Wulfsberg Electronics Division
A Chelton Group Company

C-962A/S CONTROL UNIT

Operator's Manual

Manual Number 150-040218

Revision A

April 30, 1999

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(continued)

Record of Revisions

Revision Number	Issue Date	Date Inserted	By	Revision Number	Issue Date	Date Inserted	By
A	4/30/99						

1.3 MODEL VARIATIONS (cont.)

The RT-9600, with VP interface, requires a special control unit, the C-962S. Two versions, whose only difference is instrument panel lighting, are available. The 5V and 28V versions are tabulated in Section 1.6.

1.4 DESIGN FEATURES

In addition to providing the VP interface function, several important features of the RT-9600, with VP interface, provide maximum reliability and operational flexibility. These features provide ease of installation and maintenance.

-- Plug-in modular construction with bifurcated gold card-edge connectors.

-- MIL grade epoxy impregnated fiberglass printed circuit boards with MIL spec post coating for humidity and dust protection.

-- All solid state.

-- Burn-out proof transmitter due to open or short-circuited transmission line.

-- RF gated audio sidetone exists when transmitter is producing RF power.

-- Automatic signal-to-noise squelch with manual override.

-- Interface compatible with the Motorola DVP™ external encryption unit.

-- AM detector for use with direction finding equipment.

-- Operates on either 14 or 28V DC power.

-- Low profile 1/2 ATR short package.

-- No band spread limitation.

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1.5 TECHNICAL CHARACTERISTICS (cont.)

1.5.1 RT-9600 WITH VP INTERFACE (cont.)

GENERAL SPECIFICATIONS

Other:	Meets RTCA DO-138 Environmental Catagory AAGAAAEXXXXS (when shock-mounted) and AANAAAEXXXXS (when rigid mounted) to Wulfsberg operational standards.

TRANSMITTER SPECIFICATIONS (STANDARD TEST CONDITIONS

Nominal Output Power:	Operator selectable, 1 or 10 Watts.
Output Power Tracking:	± 20% from nominal over frequency range.
Output Impedance:	50 ohms.
Duty Cycle:	Continuous (EIA).
Frequency Stability:	± 0.0005% over -30 to + 60° C.
Modulation:	± 5 kHz deviation, limited.
Audio Input:	0.175 VRMS into 200 ohms input circuit for ± 3.0 kHz deviation, adjustable.
Audio Distortion:	5%.
Modulation Tracking:	± 0.9 dB across frequency range.
Sidetone Output:	100 mW into 600 ohms, adjustable.
Microphone Circuit:	Carbon or equivalent.
FM Hum and Noise:	-30 dB.
Harmonics:	-70 dB below carrier level.
Spurious:	-80 dB below carrier level.

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1.5 TECHNICAL CHARACTERISTICS (cont.)

1.5.1 RT-9600 WITH VP INTERFACE (cont.)

GUARD RECEIVER SPECIFICATIONS (STANDARD TEST CONDITIONS) (cont.)

Response:

Image:	-85 dB.
Spurious:	-75 dB.

All other specifications same as the main receiver except the guard receiver has no DF Output and no VP capability.

SUBAUDIBLE TONE SQUELCH OPTION (CTCSS)

Number of Tones:	Eight.
Selection Method:	Selected by coding four wires on the main connector. The wire coding is generated in the control units or by external switching and may be changed between transmit and receive.
Frequency Range:	60 to 250 Hz - Field Adjustable.

1.5.2 CONTROL UNIT

Physical Dimensions:

C-962S	See Figure 2.5-5 of RT-9600 Installation Manual.

1.6 SYSTEM COMPONENTS

The following are the currently defined components of the RT-9600 Transceiver Systems, with VP interface.

1.6.1 VP TRANSCEIVERS

MODEL NUMBER	DESCRIPTION	WULFSBERG PART NUMBER
RT-9600-52	9600 Channel VHF Hi-Band Transceiver, 14/28VDC, 100mW Audio, Protruding Connector, with VP Interface.	400-0052-052

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1.6 SYSTEM COMPONENTS (cont.)

1.6.2 VP CONTROL UNITS

MODEL NUMBER	DESCRIPTION	WULFSBERG PART NUMBER
C-962S-10	RT-9600, with VP Interface, Control Unit, 150-174 MHz, 9600 Channel, 28V Integral Lights.	400-0141-010
C-962S-20	RT-9600, with VP Interface, Control Unit, 150-174 MHz, 9600 Channel, 5V Integral Lights.	400-0141-020

1.6.3 INSTALLATION KITS

NOTE: The following installation kits can be used with RT-9600, with VP Interface/C-962S installations.

MODEL NUMBER	DESCRIPTION	WULFSBERG PART NUMBER
IN-96	RT-7200/RT-9600-24 Installation Kit with Shockmount, Crimp type Connector and Crimp Sockets.	149-0029-000
	Included in the IN-96:	
	Size 16 Socket (03 Ea)	129-1017-000
	Size 20 Socket (64 Ea)	129-1019-000
	Shockmount Assembly	300-2122-000
IN-96A	RT-7200/RT9600-24 Installation Kit with Rigidmount, crimp type Connector and Crimp Sockets	149-0029-001
	Included in the IN-96A	
	Size 16 Socket (03 Ea)	129-1017-000
	Size 20 Socket (64 Ea)	129-1019-000
	Spacer, 0.75 O.D. X 0.25 I.D. X 0.316L (08 Ea)	129-0021-010
	Rigidmount Assembly	300-2122-002
IN-97	RT-9600-2 Installation Kit with Shockmount, Crimp type Connector, and Crimp Sockets.	149-0033-000
	Included in the IN-97:	
	Size 16 Socket (03 Ea)	129-1017-000
	Size 20 Socket (64 Ea)	129-1019-000
	Shockmount Assembly	300-2122-000

OVERVIEW

This manual contains instructions for using the Wulfsberg C-962A/S Control Unit. It includes operating and preset channel programming instructions for the original wide-band models and models that have been modified with the narrow-band upgrade.

The C-962A/S provides the control functions for the RT-9600/9600F VHF FM transceiver. RT-9600/9600F transceivers are capable of transmitting and receiving 9600 channels in the 150.000 to 173.9975 MHz band (one every 2.5 kHz). They are optionally equipped with one or two crystal-controlled Guard receiver modules that can be user-specified for any Guard frequency between 150.000 and 173.9975 MHz. They are also optionally equipped with CTCSS tones on both the Main and Guard Receivers. Models equipped with the VP (Voice Privacy) interface option are limited to one Guard channel. A narrow-band modification of the RT-9600/9600F is available for use with the upgraded C-962A/S.

The C-962A/S can select any of the RT's channels, and can be used to control the operation of the optional Guard receiver and subaudible CTCSS tones.

The C-962A/S stores programmable transmit and receive frequencies in non-volatile memory (no internal battery is required to maintain stored information when the equipment is turned off).

CAUTION: Federal regulations require that operators of this equipment transmit and receive over specifically authorized frequencies only.

It has been produced in two versions:

- The C-962A is designed to control RT-9600/9600F radios equipped with the Guard receiver option. Its control panel includes a Guard1/Guard 2 Selector Switch (Figure 1, Item 13) that allows the user to switch between Guard channels if the RT-9600F transceiver is equipped with two Guard receivers.
- The C-962S is designed to control RT-9600/9600F radios equipped with the VP (Voice Privacy) interface option. Its control panel includes a PVT/STD Selector Switch (see Figure 2) that allows the use to switch between encrypted (PVT) and normal (STD) operation.

Both versions can be upgraded to narrow-band operation. The C-962A/S narrow-band upgrade provides the following features and capabilities in addition to those of the original version:

- User–selectable narrow-band (12.5 kHz channel spacing) and wide-band (25 kHz channel spacing) operation. The original C-962A/S allows wide-band operation only.

  NOTE: This capability requires an RT-9600/9600F transceiver that has been modified for narrow-band operation.

- Increased number of programmable preset channels. The upgrade provides 15 memory banks that allow up to 15 presets each, for a maximum of 225. The original C-962A/S allows a maximum of 15 presets.

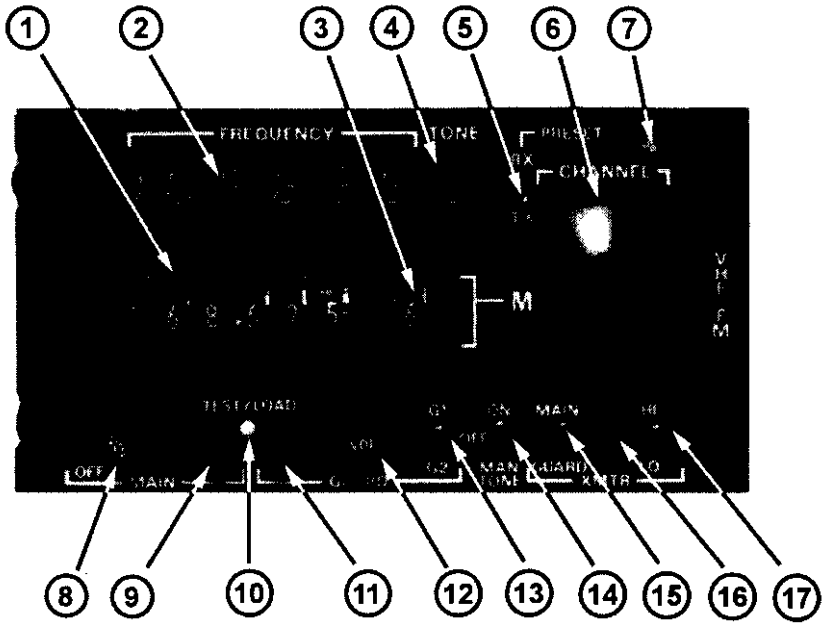
1.6 SYSTEM COMPONENTS (cont.)

1.6.3 INSTALLATION KITS (cont.)

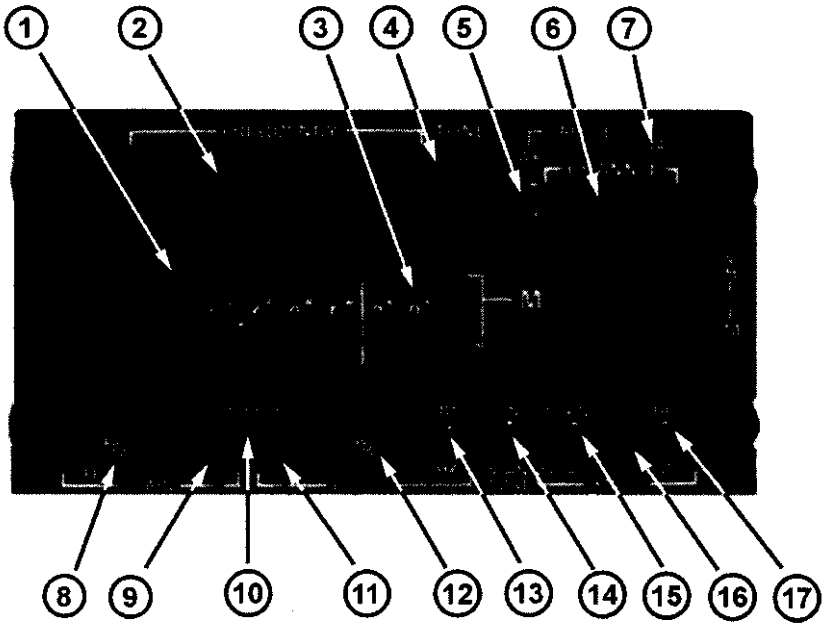
MODEL NUMBER	DESCRIPTION	WULFSBERG PART NUMBER
IN-722/962-1 (cont.)	Small Junction Shell	129-1021-000
	Crimp Socket, No.20, D Style (75 Ea)	129-1046-000
	Plug, 50S D Submin, Crimp less contacts	129-2139-000
	Plug, 25S, D Submin, Crimp less contacts	129-2140-000
	Cable Boot, 0.312 I.D.	179-0004-000
	Cable Boot, 0.437 I.D.	179-0006-000

1.6.4 INSTALLATION CONNECTOR KITS

MODEL NUMBER	DESCRIPTION	WULFSBERG PART NUMBER
IN-96A-2	Plug, 67S, DPXB, Crimp Type with sockets for Recessed Transceiver connector.	149-0029-002
	Included in the IN-96A-2:	
	Size 16 Socket (03 Ea)	129-1017-000
	Size 20 Socket (64 Ea)	129-1019-000
	Plug 67S, ARINC, Crimp less sockets	129-2040-000
IN-97A-2	Plug, 67S, DPXP, Crimp Type with sockets for Protruding Transceiver Connector.	149-0033-002
	Included in the IN-97A-2:	
	Size 16 Socket (03 Ea)	129-1017-000
	Size 20 Socket (64 Ea)	129-1019-000
	Jack 67S, ARINC, crimp less sockets	129-2045-000



a. Original



b. With Narrow-band Upgrade

Figure 1. C-962A Controls

1.6 SYSTEM COMPONENTS (cont.)

1.6.5 ANTENNAS, MICROPHONE AND ACCESSORY

See RT-9600 Installation Manual Section 1.6.9.

1.6.6 MODULES AND CRYSTALS

MODEL NUMBER	DESCRIPTION	WULFSBERG PART NUMBER
MC-96A-3	R/T Module, RT-9600, with VP Interface	300-2097-003
MC-96B-2	Synthesizer Module, RT-9600, with VP Interface	300-2098-002
MC-96D-2	Audio Module, 100 mWatt, RT-9600, with VP Interface	300-2100-003

See RT-9600 Installation Manual Section 1.6.10 for other modules.

1.6.7 MAINTENANCE MANUALS

MODEL NUMBER	DESCRIPTION	WULFSBERG PART NUMBER
SM-9600	Maintenance Manual - RT-9600	150-0058-000
SM-722/722A/ 962/962A/962S	Maintenance Manual, C-722/ C-722A/C-962/C-962A/C-962S Control Units	150-0073-000
SM-9600 DVP	Maintenance Manual, RT-9600, with VP Interface, Addendum	150-0130-000

1.6.8 TEST EQUIPMENT

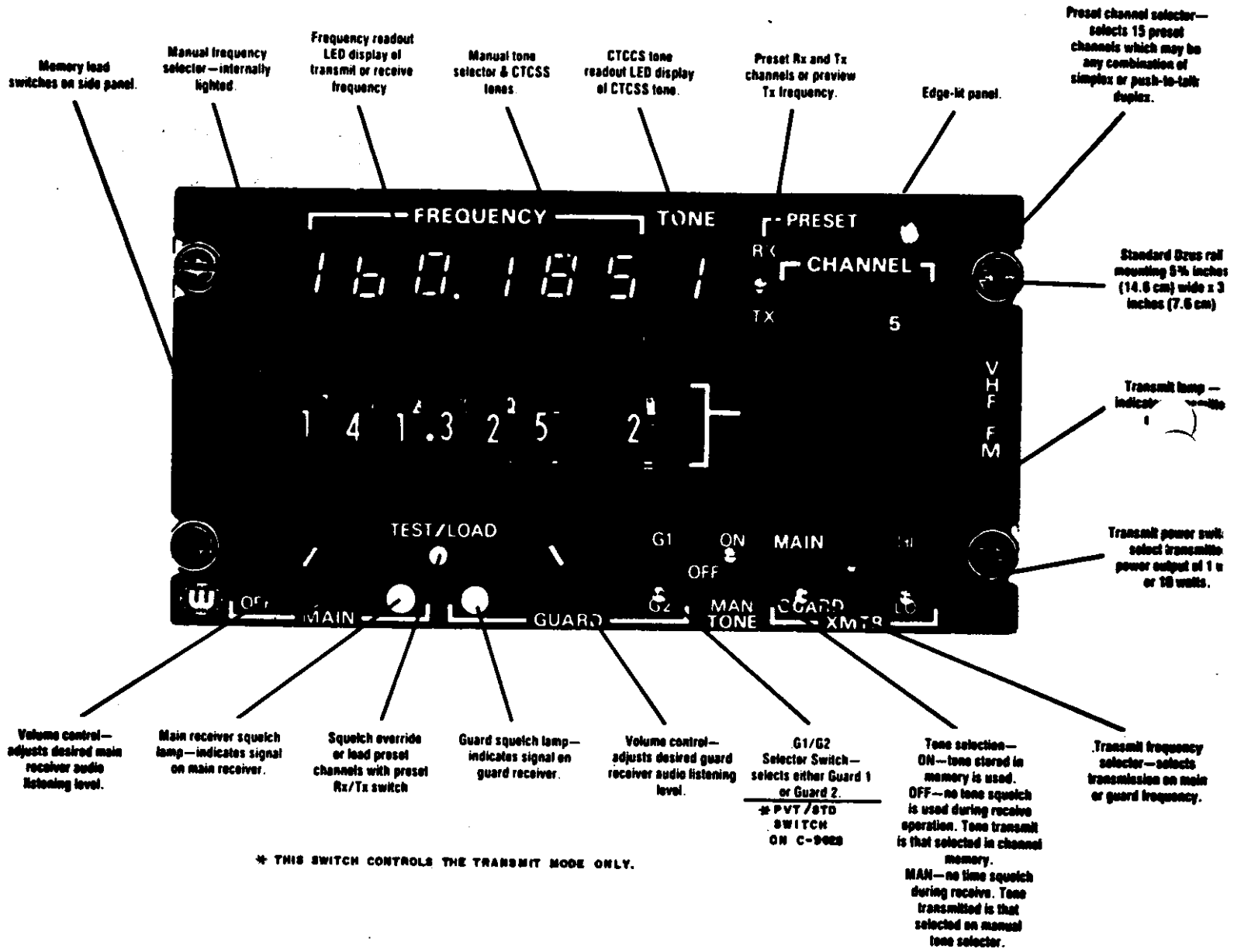
See RT-9600 Installation Manual, Section 1.6.12.

1.6.9 MILITARY ACCESSORIES

Military accessories are not applicable to the RT-9600 Transceiver, with VP Interface.

Table 1. C-962A/S Controls

Item No.	Control	Function
1	Manual Frequency Selector Thumbwheel Switches	Allows the operator to set the frequency for the manual channel. Allows the operator to select the frequency when programming or reprogramming a channel.
2	Frequency LED Display	Normally shows the receive frequency. Shows the transmit frequency when the mic is keyed or the Preset Channel Transmit/Receive Selector Switch (Item 5) is in the **TX** position.
3	Tone Selector Thumbwheel Switches	Allows the operator to manually set the CTCSS tone. Allows the operator to select the CTCSS tone when programming or reprogramming a channel.
4	Tone LED Display	Indicates the CTCSS tone number (if any) programmed or manually selected for the currently selected channel.
5	Preset Channel Transmit/Receive Selector Switch	Displays the currently selected transmit or receive frequency. Allows the operator to specify the frequency as transmit or receive when programming or reprogramming a channel.
6	Preset Channel Selector	Allows the operator to select the manual channel or preset channels.
7	Photo-sensor	Automatically Adjusts the brightness of the Transmit/Squelch (Receive) LEDs (Items 9, 11, and 16).
8	Main Receiver On/Off/Volume Control	Turns the equipment On and Off; adjusts the Main Receiver audio level.
9	Main Receiver Squelch (Receive) LED	Lights when the Main receiver receives a signal.
10	Test/Load Button	Disengages the automatic squelch for both the Main and Guard receivers. Loads programmed frequencies and CTCSS tones into memory. Loads the selected memory bank. Loads the selected CTCSS tone group.
11	Guard Receiver Squelch (Receive) LED	Lights when the Guard receiver receives a signal.
12	Guard Receiver Volume Control	Adjusts the Guard receiver audio level.
13	Guard 1/Guard 2 Selector Switch	On a C-962A with two Guard channels, controls whether Guard channel 1 or channel 2 transmit frequency is used.
14	Tone On/Off/Manual Selection Switch	Enables/disables the automatic tone feature during receive operation.
15	Main/Guard Transmit Selector Switch	Selects transmission over the Main or Guard receiver.
16	Transmit LED	Lights when a signal is transmitted.
17	High/Low Transmit Power Selector Switch	Selects 1 Watt or 10 Watts transmitter power output.



* THIS SWITCH CONTROLS THE TRANSMIT MODE ONLY.

NOTE: The C-962S Control Unit has an internally accessible THUMBWHEEL ENABLE switch (A4S1C). When this switch is placed in the OFF (leverarm away from PC Board towards bottom of unit) position, the manual M channel selector position becomes inoperative.

CONTROLS AND FUNCTIONS FOR THE C-962S
FIGURE 1.7-1

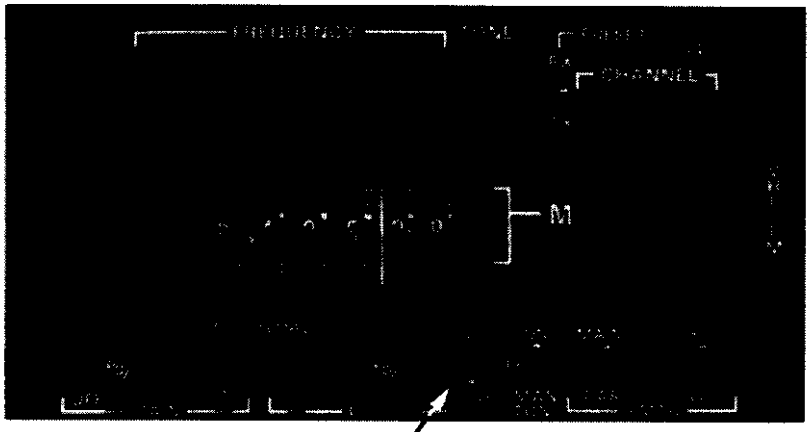


Figure 2. C-962S Control Panel

- Increased number of user-specified subaudible CTCSS tones. The upgraded C-962A/S can generate up to 46 Wulfsberg Group tones, 49 Technisonic Group tones, and 33 CDF (California Department of Forestry) Group tones. Unlike the original C-962A/S, it does not rely on the tone generating capability built into the RT-9600, which is limited to eight.

The narrow-band upgrade includes an 11-character, 5 x 7 dot-matrix LED display to accommodate its added capabilities (for example, two-digit tone codes). The original has a seven-character, seven-segment LED display. In addition, the upgrade includes two Tone Selector Thumbwheel Switches instead of one on the original.

The following features of the C-962A/S are configured by internal switch settings:

- The Thumbwheel Enable/Disable Switch - Allows the Manual Frequency and Tone Selector Thumbwheel Switches (Figure 1, Items 1 and 3) to be enabled/disabled. Setting the switch to the Off position disables manual frequency selection when the Preset Channel Selector is set to the M (Manual) channel, and prevents the operator from reprogramming the preset channel settings.
- Memory Load Switch – Switch must be set to ON to allow the operator to reprogram preset channels.

The following features of the C-962A/S are configured through connections in the wiring harness:

- Thumbwheel Backlighting – Backlighting of the manual frequency and tone selector thumbwheel switches can be disabled during installation (refer to Manual Number 150-0061-000, Paragraph 2.8.10).
- Frequency and Tone LED Displays – On the original C-962A/S, the LED displays can be configured during installation to operate continuously or to operate only when selected by the Preset Channel Transmit/Receive Selector Switch. On the C-962A/S with the narrow-band upgrade, the LED displays operate continuously.

1.10 PRESET CHANNEL PROGRAMMING INSTRUCTIONS (cont.)

1.10.2 MAIN TX/RX FREQUENCY

1. Set switch A4S1 on Logic Board labeled MEMORY LOAD to the ON position. Set A4S1C to the MAIN LOAD position. See Figure 1.7-1 for switch locations.

2. Select the desired channel to be programmed on the CHANNEL SELECTOR knob.

3. Set up TX frequency and CTCSS tone on the thumbwheels. (If no tone is desired, set the CTCSS selector to the OFF position.)

4. Set TX selector to MAIN.

5. Operate LOAD SELECT switch to TX LOAD position.

6. Push and release TEST/LOAD button. The TX frequency is now loaded for the selected channel.

7. Set up RX frequency and CTCSS tone on the thumbwheel.

8. Operate LOAD SELECT switch to RX LOAD position.

9. Push and release TEST/LOAD button. The RX frequency is now loaded for the selected channel.

10. Changes in stored channel information may be inhibited by operating MEMORY LOAD switch A4S1B to the OFF position.

CAUTION

All unallocated channel locations must be programmed to 100.000 MHz TX and RX.

1.10.3 GUARD TX FREQUENCY

1. Set internal switch A4S1B on Logic Board labeled MEMORY LOAD to the ON position. Set internal switch A4S1A to the GUARD LOAD position.

2. Any channel other than manual may be selected for the guard frequency programming operation.

OPERATING THE CONTROLS

This section introduces the features of the C-962A/S control panel. Figure 1 locates each of the controls, and Table 1 lists them with a brief description.

Main Receiver On/Off/Volume Control

To turn the equipment ON, rotate the Main Receiver On/Off/Volume Control (Figure 1, Item 8) clockwise.

NOTE: Aircraft power must be available to the unit by operating the appropriate switches and/or circuit breakers. To hear the audio, the appropriate remote audio select switches (if any) must be in the proper position and the volume control set to the appropriate level.

In addition, the Main Receiver On/Off/Volume Control is used to set the audio level. For more accurate volume adjustment, press the Test/Load Button (Figure 1, Item 10) while adjusting the volume.

Test/Load Button

The Main and Guard receivers feature an automatic squelch that allows maximum receive sensitivity without ambient RF noise tripping the squelch. When the Test/Load Button (Figure 1, Item 10) is pressed, the automatic squelch is disengaged for both the Main and Guard receivers and both receivers will have maximum sensitivity. In addition to helping adjust the audio, the Test/Load Button can be used to determine if a receive signal exists below the threshold of the automatic squelch.

The Test/Load Button also used in the following functions:

- Selecting the memory bank (refer to *Selecting Channels on the C-962A/S with the Narrow-band Upgrade*, on page 7).
- Loading programmed frequencies and CTCSS tones into memory (refer to *Programming Preset Channels*, on page 10).
- Selecting the CTCSS tone group (refer to *Selecting CTCSS Tones*, on page 12).

Frequency/Tone LED Display

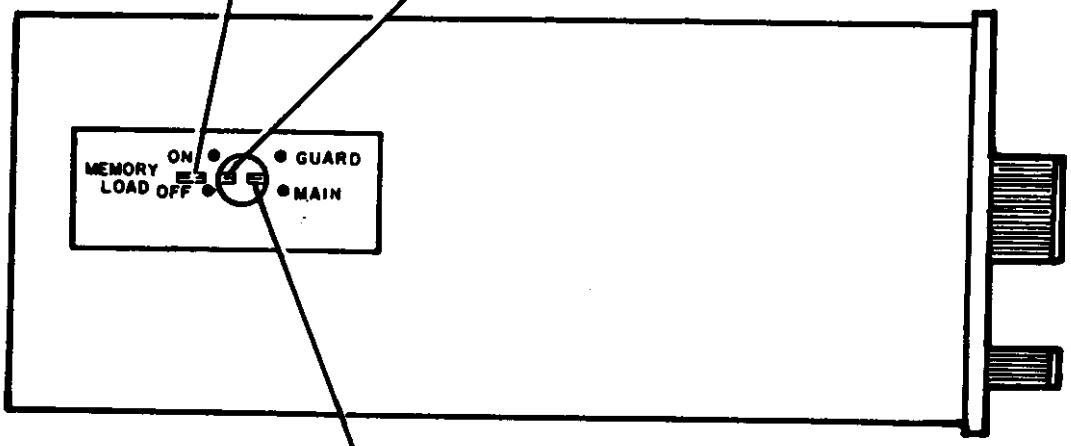
The Frequency LED Display (Figure 1, Item 2) normally shows the currently selected receive frequency. It shows the transmit frequency when the operator keys the mic or holds the Preset Channel Transmit/Receive Selector Switch (Figure 1, Item 5) in the **TX** position.

The Tone LED Display (Figure 1, Item 4) shows the CTCSS tone number (if any) programmed or manually selected for the currently selected channel.

NOTE: On the original C-962A/S, the Frequency/Tone LED Display can be configured during installation to operate continuously or to operate only when selected by the Preset Channel Transmit/Receive Selector Switch. On the C-962A/S with the narrow-band upgrade, the LED displays operate continuously.

S1-C: THUMBWHEEL ENABLE.
NOT VISABLE THROUGH HOLE IN UNIT SIDE.
TO ENABLE MOVE LEVERARM UP TOWARD TOP OF UNIT.

S1-B: MEMORY LOAD ENABLE. MOVE TO "ON" POSITION TO PROGRAM CHANNEL MEMORY.



S1-A: GUARD OR MAIN PROGRAMMING SELECTOR, MUST BE RETURNED TO MAIN POSITION AFTER PROGRAMMING.

C-962S OPERATIONAL MODE SWITCHES
FIGURE 1.10-1

Receive/Transmit LEDs

The C-962A/S has three receive/transmit LEDs.

- When a signal is received over the Main receiver, the yellow Main Receiver Squelch (Receive) LED (Figure 1, Item 9) lights.
- When a signal is received over the Guard receiver, the yellow Guard Receiver Squelch (Receive) LED (Figure 1, Item 11) lights.
- When a signal is transmitted, the green Transmit LED (Figure 1, Item 16) lights.

Main/Guard Transmit Selector Switch

The Main/Guard Transmit Selector Switch (Figure 1, Item 15) allows the operator to transmit over the Main or Guard receiver.

- To transmit over the Main receiver, set the switch to **MAIN**.
- To transmit over the Guard receiver, set the switch to **GUARD**.

NOTE: Also check the setting of the High/Low Transmit Power Selector Switch (Figure 1, Item 17), which determines the power output level of the transmitter.

1.13 SPECIAL OPERATIONAL CONSIDERATIONS FOR DIRECTION FINDING APPLICATIONS

See RT-9600 Installation Manual Section 1.14.

1.14 VP OPERATION

The PVT/STD switch on the C-962S controls only the VP function in the transmit mode. In the receive mode the Motorola DVP™ external encryption unit is able to automatically distinguish the difference between an encrypted signal and an unencrypted signal. In the PVT, the transceiver will transmit a VP encoded signal; in STD, the transceiver will transmit a "clear" signal. Whenever PTT is enabled in the STD condition, an Alert Tone will be heard in the sidetone to alert the operator that the transmission is not encrypted.

SELECTING PRESET CHANNELS

To select preset channels, switch the Preset Channel Selector (Figure 1, Item 6) from **M** (the Manual channel) to position 1 through 15.

Selecting Channels on the Original C-962A/S

The original C-962A/S allows a maximum of 15 presets channels. Each channel can be simplex (the RT transmits and receives over the same frequency) or semi-duplex (transmit and receive frequencies are different).

To select a preset channel, turn the Preset Channel Selector to the desired position (1 through 15). As the selector is turned to each position, the Frequency LED Display and the Tone LED Display indicate the receive frequency and CTCSS tone number (if any) programmed for that channel.

NOTE: The Frequency/Tone LED Display can be configured during installation to operate continuously or to operate only when the Preset Channel Transmit/Receive Selector Switch is pressed and held.

Selecting Channels on the C-962A/S with the Narrow-band Upgrade

The C-962A/S narrow-band upgrade provides 15 memory banks (Bank A through Bank O) that allow 15 preset channels per bank, for a maximum of 225.

The Frequency/Tone LED Display has 11 characters:

- The first (leftmost) character indicates the currently selected bank or appears blank in manual mode.
- The next seven characters indicate the currently selected frequency.
- The next (third from last) character shows a lowercase **n** when narrow-band operation is selected or appears blank for wide-band operation.
- The last two characters show the currently selected CTCSS tone (dashes appear if none are selected).

To select a different memory bank, use the following procedure:

1. Set the first (leftmost) thumbwheel switch to **B** (Bank). The Frequency/Tone LED Display indicates the currently selected bank and shows the current position of the Preset Channel Selector in parentheses; for example, **Bank = E (B)**.
2. Turn the Preset Channel Selector to the desired bank.
3. Press the Test/Load Button.

2.3 INSTALLATION - IN-96A/IN-97A RIGIDMOUNT (cont.)

The rigidmount connector should be wired using the crimp sockets that accompany the rigidmount installation kit. The sockets should be attached to the aircraft wiring and installed into the connector using the following equipment schedule.

SOCKET	No. 16, WEI P/N 129-1017-000 ITT Cannon P/N 031-9084-001 (Accepts Wire No. 16, 18, 20)	No. 20 WEI P/N 129-1019-000 ITT Cannon P/N 031-9134-004 (Accepts Wire No. 20, 22, 24)
CRIMP TOOL	ITT Cannon P/N M22520/1-01 (with M225/1-02 head) or ITT Cannon P/N MS-3191-1 (with std. locator head) or Daniels P/N M22520/1-01 (with TH276 or TH25 head)	ITT Cannon P/N M22520/1-01 (with L-3198-20 HD head) or ITT Cannon P/N MS-3191-1 (with P20-2191-20 head) or Daniels P/N M22520/1-01 (with TH164 or TH25 head)
EXTRACTION TOOL	ITT Cannon P/N CET-16-9	ITT Cannon P/N CIET-20HDL or ITT Cannon P/N CET-20-11

Crimp, Insertion and Extraction Tool Manufacturer Names and Addresses

Daniels Manufacturing
2260 Franklin Road
Bloomfield Hills, MI
48013
(313)338-9611

ITT Cannon
10550 Talbert Avenue
Fountain Valley, CA
92708
(714)964-7400

4. Set the first thumbwheel back to **1** or **1n**. The Frequency/Tone LED Display indicates the receive frequency and CTCSS tone number (if any) programmed for the channel currently selected by the Preset Channel Selector.

To select a different preset channel in the memory bank, turn the Preset Channel Selector to the desired position (1 through 15). As the selector is turned to each position, the Frequency LED Display and the Tone LED Display indicate the receive frequency and CTCSS tone number (if any) programmed for that channel.

2.7 AVIONICS INSTALLATION WIRING CONSIDERATIONS - TRANSCEIVER SIDE

2.7.1 AUDIO AND SIDETONE HI AND LO (pins 15 and 16)

Audio and sidetone outputs share common pins in the RT-9600, with VP interface. The audio and sidetone outputs (output impedance of 600 ohms) are capable of 7.8 VRMS into 600, or more, ohms.

2.7.2 DF DISABLE (pin 54)

This line will disable the linear IF inside the unit and provide superior squelch action and sensitivity when connected to airframe ground. It should be permanently grounded at the mounting rack when DF equipment is not installed in the aircraft. If used with DF equipment, this line must be open during Direction Finding operations.

2.7.3 DF AUDIO (pin 19)

Provides an audio output for use with DF equipment requiring AM receiver response. With an output impedance of 500 ohms, the DF Audio output can supply 400 mVRMS open circuit with an RF signal modulated 50% at 1000Hz.

When the RT-7200 or RT-9600 is used in conjunction with the Collins DF301E Automatic Direction Finder, knowledge of the Transceiver modulation phase delay at 5.68 kHz is necessary for proper DF301E compensation. This phase information is found on a label on the rear panel of the RT-9600 DVP.

For DF or ADF systems designed to be used in conjunction with FM receivers, use UNSQUELCHED MAIN AUDIO as the audio connection from the transceiver to the DF or ADF unit.

SELECTING A MANUAL FREQUENCY

To select a manual channel, the Preset Channel Selector (Figure 1, Item 6) must be set to the **M** (Manual) position. In the manual mode, the Manual Frequency Selector Thumbwheel Switches (Figure 1, Item 1) become active and determine the receive frequency of the Main receiver. The radio operates in simplex mode when the Main/Guard Transmit Selector Switch (Figure 1, Item 15) is set to **MAIN**.

NOTE: Setting the internal Thumbwheel Enable/Disable Switch to the Off position prevents the operator from selecting the frequency manually.

The international aircraft standard is used in the selection and display of the 0.5 kHz frequencies in the Frequency LED Display; for example:

154.320 is displayed as 154.320

154.3225 is displayed as 154.322

154.325 is displayed as 154.325

154.3275 is displayed as 154.327

NOTE: On the original C-962A/S, the LED displays can be configured during installation to operate continuously or to operate only when selected by the Preset Channel Transmit/Receive Selector Switch. On the C-962A/S with the narrow-band upgrade, the LED displays operate continuously.

The C-962A/S narrow-band upgrade allows the operator to select narrow-band or wide-band mode. To select narrow-band, turn the first (leftmost) thumbwheel switch to the **1n** position. The third from last character in the Frequency/Tone LED Display displays a lowercase **n** when narrow-band mode is selected. It appears blank when wide-band is selected.

CAUTION: Federal regulations require that operators of this equipment transmit and receive over specifically authorized frequencies only.

In addition, the operator can manually select optional CTCSS tones using the Tone Selector Thumbwheel switch (Figure 1, Item 3) (refer to *Selecting CTCSS Tones*, on page 12). If no tones are desired, the tone selector switch should be set to the Off position. In manual operation, the subaudible CTCSS tone is used on both transmit and receive when the Tone On/Off/Manual Selection Switch (Figure 1, Item 14) is set to **ON** (refer to *Disabling the Automatic Tone Feature*, on page 13). The selected tone appears in the Tone LED Display (Figure 1, Item 3).

CAUTION: Incorrect use of the tone selector can cause communication failures.

2.7 AVIONICS INSTALLATION WIRING CONSIDERATIONS - TRANSCEIVER SIDE (cont.)

2.7.9 14 V SWITCHED (pin 65)

Provision for switched 14 V power from the RT-9600, with VP interface. This pin will provide 14V DC. Exercise caution not to exceed a combined current drain of 500 mA from pin 65.

2.7.10 DISC (pin 12)

This is a buffered output of the main receiver FM detector and it has the following characteristics.

Output Level:	0.6VRMS (referenced to ± 3 kHz FM deviation with 1 kHz rate) with 5VDC offset. Measured when output to a 100K ohm load.
Output Impedance:	5.6K ohm
Frequency Response:	3 dB BW 0.5 Hz to 5 kHz
Distortion:	8%, maximum, when a ± 4 kHz FM (1 kHz) signal at a 1000uV level is input to the antenna port.

2.7.11 CH MIC HI (pin 67)

This is an output of the mic circuit that is connected to the external DVP™ encryption unit.

Output Level:	0.25VRMS when 0.175VRMS (1 kHz) is applied to RT-9600, with VP interface, microphone input. AC coupled. Minimum load 100K ohms.

2.7.12 RAD MIC HI (pin 63)

This is an input for standard modulation.

Input Level:	0.25VRMS (1 kHz) required to produce ± 3.5 kHz FM when mod limiter is set to limit at ± 5 kHz with 1.75VRMS. 3.6VDC offset.
Input Impedance:	16K ohms.

OPERATING THE GUARD RECEIVERS

The RT-9600/9600F transceiver can include one or two optional crystal-controlled fixed-frequency Guard receivers. The Guard receivers are separate from the Main receiver, and can provide one or two Guard channels. The C-962A control unit's Guard controls (Figure 1, Items 11, 12, 13, and 15) control the Guard receiver when installed.

NOTE: RTs equipped with the VP (Voice Privacy) interface option are limited to one Guard channel.

The operator can monitor the Guard receiver and Main receiver simultaneously or individually by setting the Main Receiver On/Off/Volume Control (Figure 1, Item 8) and/or the Guard Receiver Volume Control (Figure 1, Item 12) to audible listening levels.

If the RT-9600F transceiver has two Guard receivers installed, the C-962A allows the operator to select the desired Guard channel by setting the position of the Guard1/Guard 2 Selector Switch (Figure 1, Item 13).

When the Guard receiver receives a signal, the yellow Guard Receiver Squelch (Receive) LED (Figure 1, Item 11) lights.

A Guard transmit frequency can be programmed for the Guard channel (or both channels if the RT-9600F has two Guard receivers installed). To transmit on the Guard transmit frequency, set the Main/Guard transmit Selector Switch (Figure 1, Item 15) to the **GUARD** position. The C-962A Guard 1/Guard 2 Selector Switch (Figure 1, Item 13) controls whether the Guard 1 or 2 transmit frequency is used.

The Guard receiver can operate simplex or semi-duplex. The setting of the High/Low Transmit Power Selector Switch (Figure 1, Item 17) determines the power output level of the Guard transmitter.

2.8 AVIONICS INSTALLATION WIRING CONSIDERATIONS - CONTROL UNIT SIDE (cont.)

2.8.4 DIMMER DISABLE (pin 21)

This line is used when the C-962S dimmer function is to be overridden. Ground the dimmer disable (pin 21) to hold the frequency display in bright mode.

2.8.5 CONTROL POWER (pins 19 and 20)

Power is fed to the control unit through these lines. Any voltage from 9 to 33V DC will operate the C-962S. The circuit must be capable of supplying at least 750 mA.

2.8.6 (DISPLAY ON)' (pin 23)

By grounding this line the LED frequency display will be lit whenever the unit is on. If this line is left open, the LED frequency display will be lit only when PRESET RX or TX is selected.

2.8.7 (TW LITES OFF)' (pin 24)

The thumbwheel backlighting is normally lit whenever the unit is on. Grounding this pin will disable the backlighting of the thumbwheels.

2.9 SPECIAL CONSIDERATIONS

An RT-9600, with VP Interface/C-962S (without an external encryption unit) can be operated in a standard RT-9600/C-962A installation by making the appropriate connections at the 67 pin connector on the transceiver's mounting tray. These connections are:

1. Connect CH PTT (pin 66) to RAD PTT (pin 64).
2. Connect CH MIC HI (pin 67) to RAD MIC HI (pin 63).
3. Connect DISC (pin 12) to RX AUDIO (pin 59).
4. Connect CH TONE D SELECT (pin 14) to RAD TONE D SELECT (pin 60).

To ensure proper operation, no external decoders should be used and no connections should be made to pin 66.

PROGRAMMING PRESET CHANNELS

The C-962A/S allows the Main receiver transmit and receive channels and the Guard receiver transmit channels to be programmed.

NOTE: The internal Thumbwheel Enable/Disable Switch and Memory Load Switch must be set to ON to allow preset channel programming.

To program or reprogram a channel, use the following procedure:

1. Set the Preset Channel Selector (Figure 1, Item 6) to the channel to be programmed (refer to *Selecting Preset Channels*, on page 6).

   NOTE: For a C-962A/S with the narrow-band upgrade, ensure that the proper memory bank is selected.

2. Turn the Manual Frequency Selector Thumbwheel Switches (Figure 1, Item 1) to the desired receive frequency.

   The C-962A/S narrow-band upgrade allows narrow-band operation to be selected by turning the first (leftmost) thumbwheel switch to the **1n** position.

3. Turn the Tone Selector Thumbwheel Switches (Figure 1, Item 3) to the desired receive CTCSS tone (refer to *Selecting CTCSS Tones*, on page 12). If no tone is desired, set the switch to the Off position.

4. Set the Main/Guard Transmit Selector Switch (Figure 1, Item 15) to **MAIN**.

5. Press and hold the Preset Channel Transmit/Receive Selector Switch (Figure 1, Item 5) in the **RX** position.

6. While holding the Preset Channel Transmit/Receive Selector Switch, press and release the Test/Load button (Figure 1, Item 10). The receive frequency is now loaded for the selected channel.

7. Turn the Manual Frequency Selector Thumbwheel Switches to the desired transmit frequency.

8. Turn the Tone Selector Thumbwheel Switches to the desired transmit CTCSS tone. (refer to *Selecting CTCSS Tones*, on page 12). The transmit tone can be different from the receive tone. If no tone is desired, set the switches to the Off position.

9. Press and hold the Preset Channel Transmit/Receive Selector Switch in the **TX** position.

10. While holding the Preset Channel Transmit/Receive Selector Switch, press and release the Test/Load Button (Figure 1, Item 10). The transmit frequency is now loaded for the selected channel.

Repeat this procedure to program additional channels.

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CHECKING PRESET CHANNEL FREQUENCIES

To check the transmit/receive frequencies and CTCSS tones programmed for a channel, use the following procedure.

CAUTION: DO NOT PUSH THE TEST/LOAD BUTTON DURING THIS PROCEDURE.

1. To check the frequencies and CTCSS tones of the Main receiver, set the Main/Guard Transmit Selector Switch (Figure 1, Item 15) to **MAIN**.

2. Switch the Preset Channel Selector (Figure 1, Item 6) to the channel to be checked (refer to *Selecting Preset Channels*, on page 6).

   NOTE: For a C-962A/S with the narrow-band upgrade, ensure that the proper memory bank is selected.

3. To check the transmit frequency, press and hold the Preset Channel Transmit/Receive Selector Switch (Figure 1, Item 5) in the **TX** position. The Frequency LED Display and the Tone LED Display indicate the transmit frequency and CTCSS tone number (if any) programmed for that channel.

4. To check the receive frequency, press and hold the Preset Channel Transmit/Receive Selector Switch in the **RX** position. The Frequency LED Display and the Tone LED Display indicate the receive frequency and CTCSS tone number (if any) programmed for that channel.

5. To check the Guard receiver frequencies, set the Main/Guard Transmit Selector Switch to **GUARD**. If the RT has two Guard channels, use the Guard 1/Guard 2 Selector Switch to select the channel to be checked.

6. To check the Guard receiver transmit frequency, press and hold the Preset Channel Transmit/Receive Selector Switch in the **TX** position. The Frequency LED Display and the Tone LED Display indicate the transmit frequency and CTCSS tone number (if any) programmed for that channel.

NOTE: The Guard receive frequency is crystal-controlled and cannot be checked.

2.9 SPECIAL CONSIDERATIONS (cont.)

Conversely, an RT-9600/C-962A combination can operate in an RT-9600, with VP Interface/C-962S installation, provided that an external encryption unit is not connected. By doing this, no external decoders can be used and Guard channel 2 is not available.

NOTE: An RT-9600, with VP Interface, is not compatible with a C-962A and an RT-9600 is not compatible with a C-962S.

SELECTING CTCSS TONES

Selecting Tones on the Original C-962A/S

For an original C-962A/S and an RT-9600/9600F equipped with the CTCSS tone option, the CTCSS tones on each of the 15 programmable channels can be preset to one of eight possible tone frequencies. The original C-962A/S has one Tone Selector Thumbwheel Switch (Figure 1, Item 3) that can be set to Tones 1 through 8 or OFF. It has a one-character Tone LED Display (Figure 1, Item 4).

Selecting Tones on the C-962A/S with the Narrow-band Upgrade

The C-962A/S narrow-band upgrade can generate up to 46 Wulfsberg Group tones (refer to Table 2), 49 Technisonic Group tones (refer to Table 3), and 33 CDF (California Department of Forestry) Group tones (refer to Table 4). In the narrow-band upgrade, the tones are generated in the control head and fed into the RT-9600F via the EXT CTCSS TONE IN line.

The upgrade includes two Tone Selector Thumbwheel Switches and a two-character Tone LED Display. The left Tone Selector Thumbwheel Switch can be set to 0 through 6 or OFF; the right switch can be set to 0 through 9.

To select the tone group, use the following procedure:

1. Set the first (leftmost) thumbwheel switch to **B** (Bank).

2. To display the currently selected tone group, press the Preset Channel Transmit/Receive Selector Switch (Figure 1, Item 5) to the **RX** position. The current selection appears in the Frequency/Tone LED Display; for example, **Tones=WFBG** indicates that Wulfsberg Group tones are selected.

3. To select a different tone group, press the Preset Channel Transmit/Receive Selector Switch to the **TX** position repeatedly to cycle through the three options.

   When the desired option appears in the Frequency/Tone LED Display (for example, **Tones? CDF**), press the Test/Load Button to select it. The question mark in the display changes to an equals sign to indicate that the group is now selected (for example, **Tones=CDF**).

4. Return the first (leftmost) thumbwheel switch to **1** or **1n** to display the currently selected frequency.

NOTE: The selected tone group is used for all stored preset channels. If a tone number is selected that is not in the selected tone group (for example, Wulfsberg Group tone number 10), the Tone LED Display shows dashes and the C-962A/S does not generate a tone.

Channels with different transmit and receive tones can be programmed. When the Preset Channel Selector (Figure 1, Item 6) is set to the **M** (Manual) channel, the Tone Selector Thumbwheel Switches (Figure 1, Item 3) are used to select the tone. The transmit and receive tones are the same when the manual channel is selected.

2.7 AVIONICS INSTALLATION WIRING CONSIDERATIONS - TRANSCEIVER SIDE (cont.)

2.7.13 RX AUDIO (pin 59)

This is an input for low level receiver audio signals.

Input Level:	0.5VRMS (1 kHz) required in order to meet audio output specifications. AC coupled.
Input Impedance:	21K ohm (at 1 kHz) -- comprised of 18K ohm series resistor and 0.05uF shunt capacitor.

2.8 AVIONICS INSTALLATION WIRING CONSIDERATIONS - CONTROL UNIT SIDE

NOTE: Pin numbers refer to pins of the control unit connector J2.

2.8.1 HEADSET AND HEADSET RETURN (pins 1, 2, 5, and 6)

This output supplies both the receiver audio and the sidetone outputs on the same lines.

2.8.2 PANEL LIGHTS (pins 12, 15, 16, 17, 18, 22)

Connect pin 17 (used with 5V integral lights control units), pin 15 (used with 14V integral lights control units), or pin 16 (used with 28V integral lights control units) to the appropriate voltage aircraft dimmer circuit. The C-962S provides a bright frequency display when aircraft panel lighting is dim and a dim display when panel lighting is bright.

Connect pin 12 to the aircraft dimmer return or LO circuit.

2.8.3 AUDIO IN AND PTT (pins 7, 8, and 9)

Connect to aircraft microphone system. To minimize ground current induced noise make sure that pin 9 is grounded to airframe ground as close as possible to the microphone jack ground. Further insure that the AUDIO IN RETURN line and the SHIELD line found on pin 10 of the transceiver connector are not grounded at any other location.

Disabling the Automatic Tone Feature

The automatic tone feature can be disabled during receive operation by setting the Tone On/Off/Manual Selection Switch to **OFF** or **MAN**.

- In the **OFF** position, the preset tone is used during transmit operation only; no tone is used during receive operation.
- In the **MAN** position, the manually selected tone is used during transmit operation; no tone is used during receive operation.

2.7 AVIONICS INSTALLATION WIRING CONSIDERATIONS - TRANSCEIVER SIDE (cont.)

2.7.4 UNSQUELCHED MAIN AUDIO (pin 30)

This is a buffered output of the main FM receiver, unaffected by squelch action or volume control. Standard modulation produces 0.50 VRMS into 1K ohm or greater impedance. Do not load this output with less than 600 ohms.

2.7.5 RAD PTT (pins 26 and 64)

When these pins are grounded, the transmit function is enabled.

2.7.6 CH PTT (pin 66)

This pin is an output to the external DVP™ encryption unit. When grounded, the transmitter is enabled provided an external DVP™ encryption unit is interfaced to the RT-9600, with VP Interface, or when CH PTT is connected to RAD PTT.

2.7.7 RAD SQUELCH DISABLE (pin 25)

When this pin is grounded, the squelch function is disabled.

2.7.8 DVP MOD (pin 18)

These are the characteristics of the DVP MOD input.

Input Impedance:	100K ohm; AC coupled with any applied DC voltage not to exceed 5VDC.
Input Level:	A fixed level between 2V p-p and 4V p-p is required to produce ± 4 kHz FM deviation. An external source with an adjustable output is required.
Frequency Response:	FM deviation will be within ± 20% of ± 4 kHz deviation from 0.5 Hz to 20 kHz.
Distortion:	5%, max. when modulated at ± 4 kHz deviation with a 1 kHz tone.

Table 2. Wulfsberg Group Tones

Tone No.	Code	Frequency (Hz)	Tone No.	Code	Frequency (Hz)
00	--	-----	35	21	179.9
01	00	67.0	36	23	186.2
02	02	71.9	37	25	192.8
03	03	74.4	38	28	203.5
04	04	77.0	39	--	-----
05	05	79.7	40	--	-----
06	06	82.5	41	2A	210.7
07	07	85.4	42	2B	218.1
08	08	88.5	43	2C	225.7
09	--	-----	44	2E	233.6
10	--	-----	45	2F	241.8
11	09	91.5	46	30	250.3
12	0A	94.8	47	2D	229.1
13	0B	97.4	48	--	-----
14	0C	100.0	49	--	-----
15	0D	103.5	50	--	-----
16	0E	107.2	51	01	69.4
17	0F	110.9	52	1A	159.8
18	10	114.8	53	1C	165.5
19	--	-----	54	1E	171.3
20	--	-----	55	20	177.3
21	11	118.8	56	22	183.5
22	12	123.0	57	24	189.9
23	13	127.3	58	26	196.6
24	14	131.8	59	--	-----
25	15	136.5	60	--	-----
26	16	141.3	61	27	199.5
27	17	146.2	62	29	206.5
28	18	151.4	63	31	254.1
29	--	-----	64	--	-----
30	--	-----	65	--	-----
31	19	156.7	66	--	-----
32	1B	162.2	67	--	-----
33	1D	167.9	68	--	-----
34	1F	173.8	69	--	-----

2.4 INSTALLATION - TRANSCEIVERS

See Figure 2.7-1 for RT-9600, with VP Interface/C-962S installation wiring diagram. Refer to the wiring consideration notes in Section 2.7.

The MIC and SIDETONE adjustments on the front of the transceiver allow variation of the levels to accommodate differences in installations. They are multiple turn potentiometers.

MIC is factory set so that 0.175 VRMS at 1000 Hz will provide standard deviation. If the microphone to be used with the transceiver does not provide standard output, its output may be compensated for by adjustment of the MIC setting.

Internal to the transceiver are HIGH POWER and LOW POWER transmitter output power adjustments. These are adjusted at the factory for 10 watt/1 watt respectively. For use under FCC Parts 83 or 90, and DOC RSS-119 and RSS-182 no adjustment of these potentiometers should be made. For use under FCC Part 87, it is mandatory that the HIGH POWER setting be adjusted so that the RF power output shall not exceed 5 watts. See the appropriate section in the RT-9600 Maintenance Manual for transmitter power adjustment procedures. (NOTE: Although not specifically type accepted under Part 87, the RT-9600 complies with Part 87 requirements when adjusted as outlined above.)

SIDETONE should be adjusted to a level that will give the desired audio output without causing feedback squeal when used with a speaker. The sidetone level will not be changed by the volume control on the control unit.

See the RT-9600 Installation Manual, Figures 2.4-1 and 2.4-2, for transceiver outline drawings.

2.5 INSTALLATION - CONTROL UNITS

All control units are designed to mount on Dzus rails per MS-25213. The IN-722/962 should be used with the C-962S.

See the RT-9600 Installation Manual, Section 2.5 for other installation details.

2.6 INSTALLATION - ANTENNAS

See RT-9600 Installation Manual, Section 2.6.

Table 3. Technisonic Group Tones

Tone No.	Code	Frequency (Hz)	Tone No.	Code	Frequency (Hz)
00	--	-----	35	--	-----
01	00	67.0	36	--	-----
02	02	71.9	37	--	-----
03	03	74.4	38	--	-----
04	04	77.0	39	--	-----
05	05	79.7	40	--	-----
06	06	82.5	41	--	-----
07	07	85.4	42	--	-----
08	08	88.5	43	--	-----
09	09	91.5	44	--	-----
10	0A	94.8	45	--	-----
11	0B	97.4	46	--	-----
12	0C	100.0	47	01	69.4
13	0D	103.5	48	1A	159.8
14	0E	107.2	49	1C	165.5
15	0F	110.9	50	1E	171.3
16	10	114.8	51	20	177.3
17	11	118.8	52	22	183.5
18	12	123.0	53	24	189.9
19	13	127.3	54	26	196.6
20	14	131.8	55	27	199.5
21	15	136.5	56	29	206.5
22	16	141.3	57	2A	210.7
23	17	146.2	58	2B	218.1
24	18	151.4	59	2C	225.7
25	19	156.7	60	2D	229.1
26	1B	162.2	61	2E	233.6
27	1D	167.9	62	2F	241.8
28	1F	173.8	63	30	250.3
29	21	179.9	64	--	-----
30	23	186.2	65	--	-----
31	25	192.8	66	--	-----
32	28	203.5	67	--	-----
33	--	-----	68	--	-----
34	--	-----	69	--	-----

SECTION 2

INSTALLATION

2.1 GENERAL

This section contains instructions and considerations for the proper installation of the RT-9600 Transceiver System, with VP Interface.

The information presented herein is necessary for the proper operation and satisfactory performance of the equipment.

2.2 UNPACKING AND INSPECTING EQUIPMENT

Physically compare the presence of each item in the shipment with that shown on the packing list. Exercise care when unpacking each unit. Make a visual inspection of each unit for evidence of damage incurred during shipment. If a claim for damage is to be made, save the shipping container to substantiate the claim. When all equipment is unpacked, it is suggested the carton and packing material be saved for possible reshipment.

2.3 INSTALLATION - IN-96A/IN-97A RIGIDMOUNT

The rigidmount captivates the transceiver and may be mounted in any convenient remote location. Allow sufficient room at the front for cable and connector entry.

Mounting dimensions for the rigidmount are shown in Figure 2.3-2 of the RT-9600 Installation Manual. The mount is secured to the mounting surface with Number 8 machine screws, or equivalent and appropriate lock nuts.

NOTE

The system has been vibration, temperature and altitude tested to assure performance in any aircraft environment; however, controlled environments improve the system reliability. This factor should be considered when selecting a remote site.

Table 4. California Department of Forestry (CDF) Group Tones

Tone No.	Code	Frequency (Hz)	Tone No.	Code	Frequency (Hz)
00	--	-----	35	22	183.5
01	0F	110.9	36	23	186.2
02	12	123.0	37	24	189.9
03	14	131.8	38	25	192.8
04	15	136.5	39	26	196.6
05	17	146.2	40	27	199.5
06	19	156.7	41	28	203.5
07	1D	167.9	42	29	206.5
08	0D	103.5	43	2A	210.7
09	0C	100.0	44	2B	218.1
10	0E	107.2	45	2C	225.7
11	10	114.8	46	2D	229.1
12	13	127.3	47	2E	233.6
13	16	141.3	48	2F	241.8
14	18	151.4	49	30	250.3
15	00	67.0	50	31	254.1
16	01	69.4	51	--	-----
17	02	71.9	52	--	-----
18	03	74.4	53	--	-----
19	04	77.0	54	--	-----
20	05	79.7	55	--	-----
21	06	82.5	56	--	-----
22	07	85.4	57	--	-----
23	08	88.5	58	--	-----
24	09	91.5	59	--	-----
25	0A	94.8	60	--	-----
26	0B	97.4	61	--	-----
27	11	118.8	62	--	-----
28	1A	159.8	63	--	-----
29	1B	162.2	64	--	-----
30	1C	165.5	65	--	-----
31	1E	171.3	66	--	-----
32	1F	173.8	67	--	-----
33	20	177.3	68	--	-----
34	21	179.9	69	--	-----

1.11 FREQUENCY/TONE REVIEW (cont.)

1.11.1 UNKEYED TRANSMITTER (cont.)

If the seven segment frequency display has been enabled by grounding rear connector P2, pin 23, the display will show the receive frequency and tone being used. To review channel memory of both frequency and tone information, make certain that the TONE switch is in the ON position, otherwise the tone stored in memory will not be displayed. If P2, pin 23 has not been grounded, the received frequency/tone information can still be reviewed by placing the PRESET switch into the RX position.

1.11.2 KEYED TRANSMITTER

If the seven segment frequency/tone display has been enabled, then the display will show the transmitter frequency and tone being used as determined by the XMTR MAIN/GUARD and TONE switches.

If it is desired to review the transmit channel memory of both frequency and tone without actually transmitting, make certain that the TONE switch is in either the ON or the OFF position. Then place the PRESET switch into the TX position. This will display the transmit channel memory as determined by the XMTR MAIN/GUARD switch.

1.12 MANUAL OPERATION

1. Rotate the CHANNEL SELECTOR switch to the manual channel.

2. Set the thumbwheels to the frequency and tone desired. The selected frequency and tone is common to both transmit and receive operations (Simplex channel).

NOTE

The C-962S Control Unit has an internally accessible THUMBWHEEL ENABLE switch (A4S1C). When this switch is in the OFF position (leverarm away from PC Board towards bottom of unit), the manual (M) channel selector position becomes inoperative.

When the THUMBWHEEL ENABLE switch (A4S1C) is in the ON position, any operator of the system must be responsible for assuring proper operation as required by FCC Rules and Regulations, paragraph 90.433.

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1.10 PRESET CHANNEL PROGRAMMING INSTRUCTIONS (cont.)

1.10.3 GUARD TX FREQUENCY (cont.)

3. Set up TX frequency and CTCSS tone on the thumbwheels. (If no tone is required, set the TONE SELECTOR thumbwheel in the OFF position.)

4. Set TX-GUARD/MAIN selector to GUARD position.

5. Operate LOAD SELECT switch to TX LOAD position.

6. Push and release TEST/LOAD button. The Guard TX frequency is now loaded.

7. To load the other TX Guard frequencies, repeat steps 3 through 7.

8. Changes to guard frequencies may be inhibited by operating the internal MEMORY LOAD switch to the OFF position or by returning the GUARD/MAIN LOAD switch to the MAIN position.

NOTE

For proper control operation, the GUARD/MAIN switch MUST be returned to MAIN position.

CAUTION

Any unallocated Guard TX channel location(s) must be programmed to 100.0000 MHz.

1.11 FREQUENCY/TONE REVIEW

NOTE: Do not operate the TEST/LOAD button during this procedure.

1.11.1 UNKEYED TRANSMITTER

The frequency display will show the receive frequency and tone associated with the particular channel selected on the CHANNEL SELECTOR switch.

RT-9600, WITH VP INTERFACE, ADDENDUM

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1.9 TONE SQUELCH (CTCSS) (cont.)

When used on transmit, the tone squelch signal will modulate the transceiver at a typical deviation of 700 Hz and will open the squelch on another receiver equipped to recognize the tone frequency being transmitted. The tone frequency transmitted is selected by the TONE SELECT lines in the same manner as the receive tone.

The CTCSS tone squelch may be preset to one of eight possible tone frequencies, on each of the 15 programmable channels. The transmit and receive tones may be different. With the channel selector in the MANUAL position, the tone selection is directly controlled by the TONE THUMBWHEEL switch. Transmit and receive tones are the same for this condition.

NOTE: When the RT-9600 is interfaced to a Motorola DVP™ module and is in the PVT mode, the transmit CTCSS function is disabled.

1.10 PRESET CHANNEL PROGRAMMING INSTRUCTIONS

NOTE

The C-962S Control Unit has an internally accessible THUMBWHEEL ENABLE switch (A4S1C). When this switch is in the OFF position (leverarm away from PC Board toward bottom of unit), the manual (M) channel selector position becomes inoperative.

When the THUMBWHEEL ENABLE switch (A4S1C) is in the ON position, any operator of the system must be responsible for assuring proper operation as required by FCC Rules and Regulations, paragraph 90.433.

1.10.1 THUMBWHEEL ENABLE FUNCTION

The THUMBWHEEL ENABLE FUNCTION is provided to prevent control unit programming by individuals not responsible for assuring proper operation per FCC Rules and Regulations, paragraph 90.433.

In order to program the preset channels on a C-962S (one having a Mod 1, or above, Logic Board) proceed as follows:

1. Set switch A4S1C to the ON (leverarm up) position. See Figure 1.10-1 for location and operation of switch.
2. Program the Main TX/RX and Guard TX (if desired) frequencies as described in Sections 1.10.2 and 1.10.3.
3. Set switch A4S1C to the OFF (leverarm down) position.

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(continued)

LIST OF ILLUSTRATIONS

1.7 CONTROL FUNCTION

The function of each control on the C-962S is shown in Figure 1.7-1.

NOTE

The C-962S Control Unit has an internally accessible THUMBWHEEL ENABLE switch (A4S1C). When this switch is in the OFF position (leverarm away from PC board toward bottom of unit), the manual (M) channel selector position becomes inoperative.

When the THUMBWHEEL ENABLE switch (A4S1C) is in the ON position, any operator of the system be responsible for assuring proper operation as required by FCC Rules and Regulations, paragraph 90.433.

1.8 PRESET CHANNELS

The C-962S features the capability to preset the transmit and receive frequencies as well as the tone squelch frequencies. It is possible to program the control unit to cause the transceiver to transmit on a different frequency than it receives and to use a different tone squelch, or none at all, on transmit than receive. Using the preset feature, there are no restrictions on transmit to receive frequency spacing or combinations of tone squelch functions.

1.9 TONE SQUELCH (CTCSS)

This is an option in the RT-9600, with VP interface, that will allow the receiver audio to be heard only when the transmitter being received is modulated with a continuous tone in the frequency range of 50 to 250 Hz. The exact frequency necessary to open the tone squelch is determined by the coding of the TONE SELECT lines in the transceiver. See the RT-9600 Maintenance Manual for adjustment details.

RT-9600, WITH VP INTERFACE, ADDENDUM

SECTION 1

DESCRIPTION AND OPERATION

1.1 INTRODUCTION

This addendum contains information pertaining to the installation and operation of the RT-9600 with VP (Voice Protection) interface. The RT-9600 equipped with the VP interface is compatible with external encryption units such as the Motorola DVP™* System. Certain functions of the "standard" RT-9600 have been eliminated to accommodate the VP function.

The RT-9600, with VP interface, has several modules that are different from those found in the standard RT-9600. The RT-9600, with VP interface, must be used in conjunction with a unique control unit, the C-962S, and with a unique wiring interconnect. Because of these factors, the RT-9600, with VP interface, is not compatible with "standard" RT-9600 systems. Module swapping must be judiciously applied since some modular subassemblies will not interchange.

1.2 PURPOSE OF EQUIPMENT

The Wulfsberg RT-9600, with VP interface, provides either standard FM or voice secure (VP) two-way voice communications in the frequency range of 150.0000 to 173.9975 MHz when used in conjunction with a Motorola DVP™ external encryption unit. Channneling is in 2.5 kHz increments for a total of 9600 channels.

To accomplish VP operation, the transmitter signal is digitally encrypted (coded). For reception the VP equipped system has the ability to decode the encrypted VP signal and recover the transmitted intelligence. Encryption provides voice security to prevent unauthorized eavesdropping; only the intended user(s) can monitor the transmission.

1.3 MODEL VARIATIONS

There are eight models (flavors) of the RT-9600, with VP interface. These eight models are tabulated in Section 1.6. Individual variations should be considered to assure the desired model is procured.

*DVP™ is a trademark of Motorola, Inc.

1.6 SYSTEM COMPONENTS (cont.)

1.6.4 INSTALLATION CONNECTOR KITS (cont.)

MODEL NUMBER	DESCRIPTION	WULFSBERG PART NUMBER
IN722/962-2	Plug 25S, D, Solder Type with latches and cable boot.	149-0034-002
	Included in the IN-722/962-2:	
	Small End Disc Latch with screws and nuts (02 Ea)	129-1020-000
	Small Junction Shell	129-1021-000
	Plug, 25S, D, Submin, Solder	129-2034-000
	Cable Boot, 0.312 I.D.	179-0004-000
IN-722/ 962-3	Plug, 50S, D, Solder Type with latches and cable boot.	149-0034-003
	Included in the IN722/962-3:	
	Large End Disc Latch with screws and nuts (02 Ea)	129-1013-000
	Large Junction Shell	129-1020-000
	Plug, 50S, D, Submin, Solder	129-2033-000
	Rubber Cable Boot, 0.437 I.D.	179-0006-000
IN-722/ 962-4	Plug, 25S, D, Crimp type with Sockets, latches and cable boot.	149-0034-004
	Included in the IN-722/962-4:	
	Small End Disc Latch with screws and nuts (02 Ea)	129-1013-000
	Small junction shell	129-1021-000
	Crimp Sockets, No.20, D style (25 Ea)	129-1046-000
	Plug, 25S, D, Submin, crimp less sockets	129-2140-000
	Rubber Cable Boot, 0.312 I.D.	179-0004-000
IN-722/ 962-5	Plug, 50S, D, Crimp type with sockets, latches and cable boot	149-0034-005
	Included in the IN-722-962-5:	
	Large End Disc Latch with screws and nuts	129-1012-000
	Large Junction Shell	129-1020-000
	Crimp Sockets, No.20, D style (50 Ea)	129-1046-000
	Plug, 50S, D, Submin, crimp less sockets	129-2139-000
	Rubber Cable Boot, 0.437 I.D.	179-0006-000

1.5 TECHNICAL CHARACTERISTICS

1.5.1 RT-9600 WITH VP INTERFACE

GENERAL SPECIFICATIONS

Frequency Range:	FCC Type Accepted 150 to 174 MHz. DOC Type Accepted 150 to 174 MHz.
Channelling:	25 or 30 kHz (standard or split) under FCC parts 74, 83 and 90. 30 kHz under DOC RSS-119. 25 KHz under DOC RSS-182.
Tunability:	Capable of 2.5 kHz increments.
Mode:	Simplex or Semi-duplex, 16F3.
Physical Dimensions:	See Figures 2.4-1 and 2.4-2 of RT-9600 Installation Manual.
Weight:	9.3 lbs (4.22 kg).
Mounting:	Rigidmount-upright only.
Power Requirements:	
Voltage:	13.75V DC ± 20% or 27.5V DC ± 20%.
Current:	
Standby:	1.3 Amps maximum
Receive:	1.5 Amps maximum
Transmit:	5.5 Amps maximum
Control:	Remote with C-962S Control Unit.
Warm-up Time:	Not required
Temperature:	
Storage:	-55 to +85° C.
Operate:	-40 to +60° C.
Altitude:	51,000 feet MSL.
Certification:	FCC Parts 15, 74, 83, and 90. DOC RSS-119 (501 191 126X) DOC RSS-182 (501 821 271V).

1.6 SYSTEM COMPONENTS (cont.)

1.6.3 INSTALLATION KITS (cont.)

MODEL NUMBER	DESCRIPTION	WULFSBERG PART NUMBER
IN-97A	RT-9600-2 Installation Kit with Rigidmount, Crimp Type Connector and Crimp Sockets.	149-0033-001
	Included in the IN-97A:	
	Size 16 Socket (03 Ea)	129-1017-000
	Size 20 Socket (64 Ea)	129-1019-000
	Spacer, 0.76 O.D. x 0.25 I.D. x 0.3161 (08 Ea)	191-0021-010
	Rigidmount Assembly	300-2122-003
IN-722/962	Installation Kit, C-722A/C-962A Control with Solder Type Connectors.	149-0034-000
	Included in the IN-722/962:	
	Screws and Nuts (02 Ea)	129-1012-000
	Small End Disc Latch with Screws and Nuts (02 Ea)	129-1013-000
	Large Junction Shell	129-1020-000
	Small Junction Shell	129-1021-000
	Plug, 50S, Rectangular, Solder	129-2033-000
	Plug, 25S, Rectangular, Solder	129-2034-000
	Rubber Cable, Boot, 0.312 I.D.	129-0004-000
	Rubber Cable Boot, 0.437 I.D.	179-0006-000
IN-722/962-1	Installation Kit, C-722A/C962A Control with Crimp Type Connector and Crimp Sockets.	149-0034-001
	Included in the IN-722/962-1:	
	Large End Disc Latch with screws and nuts (02 Ea)	129-1012-000
	Small End Disc Latch with screws and nuts (02 Ea)	129-1013-000
	Large Junction Shell	129-1020-000

1.5 TECHNICAL CHARACTERISTICS (cont.)

1.5.1 RT-9600 WITH VP INTERFACE (cont.)

MAIN RECEIVER SPECIFICATIONS (STANDARD TEST CONDITIONS)

Usable Sensitivity:	0.5 uV, 12 dB SINAD (EIA).
Quieting Sensitivity:	1.0 uV, 20 dB quieting (EIA).
Adjacent Channel:	-70 dB (EIA).
Intermodulation:	-70 dB (EIA).
Response:	
Spurious:	-90 dB.
Image:	-90 dB.
Modulation Acceptance:	7 kHz minimum (EIA).
Squelch:	
Threshold Setting:	4 dB SINAD or less.
Tight Setting:	14 to 16 dB SINAD.
Audio Output:	100 mW into 600 ohms.
Audio Distortion:	7% EIA.
Frequency Tolerance:	± 0.001% over temperature range.
Hum and Noise:	
Unsquelched:	-30 dB.
Squelched:	-45 dB.
DF Output:	400 mVRMS open circuit (50% modulation) 500 ohms output impedance.

GUARD RECEIVER SPECIFICATIONS (STANDARD TEST CONDITIONS)

Channel Frequency:	Customer specified. Any frequency between 150.0000 and 173.9975 MHz allowed. VP systems are restricted to one Guard frequency channel.

1.6 SYSTEM COMPONENTS (cont.)

1.6.1 VP TRANSCEIVERS (cont.)

MODEL NUMBER	DESCRIPTION	WULFSBERG PART NUMBER
RT-9600-55	9600 Channel VHF Hi-Band Transceiver, 14/28 VDC, 100mW Audio, Protruding Connector, with Guard Receiver, with VP Interface.	400-0052-055
RT-9600-58	9600 Channel VHF HI-Band Transceiver, 14/28 VDC, 100 mW Audio, Protruding Connector with CTCSS Tones, with VP Interface.	400-0052-058
RT-9600-61	9600 Channel VHF HI-Band Transceiver, 14/28 VDC, 100 mW Audio, Protruding Connector, with Guard Receiver and CTCSS Tones, with VP Interface.	400-0052-061
RT-9600-74	9600 Channel VHF HI-Band Transceiver, 14/28 VDC, 100mW Audio, Recessed Connector, with VP Interface.	400-0052-074
RT-9600-75	9600 Channel VHF HI-Band Transceiver, 14/28 VDC, 100 mW Audio, Recessed Connector, with Guard Receiver, with VP Interface.	400-0052-075
RT-9600-76	9600 Channel VHF HI-Band Transceiver 14/28 VDC, 100 mW Audio, Recessed Connector, with CTCSS Tones, with VP Interface.	400-0052-076
RT-9600-77	9600 Channel VHF HI-Band Transceiver, 14/28 VDC, 100 mW Audio, Recessed Connector, with Guard Receiver and CTCSS Tones, with VP Interface.	400-0052-077