iCOM

INSTRUCTION MANUAL

TRUNKING UNIT
UT-111

Icom Inc.

CONTENTS

INTRODUCTION

The UT-111 is a microprocessor based LTR® Trunking Mobile Logic Board designed for use in ICOM transceivers. It is designed to be compatible with LTR® based trunking systems. The UT-111 Logic Board controls all radio trunking functions, and is installed as a plug-in option board in the transceiver. The UT-111 is programmed by PC software that operates in conjunction with the transceiver's radio programming software.

The UT-111 Logic Board includes the following features

- Multiple System Selection
- Up to 10 Selectable Groups in each System
- Group Scan
- Priority Receive ID
- Block Decode
- Trunked and Conventional Operation
- Interconnect Operation
- Talk Around Function
- DTMF Overdialing
- DTMF Selective Call Decoder*
- Transmit ANI*
- Radio Kill Function
- Clear to Talk Tone
- Receive Only Groups
- TX and RX ID Codes may be different
- Busy Channel Lockout
- PC Programming
- Alignment Mode

* These features cannot be enabled with Icom cloning software CS-F3 version 3.0 or CS-F300 version 2.1.
LTR® is a registered trademark of Transcrypt International.

Notes:

Channel selection, transmit control, receiver audio and other transceiver functions are all under the control of the UT-111 Logic Board while in the trunking mode.

1.1 Channel Bank Selection

If so equipped, multiple Systems may be selected by pressing the Channel Bank Button on the transceiver. This feature allows a user to easily switch between various trunking systems and conventional systems. A channel bank is defined as a number of channels that are grouped together by the transceiver. Each channel bank may be configured as a trunking bank, or as a conventional bank. When a trunking bank is selected, the Logic Board has full control of the transceiver. In a conventional bank, the Logic Board de-activates and returns control back to the transceiver. Channel Banks are typically identified on the transceiver's LCD display by an alpha tag that is programmed by the radio dealer.

In the conventional mode the Logic Board is disabled and the control of all radio functions are returned to the transceiver. To enter the Conventional Mode, the user switches to a programmed Conventional Channel Bank. Please refer to the transceiver's instruction manual on the various modes of operation available in the conventional mode. A transceiver may have as many channel banks as memory allows. The IC–F4/F400 series radios support two channel banks.

The Channel Bank Button is defined by using the transceiver's programming software. Please see the transceiver programming manual for more information.

1.2 Priority ID Codes

ID codes have a priority order such that if an incoming call with a higher priority is decoded, it will override a call with a lower priority. When an ID is received that is of a higher priority, that ID will be immediately decoded while trunked on the home channel.

The priority of the programmed ID codes for each System, from highest to lowest, is as follows:

1. Priority Receive ID
2. Selected Group ID
3. Group Scan ID
4. Block Decode ID

heard. When Group 0 (Group Scan) is selected, a high beep tone is generated. The last selected Group ID is always selected on power up, or when a Channel Bank change has occurred.

Please refer to the radio transceiver's programming software for the Trunking Group SW assignment.

Receive Only Groups ID

A Group ID can be programmed such that the receiver will decode the Group ID, but transmission on that group is disabled. If transmission is attempted on a Receive Only Group, the transceiver will immediately generate a single low beep tone when the user presses the PTT Switch. This feature is programmed by the radio dealer.

Group Scan ID

Group Scan allows the user to scan all selectable Group ID codes contained within the selected system. Group Scan is selected by pressing the Trunking Group SW until the group number '#0' is shown in the LCD display. Upon detection of a Group Code, the transceiver will stop scanning, pass receive audio, and display the decoded Group ID, **#1, #2, #3, ... #10**, on the LCD display. Note on some transceivers, a decoded Group ID may be displayed using a different display character. Once the group number is displayed, the user may also transmit on the displayed group. If no group number is displayed during scanning, transmission is inhibited until a valid Group ID is decoded. The transceiver will generate a busy tone immediately when the PTT Switch is pressed if transmission is inhibited.

To prevent switching to another Group ID while in the Group Scan mode, the Scan Resume timer locks in the currently decoded Group ID for a duration from 1 to 35 seconds. The Scan Resume timer is reloaded each time the currently decoded Group ID is detected. In addition, any time the user presses the PTT Switch, the Scan Resume timer will be re-loaded. This ensures that the response to your transmission is received before Group Scan is resumed. When the Scan Resume timer expires, scanning of all programmed Group IDs in the selected system will continue. Transmission after the Scan Resume timer expires will still be on the previous displayed group provided no other Group ID has been detected.

The duration of the Scan Resume timer is programmed by the radio dealer. In addition, certain Group ID codes, such as interconnect IDs, may be optionally locked out of the Group Scan mode by the radio dealer.

Block Decode ID

The Logic Board can be programmed to decode a range of ID codes from 001 to 250. This is accomplished by programming the Upper Block Decode and Lower Block Decode registers. When an ID code is received that is within the range of the Upper Block and Lower Block ID codes, the receiver will open and the display will indicate 'bd'. The Block Decode is a receive only function, and transmission on a decoded Block ID is not possible.

1.3   Selective Call DTMF Decoder*

A Selective Call DTMF Decoder is available for use and is programmed by the radio dealer. This Decoder allows for the selective call of an individual or group of radio transceivers. When the programmed 4 to 8 digit DTMF sequence is decoded, the transceiver will generate a ring signal to alert the user of an incoming call. The transceiver will then pass audio to the speaker, and the display will indicate 'CA'.

Each transceiver in the trunking system may be programmed with a unique selective call DTMF sequence. This allows for privacy between users on a Group ID even if many other transceivers are programmed with the same Group ID. The Decoder is global in nature, and will operate on any selected trunked system. The Decoder can be enabled or disabled for each programmed Group ID in the transceiver. The Selective Call DTMF Decoder is also operational while in the Scan Mode.

If the Selective Call DTMF Decoder is enabled for a particular Group ID, audio on that selected Group ID will not be passed until the selective call has been received. If a user desires to place a call on that Group ID, pressing the PTT switch to transmit will momentarily disabled the Decoder, and allow audio to pass to the speaker. Audio on that Group ID will be muted after activity on the selected Group ID ceases, and the Selective Call Timeout occurs. The Selective Call Timeout is programmed by the radio dealer, and can range from 1 to 35 seconds.

* This feature cannot be enabled with Icom cloning software CS-F3 version 3.0 or CS-F300 version 2.1.

A Transpond Function is also available when the Selective Call DTMF Decoder is enabled. After receipt of a selective call, the transceiver will key the transmitter on the selected Group ID, and transmit a double beep tone to confirm that the selective call was received. This feature can be enabled or disabled for each programmed Group ID. The Transpond Function should only be used when selective calling individual transceivers. Otherwise, multiple transceivers will send the transpond signal on the trunking system at the same time causing a collision.

When sending a DTMF selective call to a transceiver, or group of transceivers, each digit should be sent at a rate of at least one digit per second. The Selective Call DTMF Decoder may be programmed with any digits from 0 to 9.

1.4   Radio Kill Function

The Selective Call DTMF Decoder is also used to disable a transceiver (Radio Kill) from a remote location. Upon receipt of the Radio Kill DTMF signal, the transceiver will be disabled, and will generate a continuous low beeping tone. The transceiver will also key the transmitter on the selected Group, and transmit a double beep tone to confirm that the Radio Kill instruction was received. The transceiver may then only be reactivated by the radio dealer by PC programming, or by entering the Alignment Mode. Each transceiver in the system should be programmed with a unique Radio Kill DTMF sequence to allow any individual radio to be disabled. However, any number of transceivers may use the same DTMF Kill sequence to deactivate multiple transceivers simultaneously.

Although a transceiver may receive the Radio Kill instruction on any programmed Group ID, the transceiver must have the correct Group ID selected. Since the Priority Receive ID takes precedence over all other ID Codes, a Radio Kill instruction should be transmitted using the Priority Receive ID to insure the instruction is received by the transceiver.

1.5   DTMF Encoder

A DTMF Encoder is provided for selective calling, and for placing and receiving interconnect calls. To use the DTMF Encoder, press the PTT Switch on the transceiver, and then use the keypad on the front of the transceiver for dialing. When a key is pressed, the DTMF sidetone will be heard in the transceiver's speaker. The PTT Switch must be released when dialing is completed.

1.6   Transmit ANI*

The internal DTMF Encoder may also be used for Automatic Number Identification (ANI) of individual transceivers. This feature may be enabled or disabled for each programmed Group ID. The transmitted ANI sequence consists of a string of DTMF digits, transmitted at 10 digits per second. The DTMF sequence that is transmitted for the ANI sequence is the same sequence that is used for the Selective Call DTMF Decoder. A four digit sequence takes approximately 200 milliseconds to transmit. The ANI sequence is transmitted at the beginning of each transmission as soon as the transceiver has made a successful handshake with the trunking system.

---

*   This feature cannot be enabled with Icom cloning software CS-F3 version 3.0 or
CS-F300 version 2.1.

2.1 Originating a Dispatch Call

To originate a Dispatch Call, first select the desired System and Group ID if applicable. Then press the PTT Switch to transmit. After the Clear to Talk tone is heard, the user may proceed to talk. The Clear to Talk tone is a short high frequency tone. The Clear to Talk tone indicates when a successful connection has been established with the trunking system. Release the PTT Switch at the completion of the message, and listen for a response.

If all trunking channel are busy during a call origination, a busy tone will be *immediately* heard when the PTT Switch is pressed. The user must then release the PTT switch, and try again in a few moments.

If the transceiver is out of range of the trunking system, the busy tone will be generated *a few seconds* after the PTT Switch is pressed. The user must then release the PTT Switch, and move to a location that is within range of the trunking system.

2.2 Receiving a Dispatch Call

To receive a Dispatch Call, first select the desired System and Group ID if applicable. When an incoming message is received, the user may press the PTT Switch to respond to the message. After the PTT Switch is pressed, wait for the Clear to Talk tone, then proceed to talk. Release the PTT Switch at the completion of the message, and listen for a response.

2.3 Busy Channel Lockout

Anytime the transceiver is receiving a signal on a selected group in the trunking mode, the transmitter will be automatically locked out, and inhibited from transmitting. This prevents multiple users in the same group from transmitting at the same time, and reduces missed messages. If a user attempts to transmit while receiving a signal from the selected group, a single low beep tone will be heard immediately when the PTT switch is pressed.

2.4   Interconnect Calls

To place an interconnect call, first select the Group ID programmed for
interconnect use. Then press the PTT Switch momentarily to obtain dial
tone. If dial tone is not received, wait for a few minutes and try again.
Once dial tone is heard, press the PTT Switch and dial the telephone
number desired on the transceiver's keypad. At the end of dialing, release
the PTT Switch and listen for the party to answer the call. To talk to the
party, press the PTT Switch, wait for the Clear to Talk tone, and then
begin speaking. Release the PTT Switch to listen. At the end of the call,
hold down the PTT Switch and press the '#' key on the keypad to terminate
the call.

To receive an incoming interconnect call, the transceiver must first be set
to the interconnect Group ID. When ringing is heard, press the PTT Switch
to answer the call. To talk to the party, press the PTT Switch, wait for the
Clear to Talk tone, and then begin speaking. Release the PTT Switch to
listen. At the end of the call, hold down the PTT Switch and press the '#'
key on the keypad to terminate the call.

Installation consists of opening the transceiver and plugging in the UT-111 Module. The installation and alignment procedures are described below. Refer to the transceiver service manual for more details.

3.1 • Installation Procedure

Installation into the IC-F3/F4 series transceivers

♦   Attach the UT-111 as shown below.

Top View

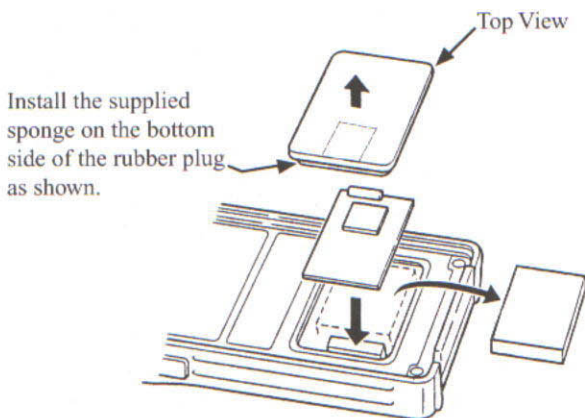Install the supplied sponge on the bottom side of the rubber plug as shown.

Figure 3-1 • Installation into the IC-F3/F4 transceiver

Installation into the IC-F400 series transceivers
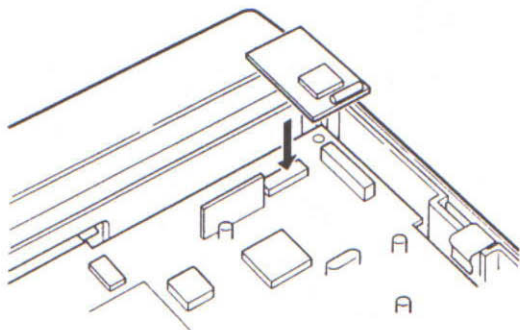
♦ Attach the UT-111 as shown below.

**Figure 3-2 • Installation into the
IC-F400 series mobile transceivers**

Note: Refer to UT-111 mobile logic board jumper selection for mobile radio applications.

3.2   UT-111 Mobile Logic Board Jumper Selection

Factory default jumper settings = JU1 and JU2 Out (Open).

		JU1	JU2
Mobile Models	IC-F400 Series	OUT (Open)	IN (Closed)
Portable Models	IC-F4 Series	OUT (open)	OUT (Open)
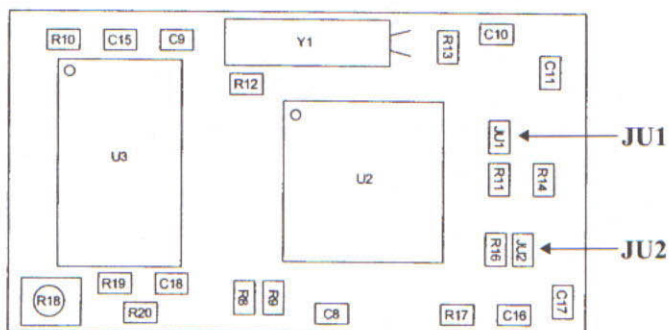
Top View

3.3   Alignment Procedure

The Alignment Mode is used for setting the DTMF transmit deviation level from the Logic Board. This mode is only used with portable transceivers that have a front panel DTMF keypad. The Logic Board will generate DTMF only while in the trunking mode. This adjustment is only required if DTMF overdial will be used and the portable transceiver is equipped with a keypad used for DTMF generation. The Alignment Mode may also used for re-activating a transceiver that has been disabled by Radio Kill, however re-activating a transceiver is usually done through the radio programming software.

To enter the Alignment Mode, use the following procedure:

1. Make sure the transceiver is set to a trunking channel bank.
2. Turn the transceiver off.
3. Press and hold down the # key on the front panel keypad.
4. Turn on the transceiver.
5. Release the # key one second after the end of the power up beep.
6. Enter the dealer programmed 5 digit Program Access Code, followed by the # key. The default access code is '12345'.
7. The Logic Board will respond with a high beep tone. If a low beep tone is heard, the access code entered was incorrect. Turn the transceiver off and try the procedure again.

While in the Alignment Mode, the transceiver will be set to the home channel of the currently selected trunking system. The receive audio will be open, and the PTT switch can be used to key the transmitter on the home channel.

Now press the PTT switch, and at the same time, press a digit from 0 to 9 on the keypad to generate a DTMF signal. Using a small slotted alignment tool, adjust the DTMF level pot, R18, on the Logic Board for a level of 2/3 of the maximum system deviation (3.3kHz on a 5kHz system).

Be careful that the DTMF signal is not limited, clipped or distorted in the transmitter. Do not use a deviation meter when making this adjustment because a meter can not indicate distortion or signal limiting. A service monitor with a modulation scope should be used instead. To exit the Alignment Mode, remove power from the transceiver.

This section provides programming instructions for both the radio and the UT-111 Logic Board, using CS-F3 Version 3.0 or CS-F300 Version 2.1 Cloning Software supplied by Icom. Both mobile and portable radios have similar programming requirements. Please refer to the example programming screens provided as a basic guide for each type of radio.

The radio should be programmed in the sequence listed. Several radio features must be enabled before the channel information can be entered. **Caution: Features not selected in the sample screens may not be compatible with the UT-111.**

4.1   Radio Programming

Portable Radio Programming

The following programming examples were developed for the IC-F4 series radios. They may be used as a guide for other portable models compatible with the UT-111 Logic Board.

♦ **Key and Display Assign 1 and 2 Screens (Figure 1)**

Figure 1 represents a typical button assignment used for a IC-F4 and F4S model radios. The MR-CH Bank / Free function on screen 2 must be defined in order to program the trunking features.

Figure 1

To enable the trunking function, use the Channel Attributes (CH Atr) field to open the menu. Select the SmarTrunk ON/OFF function. This will place the selected channel bank 1 (Bnk 1T) in the trunking mode. The word "SmarTrunk" is displayed vertically to the left of the channel numbers indicating bank 1 is assigned to trunking operation.

Other basic radio features such as CTCSS / DCS, Selective Call, ANI and Scan are not compatible with the trunking mode of operation and should not be enabled. An additional Trunking or Conventional bank may be programmed as desired. If an additional Trunking Bank is programmed, the trunking data programmed into the UT-111 for bank 1 will apply to bank 2.

Note: The SmarTrunk ON/OFF function is used to enable both UT-105 SmarTrunk and UT-111 LTR cards.

Mobile Radio Programming

The following programming examples were developed for the IC-F400 series radios. They may be used as a guide for other mobile models compatible with the UT-111 Logic Board.

♦ **Key and Display Assign (Figure 3)**

Figure 3 represents a typical button assignment used for a IC-F400 series mobile radios. The MR-CH Bank/Free function must be defined in order to program the trunking features.
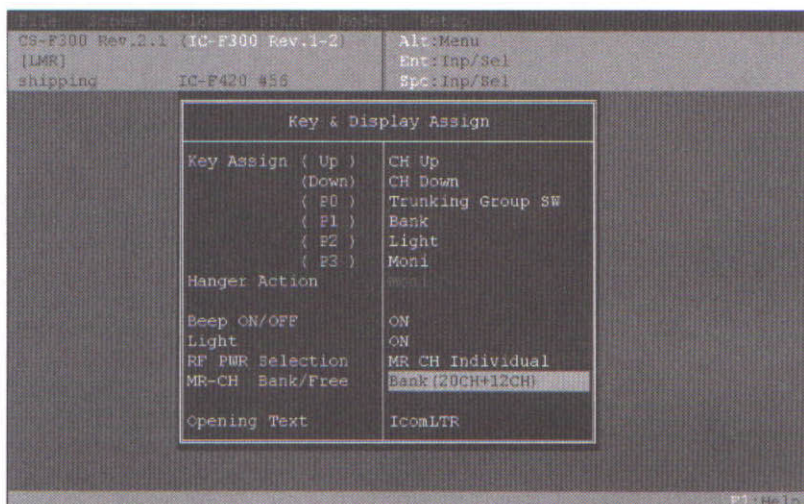

Figure 3

In the example, the Bank (20CH+12CH) has been selected to support a 20 channel system. This screen represents a configuration which has been tested for proper operation. If you enable radio functions other than those shown, extensive testing should be done to determine if the function selected is compatible with the UT-111 Logic Board.

In addition, one key must be assigned as the "Trunking Group SW" button so that a user can select a group. Finally, one key must be assigned as "Bank Up" to allow the user to select the bank.

All keys and display assignments are made using the arrow keys to move the highlight to the desired key function and press "Enter". A list of allowable functions appears. Note that some lists extend beyond the screen and will scroll to reveal other functions.

♦ **Memory Channel Screen (Figure 4)**

Figure 4 represents a typical channel assignment.
There are several areas in this screen which require
special attention. In order for the UT-111 Logic board
to operate, the trunking function must be enabled.

Figure 4

To enable the trunking function, use the Channel
Attributes (CH Atr) field to open the menu. Select
the SmarTrunk ON/OFF function. This will place the
selected channel bank 1 (Bnk 1T) in the trunking
mode. The word "SmarTrunk" is displayed vertically
to the left of the channel numbers indicating bank 1
is assigned to trunking operation.

Other basic radio features such as CTCSS / DCS,
Selective Call, ANI and Scan are compatible with the
trunking mode of operation and should not be
enabled. An additional Trunking or Conventional
bank may be programmed as desired. If an additional
Trunking Bank is programmed, the trunking data
programmed into the UT-111 for bank 1 will apply to
bank 2.

Note: *The SmarTrunk ON/OFF function is used to
enable both UT-105 SmarTrunk and UT-111 LTR
cards.*

4.2 UT-111 Logic Board Programming

Programming the UT-111 is accomplished with Software supplied by Icom. The opening screen of Icom Cloning Software displays three programming options. Select the UT-111 option to program the UT-111 Logic Board. The UT-111 software uses the same DOS commands and is configured similar to the mobile or portable radio software.

Prior to programming the UT-111 Logic Board, information regarding the system technical requirements, features available and general operation must be obtained from the system operator. Other non-system features can be selected and programmed based on the customer's requirements. Please refer to the Operation section of the manual for specific information on the functionality of each of the UT-111 features.

Global Features Programming (Figure 5)

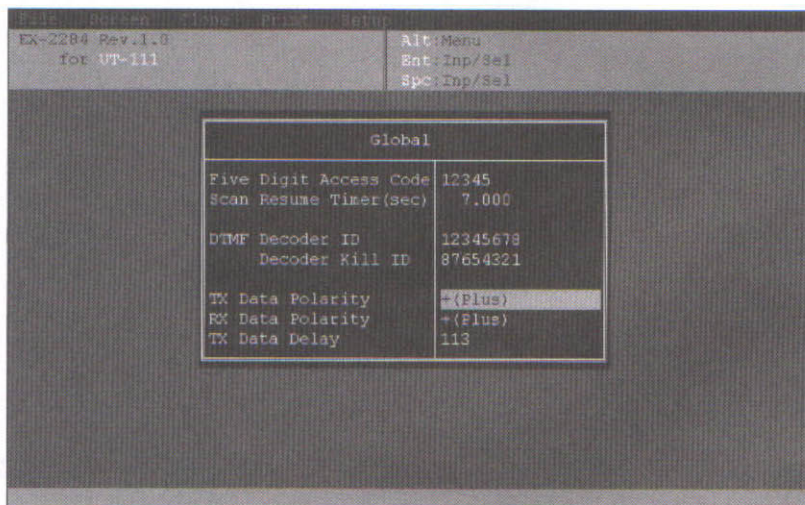Refer to Figure 5 to view an example of the programming described in this section.

Figure 5

The following programming sequence is in the order of the functions listed on the Global screen in Figure 5. Select Global from the Screen menu.

Warning: Current cloning software does not support Selective Call, Transponder or ANI feature.

♦ Five Digit Access Code - This function applies a Password to this file which must be entered in order to access the information in the file. Enter five numerical digits in this field.

♦ Scan Resume Timer (sec) – This delay time can be set from 1 to 35 seconds. Refer to the Operation section 1.2 under Group ID for a detailed explanation of this function.

♦ DTMF Decoder ID* – This feature requires a 4 to 8 digit ID number. Refer to the Operation section 1.3 under Selective Call DTMF Decoder for a detailed explanation of this function.

♦ DTMF Decoder Kill ID – This feature requires a 4 to 8 digit ID number. Refer to the Operation section 1.4 under Radio Kill Function for a detailed explanation of this function.

♦ TX Data Polarity – This function controls the polarity of the system data transmitted. Programming depends on the requirements of the specific radio model. The IC F4 series portable radios require this setting to be + (Plus). The IC-F400 series mobile radios require this setting to be – (Minus).

♦ RX Data Polarity – This function controls the polarity of the system data received. Programming depends on the requirements of the specific radio model. The IC F4 series portable radios require this setting to be + (Plus). The IC-F400 series mobile radios require this setting to be + (Plus).

♦ TX Data Delay – This setting establishes the Data Send delay required by the specific model radio. The IC F4 series portable radios require this setting to be 113. The IC-F400 series mobile radios require this setting to be 108.

---

* This feature cannot be enabled with Icom cloning software CS-F3 version 3.0 or CS-F300 version 2.1.

Default settings for CS-F3:
For VHF radio, the default file is F3.STL
For UHF radio, the default file is F4.STL

Default settings for CS-F300:
For VHF radio the default is F300
For UHF radio the default is F400

Note: Default settings for data polarity and data delay can be entered using the .STL files provided with the cloning software. Select "File", "Load" and "Enter" to list the available files. Highlight the desired file and press "Enter".

System Features Programming (Figure 6)

Refer to Figure 6 to view an example of the programming described in this section.

Figure 6

The following programming sequence is in the order of the functions listed on the System 1 screen in figure 6. Select System 1 from the Screen menu.

- Area number – This system information must be provided by the system operator. Typical options are 1 or 0.

- Home Repeater – This system information must be provided by the system operator. The Home Repeater must be assigned to a specific valid channel number with correct frequency information for the system.

- Priority Receive ID – This feature is optional. Refer to the Operation section 1.2 under Priority Receive ID for a detailed explanation of this feature.

- Receive Block Decode Upper ID and Receive Block Decode Lower ID – This feature is optional. Refer to the Operation section 1.2 under Block Decode ID for detailed information.

Group Codes 1 through 10 Programming

♦ TX ID and RX ID – This system information must be provided by the system operator.

♦ Scan – This feature is optional. Refer to the Operation section 1.2 under Group Scan ID for detailed information.

♦ Interconnect – This feature is optional. Information as to the functionality of the feature must be provided by the system operator. Any valid Group Code may be programmed for Interconnect by selecting Yes or No in this field. Refer to the Operation section 2.4 under Interconnect Calls for detailed information.

Programming Worksheet

The Programming Worksheet is designed to help the radio dealer program and keep track of the information programmed in a transceiver. Each transceiver may have it's own worksheet. Although this worksheet only shows two systems, additional system data can be recorded in a similar format.

Model Transceiver: _____

Radio Serial Number: _____

Global Features

Program Access Code (5 digit): _____

Scan Resume Timer (1-35 seconds): _____

Selective Call Timeout (1-35 seconds): _____

Transmit Data Polarity (normal/inverted): _____

Receive Data Polarity (normal/inverted): _____

DTMF Selective Call Decoder:

DTMF ID (4 to 8 digits): _____

DTMF Kill ID (4 to 8 digits): _____

System Data

SYSTEM 1						
Area Number (0/1): _____						
Home Repeater (1-20): _____						
Priority Receive ID (1-250): _____						
Receive Block Decode Upper ID (1-250): _____						
Receive Block Decode Lower ID (1-250): _____						

Group	TX ID	RX ID	Scan	Interconnect	Selective Call	Transpond	ANI
1	___	___	___	___	___	___	___
2	___	___	___	___	___	___	___
3	___	___	___	___	___	___	___
4	___	___	___	___	___	___	___
5	___	___	___	___	___	___	___
6	___	___	___	___	___	___	___
7	___	___	___	___	___	___	___
8	___	___	___	___	___	___	___
9	___	___	___	___	___	___	___
10	___	___	___	___	___	___	___

SYSTEM 2						
Area Number: _____						
Home Repeater: _____						
Priority Receive ID: _____						
Receive Block Decode Upper ID: _____						
Receive Block Decode Lower ID: _____						

Group	TX ID	RX ID	Scan	Interconnect	Selective Call	Transpond	ANI
1	___	___	___	___	___	___	___
2	___	___	___	___	___	___	___
3	___	___	___	___	___	___	___
4	___	___	___	___	___	___	___
5	___	___	___	___	___	___	___
6	___	___	___	___	___	___	___
7	___	___	___	___	___	___	___
8	___	___	___	___	___	___	___
9	___	___	___	___	___	___	___
10	___	___	___	___	___	___	___

Count on us!