Exhibit 8: User's Manual

A copy of the user's manual is enclosed below. The compliance statement for the 900 μHopper is located on page 15 of the manual.

WWC MICRO HOPPER DATA RADIO

USER'S GUIDE

Corporate - 2441 South 385 West, West Valley City, UT 84120 • Tel. 801-575-6600 • Fax 801-575-6621
Engineering - 6750 West 93rd Street, Overland Park, KS 66212 • Tel. 913-652-0353 • Fax 913-652-0358

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Quick Start Guide

Contents

The World Wireless Communications Micro Hopper Developer Kit contains the following items:

- User's Guide with technical diagrams
- Micro HopperRadios with RS-232 CIM Boards
- 900 Megahertz Antennas
- 9-volt, 0.5 amp DC Power Adapters
- Serial Data Cables with 9-pin connectors

Getting Started

You will need to supply the following items:

- RS-232 terminals or a computers (PC) running a communication software package

- Serial COM port for connecting the terminal or computer to the CIM boads.
  - 120-volt AC power source for the radio power supplys
  - A standard 25-pin to 9-pin adapter if your PC or terminal does not have a 9-pin serial port available

Setting up the Radios

1. Locate the antennas and install them on the antenna connectors of the Hopper radios. Set the radios with antennas aside in a safe place.
2. Remove the 9-pin serial cable from the box and attach it to an available serial COM port on your PC or terminal. If the port has a 25-pin connector, use the appropriate adapter, which is not supplied with this kit.
3. Attach the other end of the serial cable RS-232 to the CIM board.
4. Plug the power supply into a 120-volt AC outlet. Power up the radio by plugging the radio into the CIM board and the cable from the power supply into the CIM board.

If you are using a terminal or a PC with a communications program other than the Data Radio Configuration program, set the communications parameters of your terminal to 19,200 baud, 8 data bits, no parity, and one stop bit. You will also want to enable "local echo" or "half-duplex" mode so that the characters typed will appear on the screen as well as be sent to the radio.

If you are using a PC with the supplied Configuration program, the following instructions will explain how to set up your computer for use with the radio.

Installing the Software

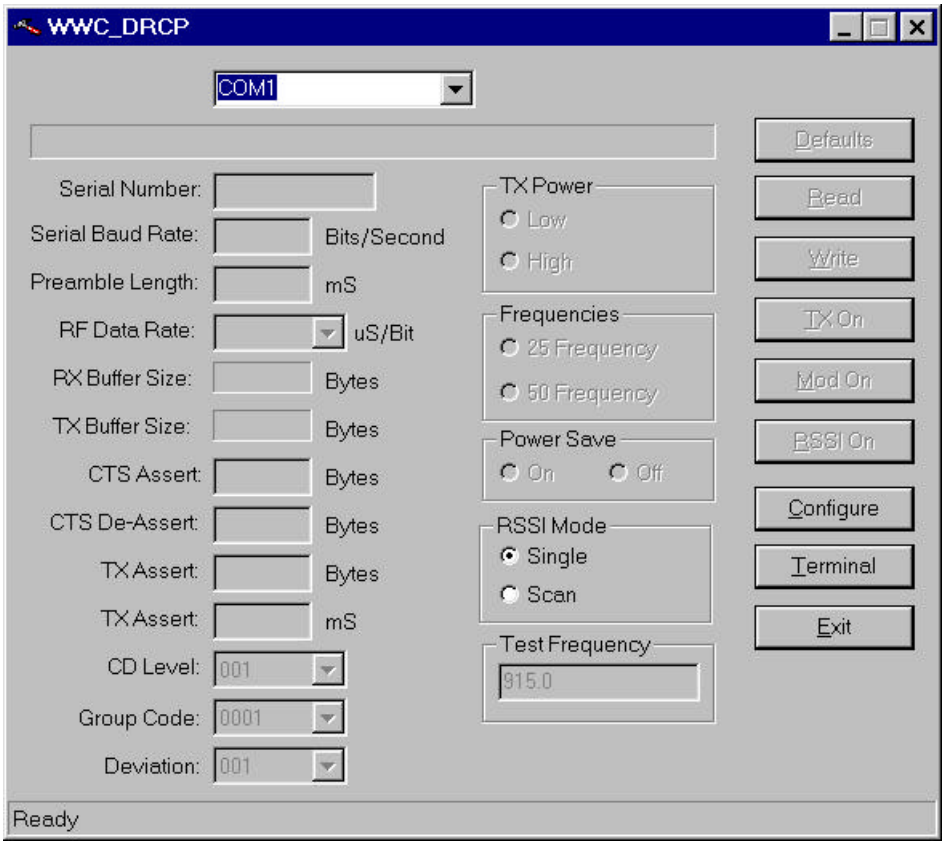
You are now ready to install the software.

1. Turn on your computer and start Windows.
2. Insert the first Install disk in your disk drive.
3. Click the Windows “Start” button, point to “Run”.
4. In the “Open” box type “a:setup” and press Return.
5. Follow the instructions on your screen, inserting the remaining disk(s) when prompted.

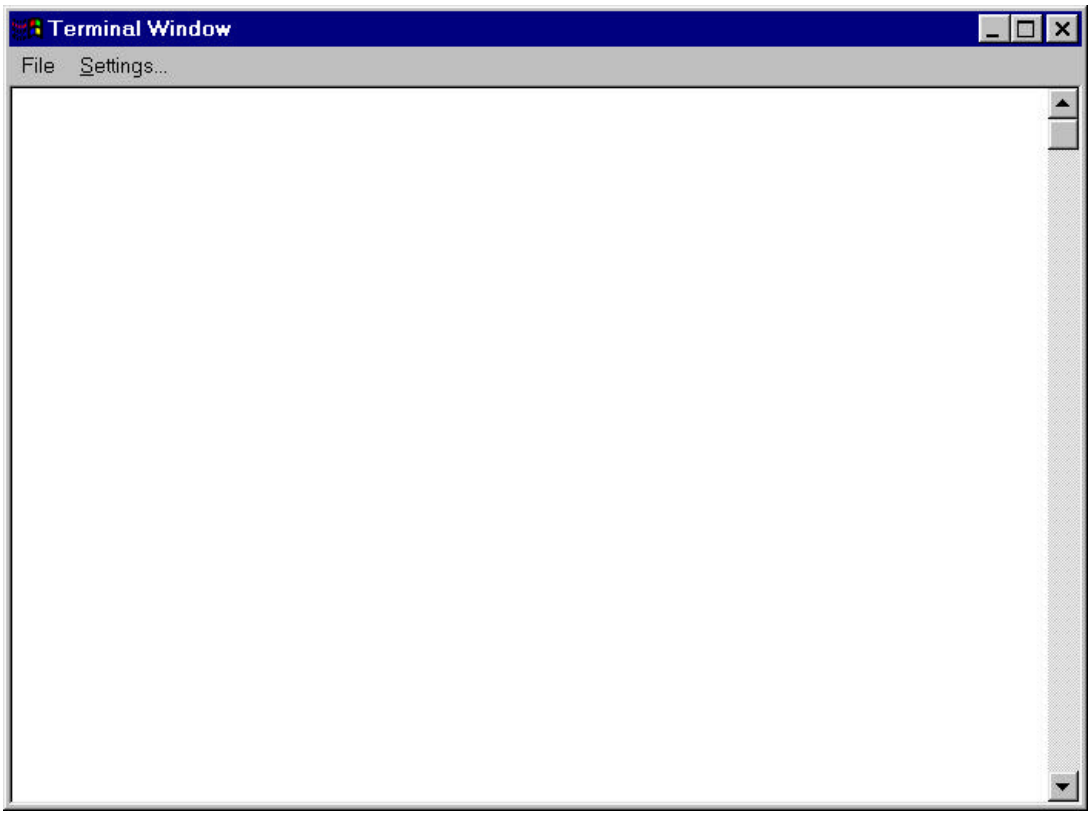
You are now ready to use the Hopper Radio Configuration program.

Performing a Quick Start Radio Test

1. Launch the Configuration program by clicking “Start” then “Programs” then “Hopper 900 Configuration”. You should see the screen as shown below.



2. Select the appropriate COM port to which the radio is connected.



3. Click on the “Terminal” button to open the terminal test window. You should see the screen as shown below.
4. Go to the Settings... drop down box and select a baud rate of 19,200. Also select the New Line check box, this will cause the cursor to advance to a new line each time a carriage return is received.
5. Setup the second radio in the same manner.
6. Type text to communicate between the terminals or PC’s and verify proper radio operation.

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WWC Micro Hopper Data Radio

General Information

The Data Radio is a frequency-hopping data transceiver operating in the 902-928 MHz ISM band. The transceiver is designed to operate under Part 15 of the FCC rules and regulations and is designed as an OEM module for professional integration into other products or field devices. When installed using a World Wireless Communications approved antenna, the user need only make sure the radio's FCC label or a copy of the FCC label is clearly visible on the outside of the integrated product.

Caution: *If this radio is integrated into another product, the user is responsible for complying with the external labeling requirements as directed in the FCC Rules and Regulations part 15.19. The user may only use antennas that have been tested and approved with this radio without obtaining their own FCC certification.*

The unit operates on 25 discrete frequencies within the ISM band. Using a high-speed phase-locked loop synthesizer, the receiver is able to quickly acquire synchronization with the transmitter and receive the transmitted data.

The Data Radio is connected to a host device using a 20-pin dual in-line header. This connection provides the radio with the required DC power source and allows the Data Radio to be programmed, configured, and provides I/O lines for a TTL level RS-232 port.

Data is transported across the RF channel in a transparent, promiscuous mode. In other words, data sent into the serial port on one radio will be presented out of the serial port on all other radios that are within range and have the same group code. Data verification and retries are the responsibility of the host (DTE) device.

The CIM board provides visual indication of operation and packet reception using on-board LED indicators.

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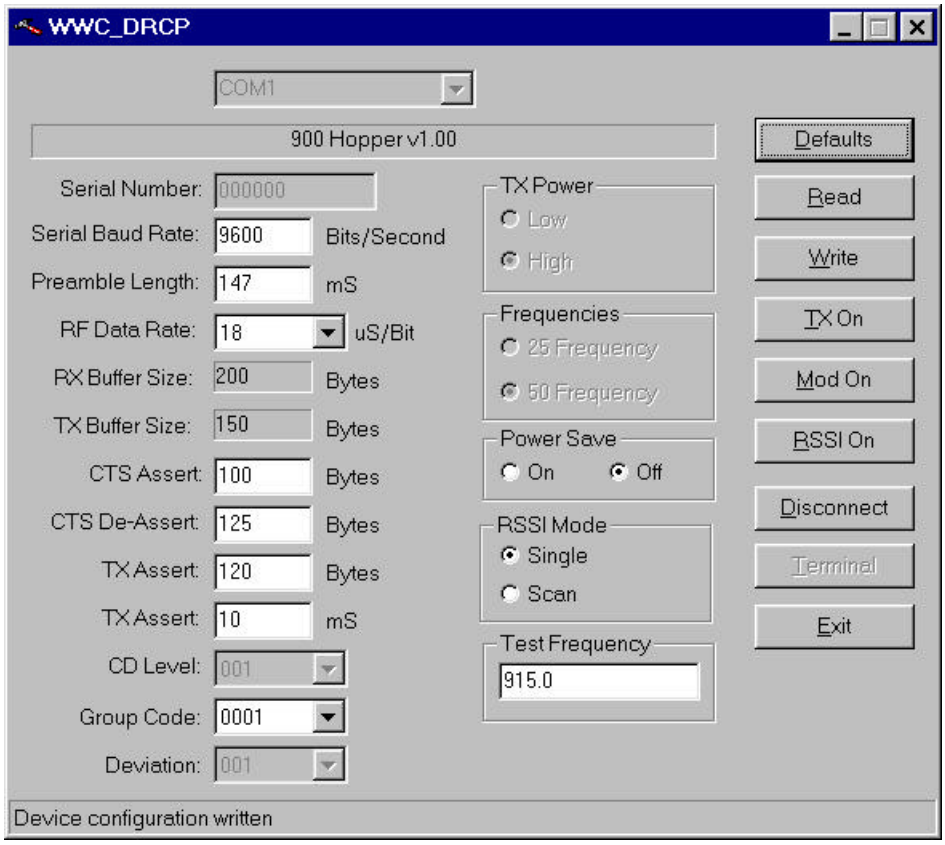
Programming and Configuring Selections



Commands are accepted by the radio when it is in “configure” mode. On the figure of the main menu shown above, “Configure” toggles with “Disconnect.” Select “Configure”, make changes as desired, and select “Write.” Your radio is configured.

Basic Commands

Serial Port on PC

Default to COM1. The configuration program supports COM1 through COM8.

Exhibit 8

(i) Serial Number

This unique number is predetermined by the manufacturer.

(ii) Serial Baud Rate

This is the baud rate the data radio uses to talk to a PC or external device. The default is 19,200 bits/second. Drop-down settings allow standard baud rates from 2400 to 19,200 bps.

(iii) Preamble Length

This is the amount of time the transmitting radio sends a polling preamble to search for a receiving radio. Default is 147 mS.

(iv) RF Data Rate

This determines how fast the transmitting radio sends data. The default is 18 with drop-down settings of 35 and 50.

(v) RX buffer size

The RX (receiving) buffer size is the number of bytes stored in the receive buffer. The default predetermined by the manufacturer is 200 bytes.

(vi) TX buffer size

The TX (transmission) buffer size is the number of bytes stored in the transmit buffer. The default predetermined by the manufacturer is 150 bytes.

(vii) CTS Assert

CTS (Clear to Send) Assert, also known as “flow control on,” has a default setting of 100 bytes.

(viii) CTS De-Assert

CTS De-Assert, also known as “flow control off,” is defaulted to 125 bytes.

(ix) TX Assert

The volume or amount of time the transmitting radio will collect or wait before it transmits. Default is 10 mS.

(x) CD Level

Carrier Detect level. Lets the scanning radio determine if there's a valid signal to receive. This is a factory alignment setting.

(xi) Group Code

Lets you set any number of radios to the same group. There are 1400 available groups. Radios with different group codes will not receive each other. The data radio's default setting is Group 1.

(xii) Deviation

This is a factory alignment setting.

(xiii) TX Power

This setting allows the user to change the transmitter output power. This feature is not supported on all products. The default setting is "high".

(xiv) Frequencies

Number of frequencies available for the data radio to scan. Choices for this setting vary with radio model.

(xv) Power Save

When enabled, the radio reduces power consumption where possible. The default setting is off.

(xvi) RSSI Mode

Receive Signal Strength Indicator. Lets you know how strong a receive signal is on any given frequency. Selecting "single" will hold the radio on a specific channel while selecting "scan" will cycle through all available channels displaying the most recent and peak signal strength values. The default mode is single channel mode.

(xvii) Test Frequency

Lets you test the sending and receiving frequency of any two radios. The default is set to 915.0. Available frequencies are 902-928 MHz.

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Default Settings

Serial Baud Rate.....

19,200 bits/second

Preamble Length:.....180 mS

RF Data Rate:..... 50 uS

RX buffer size:..... 64 bytes*

TX buffer size:..... 50 bytes*

CTS Assert:..... 32 bytes

CTS De-assert:..... 31 bytes

TX Assert:.....1 bytes/1 mS

CD Level:.....Factory setting

Group

Code:.....0001

–1400

Deviation:..... Factory setting

TX Power:..... 4*

Frequencies:.....25 frequency*

Power save:.....Off

RSSI mode:.....Single

Test Frequency:.....915.0

*predetermined by manufacturer

WWC Micro Hopper Data Radio

Specifications

General Specifications

Power Source ..... 5 VDC, 1.5 Watts

Temperature ..... -40 to +80 °C

Antenna Impedance ..... 50 Ohms unbalanced

Antenna Connection ..... SMA female

Operation Mode ..... Frequency Hopping Spread Spectrum

Frequency Control ..... PLL Synthesizer, 100 kHz step size

Operating Band ..... ISM 902 MHz – 928 MHz

Channel Spacing ..... 400 kHz

Modulation System ..... Direct FM

System Deviation ..... 100 kHz max

Channel Capacity 25

Data Rate ..... 20 kbps

Receiver Sensitivity ..... –94 dBm

Data Interface ..... Asynchronous Serial – TTL RS-232

Size ..... Approx. 1.75” x 2.47” x 0.375”

FCC Compliance ..... Part 15

Transport Protocol ..... Transparent

Transmitter Output Power ..... 0.1 Watt

Line of Site Range ..... 1500 Feet

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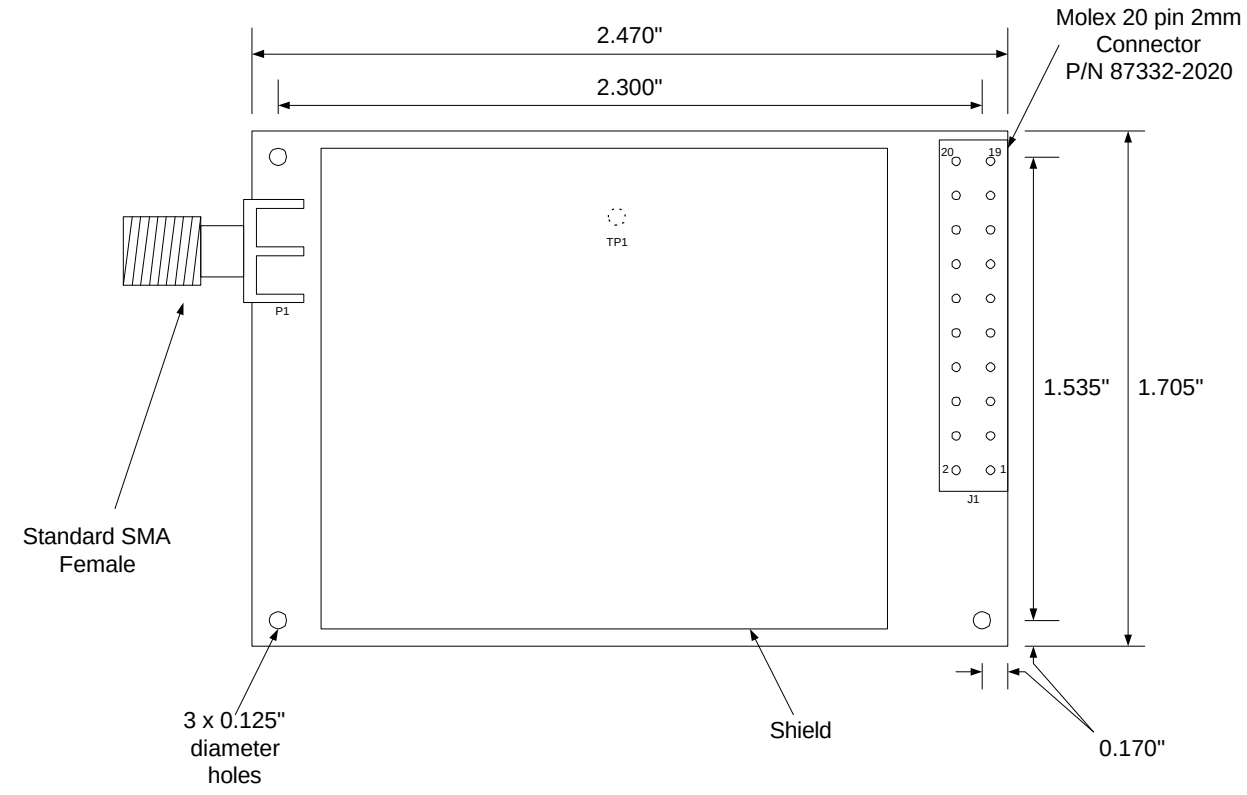
WWC Micro HopperData Radio
Radio Hardware Interface

Mechanical Overview



WWC World Wireless Communications, Inc. DESIGN ENGINEERING	World Wireless Communications, Inc. Design Engineering 6750 West 93rd Street Overland Park, KS 66212 Tel 913-652-0353 Fax 913-652-0358	Rev	Description	By	Date
		1	Initial Release	BMc	4/29/99
		2	Changed dimensions	BMc	6/16/99
	Micro Hopper Mechanical Detail				
	Drg No:011-1882-01				Rev:2

WWC Micro Hopper Data Radio
Hardware Interface

Pin Definitions for Connector J1

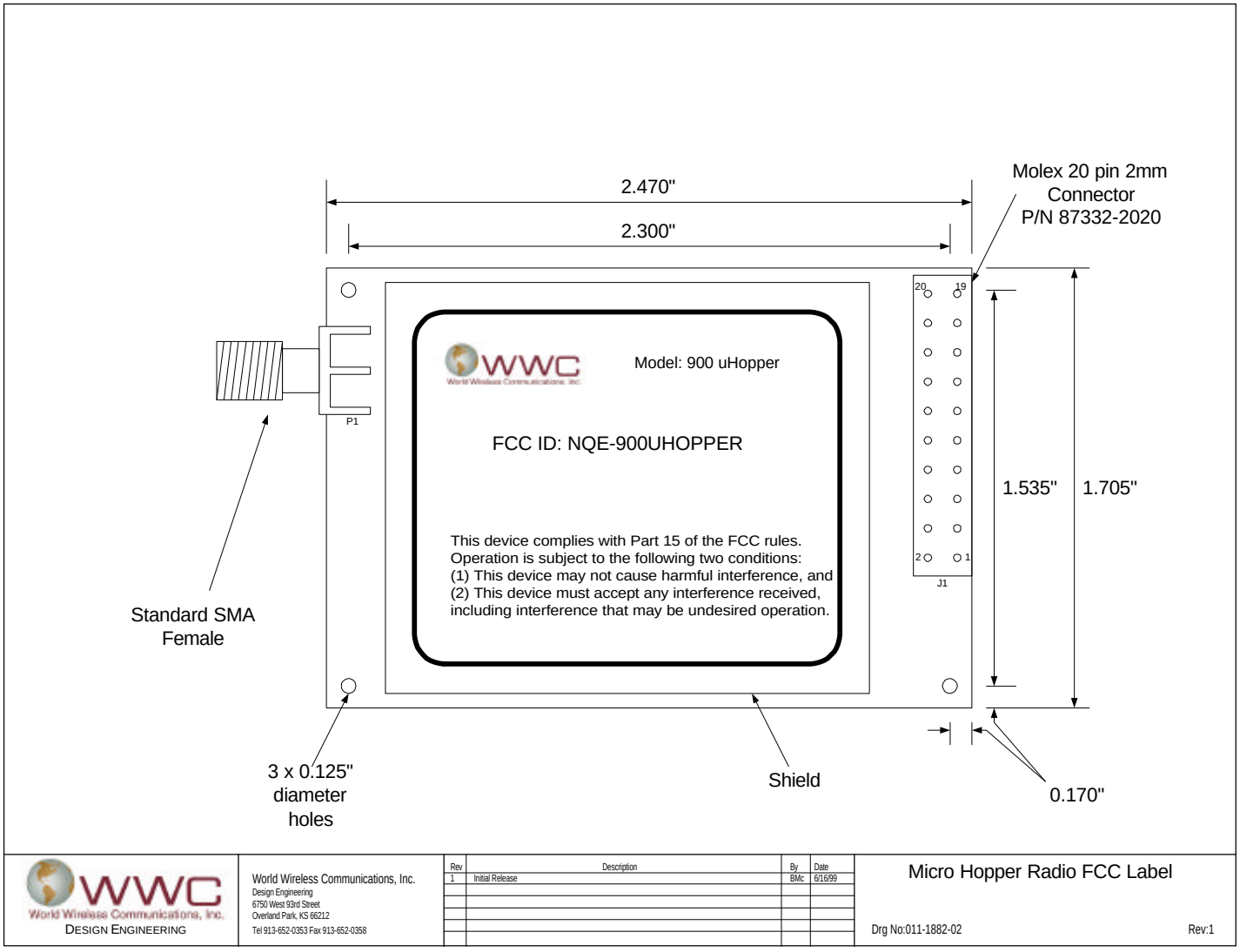
The following pin out summary is achieved through a 20 pin 2mm connector J1 (Molex P/N 87332-2020).

PIN	FUNCTION
1	AT90S8515 MOSI
2	Received Data
3	AT90S8515 MISO
4	Clear to Send Out
5	AT90S8515 SCK
6	Data Terminal Ready In
7	Reset
8	Request to Send In
9	Factory Use
10	Transmit Data
11	Factory Use
12	NC
13	NC
14	NC
15	NC
16	NC
17	5 VDC In
18	Ground
19	5 VDC In
20	Ground

WWC Micro Hopper Data Radio
Interface Board

Exhibit 8

Mechanical Overview



WWC World Wireless Communications, Inc. DESIGN ENGINEERING	World Wireless Communications, Inc. Design Engineering 6750 West 93rd Street Overland Park, KS 66212 Tel 913-652-0353 Fax 913-652-0358	Rev	Description	By	Date
		1	Initial Release	BMc	6/16/99

Micro Hopper Radio FCC Label

Drg No:011-1882-02 Rev:1

WWC Micro Hopper Data Radio
Hardware Interface

FCC Compliance Warning

Changes or modifications to the Micro Hopper Data Radio not expressly approved by World Wireless Communications could void the user's authority to operate this product.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, users and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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Glossary

Baud

Measurement of the signaling speed of a data transmission device.

CD

Carrier Detect level. Used to tell the scanning radio if a receiving radio is present.

Communication (COM) Ports

Designation of serial communications channels. COM port designations for this radio are COM1 through COM8.

Configuration Default

Operating characteristics of this data radio. The configuration default parameters are stored in the data radio's non-volatile memory and are predetermined by the manufacturer.

CTS

Clear to Send. A control signal used in conjunction with Request to Send (RTS) to perform data flow control.

Flow Control

A method used to regulate the flow of data between two devices; in this instance, between the customer DTE and the data radio.

Group Code

A setting to designate which group to which a radio will belongs. A radio will only "hear" other radios with the same group code. You may program up to 1400 different groups with unlimited radios in each group.

Modulation

The shifting of transmit frequency representing the data being transmitted.

Preamble Length

The length of time a transmitting radio sends a preamble so that a receiving radio can search for the preamble.

RF Data Rate

How fast the transmitting radio sends data across the RF channel.

RSSI

Receive Signal Strength Indicator. Indicates signal strength on any given frequency.

RTS

Request to Send. A control signal used in conjunction with Clear to Send (CTS) to perform data flow control.

RX Buffer Size

Number of bytes in the receive buffer.

Serial Baud Rate

Baud rate the radio uses to talk to a PC or external device.

TX Assert

Amount of time the transmitting radio will wait before it begins to send data.

TX Buffer

Number of bytes available for the transmit buffer.

TX Power

Transmitting power. The radio has 4 settings for range, with setting 4 providing the greatest range.