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ELECTRONIC AND AVIONICS SYSTEMS

INSTALLATION/MAINTENANCE MANUAL

BENDIX/KING®

KX99

HAND HELD
VHF NAV/COMM

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SECTION I
GENERAL INFORMATION

1.1 INTRODUCTION

This manual contains information relative to the physical, mechanical, and electrical characteristics of the King Radio Corporation Model KX99, hand-held VHF aircraft communication transceiver.

1.2 EQUIPMENT DESCRIPTION

The KX99 is a 720 channel, hand-held VHF aircraft communication transceiver with a 1.5 Watt transmitter output. The KX99 also receives 200 navigation channels, converts VOR information and displays the radial or course deviation on a liquid crystal display. LOC signals are not converted or displayed but audio is available. NOAA weather broadcasts may also be received.

Features and frequencies are selected by keypad entry. The unit is powered by a twist off battery pack. The keypad and display may be illuminated for night use. Volume and squelch sensitivity knobs are on the top of the unit. Jacks for an external headphone and microphone are provided. The flexible antenna may be removed so that an external antenna may be connected.

1.3 TECHNICAL CHARACTERISTICS

	KX 99
Compliance	FCC: Parts 2, 15, and 87
Physical Characteristics	Height: 8.00 in Width: 2.80 in Depth: 1.85 in Weight: 1.75 lbs
Frequency Stability	.002%
Operating Temperature Range	–20 to +55 Degrees C.
Power Requirements	Receive: squelched, 80 mA. Receive: full vol, 200 mA. Transmit: 1200 mA.
RECEIVER	
Frequency Range	108 to 135.975 MHz (expendable to 136.975MHz) 161.50 to 163.275MHz Weather
Modulation Acceptance	6K00A3E and VOR/LOC 16K0F3E for Weather
Selectivity	–6 dB at ± 15 KHz
Adjacent Channel Rejection	–40 dB Com and –60 dB Nav
Channel Spacing	25 KHz Com and 50 KHz Nav
Spurious and Image Rejection	–60 dB
Audio Output Power and Distortion	500 mW into 8Ω, with less then 10% distortion

TRANSMITTER

Emission Mode	6K00A3E
Transmitter Power	1.5 Watts (4.8 Watt P.E.P.)
Modulation	Not less than 80% upward mod.
Spurious Emissions	-50dB or less
VSWR	Stable into 15:1 VSWR No damage into 30:1 VSWR
Audio Distortion	10% Maximum
Duty Cycle	No damage continuously keyed
Microphone	Internal Electret or External

1.4 UNITS AND ACCESSORIES

1.4.1 UNITS

The KX 99 is available in two versions. KX 99 King P/N 069-1026-00 will transmit up to 135.975MHz. KX 99 King P/N 069-1026-01 will transmit up to 136.975MHz.

1.4.2 STANDARD ACCESSORIES

Both versions of the KX 99 come standard with the following accessories:

PART NUMBER	DESCRIPTION	QUANTITY
006-1095-00	FCC FORM 404	1.00
006-1096-00	FCC FORM 406	1.00
006-1098-00	WARRANTY CARD	1.00
006-8428-00	PILOTS GUIDE	1.00
015-0190-00	WALL CHARGER 115/230	1.00
047-7525-01	BELT CLIP HNDHLD WF	1.00
057-3435-00	OPERATING GUIDE DECAL	2.00
063-9022-00	WRIST STRAP	1.00
071-0049-00	HEADSET ADAPTER	1.00
071-1441-00	RUBBER VHF ANTENNA	1.00
089-6617-04	PHP M2.5-4.5X4	2.00
200-3224-81	NICAD BATTERY PACK	1.00

1.4.3 OPTIONAL ACCESSORIES

The following units are available as optional accessories for the KX99.

Part Number	Description
062-0103-80	110V 1 Hour Charger
062-0103-81	220V 1 Hour Charger
062-0107-80	Vehicular Trickle Charger
062-0108-80	110V 5 Unit 1 Hour Charger
062-0108-81	220V 5 Unit 1 Hour Charger
071-0034-80	Spare Leather Cover
071-0037-80	Spare Belt Loop W/Swivel Socket
071-0038-81	Leather Case
071-0039-80	Earphone
071-0049-00	Headset Adapter
071-0056-00	Replaceable Cell Battery Box
071-1443-01	Antenna Adapter W/Cable
071-6118-00	Cloth Carrying Case
155-2481-00	Cigar Lighter Trickle Charger

1.5 LICENSE REQUIREMENTS

The Federal Communications Commission requires that the operator of the KX99 transmitter hold a restricted radiotelephone operators permit (FCC Form 753) or higher class license.

An Aircraft Station License (FCC Form 404, New Aircraft Station License, or FCC Form 405A, Renewal of Aircraft Station License) is required for this equipment. If the transceiver is to be used as a ground station, then FCC Form 406, Application for Ground Station Authorization in the Aviation Service, should be used.

FCC forms 404, 406, and 753 have been included with the KX99. If extra forms are needed, they are available from the nearest field office of the FCC, no examination is required.

This equipment has been accepted by the FCC and entered on their list of Type Accepted Equipment as King Radio Corporation Model KX99, (ASY90Q KX99 or ASY7BL KX99).

> The VHF transmitter in this equipment is guaranteed to meet FCC acceptance over the operating temperature range only when a King crystal is used in the stabilized master oscillator. Use of other than a King crystal is considered an unauthorized modification, and will void the warranty.

1.6 SERVICE INFORMATION

If you have questions regarding service you may contact the factory at the address below:

King Radio Corporation
400 N. Rogers Rd.
Olathe, Kansas 66062
(913) 782-0400

1.7 WARRANTY INFORMATION

The KX 99 carries a standard one (1) year warranty, including parts and labor.

SECTION II
INSTALLATION

2.1 GENERAL INFORMATION

This section contains suggestions and factors to consider before using the KX99 transceiver. Close adherence to these suggestions will assure more satisfactory performance from the equipment.

2.2 UNPACKING AND INSPECTING

Exercise extreme care when unpacking the unit and accessories. Make a visual inspection of the 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 has been unpacked, return all the packing material to the container for future use in storing or shipping the radio.

2.3 NICKEL CADMIUM (NI-CAD) BATTERY PACK

The power source for the KX99 is a 9.6 Volt, 800 mA hour, rechargeable nickel-cadmium battery pack. The battery that is shipped with the KX99 will not be fully charged and should be charged prior to use. The KX99 has a low battery indicator 'beep' tone that will signal the user when the battery is almost unusable. If possible, the battery should be fully discharged before recharging. This will maintain the maximum useful charge in the battery and avoid "memory" problems associated with this type battery.

The KX 99 comes standard with a trickle charger capable of operating on either 115V or 230V. To charge the battery; plug the charger module into an appropriate wall outlet and plug the other end into the connector marked "CHRG" which is located on top of the KX 99. It takes approximately 12 hours to fully charge the NiCad battery pack.

CAUTION

To avoid possible damage to the KX 99 115V/230V select make absolutely certain that the V switch located on the trickle charger is in the correct position for the voltage to be used.

The amount of time that the NiCad battery pack will power the KX 99 on one charge depends on a number of factors:

1. The duty cycle (amount of time the unit is transmitting versus time receiving a signal versus squelched standby operation. Transmitting discharges the battery fastest.
2. The volume level of the received signal.
3. The temperature. A colder battery will not last as long.

The following table shows approximate life of fully changed NiCad battery at several different duty cycles with midlevel volume and the battery at room temperature.

LIFE (Hrs)	STBY%	REC%	TX%
7.0	95	3	2
5.3	90	5	5
4.1	25	70	5
3.8	80	10	10
2.4	60	20	20

CAUTION

* DO NOT- store a discharged battery pack.

* DO NOT- store a battery pack where it might be accidentally shorted. The current capability is tremendous.

* DO NOT- crush or disassemble a Ni-Cad battery pack. There are toxic chemicals inside.

* DO NOT- dispose of the battery pack in a fire.

* DO NOT- exceed the recommended quick charge current. Use only the approved chargers.

2.4 ALKALINE BATTERY PACK

An Alkaline Cell type battery pack is available for the KX99 as an option. ALKALINE BATTERY PACKS ARE NOT TO BE RECHARGED The Alkaline battery pack is to be used until it is fully discharged then discarded. Alkaline batteries are used for radios that are maintained for emergency purposes because they have extremely long shelf life and no maintenance is required.

The alkaline battery pack holds 10 "AA" size cells. To gain access to the 10 cells, first remove the battery pack from the KX 99 (see below). Next, with one hand holding the outside of the battery pack case, use the other hand to press down firmly on the center hub on the top of the case. The battery cell holder will slide out the bottom of the case. The following table show approximate battery life of alkaline cells.

Life (Hrs)	STBY%	REC%	TX%
x	95	3	2
x	90	5	5
x	25	70	5
x	80	10	10
x	60	20	20

2.5 BATTERY INSTALLATION AND REMOVAL

To install the battery, (Refer to Figure 2-1) locate the center hub on the top of the battery pack into the recess on the bottom of the unit. Position the battery pack at a 30° offset so that the two metal studs on the battery pack go into their respective recesses on the bottom of the unit. Apply upward pressure to the pack while twisting the pack so that it's sides are flush with the sides of the unit. The metal tab on the side if the unit will lock the pack into position. To remove the battery, turn the radio off. Press up on the metal tab on the side of the unit while twisting the battery pack 30° and remove it from the radio.

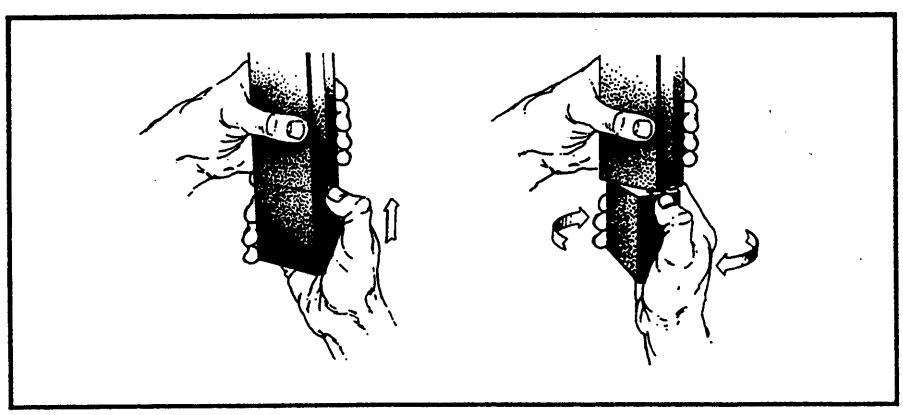


FIGURE 2-1 BATTERY PACK REMOVAL

2.6 HEADPHONE/MICROPHONE ADAPTER

External headphone and microphone jacks are located on top of the KX 99. The supplied headphone/microphone adapter allows standard aircraft headphones and microphones to be used with the KX 99. The clip on the adapter should be connected to the protruding attached point on the right side of the unit to provide strain relief. If a headset with a boom mike is used, the transmit key button on the side of the KX 99 may be used to key the transmitter. A separate push-to-talk switch may also be used with the headphone/microphone adapter.

2.7 ANTENNA

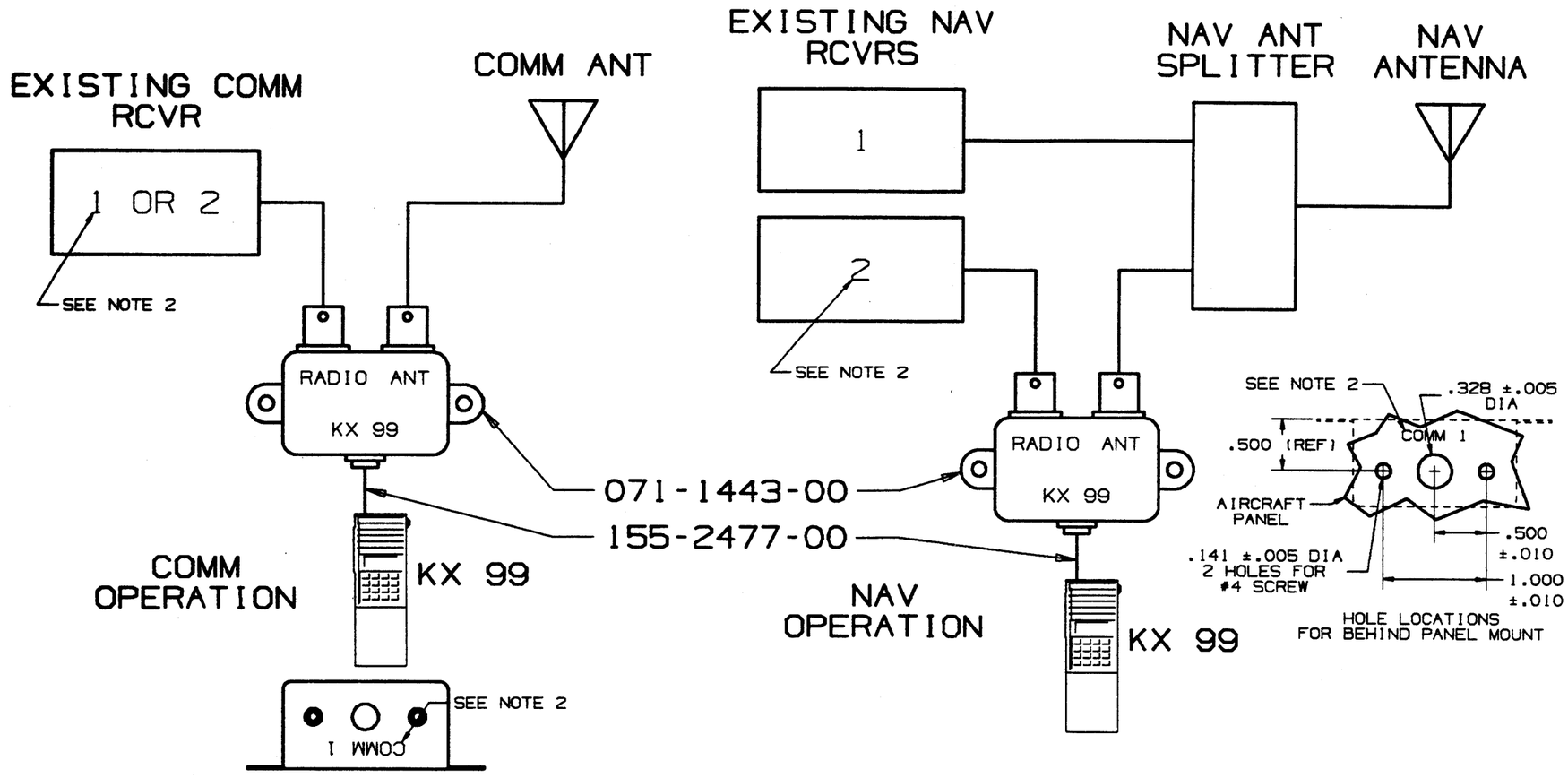
The flexible antenna that is included with the KX99 is very convenient and may be used for both communications and navigation purposes. A more efficient antenna may be required for some applications, particularly when used inside an aircraft, automobile or other metal enclosure. The 'BNC' type connector is standard for aircraft use, therefore little difficulty should be encountered when connecting to an existing aircraft antenna.

The VOR/LOC radio signals are received best by a horizontal antenna and communications signals are best received by a vertical antenna. This is a good point to keep in mind when trying to receive weak signals. When using the flexible antenna in a cockpit or an automobile, try to place the antenna in the center of a window toward the station you are trying to receive. Remember, if the received station is weak and noisy, that station is not likely to hear your transmitter. Try to obtain the best received signal before attempting to call the station.

An optional antenna adapter is available (KPN 071-1443-01). The antenna adapter allows the KX 99 to be used with an existing outside aircraft antenna. The antenna adapter can be permanently installed in the aircraft and it is connected between the outside aircraft communications or navigation antenna and an existing Comm or NAV receiver. Refer to Figures 2-2 and 2-3. When the cable is plugged into the antenna adapter the existing comm or nav receiver will be disconnected from the outside aircraft antenna and the antenna will now be connected to the KX 99. When the adapter cable is not plugged in the existing navigation or communications receiver will be connected to the outside antenna.

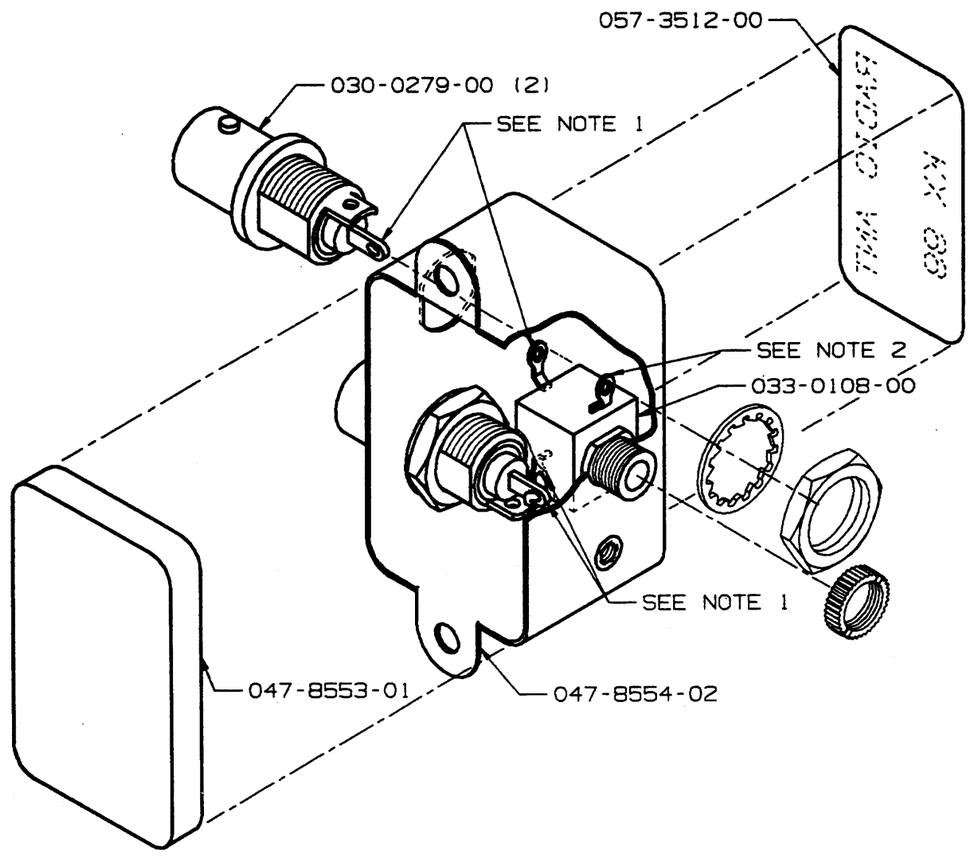
NOTE

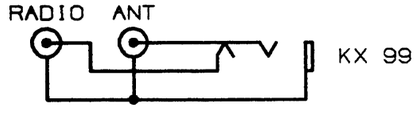
The KX 99 should not be used as a transceiver when it is connected to an external navigation antenna. This may result in damage to the unit.



NOTES:
1. 071-1443-01 CONTAINS ONE EACH OF 071-1443-00 AND 155-2477-00.
2. INCLUDED WITH 071-1443-00 ARE ONE EACH OF COMM 1, COMM 2, NAV 1 AND NAV 2 LABELS TO IDENTIFY WHICH RADIO WOULD GIVE UP THE USE OF THE ANTENNA WHEN THE KX 99 WAS PLUGGED INTO THE ADAPTER.

FIGURE 2-2 ANTENNA ADAPTER INSTALLATION DRAWING





SCHEMATIC

NOTES

1. CONNECT TERMINALS WITH KPN 026-0027-00 AND SOLDER.
2. SOLDER TO THE INSIDE OF CAN.
3. ASSEMBLE 047-8553-01 INTO 047-8554-02 AND SOLDER ALL AROUND THE EDGES.
4. BEND TERMINALS OF 030-0108-00 TO PROVIDE SHORTEST CONNECTION TO BNC CONNECTOR AND CAN.

REF. 071-1443-00

FIGURE 2-3 ANTENNA ADAPTER ASSEMBLY AND SCHEMATIC

SECTION III
OPERATION

3.1 INTRODUCTION

This section contains the basic operating procedure for the KX99.

3.2 GENERAL

When using a hand-held radio, it is best to be as high and away from obstructions as possible. If a received station is weak and noisy it is not likely that they will hear your transmission. Try to get a more favorable location before transmitting

When the KX99 is used for a Navigation Receiver, the audio should be used to position the radio for the best noise-free reception. If an external antenna is used the radio may be positioned for convenient viewing. An external navigation antenna will work poorly for communication frequencies and is not recommended.

3.2.1 UNIT CONTROLS

A. On/Off Volume Knob

Turning the knob clockwise from the OFF position turns the unit on and increases the speaker volume as clockwise rotation is continued.

B. Squelch Sensitivity Adjustment

When the squelch control is turned counterclockwise to the stop the squelch is completely open and receiver noise can be heard over the speaker. Turning the squelch control clockwise until the receiver noise is eliminated from the speaker will cause only received transmissions to be heard over the speaker. The squelch control must be set to tune out the receiver noise for the scanning function to be operational. The squelch control should be fully counterclockwise for WX channel operation.

C. Antenna BNC Connector

The flexible rubber antenna or an external antenna is connected to this connector.

D. Wall Charger Input Jack

The external wall charger plugs into this jack to recharge the NiCad battery pack provided with the unit. Do not attempt to use this jack to recharge the optional replaceable cell battery pack since damage to the unit may occur.

E. Headphone Jack

When a headphone is used, the headphone connector of the headphone/microphone adapter is plugged into this jack. Also, an earphone or an external speaker having a 2.5 millimeter, 2 conductor plug may be plugged directly into this jack. The internal speaker is disabled when this jack is being used.

F. Microphone

When a headset having a boom microphone is used or an external microphone is used, the microphone connector of the headphone/microphone adapter is plugged into the this jack. Also, an external microphone having a 3.5 millimeter, 3 conductor plug with the tip of the connector connected to the mike key line and the ring connected to the microphone audio line may be plugged directly into this jack.

G. Transmit Lockout Button

The transmitter is disabled when the transmit lockout button is pressed in. To reenable transmitter operation, depress the button again so it is in the "out" or "up" position.

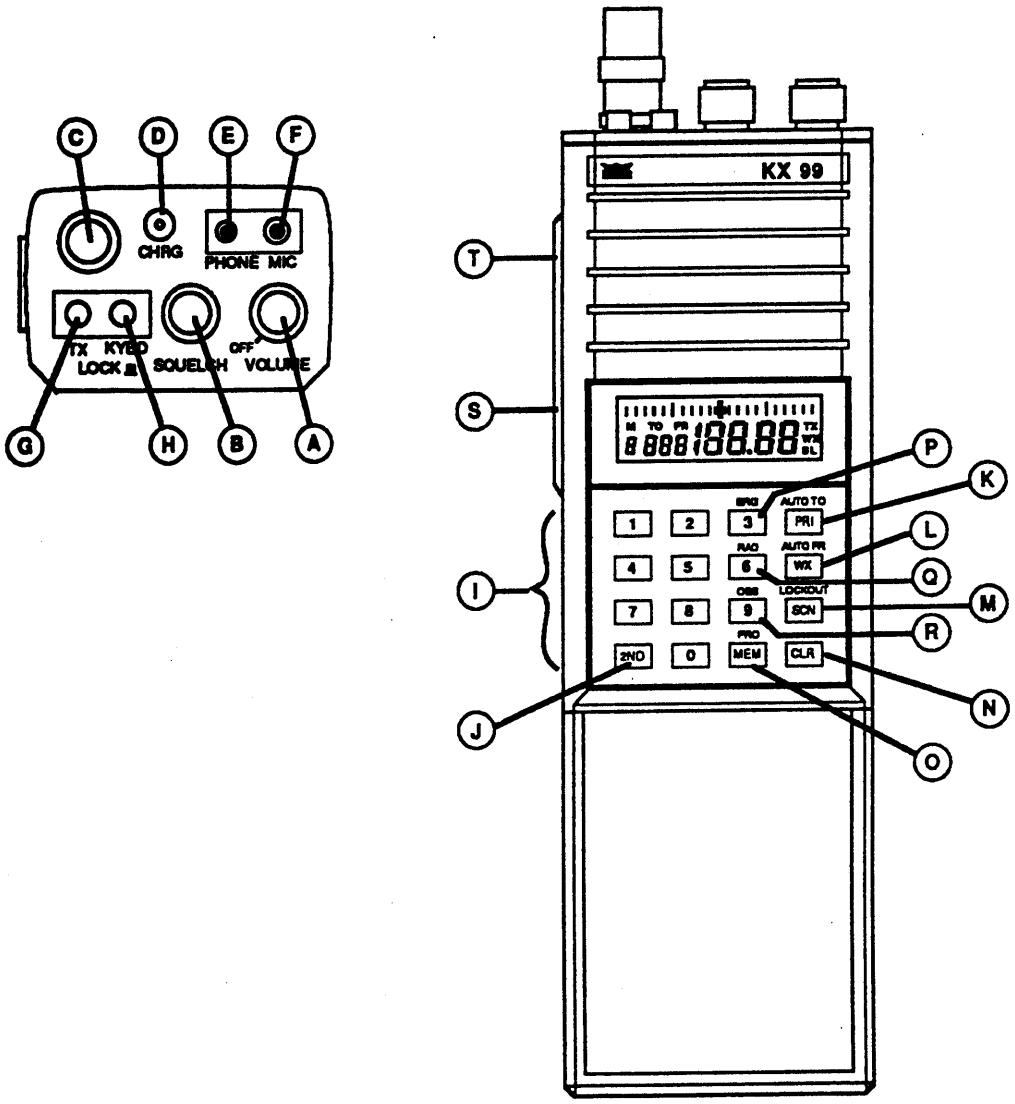


FIGURE 3-1 KX 99 CONTROLS AND FEATURES

H. Keyboard Lockout Button

When the Keyboard lockout button is in the "in" position, no inputs from the keyboard will be accepted. To reenable the keyboard depress the keyboard lockout button again so it is in the "out" or "up" position.

I. Numeric Keys

The numeric keys on the keyboard are used to enter frequencies into the KX 99. For example, entering the numbers 1 + 2 + 6 + 5 + 2 in sequential order would enable the unit to receive and transmit on 126.525MHz. Numeric buttons 3, 6, and 9 are also used in conjunction with the 2ND (2nd function) button to control the navigation display. (Navigation display control will be discussed in further paragraphs)

J. 2ND (Second Function Key)

Depressing the Second Function Key and then any of the seven keys in the keyboard with dual functions will enable the second function of the key pressed.

K. PRI (Priority Key)

Pressing the PRI key causes the unit to monitor the priority frequency for any activity once every second. Depressing the PRI key again while in the Priority mode will cause the unit to exit the priority mode.

AUTO TO

Pressing the 2ND key followed by the AUTO TO key (2nd function of the PRI key) when a valid VOR signal is being received, automatically selects the OBS setting that centers the CDI with a TO indication.

L. WX (Weather Key)

Pressing the WX key and any of the numeric keys 1 through 7 will enable the unit to receive NOAA National Weather Service Broadcasts on any of the 7 weather channels.

AUTO FR

Pressing the 2ND key followed by the AUTO FR key (2nd function of the WX key) when a valid VOR signal is being received, automatically selects the OBS setting that centers the CDI with a FROM indication.

M. SCN (Scan Key)

Depressing the SCN key enables the frequency scan mode. Depressing the key again while in the frequency scan mode will cause the unit to exit the scan mode. This key is also used in conjunction with the memory scan mode.

LOCKOUT

Pressing the 2ND key followed by the LOCKOUT key (2nd function of the LOCKOUT key) causes the displayed memory channel to be skipped in the memory scan mode.

N. CLR (Clear Key)

Depressing the CLR key clears the display of any partial or erroneous entries and will cause the unit to display the last valid entry.

O. MEM (Memory Key)

Depressing the MEM key and then any numeric key 0 through 9 tunes the KX 99 to the frequency stored in that memory location.

PRO (Program Key)

Pressing the 2ND key followed by the PRO key (2nd function of the MEM key) puts the KX 99 in the program mode. The displayed frequency is then programmed into the desired memory channel by pressing the appropriate numeric key.

P. BRG (Bearing Key)

Pressing the 2ND key followed by the BRG key (2nd function of the 3 key) causes the bearing to the tuned VOR station to be displayed.

Q. RAD (Radial Key)

Pressing the 2ND key followed by the RAD key (2nd function of the 6 key) causes the radial from the tuned VOR station to be displayed.

R. OBS (Omnibearing Selector Key)

Pressing the 2ND key followed by the OBS key (2nd function of the 9 key) causes the existing OBS setting for the tuned VOR station to dash. The new OBS setting can now be selected by entering the desired three number setting. For example, entering the numbers 0 + 2 + 5 in sequential order will cause the 25° OBS setting to be selected.

S. Microphone Key (Push-to-Talk)

Enables the unit to transmit on the selected frequency if it is a valid communications channel.

T. Display Lamp Switch

When the display lamp switch is depressed the keyboard and the display are illuminated for easy night viewing. The lamp will remain on as long as the switch is depressed.

3.3 OPERATION

3.3.1 BASIC OPERATION

A. Receive (Listen)

Turn the power on by rotating the VOL (volume) knob clockwise past the OFF detent. Select the appropriate frequency using the keypad. Rotate the SQ (squelch) knob counter-clockwise until receiver noise is heard. Set the volume to a comfortable level, then rotate the SQ knob clockwise until the receiver noise stops. Further rotation clockwise tightens the squelch setting, making it necessary for stronger signals to open the squelch and allow a message to be heard.

B. Transmit (Talk)

Press and hold the side PTT (push to talk) switch. The display will show a TX when the transmitter is on. Talk in a normal voice with the speaker/microphone (The KX 99 utilizes a combination speaker/microphone. When the transmitter is keyed the speaker acts as the microphone for the transmitter. When the unit is in receive mode received audio is heard over the speaker.) 1/2 an inch or less away from your lips. Make each transmission as brief as possible. Release the PTT switch to end the transmission.

3.3.2 KEYPAD OPERATIONS

A. Entering a Frequency

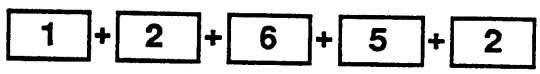
With a changed battery pack attached and an antenna installed on the unit, turn the On/Off/Volume knob to the on position. The unit will display the last frequency entered when the unit was turned off. This frequency is set at 118.00MHz at the factory. With the squelch adjusted completely open (counterclockwise) adjust the volume to a comfortable level. To eliminate the receiver noise in the speaker becomes quiet. Frequencies may now be entered via the keyboard.

NOTE

Be sure the keyboard lockout button is in the "up" or "out" position or the unit will not accept entries from the keyboard.

Enter a frequency by pressing the 5 desired keys starting with 1 for the 100s MHz. After the 1 has been entered, dashes will appear for the remaining digits is entered. Each digit is checked for validity when entered and invalid digits will not be allowed. Pressing the CLR key will clear any digits that have been entered and restore the last valid frequency that was entered.

For example, to select the frequency 126.525MHz enter the first five numbers of the frequency. Depress the keys on the keyboard in the following order:



The unit will now transmit and receive on 126.525MHz.

NOTE

The unit will not transmit if the transmitter lockout button is pushed in. To transmit, the transmitter lockout button must be in the "out" or "up" position.

To change frequencies, simply enter the first five numbers of the new frequency.

B. VOR Navigation Modes

The KX 99 navigation modes are valid only for VOR frequencies between 108.00MHz and 117.95MHz. If a localizer frequency is selected, the letters "LOC" are displayed but no navigation information is displayed. However, audio is still available on the localizer frequencies. When operating in any of the VOR modes the SQUELCH knob should be turned to a fully counterclockwise position.

C. Basic NAV CDI Mode

To enter a VOR frequency (115.90MHz for example) press the keys on the keyboard in the following order:

[1] + [1] + [5] + [9] + [0]

When a VOR frequency is selected the display shows the frequency, the last selected course (085) and a Course Deviation Indicator (CDI). When the selected VOR station is not being received a flagged condition is indicated by the CDI bars extending across the entire length of the top of the display and the absence of a TO or FR annunciation above the selected course.

This display indicates that a VOR signal is being received. The "TO-FR" annunciator is indicating "TO", the selected course is 85 degrees and the CDI indicates that the course is to the right of the aircraft three degrees. Full scale CDI deviation is 10 degrees (10 tick marks left or right of the center.)

D. Course Selection (Changing the OBS Setting)

Enter a valid navigation frequency as previously described. The display will show the frequency, the last selected course, and the CDI. Depress the keys in the following order:

OBS
[2ND] + [9]

The OBS window will now display three dashes and will accept any valid OBS setting between 0° and 360°. To enter a valid course three digits must be entered. For example: To enter a course of 0°, 000 would have to be entered. To enter a course of 5°, 005 would have to be entered.

To enter a course of 90° depress the keys on the keyboard in the following order:

[0] + [9] + [0]

The OBS window will display the selected course of 090°. If a valid navigation signal is being received the course deviation indicator will display deviation from the selected course of 90° and the appropriate TO or FR (From) indication will be displayed above the OBS window. Figure 3-2 shows the aircraft to be right of the 90° selected course. With the selected course of 90° the deviation from the selected course is 5°. The 5° deviation will be indicated by the KX 99 CDI as shown the display to the right.

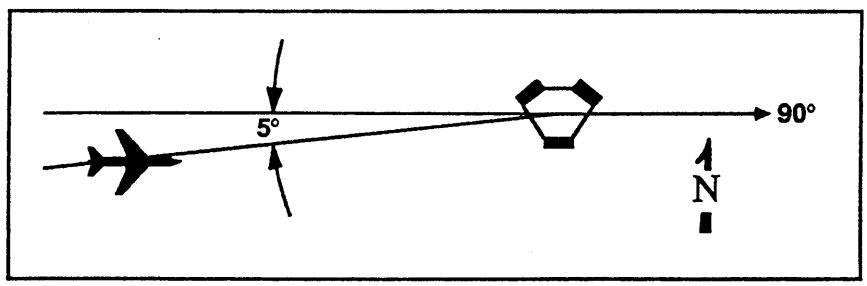


FIGURE 3-2

E. Centering the CDI with a TO indication

While a VOR signal is being received, pressing the 2ND key followed by the AUTO TO key will activate the Auto Course Mode and automatically center the CDI (Course Deviation Indicator) with the "TO" annunciator displayed. The OBS setting is then latched and the CDI operates in the basic NAV CDI mode.

NOTE

Wait approximently 10 seconds after selecting a new NAV frequency before using the AUTO TO feature in order to allow the navigation filters to settle.

For example, to center the CDI at right with a "TO" indication press the following keys:

AUTO TO

2ND + PRI

Before Pressing AUTO TO Function

After Pressing AUTO TO Function

F. Centering the CDI with a FR (From) Indication

While a VOR signal is being received, pressing the 2ND key followed by the AUTO FROM key will activate the Auto Course Mode and automatically center the CDI (Course Deviation Indicator) with the "FR" (From) annunciator displayed. The OBS setting is then latched and the CDI operates in the basic NAV CDI mode.

NOTE

Wait approximently 10 seconds after selecting a new NAV frequency before using the AUTO FR feature in order to allow the navigation filters to settle.

For example, to center the CDI at right with "FR" indication press to following keys:

AUTO FR

2ND + WX

Before Pressing AUTO FR Function

After Pressing AUTO FR Function

G. Displaying Radial from the VOR Station

The radial tracking mode is activated by first selecting a VOR frequency and then pressing the 2ND key followed by the RAD key. The CDI will no longer be displayed. A "FR" (From) annunciation is displayed above the OBS window. The radial from the VOR station is displayed in the OBS window. The radial displayed in the OBS window will change as the aircraft changes position with respect to the VOR station. For example, to enter the radial tracking mode press the following keys:

RAD
2ND + 6

Before Pressing RAD Function

After Pressing RAD Function

If a valid VOR signal is not being received, a flagged condition is indicated by dashes being displayed in the OBS window and no "FR" annunciation being displayed.

H. Displaying Bearing to the VOR Station

The beating tracking mode is activated by first selecting a VOR frequency and then pressing the 2ND key followed by the BRG key. The CDI will no longer be displayed. A "TO" annunciation is displayed above the OBS window. The bearing displayed in the OBS window will change as the aircraft changes position with respect to the VOR station. For example, to enter the bearing tracking mode press the following keys:

BRG
2ND + 3

Before Pressing BRG Function

After Pressing BRG Function

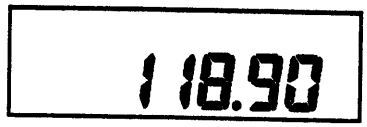
If a valid VOR signal is not being received, a flagged condition is indicated by dashes being displayed in the OBS window and no "TO" annunciation being displayed.

I. Programming Memory Locations 1-9

Ten memory locations exist so that frequently used frequencies can be quickly called up and so that these same frequencies may be scanned in the memory scan mode. Any frequency from 108.00 to 136.975 (135.975 on KPN 069-1026-00 version units) may be entered into any of the ten Memory Locations, numbered 0 through 9. Memory Location 0 is reserved for duplex operation. Duplex operation is transmitting on one frequency and receiving on another frequency. If duplex operation is not desired, it may also be programmed with a single frequency. Refer to the section entitled Duplex Operation. To enter a frequency into Memory Location 1 through 9 the frequency must first be entered and then it is stored into the desired Memory Location. For example, to enter the frequency 118.90MHz into Memory Location 1:

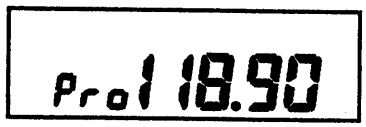
First the desired frequency must be entered. Press the keys on the keyboard in the following order:

[1] + [1] + [8] + [9] + [0]



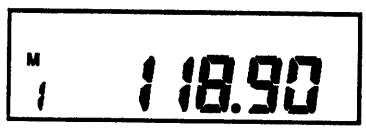
Now that the desired frequency has been entered it now must be stored in Memory Location number 1 as desired. Press the keys on the keyboard in the following order:

PRO
[2ND] + [MEM]



The frequency entered will now be displayed in the frequency window and the Program mode will be annunciated by "Pro" being displayed in the OBS window. To store the frequency 118.90MHz into any Memory Location 1 through 9 press the corresponding number for that Memory Location. Example:

To store in Memory Location 1 press the 1 key on the keyboard, to store in Memory Location 2 press the 2 key on the keyboard, and so on. In this case press the number 1 key on the keyboard. An M along with the Memory Location number will be displayed on the left side of the display indicating the frequency window is displaying the frequency stored in that Memory Location. The frequency, 118.90MHz, is now permanently stored in Memory Location 1 until it is reprogrammed.



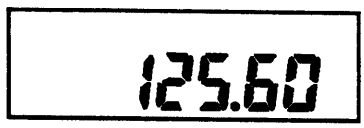
J. Recalling Memory Locations

Any of the frequencies from the ten memory locations can be recalled by simply pressing the MEM key on the keyboard followed by the corresponding Memory Location. For example, pressing MEM and then the 1 key will recall the frequency stored in Memory Location 1.

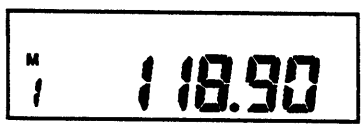
To recall the frequency previously stored in Memory Location 1 press the keys on the keyboard in the following order:

[MEM] + [1]

The display will now show M and 1 on the left side of the display indicating the frequency in Memory Location 1 is being displayed. The frequency window will display 118.90 as stored in the previous section.



Before Pressing MEM Function



After Pressing MEM Function

K. Duplex Operation

Duplex operation allows the unit to receive on one frequency and transmit on another. An example of when duplex operation may be used is when transmitting to a Flight Service Station (FSS) on 122.10MHz and receiving the FSS over a navigation frequency such as 111.00MHz. Memory Location 0 has been reserved for this feature. In duplex operation the receive frequency is entered and stored first, then the transmit frequency is entered and then stored. For example:

To enter a receive frequency of 111.00MHz and a transmit frequency of 122.10MHz press the keys on the keyboard in the following order:

[1] + [1] + [1] + [0] + [0]

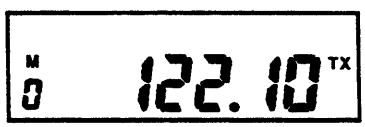
The frequency 111.00MHz will now be displayed in the frequency window along with the appropriate CDI and TO or FR (From) indication. Press the keys on the keyboard in the following order:

PRO
[2ND] + [MEM] + [0]

The CDI display will be removed and M and 0 will be displayed on the left side to the display. The program annunciation "Pro" will still be displayed in the OBS window and the frequency window will display dashes. The transmit frequency of 122.10MHz may now be entered. Depress the keys on the keyboard in the following order:

[1] + [2] + [2] + [1] + [0]

Two seconds after a valid frequency has been entered the display will revert back to the receive frequency and any appropriate CDI indication. The transmit frequency may be checked by momentarily depressing the Mike Key button on the side of the unit. The frequency window will display the transmit frequency anytime the unit is transmitting.



For Normal Operation of memory location 0, to receive and transmit on the same frequency, the frequency must be entered first as the receive frequency and then again as the transmit frequency.

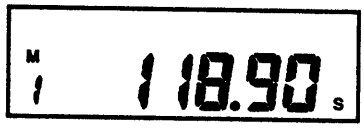
L. Scan Modes

The scan modes allow the user to sequentially step through a group of frequencies to find an active frequency. When a transmission is received, the radio will stop scanning and remain on that frequency until the activity stops. After the frequency has been inactive for 2 seconds, the scan process will resume. There are 2 scan modes; memory scan and frequency scan. Before initiating either scan mode it is important to have the squelch knob properly adjusted such that the background noise in the speaker just disappears. That is, any further counterclockwise rotation would cause the background noise to return. If the unit is keyed during scan operation the scan will be disabled and the unit stay turned to the frequency it was tuned to when the unit was keyed.

M. Memory Scan

To enable the scanning of Memory Locations 0 through 9 depress the keys on the keyboard in the following order:

MEM + SCN

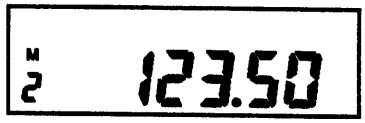


The unit will now begin scanning the frequencies stored in Memory Locations 0 through 9 that have not been locked out. An "S" will be displayed in the lower right side of the display to indicate a scan mode has been activated. The Memory Scan mode can be cancelled by again pressing the MEM key followed by the SCN key.

N. Memory Lockout

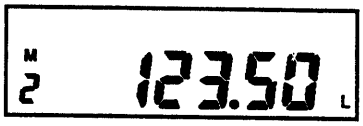
Memory Lockout applies only to the Memory Scan mode and not the Frequency Scan mode. Any of the 10 Memory Locations can be omitted from the scanning sequence. The memory location is first displayed in the frequency window and then locked out. For example, to lockout the frequency stored in Memory Location 2 depress the keys on the keyboard in the following order:

MEM + 2



The frequency window will now display the frequency stored in Memory Location 2. An M and a 2 will be displayed on the left hand side of the display indicating that the frequency stored in Memory Location 2 is being displayed. Continue to depress the keys on the keyboard in the following order:

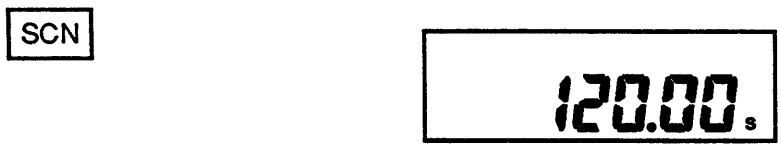
LOCKOUT
2ND + SCN



An L will now appear in the lower right corner of the display to indicate that the frequency stored in Memory Location 2 has been locked out of the scan sequence. To restore a locked out Memory Location to the Memory Scan sequence, perform the same sequence as above and the memory location will be returned to the scan sequence and the "L" will be removed from the display.

O. Frequency Scan Mode

The Frequency Scan mode scans the frequency range in 25 KHz steps between the frequency stored in Memory Location 1 and the frequency stored in Memory Location 9. Only COMM frequencies 118.00MHz-136.975MHz) may be scanned in the Frequency Scan mode. For example to scan the frequency range of 120.00 to 124.50MHz, 120.00 must first be stored in Memory Location 1 and 124.50 must be stored in Memory Location 9. Refer to the section entitled Programming Memory Location 1-9 for storing 120.00 and 124.50 in the appropriate memory locations. After the frequencies have been stored, depress the following key on the keyboard:



An S will appear in the bottom right corner of the display indicating the Scan mode has been initiated. The unit will start scanning through the frequency range in 25KHz steps to 124.50MHz. When the frequency window gets to 124.50 it will reset and start counting at 120.00 again. To exit the Frequency Scan mode at any time, simply depress the SCN button on the keyboard again. If the unit is keyed during scan operation the scan option will be disabled and the unit will remain tuned to the frequency it was tuned to when the unit was keyed.

If either of the memory locations contain a navigation frequency (108.00 to 117.95MHz) the scan limit will be the appropriate end of the communications band. For example, if Memory Location 1 has a navigation frequency stored in it the scan will begin at 118.00MHz and if Memory Location 9 has a navigation frequency stored in it the scan will reset when it reaches 136.975MHz (135.975MHz on KPN 069-1026-00 version units).

P. Priority Mode

When the Priority mode of the KX 99 is enabled the unit will check the Priority frequency once a second for any activity. If any activity is present on the Priority frequency the receiver will stay tuned to the Priority frequency until there is no activity for 2 seconds. Keying the transmitter within two seconds after the last transmission on the Priority frequency will disable the Priority mode. The Priority mode cannot be enabled if a navigation frequency is selected (108.00 to 117.95MHz) and a navigation frequency cannot be programmed as the Priority frequency.

To enable the priority mode press the following key on the keyboard:

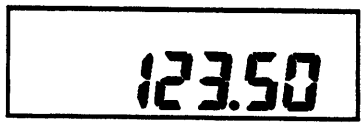
The frequency window will now display the frequency that was selected and will display the Priority Frequency once a second. The Priority annunciation P will also be displayed on the left side of the display. To exit the Priority mode at any time, simply depress the PRI key on the keyboard again. If there is any activity on the Priority channel the unit will remain tuned to the Priority frequency for two seconds after all transmission activity on the Priority frequency has stopped. If the transmitter is keyed within two seconds after receiving a transmission on the Priority frequency the unit will remain tuned to the Priority frequency and the Priority mode will be disabled. It may be reenabled at any time be depressing the PRI button again.

Q. Priority Programming

To program a priority frequency into memory it must first be entered on the display. For example, to enter the frequency 123.50MHz as the Priority frequency press the keys on the keyboard in the following order:

[1] + [2] + [3] + [5] + [0]

The frequency 123.50MHz is now displayed on the frequency window. Continue to press the keys on the keyboard in the following order:



PRO
[2ND] + [MEM] + [PRI]

A "P" will appear in the lower right corner of the display. The frequency window will display the Priority frequency. When another frequency is entered the Priority annunciation ("P") and Priority frequency will no longer be displayed.

R. NOAA Weather Radio Channels

The National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce is responsible for the NOAA Weather Radio Service. The radio service provides continuous broadcasts of the latest weather information from the National Weather Service. The weather messages are repeated every four to six minutes and are revised every one to three hours, or as weather condition dictate. During severe weather conditions the normal taped forecasts are interrupted to provide special warnings and advisories. The majority of the stations operate on a 24 hour basis.

NOTE

These weather broadcasts are not tailored specifically for pilots but can serve to give a general idea of the local weather picture. These broadcasts do not delete the requirement to get current aviation weather from a Flight Service Station or other professional aviation weather service.

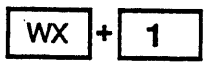
Since reception is limited to line of sight of the antenna, range of the signal is usually less than 40 miles from the antenna site if the receiver is on the ground. Although the effective range of the receiver will be increased in flight due to increased height of the antenna, it is quite likely that multiple stations may be received simultaneously.

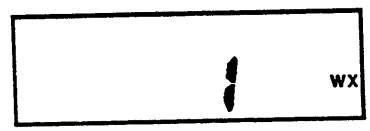
S. Monitoring the NOAA Weather Radio Broadcasts

Broadcast frequencies ranging from 162.40 to 162.55MHz are used for the 7 different weather channels. These frequencies are available on the KX 99 and are listed below:

Channel	Frequency
1	162.550MHZ
2	162.400MHz
3	162.475MHz
4	162.425MHz
5	162.450MHz
6	162.500MHz
7	162.525MHz

To receive any of the 7 NOAA National Weather Service channels press the WX key followed by the weather channel number you wish to receive. For example to receive weather channel 1 depress the keys in the following order:





SECTION IV

THEORY OF OPERATION

4.1 GENERAL

4.1.1 KX99 FEATURES

The KX99 is a hand-held VHF aircraft communications transceiver and navigation/weather receiver. The functional capabilities are:

A. A microprocessor controlled communication transceiver which operates from 118.00MHz to 135.975MHz in the -00 radio (to 136.975MHz in the -01 radio) in 25KHz increments providing 720 (760) channels.

B. A microprocessor controlled navigation receiver for VOR signals from 108.00MHz to 117.95MHz in 50KHz increments providing 200 channels.

C. A microprocessor controlled weather receiver for FM weather broadcasts in the range of 161.650MHz to 163.275MHz providing 10 channels.

D. A microprocessor controlled VOR converter capable of:

1. Calculating the VOR radial.
2. Displaying VOR information as a radial from or a bearing to the station.
3. Displaying VOR information in a simulated Deviation-Bar with an OBS entered from the keyboard.

E. Digital display of:

1. Current frequency.
2. Current memory channel.
3. VOR radial or bearing to station.

F. Non-volatile memory storage of all operating data.

4.1.2 KX 99 Electrical Design

The KX99 is made up of the following sections:

A. A control section using a microprocessor to read the keyboard, convert the keyboard information into tuning data for the frequency synthesizer, turn on the NAV converter and decode any VOR information which is present, display all data in the liquid crystal display.

B. A combination COMM/NAV/WX receiver with a four pole varactor tuned front end, bipolar cascode RF amplifier, MOS-FET active mixer, 6-pole monolithic crystal filter and integrated circuit IF amplifiers. The WX receiver uses an integrated circuit for a second mixer and FM detection. The FM integrated circuit is also used to provide a noise squelch.

C. A broadband transmitter followed by a 3 section lowpass filter.

D. A VOR converter which processes the VOR composite signal from the NAV receiver and displays a D-Bar or the station radial.

4.2 BLOCK DIAGRAM CIRCUIT THEORY

4.2.1 MICROPROCESSOR

The microprocessor controls all functions of the KX99 and contains 4K of permanent Read Only Memory (ROM) for program instruction. Thirty-two bytes of non-volatile memory are available externally for frequency and status information storage. The microprocessor receives its clock reference signal from the 3.975MHz master oscillator on the synthesizer chip.

The microprocessor sends two binary words to the LSI synthesizer to program the reference phase and variable phase divide ratios. The variable signal is phase-compared to the reference frequency in the LSI and "up" and "down" error pulses are fed to the integrating filter to provide a DC error signal for correcting the VCO frequency.

The microprocessor monitors the 4 lines from the keypad to determine if a key has been pressed. When one of these lines goes low, the microprocessor Will examine each of the 4 keyboard rows to determine which key was pressed.

The microprocessor sends two binary words to the display driver to activate the display drive circuitry and to display the correct segments. The integrated circuit display driver contains all of the necessary oscillators, dividers, and associated circuitry to light up a liquid crystal display. Programming information from the microprocessor will tell the display driver which segments are to be turned on.

4.2.2 RECEIVER

Figure 4-1 shows the block diagram of the receiver.

The received signal passes through part of the transmitter low-pass filter where the signal is switched to the receiver by the T-R diodes. A four pole, varactor tuned preselector suppresses the image and spurious signals. A cascode bipolar RF amplifier provides low noise gain and acts as the RF gain control. An active MOS-FET mixer converts the received signal to the 11.4MHz IF to be filtered by a 6 pole monolithic crystal filter. The IF signal is amplified by two integrated circuit amplifier stages, each with AGC applied. The transistor detector and squelch control gate follows the IF amplifier. A 455KHz second IF is provided by an integrated circuit and is used for FM signal reception and to provide a noise squelch. Either AM or FM audio can be selected to be fed to the integrated circuit audio amplifier which amplifies the signal to 500 milliwatts into 8 ohms.

The voltage controlled oscillator (VCO) receives DC control information on the coaxial cable which also carries the VCO frequency to the microprocessor board for comparison in the synthesizer LSI. The control voltage is low-pass filtered and applied to the two varactors for frequency control. The output from the MOS-FET VCO is buffered and directed to:

The LSI on the microprocessor board for frequency comparison.

The receiver for local oscillator injection.

The transmit buffers.

The transmitter buffer amplifier is controlled by the PTT logic of the radio.

4.2.3 TRANSMITTER/MODULATOR

Figure 4-2 shows the block diagram of the transmitter and modulator.

When the PTT key is activated and the microprocessor determines that the display shows a valid transmit frequency, the VCO is retuned to the displayed frequency. The transmit buffers are turned on and 1.5 watts output is obtained.

The modulation signal will cause the supply voltage on the first two transmitter stages to vary, thus causing the output of the transmitter to be modulated. A three section elliptic function type filter follows the transmitter to suppress harmonics.

KING
KX 99
HAND HELD NAV/COMM

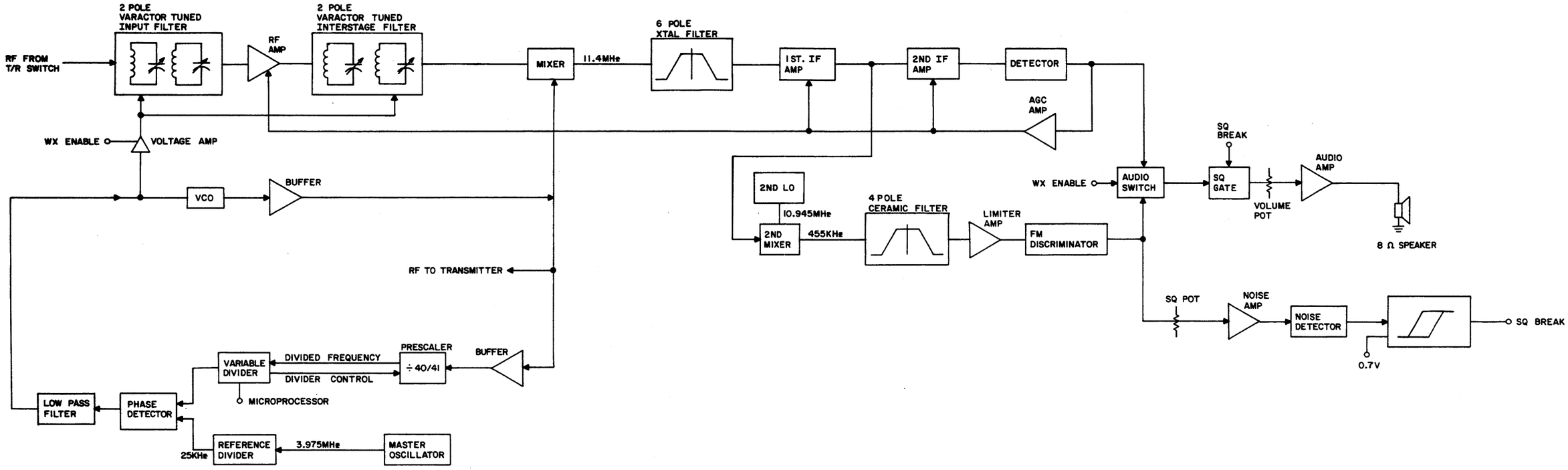


FIGURE 4-1 RECEIVER/SYNTHESIZER BLOCK DIAGRAM
(Dwg No 696-5692-03 R-0)

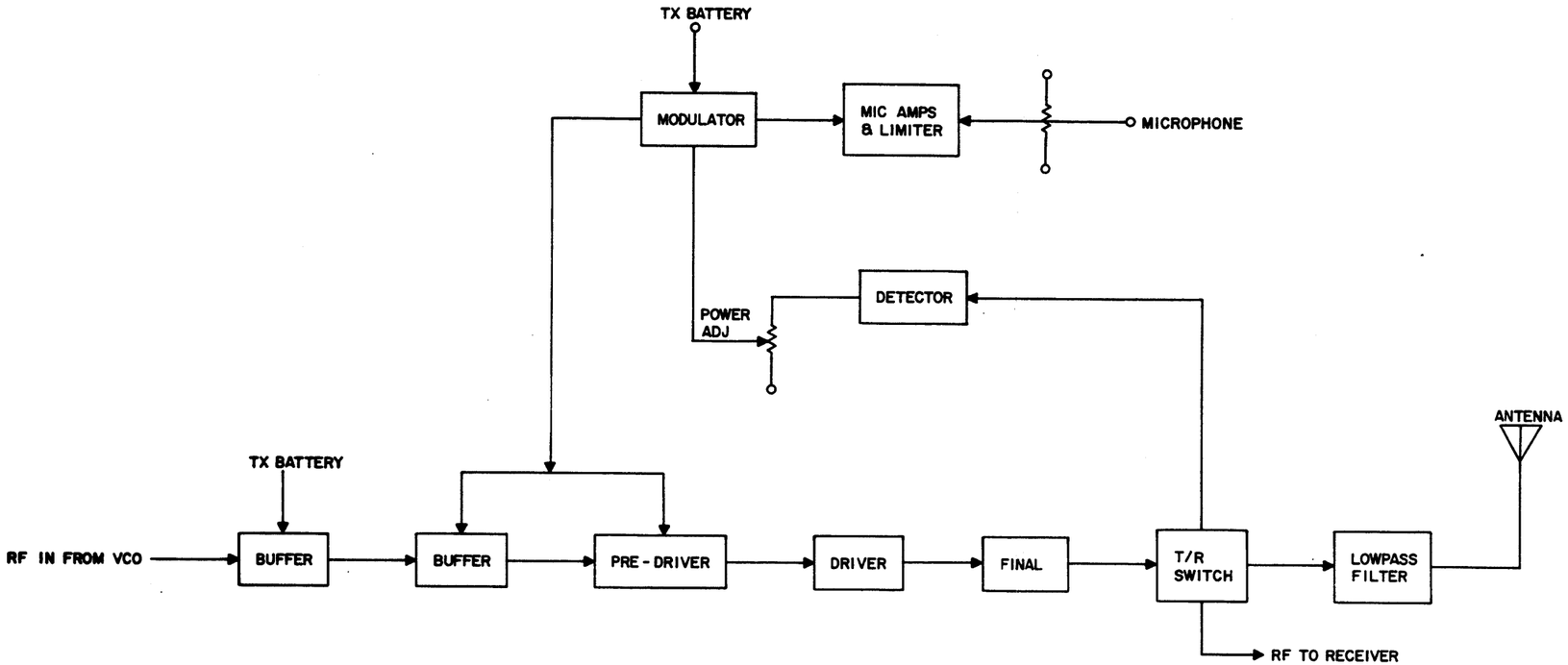


FIGURE 4-2 TRANSMITTER BLOCK DIAGRAM
(Dwg No 696-5692-02 R-0)

4.2.4 VOR CONVERTER

Figure 4-3 shows the block diagram of the VOR converter.

The VOR composite signal is buffered from the detector and passed up to the microprocessor board. The composite signal is fed to two circuits to decode the reference and variable phases. An active lowpass filter is used to remove the 9960Hz and leave only the 30Hz variable phase information. To get the reference phase information the signal is passed through a 9960Hz bandpass filter and a squaring amplifier. The output of the squaring amplifier is fed into a PLL discriminator to demodulate the 30Hz reference information. This signal is then lowpass filtered to form the reference phase signal.

Both the reference and variable phase signals are read by the A/D converter and the results are transferred to the microprocessor by means of a serial data stream.

The microprocessor bandpass filters each 30Hz signal and compares the phase between the signals to determine the radial from the VOR station. The radial information is then displayed in the LCD.

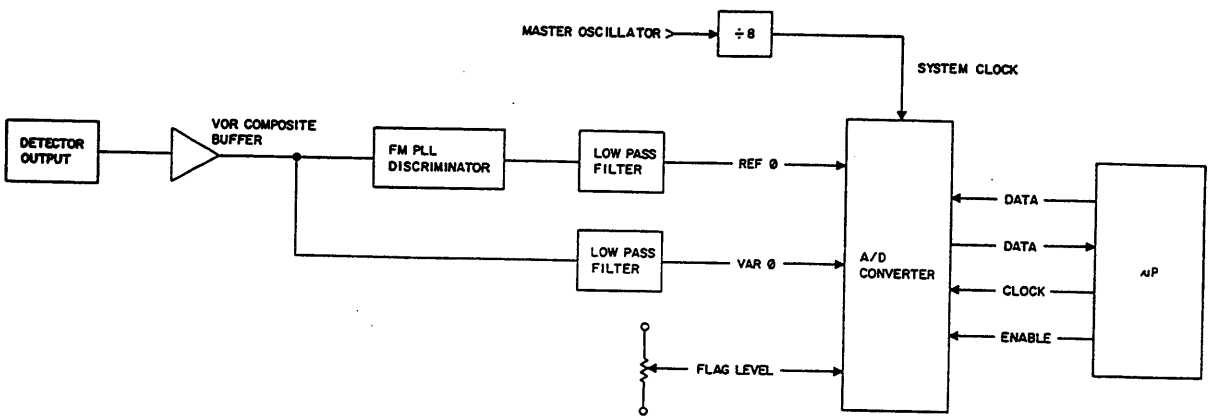


FIGURE 4-3 VOR CONVERTER BLOCK DIAGRAM
(Dwg No 696-5692-01 R-0)

4.3 DETAILED CIRCUIT THEORY

4.3.1 MICROPROCESSOR CONTROLLER

The microprocessor controls the functions of the following blocks:

A. LSI Frequency Synthesizer
B. Display Driver
C. Non-volatile Memory
D. Keypad
E. A/D Converter
F. VOR Converter

4.3.1.1 LSI Frequency Synthesizer

The frequency synthesizer, I107, uses an external crystal to provide a stabilized master oscillator. The microprocessor sends a 16 bit serial data word to pin 13 of the LSI to program the reference divider which divides the master oscillator frequency. The resulting signal is used as a reference phase signal. The microprocessor sends a 24 bit serial data word to the LSI to program the variable divider which divides the output from the prescaler. This signal is used as a variable reference phase.

The serial data clock pin 12 and the latch enable pin 14 enable the LSI to receive data from the microprocessor.

The output of the VCO is applied to the base of the prescaler buffer, Q706, by means of a shielded wire and C721. Q104 and Q706 are the active components of the buffer that provides isolation for the VCO. The prescaler, I708, receives the output of the buffer at pin 5 and divides its frequency by one of two divide ratios. The divide ratio is specified by the modulus control output from the LSI. The divided output from the prescaler is applied to the LSI at pin 10 where it is divided by the variable divide ratio from the microprocessor to form the variable reference phase.

The variable and reference phase signals are compared by the phase comparator in I701 with the difference appearing as "Up" and "Down" pulses on pin 7. These pulses are integrated by C726 and C101 and provide the DC tuning voltage to the VCO.

4.3.1.2 Display Driver

The display is a liquid crystal type and all necessary driving waveforms are generated by the display driver, I501. The microprocessor sends 24 bits of serial data to the display driver pin 9 to set up the multiplex rate and enable the display. After this data has been sent, the microprocessor sends 128 bits of serial data to program individual display segments to be on or off.

Other pins used in the data transfer process to I501 are the serial data clock pin 8, the display chip select pin 10, the display command or data input pin 12 which tells the chip whether it is receiving control or display data bits, and the display busy line pin 11 which tells the microprocessor that the chip is ready to receive data.

4.3.1.3 Non-volatile Memory

The non-volatile memory, I702, is an electrically erasable programmable read only memory (EEPROM) with a capacity of 16 X 16 bits.

The memory communicates with the microprocessor by means of a serial interface bus. When writing to the memory the microprocessor sends out 8 bits to enable writing, 8 bits to erase the selected cell, 24 bits to write data into the cell, and 8 bits to disable writing to the memory. When reading from the memory the microprocessor sends out 8 bits to select the location to read and then provides 16 clock cycles so that the memory can send its data to the microprocessor over the serial data line.

4.3.1.4 Keypad

The 16 key keypad is the only way to get data into the microprocessor. The pad is configured in 4 rows and 4 columns so that it takes 8 lines from the microprocessor to read the keyboard. The rows are driven low by the microprocessor and the columns are pulled up to 5 volts by R509-R512. Whenever a key is depressed a low logic level will appear on 1 of the 4 column inputs to the microprocessor. The micro will scan each row of keys to determine which key was pressed.

4.3.1.5 A/D Converter

When a NAV frequency is selected, the microprocessor will send a low signal on the NAV ENABLE line and turn on Q704 providing power to the VOR detection circuitry and the A/D converter.. Outputs from the VOR circuitry are sampled by the A/D converter, I704. I703 divides down the master oscillator frequency and provides a conversion clock for the A/D converter. The sampled inputs are sent back to the microprocessor by means of a serial data stream. The microprocessor sends 8 bits of data to the A/D converter to tell it which of its 11 inputs to sample next. While these 8 bits are going into pin 17, 8 bits of data which represent the last conversion result are coming out of pin 16. The A/D converter also has a chip select input on pin 15 and the serial clock input on pin 18.

4.3.1.6 VOR Converter

The microprocessor uses the NAV information obtained from the A/D converter to calculate the radial from a VOR station. Once this radial has been calculated, it can be displayed in a number of different formats. It can be shown as a radial number or when 180 degrees is added to it, it can be shown as a bearing to the station. The radial can also be compared against an OBS setting which has been entered from the keypad and light up a D-Bar in the liquid crystal display.

To obtain the VOR radial, both a reference phase signal and a variable phase signal are sampled by the A/D and the waveform value is passed to the microprocessor. The microprocessor then does a digital band pass filter on these two signals to remove any noise. The microprocessor can now compare the phases of the reference signal and the variable signal to determine the radial from the station. The amplitude of the signals are also analyzed to check to see if a flag condition exists. The flag threshold level is determined by R740 and R741. The microprocessor will read this voltage and compute a flag level. The higher this voltage, the stronger the signal needs to be, to "pull the flag" on the converter.

4.3.2 RECEIVER SECTION

4.3.2.1 Antenna Coupler

In receive mode, the TX BATT line is low so CR307 and CR308 are not conducting. This allows the desired receive signal to pass through the transmitter lowpass filter and up to C400 which matches the transmit switch to L301. Varactor diode CR302A tunes with L301 to form the first pole of the preselector. Varactor diode CR302B tunes with T301 to form the second pole of the preselector. The output of the second pole of the preselector is coupled by C303 to the base of the RF amplifier.

4.3.2.2 RF Amplifier

Q302 and Q303 form a cascode RF amplifier. Q302 is a high gain, AGC'able NPN transistor. The base is biased near 1.7 Volts to provide about 10dB of RF gain with 3mA of collector current. As the AGC voltage rises, the base voltage will increase and the gain the of transistor will be reduced. A base voltage of 2.3V will provide about a 40 dB reduction in gain. Q303 is used as an active impedance converter to match Q302 into the third pole of the preselector. L304, and L306 along with CR302C and D and associated circuitry comprise the last 2 poles of the preselector. The varactor diodes will tune the circuit to the desired frequency to reduce unwanted signals. L305 provides coupling between filter elements and help to improve the image rejection.

4.3.2.3 Mixer

L322 couples the desired signal from the preselector into gate 1 of the mixer, Q304. The mixer is an N channel depletion mode dual gate FET. The local oscillator signal, which is 11.4 MHz above the desired signal in COMM/NAV mode and 11.4MHz below the desired signal in WX mode is coupled into gate 2 by C314. Q304 provides approximately 2dB of conversion gain with a typical source current of .5mA and a signal level at gate 2 of approximately +7dBm. Mixing action in Q304 results in a desired signal of 11.4MHz at the drain of Q304. The drain is tuned to 11.4MHz by T302 which also matches the FET into the 4500 ohm crystal filter.

4.3.2.4 1st IF Amplifier

Crystal filter FL301 provides the desired narrow bandpass for the receiver to reduce most of the unwanted signals. The desired signal passes through the crystal filter and is coupled into I305, the 1st IF amplifier, by T303. AGC current is applied to pin 5 and provides approximately 40 dB of AGC range. T310 tunes the output of I305 and provides an impedance stepdown to the input of the second IF amplifier.

4.3.2.5 2nd IF Amplifier

I301 is the second IF amplifier. It provides the necessary gain, AGC, and output capability to drive the detector. AGC is also applied to pin 5 and provides 40 dB of AGC range. T304 tunes the output to 11.4MHz and matches it to the detector.

4.3.2.6 Detector

Q307 is the amplitude modulation detector. It is biased near collector cutoff by Q308, which is diode connected to provide stable bias and temperature compensation.

4.3.2.7 AGC Circuit

AGC voltage is derived from the average value of the detector collector voltage. Operational amplifier I102B is configured as a voltage follower so that the AGC circuit does not load down the detector. I102A compares the detector voltage with a DC reference from R133 and R134, amplifies it, filters out the audio variations, inverts it, and feeds it back to the RF amplifier and the 1st and 2nd IF amplifiers. If the signal level were to increase, the detector voltage would drop and the AGC voltage would increase. This would cause the AGC line to go to a higher voltage to reduce the gain of the IF amplifiers first. CR301A, CR301B, CR302A, and CR302B provide an AGC delay to the RF amplifier. As the AGC voltage increases the receiver gain will be reduced and will cause the detector voltage to rise back to its normal operating point.

4.3.2.8 FM Receiver

A. 2nd Mixer and IF Amplifier

I303 provides all functions necessary to demodulate a frequency modulated signal. Signal is coupled from the 11.4MHz 1st IF amplifier by C334 to pin 16 of I303. Y301 provides a second local oscillator frequency of 10.945MHz which mixes with the 11.4MHz input signal to yield a 455KHz second IF. This signal is passed through FL302 to remove any unwanted signals and to couple only the desired signal into pin 5 of I303. An internal limiter amplifier will boost the signal prior to demodulation to minimize the effects of noise on the signal.

B. Discriminator

A signal is coupled out of the limiter amplifier and into the ceramic discriminator, FL303, by C349. FL303 is tuned so that 455KHz is midway up one of the filter passband edges. As the frequency of the signal changes, as it would when frequency modulated, the output voltage of the filter will change as the frequency moves up and down the edge of the filter. The varying voltage corresponds to the modulated audio and it appears on pin 9 of I303.

4.3.2.9 Squelch Circuit

A noise squelch has been implemented by using I303. Audio from pin 9 of I303 is filtered by C341 and C342 to remove the residual 455KHz noise. The signal is then applied to the top of the squelch control pot, R122. Signal is taken off the wiper arm of the pot and is amplified and high pass filtered by I302A to remove any voice modulation. The signal is applied to pin 10 of I303 where is is further amplified and filtered. C337 couples the amplified signal to the noise detector diode CR304 which converts the noise into a DC voltage. When sufficient noise is available to make the DC voltage at pin 12 of I303 greater than 0.7V, pin 13 goes to an output low. When the microprocessor sees that this line is low, it provides a high level signal to the gate of Q107 which mutes the audio.

In a strong signal condition or when the squelch pot is turned down, CR304 will not rectify enough noise to raise the voltage at pin 12 above 0.7VDC. This will cause pin 13 of I303 to go to a high logic level, which the microprocessor will see. Then it will send a low signal to the gate of Q107 and turn on the audio.

4.3.2.10 Audio Switching

CR104 provides a means of directing either the AM detector signal or the FM demodulated signal to the audio amplifier. When tuning an AM frequency the WX ENABLE line from the microprocessor is low. This turns off Q114 which turns on Q116 and causes one half of CR104 to conduct and pass the audio signals from the detector. R128 and R127 attenuate the AM signal slightly to balance the volume level between AM and FM reception. If the WX ENABLE line is high, Q116 is turned off and the other half of CR104 is conducting. The AM audio is not allowed to pass through and audio from I303 is amplified.

4.3.2.11 Audio Limiter and Amplifier

The received audio is clipped by CR108 to limit noisy signals. After limiting, audio passes through Q107 which is a P-channel JFET. A low level on the gate of Q107 allows audio to pass while a high level on the gate will block the audio. The top of the volume pot is connected to the drain of Q107 and audio is taken from the wiper to the audio amplifier. The audio amplifier provides about 35dB of gain and the power necessary to drive a low impedance speaker to rated power. C133 couples amplified audio to a speaker.

4.3.3 TRANSMITTER

4.3.3.1 TX Buffer

RF is fed from the VCO buffer to Q309 by a short piece of shielded wire. The drive level is approximately +7dBm. When in transmit mode, the TX BATT line is at 9VDC and Q309 has power to provide about 14dB of RF gain. When in receive mode, the TX BATT line is at 0VDC and Q309 is turned off. While Q309 is not conducting it provides attenuation to limit the local oscillator radiation through the transmitter.

4.3.3.2 Modulator

Q310 and Q311 are the modulated stages in the transmitter string. Low level modulation has been used in the KX99. The modulator output signal from Q314 supplies power to the base and collector of Q310 and to the base of Q311. When no modulation is present, modulator voltage is at 2.5V and Q310 and Q311 are producing a nominal amount of power. As the output voltage of the modulator increases or decreases, the power produced by Q310 and Q311 will likewise increase or decrease thus modulating the RF carrier.

4.3.3.3 Driver

T306 provides a broadband match from Q311 to the input network of Q312 which is the RF driver. Q312 is operated as a Class C amplifier and provides up to 1Watt of RF output power. The collector is broadband tuned by T307 and R370.

4.3.3.4 Final

C368, C367 and C369 form the input matching network for the final power amplifier Q313. The final is operated Class C and can produce about 9 Watts of power. The low collector impedance is stepped up to 50 ohms by T308, C376, C377 and C378.

4.3.3.5 Low Pass Filter

The low pass filter is a modified 3 section elliptic design located between the final and the antenna to attenuate all harmonics which may be generated by the transmitter. During transmit mode when the TX BATT line is high, pin diodes CR307 and CR308 are conducting. This allows RF power from the final to be coupled into the low pass filter by C371 and C382 and keeps the power out of the receiver.

4.3.4 MODULATOR

4.3.4.1 Microphone Input Circuit

The internal microphone is biased by R150 and R151 and signal from it is coupled to I105A by R153 and C146. An external microphone is biased by R152 and signal is coupled to I105A by R154 and C145.

4.3.4.2 Mic Clipper

The microphone audio is amplified to a clipping point by I105A. The gain of the amplifier is adjusted by R156. I105A is biased at 1/2 supply to provide symmetrical clipping of the input signal.

4.3.4.3 Mic Limiter

R165 and C150 form a low pass filter to attenuate any unwanted high frequencies. Signal is coupled into I105B, the modulation limiter, by R160. The gain of I105B is adjusted by R161 to obtain the desired modulation level. The output of I105B is coupled through C136 to the speaker and the external speaker jack providing sidetone.

4.3.4.4 Modulator

Signal is also coupled from the mic limiter to pin 3 of the modulator, I304A, and lowpass filtered by R178, R179, and C393. RF is sampled from the final output by C390 and R366 and converted to a DC voltage by CR309, CR310, and C391. The output of this simple AM detector is applied to the top of the power control pot, R367. Signal from the wiper of R367 is applied to pin 2 of I304. The output of the modulator will be the difference in the microphone input signal and the detected signal from the transmitter. In this manner the modulated output of the transmitter is forced to be the same as the microphone input signal. The output drive capability of the modulator is increased by Q314 which is configured as a voltage follower.

4.3.5 VOLTAGE CONTROLLED OSCILLATOR (VCO)

The voltage controlled oscillator is a modified Hartley type oscillator operating at the displayed frequency in the transmit mode and 11.4MHz above or below the displayed frequency when providing the L.O. signal in the receive mode. Q101 is the active component and varactor diodes CR302E and CR302F provide electronic tuning of the oscillating frequency.

As described in the microprocessor control section, the phase detector from the frequency synthesizer produces "UP" and "DOWN" pulses which are integrated to form a DC control voltage for the VCO. R101, R102, and C101 form a compensation network to provide loop stability, this voltage is applied to the 4 varactor diodes in the receiver section to tune the preselector filters. The output of the compensation network is further filtered by R106, C105 and R107, C106 to attenuate the 25KHz reference phase noise. After filtering, the voltage is applied to the cathodes of the two varactor diodes.

If the VCO were to be too low in frequency, the phase detector output would pulse "UP" signals which would be integrated to increase the DC tuning voltage. The higher voltage would reduce the capacitance of CR302D and CR302E, thus causing the VCO to oscillate at a higher frequency.

4.3.6 VOR CONVERTER

4.3.6.1 Reference Phase

The VOR composite signal is buffered from the detector by I102B and passed up to the VOR board by the flex circuit. The 9960Hz reference signal is first bandpass filtered by C703 and L701 to remove some of the 30Hz. The output from the bandpass filter is applied to the base of Q705 which is configured as a high gain limiter. The signal is then applied to a phase-locked loop discriminator, I706 pin 14. The reference information is a 30Hz signal which has been frequency modulated onto the 9960Hz carrier. The free running oscillator frequency of the phase locked loop is set by R718 to 9960Hz. Any frequency deviation from 9960Hz will show up as a voltage variation on pin 10 when the loop tries to lock onto the frequency modulated signal. The output from I706 is coupled into a 200Hz active lowpass filter, I705B by C310. This filter will attenuate any voice frequencies and pass the signal on to the A/D converter.

4.3.6.2 Variable Phase

The variable phase information is contained in the 30Hz amplitude modulated portion of the composite signal. The 30Hz signal is coupled into a 200Hz active lowpass filter, I705A, by C313. This filter will eliminate the 9960Hz reference signal and attenuate any voice signal which might be present. The output of the filter is directly coupled to the A/D converter.

4.3.7 POWER SUPPLY

All power for the KX99 is supplied from an attached 9.8VDC battery pack. The battery supplies power to two integrated circuit regulators, I104 which has a 5.0V output and I106 which has an 8.3V output. I106 also contains a voltage sense circuit which sets pin 5 of I106 low when the battery voltage begins to drop. Pin 5 is monitored by the microprocessor and when it goes low, the microprocessor makes a beep in the speaker every 3 seconds.

A built-in battery charger is also in the power supply. Q111 is configured as a constant current source to trickle charge the attached Ni-Cad battery pack. When a voltage greater than about 14V is applied to R148 and CR105, Q111 will conduct and supply current into the battery.

SECTION V

MAINTENANCE

5.1 GENERAL INFORMATION

This section contains information on test, alignment, inspection, cleaning, and repair procedures for the KX 99.

Information concerning semiconductor and integrated circuit maintenance along with specific operating characteristics can be found in Appendix A of this manual.

5.1.1 STANDARD TEST SIGNAL DESCRIPTION

A. Standard Audio Test Signal

An RF carrier amplitude modulated 30% by a 1000Hz tone.

B. Standard VOR Test Signal

An RF carrier, amplitude modulated simultaneously at 30% ±1% by (a) a 9960Hz subcarrier which is in turn frequency modulated at a deviation ratio of 16 by a 30Hz ±1Hz "Reference Phase Signal" and (b) 30% ±1% by a 30Hz ±1Hz "Variable Phase Signal", which can be varied in phase with respect to the reference signal.

C. Standard FM RF Signal

An RF carrier frequency modulated to a peak deviation of 3KHz by a 1000Hz tone.

NOTES:

1. All RF voltages are "HARD" Microvolts. "Hard" microvolts indicates the use of a 6dB 50Ω pad between the signal generator and the receiver. (Example: A receiver with 6dB S+N/N at 2uV hard must have 1uV of sensitivity.)
2. A standard modulator test signal is a .4VRMS, 1KHz tone, open circuit with the network shown in Figure 5-1.
3. Audio amplifier speaker output is 8 ohms. The audio output can be heard over the internal speaker or when a jack is plugged into the external audio output the speaker is switched off and the audio is routed out through the external audio output.
4. ≥ means greater than or equal
   ≤ means less than or equal

5.2 TEST AND ALIGNMENT

5.2.1 TEST EQUIPMENT

The following test equipment or equivalent, is required to properly align and test the KX 99. All test equipment must be calibrated before attempting alignment.

A. Power Supply: Sorenson SRL 40-6 (10.0V @ 3.0 Amps).

B. R.F. Signal Generator: HP 8640B (with avionics option).

C. Audio Signal Generator: HP 200CD Wide Range Oscillator.

D. Digital Multimeter: Fluke 8000A.

E. R.F. Wattmeter: Bird Model 611.

F. Frequency Counter: HP 5245L

G. Audio Wattmeter with Load: Eico Model 261

H. Oscilloscope: Tektronix Model 465 or equivalent.

I. Linear Detector: Figure 5-2.

J. VOR Audio Signal Generator: TIC Model T-20A.

K. KX 99 Test Panel (if available) or the following cables.

1. BNC - BNC for RF.
2. 3.5mm, 3 conductor for Mic input.
3. 2.5mm, 2 conductor for external head phone.
4. Alligator clips to supply power.

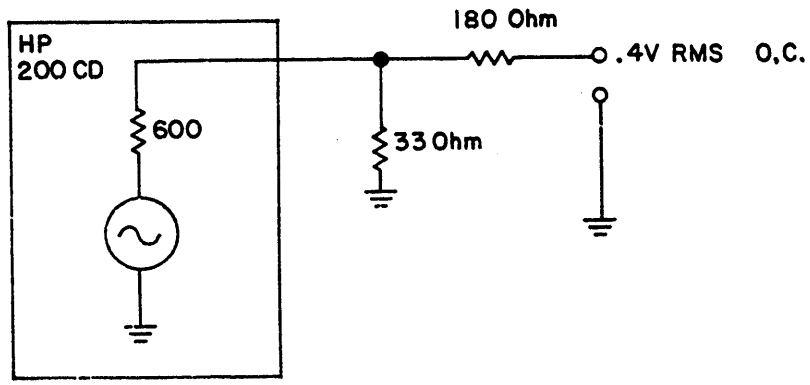
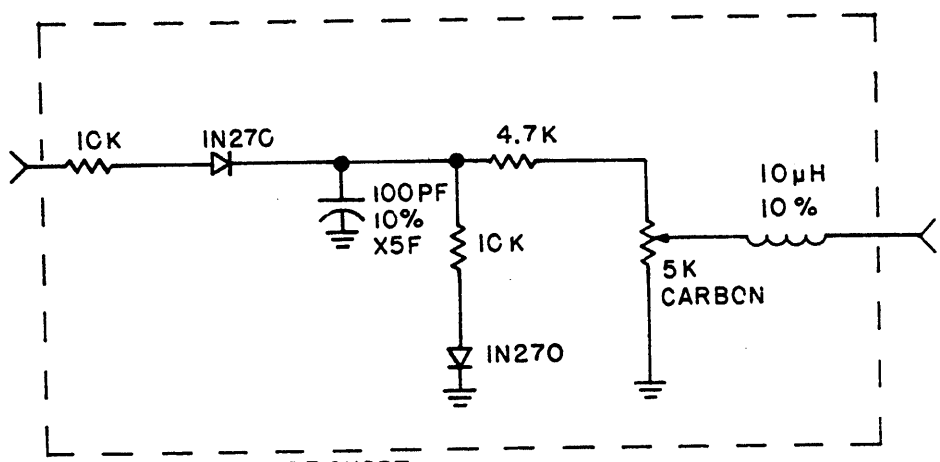


FIGURE 5-1 STANDARD MICROPHONE TEST CIRCUIT



1. ALL LEADS MUST BE SHORT.
2. HOUSE IN SMALL METAL BOX.
3. ALL RESISTORS ARE 1/4 W, 5% CARBON.

FIGURE 5-2 LINEAR DETECTOR

5.2.2 OVERALL TESTS PERFORMANCE SHEET

The following test is provided to aid the technician in locating troubled areas within the radio.

The indication that should be observed during the test is indicated in red.

TEST DATA SHEET

SERIAL NO:_____

5.2.3 CONTROL FUNCTIONS

NOTE: The term "OK" indicates that particular function is operating properly.

A. Display: _____OK

When the unit is turned on with the "2ND" key depressed all segments of the display should be visible.

B. Keypad active: _____OK Beep heard: _____OK

C. Memory: _____OK

When the unit is turned OFF after 3 seconds of operation and then back ON, the last frequency is displayed.

5.2.4 AM RECEIVER

A. Receiver Sensitivity:

1. S+N/N:

108.000MHz_____ NLT 6dB
118.000MHz_____ NLT 6dB
126.500MHz_____ NLT 6dB
135.975MHz_____ NLT 6dB

Input a 2 microvolt (uV) standard audio test signal into the unit. Monitor the speaker audio while switching modulation off.

2. Quieting:

112.500Mhz_____ NLT 25dB S+N/N
126.500MHz_____ NLT 25dB S+N/N

Input a 100uV standard audio test signal into the unit. Monitor the speaker audio while switching modulation off.

B. AGC characteristics: _____ NMT 3dB

With the unit set to 126.50MHz monitor the speaker output. Vary the input from 5uV to 20KuV.

C. Selectivity

Using the AGC voltage produced by a 3uV standard signal reference at 126.500MHz, measure and record the frequencies which reproduce the AGC REF voltage at 6dB and 60dB above the reference input.

3uV AGC Reference _____VDC

1. 6dB Bandwidth:

Above_____ >126.513MHz Below_____ <126.487MHz

2. 60dB Bandwidth:

Above_____ <126.550MHz Below_____ >126.450MHz

D. Volume Control: Min_____ NMT 50uW Max_____ NLT 500mW

Input a standard 100uV signal into the unit. Monitor the speaker output.

E. Audio Distortion: 350Hz = ___% 1KHz = ___% 2.5KHz = ___% NMT 15%

Input a 100uV 85% modulated signal between 350Hz and 2500Hz.

F. Audio Response: 350Hz = ____ NMT 6dB down 1000Hz = 0dB
2500Hz = ____ NMT 6dB down

Input a standard 100uV signal into the unit. Monitor the speaker output.

5.2.5 TRANSMITTER

A. Power Out: 1.5 Watts Min.

118.00MHz _____ Watts 126.50MHz____ Watts 135.975MHz____ Watts

After 30 sec. continuous key: Min 1.0 Watts

118.00MHz _____ Watts 126.50MHz____ Watts 135.975MHz____ Watts

Low Voltage: Min 0.75 Watts @ 8.5VDC

118.00MHz _____ Watts 126.50MHz____ Watts 135.975MHz____ Watts

B. Modulation:

1. Capabilities

Input a standard modulator test signal into the external mic input. Using the linear detector measure the TX modulation.

118.000MHz: _____ NLT 70%
126.500MHz: _____ NLT 70%
135.975MHz: _____ NLT 70%

2. Carrier Noise level

Modulate the carrier with 85% at 1000Hz. Measure noise on the carrier with the modulation removed.

118.000MHz: _____ NMT -40dB
126.500MHz: _____ NMT -40dB
135.975MHz: _____ NMT -40dB

3. Demodulated Audio Distortion

Modulate the carrier 30% with 350 - 2500Hz. Using the linear detector and a distortion analyzer measure distortion.

350Hz_____ NMT 15% 1KHz_____ NMT 15% 2.5KHz_____ NMT 15%

5.2.6 VOR CONVERTER

A. VOR Flag Sensitivity:
Input a standard NAV signal at 2uV. Monitor the D-Bar display to check flag.

108.00MHz _____ OK
114.90MHz _____ OK
117.95MHz _____ OK

B. AGC:

Vary the input from 5uV to 20KuV with a standard NAV signal. Monitor the speaker output and the D-Bar display.

112.50MHz: Audio Level Variation _____dB (3dB Max)

Bearing Variation _____Deg (2 deg Max)

C. Nav Audio Output: _____mW NLT 200mW

Input a 20uV signal with 10% mod at 1000Hz. Monitor the speaker output.

D. VOR Bearing Error:

Input a 100uV VOR Test signal. Monitor the radial in the display.

RADIAL	Digital		RADIAL	Digital
000	_____	180		
030	_____	210	_____	
060	_____	240	_____	
090	_____	270	_____	
120	_____	300	_____	
150	_____	330	_____	

5.2.7 WEATHER RECEIVER

A. Receiver Sensitivity:

Input a standard FM RF test signal. Monitor the speaker audio output.

1. S+N+D/N+D: WX8 161.650MHz _____ NLT 12dB
   WX0 163.275MHz _____ NLT 12dB
2. Quieting: WX1 162.550MHz _____ NLT 25dB

Input a 100uV standard FM test signal. Monitor the speaker audio and remove modulation.

B. Volume Control: Min_____ NMT 50uW Max_____ NLT 500mW

Input a 100uV standard FM signal into the unit. Monitor the speaker output.

C. Audio Distortion: 350Hz = ___% 1KHz = ___% 2.5KHz = ___% NMT 15%

Input a 100uV, 3KHz frequency modulated signal between 350Hz and 2500Hz.

D. Audio Response:

500Hz	_____	+6.6 to +10.6dB
1000Hz	0dB	
2500Hz	_____	−5.75 to −9.75dB

Input a 100uV, 3KHz frequency modulated signal between 350Hz and 2500Hz. Monitor the speaker output. (6dB +1/−3dB de-emphasis)

5.2.8 Receiver Alignment

5.2.8.1 Initial Control Settings

Set the power supply for nominal battery voltage, 9.6VDC.

R167	Noise Squelch	Mid Range
R147	Volume Control	Max CCW (off)

5.2.8.2 Frequency Adjust

A. Apply power and advance volume to turn on. Count the VCO frequency at TP102 on the receiver board with the frequency selector at 118.00MHz.

B. Adjust C724 for a reading of 129.400 MHz ±200Hz. This adjustment must be made within 60 seconds of turn on at normal room temperature to insure temperature tracking within MPS limits.

5.2.8.3 VCO Adjust

A. Read voltage at TP101 and adjust T101 for 1.0 ±0.05VDC at 108.00MHz in receive mode.

B. Switch to 135.975MHz and adjust C107 for 3.9 ±0.05V in receive mode.

C. Repeat steps a and b as necessary to achieve desired results. Key the transmitter at 118.00MHz and insure that the voltage is greater than 0.85VDC.

5.2.8.4 RF-IF Alignment

A. Set the frequency control to 126.50MHz.

B. Inject a 126.50MHz signal with no modulation into the antenna connector and supply sufficient RF to obtain a 0.5V increase at TP301 on the RX/TX board.

C. Tune T302, T303, T310, and T304 for maximum voltage at TP301. If necessary, reduce the input signal to keep the voltage at TP301 below 5.0VDC.

D. Tune T301, L301, L304, and L306 for maximum voltage at TP301.

5.2.9 VOR CONVERTER ALIGNMENT

5.2.9.1 Initial Control Settings

Adjust the PLL VCO Adjust, R718, to Mid-range.

5.2.9.2 PLL Adjust

A. Set the frequency to 112.60 MHz.

B. Apply an unmodulated 1000uV signal to the radio.

C. Count the frequency at TP701 and adjust R718 for a frequency of 9960±30Hz.

D. Apply a 1000uV Standard VOR Test Signal to the radio.

E. Adjust R718 so that the voltage on TP702 is 4.8 ±0.1 VDC.

5.2.9.3 VOR Centering

A. Set the frequency to 112.60 MHz.

B. Apply a 1000uV Standard VOR Test Signal.

C. Adjust Bearing on the VOR generator to 0.00 FROM and set the OBS on the radio to 000.

D. Allow the converter to run for 10 seconds to lock on to the signal.

E. Momentarily ground pin 2 of the microprocessor, I701. Two pads have been provided on the board.

F. Verify that the CDI is now centered.

5.2.10 Weather Receiver Alignment

A. Channel the radio to WX1.

B. Inject a 162.550 MHz 100uV standard FM test signal.

C. Adjust R173 for maximum signal to noise ratio.

D. Reduce signal level to 2uV.

E. Adjust R173 for maximum signal to noise ratio.

5.2.11 TRANSMITTER AND MODULATOR ALIGNMENT

5.2.11.1 Power Tracking

A. Set R357 fully CW for max power.

B. Key the transmitter at 135.975.

C. Adjust C378 for maximum power out.

D. Check several COMM channels and make sure that the output is relatively flat from 118.00MHz to 135.975 MHz and greater than 6.5 Watts.

E. If more than 1.5 Watts of variation is detected or if max power is less than 6.5 Watts, re-adjust C378.

5.2.11.2 Modulator Adjustments

A. Set R156 (Mic Gain) and R161 (Mod Limit) full-CW.

B. Adjust R357 to obtain 1.5 Watts minimum across the band with no modulation.

C. Input a 350Hz, 1.5VRMS microphone signal.

D. Adjust R161 for a mod level of 80%

E. Input a standard microphone test signal.

F. Adjust R156 until clipping of both detected waveform peaks goes away.

G. Verify that the transmitter does not break up with a 1.5VRMS mic input signal.

5.2.12 FINAL ADJUSTMENTS

The following test is done to insure that the LCD is seated properly and to reset the non-volatile memory.

A. Turn off the radio power.

B. Press down and hold the "2ND" key while turning on the radio power.

C. At this point, all segments in the LCD should be lit. If they are not, some adjustment of the display may be necessary.

D. After verifying correct display operation, press the "WX" key to reset the non-volatile memory and exit from this test.

5.3 OVERHAUL

5.3.1 VISUAL INSPECTION

This section contains instructions to assist in determining, by inspection, the condition of KX99 assemblies. Defects resulting from wear, physical damage, deterioration, or other causes can be found by these inspection procedures. To aid inspection, detailed procedures are arranged in alphabetical order.

A. Capacitors, Fixed

Inspect capacitors for case damage, body damage, and cracked, broken, or charred insulation. Check for loose, broken, or corroded terminal studs, lugs, or leads. Inspect for loose, broken, or improperly soldered connections. On chip caps be especially alert for hairline cracks in the body and broken terminations.

B. Capacitors, Variable

Inspect trimmers for chipped and cracked bodies, damaged dielectrics and damaged contacts.

C. Chassis

Inspect the chassis for deformation, dents, punctures, badly worn surfaces, damaged connectors, damaged fastener devices, loose or missing hardware, component corrosion, and damage to the finish.

D. Connectors

Inspect connectors for broken parts, and other irregularities. Inspect for cracked or broken insulation and for contacts that are broken, deformed, or out of alignment. Also, check for corroded or damaged plating on contacts and for loose, improperly soldered, broken, or corroded terminal connections.

E. Covers and Shields

Inspect covers and shields for punctures, deep dents, and badly worn surfaces. Also, check for damaged fastener devices, corrosion and damage to finish.

F. Flex Circuits

Inspects flex circuits for punctures, and badly worn surfaces. Check for broken traces, especially near the solder contact points.

G. Fuse

Inspect for blown fuse and check for loose solder joints.

H. Insulators

Inspect insulators for evidence of damage, such as broken or chipped edges, burned areas, and presence of foreign matter.

I. Jacks

Inspect all jacks for corrosion, rust, deformations, loose or broken parts, cracked insulation, bad contacts, or other irregularities.

J. Potentiometers

Inspect all potentiometers for evidence of damage or loose terminals, cracked insulation or other irregularities.

K. Resistors, Fixed

Inspect the fixed resistors for cracked, broken, blistered, or charred bodies and loose, broken, or improperly soldered connections. On chip resistors be especially alert for hairline cracks in the body and broken terminations.

L. RF Coils

Inspect all RF coils for broken leads, loose mountings, and loose, improperly soldered, or broken terminal connections. Check for crushed, scratched, cut or charred windings. Inspect the windings, leads, terminals and connections for corrosion or physical damage. Check for physical damage to forms and tuning slug adjustment screws.

M. Terminal Connections soldered

1. Inspect for cold-soldered or resin joints. These joints present a porous or dull, rough appearance. Check for strength of bond using the points of a tool.

2. Examine the terminals for excess solder, protrusions from the joint, pieces adhering to adjacent insulation, and particles lodged between joints, conductors, or other components.

3. Inspect for insufficient solder and unsoldered strands of wire protruding from conductor at the terminal. Check for insulation that is stripped back too far from the terminal.

4. Inspect for corrosion at the terminal.

N. Transformers

1. Inspect for signs of excessive heating, physical damage to case, cracked or broken insulation, and other abnormal conditions.

2. Inspect for corroded, poorly soldered, or loose connecting leads or terminals.

O. Wiring/Coaxial Cable

Inspect wiring in chassis for breaks in insulation, conductor breaks, cut or broken lacing and improper dress in relation to adjacent wiring or chassis.

5.3.2 CLEANING

A. Using a clean, lint-free cloth lightly moistened with soap and water only, remove the foreign matter from the equipment case and unit front panel. Wipe dry using a clean, dry, lint-free cloth.

B. Using a hand controlled dry air jet (not more than 15psi), blow the dust from inaccessible areas. Care should be taken to prevent damage by the air blast.

C. Clean the receptacles and plugs with a hand controlled dry air jet (not more than 25psi), and a clean, lint-free cloth lightly moistened with soap and water only. Wipe dry with a clean, dry, lint-free cloth.

5.3.3 REPAIR

This section describes the procedure along with any special techniques for replacing damaged or defective components.

5.3.4 KX 99 DISASSEMBLY

5.3.4.1 Initial Disassembly

A. Remove the battery pack by releasing the spring latch and twisting it off.

B. Remove the 5 screws from the back of the radio.

C. Remove the 4 screws from the battery latch plate on the bottom of the radio.

D. Remove the back from the chassis assembly.

E. Carefully remove the chassis assembly from the front cover taking care not to damage the flex circuit going to the front cover.

5.3.4.2 Separation of the Frames

A. Depress both of the lock buttons on top of the radio to prevent tearing the rubber gaskets.

B. Remove the volume and squelch knobs from the top of the radio.

C. Remove the 4 small screws on the outside of the frame assembly.

D. Grasp 1 frame in each hand and open the frame assembly like a book.

5.3.4.3 Display Board Removal

A. Remove the 6 screws which hold the shield to the display board.

B. Remove the remaining screw in the display board.

C. The board can now be taken out of the front cover.

5.3.4.4 VOR Board Removal

A. Remove the 3 screws which hold the VOR board onto the Audio board.

B. Remove the VOR board.

5.3.5 KX99 ASSEMBLY

Before beginning re-assembly make sure that all shields and wires have been installed.

5.3.5.1 Frame Assembly

A. Lock both of the push buttons on top of the board in the down position.

B. Insert the hinges on the RX/TX frame into the slots on the audio frame.

C. Install full board insulator on the back side of the audio board.

D. Fold the frame halves together insuring that the locking switches are properly seated beneath the rubber boot.

E. Install the 4 screws in the side of the frames.

5.3.5.2 VOR Board Installation

A. Place the VOR board down against its 3 mounting standoffs insuring that no wires are pinched.

B. Install the 3 screws to secure the board.

5.3.5.3 Front Cover Installation

A. Install the volume and squelch knobs.

B. Insert the frame assembly into the front cover and insure that the wiring harness is not pinched.

C. Seat the front cover into the top plate insuring that the top plate gasket seals properly.

D. Install the battery latch plate to the bottom of the cover with the 2 front-most screws.

E. Install gasket in the grove on the back cover.

F. Seat the back cover against the gasket on the top plate and pivot down to seal with the front cover.

G. Install the heat sink screw in the back cover to hold it in place.

H. Install the other 4 screws in the back cover.

I. Install the remaining screws in the battery latch plate and snug all screws down.

5.4 TROUBLESHOOTING

This troubleshooting section is intended as a guide for the technician in isolating a malfunction in the KX99. Before troubleshooting the radio, a thorough understanding of the Theory of Operation should be accomplished. The technique (fault finding through elimination) should be used as a basis in locating the troubled area. The following steps should be performed before any troubleshooting procedures are applied.

A. Perform a bench check to determine if the unit is the source of the problem.

B. Determine the exact problem. Is it the receiver or is it the transmitter?

Once you have determined the problem section, consult the trouble flow charts and schematics for information pertaining to voltages and waveforms.

NOTE: Check all flex circuits carefully for broken traces or unsoldered connections before troubleshooting.

5.4.1 POWER SUPPLY TROUBLESHOOTING

A. Verify 9.6 volts on each end of fuse F101.

B. Verify 8.3 volts on pin 1 of I106.

C. Verify 5 volts on pin 34 of I701.

If voltages are present but low, verify that your bench supply is not in current limiting.

5.4.2 MASTER OSCILLATOR

Verify reference frequency of 3.975MHz on pin 39 of I701.

5.4.3 TUNING VOLTAGE

Verify the following tuning voltages on TP101.

A. 108.00MHz 1.00V
B. 118.00MHz 2.03V
C. 126.50MHz 2.84V
D. 135.95MHz 3.88V
E. WX 1 4.36V

5.4.4 LOCAL OSCILLATOR

A. Verify that the LO level is more than 0.5 volt p-p at TP302 with an oscilloscope.

B. Verify that the LO is 11.4MHz above the desired frequency in AM mode and 11.4MHz below the desired frequency in WX mode.

5.4.5 DETECTOR

Verify approximately 2Vp-p at R332 with 100uV, 30% modulation at 1KHz.

5.4.6 AGC AMPLIFIER

A. Set frequency at 126.45MHz.

B. The voltage at TP301 is typically 6.01V with a 100uV signal, 3.95V with no signal.

5.4.7 AUDIO

With 100uV, 30% modulated at 1KHz, the audio output should be 500mW minimum into an 8 ohm load.

5.4.8 TRANSMITTER

A. Verify correct frequency at TP302.

B. Verify collector of Q308 at +7.3V.

C. Verify collector of Q310 at +2.45V at 1.5 Watts and 6.3V at 7.5W.

D. Verify collectors of Q311, Q312, Q313 at +9.6V.

E. Verify that the junction of L314 and C381 is at +1.4V.

5.4.9 NAV CONVERTER

Channel radio to 112.60MHz and inject a 100uV standard VOR test signal.

A. Verify that the voltage at pin 16 of I706 is 9.6V.

B. Verify that the voltage at pin 20 of I704 is 4.8V.

C. Verify frequency at TP701 is 9960Hz.

D. Verify 30Hz sine-wave 2.0Vp-p at pins 1 and 2 of I704.

E. Verify that data pulses from the microprocessor appear on pins 15, 16, 17, and 18 of I704.

F. Verify frequency at pin 19 of I704 of 496KHz.

5.4.10 MICROPROCESSOR

A. Verify 5.0V on pins 1, 2, 34, and 40 of I701.

B. Verify that pin 29 of I701 is at 5.0V with pulses going low.

C. Verify that serial data appears on pins 18 and 19 of I701.

5.4.11 DISPLAY

A. Verify that the voltage on I501 pin 7 is 4.8V.

B. Verify the waveform on pin 15 of I501.

C. Verify that these data signals appear on the following pins of I501.

1. Pin 8, normally high level with low going pulses.
2. Pin 9, normally low level with high going pulses.
3. Pin 10, normally high level with low going pulses.
4. Pin 11, normally high level with low going pulses.
5. Pin 12, normally low level with high going pulses.

SECTION VI
ILLUSTRATED PARTS LIST

INTRODUCTION

This Illustrated Parts List (IPL) provides for the proper identification of replacement parts. Individual Bills of Material (BOM) within this IPL are arranged in numerical order by BOM number. Each BOM is followed by the Assembly Drawing and Schematic Diagram for that assembly.

Parts identified in this IPL by King Part Number meet design specifications for this equipment and are the recommended replacement parts. Warranty information concerning King replacement parts are contained in Service Memo #1, KPN 600-8001-XX.

BILL OF MATERIAL DESCRIPTION

This section describes the various items that appear on the Bills of Material. A sample BOM is included in this section as Figure 6-1.

1. BOM Number

   The Bill of Material Number appears at the top of the BOM as a 9-digit number which is also the King Part Number for the assembly. The BOM Number is followed by the assembly description and the revision level of the BOM.

2. Symbol Column

   This column contains the Reference Designators of the electrical components of the assembly. Mechanical parts are not assigned Reference Designators. The Reference Designator consists of a letter abbreviation which indicates the type of component followed by the number assigned to that part (C101, Q101, etc). Common Reference Designator abbreviations are listed below.

B	Motor or Synchro	Q	Transistor
C	Capacitor	P	Plug
CJ	Circuit Jumper	R	Resistor
CR	Diode	RT	Thermistor
DS	Lamp	S	Switch
F	Fuse	T	Transformer
FL	Filter	TP	Test Point
I	Integrated Circuit	U	Resistor/Capacitor Network
J	Jack	V	Photocell/Vacuum Tube
L	Inductor	WG	Waveguide
M	Meter	Y	Crystal

3. Part Number Column

   This column contains the King Part Number for each part. Special purpose 999-9999-XX series part numbers may appear in the BOM and are described below.

   1. CR401 999-9999-96 RESERVED

      The Reference Designator CR 401 has been reserved for future use; the assembly does not currently include a CR401.

   2. CR401 999-9999-97 SEE NEXT ASSEMBLY

      CR401 is a part of the electrical circuit but due to assembly or testing requirements is actually part of a different assembly.

   3. CR401 999-9999-98 NOT USED

      The Reference Designator CR401 is available for future assignment. The assembly does not currently include a CR 401.

   4. CR401 999-9999-99 DO NOT USE

      The Reference Designator CR401 has been previously used for this assembly and later deleted. It may not be reassigned on this assembly.

5. I401 999-9999-90 REF SFTWARE SET

I401 is a programmed memory device. Refer to Section 8, Software Device Part Number Designation.

4. Description Column

This column contains the description of each part in the assembly. Common abbreviations which may appear in this column are listed below.

AL	Aluminum	MY	Mylar
ASSY	Assembly	PC	Polycarbonate
BIFLR	Bifilar	PF	Precision Film
BOM	Bill of Material	PP	Paper
CC	Carbon Composite	PS	Polystrene
CF	Carbon Film	QW	Quarter Watt
CH	Choke	RES	Resistor
CAP	Capacitor	S	Silicon
CR	Ceramic	SCR	Screw
DC	Disc Ceramic	SM	Silver Mica
DIO	Diode	STDF	Standoff
EL	Electrolytic	SW	Switch
EW	Eighth Watt	TERM	Terminal
FC	Fixed Composition	TN	Tantalum
FERR	Ferrite	TST PT	Test Point
FLTR	Filter	TW	Tenth Watt
FT	Feedthru	VA	Variable
HV	High Voltage	WW	Wire Wound
HW	Half Watt	XFMR	Transformer
IC	Integrated Circuit	XSTR	Transistor
MC	Monolithic Ceramic	XTAL	Crystal

5. Assembly (A) Column

An "A" in this column indicates that the part indicated is an assembly. If the KPN and description reads "200-XXXX-99 COMMON BOM" the parts for that assembly are included in the same BOM. The parts breakdown for an assembly with any other KPN will be found in the BOM with the same number.

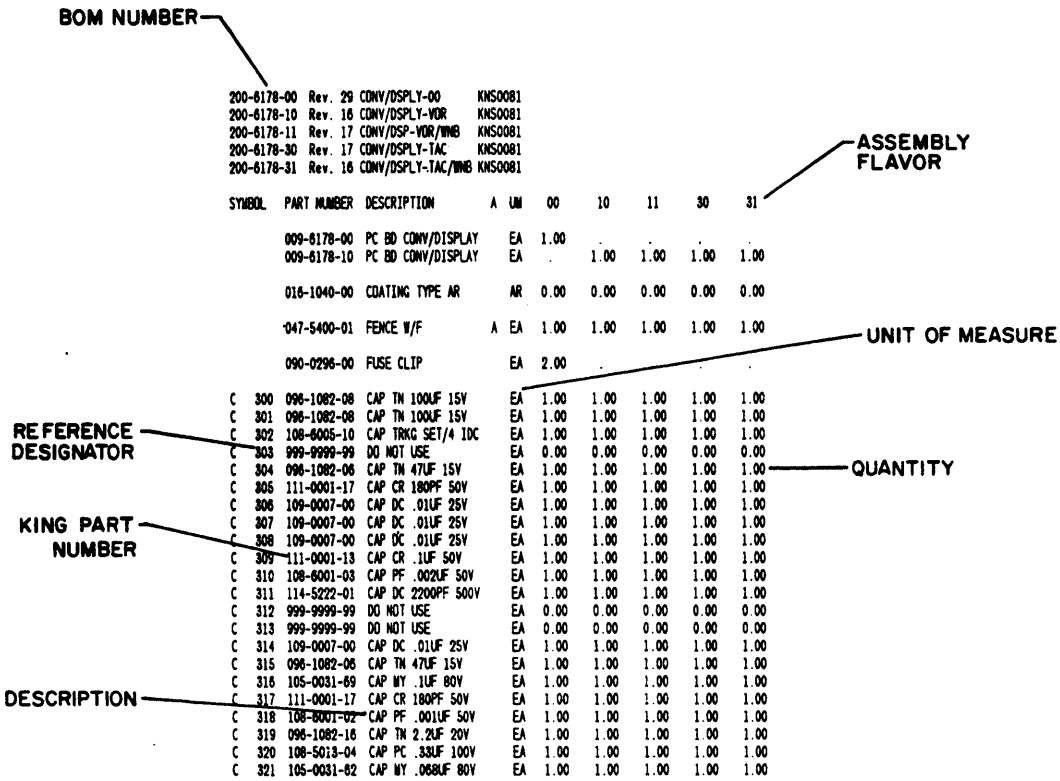
6. Unit of Measure (UM) Column

This column indicates the Unit of Measure for each part. Common abbreviations found in this column are listed below.

EA	Each	RF	For Reference Only
FT	Foot	IN	Inch
AR	As Required		

7. Quantity and Flavor Columns

Individual flavors of an assembly are identified by the last two digits of the KPN. Part quantities for each flavor will be indicated under headings numbered 00 through 99 as required. The parts indicated in the 99 Column are common to all other flavors of the assembly and are considered the Common Bill of Material for the assembly.



200-6178-00 Rev. 29 CONV/DSPLY-00 KNS0081
200-6178-10 Rev. 16 CONV/DSPLY-VOR KNS0081
200-6178-11 Rev. 17 CONV/DSP-VOR/MMB KNS0081
200-6178-30 Rev. 17 CONV/DSPLY-TAC KNS0081
200-6178-31 Rev. 16 CONV/DSPLY-TAC/MMB KNS0081

SYMBOL	PART NUMBER	DESCRIPTION	A	UM	00	10	11	30	31
	009-6178-00	PC BD CONV/DISPLAY		EA	1.00	.	.	.	.
	009-6178-10	PC BD CONV/DISPLAY		EA	.	1.00	1.00	1.00	1.00
	016-1040-00	COATING TYPE AR		AR	0.00	0.00	0.00	0.00	0.00
	047-5400-01	FENCE W/F	A	EA	1.00	1.00	1.00	1.00	1.00
	090-0296-00	FUSE CLIP		EA	2.00	.	.	.	.
C 300	096-1082-08	CAP TN 100UF 15V		EA	1.00	1.00	1.00	1.00	1.00
C 301	096-1082-08	CAP TN 100UF 15V		EA	1.00	1.00	1.00	1.00	1.00
C 302	108-6005-10	CAP TRKG SET/4 IDC		EA	1.00	1.00	1.00	1.00	1.00
C 303	999-9999-99	DO NOT USE		EA	0.00	0.00	0.00	0.00	0.00
C 304	096-1082-06	CAP TN 47UF 15V		EA	1.00	1.00	1.00	1.00	1.00
C 305	111-0001-17	CAP CR 180PF 50V		EA	1.00	1.00	1.00	1.00	1.00
C 306	109-0007-00	CAP DC .01UF 25V		EA	1.00	1.00	1.00	1.00	1.00
C 307	109-0007-00	CAP DC .01UF 25V		EA	1.00	1.00	1.00	1.00	1.00
C 308	109-0007-00	CAP DC .01UF 25V		EA	1.00	1.00	1.00	1.00	1.00
C 309	111-0001-13	CAP CR .1UF 50V		EA	1.00	1.00	1.00	1.00	1.00
C 310	108-6001-03	CAP PF .002UF 50V		EA	1.00	1.00	1.00	1.00	1.00
C 311	114-5222-01	CAP DC 2200PF 500V		EA	1.00	1.00	1.00	1.00	1.00
C 312	999-9999-99	DO NOT USE		EA	0.00	0.00	0.00	0.00	0.00
C 313	999-9999-99	DO NOT USE		EA	0.00	0.00	0.00	0.00	0.00
C 314	109-0007-00	CAP DC .01UF 25V		EA	1.00	1.00	1.00	1.00	1.00
C 315	096-1082-06	CAP TN 47UF 15V		EA	1.00	1.00	1.00	1.00	1.00
C 316	105-0031-69	CAP MY .1UF 80V		EA	1.00	1.00	1.00	1.00	1.00
C 317	111-0001-17	CAP CR 180PF 50V		EA	1.00	1.00	1.00	1.00	1.00
C 318	108-6001-02	CAP PF .001UF 50V		EA	1.00	1.00	1.00	1.00	1.00
C 319	096-1082-16	CAP TN 2.2UF 20V		EA	1.00	1.00	1.00	1.00	1.00
C 320	108-5013-04	CAP PC .33UF 100V		EA	1.00	1.00	1.00	1.00	1.00
C 321	105-0031-62	CAP MY .068UF 80V		EA	1.00	1.00	1.00	1.00	1.00

FIGURE 6-1 TYPICAL BILL OF MATERIAL

8. Software Configuration Documentation

There are two KPN formats used in the documentation of software in the BOM's.

1. 122-XXXX-RL

   Individual electrically or mask programmed devices use KPN's which are of the format 122-XXXX-RL. This is the programmable device which has the software program in it.

2. 125-XXXX-RL

   Programmed device sets or software sets use KPN's which are of the format 125-XXXX-RL. The 125-XXXX-RL software set is itself a BOM which may contain either a list of (1) one or more 122-XXXX-RL programmed devices or (2) one or more 125-XXXX-RL software sets.

The -RL KPN suffix is a two digit number used to indicate the revision level of software in the programmed device or the revision level of the software set. This suffix is incremented with every revision of the software.

A 125-XXXX-RL KPN is assigned to every unit which uses one or more programmed devices and is referred to as the system software set. The current level system software set KPN is listed in the Final Assembly BOM for the unit. If the unit has only one sub-assembly which uses programmed devices, the system software set 125-XXXX-RL BOM will list one or more 122-XXXX-RL KPN's for the programmed devices on that sub-assembly with their reference designators. If the unit has more than one sub-assembly which uses programmed devices, the 125-XXXX-RL KPN shown in the Final Assembly BOM will list the software sets for these sub-assemblies using 125-XXXX-RL KPN's. These sub-assembly software set KPN's will list one or more 122-XXXX-RL KPN's for the programmed devices used on the sub-assemblies with their reference designators. The 125-XXXX-RL BOM's for the system software set and the sub-assembly software set can be found immediately following the Final Assembly BOM for the unit.

A software configuration tag is located on a permanent exterior surface of a unit containing software. It may be either a separate tag placed close to the serial number tag or a part of the serial number tag. The software configuration tag shows the revision level of the system software set which is contained in the unit. The number shown on the tag corresponds to the -RL suffix of the system software set 125-XXXX-RL for the unit. The number on the tag may indicate the revision level of system software contained in the unit is a lower revision level than that shown as current in the Final Assembly BOM. An example of an software configuration tag is shown below:

When ordering replacement programmed devices, individual programmed devices can be ordered using 122-XXXX-RL KPN's. When a set of programmed devices is required, the set can be ordered using the 125-XXXX-RL KPN. The system software set for the unit can also be ordered using the 125-XXXX-RL KPN. The software configuration tag must be used as the reference for the revision level of the system software set from which KPN's are determined for ordering programmed devices or software sets.

CAUTION

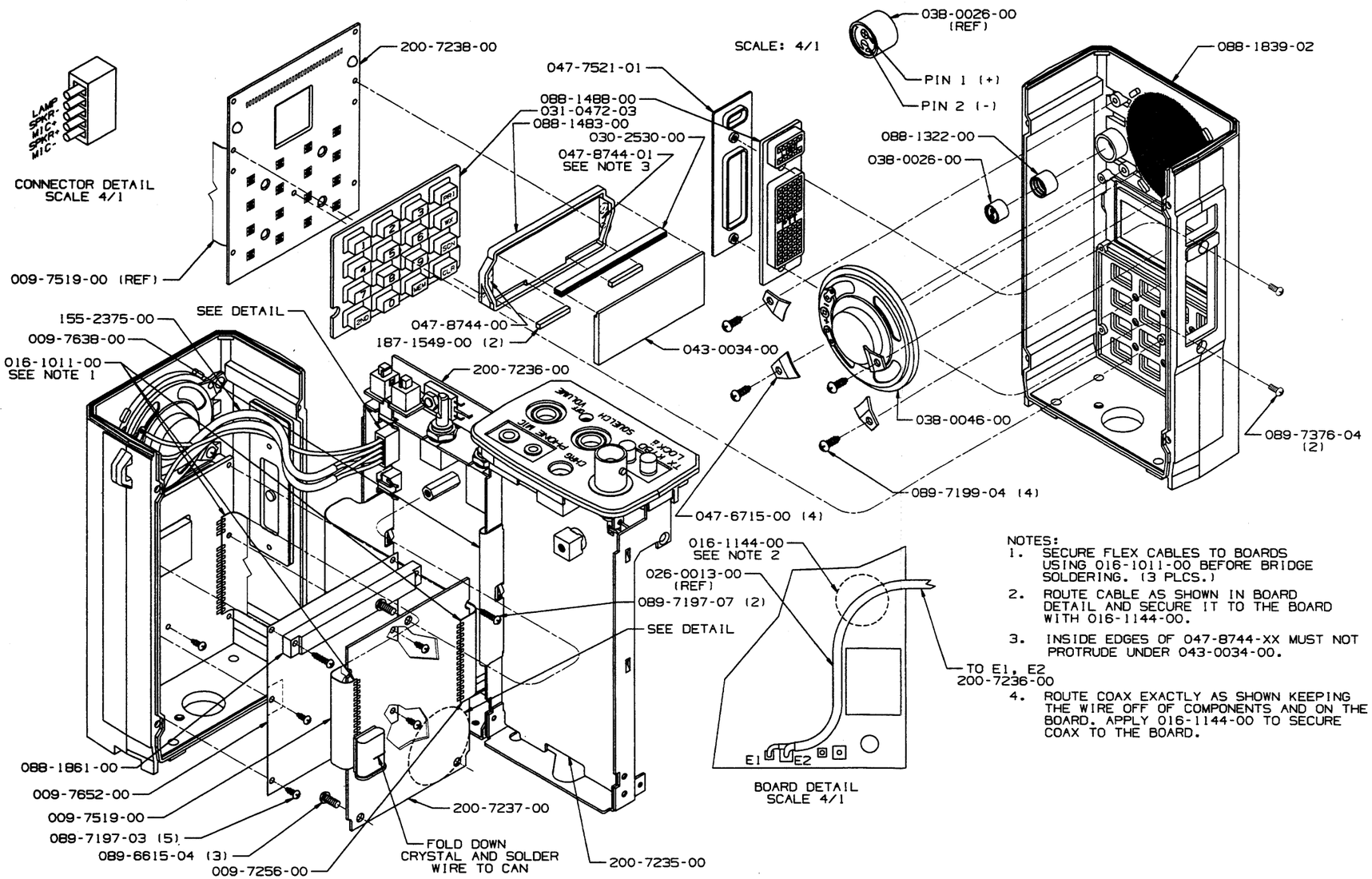
WHEN ORDERING PROGRAMMED DEVICES, CAUTION MUST BE EXERCISED TO INSURE THAT THE CORRECT REVISION LEVEL OF SOFTWARE OR PROGRAMMED DEVICE IS ORDERED TO AVOID POSSIBLE HARDWARE OR SOFTWARE INCOMPATIBILITIES.

069-1026-00 REV 0 AFCT COM/NAV H/H KX 0099
069-1026-01 REV 0 AFCI COM/NAV H/H KX 0099
069-1026-99 REV 7 AFCT COM/NAV H/H KX 0099

SYMBOL	PART NUMBER	DESCRIPTION	A	UM	00	01	99
	009-7256-00	PCBD CBL FLX AUDIO		EA	.	.	1.00
	009-7519-00	PC BD CA FLEX VOR		EA	.	.	1.00
	009-7638-00	PCBD CABLE FLEX RF		EA	.	.	1.00
	009-7652-00	PC BD DSPLY SHLD		EA	.	.	1.00
	012-1416-00	INSULATOR, BOARD		EA	.	.	1.00
	016-1004-00	COMPOUND THRML JNT		AR	.	.	1.00
	016-1011-00	ADH PLIOBOND 20		AR	.	.	1.00
	016-1013-00	VAC GREASE DC 976		AR	.	.	1.00
	016-1144-00	TAK PAK ADV 122-92		AR	.	.	1.00
	026-0030-00	WIRE CU24AWG TIN		IN	.	.	0.60
	030-2530-00	ZEBRA CONNECTOR		EA	.	.	1.00
	031-0472-03	KEYPAD	A	EA	.	.	1.00
	038-0026-00	MIC CARTRIDGE		EA	.	.	1.00
	038-0046-00	SPKR MY 1.562 DIA		EA	.	.	1.00
	043-0034-00	KX 99 LCD		EA	.	.	1.00
	047-6715-00	SPEAKER CLIP		EA	.	.	4.00
	047-6968-01	BATTERY LTCH PLT	A	EA	.	.	1.00
	047-7521-01	PLATE SPRT W/F		EA	.	.	1.00
	047-8744-00	LIGHT BLOCK DIFF		EA	.	.	1.00
	047-8744-01	LIGHT BLOCK DIFF		EA	.	.	1.00
	057-2208-00	FLAVOR STCKR		EA	1.00	.	.
	057-2208-01	FLAVOR STCKR		EA	.	1.00	.
	057-3346-00	SERIAL TAG		EA	.	.	1.00
	069-1026-99	AFCT COM/NAV H/H	A	EA	1.00	1.00	.
	073-0700-02	REAR HSG W/PNT	A	EA	.	.	1.00
	076-1957-01	SPACER, HEX M2X.40		EA	.	.	3.00
	088-1322-00	BUSHING MICROPHONE		EA	.	.	1.00
	088-1482-02	KNOB CONT CMPLT	A	EA	.	.	2.00
	088-1483-00	DIFFUSER LIGHT		EA	.	.	1.00
	088-1484-01	PROT CAP KX 99		EA	.	.	1.00
	088-1488-00	BOOT PTT/LIGHT		EA	.	.	1.00
	088-1839-02	FRNT CVR PORTABLE	A	EA	.	.	1.00
	088-1861-00	SUPPORT BAR		EA	.	.	1.00
	089-6615-04	SCR PHD M2.0-.40X4		EA	.	.	6.00
	089-6728-04	SCREW FHP (METRIC)		EA	.	.	4.00
	089-6730-07	SCR FHP (METRIC)		EA	.	.	4.00
	089-7071-05	PHP M2.5-4.5X5 BK		EA	.	.	1.00
	089-7197-03	SCR ST M1.4X0.45		EA	.	.	5.00
	089-7197-07	SCR ST M1.4X0.45		EA	.	.	2.00
	089-7198-10	SCR ST M2.0X0.50		EA	.	.	4.00
	089-7199-04	SCR ST M 2.0X0.60		EA	.	.	4.00
	089-7376-04	MET SCR PHP M2.0X6		EA	.	.	2.00
	089-8108-34	WASHER S-L #3		EA	.	.	1.00
	155-2375-00	CABLE ASSY KX 99		EA	.	.	1.00
	187-1411-00	GASKET O RING		EA	.	.	1.00
	187-1412-00	GASKET TOP VHF7300		EA	.	.	1.00
	187-1413-00	GASKET HSG VHF7300		EA	.	.	1.00
	187-1549-00	SPCR LCD HAND HLD		EA	.	.	2.00

SYMBOL	PART NUMBER	DESCRIPTION	A	UM	00	01	99
	200-7235-00	RX/TX BOARD	A	EA	.	.	1.00
	200-7236-00	AUDIO/SYNTH BD	A	EA	.	.	1.00
	200-7237-00	UPROC/NAV BD	A	EA	1.00	.	.
	200-7237-01	U[ROC/NAV BD	A	EA	.	1.00	.
	200-7238-00	DISPLAY/KEYBOARD	A	EA	.	.	1.00
CR 302	007-4104-00	VARACTOR MV209M6		EA	.	.	1.00
I 701	125-0284-00	KX99 CONTROL	A	EA	.	.	1.00
REF 1	300-3635-00	KX99 FINAL ASSY		RF	.	.	X.

KING
KX 99
HAND HELD NAV/COMM



NOTES:
1. SECURE FLEX CABLES TO BOARDS USING 016-1011-00 BEFORE BRIDGE SOLDERING. (3 PLCS.)
2. ROUTE CABLE AS SHOWN IN BOARD DETAIL AND SECURE IT TO THE BOARD WITH 016-1144-00.
3. INSIDE EDGES OF 047-8744-XX MUST NOT PROTRUDE UNDER 043-0034-00.
4. ROUTE COAX EXACTLY AS SHOWN KEEPING THE WIRE OFF OF COMPONENTS AND ON THE BOARD. APPLY 016-1144-00 TO SECURE COAX TO THE BOARD.

FIGURE 6-2 KX 99 FINAL ASSEMBLY
(Dwg No 300-3635-00 R-3)
(Sheet 1 of 2)

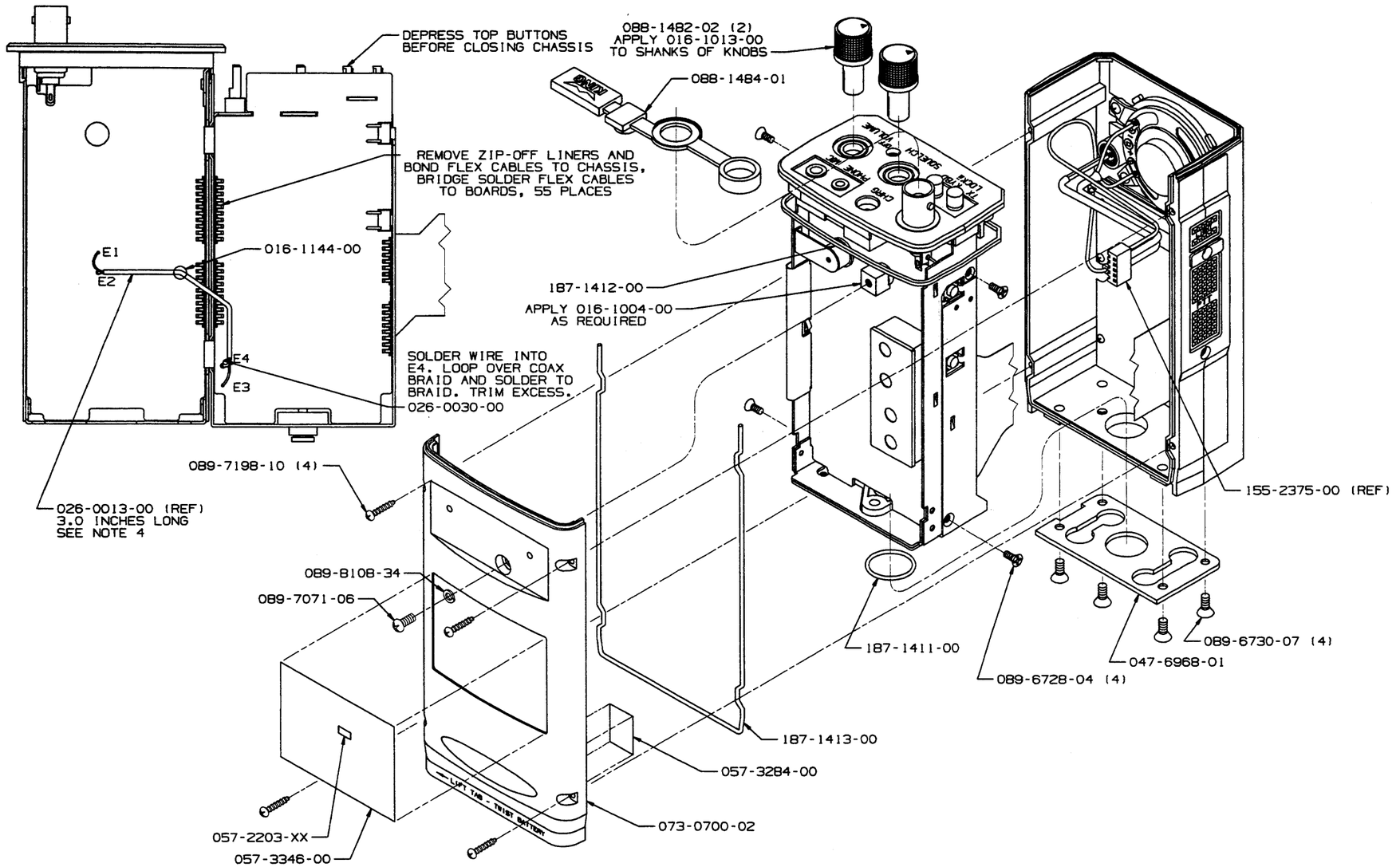


FIGURE 6-2 KX 99 FINAL ASSEMBLY
(Dwg No 300-3635-00 R-3)
(Sheet 2 of 2)

200-7235-00 REV 7 RX/TX BOARD KX 0099

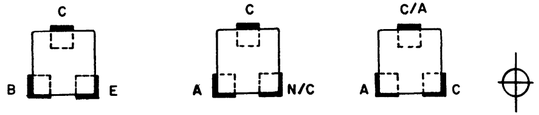
SYMBOL	PART NUMBER	DESCRIPTION	A	UM	00
	009-7235-00	PC BD RX/TX		EA	1.00
	009-7712-00	SHIELD XMTR		EA	1.00
	012-1174-00	INSULATOR		EA	3.00
	016-1021-00	ENCAP 3116 RTV		AR	1.00
	016-1040-00	COATING TYPE AR		AR	1.00
	016-1124-00	FOAM TAPE V1002		AR	1.00
	024-5019-05	WIRE #30 BLUE		IN	3.00
	026-0003-00	WIRE COP TIN 22G		IN	0.50
	047-7334-05	FRAME REAR VHF7300	A	EA	1.00
	047-8288-01	SHIELD, PRES	A	EA	1.00
	047-8290-05	FENCE RF	A	EA	1.00
	047-8293-01	COVER RF	A	EA	1.00
	047-8294-01	FENCE XMTR FILTER		EA	1.00
	047-8295-01	HEAT SINK DRIVER		EA	1.00
	047-8501-01	SHIELD DETECTOR	A	EA	1.00
	076-1768-01	ADPT HEATSINK W/F	A	EA	1.00
	088-1443-03	TOP PLTE HANDHELD		EA	1.00
	088-1481-02	P/BTN W/F	A	EA	2.00
	088-1489-00	SEAL HI/LO/LOCK		EA	1.00
	088-1862-00	SWITCH SEAL		EA	2.00
	089-7376-04	MET SCR PHP M2.0X6		EA	1.00
	091-0320-00	INSUL TO-5		EA	1.00
C 301	999-9999-98	NOT USED		RF	X.
C 302	106-4102-26	CAP CH1KPFNPO 100V		EA	1.00
C 303	106-4390-26	CAP CH39PFNPO/100V		EA	1.00
C 304	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C 305	097-0148-15	CAP EL 10UF		EA	1.00
C 306	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C 307	999-9999-98	NOT USED		RF	X.
C 308	106-4102-26	CAP CH1KPFNPO 100V		EA	1.00
C 309	106-4102-26	CAP CH1KPFNPO 100V		EA	1.00
C 310	999-9999-98	NOT USED		RF	X.
C 311	999-9999-98	NOT USED		RF	X.
C 312	106-4102-26	CAP CH1KPFNPO 100V		EA	1.00
C 313	999-9999-98	NOT USED		RF	X.
C 314	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C 315	106-4103-57	CAP CH 10KX7R/100V		EA	1.00
C 316	106-4103-57	CAP CH 10KX7R/100V		EA	1.00
C 317	106-0072-06	CAP CH5.6PFNPO/50V		EA	1.00
C 318	999-9999-98	NOT USED		RF	X.
C 319	106-4102-26	CAP CH1KPFNPO 100V		EA	1.00
C 320	106-4102-26	CAP CH1KPFNPO 100V		EA	1.00
C 321	106-4102-26	CAP CH1KPFNPO 100V		EA	1.00
C 322	106-4102-26	CAP CH1KPFNPO 100V		EA	1.00
C 323	999-9999-98	NOT USED		RF	X.
C 324	999-9999-98	NOT USED		RF	X.
C 325	999-9999-98	NOT USED		RF	X.
C 326	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C 327	106-4103-57	CAP CH 10KX7R/100V		EA	1.00
C 328	097-0148-13	CAP EL 47UF		EA	1.00
C 329	106-4473-47	CAP CH 47K X7R/50V		EA	1.00
C 330	106-4103-57	CAP CH 10KX7R/100V		EA	1.00
C 331	106-4473-47	CAP CH 47K X7R/50V		EA	1.00
C 332	097-0148-13	CAP EL 47UF		EA	1.00
C 333	999-9999-98	NOT USED		RF	X.
C 334	106-4100-26	CAP CH10PFNPO/100V		EA	1.00
C 335	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C 336	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C 337	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C 338	106-4390-26	CAP CH39PFNPO/100V		EA	1.00

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	00
C	339	106-4103-57	CAP CH 10KX7R/100V		EA	1.00
C	340	106-4103-57	CAP CH 10KX7R/100V		EA	1.00
C	341	106-4102-26	CAP CH1KPFNPO 100V		EA	1.00
C	342	106-4102-26	CAP CH1KPFNPO 100V		EA	1.00
C	343	097-0148-11	CAP EL 22UF		EA	1.00
C	344	106-4470-26	CAP CH47PFNPO/100V		EA	1.00
C	345	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C	346	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C	347	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C	348	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C	349	106-4820-26	CAP CH82PFNPO/100V		EA	1.00
C	350	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C	351	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C	352	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C	353	106-4100-26	CAP CH10PFNPO/100V		EA	1.00
C	354	999-9999-98	NOT USED		RF	X.
C	355	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C	356	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C	357	106-4560-26	CAP CH56PFNPO/100V		EA	1.00
C	358	106-4102-26	CAP CH1KPFNPO 100V		EA	1.00
C	359	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C	360	106-4102-26	CAP CH1KPFNPO 100V		EA	1.00
C	361	106-4560-26	CAP CH56PFNPO/100V		EA	1.00
C	362	999-9999-98	NOT USED		RF	X.
C	363	999-9999-98	NOT USED		RF	X.
C	364	106-4102-26	CAP CH1KPFNPO 100V		EA	1.00
C	365	106-4102-26	CAP CH1KPFNPO 100V		EA	1.00
C	366	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C	367	106-4560-26	CAP CH56PFNPO/100V		EA	1.00
C	368	106-4560-26	CAP CH56PFNPO/100V		EA	1.00
C	369	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C	370	999-9999-98	NOT USED		RF	X.
C	371	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C	372	999-9999-98	NOT USED		RF	X.
C	373	106-4102-26	CAP CH1KPFNPO 100V		EA	1.00
C	374	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C	375	999-9999-98	NOT USED		RF	X.
C	376	106-4330-26	CAP CH33PFNPO/100V		EA	1.00
C	377	106-4100-26	CAP CH10PFNPO/100V		EA	1.00
C	378	102-0054-01	CAP CERAMIC TRIM		EA	1.00
C	379	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C	380	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C	381	106-4471-26	CAPCH470PFNPO/100V		EA	1.00
C	382	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C	383	106-4330-26	CAP CH33PFNPO/100V		EA	1.00
C	384	106-4270-26	CAP CH27PFNPO/100V		EA	1.00
C	385	106-4270-26	CAP CH27PFNPO/100V		EA	1.00
C	386	106-4100-26	CAP CH10PFNPO/100V		EA	1.00
C	387	106-0072-09	CAP CH6.8PFNPO/50V		EA	1.00
C	388	106-0072-06	CAP CH5.6PFNPO/50V		EA	1.00
C	389	999-9999-98	NOT USED		RF	X.
C	390	106-4120-26	CAP CH12PFNPO/100V		EA	1.00
C	391	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C	392	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C	393	106-4183-57	CAP CH 18KX7R/100V		EA	1.00
C	394	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C	395	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C	396	999-9999-98	NOT USED		RF	X.
C	397	999-9999-98	NOT USED		RF	X.
C	398	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C	399	999-9999-98	NOT USED		RF	X.
C	400	106-0072-09	CAP CH6.8PFNPO/50V		EA	1.00
C	401	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C	402	106-4102-26	CAP CH1KPFNPO 100V		EA	1.00
C	403	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C	404	999-9999-98	NOT USED		RF	X.
C	405	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C	406	999-9999-98	NOT USED		RF	X.
C	407	999-9999-98	NOT USED		RF	X.
C	408	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00

SYMBOL	PART NUMBER	DESCRIPTION	A UM	00
CR 301	007-6223-00	DIO DA204K	EA	1.00
CR 302	999-9999-97	USED ON NEXT ASSY	RF	X.
CR 303	007-6223-00	DIO DA204K	EA	1.00
CR 304	007-6223-00	DIO DA204K	EA	1.00
CR 305	007-6223-00	DIO DA204K	EA	1.00
CR 306	999-9999-98	NOT USED	RF	X.
CR 307	007-6240-00	DIO PIN M1301	EA	1.00
CR 308	007-6240-00	DIO PIN M1301	EA	1.00
CR 309	007-6179-00	DIO SI MMBD501	EA	1.00
CR 310	007-6179-00	DIO SI MMBD501	EA	1.00
FL 301	017-0068-01	FILTER XTAL 11.4MH	EA	1.00
FL 302	017-0106-00	FLTR CR 455KHZ	EA	1.00
FL 303	017-0131-00	CERAMIC DSCRMNTR	EA	1.00
I 301	120-3020-01	IC IF AMP SO	EA	1.00
I 302	120-3053-09	LM358D DUAL OP AMP	EA	1.00
I 303	120-3164-01	IC MC3357D	EA	1.00
I 304	120-3361-00	OP AMP SO MC3458	EA	1.00
I 305	120-3020-01	IC IF AMP SO	EA	1.00
J 301	033-0178-00	3.5MM 3 COND JACK	EA	1.00
J 302	033-0150-00	2.5 MM JACK	EA	1.00
J 303	033-0151-00	JACK DC POWER	EA	1.00
J 304	030-0279-00	BNC CONN	EA	1.00
L 301	019-3198-01	VAR COIL 2.5T	EA	1.00
L 302	019-2576-14	IND MIN 3.3. UH	EA	1.00
L 303	019-2576-06	IND MIN .68 UH	EA	1.00
L 304	019-3198-01	VAR COIL 2.5T	EA	1.00
L 305	019-2576-09	IND MIN 1.2 UH	EA	1.00
L 306	019-3198-01	VAR COIL 2.5T	EA	1.00
L 307	019-2576-00	IND MIN .22UH	EA	1.00
L 308	013-0006-01	FERR BEAD	EA	1.00
L 309	013-0006-01	FERR BEAD	EA	1.00
L 310	013-0006-01	FERR BEAD	EA	1.00
L 311	013-0006-01	FERR BEAD	EA	1.00
L 312	999-9999-98	NOT USED	RF	X.
L 313	019-2463-00	INDUCTOR 1/2T	EA	1.00
L 314	019-2576-09	IND MIN 1.2 UH	EA	1.00
L 315	019-2463-05	INDUCTOR 5 1/2T	EA	1.00
L 316	019-2463-04	INDUCTOR 4 1/2T	EA	1.00
L 317	019-2463-04	INDUCTOR 4 1/2T	EA	1.00
L 318	019-2463-06	INDUCTOR 6 1/2T	EA	1.00
L 320	013-0006-01	FERR BEAD	EA	1.00
L 322	019-2576-06	IND MIN .68 UH	EA	1.00
L 330	013-0006-01	FERR BEAD	EA	1.00
Q 301	999-9999-98	NOT USED	RF	X.
Q 302	007-0220-00	XSTR S MPS6568A	EA	1.00
Q 303	007-0536-00	XSTR MMBR920	EA	1.00
Q 304	007-0452-00	XSTR 3N212	EA	1.00
Q 307	007-0179-01	XSTR SOT23 2N3904	EA	1.00
Q 308	007-0179-01	XSTR SOT23 2N3904	EA	1.00
Q 309	007-0195-01	XSTR MPSH10 SOT-23	EA	1.00
Q 310	007-0195-01	XSTR MPSH10 SOT-23	EA	1.00
Q 311	007-0541-00	XSTR RF MXR3866	EA	1.00
Q 312	007-0418-00	XSTR RF SRF3163	EA	1.00
Q 313	007-0538-00	XSTR RF POWER	EA	1.00
Q 314	007-0179-01	XSTR SOT23 2N3904	EA	1.00
R 301	130-5511-23	RES CHIP 510 EW 5%	EA	1.00
R 302	999-9999-98	NOT USED	RF	X.
R 303	130-5101-23	RES CH 100 EW 5%	EA	1.00
R 304	130-5272-23	RES CHIP 2.7KEW5%	EA	1.00
R 305	130-5362-23	RES CHIP 3.6K5%EW	EA	1.00
R 306	130-5513-23	RES CHIP 51K EW 5%	EA	1.00
R 307	130-5513-23	RES CHIP 51K EW 5%	EA	1.00
R 308	130-5513-23	RES CHIP 51K EW 5%	EA	1.00
R 309	130-5182-23	RES CHIP 1.8KEW5%	EA	1.00

SYMBOL	PART NUMBER	DESCRIPTION	A	UM	00
R 310	130-5513-23	RES CHIP 51K EW 5%		EA	1.00
R 311	130-5513-23	RES CHIP 51K EW 5%		EA	1.00
R 312	130-5510-23	RES CHIP 51 EW 5%		EA	1.00
R 313	130-5681-23	RES CH 680 EW 5%		EA	1.00
R 314	130-5153-23	RES CHIP 15K EW 5%		EA	1.00
R 315	130-5201-23	RES CHIP 200EW5%		EA	1.00
R 316	130-5683-23	RES CHIP 68K EW 5%		EA	1.00
R 317	130-5153-23	RES CHIP 15K EW 5%		EA	1.00
R 318	130-5104-23	RES CH 100K EW 5%		EA	1.00
R 319	130-5104-23	RES CH 100K EW 5%		EA	1.00
R 320	999-9999-98	NOT USED		RF	X.
R 321	999-9999-98	NOT USED		RF	X.
R 322	999-9999-98	NOT USED		RF	X.
R 323	999-9999-98	NOT USED		RF	X.
R 324	130-5473-23	RES CHIP 47KEW5%		EA	1.00
R 325	130-5101-23	RES CH 100 EW 5%		EA	1.00
R 326	130-5333-23	RES CHIP 33K EW 5%		EA	1.00
R 327	130-5100-23	RES CH 10 EW 5%		EA	1.00
R 328	999-9999-98	NOT USED		RF	X.
R 329	130-5103-23	RES CH 10K EW 5%		EA	1.00
R 330	130-5101-23	RES CH 100 EW 5%		EA	1.00
R 331	130-5202-23	RES CHIP 2K5%EW		EA	1.00
R 332	130-5103-23	RES CH 10K EW 5%		EA	1.00
R 333	999-9999-98	NOT USED		RF	X.
R 334	999-9999-98	NOT USED		RF	X.
R 335	999-9999-98	NOT USED		RF	X.
R 336	999-9999-98	NOT USED		RF	X.
R 337	999-9999-98	NOT USED		RF	X.
R 338	999-9999-98	NOT USED		RF	X.
R 339	130-5203-23	RES CHIP 20K EW 5%		EA	1.00
R 340	130-5474-23	RES CHIP 470KEW5%		EA	1.00
R 341	130-5123-23	RES CHIP 12K5%EW		EA	1.00
R 342	130-5304-23	RES CHIP 300KEW5%		EA	1.00
R 343	130-5392-23	RES CHIP 3.9KEW5%		EA	1.00
R 344	130-5222-23	RES CHIP 2.2KEW5%		EA	1.00
R 345	130-5101-23	RES CH 100 EW 5%		EA	1.00
R 346	999-9999-98	NOT USED		RF	X.
R 347	130-5182-23	RES CHIP 1.8KEW5%		EA	1.00
R 348	130-5182-23	RES CHIP 1.8KEW5%		EA	1.00
R 349	130-5473-23	RES CHIP 47KEW5%		EA	1.00
R 350	130-5152-23	RES CHIP 1.5KEW5%		EA	1.00
R 351	130-5101-23	RES CH 100 EW 5%		EA	1.00
R 352	130-5562-23	RES CHIP 5.6KEW5%		EA	1.00
R 353	130-5511-23	RES CHIP 510 EW 5%		EA	1.00
R 354	130-5682-23	RES CHIP 6.8KEW5%		EA	1.00
R 355	130-5511-23	RES CHIP 510 EW 5%		EA	1.00
R 356	130-5100-23	RES CH 10 EW 5%		EA	1.00
R 357	130-5152-23	RES CHIP 1.5KEW5%		EA	1.00
R 358	130-5510-23	RES CHIP 51 EW 5%		EA	1.00
R 359	130-5100-23	RES CH 10 EW 5%		EA	1.00
R 360	130-5100-23	RES CH 10 EW 5%		EA	1.00
R 361	130-5510-23	RES CHIP 51 EW 5%		EA	1.00
R 362	999-9999-98	NOT USED		RF	X.
R 363	999-9999-98	NOT USED		RF	X.
R 364	130-5100-23	RES CH 10 EW 5%		EA	1.00
R 365	131-0221-23	RES CF 220 QW 5%		EA	1.00
R 366	130-5471-23	RES CHIP 470EW5%		EA	1.00
R 367	133-0351-04	POTENTIOMETER 10K		EA	1.00
R 368	130-5104-23	RES CH 100K EW 5%		EA	1.00
R 369	130-5102-23	RES CH 1K EW 5%		EA	1.00
R 370	130-5910-23	RES CH 91.0OHMS EW		EA	1.00
R 401	130-5561-23	RES CHIP 560EW5%		EA	1.00
R 402	130-5682-23	RES CHIP 6.8KEW5%		EA	1.00
R 403	130-5100-23	RES CH 10 EW 5%		EA	1.00
R 404	130-5822-23	RES CHIP 8.2KEW5%		EA	1.00
R 405	130-5333-23	RES CHIP 33K EW 5%		EA	1.00
R 406	999-9999-98	NOT USED		RF	X.
R 407	130-5334-23	RES CHIP 330KEW5%		EA	1.00
R 408	130-5474-23	RES CHIP 470KEW5%		EA	1.00
R 409	130-5105-23	RES CHIP 1M EW 5%		EA	1.00

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	00
REF	1	300-7235-00	RX/TX BD ASSY		RF	X.
REF	2	002-7235-00	SCH RX/TX BD		RF	X.
T	301	019-3198-03	VAR COIL 2.5T		EA	1.00
T	302	019-8239-00	XFMR MIXER		EA	1.00
T	303	019-8238-00	XFMR IF XTAL		EA	1.00
T	304	019-8236-00	XFMR IF DET		EA	1.00
T	305	019-3082-00	XFMR BFLR RF 4T		EA	1.00
T	306	019-3026-00	XFMR TW BIFLR 3T		EA	1.00
T	307	019-3026-02	XFMR TW BIFLR		EA	1.00
T	308	019-3338-00	XFMR BFLR RF		EA	1.00
T	310	019-8237-00	XFMR IF		EA	1.00
Y	301	044-0274-00	XTAL 10.945MHZ		EA	1.00



Q3, Q7, Q8, Q9
Q10, Q14

CR9, CR10

CR1, CR3, CR4
CR5

NOTES:

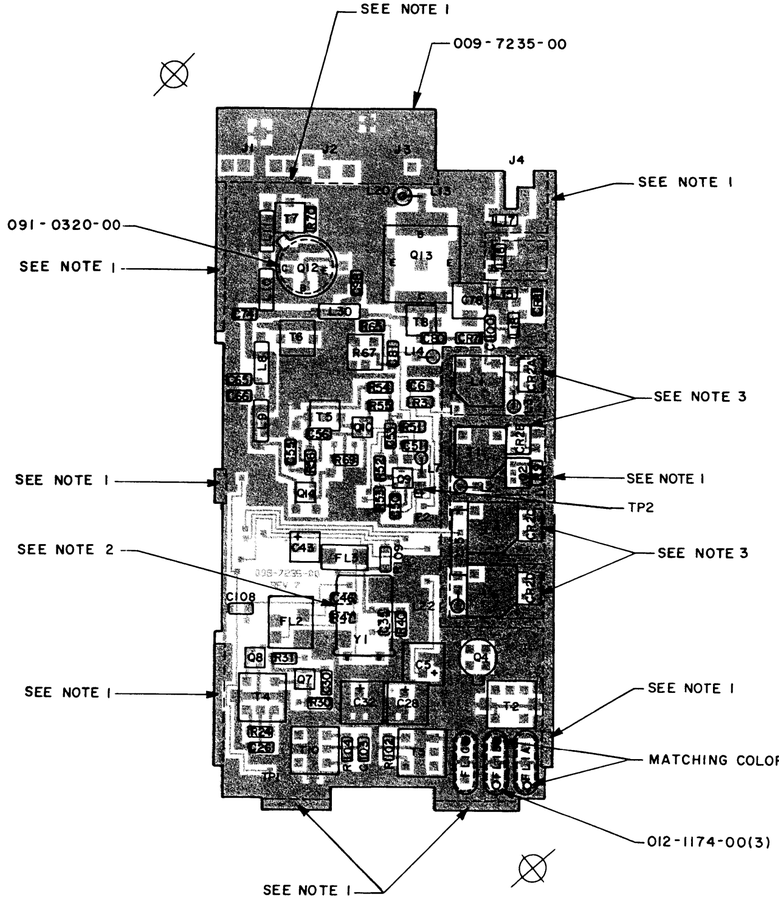
1. PRIOR TO POST COATING BOTH SIDES OF P.C. BOARD WITH KPN 016-1040-00, MASK OFF THE FOLLOWING: ALL "E" NUMBERS, TP1, TP2, R67, C78, T1, L1, L4, L6, T2, T3, T4, T10, Q12, Q13, J1, J2, J3, J4, J5, AND AREAS INDICATED WITH DASHED LINES.
2. C46, R47, C35 ARE LOCATED ON NEARSIDE OF P.C. BOARD UNDER Y1. FOAM TAPE (KPN 016-1124-00) IS STUCK TO Y1 TO PROVIDE INSULATION WHEN BENT OVER THE COMPONENTS.
3. CR2 A,B,C,D, ARE PART OF A MATCHED SET OF 6 DIODES. CR2 E,F ARE ON 200-7236-00.

REWORK NOTES:

A. SOLDER C52 TO THE PAD OF Y1 AND TO THE INDICATED FEED THRU HOLE.

B. INSTALL CR5 UPSIDE DOWN ON PC BOARD AND SECURE WITH 016-1021-00. SOLDER THE CATHODE TO R26. SOLDER ONE END OF 024-5019-05 TO THE ANODE OF CR5 AND THE OTHER END TO THE INDICATED FEED THRU.

NOTE: ADD 300 TO ALL REFERENCE DESIGNATORS.
I.E: R4 = R304
R107 = R407



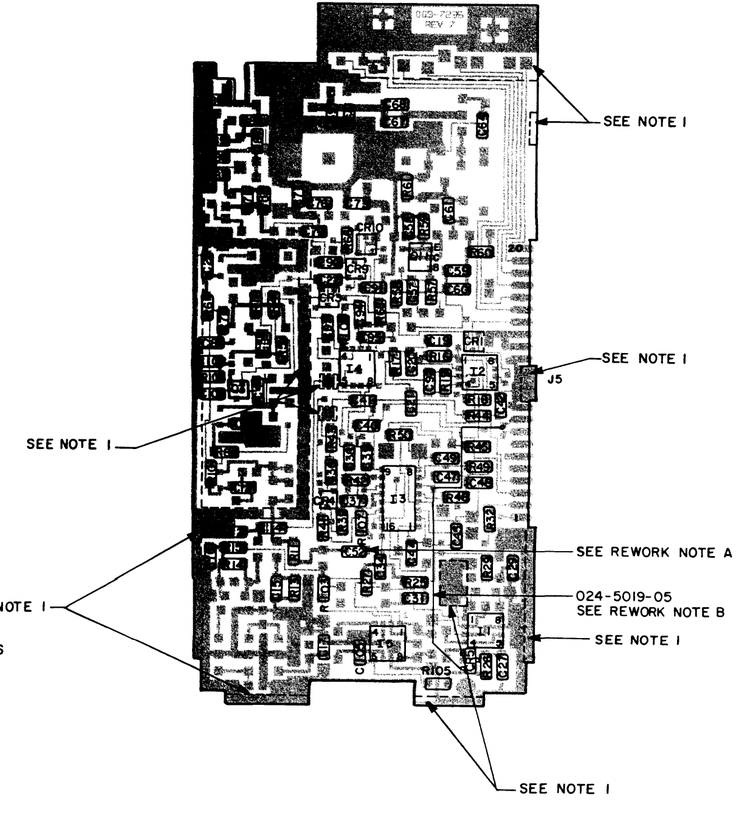
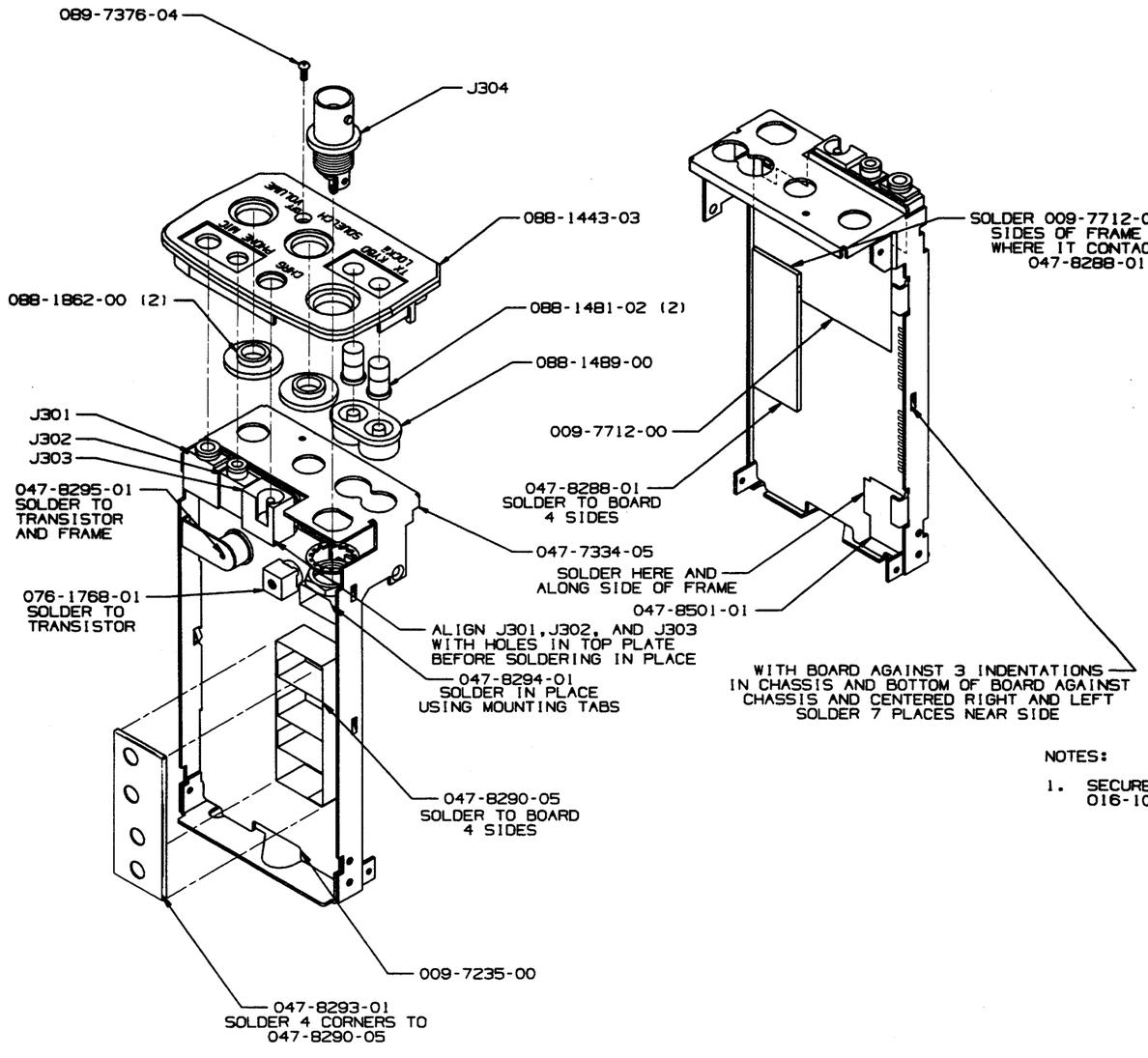


FIGURE 6-3 RECEIVER/TRANSMITTER BOARD ASSEMBLY
(Dwg No 300-7235-00 R-3)
(Sheet 1 of 2)



NOTES:

1. SECURE FERRITE BEADS TO BOARD WITH 016-1011-00.

FIGURE 6-3 RECEIVER/TRANSMITTER BOARD ASSEMBLY
(Dwg No 300-7235-00 R-3)
(Sheet 2 of 2)

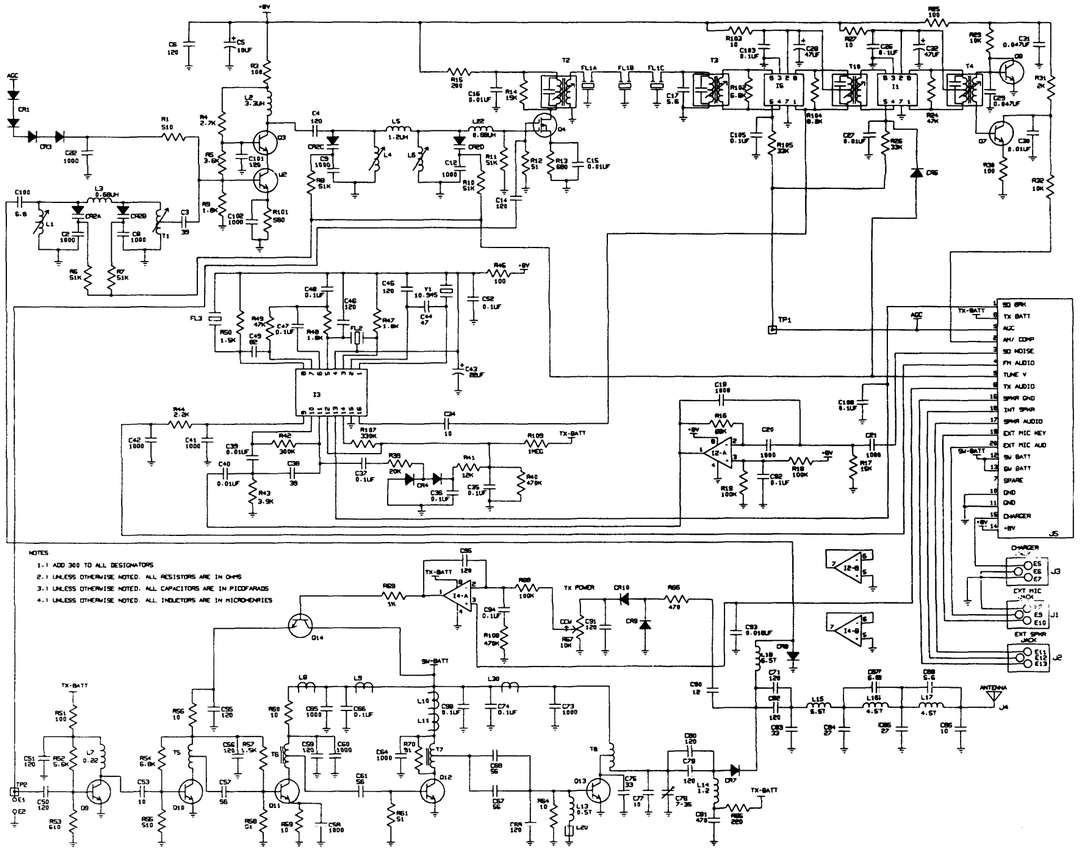


FIGURE 6-4 RECEIVER/TRANSMITTER BOARD SCHEMATIC
(Dwg No 002-7235-00 R-8)

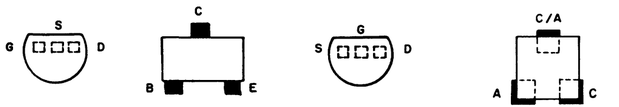
200-7236-00 REV 10 AUDIO/SYNTH BD KX 0099

SYMBOL	PART NUMBER	DESCRIPTION	A	UM	00
	008-0038-00	TERM BIFUR .053L		EA	2.00
	009-7236-00	PC BD AUDIO/SYNTH		EA	1.00
	009-7452-00	PC BD SWITCH		EA	1.00
	009-7714-00	SHIELD, AUDIO BD		EA	1.00
	016-1040-00	COATING TYPE AR		AR	1.00
	025-0067-02	WIRE #24 PVC RED		IN	4.00
	026-0013-00	CA COAX RG-178BU		IN	8.00
	047-6967-05	FRAME W/F	A	EA	1.00
	047-8289-01	FENCE, VCO	A	EA	1.00
	047-8337-01	BOTTOM COVER VCO		EA	2.00
	047-8715-01	SHIELD BUFFER		EA	1.00
	076-1446-00	POSITIVE CONTACT		EA	1.00
	088-1825-00	HOUSING BATT CONT		EA	1.00
	089-6617-06	PHP M2.5-4.5X6		EA	1.00
	089-6728-04	SCREW PHP (METRIC)		EA	2.00
	089-8217-00	LOCK WASHER #2		EA	1.00
	089-8335-00	WSHR CURVED SPRING		EA	1.00
	090-0019-00	RING RTNR .125		EA	1.00
	090-0459-01	NUT HEX M2.5X0.45		EA	1.00
	091-0286-02	INSUL XSTR .687		EA	1.00
C 101	097-0148-15	CAP EL 10UF		EA	1.00
C 102	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C 103	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C 104	999-9999-98	NOT USED		RF	X.
C 105	106-4103-57	CAP CH 10KX7R/100V		EA	1.00
C 106	106-4103-57	CAP CH 10KX7R/100V		EA	1.00
C 107	102-0054-01	CAP CERAMIC TRIM		EA	1.00
C 108	106-4102-26	CAP CH1KPFNPO 100V		EA	1.00
C 109	106-4102-26	CAP CH1KPFNPO 100V		EA	1.00
C 110	097-0148-13	CAP EL 47UF		EA	1.00
C 111	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C 112	097-0148-10	CAP EL 10UF		EA	1.00
C 113	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C 114	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C 115	106-4270-26	CAP CH27PFNPO/100V		EA	1.00
C 116	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C 117	999-9999-98	NOT USED		RF	X.
C 118	999-9999-98	NOT USED		RF	X.
C 119	999-9999-98	NOT USED		RF	X.
C 120	106-4121-26	CAPCH120PFNPO/100V		EA	1.00
C 121	106-4100-26	CAP CH10PFNPO/100V		EA	1.00
C 122	106-4220-26	CAP CH22PFNPO/100V		EA	1.00
C 123	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C 124	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C 125	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C 126	097-0148-12	CAP EL 33UF		EA	1.00
C 127	097-0148-09	CAP EL 47UF		EA	1.00
C 128	097-0148-09	CAP EL 47UF		EA	1.00
C 129	106-4562-57	CAPCH5600PFX7R/100		EA	1.00
C 130	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C 131	999-9999-98	NOT USED		RF	X.
C 132	097-0148-10	CAP EL 10UF		EA	1.00
C 133	097-0109-06	CAP EL 100UF 16V		EA	1.00
C 134	097-0148-11	CAP EL 22UF		EA	1.00
C 135	999-9999-98	NOT USED		RF	X.
C 136	097-0148-25	CAL EL 1UF		EA	1.00
C 137	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	00
C	138	106-4332-47	CAPCH3300PFX7R/50V		EA	1.00
C	139	106-4471-26	CAPCH470PFNP0/100V		EA	1.00
C	140	106-4102-26	CAP CH1KPFNP0 100V		EA	1.00
C	141	097-0148-17	CAP EL 33UF		EA	1.00
C	142	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C	143	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C	144	096-1082-05	CAP TN 10UF 20V		EA	1.00
C	145	106-4103-57	CAP CH 10KX7R/100V		EA	1.00
C	146	106-4183-57	CAP CH 18KX7R/100V		EA	1.00
C	147	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C	148	106-4121-26	CAPCH120PFNP0/100V		EA	1.00
C	149	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C	150	106-4123-57	CAPCH12KPFX7R/100V		EA	1.00
C	151	106-4221-26	CAP CH220PFNP0/100		EA	1.00
C	152	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C	153	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C	154	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C	155	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C	156	106-4101-26	CAPCH100PFNP0/100V		EA	1.00
C	157	097-0148-10	CAP EL 10UF		EA	1.00
CR	103	007-6223-00	DIO DA204K		EA	1.00
CR	104	007-6223-00	DIO DA204K		EA	1.00
CR	105	007-6223-00	DIO DA204K		EA	1.00
CR	106	007-6223-00	DIO DA204K		EA	1.00
CR	107	007-5032-39	DIO Z 1N5352B		EA	1.00
CR	108	007-6223-00	DIO DA204K		EA	1.00
CR	302	999-9999-97	USED ON NEXT ASSY		RF	X.
F	101	036-0057-09	FUSE 275 125V 4A		EA	1.00
I	101	120-3053-09	LM358D DUAL OP AMP		EA	1.00
I	102	120-3361-00	OP AMP SO MC3458		EA	1.00
I	103	120-3129-02	IC LM386N-3		EA	1.00
I	104	120-3220-00	5V REGULATOR		EA	1.00
I	105	120-3192-00	OP AMP MC4558CD		EA	1.00
I	106	120-3389-02	IC REG LP2951		EA	1.00
J	101	030-2617-05	CONN WAFER 2MM 5C		EA	1.00
Q	101	007-0579-00	XSTR 2SK241		EA	1.00
Q	102	007-0195-01	XSTR MPSH10 SOT-23		EA	1.00
Q	104	007-0195-01	XSTR MPSH10 SOT-23		EA	1.00
Q	105	007-8064-16	TSTR DIGITAL SO		EA	1.00
Q	106	007-8064-17	TSTR DIGITAL SO		EA	1.00
Q	107	007-0280-00	XSTR E176/J176		EA	1.00
Q	108	007-0179-01	XSTR SOT23 2N3904		EA	1.00
Q	111	007-0276-01	XSTR MJE170		EA	1.00
Q	112	007-0542-00	XSTR PNP MMBTA64		EA	1.00
Q	113	007-8064-17	TSTR DIGITAL SO		EA	1.00
Q	114	007-8064-17	TSTR DIGITAL SO		EA	1.00
Q	115	007-8064-17	TSTR DIGITAL SO		EA	1.00
Q	116	007-8064-17	TSTR DIGITAL SO		EA	1.00
Q	117	007-8064-17	TSTR DIGITAL SO		EA	1.00
Q	118	999-9999-98	NOT USED		RF	X.
R	101	130-5101-23	RES CH 100 EW 5%		EA	1.00
R	102	130-5331-23	RES CHIP 330 EW5%		EA	1.00
R	103	999-9999-98	NOT USED		RF	X.
R	104	999-9999-98	NOT USED		RF	X.
R	105	999-9999-98	NOT USED		RF	X.
R	106	130-5103-23	RES CH 10K EW 5%		EA	1.00
R	107	130-5103-23	RES CH 10K EW 5%		EA	1.00
R	108	130-5103-23	RES CH 10K EW 5%		EA	1.00
R	109	130-5101-23	RES CH 100 EW 5%		EA	1.00
R	110	130-5101-23	RES CH 100 EW 5%		EA	1.00
R	111	130-5101-23	RES CH 100 EW 5%		EA	1.00
R	112	130-5101-23	RES CH 100 EW 5%		EA	1.00
R	113	130-5393-23	RES CHIP 39K EW 5%		EA	1.00
R	114	130-5123-23	RES CHIP 12K5%EW		EA	1.00

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	00
R	115	130-5304-23	RES CHIP 300KEW5%		EA	1.00
R	116	130-5474-23	RES CHIP 470KEW5%		EA	1.00
R	117	999-9999-98	NOT USED		RF	X.
R	118	130-5102-23	RES CH 1K EW 5%		EA	1.00
R	119	130-5333-23	RES CHIP 33K EW 5%		EA	1.00
R	120	130-5103-23	RES CH 10K EW 5%		EA	1.00
R	121	999-9999-98	NOT USED		RF	X.
R	122	133-0354-00	VOLUME POT 10K		EA	1.00
R	123	130-5512-23	RES CHIP 5.1KEW5%		EA	1.00
R	124	130-5244-23	RES CHIP 240K5%EW		EA	1.00
R	125	130-5754-23	RES CHIP 750KEW5%		EA	1.00
R	126	130-5104-23	RES CH 100K EW 5%		EA	1.00
R	127	130-5363-23	RES CHIP 36KEW5%		EA	1.00
R	128	130-5134-23	RES CHIP 130KEW5%		EA	1.00
R	129	131-0152-13	RES CF 1.5K EW 5%		EA	1.00
R	130	130-5332-23	RES CHIP 3.3KEW5%		EA	1.00
R	131	130-5102-23	RES CH 1K EW 5%		EA	1.00
R	132	130-5224-23	RES CHIP 220K5%EW		EA	1.00
R	133	130-5104-23	RES CH 100K EW 5%		EA	1.00
R	134	130-5204-23	RES CHIP 200KEW5%		EA	1.00
R	135	130-5103-23	RES CH 10K EW 5%		EA	1.00
R	136	130-5104-23	RES CH 100K EW 5%		EA	1.00
R	137	130-5105-23	RES CHIP 1M EW 5%		EA	1.00
R	138	133-0353-01	VOLUME POT SWITCH		EA	1.00
R	139	130-5101-23	RES CH 100 EW 5%		EA	1.00
R	140	130-5151-23	RES CHIP 150EW5%		EA	1.00
R	141	130-5511-23	RES CHIP 510 EW 5%		EA	1.00
R	142	130-5203-23	RES CHIP 20K EW 5%		EA	1.00
R	143	130-5022-23	RES CH 2.2		EA	1.00
R	144	131-0102-13	RES CF 1K EW 5%		EA	1.00
R	145	130-5203-23	RES CHIP 20K EW 5%		EA	1.00
R	146	130-5102-23	RES CH 1K EW 5%		EA	1.00
R	147	130-5474-23	RES CHIP 470KEW5%		EA	1.00
R	148	130-5100-23	RES CH 10 EW 5%		EA	1.00
R	149	130-5512-23	RES CHIP 5.1KEW5%		EA	1.00
R	150	130-5223-23	RES CHIP 22K EW 5%		EA	1.00
R	151	130-5103-23	RES CH 10K EW 5%		EA	1.00
R	152	130-5301-23	RES CHIP 300 EW 5%		EA	1.00
R	153	130-5103-23	RES CH 10K EW 5%		EA	1.00
R	154	130-5183-23	RES CHIP 18KEW5%		EA	1.00
R	155	130-5334-23	RES CHIP 330KEW5%		EA	1.00
R	156	133-0351-08	POTENTIOMETER 220K		EA	1.00
R	157	130-5104-23	RES CH 100K EW 5%		EA	1.00
R	160	130-5623-23	RES CHIP 62KEW5%		EA	1.00
R	161	133-0351-08	POTENTIOMETER 220K		EA	1.00
R	162	130-5104-23	RES CH 100K EW 5%		EA	1.00
R	164	130-5513-23	RES CHIP 51K EW 5%		EA	1.00
R	165	130-5103-23	RES CH 10K EW 5%		EA	1.00
R	166	999-9999-98	NOT USED		RF	X.
R	167	130-5513-23	RES CHIP 51K EW 5%		EA	1.00
R	168	131-0362-13	RES CF 3.6K EW 5%		EA	1.00
R	169	130-5133-22	RES CHIP 13K EW 2%		EA	1.00
R	170	130-5753-22	RES CH 75K EW2%		EA	1.00
R	171	130-5513-23	RES CHIP 51K EW 5%		EA	1.00
R	172	130-5753-23	RES CHIP 75KEW 5%		EA	1.00
R	173	133-0351-07	POTENTIOMETER 100K		EA	1.00
R	174	130-5104-23	RES CH 100K EW 5%		EA	1.00
R	175	130-5104-23	RES CH 100K EW 5%		EA	1.00
R	176	130-5513-23	RES CHIP 51K EW 5%		EA	1.00
R	177	130-5333-23	RES CHIP 33K EW 5%		EA	1.00
R	178	130-5512-23	RES CHIP 5.1KEW5%		EA	1.00
R	179	130-5103-23	RES CH 10K EW 5%		EA	1.00
R	199	130-5103-23	RES CH 10K EW 5%		EA	1.00

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	00
REF	1	300-7236-00	AUDIO/SYNTH ASSY		RF	X.
REF	2	002-7236-00	SCH AUDIO/SYNTH BD		RF	X.
S	102	031-0533-00	SWITCH TACTILE		EA	1.00
S	103	031-0533-00	SWITCH TACTILE		EA	1.00
S	104	031-0532-00	SWITCH LATCHING		EA	1.00
S	105	031-0532-00	SWITCH LATCHING		EA	1.00
T	101	019-3339-00	RF COIL MC131		EA	1.00
T	102	019-3082-00	XFMR BFLR RF 4T		EA	1.00
T	103	019-3082-00	XFMR BFLR RF 4T		EA	1.00



Q1 | Q2,Q4,Q5,Q6,Q8 Q12 THRU Q17 | Q7 | CR3 THRU CR6 CR8

NOTES:

1. PRIOR TO POST COATING BOTH SIDES OF P.C. BOARD WITH KPN 016-1040-00, MASK OFF THE FOLLOWING: FI, J1, J2, J3, R56, R61, R73, T1, C7, ALL "E" NUMBERS, AND AREAS SHOWN WITH DASHES, 3 MOUNTING HOLES.
2. DIMENSIONS IN INCHES, (XX) IN MILLIMETERS.
3. R72 IS SOLDERED TO C3.
4. CR2E AND CR2F ARE PART OF A MATCHING SET OF 6 DIODES. THE OTHER 4 DIODES ARE ON 200-7235-00.

REWORK NOTES:

A. SCRAPE AWAY SOLDER MASK FROM OUTLINED AREA. SOLDER ONE END OF C51 TO FEED THRU HOLE AND THE OTHER END TO SCRAPED AWAY AREA AS INDICATED.

B. SOLDER ONE END OF C8 TO JUNCTION OF R110 & R11. THE OTHER END TO GROUND NEXT TO VCO FENCE.

C. SOLDER R68 INTO THE 2 INDICATED FEED THRUS. RESISTOR BODY MUST MAKE CONTACT WITH THE P.C. BOARD.

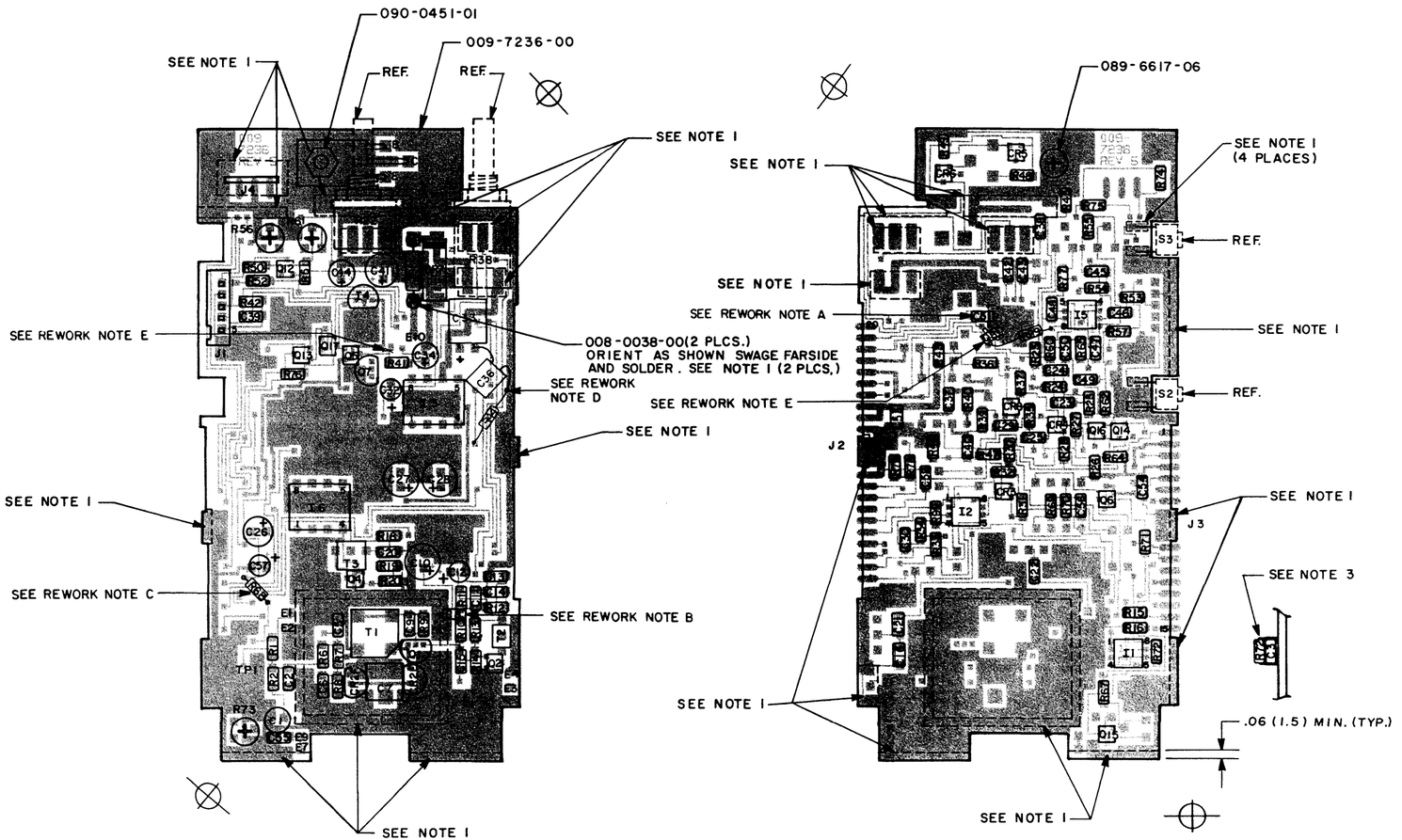
D LAY C33 ON ITS SIDE TO EXPOSE THE LEADS. SOLDER THE - LEAD OF C36 TO THE - LEAD OF C33. SOLDER R44 INTO THE INDICATED FEEDTHRU HOLE AND TO THE + LEAD OF C36.

E SCRAPE AWAY SOLDER MASK FROM OUTLINED AREA. SOLDER COLLECTOR OF Q8 TO INDICATED FEED THRU AND EMITTTER TO SCRAPED AWAY AREA, AND BASE TO INDICATED FEEDTHRU. SOLDEIR ONE END OF R29 TO THE BASE OF Q8 AND THE OTHER END INTO THIE INDICATED FEEDTHRU. R29 MUST LAY FLAT AGAINST THE P.C. BOARD. CUT INDICATED PATH ON NEARSIDE TO ISOLATE FEEDTHRU.

FIGURE 6-5 AUDIO/SYNTHESIZER BOARD ASSEMBLY
(Dwg No 300-7236-00 R-2)
(Sheet 1 of 2)

NOTE: ADD 100 TO ALL REFERENCE DESIGNATORS.

I.E. C5 = C105



NOTES:

1. DO NOT ALLOW SOLDER TO INTERFERE WITH INSTALLATION OF R122 AND R138.

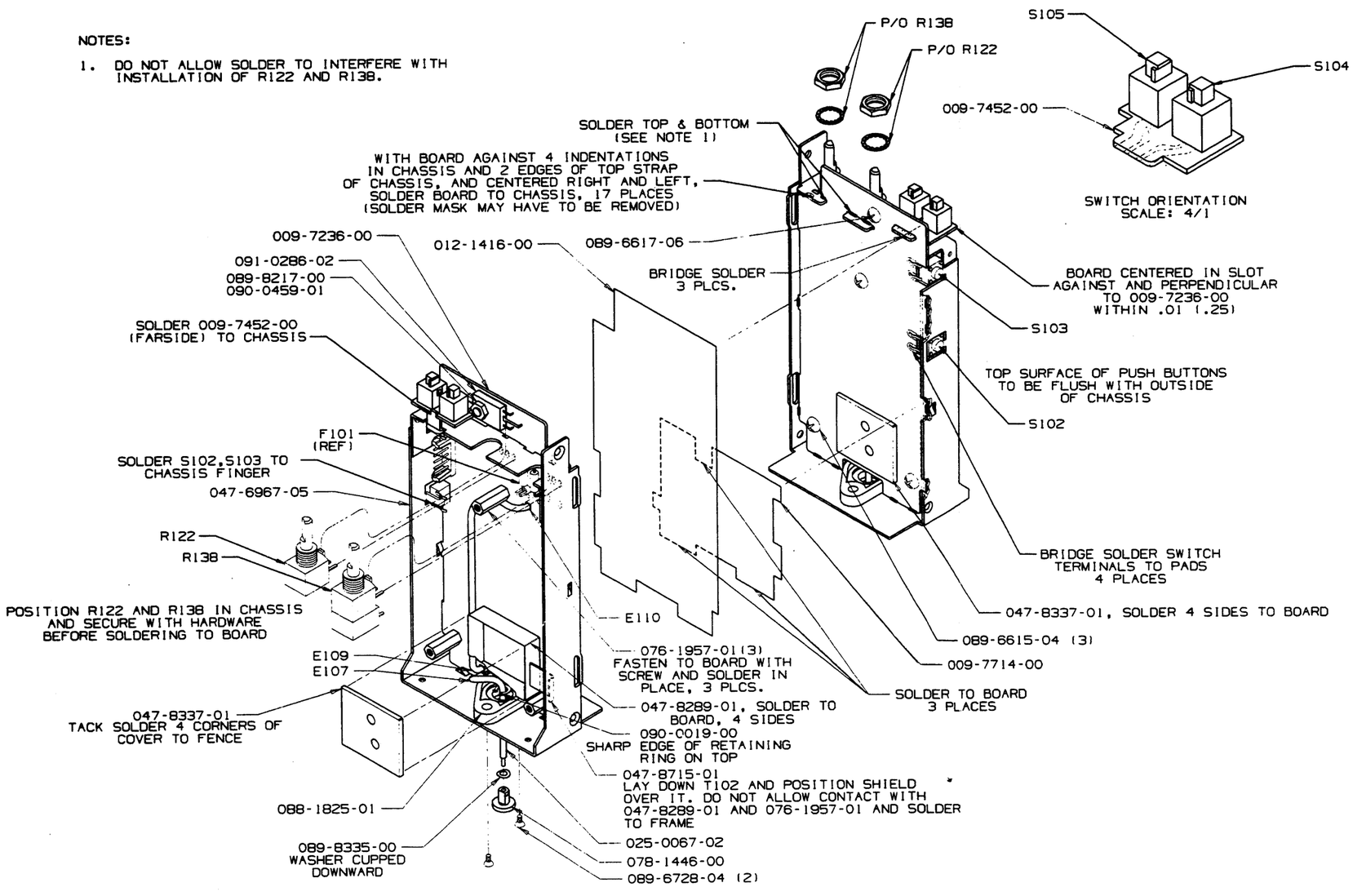
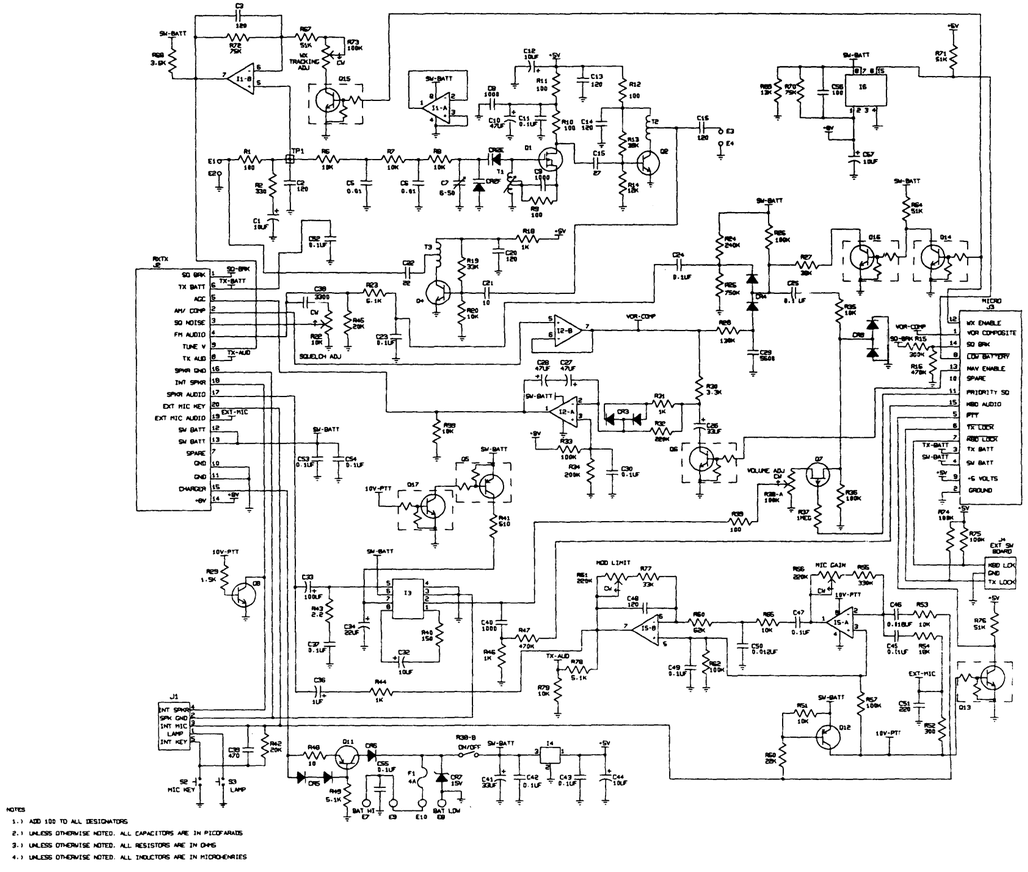


FIGURE 6-5 AUDIO/SYNTHESIZER BOARD ASSEMBLY
(Dwg No 300-7236-00 R-2)
(Sheet 2 of 2)



NOTES
1.) ADD 100 TO ALL DESIGNATORS
2.) UNLESS OTHERWISE NOTED, ALL CAPACITORS ARE IN PICOFARADS
3.) UNLESS OTHERWISE NOTED, ALL RESISTORS ARE IN OHMS
4.) UNLESS OTHERWISE NOTED, ALL INDUCTORS ARE IN MICROHENRIES

FIGURE 6-6 AUDIO/SYNTHESIZER BOARD SCHEMATIC
(Dwg No 002-7236-00 R-11)

200-7237-00 REV 0 UPROC/NAV BD KX 0099
200-7237-01 REV 0 U[ROC/NAV BD KX 0099
200-7237-99 REV 5 UPROC/NAV BD KX 0099

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	00	01	99
		009-7237-00	PC BD UPROC/NAV		EA	.	.	1.00
		016-1124-00	FOAM TAPE V1002		AR	.	.	1.00
		024-5019-05	WIRE #30 BLUE		IN	.	.	1.50
		026-0003-00	WIRE COP TIN 22G		IN	.	.	0.50
		200-7237-99	UPROC/NAV BD	A	EA	1.00	1.00	.
C	701	999-9999-98	NOT USED		RF	.	.	X.
C	702	106-4104-78	CAP CH 100KZ5U/50V		EA	.	.	1.00
C	703	106-4103-57	CAP CH 10KX7R/100V		EA	.	.	1.00
C	704	106-4104-78	CAP CH 100KZ5U/50V		EA	.	.	1.00
C	705	097-0148-10	CAP EL 10UF		EA	.	.	1.00
C	706	106-4104-78	CAP CH 100KZ5U/50V		EA	.	.	1.00
C	707	106-4222-16	CAPCH2200PFNPO/50V		EA	.	.	1.00
C	708	097-0148-25	CAL EL 1UF		EA	.	.	1.00
C	709	106-4222-16	CAPCH2200PFNPO/50V		EA	.	.	1.00
C	710	097-0148-25	CAL EL 1UF		EA	.	.	1.00
C	711	106-4103-57	CAP CH 10KX7R/100V		EA	.	.	1.00
C	712	106-4222-16	CAPCH2200PFNPO/50V		EA	.	.	1.00
C	713	097-0148-25	CAL EL 1UF		EA	.	.	1.00
C	714	106-4822-47	CAPCH.0082MFX7R/50		EA	.	.	1.00
C	715	106-4222-16	CAPCH2200PFNPO/50V		EA	.	.	1.00
C	716	999-9999-98	NOT USED		RF	.	.	X.
C	717	097-0148-25	CAL EL 1UF		EA	.	.	1.00
C	718	106-4104-78	CAP CH 100KZ5U/50V		EA	.	.	1.00
C	719	106-4222-16	CAPCH2200PFNPO/50V		EA	.	.	1.00
C	720	106-4470-26	CAP CH47PFNPO/100V		EA	.	.	1.00
C	721	106-4220-26	CAP CH22PFNPO/100V		EA	.	.	1.00
C	722	106-4470-26	CAP CH47PFNPO/100V		EA	.	.	1.00
C	723	106-4330-26	CAP CH33PFNPO/100V		EA	.	.	1.00
C	724	102-0053-00	CAP VC 6.5PF		EA	.	.	1.00
C	725	106-4333-47	CAP CH 33K X7R/50V		EA	.	.	1.00
C	726	106-4121-26	CAPCH120PFNPO/100V		EA	.	.	1.00
C	727	106-4104-78	CAP CH 100KZ5U/50V		EA	.	.	1.00
C	728	106-4104-78	CAP CH 100KZ5U/50V		EA	.	.	1.00
C	729	106-4470-26	CAP CH47PFNPO/100V		EA	.	.	1.00
C	730	106-4104-78	CAP CH 100KZ5U/50V		EA	.	.	1.00
CR	701	007-6222-00	DIO DAN202K		EA	.	.	1.00
CR	702	007-6222-00	DIO DAN202K		EA	.	.	1.00
I	701	999-9999-97	USED ON NEXT ASSY		RF	.	.	X.
I	702	120-2156-00	16X16 BIT EEPROM		EA	.	.	1.00
I	703	123-4024-03	IC 74HC4024 SO-14		EA	.	.	1.00
I	704	120-3246-00	TLC541IFN AID CONV		EA	.	.	1.00
I	705	120-3192-00	OP AMP MC4558CD		EA	.	.	1.00
I	706	120-6038-03	IC 4046 SO PKG		EA	.	.	1.00
I	707	120-6113-02	MC145158FN		EA	.	.	1.00
I	708	120-0203-00	VHF PRESCALER		EA	.	.	1.00
L	701	019-2572-29	IND MIN 27NH		EA	.	.	1.00
Q	701	007-8064-00	TSTR DIGITAL SO		EA	.	.	1.00
Q	702	007-0542-00	XSTR PNP MMBTA64		EA	.	.	1.00
Q	703	007-0179-01	XSTR SOT23 2N3904		EA	.	.	1.00
Q	704	007-8064-00	TSTR DIGITAL SO		EA	.	.	1.00
Q	705	007-0179-01	XSTR SOT23 2N3904		EA	.	.	1.00
Q	706	007-0195-01	XSTR MPSH10 SOT-23		EA	.	.	1.00
Q	707	007-0065-01	XSTR 2N3906 (SOT)		EA	.	.	1.00
Q	708	007-0065-01	XSTR 2N3906 (SOT)		EA	.	.	1.00

SYMBOL	PART NUMBER	DESCRIPTION	A	UM	00	01	99
R 703	130-5103-23	RES CH 10K EW 5%		EA	.	.	1.00
R 704	130-5104-23	RES CH 100K EW 5%		EA	.	.	1.00
R 705	130-5104-23	RES CH 100K EW 5%		EA	.	.	1.00
R 706	130-5104-23	RES CH 100K EW 5%		EA	.	.	1.00
R 707	130-5103-23	RES CH 10K EW 5%		EA	.	.	1.00
R 708	130-5104-23	RES CH 100K EW 5%		EA	.	.	1.00
R 709	999-9999-98	NOT USED		RF	.	.	X.
R 710	999-9999-98	NOT USED		RF	.	.	X.
R 711	130-5104-23	RES CH 100K EW 5%		EA	.	.	1.00
R 712	130-5104-23	RES CH 100K EW 5%		EA	.	.	1.00
R 713	130-5393-23	RES CHIP 39K EW 5%		EA	.	.	1.00
R 714	130-5273-23	RES CHIP 27K EW 5%		EA	.	.	1.00
R 715	130-5104-23	RES CH 100K EW 5%		EA	.	.	1.00
R 716	130-5184-23	RES CH 180K EW 5%		EA	.	.	1.00
R 717	130-5753-23	RES CHIP 75KEW 5%		EA	.	.	1.00
R 718	133-0351-07	POTENTIOMETER 100K		EA	.	.	1.00
R 719	130-5823-23	RES CHIP 82KEW5%		EA	.	.	1.00
R 720	130-5184-22	RES CH 180K EW 2%		EA	.	.	1.00
R 721	130-5274-22	RES CHIP 270KEW2%		EA	.	.	1.00
R 722	130-5114-22	RES CHIP 110KEW2%		EA	.	.	1.00
R 723	130-5394-23	RES CHIP 390K EW5%		EA	.	.	1.00
R 724	130-5274-22	RES CHIP 270KEW2%		EA	.	.	1.00
R 725	130-5274-22	RES CHIP 270KEW2%		EA	.	.	1.00
R 726	130-5134-22	RES 130K 2% EW		EA	.	.	1.00
R 727	130-5394-23	RES CHIP 390K EW5%		EA	.	.	1.00
R 728	999-9999-98	NOT USED		RF	.	.	X.
R 729	999-9999-98	NOT USED		RF	.	.	X.
R 730	130-5102-23	RES CH 1K EW 5%		EA	.	1.00	.
R 730	999-9999-97	USED ON NEXT ASSY		RF	.	.	X.
R 731	130-5102-23	RES CH 1K EW 5%		EA	1.00	.	.
R 731	999-9999-97	USED ON NEXT ASSY		RF	.	.	X.
R 732	130-5511-23	RES CHIP 510 EW 5%		EA	.	.	1.00
R 733	130-5361-23	RES CHIP 360 EW 5%		EA	.	.	1.00
R 734	130-5333-23	RES CHIP 33K EW 5%		EA	.	.	1.00
R 735	130-5822-23	RES CHIP 8.2KEW5%		EA	.	.	1.00
R 736	130-5681-23	RES CH 680 EW 5%		EA	.	.	1.00
R 737	130-5103-23	RES CH 10K EW 5%		EA	.	.	1.00
R 738	130-5511-23	RES CHIP 510 EW 5%		EA	.	.	1.00
R 739	130-5101-23	RES CH 100 EW 5%		EA	.	.	1.00
R 740	130-5623-23	RES CHIP 62KEW5%		EA	.	.	1.00
R 741	130-5363-23	RES CHIP 36KEW5%		EA	.	.	1.00
R 742	130-5473-23	RES CHIP 47KEW5%		EA	.	.	1.00
R 743	130-5101-23	RES CH 100 EW 5%		EA	.	.	1.00
R 744	130-5473-23	RES CHIP 47KEW5%		EA	.	.	1.00
R 745	130-5220-23	RES CHIP 22 5% EW		EA	.	.	1.00
R 746	130-5220-23	RES CHIP 22 5% EW		EA	.	.	1.00
R 747	130-5102-23	RES CH 1K EW 5%		EA	.	.	1.00
R 748	131-0123-13	RES CF 12K EW 5%		EA	.	.	1.00
REF 1	300-7237-00	UPROC/NAV BD ASSY		RF	.	.	X.
REF 2	002-7237-00	SCH UPROC/NAV BD		RF	.	.	X.
Y 701	044-0272-00	8.975 MHZ X-TAL		EA	.	.	1.00

Q1 THRU Q8 CR1, CR2

NOTES:

1. PRIOR TO POST COATING BOTH SIDES OF P.C. BOARD WITH KPN 016-1040-00, MASK OFF THE FOLLOWING: TP1, TP2, TP3, J1, J2, E1, C24, R18, E2, 3 MOUNTING HOLES.

2. R30 USED ON -01 RADIO
   R31 USED ON -00 RADIO

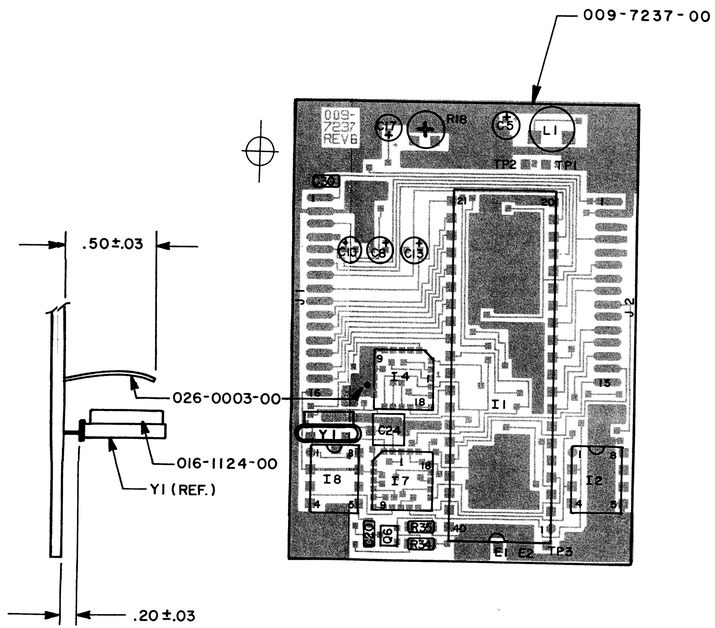
REWORK NOTES:

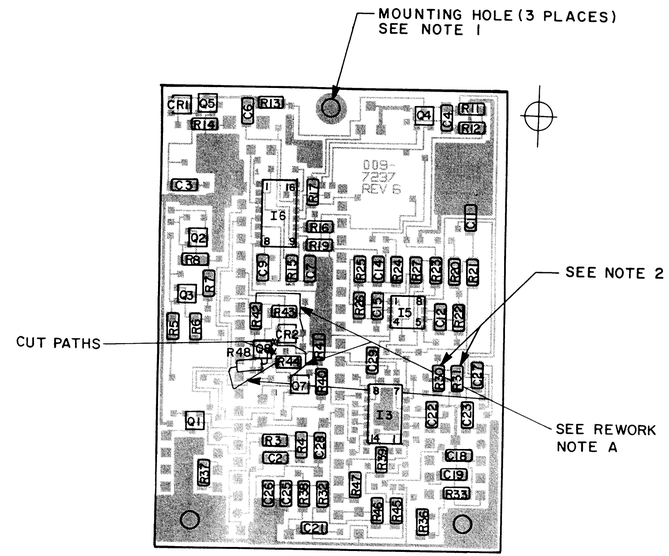
A. ISOLATE THE COLLECTOR OF Q8 BY CUTTING 2 TRACES SHOWN. SOLDER 024-5019-05 TO R42 AND TO THE INDICATED FEED THRU. SOLDER 024-5019-05 TO ANODE OF CR2 AND TO THE BASE OF Q7. SOLDER R48 TO COLLECTOR OF Q8 AND R44 AS INDICATED AND BEND DOWN CLOSE TO BOARD.

FIGURE 6-7 VOR/MICROPROCESSOR BOARD ASSEMBLY
(Dwg No 300-7237-00 R-0)

NOTE: ADD 700 TO ALL REFERENCE DESIGNATORS.

I.E. R4 = R704





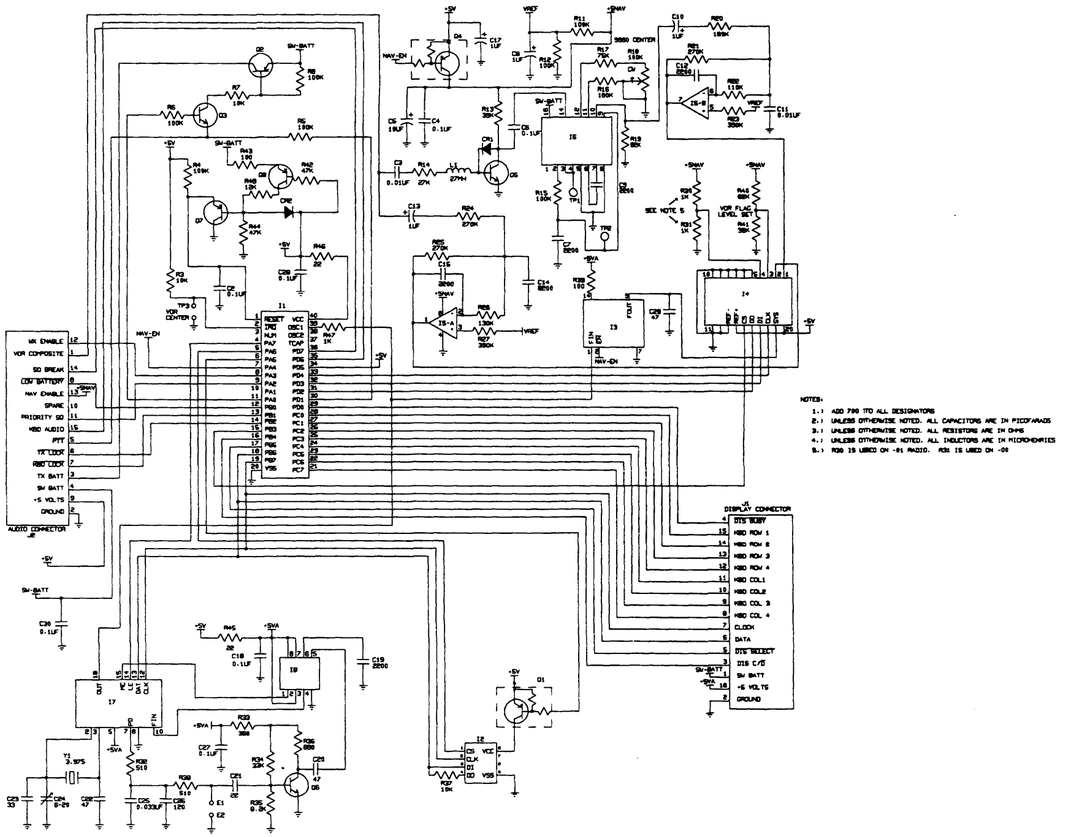


FIGURE 6-8 VOR/MICROPROCESSOR BOARD SCHEMATIC
(Dwg No 002-7237-00 R-8)

200-7238-00 REV 4 DISPLAY/KEYBOARD KX 0099

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	00
		009-7238-00	PC BD DSPL/KEYBD		EA	1.00
		024-5019-05	WIRE #30 BLUE		IN	1.00
C	501	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
C	502	106-4102-57	CAP CH 1K X7R/100V		EA	1.00
C	503	106-4102-57	CAP CH 1K X7R/100V		EA	1.00
C	504	106-4102-57	CAP CH 1K X7R/100V		EA	1.00
C	505	106-4104-78	CAP CH 100KZ5U/50V		EA	1.00
DS	502	037-0027-01	LMP 6802AS15 T1 5V		EA	1.00
DS	503	037-0027-01	LMP 6802AS15 T1 5V		EA	1.00
DS	504	037-0027-01	LMP 6802AS15 T1 5V		EA	1.00
DS	505	037-0027-01	LMP 6802AS15 T1 5V		EA	1.00
DS	506	037-0027-01	LMP 6802AS15 T1 5V		EA	1.00
DS	507	037-0027-01	LMP 6802AS15 T1 5V		EA	1.00
I	501	120-6154-00	LCD DRVR UPD7225		EA	1.00
R	501	130-5204-23	RES CHIP 200KEW5%		EA	1.00
R	502	130-5104-23	RES CH 100K EW 5%		EA	1.00
R	503	130-5104-23	RES CH 100K EW 5%		EA	1.00
R	504	130-5104-23	RES CH 100K EW 5%		EA	1.00
R	505	130-5133-23	RES CHIP 13KEW5%		EA	1.00
R	506	130-5104-23	RES CH 100K EW 5%		EA	1.00
R	507	130-5104-23	RES CH 100K EW 5%		EA	1.00
R	508	130-5102-23	RES CH 1K EW 5%		EA	1.00
R	509	130-5104-23	RES CH 100K EW 5%		EA	1.00
R	510	130-5104-23	RES CH 100K EW 5%		EA	1.00
R	511	130-5104-23	RES CH 100K EW 5%		EA	1.00
R	512	130-5104-23	RES CH 100K EW 5%		EA	1.00
R	513	130-5105-23	RES CHIP 1M EW 5%		EA	1.00
REF	1	300-7238-00	DISPLAY BD		RF	X.
REF	2	002-7238-00	SCH DSPL/KEYBD		RF	X.

NOTES:

1. PRIOR TO POST COATING FARSIDE (LAYER 2) OF P.C. BOARD, MASK ALL OF NEARSIDE (LAYER 1), ALL "E" NUMBERS, ALL HOLES AND DASHED-IN AREAS INDICATED.
   POST COATING MUST BE SMOOTH WITHOUT BUBBLES.

REWORK NOTES:

A. CUT TRACE BETWEEN R6 & R7. SOLDER ONE END OF 024-5019-05 TO R6 AND THE OTHER END TO TERMINAL # 7. SOLDER R.3 ON TOP OF C5.

NOTE: ADD 500 TO ALL REFERENCE DESIGNATORS.

I.E. : R4 = R504

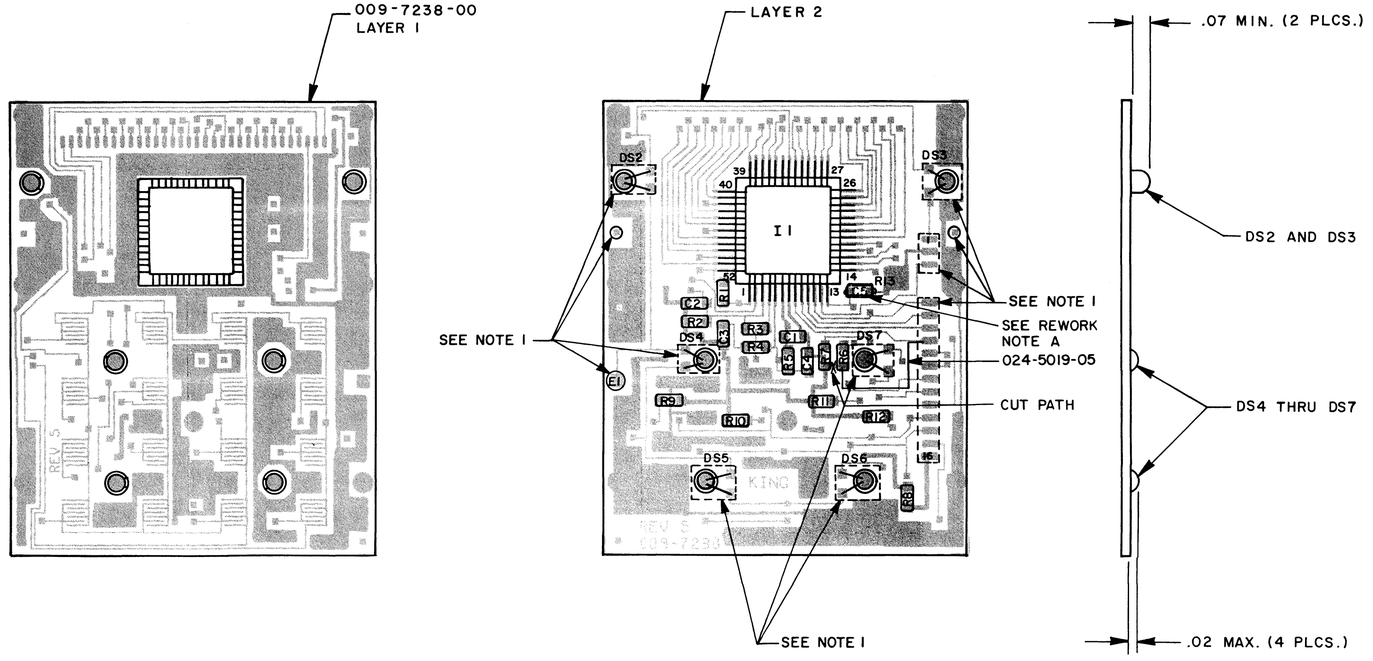
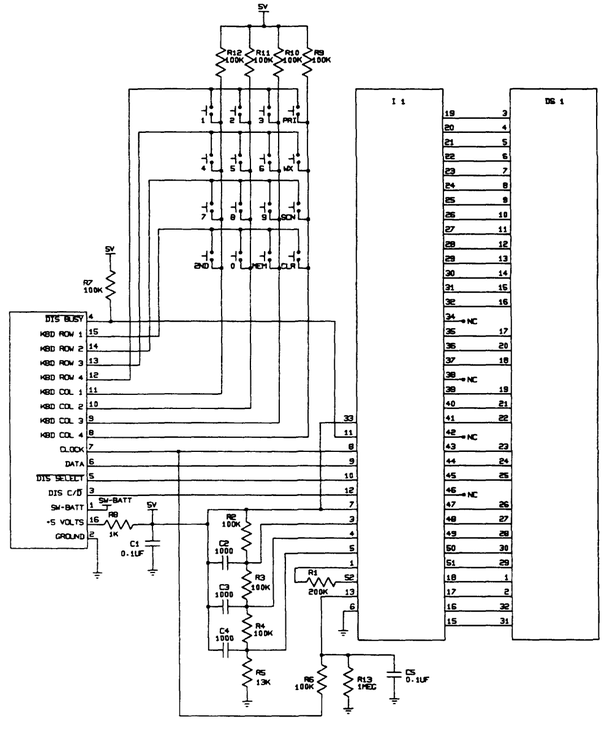


FIGURE 6-9 DISPLAY/KEYBOARD ASSEMBLY
(Dwg No 300-7238-00 R-1)



NOTES

1.) ADD S00 TO ALL DESIGNATORS
2.) UNLESS OTHERWISE NOTED. ALL RESISTORS ARE IN OHMS
3.) UNLESS OTHERWISE NOTED. ALL CAPACITORS ARE IN PICOFARADS
4.) UNLESS OTHERWISE NOTED. ALL INDUCTORS ARE IN MICROHENRIES

FIGURE 6-10 DISPLAY/KEYBOARD SCHEMATIC
(Dwg No 002-7238-00 R-3)