Operator's Manual

MIDLAND®

Base Tech IV Series

94-3110B 110 Watt VHF P25 Base/Repeater Station

94-4100B 100 Watt UHF P25 Base/Repeater Station

Perspective picture here

P25
DIGITAL WIRELESS • SANS FIL
DIGITAL • NUMÉRIQUE
DIGITAL • INALÁMBRICO

www.midlandradio.com

WARNING: The antenna(s) used for this transmitter must be fixed-mounted on outdoor permanent structures with a separation distance of at least 6 meters from all persons during normal operation. The peak conducted output power at each antenna terminal must not exceed 250 Watts and the peak radiated output power must not exceed 1000 Watts EIPR. Users and installers must ensure that FCC requirements for satisfying RF exposure compliance are met. (See FCC Rules Part 1, Sections 1307 and 1310)

NOTICE: The AMBE+2 ™ voice coding Technology embodied in this product is protected by intellectual property rights including patent rights, copyrights and trade secrets of Digital Voice Systems, Inc. This voice coding Technology is licensed solely for use within this Communications Equipment. The user of this Technology is explicitly prohibited from attempting to extract, remove, decompile, reverse engineer or disassemble the Object Code, or in any other way convert the Object Code into a human readable form. U.S. Patents Nos. #5,870,405, #5,826,222, #5,754,974 #5,701,390, #5,715,365, #5,649,050, #5,630,011, #5,581,656, #5,517,511, #5,491,772, #5,247,579, #5,226,084 and #5,195,166.

Contents

Conventions and Symbols in this Book

⚡ **This symbol marks a "caution". Cautions are special notices which you should read and follow carefully to avoid possible damage to your equipment and to avoid potential danger to yourself or other people.**

! **This symbol marks an "important point". Important points are specific instructions which should be followed closely for proper operation.**

📄 *This symbol marks a "note". Notes are hints or tips which offer additional information to help you.*

Disclaimer

Midland Radio Corporation is committed to continuous quality improvements, for this reason specifications may change without prior notice.

Every effort has been made to ensure that the information in this document is complete, accurate, and up-to-date. Midland assumes no responsibility for the results of errors beyond its control. The manufacturer of this equipment also cannot guarantee that changes in the equipment made by unauthorized people will not affect the transceiver's performance or functions.

Introduction

Thank you for choosing the Midland Base Tech IV P25 Base/Repeater Station to meet your communication needs. Properly used, this product will give you many years of reliable service. To get the most out of your purchase, be sure to carefully read this manual before operating the radio.

Models

There are two models in the Base Tech IV series.

94-3110B – 5 – 110 Watts VHF, 146-174 MHz.
94-4100B – 2 – 100 Watts UHF, 440-475 MHz.

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Radio Features

The Base Tech IV series base/repeater stations are programmable, synthesized transceivers featuring:

☑ P25 operation

☑ Transmit power continuously variable up to 100 Watts, UHF; 110 Watts, VHF.

☑ 12.5 KHz channel spacing.

☑ 4 programmable buttons. The function of each button is assigned by dealer programming.

☑ 6 LED indicators for power-on, busy, transmit, alarm, digital and repeat.

☑ Multi-function rotary encoder knob for volume, channel, squelch, and backlight level.

☑ 50 CTCSS tones and 83 CDCSS codes are programmable per channel. In addition, a custom CTCSS tone frequencies and a custom CDCSS are programmable.

☑ A busy channel lockout feature is programmable. An override function is available to allow transmission during repeater hangtime.

☑ A transmit time-out timer may be programmed to limit continuous transmission time. A penalty timer is also programmable.

☑ A talk-around function button may be programmed to allow for repeater talk-around without using an additional channel.

☑ A configurable emergency mode may be activated by a programmable function button.

☑ A password function is available to prevent unauthorized radio operation. When programmed, a four keypress

sequence must be entered each time the radio is turned on, in order to operate the radio.
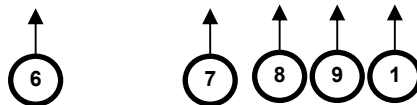
Recommended Accessories
|	
???	Replacement microphone
???	Desktop microphone
???	DTMF microphone

Radio Controls

**Front Panel**

front panel picture here

1. Power switch. Press and release to turn the transceiver on. Press and release again to turn the transceiver off.

2. LED power indicator.

3. Multi-function rotary encoder. This knob is used for volume, channel, squelch and backlight adjustments. Press to step through the available functions. Rotate to change the level for the selected function.

4. LED status indicators. Light to indicate:
   BUSY   Channel is busy
   TRANSMIT Radio is transmitting
   ALARM   Radio is in alarm
   DIGITAL   Digital receive or transmit mode
   REPEAT   Repeat mode is selected

5. Backlit LCD display. A 4 line 20 character display providing channel and operating information.

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6. Programmable function buttons. 4 buttons with dealer programmed options/functions.

7. Internal front speaker.

8. USB type B programming jack.

9. 3.5 mm mono headphone jack.

10. RJ45 microphone jack.

Rear Panel
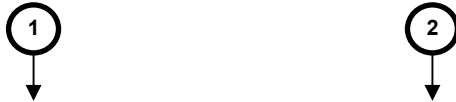
Rear panel picture here
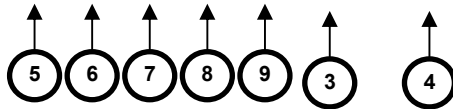
1. DB25 expansion connector.

2. RJ45 tone remote/E&M connector.

3. Ethernet connector.

4. Remote switch.

5. Type N receiver input connector.

6. External reference input connector. BNC jack for connection of optional 10 MHz reference oscillator.

7. Type N transmitter output connector.

8. Fuse holder.

9. 13.6 V DC power connector (negative ground only).

Backlit LCD Details

Setup

Unpacking

The following items are supplied in the standard package:

- ☑ One transceiver.

- ☑ One palm microphone.

- ☑ One DC power cord

- ☑ One user's manual.

Installation

Radio installation should only be done by qualified and trained personnel, familiar with automotive electronics installation, and FCC RF exposure guidelines. This transceiver should be connected to a 12VDC power supply capable of 20 amps. More complete installation instructions are available in the corresponding radio service manual.

Antenna selection, installation and positioning requires knowledge of RF radiation and exposure conditions and should be performed by qualified personnel only. Please consult your dealer or communications coordinator for more information.

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Basic Operation

> ! **Before turning on your radio for the first time, you should ensure power connections have been made correctly and all antenna connections are proper and secure.**

Turning the Radio On and Off

Press and release the power button. The power LED should light indicating the radio power is on. The radio will perform some software loading and checks then display the channel. To turn the radio off, press and release the power button again.

If "Password?" is displayed after turning on the radio, you must enter the programmed password (4 keypress sequence) to use the radio. Consult your dealer or communications coordinator if you have further questions.

Channel Selection

Press and release the rotary encoder knob until the channel is displayed. While the channel is being displayed, rotate the rotary encoder knob to select the desired operating channel. Please consult your dealer or communications coordinator regarding channels programmed in your radio.

Receiving Transmissions from Other Radios

Each channel of your radio may be programmed for analog receive operation, digital receive operation, or mixed (both) receive operation. The following paragraphs describe these modes of operation. Ask your dealer or communications coordinator if you have questions on how your radio has been programmed to operate.

Analog Receive Operation

If the channel is not programmed with CTCSS/CDCSS, a signal that matches the programmed receive frequency will be heard if it is of sufficient strength to exceed the squelch threshold. An on frequency signal exceeding the squelch threshold level will be indicated by a lit Busy indicator and speaker unmute indicator.

CTCSS or CDCSS signaling adds an additional condition to carrier squelch operation. In addition to the signal having to exceed the squelch threshold level, the received signal must also have the correct CTCSS tone or CDCSS code before the audio will be passed to the speaker. CTCSS or CDCSS signaling allows multiple users on the same frequency to hear only signals which have their correct CTCSS tone or CDCSS code. An on frequency signal with the correct CTCSS or CDCSS signaling will be indicated by a lit Busy indicator and speaker unmute indicator. A Busy indicator with the speaker mute indicator means that the channel is busy, but the correct CTCSS or CDCSS signaling is not present.

> *CTCSS/CDCSS allows multiple users to share the same frequency. However CTCSS/CDCSS is only useful to avoid disturbing other users with messages not related to them. If more than one radio is transmitting at the same time, this will cause interference. Do not transmit if the Busy indicator is lit. Wait until the channel is clear before transmitting.*

Digital Receive Operation

When a P25 digital transmission is received, it will be heard if the required conditions are met. P25 digital signals have several mechanisms to allow users to hear only conversations intended for them. A received P25 digital signal will be indicated by lit Busy and Digital indicators.

The primary condition the P25 digital signal must match is the Network Access Code, or NAC. The NAC provides much the same functionality as CTCSS/CDCSS do for an analog signal. The received signal will only be heard if the NAC from the received signal is matched to the channel parameters. There is a special NAC, hexadecimal F7E, which indicates to the receiver to allow signals received with any NAC to be heard. This provides much the same functionality as an analog signal without CTCSS/CDCSS.

The P25 digital signal may be further addressed to everyone, to a specific talk group, or to an individual unit ID. If the receiver is

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configured for normal digital squelch mode, all signals with matching NAC will be heard. If the receiver is configured for selective squelch mode, only signals addressed to the proper talk group or individual ID will be heard.

Mixed Receive Operation

If the radio channel is programmed for mixed receive operation, the radio will receive both analog and P25 digital signals. The receiver will automatically switch to the appropriate mode depending on which type of signal is detected. Analog and P25 digital receive operation is as described above.

Transmitting to Other Radios

> ! **Before transmitting, the FCC requires you monitor the channel to make sure it is clear. Transmitting while someone else is transmitting will create interference and disrupt both conversations.**

The radio is capable of transmitting both analog and P25 digital signals. The radio channel is configured for a default transmit mode. The current transmit mode is indicated on the LCD display, and by the lit Digital indicator (when digital TX Mode is selected). A programmable function button may be set up to allow the user to choose the desired transmit mode. Follow these steps to transmit to other radios.

1. Check that the radio is in the desired transmit mode.

2. Monitor the channel by pressing the programmed function button. Channel activity is also indicated by the lit Busy indicator.

3. If the channel is clear, press and hold the push to talk (PTT) switch on the side of the microphone.

4. The Transmit indicator will light while the radio is transmitting.

5. Hold the microphone approximately 2 inches from your mouth and speak across the face of the microphone in a clear, normal voice.

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6.   Keep the PTT switch pressed until you have finished speaking.

7.   Release the PTT switch to return to receive mode.

     📄 *Press PTT before you start talking and release PTT after you have finished speaking.*

     📄 *The radio might be programmed with a **timeout timer** which will automatically end your transmission after a preset time. In this case release PTT and wait for a few seconds. The radio transmitter will be enabled again after a few seconds. Ask your dealer or communications coordinator for further details.*

     📄 *The radio might be programmed for **busy channel lock out**, which automatically disables the transmitter if your channel is busy. In this case wait until the channel is clear.*

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Programmable Functions

For increased flexibility and customization, the four front panel buttons may be programmed with the following functions:

⬜ **Monitor**

Press and release this button to toggle the monitor mode. While in monitor mode, the radio will receive any CTCSS/CDCSS/NAC.

⬜ **P25 Squelch Mode**

On digital or mixed mode receive channels, press and release this button to toggle the digital squelch mode. While in normal squelch mode the radio will receive all talk groups and individual calls. While in selective squelch mode the radio will receive only the programmed talk group and individual calls addressed to its unit ID.

⬜ **P25 Call Mode**

Press and release this button to toggle the P25 call mode. While in group call mode, the radio will transmit normal group calls with the programmed talk group. While in individual call mode, the radio will transmit individual calls to the selected unit ID. While in all call mode, the radio will transmit group calls to talk group 65535 (everyone).

⬜ **Transmit Power**

Press and release this button to toggle the transmit power selection. While in high power mode the radio will transmit at the power level set by the high power adjustment. While in low power mode the radio will transmit at the power level set by the low power adjustment.

⬜ **Transmit Mode**

Press and release this button to toggle the transmit mode. The radio will transmit analog or P25 digital signals based on the selected transmit mode.

☐ **Messaging Mode**
Press and release this button to switch between the available messaging modes. The available messaging modes include call alert, radio check, radio inhibit, radio uninhibit, radio monitor, status update, status request, short message and telephone dial.

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☐ **Direct Channel**
Press and release this button to switch to the configured channel.

☐ **Emergency Mode**
Press and hold for two seconds to activate the emergency function. The configured emergency action will be performed.

☐ **Keylock**
Press and hold for two seconds to lock all other front panel keys. Press and hold again to unlock.

☐ **Talk Around**
Press and release this button to shift the radio transmit frequency to the programmed channel receive frequency. This allows the radio to communicate directly with other radios, which normally communicate through a repeater system. Press again to change back to the programmed transmit frequency.

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Message Display Quick Reference

Error Codes

Display	Description

Specifications

General specifications	94-3110B VHF	94-4100B UHF
Frequency range	146-174 MHz	440-475 MHz
FCC ID number	MMA943110B	MMA944100B
FCC type acceptance	Part 90	Part 90
Modulation type	11K0F3E/11K0F1D/11K0F2D	11K0F3E/11K0F1D/11K0F2D
Maximum number of channels	500	500
Channel spacing	12.5 KHz	12.5 KHz
Channel stepping	2.5/5/6.25 KHz	5/6.25 KHz
CTCSS/DCS per channel	50 CTCSS/83 CDCSS	50 CTCSS/83 CDCSS
Input voltage	13.6 Vdc ±15%	13.6 Vdc ±15%
Size (H x W x D)	3.4 x 18.2 x 14.2 in	3.4 x 18.2 x 14.2 in
	(88 x 462 x 360 mm)	(88 x 462 x 360 mm)
Weight	24 lbs (11 kg)	24 lbs (11 kg)
EIA/TIA-603 receiver specs		
Frequency stability	±1.5 ppm (-30° to +60° C)	±1.5 ppm (-30° to +60° C)
12 dB SINAD sensitivity	0.3 µV	0.3 µV
Selectivity	80 dB	80 dB
Intermodulation rejection	85 dB	85 dB
Spurious rejection	100 dB	100 dB
Hum and noise (analog/digital)	45 dB/50 dB	45 dB/50 dB
Squelch sensitivity	<12dB Sinad	<12dB Sinad
Audio response	per EIA/TIA-603 specs	per EIA/TIA-603 specs
Audio output	1 Watts <5% THD into 8Ω	1 Watts <5% THD into 8Ω
RF input impedance	50 Ω	50 Ω
EIA/TIA-603 transmitter specs		
RF power output	5-110 Watts	2-100 Watts
Frequency stability	±1.5 ppm (-30° to +60° C)	±1.5 ppm (-30° to +60° C)
Modulation limiting	±2.5 kHz	±2.5 kHz
Spurious emissions	80 dBc	80 dBc
FM hum & noise (analog/digital)	45 dB/50 dB	45 dB/50 dB
Audio response	per EIA/TIA-603 specs	per EIA/TIA-603 specs
Audio distortion	<5% 1 KHz @ 60% dev.	<5% 1 KHz @ 60% dev.
RF output impedance	50 Ω	50 Ω

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Warranty Statement

Midland Radio Corporation (herein, Midland) warrants each new radio product manufactured or supplied by it to be free from defects in material and workmanship under normal use and service for a period listed below, provided that the user has complied with the requirements stated herein.

The Warranty period begins on the date of purchase from an Authorized Midland Sales and Service Outlet. This Warranty is offered to the original end user and is not assignable or transferable. Midland is not responsible for any ancillary equipment attached to or used in conjunction with Midland products.

Midland offers to the original end user a Five (5) Year Limited Warranty on Midland Business and Industrial Base Station/Repeater products. Accessories carry a One (1) Year Limited Warranty.

During this period, if the product fails to function under normal use because of manufacturing defect(s) or workmanship, it should be returned to the Authorized Midland Sales and Service Outlet from which it was purchased. The Sales and Service Outlet will repair the product or return the product for repair to Midland or its Authorized Repair Depot. The user is responsible for the payment of any charges or expenses incurred for the removal of the defective product from the vehicle or other site of its use; for the transportation of the product to the Sales and Service Outlet; for the return of the repaired / replacement product to the site of its use and for the reinstallation of the product.

Midland shall have no obligation to make repairs or to cause replacement required, which results from normal wear and tear or is necessitated in whole or in part by catastrophe, fault or negligence of the user, improper or unauthorized alterations or repairs to the Product, incorrect wiring, use of the Product in a manner for which it was not designed or by causes external to the Product. This Warranty is void if the product serial number is altered, defaced or removed.

Midland's sole obligation hereunder shall be to replace or repair the Product covered in this Warranty. Replacement, at Midland's option, may include a similar or higher-featured product. Repair may include the replacement of parts or boards with functionally equivalent reconditioned or new parts or boards. Replaced parts, accessories, batteries or boards are warranted for the balance of the original time period. All replaced parts, accessories, batteries or boards become the property of Midland.

THE EXPRESS WARRANTIES CONTAINED HEREIN ARE IN LIEU OF ALL OTHER WARRANTIES, EITHER EXPRESSED OR IMPLIED OR STATUTORY, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

FOR ANY PRODUCT WHICH DOES NOT COMPLY WITH THE WARRANTY SPECIFIED, THE SOLE REMEDY WILL BE REPAIR OR REPLACEMENT. IN NO EVENT WILL MIDLAND BE LIABLE TO THE BUYER OR ITS CUSTOMERS FOR ANY DAMAGES, INCLUDING ANY SPECIAL, INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES, OR FOR THE LOSS OF PROFIT, REVENUE OR DATA ARISING OUT OF THE USE OF OR THE INABILITY TO USE THE PRODUCT.

This warranty is void for sales and deliveries outside of the U. S. A. and Canada.

📄 *This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.*

📄 *This radio operates in FCC regulated frequency bands. All radios must be licensed by the FCC before use. Because this radio contains a transmitter, Federal law prohibits unauthorized use or adjustments of this radio.*