

# 9800 Series

## SERVICE MANUAL ADDENDUM

SMARTNET™/SMARTZONE®/CONVENTIONAL MOBILE

### 9883 800 MHz MOBILE

SMARTNET™/SMARTZONE®/CONVENTIONAL

*13.6 VDC, 15 or 30 Watts*

*806-824 MHz Transmit*

*851-870 MHz Receive*

*Part No. 242-98xx-30x/-50x*



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# **98xx Series**

## **SMARTNET™/SmartZone®/Conventional FM Mobile Radio**

### **Service Manual Addendum**

**13.6 VDC, 806-824 MHz Transmit, 851-870 MHz Receive**  
**Part No. 242-9883-3xx (SMARTNET Only)**  
**Part No. 242-9883-5xx (SMARTNET/SmartZone)**

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## SECTION 1 GENERAL INFORMATION

### 1.1 SCOPE OF MANUAL

This addendum updates the following LTR<sup>®</sup> 9800-series service manual with the additional information needed to service 9800-series SMARTNET<sup>™</sup>/SmartZone<sup>®</sup> transceivers.

**98xx Series UHF/800/900 MHz Service Manual,  
Part No. 001-9800-001**

### 1.2 DIFFERENCES BETWEEN LTR AND SMARTNET/SMARTZONE VERSIONS

#### 1.2.1 HARDWARE DIFFERENCES

The 98xx SMARTNET/SmartZone transceivers use the same basic PC boards and mechanical package used for high tier LTR models. The only change is the addition of a DSP board that mounts on top of the current audio/logic board. This DSP board provides the SMARTNET/SmartZone control and signal processing functions.

Therefore, use the service manual listed above to service all boards except the DSP board. Service and interfacing information for that board is located in Section 5 of this addendum.

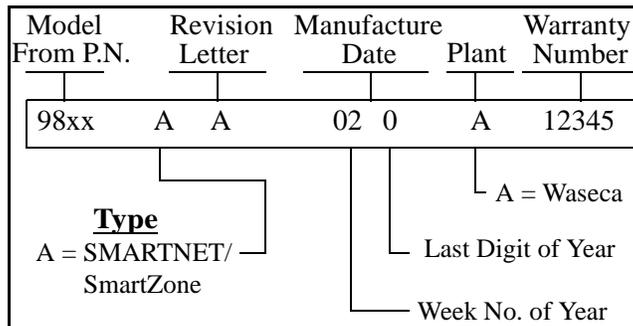
#### 1.2.2 SOFTWARE DIFFERENCES

The audio/logic and DSP board operating software (firmware) is unique to this transceiver. In addition, the programming and tuning software is also different. Therefore, new Operation, Programming, and Alignment sections are included in this manual.

The programming and tuning programs are now Windows<sup>®</sup> based. Therefore, Windows 95, 98, or NT 4 or later is required to run these programs. The programming software is called PCTrunk<sup>™</sup>, and the alignment software is called PCTune<sup>™</sup>. Refer to Sections 1.5.5 and 1.5.6 for more information on programming and alignment.

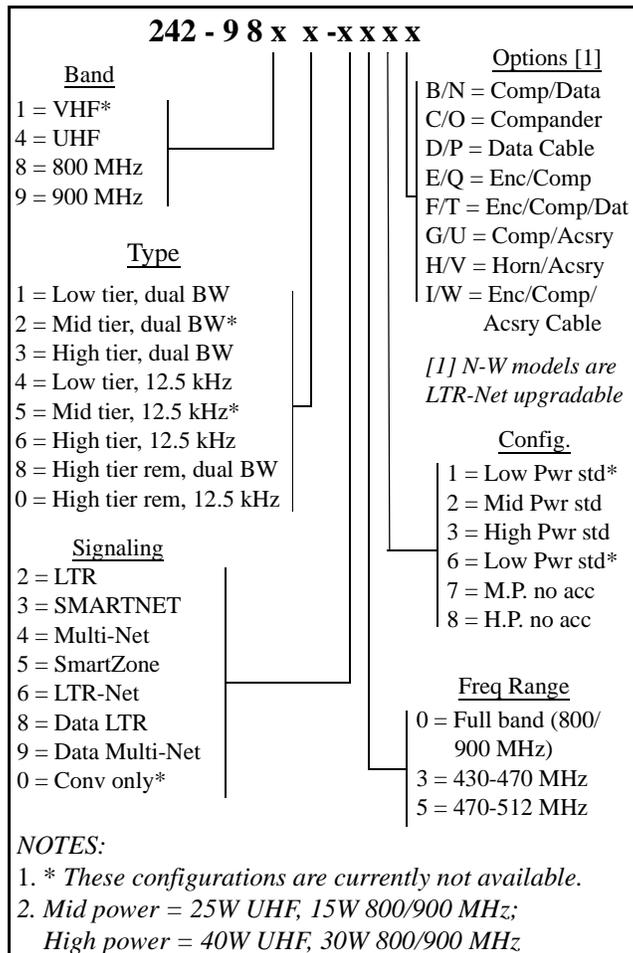
### 1.3 TRANSCEIVER IDENTIFICATION

The transceiver identification (serial) number is printed on a label that is attached to the chassis. The information contained in this number is as follows.



### 1.4 PART NUMBER BREAKDOWN

The following is a breakdown of the part number used to identify this transceiver.



1.5 MISCELLANEOUS

1.5.1 ACCESSORIES

Table 1-1 is a partial listing of accessories that are available for 9800-series transceivers. Refer to this table in the service manual for other accessories that are available.

**Table 1-1 98xx Accessories**

Accessory	Part No.
Optional SMARTNET/SmartZone key cap kit (see Section 1.5.2)	587-9840-105
Programming Accessories	
Remote Programming Interface (RPI)	023-9800-000
Cable, RPI to transceiver	597-2002-200
Cable, RPI to computer, 6 ft. (DB9F to DB9M)	597-5900-002
PCTrunk personality programming software, Win 95/NT, CD-ROM	023-9998-453
PCTune alignment software (see Section 1.5.6)	Contact Cust. Service

1.5.2 KEY CAP KITS

Key Cap Kit, Part No. 587-9840-003, is included with each transceiver. This kit includes the five key caps listed below.

**EMER F1 F2 F3 SCAN**

Optional Key Cap Kit, Part No. 587-9840-105, is also available. This kit includes the key caps shown below.

**F1 F2 F3 F4 SCAN  
 BKLHT MSG HORN C/S DISP  
 PRIED SELSQ MON TGSEL PHONE  
 RESP NUIS STATUS TXPWR (Blank)  
 ALERT EMER RWS TONES (Blank)**

To remove a key cap, insert a tool with a sharp tip in the slot on the bottom of the cap and carefully pry against the front panel to release the cap.

1.5.3 SYSTEMS, CHANNELS, AND ZONES

A zone and channel are selected to place and receive calls. The following describes the relationship between systems, channels, and zones.

Systems

A system as used with this transceiver is a collection of channels (talk groups) belonging to the same repeater site. A system defines all the parameters and protocol definitions required to access a site. Up to 1 conventional system and 15 SmartNet/SmartZone systems can be programmed (16 total). Systems are used for programming purposes only and are not selectable by the user.

Channels

A channel selects a radio channel or talk group in a system as follows:

**Conventional Mode** - A channel selects a specific radio channel, Call Guard (CTCSS/DCS) squelch coding, and other parameters unique to that channel.

**SmartNet/SmartZone Mode** - A channel selects a specific talk group, announcement group, emergency group, and other parameters unique to that channel.

As previously described, a maximum of up to 256 channels can be programmed with the preceding modes. The conventional system can be programmed with up to 256 channels, and each SmartNet/SmartZone system can be programmed with up to 256 talk groups (channels).

Therefore it is theoretically possible to program any combination of these systems that produces up to 256 total channels. However, the maximum number may be limited by the available memory. For example, since more memory is required to program a SmartNet system than a conventional system, the total number of channels decreases as the number of SmartNet systems increases. The programming software displays a bar graph which shows the amount of available memory space that is used by the current data. Refer to Section 3.1.10 for more information.

## Zones

A zone is a collection of up to 16 channels of any type (conventional or SmartNet/SmartZone). For example, a zone could include 12 conventional channels and 4 SmartNet channels. Zones are similar to banks used in other EFJohnson transceivers. One use of zones may be to program the channels used for operation in a specific geographical area. Up to 16 zones can be programmed.

### 1.5.4 NPSPAC MODELS

All 800 MHz models meet the stricter specifications established by NPSPAC (National Public Safety Panel Advisory Committee) for public safety frequencies from 821-824 and 866-869 MHz. Maximum deviation on NPSPAC channels is 4 kHz, and it is automatically changed to the level set for NPSPAC channels when one of these channels is selected.

### 1.5.5 PROGRAMMING

The transceiver is programmed using a PC-compatible computer, the EFJohnson Remote Programming Interface (RPI), and the PCTrunk™ programming software (see Table 1-1). Programming is described in Section 3. The operating software (firmware) is Flash upgradable if required. Keypad programming is not available with this transceiver.

### 1.5.6 TRANSCEIVER ALIGNMENT

Transceiver alignment is performed using the same computer and RPI used to perform programming (see preceding section) and special PCTune™ software. Only three adjustments are made manually and the rest are made electronically using the PCTune software. Therefore, if the manual adjustments do not require readjustment, the transceiver can be tuned without removing the top cover to access internal adjustments. Refer to Section 4 for more information.

## SECTION 2 OPERATION

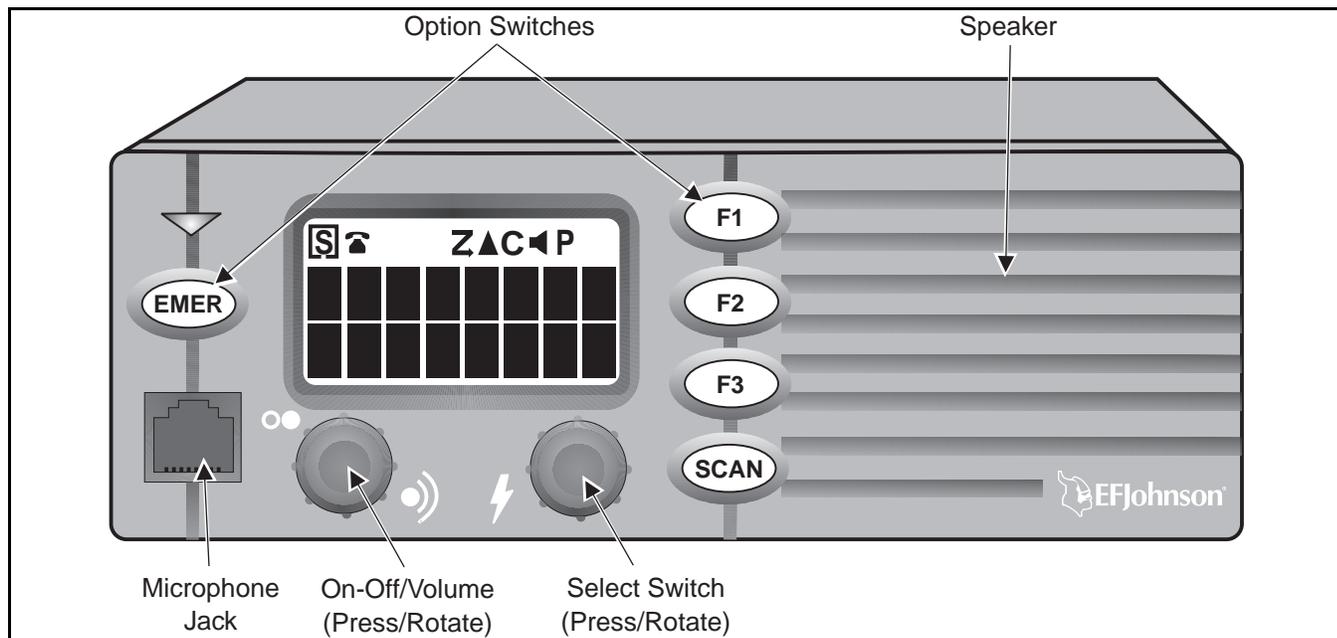


Figure 2-1 Front Panel Controls And Indicators

## 2.1 FEATURES

## 2.1.1 GENERAL FEATURES

- Up to 16 zones with home zone select
- Up to 16 channels per zone (256 channels total)
- Standard and radio-wide scan
- Five programmable option switches
- Time-out timer
- 16-character LCD alphanumeric display with 8 status annunciators

## 2.1.2 CONVENTIONAL FEATURES

- Up to 256 channels programmable
- Scanning with three user programmable scan lists
- Priority channel sampling when scanning
- Busy channel lockout (transmit disable on busy)
- Monitor mode
- Call Guard<sup>®</sup> (CTCSS/DCS) or carrier squelch control
- Penalty and conversation timers
- Repeater talk-around
- DTMF/ANI signaling
- User selectable high and low power output

2.1.3 SMARTNET<sup>™</sup> II FEATURES

- Up to 256 talk groups programmable
- Group, Enhanced Private Conversation<sup>™</sup>, Private Conversation II<sup>™</sup>, and telephone Calls
- Call Alert<sup>™</sup> (paging)
- Emergency alarms and calls
- Messaging
- Priority monitor scanning with user programmable scan lists
- Failsoft operation
- Dynamic regrouping

2.1.4 SMARTZONE<sup>®</sup> FEATURES

- Site trunking
- Site search
- Site lock/unlock

## 2.2 CONTROLS AND DISPLAY

**On-Off Volume** - Pressing this knob turns power on and off, and rotating it sets the speaker volume (see Section 2.3.2).

**Select Switch** - Rotating this switch increases or decreases the selected channel. It is also used for other functions such as selecting the zone and scrolling through lists. See Section 2.3.5 for more information.

**Option Switches** - The five front panel option switches can be programmed for various functions. Refer to Section 2.3.4 for more information.

**Transmit/Busy Indicator** - Indicates the following conditions:

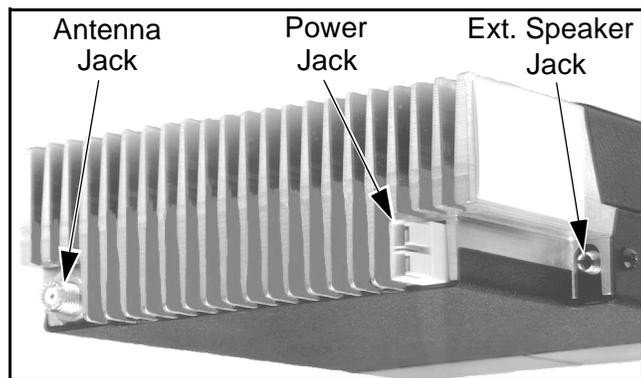
Red - Transmitter is keyed

Green - The currently selected receive channel may be busy because a carrier (signal) is being detected (see Section 2.4.3).

**Microphone Jack** - Connection point for the microphone.

**Microphone Push-To-Talk (PTT) Switch** - Push-button on the microphone which is pressed to key the transmitter.

**Speaker** - The internal speaker is located behind the grille. An optional speaker can be connected to the external speaker jack located on the back. See “Speaker Jack” description in next section for more information.



2.2.1 REAR PANEL JACKS AND CONNECTORS

**Antenna Jack** - Miniature UHF jack for connecting the 50-ohm antenna.

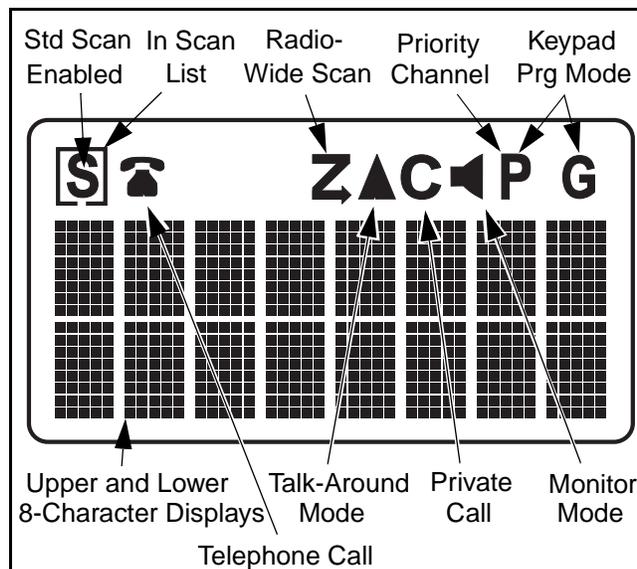
**Power Jack** - Connection point for the power cable which attaches to the vehicle battery. A nominal 12-volt DC, negative ground power source is required.

**Speaker Jack** - Connection point for an optional external 4.7-ohm, 5-watt speaker. The internal speaker

is automatically disabled when a speaker is plugged into this jack.

**Accessory Cable (Not Shown)** - This optional pigtail cable installs in the speaker jack opening and is used to connect the ignition sense input and other outputs.

2.2.2 DISPLAY DESCRIPTION



**Upper 8-Character Display** - This alphanumeric display indicates the channel alias or information about the selected mode. With conventional operation, it may also indicate the channel number or frequency (see Section 2.4.2).

**Lower 8-Character Display** - This alphanumeric display indicates additional information pertaining to the current mode when necessary.

**S** - Indicates that standard scanning is enabled (see Section 2.3.11). Standard and radio wide scanning cannot be enabled at the same time.

 - The box around the “S” indicates that the current conventional or SMARTNET/SmartZone channel is in the standard scan list (Section 2.3.11).

 - With SMARTNET/SmartZone channels only, indicates that the telephone (interconnect) mode is selected (Section 2.5.6).

**Z** - Indicates that radio-wide scan is enabled (see Section 2.3.11).

**▲** - Indicates that repeater talk-around is enabled on the selected conventional channel (see Section 2.4.9).

**C** - Indicates that a SMARTNET/SmartZone private call is occurring (Sections 2.5.4 and 2.5.5).

**🔊** - Indicates that the conventional monitor mode is enabled (Section 2.4.4).

**P** - Indicates that the selected conventional channel is a priority channel (Section 2.4.12).

## 2.3 GENERAL OPERATION

### 2.3.1 INTRODUCTION

This section (2.3) describes features available with both conventional and SMARTNET/SmartZone (trunked) operation. For information on features unique to conventional channels, refer to Section 2.4, and for information on features unique to SMARTNET/SmartZone channels, refer to Section 2.5.

### 2.3.2 TURNING POWER ON AND SETTING VOLUME

Power is turned on and off by pressing the On-Off/Volume switch on the front panel. When power is initially turned on, an alert tone sounds and the radio software version is momentarily displayed. The zone alias is then displayed followed by the unit ID if a SMARTNET/SmartZone channel is selected (see Section 2.5.2). The selected channel is then indicated. When power is turned off, the display may remain on for a few seconds. It is recommended that power not be turned back on again until the display is blank.

The volume level is adjusted by rotating the On-Off/Volume switch. The relative volume level can be determined by noting the position of the index on the knob. You may also be able to enable a reference tone for setting the volume as follows:

- If key press tones are enabled (see Section 2.3.8), a short tone sounds when front panel option keys are pressed.

- If a conventional channel is selected and the Monitor option switch is programmed (see Section 2.4.4), pressing that switch unquelsches/squelches the receiver and either voice or background noise is heard. If a SMARTNET/SmartZone channel is selected, the receiver cannot be manually unquelsched.

### 2.3.3 BACKLIGHT

The backlight for the display and keypad can be manually turned on and off if the Backlight option switch is programmed. Pressing this switch cycles between the Bright, Dim, and Off modes. If this switch is not programmed, the backlight is fixed in one of these modes.

### 2.3.4 OPTION SWITCHES

All five push-button switches on the front panel are programmable for the functions indicated in Table 2-1. If your radio is programmed with both conventional and SMARTNET/SmartZone channels (see Section 2.3.12), these option switches can be programmed to control a different set of functions for each channel type. For example, a switch could select the Monitor Mode when a conventional channel is selected and Private Calls when a SMARTNET/SmartZone channel is selected. If no option switch has been programmed to control a particular function, that function may not be available or in a fixed mode.

### 2.3.5 CHANNEL AND ZONE SELECTION

#### Channel Select

To change the selected channel, rotate the Select switch. The selected channel alias (name) is indicated on the top line of the display. With conventional channels, the channel number or frequency may also be displayed as described in Section 2.4.2.

#### Zone Select

A zone is a group of up to any 16 conventional and SMARTNET/SmartZone channels defined by programming (see Section 1.5.3). Up to 16 zones can be programmed for a total of 16 x 16 or 256 channels. One use of zones may be to select groups of channels programmed for operation in different geographical areas or radio systems. Zones are selected as follows:

1. Press the Zone option switch and the alias (name) of the current zone is indicated on the upper line of the display.
2. Rotate the Select switch to display the desired zone. Then to select that zone and exit this mode, press the Select switch or wait 4 seconds.

zone. To select the home zone, simply press this switch. Then to change the home zone to the currently selected zone, press and hold this switch until a tone sounds (approximately 1 second).

**Table 2-1 Option Switch Functions**

<b>Function [Sugg. Sw. Label]</b>	<b>Conv. Mode</b>	<b>Smart Net Mode</b>	<b>Smart- Zone Mode</b>	<b>See Section</b>
Backlight [BKLHT]	X	X	X	2.3.3
Call Alert [ALERT]		X	X	2.5.7
Call Response [RESP]		X	X	2.5.4, 2.5.5
Displayed Information [DISP]	X			2.4.2
Emergency [EMER]		X	X	2.5.10
High/Low Power [TxPWR]	X			2.4.10
Home Zone	X	X	X	2.3.6
Message [MSG]		X	X	2.5.8
Monitor [MON]	X			2.4.4
Normal/Selective [SELSQ]	X			2.4.6
Phone [PHONE]		X	X	2.5.6
Priority Edit [PRIED]	X			2.4.12
Private Call		X	X	2.5.4, 2.5.5
Radio Wide Scan [RWS]	X	X	X	2.3.11
Repeater Talk-Around	X			2.4.9
Scan [SCAN]	X	X	X	2.3.11
Scan Edit	X	X	X	2.4.11
Site Lock			X	2.5.14
Site Search			X	2.5.14
Status [STATUS]		X	X	2.5.9
Tones On-Off [TONES]	X	X	X	2.3.8
Zone	X	X	X	2.3.5

**2.3.6 HOME ZONE**

The radio can be programmed with a home zone. Then when power is turned on, the radio can be programmed so that either the home zone or last selected zone is automatically selected.

If the Home Zone option switch is programmed, it can be used to quickly select or change the home

**2.3.7 TIME-OUT TIMER**

The time-out timer disables the transmitter if it is keyed for longer than the programmed time. It can be programmed on each channel for times from 15 seconds up to 3 minutes, 45 seconds or disabled (not used). If the transmitter is keyed continuously for longer than the programmed time, the transmitter is disabled and an invalid condition tone sounds. Five seconds before time-out occurs, an alert tone sounds to indicate that time-out is approaching. The timer and tone are reset by releasing the PTT switch.

One use of this feature is to prevent a channel from being kept busy for an extended period by an accidentally keyed transmitter. It can also prevent possible transmitter damage caused by transmitting for an excessively long period. Conventional channels can also be programmed with the Penalty and Conversation timers that are described in Sections 2.4.7 and 2.4.8.

**2.3.8 TONE ENABLE/DISABLE**

The supervisory tones (see Section 2.6) can be enabled and disabled by the Tones On-Off option switch if it is programmed. When tones are enabled by this switch, "TONE ON" is momentarily displayed on the lower line and a tone sounds. Conversely, when tones are disabled, "TONE OFF" is displayed and no tone sounds. If the Tones On-Off option switch is not programmed, tones are fixed in the on or off mode by programming.

**2.3.9 POWER TURN-OFF DELAY**

The transceiver can be installed so that the vehicle ignition switch as well as the front-panel power switch controls transceiver power. This is done by connecting the accessory ignition switch wire to a power source switched by the ignition switch. Power off delays of 0-254 minutes or Forever can then be programmed. This delay can be overridden at any time by turning power off using the front-panel power switch or turning the ignition switch back on.

A turn-off delay allows the radio to remain active for the programmed delay time after the ignition switch is turned off. At the same time, advantages of ignition switch control can be utilized such as preventing battery discharge that may occur if the transceiver is accidentally left on for an extended period.

### 2.3.10 TEMPERATURE AND VOLTAGE MONITORING

#### Excessive Transceiver Temperature

If the internal transceiver temperature becomes excessive, a tone sounds and “HOT” is displayed on the bottom line. Transmit power is then automatically cut back to approximately 1/3 of normal to limit heat generation. When the temperature is no longer excessive, power output automatically returns to normal. This condition may be caused by transmitting for extended periods or operating in a very warm environment.

If the temperature continues rising to the point where serious transceiver damage could result, “TOO HOT” is displayed, a tone sounds, and the transmitter is disabled. The PTT switch must then be released and the temperature drop to the excessive range or lower to transmit again.

#### Low Voltage Conditions

If the voltage applied to the transceiver decreases to the point where improper operation could result, “LO VOLT” is displayed on the bottom line, a tone sounds, and the transmitter is disabled. This condition is usually caused by a discharged vehicle battery. To clear this condition, operate the vehicle to charge the battery or transmit with the vehicle running.

### 2.3.11 SCANNING

#### Introduction

Scanning cycles through a list of channels, called a “scan list”, checking each for messages. When a message is detected that your transceiver is programmed to receive, scanning stops and the message is received. Shortly after the message is complete, scanning resumes (unless it has been disabled). If the microphone off-hook condition is

detected, the microphone must also be on-hook for scanning to occur. An off-hook condition also disables coded squelch as described in Section 2.4.3

There are two basic scan modes: Standard and Radio Wide. The Standard mode is unique to the type of channel selected (conventional or SMARTNET/SmartZone), and the Radio Wide mode is the same regardless of the channel type selected. Only one of these scan modes can be enabled at a time. Therefore, if standard scanning is enabled while radio wide scanning is occurring, radio wide scanning is automatically disabled and vice versa. More information on these modes follows.

#### Standard Scanning

Standard scanning monitors only channels that are the same type as that currently selected. Therefore, if a conventional channel is selected, only conventional channels are scanned, and if a SMARTNET channel is selected, only SMARTNET channels are scanned. Standard scanning is turned on and off by the Scan option switch as follows. If this switch is not programmed, standard scanning is not available.

- To turn standard scanning on, press the Scan option switch. Scanning is enabled when the “**S**” icon is indicated in the upper left corner of the display and SCAN x (conventional) or SCAN ON (SMARTNET/SmartZone) is briefly displayed on the lower line of the display. The “x” is the number of the conventional scan list (1, 2, or 3) that is selected. Refer to Section 2.4.11 for more information.
- To turn scanning off, press the Scan option switch again. The “**S**” icon is then no longer indicated and “SCAN OFF” is briefly displayed.
- If the zone or channel is changed while scanning is selected, scanning continues on the same or a different scan list (see scan list information which follows).

#### Radio Wide Scanning

Radio wide scanning monitors the channels in the preprogrammed radio wide scan list (see information

which follows). This list may contain up to 16 channels of any type (conventional or SMARTNET/SmartZone) assigned to any zone. Radio wide scanning is turned on and off by the Radio Wide Scan option switch as follows. If this switch is not programmed, radio wide scanning is not available.

- To turn radio wide scanning on, press the Radio Wide Scan option switch. The **Z** icon is then displayed continuously and “RWS ON” is displayed briefly on the lower line of the display.
- To turn radio wide scanning off, press the Radio Wide Scan option switch again. The **Z** icon is then no longer indicated and “RWS OFF” is displayed briefly.
- If the zone or channel is changed while radio wide scanning, scanning continues normally.

### Scan Resume Delay

When a message is received or transmitted while scanning, there is a programmable delay before scanning resumes. The delay after receiving a call prevents another message from being received before you can make a response, and the delay after transmitting a call ensures that you hear a response to your call instead of another message occurring on some other channel.

### Standard Mode Scan List

*NOTE: The selected channel is always scanned.*

With conventional operation, up to three scan lists can be programmed. The list that is scanned is selected by the Scan option switch as described on Section 2.4.11. Selecting another conventional channel does not change the current scan list. The scan lists are user programmable if the Scan Edit option switch is programmed (see “Programming a Scan List” which follows).

With SMARTNET/SmartZone operation, each channel can be programmed so that one of up to three different scan lists is automatically selected or scanning is disabled. The scan lists are user programmable if the Scan Edit option switch is programmed (see “Programming a Scan List” which follows).

### Radio Wide Mode Scan List

With radio wide scanning, there is only one preprogrammed scan list available regardless of the type of channel selected, and it is not user programmable.

### Determining Which Channels are in Scan List

With standard conventional scanning, the selected channel is in the current scan list if the box  icon (around “**S**”) is indicated in the upper left corner of the display. Channels in SMARTNET/SmartZone standard scan lists are indicated only when editing a scan list. Channels in the radio wide scan list are not indicated.

### Nuisance Channel Delete

With standard scanning, both conventional and SMARTNET/SmartZone channels can be temporarily deleted from the scan list. This feature is not available with radio wide scanning. Proceed as follows:

*NOTE: The selected channel and conventional priority channels cannot be deleted from the scan list.*

1. While receiving a message on the channel to be deleted, press and hold the Scan option switch until the alert tone sounds (about 1 second).
2. The channel is then deleted and scanning of the remaining channels in the scan list resumes.
3. Deleted channels are added back into the scan list if any of the following occur:
  - Scanning is turned off and then on again using the Scan switch.
  - The selected channel is changed.
  - Transceiver power is turned off and then on again.

### Programming a Scan List

If the Scan Edit option switch is programmed, conventional and SMARTNET/SmartZone standard scan lists can be user programmed as follows:

1. Make sure that both standard and radio wide scanning are off (neither the standard scan “**S**” icon or

radio-wide scan **Z** icon is displayed). Then press the Scan Edit option switch to select the scan list edit mode.

2. With conventional channels, if applicable, select the list to be edited (1-3) by rotating and then pressing the Select switch. The selected list is indicated as “SCAN x”, where “x” is the list number from 1-3. If user programming is disabled on a list, “NO LIST” is momentarily displayed and it cannot be edited.

With SMARTNET/SmartZone channels, the scan list for the selected channel is fixed and cannot be changed. Scanning may also be disabled on the channel in which case “NO LIST” is momentarily displayed and scan list editing is not available.

3. Select the channel you want to add or delete by rotating the Select switch. After the last conventional channel in the current zone is displayed, the first valid channel in the next zone is displayed and vice versa. SMARTNET/SmartZone lists are limited to 16 channels. If an attempt is made to add more than 16, “LIST FULL” is displayed and a channel must be deleted before another can be added.
4. If the selected channel is in the scan list (scanned), the box  icon (around “S”) is indicated in the upper left corner of the display. To change the status of the displayed channel, press the Select switch.

*NOTE: The priority channel cannot be deleted (see “Priority Channel Sampling” description which follows).*

5. To exit this mode and save the changes, press the Scan Edit option switch again.

## 2.3.12 CONVENTIONAL AND SMARTNET/ SMARTZONE OPERATION

### Introduction

Each selectable channel is programmable for either conventional or SMARTNET™/SmartZone® (trunked) operation. For example, Zone 1/Channel 1 could be a conventional channel, Zone 1/Channel 2 a SMARTNET/SmartZone channel, and so on. More information on these modes follows.

### Conventional Operation

This is a non-trunked operation mode which accesses independent radio channels (there is no automatic access to several channels as with trunked operation). Monitoring before transmitting may not occur automatically in this mode, so you may have to manually monitor the channel before transmitting to make sure that it is not being used by anyone else (see Section 2.4.3). Selecting a conventional channel selects a transmit and receive frequency and other parameters such as Call Guard squelch coding.

### SMARTNET/SmartZone Operation

This is a trunked operating mode that uses ID codes to select which mobiles are being called and which calls are received. Monitoring is performed automatically and special messages and tones indicate busy and out-of-range conditions. Enhanced features include roaming (SmartZone only), telephone, private, and emergency calls, Call Alert, and messaging. Operating features unique to SMARTNET/SmartZone channels are described in Section 2.5.

This radio supports only the SMARTNET II trunking protocol. It does not support the SMARTNET I (also referred to as Type I) protocol. When a SMARTNET or SmartZone channel is selected or the radio is powered up on one of those channels, it searches for a control channel and attempts to register on the radio system. Once a control channel is found, the alias (name) of the selected channel is displayed. If a control channel could not be found (because of an out of range condition or the system ID is not correct, for example), “NO SYS” is displayed and the radio continues to search for a control channel.

The control channel transmits and receives system information to and from all radios registered on the system. Therefore, once a control channel is found, it is continuously monitored for incoming call information and is used to make call requests. The radio automatically changes to a traffic channel to place and receive calls and then returns to the control channel when the call is complete.

## 2.4 CONVENTIONAL FEATURES

### 2.4.1 INTRODUCTION

The following information describes features unique to the conventional operating mode (described briefly in Section 2.3.12). Refer to Section 2.3 for information on features common to all operating modes, and to Section 2.5 for information on features unique to the SMARTNET/SmartZone mode.

### 2.4.2 DISPLAY MODE SELECTION

If the Displayed Information option switch is programmed, the display mode used to indicate conventional channels can be user selected. Pressing this switch cycles between the following modes. The selected mode does not change when power is turned off. If the Displayed Information option switch is not programmed, the Alias mode is always used.

**Alias** - The preprogrammed alphanumeric tag for the channel is displayed.

**Number** - The channel number from 1-16 is displayed.

**Frequency** - The receive frequency of the selected channel is displayed in megahertz.

### 2.4.3 MONITORING BEFORE TRANSMITTING

With conventional operation, channels are monitored automatically or manually as follows:

#### Automatic Channel Monitoring

If the selected channel is programmed for the Busy Channel Lockout feature, monitoring is performed automatically. Refer to the description of this feature in Section 2.4.5 for more information.

#### Manual Channel Monitoring

The automatic monitoring just described may not be programmed or it may occasionally disable the transmitter even if the channel is not in use. In this case, the channel must be monitored manually as follows:

**Busy Indicator** - With scanning disabled, note if the Transmit/Busy indicator on the front panel is green. If it is not, the channel is not being used and the call can be transmitted. If it is on, a carrier is being detected, so the channel may be busy (see next paragraph).

**Monitor Mode** - There may be times when the busy indication is displayed even though no one is using the channel. Monitoring should then be performed by disabling Call Guard squelch by taking the microphone off-hook (if off-hook detection is enabled), pressing the Normal/Selective switch as described in on Section 2.4.6, or by selecting the monitor mode as described next.

### 2.4.4 MONITOR MODE

The monitor mode temporarily disables squelch control features (such as Call Guard<sup>®</sup> squelch) so that all messages are heard on the selected channel. It also overrides the Busy Channel Lockout feature (see next section) and temporarily disables scanning.

To monitor the selected channel, select the monitor mode by briefly pressing the MON option switch (if available). The  icon is displayed and the receiver unsquelches when the monitor mode is enabled. To disable the monitor mode and return to normal operation, press the MON switch a second time.

When scanning is enabled, pressing and holding the MON option switch until a tone sounds (approximately 1 second) monitors the scanned channel instead of the selected channel.

### 2.4.5 BUSY CHANNEL LOCKOUT

The Busy Channel Lockout feature (also called Transmit Disable On Busy) automatically disables the transmitter if the channel is busy when the PTT switch is pressed. When a busy condition is detected by this feature, the transmitter is disabled, "BUSY" is indicated on the lower line of the display, and a tone similar to a standard telephone busy tone sounds until the PTT switch is released. This feature is programmed to operate in one of the following modes on each channel:

Off - The transmitter keys even if the channel is busy.

Noise - The transmitter is disabled if any signal is detected on the channel.

Tone - The transmitter is disabled if the detected squelch coding is not correct.

If busy override is permitted by programming, it is possible to transmit even when the transmitter is disabled by this feature. Simply release the PTT switch and then quickly press it again.

## 2.4.6 CALL GUARD SQUELCH

### General

Call Guard<sup>®</sup> squelch (also called CTCSS/DCS signaling) may be programmed on conventional channels. This feature eliminates distracting messages intended for others using the channel by using a subaudible tone or digital code to control the squelch. This tone or code is unique to a user or talk group on that channel. It is transmitted by the mobile placing a call, and if Call Guard squelch is programmed in the mobile receiving the call, it must detect the correct tone or code to receive the call.

### Call Guard Squelch Enable/Disable

To disable Call Guard (Selective) squelch so that all messages on the selected or scanned conventional channels are heard, take the microphone off-hook (if off-hook detection is enabled) or press the Normal/Selective option switch if programmed. Then to re-enable Call Guard squelch, place the microphone back on-hook or press the Normal/Selective switch again.

When Call Guard squelch is disabled by the option switch, "SQ NORM" is flashed on the lower line of the display, and when it is enabled, "SQ SLCT" is flashed. The mode selected by this switch does not change when other channels are selected or power is cycled. Call Guard squelch can also be disabled by the monitor mode described in Section 2.4.4.

## 2.4.7 PENALTY TIMER

A penalty timer may be programmed on conventional channels to prevent transmissions for a time after the time-out timer described in Section 2.3.7 disables the transmitter. The penalty timer starts when

the PTT switch is released after the transmitter has been disabled. If the PTT switch is pressed during the penalty time, the time-out indication occurs again. A beep sounds when the penalty timer expires and the transmitter can then be keyed.

## 2.4.8 CONVERSATION TIMER

A conversation timer can be programmed on conventional channels to limit the total length of a conversation rather than just the length of each transmission as with the time-out timer. This timer is reset when the time between transmissions exceeds the penalty time just described. A warning tone sounds 5 seconds before the conversation timer expires. When it expires, the transmitter is disabled and a warning tone sounds. The transmitter remains disabled for the length of the penalty time, and a beep sounds when it can be keyed again.

## 2.4.9 REPEATER TALK-AROUND

Normally, all transmissions go through a repeater which usually increases range. However, if out of range of the repeater, you cannot talk to anyone else on that channel even though the mobile you are calling may be only a short distance away. To allow communication when this situation occurs, repeater talk-around can be used to allow direct communication with a mobile without going through a repeater.

Repeater talk-around can be selected if the Repeater Talk-Around option switch is programmed. When talk-around is enabled by this switch, the ▲ icon is displayed and "RTA ON" is flashed on the lower line of the display. Then when it is disabled by pressing the switch again, that icon is no longer displayed and "RTA OFF" is flashed. Changing channels or turning power off does not change the selected talk-around mode.

## 2.4.10 POWER OUTPUT SELECT

If the High/Low Power option switch is programmed and power selection is permitted on the current channel by programming, either high or low transmitter power can be selected. Pressing this switch toggles the power setting. The new level is flashed on the lower line of the display when this switch is pressed as "HI POWER" or "LO POWER". If power

selection is not permitted on the current channel, the fixed power level is flashed and no power change occurs. Turning power off or changing channels does not change the power setting selected for a channel.

### 2.4.11 CONVENTIONAL MODE SCANNING

#### General

The following information describes scanning features unique to conventional operation. Scan operation common to all modes is described in Section 2.3.11, and scan operation unique to SMARTNET/SmartZone operation is described in Section 2.5.12.

#### Selecting a Scan List

With conventional standard scanning, one of up to three scan lists can be selected. Scanning is turned on and off and the scan list selected by repeatedly pressing the Scan switch as follows:

1. Press the Scan option switch once to enable scanning and Scan List 1. The “**S**” icon is then indicated in the upper left corner of the display and “SCAN 1” is momentarily displayed on the bottom line.
2. Press the Scan option switch again to select Scan List 2 (if available), and “SCAN 2” is momentarily displayed. Press it again to select Scan List 3 (if available).
3. Pressing the Scan option switch again disables scanning (the “**S**” icon is no longer displayed). If the Scan option switch is pressed again, the cycle repeats.

#### Transmitting in Scan Mode

Each conventional scan list can be programmed for one of the following modes. These modes determine if priority sampling occurs and also the channel on which transmissions occur while scanning. Refer to the next section for more information.

**No Priority** - No priority channel sampling occurs when the list is selected. The radio transmits on the selected channel.

**Priority/Tx Priority** - Priority sampling occurs and the priority channel is the one programmed in the

selected scan list. The radio transmits on the priority channel.

**Priority/Tx Selected** - Priority sampling occurs and the priority channel is the one programmed in the selected scan list. The radio transmits on the selected channel.

**Priority on Selected** - The priority channel is always the selected channel. The radio transmits on the selected channel.

**Talkback** - No priority sampling occurs. The radio transmits on the channel of a call while scanning is halted. Then once scanning resumes, it transmits on the selected channel.

### 2.4.12 PRIORITY CHANNEL SAMPLING

#### General

The priority channel sampling feature ensures that when standard scanning, messages on the priority channel are not missed while listening to a message on some other channel. The transceiver can be programmed so that the priority channel is a fixed channel associated with the current scan list, the currently selected channel, or not used. When the selected channel is a priority channel, “**P**” is indicated in the upper right part of the display.

Priority channel sampling occurs only with Standard conventional scanning. It does not occur with Radio Wide scanning, when listening to any type of SMARTNET/SmartZone call, or when transmitting. A series of “ticks” may be heard when the priority channel is sampled while listening to a message on some other channel.

The priority sampling times are programmed by the following parameters:

**Lookback Time A** - This time determines how often the priority channel is checked for activity. Times of 0.25-4.00 seconds in 0.25-second steps can be programmed.

**Lookback Time B** - This time determines how often the priority channel is checked once an incorrect Call Guard (CTCSS/DCS) code is detected. Since it takes much longer to detect an incorrect Call Guard signal

than a carrier, this time should be relatively long to prevent the interruptions from making a message difficult to understand. Times of 0.5-8.0 seconds can be programmed in 0.5-second steps.

### Changing The Priority Channel

If a specific priority channel is associated with the current scan list, it can be changed if the Priority option switch is programmed. Proceed as follows:

1. Make sure all scanning is off (neither the standard scan “**S**” icon or radio-wide scan **Z** icon is displayed).
2. Select the channel that you want to be the priority channel using the Select switch in the normal manner. If the channel is in a different zone, also select the appropriate zone.
3. Press the Priority option switch and the “**P**” icon is displayed to indicate that the selected channel is now the priority channel.

### 2.4.13 STANDARD CONVENTIONAL CALLS

Standard conventional calls are calls to or from other mobile units on the selected channel. The proper coded Call Guard signaling (see Section 2.4.6) may need to be transmitted for them to receive your call and also for you to receive their calls. Proceed as follows to place and receive these calls:

#### Placing a Standard Conventional Call

1. Turn power on and set the volume as described in Section 2.3.2. Select the channel programmed for the mobile you want to call (see Section 2.3.5).
2. Monitor the channel automatically or manually as described in Section 2.4.3.
3. Press the PTT switch and the call proceeds as follows:
  - If the Busy Channel Lockout feature is programmed on the channel, the transmitter is automatically disabled if the channel is busy (see description in Section 2.4.5).

- Otherwise, busy and out-of-range conditions are not indicated and speaking can begin after monitoring the channel.

4. Press (and hold) the PTT switch to talk and release it to listen.

### Receiving a Standard Conventional Call

1. Select or scan the channel programmed for the call you want to receive (refer to Sections 2.3.11 and 2.4.11 for more scanning information).
2. When the call is received, press the PTT switch to talk and release it to listen. If scanning, you may have to respond before scanning resumes to ensure that the response occurs on the channel of the call.

### 2.4.14 DTMF/ANI SIGNALING

DTMF (Dual Tone Multi-Frequency) tones can be generated manually or automatically for ANI (Automatic Number Identification) and other purposes. The following options may be enabled by programming for each conventional channel:

**DTMF Keypad** - Pressing 0-9, \*, or # on the keypad of an optional DTMF microphone transmits the corresponding tone (the PTT switch must also be pressed if the transmitter does not automatically turn on when a key is pressed).

**Pre-Tx ANI** - A preprogrammed ANI sequence is automatically sent when you press the PTT switch.

**Post-TX ANI** - A preprogrammed ANI sequence is automatically sent each time you release the PTT switch.

**Disabled** - ANI signaling is disabled.

## 2.5 SMARTNET/SMARTZONE FEATURES

### 2.5.1 INTRODUCTION

The following information describes the features unique to the SMARTNET/SmartZone operating mode described briefly in Section 2.3.12. Features common to all operating modes are described in

Section 2.3, and features unique to the conventional mode are described in Section 2.4.

### 2.5.2 VIEWING UNIT ID

Each radio in a SMARTNET system is identified with a system ID and Unit ID. To display the Unit ID, make sure that a SMARTNET/SmartZone channel is selected and then turn power off and then on again. The software version number, current zone, and six-digit Unit ID are then displayed in sequence. The Unit ID is displayed as IDxxxxxx.

### 2.5.3 STANDARD GROUP CALLS

Standard calls are between you and another mobile, group of mobiles, or a control station (a radio at a fixed location). Most calls you make will probably be this type.

#### Placing a Standard Group Call

1. Turn power on and set the volume as described in Section 2.3.2. Select the channel programmed for the talk group you want to call (see Section 2.3.5). A regular or announcement talk group can be selected.
2. Press the PTT switch and when the alert tone sounds, begin talking. Other indications that may occur are as follows:
  - If the busy tone sounds and “BUSY” is displayed, the system is busy. Release the PTT switch and wait for the call back tone to sound. Then press the PTT switch within 3 seconds and begin talking.
  - If a continuous tone sounds while pressing the PTT switch, an out-of-range condition may exist. Drive closer or away from shielding objects and try again.
  - If your unit ID is invalid, the call is being made to an invalid group ID, or group calls are not allowed, “INVALID ID” is displayed and an alert tone sounds.

#### Receiving a Standard Call

When a SMARTNET/SmartZone group call is received, the transceiver can be programmed to

display either the talk group of the incoming call or the ID of the radio making the incoming call. If the ID is in the Trunking Call List, the alias of that mobile is displayed instead of the ID. If neither of these features are programmed, the alias of the selected talk group continues to be displayed when a call is received.

### 2.5.4 ENHANCED PRIVATE CONVERSATION CALLS

#### General

Private calls allow you to place a call to a specific mobile unit. Either the Enhanced Private Conversation™ or Private Conversation II™ modes may be programmed depending on the capabilities of the radio system. Operation in the Enhanced Private Conversation mode is described in the following information, and operation in the Private Conversation II mode is described in Section 2.5.5.

The Private Call option switch is required to place these calls, and either that switch or the Call Response option switch is required to receive them. Proceed as follows.

#### Placing an Enhanced Private Conversation Call

This call is initiated by selecting the unit ID from a call list (list entry) or by directly entering it using the microphone keypad (direct entry). Proceed as follows:

##### List Entry Method

1. With a SMARTNET/SmartZone channel selected, momentarily press the Private Call option switch. The private call mode is then indicated by “C” in the upper part of the display. Then if the last ID called matches an ID in your call list, it is displayed on the lower line and the name is displayed on the upper line. Otherwise, only the last ID called is displayed.
2. Scroll through the private call list by rotating the Select switch until the desired ID is displayed. To cancel the call, press the Private Call switch.
3. Press the PTT switch to initiate the call. The display then indicates the alias of the destination radio. Proceed to the bulleted list following the next method for conditions that may occur next.

Direct Entry Method (With DTMF Microphone Only)

1. With a SMARTNET/SmartZone channel selected, press and hold the Private Call option switch until a tone sounds (approximately 1 second). The last ID called is displayed on the upper line, and the private call mode is indicated by “**C**” in the upper part of the display.
2. Using the 0-9, #, and \* keys, enter the 6-digit ID of the mobile unit you are calling. To erase the last digit entered, rotate the Select switch counterclockwise, and press the Private Call switch to cancel the call.
3. Press the PTT switch to initiate the call. If the entered ID is invalid, “INVALID” is momentarily displayed and the call is not initiated. If the entered ID is valid, the alias of the ID is displayed on the lower line if it matches an ID in your call list. Otherwise, only the ID you entered continues to be displayed. Any of the following conditions may then occur:
  - If the radio you are calling is on the air, telephone type “ringing” is heard for 20 seconds or until the called party answers.
  - If the called party answers and the call is successful, the person’s voice is heard and the call is carried on the same as a group call. To end the call at any time, press the Private Call switch.
  - If the called party does not answer within 20 seconds, “NO ANSWR” is displayed and a continuous tone sounds. End the call by pressing the Private Call switch.
  - If the called radio is not in service, no ringing is heard, “NO ACK” is displayed, and a continuous tone sounds. End the call by pressing the Private Call switch.
  - If neither your radio nor the radio being called is authorized to make unit-to-unit calls, “NO ACK” is displayed and a continuous tone sounds. End the call by pressing the Private Call switch.
  - If the called party answers but the radio system is busy, four low tones sound and “BUSY” is

displayed. When the system is no longer busy, the called party automatically responds.

- If an out-of-range condition exists or the radio system is not in service, “NO SYS” is displayed and a continuous tone sounds. End the call by pressing the Private Call switch.

Receiving an Enhanced Private Conversation Call

This call is automatically received if a SMARTNET/SmartZone channel is selected. Proceed as follows:

1. When this call is received, a recurring unit call tone (three beeps) sounds for up to 20 seconds and “CALL RCV” is displayed on the lower line.
2. To answer the call, press the Private Call option switch and then the PTT switch and begin talking. The private call mode is indicated by “**C**” in the upper part of the display, and the alias of the incoming call is displayed if the ID is in your call list. Otherwise, the unit ID is displayed. *NOTE: If the Private Call option switch is not pressed before the PTT switch, a group call is transmitted on the selected group.*
  - To end the call when the conversation is complete or at any other time, press the Private Call switch.
  - If private calls are not permitted (Private Call switch not programmed), press the Call Response option switch, if available, to answer the call.
  - If the call is not answered within 20 seconds, it is automatically terminated.
  - If the radio system is busy, four low tones sound and “BUSY” is displayed. When the system is no longer busy, the call back tone (four beeps) is heard and your radio automatically starts transmitting. Press the PTT switch to continue the call.
  - To ignore an incoming call, wait 20 seconds until the recurring unit call tone stops sounding.

## 2.5.5 PRIVATE CONVERSATION II CALLS

### General

Private calls allow you to place a call to a specific mobile unit. Either the Enhanced Private Conversation™ or Private Conversation II™ modes may be programmed depending on the capabilities of the radio system. Operation in the Enhanced Private Conversation mode is described in Section 2.5.4, and operation in the Private Conversation II mode is described in the following information.

The Private Call option switch is required to place these calls, and either the Private Call or Call Response option switch is required to receive them. Proceed as follows.

### Placing a Private Conversation II Call

This call is initiated by selecting the unit ID from a call list (list entry) or by directly entering it using the microphone keypad (direct entry). Proceed as follows:

#### List Entry Method

1. With a SMARTNET/SmartZone channel selected, momentarily press the Private Call option switch. The private call mode is indicated by “**C**” in the upper part of the display, and the alias (name) of the last ID called is displayed if it matches an ID in your call list. Otherwise, the last ID called is displayed.
2. Scroll through the private call list by rotating the Select switch until the desired ID is displayed. Press the Private Call switch again to cancel the call.
3. Press the PTT switch to initiate the call. The display then indicates the alias of the destination radio. Wait approximately 1 second and then begin talking. Proceed to the bulleted list following the next method for conditions that may occur next.

#### Direct Entry Method (With DTMF Microphone Only)

1. With a SMARTNET/SmartZone channel selected, press and hold the Private Call option switch until a tone sounds (approximately 1 second). The last ID called is displayed on the upper line, and the private call mode is indicated by “**C**” in the upper part of the display.

2. Using the 0-9, #, and \* keys, enter the 6-digit ID of the mobile unit you are calling. To erase the last digit entered, rotate the Select switch counterclockwise, and press the Private Call switch to cancel the call.
3. Press the PTT switch to initiate the call. If the entered ID is invalid, “INVALID” is momentarily displayed and the call is not initiated. If the entered ID is valid, the alias of the ID is displayed on the lower line if it matches an ID in your call list. Otherwise, only the ID you entered continues to be displayed. Wait approximately 1 second and begin talking. Any of the following conditions may then occur:
  - If the called party answers and the call is successful, the person’s voice is heard and the call is carried on the same as a group call. To end the call at any time, press the Private Call switch.
  - If the radio system is busy, four low tones sound and “BUSY” is displayed. When the system is no longer busy, the call back tone (four beeps) is heard and a channel is automatically acquired. Press the PTT switch to continue the call.

### Receiving a Private Conversation II Call

Private calls are automatically received if a SMARTNET/SmartZone channel is selected. Proceed as follows:

1. When a call is received, an alert tone sounds and the caller’s voice is heard. While voice is heard, “**C**” is indicated in the upper part of the display and “CALL RCV” is displayed and the lower line of the display.
2. To answer the call, press the Private Call option switch and then the PTT switch and begin talking. The private call mode is indicated by “**C**” in the upper part of the display, and the alias of the incoming call is displayed if the ID is in your call list. Otherwise, the unit ID is displayed. *NOTE: If the Private Call option switch is not pressed before the PTT switch, a group call is transmitted on the selected group.*
  - To end the call when the conversation is complete or at any other time, press the Private Call option

switch again. If the call is not answered within 20 seconds, it is automatically terminated.

- If private calls are not permitted (Private Call switch not programmed), press the Call Response option switch, if available, to answer the call.

## 2.5.6 TELEPHONE CALLS

### General

Telephone calls allow you to place and receive calls over the public telephone system using your transceiver. If your transceiver is programmed for telephone calls (Phone option switch programmed), they are placed and received as follows:

### Placing a Telephone Call

Telephone calls can be placed by selecting the number from a preprogrammed phone number list (list entry) or by directly entering it using the microphone keypad (direct entry). Proceed as follows:

#### List Entry Method

1. With a SMARTNET/SmartZone channel selected, momentarily press the Phone option switch. The phone mode is indicated by the  icon, and the display indicates the alias of the last called telephone number if it is in your phone number list. Otherwise, the last called telephone number is displayed.
2. Scroll through the list of telephone numbers by rotating the Select switch until the desired number is found. Press the Phone option switch again to cancel the call.
3. Press the PTT switch to initiate the call. The display indicates "DIALING" while the connection to the phone system is occurring. Once connected, the normal dial tone is heard and the alias of the number being called is again displayed. The radio then automatically dials the telephone number and the normal ringing or busy tone is heard. Proceed to the bulleted list following the next method for conditions that may occur next.

### Direct Entry Method (With DTMF Microphone Only)

1. With a SMARTNET/SmartZone channel selected, press and hold the Phone option switch until a tone sounds (approximately 1 second). The last phone number called is displayed, and the phone mode is indicated by the  icon.
2. Enter the number using the **0-9**, **\***, and **#** keys. To enter a pause (indicated by "P"), press **\*** and then **#**. The number scrolls to the left in the display so that the seven right-most digits are always displayed. Numbers up to 16 digits (including pauses) can be entered. To erase the last digit entered, rotate the Select switch counterclockwise, and press the Phone switch to cancel the call.
3. Press the PTT switch to initiate the call. The display indicates "DIALING" while the connection to the phone system is occurring. Once connected, the normal dial tone is heard and the alias of the number being called is again displayed. The radio then automatically dials the telephone number and the normal ringing or busy tone is heard. Any of the following conditions may then occur.
  - After the called party answers, press the PTT switch to talk and release it to listen. You cannot talk and listen at the same time because the radio cannot transmit and receive at the same time. Each time the PTT switch is released, a tone is heard by the other party that indicates when a response can be made. To end the call when the conversation is complete or at any other time, press the Phone option switch again.
  - If equipped with an optional DTMF microphone, a number can be dialed during a call.
  - If an out-of-range condition exists or the radio system is not in service, "HANG UP" is displayed and a continuous tone sounds. End the call by pressing the Phone option switch.
  - If you are not authorized to make telephone calls, "REJECT" is displayed and a continuous tone sounds. End the call by pressing the Phone option switch.

- If the radio system is busy, “BUSY” is displayed and a busy tone sounds. The call automatically proceeds when the radio system becomes available. If the call is ended before it proceeds, your position in queue is lost.

### Answering a Telephone Call

Telephone calls are automatically received if a SMARTNET/SmartZone channel is selected. Proceed as follows:

1. When a telephone call is received, “ringing” similar to a standard telephone is heard, and the display indicates “PHONE” on the bottom line.
2. To answer the call, press the Phone option switch and the phone mode is indicated by the  icon. Press the PTT switch to talk and release it to listen.
3. To end the call when the conversation is complete or at any other time, press the Phone option switch again.

### 2.5.7 CALL ALERT

The Call Alert™ feature allows pages to be sent and received as follows:

#### Sending a Page

1. With a SMARTNET/SmartZone channel selected, momentarily press the Call Alert option switch. The tag (alias) of the last ID called is displayed if it matches an ID in your call list. Otherwise, the last ID called is displayed.
2. To select the desired ID, rotate the Select switch to scroll through the ID list. Press the Call Alert option switch again to cancel the call.
3. Press the PTT switch to send the page. The display then indicates the alias of the radio being paged. Conditions that may then occur are as follows:
  - If the radio you are paging is on the air and received your page, a signaling success tone (six beeps) sounds and the display momentarily indicates “ACK RCVD” on the bottom line. The alias

of the selected channel is then displayed continuously.

- If the radio you are paging is not in service, a tone sounds and “NO ACK” is displayed. Press the Call Alert switch again to cancel the page.

### Answering a Page

1. When a page is received, “PAGE RCV” is indicated on the bottom line and a recurring received page tone (six beeps) sounds.
2. Answering a page is the same as placing a private call. Therefore, press the Private Call option switch and follow the instructions for placing a private call in Section 2.5.4 or 2.5.5, whichever is applicable.

### 2.5.8 MESSAGING

The messaging feature allows preprogrammed messages to be sent to your dispatcher. Up to 16 messages can be preprogrammed, and they are identified by alias (name). If a Message option switch is programmed, messages are sent as follows:

1. Momentarily press the Message option switch. The alias of the last message sent is displayed.
2. Scroll through the message list by rotating the Select switch until you find the desired message. Press the Message option switch again to cancel the message.
3. Press the PTT switch to send the message. When the message is received and acknowledged by the dispatcher, a signaling success tone (six beeps) sounds and the display returns to the normal channel indication. If there is no acknowledgment after 6 seconds, a tone sounds and “NO ACK” is displayed. Press the Message option switch again to return to normal operation.

### 2.5.9 SENDING STATUS CONDITIONS

The status feature allows you to send your current status to a dispatcher. Up to eight status conditions can be preprogrammed, and they are identified by an alias (name). If the Status option switch is programmed, status conditions are sent as follows:

1. Momentarily press the Status option switch, and the alias of the last status sent is displayed.
2. To change the displayed status, scroll through the status list by rotating the Select switch. Press the Status option switch again to cancel this function.
3. Press the PTT switch to send the status. When the message is received and acknowledged by the dispatcher, a signaling success tone (six beeps) sounds and the display returns to the normal channel indication. If there is no acknowledgment after 6 seconds, a tone sounds and "NO ACK" is displayed. Press the Status option switch again to return to normal operation.

### 2.5.10 EMERGENCY ALARM AND CALL

#### Introduction

Emergency Alarms and Emergency Calls are separate functions that can be individually enabled or disabled on each SMARTNET/SmartZone system. The Emergency option switch is also required for these functions, and it is always the button to the left of the display when it is used. Emergency Alarms and Calls are transmitted on the emergency talk group programmed on the selected system.

#### Emergency Alarms

An emergency alarm is a special data transmission that alerts a dispatcher of an emergency situation. Proceed as follows to activate an emergency alarm:

1. Select a SMARTNET/SmartZone channel that has this feature enabled and then press the Emergency option switch. The radio then begins automatically transmitting an emergency alarm data message and "EMERGENCY" is indicated in the display for 3 seconds.
2. When the emergency alarm is acknowledged, the emergency acknowledge tone (two beeps) sounds. Silent operation may also be programmed in which case no tone sounds and there is no indication that an acknowledgment occurred.
3. The radio continues to transmit this message until an acknowledgment is received or the programmed

number of attempts have been made. To exit this mode, power must be turned off and then on again.

#### Emergency Calls

An emergency call urgently requests access to a voice channel. To place this call, proceed as follows:

1. Select a SMARTNET/SmartZone channel that has this feature enabled and press the Emergency option switch. The emergency mode is indicated when "EMERGENCY" is indicated in the display for 3 seconds.
2. To place the emergency call, manually press the PTT switch and begin speaking as with a standard call. All group calls which follow are then emergency calls (private, telephone, and call alert calls are not allowed). If the channel is changed, the call is made on the emergency talk group programmed for the new channel.
3. To exit this mode, power must be turned off and then on again.

### 2.5.11 FAILSOFT OPERATION

If a failure occurs in the SMARTNET/SmartZone system so that it cannot be used, the transceiver automatically enters the failsoft mode. When this mode is selected, "FAILSOFT" is indicated on the lower line of the display.

When in the failsoft mode, operation is in the conventional mode on a preprogrammed failsoft channel. If a transmission is attempted before a failsoft channel is located, a continuous tone sounds until the PTT switch is released. When the radio system returns to normal operation, this condition is automatically detected and normal operation resumes.

### 2.5.12 SMARTNET/SMARTZONE SCANNING

Scanning on a SMARTNET/Smartzone channel is similar to the standard and radio wide scanning described starting in Section 2.3.11. Each channel can be programmed with a different scan list that includes up to 16 channels, one of which can be a priority channel. Up to three lists can be programmed, and

they are user programmable if the Scan Edit option switch is programmed (see “Programing a Scan List” in Section 2.3.11).

Scanning is enabled/disabled by the Scan option switch. In addition, channels can be programmed so that scanning automatically starts whenever the channel is selected. Scanning is temporarily disabled and “**S**” turns off if a channel is selected that has scanning disabled. Then when a channel is selected again that permits scanning, it is automatically re-enabled.

When responding to messages in the scan mode, programming determines if the response always occurs on the talk group of the call or the selected talk group (if they are different). Transmissions occurring at other times always occur on the selected talk group.

In addition to calls on channels in the scan list, pages, private calls, and telephone calls are received while scanning. Messages on the priority channel are received while listening to lower priority messages. However, private and telephone calls are not interrupted by calls on the priority channel.

### 2.5.13 DYNAMIC REGROUPING

The dynamic regrouping feature allows a dispatcher to switch users to a dynamically defined channel to receive an important message. Dynamic regrouping operates as follows:

1. When this command is received, the alternating dynamic regrouping tone sounds, the transceiver automatically changes to the regrouping channel, and the display indicates “REGROUP” on the lower line. All transmitting and receiving then occurs on this channel.
2. To reset all talk and announcement groups to normal so that only the designated regrouping channel is on the dynamic group, manually select the designated regrouping channel if you know it. If this channel is not selected or there is no designated regrouping channel, all transmissions occur on the dynamically assigned group regardless of which channel is selected, and the regrouping tone sounds each time the PTT switch is pressed.

3. When regrouping is canceled by the dispatcher, transceiver operation returns to normal.

### 2.5.14 SMARTZONE FEATURES

#### Introduction

As described in Section 2.3.12, the SmartZone® mode provides wide area coverage by allowing roaming between SMARTNET and conventional sites. SmartZone operation is the same as SMARTNET with the following additional features:

#### Determining Current Site

To determine the current radio site, momentarily press the Site Search option switch (if programmed). If currently registered on a site, “SITE x” is displayed on the top line, where “x” is the site number. If the site is locked (see following), “LOCK x” is displayed instead. The RSSI (Receive Signal Strength Indicator) value of the current site as “RSSI x” is displayed on the bottom line as “RSSI x”. To exit, press the Site Search switch again.

#### Searching For a New Site

Press the Site Search option switch as described above. Then to scroll through the other programmed sites, rotate the Select switch while “SITE x” or “RSSI x” is displayed. To select the displayed site, press the Site Search option switch. To exit this mode and return to normal operation, press the Site Search switch again. If site lock is on when site search is entered (see following), the radio will be locked on the new site when this function is exited.

#### Locking/Unlocking a Site

It is sometimes desirable to stay on the current site regardless of signal level. To lock the radio on the current site so that it does not search for another, press the Site Lock option switch (if programmed). The display then momentarily indicates “LOCK x” to indicate that the current site is locked (“x” is the current site number). To unlock the site, press the Lock switch again and “UNLOCK” is momentarily displayed.

When locked on a site, it is still possible to search for a different site using the site search function described in the preceding section. When a new site is found, the radio is then locked on that site.

## 2.6 SUPERVISORY TONES

### Single Beep (Alert Tone)

- Power was turned on and a successful power-up sequence occurred (Section 2.3.2).
- The time-out timer is about to expire or the penalty timer has expired (Sections 2.3.7 and 2.4.7).
- The conversation timer is about to expire (Section 2.4.8).
- The system received your page but the paged mobile is not on the air (Section 2.5.7).
- Telephone interconnect is not operational (Section 2.5.6).

### Continuous Tone (Invalid or No Acknowledge Condition)

- A transmission is being attempted on an unprogrammed channel or a conventional channel programmed as receive-only.
- The transmitter is disabled by the busy channel lockout feature (Section 2.4.5).
- The transmitter has been disabled by the time-out timer feature (Section 2.3.7).
- The transmitter has been disabled by the conversation timer (Section 2.4.8).
- An out-of-range condition exists (SMARTNET/SmartZone only).
- A transmission is being attempted before the penalty timer has expired (Section 2.4.7).
- Dynamic regrouping has been exited but the dynamic regrouping channel is still selected (Section 2.5.13).
- The paged mobile did not acknowledge the page (Section 2.5.7).
- The message that was sent has not been acknowledged (Section 2.5.8).
- The status condition that was sent has not been acknowledged (Section 2.5.9).

### Single Short Medium-Pitch Tone

- A valid key has been pressed.

### Single Short Low-Pitch Tone

- An invalid key has been pressed.

### Six Beeps (Recurring)

- The page was received (Section 2.5.7).

### Three Beeps (Recurring)

- A unit-to-unit call was received (Section 2.5.4).

### Six Beeps

- The paged radio received the page and acknowledged it (Section 2.5.7).
- The message that was sent has been received and acknowledged (Section 2.5.8).
- The status condition that was sent has been received and acknowledged (Section 2.5.9).

### Two Beeps

- The emergency alarm condition was acknowledged (Section 2.5.10).

### Gurgle-Like Tone

- Dynamic regrouping has occurred (Section 2.5.13).
- Dynamic regrouping has occurred but the regrouping channel is not selected (Section 2.5.13).

### Four Low Tones (Busy Signal)

- The radio system is busy or a busy condition exists when making a telephone call.

### Four Alternating High and Low Tones

- A channel is available after a busy condition occurred (SMARTNET/SmartZone only).

## SECTION 3 PROGRAMMING

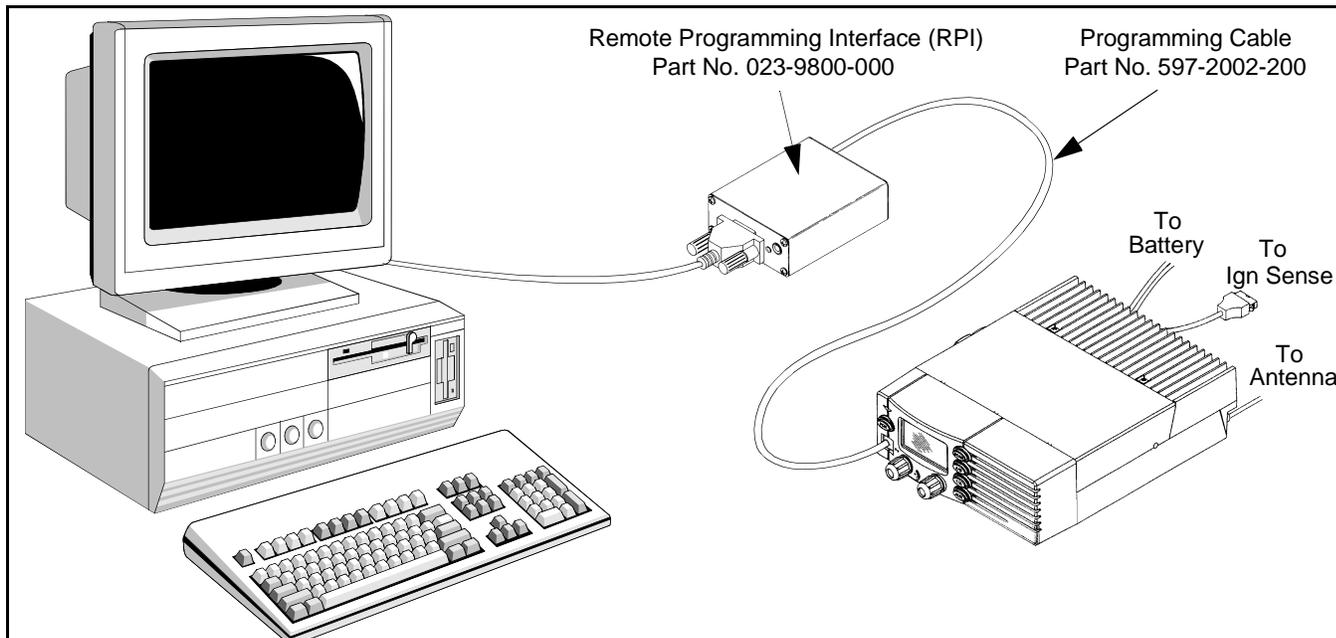


Figure 3-1 Programming Setup

## 3.1 GENERAL

## 3.1.1 PROGRAMMING SETUP

The following items are required to program the transceiver and control unit. The part numbers of this equipment are shown in Table 1-1 in Section 1. The programming set-up is shown above.

- IBM® PC or compatible personal computer
- Remote Prog. Interface (RPI) P.N. 023-9800-000
- Cables from the RPI to the computer and transceiver
- E.F. Johnson PCTrunk programming software.

## 3.1.2 COMPUTER DESCRIPTION

The computer used to run this program should meet the following minimum requirements:

- Windows® 3.1, 95/98, or NT 3.51 (Windows NT/2000 is supported only by PCTrunk Version 5.10.0 or later)
- Intel® 486 processor or equivalent
- At least 4 MB of RAM

- A hard disk drive with at least 5 MB of free space
- A CD-ROM drive
- An available serial port

*NOTE: With the descriptions which follow, it is assumed that you have a basic understanding of how to use your Windows-based operating system. If you are not familiar with some of the Windows functions described, refer to your Help Screens and manuals included with your Windows software.*

## 3.1.3 PCTRUNK SOFTWARE INSTALLATION

The PCTrunk software is supplied on a CD-ROM. Install this software as follows:

1. Make sure that there are no other Windows applications open during this installation procedure. Also, make sure that the computer meets the minimum requirements listed in the preceding section.
2. Insert PCTrunk CD-ROM in the CD drive of your computer.

3. **Windows 3.1** - In the Program Manager, double click the SETUP.EXE file on the CD-ROM or click that file name and select File > Run.

**Windows 95/98/NT** - In the bottom left corner of the screen, select Start > Run and then click the Browse button in the window that is displayed. Then in the "Look In:" pull-down menu, select the CD-ROM drive and the file "Setupxx.x.exe". Click the open button and then from the Run window, click OK and the installation process begins. (The "xx.x" in the filename is the version of PCTrunk being loaded.)

4. Follow the instructions displayed by the setup program. The default directory for the program is \Program Files\PCTrunk. If you wish to use some other directory, click Browse and select it or type the name.

### 3.1.4 CONNECTING RPI TO COMPUTER AND TRANSCEIVER

#### RPI Information

The RPI provides the required interface between the computer and transceiver. It converts the RS-232 logic levels from the computer to the TTL logic levels required by the transceiver microprocessor and vice versa.

A new RPI (Part No. 023-9800-000) has been designed for this transceiver. This RPI is backward compatible, so it can also be used to program other E.F. Johnson transceivers which require an RPI (except the 5300 series). This new RPI is required to Flash program the transceiver to update the logic board operating software, and it has a phone jack that is required for injecting the transmit audio signal during alignment. To perform the standard personality programming described in most of this section, earlier RPI's such as Part No. 023-5810-000 or 023-9750-000 can also be used.

When programming both front and remote models of this transceiver, the switch on the front panel of the RPI selects either the standard or Flash programming mode. The standard mode is selected when it is away from the LED and the indicator is green, and the Flash mode is selected when it is toward the LED and the

indicator is amber. The standard mode should be selected for all but Flash programming.

With some remote mount transceivers (not 9800 series), this switch is used to turn transceiver power on and off. A separate 9-16 VDC, 200 mA power supply (such as P.N. 563-0001-005) must then be plugged into the RPI power jack to provide power to the RPI.

#### Cable Information

The cables from the RPI to the computer and transceiver are not included with the RPI. The -9800-RPI has a female DB9 connector for the computer connection. Since most computer serial ports have a male DB9 or DB25 connector, a male DB9 to female DB9 or DB25 is usually required. This is a standard cable available at most computer supply stores. A suitable cable is also listed in Table 1-1.

The cable from the RPI to the transceiver has modular telephone-style connectors on each end. It plugs into the microphone jack on the front panel of the transceiver. The cable for this application is also listed in Table 1-1.

### 3.1.5 STARTING AND EXITING

#### To Start PCTrunk From Windows 3.1

In the Program Manager, open the PCTrunk group window. Then double-click the PCTrunk icon.

#### To Start PCTrunk From Windows 95/98

Click the Start button and select the PCTrunk group. Then double-click the PCTrunk icon.

#### To Exit PCTrunk:

Select File > Exit or press ALT + F4.

### 3.1.6 PROGRAMMING FILE TYPES

Programming data is stored in a disk file that can be saved, read, copied, and deleted (see Section 3.3.1). The file that is stored for each programming session has the .DAT extension.

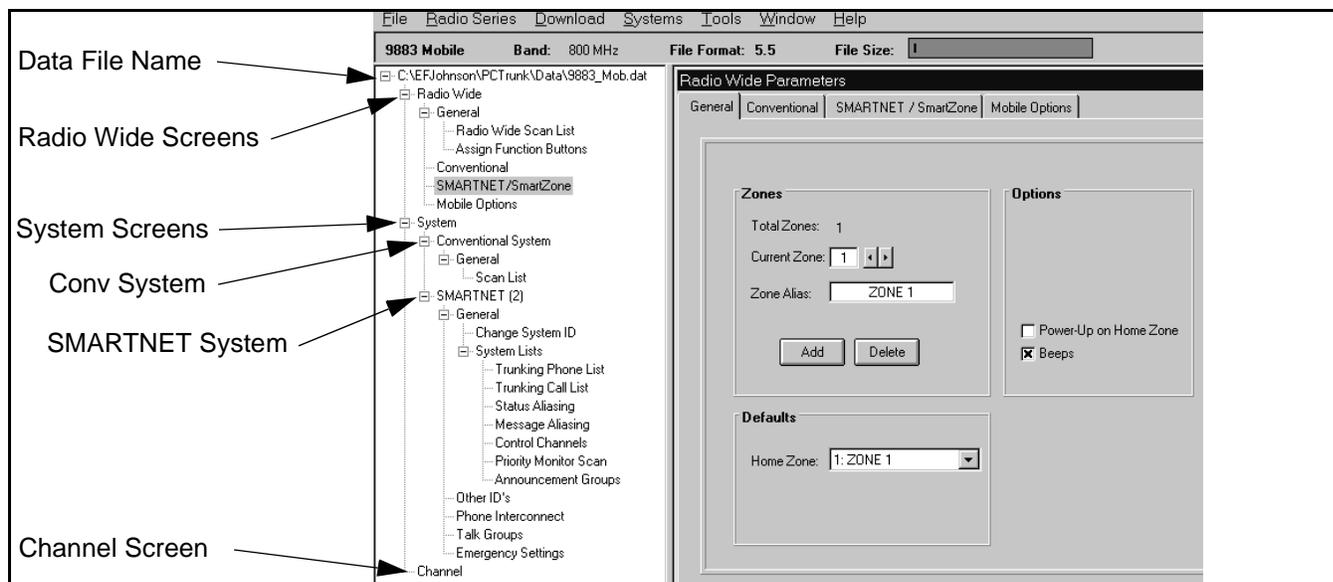


Figure 3-2 Main Screen (Later PCTrunk Versions)

### 3.1.7 HELP FILES

To display help information on the current screen, click Help in the menu bar or press F1.

### 3.1.8 SCREEN GROUPS

#### General

The following screen groups are displayed:

**Radio-Wide** - These screens program parameters that are the same for all systems and channels. Separate screens are displayed for General, Conventional, SMARTNET/SmartZone, and Mobile Options parameters. Refer to Section 3.4 for more information on these screens.

**System** - These screens program the parameters that are unique to the displayed Conventional, SMARTNET, or SmartZone system. The system to be edited is selected as described in Section 3.1.11.

**Channel** - This screen programs unique channel parameters and assigns channels to each zone. The specific parameters indicated in this screen are determined by the type of system selected in the “Type” box (Conventional, SMARTNET, SmartZone).

### 3.1.9 DISPLAYING SCREENS

The latest release of PCTrunk uses a different method of displaying screens. Proceed as follows to select which screens are displayed with the different versions:

#### Revised PC Trunk (Version 5.10.0 or Later)

Revised versions of PCTrunk use a pane on the left side of the screen (see Figure 3-2) to display the screen structure similar to the directory structure of a hard drive. Click the “+” to expand the branch and “-” to collapse it. Then to display a screen, simply click its name. The current screen may have to be closed in order to select another one.

#### Early PCTrunk (Versions Prior to 5.10.0)

With early versions of PCTrunk, the screens are displayed in cascade style or they can be minimized like any Windows screen. To cascade the active screens, select Window > Cascade from the menu bar.

To pop a screen to the front, click the applicable button which follows. For example, if the Channel screen is displayed and you want to quickly pop the Radio-Wide screen to the front, click the Radio-Wide button. These buttons can be displayed or hidden by

clicking Window > Toolbar. A window can also be displayed by selecting it in the Window Menu.



**Screen Pop-Up Buttons  
(Early PC Trunk Versions)**

### 3.1.10 FILE SIZE INDICATOR

The maximum number of channels that can be programmed may be limited by the available memory space in the radio (see Section 1.5.3). A running indication of the amount of memory used by the current data (if it was downloaded to the radio) is displayed by a bar graph as shown in Figure 3-2 and the preceding illustration. When the bar reaches the right end, available memory is full and some channels may need to be deleted to program more information.

### 3.1.11 CREATING AND DISPLAYING SYSTEMS

To create a new SMARTNET or SmartZone system, select Systems > Add Systems and then the desired system type from the menu bar (see Section 3.3.5). This menu is also used to delete a system.

*NOTE: Only one conventional system can be set up, and it is automatically created when a new file is created as described in Section 3.3.1. Therefore, there is no option to add a conventional system.*

Only one system can be displayed at a time, so select the system to be edited as described in the preceding section. Systems are indicated by number and type. Channels and talk groups for all programmed systems are set up in the Channels screen. Therefore, any channel can be selected when programming channel information.

## 3.2 PROGRAMMING PROCEDURE

The following is a general procedure you can use to program a transceiver.

### 3.2.1 PRELIMINARY

1. Select a programming file as follows:

**Create a New File** - To start with a new file containing default parameters, select File > New and then the frequency band of the radio (VHF/ UHF/800 MHz).

**Open An Existing File** - To open an existing file stored on disk, select File > Open and then the file to be opened.

**Upload a File From a Radio** - To transfer a file from a radio to the computer to edit or use as a basis to program another radio, connect the radio to the computer as described in Section 3.1.4. Then turn the radio on and select Upload from the menu bar.

2. Before or after creating the programming file, be sure the correct type (98xx mobile) is selected by the Radio Type menu (see Section 3.3.2).
3. A conventional system is automatically set up when a new programming file is created. If SMARTNET or SmartZone systems are also to be programmed, set them up as described in Section 3.1.11.

### 3.2.2 PROGRAMMING RADIO WIDE PARAMETERS

1. To display the Radio Wide screens, click the screen name under Radio Wide in the left pane or click the Radio Wide button (see Section 3.1.9).
2. Program the applicable information in these screens as described in Section 3.4.

### 3.2.3 PROGRAMMING CONVENTIONAL CHANNELS

*NOTE: If no conventional channels are programmed, skip this section.*

1. Make sure the conventional system is displayed by clicking it in the left pane or selecting Window > Conventional in the menu bar.

2. If required, display the Conventional System programming screens by clicking the System button or selecting Window > Conventional System (see Section 3.1.9).

3. Program the conventional systems and channels as described in Section 3.5.

### 3.2.4 PROGRAMMING SMARTNET AND SMARTZONE SYSTEMS

*NOTE: If no SMARTNET or SmartZone systems are programmed, skip this section.*

1. Make sure the desired SMARTNET or SmartZone system is displayed by clicking it in the left pane or selecting Window > SMARTNET or SmartZone in the menu bar.

2. If required, display the screens for that system by clicking the System button or selecting Window > Desired System (see Section 3.1.9).

3. Program the SMARTNET/SmartZone system and talk groups as described in Section 3.6.

4. To program additional SMARTNET/SmartZone systems, add a new system as described in Section 3.1.11 and repeat Section 3.6.

### 3.2.5 PROGRAMMING RADIO (DOWNLOADING FILE)

When all the required programming information has been entered in the various programming screens, the information can be programmed (downloaded) into the radio. When downloading a file, be sure that all connections between the computer and radio are secure, the radio is turned on, and the proper serial port is selected (see Section 3.3.1).

Then select Download > Parameters to 98xx Mobile. If no file is currently loaded, a dialog box appears to select the desired file. If a file is already loaded when Download is selected, the current file is transferred to the radio.

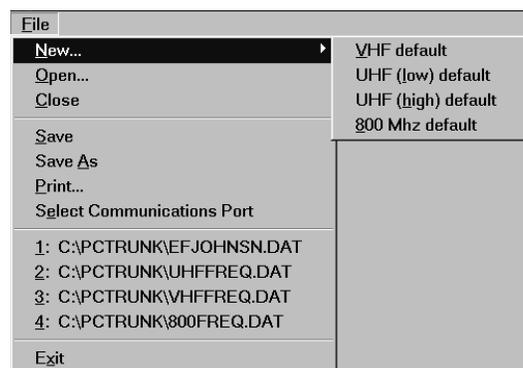
*NOTE: The information which follows (Sections 3.3-3.6) provides detailed descriptions of the parameters that are displayed in the various PCTrunk screens.*

## 3.3 MENU COMMANDS



### Menu Bar

#### 3.3.1 FILE MENU



**New** - Creates a programming file with default parameters for the selected frequency range.

**Open** - Opens a programming file that was previously saved to disk. If a modified file is currently open, you are asked if that file should be saved before the new file is opened.

**Close** - Closes the current file. If the file has been modified and the changes have not been saved, you are asked if the changes should be saved before closing.

**Save** - Saves the current file to disk using the current file name.

**Save As** - Same as “Save” except you are prompted to enter a new file name if desired.

**Print** - Prints the information in the current file.

**Select Communications Port** - Displays the Communications Port dialog box which is used to select the serial port that is used to connect the transceiver to the computer (see Section 3.1.4).

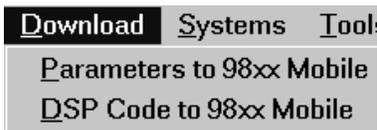
**Exit** - Closes the PCTrunk program. If the current file has been modified and the changes have not been saved, you are asked if the changes should be saved before closing.

### 3.3.2 RADIO SERIES MENU



The Radio Series menu show above selects the radio type (9883 Mobile) being programmed.

### 3.3.3 DOWNLOAD MENU

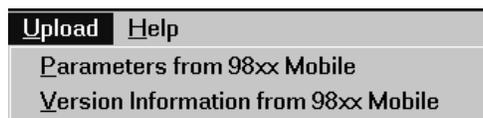


**Parameters to 98xx Mobile** - Transfers the current programming file to the radio connected to the computer.

**DSP Code to 98xx Mobile** - This function along with a special DSP upgrade file from E.F. Johnson are used to upgrade the DSP firmware. To put the radio in download mode, power the radio off, temporarily connect the microphone, and power it back on while pressing the microphone PTT switch. The DSP download mode is then indicated by “CODE” in the display. The microphone is then disconnected, the RPI connected, and the code downloaded.

### 3.3.4 UPLOAD MENU

The Upload Menu is displayed only in the opening screen before a programming file is created. The following options are displayed:



**Parameters from 98xx Mobile** - Transfers the programming data from a radio to the PCTrunk program. This data can then be viewed, edited, or saved to a disk file as desired.

**Version Information from 98xx Mobile** - Displays the software version number and serial number of the connected radio.

### 3.3.5 SYSTEMS MENU



The Systems Menu is used to create new SMARTNET and SmartZone systems. It is also used to delete current systems. Conventional systems cannot be added because only one can be created. Refer to Section 3.1.11 for more information.

### 3.3.6 TOOLS MENU

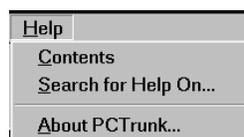
The Tools > Convert File Format function is not used with this transceiver. It converts Format 5.4 files to the 5.5 format. All 98xx models use Format 5.5.

### 3.3.7 WINDOW MENU



The Window Menu is used to select the system to be edited. It can also be used to pop one of the screens to the front. Refer to Section 3.1.9 for more information.

### 3.3.8 HELP MENU



**Contents** - Displays the help system table of contents.

**Search For Help On** - Displays the search dialog box that allows searching for a help topic by keyword.

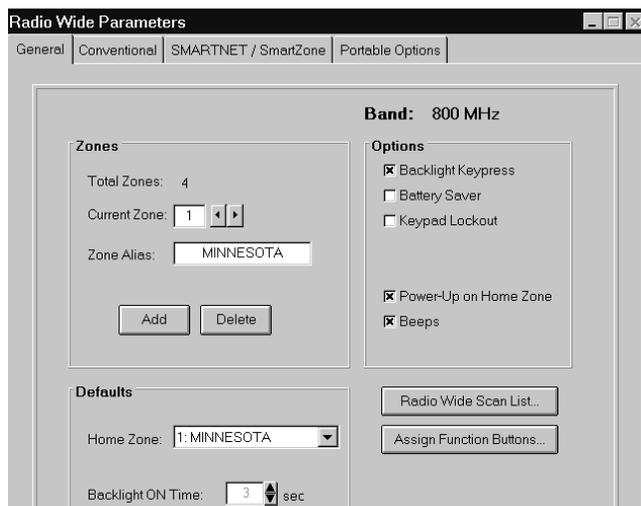
**About PCTrunk** - Displays the software version number of PCTrunk and other information.

### 3.4 RADIO-WIDE PARAMETER SCREENS

#### 3.4.1 INTRODUCTION

The radio-wide screens program the parameters that are the same for all systems, channels, and zones. Separate screens are used for General, Conventional, SMARTNET/SmartZone, and Mobile Options parameters. Refer to the information which follows.

#### 3.4.2 RADIO-WIDE GENERAL SCREEN



#### Band

Displays the operating band selected by the Radio Type Menu (see Section 3.3.2). The selected operating band must match that of the radio being programmed.

#### Zones

**Total Zones** - The total number of zones currently set up. The maximum number allowed is 16. Zones are added by clicking the Add button (see following).

**Current Zone** - Indicates the currently selected zone. To select another zone, click the up/down arrows.

**Zone Alias** - Edits the unique alpha identification for the displayed zone. Up to 8 characters can be entered. The zone alias is briefly displayed whenever a new zone is selected. Refer to Section 1.5.3 for more information on zones.

**Add (Zones) Button** - Adds another zone.

**Delete (Zones) Button** - Deletes the last zone added.

#### Defaults

**Home Zone** - Selects the zone that is selected by the Home Zone option switch if programmed.

#### Options

**Power-Up On Home Zone** - If checked, the home zone is always selected at power-up.

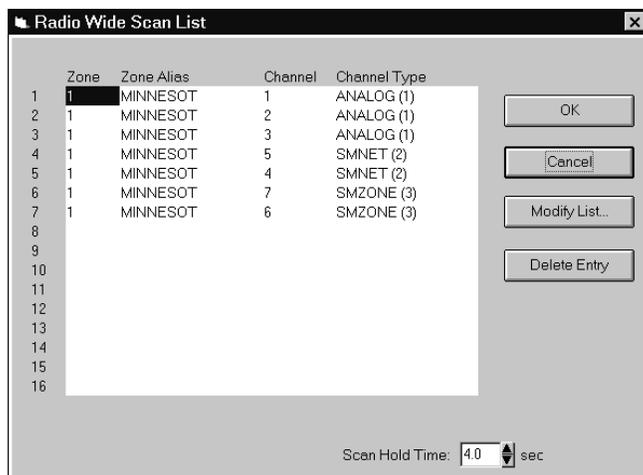
**Beeps** - If checked, all tones are enabled. Otherwise, no tones sound (see Section 2.3.8).

*NOTE: With PCTrunk, Version 5.10.0 or later, the following screens are selected by clicking their name in the left pane, not by clicking the button in the General screen.*



*NOTE: The radio-wide scan list cannot be programmed until all channels to be included have been set up as described in the Conventional and SMARTNET/SmartZone sections (3.5 and 3.6, respectively).*

Clicking the Radio Wide Scan List name in the left pane or that button in the General screen displays the following screen which programs the radio-wide scan list described in Section 2.3.11. The buttons and other parameters in this screen are as follows:



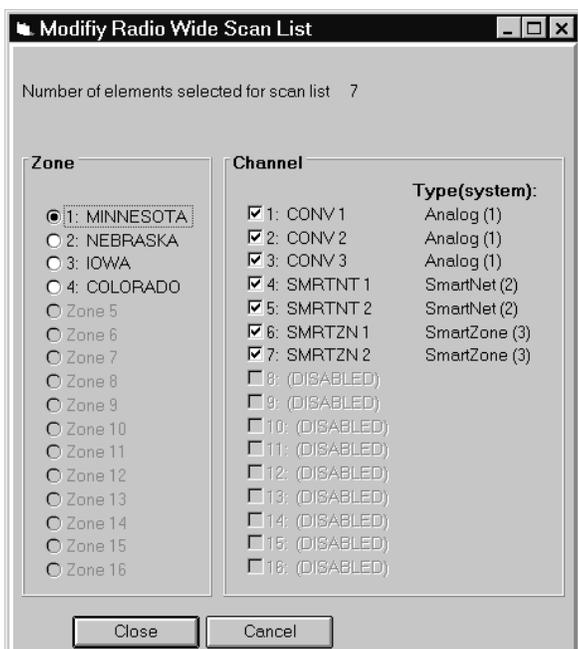
**Radio-Wide Scan List Screen**

Modify List...

**Button** - Displays the following screen that selects the channels in each Zone and System that are in this scan list. Select each Zone and then the channels to be included from that zone.

**Delete Entry** - Deletes the selected channel from the scan list.

**Scan Hold Time** - This programs the delay that occurs before radio-wide scanning resumes after a message is no longer being received. Times of 0 - 7.5 seconds can be programmed (see Section 2.3.11).



**Modify List Screen**

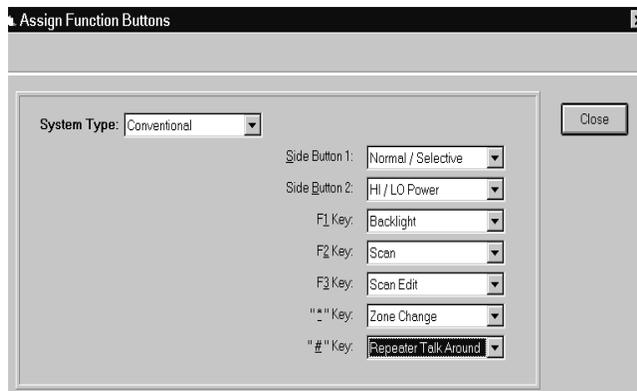
Assign Function Buttons...

**Assign Function Buttons**

Clicking “Assign Functions Buttons” in the left pane or that button in the General screen displays the following screen which programs the five front panel option switches. These switches can be programmed with a different set of functions for each operating mode (conventional and SMARTNET/SmartZone). Refer to Section 2.3.4 for more information.

Program the option switches as follows:

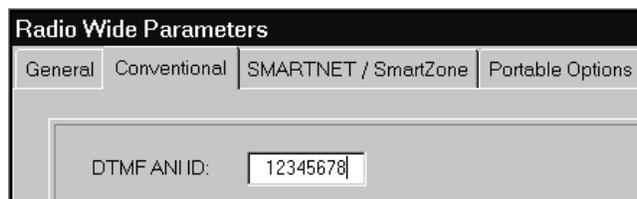
1. In the System Type pull-down menu, select the mode to be programmed (either conventional or SMARTNET/SmartZone).



**Assign Function Buttons Screen**

2. To program a switch, click the arrow to display the pull-down menu and then select the desired function from that menu.
3. Repeat for all switches and modes to be programmed and then exit this screen by clicking the Close button.

### 3.4.3 RADIO-WIDE CONVENTIONAL SCREEN



The radio-wide conventional screen is shown above, and it is used to program the DTMF ANI ID. This ID is used on channels programmed for pre- or post-transmit ANI (see Section 3.5.4) and consists of eight digits from 0-9.

### 3.4.4 RADIO-WIDE SMARTNET/SMARTZONE SCREEN

The radio-wide SMARTNET/SmartZone screen is shown on the next page, and it is used to program the following parameters:

#### Full Spectrum CC Scan

In a SmartZone system, if all potential control channel frequencies have been searched, the radio enters a channel-by-channel search across the full spectrum that the radio covers. The timer sets the time

The screenshot shows the 'Radio Wide Parameters' configuration window. It has tabs for 'General', 'Conventional', 'SMARTNET / SmartZone', and 'Mobile Options'. The 'SMARTNET / SmartZone' tab is selected. The window contains several sections:

- Full Spectrum CC Scan:** Radio buttons for 'Off' (selected) and 'On'. A 'Timer' is set to 5 seconds.
- Hot DTMF:** Radio buttons for 'Disable' (selected) and 'Enable'.
- Display Options:** Radio buttons for 'Talk Group on Rx' (selected) and 'PTT ID'.
- Scan Talkback:** Radio buttons for 'Selected Group' and 'Active Group' (selected).
- Voice On Control:** Radio buttons for 'Disable' (selected) and 'Enable'. Below are three time settings: 'Site Lock Time' (15 sec), 'Activation Time' (500 msec), and 'Pending Emergency Time' (500 msec).
- Adjustable Parameters:** Three time settings: 'Busy Over-ride Delay' (0 sec), 'Affiliate Hold Off' (1 sec), and 'Failsoft Inactivity' (30 sec).

### Radio Wide SMARTNET/SmartZone Screen

it performs this scan before it checks the expected frequencies again. After it checks these frequencies, it returns to full spectrum scanning. This cycle repeats until a control channel is found.

On-Off - Enables or disables full spectrum scan.

Timer - Sets the time that full spectrum scanning occurs as just described.

### Hot DTMF

Enable/Disable - When enabled, allows the user to send DTMF tones while transmitting. When disabled, pressing numeric keys (0-9, \*, #) while transmitting has no affect.

### Display Options

These functions select what is displayed when group calls are received (see Section 2.5.3). If neither function is selected, the selected talk group alias is always displayed. Both cannot be selected.

Talk Group on Rx - The alias of the talk group on which the call is being received is displayed.

PTT ID - The ID of the mobile placing the call is displayed. If the ID matches an ID in the Trunking Call List, the alias of that ID is displayed instead.

### Scan Talkback

When a message is received when scanning, this parameter selects how the radio responds during the call hang time. "Selected Group" forces it to transmit on the selected talk group, and "Active Group" forces it to transmit on the scanned or active talk group.

### Voice On Control

With SmartZone operation, some remote sites are designated Voice On Control sites. In these sites, if all available traffic channels are occupied, control channels become traffic channels when additional traffic channels are requested. The Voice On Control parameters determine how the radio reacts to various situations that may occur. For example, when a conversation is complete, the radio may look for a control channel that has become a traffic channel.

Enable/Disable - Determines if the voice on control parameters are active.

Site Lock Time - This is the amount of time a radio remains on the Voice On Control site before looking for another site.

Activation Time - This is the amount of time the radio waits when the control channel comes back from Voice On Control before it transmits any pending ISWs. This prevents all radios on a Voice On Control site from submitting ISWs at the same time.

Pending Emergency Time - This is the amount of time the radio waits to submit an Emergency ISW after the control channel returns from the Voice On Control mode.

### Adjustable Parameters

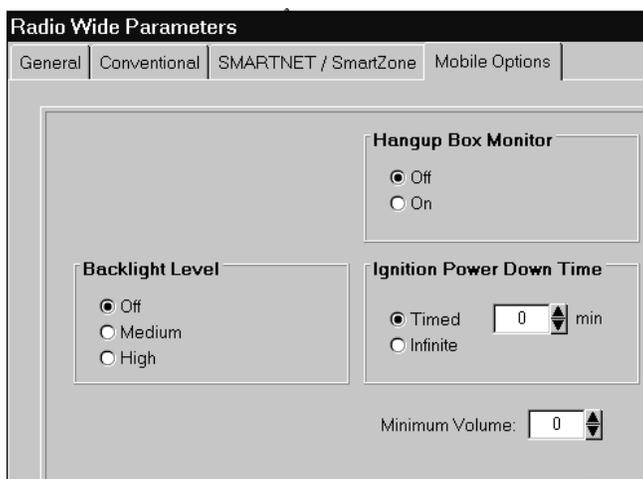
Busy Override Delay - With SmartZone operation, this is the amount of time a user must press the PTT switch to override a SmartZone busy that occurs because some member of the talk group is present at a site where there are no traffic channels available.

Affiliate Hold Off - With SmartZone operation, this is the delay time that occurs after acquiring the control channel before it sends an affiliation ISW.

This prevents all radios on the system from sending affiliation ISWs at the same time.

Failsoft Inactivity - Programs failsoft operation (see Section 2.5.11). If the radio remains inactive (no receive or transmit activity on channel) while operating in the failsoft mode for the programmed time, the radio momentarily leaves the failsoft mode and attempts to find a control channel. If “0” is programmed, the radio does not leave the failsoft mode.

### 3.4.5 RADIO-WIDE MOBILE OPTIONS SCREEN



The radio-wide Mobile Options screen is used to program the following parameters:

Backlight Level - Selects the default backlight level whenever power is on. This setting can be overridden by the backlight option switch if it is programmed.

Hang-Up Box Monitor - Selecting “Off” disables microphone off-hook detection. Taking the microphone off-hook then does not disable coded squelch functions or scanning. Selecting “On” enables microphone off-hook detection.

Ignition Power Down Time - When the ignition switch controls transceiver power, this sets the delay that occurs between when the ignition switch is turned off and when transceiver power actually turns off. Times of 0-254 minutes can be programmed or an infinite time (no turn-off) can be selected (Section 2.3.9).

Minimum Volume - Sets the minimum volume level that can be selected by the volume control. This can be used to prevent missed messages caused by inadvertently turning the volume down too far. Relative levels of 0-255 can be set (“0” sets the lowest minimum volume).

## 3.5 PROGRAMMING CONVENTIONAL SYSTEMS AND CHANNELS

### 3.5.1 INTRODUCTION

The following information describes how conventional channels are programmed. Conventional systems do not need to be set up because only one can be programmed, and it is automatically set up when the programming file is selected as described in Section 3.1.6. Up to 256 conventional channels can be programmed (if no SMARTNET/SmartZone systems are programmed). Refer to Section 1.5.3 for more information on systems and channels.

The following is the recommended procedure for programming conventional channels:

1. Program the radio-wide information as described in Section 3.4.
2. If other types of systems are programmed, make sure the conventional system is selected in the left pane or by selecting Window > Conventional in the menu bar (see Section 3.1.9).
3. Program the conventional system information and then the channel information as follows.

### 3.5.2 CONVENTIONAL SYSTEM GENERAL SCREEN

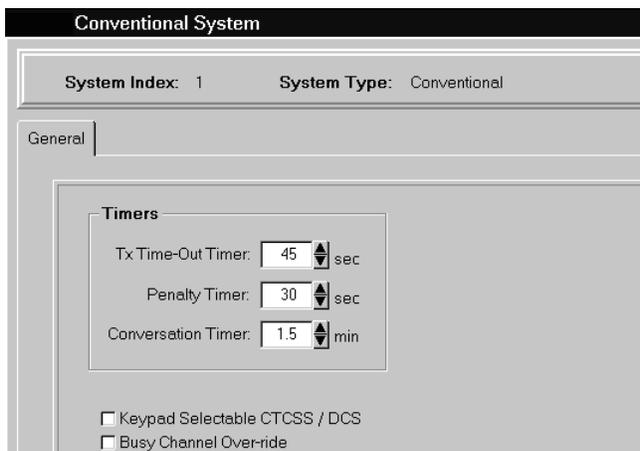
The conventional system General screen is shown on the next page, and it programs the following parameters:

#### Timers

Tx Time-Out Timer - This timer limits the length of transmissions (Section 2.3.7). Times up to 3 minutes, 45 seconds in 15-second steps can be programmed.

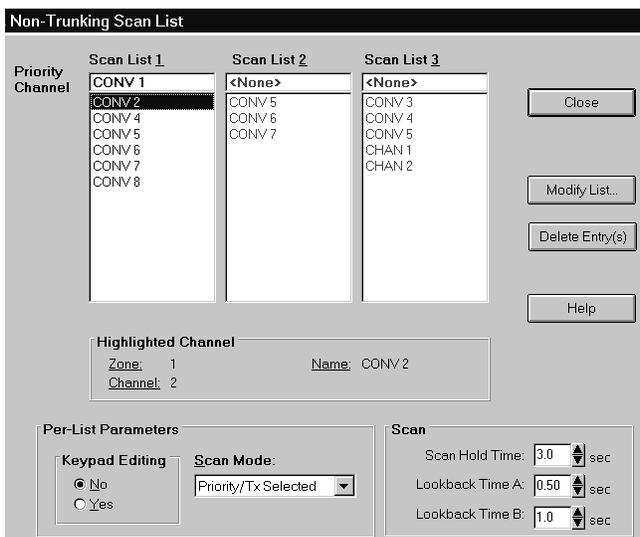
**Penalty Timer** - This timer disables transmitting after the time-out timer expires (Section 2.4.7). Times up to 3 minutes, 45 seconds in 15-second steps can be programmed.

**Conversation Timer** - This timer limits the total length of a conversation (Section 2.4.8). Times up to 7.5 minutes in 0.5-minute steps can be programmed.



**Conventional System General Screen**

**Busy Channel Override** - Selects if the busy channel lockout feature can be overridden by quickly releasing and then pressing the PTT switch (see Section 2.4.5).



**Conventional System Scan List Screen**

**Scan List... Scan List Button**

Clicking Scan List in the left pane or that button in the General screen displays the preceding screen which is used to program the conventional scan lists described in Section 2.4.11.

*NOTE: The conventional scan lists cannot be programmed until all the conventional channels are programmed. Therefore, first program the channels as described in Sections 3.5.3 and 3.5.4.*

To modify a list, click **Modify List...** and the screen which follows is displayed. Select the desired scan list in the box on the top and then select the zone and the channels from that zone to be included. Repeat for each zone. Do this for each list programmed. The **Delete Entry(s)** button deletes the selected channel(s) from the scan list.



**Conventional System Modify Scan List Screen**

The following parameters are programmed in the Conventional System Scan List Screen shown on the left.

**Keypad Editing**

This function selects if the user is allowed to edit the scan list. This requires the Scan Edit option switch

as described in Section 2.3.11. User editing can be enabled and disabled on each scan list.

### Scan Mode

Sets the channel on which transmissions occur when the PTT switch is pressed while scanning. A different mode can be programmed for each scan list. In addition, it selects if priority sampling is used and also the type of priority channel (see the “Priority Channel” description which follows). The following modes are available:

**No Priority** - Priority sampling does not occur (all channels are scanned in sequence). The radio transmits on the selected channel.

**Priority/Tx Priority** - Priority sampling occurs and the priority channel is the one programmed in the selected scan list. The radio transmits on the priority channel.

**Priority/Tx Selected** - Priority sampling occurs and the priority channel is the one programmed in the selected scan list. The radio transmits on the selected channel.

**Priority on Sel Chan** - The priority channel is always the selected channel (even if the scan list is programmed with a priority channel). The radio transmits on the selected channel.

**Talkback Scan** - No priority sampling occurs (even if the scan list is programmed with a priority channel). The radio transmits on the channel of a call while scanning is halted. Then when scanning resumes, it transmits on the selected channel.

### Scan Timers

**Scan Hold Time** - Sets the delay that occurs before scanning resumes after a signal is no longer received (see Section 2.3.11).

**Lookback Time A** - This time determines how often the priority channel is checked for activity. Times of 0.25-4.00 seconds in 0.25-second steps can be programmed.

**Lookback Time B** - This time determines how often the priority channel is checked once an incor-

rect Call Guard (CTCSS/DCS) code is detected. Since it takes much longer to detect an incorrect Call Guard signal than a carrier, this time should be relatively long to prevent the interruptions from making a message difficult to understand. Times of 0.5-8.0 seconds can be programmed in 0.5-second steps.

### Priority Channel Selection

The Scan Mode parameter in the preceding Conventional System Scan List screen selects if priority channel sampling is enabled on the selected scan list. It also selects the type of priority channel (either fixed or the selected) if applicable.

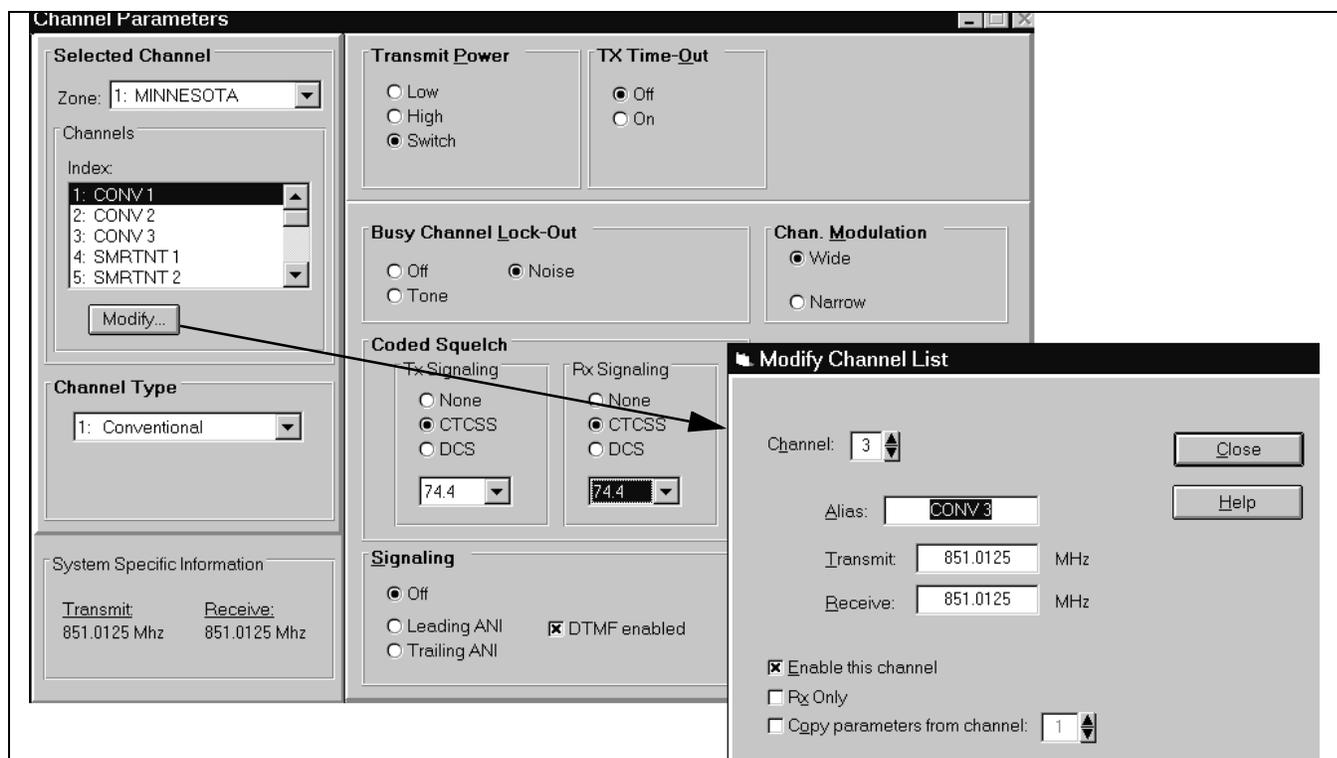
If the “Priority/Tx Priority” or “Priority/Selected” mode is programmed, fixed priority channel sampling is selected. The fixed priority channel must then be chosen for the scan list. To do this, click the  button in the preceding Modify Scan List screen and then select the desired zone/channel. Refer to Section 2.4.12 for more information on priority channel sampling.

### 3.5.3 SETTING UP CONVENTIONAL CHANNELS

The conventional Channel screen shown in Figure 3-3 which follows is displayed when a conventional channel is selected. This screen programs unique channel parameters and also assigns channels to the selectable zones displayed by the transceiver.

The general procedure for setting up a conventional channel is as follows. Refer to the descriptions which follow this procedure for information on the parameters in the channel screens.

1. Make sure that the desired zone is selected in the Zone box.
2. Select the channel number in the Channels Index box which is to be programmed with the channel. If the channel number display mode is selected (see Section 2.4.2), this will be the number displayed when the channel is selected.
3. To assign a conventional channel, select “Conventional” as the channel type.



**Figure 3-3 Conventional Channel Screen**

- Click the Modify button to display the screen which enables that channel and programs the alias (tag) and transmit and receive frequencies. Then program the other parameters in the main part of the screen. Refer to the next section for more information.

### 3.5.4 CONVENTIONAL CHANNEL SCREEN PARAMETERS

The following parameters are programmed in the conventional channel screen shown in Figure 3-3.

#### Selected Channel

**Zone Box** - Clicking the arrow to the right of this box displays the available zones. Click on a zone to select it. Zones and zone aliases are set up on the Radio-Wide General screen described in Section 3.4.2.

**Channel Index Box** - Displays the available channels in the selected zone. The channel type is selected by the Channel Type box below it.

**Modify Button** - Displays the small screen shown in Figure 3-3 which enables the

channel (makes it selectable) and programs the alias (tag) and transmit and receive frequencies.

The parameters in this screen are as follows:

- Channel** - Selects the channel to be edited.
- Alias** - Programs the identification that is displayed when the channel is selected. Up to 8 characters can be programmed.
- Transmit** - Programs the transmit frequency of the channel.
- Receive** - Programs the receive frequency of the channel.
- Enable This Channel** - The box must be checked for the channel to be selectable.
- Rx Only** - The box is checked if the channel is receive-only (transmitter disabled).
- Copy Parameters From Channel** - If another channel is selected, the parameters from that channel are copied to the new channel.

*NOTE: Channel numbers not assigned must be programmed for conventional operation and then not enabled in the Modify screen because SMARTNET/SmartZone channels cannot be disabled.*

## Channel Type

Channel Type Box - Selects the specific system from which the channel is selected. All programmed systems are displayed by number and type (conventional, SMARTNET, SmartZone). When a different channel type is selected, the screen for that type of channel is automatically displayed.

System Specific Information - With conventional systems, indicates the frequency of the selected channel without having to select the Modify box.

## Transmit Power

This fixes the transmit power on the channel for the high or low level or allows it to be switch selectable (the Hi/Lo Power option switch is then required). Refer to Section 2.4.10 for more information.

## Tx Time-Out

This enables or disables the time-out timer on the channel. The time-out timer time is programmed in the conventional system General screen (Section 3.5.2).

## Busy Channel Lockout

Off = disabled, Noise = transmit disallowed if carrier is detected, Tone = transmit allowed with carrier detected only if correct Call Guard (CTCSS/DCS) code is detected.

## Coded Squelch

This sets the transmit and receive Call Guard (CTCSS/DCS) coding, if any, used on the channel. If "None" is selected, no code is transmitted and carrier-controlled squelch is used when receiving (Section 2.4.6). The standard Call Guard tones and codes are listed in Table 3-1 on page 3-23.

## Signaling

Off - No ANI signaling is used.

Leading ANI - A DTMF-coded ID is sent at the beginning of each transmission. This ID is set in the radio-wide conventional screen (Section 3.4.3).

Trailing ANI - A DTMF-coded ID is sent at the end of each transmission.

## Channel Modulation

This selects if the channel modulation is wide-band (5 kHz) or narrowband (2.5 kHz).

## 3.6 PROGRAMMING SMARTNET/SMARTZONE SYSTEMS AND CHANNELS

### 3.6.1 INTRODUCTION

To program SMARTNET and SmartZone systems and channels, proceed as follows:

1. Program the SMARTNET/SmartZone radio-wide information as described in Section 3.4.
2. To create a new SMARTNET/SmartZone system, select the Systems > Add Systems in the menu bar (see Section 3.1.11). Up to sixteen systems of any type can be programmed as described in Section 1.5.3.
3. Program the SMARTNET/SmartZone system information as described starting in the next section. Make sure the desired SMARTNET or SmartZone system is displayed by clicking it in the left pane or selecting it in the Window menu in the menu bar (see Section 3.1.9). Then program the channels as described starting in Section 3.6.8.

### 3.6.2 SMARTNET/SMARTZONE SYSTEM GENERAL SCREEN

The SMARTNET/SmartZone System General screen is shown on the next page, and it programs the following parameters:

#### Restricted Access

Change System ID - Clicking Change System ID in the left pane or that button in the General screen displays the Change System ID screen which is used to enter the system ID of the system. This ID is entered as a hexadecimal number from 0-9 and A-F. Valid numbers are from 0001-FFFF. The system ID corresponding to the desired ID must also be located in the "key" subdirectory of the program file.

System ID - Read-only field which shows the ID of the system currently being edited.

**SMARTNET/SmartZone System General Screen**

### Splinter Channels

When splinter channels are enabled, the receive and transmit frequencies are 12.5 kHz lower than the normal frequencies. Splinter channels are used only as required in the Mexico and Canada border areas for frequencies between 806 and 820.975 MHz.

### Channel Modulation

When “Wideband” is enabled, the radio operates with a 4 kHz maximum deviation between 821.000 and 824.975 MHz and 5 kHz maximum deviation for all other frequencies. When it is disabled, deviation is 5 kHz with all frequencies.

### PTT ID

This enables or disables the PTT ID.

### Transmission Trunking

Selecting “Disabled” removes the hang time at the end of a normal conversation. This forces the radio to always contact the control channel when seeking a channel grant instead of being able to key up on the hang time of another conversation.

### System Lists

Clicking System Lists in the left pane or that button in the General screen displays the screens used to program the various lists that are unique for each SMARTNET/SmartZone system. Refer to Section 3.6.7 for more information on these lists.

### Dynamic Regrouping

Enable For This System - When this box is checked, a dynamic regrouping channel is enabled. This is a SMARTNET channel which has the corresponding talk group dynamically set by the dispatcher.

Zone - The physical zone containing the dynamic regrouping channel. The value is selected on the Channel Parameters screen.

Channel - The physical channel used for dynamic regrouping. The value is selected on the Channel Parameters screen.

### Affiliation Type

Automatic - The radio immediately affiliates with the central controller as soon as it is turned on and automatically re-affiliates each time the talk group is changed.

On PTT - The radio affiliates with the central controller only when the PTT switch is pressed.

### Time-Out Timer

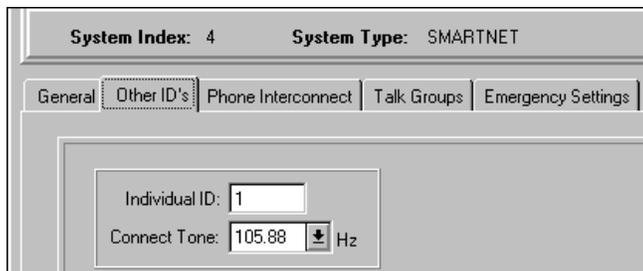
This programs the time-out timer setting for the system. It can be programmed for 0 min, 15 sec up to 3 min, 45 sec or it can be disabled (see Section 2.3.7).

### ISW Delay Time

Increasing or decreasing this value changes the transmission timing of ISW's relative to the reception of OSW's.

### 3.6.3 SMARTNET/SMARTZONE SYSTEM OTHER ID'S SCREEN

The SMARTNET/SmartZone Other ID's screen follows, and it programs the these parameters.

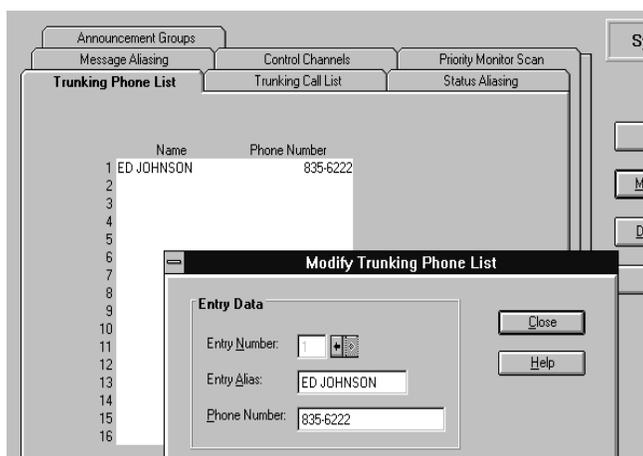


**SMARTNET/SmartZone Other IDs Screen**

Individual ID - Uniquely identifies the radio on a particular system. Each radio must have a different Unit ID. Valid Unit IDs are from 1-65535.

Connect Tone - The tone expected by the controller on the traffic channel to verify that a subscriber transmission is occurring. This tone should be set the same as it is in the controller.

### 3.6.4 SMARTNET/SMARTZONE SYSTEM PHONE INTERCONNECT SCREEN



The SMARTNET/SmartZone Phone Interconnect screen is shown above, and the parameters it programs are as follows:

#### Phone Interconnect

Refer to Section 2.5.6 for more information on telephone calls.

Disabled - Telephone calls cannot be placed or received.

Answer Only - Telephone calls can be received but not placed.

List Only - Telephone calls can be placed and received, and numbers can be recalled from memory only.

Unlimited - Telephone calls can be placed and received, and numbers can be recalled from memory or dialed using a microphone keypad.

#### Private Call

This is the same as the preceding Phone Interconnect except it is for private (unit-to-unit) calls. Refer to Sections 2.5.4 and 2.5.5 for more information.

#### Private Call II

This programs either standard (Private Conversation II™) or enhanced (Enhanced Private Conversation™) private calls as follows:

Standard - The user does not receive any feedback when the called radio is not active in the system. Only a “No Answer” is received if the called radio does not answer.

Enhanced - When a call is placed, the system tells the user if the called radio is currently active in the system and within range. The calling radio displays “NO ACK” if the called radio is not active in the system and “NO ANSWR” if it is active but does not answer.

#### Phone DTMF Timing

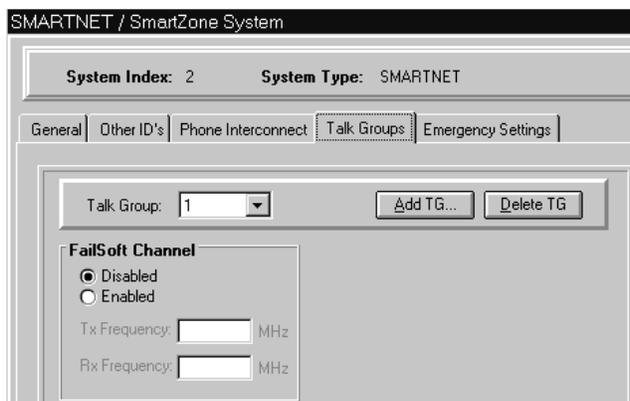
Initial Delay - Delay from 50-500 milliseconds from when a traffic channel is granted for phone interconnect to the start of the dialing out of the phone number.

Digit Duration - Duration from 50-500 milliseconds of each phone number digit.

Inter-Digit Delay - Delay from 50-500 milliseconds between each digit of a phone number.

### 3.6.5 SMARTNET/SMARTZONE SYSTEM TALK GROUPS SCREEN

The SMARTNET/SmartZone Talk Groups screen is used to set up SMARTNET/SmartZone talk groups



**SMARTNET/SmartZone System Talk Groups Screen**

and program unique talk group information. This screen is shown on the next page, and the parameters it programs are as follows:

**Talk Group** - Selects the talk group to program. This is the actual ID of the talk group. Talk groups are added or deleted by clicking the Add TG or Delete TG button (see following). Talk groups are assigned to channels on the channel screen (see Section 3.6.9).

**Add TG...** - Clicking this button displays a dialog box that adds a new talk group. The alias (alphanum) of up to 8 characters is entered, and the new group is then added after the others that are already set up. Each SMARTNET/SmartZone system can be programmed with up to 256 talk groups.

**Delete TG** - Clicking this button deletes the currently selected talk group (the one displayed in the "Talk Group" box).

### Failsoft Channel

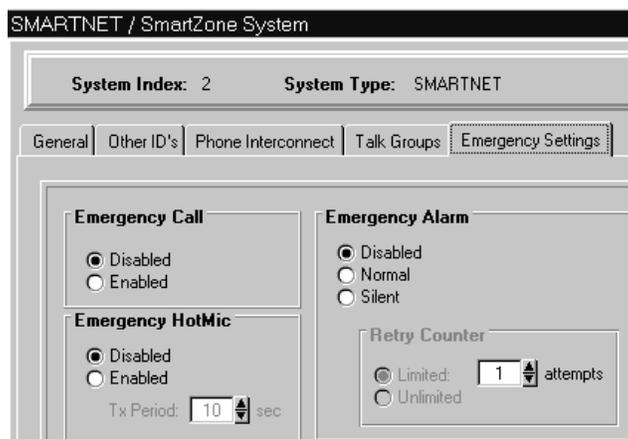
**Enable** - Enables a failsoft channel on the talk group if a controller failure occurs (see Section 2.5.11).

**Disable** - The failsoft mode is not entered if the controller fails.

**Tx/Rx Frequency** - Programs the failsoft channel frequency if "Enabled" is checked.

### 3.6.6 SMARTNET/SMARTZONE SYSTEM EMERGENCY SETTINGS SCREEN

The SMARTNET/SmartZone Emergency Settings screen and the parameters it programs are as follows:



### Emergency Call

**Enable** - When the Emergency option switch and then the PTT switch are pressed, an emergency group call is transmitted.

**Disable** - An emergency group call is not authorized.

### Emergency Hot Mic

**Enable** - When an emergency alarm is generated and the emergency alarm acknowledgment received, the emergency mode is automatically entered and transmitting begins for the time specified by the Tx Period parameter (see following).

**Disable** - Automatic transmissions do not occur.

**Tx Period** - Defines the period during which transmissions occur with the microphone audio unmuted (without user intervention). Times of 10-120 seconds in 10-second steps can be selected.

### Emergency Alarm

**Disabled** - No emergency signal is sent when the user presses the Emergency option switch.

**Normal** - When the user presses the Emergency option switch, an emergency signal is sent to the dispatcher. Audio and visual feedback is provided by the radio.

**Silent** - Same as “Normal” except no audio or visual feedback is provided.

**Retry Counter** - When “Unlimited” is selected, an emergency call is repeated until acknowledged or canceled. When “Limited” is checked, calls are attempted only the specified number of times.

**Entry Alias** - Up to 8 characters can be entered to identify the phone number. This identification is displayed when phone numbers are selected by the user from the list. Only uppercase letters can be entered, so lowercase letters are automatically converted to uppercase by the program.

**Phone Number** - This is the number dialed when the location is selected. Characters that can be entered include 0-9, #, (,), and P (a “P” programs a pause). The maximum number of digits excluding (,) and spaces is 16, and the maximum including (,) and spaces is 24.

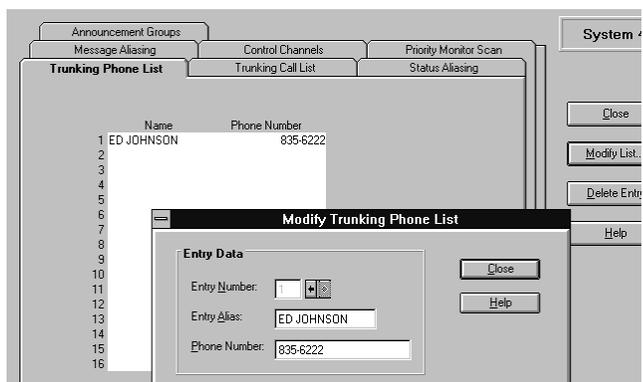
**Close** - Clicking this button verifies the current entry, stores it, and then closes the dialog box. If the current entry contains an invalid field, the dialog box does not close and the invalid field is highlighted.

**Help** - Accesses the Help screen. Help can also be selected at any time by pressing the F1 key.

### 3.6.7 SMARTNET/SMARTZONE SYSTEM LISTS SCREENS

Clicking System Lists in the left pane or the **System Lists...** button in the SMARTNET General screen (if applicable) displays the screens used to program the various lists that are unique for each SMARTNET/SmartZone system. These screens are as follows:

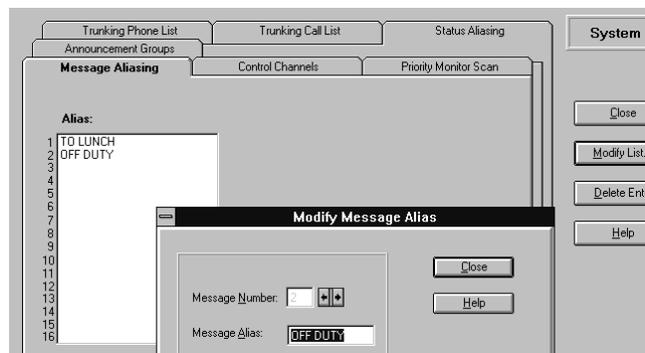
#### Trunking Phone List Screen



This screen programs the phone number list if used (see Section 2.5.6). To edit this list, click the Trunking Phone List tab and then the “Modify List” button on the right side of the screen. The following information is then programmed in the dialog box that is displayed:

**Entry Number** - This box selects the entry to be edited. The scroll bars to the right of this box select the desired entry. A phone list can contain up to 16 entries. Selecting a new entry number automatically validates and stores the current entry. If the current entry contains an invalid field (for example, too many digits in the phone number), the entry number does not change and the invalid field is highlighted.

#### Message Aliasing Screen



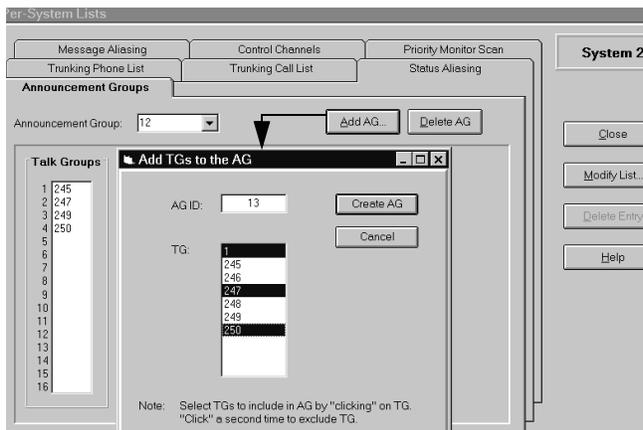
This screen associates an alias (name) with each message number (see Section 2.5.8). To edit this list, click the Message Aliasing tab and then the “Modify List” button on the right side. The following information is then programmed in the dialog box that is displayed:

**Message Number** - This box selects the message to be edited. The scroll bars to the right of this box select the desired message number.

**Message Alias** - Programs the alias which can be up to any 8 alphanumeric characters.

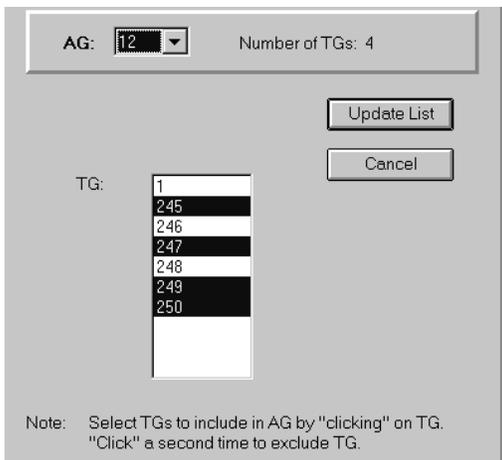
**Close Button** - Validates the entry and closes the dialog box. The entry is also validated when another message number is selected.

### Announcement Groups Screen



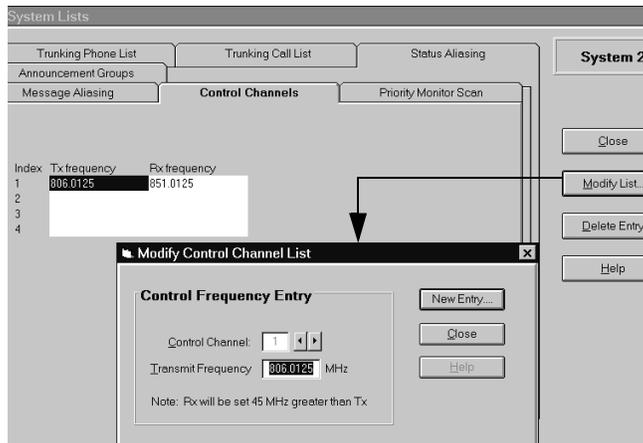
This screen programs the announcement groups that are used to communicate with several talk groups simultaneously. There can be up to 3 announcement groups per system, and each announcement group can have up to 15 talk groups.

To create an announcement group, click the “Add AG” button and the “Add TGs to the AG” screen shown above is displayed. Enter the announcement group ID, click the talk groups to select/de-select those that are to be included, and then create the announcement group by clicking the “Create AG” button. To delete the current announcement group, click the “Delete AG” button.



To edit an announcement group, click the “Modify List” button on the right and the preceding screen is displayed. Select the announcement group to be edited from a pull-down menu selecting by clicking the “AG” arrow. Then click the talk groups to select/de-select them and then click the “Update List” button to make the changes.

### Control Channels Screen



This screen allows the system manager to view and edit the control channels. Each SMARTNET system can have up to four control channels, and each SmartZone system can have up to 32 control channels. Only one control channel is active at a time.

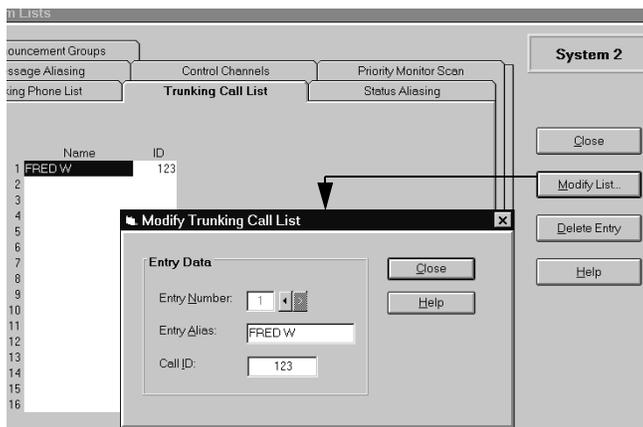
To edit this list, click the Control Channels tab and then the “Modify List” button on the right side. The following information is then programmed in the dialog box that is displayed:

**Control Channel** - Selects the control channel to be edited. To add a new channel, click the “New Entry” button.

**Frequency** - The transmit and receive frequency of the control channel. These are the mobile frequencies, not the repeater frequencies. Only multiples of 5 kHz and 6.25 kHz are valid. With 800 MHz frequencies, a receive frequency 45 MHz above the transmit frequency is automatically entered.

**New Entry Button** - Click this button to display the dialog box used to add another control channel.

## Trunking Call List Screen



This screen allows the list of IDs used for private calls to be programmed. A maximum of 16 IDs can be programmed (see Sections 2.5.4 and 2.5.5).

To edit this list, click the Trunking Call List tab and then the “Modify List” button on the right side. This following information is then programmed in the dialog box that is displayed:

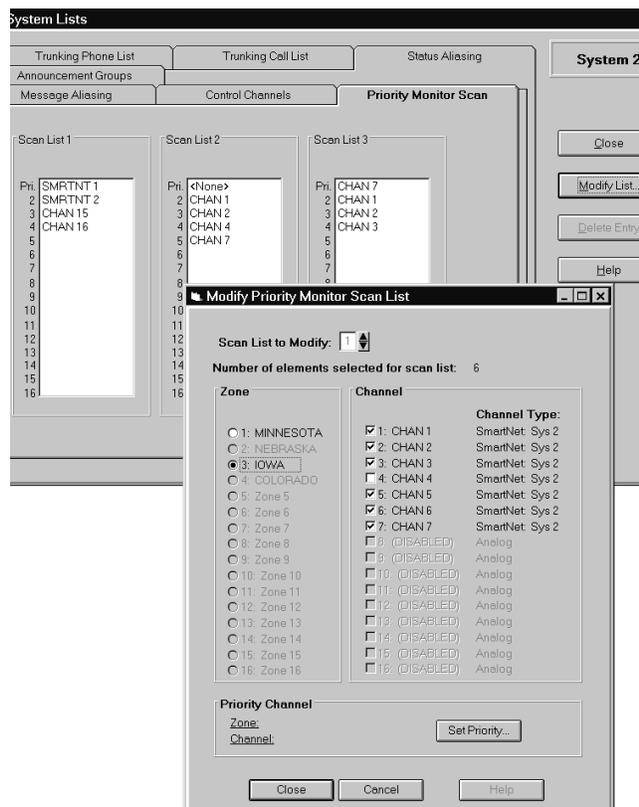
**Entry Number** - This box selects the entry to be edited. The scroll bars to the right of this box select the desired entry. A private call list can contain up to 16 entries. Selecting a new entry number automatically validates and stores the current entry. If the current entry contains an invalid field, the entry number does not change and the invalid field is highlighted.

**Entry Alias** - Up to 8 characters can be entered to identify the user being called. This identification is displayed when the mobile to be called is selected by the user from the list. Only uppercase letters can be entered, so lowercase letters are automatically converted to uppercase by the program.

**Call ID** - This is the ID of the radio being called. Valid entries are 1-65535. A “0” is detected as no entry.

**Close Button** - Verifies the current entry, stores it, and then closes the dialog box. If the current entry contains an invalid field, the dialog box does not close and the invalid field is highlighted.

## Priority Monitor Scan Screen



This screen programs up to three Priority Monitor scan lists that are allowed. Each scan list can contain up to 15 channels plus a priority channel (see Section 2.5.12). These channels must be from the same SMARTNET/SmartZone system. Channels set up for other systems are not allowed.

To edit a list, click the Priority Monitor Scan tab and then click the “Modify List” button on the right side. A screen similar to the bottom screen shown above is then displayed to select the channels to be included in that scan list. Select channels as follows:

1. Select the scan list to be edited by clicking the scroll bars next to the “Scan List To Modify” box.
2. Select the first zone with channels to be included and select the desired channels. Repeat for the other zones.
3. To select the priority channel, click the Set Priority button. Then select the desired Zone/Channel or “None” if no priority channel is to be scanned.

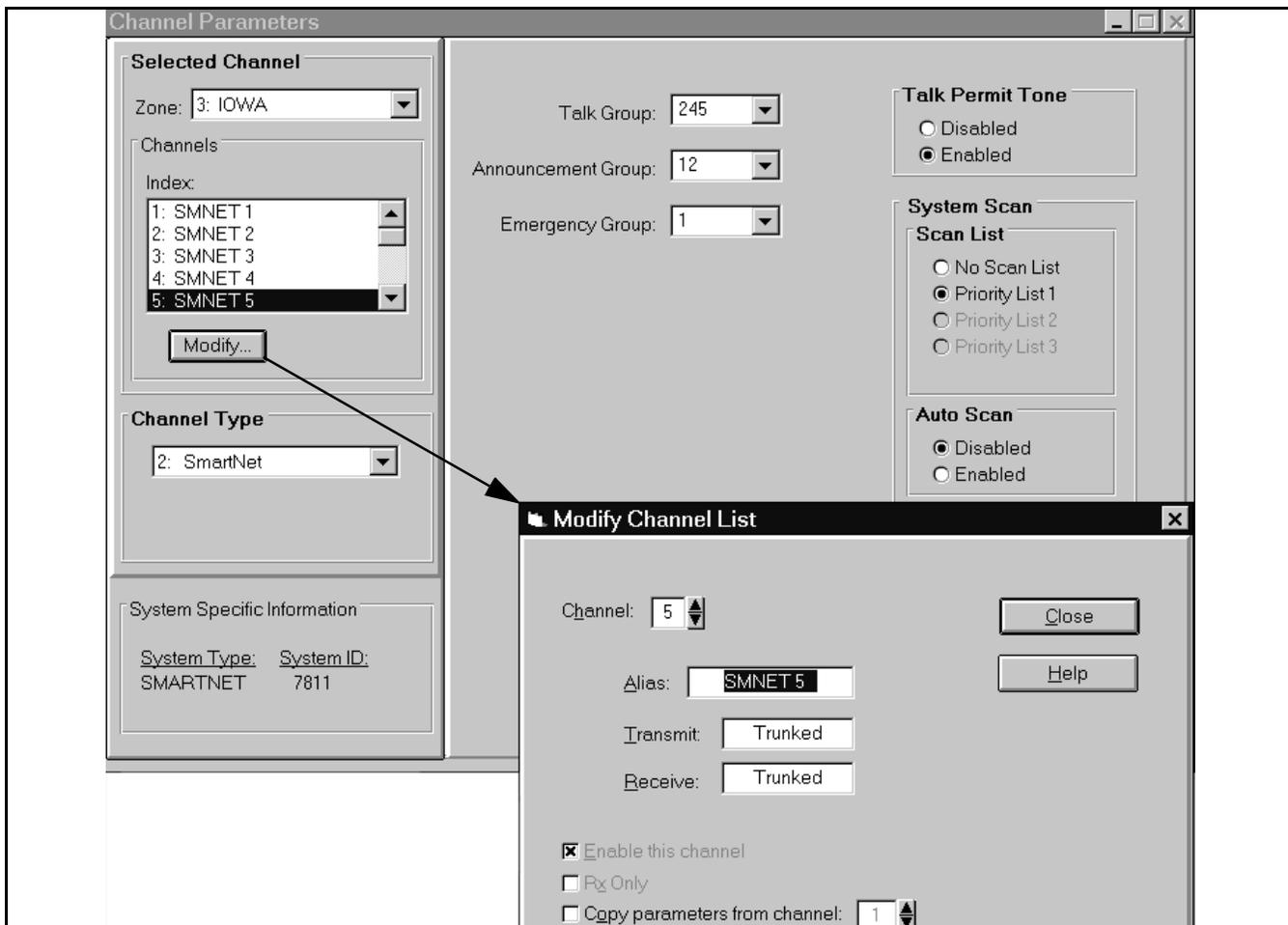
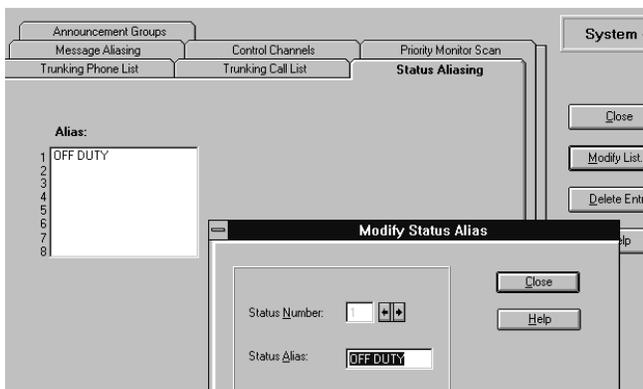


Figure 3-4 SMARTNET/SmartZone Channel Screen

4. Repeat the preceding steps for the other scan lists if applicable.

**Status Aliasing Screen**



This screen is shown above, and it programs the alias for each of up to eight status conditions that can be sent. The meaning of each status number is defined by the system manager. Refer to Section 2.5.9 for more information.

To edit this list, click the Status Aliasing tab and then the “Modify List” button on the right side. The following information is then programmed in the dialog box that is displayed:

Status Number - The scroll bars to the right of this box select the status number that is to be edited.

Status Alias - Programs up to 8 characters that identify the status. This identification is displayed when the user selects a status condition.

### 3.6.8 SETTING UP SMARTNET/SMARTZONE CHANNELS

The SMARTNET/SmartZone Channel screen shown in Figure 3-4 is displayed when the SMARTNET or SmartZone channel type is selected. This screen programs unique channel parameters and also assigns channels to the selectable zones displayed by the transceiver.

The general procedure for setting up a SMARTNET/SmartZone channel is as follows. Refer to the descriptions which follow this procedure for information on SMARTNET/SmartZone Channel screen parameters.

1. Make sure that the desired zone is selected in the Zone box.
2. Select the channel number in the Channels Index box which is to be programmed with the channel.
3. To set up a SMARTNET channel, select "SMARTNET" as the channel type, and to set up a SmartZone channel, select "SmartZone".
4. Click the Modify button to display the dialog box shown in the lower part of Figure 3-4. This box programs the alias (tag) that is displayed when it is selected.
5. Program the other parameters in the main part of the screen (see information which follows).

### 3.6.9 SMARTNET/SMARTZONE CHANNEL SCREEN PARAMETERS

The following parameters are programmed in the SMARTNET/SmartZone channel screen shown in Figure 3-4.

#### Selected Channel

Zone Box - Clicking the arrow to the right of this box displays the available zones. Click on a zone to select it. Zones and zone aliases are set up on the Radio-Wide General screen described in Section 3.4.2.

Channel Index Box - Displays the channels in the selected zone. The channel type is selected by the Channel Type box below it.

 - Displays the screen shown in the lower part of Figure 3-4. The parameters programmed in this screen are as follows:

- Channel - Selects the channel to be edited.
- Alias - Programs the identification that is displayed when the channel is selected. Up to 8 characters can be programmed.
- Transmit - Not programmable because the transmit frequency is dynamically assigned over the air ("Trunked" is always displayed).
- Receive - Dynamically assigned like the transmit frequency.
- Enable This Channel - Not used because SMARTNET/SmartZone channels are always enabled if set up. To disable a channel so that it is not selectable, choose the conventional type and do not check this box.
- Copy Parameters From Channel - If another channel is selected in the box, the parameters from that channel are copied to the new channel.

#### Channel Type

Channel Type Box - Selects the specific system from which the channel is selected. All programmed systems are displayed by number and type (conventional, SMARTNET, SmartZone). When a different channel type is selected, the screen for that type of channel is automatically displayed.

#### Other Screen Parameters

System Specific Information - With SMARTNET/SmartZone systems, indicates the system ID programmed on the system General screen (see Section 3.6.2).

Talk Group - Selects the talk group selected by that channel. Talk groups are programmed in the Talk Group screen described in Section 3.6.5.

Announcement Group - Selects one of up to three announcement groups selected by the channel. Refer to "Announcement Group Screen" in Section 3.6.7 for more information.

Emergency Group - Selects the talk group used for emergency calls.

Talk Permit Tone - When enabled, a short tone sounds after a request for a group call has been approved by the main controller. This indicates that speaking can begin. When disabled, no audio feedback is used to indicate when speaking can begin.

System Scan - Selects the Priority Monitor Scan list selected by the channel (see "Priority Monitor Scan

Screen" description in Section 3.6.7). If "No Scan List" is programmed, scanning is not selectable on that channel.

Auto Scan - When enabled and a channel is selected, the radio automatically begins scanning the scan list associated with that channel. When disabled, scanning can only be started manually by the Scan option switch.

**Table 3-1 Call Guard (CTCSS/DCS) Codes and Tones**

Recommended Tone Call Guard Codes									
Code	Freq	Code	Freq	Code	Freq	Code	Freq	Code	Freq
01	67.0	10	94.8	19	127.3	28	173.8	37*	241.8
02	71.9	11**	97.4	20	131.8	29	179.9	38*	250.3
03	74.4	12	100.0	21	136.5	30	186.2	39**	69.3
04	77.0	13	103.5	22	141.3	31	192.8	40**	206.5
05	79.7	14	107.2	23	146.2	32	203.5	41**	229.1
06	82.5	15	110.9	24	151.4	33	210.7	42**	254.1
07	85.4	16	114.8	25	156.7	34*	218.1		
08	88.5	17	118.8	26	162.2	35*	225.7		
09	91.5	18	123.0	27	167.9	36*	233.6		
* These tones normally are not used because of their close proximity to the voice frequencies									
** This tone is normally not used because it may cause interference with adjacent tones.									
Recommended Digital Call Guard Codes									
023	065	131	172	261	346	431	532	654	743
025	071	132	174	263	351	432	546	662	754
026	072	134	205	265	364	445	565	664	
031	073	143	223	271	365	464	606	703	
032	074	152	226	306	371	465	612	712	
043	114	155	243	311	411	466	624	723	
047	115	156	244	315	412	503	627	731	
051	116	162	245	331	413	506	631	732	
054	125	165	251	343	423	516	632	734	

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FCC Chan. No.	Mobile Rx Freq.	Mobile Tx Freq.	FCC Chan. No.	Mobile Rx Freq.	Mobile Tx Freq.	FCC Chan. No.	Mobile Rx Freq.	Mobile Tx Freq.
1	851.0125	806.0125	49	852.2125	807.2125	97	853.4125	808.4125
2	851.0375	806.0375	50	852.2375	807.2375	98	853.4375	808.4375
3	851.0625	806.0625	51	852.2625	807.2625	99	853.4625	808.4625
4	851.0875	806.0875	52	852.2875	807.2875	100	853.4875	808.4875
5	851.1125	806.1125	53	852.3125	807.3125	101	853.5125	808.5125
6	851.1375	806.1375	54	852.3375	807.3375	102	853.5375	808.5375
7	851.1625	806.1625	55	852.3625	807.3625	103	853.5625	808.5625
8	851.1875	806.1875	56	852.3875	807.3875	104	853.5875	808.5875
9	851.2125	806.2125	57	852.4125	807.4125	105	853.6125	808.6125
10	851.2375	806.2375	58	852.4375	807.4375	106	853.6375	808.6375
11	851.2625	806.2625	59	852.4625	807.4625	107	853.6625	808.6625
12	851.2875	806.2875	60	852.4875	807.4875	108	853.6875	808.6875
13	851.3125	806.3125	61	852.5125	807.5125	109	853.7125	808.7125
14	851.3375	806.3375	62	852.5375	807.5375	110	853.7375	808.7375
15	851.3625	806.3625	63	852.5625	807.5625	111	853.7625	808.7625
16	851.3875	806.3875	64	852.5875	807.5875	112	853.7875	808.7875
17	851.4125	806.4125	65	852.6125	807.6125	113	853.8125	808.8125
18	851.4375	806.4375	66	852.6375	807.6375	114	853.8375	808.8375
19	851.4625	806.4625	67	852.6625	807.6625	115	853.8625	808.8625
20	851.4875	806.4875	68	852.6875	807.6875	116	853.8875	808.8875
21	851.5125	806.5125	69	852.7125	807.7125	117	853.9125	808.9125
22	851.5375	806.5375	70	852.7375	807.7375	118	853.9375	808.9375
23	851.5625	806.5625	71	852.7625	807.7625	119	853.9625	808.9625
24	851.5875	806.5875	72	852.7875	807.7875	120	853.9875	808.9875
25	851.6125	806.6125	73	852.8125	807.8125	121	854.0125	809.0125
26	851.6375	806.6375	74	852.8375	807.8375	122	854.0375	809.0375
27	851.6625	806.6625	75	852.8625	807.8625	123	854.0625	809.0625
28	851.6875	806.6875	76	852.8875	807.8875	124	854.0875	809.0875
29	851.7125	806.7125	77	852.9125	807.9125	125	854.1125	809.1125
30	851.7375	806.7375	78	852.9375	807.9375	126	854.1375	809.1375
31	851.7625	806.7625	79	852.9625	807.9625	127	854.1625	809.1625
32	851.7875	806.7875	80	852.9875	807.9875	128	854.1875	809.1875
33	851.8125	806.8125	81	853.0125	808.0125	129	854.2125	809.2125
34	851.8375	806.8375	82	853.0375	808.0375	130	854.2375	809.2375
35	851.8625	806.8625	83	853.0625	808.0625	131	854.2625	809.2625
36	851.8875	806.8875	84	853.0875	808.0875	132	854.2875	809.2875
37	851.9125	806.9125	85	853.1125	808.1125	133	854.3125	809.3125
38	851.9375	806.9375	86	853.1375	808.1375	134	854.3375	809.3375
39	851.9625	806.9625	87	853.1625	808.1625	135	854.3625	809.3625
40	851.9875	806.9875	88	853.1875	808.1875	136	854.3875	809.3875
41	852.0125	807.0125	89	853.2125	808.2125	137	854.4125	809.4125
42	852.0375	807.0375	90	853.2375	808.2375	138	854.4375	809.4375
43	852.0625	807.0625	91	853.2625	808.2625	139	854.4625	809.4625
44	852.0875	807.0875	92	853.2875	808.2875	140	854.4875	809.4875
45	852.1125	807.1125	93	853.3125	808.3125	141	854.5125	809.5125
46	852.1375	807.1375	94	853.3375	808.3375	142	854.5375	809.5375
47	852.1625	807.1625	95	853.3625	808.3625	143	854.5625	809.5625
48	852.1875	807.1875	96	853.3875	808.3875	144	854.5875	809.5875

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FCC Chan. No.	Mobile Rx Freq.	Mobile Tx Freq.	FCC Chan. No.	Mobile Rx Freq.	Mobile Tx Freq.	FCC Chan. No.	Mobile Rx Freq.	Mobile Tx Freq.
145	854.6125	809.6125	193	855.8125	810.8125	241	857.0125	812.0125
146	854.6375	809.6375	194	855.8375	810.8375	242	857.0375	812.0375
147	854.6625	809.6625	195	855.8625	810.8625	243	857.0625	812.0625
148	854.6875	809.6875	196	855.8875	810.8875	244	857.0875	812.0875
149	854.7125	809.7125	197	855.9125	810.9125	245	857.1125	812.1125
150	854.7375	809.7375	198	855.9375	810.9375	246	857.1375	812.1375
151	854.7625	809.7625	199	855.9625	810.9625	247	857.1625	812.1625
152	854.7875	809.7875	200	855.9875	810.9875	248	857.1875	812.1875
153	854.8125	809.8125	201	856.0125	811.0125	249	857.2125	812.2125
154	854.8375	809.8375	202	856.0375	811.0375	250	857.2375	812.2375
155	854.8625	809.8625	203	856.0625	811.0625	251	857.2625	812.2625
156	854.8875	809.8875	204	856.0875	811.0875	252	857.2875	812.2875
157	854.9125	809.9125	205	856.1125	811.1125	253	857.3125	812.3125
158	854.9375	809.9375	206	856.1375	811.1375	254	857.3375	812.3375
159	854.9625	809.9625	207	856.1625	811.1625	255	857.3625	812.3625
160	854.9875	809.9875	208	856.1875	811.1875	256	857.3875	812.3875
161	855.0125	810.0125	209	856.2125	811.2125	257	857.4125	812.4125
162	855.0375	810.0375	210	856.2375	811.2375	258	857.4375	812.4375
163	855.0625	810.0625	211	856.2625	811.2625	259	857.4625	812.4625
164	855.0875	810.0875	212	856.2875	811.2875	260	857.4875	812.4875
165	855.1125	810.1125	213	856.3125	811.3125	261	857.5125	812.5125
166	855.1375	810.1375	214	856.3375	811.3375	262	857.5375	812.5375
167	855.1625	810.1625	215	856.3625	811.3625	263	857.5625	812.5625
168	855.1875	810.1875	216	856.3875	811.3875	264	857.5875	812.5875
169	855.2125	810.2125	217	856.4125	811.4125	265	857.6125	812.6125
170	855.2375	810.2375	218	856.4375	811.4375	266	857.6375	812.6375
171	855.2625	810.2625	219	856.4625	811.4625	267	857.6625	812.6625
172	855.2875	810.2875	220	856.4875	811.4875	268	857.6875	812.6875
173	855.3125	810.3125	221	856.5125	811.5125	269	857.7125	812.7125
174	855.3375	810.3375	222	856.5375	811.5375	270	857.7375	812.7375
175	855.3625	810.3625	223	856.5625	811.5625	271	857.7625	812.7625
176	855.3875	810.3875	224	856.5875	811.5875	272	857.7875	812.7875
177	855.4125	810.4125	225	856.6125	811.6125	273	857.8125	812.8125
178	855.4375	810.4375	226	856.6375	811.6375	274	857.8375	812.8375
179	855.4625	810.4625	227	856.6625	811.6625	275	857.8625	812.8625
180	855.4875	810.4875	228	856.6875	811.6875	276	857.8875	812.8875
181	855.5125	810.5125	229	856.7125	811.7125	277	857.9125	812.9125
182	855.5375	810.5375	230	856.7375	811.7375	278	857.9375	812.9375
183	855.5625	810.5625	231	856.7625	811.7625	279	857.9625	812.9625
184	855.5875	810.5875	232	856.7875	811.7875	280	857.9875	812.9875
185	855.6125	810.6125	233	856.8125	811.8125	281	858.0125	813.0125
186	855.6375	810.6375	234	856.8375	811.8375	282	858.0375	813.0375
187	855.6625	810.6625	235	856.8625	811.8625	283	858.0625	813.0625
188	855.6875	810.6875	236	856.8875	811.8875	284	858.0875	813.0875
189	855.7125	810.7125	237	856.9125	811.9125	285	858.1125	813.1125
190	855.7375	810.7375	238	856.9375	811.9375	286	858.1375	813.1375
191	855.7625	810.7625	239	856.9625	811.9625	287	858.1625	813.1625
192	855.7875	810.7875	240	856.9875	811.9875	288	858.1875	813.1875

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**800 MHz Channels**

<b>FCC Chan. No.</b>	<b>Mobile Rx Freq.</b>	<b>Mobile Tx Freq.</b>	<b>FCC Chan. No.</b>	<b>Mobile Rx Freq.</b>	<b>Mobile Tx Freq.</b>	<b>FCC Chan. No.</b>	<b>Mobile Rx Freq.</b>	<b>Mobile Tx Freq.</b>
289	858.2125	813.2125	337	859.4125	814.4125	385	860.6125	815.6125
290	858.2375	813.2375	338	859.4375	814.4375	386	860.6375	815.6375
291	858.2625	813.2625	339	859.4625	814.4625	387	860.6625	815.6625
292	858.2875	813.2875	340	859.4875	814.4875	388	860.6875	815.6875
293	858.3125	813.3125	341	859.5125	814.5125	389	860.7125	815.7125
294	858.3375	813.3375	342	859.5375	814.5375	390	860.7375	815.7375
295	858.3625	813.3625	343	859.5625	814.5625	391	860.7625	815.7625
296	858.3875	813.3875	344	859.5875	814.5875	392	860.7875	815.7875
297	858.4125	813.4125	345	859.6125	814.6125	393	860.8125	815.8125
298	858.4375	813.4375	346	859.6375	814.6375	394	860.8375	815.8375
299	858.4625	813.4625	347	859.6625	814.6625	395	860.8625	815.8625
300	858.4875	813.4875	348	859.6875	814.6875	396	860.8875	815.8875
301	858.5125	813.5125	349	859.7125	814.7125	397	860.9125	815.9125
302	858.5375	813.5375	350	859.7375	814.7375	398	860.9375	815.9375
303	858.5625	813.5625	351	859.7625	814.7625	399	860.9625	815.9625
304	858.5875	813.5875	352	859.7875	814.7875	400	860.9875	815.9875
305	858.6125	813.6125	353	859.8125	814.8125	401	861.0125	816.0125
306	858.6375	813.6375	354	859.8375	814.8375	402	861.0375	816.0375
307	858.6625	813.6625	355	859.8625	814.8625	403	861.0625	816.0625
308	858.6875	813.6875	356	859.8875	814.8875	404	861.0875	816.0875
309	858.7125	813.7125	357	859.9125	814.9125	405	861.1125	816.1125
310	858.7375	813.7375	358	859.9375	814.9375	406	861.1375	816.1375
311	858.7625	813.7625	359	859.9625	814.9625	407	861.1625	816.1625
312	858.7875	813.7875	360	859.9875	814.9875	408	861.1875	816.1875
313	858.8125	813.8125	361	860.0125	815.0125	409	861.2125	816.2125
314	858.8375	813.8375	362	860.0375	815.0375	410	861.2375	816.2375
315	858.8625	813.8625	363	860.0625	815.0625	411	861.2625	816.2625
316	858.8875	813.8875	364	860.0875	815.0875	412	861.2875	816.2875
317	858.9125	813.9125	365	860.1125	815.1125	413	861.3125	816.3125
318	858.9375	813.9375	366	860.1375	815.1375	414	861.3375	816.3375
319	858.9625	813.9625	367	860.1625	815.1625	415	861.3625	816.3625
320	858.9875	813.9875	368	860.1875	815.1875	416	861.3875	816.3875
321	859.0125	814.0125	369	860.2125	815.2125	417	861.4125	816.4125
322	859.0375	814.0375	370	860.2375	815.2375	418	861.4375	816.4375
323	859.0625	814.0625	371	860.2625	815.2625	419	861.4625	816.4625
324	859.0875	814.0875	372	860.2875	815.2875	420	861.4875	816.4875
325	859.1125	814.1125	373	860.3125	815.3125	421	861.5125	816.5125
326	859.1375	814.1375	374	860.3375	815.3375	422	861.5375	816.5375
327	859.1625	814.1625	375	860.3625	815.3625	423	861.5625	816.5625
328	859.1875	814.1875	376	860.3875	815.3875	424	861.5875	816.5875
329	859.2125	814.2125	377	860.4125	815.4125	425	861.6125	816.6125
330	859.2375	814.2375	378	860.4375	815.4375	426	861.6375	816.6375
331	859.2625	814.2625	379	860.4625	815.4625	427	861.6625	816.6625
332	859.2875	814.2875	380	860.4875	815.4875	428	861.6875	816.6875
333	859.3125	814.3125	381	860.5125	815.5125	429	861.7125	816.7125
334	859.3375	814.3375	382	860.5375	815.5375	430	861.7375	816.7375
335	859.3625	814.3625	383	860.5625	815.5625	431	861.7625	816.7625
336	859.3875	814.3875	384	860.5875	815.5875	432	861.7875	816.7875

## 800 MHz Channels

FCC Chan. No.	Mobile Rx Freq.	Mobile Tx Freq	FCC Chan. No.	Mobile Rx Freq.	Mobile Tx Freq	FCC Chan. No.	Mobile Rx Freq	Mobile Tx Freq
433	861.8125	816.8125	481	863.0125	818.0125	529	864.2125	819.2125
434	861.8375	816.8375	482	863.0375	818.0375	530	864.2375	819.2375
435	861.8625	816.8625	483	863.0625	818.0625	531	864.2625	819.2625
436	861.8875	816.8875	484	863.0875	818.0875	532	864.2875	819.2875
437	861.9125	816.9125	485	863.1125	818.1125	533	864.3125	819.3125
438	861.9375	816.9375	486	863.1375	818.1375	534	864.3375	819.3375
439	861.9625	816.9625	487	863.1625	818.1625	535	864.3625	819.3625
440	861.9875	816.9875	488	863.1875	818.1875	536	864.3875	819.3875
441	862.0125	817.0125	489	863.2125	818.2125	537	864.4125	819.4125
442	862.0375	817.0375	490	863.2375	818.2375	538	864.4375	819.4375
443	862.0625	817.0625	491	863.2625	818.2625	539	864.4625	819.4625
444	862.0875	817.0875	492	863.2875	818.2875	540	864.4875	819.4875
445	862.1125	817.1125	493	863.3125	818.3125	541	864.5125	819.5125
446	862.1375	817.1375	494	863.3375	818.3375	542	864.5375	819.5375
447	862.1625	817.1625	495	863.3625	818.3625	543	864.5625	819.5625
448	862.1875	817.1875	496	863.3875	818.3875	544	864.5875	819.5875
449	862.2125	817.2125	497	863.4125	818.4125	545	864.6125	819.6125
450	862.2375	817.2375	498	863.4375	818.4375	546	864.6375	819.6375
451	862.2625	817.2625	499	863.4625	818.4625	547	864.6625	819.6625
452	862.2875	817.2875	500	863.4875	818.4875	548	864.6875	819.6875
453	862.3125	817.3125	501	863.5125	818.5125	549	864.7125	819.7125
454	862.3375	817.3375	502	863.5375	818.5375	550	864.7375	819.7375
455	862.3625	817.3625	503	863.5625	818.5625	551	864.7625	819.7625
456	862.3875	817.3875	504	863.5875	818.5875	552	864.7875	819.7875
457	862.4125	817.4125	505	863.6125	818.6125	553	864.8125	819.8125
458	862.4375	817.4375	506	863.6375	818.6375	554	864.8375	819.8375
459	862.4625	817.4625	507	863.6625	818.6625	555	864.8625	819.8625
460	862.4875	817.4875	508	863.6875	818.6875	556	864.8875	819.8875
461	862.5125	817.5125	509	863.7125	818.7125	557	864.9125	819.9125
462	862.5375	817.5375	510	863.7375	818.7375	558	864.9375	819.9375
463	862.5625	817.5625	511	863.7625	818.7625	559	864.9625	819.9625
464	862.5875	817.5875	512	863.7875	818.7875	560	864.9875	819.9875
465	862.6125	817.6125	513	863.8125	818.8125	561	865.0125	820.0125
466	862.6375	817.6375	514	863.8375	818.8375	562	865.0375	820.0375
467	862.6625	817.6625	515	863.8625	818.8625	563	865.0625	820.0625
468	862.6875	817.6875	516	863.8875	818.8875	564	865.0875	820.0875
469	862.7125	817.7125	517	863.9125	818.9125	565	865.1125	820.1125
470	862.7375	817.7375	518	863.9375	818.9375	566	865.1375	820.1375
471	862.7625	817.7625	519	863.9625	818.9625	567	865.1625	820.1625
472	862.7875	817.7875	520	863.9875	818.9875	568	865.1875	820.1875
473	862.8125	817.8125	521	864.0125	819.0125	569	865.2125	820.2125
474	862.8375	817.8375	522	864.0375	819.0375	570	865.2375	820.2375
475	862.8625	817.8625	523	864.0625	819.0625	571	865.2625	820.2625
476	862.8875	817.8875	524	864.0875	819.0875	572	865.2875	820.2875
477	862.9125	817.9125	525	864.1125	819.1125	573	865.3125	820.3125
478	862.9375	817.9375	526	864.1375	819.1375	574	865.3375	820.3375
479	862.9625	817.9625	527	864.1625	819.1625	575	865.3625	820.3625
480	862.9875	817.9875	528	864.1875	819.1875	576	865.3875	820.3875

**PROGRAMMING**

**800 MHz Channels**

FCC Chan. No.	Mobile Rx Freq.	Mobile Tx Freq.	FCC Chan. No.	Mobile Rx Freq.	Mobile Tx Freq.	FCC Chan. No.	Mobile Rx Freq.	Mobile Tx Freq.
577	865.4125	820.4125	623	866.3000	821.3000	669	866.9000	821.9000
578	865.4375	820.4375	624	866.3125	821.3125	670	866.9125	821.9125
579	865.4625	820.4625	625	866.3250	821.3250	671	866.9250	821.9250
580	865.4875	820.4875	626	866.3375	821.3375	672	866.9375	821.9375
581	865.5125	820.5125	627	866.3500	821.3500	673	866.9500	821.9500
582	865.5375	820.5375	628	866.3625	821.3625	674	866.9625	821.9625
583	865.5625	820.5625	629	866.3750	821.3750	675	866.9750	821.9750
584	865.5875	820.5875	630	866.3875	821.3875	676	866.9875	821.9875
585	865.6125	820.6125	631	866.4000	821.4000	-	867.0000	822.0000
586	865.6375	820.6375	632	866.4125	821.4125	677	867.0125	822.0125
587	865.6625	820.6625	633	866.4250	821.4250	-	867.0250	822.0250
588	865.6875	820.6875	634	866.4375	821.4375	678	867.0375	822.0375
589	865.7125	820.7125	635	866.4500	821.4500	679	867.0500	822.0500
590	865.7375	820.7375	636	866.4625	821.4625	680	867.0625	822.0625
591	865.7625	820.7625	637	866.4750	821.4750	681	867.0750	822.0750
592	865.7875	820.7875	638	866.4875	821.4875	682	867.0875	822.0875
593	865.8125	820.8125	-	866.5000	821.5000	683	867.1000	822.1000
594	865.8375	820.8375	639	866.5125	821.5125	684	867.1125	822.1125
595	865.8625	820.8625	-	866.5250	821.5250	685	867.1250	822.1250
596	865.8875	820.8875	640	866.5375	821.5375	686	867.1375	822.1375
597	865.9125	820.9125	641	866.5500	821.5500	687	867.1500	822.1500
598	865.9375	820.9375	642	866.5625	821.5625	688	867.1625	822.1625
599	865.9625	820.9625	643	866.5750	821.5750	689	867.1750	822.1750
600	865.9875	820.9875	644	866.5875	821.5875	690	867.1875	822.1875
-	866.0000	821.0000	645	866.6000	821.6000	691	867.2000	822.2000
601	866.0125	821.0125	646	866.6125	821.6125	692	867.2125	822.2125
-	866.0250	821.0250	647	866.6250	821.6250	693	867.2250	822.2250
602	866.0375	821.0375	648	866.6375	821.6375	694	867.2375	822.2375
603	866.0500	821.0500	649	866.6500	821.6500	695	867.2500	822.2500
604	866.0625	821.0625	650	866.6625	821.6625	696	867.2625	822.2625
605	866.0750	821.0750	651	866.6750	821.6750	697	867.2750	822.2750
606	866.0875	821.0875	652	866.6875	821.6875	698	867.2875	822.2875
607	866.1000	821.1000	653	866.7000	821.7000	699	867.3000	822.3000
608	866.1125	821.1125	654	866.7125	821.7125	700	867.3125	822.3125
609	866.1250	821.1250	655	866.7250	821.7250	701	867.3250	822.3250
610	866.1375	821.1375	656	866.7375	821.7375	702	867.3375	822.3375
611	866.1500	821.1500	657	866.7500	821.7500	703	867.3500	822.3500
612	866.1625	821.1625	658	866.7625	821.7625	704	867.3625	822.3625
613	866.1750	821.1750	659	866.7750	821.7750	705	867.3750	822.3750
614	866.1875	821.1875	660	866.7875	821.7875	706	867.3875	822.3875
615	866.2000	821.2000	661	866.8000	821.8000	707	867.4000	822.4000
616	866.2125	821.2125	662	866.8125	821.8125	708	867.4125	822.4125
617	866.2250	821.2250	663	866.8250	821.8250	709	867.4250	822.4250
618	866.2375	821.2375	664	866.8375	821.8375	710	867.4375	822.4375
619	866.2500	821.2500	665	866.8500	821.8500	711	867.4500	822.4500
620	866.2625	821.2625	666	866.8625	821.8625	712	867.4625	822.4625
621	866.2750	821.2750	667	866.8750	821.8750	713	867.4750	822.4750
622	866.2875	821.2875	668	866.8875	821.8875	714	867.4875	822.4875

## 800 MHz Channels

FCC Chan. No.	Mobile Rx Freq.	Mobile Tx Freq	FCC Chan. No.	Mobile Rx Freq.	Mobile Tx Freq	FCC Chan. No.	Mobile Rx Freq	Mobile Tx Freq
-	867.5000	822.5000	759	868.1000	823.1000	807	868.7000	823.7000
715	867.5125	822.5125	760	868.1125	823.1125	808	868.7125	823.7125
-	867.5250	822.5250	761	868.1250	823.1250	809	868.7250	823.7250
716	867.5375	822.5375	762	868.1375	823.1375	810	868.7375	823.7375
717	867.5500	822.5500	763	868.1500	823.1500	811	868.7500	823.7500
718	867.5625	822.5625	764	868.1625	823.1625	812	868.7625	823.7625
719	867.5750	822.5750	765	868.1750	823.1750	813	868.7750	823.7750
720	867.5875	822.5875	766	868.1875	823.1875	814	868.7875	823.7875
721	867.6000	822.6000	767	868.2000	823.2000	815	868.8000	823.8000
722	867.6125	822.6125	768	868.2125	823.2125	816	868.8125	823.8125
723	867.6250	822.6250	769	868.2250	823.2250	817	868.8250	823.8250
724	867.6375	822.6375	770	868.2375	823.2375	818	868.8375	823.8375
725	867.6500	822.6500	771	868.2500	823.2500	819	868.8500	823.8500
726	867.6625	822.6625	772	868.2625	823.2625	820	868.8625	823.8625
727	867.6750	822.6750	773	868.2750	823.2750	821	868.8750	823.8750
728	867.6875	822.6875	774	868.2875	823.2875	822	868.8875	823.8875
729	867.7000	822.7000	775	868.3000	823.3000	823	868.9000	823.9000
730	867.7125	822.7125	776	868.3125	823.3125	824	868.9125	823.9125
731	867.7250	822.7250	777	868.3250	823.3250	825	868.9250	823.9250
732	867.7375	822.7375	778	868.3375	823.3375	826	868.9375	823.9375
733	867.7500	822.7500	779	868.3500	823.3500	827	868.9500	823.9500
734	867.7625	822.7625	780	868.3625	823.3625	828	868.9625	823.9625
735	867.7750	822.7750	781	868.3750	823.3750	829	868.9750	823.9750
736	867.7875	822.7875	782	868.3875	823.3875	830	868.9875	823.9875
737	867.8000	822.8000	783	868.4000	823.4000	-	869.0000	824.0000
738	867.8125	822.8125	784	868.4125	823.4125	-	869.0125	824.0125
739	867.8250	822.8250	785	868.4250	823.4250	-	869.0250	824.0250
740	867.8375	822.8375	786	868.4375	823.4375	-	869.0375	824.0375
741	867.8500	822.8500	787	868.4500	823.4500	-	869.0500	824.0500
742	867.8625	822.8625	788	868.4625	823.4625	-	869.0625	824.0625
743	867.8750	822.8750	789	868.4750	823.4750	-	869.0750	824.0750
744	867.8875	822.8875	790	868.4875	823.4875	-	869.0875	824.0875
745	867.9000	822.9000	791	868.5000	823.5000	-	869.1000	824.1000
746	867.9125	822.9125	792	868.5125	823.5125	-	869.1125	824.1125
747	867.9250	822.9250	793	868.5250	823.5250	-	869.1250	824.1250
748	867.9375	822.9375	794	868.5375	823.5375	-	869.1375	824.1375
749	867.9500	822.9500	795	868.5500	823.5500	-	869.1500	824.1500
750	867.9625	822.9625	796	868.5625	823.5625	-	869.1625	824.1625
751	867.9750	822.9750	797	868.5750	823.5750	-	869.1750	824.1750
752	867.9875	822.9875	798	868.5875	823.5875	-	869.1875	824.1875
-	868.0000	823.0000	799	868.6000	823.6000	-	869.2000	824.2000
753	868.0125	823.0125	800	868.6125	823.6125	-	869.2125	824.2125
-	868.0250	823.0250	801	868.6250	823.6250	-	869.2250	824.2250
754	868.0375	823.0375	802	868.6375	823.6375	-	869.2375	824.2375
755	868.0500	823.0500	803	868.6500	823.6500	-	869.2500	824.2500
756	868.0625	823.0625	804	868.6625	823.6625	-	869.2625	824.2625
757	868.0750	823.0750	805	868.6750	823.6750	-	869.2750	824.2750
758	868.0875	823.0875	806	868.6875	823.6875	-	869.2875	824.2875

**PROGRAMMING****800 MHz Channels**

<b>FCC Chan. No.</b>	<b>Mobile Rx Freq.</b>	<b>Mobile Tx Freq</b>
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<b>FCC Chan. No.</b>	<b>Mobile Rx Freq.</b>	<b>Mobile Tx Freq</b>
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<b>FCC Chan. No.</b>	<b>Mobile Rx Freq</b>	<b>Mobile Tx Freq</b>
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- 869.3000 824.3000  
- 869.3125 824.3125  
- 869.3250 824.3250  
- 869.3375 824.3375  
- 869.3500 824.3500  
- 869.3625 824.3625  
- 869.3750 824.3750  
- 869.3875 824.3875  
- 869.4000 824.4000  
- 869.4125 824.4125  
- 869.4250 824.4250  
- 869.4375 824.4375  
- 869.4500 824.4500  
- 869.4625 824.4625  
- 869.4750 824.4750  
- 869.4875 824.4875  
- 869.5000 824.5000  
- 869.5125 824.5125  
- 869.5250 824.5250

- 869.5375 824.5375  
- 869.5500 824.5500  
- 869.5625 824.5625  
- 869.5750 824.5750  
- 869.5875 824.5875  
- 869.6000 824.6000  
- 869.6125 824.6125  
- 869.6250 824.6250  
- 869.6375 824.6375  
- 869.6500 824.6500  
- 869.6625 824.6625  
- 869.6750 824.6750  
- 869.6875 824.6875  
- 869.7000 824.7000  
- 869.7125 824.7125  
- 869.7250 824.7250  
- 869.7375 824.7375  
- 869.7500 824.7500  
- 869.7625 824.7625

- 869.7750 824.7750  
- 869.7875 824.7875  
- 869.8000 824.8000  
- 869.8125 824.8125  
- 869.8250 824.8250  
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- 869.8500 824.8500  
- 869.8625 824.8625  
- 869.8750 824.8750  
- 869.8875 824.8875  
- 869.9000 824.9000  
- 869.9125 824.9125  
- 869.9250 824.9250  
- 869.9375 824.9375  
- 869.9500 824.9500  
- 869.9625 824.9625  
- 869.9750 824.9750  
- 869.9875 824.9875

## SECTION 4 ALIGNMENT AND PERFORMANCE TESTS

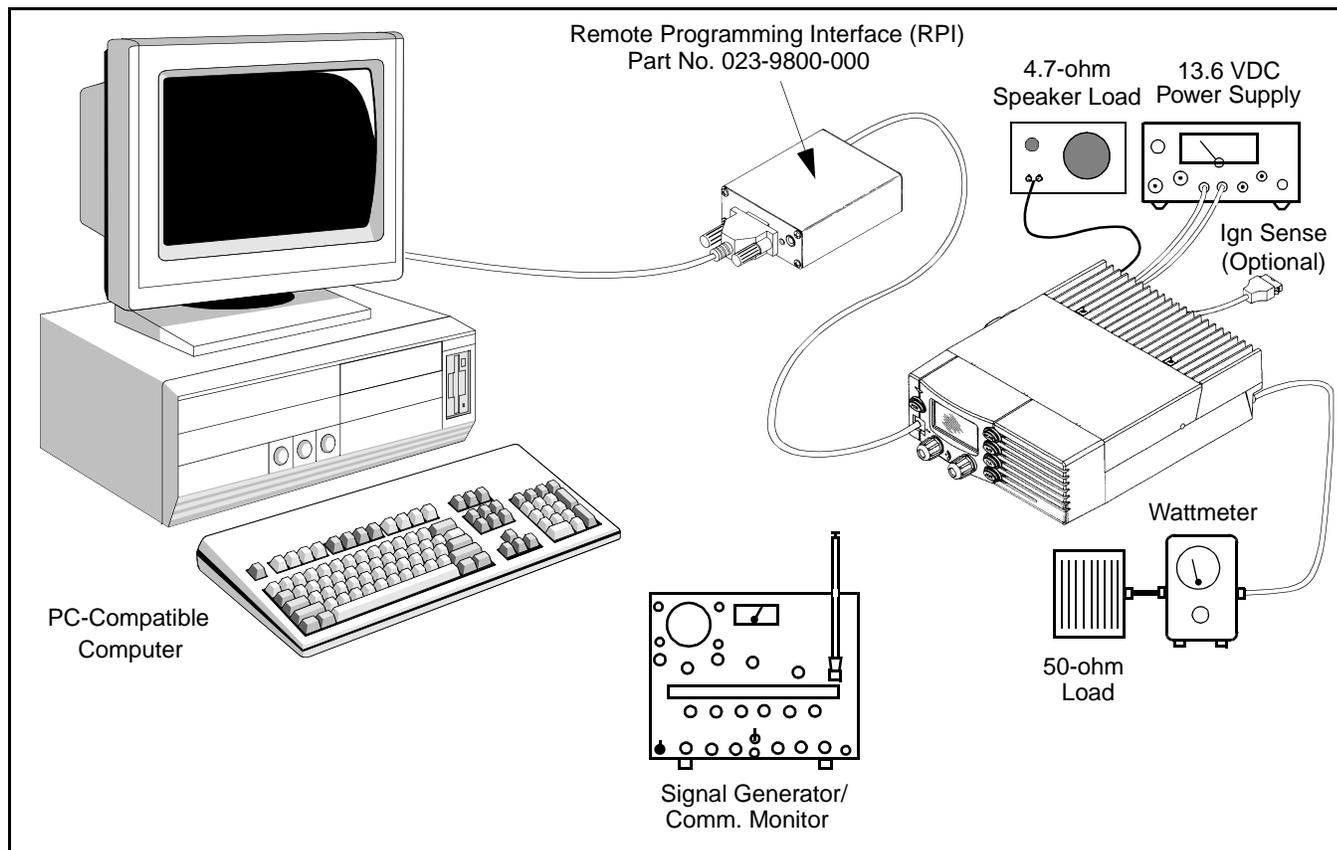


Figure 4-1 Alignment Setup

## 4.1 GENERAL

## 4.1.1 INTRODUCTION

The alignment procedure described in this section should be performed if repairs are made that could affect the factory alignment. In addition, before a transceiver is initially placed in service, the performance tests described in Section 4.8 should be performed.

To perform the alignment described in this section, special PCTune software (see Table 1-1) and the same basic computer setup used for programming is required. This equipment is shown above and also described in Section 3.1. Remote Programming Interface (RPI), Part No. 023-9800-000, or others can be used (except 023-5300-000). The speaker and microphone audio jacks on the 9800 RPI are not required in this application.

With 800 MHz models, only three or four adjustments are made manually and the others are made digitally using the PCTune software. The manual adjustments tune the IF and high power PA, and set the TCXO frequency. If they do not need to be reset, the transceiver can be tuned without removing the top or bottom covers.

This transceiver does not have a special test mode that is selected. The PCTune software automatically selects the frequencies and other test conditions that are required to perform the alignment. If the transceiver must be controlled manually to perform such things as testing or troubleshooting, program temporary conventional channels.

## 4.1.2 TEST SETUP

Connect the test setup shown in Figure 4-1. Additional information follows on equipment in this setup.

**RF Signal Generator** - When connecting the generator to the antenna jack, use at least a 6 dB pad between the generator and transceiver. This protects the generator if the transmitter is accidentally keyed and also ensures that a 50-ohm load exists. The input levels listed in the PCTune screens are at the antenna jack, so increase the generator output accordingly.

**Power Source** - Typical current when transmitting is 7 amperes with 15-watt models, and 11 amperes with 30-watt models. Therefore, a power supply capable of producing that current at 13.6 volts is required.

**Wattmeter/Load** - The wattmeter and dummy load must measure and dissipate up to approximately 30 watts. For accurate power output measurement at 800 MHz, use a minimum number of connectors with a Teflon or better dielectric. If coaxial cable is used, it should be a minimum length of a low-loss type.

**Speaker Load** - The speaker load is connected to the 1/8" phone jack on the back of the transceiver.

**Computer and RPI** - The RPI is connected to the computer and transceiver as described in Section 3.1.4. RPI, Part No. 023-9800-000 or other RPIs (except 023-5300-000) can be used as described in the preceding section.

### 4.1.3 TUNE SOFTWARE

#### General

The PCTune software is a Windows<sup>®</sup>-based program. Minimum software and hardware requirements are as follows:

- Windows<sup>®</sup> 95 or 3.1
- 386SX or faster microprocessor
- 4 megabytes of RAM
- 3 megabytes free space available on hard drive
- An available serial port

#### Software Installation

Proceed as follows to install this software:

1. Close all applications that are currently running (other than Windows).

2. Insert the disk containing the PCTune software in drive A: (or B:).
3. From the Windows 95 taskbar, choose RUN and open SETUP.EXE on drive A: (or B:). Alternatively, use File Explorer and double click SETUP.EXE.

From the Windows 3.1 Program Manager, choose FILE > RUN and select the SETUP.EXE file on drive A: (or B:).

4. Follow the instructions on the screen. The program is automatically loaded on the hard drive and start-up shortcuts or groups are created.

#### Starting PCTune

**From Windows 95** - Select Start in the taskbar, then Programs > PCTune > PCTune.

**From Windows 3.1** - From the Program Manager, open the PCTune group and then double click the PCTune icon.

#### Exiting PCTune

Select File > Exit or click the "X" button on the right end of the title bar.

### 4.1.4 PRELIMINARY SETUP

1. With transceiver power turned off, connect the RPI to an unused serial port of the computer. Then connect the RPI to the microphone jack of the transceiver (see Section 3.1.4).
2. Start the PCTune program as described in the preceding section. If required, select the serial port being used by selecting Options > Set Comm Port.
3. Turn transceiver power on and the green indicator on the RPI should light. Move the selector switch on the RPI to the other position if this indicator is amber.
4. Follow the instructions on the screen to display the main screen shown in Figure 4-2. Select Tuning > Complete Tuning to automatically step through a complete alignment or Tuning > Partial Tuning to manually select each adjustment.

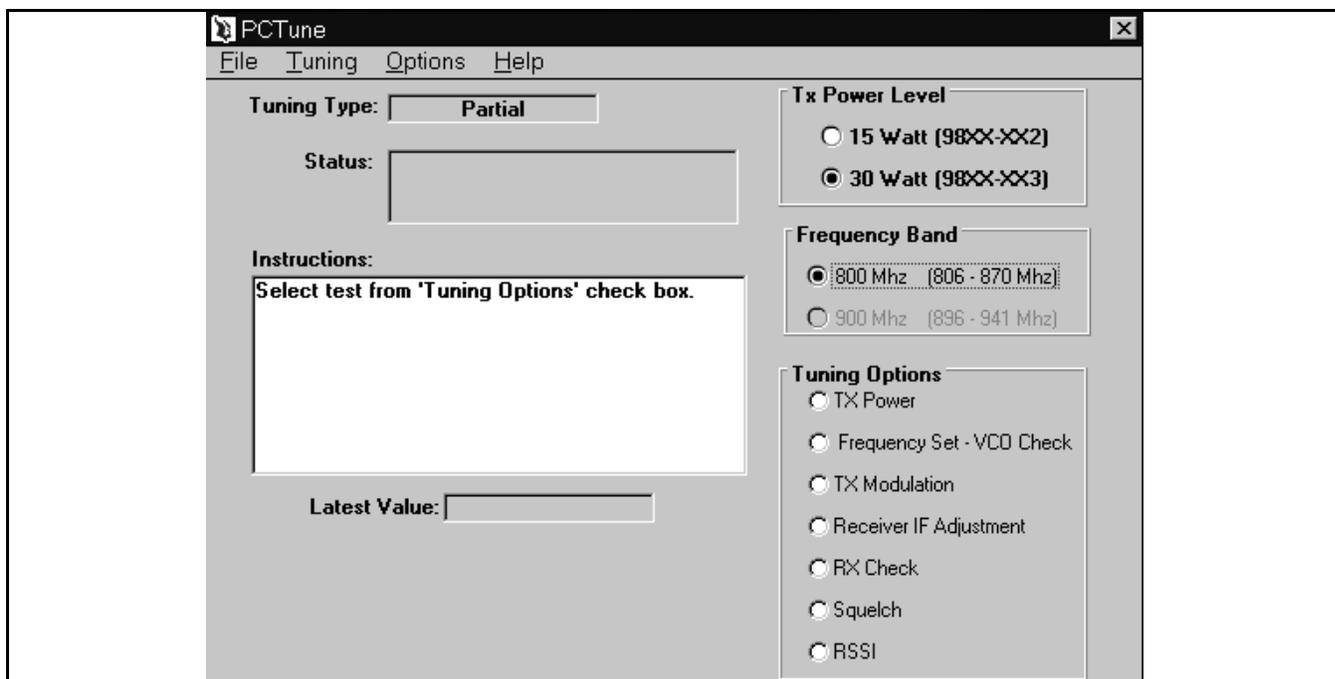


Figure 4-2 PCTune Main Screen

- The computer then attempts to establish communication with the transceiver. When communication is established, “Com Link Established” is displayed in the “Status” box and “TUNING” is indicated in the transceiver display. Instructions are then displayed in the “Instructions” box on how to proceed with each adjustment.

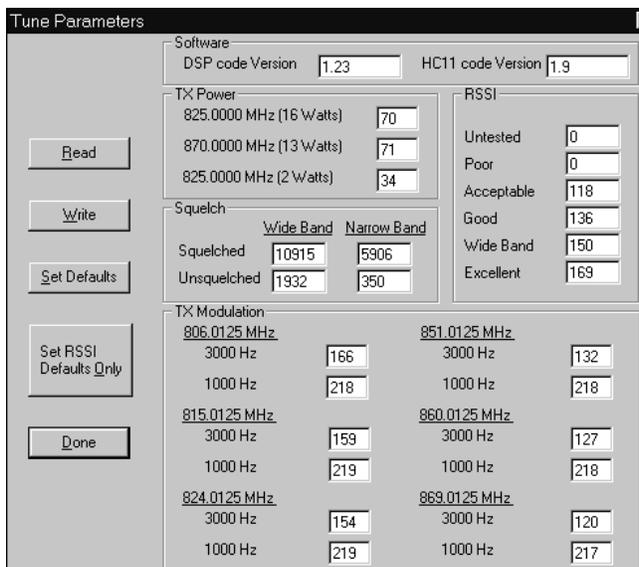


Figure 4-3 Tune Parameters Screen

#### 4.1.5 READING CURRENT SETTINGS

To read and display the settings currently programmed in a transceiver, select Tuning > Display Tune Parameters from the Menu bar. The screen in Figure 4-3 is then displayed. The following functions can be performed from this screen:

- To read the settings in the transceiver from this screen, click the “Read” button.
- To write the settings in this screen to the transceiver, click the “Write” button.
- To set all parameters in this screen to a default level, click the “Set Defaults” button.
- To set only the RSSI levels to the default level, click the “Set RSSI Defaults Only” button.

#### 4.2 TRANSMIT POWER OUTPUT

- Connect a wattmeter and 50-ohm load to the antenna jack as shown in Figure 4-1. Manually or automatically select “Tx Power” and follow the on-screen instructions.

2. With high power (30W) models only, C656 on the PA board is adjusted for minimum current. Remove the bottom cover and adjust C656 as required.
3. Adjust for the displayed power output at various frequencies across the band. A high and low power output level is set by this function. The allowable power output range for each model is as follows:

**Mid Power (15W) Models - 2-15 watts**

**High Power (30W) Models - 10-30 watts**

### 4.3 FREQUENCY SET/VCO CHECK

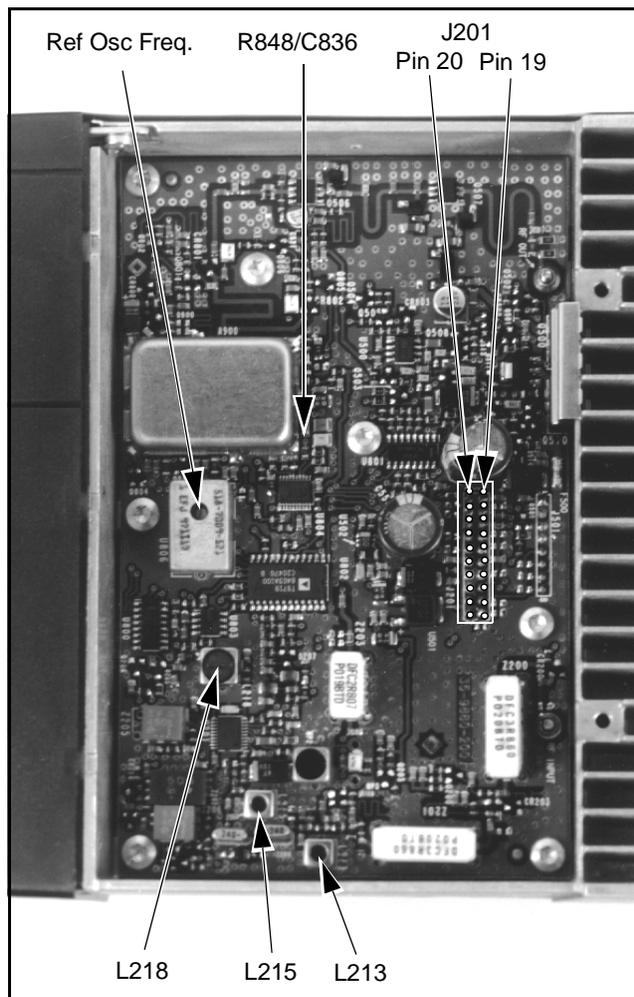
1. Connect a 50-ohm load to the antenna jack and monitor the transmit signal with a communication monitor.
2. Select the Frequency Set/VCO Check function. Set the communication monitor to the displayed frequency and click the "OK" button to key the transmitter and begin the adjustment process.
3. If adjustment is required, remove the top cover of the transceiver to access the RF board. Then manually adjust the variable capacitor in reference oscillator U806 for the displayed frequency  $\pm 100$  Hz (see Figure 4-4). This also sets the receive frequency.
4. The VCO control line voltage can be checked for the indicated readings at the junction of R848 and C836. If it is not within the indicated limits, there may be a synthesizer problem or the VCO may be defective. The control voltage is not adjustable.

### 4.4 TRANSMIT MODULATION

Transmit modulation is set by balancing the modulation produced by 80 Hz and 3 kHz tones and then setting modulation limiting using a 1 kHz tone. All of these tones are internally generated by the transceiver, so no external audio generator is required. Proceed as follows:

1. Connect a 50-ohm load to the antenna jack and monitor the transmit signal with a communication monitor. Manually or automatically select "Tx Modulation".

2. Set the communication monitor for the displayed frequency and then click "OK" to transmit a signal modulated with an 80 Hz tone. Enter the measured deviation (in hertz) in the displayed box and click "OK".
3. Continue following the screen instructions to adjust the 3 kHz tone deviation. The + and - buttons are clicked to set the deviation to the indicated level. The 1 kHz tone is then adjusted.
4. The preceding 3 kHz and 1 kHz tone adjustments are then repeated on several frequencies across the band. After the last adjustment is made, the transmitter unkeys and the settings are stored.



**Figure 4-4 Alignment Points Diagram**

#### 4.5 RECEIVER IF ALIGNMENT AND CHECK

1. If required, remove the top cover of the transceiver to access the RF board. Manually or automatically select "Receiver IF Alignment".
2. Connect an RF signal generator to the antenna jack using a 6 dB or greater pad. Set the generator output for the displayed frequency, modulated with 1 kHz at 3 kHz deviation.
3. Connect the DC voltmeter to J201, pin 20 (see Figure 4-4). Set the generator output level for  $-47$  dBm (1.0 mV) at the antenna jack. and manually adjust L218 for a meter reading of  $2.9\text{ V} \pm 0.1\text{ V}$ .
4. Set the generator output level for  $-80$  dBm ( $22\ \mu\text{V}$ ) at the antenna jack. Connect a SINAD meter to the speaker jack on the back of the transceiver and adjust the volume level to approximately 1/3 of the maximum level. Click "OK" and manually adjust L213 and L215 for best SINAD.
5. Manually or automatically select "Receiver Check". Follow the instructions to check SINAD sensitivity on the low, mid, and high channels indicated. Click the Wide Band/Narrow Band button to switch the selected bandwidth. Use 3 kHz deviation for wide band channels and 1.5 kHz deviation for narrow band channels.

#### 4.6 SQUELCH ADJUSTMENT

1. Connect an RF signal generator to the antenna jack using a 6 dB or greater pad. Also connect a SINAD meter to the speaker jack and adjust the volume to 1/3 maximum if required.
2. Manually or automatically select "Squelch". Set the signal generator for the indicated frequency and modulation and adjust the output level for the indicated SINAD level.
3. Follow the instructions on the screen to adjust the wide and narrow band squelch level.

#### 4.7 RSSI ADJUSTMENT

This adjustment calibrates the RSSI signal level. Proceed as follows:

1. Manually or automatically select "RSSI". Connect an RF signal generator to the antenna jack using a 6 dB or greater pad and set it for the displayed frequency and output level.
2. Follow the instructions displayed on the screen.

#### 4.8 PERFORMANCE TESTING

Performance testing can be accomplished by programming temporary conventional channels and then checking receiver and transmitter operation on those channels. Channels should be programmed at the low, mid, and high ends of the operating band.

The PCTune software described in the preceding information can also be used for basic performance testing. Transmitter power output can be checked as described in Section 4.2, and receiver sensitivity can be checked as described in Section 4.5.

Receiver and transmitter specifications you may want to check are as follows:

##### Receiver Specifications

12 dB SINAD Sensitivity -  $0.35\ \mu\text{V}$  maximum  
 Audio Power Output - 5 watts (w/external 4.7-ohm load)  
 Audio Distortion - Less than 5%

##### Transmitter Specifications

RF Power Output:  
 15-Watt Models - 2-15 watts  
 30-Watt Models - 10-30 watts

Wideband Deviation:  
 Voice Only -  $3.0\text{ kHz} \pm 100\text{ Hz}$   
 Data Only -  $1000\text{ Hz} \pm 100\text{ Hz}$   
 Total Voice and Data -  $4.7\text{ kHz}$  maximum

Narrow Band Deviation:  
 Voice Only -  $1.2\text{ kHz} \pm 100\text{ Hz}$   
 Data Only -  $800\text{ Hz} \pm 100\text{ Hz}$   
 Total Voice and Data -  $2.3\text{ kHz}$  maximum

**SECTION 5 DSP BOARD SERVICING INFORMATION**

**98xx Audio/Logic Board Part Changes**

Ref No.	Description	Part No.
<b>ADDED PARTS</b>		
J 310	10-pin single in-line header	515-7100-010
J 311	10-pin single in-line header	515-7100-010
<b>DELETED PARTS</b>		
	<b>Location</b>	
C 335	J302, pin 9	510-2625-479
R 354	U301D, pin 14 output jumper	569-0115-001
R 383	U303D, pin 14 output jumper	569-0115-001
U 102	U101, pin 32 (4K x 8 EEPROM)	544-5001-416

**98xx RF Board Part Change**

Ref No.	Description	Part No.
J201	20-pin connector, .82" pin male	515-7103-060

**DSP Board Parts List**

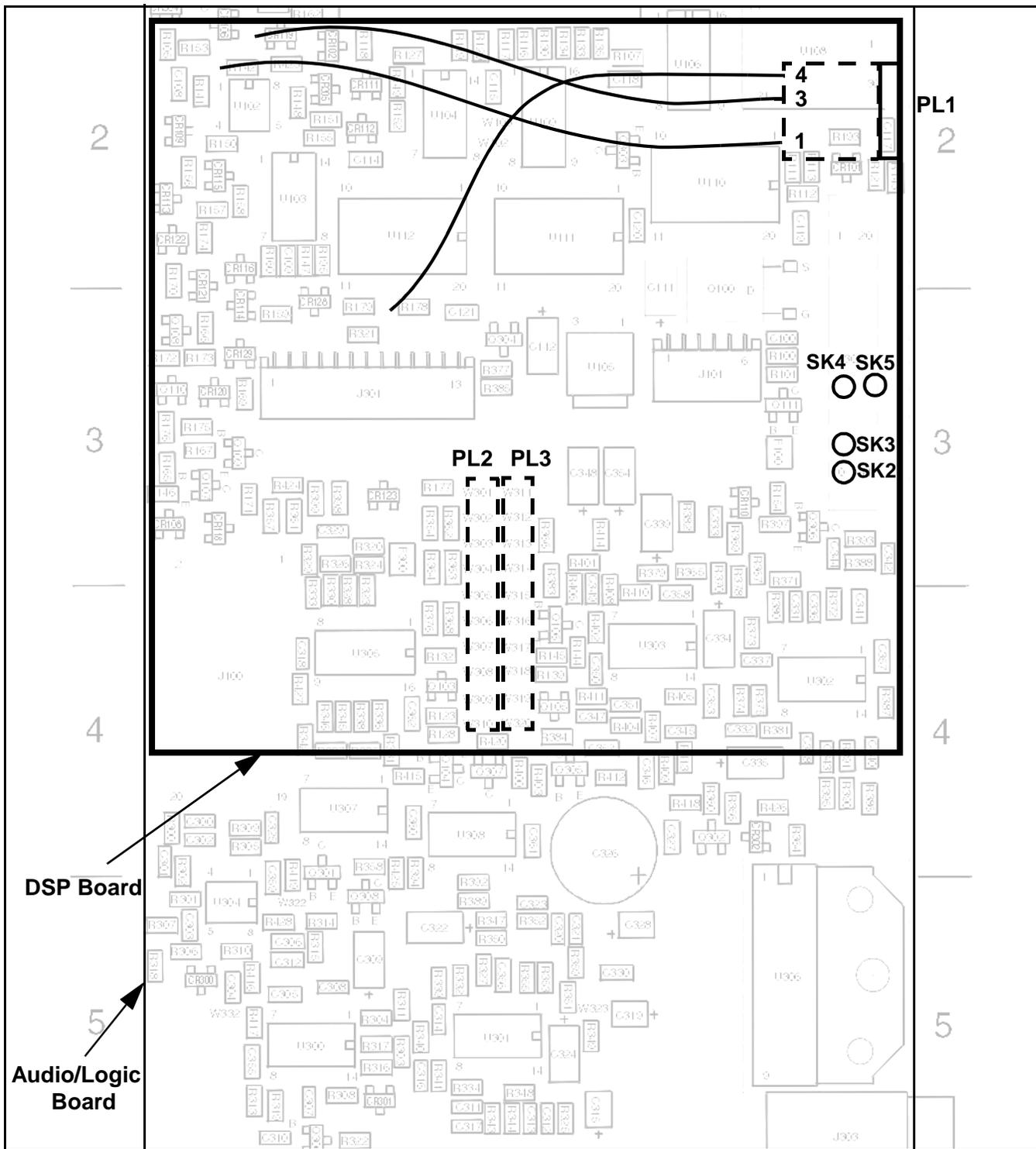
Ref No.	Description	Part No.
C 001	100 nF X7R ±10% 50V cer smd	510-3605-104
C 002	100 nF X7R ±10% 50V cer smd	510-3605-104
C 003	100 nF X7R ±10% 50V cer smd	510-3605-104
C 004	10 µF low ESR tantalum	510-2610-100
C 005	10 µF low ESR tantalum	510-2610-100
C 006	100 nF X7R ±10% 50V cer smd	510-3605-104
C 007	.001 µF NPO ±5% cer smd	510-3601-102
C 008	4.7 µF ±10% 50V tantalum	510-2622-479
C 009	390 pF ±5% NPO 50V cer smd	510-3601-391
C 010	390 pF ±5% NPO 50V cer smd	510-3601-391
C 011	4.7 µF ±10% 50V tantalum	510-2622-479
C 012	390 pF ±5% NPO 50V cer smd	510-3601-391
C 013	390 pF ±5% NPO 50V cer smd	510-3601-391
C 014	4.7 µF ±10% 50V tantalum	510-2622-479
C 015	100 nF X7R ±10% 50V cer smd	510-3605-104
C 016	.001 µF NPO ±5% 50V cer smd	510-3601-102
C 017	10 µF low ESR tantalum	510-2610-100
C 018	10 µF low ESR tantalum	510-2610-100
C 019	100 nF X7R ±10% 50V cer smd	510-3605-104
C 020	100 nF X7R ±10% 50V cer smd	510-3605-104
C 021	.001 µF NPO ±5% 50V cer smd	510-3601-102
C 022	100 nF X7R ±10% 50V cer smd	510-3605-104

Ref No.	Description	Part No.
C 023	100 nF X7R ±10% 50V cer smd	510-3605-104
C 024	.001 µF NPO ±5% 50V cer smd	510-3601-102
C 025	100 nF X7R ±10% 50V cer smd	510-3605-104
C 026	100 nF X7R ±10% 50V cer smd	510-3605-104
C 027	100 µF 16V tantalum smd	510-2616-101
C 028	100 µF 16V tantalum smd	510-2616-101
C 029	100 µF 16V tantalum smd	510-2616-101
C 030	10 µF low ESR tantalum	510-2610-100
C 031	100 nF X7R ±10% 50V cer smd	510-3605-104
C 032	100 nF X7R ±10% 50V cer smd	510-3675-104
C 033	100 nF X7R ±10% 50V cer smd	510-3605-104
C 034	.001 µF NPO ±5% 50V cer smd	510-3601-102
C 035	100 nF X7R ±10% 50V cer smd	510-3605-104
C 036	.001 µF NPO ±5% 50V cer smd	510-3601-102
C 037	100 nF X7R ±10% 50V cer smd	510-3605-104
C 038	100 nF X7R ±10% 50V cer smd	510-3605-104
C 039	100 nF X7R ±10% 50V cer smd	510-3605-104
C 041	470 pF X7R ±10% 50V cer smd	510-3605-471
C 042	470 pF X7R ±10% 50V cer smd	510-3605-471
C 044	100 nF X7R ±10% 50V cer smd	510-3605-104
C 045	.001 µF NPO ±5% 50V cer smd	510-3601-102
C 046	100 nF X7R ±10% 50V cer smd	510-3605-104
C 047	.001 µF NPO ±5% 50V cer smd	510-3601-102
C 048	100 nF X7R ±10% 50V cer smd	510-3605-104
C 049	.001 µF NPO ±5% 50V cer smd	510-3601-102
C 050	100 nF X7R ±10% 50V cer smd	510-3605-104
C 051	.001 µF NPO ±5% 50V cer smd	510-3601-102
C 052	100 nF X7R ±10% 50V cer smd	510-3605-104
C 053	.001 µF NPO ±5% 50V cer smd	510-3601-102
C 054	100 nF X7R ±10% 50V cer smd	510-3605-104
C 055	.001 µF NPO ±5% 50V cer smd	510-3601-102
C 056	100 nF X7R ±10% 50V cer smd	510-3605-104
C 057	.001 µF NPO ±5% 50V cer smd	510-3601-102
C 058	100 nF X7R ±10% 50V cer smd	510-3605-104
C 059	.001 µF NPO ±5% 50V cer smd	510-3601-102
C 060	100 nF X7R ±10% 50V cer smd	510-3605-104
C 061	.001 µF NPO ±5% 50V cer smd	510-3601-102
C 062	100 nF X7R ±10% 50V cer smd	510-3605-104
C 063	.001 µF NPO ±5% 50V cer smd	510-3601-102
C 064	100 nF X7R ±10% 50V cer smd	510-3605-104
C 065	.001 µF NPO ±5% 50V cer smd	510-3601-102
C 066	100 nF X7R ±10% 50V cer smd	510-3605-104
C 067	.001 µF NPO ±5% 50V cer smd	510-3601-102

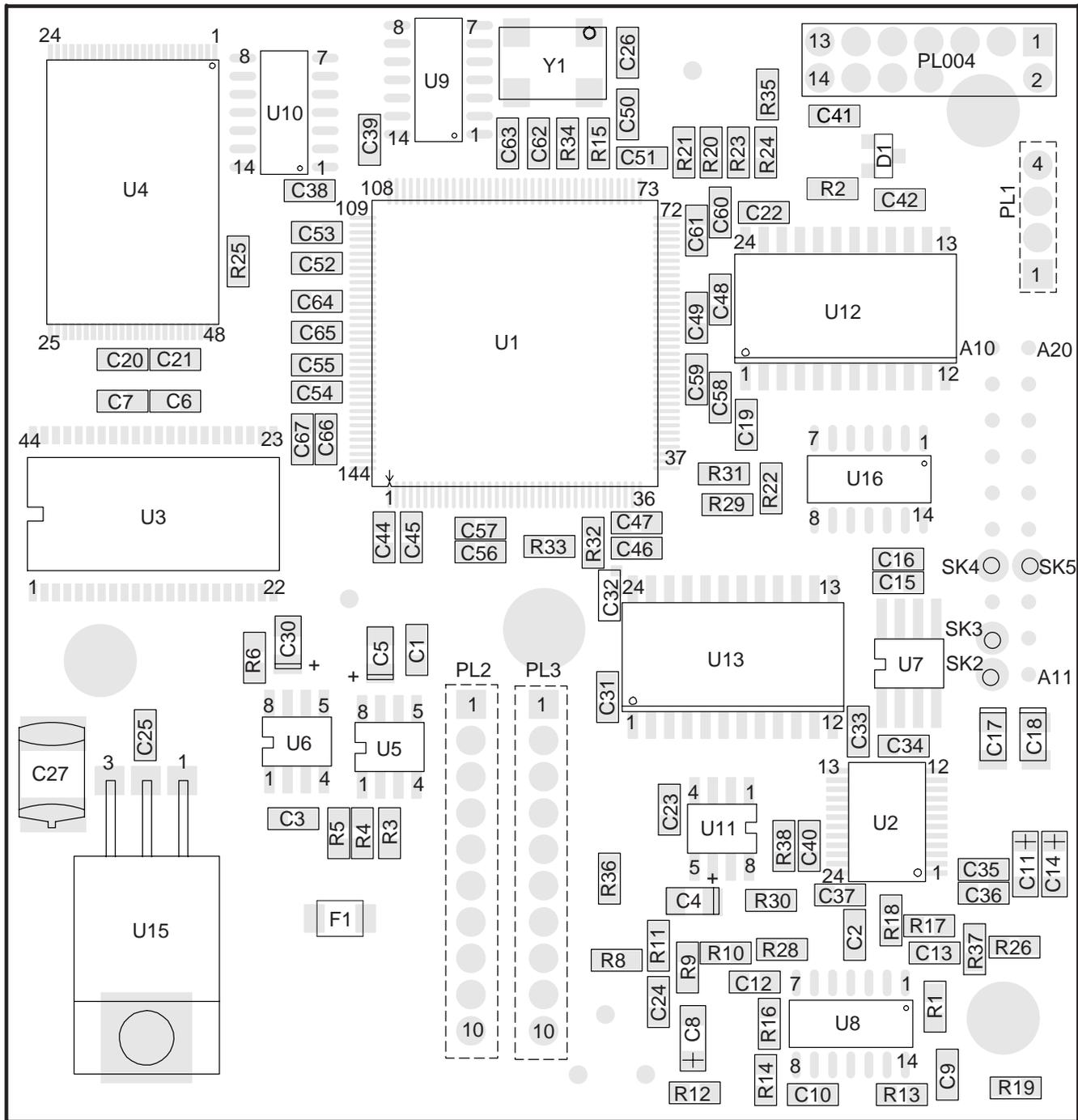
DSP BOARD PARTS LIST (CONT'D)

Ref No.	Description	Part No.
F 001	Fuse, 0.6A smd	534-5001-002
D 001	Dual switch-com cathode	523-1504-022
MP 182	Washer, insulated #6 fiber	596-4406-010
MP 185	0.197 swage mount	013-1188-053
PCB001	PC board, SN/SZ DSP (rev 7)	035-1825-180
PL 001	4-pin angle header, 1" center	515-9035-004
PL 002	10-pin single inline header	515-7100-010
PL 003	10-pin single inline header	515-7100-010
R 001	2.0k ohm $\pm 5\%$ 1/8W smd	569-0105-202
R 002	4.7k ohm $\pm 5\%$ 1/8W smd (revised versions)	569-0105-472
	0 ohm jumper (unrevised versions)	569-0105-001
R 003	270k ohm $\pm 5\%$ 1/8W smd	569-0105-274
R 004	82k ohm $\pm 5\%$ cer smd	569-0105-823
R 005	160k ohm $\pm 5\%$ cer smd	569-0105-164
R 006	270k ohm $\pm 5\%$ 1/8W smd	569-0105-274
R 007	0.5 ohm $\pm 5\%$ 1W smd	569-0175-05A
R 008	6.8k ohm $\pm 5\%$ 1/8W smd	569-0105-682
R 009	15k ohm $\pm 5\%$ 1/8W smd	569-0105-153
R 010	18k ohm $\pm 5\%$ 1/8W smd	569-0105-183
R 011	1.8k ohm $\pm 5\%$ 1/8W smd	569-0105-182
R 012	15k ohm $\pm 5\%$ 1/8W smd	569-0105-153
R 013	30k ohm $\pm 5\%$ 1/8W smd	569-0105-303
R 014	30k ohm $\pm 5\%$ 1/8W smd	569-0105-303
R 015	10k ohm $\pm 5\%$ 1/8W smd	569-0105-103
R 016	30k ohm $\pm 5\%$ 1/8W smd	569-0105-303
R 017	30k ohm $\pm 5\%$ 1/8W smd	569-0105-303
R 018	18k ohm $\pm 5\%$ 1/8W smd	569-0105-183
R 019	2.0k ohm $\pm 5\%$ 1/8W smd	569-0105-202
R 020	10k ohm $\pm 5\%$ 1/8W smd	569-0105-103
R 021	10k ohm $\pm 5\%$ 1/8W smd	569-0105-103

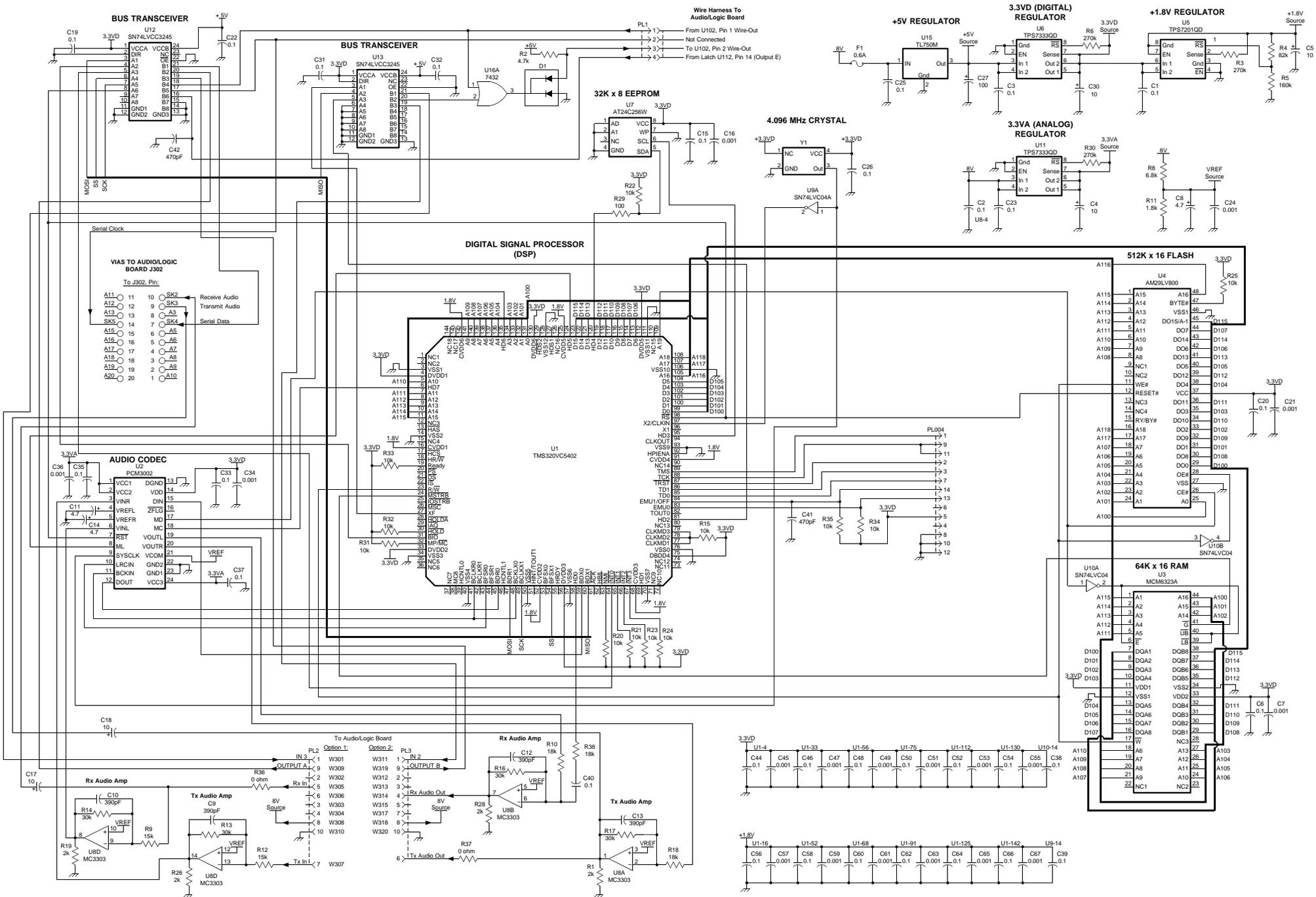
Ref No.	Description	Part No.
R 022	10k ohm $\pm 5\%$ 1/8W smd	569-0105-103
R 023	10k ohm $\pm 5\%$ 1/8W smd	569-0105-103
R 024	10k ohm $\pm 5\%$ 1/8W smd	569-0105-103
R 025	10k ohm $\pm 5\%$ 1/8W smd	569-0105-103
R 026	2.0k ohm $\pm 5\%$ 1/8W smd	569-0105-202
R 028	2.0k ohm $\pm 5\%$ 1/8W smd	569-0105-202
R 029	100 ohm $\pm 5\%$ 1/8W smd	569-0105-101
R 030	270k ohm $\pm 5\%$ 1/8W smd	569-0105-274
R 031	10k ohm $\pm 5\%$ 1/8W smd	569-0105-103
R 032	10k ohm $\pm 5\%$ 1/8W smd	569-0105-103
R 033	10k ohm $\pm 5\%$ 1/8W smd	569-0105-103
R 034	10k ohm $\pm 5\%$ 1/8W smd	569-0105-103
R 035	10k ohm $\pm 5\%$ 1/8W smd	569-0105-103
SK 002	Crystal socket	515-5006-018
SK 003	Crystal socket	515-5006-018
SK 004	Crystal socket	515-5006-018
SK 005	Crystal socket	515-5006-018
U 001	Fixed point DSP TMS320VC5402	544-5003-121
U 002	Audio CODEC PCM3002	544-3016-055
U 003	64K x 163V SRAM MCM6323A	544-5001-130
U 004	256K x 16 FLASH AM29LV800	544-9050-020
U 005	Voltage regulator TPS7201QD	544-2003-153
U 006	Voltage reg 3.3V TPS7333QD	544-1020-009
U 007	32K x 8 EEPROM AT24C256W	544-1020-256
U 008	Op amp, quad MC3303	544-2020-008
U 009	Hex inverter SN74LVC04A	544-3774-020
U 010	Hex inverter SN74LVC04A	544-3774-020
U 011	Voltage reg 3.3V TPS7333QD	544-1020-009
U 012	Bus xcvr, octal SN74LVCC3245	544-1010-248
U 013	Bus xcvr, octal SN74LVCC3245	544-1010-248
U 015	Voltage regulator, 5V TL750M	544-1020-750
U 016	2 input OR quad 74HC32	544-3766-032
Y 001	Crystal, 4.096 MHz smd	521-3060-061



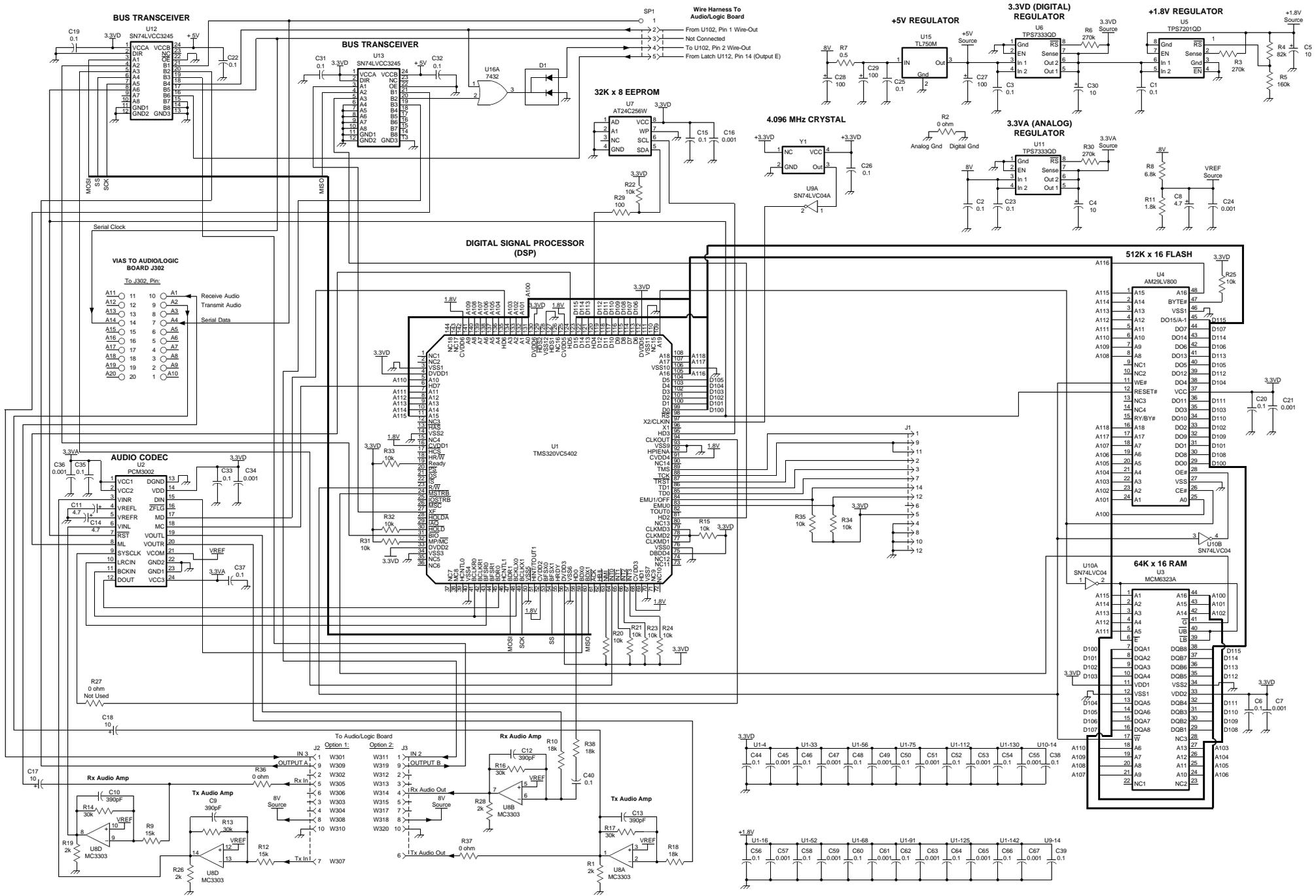
DSP BOARD CONNECTIONS TO AUDIO/LOGIC BOARD



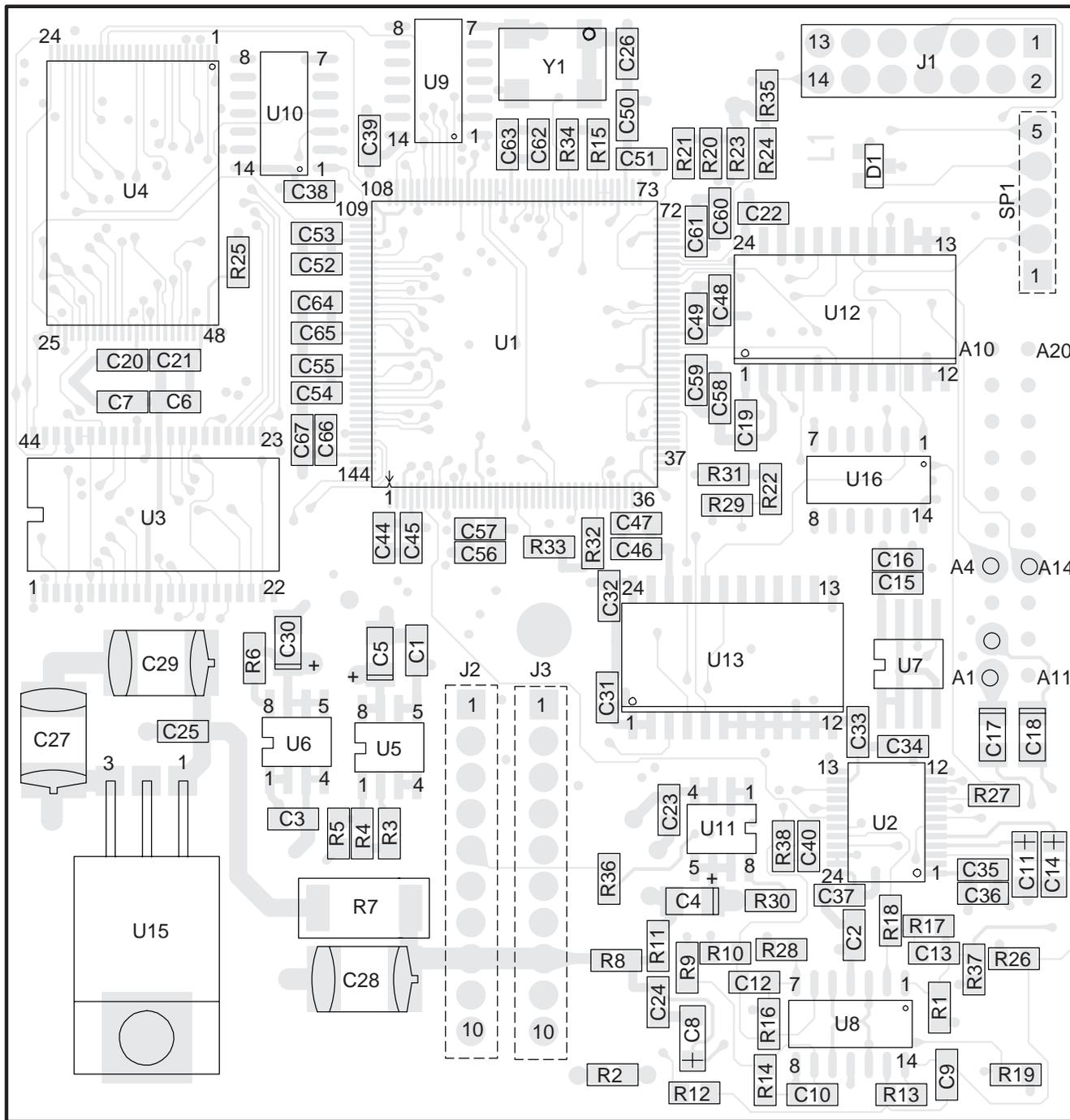
REVISED DSP BOARD COMPONENT LAYOUT



REVISED DSP BOARD SCHEMATIC DIAGRAM



UNREVISED DSP BOARD SCHEMATIC DIAGRAM



UNREVISED DSP BOARD COMPONENT LAYOUT

