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Wireless Technology, Inc.

**AR4000-D Short Range
Wireless Combo Video &
Data Systems**

*Installation and
Operation Manual*

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INFORMATION

FCC NOTICE

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- 1.) This device may not cause harmful interference.
- 2.) This device must accept any interference that may be received, including interference that may cause undesired operation.

READ THIS MANUAL

Every effort has been made to insure that this WTI system is of the highest quality. This product has been carefully inspected to comply with rigid quality standards before shipment to you. In consideration of your investment and the desire to obtain full performance capability engineered into your new WTI product, we recommend that you read this manual before attempting to operate your system.

FOR MORE ASSISTANCE OR MORE INFORMATION:

WTI (Wireless Technology, Inc.)
2064 Eastman Avenue, Suite 113
Ventura, CA 93003-7787

TEL: 805/339-9696
TOLL FREE: 866/gotowti
FAX: 805/339-0932

EMAIL: sales@gotowti.com

INTERNET: <http://www.gotowti.com>

The software / firmware furnished with the equipment is confidential to and is copyrighted by *Wireless Technology, Inc.* (WTI). It is not to be copied or disclosed in any manner without the consent of *Wireless Technology, Inc.* (WTI). The software/firmware is furnished to the purchaser under a license for use on a single system.

Information furnished by *Wireless Technology, Inc.* (WTI) is believed to be accurate and reliable. However, no responsibility is assumed by *Wireless Technology, Inc.* (WTI) for its use or for any infringements of other rights of third parties, which may result from its use. No license is granted by implications or otherwise under any patent or patent rights of *Wireless Technology, Inc.* (WTI).

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WARRANTY

We appreciate your purchase of *Wireless Technology, Inc.* (WTI) security products. We take pride in the quality of our products and have manufactured each new WTI product to exacting quality standards. In normal use, it will provide you with years of satisfactory performance. However, should you experience difficulty; you are protected under the provisions of this warranty.

WTI warrants to the original user a product that is free of defects in materials and workmanship in normal use. WTI warrants to the original user that WTI's wireless RF transmission system products will be free of defects in materials and workmanship in normal use for a period of 12 months from the date of sale. WTI's obligation under this warranty shall be limited to the repair, including all necessary parts and the cost of labor connected therewith, or at our option, the replacement of any product that shows evidence of a manufacturing defect within the warranty period.

This warranty is extended to all WTI products purchased and used within the United States of America and is valid only when service is rendered by the authorized *Wireless Technology, Inc.* (WTI) Warranty Station.

This warranty shall not apply to appearance or accessory items including, but not limited to, knobs, connectors, cabinets and connecting cables. This warranty shall not, in addition, apply to repairs or replacements necessitated by any cause beyond the control of WTI including, but not limited to, acts of nature, improper installation, misuse, lack of proper maintenance, accident, voltage fluctuations, unauthorized repairs or modifications.

This warranty becomes void in the event serial numbers are altered, defaced or removed, or an attempt is made to field service or alter performance of any RF transmission component.

WTI reserves the right to make changes in design, or to make additions to, or improvements upon, products without incurring any obligation to install the same on products previously manufactured.

The foregoing is in lieu of all other warranties expressed or implied and WTI neither assumes nor authorizes any person to assume for it any other obligation or liability in connection with the sale of our products. In no event shall WTI or its Authorized Dealers be liable for special or consequential damage arising from the use of this product, or any delay in the performance of this warranty due to causes beyond its control.

REPAIRS AND RETURNS

REPAIR AUTHORIZATION

Please contact *Wireless Technology, Inc.* (WTI), to obtain a repair authorization number (RA) and provide the following information:

1.) Product Model & Serial Numbers

2.) Date of shipment, purchase order number, sales order number or WTI invoice number.

3.) Details of the defect or malfunction. If there is a dispute regarding the warranty or product, which does not fall under the warranty conditions stated within the description of the written warranty, please include a written explanation with the product when returned.

SHIP FREIGHT PRE-PAID TO:

WTI (*Wireless Technology, Inc.*)
2064 Eastman Avenue, Suite 113
Ventura, CA 93003-7787

TEL 805/339-9696
FAX 805/339-0932

RETURNS

No unauthorized returns will be accepted. All returns must have an authorized (RA) number issued by the factory (CA number if returned for credit and RA number if returned for repair). Products returned for repair or credit will be rejected if no authorization number has been issued or freight has not been pre-paid. All merchandise returned for credit will be subject to a 20% restocking and refurbishing charge.

SAFEGUARDS AND TOOLS

IMPORTANT SAFEGUARDS

- 1.) Read Instructions. It is important to read all safety and operating instructions before installing or using this equipment.
- 2.) Retain Instructions. Retain this manual and any supplements for future reference.
- 3.) Follow Instructions. Follow all instructions herein for use of this equipment.

Do not attempt to open the sealed Transmitter or Receiver Assembly. There are no user-serviceable parts inside. Refer servicing to the WTI factory service center only.

- 4.) Heed all warnings. Adhere to all warnings on the equipment, and in this manual.
- 5.) To reduce the risk of electric shock or equipment damage, work on the unit only when the power is shut off and is unplugged from its power source to prevent accidental activation. Also take precautions to avoid contact between the equipment and other electrical wires or power sources that may be present at the installation site.

RECOMMENDED TOOLS AND ACCESSORIES FOR PROPER INSTALLATION:

- 1.) Tie-wraps to secure cable runs
- 2.) Phillips screwdriver
- 3.) Slot screwdriver
- 4.) Cordless power drill
- 5.) Set of open end or SAE wrenches
- 6.) Silicone caulking compound for antenna connector
- 7.) Self-sealing connector tape - Used to weatherproof all outdoor cable connections
- 8.) ¾" PVC flex conduit if boxes are mounted outdoors
- 9.) Hand held radios

WTI (*Wireless Technology, Inc.*) recommends the use of RG59/U such as Belden 8241 or equivalent 75Ω coaxial cable with 22-gauge solid copper center conductor and foam polyethylene dielectric. Either RG6/U or RG11/U would make an excellent substitute.

Long coaxial cable runs cause signal degradation and/ or "SYNC" discrepancies. Limit RG59/U cable lengths to 800 feet. For coaxial runs from 800 feet to 1000 feet, use RG6/U or RG11/U.

Do not use screw on type BNC connectors. They are not suited for reliable installations.

INTRODUCTION

AR4000-D FIXED SITE TRANSMISSION SYSTEMS

When conventional cable installations are impractical or impossible, the AR4000-D Short Range Fixed Site System provides high quality, real-time wireless video transmission and reception. The AR4000-D provides exceptional performance through all climates and is not affected by fog, rain or snow.

AR4000-D SERIES FEATURES

- Eight field-selectable channels of operation.
- LED power light on both transmitter and receiver.
- Utilizes high-technology microstrip antennas.
- Channel lock VCO.
- Optional thermostatically controlled heater.
- No user license required.

THE AR900DM (*Integrated within the AR4000-D unit*)

The AR900DM uses Frequency Hopping Spread Spectrum modulation, where the units “hop” from frequency to frequency many times per second using a specific hop pattern applied to all the transceivers in the same network. A distinct hopping pattern is provided for each Channel Number, thereby allowing multiple networks to co-exist in the same area without interference.

The AR900DM transceivers operate in a Point-to-Point or Point-to-Multipoint, Client-Server or Peer-to-Peer architecture. One transceiver is configured as a Server and there can be one or many Clients. To establish synchronization between transceivers, the Server emits a beacon. Upon detecting a beacon, a Client transceiver informs its Host and a RF link is established.

The AR900DM series implement a proprietary communication protocol to provide secure data transmissions. As it uses FHSS technology, the data remains reliable over long distances. The use of license free frequency bands ensure that the units are ready to use with no further certification requirements.

Each unit is small and easily portable for use in mobile and temporary settings as well as for fixed installations. The AR900DM configuration software enables custom configurations based on unique application requirements.

AR900DM FEATURES

- Transparent operation, supports any legacy system.
- Transmits around corners, through walls.
- Reliable communication up to 115.2Kbps.

MOUNTING

When mounting boxes to a mast, insert stainless steel clamp straps through the slots in the pole mount brackets and tighten.

Comply with all industry standards for safety and grounding.

POWER WIRING

If desired, plumb weather tight conduit from inside the building to the AR4000-D box. Wire power to the top three screws of power supply using 16-gauge (for up to 150 feet) to 14-gauge (for up to 300 feet) wire. Be sure to fuse the power source appropriately for the size of wire used. For example, with the 16-gauge wire you must have an upstream fuse of 10 amps maximum to meet NEC requirements.

Connect an appropriate video monitor via a 75 Ω coaxial cable to the AR4000-D receiver's video output. Terminate monitor if necessary. Power-up the AR4000-D receiver and make sure that there is "VIDEO SNOW" on the monitor. "VIDEO SNOW" is black and white specs appearing on the screen of the monitor. If there are black and white lines in the picture, or any other patterns of dots that do not match the description of "VIDEO SNOW", change the RF channel until any interference is eliminated or minimized.

Mount the AR4000-D transmitter pointing toward and in direct line-of-sight to the AR4000-D receiver at the other end of the link. Insure that no obstacles break the line-of-sight even temporarily. Mount as high as possible to avoid RF reflections (multi-path). Make sure that the transmitter RF channel is set the same as the receiver.

Connect the AR4000-D receiver's video output to the permanent system video monitor via a 75 Ω coaxial cable. Connect an appropriate camera or other video source via a 75 Ω coaxial cable to the AR4000-D transmitter's video input.

Secure the door on each NEMA 4X non-metallic enclosure to ensure an environmental seal.

TIP: Separating power supply wiring from data wiring will reduce noise pickup. Use of shielded twisted cable for power will even further reduce noise pickup.

DATA WIRING

Connect data cable to the Phoenix connector terminals. See Figure 1 for location (Labeled "TS1" on the circuit board) and Figure 2 for typical wiring example. The example shown uses a WTI DTC-720 desktop keyboard and a camera configured for P-Code at 4800 Baud. Follow the instructions included with your equipment for wiring and configuration.

TX/RX SELECTOR

Install the jumper over the two pins that correspond to the use of unit:

Transmit (TX) - Center pin and Left pin.

Receive (RX) - Center pin and Right pin.

FIGURE 1: UNIT TECHNICAL DRAWING

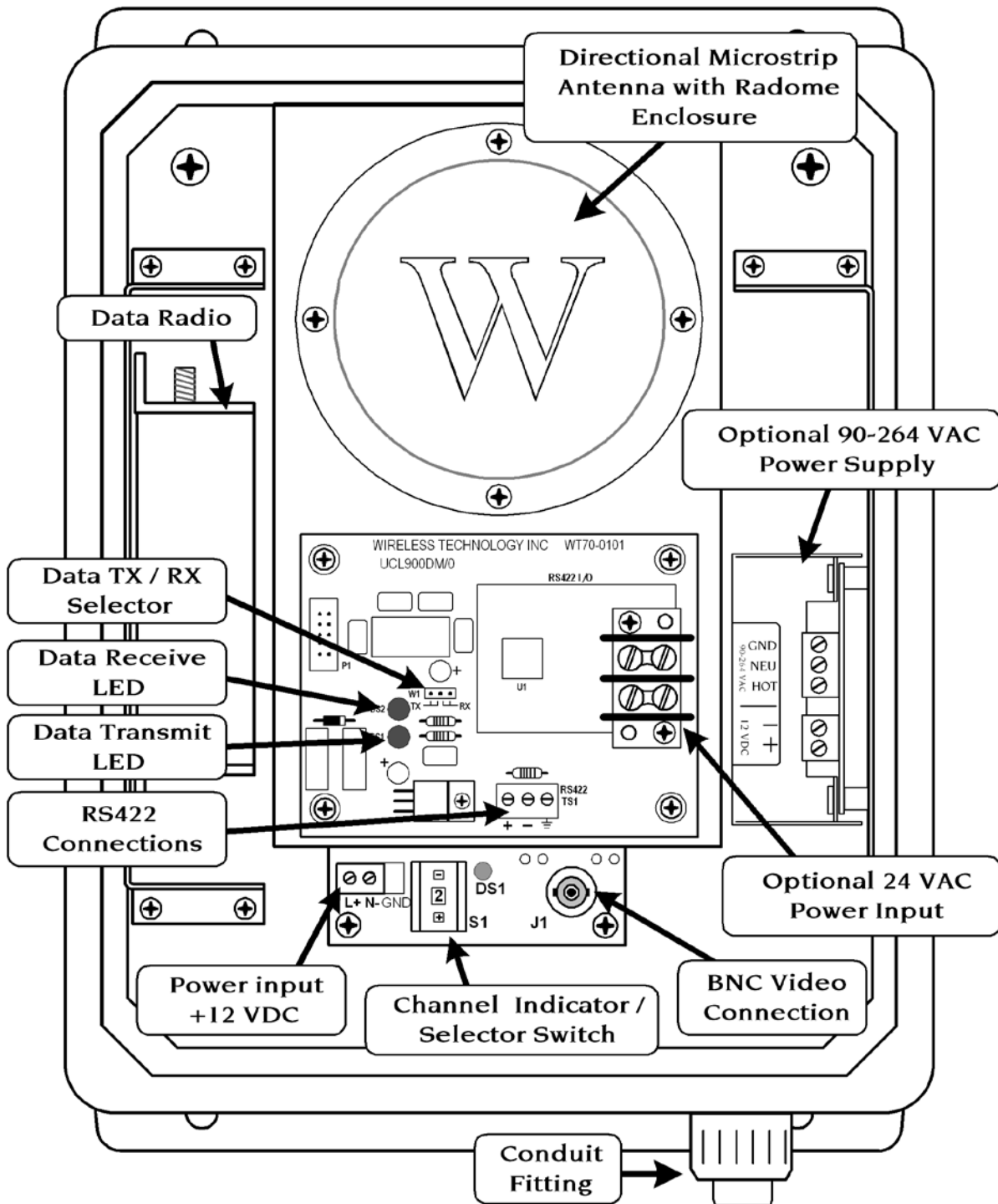
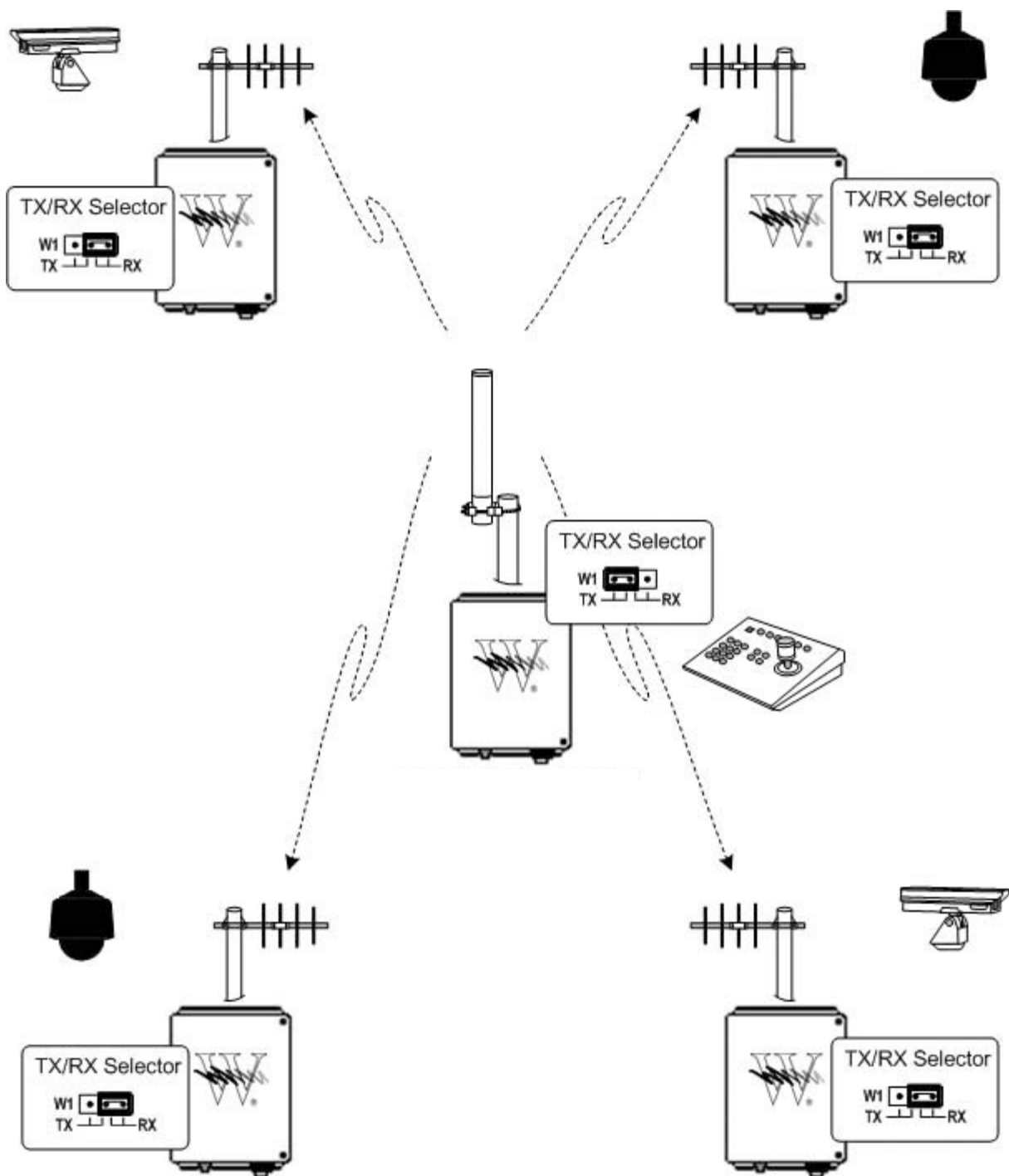


FIGURE 2: EX. MULTIPLE CAM. / RECEIVER SYSTEM



CONFIGURATION

The AR900DM configuration utility software is available for download on WTI's company web site at www.gotowti.com/software

Note: the 's' in the word software must be lowercase!

To Download:

- ~Click on AR900DM.zip
- ~Click "save" (note the location where you save this file)

To Install:

- ~Double click the AR900DM.zip file on your computer
- ~Double click setup.exe
- ~Click "run" if you receive a security warning due to an unknown publisher
- ~ Accept all defaults

PROGRAMMING THE AR900DM SECTION OF THE AR4000-D UNIT

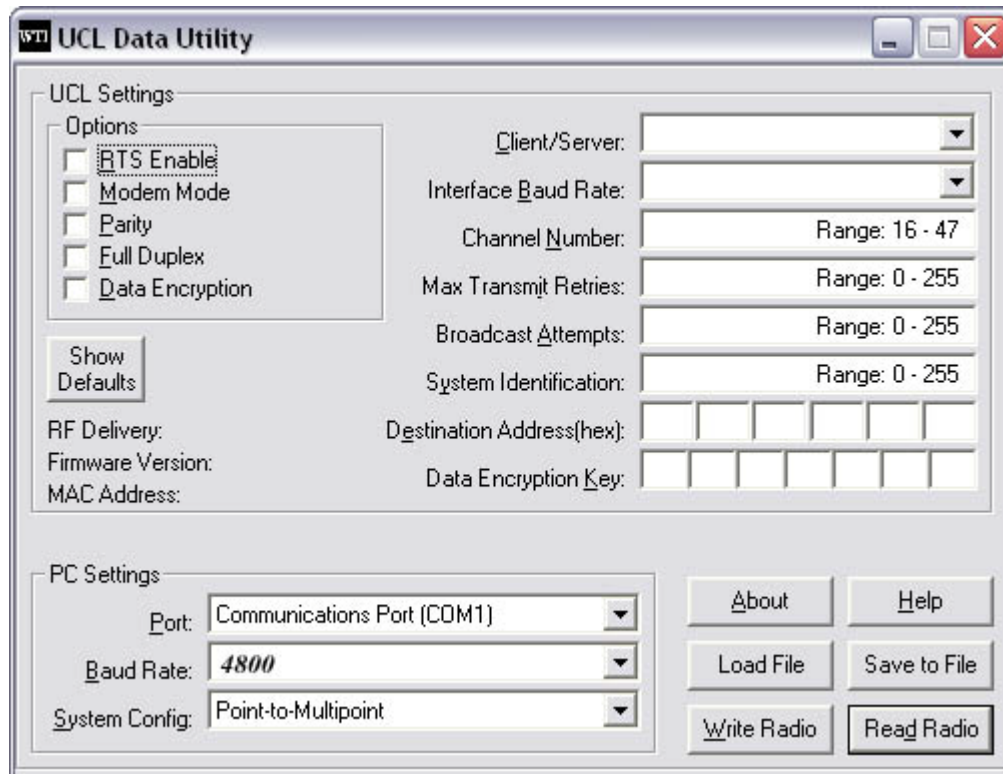
1. Connect a AR900DM unit to the serial communications port on the PC.
2. Connect the power supply to the AR900DM unit. Make sure the Power LED is on.
3. Start the AR900DM Configuration Utility.
4. Select the COM Port that is connected to the AR900DM unit on the PC Settings section.
5. Select the Interface Baud Rate of the AR900DM unit. All AR900DM units are shipped with a default rate of 4800 (unless units have been pre-configured to match specific serial settings). If the Interface Baud Rate of the AR900DM unit is changed as described in Section 4.2 Changing AR900DM Settings, then PC Setting Baud Rate must be set to the same Baud Rate to allow proper programming of the units.
6. Select the System Configuration for the AR900DM network, Point-to-Point (one Server and one Client) or Point-to-Multipoint (one Server and multiple Clients).
7. Select Read Radio to display the current settings of the AR900DM unit.
8. Change desired settings.
9. After all changes have been made, select Write Radio to save the changes.
10. Cycle Power to the unit after all changes has been saved. This will set the AR900DM unit to its normal mode of operation.

Note: The Show Defaults button can be used to display the default Radio settings.

CONFIGURATION

AR900DM SETTINGS

The AR900DM settings page is shown below, as it will appear the first time the program is run.



PC SETTINGS

Port: Serial communications port of the PC connected to the AR900DM unit.

Baud Rate: Must equal the Interface Baud Rate setting of the AR900DM unit that is about to be programmed.

System Configuration: Type of AR900DM network to be configured. Valid choices are Point-to-Point (one Server and one Client) or Point-to-Multipoint (one Server and multiple Clients).

Attention: When setting up a Point-to-Point network the Server's Destination address must be set to the Client's MAC Address.

CONFIGURATION

Client/Server: Designates AR900DM type. In each network, there must be only one Server. All other AR900DM units must be programmed as Clients. The number of Clients in the network is not limited; however, if performance diminishes, consider additional RF Networks.

Interface Baud Rate: This defines the baud rate used for communicating with the AR900DM over the serial interface. The RF baud rate is fixed at 76.8 Kbps and is independent of the Interface Baud Rate. The default baud rate setting is 4800 bps unless the units have been pre-configured by Wireless Technology, Inc. (WTI). The Interface Baud Rate setting of the AR900DM must match the Baud Rate setting of its host device.

Channel Number: A number that designates an independent network of AR900DM units. Up to 32 independent networks can be created. The valid range of values for this field is 16 to 47.

Max Transmit Retries (For Clients and Servers in Point-to-Point networks only): This value represents the maximum number of times a particular data packet will be transmitted unsuccessfully, or without an acknowledgement, before the AR900DM discards the packet. The default value is 16 attempts. If communication is lost and the Client's Link LED is on, try increasing this value in small increments until communication is reestablished.

Note: *This value is always associated with Client radios and Server radios in Point to Point Mode. The valid range of values for this field is 2 to 255.*

Broadcast Attempts (For Servers in Point-to-Multipoint networks only): This value represents the number of times a data packet will be transmitted by the Server AR900DM. The default value is 4 attempts. If communication is lost and the Clients' Link LED is on, try increasing this value in small increments until communication is reestablished. The valid range of values for this field is 2 to 255

System Identification: A number from 0 to 256 that provides added security to each independent network of AR900DM units. The System ID is used in conjunction with the Channel Number and serves as an RF password to maintain secure transfers of data. The combination of the Channel Number and System ID must be unique to each network of AR900DMs to establish communication. Multiple Servers in the same coverage area must be programmed with different Channel Numbers to prevent inoperability of the networks. The System ID will not prevent inoperability that occurs from locating multiple Servers with the same Channel Number in the same coverage area.

Important Note: *Separate Co-located AR900DM networks must operate on different Channel Numbers. All units in a given AR900DM network must have identical Channel Numbers and System IDs.*

Data Encryption Key: Encryption is the process of encoding an information bit stream to secure the data content. The DES algorithm is a common, simple and well-established encryption routine. An encryption key of 56 bits is used to encrypt the packet. The receiver must use the exact same key to decrypt the packet; otherwise garbled data will be produced.

CONFIGURATION

Destination Address: The MAC Address of the remote AR900DM in a Point-to-Point network. Used to optimize Point-to-Point communications by utilizing RF Acknowledgement.

Firmware Version: Displays the AR900DM firmware version.

MAC Address: A unique 6 Byte, IEEE 802.3 Ethernet address assigned by Wireless Technology, Inc. (WTI) to each UCL900DM.

OPTIONAL SETTINGS

Data Encryption: Enables the Data Encryption Key. All AR900DMs in the same network must have the same encryption setting.

RTS Enable: Enables the Request to Send control line. When enabled, enables Hardware Flow Control. Refer to Section 2.3 Hardware Flow Control.

Parity: Needs to be enabled if host requires even or odd parity and 8 data bits. This is considered as 9-bit mode. Note: Enabling Parity cuts the overall throughput into half.

Full Duplex: This mode restricts Client radios to transmitting on odd numbered frequency hop bins and the Server to even numbered frequency hop bins. Though the RF hardware is still technically half duplex, it makes the transceiver seem full duplex. This can cause overall throughputs to be cut in half. Note: All transceivers on the same network must have the same setting for Full Duplex.

Modem Mode: Full modem handshaking is supported by the transceivers when Modem Mode is enabled. Modem Mode is incompatible with RS232 Interface. Enables DCD, DTR, DSR and Ring Indicator control lines.

SPECIFICATIONS

TRANSMITTER – TX

Power Options	12VDC @ 500mA wall transformer (standard) or 85-264VAC, 50/60Hz, 25 watts
Heater Model Power Options	24VAC @ 1.4A wall transformer (standard) or 85-264VAC, 50/60Hz, 40 watts
<i>Frequency Band</i>	5.732 GHz to 5.867 GHz
Frequency Accuracy	50 ppm, -20°C (-4°F) to +45°C (+113°F)
Effective Radiated Power	50,000 μV/meter @ 3 meters
Transmitter Attack Time	Less than 5 m sec.
Spurious & Harmonics	Less than -60 dBc
Modulation	FM video
Pre-Emphasis	Complies with ITR and CCIR, 405-1
Transmitter Antenna	Gain + 3dBdl / 160°
Video Input	BNC female connector
Video Input Format	B/W or color, NTSC or PAL composite video signal
Video Input Level	1.0V P-P, 75Ω

RECEIVER – RX

Power Options	12VDC @ 500mA wall transformer (standard) or 85-264VAC, 50/60Hz, 25 watts
Heater Model Power Options	24VAC @ 1.4A wall transformer (standard) or 85-264VAC, 50/60Hz, 40 watts
Receiver Input Sensitivity	-70 dBm
Receiver Accuracy	0.02%, -20° C (-4° F) to +45° C (+113° F)
Effective Radiated Power	50,000 μV/meter @ 3 meters
Spurious & Harmonics	Less than -60 dBc
Noise Figure (total system)	<4 dB
Video Output	BNC female connector
Video Output Level	1.0V P-P, 75Ω
Receiver Antenna	Gain + 3dBdl / 14°

SPECIFICATIONS

P/T/Z DATA TRANSCEIVER – AR900DM

Power Options	12VDC @ 500mA wall transformer (standard) or 85-264VAC, 50/60Hz, 25 watts
Heater Model Power Options	24VAC @ 1.4A wall transformer (standard) or 85-264VAC, 50/60Hz, 40 watts
Operating Temperature	20° C (-4° F) to +65° C (+149° F)
Frequency Band	902 MHz ~ 928 MHz
Output Power	100mW
Radio Technique	FHSS
Modulation	FSK
Channels	32
Antenna Connector	"N" type female (50Ω)
Supported Communications	Standard: RS422, RS485 (2-wire) Optional: RS232, RS485 (4-wires)

Made in the USA
Conforms to EIA-330-CCTV-A

SYSTEM POWER

Phoenix contact P/N 1757019

SYSTEM DIMENSIONS

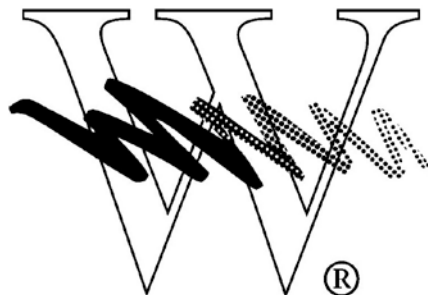
Weight: 7 lbs. (3.2 kgs.)
Size: 9.3" (23.6cm) W x 11.3" (28.7cm) H x 5.3" (13.5cm) D

Weatherproof NEMA 4X non-metallic enclosure provided with a mast-mounted bracket (2" diameter mast, minimum size).



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Due to Wireless Technology, Inc. (WTI) continuing efforts to engineer the best product that is most responsive to our customer's needs, the above specifications are subject to change without notice.