

PRINTING INSTRUCTION

**PILOT'S GUIDE, C-5000 COMMUNICATION
MANAGEMENT CONTROLLER
150-041103.B**

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**PILOT'S
GUIDE**

*Engineering and Production by Wulfsberg Electronics,
A Cobham Avionics & Surveillance Group Company.*

**WULFSBERG
FLEXCOMM II**

(C-5000)

(P-25 Capable)

COMMUNICATION MANAGEMENT
CONTROLLER

Part Number 31300-1X02-1XX0

*MANUAL NUMBER 150-041103
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Wulfsberg Electronics

C-5000 Pilot's Guide

Wulfsberg Electronics, A Cobham Avionics & Surveillance Group Company, located in Prescott, Arizona, designs and manufactures the Wulfsberg Electronics C-5000 suite of products, including the FLEXCOMM, FLEXCOMM I and FLEXCOMM II. For more than 25 years, Wulfsberg Electronics has distinguished itself by providing top quality avionics products for civil, air transport, and military applications.

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Introduction

The Wulfsberg C-5000 Communication Management Controller (CMC) is a microprocessor-based control head device that controls one or two Wulfsberg transceivers. The C-5000 supports the full line of Wulfsberg FLITECOMM, FLEXCOMM I, and FLEXCOMM II transceivers. This manual is intended to quickly instruct the user on the basic operations of the C-5000 and also outline the advanced operations that set the C-5000 apart from any other communication device.

Features

The C-5000 provides a host of powerful features, including

- Controls Wulfsberg RT-5000, RT-406F, RT-450, RT-138(F), RT-30, RT-118, RT-9600(F) and RT-7200 transceivers.
- 700 preset channels, programmable from the front panel or using Wulfsberg's Remote Programmer software.
- Users can dial in frequencies, PL tones, and transmit power on two "manual" channels.
- Advanced multi-radio modes, such as Simulcast, Relay, Repeater, and Relay-Simulcast.
- Control encryption functions embedded in the RT-5000 transceiver such as P25 Digital Modulation and encryption with Over the Air Rekey (OTAR) capability.

Transceiver Overview

The C-5000 provides support for the Wulfsberg FLITECOMM, FLEXCOMM I, and FLEXCOMM II transceivers. It is very important that users know the number and type of transceivers connected to the C-5000, since different transceivers have very different capabilities and features. Here is a summary of the supported transceivers and their capabilities.

FLEXCOMM II

This product line consists of the RT-5000 AM/FM transceivers, which cover the 29.7 to 960 MHz frequency range. The optional Guard Receiver can be specified as a single channel crystal guard (available in three frequency ranges), a tunable multi-channel guard (29.7 – 960 MHz), or a multi-band digital-capable guard (available in four frequency ranges). RT-5000's are equipped with CTCSS and DCS tones on both the Main and Guard Receivers. The MTM (digital-capable) Guard variant of the RT-5000 adds support for P25 and Trunking channels, with encryption and over-the-air-rekey (OTAR) capability.

FLEXCOMM I

This product line currently consists of the RT-30, RT-138F, and RT-406F transceivers. The C-5000 also supports the RT-118, RT-138, and RT-450 transceivers, which are no longer manufactured but remain in wide use. The RT-30, RT-138F, and RT-406F FM transceivers cover the 29.7 to 49.99 MHz, 138.0 to 173.9975 MHz, and 406.0 to 511.9975 MHz frequency ranges, respectively. These transceivers can be specified with a single-channel, crystal-controlled, Guard Receiver that operates on a customer-specified frequency. An optional Guard Receiver CTCSS decoder with programmable Guard Receiver tone can also be specified.

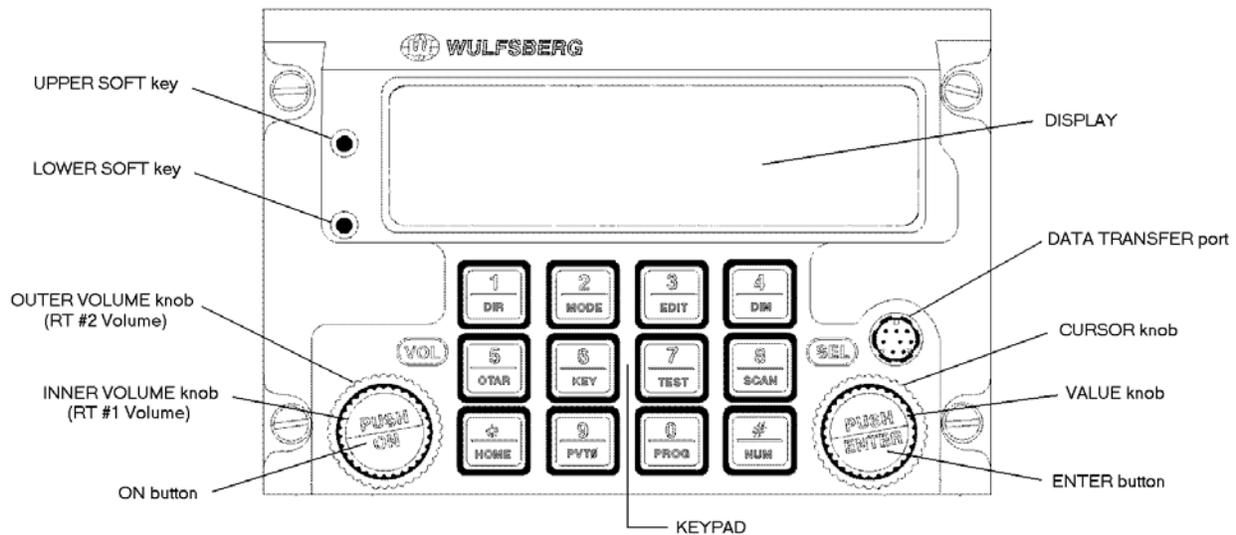
FLITECOMM

This product line is no longer manufactured, but remains in wide use. It consisted of the RT-7200, RT-9600, and RT-9600F transceivers. They were available with a two-channel, crystal-controlled, Guard Receiver that could be user-specified for any Guard frequency between 138.000 and 173.9950 MHz (RT-7200) or between 150.000 and 173.9975 MHz (RT-9600/9600F). They were equipped with CTCSS tones on both the Main and Guard Receivers.

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Basic Operation

Front Panel & Controls



DISPLAY - The C-5000 has a 2 line display, with 20 characters on each line. It provides the visual feedback for the system. Exactly what is displayed depends on the current operating mode of the C-5000. During normal operation, the top line shows information for transceiver #1 and the bottom line shows information for transceiver #2.

UPPER SOFT key – This key's use depends on the current operating mode of the C-5000. Some examples of its use are: increasing the display brightness and selecting radio 1's guard receiver.

LOWER SOFT key - This key's use depends on the current operating mode of the C-5000. Some examples of its use are: decreasing the display brightness and selecting radio 2's guard receiver.

OUTER VOLUME knob – This rotary switch is used to control the volume of radio 2.

INNER VOLUME knob – This rotary switch is used to control the volume of radio 1.

ON button – This button is used to turn the C-5000 on or off.

CURSOR knob – This rotary switch is used to move the cursor around the display.

VALUE knob – This rotary switch is used to modify values above the cursor.

ENTER button – This button's use is dependent on the C-5000's current operating mode, but is primarily used to finalize data entry operations.

DATA TRANSFER PORT – This serial port is used to transfer data between the C-5000 and the Wulfsberg Remote Programmer software. **While preset channels can be programmed from the front panel, the best method is to use a PC and the Wulfsberg Remote Programming (RP) software.**

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KEYPAD – The C-5000 has a 12 button keypad. Each button's primary functions are described below.



1:DIR Toggles the transceiver under cursor control in and out of DIRECT mode. Use this button to enter a "1" during keypad entry mode.



2:MODE This button will cycle through the enhanced modes of operation. Use this button to enter a "2" during keypad entry mode.



3:EDIT This button will display the EDIT PAGE for the transceiver under cursor control. Use this button to enter "3" during keypad entry mode.



4:DIM This button will display the page used to control the display's brightness. Use this button to enter a "4" during keypad entry mode.



5:OTAR This button will initiate an "Over The Air Rekey" for the transceiver under cursor control. Use this button to enter a "5" during keypad entry mode.



6:KEY This button will prompt the user for a transmit encryption key to override the preset value for the transceiver under cursor control. Use this button to enter a "6" during keypad entry mode.



7:TEST This button will override the squelch system of the radio under cursor control, allowing the user to set the volume level. Use this button to enter a "7" during keypad entry mode.



8:SCAN FUNCTION NOT AVAILABLE AT THIS TIME. Use this button to enter a "8" during keypad entry mode.



***:HOME** This button will display the HOME PAGE, except in some advanced modes of operation, where it will return the user to a previous page or mode of operation. Use this button to enter a "*" during keypad entry mode.



9:PVT ϕ This button will toggle the transceiver under cursor control in and out of private mode. Use this button to enter a "9" during keypad entry mode.



0:PROG This button will display the programming password page. Use this button to enter a "0" during keypad entry mode.



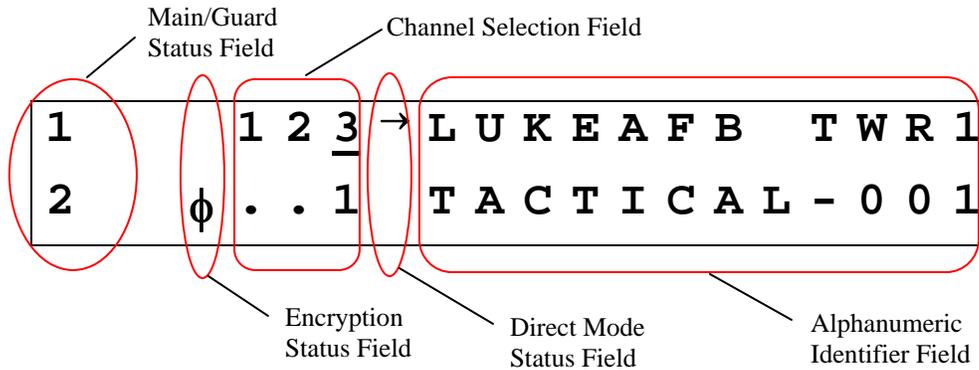
#:NUM This button will select keypad entry mode, such as for entering a channel number or frequency using the keypad. Use this button to enter a "#" during keypad entry mode.

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The Home Page

The HOME PAGE is the primary operational page of the C-5000. The HOME PAGE becomes visible when the C-5000 is ready for user input, immediately after the power up and initialization sequences have completed. The C-5000 can control two radios. When viewing the HOME PAGE, Radio 1 is always displayed on the top line. Radio 2 is always displayed on the bottom line. Virtually all keypad-initiated operations are performed on the radio under cursor control. The radio under cursor control is the radio whose line the cursor is currently located on. The cursor can be quickly toggled between radios (display lines) by pressing the ENTER button.

The following illustration is an example of what the HOME PAGE looks like.



Main/Guard Status Fields – These fields display symbols indicating the current status of all the available transceivers in the system. The symbols are as follows.

- – Indicates a radio is available, but not enabled.
- ▶ – Indicates a radio is transmitting.
- 1** – Indicates radio 1 is available and enabled.
- 2** – Indicates radio 2 is available and enabled.
- 1** – Indicates radio 1 is receiving.
- 2** – Indicates radio 2 is receiving.

Encryption Status Field – This field displays the encryption indicator symbol (φ) when encryption is turned on, or a blank if encryption is turned off.

Channel Selection Field – This field displays the currently selected channel.

Direct Mode Status Field – This field displays the direct mode indicator symbol (→) when the current channel is a direct channel, or the channel has been forced to be a direct channel by pressing the DIR button.

Alphanumeric Identifier Field – This field displays the 12 character name of the currently selected channel, unless the manual channel is selected, in which case the manual channel's receive frequency will be displayed.



You can always get back to the HOME PAGE by pressing the HOME button one or more times.

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Turning the System On and Off

To power the C-5000 ON, press and hold the ON button for approximately one second. When initialization is complete, the HOME PAGE will appear on the display.

To power the C-5000 OFF, press and hold the ON button for several seconds. The following message flashes on the display several times:

**!!! USE CAUTION !!!
TURNING SYSTEM OFF**

Continue to hold the ON button until the message stops flashing and the display turns off.

Setting the Display Brightness

When you first power ON the C-5000, the display is at its maximum brightness. To adjust the brightness level, ensure you are on the HOME PAGE, then press the DIM button. The display will appear as follows.

**← UP CHANGE DISPLAY
← DOWN BRIGHTNESS**

Press the UPPER SOFT KEY to brighten the display. Press the LOWER SOFT KEY to dim the display. Press the HOME button to return to the HOME PAGE.

NOTE:

The DIM key can be configured to invoke the MUTE function instead of the DIM function. In this case, you must press the MODE button several times to access the display brightness page.

Setting the Volume Level

When you first power ON the C-5000, the volume level will be set to the level that was active when the unit was powered down. You can change the volume level as follows.

Radio 1

- Place the cursor on the top line of the display.
- Tune to a channel with activity on it or press the TEST button. This will unscquelch the radio, allowing you to hear the current volume level.
- Rotate the INNER VOLUME knob clockwise to increase the volume level, or counterclockwise to decrease the volume level.

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Radio 2

- Place the cursor on the bottom line of the display.
- Tune to a channel with activity on it or press the TEST button. This will unscquelch the radio, allowing you to hear the current volume level.
- Rotate the OUTER VOLUME knob clockwise to increase the volume level, or counterclockwise to decrease the volume level.

Selecting a Preset Channel Using the Cursor/Value Knob

When the C-5000 first powers on, the selected channels will be set to those that were active when the unit was powered down. To select a different preset channel, do one of the following:

- Move the cursor under the least significant digit of the channel number you want to change. The illustration below shows a user preparing to change the channel for radio 1.

1		1 2 <u>3</u> →	L U K E A F B	T W R 1
2	ϕ . . 1		T A C T I C A L - 0 0 1	

- Turn the VALUE knob clockwise to select the next available channel with a higher number. Turn the VALUE knob counterclockwise to select the next available channel with a lower number. Keep turning the VALUE knob until the desired channel is selected.

You can also increment the channel number by 10's and 100's. You do this by placing the cursor under the 10's or 100's digit and turning the VALUE knob as described above. The following illustration depicts the cursor under the 10's digit. The 100's digit would be one to the left of the 10's digit.

1		1 <u>2</u> 3 →	L U K E A F B	T W R 1
2	ϕ . . 1		T A C T I C A L - 0 0 1	

Selecting a Channel Using the Keypad

Occasionally, it is desirable to select a preset channel by entering its number via the keypad, rather than dialing it in with the cursor/value knobs. This can be performed as follows.

- Place the cursor under any digit of the channel number you want to change.
- Press the NUM button. The following illustration depicts the display after the NUM button has been pressed while radio 1 was under cursor control.

1		C H A N = . . 0	< E N T E R >
2	ϕ . . 1		T A C T I C A L - 0 0 1

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- Input the channel number using the keypad buttons.
- Press the ENTER button.

The input channel number will be selected, assuming it was a valid channel. If you input an invalid channel number, the display will reappear as depicted above, giving you the opportunity to input a valid channel number. You can press the HOME button to cancel the input operation and return to the HOME PAGE.

Selecting a Channel by Alphanumeric Identifier

It is sometimes desirable to select a preset channel by name as opposed to number. This can be performed as follows.

- Place the cursor under the alphanumeric identifier field of the radio you want to tune the channel on. The following illustration shows the cursor under radio 1's alphanumeric identifier field.

1		1 2 3 →	<u>L</u> U K E A F B	T W R	1
2	φ . .	1	T A C T I C A L	-	0 0 1

- Rotate the VALUE knob clockwise to select the next channel in alphabetic order. Turning the VALUE knob counterclockwise will select the previous channel in alphabetic order. Continue to turn the VALUE knob until the desired channel is displayed.

NOTE:

- 1) The manual channel cannot be selected since it doesn't have an alpha identifier!
- 2) The cursor will not move under the alphanumeric identifier field if the manual channel is selected.

Selecting the Manual Channel

The manual channel is used to tune channels not already programmed as presets into the C-5000's memory. Each radio has its own manual channel. The manual channel is located at channel number 0, and is displayed as ".M". You can select the manual channel by either entering channel 0 from the keypad, or by dialing it in using the cursor/value knobs. The following illustration depicts a C-5000 with the manual channel for radio 1 selected.

1		. . <u>M</u>	1 5 6 . 2 0 0
2	φ . .	1	T A C T I C A L - 0 0 1

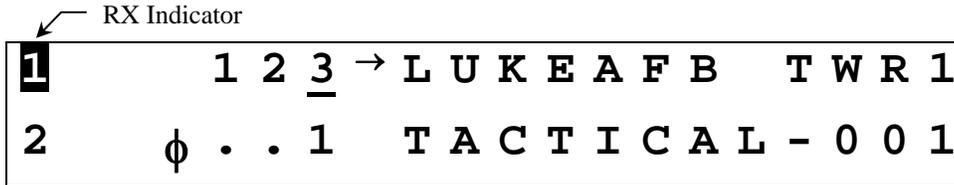
The manual channel's frequency is displayed in place of the alphanumeric identifier for preset channels. Once the manual channel is selected, press the EDIT button to edit the channel information. The C-5000 automatically stores the manual channel information on power down.

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Receiving/Transmitting

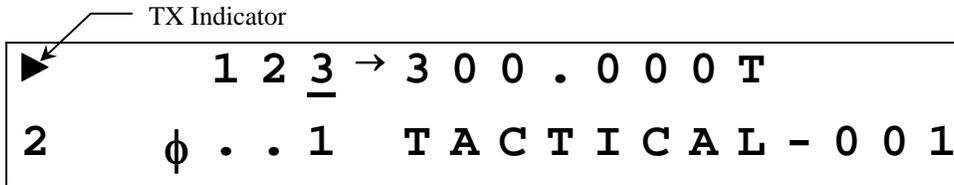
Receiving

The C-5000 is constantly monitoring its radios for reception. When a signal is received, the C-5000 will light the receive indicator for the receiving radio, and route the audio to the operator's headset (Assuming the associated intercom switch is selected). The following illustration depicts radio 1 receiving.



Transmitting

To transmit on a radio system, select the appropriate source on your audio panel, and key the microphone. Transmission will begin on the radio's currently selected channel. During the transmission, the radio's transmit indicator will light, and the channel's transmit frequency will be displayed. The following illustration depicts radio #1 transmitting.



Enabling/Disabling Transceivers

You can enable (turn audio on) or disable (turn audio off) any radio under the C-5000's control.

Disabling (Turning Off) a Transceiver

- Place the cursor under the R/T status indicator. The following illustration shows the cursor under Radio #1's status indicator.



- Rotate the VALUE knob once in either direction. The display will indicate the radio has been turned off, as the following illustrates.



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Enabling (Turning On) a Transceiver

- Place the cursor under the radio's status indicator. The following illustration shows the cursor under radio 2's status indicator.

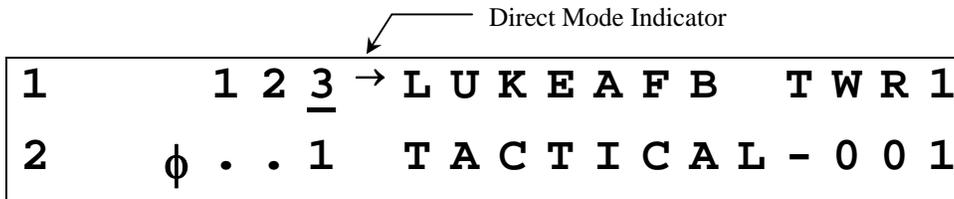


- Rotate the VALUE knob once in either direction. The display will indicate the radio has been turned on, as the following illustrates.



Using the Direct/Repeat Feature

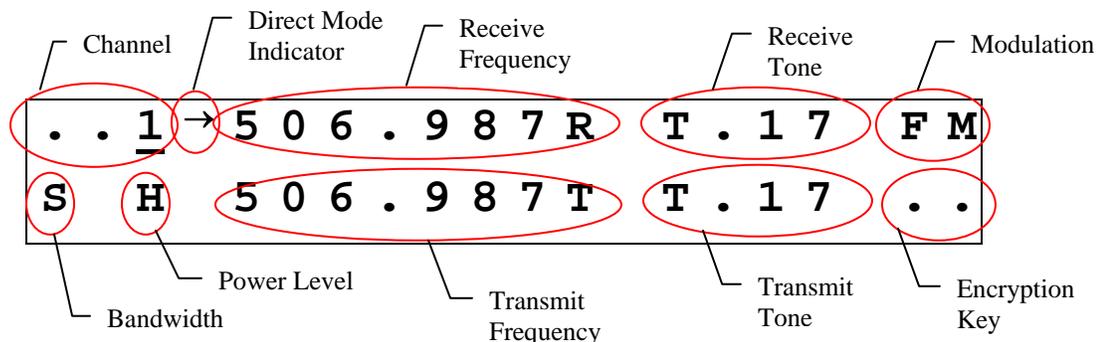
The C-5000 supports both direct and repeat modes of operation. Any preset channel that has identical transmit and receive frequencies is considered a direct channel. If the transmit and receive frequencies are different, the C-5000 considers the channel a repeater channel. Repeater channels can be temporarily changed into direct channels by pressing the DIR button. This will temporarily copy the receive frequency into the transmit frequency, and the direct mode indicator will light. The following illustration shows radio 1 in direct mode.



NOTE:	Pressing the DIR button on a direct channel has no effect.
--------------	--

Using the Edit Page

The EDIT PAGE allows the operator to temporarily change properties of a preset channel, and permanently change properties of a manual channel. Precisely which properties can be changed varies with channel and radio type. For example, transmit power can only be changed on RT-5000 radios, because the other radios do not have variable power capability. The following illustration is an example of what the EDIT PAGE looks like. Your C-5000's display may appear differently depending on the currently selected channel and its associated properties.



Channel Identifier field – This displays the currently selected channel, i.e. the channel you are editing.

Direct Mode Status Field – This field displays the direct mode indicator symbol (→) when the current channel is a direct channel, or the channel has been forced to be a direct channel by way of the DIR button.

Receive Frequency Field – This field displays the current channel's receive frequency.

Receive Tone Field – This field displays the current channel's receive tone.

Modulation Type Field – This field displays the current channel's modulation type. The modulation types are displayed as AM, FM, P (P25), and TK (trunking).

Channel Bandwidth Field – This field displays the current channel's bandwidth. Bandwidths are displayed as S (standard), W (wide), X (extra wide), and N (narrow).

Transmit Power Level Field – This field displays the current channel's transmit power level. Power level is displayed as HI for high power or LO for low power.

Transmit Frequency Field – This field displays the current channel's transmit frequency.

Transmit Tone Field – This field displays the current channel's transmit tone.

Encryption Key Field – This field displays the current channel's transmit encryption key. The encryption key will display as a number between 1 and 16, or ".." if no key has been specified for the channel.

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Editing a Preset Channel

To temporarily change the properties of a preset channel, do the following.

- On the HOME PAGE, select the preset channel you want to edit.
- Press the EDIT button to load the channel into the EDIT PAGE.
- Move the cursor under the field containing the channel property you want to edit.
- Use the VALUE knob to change the property to the desired value.
- Press the HOME button to return to the HOME PAGE. The changes will remain in effect until the channel is changed.

NOTE:

The cursor cannot be moved under channel property fields that are not editable.

Editing a Manual Channel

To change the properties of a manual channel, do the following.

- On the HOME PAGE, select the manual channel you want to edit.
- Press the EDIT button to display the EDIT PAGE.
- Move the cursor under the field containing the channel property you want to edit.
- Use the VALUE knob to change the property to the desired value.
- Press the HOME button to return to the HOME PAGE and save the manual channel's current state.

NOTE:

The cursor cannot be moved under channel property fields that are not editable.

Changing PL and DPL (CTCSS and DCS) Tones

The C-5000 supports both CTCSS (PL) and DCS (DPL) tones. The tone used by a channel can be temporarily overridden on the EDIT PAGE. You can select any valid tone, or turn tones off. (Channels programmed to use the ITM of an MTM Guard receiver module in an RT-5000 cannot be changed)

Turning Tones Off

- Move the cursor under the "T" of the receive tone field, as depicted below.

.	.	1	5	0	6	.	9	8	7	R	<u>T</u>	.	1	7	F	M
S	H	5	0	9	.	9	8	7	T	T	.	1	7	.	.	.

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- Rotate the VALUE knob clockwise once. The receive tone field will show "... " as depicted below.

. . 1 5 0 6 . 9 8 7 R <u>T</u> . . . F M
S H 5 0 9 . 9 8 7 T T . 1 7 . .

- Press the ENTER button to move the cursor under the "T" of the transmit tone field.
- Rotate the VALUE knob clockwise once. The transmit tone field will show "... " as depicted below.

. . 1 5 0 6 . 9 8 7 R T . . . F M
S H 5 0 9 . 9 8 7 T <u>T</u>

Selecting a PL (CTCSS) Tone

- Move the cursor under the least significant digit of the tone field you want to change. The illustration below assumes we want to change the receive tone.

. . 1 5 0 6 . 9 8 7 R T . 1 <u>7</u> F M
S H 5 0 9 . 9 8 7 T T . 1 7 . .

- Rotate the VALUE knob clockwise to increment the tone, or counterclockwise to decrement the tone. Keep rotating the VALUE knob until the desired tone is displayed.

NOTE: Appendix A lists the frequencies associated with the Wulfsberg CTCSS tone numbers.

Selecting a DPL(DCS) Tone

- Move the cursor under the most significant digit of the tone field you want to change. The illustration below assumes we want to change the receive tone.

. . 1 5 0 6 . 9 8 7 R T <u>.</u> 1 7 F M
S H 5 0 9 . 9 8 7 T T . 1 7 . .

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- Rotate the VALUE knob clockwise to increment the tone, or counterclockwise to decrement the tone. Continue rotating the VALUE knob until the most significant digit is that of the desired tone.
- Move the cursor under the least significant digit of the tone, as illustrated below.

.	.	1	5	0	6	.	9	8	7	R	T	0	2	<u>3</u>	F	M
S	H	5	0	9	.	9	8	7	T	T	.	1	7	.	.	

- Rotate the VALUE knob clockwise to increment the tone, or counterclockwise to decrement the tone. Keep rotating the VALUE knob until the desired tone is displayed.



A "0-7" in the first position means you are selecting a DCS tone. This is a special kind of tone that is rarely used.

Changing Transmit Power

The C-5000 supports the selection of high and low transmit power. Normally high power is used, however, if interference or other transmit issues are experienced, low power may be selected to help remedy the issue. If you have a radio that supports multiple power levels, such as the RT-5000, you can alter the power setting from the EDIT PAGE as follows.

- Move the cursor under the transmit power field, as depicted below.

.	.	1	5	0	6	.	9	8	7	R	T	.	1	7	F	M
S	<u>H</u>	5	0	9	.	9	8	7	T	T	.	1	7	.	.	

- Rotate the VALUE knob clockwise once. The power indicator will toggle between high and low with each turn of the VALUE knob.

Changing Modulation Type

The modulation type can only be changed on the manual channel, and can only toggle between AM and FM. To change the manual channel's modulation type, do the following.

- Move the cursor under the modulation field, as depicted below.

.	.	M	5	0	6	.	9	8	7	R	T	.	1	7	<u>F</u>	M
S	H	5	0	9	.	9	8	7	T	T	.	1	7	.	.	

- Rotate the VALUE knob clockwise once. The modulation indicator will toggle between AM and FM. **(118-136 MHz and 225-400 MHz are normally AM frequencies. All other frequencies are usually FM)**

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Changing Receiver Bandwidth

The receiver bandwidth can only be changed on the manual channel. To change the manual channel's receiver bandwidth, do the following.

- Move the cursor under the bandwidth field, as depicted below.

.	.	M	5	0	6	.	9	8	7	R	T	.	1	7	F	M
<u>S</u>	H	5	0	9	.	9	8	7	T	T	.	1	7	.	.	

- Rotate the VALUE knob in either direction. Each turn of the VALUE knob will select the next bandwidth option in the list. Turn the VALUE knob until the desired bandwidth symbol is displayed. The available options are as follows.

N – Narrow – 12.5 kHz

S – Standard - 25 kHz

W – Wide – 35 kHz

X – Extra Wide – 70 kHz



Unless specifically instructed otherwise, always select “S” (Standard)..

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Enhanced System Features

Phone Patch Mode

The C-5000 can patch into the phone system using both DTMF and pulse dialing. This requires equipment on the ground, such as a transceiver and an interface box, to connect the base station radio to the telephone lines. This is NOT a cellular phone.

- From the HOME PAGE, select the radio and channel. Press the MENU button. The following display page will appear.

←	D T M F	S E L E C T	P H O N E
←	P U L S E	D I A L I N G	M O D E

- Press the UPPER SOFT KEY to select DTMF dialing, or the LOWER SOFT KEY to select pulse dialing. In either case, the next display page will appear, and will look similar to the following. This example shows the dialing operation being performed on radio 1, channel 1.

←	S E N D	1	. . 1
←	H O M E	# -	_

- Input the digits you want to dial using the keypad. Alpha characters can be input by turning the VALUE knob until the desired character is displayed, then pressing the ENTER button. Pressing the ENTER button while a blank is displayed inputs a ½ second delay. As soon as you begin input, the display will change slightly. The following depicts a sample entry.

←	S E N D	1	. . 1
←	C L R	# -	1 2 3 4 5 6 7 8 * 9 0 #

- Press the UPPER SOFT KEY to dial the displayed data, or the LOWER SOFT KEY to erase the displayed data.
- Press the LOWER SOFT KEY (labeled HOME) to return to the HOME PAGE.

Simulcast Operation

Simulcast Mode allows you to transmit simultaneously to two other locations that have radios tuned to different frequencies. At the same time, the Main RT systems and Guard Receivers are able to receive on their currently selected channels. You can establish simulcast operation as follows.

- Ensure you are on the HOME PAGE.
- Select the desired channel for radio 1.

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- Select the desired channel for radio 2.
- Press the MODE button until the following display page appears.

P R E S S E N T E R B U T T O N
F O R S I M U L C A S T M O D E

- Press the ENTER button. The following illustrates the SIMULCAST PAGE for radio 1 on channel 1 and radio 2 on channel 2.

S I M U L C A S T M O D E
1 . . 1 2 . . 2

- Press the HOME button to exit simulcast mode and return to the HOME PAGE.
- Use either RT1 or RT2 mic position on the audio selector panel to initiate a transmission.

Relay Operation

Relay Mode allows your aircraft's C-5000-based transceiver system to function as a cross-band repeater. If a Relay Mode link is established between two locations, a message received from one location is automatically retransmitted to the other. You can establish relay operation as follows.

- Ensure you are on the HOME PAGE.
- Select the desired channel for radio 1.
- Select the desired channel for radio 2.
- Press the MODE button until the following display page appears.

P R E S S E N T E R B U T T O N
F O R R E L A Y M O D E

- Press the ENTER button. The following illustrates the RELAY PAGE for radio 1 on channel 1 and radio 2 on channel 2.

R E L A Y M O D E
1 . . 1 2 . . 2

- Press the HOME button to exit relay mode and return to the HOME PAGE.

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Relay/Simulcast Operation

Relay-Simulcast mode combines the functions of Relay Mode and Simulcast Mode. It allows you to establish an automatic radio link with two other locations that have radios tuned to different frequencies in different frequency bands, and allows you to transmit to those same locations simultaneously. You can establish relay/simulcast operation as follows.

- Ensure you are on the HOME PAGE.
- Select the desired channel for radio 1.
- Select the desired channel for radio 2.
- Press the MODE button until the following display page appears.

```
P R E S S   E N T E R   B U T T O N
F O R   R E L A Y / S I M U L C A S T
```

- Press the ENTER button. The following illustrates the RELAY/SIMULCAST PAGE for radio 1 on channel 1 and radio 2 on channel 2.

```
R E L A Y / S I M U L C A S T   M O D E
1       . . 1   2       . . 2
```

- Press the HOME button to exit relay/simulcast mode and return to the HOME PAGE.

Repeater Operation

Repeater mode allows the C-5000-based system to act as an airborne repeater, providing a radio link between two ground locations that transmit and receive in the same frequency band. You can establish repeater operation as follows.

- Ensure you are on the HOME PAGE.
- Select the desired channel for radio 1.
- Press the MODE button until the following display page appears.

```
P R E S S   E N T E R   B U T T O N
F O R   R E P E A T E R   M O D E
```

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- Press the ENTER button. The following illustrates the REPEATER PAGE for radio 1 on channel 1 and radio 2 on channel 2.

R E P E A T E R M O D E			
1	. . 1	2	R C V

- Press the HOME button to exit repeater mode and return to the HOME PAGE.

NOTE:

The repeater function is limited to use with Main transceivers. Guard receivers cannot be used.

NOTE:

It is possible to perform the equivalent function of a P25 airborne repeater using the RT-5000's MTM Guard transceivers. This requires specially programmed pairs of preset channels used in conjunction with the C-5000's relay mode. Consult the C-5000 operator's manual for more detailed information on this subject.

Assuming the recommendations in the C-5000 operator's manual have been followed, the following procedure can be used to accomplish a P25 airborne repeater:

1. Select the repeater channel on RT #1.
2. Use the DIR button to put RT #1 into direct mode.
3. Select the repeater channel alternate on RT #2.
4. Enter into relay mode using the procedure above.

Encryption Features

Turning Encryption On and Off

Put the cursor on the top or bottom line depending on which radio is to be selected. Press the PVT button to toggle encryption on and off. If the C-5000 has been configured to control an RT-5000 with an encryption module and the preset channel being used has been set up for encryption, the privacy indicator will light.

NOTE:

Encryption can only be turned on for channels that have been pre-programmed with an encryption key. Three error beeps will sound if the channel has not been setup for encryption.

Changing the channel will automatically reset the encryption setting to OFF. The encryption device in the RT-5000 will still decode encrypted messages i.e. the encryption ON/OFF affects only the transmit and not the receive function of the encryption unit.

Selecting an Encryption Key

The preset encryption key (sometimes called KEYMAT) for a channel can be temporarily changed as follows.

- Ensure you are on the HOME PAGE, the cursor is on the line of the radio you wish to select, and an encryption capable channel is selected.
- Press the KEY button. The following illustrates the display when the KEY button was pressed with the cursor on the top line, i.e. on radio 1. If the KEY button is pressed on a channel that has not been preset to use encryption, three warning beeps will sound.

T X	KEY =	<u>P</u>SET	< ENTER >
2	φ . . 1	TACTICAL	- 0 0 1

- Rotate the VALUE knob to change the encryption key. A value of "PSET" indicates you want to use the channel's preset encryption key. A numeric value (1-16) indicates you want to override the preset key with the specified key.
- Press the ENTER button to accept the displayed key. The display will return to the HOME PAGE.
- When transmitting, if encryption keys are properly loaded, a tone at the start of the transmission will be generated by the radio and heard by the operator. Begin speaking AFTER the tone or part of your transmission will be lost.
- When transmitting in the encrypted mode, if you hear a continuous warble tone, this indicates that the encryption key(s) have not been loaded. Either manually enter encryption keys or perform an OTAR if your system has that capability.
- The selected KEYMAT will remain in effect until it is changed or the system is powered down.

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Performing an OTAR

- Ensure you are on the HOME PAGE, the cursor is on the line of the radio you wish to select, and an OTAR capable channel is selected.
- Press the OTAR button. The following illustrates the display when the OTAR button was pressed with radio 1 under cursor control.

1	ENTER = START OTAR
2	φ . . 1 TACTICAL - 001

- Press the ENTER button to initiate the OTAR process. The status of the OTAR will be displayed on the radio's display line. Status messages include "OTAR REQUESTED", "OTAR IN PROGRESS", "OTAR ABORTING", "OTAR COMPLETE", and "OTAR FAILED". The following illustrates the display with an OTAR in progress.

1	OTAR IN PROGRESS
2	φ . . 1 TACTICAL - 001

- When the OTAR is finished, the display will indicate its success or failure. The following illustrates the display after a successful OTAR.

1	OTAR COMPLETE
2	φ . . 1 TACTICAL - 001

- Press the HOME button to acknowledge the completion of the OTAR and return to normal HOME PAGE operation.
- Normal OTAR operations take 10 – 30 seconds depending on signal strength and channel availability.

The OTAR process can be aborted by pressing the HOME button while the "OTAR IN PROGRESS" message is being displayed. Doing so will send the abort command to the digital transceiver, and display a status message like the following

1	OTAR ABORTING
2	φ . . 1 TACTICAL - 001

NOTE:

The OTAR process will automatically time-out after 2 minutes of unsuccessful OTAR attempts.

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Programming Preset Channels



The C-5000 must be configured before preset channels are programmed, or the unit will not operate properly.

Programming Preset Channels Using the Front Panel

Although Wulfsberg highly recommends using the PC based Remote Programmer software to program preset channels for the C-5000, they can be programmed from the front panel. The process is as follows.

- Ensure you are on the HOME PAGE.
- Press the PROG button. If the C-5000 has been programmed to require a password to enter this mode, you will be prompted to enter a password, as follows.

```
ENTER PASSWORD 2
# = . . . < ENTER >
```

- Input the appropriate password using the keypad and press the ENTER button.
- Press the MODE button until the following display page appears.

```
PROG : 2 = NEXT 3 = BACK
< ENTER > = CHANNELS
```

- Press the ENTER button to invoke the CHANNEL MAIN MENU PAGE, depicted below.

```
PROG : CHANNEL
2 = ADD 3 = CHG 4 = DEL
```

- Press the MODE button to add a new channel or the EDIT button to modify an existing channel. The pages are nearly identical for both functions. The illustrations that follow assume we are adding a channel, i.e. we pressed the MODE button.

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P R O G : 2 = N E X T 3 = B A C K A D D - . . <u>1</u>

- Use the cursor/value knobs to select the number for the new channel. **Only available channel numbers will be displayed.** Press the MODE button to go to the next menu page.

P R O G : 2 = N E X T 3 = B A C K R / T S Y S # = <u>1</u>

- Use the cursor/value knobs to select the radio this channel is being programmed for. Press the MODE button to go to the next menu page.
- If both radios are RT-5000's with the same part number, both radios will be able to use any channel. In this case, set this value to "1".

P R O G : 2 = N E X T 3 = B A C K C H A N I D = <u>.</u>

- Use the cursor/value knobs to input the alphanumeric identifier for the channel being programmed. This identifier can be a maximum of 12 characters in length. Turning the VALUE knob will enumerate all the characters available for the identifier. Press the MODE button to go to the next menu page.

P R O G : 2 = N E X T 3 = B A C K C H A N N E L T Y P E = <u>F</u> M

- Use the cursor/value knobs to input the modulation type for the channel being programmed. This can be AM, FM, P (P25), or TK (trunking). Press the MODE button to go to the next menu page.

P R O G : 2 = N E X T 3 = B A C K Z O N E = . <u>.</u> C H A N N E L = . .
--

- Use the cursor/value knobs to input the zone and channel number for a RT-5000 digital transceiver channel. Leave these fields blank if you are not programming a digital transceiver channel. If the C-5000 is configured for single-zone operation, you will only be able to input the channel number. Press the MODE button to go to the next menu page.

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NOTE:

It is very important that the zone/channel information entered on this page match the settings programmed into the ITM via CPS. The system will not function properly if this information is incorrect.

```
P R O G :   2 = N E X T       3 = B A C K
R X   F R E Q = 0 0 0 . 0 0 0
```

- Use the cursor/value knobs or the keypad to input the channel's receive frequency. Press the MODE button to go to the next menu page.

```
P R O G :   2 = N E X T       3 = B A C K
R X   T O N E = . . .
```

- Use the cursor/value knobs to input the channel's receive tone. Refer to the section on changing tones via the EDIT PAGE for details on specifying DCS and CTCSS tones. Press the MODE button to go to the next menu page.

```
P R O G :   2 = N E X T       3 = B A C K
T X   F R E Q = 0 0 0 . 0 0 0
```

- Use the cursor/value knobs or the keypad to input the channel's transmit frequency. Specifying a transmit frequency of 000.000 indicates the channel is a receive-only channel. Press the MODE button to go to the next menu page.

```
P R O G :   2 = N E X T       3 = B A C K
T X   T O N E = . . .
```

- Use the cursor/value knobs to input the channel's transmit tone. Refer to the section on changing tones via the EDIT PAGE for details on specifying DCS and CTCSS tones. Press the MODE button to go to the next menu page.

```
P R O G :   2 = N E X T       3 = B A C K
T X   P O W E R = H I
```

- Use the cursor/value knobs to input the channel's transmit power as HI or LO. Press the MODE button to go to the next menu page.

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```
PROG : 2 = NEXT      3 = BACK
ENCRYPTION TYPE = CLR
```

- Use the cursor/value knobs to input the channel's encryption type. This option can be CLR (no encryption), EXT (external encryption), STD (internal encryption on internal transceiver module), or OTAR (internal encryption with OTAR capability on internal transceiver module). Press the MODE button to go to the next menu page.

```
PROG : 2 = NEXT      3 = BACK
ENCRYPTION KEY = . .
```

- Use the cursor/value knobs to input the channel's encryption key. This page will only appear if applicable, i.e. an encryption type of STD or OTAR was specified above. Press the MODE button to go to the next menu page.

```
PROG : 2 = NEXT      3 = BACK
RX BANDWIDTH = STD
```

- Use the cursor/value knobs to input the channel's receive bandwidth. Valid options are STD (standard), NARROW, WIDE, and X-WIDE (extra wide). The default is STD. Press the MODE button to go to the next menu page.

```
PROG : 2 = NEXT      3 = BACK
4 = ADVANCED FEATURES
```

- Typically, the previous channel properties are all you need to specify. Pressing the MODE button will skip over the "advanced features" menu pages to the page that lets you permanently save your channel.
- Channels using an ITM in the RT-5000 will NEVER require the user to input advanced information.
- Press the DIM button to continue with the "advanced features".

```
PROG : 2 = NEXT      3 = BACK
2ND IF INJECTION = HI
```

- Use the cursor/value knobs to input the channel's second I.F. Injection as HI or LO. The default is HI. Press the MODE button to go to the next menu page.

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```
PROG : 2 = NEXT      3 = BACK
3RD I F I N J E C T I O N = L O
```

- Use the cursor/value knobs to input the channel's third I.F. Injection as HI or LO. The default is LO. Press the MODE button to go to the next menu page.

```
PROG : 2 = NEXT      3 = BACK
RX A U D I O P H A S E = 0
```

- Use the cursor/value knobs to input the channels receive audio phase as 0 or 180. The default is 0. Press the MODE button to go to the next menu page.

```
PROG : 2 = NEXT      3 = BACK
TX A U D I O P H A S E = 0
```

- Use the cursor/value knobs to input the channel's transmit audio phase as 0 or 180. The default is 0. Press the MODE button to go to the next menu page.

```
PROG : 2 = NEXT      3 = BACK
TX D E V I A T I O N = 5 . 0 K H Z
```

- Use the cursor/value knobs to input the channel's transmit deviation. This can be 3.0KHz, 5.0KHz, 4.0KHz, or 5.6KHz. The default is 5.0KHz. Press the MODE button to go to the next menu page.

```
PROG : 2 = SAVE      3 = BACK
. . 1 P R E S E T C H A N 1
```

- Press the MODE button to permanently save the channel and return to the CHANNEL MAIN MENU PAGE. You may also review your changes by pressing the EDIT button, or cancel the operation by pressing the HOME button.

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Glossary

AM – Acronym for “Amplitude Modulation”. In this type of modulation, the amplitude of the signal is varied in proportion to the voice or data input signal. The signal quality can be severely degraded because of lightning or man made electrical noise. AM is only used in the frequency ranges 108 to 152 MHz and 225 to 400 MHz. All air traffic control functions use AM modulation.

Audio Phase – The RT-5000 can invert the phase of the audio signal during transmit or receive. This is sometimes necessary for DPL systems to work.

Bandwidth – A term used to describe the amount of frequency a channel has to transmit a signal. Two of the most common FM channel bandwidths are 12.5 kHz (Narrow) and 25 kHz (Standard). Some special signals, such as military encryption, work best when using 35 kHz (Wide) or 70 kHz (Extra-wide) channels. All of these bandwidths are available in the RT-5000.

Channel – A group of radio characteristics, such as receive & transmit frequencies, modulation, power levels, etc.

CMC – An acronym for Communication Management Controller. The C-5000 is a CMC.

CTCSS – Acronym for “Continuous Coded Squelch System”.

DCS – Acronym for “Digital Coded Squelch”

DES – Acronym for “Digital Encryption Standard”. This is an algorithm by which signals are encrypted.

Deviation – The amount of peak change the RF signal varies from the carrier in proportion to the amplitude of the voice signal.

DPL – Acronym for “Digital Private Line”. Also known as DCS.

DTMF – Dual Tone Multiple Frequency. On a telephone keypad, each row and column have unique audio tones that are sent when a button is pushed. At the receiver, a decoder listens for a row tone and a column tone and can determine from that, which button has been pushed.

Direct – Also known as simplex, car-to-car, and talk-around. This mode of operation allows you to bypass the repeater and talk directly to another radio. Transmit and receive frequencies are the same.

Encryption – Method by which a signal is “scrambled” so that other listeners cannot understand what is being transmitted.

Encryption Key – When encrypting a transmission, the algorithm used to scramble the information requires both the transmitting and receiving devices to have a number. This number is called an Encryption Key. Some systems are limited to one key and others are capable of having multiple keys.

Flexcomm I – First generation of Flexcomm control heads and transceivers. This includes the C-1000 control head and RT-30, RT-138(F), RT-450, RT-406F transceivers.

Flexcomm II – Second generation of Flexcomm control heads and transceivers. This includes the C-5000 control head and RT-5000 multi-band transceiver.

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FM – Acronym for “Frequency Modulation”. In this type of modulation, the frequency of the signal is varied from its center point in proportion to the amplitude of the voice or data signal. Most importantly, this type of modulation is not affected by lightning or other atmospheric noise.

Guard Receiver – Second receiver added to the transceiver to monitor a specific frequency. Some common “guard” frequencies are 121.5, 243, Marine channel 16, and Marine channel 70. However, this optional function can also be used to monitor a dispatch channel, or an important tactical frequency. Some Guard receivers have a single frequency that is set in hardware. Other options, available only in the RT-5000, are a programmable dual channel receiver and a multi-band P25/Trunking compatible unit.

IF Injection – In a superhetrodyne receiver, high frequency signals are progressively lowered in frequency until only the audio is left. This is done by multiplying the RF Signal by a sinewave either above or below the RF carrier. Mathematically this results in an “Intermediate Frequency” (IF) frequency that is the sum and difference of the two signals. The RT-5000 has the capability of having either High (Above) or Low (Below) the signal frequency. What this means is if you have a signal interfering with the desired signal, sometimes the interference can be eliminated by switching either the 2nd or 3rd injection setting.

Interoperability – The ability for different radio systems to communicate with each other directly. For example, when one manufacturer’s radio products will communicate with another’s, they are said to be “Interoperable”.

ITM – “Internal Transceiver Module”. This is the module that is physically placed in the Guard Receiver slot in the RT-5000. This is the part of the radio that can perform P25, encryption, and Motorola Trunking. Each ITM covers a specific frequency band – 138-174, 403-470, 450-520, and 800 MHz. Up to two ITM’s can be put into one RT-5000 however one must be below 400 MHz and one above 400 MHz.

KEYMAT – Another name for encryption key.

KVL – Acronym for Key Variable Loader. It is a Motorola product for loading encryption keys into an encryption capable radio.

Main Receiver – Full function receiver located in every transceiver.

Manual Channel – A special preset channel that allows the operator to manipulate channel information “on the fly” without going into programming mode. On the C-5000 this special channel is labeled “.M” and is located at channel 0.

MODE 1 – Operational mode of the C-5000/RT-5000 system where the operator does not know there is a main and guard located in the transceiver. This simplifies the user interface dramatically. However, only one receiver, the main or the ITM module in the Guard is in operation at one time so only one channel is monitored.

MODE 2 – Operational mode of the C-5000/RT-5000 system where the main and guard receiver are both monitoring frequencies at the same time. The user interface is more complex in that the user must select using the silver “soft” buttons on the C-5000 which channel to display and transmit on.

OTAR – Acronym for “Over The Air Re-key”. Method by which the Encryption Key is transmitted over the radio channel, hence “over the air”.

P25 – Digital Modulation Standard.

Page – The contents of the display. Sometimes called a screen or view.

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PL – Acronym for “Private Line”. Also known as CTCSS or sub-audible tone.

Preset Channel – A channel that has been programmed into the memory of a control head or transceiver.

Private – Another name for encryption.

Repeat – This mode of operation uses a ground or air based repeater to retransmit your signal to another radio. Transmit and receive frequencies are different.

RP - Acronym for “Remote Programmer”. Wulfsberg’s software to program the C-5000 with channel information via a connector of the front of the C-5000 is called the RP Software. It is recommended that this method is used whenever possible to program the C-5000 memory. While front panel programming is available for emergencies, using the RP software is less prone to operator errors and automatically provides for memory backup in case on control head failure.

RSS – Acronym for “Radio Service Software”. A PC application used for configuring, uploading, and downloading information into the RT-5000’s Internal Transceiver Modules.

RT System – Another way of saying Receiver/Transmitter System. Most often, the term refers to a single transceiver. However, because the Flexcomm I transceivers can be ganged together and controlled as one radio, it can refer to more than one transceiver. The C-5000 can control up to two RT systems.

RX – Abbreviation for “Receive”

Shadow Key – Special encryption key used to encrypt the keys received during the OTAR process.

Squelch level – Signal level at which the radio will detect a strong enough signal has been detected by the radio and audio is allowed to go to the user.

Transceiver – A radio containing both a transmitter and a receiver, co-located in one box.

Trunking – A term used to describe a communication system that automatically assigns an available channel to the operator. This type of system can improve channel use to the point that more conversations are going on than channels available. There are many different Trunking systems available. Most are proprietary to each manufacturer. In other words, system built by different radio manufacturers will NOT communicate with each other. Only the P25 Trunking standard guarantees interoperability.

TX – Abbreviation for “Transmit”.

Volume – Loudness of a voice signal.

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Appendix A – CTCSS (PL) Tone Codes

C-5000 TONE CODE	TONE FREQ (HZ)	EIA TONE CODE	C-5000 TONE CODE	TONE FREQ (HZ)	EIA TONE CODE
01	67.0	XZ	35	179.9	6B
02	71.9	XA	36	186.2	7Z
03	74.4	WA	37	192.8	7A
04	77.0	XB	38	203.5	M1
05	79.7	SP	39	N/A	N/A
06	82.5	YZ	40	N/A	N/A
07	85.4	YA	41	210.7	M2
08	88.5	YB	42	218.1	M3
09	N/A	N/A	43	225.7	M4
10	N/A	N/A	44	233.6	M5
11	91.5	ZZ	45	241.8	M6
12	94.8	ZA	46	250.3	M7
13	97.4	ZB	47	229.1	9Z
14	100.0	1Z	48	150.0	
15	103.5	1A	49	N/A	N/A
16	107.2	1B	50	N/A	N/A
17	110.9	2Z	51	69.3	WZ
18	114.8	2A	52	159.8	
19	N/A	N/A	53	165.5	
20	N/A	N/A	54	171.3	
21	118.8	2B	55	177.3	
22	123.0	3Z	56	183.5	
23	127.3	3A	57	189.9	
24	131.8	3B	58	196.6	
25	136.5	4Z	59	N/A	N/A
26	141.3	4A	60	N/A	N/A
27	146.2	4B	61	199.5	
28	151.4	5Z	62	206.5	8Z
29	N/A	N/A	63	254.1	0Z
30	N/A	N/A	64	Reserved	
31	156.7	5A	65	Reserved	
32	162.2	5B	66	Reserved	
33	167.9	6Z	67	Reserved	
34	173.8	6A	68	Reserved	

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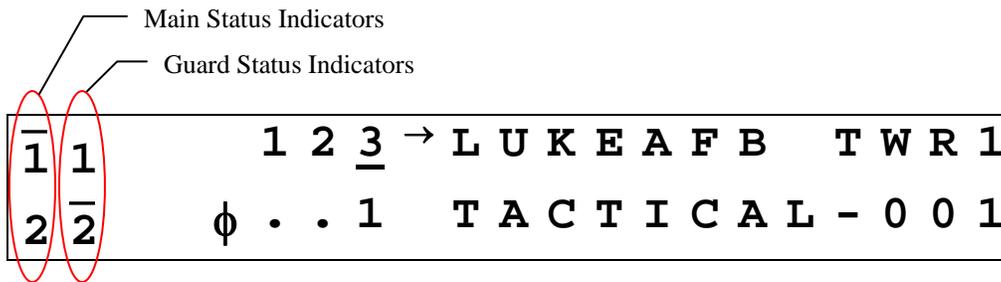
Appendix B – Mode 2 Operation

Overview

The C-5000 has the capability to control the RT-5000 in such a way that the user can monitor both the main and the Guard (ITM) channel at the same time. This mode of operation is more difficult to use than MODE 1.

The Home Page

The only visible difference in the HOME PAGE from Mode 1 operation is in the Main/Guard status fields. The illustration below depicts the HOME PAGE for a system comprised of two digital RT-5000 radios. Both radios are configured to operate in Mode 2. The Main transceiver is the active transceiver on radio 1. The digital transceiver (Guard) is the active transceiver on radio 2. The active transceiver is the one that will transmit when the push-to-talk switch is depressed.



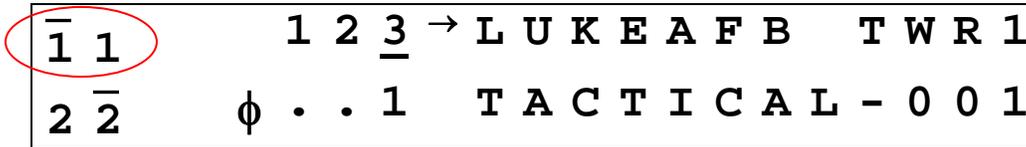
Main/Guard Status Fields – These fields display symbols indicating the current status of all the available transceivers in the system. The symbols are as follows.

- – Indicates a radio is available, but not enabled.
- ▶ – Indicates a radio is transmitting.
- 1** – Indicates Main/Guard 1 is available and enabled, but not active.
- 2** – Indicates Main/Guard 2 is available and enabled, but not active.
- 1** (with horizontal bar above) – Indicates Main/Guard 1 is available, enabled, and active.
- 2** (with horizontal bar above) – Indicates Main/Guard 2 is available, enabled, and active.
- 1** (with vertical bar to the left) – Indicates Main/Guard 1 is receiving.
- 2** (with vertical bar to the left) – Indicates Main/Guard 2 is receiving.

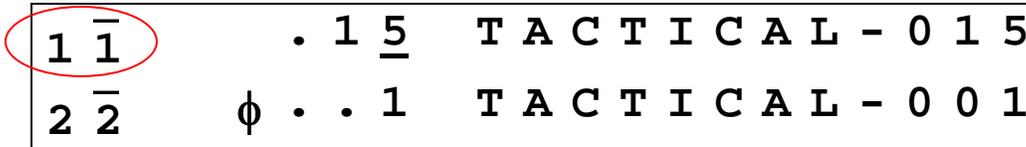
Setting the Active Transceiver

You can toggle the active transceiver for a radio between Main and Guard by pressing the soft keys. The UPPER SOFT key toggles the active transceiver for radio 1. The LOWER SOFT key toggles the active transceiver for radio 2. The following sequence of illustrations demonstrates this process for radio 1.

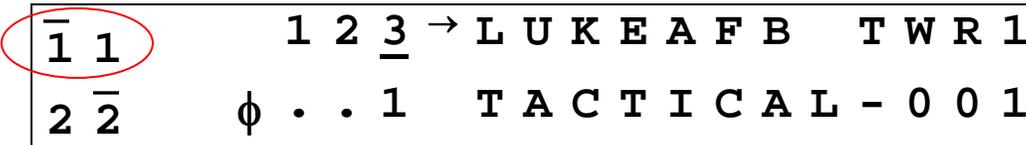
The Main transceiver is currently active.



Pressing the UPPER SOFT key makes the digital transceiver (Guard) active.



Pressing the UPPER SOFT key again makes the Main transceiver active.



Selecting Preset Channels

Selecting preset channels in Mode 2 is conceptually the same as in Mode 1. If an MTM Guard receiver is active, the user can only select preset channels programmed for an ITM, and the main transceiver will only allow you to select channels programmed for a main transceiver. A ramification of this is that you cannot select the manual channel while the Guard receiver is active.

Appendix C – Single Microphone Operation

Overview

Starting with software modification 11 (SWID 11), the C-5000 has the ability to control both radios with a single microphone/headset. This feature, hereafter called single-mic mode, is useful for installations where audio panel space is limited, or it is otherwise impractical to dedicate two ports to the C-5000.

The main features of single-mic mode are as follows:

- Audio from all enabled sources are routed to the primary headset.
- The operator can dynamically select which transceiver will be used for transmit.
- Supports both Mode 1 and Mode 2 operation.

Configuring Single-Mic Mode

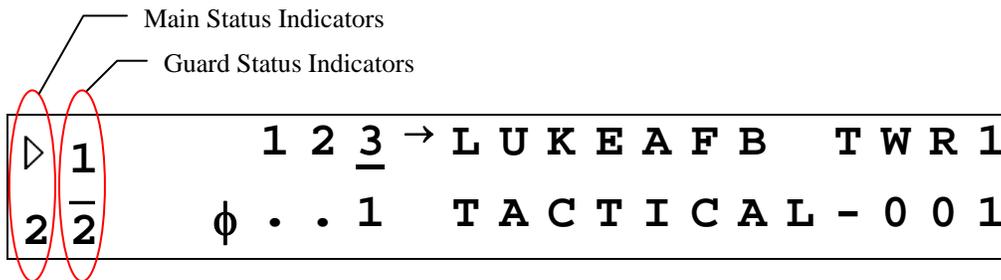
You can configure the C-5000's microphone mode using either the Wulfsberg Remote Programmer software or from the C-5000's front panel. To set the option using the Remote Programmer software, simply select Single or Dual from the Mic Mode combo box, located on the Hardware Configuration screen. To set the option from the C-5000's front panel, simply select SINGLE or DUAL from the option list on the MIC MODE configuration page. This page, depicted below, is located under the SETUP MISC. sub-menu of the CFG SYSTEM menu.

```

S E T U P :   2 = N E X T   3 = B A C K
              M I C   M O D E   - S I N G L E
    
```

The Home Page

The main visible difference in single-mic mode is the addition of the active RT indicator, displayed as an unfilled triangle. The active RT indicator shows which RT will be used for transmit. The illustration below depicts the HOME PAGE for a system comprised of two digital RT-5000 radios. Both radios are configured to operate in Mode 2. The Main transceiver of radio 1 is the both the active transceiver for radio 1 and the active RT for the entire system. The digital transceiver (Guard) is the active transceiver on radio 2.



Setting the Active RT

You can change the active RT by pressing the soft keys. If radio 1 does not already contain the active RT, pressing the UPPER SOFT key will make radio 1's active transceiver the active RT. If radio 1 already contains the active RT, pressing the UPPER SOFT key toggles the active RT between radio 1's Main and Guard. The LOWER SOFT key performs the same operations for radio 2. The following sequence of illustrations demonstrates changing the active RT using the soft keys.

The Guard transceiver of radio 2 is currently the active RT.



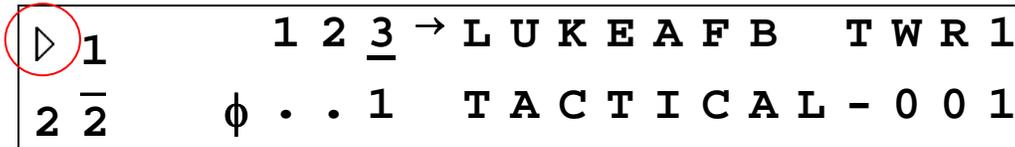
Pressing the UPPER SOFT key makes the Main transceiver of radio 1 the active RT.



Pressing the UPPER SOFT key again makes the Guard transceiver of radio 1 the active RT.



Pressing the UPPER SOFT key again makes the Main transceiver of radio 1 the active RT.



Pressing the LOWER SOFT key makes the Guard transceiver of radio 2 the active RT.



Pressing the LOWER SOFT key again makes the Main transceiver of radio 2 the active RT.

