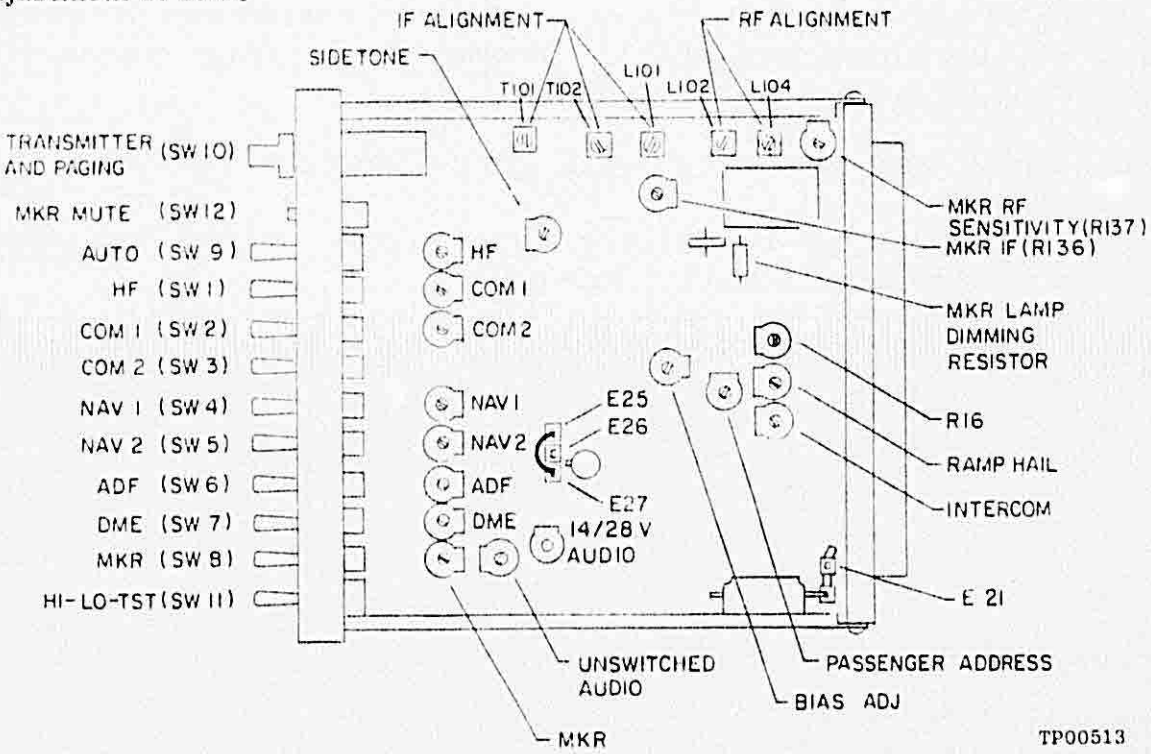


FIGURE 2-5. COMPONENT LOCATION, PARTIAL

2.3 MECHANICAL INSTALLATION

2.3.1 Mounting Tray

The CP 136T is supplied with a mounting tray designed to mount behind the aircraft instrument panel using three No. 6-32, 100° Flat head screws. Figure 2-6 provides a detailed drawing of the tray and the parts in the Installation Kit. This figure also provides all the necessary dimensions for the panel cutout as well as dimensions for mounting bracket locations. A full scale panel cutout template is also provided.

Vertical spacing between Units in a rack can be critical. Proper spacing can be achieved by using the spacers (item 1) provided in the Kit. These spacers, when installed, will provide the space required allowing the Units to be installed in the tray without the trim panels touching, yet having minimum clearance between them.

Mounting brackets (3) are not supplied due to the wide range in mounting requirements. Suitable mounting brackets may be fabricated from ordinary sheet metal or angle stock.

To ensure a sturdy mount, rear support for the unit should be provided.

The tray must be provided with a good electrical ground to the airframe.

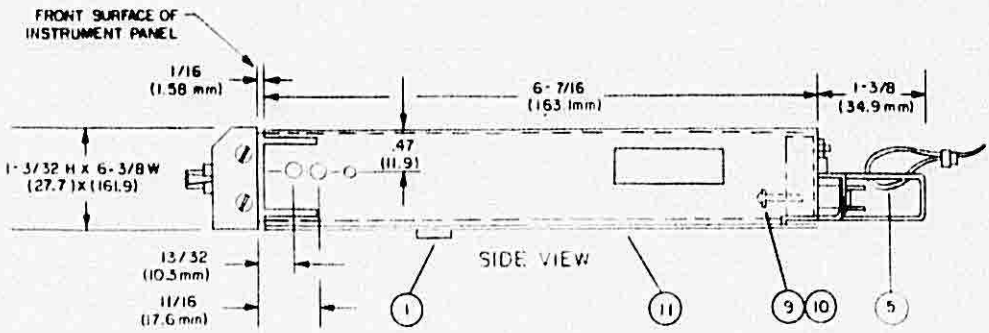
2.3.2 Insertion And Removal

The CP 136T is secured to the mounting tray by an Allen head ramping screw running from the front panel through the rear of the unit to a self-locking nut attached to the tray rear panel. The access hole for the ramping screw is located on the front panel between receive audio switches C1 and C2 (see Figure 1-1).

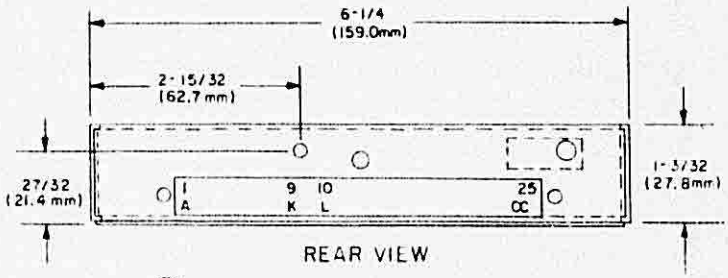
Slide the unit straight into the tray until the ramping screw contacts the self-locking nut. Using a 5/64" Allen wrench, turn the screw clockwise until the mating connector is engaged and the unit is firmly secured in the tray.

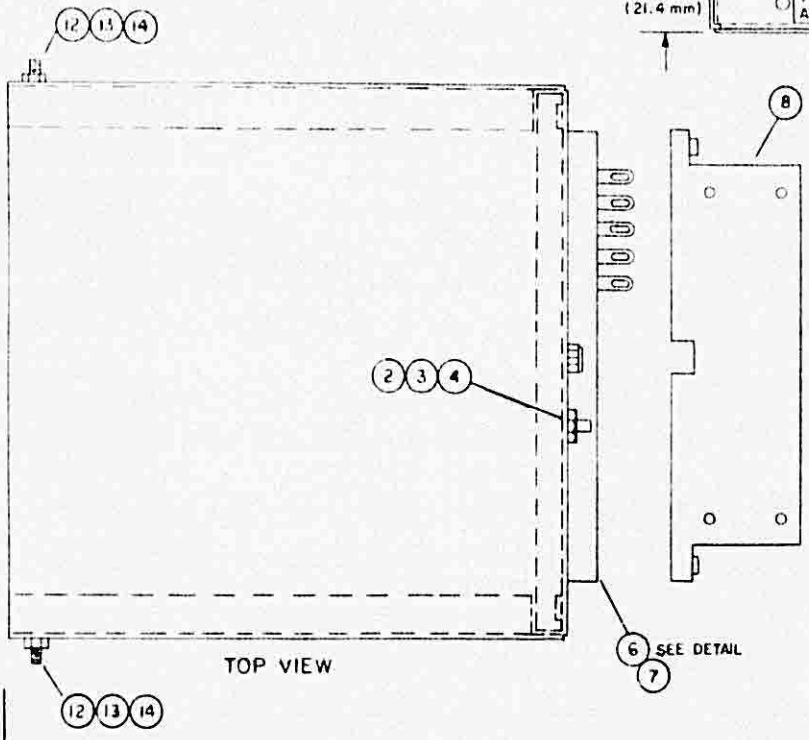
DO NOT RAM THE UNIT INTO THE TRAY OR OVER TIGHTEN THE RAMPING SCREW.

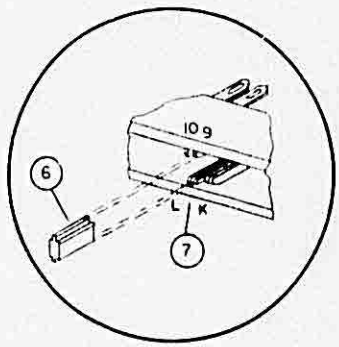
To remove the unit, turn the ramping screw counterclockwise until it is clear of the self-locking nut and then pull the unit straight out.



NOTES
REFER TO TABLE 1.2 PAGE 1-7, FOR CIRCLED ITEM NUMBERS, PART NUMBERS AND DESCRIPTION.







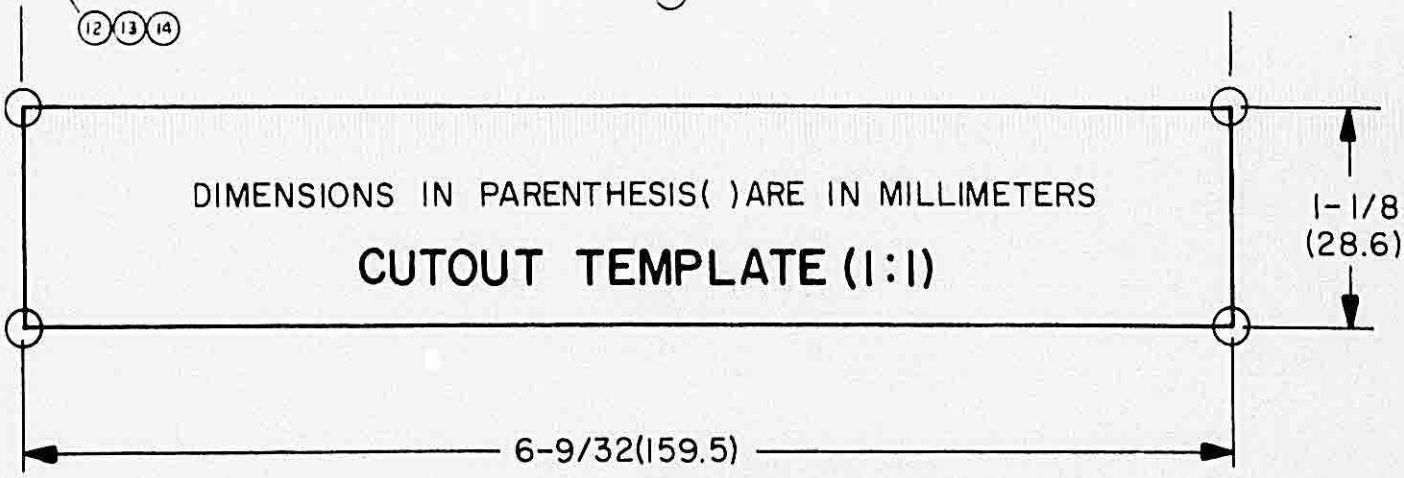


FIGURE 2-6. MECHANICAL INSTALLATION

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SEE BLOW-UP

2.4 ANTENNA INSTALLATION

Since the CP 136T is equipped with a Marker Beacon Receiver, an antenna is required. The Installation Kit provides a MKR antenna cable (see Figure 2-6A).

Marker Beacon antennas vary widely in form and gain. Narco Avionics markets the VMA-15 Marker Beacon Antenna shown in Figure 2-7. This non-TSO'd 50 ohm antenna provides 10 dB of gain with a single lobed, downward directed pattern. Rugged enough for use on all sub-sonic aircraft, the electrical elements are sealed by foamed-in-place resin within a plastic housing. Additional information is presented in the VMA-15 Installation Manual.

Alternate antennas may be the Marker Beacon only type, as shown in Figure 2-8, or a combination ADF Sense/Marker Beacon Antenna. A recommended combination antenna is the Model AD92 marketed by Antenna Developments of Cleveland, Ohio.

Figure 2-8 shows a non-TSO'd off-center fed antenna. This antenna should be located under, and spaced about six inches away from the fuselage by a pair of support masts. Note that the point where the lead-in is connected is displaced five inches from the center. of the antenna wire. This dimension is important for proper impedance matching.

The Marker Beacon Antenna should be located as far aft as possible to reduce noise pick-up. Past experience has shown that placing the tap forward or aft of the center can make a large difference in the performance, due to capacity unbalances, etc. It is therefore recommended that the tap be moved to that side of center where the best reception occurs.

A shorter (quarter-wave) bent-rod, shunt fed antenna mounted on the under surface of the aircraft has been found to be satisfactory if the feed point is adjusted for best reception.

The RG 188 A/U antenna cable braid is connected to the metal skin or frame of the aircraft at a point opposite the connection to the antenna wire. The center conductor is connected to a feed-thru insulator, which in turn, is connected to the antenna BNC connector.

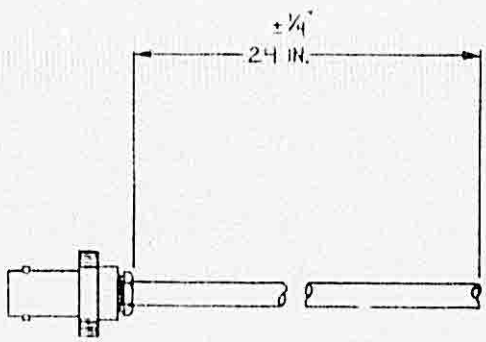


FIGURE 2-6A. MKR ANTENNA

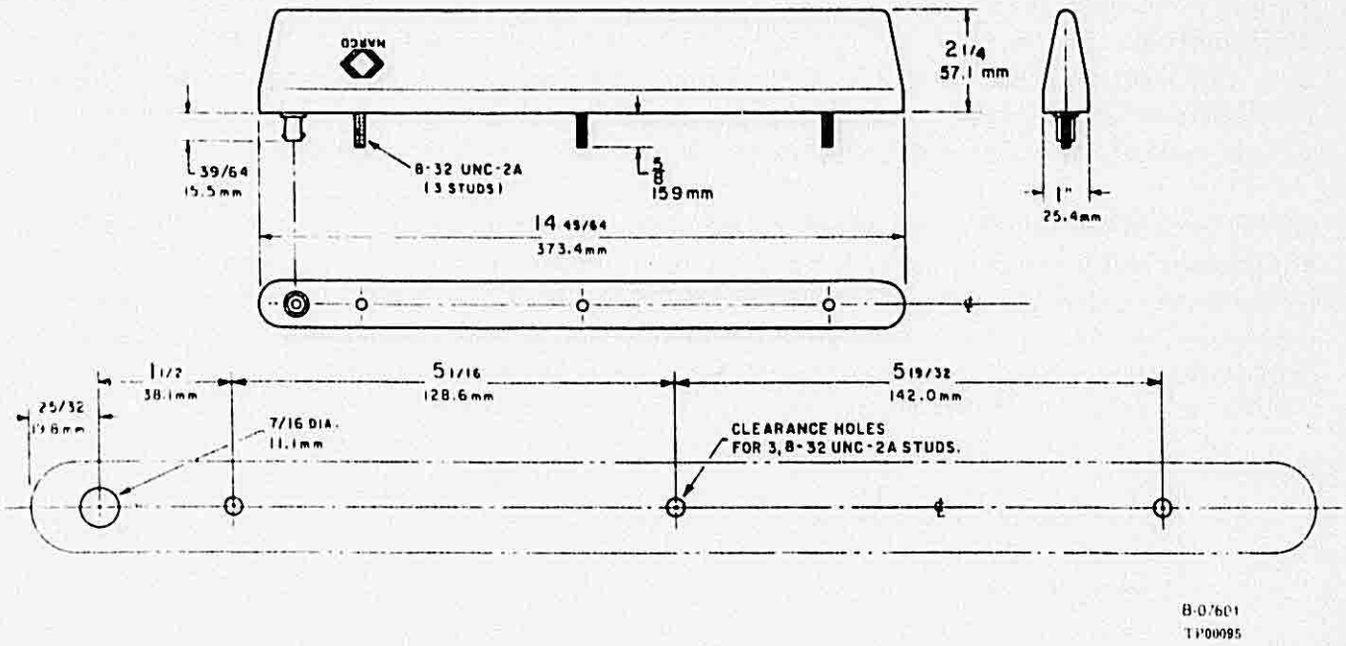


FIGURE 2-7. VMA-15 MARKER BEACON ANTENNA

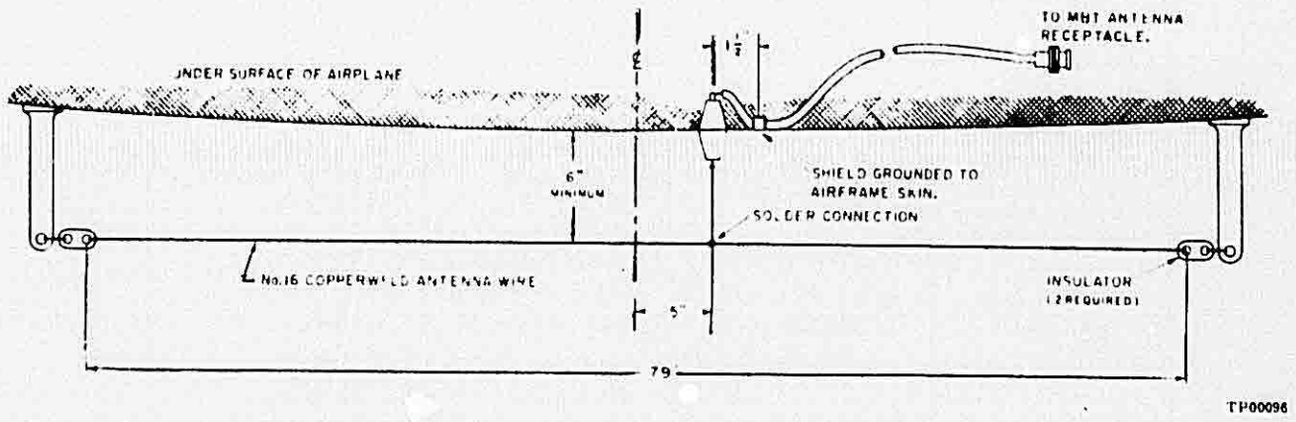


FIGURE 2-8. MARKER BEACON OFF-CENTER FED ANTENNA

SEE BLOW-UP

2.5 ELECTRICAL INSTALLATION

At this point each receive audio source shall have been assigned to a front panel switch and connector pin. If these assignments have not yet been completed, refer to Section 2.1, Introduction, and Table 2.1, Connector Pin Assignments. To further expedite installation decisions system schematics of the CP 136T have been included at the end of this manual for additional installation support (Figures 1-2 and 1-3).

Audio input potentiometers on receive, sidetone, intercom and paging inputs allow precise adjustment and proportioning of all audio levels. These potentiometers are factory set to the levels indicated in the Product Specifications Section. Initial adjustment of the pots was done during the Pre-Installation Bench Test. Final adjustments should be made in the aircraft with engine(s) running, refer to Pre-Flight Test section.

TABLE 2.1 CONNECTOR PIN ASSIGNMENTS

System Function And (Control Switch)	J101- Pin No.	Notes	System Function And (Control Switch)	J101- Pin No.	Notes
Power Connections (Audio Circuits)			Transmitter Connections		
Ground	7		Mike Jack Key, Tip	16	
Ground	8		Mike Jack Audio, Ring	R	
14/28V Phones	F	Refer to	HF Key	S	Refer to
14/28V Speaker	1	Section	HF Mike Audio	V	Section
14V Dimmer	P	2.5.1	HF Sidetone	20	2.5.2
28V Dimmer	C		Com 1 Key	15	
Receive Audio Input			Com 1 Mike Audio	U	
HF (SW 1)	K	Refer to	Com 1 Sidetone	19	
Com 1 (SW 2)	J	Section	Com 2 Key	14	
Com 2 (SW 3)	H	2.5.2	Com 2 Mike Audio	T	
Nav 1 (SW 4)	N		Com 2 Sidetone	18	
Nav 2 (SW 5)	E	Refer to	Marker Beacon		
ADF (SW 6)	D	Section	14/28V	23	Refer to Section 2.5.1
DME (SW 7)	24	2.5.3	O-M-I Dim	Y	Refer to Section 2.5.1
Unswitched	6	Decision height or other warning audio.	Antenna	CC	Coax Center Conductor
MKR Parallel (SW 8)	Z	Refer to Section 2.5.4	Antenna Ground	25	Coax Braid
Audio Output			Internal MKR Audio (SW 8)	Z	Refer to Section 2.5.4
14V Speaker	2		MKR Sensitivity	BB	
28V Speaker	3		MKR Test	AA	Do Not Wire
Cockpit Speaker	4	Refer to	White Lamp	17	To These
Speaker Input	5	Section	Amber Lamp	W	Pins
PA Speaker (SW 10)	B	2.5.6	Blue Lamp	X	
EXT Speaker (SW 10)	9		Lamp Common	21	
Headphones	13		MKR Audio Mute	22	
Low Level	A	Refer to Section 2.5.7	Intercom		
			Intercom 1	10	Refer to
			Intercom 2	11	Section
			Intercom 3	L	2.5.8
			Intercom 4	M	
			No Connection	12	

2.5.1 Power Connections

Figure 2-9 illustrates the power connections to the Audio Panel and Marker Beacon sections of the CP 136T. Pay particular attention to the required wire sizes, circuit breaker ratings, and use of three separate pins (J101-7, 8, and 25) for unit ground. Be sure the mounting hardware provides a good ground for the mounting tray.

Pilot lamps wired to the aircraft's dimmer bus will exhibit continuously variable intensity. MKR lamps, however, have one step dimming. Application of a voltage between 2 Vdc and 30 Vdc to the MKR Dimming input (pin Y) will cause the O-M-I lights to dim to preset intensity.

Figure 2-5 locates the one-half watt resistor that presets lamp intensity. To further dim the lights, remove this resistor and install a higher resistance resistor selected to yield the desired dimming. To increase the dimmed lights intensity, resistively shunt the installed resistor. Total resistor power rating must be one-half watt or greater. Dimming compensation should be done using the test equipment set-ups in Figure 2-4. Be sure to check the intensity of each light. Since the MKR TST mode defeats lamp dimming, generator modulation frequency must be changed to light each lamp.

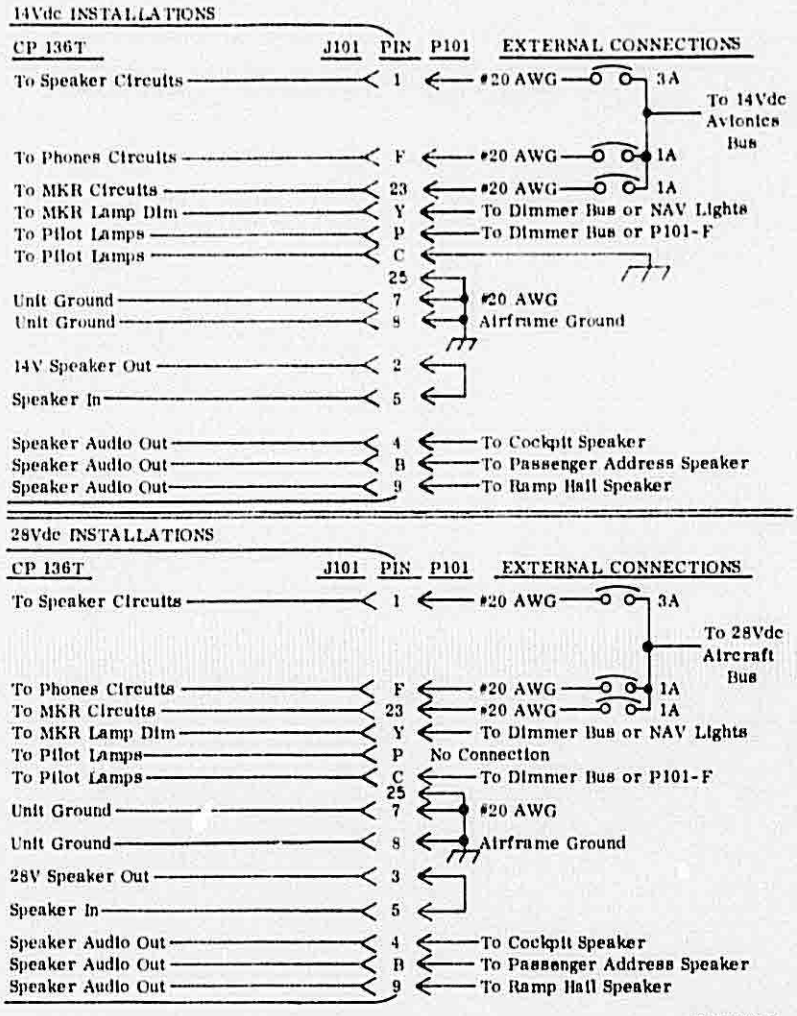


FIGURE 2-9. POWER AND SPEAKER CONNECTIONS

2.5.2 Transceiver Connections And HF Lock-Out

Up to three HF and/or VHF transceivers may be controlled by the CP 136T. Audio panel connections to a Narco COM 120 are shown in the systems drawings at the end of Section 1. Connections to a Narco COM 11 or COM 111 series transceiver are similar, however, the appropriate Installation Manual should be referred to before wiring. Audio input potentiometers should not require adjustment when using these transceivers.

Narco 1-1/2 systems (MK 12, MK 16, and MK 24) may be wired to the audio panel as shown in Figure 2-10. The COM/NAV is shown connected for C/N2 operation: C/N1 use requires equivalent connections. Audio input potentiometers may require adjusting in these systems.

All three sidetone inputs are adjusted by a single potentiometer. Large variations in sidetone levels between the transceivers, unless adjustable within the transceiver, will require external series resistors for equalization.

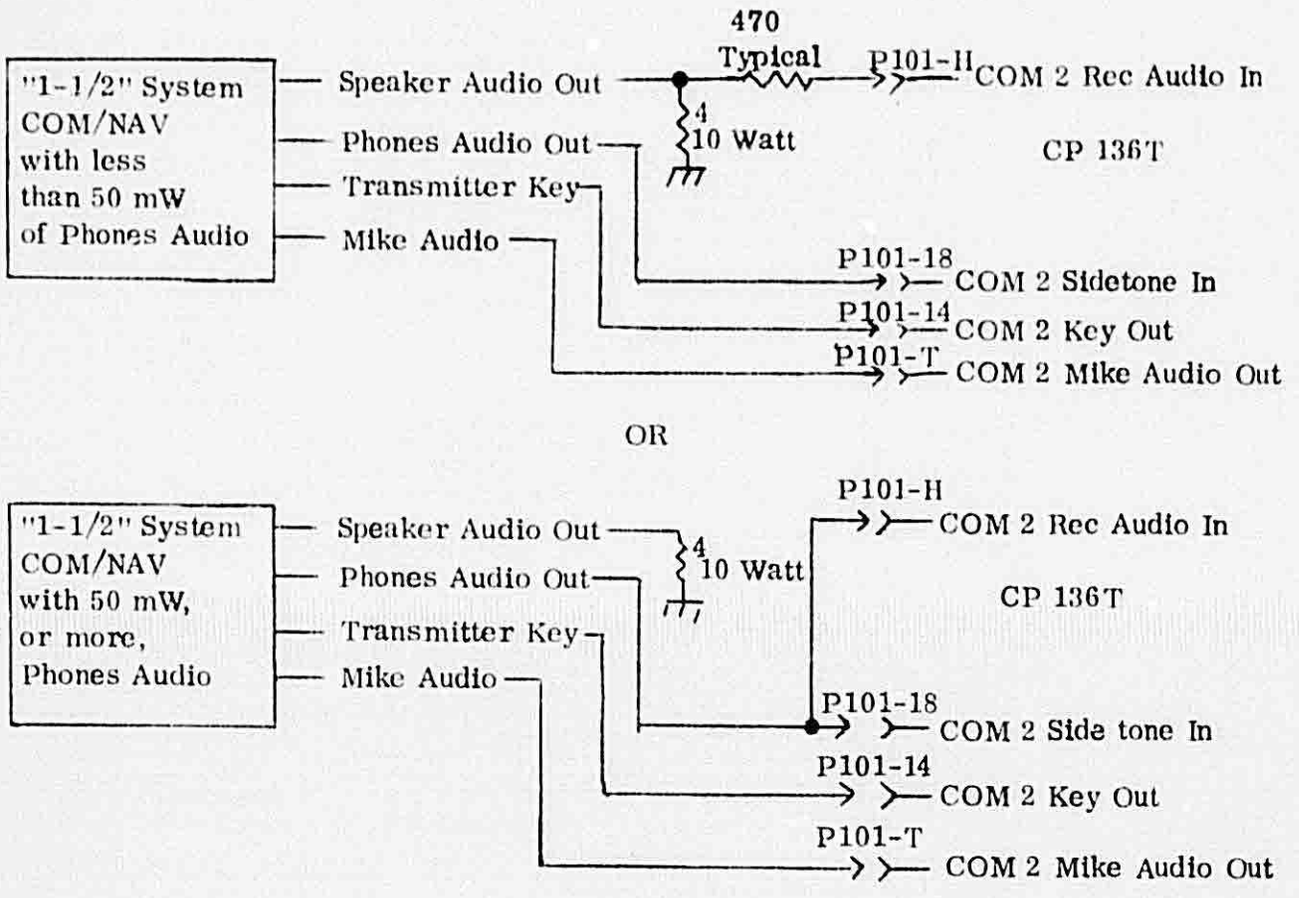


FIGURE 2-10. TYPICAL 1-1/2 SYSTEM INTERCONNECTIONS

2.5.2.1 Blanking Out the HF Function

In installations that do not have an HF transceiver, the letters HF should be blanked out from the Transmitter And Paging Switch (SW10) and the toggle switch (SW1) normally reserved for HF receiver audio selection (refer to Figure 2-1). Blank labels are provided in the Installation Kit for such purposes. In addition, the mechanical stop in the Transmitter And Paging Selector switch may be moved to eliminate the HF position by the following procedure:

Refer to Figure 2-11

1. Place the switch in the C1 position.
2. Remove the knob using a #2 Allen wrench.
3. Remove the trim panel by first removing the four flat head screws located on the panel sides and gently pulling the trim panel straight out. When removing the trim panel care should be taken not to disturb the position of the Marker Lamps.
4. Remove the switch mounting hardware using a 1/2" nut driver.
5. Slide the switch back from the panel; be careful not to break any wires attached to the switch.
6. To free the key ring hold the unit vertically, toggle switches pointing downward, and insert a sharp scribe in the key ring recess.
7. Place the key ring finger in the HF lockout aperture and reassembly the unit.
8. From the Installation Kit select two black, blank labels and cover the letters "HF" at receive audio and transmitter switches.

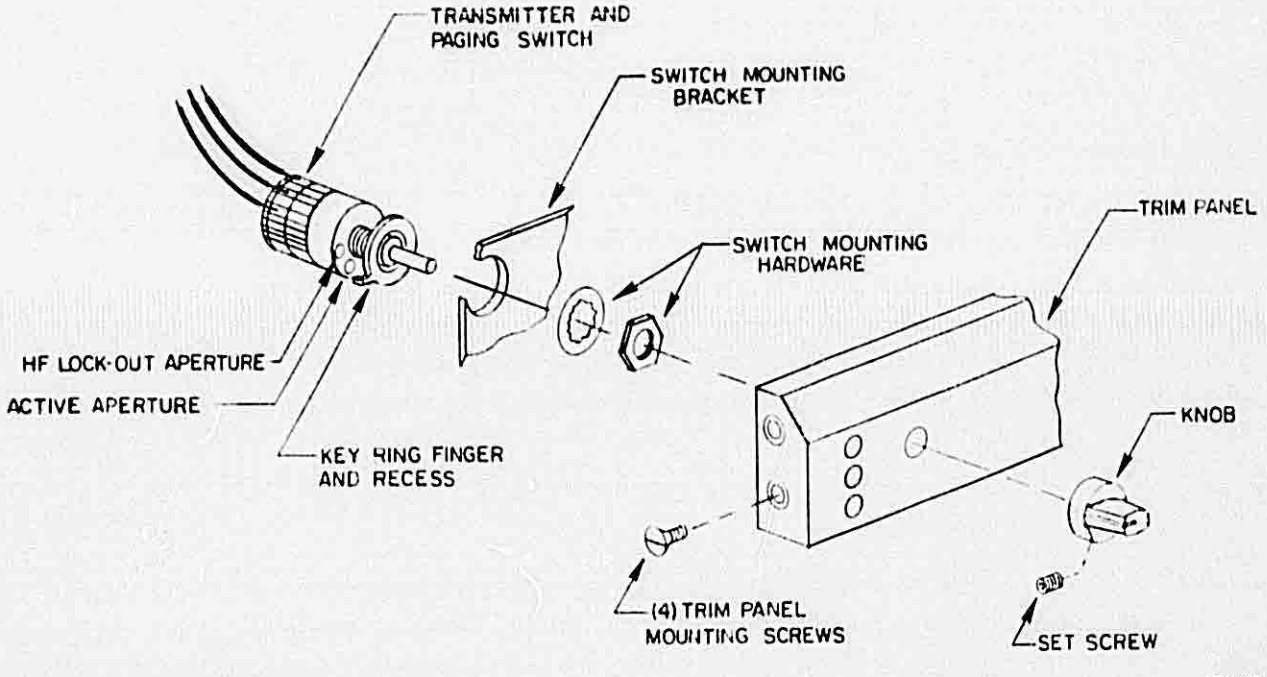


FIGURE 2-11. HF LOCK-OUT

2.5.3 NAV Receiver Audio Inputs

Four audio inputs are provided for navigation receiver audio. Typically these inputs are from NAV, ADF, and DME equipments. When these four inputs are used for dual NAV and dual ADF, for instance, DME audio may be combined with MKR audio as detailed in Section 2.5.4.

2.5.4 MKR Audio Input (P101-Z)

Audio from the built-in Marker Beacon is switched to the speaker or phones amplifiers by the MKR switch SW8 (refer to Figure 2-12). Another audio source, such as DME audio, may be combined with the MKR audio by connecting this second audio to J101-Z, MKR Audio In, (which could be referred to as a fifth Nav audio input). To prevent loading the internal MKR audio, and to proportion the external and internal audio levels, the second audio source should incorporate a series isolation resistor of not less than 1.5K ohms.

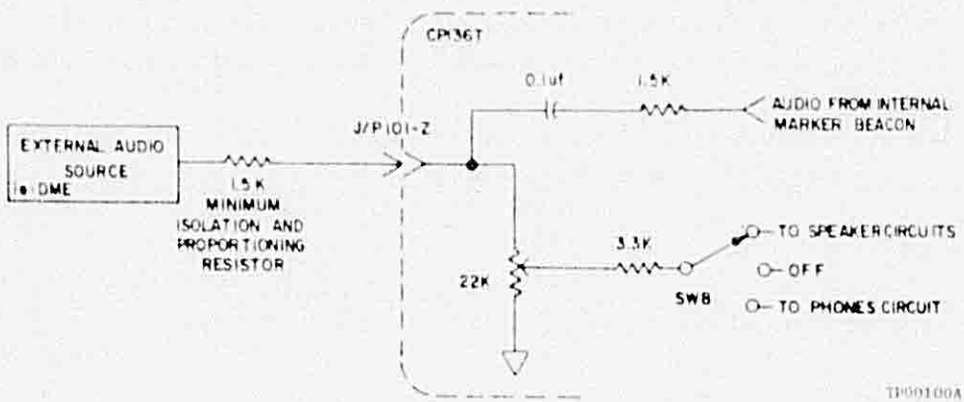


FIGURE 2-12. MKR AUDIO INPUT

A label is provided in the Installation Kit Label Set for [MKR / DME] use of the MKR switch. If the external audio source is a Narco DME 190, 190 TSO, or 195 the isolation resistor should be located within the DME's connector housing.

2.5.5 Sixth NAV Receiver Audio

If an HF transceiver is not part of the avionics system the HF input (P101-K) may be used as a sixth NAV receiver audio and activated by SW1.

In this case, the NAV audio is connected to P101 pin K and the HF position locked-out (refer to Section 2.5.2). Finalize this task by placing, from the Label Set, a black label over the Transmitter and Paging Selector's "HF" and the appropriate NAV label over the trim panel's "HF" (beneath SW1's toggle).

2.5.6 Speakers, Microphones, And Headphones

IMPORTANT

Speaker connections to P101 are dependent upon aircraft avionics bus voltage (14 or 28V). Figure 2-9 shows the proper connections.

Speaker voice coil terminals should not be grounded at the speaker. Shielded audio cable is used to interconnect CP136T and speaker with cable braid supplying a ground return from speaker to P101 pin 7 or pin 8.

Cockpit Speaker

The cockpit speaker should be a four ohm unit capable of handling 10 watts. When two speaker are located in the cockpit, eight ohm units connected in parallel are recommended.

Passenger Address Speaker

Four or eight ohm, 10 watt speakers may be used for Passenger Address. The CP 136T's internal PA potentiometer should be adjusted, while speaking into the aircrafts microphone, for rated power output or just into clipping. An L Pad should be connected to the PA speaker to control cabin audio volume.

Ramp Hail Speaker

The Ramp Hail speaker may also be a four or eight ohm unit and must be able to dissipate 10 watts. If a sixteen ohm speaker is used a four to sixteen ohm matching transformer is required. Usually mounted in a wheel well in a single engine aircraft or in the nose of twin engine aircraft, the speaker must be rugged, waterproof, and carefully mounted.

Microphones

Microphones should be of good aircraft quality as typified by the Narco M-700B. Where more than one microphone is used, all should be of a similar type (dynamic, carbon, etc.) producing similar output voltages. Several microphones, with variations in output voltage, will result in erratic transmitter modulation or intercom operation.

2.5.6 Continued

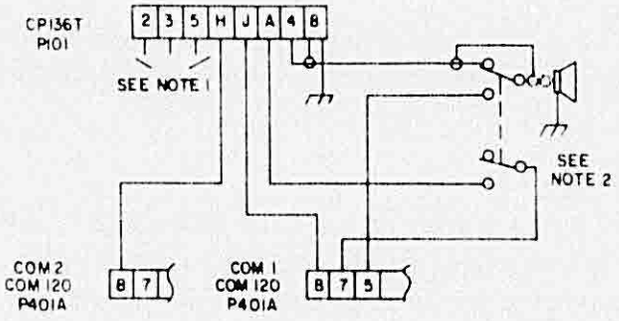
Headphones

Headphones should be of good aircraft quality with an impedance between 300 and 1000 ohms. Where more than one headset is used the total load to be driven by the CP 136T Phones Output should not be less than 150 ohms.

2.5.7 Redundant Speaker Amplifier

The CP 136T allows for an optional redundant speaker amplifier hook-up that utilizes the COM 1 high level amplifier. Should the Audio Panel's speaker amplifier fail, the high level amplifier in COM 1 will function as the cockpit speaker amplifier.

Narco COM 11 and COM 111 series transceivers as well as the COM 120 may be wired as shown in Figure 2-13. The double-pole, double-throw switch is mounted to the aircraft instrument panel. Label the switch to indicate its purpose.



NOTES: 1) 14V INSTALLATIONS - JUMPER P101-2 TO P101-5
28V INSTALLATIONS - JUMPER P101-3 TO P101-5
2) INSTRUMENT PANEL MOUNTED DPDT SWITCH SHOWN IN NORMAL POSITION, AUDIO PANEL SPEAKER AMPLIFIER IN USE.

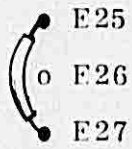
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FIGURE 2-13. REDUNDANT COCKPIT AMPLIFIER HOOK-UP

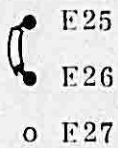
2.5.8 Intercom

Four Intercom microphone inputs are provided (P101-10, 11, L, and M). Microphone current is supplied to all four inputs with microphone audio driving the CP 136T's headphone amplifier circuits. The headphone amplifier is capable of driving a load impedance of between 150 and 1000 ohms.

As shipped, the Intercom inputs are muted during transmit. If desired, the jumper may be changed such that Intercom inputs are present during transmit. Refer to Figure 2-5 and the following detail.



MUTED



NOT MUTED

Figure 2-5 also locates the Intercom potentiometer. During the pre-installation bench test the intercom system should be operated with the microphones/headsets to be installed in the aircraft, and the Intercom potentiometer adjusted for the desired Intercom audio volume. Since all four inputs are simultaneously adjusted, all microphone/headsets should have similar operating and electrical characteristics.

Figures 2-14 through 2-16 present simplified intercom systems which may be used as a basis for designing a complete system.

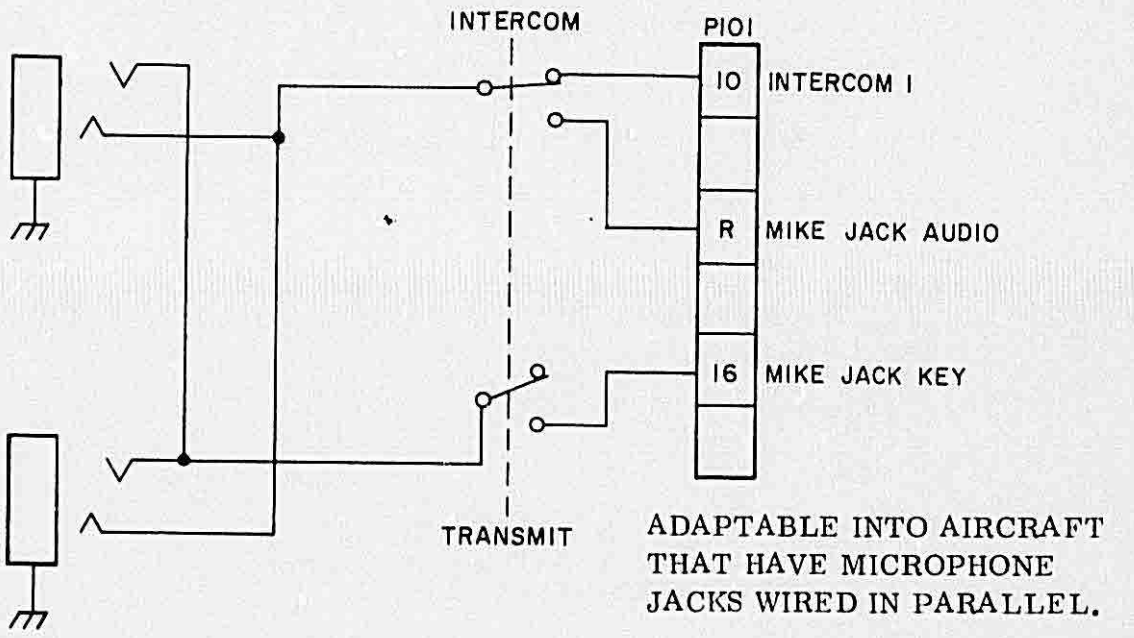
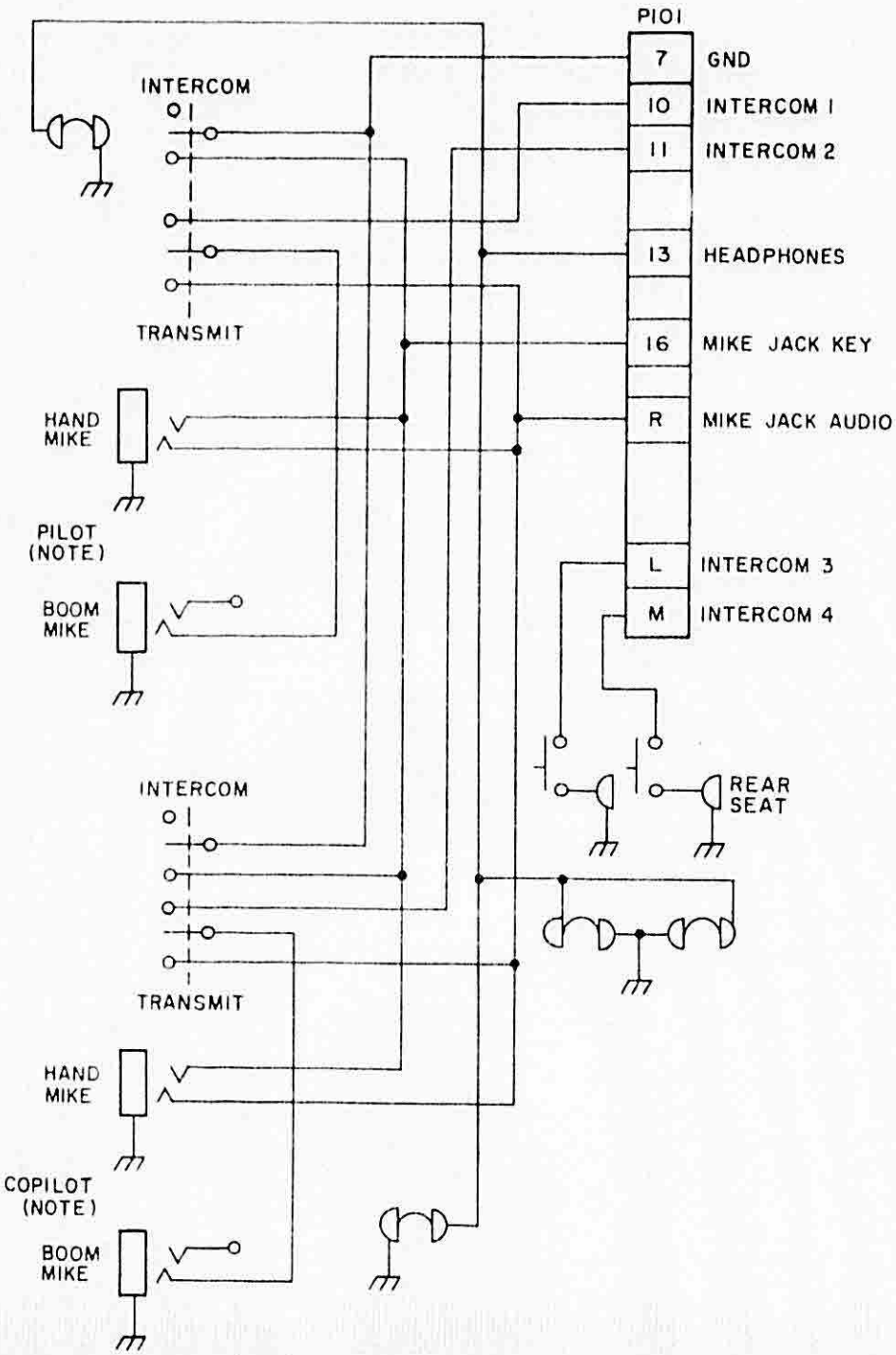


FIGURE 2-14. BASIC INTERCOM SYSTEM



NOTE: BOOM MICROPHONE OR HAND MICROPHONE CAN BE USED. HOWEVER, THERE WILL BE NO INTERCOM WHEN HAND MICROPHONE IS USED.

T100103

FIGURE 2-15. WHEEL PUSH-TO-TALK INTERCOM SYSTEM-FIXED WING

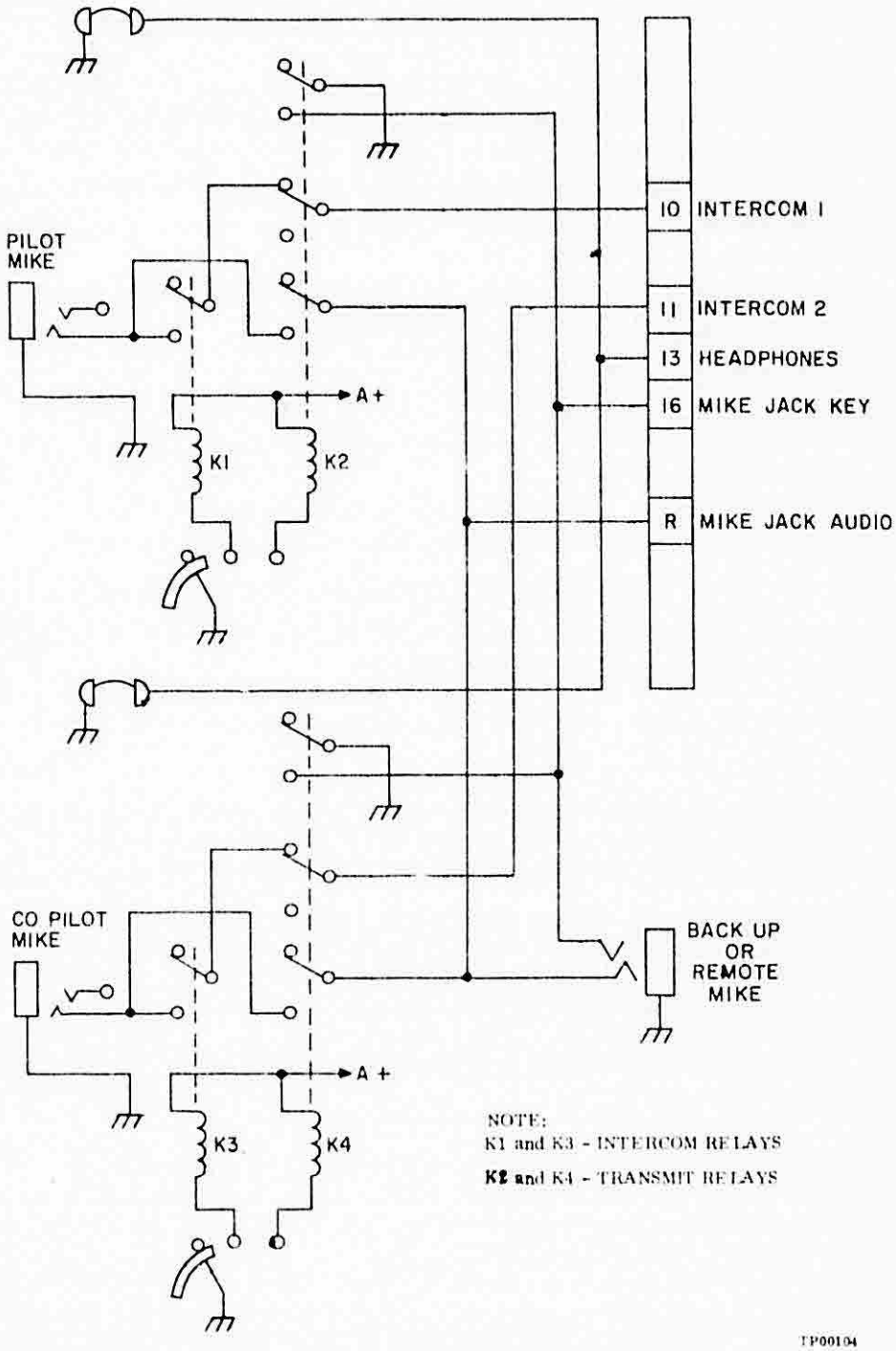


FIGURE 2-16. BASIC INTERCOM SYSTEM, HELICOPTER

2.6 POST INSTALLATION TEST

During this series of tests operate all possible interference generating aircraft equipment (rotating beacon, fuel pump, etc.), avionics pulse equipment, and run engine(s). Note any abnormal meter deflections, noise in the audio system, or other unusual occurrances.

The Pre-Installation Tests will have produced a known, working CP 136T, and if so tested, a functioning avionics system including interconnect cables. Some adjusting of the Audio Panels potentiometers may yet be necessary and, as noted previously, Figure 2-5 locates these components.

The first check is a thorough inspection of the installation to be sure all aircraft flight controls operate freely and with full travel or deflection.

2.6.1 Pre-Flight Tests (As Appropriate)

A. Transceivers

1. Set all audio panel toggle switches to their center OFF position.
2. a) Turn on the HF transceiver and tune to an available active channel.
   b) Rotate the audio panels Transmitter And Paging Selector to the HF position and set the HF toggle switch to Phones.
3. Transmit and receive: check receive audio, sidetone, and microphone connections.
4. Set HF toggle to Speaker: transmit and receive to check speaker audio.
5. Set HF toggle to center OFF.
6. In turn, perform steps 2 through 5 for C1 and C1 transceivers.
7. a) Set AUTO toggle to Phones
   b) Transmitter And Paging Selector is set to C2.
8. Transmit and receive; check receive audio.
9. Set AUTO toggle to Speaker and perform step 8.
10. In turn, perform steps 7 through 9 for C1 and HF transceivers.

B. NAV Receive And Unswitched Audios

1. In turn, turn on and select each NAV, ADF, DME and MKR audio source. Check both speaker and phones toggle positions. Where two audio sources are selected by a single toggle (example DME/MKR or NAV/MKR) check relative loudness of each source and if necessary proportion audio levels.
2. Activate or place in TEST mode radar altimeter or other audio source driving the Audio Panels Unswitched Audio input. Audio should be heard in speaker and phones.

C. Marker Beacon

1. Set MKR toggle (SW 8) to phones and hold the HI-LO-TST switch in the TST position. All three MKR lamps must light and a tone will be audible in the phones.

2. Set MKR toggle to speaker and hold the HI-LO-TST switch in the TST position. All three MKR lamps must light and a tone will be audible in speaker.

3. Set HI-LO-TST switch to LO. Using a ramp type Marker Beacon test set check that each O-M-I lamp lights brightly and MKR audio level is satisfactory.

O - Blue	400 Hz Modulation
M - Amber	1300 Hz Modulation
I - White	3000 Hz Modulation

4. Decrease test set output signal until white lamp dims.

5. Set MKR sensitivity toggle to HI: white lamp should glow brightly.

6. Turn on aircraft instrument lights. White MKR lamp must dim and Audio Panel nomenclature be evenly illuminated.

7. Turn off instrument lights.

D. PA and EXT

1. Rotate Transmitter And Paging Selector to PA, speak into the microphone, and check for adequate cabin speaker volume.

   Selected COM and NAV receive audio will be heard in the cabin speaker until the mike is keyed. An "L Pad" should be used to set cabin speaker volume.

2. Rotate Transmitter And Paging Selector to EXT, speak into the microphone and check for Ramp Hail audio.

   Selected COM and NAV receive audio will be heard in the ramp hail speaker until the mike is keyed. Rotate Transmitter And Paging Selector to C1.

E. Intercom

1. Activate Intercom system, speak into mike and check for adequate volume at each Intercom stations.

2. Perform step 1 at each Intercom station.

2.6.2 Flight Test

A flight test of the audio circuitry contained in the CP 136T should not be necessary if the pre-flight tests have been successfully completed. However, a flight test is recommended to perform the following checks and adjustments on the Marker Beacon Receiver.

A. Adjust receiver sensitivity in LO sensitivity mode.
B. Verify receiver performance in HI sensitivity mode.
C. Look for variations in receiver sensitivity due to various landing gear and flight control surface configurations.
D. Check for sufficient marker audio volume and lamp brilliance.

Receiver sensitivity has been factory-set for satisfactory performance with a standard Marker Beacon Antenna. Should further adjustment be required, refer to Figure 2-5 for the location of the RF SENSITIVITY control. Clockwise rotation increases the sensitivity, counterclockwise rotation decreases the sensitivity.

An in-flight Marker Beacon Receiver sensitivity test procedure follows:

1. Set receiver to LO sensitivity.
2. Fly at a known ground speed, 1000 feet AGL.
3. On localizer centerline, measure the time (in seconds) that the marker lamp remained lit.
4. Refer to Table 2.2 for correlation.

TABLE 2.2 LO SENSITIVITY LIGHT TIME AT 1,000 FEET (AGL)

GROUND SPEED, In Knots	LIGHT TIME, In Seconds	
	Minimum	Maximum
90	13	20
110	11	16
130	9	14
150	8	12

To calculate flight time for ground speeds other than those tabled:

$$\text{Minimum Light Time (Seconds)} = \frac{1775}{\text{Ground Speed in Knots}}$$

$$\text{Maximum Light Time (Seconds)} = \frac{1183}{\text{Ground Speed in Knots}}$$

2.7 AIRCRAFT LICENSE REQUIREMENTS

To certify the installation FAA Form 337 must be completed. In addition, weight and balance plus any operating limitations must be entered in the aircraft logbook. Refer to current Federal Aviation Regulations for any additional requirements.

Audio Panel weight and power requirements are provided in Section 1.3 Product Specifications. Installation Manual part number is located on the front cover, lower center.

3.1 AUDIO PANEL, OVERALL DESCRIPTION

The CP 136T audio panel accepts: aircraft communication and navigation audio signals, provides switching, combining, and isolation circuits. These circuits produce a phones output and a low-level audio output (see Section 2.5.7). The Unit also contains a speaker amplifier which produces an output for direct application to a cabin speaker(s).

The block diagram, Figure 3-1, shows the functional relationship of the various switching and amplifier circuits, and several associated circuits.

An unswitched alarm audio signal is applied by way of amplifier, U4, to the phones amplifier circuit of U4 and hence to the earphone jacks (J101-13) as well as to the speaker amplifier. Up to four intercom inputs can be applied to U4 by means of an internal combining network and Q1, the intercom isolation amplifier.

Input switching and combining circuits are employed to apply selected input signals to amplifier U4 which allows for:

(a) Audio from three COM transceivers to be selected
(b) Audio from two NAV receivers to be selected
(c) Audio from an ADF receiver to be selected
(d) Audio from both a DME and MKR to be selected

Note that any one or a combination of these input signals can be introduced to both the phones isolation amplifier (U4) and the speaker isolation amplifier (U5).

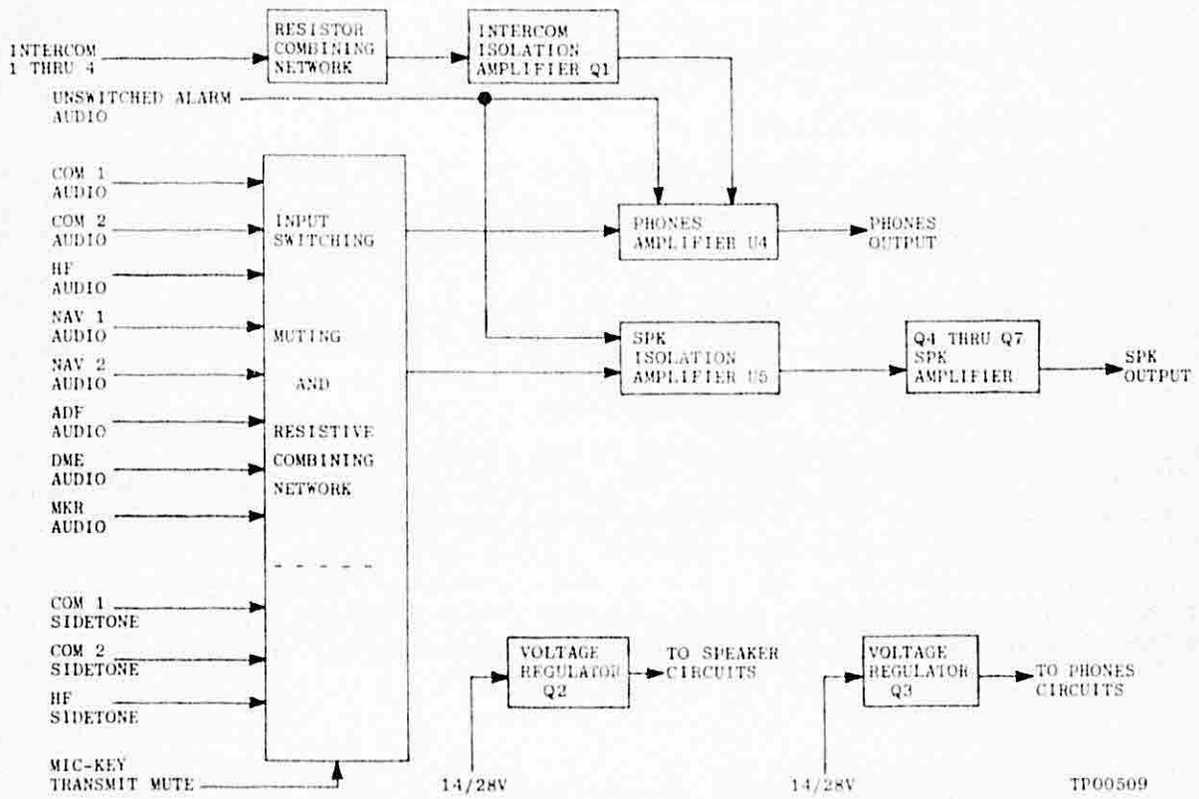


FIGURE 3-1. AUDIO PANEL, BLOCK DIAGRAM

3.1 Continued

In addition, the sidetone from the three COM transceivers is applied to amplifier U4 when the equipments are transmitting instead of receiving. Although these inputs are shown separately, for functional reasons, the COM 1 receive audio and COM 1 sidetone are selected by a single switch (COM 2 and COM 3 circuits are identical).

CP 136T's speaker amplifier, Q4, Q5, Q6, and Q7 is self contained. The amplifier is fed audio signals from the speaker isolation amplifier U5. Note that the unswitched alarm signal is also applied to the speaker isolation amplifier.

Audio select switches SW1 (HF), SW2 (COM 1), and SW3 (COM 2) control U1, U2A, and U2B which are quad analog switches. U2C and U2D are used to mute the phones and speaker audio inputs and U3A, B, and C steer the sidetone and intercom audio to the phones amplifier.

Two voltage regulators Q2 and Q3 are used to provide regulated A+ to the various transistors and IC's. Each regulator is supplied from a separate source. Q2 provides A+ to the speaker switching and speaker amplifier while Q3 provides A+ to the phones switching and phones amplifier.

3.2 AUDIO PANEL, DETAILED CIRCUIT DESCRIPTION

Refer to Figure 6-1 and Figure 3-1 as applicable.

3.2.1 Unswitched Audio

The unswitched audio input which may be an alarm signal such as loss of helicopter rotor power, is applied by way of R43 and C20 to U4's input, pin 2 and thru C21 to U5's input, pin 2. The input level of this signal can be adjusted by means of R10.

3.2.2 Intercom Amplifier

A number of intercom inputs, from one to four, are combined by means of a resistive network and applied, via C3 and R9, to the base of Q1. The intercom input level is adjusted by R9. The output of Q1 is applied thru U3C (the intercom mute select) to Q4's input pin 3, the phones amplifier. The output of U4 (pin 6) is transformer coupled to the earphone jacks by way of a phones output terminal.

3.2.3 Input Switching And Combining

Toggle switches SW1 thru SW8 and associated combining circuits permit selection of HF, COM 1, COM 2, NAV 1, NAV 2, ADF, DME, and MKR input signals. Level setting potentiometers (R1 thru R8) are provided for each input and common lines apply the signal to either U4 the phones amplifier or U5 the speaker isolation amplifier. Switches SW1 thru SW8 are single-pole single-throw, center off switches, and are used to control the quad analog switching IC's.

3.2.3 Continued

SW10 is a five position rotary switch with six sections, A thru F. Sections A and B are connected to SW9 the auto-com switch. When the auto-com switch (SW9) is placed in the up position (SPK) A+ is applied thru R58 to the MIC select switch SW10A. With the MIC select switch (SW10) in the COM 1 position analog switch U1C is turned on allowing COM 1 audio to pass thru to the speaker isolation amplifier U5 and on to the speaker amplifier circuit. Note that this overrides the COM 1 audio select switch. Auto-com can be selected on either speaker or phones and can be used with COM 1, COM 2, and HF.

SW10 section C is used to select the sidetone of the transmitter in use. This signal is applied thru R60 and C32 to U3B. With U3B turned on, the signal is applied thru R42 and C18 to the input terminal of U4 and the phones amplifier.

SW10 section D is used to steer the mic jack audio to the selected transmitter.

SW10 section E is used to steer the mic jack key to the selected transmitter. It also provides a ground to CR7 and CR8 which activates U2C and U2D muting the phone and speaker amplifiers.

3.2.4 Speaker Amplifier

The speaker amplifier is capable of producing 10 watts across a 4 ohm load with the standard 3.5 volts rms on any receiver input terminal. The first stage, Q4 is a voltage amplifier, the output is developed across the primary of T2 whose secondary feeds Q5 and Q6. Transformer T3 couples the output of Q5 and Q6 to the external load. Transformer T3 has two output terminals; one is used when the primary input power is 14 volts, the other when it is 28 volts.

R13 is used to adjust the bias for the push-button stages Q5 and Q6 and R15 is used to adjust the amplifier for the proper power output.

3.2.5 Voltage Regulators (Q2, Q3)

There are two identical voltage regulator circuits; Q3 and its associated components are dedicated to the phones while Q2 and its counterparts are dedicated to the speaker amplifier and speaker(s). Each circuit is fed from a separate A+ input.

The transformer (Q2/Q3) functions as a series regulator whose base is held constant by the Zener diode. The circuit is protected from surge voltages by a second Zener diode.

3.3 MARKER BEACON RECEIVER, PURPOSE AND OVERALL DESCRIPTION

3.3.1 Purpose Of Marker Beacon

The Instrument Landing System (ILS) requires three separate radio navigation signals to define the glide path a pilot is to follow during his approach to a runway. The glide path is defined vertically by the glide slope signal and horizontally by a localizer signal. At the intersection of the localizer and glide slope signals lies the glide path as shown in Figure 3-2. Specific points along the glide path are located by the marker beacons. Table 3-1 explains some of the marker beacon characteristics.

Marker beacons are also used as Low Frequency Range Station locators as well as Fan Markers for radio range courses and specific points along airways. The marker beacon signal is a 75 MHz rf carrier that is amplitude modulated 95% by either 400, 1300, or 3000 Hz subcarriers. Recognition of outer, middle, and inner markers is by means of the modulation frequency and audio code described in Table 3.1. For further information on Instrument Landing Systems, refer to the Airman's Information Manual, published by the FAA.

TABLE 3.1. ILS MARKER BEACON CHARACTERISTICS

MARKER	LAMP COLOR	AUDIO TONE	CODE	TRANSMITTER LOCATION
Outer	Blue	400 Hz	2 Dashes/sec	4 to 7 miles from end of runway at glide path intercept
Middle	Amber	1300 Hz	Alternate dots	Approximately 3500 feet from landing threshold
Inner	White	3000 Hz	Continuous dots	Located to define decision height (DH) point between middle marker and landing threshold

TP00508

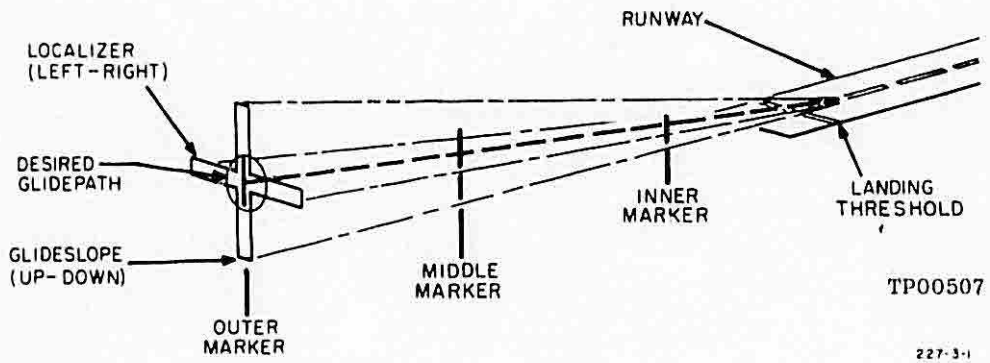


FIGURE 3-2. APPROACH GLIDE PATH

3.3.2 Overall Description

The block diagram, Figure 3-3, shows the functional relationship of the Marker Beacon Receiver circuits and associated test and dimmer circuits. The basic 75 MHz superheterodyne receiver consists of transistor mixer and crystal oscillator circuits, and an IC that includes IF amplifier, detector and audio preamplifier circuits. A three section audio filter provides either 400, 1300, or 3000 Hz signals, when received, to audio amplifiers and lamp drivers to light the appropriate marker indicator. The combined audio is also applied to the Audio Panel for routing to phones and speakers. A test tone of 1000 Hz can also be applied to this audible line. A voltage regulator provides +9.5 volts to all transistor and IC circuits. A dimmer circuit reduces indicator brilliance for use at night.

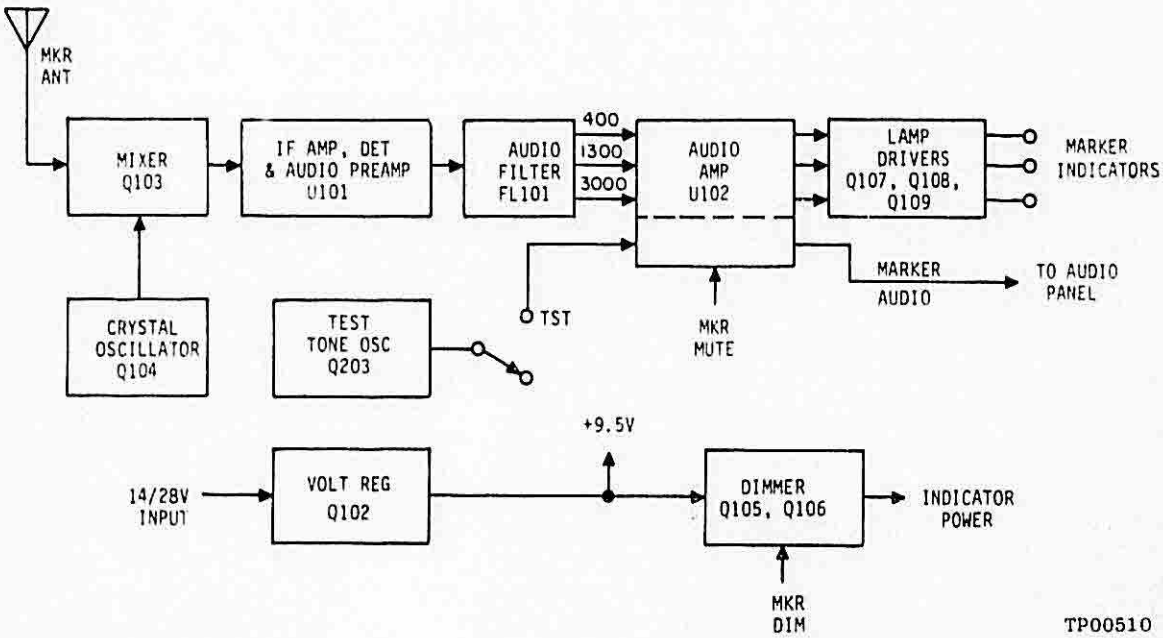


FIGURE 3-3. MARKER BEACON RECEIVER, BLOCK DIAGRAM

3.4 MARKER BEACON RECEIVER CIRCUITS, DETAILED DESCRIPTION

Refer to Figure 6-2.

3.4.1 Mixer And Crystal Oscillator

The 75 MHz marker signal is fed from the marker antenna through low pass filter L105, which attenuates signals of 100 MHz and above, to resistor R137. Since marker beacon antennas vary widely, R137 is provided to adjust the receiver rf sensitivity. Following R137 is a double tuned high side coupled, hi Q, 75 MHz filter. RF output from the filter is routed to the mixer, Q103.

The second input to the mixer is from local oscillator, Q104. This crystal-controlled 64.3 MHz modified Colpitts oscillator is more commonly known as a Pierce oscillator. Regenerative feedback is established by C122, C123 and C125; output energy is coupled from the Q104 collector through C121 to mixer Q103.

Local oscillator energy from Q104, at 64.3 MHz, is mixed with an incoming 75 MHz signal by Q103 to derive the 10.7 MHz IF signal. Optimum cross modulation and intermodulation performance is obtained by fixed biasing (R123, R124, R127) the mixer.

The mixer output signal is filtered by FL102, then coupled by C113 to U101 pin 2. Monolithic crystal filter FL102 provides most of the IF selectivity with L101 tuned to produce the proper IF bandpass.

3.4.2 IF Amplifier, Detector And Audio Preamplifier

U101 is a monolithic integrated circuit supplying the following circuits: two stage of IF amplification (pin 2 to pin 3 and pin 4 to pin 6); one stage of IF amplification and AM detection (pin 8 to pin 9); audio preamplification (pin 14 to pin 15); and a buffer amplifier providing delayed AGC to pin 13. Transformers T101 and T102 increase selectivity, provide impedance matching between IF stages, and are simply tuned for a peak. In the HI sensitivity mode, U101 provides approximately 30 dB of IF gain and 8 dB of audio gain.

Selection of HI or LO sensitivity is through control of the bias on CR106. In the LO sensitivity mode CR106 is forward biased, through R143 and R144, to shunt a portion of the IF signal to ground. LO mode sensitivity is adjusted by R136. Placing the front panel sensitivity switch (HI, LO, TST) in the HI position grounds the junction of R143 and R144 which removes bias from CR106 to open the shunt signal path and increase sensitivity.

3.4.3 Audio Circuits

Audio from the preamplifier is routed from the junction of R117 and R122 to FL101, pin 1, which is a three section, bridged T filter. Manufactured with thick film techniques, FL101 contains three filters, one for each of the marker modulation frequencies (400, 1300 and 3000 Hz). FL101 and U102, a quad op amp, provide audio gain only at the marker modulation frequencies, with negative feedback, and consequent attenuation, occuring at all other frequencies.

3.4.3 Continued

Marker audio from pin 13 of the audio filters is amplified by one section of U102 and is routed from U102-9, through C138 and R152, to R8 (refer to Figure 6-1) at the MKR audio input terminal of the Audio Panel. By placing SW11 in the TST position, test oscillator Q101 is turned ON and furnishes a 1000 Hz test tone via C139 and R151 to U102-8.

Muting of the marker audio is accomplished by momentarily depressing the front panel MKR MUTE pushbutton SW12 which discharges C108 through R106, thereby biasing OFF the audio amplifier portion of U102. Before audio can be fully restored, C108 must be charged through R107, which requires 10 to 14 seconds.

Audio muting serves to remove or turn OFF the marker beacon audio for a period of approximately 10 to 14 seconds. This time period is long enough to allow the MKR audio to remain muted as the aircraft passes over a marker beacon transmitter, yet is short enough to permit reactivation of the MKR audio before the next marker beacon is reached. Thus the audio can serve as an alert, then muted, and the lamps monitored.

3.4.4 Lamp Drivers

Since the three lamp driver circuits are similar, only the amber Q107 driver (1300 Hz) will be discussed. Q107 is a Darlington transistor which, when there is no received signal, is biased below cut-off (reverse bias) by R128, diodes CR107 and CR102, and the action of the front panel HI, LO, TST switch (SW11). A receive signal with 1300 Hz modulation results in the audio from U102 pin 4 being rectified by CR105 and then filtered by C129 and R133. The resulting dc voltage is sufficient to turn-on (forward bias) Q107, illuminating the amber indicator DS6.

3.4.4.1 Dimming Control

Lamp dimming is provided by Q105 and Q106, MKR DIM terminal Y is wired to the aircraft's instrument light bus. In the daytime or no dimmed mode, Q105 is cut-off by the absence of a base voltage to forward bias its base-emitter diode and CR102. Since Q105 is cut-off, Q106 is saturated by current flow through R135. The voltage drop across Q106 is now approximately 0.3 volts dc and the marker lamp will be fully lit. When the instrument lights are turned ON, Q105 is saturated, cutting off Q106. Supply current for the marker lamps must now flow through R139 and the resulting voltage drop dims the lamp.

3.4.4.2 Test Switch Operation

The HI, LO, TST switch SW11 can be set to the TST position to test the lamps. This switch defeats the dimming circuit and also saturates all three lamp driver transistors. Assuming the marker lamps are dimmed, selecting the TST position disconnects CR102 from ground, cutting off Q105 and saturating Q106 to increase the lamp supply voltage. (If the marker lamps were not dimmed, Q105 would simply remain cut off). Also, the lamp drivers Q107, Q108, and Q109 are saturated since the bias established by R128, CR107, CR102, and SW11 has been removed by opening SW11. For example, the Q107 bias is now established by R128, R132/146, CR105 and R133 and is sufficient to saturate the transistor. Since all three drivers are similarly biased, all three lamps are lit.

3.4.5 Voltage Regulator

An 11 to 30 volts dc input at terminal 23 is routed to series pass voltage regulator, Q102. The voltage reference for the regulator is a 10 volt zener diode which, with the base-emitter drop of Q102, yields a 9.5 volt regulated supply. Most circuits are supplied directly from the emitter of Q102. More critical circuits which require less ripple or additional isolation are supplied from the junction of R109 and C109.

4.1 INTRODUCTION

This section provides instructions for troubleshooting and corrective maintenance of the CP 136T Audio Panel. The contents of the section includes troubleshooting in the aircraft, alignment, and component replacement instructions.

The suggested approach to maintenance through the use of these instructions is as follows. The Electrical Bench Test of Section 2.2.2 exercises all the functions of the Audio Panel and Marker Beacon Receiver circuits, and the input and output values given there permit evaluation of the performance of the equipment. If the performance is marginal, the alignment procedures of Section 4.3 should be performed.

Failure of a function can be localized to a circuit or group of circuits through the use of the bench test procedure or the troubleshooting charts in Sections 4.4 and 4.5. Finally, voltmeter and ohmmeter measurements in the faulty circuit, with the aid of the appropriate schematic, can be made to find a faulty component.

4.2 TEST EQUIPMENT AND TOOLS REQUIRED

Test equipment required to perform the troubleshooting, alignment and adjustment procedures in this section is listed in Table 4.1. The characteristics and nomenclature of suggested test equipment is given, but other equipment with equivalent characteristics may be used.

Suggestions for the fabrication of a test cable are given in Section 2.2.2.

4.3 ALIGNMENT

4.3.1 General

The Audio Panel requires no alignment, but does have audio level adjustments. The replacement of transistors, an IC, or associated components may call for readjustment of related potentiometers. Audio potentiometers are shown in Figure 4-1. Level adjustment can be accomplished by referring to the appropriate part of Section 2.2.2.2 which gives audio test procedures and input/output specifications. If the specifications are not met, the related potentiometer is adjusted to obtain the proper results.

The Marker Beacon Receiver circuits may require alignment if the test procedures of Section 2.2.2.2 J or troubleshooting tests reveal poor performance, or if IC's, transistors, or associated components are replaced. Alignment of RF and IF circuits consists of peaking five resonant circuits, tuning a single inductor for proper IF response, and adjusting the RF and IF sensitivity potentiometers. Step-by-step procedures for performing these tuning adjustments are given in Section 4.3.2.

TABLE 4.1. TEST EQUIPMENT REQUIRED

TYPE	CHARACTERISTICS	NOMENCLATURE
VHF Signal Generator	Frequency Range: 10 to 400 MHz Modulation: AM, 0 to 95% RF Output: 1 to 500,000 microvolts Output Impedance: 50 ohms	Hewlett Packard Model 608D
Audio Signal Generator	Frequency Range: 400 to 3000 Hz Distortion: 1% maximum	Hewlett Packard Model 200 CD
Frequency Counter		Hewlett Packard Model 5246L with Prescaler Plug-In Model 5252A
Regulated DC Power Supply	Voltage Range: 0 to 30 volts Current Range: 0 to 2 amperes	Power Design Model 3650
AC VTVM		
RF Voltmeter		Boonton Model 91 CAR
Speaker Load Box	Power Capability: 15 watts	
6 dB Pad		
Audio Wattmeter		General Radio Model 583A
Ramp Test Set	Frequency: 75 MHz Modulation: 400, 1300 and 3000 Hz	Tel Instrument Model T18A
Ramp Checker		IFR-401L

TP00512

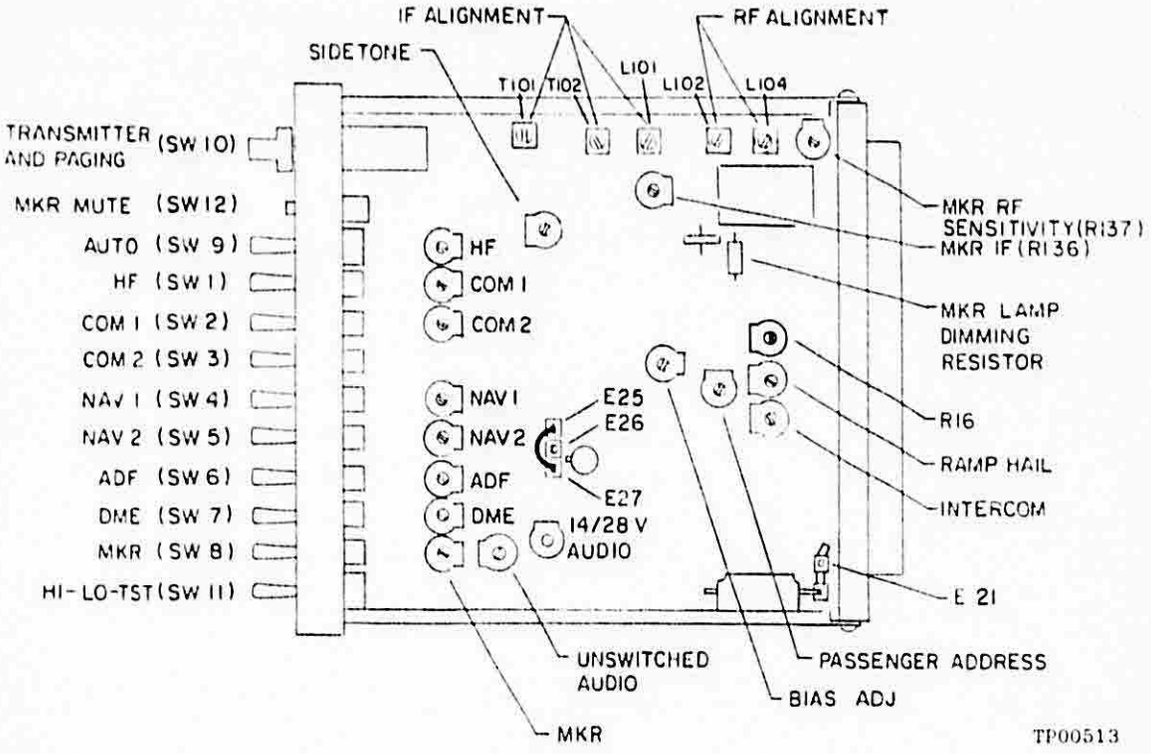


FIGURE 4-1. AUDIO INPUT LEVEL AND MARKER SENSITIVITY CONTROLS

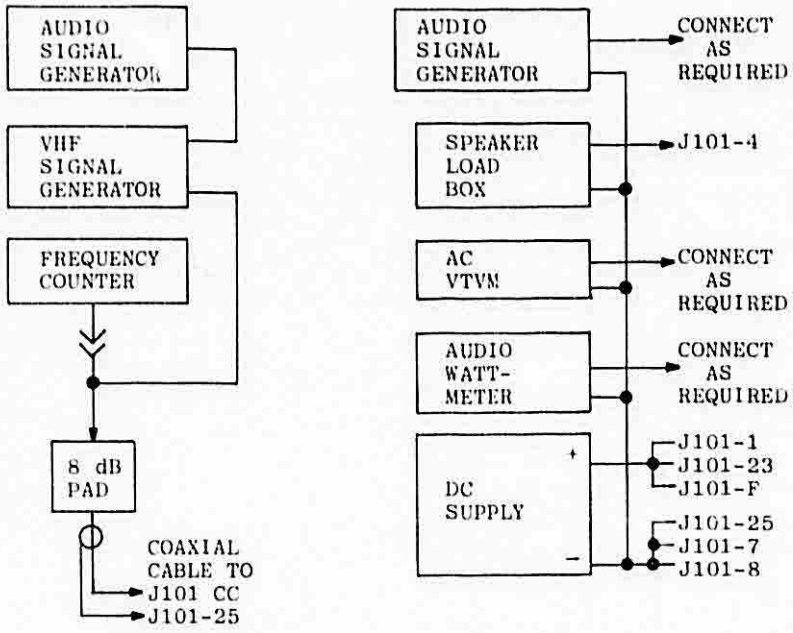
4.3.2 Marker Beacon Receiver Alignment

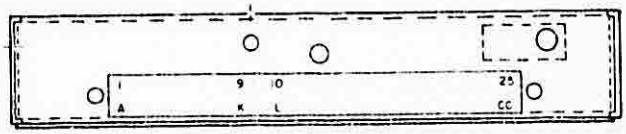
4.3.2.1 RF And IF Alignment

a. Connect test equipment as shown at the left of Figure 4-2 and apply power.
b. Set the rf signal generator to 75 MHz ±1 kHz; adjust 1.3 kHz modulation to 95%.
c. Rotate MKR volume potentiometer (R8) maximum clockwise; set sensitivity to HI.
d. Increase generator rf output level until the audio wattmeter indicates 1.0 milliwatt (0.71 volt rms).
e. Peak L101, L102, L104, T101, and T102 for maximum MKR audio output (J101-Z).

NOTE

As audio output increases, reduce generator rf output to maintain a 1.0 milliwatt audio level.





REAR VIEW

P101

MKR GROUND	25	CC	MKR ANTENNA
DME IN	24	BB	MKR SENSITIVITY
MKR 14/28V IN	23	AA	MKR TEST
MKR MUTE	22	Z	MKR AUDIO IN
MKR LAMP COMMON	21	Y	MKR DIM
HF SIDETONE	20	X	MKR LAMP-BLUE
COM 1 SIDETONE	19	W	MKR LAMP AMBER
COM 2 SIDETONE	18	V	HF MIC
MKR LAMP-WHITE	17	U	COM 1 MIKE AUDIO OUT
MIKE JACK KEY	16	T	COM 2 MIKE AUDIO OUT
COM 1 KEYOUT	15	S	HF KEY
COM 2 KEYOUT	14	R	MIKE JACK AUDIO
PHONES OUT	13	P	14V DIM
SPARE	12	N	NAV 1 IN
INTERCOM 2	11	M	INTERCOM 4
INTERCOM 1	10	L	INTERCOM 3
EXT.SPKR	9	K	HF
GROUND	8	J	COM 1 IN
GROUND	7	H	COM 2 IN
UNSWITCHED AUDIO	6	F	14/28V IN
*SPKR IN	5	E	NAV 2 IN
CABIN SPKR	4	D	ADF IN
*28V SPKR OUT	3	C	28V DIM
*14V SPKR OUT	2	B	PA SPKR
14/28V IN	1	A	LOW LEVEL OUT

*JUMPER J101-2 TO J101-5
IN 14V INSTALLATIONS
JUMPER J101-3 TO J101-5
IN 28V INSTALLATIONS

TP00514

FIGURE 4-2. BENCH TEST SET-UP

4.3.2.2 Bandwidth Check And Adjustments (Figure 4-3)

a. Set the rf generator output level to produce 1.0 milliwatt of MKR audio output (J101-Z). Note the generator setting.

b. Increase the generator rf output level 6 dB.

c. Carefully reduce rf generator frequency until MKR audio output is 1.0 milliwatt; measure and record this frequency. Return generator rf output to that level in step b.

d. Slowly increase rf generator frequency, crossing center frequency, until MKR audio output is again 1.0 milliwatt; measure and record this frequency.

e. Specifications:

6 dB bandwidth/75 MHz	:	minimum ±10 kHz
		typical ±14 kHz
		maximum ±18 kHz
peak to valley	:	1 dB maximum

NOTE

If specifications are met, delete steps f through h; if not, proceed to step f.

f. Set rf generator frequency to 75 MHz ±1 kHz. Set rf generator output level to produce 1.0 milliwatt of MKR audio output.

g. Rotate L101 core 1/2 turn (180°) clockwise; audio output should decrease approximately 3 dB.

h. Perform steps a through d.

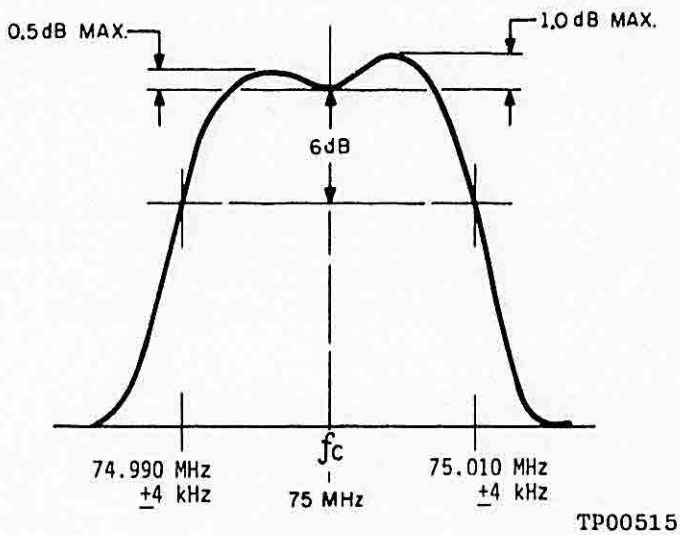


FIGURE 4-3. IF AMPLIFIER BANDPASS CURVE

4.3.2.3 HI Sensitivity Adjustments

a. Set rf generator frequency to 75 MHz ±1 kHz, modulation 1300 Hz at 95%, and rf output level to minimum.

b. Set MKR to HI sensitivity.

c. Using a jewelers straight slot screwdriver with a 1/16 inch blade width, adjust rf sensitivity control (R137) fully clockwise for maximum sensitivity.

d. Increase generator rf output to just begin to light the amber lamp; 100 microvolts is typical for lamp threshold.

e. Rotate R137 maximum counterclockwise.

f. Increase generator rf output to 400 microvolts.

g. Rotate R137 clockwise to just begin to light the amber lamp.

4.3.2.4 LO Sensitivity Adjustments

a. Switch MKR to LO sensitivity.

b. Rotate IF sensitivity control (R137) counterclockwise for minimum sensitivity.

c. Increase generator output to just begin to light the amber lamp.
Specification: 8,000 microvolts minimum for lamp threshold.

d. Reduce generator output to 2,000 microvolts. Rotate R136 clockwise to just begin to light the amber lamp.

e. Specification: 2,000 microvolts for lamp threshold.

4.4 IN AIRCRAFT TROUBLESHOOTING

The purpose of troubleshooting in the aircraft is to determine whether a fault is in the suspect equipment, in associated equipment, or in connections to or between equipments, including primary power and input/output signal connections. Interconnect wiring diagrams for 14V and 28V aircraft are shown in Figures 1-3 and 1-4. Connector pin assignments are provided in Table 2.1.

4.4.1 Audio Panel

Table 4.2 is provided to aid in checking the CP 136T in the aircraft by means of its front panel controls and associated input and output equipment. If the fault is simply differences in audio levels from associated equipment, adjustment can be performed in the aircraft; refer to Figure 2-5.

4.4.2 Marker Beacon Receiver Circuits

Figure 4-4 is provided to aid in checking the Marker Beacon Receiver circuits in the aircraft. A ramp type marker beacon test set such as Tel-Instrument Model T18A may be used as a signal generator. Be sure that the Ramp Test Set Antenna is close to the marker beacon antenna.

TABLE 4.2. AUDIO PANEL IN-AIRCRAFT TROUBLESHOOTING CHART

STEP	TEST PROCEDURE	PROBABLE CAUSE OF MALFUNCTION
	COM UNIT	
1.	Set COM 1 Unit to TST (test)	If background noise is heard from either COM 1 or COM 2, but not both, the fault is most likely in the COM receiver that did not provide background noise or in the COM/CP interconnect wiring.
2.	Set CP 136T, toggle C1, to SPEAKER (up)	
3.	Background noise should be heard in speaker	
4.	Set COM 1 Unit to OFF - CP toggle C1 to OFF (center)	
5.	Set COM 2 Unit to TST	
6.	Set CP 136T, toggle C2, to SPEAKER (up)	
7.	Background noise should be heard in speaker.	
8.	Set CP 136T, toggle C2, to OFF (center)	If background noise is not heard from either COM 1 or COM 2, the defect is most likely in the CP 136T or the COM/CP interconnect wiring such as A+, ground, etc.
9.	Repeat steps 1 to 8, however, now CP 136T, toggles C1 and C2, to PHONES (down).	
10.	Set COM 2 to OFF.	If the COM's transmit light does not come ON and vary in intensity, the fault is likely to be in that Unit that does not light or in the COM/CP interconnect wiring.
11.	Set COM 1 to ON, channel to Tower, Unicom, or Ground Control.	
12.	Set CP 136T, toggle AUTO, to SPEAKER and selector rotary switch to C1.	
13.	Key the transmitter, observe that the transmit light on COM 1 lights and flickers during your transmission. Also monitor sidetone in headset.	
14.	In a like manner repeat steps 11 to 13 for COM 2 (rotary selector is set to C2).	

TABLE 4.2. AUDIO PANEL IN-AIRCRAFT TROUBLESHOOTING CHART
(Continued)

STEP	TEST PROCEDURE	PROBABLE CAUSE OF MALFUNCTION
	NAV UNIT	
1. 2. 3. 4.	Set up an IFR-401L Ramp Checker, or equivalent, as described in the Operator's Manual for that equipment. Modulate the Ramp Checker with the 1020 Hz Ident Tone. Set the CP 136T, toggle switch N1, to SPKR position. Listen for the 1020 Hz tone in the speaker and headphones. Turn the N1 toggle switch OFF (center). Turn the N2 switch ON (up). Listen for the 1020 Hz tone in the speaker and headphones.	If either the N1 or N2 fails to provide receive audio, the fault is most likely in that NAV unit or in the audio connections between the NAV unit and the Audio Panel. If neither NAV provides receive audio, the fault is most likely in the Audio Panel.
	ADF UNIT	
1. 2. 3. 4. 5.	Tune the ADF to a local AM broadcast station. Set the CP 136T, ADF toggle switch, to SPKR position. Listen for receive audio in the speaker. Switch the ADF to PHONES position. Listen for receive audio in headphones.	If the ADF fails to provide receive audio, the fault is most likely in the ADF unit or in the audio connections between the ADF and the Audio Panel.

TABLE 4.2. AUDIO PANEL IN-AIRCRAFT TROUBLESHOOTING CHART
(Continued)

STEP	TEST PROCEDURE	PROBABLE CAUSE OF MALFUNCTION
	DME UNIT	
1. 2. 3. 4.	Set the CP 136T, DME toggle switch, to SPKR position. Listen for the random audio signal provided by the DME in the speaker. Switch the DME to PHONES position. Listen for the random audio signal provided by the DME in the headphones.	If random audio is not heard, the fault is most likely in the DME unit or in the audio connections between the DME unit and the Audio Panel.
	UNSWITCHED AUDIO	
1.	If the unit providing unswitched audio has a test function and it is actuated, the test tone should be heard in the headphones.	If the tone is not heard, the fault is most likely in the unswitched audio sensor or in the audio connections between the sensor and the Audio Panel.
	INTERCOM	
1.	Troubleshooting intercom systems will vary with the type and complexity of the intercom system installed. The best method is to first check the intercom system wiring. All intercom audio inputs (up to four) should be heard in the headphones.	If the headphones have an output on receive audio but not on intercom, the fault is most likely in the intercom system.

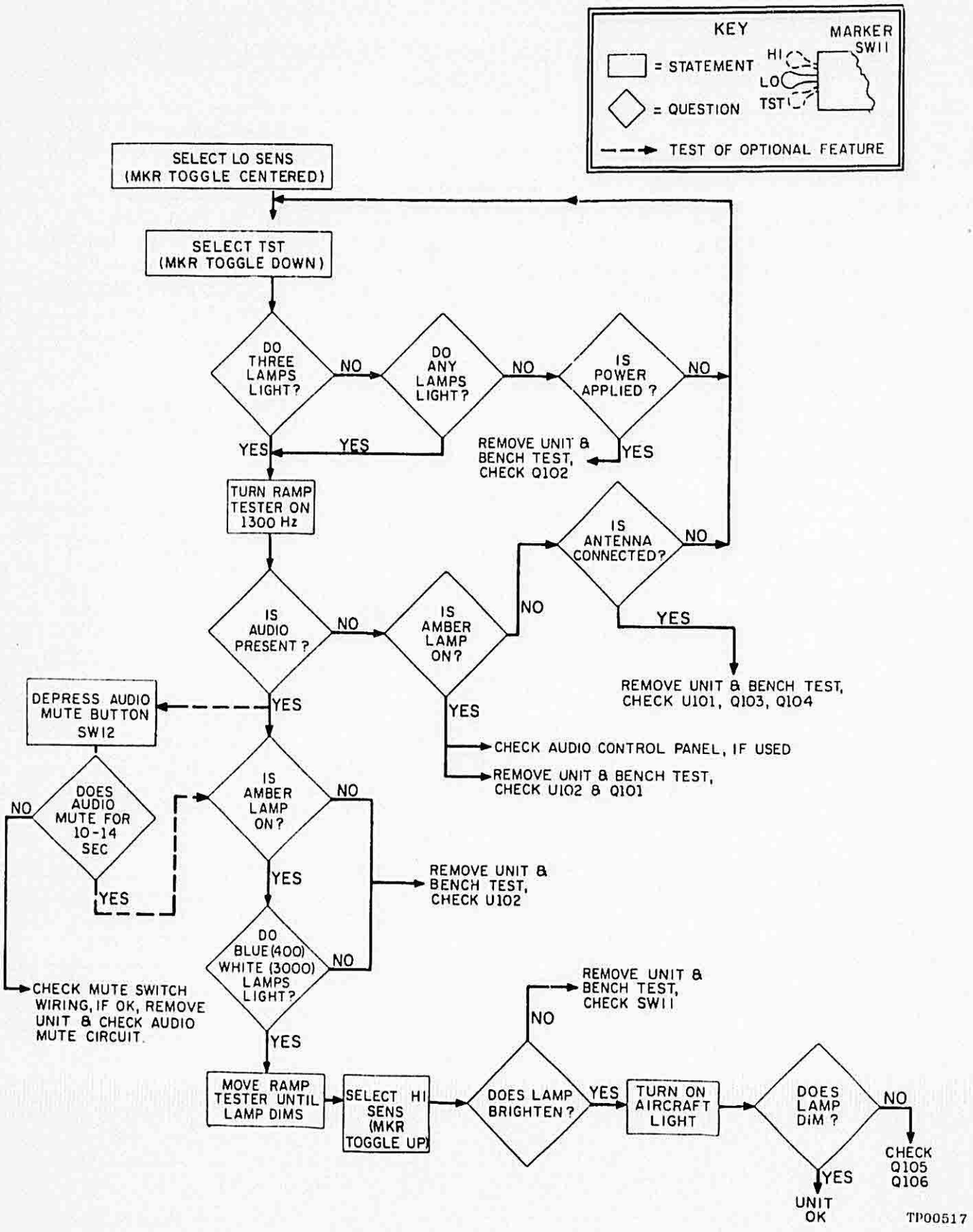


FIGURE 4-4. MARKER BEACON RECEIVER CIRCUITS, IN-AIRCRAFT TROUBLESHOOTING FLOW CHART

4.5 UNIT TROUBLESHOOTING

4.5.1 Audio Panel Circuits

Faulty circuits in the Audio Panel can be readily located using common troubleshooting techniques. Table 4.3 may be used to check out various symptoms and related circuits. Since only audio signals are handled by the audio panel, signal tracing can be accomplished by using an audio signal generator and speaker, phones, or output meter.

TABLE 4.3. AUDIO PANEL CIRCUIT TROUBLESHOOTING CHART*

SYMPTOM	AFFECTED CIRCUIT CP 136T
No intercom audio	Q-1 U3C
No speaker or phones audio	U2C, U2D, U4, U5, Q4 thru Q7
Phones audio but no speaker audio	U2D, U5, Q4 thru Q7
Speaker audio but no phones audio	U2C, U4
Phones muting but no speaker muting	U2D
Speaker muting but no phones muting	U2C
Phones audio but no sidetone audio	U3A,B

*This chart presumes that:

1. An audio signal of the proper level is available at the selected input.
2. The proper loads are connected to the amplifier outputs.
3. DC input voltage is supplied to the unit in question.

4.5.2 Marker Beacon Receiver Circuits

To expedite troubleshooting the marker beacon receiver circuits, Table 4.4 is provided.

TABLE 4.4. MARKER BEACON RECEIVER CIRCUITS TROUBLESHOOTING CHART

SYMPTOM	AFFECTED CIRCUIT
No lamp TST, audio, or marker light	Q102, CR101
Lamp TST OK; no audio and marker light	U101, Q103, or Q104, FL102, Y101
Lamp TST and marker light OK; no audio	U102, C138
Lamp TST and audio OK; no marker light	U102
Lamps will not dim or remain dim	Q105, Q106
One lamp out in TST mode, others normal	Check appropriate lamp and driver transistors Q107, Q108, Q109
Audio and marker light OK; no lamp TST	SW11

4.5.2.1 Voltage Regulator

Q102 and reference diode CR101 form a series pass voltage regulator. If the regulator has failed, be sure that a short circuit or partial short circuit on the regulated voltage bus did not cause the failure.

MKR Power Requirements:	13.75	Vdc	0.038 Ampere (no signal)
	13.75	Vdc	0.025 Ampere (one lamp illuminated)
	27.5	Vdc	0.29 Ampere (one lamp illuminated)
Regulator Output at Q102 emitter	13.75	Vdc	9.5 Vdc ±5%
	27.5	Vdc	9.5 Vdc ±5%
Regulation at Q102 emitter	11 to 30	Vdc input	5% or better
Regulated Bus Resistance:	Between Q102 emitter and ground, 100 ohms typical.		

4.5.2.2 Receiver

Table 4.5 provides a sequence of measurements designed to isolate a failed receiver circuit. Overall receiver gain may differ from the tabled values since R137 may have been adjusted to compensate for variations in marker antenna gain. After repairing a failed receiver, the Flight Test procedure in Section 2.6.2 of this manual should be performed to assure proper overall (receiver and antenna) gain.

TABLE 4.5. TYPICAL RECEIVER GAIN, HI SENSITIVITY‡

INPUT					OUTPUT	
Frequency*	Level	To	Coupling Cap.	6 dB Pad	From	Level
75 MHz	1 mV	P101-CC	none	yes	FL101-1	0.10V rms
75 MHz	1 mV	P101-CC	none	yes	U101-9	0.035V rms
75 MHz	1 mV	P101-CC	none	yes	U101-15	0.90V rms
75 MHz	200 uV	Q103-3	0.001 uf	no	FL101-1	0.10V rms
10.7 MHz	120 uV	Q103-2	0.001 uf	no	FL101-1	0.10V rms
10.7 MHz	30 uV	U101-2	0.001 uf	no	FL101-1	0.10V rms
10.7 MHz	300 uV	U101-4	0.001 uf	no	FL101-1	0.10V rms
10.7 MHz	1.5 uV	U101-8	0.001 uf	no	FL101-1	0.10V rms
75 MHz	400 uV	P101-CC	none	yes	Lamp threshold	
75 MHz	1000 uV+	P101-CC	none	yes	Lamp threshold	

+ R137 set maximum clockwise; i.e. maximum receiver sensitivity

* Modulated 95% by 1300 Hz.

‡ Table shows typical receiver gains with sensitivity potentiometers IF, R136, and RF, R137, set for 400 uV (HI) and 2,000 uV (LO) sensitivities. Where R137 has been adjusted to compensate for marker antenna gain, overall receiver gain will differ from the tabled value.

4.5.2.3 Oscillator

The low oscillator output voltage and high output impedance make measuring oscillator frequency difficult. To establish that the oscillator is operating, either of the following methods may be used:

a. Connect an rf voltmeter, such as a Boonton model 91 CAR, to Q103-2. The marker indication should be 0.2 to 0.4 volts rms.

b. Connect a high impedance dc voltmeter through a 100K ohm resistor to the base of Q104; the indication should be 0.55 to 0.65 volts dc. Using a scribe or bus wire, short L103; the voltage at the base of Q104 should increase by 0.05 volts dc.

Oscillator output frequency may be measured at the junction of R123/124 using a frequency counter with a minimum input impedance of 100K ohms shunted by a maximum of 50 pf and a sensitivity of 50 mV rms. Output frequency is 64.3 MHz $\pm$0.002%.

4.5.2.4 Lamp Circuits

The lamp circuits are composed of three similar parallel networks, so a comparison, good vs bad, method of troubleshooting may be used. Typically, 50 mV rms at FL101-1 will just begin to light a lamp.

4.6 COMPONENT REPLACEMENT

Replacement of most components of the Audio Panel is obvious by inspection or, because of previous experience, poses no problem. Since most components are mounted on the PC board, precautions must be taken to avoid damage to the board when making repairs. The use of proper soldering tools, to avoid damage to the board or components, is recommended. Such tools include soldering irons of limited wattage and small or special purpose tips, solder sipper or wick to remove solder, and heat sinks to absorb or divert heat.

Instructions are given here for the replacement of a few unusual components that require special handling.

4.6.1 Power Transistors, Q5 and Q6

The type of power transistors employed in the Audio Panel are of the type wherein the mounting screw passes through a mounting flange. These can be seen in Figure 5-1. Note that when replacing the mica washer it should be coated on both sides with thermal compound.

4.6.2 Toggle Switches

Replacement of toggle switches and the mute pushbutton switch requires only standard desoldering from PC board methods - solder wick - solder sipper, and a properly heated iron. Replacement should include a close (electrical) check of the solder points and the runs close by.

5.1 GENERAL

The Replacement Parts List is subdivided into two sections, the Mechanical Parts List and the Electrical Parts List.

5.2 MECHANICAL PARTS LIST

The Mechanical Parts List section is intended to locate, identify, and show part relationship to the Unit itself. Only reusable hardware is shown and listed as Attaching Parts.

The symbol"----*----" is used to indicate the end of that series of Attaching Parts.

Certain electrical parts are shown and listed only to show their relationship to the assembly, attaching parts, or for part location where not necessarily shown elsewhere.

PC board assemblies are listed in the mechanical parts list section only to identify, if any, those replaceable mechanical parts on the board. The blank PC board is listed only to show that it is the last and perhaps the only, mechanical part of the assembly. It is not intended that such a board would be replaced.

5.2.1 Index Numbers v/s Items in the Art

Each item shown in the art is identified by an index number or electrical symbol number (or both). Where a part is attached by more than one piece of hardware, usually one set of hardware is shown and indexed. The total quantity required to be used is shown in the quantity column. In most cases it is obvious where the other sets go. When a part is attached by a variety of types or sizes of attaching parts, sufficient indexing and drawings of these parts is provided to determine what type of hardware goes where.

5.3 ELECTRICAL PARTS LIST

The Electrical Parts List details all the electrical parts in Alpha-Numerical sequence. The location of these parts will be found in the figures of the Schematic Section as well as the Mechanical Parts Section. These parts have no index numbers but are identified by their electrical symbol numbers.

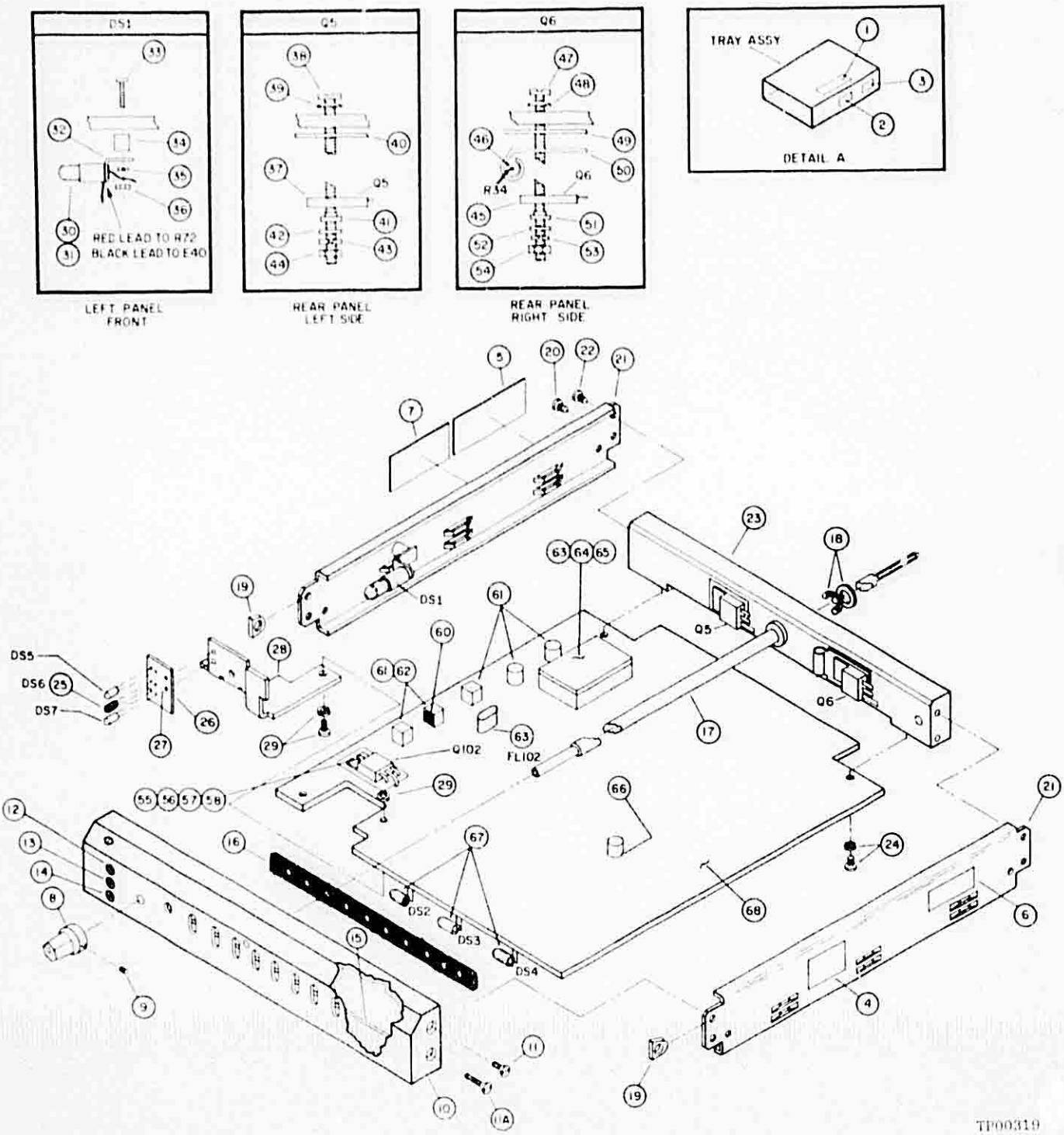


FIGURE 5-1. CP 136T AUDIO PANEL

SEE BLOW-UP

MECHANICAL PARTS LIST

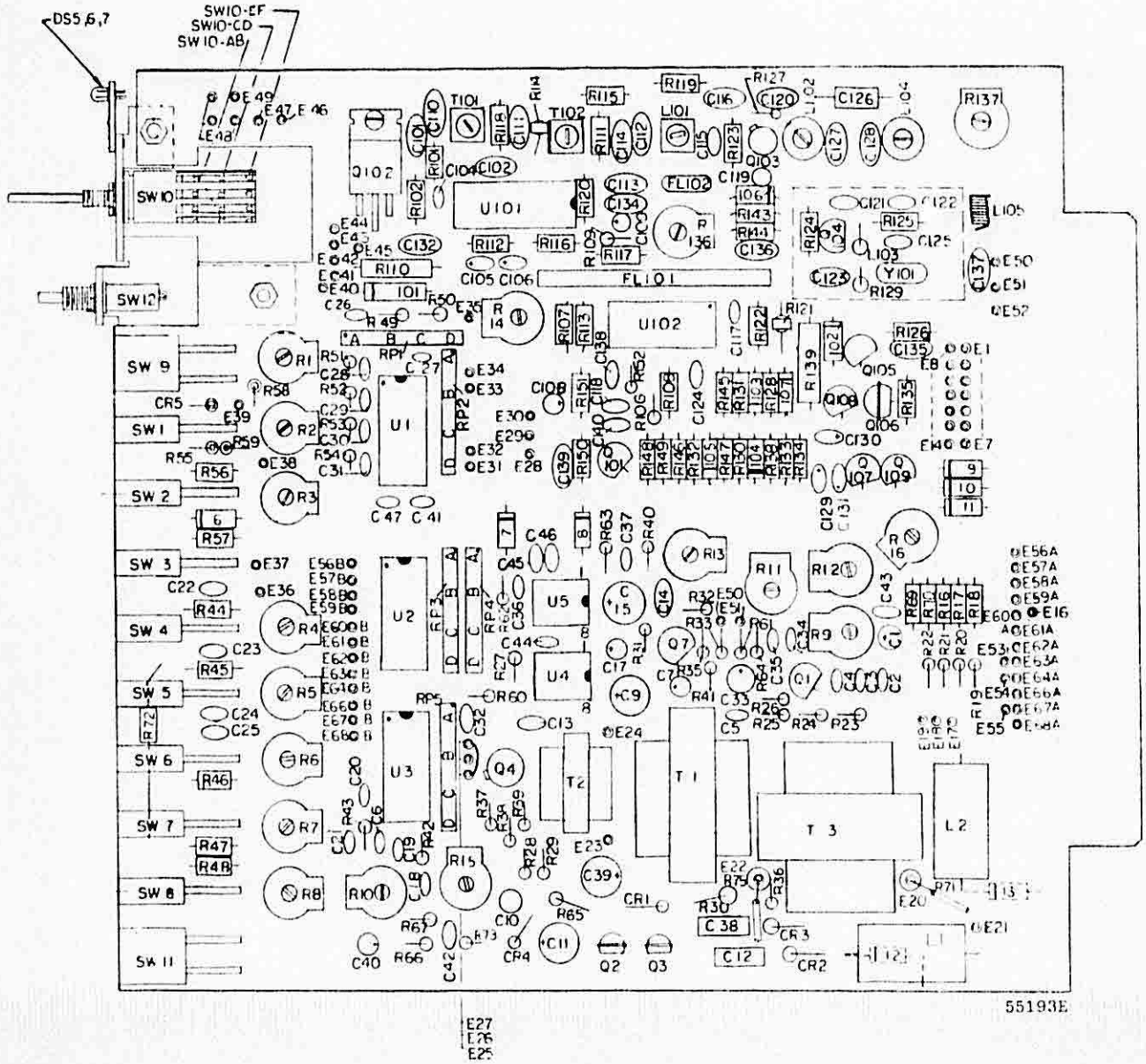
Fig. & Item No.	Part Number	Symbol Number	Description	Qty
5.1	01286-0101		CP 136T AUDIO PANEL	1
-1	04824-0007		LABEL, Nameplate, Tray	1
-2	04825-0002		LABEL, Tray (Installation)	1
-3	04825-0005		LABEL, Tray (Internal MKR RX)	1
-4	04824-0004		LABEL, Nameplate, Chassis	1
-5	04824-0005		LABEL, Nameplate, Chassis (Internal MKR RX)	1
-6	04825-0005		LABEL, Chassis, (Internal MKR RX)	1
-7	04783-0001		LABEL, 30,000 Ft.	1
-8	88216-0006		KNOB	1
			(ATTACHING PARTS)	
-9	82889-0001		SETSCREW, Hex Socket, 4-40 x 3/32	2
			----*----	
-10	54579-0004		PANEL, Trim	1
			(ATTACHING PARTS)	
-11	82819-0105		SCREW, Mach, Flat Hd, Black, 4-40 x 5/16	3
-11A	82819-0107		SCREW, Mach, Flat Hd, Black, 4-40 x 1/2	1
			----*----	
-12	56539-0010		LITE GUIDE, Clear	1
-13	56539-0009		LITE GUIDE, Amber	1
-14	56539-0008		LITE GUIDE, Blue	1
-15	57594-0003		HEATSINK, Lamp	1
-16	54575-0001		SHIELD, Lite, Felt	1
-17	57566-0003		LOCKSCREW	1
			(ATTACHING PARTS)	
-18	81192-0007		RING, Retaining, Truarc	1
	81307-0124		WASHER, Flat, Al, 5/16 OD x .166 ID x .025 thick	2
			----*----	
-19	81290-0001		NUT, "U" 2-56	4
-20	84149-0003		RIVET, Nylon	2
-21	54728-0001		PANEL, Side	2
			(ATTACHING PARTS)	
-22	82813-0002		SCREW, Mach, Bind Hd, Sl, 2-56 x 3/16	4
			----*----	

MECHANICAL PARTS LIST

Fig. & Item No.	Part Number	Symbol Number	Description	Qty
-23	54726-0001		PANEL, Rear	1
			(ATTACHING PARTS)	
-24	82813-0002		SCREW, Mach, Bind Hd, S1, 2-56 x 3/16	2
	81324-0002		WASHER, Lock, Split, No. 2	2
			----*----	
-25	81747-0009		FILTER, Blue (DS6)	1
-26	54725-0001		BRACKET, Switch (MKR Lights PC Bd)	1
			(ATTACHING PARTS)	
-27	81254-0029		RIVET	2
			----*----	
-28	54737-0001		BRACKET, Switch (SW 10/SW 12)	1
			(ATTACHING PARTS)	
-29	82814-0003		SCREW, Mach, Bind Hd, S1, 4-40 x 1/4	2
	81324-0004		WASHER, Lock, Split, No. 4	2
	82900-0003		NUT, Hex, 4-40	2
			----*----	
-30	81747-0012		FILTER, Blue (DS1)	1
-31	12000-0015	DS1	LAMP, Incandescent, 14V, .05A (Pilot)	1
-32	41278-0008		SOCKET, Lamp (with bracket)	1
			(ATTACHING PARTS)	
-33	82813-0007		SCREW, Mach, Bind Hd, S1, 2-56 x 1/2	1
-34	81213-0069		SPACER	1
-35	81324-0002		WASHER, Lock, Split, No. 2	1
-36	82900-0001		NUT, Hex, 2-56	1
			----*----	
-37	75638-0005	Q5	TRANSISTOR, NPN, (with Compression Washer)	1
			(ATTACHING PARTS)	
-38	82814-0008		SCREW, Mach, Bind Hd, S1, 4-40 x 5/8	1
-39			WASHER, Compression (supplied with Transistor)	1
-40	56276-0001		INSULATOR, Mica	1
-41	81335-0013		WASHER, Shoulder	1
-42	81307-0105		WASHER, Flat, No. 4	1
-43	81324-0004		WASHER, Lock, Split, No. 4	1
-44	82900-0003		NUT, Hex, 4-40	1
			----*----	

MECHANICAL PARTS LIST

Fig. & Item No.	Part Number	Symbol Number	Description	Qty
-45	75638-0005	Q6	TRANSISTOR, NPN (with Compression Washer)	1
-46	31214-0472	R34	RESISTOR, Silicon, 4.7K	1
			(ATTACHING PARTS)	
-47	82814-0008		SCREW, Mach, Bind Hd, S1, 4-40 x 5/8	1
-48	No Number		WASHER, Compression (supplied with Transistor)	1
-49	56276-0001		INSULATOR, Mica	1
-50	54727-0001		HOLDER (Bracket for R34)	1
-51	81335-0013		INSULATOR, Shoulder	1
-52	81307-0105		WASHER, Flat, No. 4	1
-53	81324-0004		WASHER, Lock, Split, No. 4	1
-54	82900-0003		NUT, Hex, 4-40	1
			----*----	
-55	75576-0001	Q102	TRANSISTOR, Silicon, NPN, Power	1
			(ATTACHING PARTS)	
-56	82814-0003		SCREW, Mach, Bind Hd, S1, 4-40 x 1/4	1
-57	56276-0001		INSULATOR, Mica	1
-58	81324-0004		WASHER, Lock, Split, No. 4	1
-59	82900-0003		NUT, Hex, 4-40	1
			----*----	
-60	83011-0011		INSULATOR	1
-61	83026-0001		INSULATOR (T101, T102, L101, L102, L104)	5
-62	55850-0001		SHIELD, Can (T101, T102)	2
-63	54559-0001		INSULATOR, Crystal (Y101, FL102)	2
-64	54739-0001		COVER, Shield	1
-65	54738-0001		SHIELD	1
-66	52726-0001		PAD, Transistor (Q4)	1
-67	81747-0009		FILTER, Blue (DS2, DS3, DS4)	3
-68	55186-0001		PC BOARD (Less Components) (See Figure 5-2 for detailed electrical component locations).	1



[ ] DESIGNATES DIODE, BAR INDICATES CATHODE END, CR OMITTED FOR CLARITY

FIGURE 5-2. CP 136T COMPONENT PC BD ASSY

SEE BLOW-UP

ELECTRICAL PARTS LIST

Symbol No.	Part Number	Description
C1	21564-0034	CAPACITOR, Tantalum, 22 uf ±20%, 15 Vdc
C2	24551-0002	CAPACITOR, Ceramic, Sub-min, 470 pf ±20%, 50 Vdc
C3	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C4	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C5	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C6	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C7	21564-0032	CAPACITOR, Tantalum, 10 uf ±20%, 15 Vdc
C9	21564-0038	CAPACITOR, Tantalum, 100 uf ±20%, 15 Vdc
C10	21564-0032	CAPACITOR, Tantalum, 10 uf ±20%, 15 Vdc
C11	21564-0039	CAPACITOR, Tantalum, 150 uf ±20%, 15 Vdc
C12	23107-0125	CAPACITOR, Polyester, .1 uf ±10%, 100 Vdc
C13	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C14	24556-0474	CAPACITOR, Ceramic, .47 uf ±20%, 25 Vdc
C15	21564-0038	CAPACITOR, Tantalum, 100 uf ±20%, 15 Vdc
C17	21564-0032	CAPACITOR, Tantalum, 10 uf ±20%, 15 Vdc
C18	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C19	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C20	24556-0103	CAPACITOR, Ceramic, .01 uf ±20%, 25 Vdc
C21	24556-0103	CAPACITOR, Ceramic, .01 uf ±20%, 25 Vdc
C22	24556-0224	CAPACITOR, Ceramic, .22 uf ±20%, 25 Vdc
C23	24551-0002	CAPACITOR, Ceramic, Sub-min, 470 pf ±20%, 50 Vdc
C24	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C25	24551-0002	CAPACITOR, Ceramic, Sub-min, 470 pf ±20%, 50 Vdc
C26	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C27	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C28	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C29	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C30	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C31	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C32	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C33	21564-0032	CAPACITOR, Tantalum, 10 uf ±20%, 15 Vdc
C34	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C35	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C36	24556-0224	CAPACITOR, Ceramic, .22 uf ±20%, 25 Vdc
C37	24556-0224	CAPACITOR, Ceramic, .22 uf ±20%, 25 Vdc

ELECTRICAL PARTS LIST

Symbol No.	Part Number	Description
C38	23107-0125	CAPACITOR, Polyester, .1 uf ±10%, 100 Vdc
C39	21564-0039	CAPACITOR, Tantalum, 150 uf ±20%, 15 Vdc
C40	21564-0032	CAPACITOR, Tantalum, 10 uf ±20%, 15 Vdc
C41	24551-0002	CAPACITOR, Ceramic, Sub-min, 470 pf ±20%, 50 Vdc
C42	24556-0224	CAPACITOR, Ceramic, .22 uf ±20%, 25 Vdc
C43	24556-0223	CAPACITOR, Ceramic, .02 uf ±20%, 25 Vdc
C44	24556-0103	CAPACITOR, Ceramic, .01 uf ±20%, 25 Vdc
C45	24556-0472	CAPACITOR, Ceramic, 4700 pf ±20%, 25 Vdc
C46	24556-0103	CAPACITOR, Ceramic, .01 uf ±20%, 25 Vdc
C47	24551-0002	CAPACITOR, Ceramic, Sub-min, 470 pf ±20%, 50 Vdc
C101	21291-0030	CAPACITOR, Ceramic, .01 uf ±20%, 50 Vdc
C102	21291-0030	CAPACITOR, Ceramic, .01 uf ±20%, 50 Vdc
C103	Not Used	
C104	24556-0103	CAPACITOR, Ceramic, .01 uf ±20%, 25 Vdc
C105	21564-0032	CAPACITOR, Tantalum, 10 uf ±20%, 15 Vdc
C106	21564-0032	CAPACITOR, Tantalum, 10 uf ±20%, 15 Vdc
C108	21564-0037	CAPACITOR, Tantalum, 68 ±20%, 15 Vdc (Early Units)
C108	21564-0124	CAPACITOR, Tantalum, 100 uf ±10%, 10 Vdc (Later Units)
C109	21564-0034	CAPACITOR, Tantalum, 22 uf ±20%, 15 Vdc
C110	21291-0030	CAPACITOR, Ceramic, .01 uf ±20%, 50 Vdc
C111	21291-0030	CAPACITOR, Ceramic, .01 uf ±20%, 50 Vdc
C112	21291-0030	CAPACITOR, Ceramic, .01 uf ±20%, 50 Vdc
C113	24516-0479	CAPACITOR, Ceramic, 4.7 pf ±0.5 pf, 500 Vdc, NPO
C114	21291-0030	CAPACITOR, Ceramic, .01 uf ±20%, 50 Vdc
C115	24052-0120	CAPACITOR, Mica, 12 pf ±1 pf, 500 Vdc
C116	21291-0030	CAPACITOR, Ceramic, .01 uf ±20%, 50 Vdc
C117	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C118	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C119	21564-0032	CAPACITOR, Tantalum, 10 uf ±20%, 15 Vdc
C120	21291-0030	CAPACITOR, Ceramic, .01 uf ±20%, 50 Vdc
C121	24052-0270	CAPACITOR, Mica, 27 pf ±5%, 500 Vdc
C122	24052-0121	CAPACITOR, Mica, 120 pf ±5%, 300 Vdc
C123	24052-0620	CAPACITOR, Mica, 62 pf ±5%, 300 Vdc
C124	24556-0104	CAPACITOR, Ceramic, .1 uf ±20%, 25 Vdc
C125	24052-0470	CAPACITOR, Mica, 47 pf ±5%, 300 Vdc
C126	24509-0338	CAPACITOR, Ceramic, .33 pf ±5%, 500 Vdc

ELECTRICAL PARTS LIST

Symbol No.	Part Number	Description
C127	24516-0220	CAPACITOR, Ceramic, 22 pf ±10%, 500 Vdc, NPO
C128	24516-0270	CAPACITOR, Ceramic, 27 pf ±10%, 500 Vdc, NPO
C129	21564-0029	CAPACITOR, Tantalum, 3.3 uf ±20%, 15 Vdc
C130	21564-0029	CAPACITOR, Tantalum, 3.3 uf ±20%, 15 Vdc
C131	21564-0029	CAPACITOR, Tantalum, 3.3 pf ±20%, 15 Vdc
C132	21291-0030	CAPACITOR, Ceramic, .01 uf ±20%, 50 Vdc
C133	Not Used	
C134	21291-0030	CAPACITOR, Ceramic, .01 uf ±20%, 50 Vdc
C135	21291-0030	CAPACITOR, Ceramic, .01 uf ±20%, 50 Vdc
C136	21291-0030	CAPACITOR, Ceramic, .01 uf ±20%, 50 Vdc
C137	24515-0010	CAPACITOR, Ceramic, .02 uf ±20%, 50 Vdc
C138	24556-0104	CAPACITOR, Ceramic, 0.1 uf ±20%, 25 Vdc
C139	21291-0030	CAPACITOR, Ceramic, .01 uf ±20%, 50 Vdc
C140	24556-0333	CAPACITOR, Ceramic, .033 uf ±20%, 25 Vdc
CR1	75025-0003	DIODE, Silicon, Zener, 11V
CR2	75204-0045	DIODE, Silicon
CR3	75204-0045	DIODE, Silicon
CR4	75025-0003	DIODE, Silicon, Zener, 11V
CR5	75204-0045	DIODE, Silicon
CR6	75204-0045	DIODE, Silicon
CR7	75204-0045	DIODE, Silicon
CR8	75204-0045	DIODE, Silicon
CR9	75204-0045	DIODE, Silicon
CR10	75204-0045	DIODE, Silicon
CR11	75204-0045	DIODE, Silicon
CR12	75025-0024	DIODE, Silicon, Zener, 36V
CR13	75025-0024	DIODE, Silicon, Zener, 36V
CR101	75025-0005	DIODE, Silicon, Zener, 10V
CR102	75028-0001	DIODE, Silicon
CR103	75028-0001	DIODE, Silicon
CR104	75028-0001	DIODE, Silicon
CR105	75028-0001	DIODE, Silicon
CR106	75038-0002	DIODE, Silicon, RF Switching
CR107	75028-0001	DIODE, Silicon

ELECTRICAL PARTS LIST

Symbol No.	Part Number	Description
DS1	12000-0015	LAMP, Incandescent, 14V, .08A (Pilot)
DS2	12000-0027	LAMP, Incandescent, 14V, .065A (Pilot)
DS3	12000-0027	LAMP, Incandescent, 14V, .065A (Pilot)
DS4	12000-0027	LAMP, Incandescent, 14V, .065A (Pilot)
DS5	12000-0014	LAMP, Incandescent, 5V, .115A (Marker)
DS6	12000-0014	LAMP, Incandescent, 5V, .115A (Marker)
DS7	12000-0014	LAMP, Incandescent, 5V, .115A (Marker)
FL101	26001-0101	FILTER, Audio
FL102	43208-0001	CRYSTAL FILTER, Monolithic
L1	11487-0002	CHOKE
L2	11487-0002	CHOKE
L101	11872-0002	COIL, Crystal Filter
L102	11873-0001	COIL, RF
L103	11485-0005	CHOKE, RF Insul., .22 uh
L104	11873-0001	COIL, RF
L105	11713-0005	CHOKE, RF
Q1	75561-0020	TRANSISTOR, NPN, 2N3568
Q2	75658-0013	TRANSISTOR, NPN, Dura Watt
Q3	75658-0013	TRANSISTOR, NPN, Dura Watt
Q4	75536-0001	TRANSISTOR, NPN, 2N3053
Q5	75638-0005	TRANSISTOR, Darlington, NPN
Q6	75638-0005	TRANSISTOR, Darlington, NPN
Q7	75561-0020	TRANSISTOR, NPN, 2N3568
Q101	75574-0002	TRANSISTOR, Silicon, NPN, UJT, 2N4870
Q102	75576-0001	TRANSISTOR, Silicon, NPN, Power
Q103	75611-0002	TRANSISTOR, FET
Q104	75592-0002	TRANSISTOR, Silicon, NPN
Q105	75595-0003	TRANSISTOR, Silicon, NPN, 2N5172

ELECTRICAL PARTS LIST

Symbol No.	Part Number	Description
Q106	75658-0013	TRANSISTOR, Silicon, NPN
Q107	75587-0014	TRANSISTOR, Darlington, NPN, 2N5308
Q108	75587-0014	TRANSISTOR, Darlington, NPN, 2N5308
Q109	75587-0014	TRANSISTOR, Darlington, NPN, 2N5308
R1	32054-0002	RESISTOR, Variable, 470 ±10%
R2	32054-0002	RESISTOR, Variable, 470 ±10%
R3	32054-0002	RESISTOR, Variable, 470 ±10%
R4	32054-0002	RESISTOR, Variable, 470 ±10%
R5	32054-0002	RESISTOR, Variable, 470 ±10%
R6	32054-0002	RESISTOR, Variable, 470 ±10%
R7	32054-0002	RESISTOR, Variable, 470 ±10%
R8	32054-0022	RESISTOR, Variable, 22K ±10%
R9	32054-0006	RESISTOR, Variable, 50K ±10%
R10	32054-0010	RESISTOR, Variable, 1K ±10%
R11	32054-0010	RESISTOR, Variable, 1K ±10%
R12	32054-0010	RESISTOR, Variable, 1K ±10%
R13	32054-0010	RESISTOR, Variable, 1K ±10%
R14	32054-0010	RESISTOR, Variable, 1K ±10%
R15	32054-0026	RESISTOR, Variable, 2.2K ±10%
R16	32054-0026	RESISTOR, Variable, 2.2K ±10%
R17	31216-0026	RESISTOR, Carbon, 470 ±5%, 1/8W
R18	31216-0471	RESISTOR, Carbon, 470 ±5%, 1/8W
R19	31216-0272	RESISTOR, Carbon, 2.7K ±5%, 1/8W
R20	31216-0272	RESISTOR, Carbon, 2.7K ±5%, 1/8W
R21	31216-0272	RESISTOR, Carbon, 2.7K ±5%, 1/8W
R22	31216-0102	RESISTOR, Carbon, 2.7K ±5%, 1/8W
R23	31216-0102	RESISTOR, Carbon, 1K ±5%, 1/8W
R24	31216-0103	RESISTOR, Carbon, 10K ±5%, 1/8W
R25	31216-0222	RESISTOR, Carbon, 2.2K ±5%, 1/8W
R26	31216-0101	RESISTOR, Carbon, 100 ±5%, 1/8W
R27	31216-0152	RESISTOR, Carbon, 1.5K ±5%, 1/8W
R28	31218-0102	RESISTOR, Carbon, 1K ±5%, 1/4W
R29	31218-0102	RESISTOR, Carbon, 1K ±5%, 1/4W
R30	31161-0035	RESISTOR, Wirewound, 1K ±5%, 3W

ELECTRICAL PARTS LIST

Symbol No.	Part Number	Description
R31	31216-0471	RESISTOR, Carbon, 470 ±5%, 1/8W
R32	31216-0102	RESISTOR, Carbon, 1K ±5%, 1/8W
R33	31216-0331	RESISTOR, Carbon, 330K ±5%, 1/8W
R34	31214-0472	RESISTOR, Silicon, 4.7K
R35	31216-0471	RESISTOR, Carbon, 470 ±5%, 1/8W
R36	31216-0272	RESISTOR, Carbon, 2.7K ±5%, 1/8W
R37	31216-0101	RESISTOR, Carbon, 100 ±5%, 1/8W
R38	31216-0152	RESISTOR, Carbon, 1.5K ±5%, 1/8W
R39	31216-0103	RESISTOR, Carbon, 10K ±5%, 1/8W
R40	31216-0222	RESISTOR, Carbon, 2.2K ±5%, 1/8W
R41	31216-0471	RESISTOR, Carbon, 470 ±5%, 1/8W
R42	31216-0102	RESISTOR, Carbon, 1K ±5%, 1/8W
R43	31216-0104	RESISTOR, Carbon, 100K ±5%, 1/8W
R44	31216-0563	RESISTOR, Carbon, 56K ±5%, 1/8W
R45	31216-0563	RESISTOR, Carbon, 56K ±5%, 1/8W
R46	31216-0563	RESISTOR, Carbon, 56K ±5%, 1/8W
R47	31216-0563	RESISTOR, Carbon, 56K ±5%, 1/8W
R48	31216-0563	RESISTOR, Carbon, 56K ±5%, 1/8W
R49	31216-0563	RESISTOR, Carbon, 56K ±5%, 1/8W
R50	31216-0563	RESISTOR, Carbon, 56K ±5%, 1/8W
R51	31216-0563	RESISTOR, Carbon, 56K ±5%, 1/8W
R52	31216-0563	RESISTOR, Carbon, 56K ±5%, 1/8W
R53	31216-0563	RESISTOR, Carbon, 56K ±5%, 1/8W
R54	31216-0563	RESISTOR, Carbon, 56K ±5%, 1/8W
R55	31216-0223	RESISTOR, Carbon, 22K ±5%, 1/8W
R56	31216-0223	RESISTOR, Carbon, 22K ±5%, 1/8W
R57	31216-0223	RESISTOR, Carbon, 22K ±5%, 1/8W
R58	31216-0223	RESISTOR, Carbon, 22K ±5%, 1/8W
R59	31216-0223	RESISTOR, Carbon, 22K ±5%, 1/8W
R60	31216-0563	RESISTOR, Carbon, 56K ±5%, 1/8W
R61	31216-0101	RESISTOR, Carbon, 100 ±5%, 1/8W
R62	31216-0823	RESISTOR, Carbon, 82K ±5%, 1/8W
R63	31216-0823	RESISTOR, Carbon, 82K ±5%, 1/8W
R64	31216-0153	RESISTOR, Carbon, 15K ±5%, 1/8W
R65	31161-0035	RESISTOR, Wirewound, 1K ±5%, 3W

ELECTRICAL PARTS LIST

Symbol No.	Part Number	Description
R66	31218-0102	RESISTOR, Carbon, 1K ±5%, 1/4W
R67	31218-0102	RESISTOR, Carbon, 1K ±5%, 1/4W
R68	31216-0754	RESISTOR, Carbon, 75K ±5%, 1/8W
R69	31216-0101	RESISTOR, Carbon, 100K ±5%, 1/8W
R70	31216-0471	RESISTOR, Carbon, 470 ±5%, 1/8W
R71	31198-0478	RESISTOR, Carbon, .47 ±10%, 2W
R72	31141-0102	RESISTOR, Carbon, 1K, 1/2W
R73	31216-0471	RESISTOR, Carbon, 470, 1/8W
R74	31216-0754	RESISTOR, Carbon, 75K, 1/8W
R75	31198-0478	RESISTOR, Carbon, .47 ±10%, 2W
R101	31216-0101	RESISTOR, Carbon, 100 ±5%, 1/8W
R102	31216-0331	RESISTOR, Carbon, 330 ±5%, 1/8W
R103	Not Used	
R104	Not Used	
R105	Not Used	
R106	31216-0101	RESISTOR, Carbon, 100 ±5%, 1/8W (Later Units)
R106	31216-0102	RESISTOR, Carbon, 1K ±5%, 1/8W (Early Units)
R107	31216-0224	RESISTOR, Carbon, 220K ±5%, 1/8W
R108	31216-0154	RESISTOR, Carbon, 150K ±5%, 1/8W
R109	31218-0102	RESISTOR, Carbon, 1K ±5%, 1/4W
R110	31141-0102	RESISTOR, Carbon, 1K ±10%, 1/2W
R111	31216-0472	RESISTOR, Carbon, 4.7K ±5%, 1/8W
R112	31216-0184	RESISTOR, Carbon, 180K ±5%, 1/8W
R113	31215-0824	RESISTOR, Carbon, 820K ±10%, 1/8W
R114	31205-0003	RESISTOR, Thermistor, 47K ±10%, 2.9 mw
R115	31216-0101	RESISTOR, Carbon, 100 ±5%, 1/8W
R116	31216-0472	RESISTOR, Carbon, 4.7K ±5%, 1/8W
R117	31216-0682	RESISTOR, Carbon, 6.8K ±5%, 1/8W
R118	31216-0472	RESISTOR, Carbon, 4.7K ±5%, 1/8W
R119	31216-0101	RESISTOR, Carbon, 100 ±5%, 1/8W
R120	31216-0472	RESISTOR, Carbon, 4.7K ±5%, 1/8W
R121	31205-0004	RESISTOR, Thermistor, 128.8 ohms ±10%, 8 mw
R122	31216-0102	RESISTOR, Carbon, 1K ±5%, 1/8W
R123	31216-0104	RESISTOR, Carbon, 100K ±5%, 1/8W
R124	31216-0103	RESISTOR, Carbon, 10K ±5%, 1/8W
R125	31216-0471	RESISTOR, Carbon, 470 ±5%, 1/8W

ELECTRICAL PARTS LIST

Symbol No.	Part Number	Description
R126	31216-0103	RESISTOR, Carbon, 10K ±5%, 1/8W
R127	31216-0221	RESISTOR, Carbon, 220 ±5%, 1/8W
R128	31216-0103	RESISTOR, Carbon, 10K ±5%, 1/8W
R129	31216-0224	RESISTOR, Carbon, 220K ±5%, 1/8W
R130	31216-0223	RESISTOR, Carbon, 22K ±5%, 1/8W
R131	31216-0223	RESISTOR, Carbon, 22K ±5%, 1/8W
R132	31216-0223	RESISTOR, Carbon, 22K ±5%, 1/8W
R133	31216-0473	RESISTOR, Carbon, 47K ±5%, 1/8W
R134	31216-0473	RESISTOR, Carbon, 47K ±5%, 1/8W
R135	31216-0102	RESISTOR, Carbon, 1K ±5%, 1/8W
R136	32054-0024	RESISTOR, Variable, 100 ±20%
R137	32054-0010	RESISTOR, Variable, 1K ±20%
R138	31216-0473	RESISTOR, Carbon, 47K ±5%, 1/8W
R139	31141-0470	RESISTOR, Carbon, 47 ±10%, 1/2W
R140	Not Used	
R141	Not Used	
R142	Not Used	
R143	31216-0102	RESISTOR, Carbon, 1K ±5%, 1/8W
R144	31216-0103	RESISTOR, Carbon, 10K ±5%, 1/8W
R145	31216-SEL	RESISTOR, Carbon, SEL ±5%, 1/8W
R146	31216-SEL	RESISTOR, Carbon, SEL ±5%, 1/8W
R147	31216-SEL	RESISTOR, Carbon, SEL ±5%, 1/8W
R148	31216-0101	RESISTOR, Carbon, 100 ±5%, 1/8W
R149	31216-0333	RESISTOR, Carbon, 33K ±5%, 1/8W
R150	31216-0331	RESISTOR, Carbon, 330 ±5%, 1/8W
R151	31216-0474	RESISTOR, Carbon, 470K ±5%, 1/8W
R152	31216-0471	RESISTOR, Carbon, 470K ±5%, 1/8W
R154	Not Used	
R155	Not Used	
RP1	31221-1105	RESISTOR NETWORK, 4-1 Meg Resistors, SIP
RP2	31221-1105	RESISTOR NETWORK, 4-1 Meg Resistors, SIP
RP3	31221-1105	RESISTOR NETWORK, 4-1 Meg Resistors, SIP
RP4	31221-1105	RESISTOR NETWORK, 4-1 Meg Resistors, SIP
RP5	31221-1105	RESISTOR NETWORK, 4-1 Meg Resistors, SIP

ELECTRICAL PARTS LIST

Symbol No.	Part Number	Description
S1	61627-0001	SWITCH, Toggle, SPDT
S2	61627-0001	SWITCH, Toggle, SPDT
S3	61627-0001	SWITCH, Toggle, SPDT
S4	61627-0001	SWITCH, Toggle, SPDT
S5	61627-0001	SWITCH, Toggle, SPDT
S6	61627-0001	SWITCH, Toggle, SPDT
S7	61627-0001	SWITCH, Toggle, SPDT
S8	61627-0001	SWITCH, Toggle, SPDT
S9	61626-0003	SWITCH, Taggle, DPDT
S10	61632-0001	SWITCH, Wafer, 6 Pole, 5 Position Rotary
S11	61626-0002	SWITCH, Toggle, DPDT, Momentary Down
S12	61576-0001	SWITCH, Pushbutton, Momentary, SPST
T1	11796-0001	TRANSFORMER, Transistor Driver
T2	11745-0001	TRANSFORMER, Driver
T3	11848-0001	TRANSFORMER, Output
T101	11871-0001	TRANSFORMER, 10.7 MHz
T102	11871-0001	TRANSFORMER, 10.7 MHz
U1	74072-0001	I.C., FET ANALOG SWITCH 4016
U2	74072-0001	I.C., FET ANALOG SWITCH 4016
U3	74072-0001	I.C., FET ANALOG SWITCH 4016
U4	74124-0002	I.C., Power Amplifier, 8 Pin Dip, LM380
U5	74124-0002	I.C., Power Amplifier, 8 Pin Dip, LM 380
U101	74099-0001	I.C., 3088
U102	74038-0001	I.C., Quad Op Amp, 3401
Y101	72044-0001	CRYSTAL. 64.3 MHz

6.1 GENERAL

This section provides the electrical schematic(s) for the CP 136T.

A component layout drawing of the printed circuit board assembly is also provided opposite the schematic. This drawing also identifies the runs on the component side (Pink) vs the runs on the non-component side (Gray) as an aid in tracing the circuit.

6.2 CHASSIS LEVEL CONFIGURATION

Narco's chassis level identification code system.

As new products are released for manufacture, the product is appropriately coded.

Basically the code is a series of letters that identifies each individual subassembly of the unit. Therefore, a unit with 3 subassemblies will have an initial chassis level code of AAA. A unit with 9 subassemblies will have an initial chassis level code of AAAAAAAAA. This code will usually be found near the serial number on the chassis.

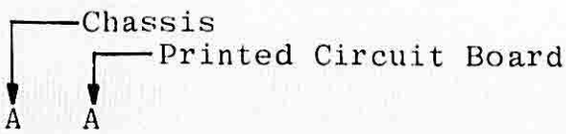
If the equipment is of a multi-unit configuration, each unit will have its own chassis level code.

Each independent subassembly is also stamped with its level code letter (a capital letter about 1/8 high). Due to space, position in the unit, or what have you, no specific spot can be called out. However, in most cases all the letters will be able to be seen by turning the unit in various positions. Some letters are on the component side, others on the opposite side.

Should a shop update a unit or subassembly it would be most advantageous to change the codes of the updated subassemblies as well as the full code number by the serial number. Solvent and a felt tipped pen should do the job.

CHASSIS LEVEL CONFIGURATION

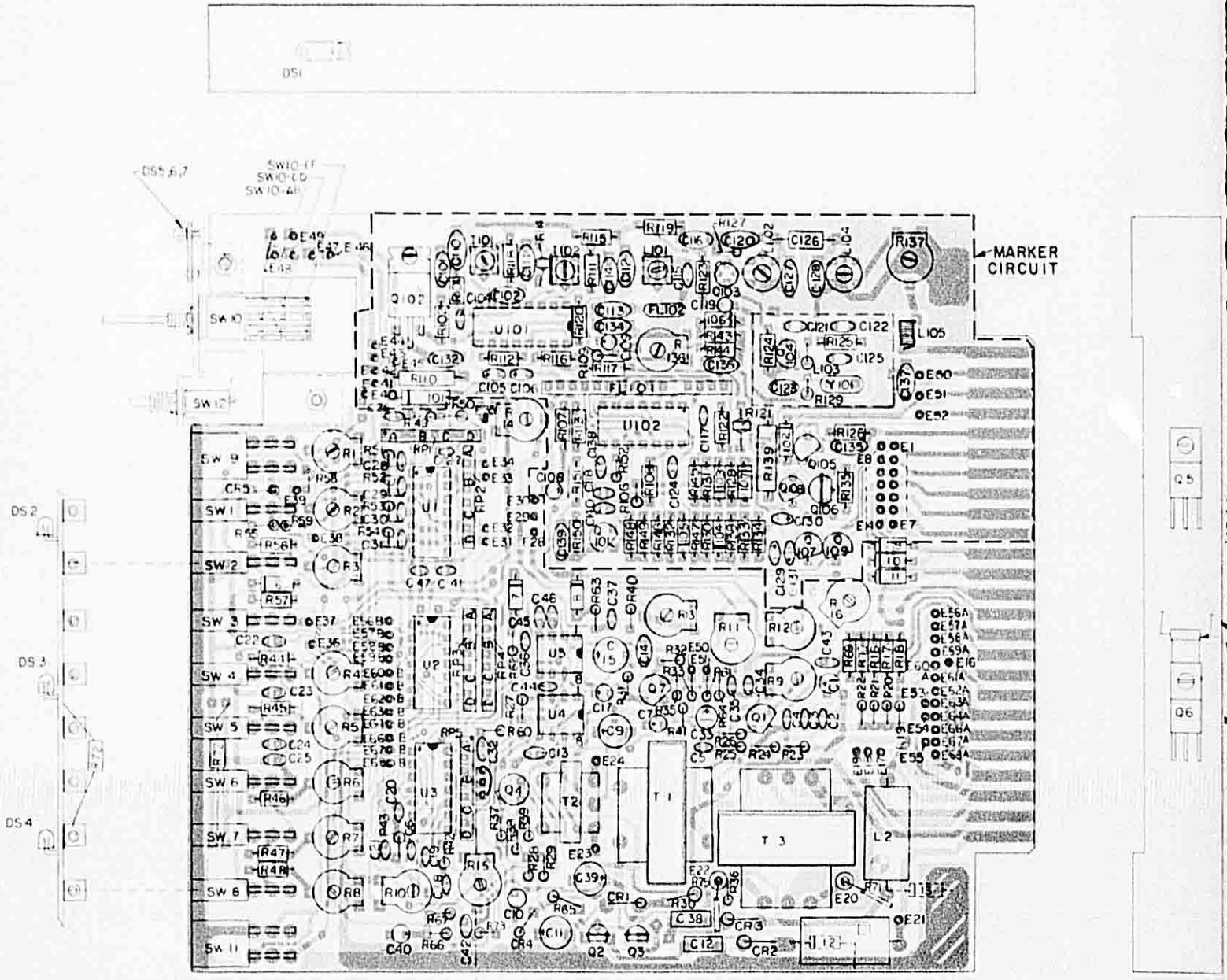
CP 136T



CP 136T AUDIO PANEL CIRCUIT

The schematic shown in Figure 6-1 is similar to that of Figure 2-17 that is identified in its lower right corner as E02517E. The current schematic E02517F was corrected as follows:

(1) R75 at Q5 was identified as R68.
(2) CR12 was CR13 . . . CR13 was CR12 . . . Also their connection points were changed.



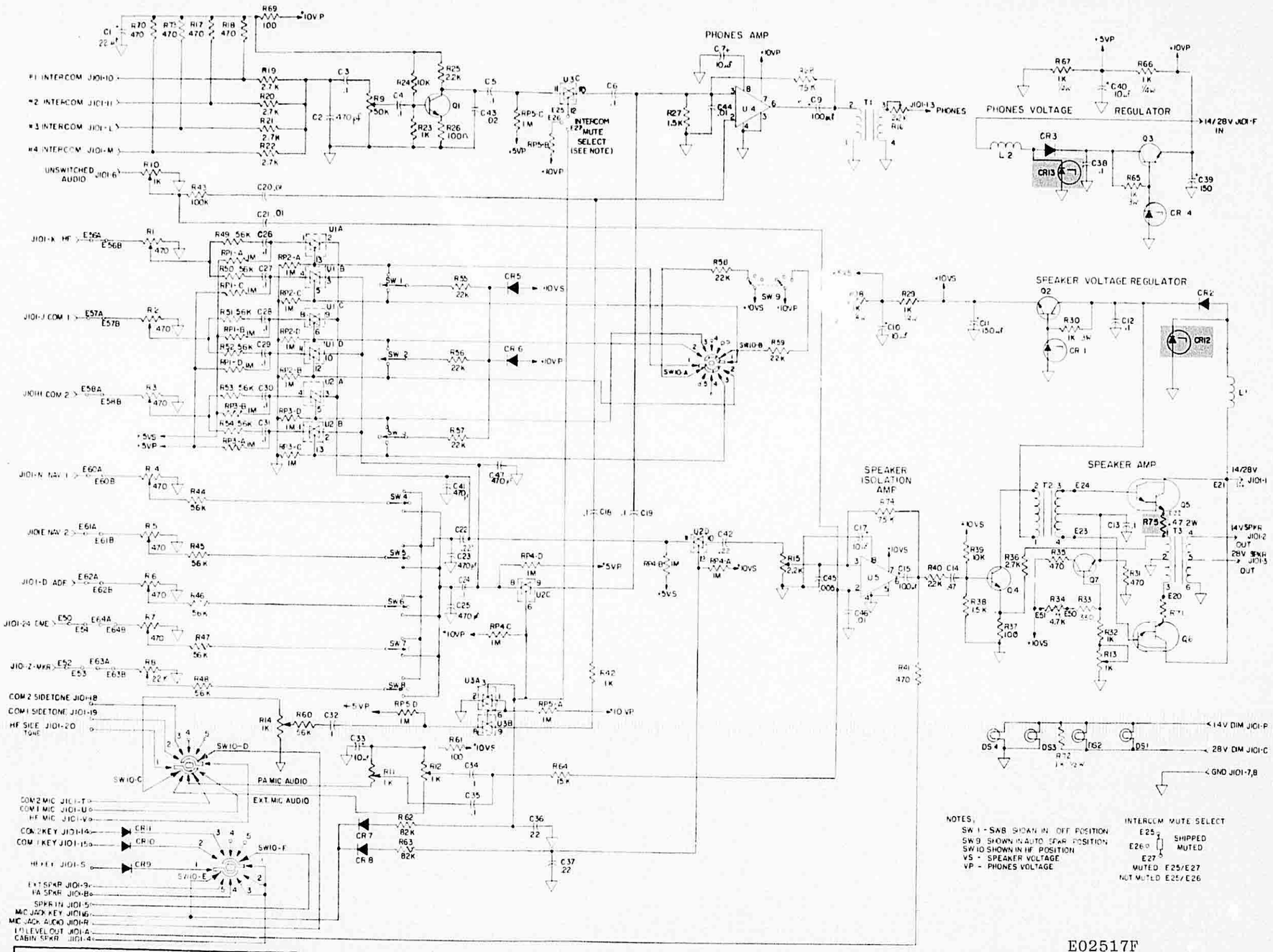
Solder runs shown in GREY are those on the "BOTTOM" (non-component) side of the board.

Solder runs shown in PINK are those on the "TOP" (component) side of the board.

D55193E
R95224C
TP00546

7/79

SEE BLOW-UP



E02517F

"Shaded areas shown on the schematic indicate those points where a change, addition, deletion, or type substitution took place."

FIGURE 6-1. CP 136T AUDIO PANEL CIRCUIT

CP 136T MARKER RECEIVER CIRCUIT

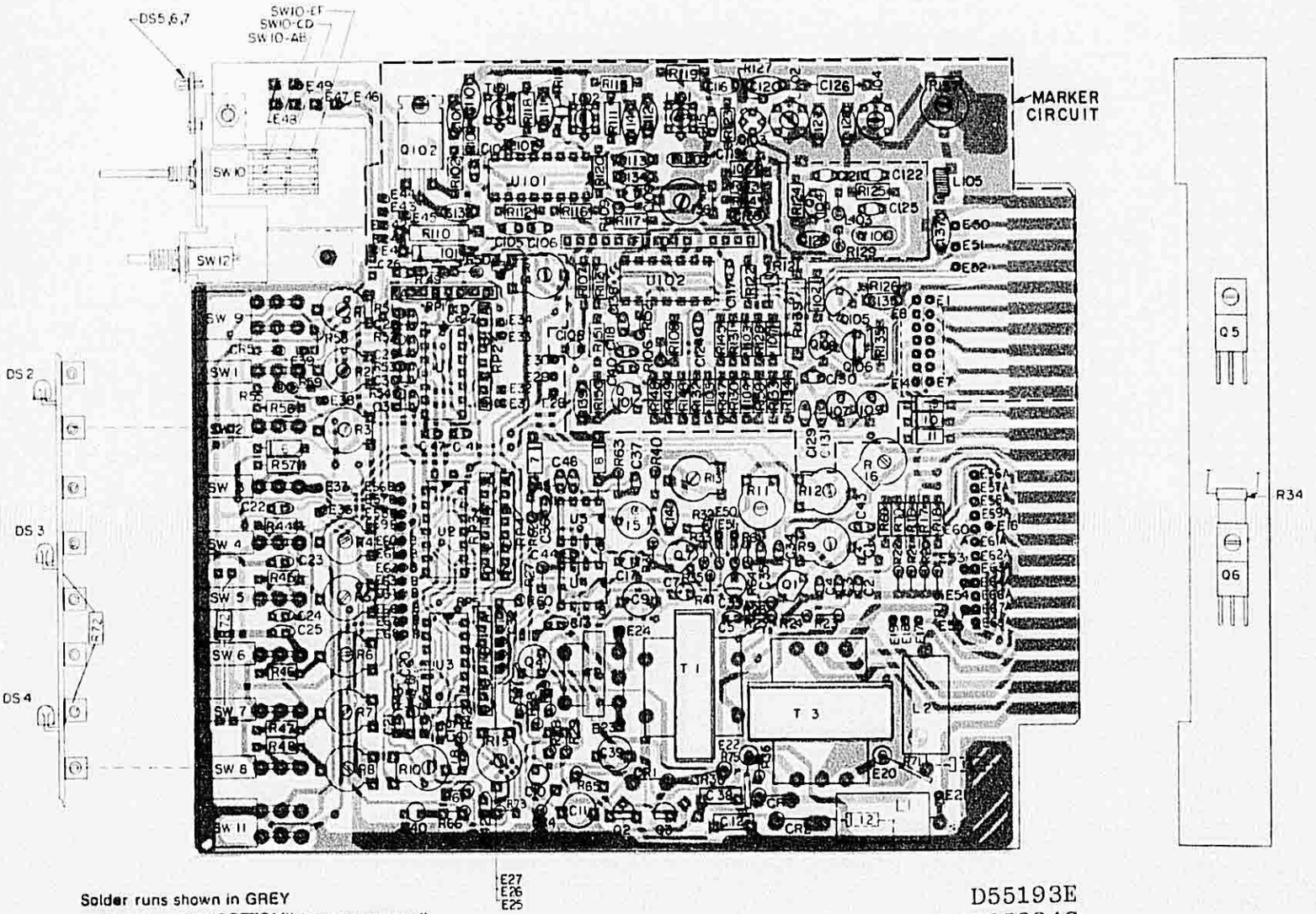
The schematic shown in Figure 6-2 is similar to that of Figure 2-18 that is identified in its lower right corner as D02526E. The current schematic D02526G shows the following changes:

To lengthen the MKR AUDIO MUTE function R106 and C108 were changed. This change gives a new range: WAS 10 to 16 seconds
NOW 14 to 22 seconds

R106 was 1K ohms
R106 now 31216-0101 RESISTOR, Carbon, 100 ±5%, 1/8W

C108 was 68 uF
C108 now 21564-0124 CAPACITOR, Tantalum, 100 uF ±10%, 10V



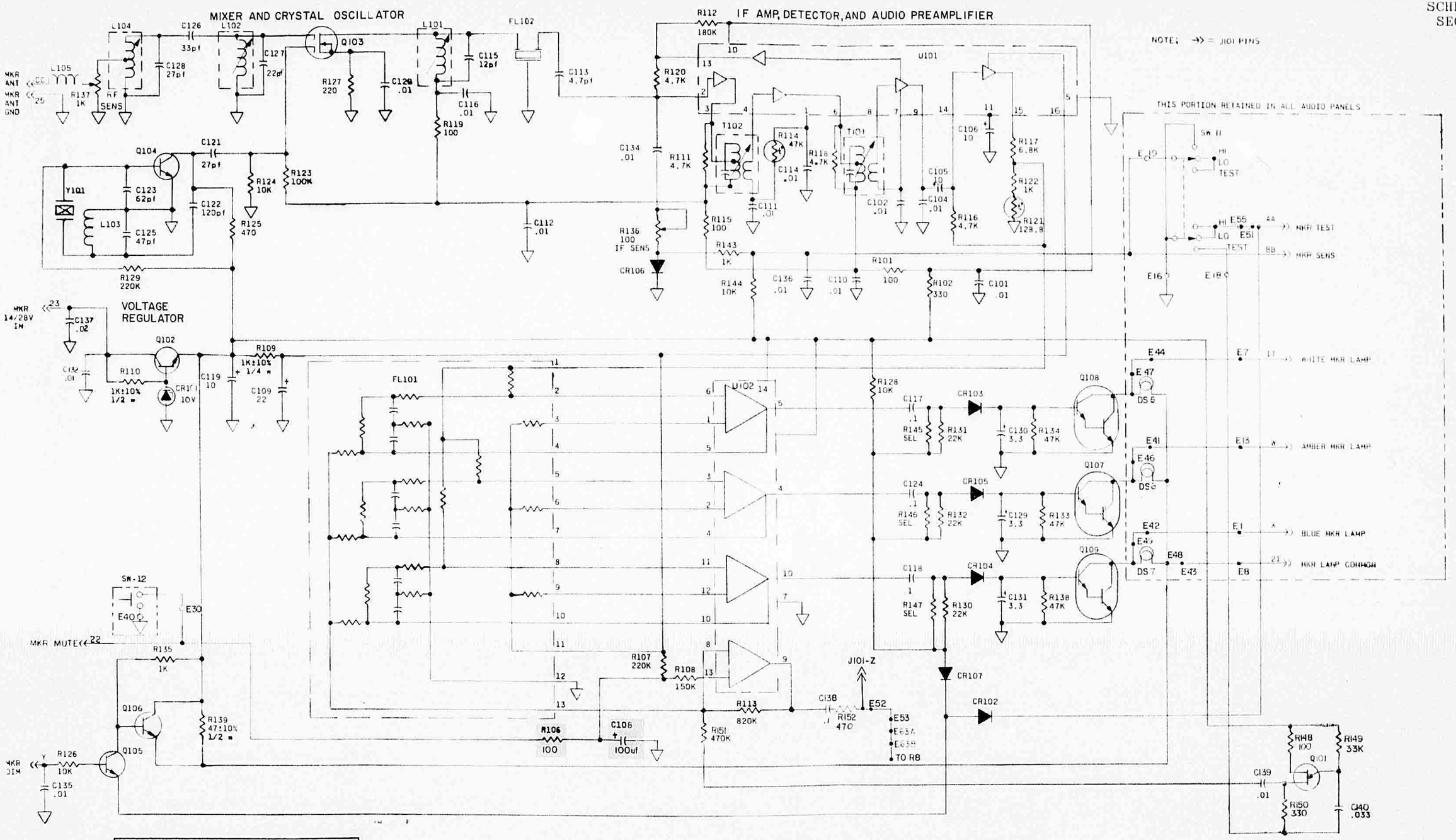


Solder runs shown in GREY are those on the "BOTTOM" (non-component) side of the board.

Solder runs shown in PINK are those on the "TOP" (component) side of the board.

D55193E
R95224C
TP00546

SEE BLOW-UP



"Shaded areas shown on the schematic indicate those points where a change, addition, deletion, or type substitution took place."

FIGURE 6-2. CP 136T MARKER RECEIVER CIRCUIT

D02526G

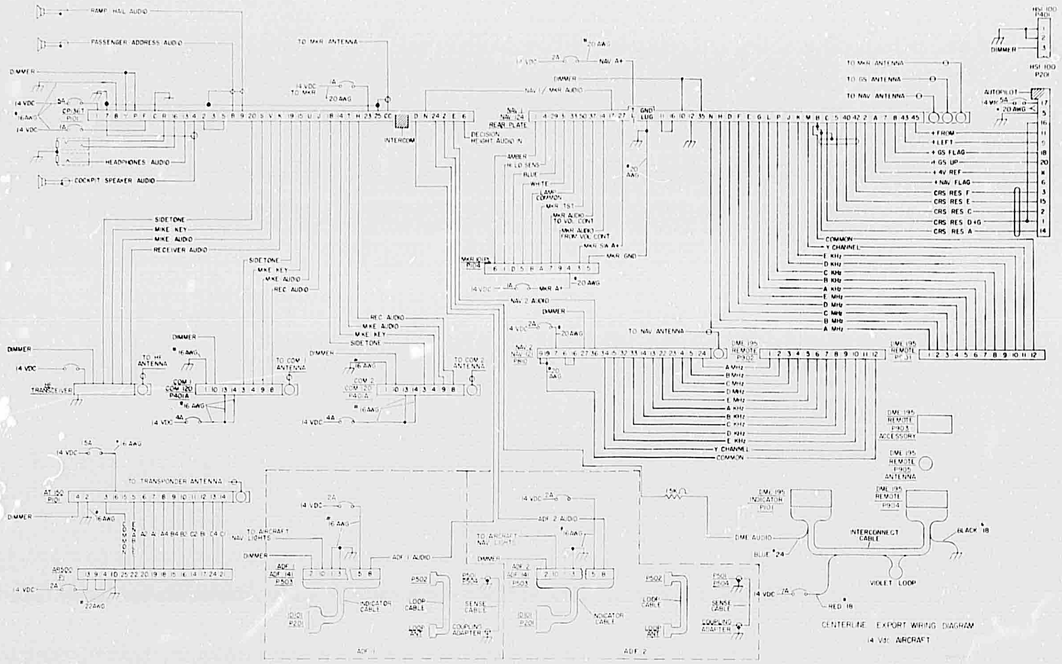


FIGURE 1-2. SYSTEM INTERCONNECT WIRING FOR 14V AIRCRAFT

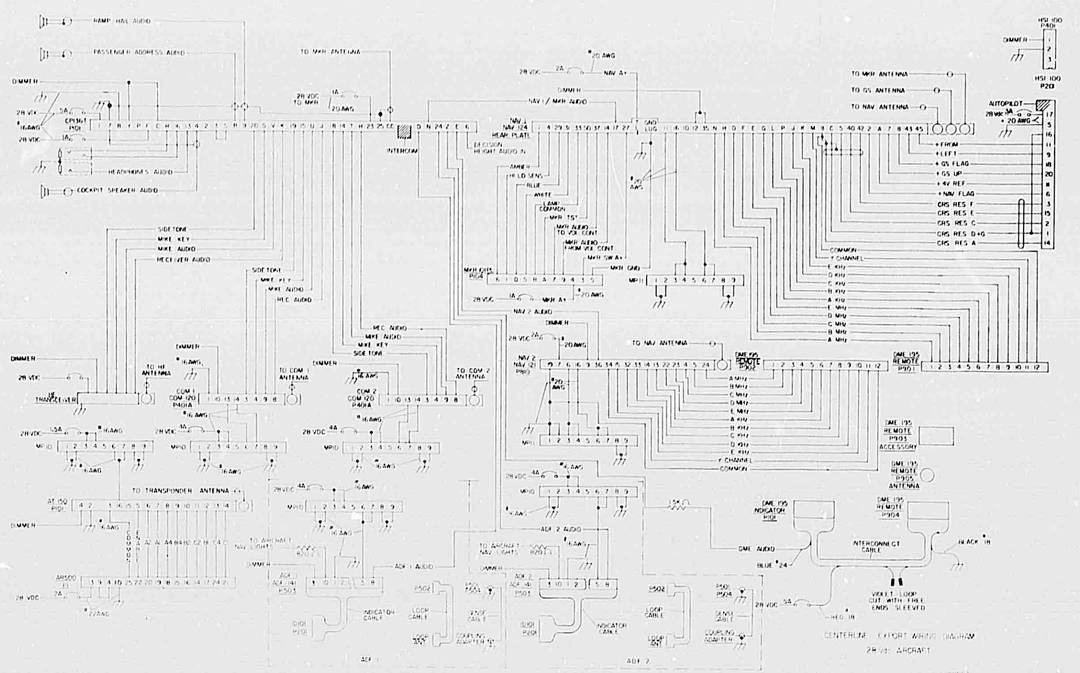
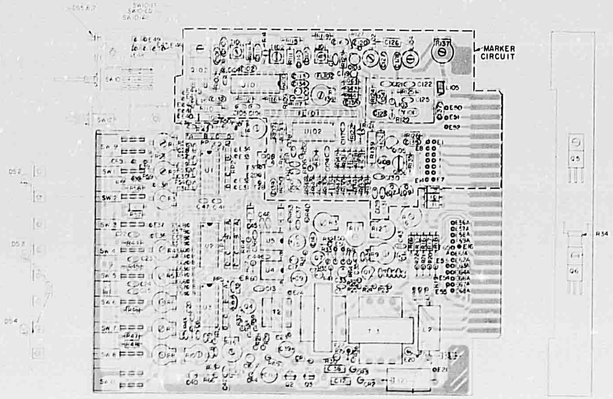


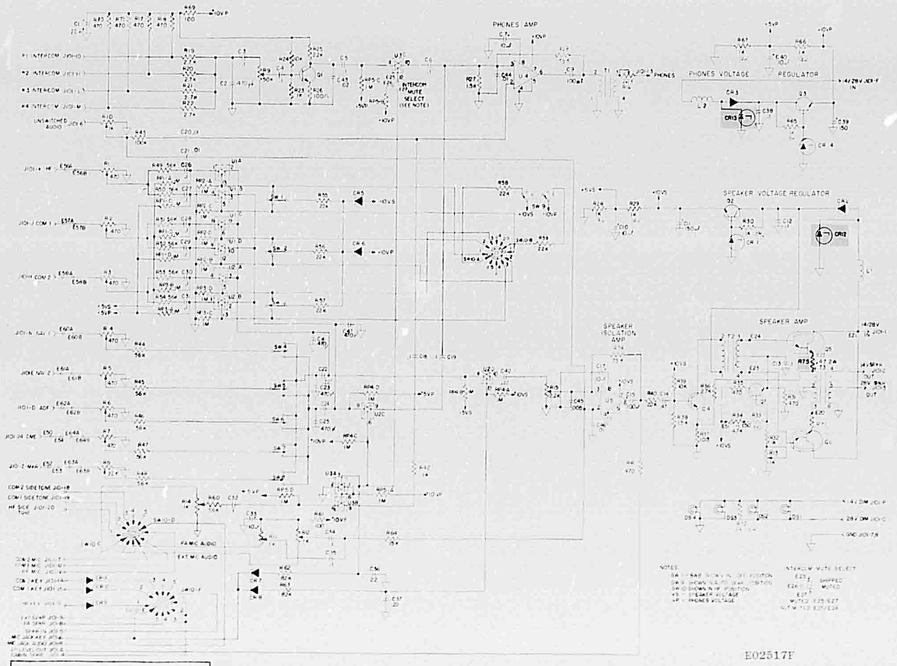
FIGURE 1-3. SYSTEM INTERCONNECT WIRING FOR 28V AIRCRAFT

CP 136T AUDIO PANEL CIRCUIT

The schematic shown in Figure 6-1 is similar to that of Figure 2-17 that is identified in its lower right corner as E02517E. The current schematic E02517F was corrected as follows:

(1) R75 at Q5 was identified as R68.
(2) CR12 was CR13 . . . CR13 was CR12 . . . Also their connection points were changed.





"Shaded areas shown on the schematic indicate those points where a change, addition, deletion, or type substitution took place."

FIGURE 6-1. CP 136T AUDIO PANEL CIRCUIT

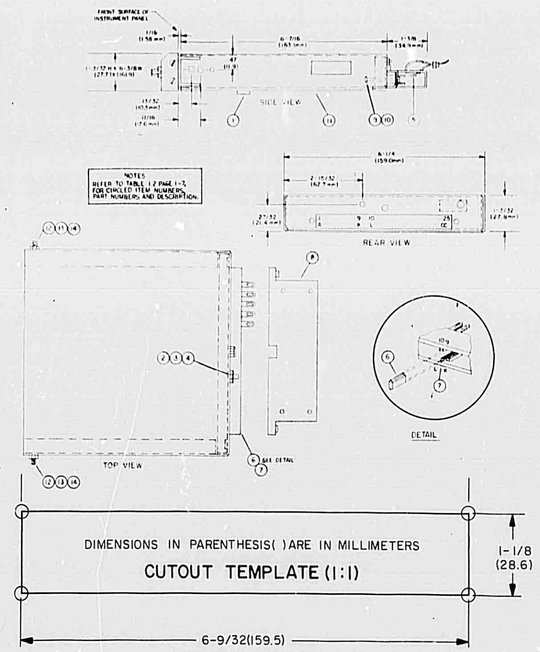


FIGURE 2-6. MECHANICAL INSTALLATION

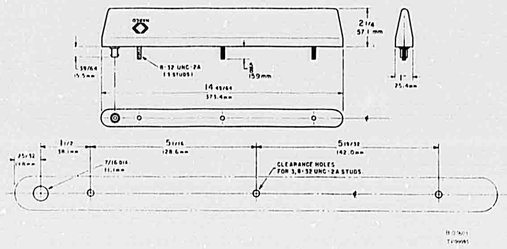


FIGURE 2-7. VMA-15 MARKER BEACON ANTENNA

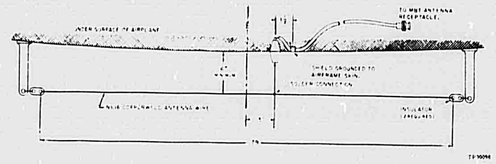


FIGURE 2-8. MARKER BEACON OFF-CENTER FED ANTENNA

NARCO AVIONICS CP 136T

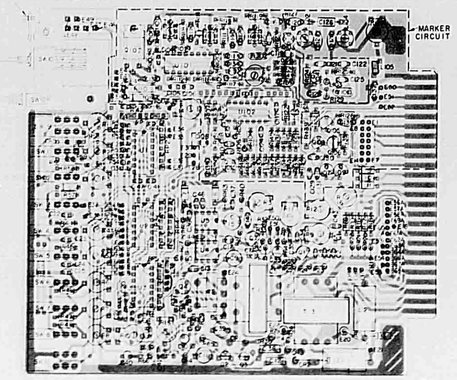
CP 136T MARKER RECEIVER CIRCUIT

The schematic shown in Figure 6-2 is similar to that of Figure 2-18 that is identified in its lower right corner as D02526E. The current schematic D02526G shows the following changes:

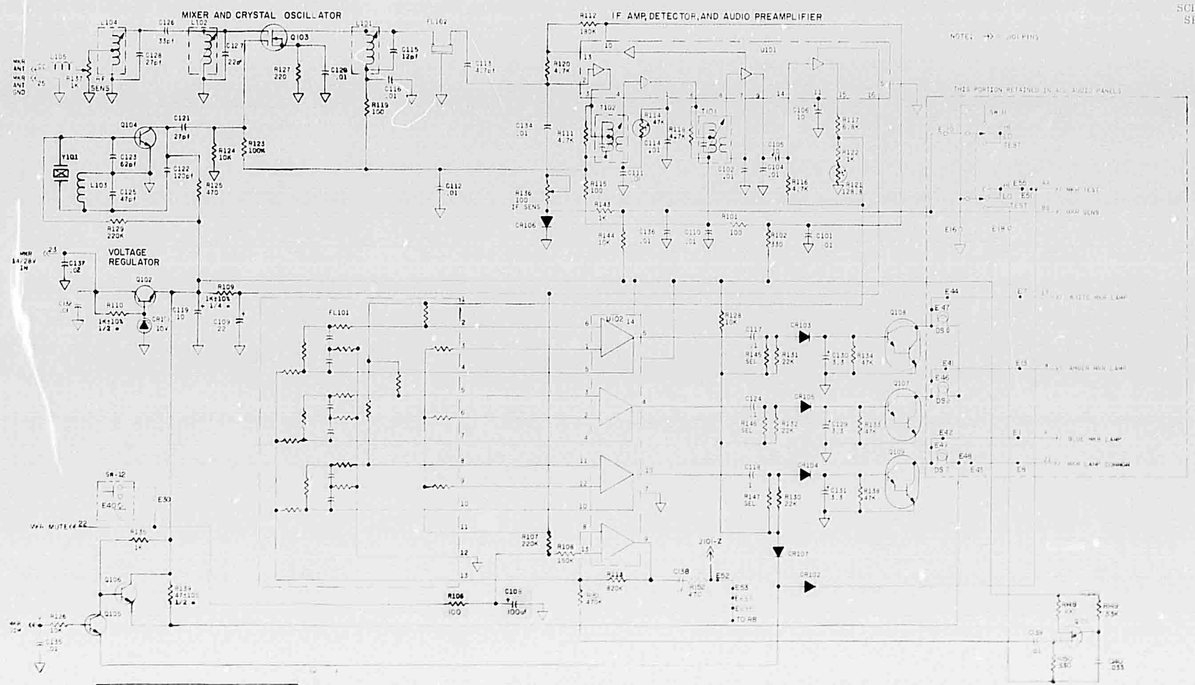
To lengthen the MKR AUDIO MUTE function R106 and C108 were changed. This change gives a new range: WAS 10 to 16 seconds
NOW 14 to 22 seconds

R106 was 1K ohms
R106 now 51216-0101 RESISTOR, Carbon, 100 ±5%, 1/8W

C108 was 68 uF
C108 now 21564-0124 CAPACITOR, Tantalum, 100 uF ±10%, 10V



D55193E
R95224C
TP00546



"Shaded areas shown on the schematic indicate those points where a change, addition, deletion, or type substitution took place."

FIGURE 6-2. CP 136T MARKER RECEIVER CIRCUIT

D02526G

CP 136T MARKER RECEIVER CIRCUIT

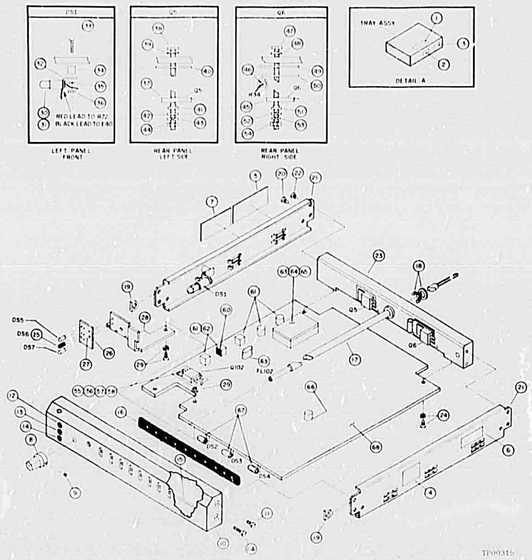
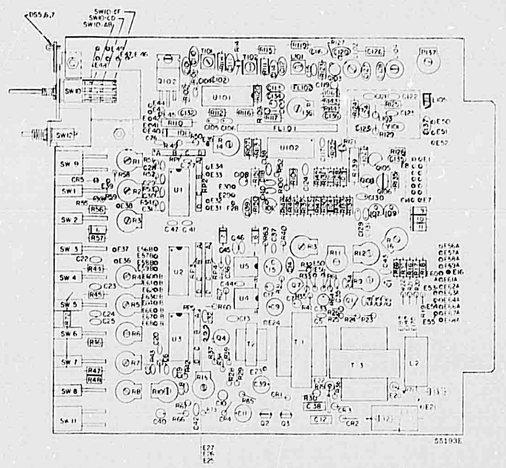


FIGURE 5-1. CP 136T AUDIO PANEL



DESIGNATES DIODE, BAR INDICATES CATHODE END, CR OMITTED FOR CLARITY

FIGURE 5-2. CP 136T COMPONENT PC BD ASSY