The Future *of* Mobile Radio

Low Band Orion
Base Station

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NOTE

Repairs to this equipment should be made only by an authorized service technician or facility designated by the supplier. Any repairs, alterations or substitution of recommended parts made by the user to this equipment not approved by the manufacturer could void the user's authority to operate the equipment in addition to the manufacturer's warranty.

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SPECIFICATION

Band	Frequency
Low Band/Low Split	29-42 MHz
Low Band/High Split	35-50 MHz

Channel Spacing
29-42 MHz — 20 kHz
35-50 MHz — 20 kHz

Supply Voltage — 13.6 ±20% Vdc

Supply Current — 30 Amps

Operating Temperature — -30°C to +60°C

Storage Temperature — -40°C to +70°C

Altitude — 15000 Feet

Duty Cycle
Transmit — 100%
Receive — 100%
Standby — 100%

Dimensions
Width — 19 Inches
Depth — 14.5 Inches (Including Externally Mounted Fan and Connectors)
Height — 8.75 Inches
Weight — 37 Pounds
(In cabinet with power supply) — 150 Pounds

PRODUCT NUMBERS

PRODUCT #	BAND (MHz)	TYPE	FCC ID NUMBER
KRD 103 139/1	29-42 MHz	Station Assembly	AXATR-338-A5
KRD 103 139/2	35-50 MHz	Station Assembly	AXATR-338-B5
KRD 103 139/11	29-42 MHz	100 Watt Continuous Duty Radio Only	AXATR-338-A5
KRD 103 139/12	35-50 MHz	100 Watt Continuous Duty Radio Only	AXATR-338-B5

PACKAGE NUMBERS

PACKAGE NUMBER	INCLUDES OPTIONS:	DESCRIPTION
BSAXS1	------	Orion, 29-42 MHz, Local Control
	BSRD1U	29-42 MHz Orion Radio Shelf *(Part # KRD 103 139/1)*
	BSSF7B	Radio Software
	BSPL3C	T99 Encode Feature Encryption
	BSPL3D	PA Feature Encryption
	BSPL3E	Emergency Feature Encryption
	BSPL3K	Priority Scan Feature Encryption
	BSPL3M	Control Head Feature Encryption
	BSPL3P	Maximum Conventional Channels Feature Encryption
	BSCT1X	Local Control
	BSMN9F	Power Cable/Mounting Supports *(Part # SXA 120 4547/1)*
BSBXS1	-------	Orion, 35-50 MHz, Local Control
	BSRD1V	35-50 MHz Orion Radio/Shelf *(Part # KRD 103 139/2)*
	BSSF7B	Radio Software
	BSPL3C	T99 Encode Feature Encryption
	BSPL3D	PA Feature Encryption
	BSPL3E	Emergency Feature Encryption
	BSPL3K	Priority Scan Feature Encryption
	BSPL3M	Control Head Feature Encryption
	BSPL3P	Maximum Conventional Channels Feature Encryption
	BSCT1X	Local Control
	BSMN9F	Power Cable/Mounting *(Part # SXA 120 4547/1)*
BSAXS2	-------	Orion, 29-42 MHz, Local/DC Remote Control
	BSRD1U	29-42 MHz Orion Radio/Shelf *(Part # KRD 103 139/1)*
	BSSF7B	Radio Software
	BSPL3C	T99 Encode Feature Encryption
	BSPL3D	PA Feature Encryption
	BSPL3E	Emergency Feature Encryption
	BSPL3K	Priority Scan Feature Encryption
	BSPL3M	Control Head Feature Encryption
	BSPL3P	Maximum Conventional Channels Feature Encryption
	BSCT1Y	Local/DC Remote Control
	BSCY1Y	DC Remote Control Board
	BSMN9F	Power Cable/Mounting Support *(Part # SXA 120 4547/1)*
BSBXS2	-------	Orion, 35-50 MHz, Local/DC Remote Control
	BSRD1V	35-50 MHz Orion Radio/Shelf *(Part # KRD 103 139/2)*
	BSSF7B	Radio Software
	BSPL3C	T99 Encode Feature Encryption
	BSPL3D	PA Feature Encryption
	BSPL3E	Emergency Feature encryption
	BSPL3K	Priority Scan Feature Encryption
	BSPL3M	Control Head Feature Encryption
	BSPL3P	Maximum Conventional Channels Feature Encryption
	BSCT1Y	Local/DC Remote Control
	BSCY1F	DC Remote Control Board
	BSMN9F	Power Cable/Mounting Supports *(Part # SXA 120 4547/1)*

PACKAGE NUMBER	INCLUDES:	DESCRIPTION
BSAXS3	-------	29-42 MHz, Local/Tone Remote Control
	BSRD1U	29-42 MHz Orion Radio/Shelf *(Part # KRD 103 139/1)*
	BSSF7B	Radio Software
	BSPL3C	T99 Encode Feature Encryption
	BSPL3D	PA Feature Encryption
	BSPL3E	Emergency Feature Encryption
	BSPL3K	Priority Scan Feature encryption
	BSPL3M	Control Head Feature Encryption
	BSPL3P	Maximum Convention Channels Feature Encryption
	BSCT1Z	Local/Tone Remote Control
	BSCY1H	Tone Remote Control Board
	BSMN9F	Power cable/Mounting Supports *(Part # SXA 120 4547/1)*
BSBXS3	------	35-50 MHz Orion Radio/Shelf
	BSRD1V	35-50 MHz Orion Radio/Shelf *(Part # KRD 103 139/2)*
	BSSF7B	Radio Software
	BSPL3C	T99 Encode Feature Encryption
	BSPL3D	PA Feature Encryption
	BSPL3E	Emergency Feature Encryption
	BSPL3K	Priority Scan Feature Encryption
	BSPL3M	Control Head Feature Encryption
	BSPL3P	Maximum Conventional Channel Feature Encryption
	BSCT1Z	Local/Tone Remote Control Board
	BSCY1H	Tone Remote Control Board
	BSMN9F	Power Cable /Mounting Supports *(Part # SXA 120 4547/1)*

OPTIONS

OPTION NUMBERS	DESCRIPTION
BSRD1U	29-42 MHz Orion Radio/Shelf *(Part # KRD 103 139/1)*
BSRD1V	35-50 MHz Orion Radio/Shelf *(Part # KRD 103 139/2)*
BSCT1X	Local Control
BSCT1Y	Local/DC Remote Control
BSCT1Z	Local/Tone Remote Control
BSCY1F	DC Remote Control Board
BSCY1H	Tone Remote Control Board, 4-Frequency
BSMN9F	Power Cable/Mounting Supports *(Part # SXA 120 4547/1)*
BSSF7B	Radio Software
BSPL3C	T99 Encode Feature Encryption
BSPL3D	PA Feature Encryption
BSPL3E	Emergency Feature Encryption
BSPL3K	Priority Scan Feature Encryption
BSPL3M	Control Head Feature Encryption
BSPL3P	Maximum Conventional channels Feature Encryption
BSPS5G	Power Supply, 120 VAC
BSPS5H	Power Supply, 230 VAC

OPTION NUMBERS	DESCRIPTION

BSPD1K   12 Vdc Fuse Panel *(For 12 V Operation*)

BSCA1S   37-Inch cabinet

BSMC3Z   Microphone *(Service)*
BSMC5A   Desk Microphone
BSMN1A   Microphone Hanger *(Service Microphone)*

BSMK3E   Optional Keycap Kit *(Scan Control Unit)*

BSCH1L   Battery Standby Charger, 120 VAC/60 Hz
BSCH1R   Battery Standby Charger with Battery Shelf, 120 VAC/60 Hz
BSCH1M   Battery Standby Charger, 230 VAC/50 Hz
BSCH3A   Battery Standby charger with Battery Shelf, 230 VAC/50 Hz

COMPATIBLE PROGRAMMING ACCESSORIES

This conventional Low band Orion Base Station is compatible with the following programming accessories:

PC Programmer	Programmer *(Version 4 & above)*	(TQ-3385)
PC Programmer	Programmer - Conventional	(TQ-3389)
PC Programming Cable	MDX Mobile Cable	(TQ-3372)
PC Programming Interface Box		(TQ-3370)

DESCRIPTION

The Low Band Orion Base Station is configured using the KRD 103 139/11 and KRD 103 139/12, 100-Watt Orion low band mobile radios and associated interfacing circuit boards mounted in a rack-mount enclosure. This unit uses 5 rack units of space and can be mounted in an industry standard 19-inch rack/cabinet. It is installable in the M/A-COM 37" cabinet *(Figures 1)*.

The Orion mobile radios are modified for of 100% transmitter duty cycle when installed in a proper forced air convection cooled enclosure.

The front panel of this unit *(Figure 2)* provides a portal for the control head of the Orion mobile radio with the normal Orion mobile radio controls. A microphone jack is provided for connecting a station desktop microphone. The control portion of the front panel *(Figures 3)* shows a **REMOTE** On/Off switch, an **INTERCOM** On/Off switch, a **VOLUME** control switch and a station **POWER** indicator LED.

The rear view of the enclosure *(Figures 4&5)* shows a cooling fan, 50-ohm antenna connector J1 *(Female Type N)*, Female Orion Power connector P3 *(2 conductor)*, and RJ11 telephone line connector J11.

This station is available in two low band splits of the Orion mobile radio *(29-42 MHz and 35-50 MHz)*. These Orion radios are available separate from the station through M/A-COM's Service Parts.

Figure 1 - Low Band Orion Base StationCabinet (Front View)

Figure 2 - Front View of Station

Figure 3 - Panel Controls

Figure 4 - Low Band Orion Base Station Cabinet
(Rear View)

MECHANICAL PACKAGE

The Low Band Orion Base Station is housed in an attractively styled, standard 19-inch panel enclosure and operates from a wide range of AC power sources. The basic station consists of the Control Panel discussed earlier, a 30-ampere power supply, and a Low Band Orion mobile radio, also discussed earlier. The base station operates from 120 or 240 VAC sources at 50/60 Hz. Input power variations of ±20% are tolerated. The basic base station combination consists of:

- Station Power Supply *(120/240 VAC, 50/60 Hz)*
- Interconnect Board
- Remote Interface combination, with one of two types of Remote Control Board
  1. DC Remote Board
  2. Tone Remote Board
- Speaker, 3.5-inches for improved radio audio quality
- Slow speed, low noise, 12 Vdc fan

The transmitter power output of the base station is the same as the selected Orion mobile radio. The station meets all applicable radio EIA standards.

INTERCONNECT BOARD

The Interconnect Board interconnects the radio in the Base Station with the controls and options *(Refer to Maintenance Manual LBI-39048)*. When the Low Band Orion mobile radio and options are connected *(Figure 6),* the following functions are controllable:

- Receiver Muting
- Audio Switching
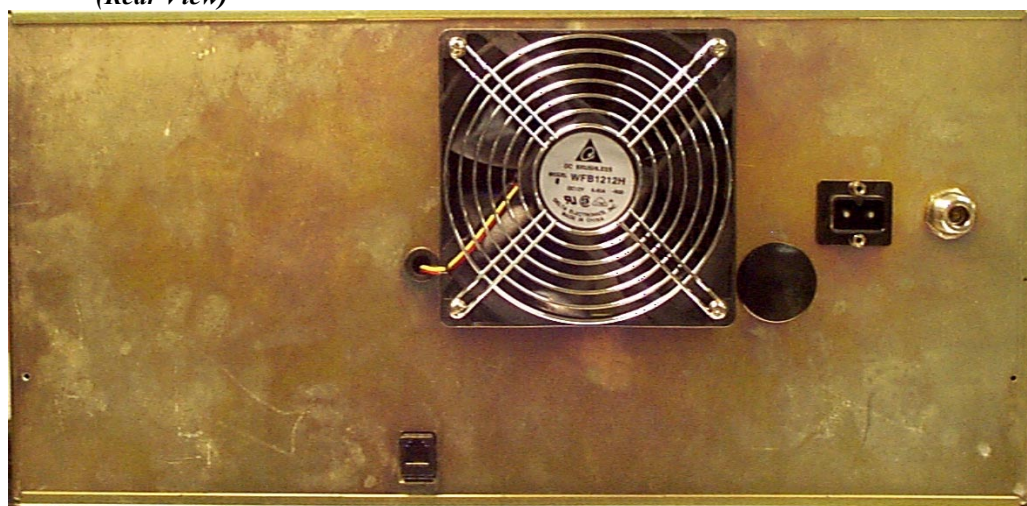- Local and Remote Keying

Figure 5 - Rear View of Station

- Channel Guard Monitor
- Volume Adjustment
- Frequency Selection
- Intercom
- Remote ON/OFF Control
- Voltage Regulator and Power Supply Choice

The Interconnect Board is provided with jacks for connection to:

- Radio
- Control Panel
- Power Supply
- Remote Interface Board (Option)
- Keypad/Frequency Select Board (Option)
- Station Speaker
- Station Fan
- Desk Top Microphone
- Clock/VU Module (Option)

A single transistor *(Q201)* is used to reduce the 13.8 Vdc power supply voltage to a suitable voltage to power the station fan. Except for this transistor, the only other circuitry on the Interconnect Board consists of Jack interconnections.

DC TONE REMOTE INTERFACE BOARD (OPTIONAL)

The optional Remote Interface Board is used to interface the radio with other remote boards as follows:

- DC Remote Board 19A704686P3 *(Refer to Maintenance Manual LBI-39594)*
- Tone Remote Board 19A704686P6 *(Refer to Maintenance Manual LBI-31552)*

The DC or TONE Remote boards allow use of the M/A-COM RCN-1000 Remote Control Consoles with the base station. It provides a 2-wire interface to the consoles for transmit, receive and intercom audio *(Figures 7, 8 & 9)*.

The intercom allows communication between the Base Station and Remote Control Consoles without keying the transmitter. All intercom or transmit conversations from the Remote Consoles are heard on the station speaker. The Remote Consoles can be set to also hear all intercom and radio transmit conversations from the Base Station. Intercom messages from the Remote Console can be set to also hear all intercom and radio transmit conversations from the Base Station. Intercom messages from the remote Consoles are muted when the station is receiving radio messages or is being used as a radio transmitter. Transmitting from the Base Station overrides a radio transmission from the Remote Consoles.
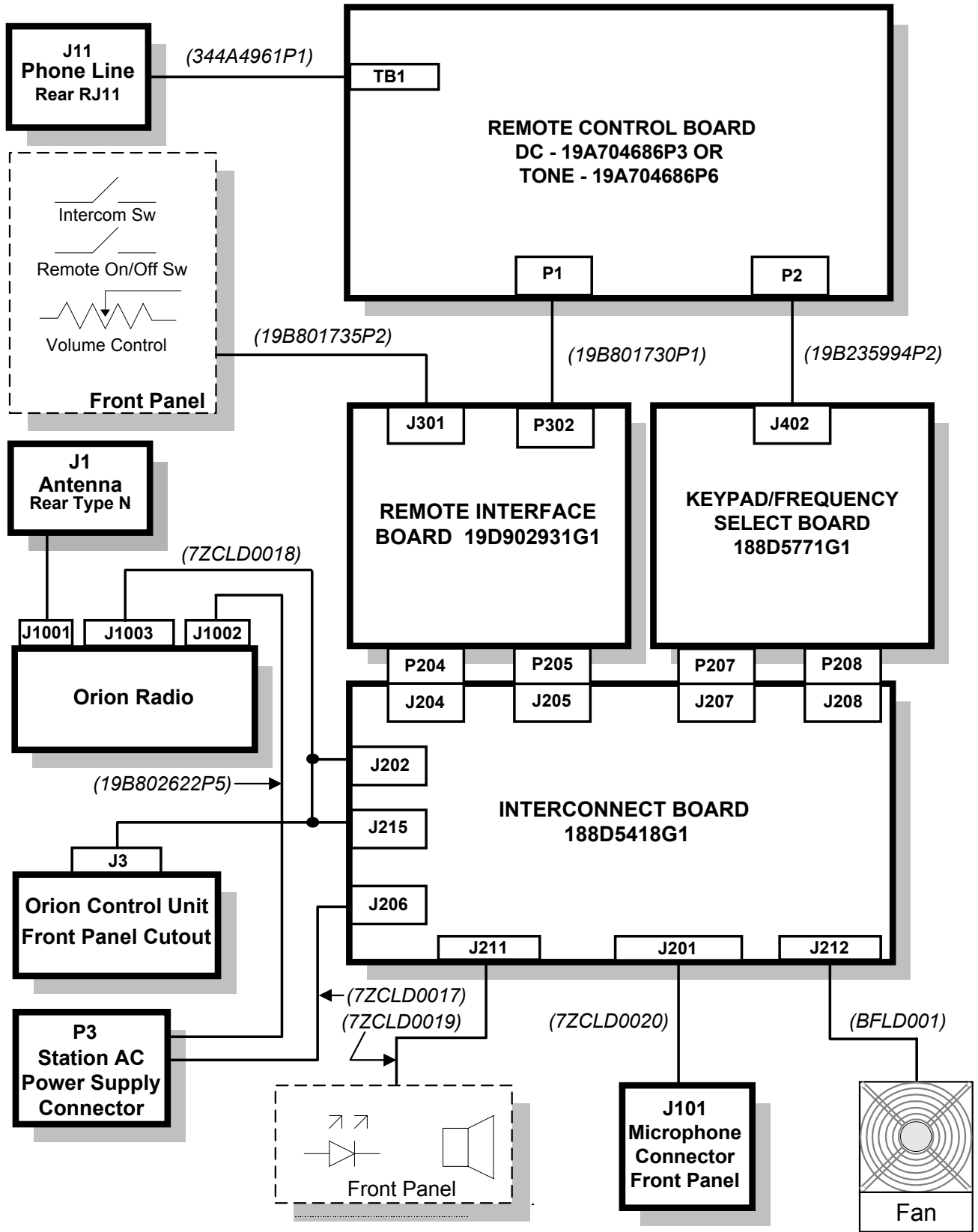
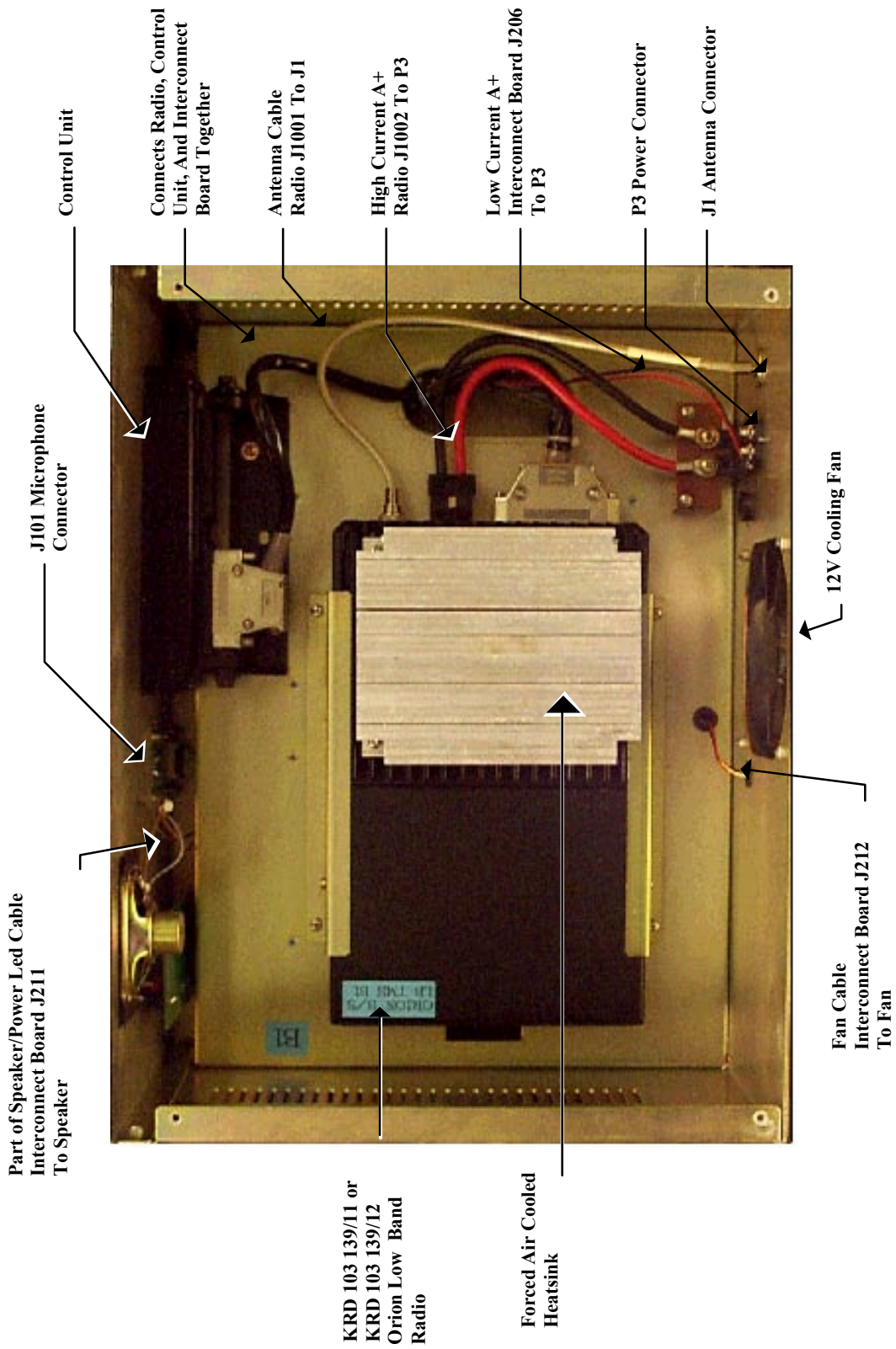**Figure 6 - Orion Low Band Base Station Block Diagram**
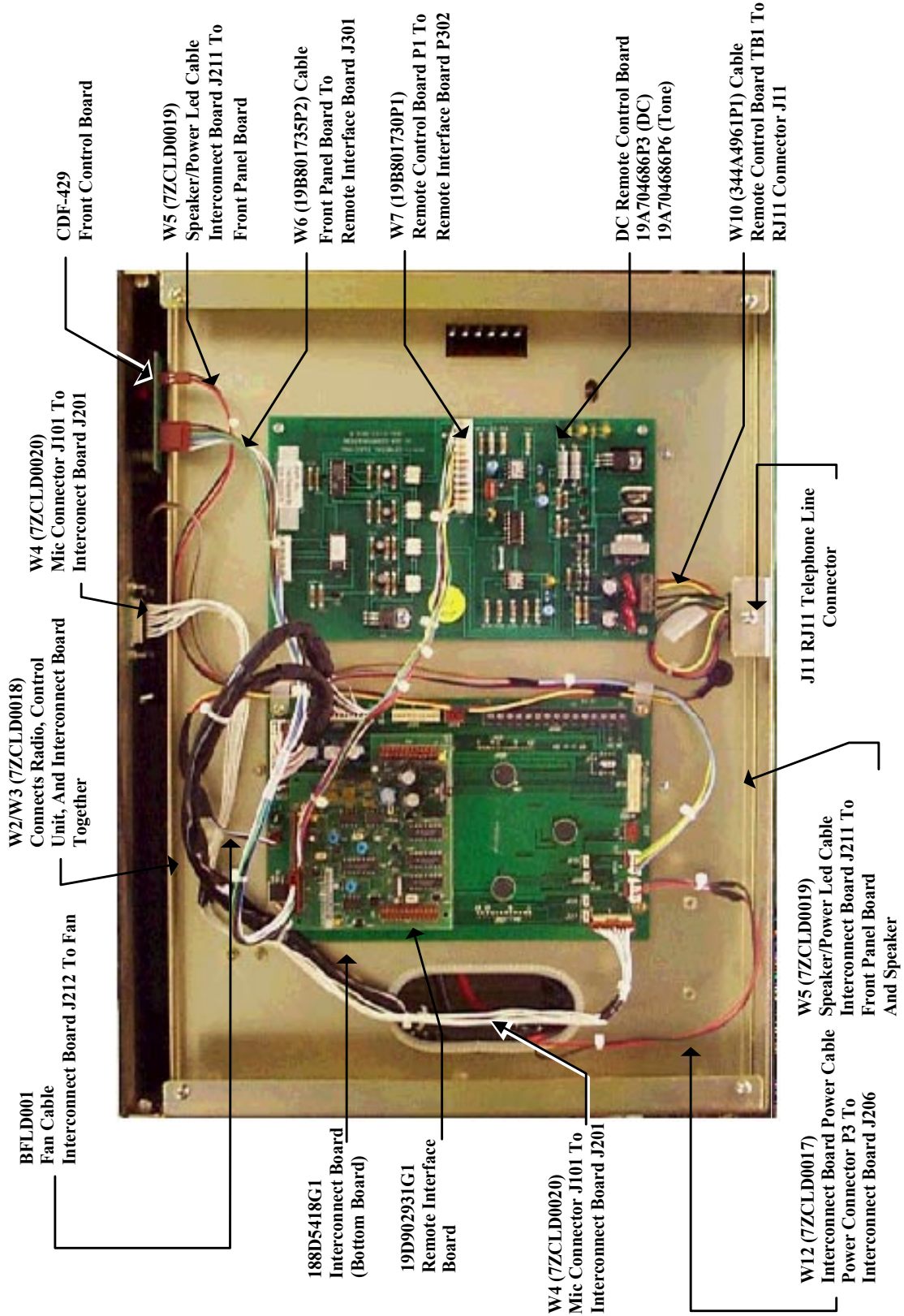
Figure 7 - Orion Low Band Base Station Connection *(Top View)*

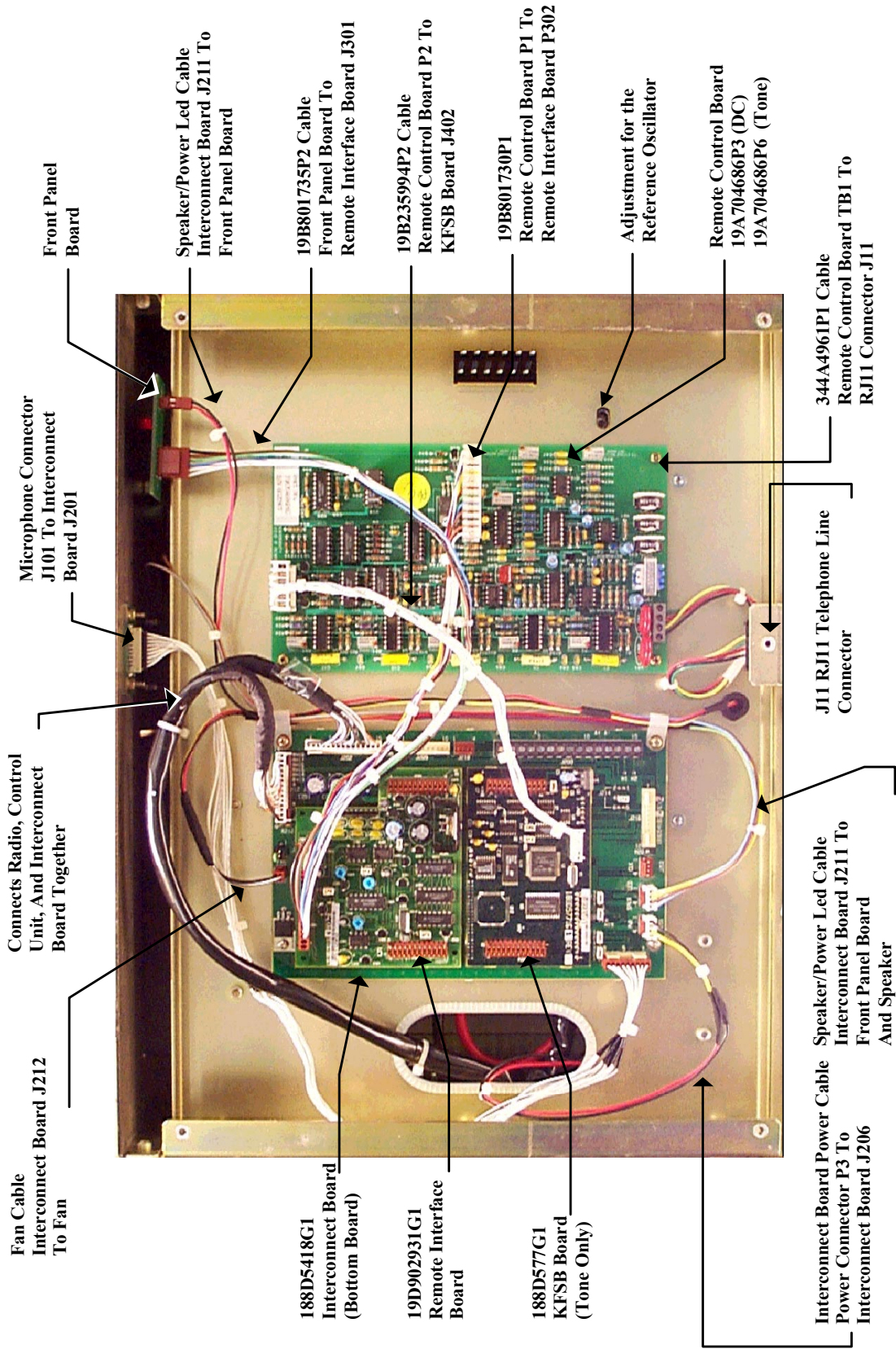**Figure 8 - Orion Low Band Base Station Connection** *(DC Bottom View)*

Figure 9 - Orion Low Band Base Station Connection *(Tone Bottom View)*

Base Station Audio Switching

The audio connections made with the Interconnect Board, with no Remote Interface Board, are shown in *Figure 10*. The processed audio output of the radio comes from the power amplifier and is connected to the station speaker through the SW SPKR HI and SW STATION SPK HI lines.
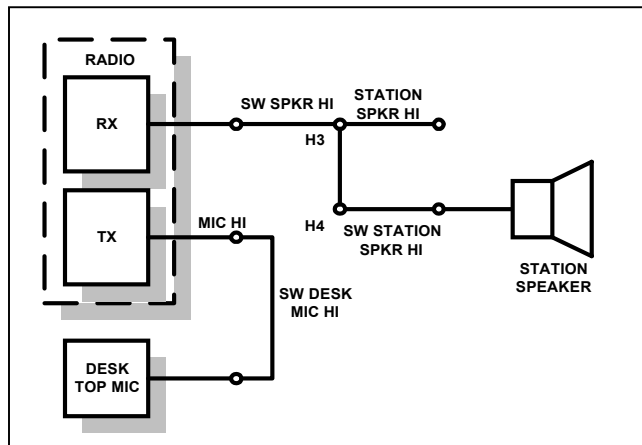

Figure 10 - Interconnect Board without Remote Interface Board Audio Connections

When a Remote Interface Board is installed, Bi-lateral switches, U304-1, U304-2, U304-3, U304-4 and FET Q302, control all of the station audio paths. When the control input is low, the switch is turned off. When the control input goes high, the switch is turned on to input audio to the selected circuit. The function of each audio switch is described, showing the operation of the system with a Remote Interface Board.

Figure 11 shows the audio paths when using the Remote Interface Board.

U304-1 Normally muted, passes audio from the desk top microphone and Intercom microphone level potentiometer to the Remote Console speaker. Passes audio when:

    1. Desktop microphone PTT **AND** REMOTE switch ON.

        OR

    2. INTERCOM switch ON **AND** (REMOTE switch OFF **OR** RX muted)

U304-2 Connects the audio from the desktop microphone to the **MIC HI** input to the radio transmitter. Passes audio when there is desktop microphone PTT AND the INTERCOM switch is OFF

U304-3 Normally muted, connects the audio from the Remote Console microphone line to the **MIC HI** input to the radio. Passes audio when there is Remote PTT **AND** no desk top microphone PTT

U304-4 Normally unmuted, connects the audio from the Remote Console microphone line, through the VOLUME potentiometer on the station Control Panel, to the station speaker. Mutes audio when:

    1. RX active

        OR

    2. Desk top microphone to Remote Speaker audio line active

Q302 A Field Effect Transistor Switch (FET), which for an ORION radio, passes processed audio from the radio audio PA through the SW SPKR HI line to the Remote Board with a line to the Remote Console Speaker. For this condition, the plugs P303 and P304 must be set for a 2-3 connection. The conditions for transmission are RX active **AND** Remote switch ON

OPERATION

INTRODUCTION

The front panel of the Low Band Orion Base Station includes the front of an Orion mobile radio, as well as a Control Panel. The station is assembled as a standard station with or without one of the combinations of options.

    1. The base station has a single red LED labeled **POWER** to indicate when the power supply is on *(Figure 3).*

    2. In addition to the **LED POWER** indicator, there is a **REMOTE ON/OFF** switch, an **INTERCOM ON/OFF** switch and a **VOLUME** control switch.

BASE STATION WITHOUT OPTIONS

Operation of the standard base station without options begins with turning ON the POWER switch. The POWER switch is located at the rear of the power supply *(Refer to the Power Supply Maintenance Manual LBI-38893).* The POWER indicator lights, showing that the
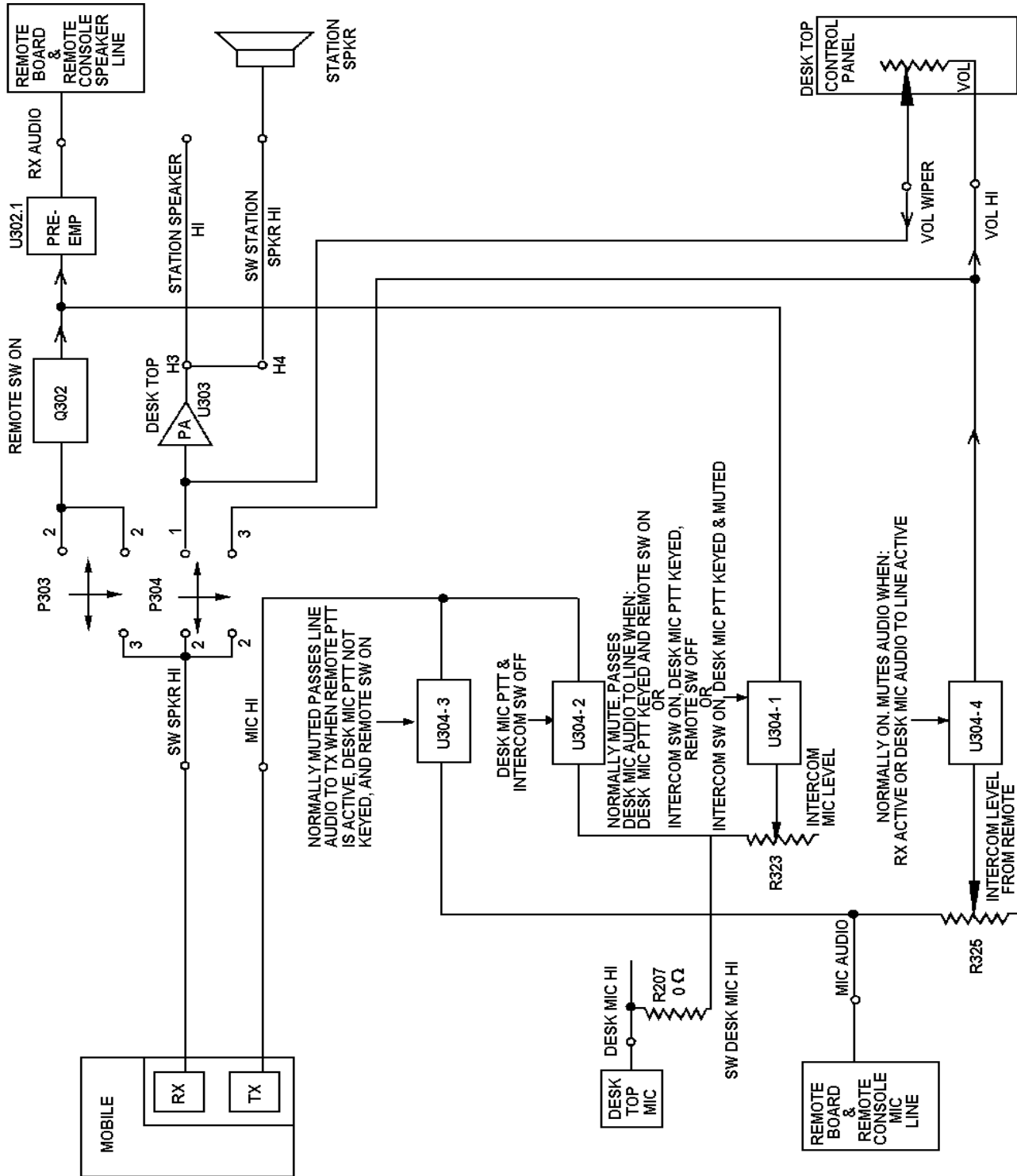
Figure 11 - Interconnect Board with Remote Interface Board

power supply is ON. The radio is **NOT** on yet. The Power Supply provides power to the station-cooling fan. The fan is ON when the POWER switch is. The radio has its own ON/OFF POWER switch.

The radio uses the base station speaker mounted behind the front panel of the station. The internal speaker of the radio is not used.

Further operation of the station is that of the Low Band Orion mobile radio. Refer to the applicable Operator's Manual for more detailed information.

BASE STATION WITH REMOTE OPTION

The DC/TONE Remote Options permit use of RCN-1000 Remote Control Consoles with the base station. Any of these options require that the station have a DC or Tone Remote Board with a Remote Interface Board. The options provide for a two- or four-wire interface to the consoles for the following functions:

- Transmit, Receive and Intercom Audio,

- Transmit Keying (PTT) Control and

- Channel Guard Monitor

OPERATION OF THE BASE STATION WITH REMOTE OPTION

Operation of the base station is described for four combinations of the INTERCOM and the REMOTE switch positions. These two switches control the various audio paths between remote and local microphone, the radio, and remote and local speakers.

1. **INTERCOM and REMOTE switches ON**

    With this switch arrangement, intercom communication is possible between the base station and the Remote Console. Also, the Remote Console can key the radio transmitter and hear the receiver audio output.

    When the Desk Top Microphone PTT is keyed, there is no connection to the radio transmitter. If the radio receiver is squelched, the speaker at the Remote Console hears the audio as an intercom conversation. Should the radio receiver be un-squelched, receiver audio is heard on both the base station speaker and the Remote Console speaker, with priority over the intercom message from the Desktop Microphone to the Remote Speaker.

    The audio from the microphone at the Remote Console is heard on the base station speaker. The Remote Console INTERCOM switch must be OFF to key the station radio transmitter

    The audio from the unsquelched radio receiver is heard on both the station speaker and the Remote Console speaker. Intercom messages from the Remote Consoles are muted when radio messages are being received, or when the base station operator is using the Desktop Microphone PTT.

2. **Base Station INTERCOM Switch ON, REMOTE Switch OFF**

    This arrangement offers intercom service only. Neither the Base Station nor the Remote Console microphone can be used to key the radio transmitter. The radio receiver audio can be heard on the station speaker, but not on the Remote Console speaker.

    A message from the desktop microphone is heard on the Remote Console speaker.

    An intercom message from the Remote Console microphone can be heard on the station speaker, but only if the desktop microphone is not active. The desktop microphone has priority over the Remote Console microphone in the intercom connection.

3. **Base Station INTERCOM Switch OFF, REMOTE Switch ON**

    These switch settings are for remote control of the radio, without an intercom connection.

    When the desktop microphone is keyed, the radio transmitter is keyed and the Remote Console is able to monitor the transmission.

    The Remote Console microphone is connected to the Remote Console speaker if the receiver is unsquelched. The PA output from the receiver is unconditionally connected to the station speaker, but is subject to the radio internal squelch.

4. **Base Station INTERCOM Switch OFF, REMOTE Switch OFF**

    This arrangement is for operating the base station as a radio.

    The desktop microphone is connected only to the radio transmitter when the desktop microphone is keyed.

    The radio receiver PA audio output is connected only to the station speaker.

A summary of audio path connections for the four combinations of INTERCOM and REMOTE switches is given in **Table 1 - REMOTE and REMOTE Audio Interfaces Summary**.

The VOLUME control is a rotary potentiometer on the Base Station Control Panel which controls the level of audio signals fed to the station speaker as determined by the INTERCOM and REMOTE switch positions.

With the Orion trunked radios, the rotary VOLUME control adjusts both the receiver and the intercom audio levels. The radio volume control buttons are disabled by a PCX programming option so that the receiver audio volume level is fixed and the internally adjusted Intercom Level adjusts the intercom audio relative to the receiver audio. This arrangement allows all Alert Tones generated by the radio to pass to the Remote Consoles at a suitable level, independent of the base station rotary VOLUME control. Refer to the applicable Operator's Manual for specific information on setting the audio level of the particular radio installed.

CIRCUIT ANALYSIS

INTERCONNECT BOARD WITHOUT A REMOTE INTERFACE BOARD

Transmit Audio Path

The Desk Top microphone is used to modulate the radio transmitter. The Interconnect Board connection between the microphone at J201-2 **DESK MIC HI** and the radio transmitter input at J202-4 **MIC HI** is made through the 0 *(zero)* ohm resistor *(R207)*. This connection is made between the **DESK MIC HI** line and the **SW DESK MIC HI** line. A jumper *(P104)* connects P104-1 **SW DESK MIC HI** and P104-2 **MIC HI**. P104 is a jumper plug for J204 in lieu of Interface Board P204. There is no active circuitry in the path.

Receive Audio Path

The station speaker is driven by the radio audio PA output, available on J202.9 **SW SPKR HI**. The Interface Board connection between the **SW SPKR HI** line and J211-3 **SW STATION SPKR HI** is made through a jumper connecting P104-7 **SW SPKR HI** and P104-8 **SW STATION SPKR HI**. P104 is a jumper plug for J204 in lieu of Interface Board P204. There is no active circuitry in the path. The volume must be controlled with the volume control on the radio.

INTERCONNECT BOARD WITH REMOTE INTERFACE BOARD

The Remote Interface Board interfaces the radio to the DC or Tone Remote Boards. Desk Top Microphone and receiver audio are gated and summed on the Interface Board. This combined audio is then sent to the Remote Board, which in turn feeds the phone line to the Remote Console Speaker.

Conversely, Remote Console Microphone audio from the phone line is buffered by the Remote Board and sent to the Remote Interface Board, which gates the audio to the radio transmitter or to the station speaker.

Audio Path from the Desk Top Microphone to the Remote Board

Audio from the Desk Top microphone enters the Interconnect Board at J201-2 **DESK MIC HI**. The 0 (zero) ohm resistor (R207) connects the **DESK MIC HI** to the **DESK MIC HI SW** on the Interface Board at P204-1 and to INTERCOM MIC LEVEL potentiometer R323, a level adjustment on the board for the Desk Top Microphone signal.

The bilateral switch (U304-1), next in the path, controls connection of the signal through to the Remote Board. The logic on the Interface Board applies 0 (zero) VDC to Control Pin 13 to keep the gate normally muted, but switches this control voltage to +10 VDC to unmute the gate for the following conditions:

Desk Top Microphone PTT keyed
AND
REMOTE Switch ON
OR
INTERCOM Switch ON
Desk Top Microphone PTT keyed
AND
REMOTE Switch OFF
OR
INTERCOM Switch ON
Desk Top Microphone PTT keyed
AND
RX muted

When the signal is gated through switch U304-1, it goes through amplifier U302-1 and to the J302-9 output as RX AUDIO, where connection is made for the Remote Board. Since the audio circuitry in the Remote Board has built-in de-emphasis, the amplifier U302-1 includes audio pre-emphasis.

Table 1 - Remote and Intercom Audio Interface Summary

Desk Top INTERCOM Switch ON, REMOTE Switch ON		
Remote Mic	→	Radio Transmitter
Remote Mic	→	Station Speaker
Desk Top Mic	⟶/ (no connection)	Radio Transmitter
Desk Top Mic	→	Remote Speaker (if RX is muted), otherwise RX → Remote Remote Speaker and Station Speaker
RX Audio	→	Station Speaker and Remote Speaker
Desk Top INTERCOM Switch ON, REMOTE Switch OFF		
Remote Mic	⟶/ (no connection)	Radio Transmitter
Remote Mic	→	Station Speaker (if Desk Mic PTT inactive)
Desk Top Mic	⟶/ (no connection)	Radio Transmitter
Desk Top Mic	→	Remote Speaker
RX Audio	⟶/ (no connection)	Remote Speaker
RX Audio	→	Station Speaker
Desk Top INTERCOM Switch OFF, REMOTE Switch ON		
Remote Mic	→	Radio Transmitter (if no Desk Top Mic) otherwise with Desk Top Mic inactive
Desk Top Mic	→	Radio Transmitter
Remote Mic	→	Desk Speaker (if Desk Top Mic PTT inactive) otherwise Remote Mic muted
Desk Top Mic	→	Radio Transmitter with Desk Top Mic PTT
Desk Top Mic	→	Remote Speaker
RX Audio	→	Remote Speaker (if RX unmuted)
RX PA Audio	→	Station Speaker
Desk Top INTERCOM Switch OFF, REMOTE Switch OFF		
Remote Mic	⟶/ (no connection)	Radio Transmitter
Remote Mic	⟶/ (no connection)	Station Speaker
Desk Top Mic	→	Radio Transmitter
Desk Top Mic	⟶/ (no connection)	Remote Speaker
RX Audio	⟶/ (no connection)	Remote Speaker
RX PA Audio	→	Station Speaker

Key: Connection = →

           No Connection = ⟶/

REMOTE INTERFACE BOARD

Remote Interface Board 19D902931G1 is used to interface the radio with DC and Tone Remote Boards 19A704686GP3 (DC) and 19A704686P6 (Tone).

The DC and Tone remote boards allow use of the RCN-1000 Remote Control Consoles with the Orion Base Station. Refer to the appropriate Maintenance Manuals as follows:

- **LBI-39048** *(Remote Interface Board 19D902931G1)*
- **LBI-31594** *(DC Remote Control Board 19A704686P3)*
- **LBI-31552** *(Tone Remote Control Board 19A704686P6)*

KEYPAD/FREQUENCY SELECT OPTION

Keypad/Frequency Select Board *(KFSB) 188D5771G1* is microprocessor controlled. This board converts information from Tone Remote Board 19A704686P6 to serial data for the Orion radio in the base station. Refer to Maintenance Manual LBI-39195.

REFERENCE FREQUENCY OSCILLATOR

The reference oscillator of the Low Band Orion Mobile Radio consist of a 5 PPM **T**emperature **C**ompensated (**X**)Crystal) **O**scillator (**TCXO**). The standard reference oscillator frequency is 12.8 MHz. The TCXO is enclosed in an RF shielded housing inside the mobile radio. Access to the oscillator trimmer is made through a hole in the top of the radio housing, which is further accessible through the bottom of the Base Station enclosure *(Figures 8 & 9).* The TCXO is compensated by an internal temperature compensating circuit for both low and high temperatures. With no additional compensation the oscillators will provide 2 PPM stability from -30-degrees C to +60-degrees C.

STATION PROGRAMMING

The radio in the Low Band Orion Base Station is programmed by an IBM compatible personal computer equipped with a serial port. The computer is connected to the station microphone connector through Adapter Box TQ-3370 and programming cable TQ-3372. (The MDX Mobile Cable) Refer to the radio PC Programming Guide for additional information on programming connections.

┌─── I**MPORTANT** ───┐

The programming cable connects to the microphone connector on the station. <u>DO NOT</u> use the microphone connector on the radio.

PROGRAMMING CONSIDERATIONS

The Orion Low Band Base Station must be programmed as though it were a desktop station. With the major exception of the hookswitch function, the Orion Low Band Base Station uses the same external I/O as the current desktop station.

The major exception consideration involves the remote Channel Guard monitor line. The Low Band version of the Orion radio inconveniently left the "Hookswitch" line off of the radio rear DB37 connector. The desktop station remote control system uses this line for the Channel Guard monitor function on other Orion models. As a result, the function had to be moved to the "Aux Input 1" function. Further, to remain compatible with the control unit hookswitch, the Aux function needs to specify an "Inverse Hookswitch." And finally, the inverse hookswitch label is not in the Aux Input selection list in EDACS3 and Programmer versions 3 and earlier.

The inverse hookswitch can be mapped to Aux Input 1 with Programmer Version 4 or later. One can also work it into the personality with EDACS3 by a patching mechanism. However, there is no way to Program the inverse hookswitch with Programmer versions 3 and below. This is why these versions of Programmer can not be used on the Orion Low band Base Station.

In summary, the following programmers may be used on the Orion Low Band Base Station.

1)	Programmers TQ3385 or TQ3389 Version 5 or above.	Base Station is fully supported
2)	Programmer Version 3 and below	Incompatible
3)	EDACS3 Version 14	Compatible with patch procedure
4)	EDACS3 Version 12 and below	Incompatible

Required Programmable External I/O Functions

"Aux Input 1" must be set for "Inverse Hookswitch" (IHKSW)

"Aux Input2" must be set for "PTT"

"External Mute" must be enabled and its sense set to "HIGH"

Continued

> The four-system/channel combinations that map the four remotely controlled channels must be defined in the "System/Group" key menu. It is considered good practice to repeat the last valid channel in the remaining system/channel positions (This includes storing a dummy value in the unused 5th position).
>
> "Minimum Volume" must be set to "15" if programming with EDACS3 or "22" if programming with a Programmer. The "Desktop Station Fixed Volume" or the "Vehicular Repeater Fixed Volume" must be set to "22".
>
> The noise blanker control needs to be added to the Orion control unit keypad by defining label "Nois" onto the desired key. The OPT key is a good place to place this control. **Note:** The control unit needs to be programmed when going through the radio programming menus.
>
> It is convenient to map Orion control unit keypad keys to "System/group" (SG?) functions corresponding to the remote control frequency choices. Again, note that the control unit needs to be programmed when going through the radio programming menus.
>
> **EDACS3 Patching Procedure**
>
> The following procedure causes EDACS3 to put the inverse hookswitch function onto Aux 1:
>
> 1. Create file "IHKSW.SC" that consists of the line: "/T30/R2/MBF/WAD"
>
>   where the slashes are forward slashes, not the directory name separating backward slashes in the \GE\EDACS3\MRK directory. This tells EDACS3 to substitute the Inverse Hookswitch keycode if it finds the AUX1 keycode as the INP1 function.
>
> 2. Create file "LBOBASE.BAT" from the "MRK.BAT" in the \GE directory. Change the line:
>   "\GE\EDACS3\mrk\EDACS3 %1 %2 %3 %4 %5 %6 %7 %8 %9"
>   from the "MRK.BAT" file to
>   "\GE\EDACS3\mrk\EDACS3**/SC IHKSW** %1 %2 %3 %4 %5 %6 %7 %8 %9"
>
> 3. Run the LBOBASE bat file.
>
> 4. On the EXT IO screen in the Options Menu set INP1 to be AUX1.
>
> 5. Program the radio.

After programming the station, power must be turned OFF and then back ON using the station power supply ON-OFF switch. This is to reset the radio and, if installed, the keypad frequency select board. The keypad frequency select board is disabled for programming and must be reset before resuming communications with the radio.

Station operation has a minimal effect on radio personality. The main difference between a station personality and a mobile personality is the ability to remotely select four channels if used with a conventional tone remote board or five system/group combinations if used in an EDACS environment with an EDACS tone remote board.

REMOTE INTERFACE BOARD 19D902931 JUMPERING

On Local/Remote stations with a 344A3383 or 188D5771 keyboard frequency select board, J307 of the remote interface board *(Remote PTT jumper)* must be set on Pins 2&3. Refer to LBI-39048 for jumper locations.

For conventional stations, J305 *(Remote CG Disable Jumper)* must be set on Pins 1&2. For EDACS stations, J305 must be set on Pins 2&3. *(The Remote CG Disable line is used for Securitone Detect on EDACS radios).*

Refer to LBI-39048 for jumper locations.

GENERAL CONSIDERATIONS

On Local/Remote stations with a keyboard frequency select board, fill all five system/group definitions. Repeat the last valid entry to the end of the table *(if the table is not full).*

ORION PROGRAMMING

The Orion radio requires Group 24 or later flash software to operate properly in the base station application. Further, the personality must be programmed with EDACS3/CONV1 Version 14 or later. Earlier versions of flash software may not recognize a keyboard frequency select board and may not operate the external mute line.

ALL ORION STATIONS, BOTH LOCAL AND REMOTE

"External Mute" must be enabled on Output 1 with a sense of "High". To setup from the top level menu, go through the "Options" (F7) menu, and the "ORION" (F2) menu, to the "EXT-IO" menu.

LOCAL ONLY STATIONS

Auxiliary (AUX) Input 2 must be programmed as a "PTT" input. To set from the top level menu, go through the "Options" (F7) menu, and the "ORION" (F2) menu, to the "EXT-IO" (F4) menu. Set "AUX Input 2" to "PTT" either by typing PTT in the adjacent data field or pressing the TAB key, ramping through selections with the up or

down arrow keys, and pressing F10 when PTT is highlighted.

REMOTE STATIONS

The personality depends on whether the station is set for single frequency remote or multi-frequency remote operation.

For single frequency remote operation (no keypad frequency select board), Aux Input 2 must be programmed as a "PTT" input.

Set the minimum volume to 15. To set from the top level menu, go to the "Options" (F7) menu and type the level in the adjacent data field.

For multi-frequency operation *(with keypad frequency select board)*, Aux Input 2 must be programmed as a "PTT" input.

Set the minimum volume to 15. To set from the top level menu, go to the "Options" (F7) menu and type the level in the adjacent data field.

Up to four channels may be defined in the system/group key menu for a conventional only radio or up to five system/group combinations may be defined in an EDACS radio. To set from the top level menu, go to the "Options" (F7) menu. Press (F8) until the "SysGrp" choice appears for key F3, Press (F3). Fill in all five choices with valid system/group names.

KEYBOARD FREQUENCY SELECT BOARD CONFIGURATION

A keyboard frequency select board must be set for EDACS or conventional stations.

For the 188D5771 Orion board, R54 must be 10k for EDACS stations and removed for conventional stations. Jumpers J403 and J404 must be on pins 2&3. Jumper J406 must be on pins 1&2. Refer to LBI-39195 for locations.

SERVICE PARTS

The following is a list of parts and assemblies for Low Band Orion Base Station Shelf Assembly KRD 103 139 that are available through M/A-COM Private Radio Systems, Inc. Service Parts.

Symbol	Part Number	Description
	188D5418G1	Interconnect Board
	19D902931G1	Remote Interface Board
	19A704686P3	Remote Control Board *(DC)*
	19A704686P6	Remote Control Board *(TONE)*
	188D5771G1	Keypad/Frequency Selector Board

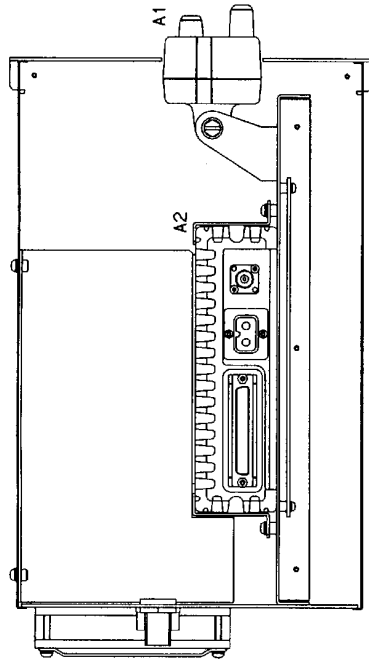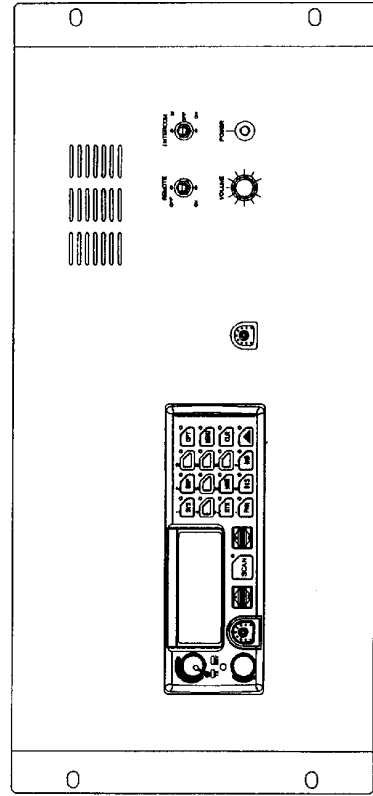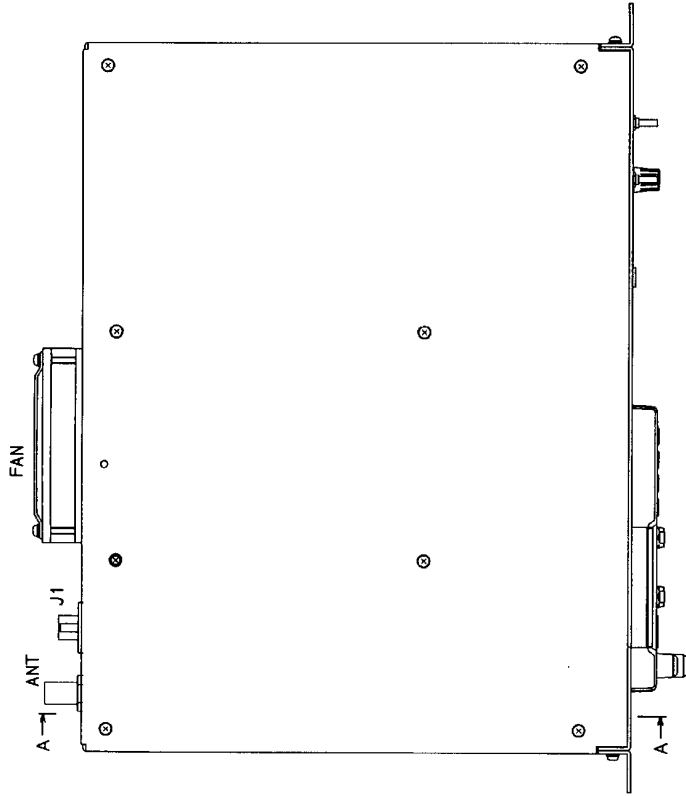| Symbol	Part Number	Description
	B19/7PCLD0014	Front Panel Board
	B19/7PCLD0015	Microphone Connection Board
A1	B19/CQD-1526	Desk Microphone Connector Board
A2	B19/CDF-429	Control Panel
		----CHASSIS----
		Forced Air Cooled Heatsink
B1	B19/7BFLD0001	12V Cooling Fan
B1-1	B19/5BFAB00023	Fan Guard (109-019C)
		----CONNECTORS----
J3	B19/5JWAV00159	Power Connector.
J101	B19/6ZZAB10000	Connector, 9 Pin *(Microphone)*.
J102	B19/5JWHZ00048	Connector, 9 Pin.
PC1	B19/7PCLDOO15A	Control Panel Board: Sim to H-7PDLD0011A.
		----CONNECTORS----
J301	B19/5JBCP00001	6 Pin.
J302	B19/5JBCP00002	2 Pin.
		----DIODE----
CD301	B19/5TZAD00195	Optoelectronic (Red): Sim to TOSHIBA TLR114.
		----RESISTOR----
VR301	B19/RVAA01087	Variable: 5k Ohms.
		----SWITCHES----
S301	B19/5SASB00287	Sim to NIHONKAIHEIKI D-2012EP.
S302	B19/5SAAB00965	Sim to NIHONKAIHEIKI D-2019E.
		----SPEAKER----
SP1	B19/5USAF00061	3.5-Inch Speaker: Sim to FOSTER C071A03S1710
		----CABLES----
W1	B19/7JJLD0001B	Antenna Cable - Radio J1002 to J1.
W2 and W3	B19/7ZCLD0018	Connects Radio, Control Unit, And Interconnect Board Together.
W4	B197ZCLD0020/	Microphone Connector J101 To Interconnect Board J201.
W5	B19/7ZCLD0019	Speaker/POWER LED, Interconnect Board J211 to Front Panel Board.
W6	19B801735P2	Front Panel Board to Remote Interface Board J301.
W7	19B801730P1	Remote Control Board P1 to Remote Interface Board P302
W8	19B235994P2	Remote Control Board P2 to KFSB Board J402
W10	344A4961P1	Remote Control Board TB1 to RJ11 Connector J11.
W11	19B802622P5	High Current A+: Radio to J1002 to P3.
W12	B19/7ZCLD0017	Low Current A+: Interconnect Board Power Cable - Power Connector P3 to Interconnect Board J206

SHELF ASSEMBLY
KRD 103 139

Symbol	Part Number	Description
		----ASSEMBLIES----
	KRD103139/11	29-42 MHz Orion Low Band Radio
	KRD103139/12	35-50 MHz Orion Low Band Radio
	B19/CAH-505AB	29-42 MHz PA Circuit *(Used in P1 Radio Assembly)*.
	B19/CAH-505BB	35-50 MHz PA Circuit *(Used in P2 Radio Assembly)*.
	344A4581P2 Or B19/CMD-556BR	Control Unit *(Scan)*
	344A4581P4 Or B19/CMD-556MR	Control Unit *(System)*
	188D5418G1	Interconnect Board
	19D902931G1	Remote Interface Board
	19A704686P3	Remote Control Board *(DC)*
	19A704686P6	Remote Control Board *(TONE)*
	188D5771G1	Keypad/Frequency Selector Board
	B19/7PCLD0014	Front Panel Board
	B19/7PCLD0015	Microphone Connection Board
A1	B19/CQD-1526	Desk Microphone Connector Board
A2	B19/CDF-429	Control Panel
		----CHASSIS----
		Forced Air Cooled Heatsink
B1	B19/7BFLD0001	12V Cooling Fan
B1-1	B19/5BFAB00023	Fan Guard (109-019C)
		----CONNECTORS----
J1		Antenna: Part of W1.
J3	B19/5JWAV00159	Power Connector.
J11		RJ11 Telephone Line.
J101	B19/6ZZAB10000	Connector, 9 Pin *(Microphone)*.
J102	B19/5JWHZ00048	Connector, 9 Pin.
P3		Power.
PC1	B19/7PCLDOO15A	Control Panel Board: Sim to H-7PDLD0011A.
		----CONNECTORS----
J301	B19/5JBCP00001	6 Pin.
J302	B19/5JBCP00002	2 Pin.
		----DIODE----
CD301	B19/5TZAD00195	Optoelectronic (Red): Sim to TOSHIBA TLR114.
		----RESISTORS----
R301	B19/5REAA05058	Metal Film: 470 Ohms 5%, 250 VDCW, 1/4 Watt.
VR301	B19/RVAA01087	Variable: 5k Ohms.
		----SWITCHES----
S301	B19/5SASB00287	Sim to NIHONKAIHEIKI D-2012EP.
S302	B19/5SAAB00965	Sim to NIHONKAIHEIKI D-2019E.

NOTE: COMPONENTS ARE ADDED, DELETED, OR CHANGED
BY PRODUCTIONS CHANGES

Symbol	Part Number	Description
		----SPEAKER----
SP1	B19/5USAF00061	3.5-Inch Speaker: Sim to FOSTER C071A03S1710
		----CABLES----
W1	B19/7JJLD0001B	Antenna Cable - Radio J1002 to J1.
W2 and W3	B19/7ZCLD0018	Connects Radio, Control Unit, And Interconnect Board Together.
W4	B197ZCLD0020/	Microphone Connector J101 To Interconnect Board J201.
W5	B19/7ZCLD0019	Speaker/POWER LED, Interconnect Board J211 to Front Panel Board.
W6	19B801735P2	Front Panel Board to Remote Interface Board J301.
W7	19B801730P1	Remote Control Board P1 to Remote Interface Board P302
W8	19B235994P2	Remote Control Board P2 to KFSB Board J402
W10	344A4961P1	Remote Control Board TB1 to RJ11 Connector J11.
W11	19B802622P5	High Current A+: Radio to J1002 to P3.
W12	B19/7ZCLD0017	Low Current A+: Interconnect Board Power Cable - Power Connector P3 to Interconnect Board J206
	19B802622P4	Rack Unit DC Power Cable
		----CABLING----
ZC1	B19/7JJLD0001A	Antenna Cable *(W1)*.
ZC2	B19/7ZCLD0016	Orion Radio Power Connector *(W11)*.
ZC3	B19/7ZCLD0017	Interconnect Board Power Cable *(W12)*.
ZC4	B19/7ZCLD0018	Connects Radio, Control Unit and Interconnect Board Together *(W2 & W3)*.
ZC5	B19/7ZCLD0019	Speaker/Power LED Cable *(W5)*.
ZC6	B19/7ZCLD0020	Microphone Connector J101 to Interconnect Board J201 *(W4)*.
		----MISCELLANEOUS----
	B19/CWY-321 or KRD 103 139/21	Rack Unit Only *(No radio Assembly)*
	SXA1204547/1	Cabinet Mounting Rails

FAN

ANT

J1

A

A

A1

A2

SECTION A-A

CHASSIS ASSEMBLY
Sheet 1
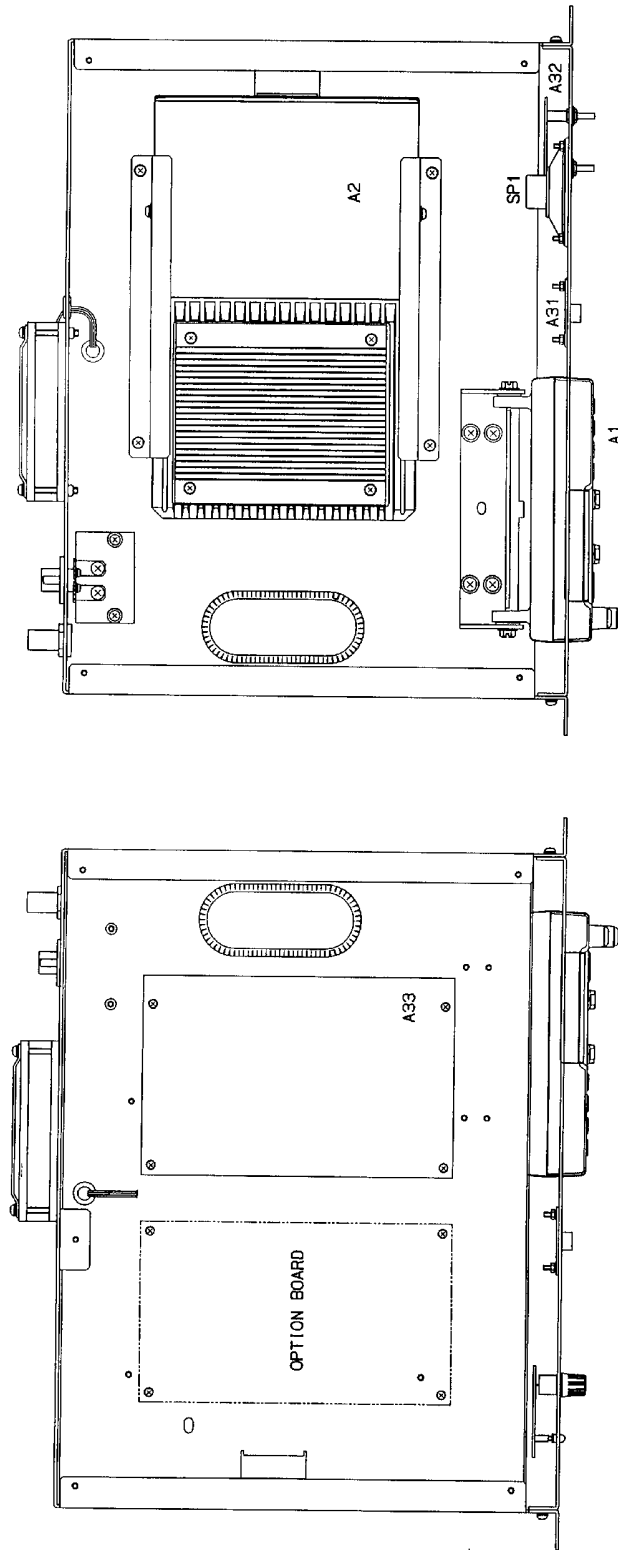
REMOVING TOP/BUTTOM COVER

A32

SP1

A31

A2

TOP VIEW

A1

ORION BASE STATION UNIT TMS   JHF-171S100

A33

OPTION BOARD

BOTTOM VIEW

CHASSIS ASSEMBLY
Sheet 2
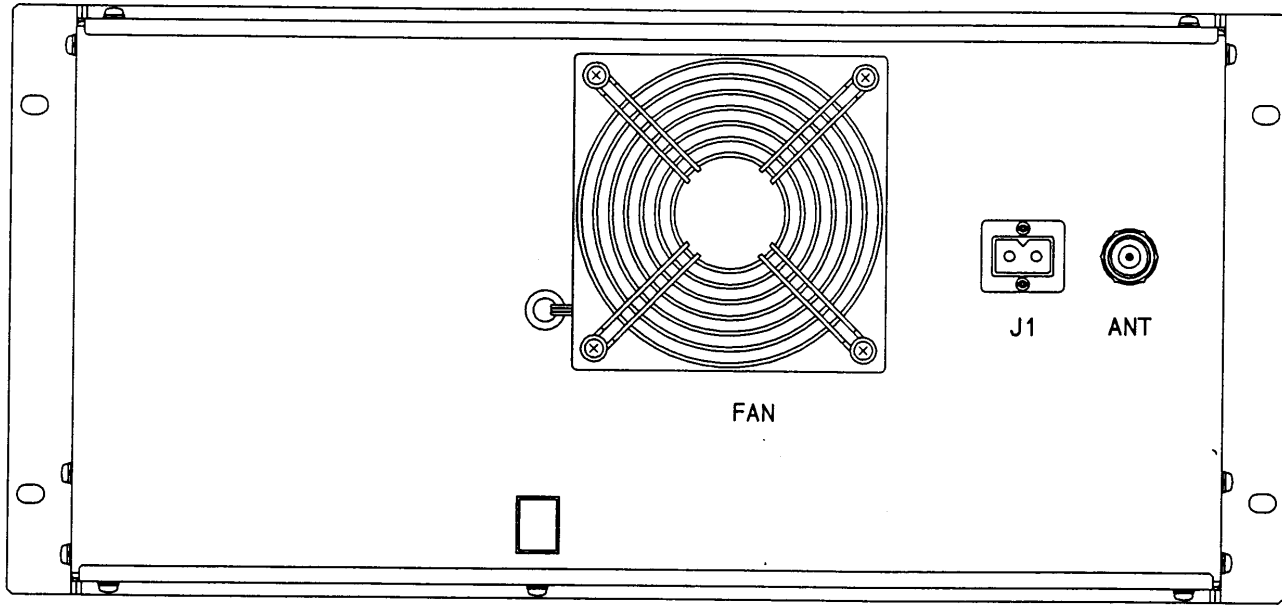
REA VIEW

ORION BASE STATION UNIT TMS   JHF-171S100

CHASSIS ASSEMBLY
Sheet 3

ORION BASE STATION UNIT TMS JHF-171S100

J301

S302

S301

RV301
5 K

C301 - C305
0 pF

J302

POWER LED

A-

CD301

R301
470 OHMS
1/10 WATT
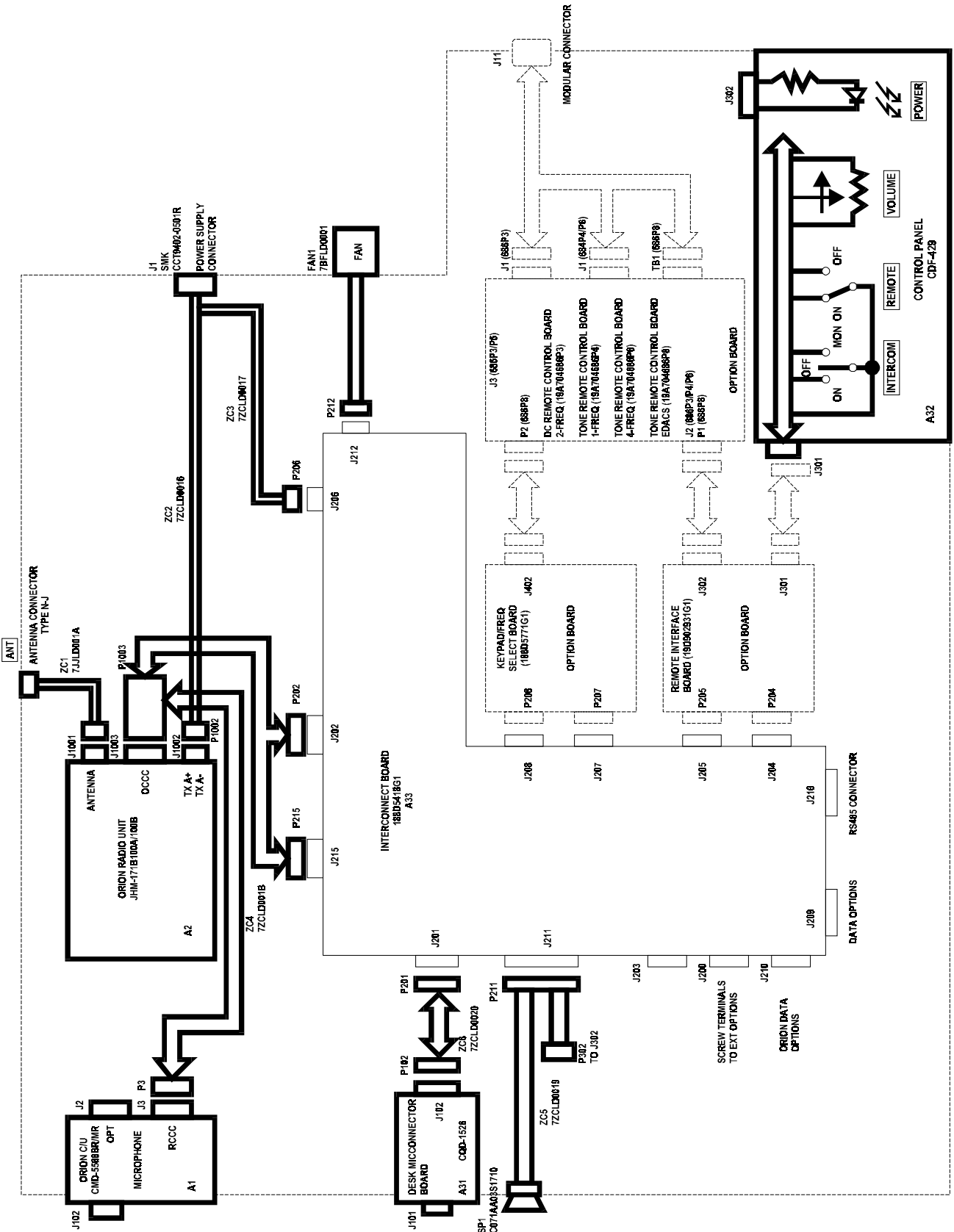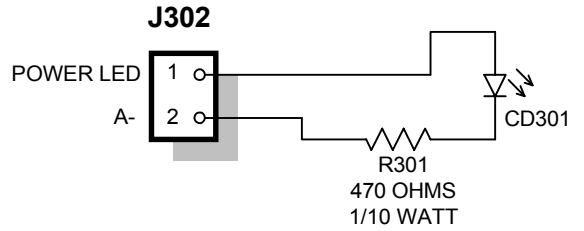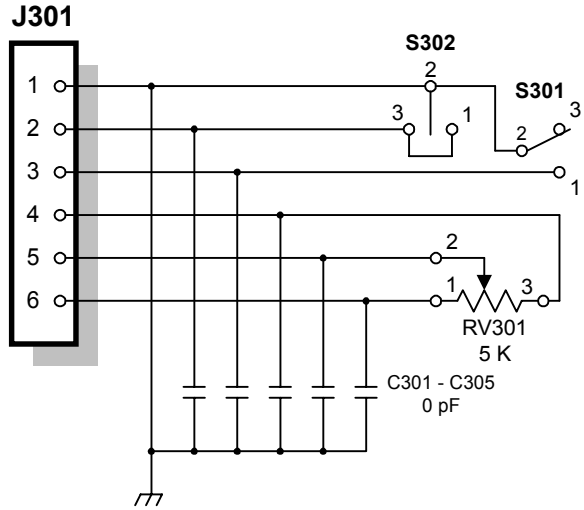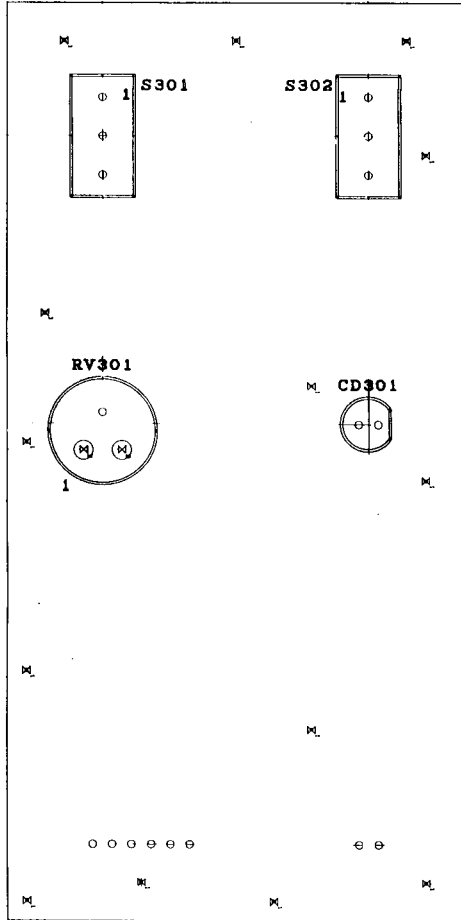
FRONT CONTROL PANEL BOARD
B19/CDF-429

J101		J102	
2		1	DESK MIC LO
1		2	DESK MIC HI
3		3	DESK MIC PTT
4		4	DISPLAY SER
5		5	KEYPAD SER
6		6	SW A+
7		7	A-
9		8	SPKR HI
8		9	CG DIS

C101-C108
0 pf
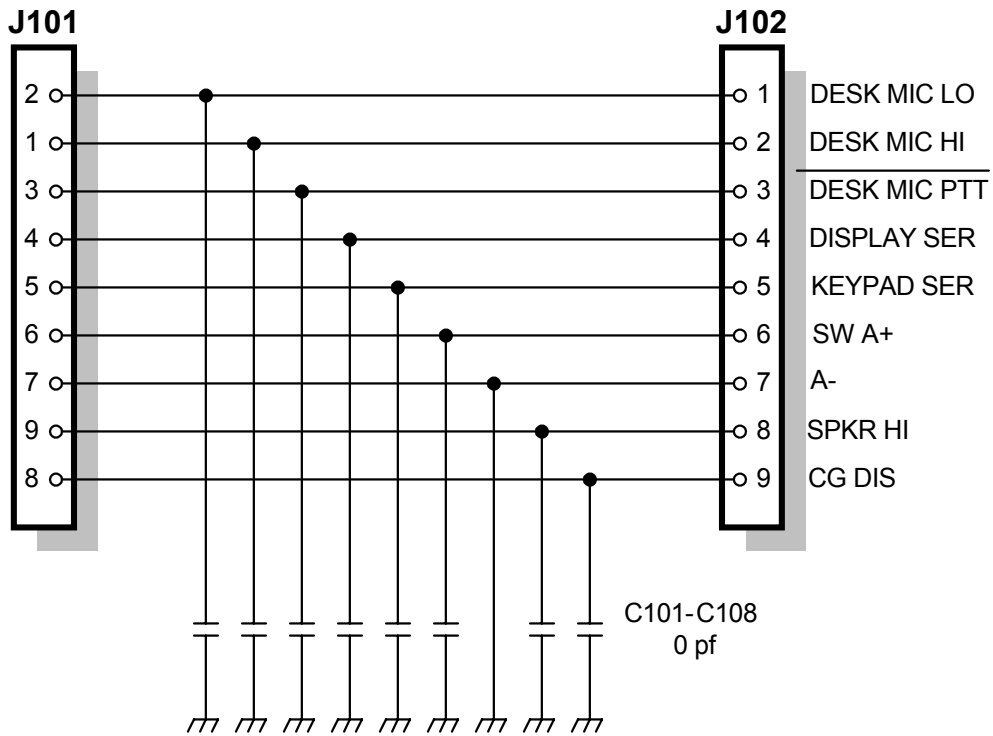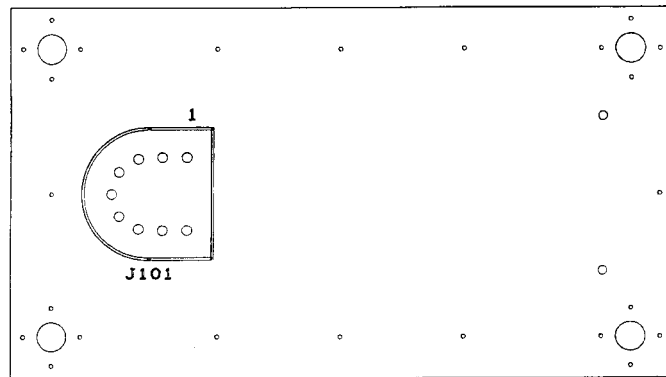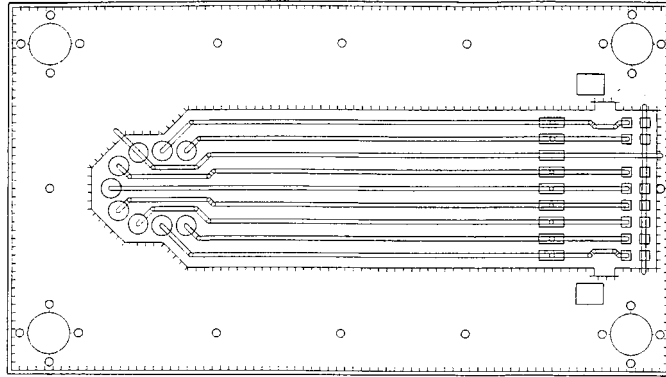
MICROPHONE CONNECTOR BOARD
B19/CQD-1526

ZC1 7JJLD0001A

N-J   TNC-P

19B802622P5

P1002

A+
A-

ZC3 7ZCLD0017

P206

4	
3	A+
2	
1	A-

ZC4 7ZCLD0018

P1003

			P202	
A-	7		1	A-
SPKR LO	18		2	SPKR LO
SPKR HI	19		3	SPKR HI
MIC HI	11		4	MIC HI
SW A+	25		5	SW A+
GE STAR (SRQST)	17		6	SRQST
PTT	23		7	PTT
CG DIS (HKSW)	26		8	HK SW
			9	SW SPKR HI
AUDIO MUTE VOL/HI	22		10	AUDIO MUTE VOL/SQ HI
			11	
MIC LO	12		12	MIC LO
RELAY	9		13	RELAY
KEY PAD SER	3		14	KEY PAD SER
DISPLAY	2		15	DISPLAY SER

P215

SUP GND	1		1	SUP GND
RTS	20		2	RST
RS485+	4		3	RS485+
INP1	21		4	INP1
RS485-	5		5	RS485-
CTS	6		6	CTS
FPROG	8		7	FPROG
EXT MIC	27		8	EXT MIC
EXT RX	28		9	EXT RX
CTRL ON	14		10	CTRL ON
XTONENC	15		11	XTONENC
XTONEDEC	16		12	XTONDEC
FDISC	29		13	FDISC
CUTST	31		14	CUTST

P3

4	RS485+
5	RS485-
7	GND
8	CUTST
11	MIC HI
12	ALO
14	CTL ON
15	XTONENC
16	XTONDEC
17	RQST
18	SPKR1
19	SPKR2
21	INP1
25	SW A+

ZC5 7ZCLD0019

P211   **P302**

A-	1	————————————————	1	A-
POWER LED	2	————————————————	2	POWER LED
SPKR HI	3			
SPKR LO	4			

SP1

ZC6 7ZCLD0020

P102   **P201**

7	————————————————	1	A-
2	————————————————	2	DESK MIC HI
1	————————————————	3	DESK MIC LO
6	————————————————	4	SW A+
5	————————————————	5	KEYPAD SER
4	————————————————	6	DISPLAY SER
3	————————————————	7	DESK MIC PTT
9	————————————————	8	CG DIS
8	————————————————	9	SPKR HI
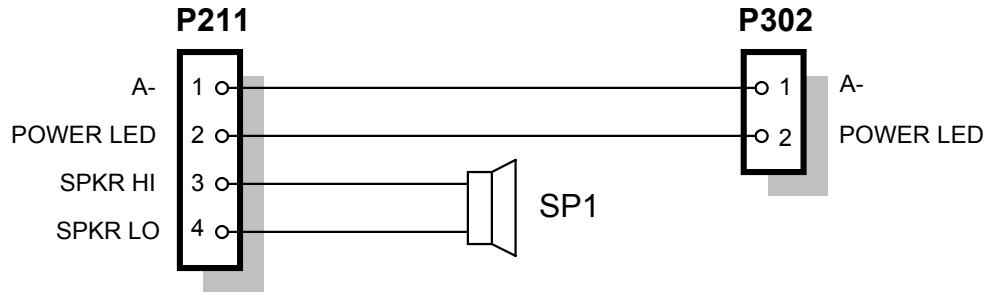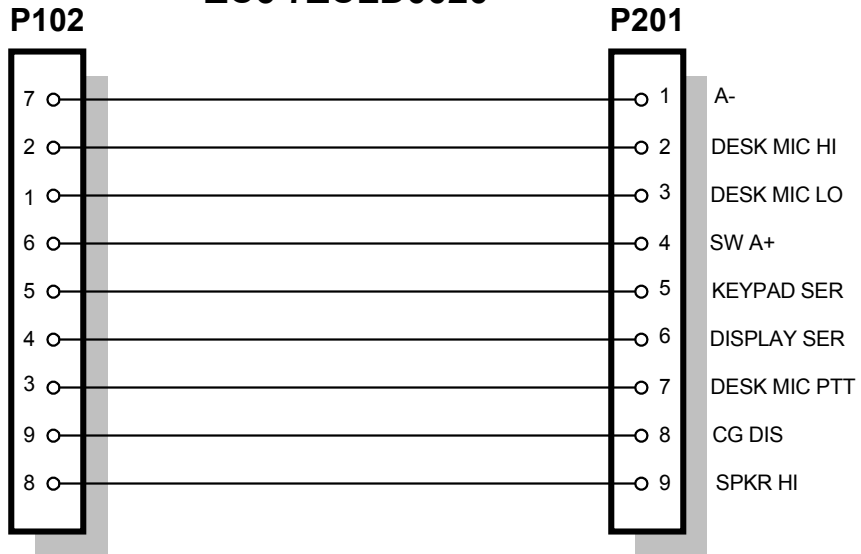
This addendum makes a correction to Low Band Orion Base Station Maintenance Manual AE/LZB 119 3218/1 R1A as Follows:

On page 20, the second paragraph should read:

"The DC and Tone Remote Control boards allow use of the RCN-1000 Remote Control Consoles with the Orion Base Station. Refer to the appropriate Maintenance Manuals as follows:"