User's Manual

8M052X04-01

REV. 0

MOBITEX AIRBASE 900

FUTURECOM
SYSTEMS GROUP INC.

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FCC Class A Digital Device or Peripheral - Information to User

➲NOTE

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, can cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

➲WARNING

Changes or Modifications not expressly approved by Futurecom Systems Group Inc. could void the user's authority to operate the equipment.

➲WARNING

U.S.A. Users:

Do not use the MOBITEX AIRBASE 900 in the frequency band 406.0 - 406.1MHz. This frequency band is reserved for use by distress beacons.

1.0 SAFETY INFORMATION

The following information may or may not be applicable to your product.
In any case, precautions should always be taken when handling any electrical product.

- This manual contains important safety and operating instructions, therefore keep this manual always on hand!

- Prior to using any product, follow all warning, safety and operating instructions written on the product and in the user's manual. **All instructions should be saved for reference in the future!**

- Always keep product dry, never expose to any kind of moisture.

- **Do Not** expose product to extreme temperatures- as found near a hot radiator or stove.

- **Do Not** expose product to open flames, cigarettes, etc.

- Precautions should be taken to avoid objects falling or liquids spilling onto product.

- **Do Not** incorporate the use of other equipment that is not recommended or sold by the manufacturer. The result may be the risk of fire or electric shock injury.

- Connect DC power cord to DC power source as marked on the product..

- **DANGER** - Never alter the AC cord or plug! If plug does not fit outlet have a qualified electrician install a proper outlet. Failure to do so results in improper connection and increases the risk of electric shock.

- This product does not contain customer serviceable components, therefore **never** disassemble the product..

- Damage Requiring Service - This product should be serviced by qualified service personnel when:
  A. The power supply cord or the plug has been damaged; or
  B. Objects have fallen, or liquid has been spilled into the product; or
  C. The product has been exposed to rain or moisture; or
  D. The product does not appear to operate normally or exhibits a marked change of performance; or
  E. The product has been dropped, or the cabinet damaged.

- If an outdoor antenna is connected, make sure the system is always grounded to allow for protection against voltage surge and built-up static charges. Outdoor antennas should always be located away from power lines.

The operator of any mobile radio should be aware of certain hazards common to the operation of vehicular radio transmissions.

A list of possible hazards follows:

1. Explosive Atmospheres

To ensure safety, make sure that the radio is off while fueling the vehicle. When the radio is mounted in the back of the trunk, never have containers of fuel in the trunk of the vehicle..

2. Interference to Vehicular Electronics Systems

Typical types of electronic devices that malfunction are -Electronic fuel injection systems, electronic anti-skid braking systems, etc., The reason for this is due to the lack of protection from radio frequency energy present when transmitting. If the vehicle contains such equipment, consult the dealer of your vehicle and enlist his aid in determining if such electronic circuits perform normally when the radio is transmitting.

3. Dynamite Blasting Caps

Dynamite blasting caps may be caused to explode by operating a radio within 500 feet of the blasting caps. Always obey the **"Turn Off Two Way Radios"** signs posted where dynamite is being used. When transporting blasting caps in your vehicle:

a. Carry the blasting caps in a closed metal box with a soft lining.
b. Leave the radio **OFF** whenever the blasting caps are being put into or removed from the vehicle.

4. Radio Frequency Energy

Do not operate the transmitter when a person is outside of the vehicle within two feet of the antenna! Failure to heed this warning may result in burns or related physical injury to the person.

5. Liquefied (LP) Gas Powered Vehicles

Mobile radio installations in vehicles powered by liquefied petroleum gas with the LP gas container in the trunk or other sealed-off space within the interior of the vehicle must conform to the National Fire Protection Association standard **(NFPA) 58** requiring that:

a. The space containing the radio equipment shall be isolated by a seal from the space containing the LP gas container and its fittings.
b. Outside filling connections shall be used for the LP gas container.
c. The LP gas container shall be vented to the outside of the vehicle.

2.0 GENERAL RADIO OPERATING PROCEDURES

Industry Canada (IC) and the Federal Communications Commission (FCC). rules and regulations must be incorporated in the use of radio systems. Familiarity with these rules by the operator is essential for proper execution of the type of radio operation that is in question. Following these rules helps to eliminate confusion, assures the most efficient use of existing radio channels, and results in a smoothly functioning radio network. When using this unit remember these rules:

1. Emergency calls always have priority over all messages! To interrupt any distress or emergency message is a violation of the IC and FCC rules. When operating the radio make sure that the line is clear before sending messages. **KEEP OFF THE AIR** when an emergency message is being sent through.

2. Use of profane or obscene language is prohibited by Federal law.

3. Sending false call letters, false distress or emergency messages is against the law.

4. IC and FCC demand that conversations are kept brief and content limited only to business. Coded messages are encouraged in order to save time.

5. Only messages that are essential for the business operations are allowed to be sent. Otherwise using the radio to send personal messages is a direct violation of the IC and FCC rules.

6. Conversations between others sharing a channel is regarded as confidential. Repeating anything overheard on the radio is against Federal Law.

7. The IC and FCC requires the operator to transmit station identification at certain times by means of call letters. Refer to the IC and FCC rules for your station's particular type of operation for the proper procedure.

8. No changes or adjustments shall be made to the equipment except by an authorized or certified electronics technician.

3.0 SPECIFICATIONS

Electrical Specifications		
	Transmit	**Receive**
Frequency of Operation	935-940 MHz	896-910 MHz
Sensitivity for 1% BER	min. -117 dBm	
Input Carrier Detection Threshold	-120 to -50 dBm	
Carrier Detection Threshold Adjustment Step	0.3 dB	
Carrier Detection Attack Time	<2 ms	
AGC Range	70 dB	
AGC Attack Time	0.3/3ms	
AGC Decay Time	0.3/3ms	
Output Power	1W to 20 W	
Output Power Tolerance	-0 dB, +1 dB	
Duty Cycle	100%	
Output Frequency Stability	Tracks Input Signal Frequency	
Passband Frequency Stability (Internal TCXO)	+/-1.5 ppm (+/–0.2 ppm optional)	
Modulation Type	Narrowband FM Data	
Bandwidth	+/- 2.4kHz	
Selectivity	55dB	
Receiver Spurious Response Rejection	>70 dB	
Receiver Intermodulation	>65 dB	
Receiver Conducted Spurious Emissions	<-57 dBm	
Transmitter Conducted Spurious Emissions	<-16 dBm and <-60 dBc	
Transmitter FM Hum and Noise	>43 dB	
Input Impedance	50 Ohms	
Output Impedance	50 Ohms	
Input VSWR	<1.5:1	
Output VSWR	<1.5:1	
Power Supply Voltage	117V AC	
Power Consumption	<2A AC	

Mechanical			**Programming**			**Alarms/Monitoring**	
RF Connectors	N Receptacles		Frequency of Operation	✓		Power	✓
Environmental	90% humidity @ 50 °C (122°F)		Output Power	✓		VSWR	✓
Operating Temperature Range	-30 to +60°C (-22 to +140°F)		Carrier Detection Threshold	✓		Temperature	✓
Dimensions	385 H x 435 W x 400 D mm (15.2" x 17.1" x 15.75")		Carrier Detection Time-out	✓		Synt. Lock	✓
Weight	45 kg (92 lb.)		Gain	✓			
			DCS/CTCSS	✓			

4.0 INTRODUCTION

This manual describes the Futurecom MOBITEX AIRBASE 900. The MOBITEX AIRBASE 900 is a synthesized, microprocessor-based, high performance radio unit. Its receiver section receives signal from the units in the field. The transmitter transmits the RF signal to the units in the field.

5.0 MAIN FEATURES

The MOBITEX AIRBASE 900 is a fully software configurable, synthesized, narrow band device, with 20 Watt output power capability. It is available in the 900MHz band. Its purpose is to receive a single RF channel, amplify and filter the channel signal and decode baseband data. On the transmit side, it receives baseband data, filters the signal and transmits it as RF signal.

The Front End (FE) stage receives a single channel off air using double heterodyne principle and downconverts the signal to an Intermediate Frequency (IF) stage. The Intermediate Frequency performs most of the signal filtering required for a given frequency band and channel spacing. The rigorous filtering allows only the desired signal (channel) to pass and to be amplified assuring that all undesired signals on other frequencies are not transmitted.

The personality of the unit can be programmed directly from a personal computer via front panel serial port. The MOBITEX AIRBASE 900 software resides in Flash memory and can be upgraded serially without opening and retesting the unit. Software upgrade/change can be performed remotely in the same way as personality change.

The chassis of the MOBITEX AIRBASE 900 is made of aluminum. The rugged construction of the unit minimizes microphonics and internal feedback. The RF connector is the N receptacle.

6.0 BLOCK DIAGRAM AND DESCRIPTION

The block diagram of the MOBITEX AIRBASE 900 is shown in 8D052A14 drawing. The MOBITEX AIRBASE 900 consists of these blocks: Front End, Intermediate Frequency, Power Amplifier and Controller module, RF duplexer, RF preamplifier, attenuator and a power supply.

6. 1 FRONT END

Front End starts with a band-pass filter that filters out of band unwanted frequencies. It is followed by a low noise amplifier which can be switched in/out of the signal path under software control. A software 30dB controlled attenuator is next. It is used to control input sensitivity and to lower intermodulation products for stronger input signals.

The next two stages consist of a Voltage Controlled Oscillator (VCO), mixer, band-pass filter and an amplifier. These two stages implement double heterodyne down conversion to Intermediate Frequency of 45.0MHz. Voltage Controlled Oscillator frequencies are based on a common Temperature Compensated Crystal Oscillator (TCXO).

6.2 INTERMEDIATE FREQUENCY

Proper selectivity of the MOBITEX AIRBASE 900 is achieved by the Intermediate Frequency stage. The selectivity is assured by the input filter together with other filters in this stage.

The signal path continues with an Automatic Gain Control Loop (AGC). The Automatic Level Control Loop maintains a constant signal level irrespective of the input signal level. The IF signal is used to produce baseband data signal and provides Received Signal Strength (RSSI) indication.

6.3 POWER AMPLIFIER

The Power Amplifier is capable of delivering up to 20W on the input/output connector. A band-pass filter filters out of band unwanted signals. The driver and the power amplifier provide the required output power. The output power level is set under software control. The real output power is compared with the desired output power level. An Automatic Level Control Loop adjusts the real output power to be precisely equal to the preset level.

An output low-pass filter assures that no unwanted higher harmonics are present on the output of the MOBITEX AIRBASE 900.

The reflected power is monitored and the output power is reduced when the reflected power increases.

6.4 RF PREAMPLIFIER AND ATTENUATOR

The RF Preamplifier and attenuator are connected to the receiver input.

6.5 RF DUPLEXER

The RF duplexer splits the low and high frequencies for the receiver and the transmitter, respectively.

7.0 SET UP

7.1 PROGRAMMING SOFTWARE INSTALLATION

Futurecom 6A046X02 Programming Software must be installed on a personal computer which will be used for the MOBITEX AIRBASE 900 field system installation. The personal computer must run under MS-DOS operating system. Software must be installed only once before the first MOBITEX AIRBASE 900 installation.

The following steps must be performed for the Futurecom MOBITEX AIRBASE 900 Programming Software installation:

1. Select the hard disk drive where software will reside, e.g. drive C: Determine 3.5 inch floppy diskette on your personal computer, e.g. A:.

2. Switch to root directory by typing **CD\<Enter>**.

3. Create FUTURCOM subdirectory by typing **MD FUTURCOM<Enter>**.

4. Switch to FUTURCOM directory by typing **CD FUTURCOM<Enter>**.

5. Insert the Futurecom MOBITEX AIRBASE 900 Programming Software disk into proper floppy drive, e.g. drive A. Type **COPY A:*.*<Enter>**. This step copies software into this directory.

7.2 MOBITEX AIRBASE 900 CONNECTIONS

The MOBITEX AIRBASE 900 must be set up in the following way before field system installation:

1. Connect the antenna to the Local Antenna Port.

2. Plug the power cord into an outlet and turn on the power switch.

MODE OF OPERATION SETTING

procedure to set up the mode of operation for the MOBITEX AIRBASE 900 is as follows:

1. Make sure that the Futurecom MOBITEX AIRBASE 900 Programming Software is installed as described earlier.

2. Connect the MOBITEX AIRBASE 900 as described in MOBITEX AIRBASE 900 Connections section and power it up.

3. Connect the personal computer to the proper front panel RS-232 connector with Futurecom CM Serial Programming Cable, part number 7W038X61-01.

4. Select the hard disk drive where the programming software is located. To select e.g. drive C type **C: <Enter>**. Switch to FUTURCOM directory by typing **CD \FUTURCOM <Enter>**.

5. Start the MOBITEX AIRBASE 900 Programming Software by typing **6A046X02 <Enter>**.

6. Select *"Setup"* field and then select *"RS-232/access type"* using cursor keys. Press **<Enter>**. Using cursor keys and **<Page Up>**, **>Page Down>** and numeric keypad **<->**, **<+>** select the following settings:

Access to unit	**Direct**
	Direct
Baud Rate	**9600** b/s
Data Bits	**8**
Stop Bits	**1**
Parity	**NO**
Comm. Port	**COM1** or **COM2** depending on the personal computer
Baud rate scanning	**disable**

Press **<Esc>**. With cursor keys select **Yes** as an answer to *Would you like to update config. file.* Press **<Enter>**.

7.4 BASICS OF GAIN SETTING

1. Set the frequencies of operation in *"Rx Ch"* and *"Tx Ch"* fields. Frequencies can also be entered by typing the number in the given field and pressing <**Enter**>.

2. Set desired output power in *"Tx PWR Pot"*.

3. Exit *"Block Diagram Menu"* by pressing <**Esc**>. With cursor keys select **Yes** as an answer to *Exit from CM setup?*. Press <**Enter**>. With cursor keys select **Yes** as an answer to *Would you like to update the E^2PROM?*. Press <**Enter**>.

4. Select *"File"* field and then select *"Exit"* using cursor keys. Press <**Enter**>. With cursor keys select **Yes** as an answer to *Exit from program*. Press <**Enter**>.

8.0 OPERATION

8.1 GENERAL

The MOBITEX AIRBASE 900 does not require any supervision once it is installed and set up. The status of the unit is indicated by proper Front Panel Indicators:

- TX DIS Indicator is a dual function indicator.
  - TX DIS Indicator is on when transmit is disabled as described later.
  - TX DIS Indicator is flashing when one of the synthesizers is out of lock (likely due to the MOBITEX AIRBASE 900 not being properly programmed).

- DC ON Indicator shows that the MOBITEX AIRBASE 900 is supplied by DC power supply.

- TX ON Indicator is on when the MOBITEX AIRBASE 900 is transmitting.

- RX ON Indicator is lit when the RF input signal is above the programmed *"Rx Level threshold comparator"* level.

- PWR Indicator is a dual function indicator.
  - PWR Indicator is permanently on when the output RF power is outside of the allowed output power tolerance.
  - PWR Indicator is flashing alternatively with VSWR Indicator when an error is found in the personality of the MOBITEX AIRBASE 900.

- VSWR Indicator is a multifunction indicator.
  - VSWR Indicator is on when an excessive reflected power is detected on the Tx Antenna connector at the instant when the transmitter is turned on.
  - VSWR Indicator flashes shortly when a valid polling serial message is received from a controller.

8.2 TRANSMIT DISABLE

The MOBITEX AIRBASE 900 transmitter can be disabled by TX DIS switch. TX DIS switch is accessed via the front panel hole with a round tool 2.5mm (0.1") in diameter. The first push disables the transmitter, a second push enables the transmitter. This function is useful during MOBITEX AIRBASE 900 set up and servicing.

8.3 RESET

RESET switch is accessed via the front panel hole with a round tool 2.5mm (0.1") in diameter. RESET switch is used to reset the MOBITEX AIRBASE 900 in an unlikely event of malfunction.

➲WARNING

Do not apply excessive force on the TX DIS and RESET switches not to cause damage!

9.0 CLEANING INSTRUCTIONS

Never use an abrasive or a petroleum based solvent cleaner on equipment. The unit can be cleaned using a mild liquid detergent and water or a soft cloth with furniture polish.

10.0 AVAILABLE OPTIONS

Below is a list of equipment options that is available for the MOBITEX AIRBASE 900. Consult with your radio supplier for ordering information.

OPTION	DESCRIPTION	PART NUMBER
	CM Serial Programming Cable (included with MOBITEX AIRBASE 900)	7W038X61-01