WATKINS-JOHNSON COMPANY

R19XX

PCS REPEATER

MANUAL

08/98

CHAPTER 1

GENERAL INFORMATION AND SAFETY PRECAUTIONS

1-1 INTRODUCTION

This manual provides information pertaining to the installation, operation, and maintenance of the Watkins-Johnson R19XXXXX PCS Repeater, shown in Figure 1-1. The model number represents the type of repeater. This manual covers the following types of PCS repeaters. The model numbers and letters are defined in the following example.

Example: **R1910CAD** is a PCS indoor repeater, with CDMA modulation, using frequency bands A and D.

Type	Modulation	PCS Frequency Band
R1910=PCS Indoor Repeater	CDMA = C TDMA = T GSM = G	AD*,BE*,FC*
R1920=PCS Outdoor Repeater	CDMA = C TDMA = T GSM = G	AD*,BE*,FC*

* Specifies dual bands.

This manual is divided into four chapters, each covering a particular topic for the operation and maintenance of the unit. The topics, are as follows:

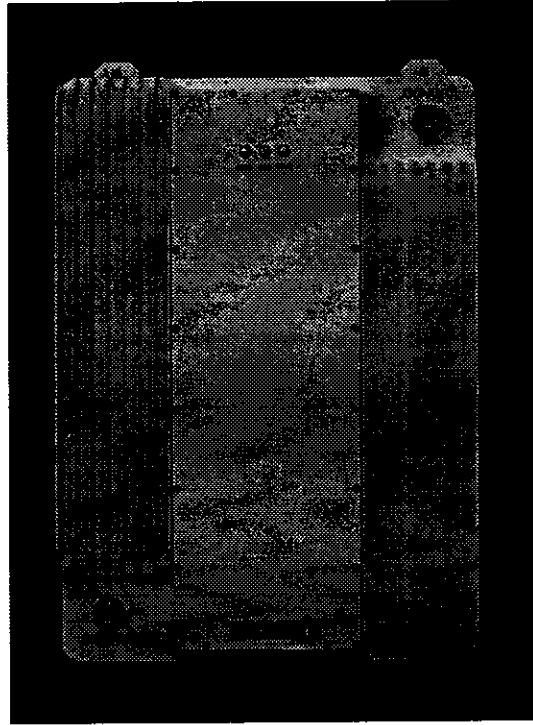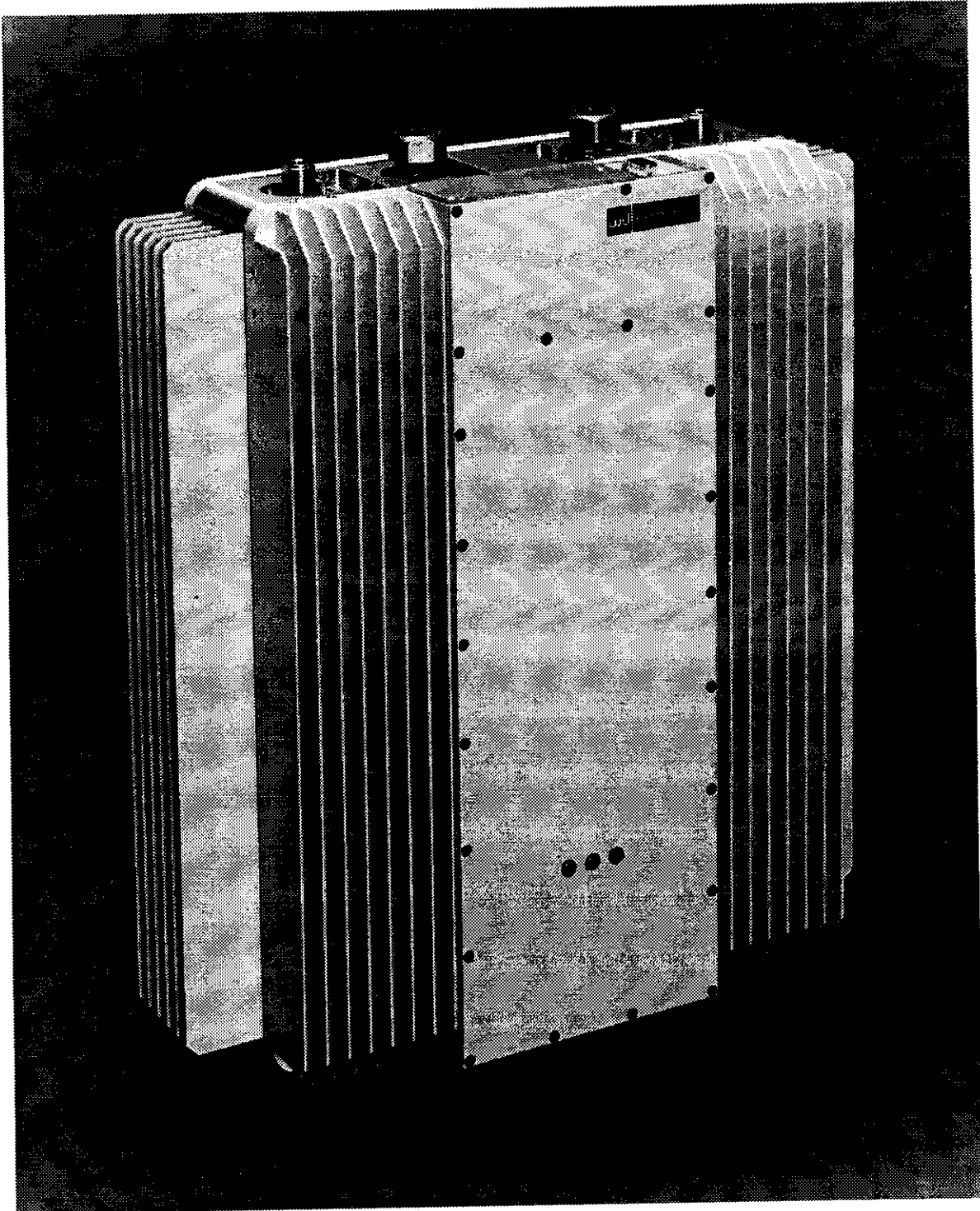| Chapter	Topic
1	General Information and Safety Precautions
2	Installation
3	Operation
4	Scheduled Maintenance
A	Appendix A- Software Commands

Figure 1-1. R1910 PCS Repeater

Figure 1-2. R1920 PCS Repeater

Chapter 1 provides a general description of the R19X0 and summarizes the electrical, mechanical, and environmental characteristics. It also provides a tabular listing of the R19X0's performance specifications. Safety precautions to be observed while operating or servicing the unit are also explained.

Chapter 2 provides instructions for the initial inspection and installation of the R19X0. It describes the purpose and function of all I/O connectors, provides initial start-up instructions, and provides installation verification tests.

Chapter 3 describes the purpose and function of all remote controls and status indicators and explains how to operate the R19X0.

Chapter 4 provides a scheduled maintenance action index and describes maintenance procedures that should be performed on a regular basis, such as cleaning and inspection.

Appendix A lists the software commands required to communicate with the R19X0, and brief descriptions of the commands.

1-2   SPECIFICATIONS

Table 1-1. R1910 Specification

DESCRIPTION	SPECIFICATION
Frequency	Band AD, BE, or FC
Output Power	100 mWatts CDMA 500 mWatts TDMA 500 mWatts PCS-1900 (GSM)
Filter Bandwidth	1.25 MHz CDMA (other filters available) 5 MHz TDMA (other filters available) 200 kHz GSM-1900 (other filters available)
Noise Figure	4 dB Typical
Maximum Input without damage	-10 dBm
Input Impedance	50 ohms
Gain Range	40 dB to 70 dB
Gain Steps	2 dB
Signal Delay	6 usec max
Power	110 VAC, 60 Hz
Alarms & Status	Synthesizer, Amplifiers, Power Amplifier, Output Power, Oscillation
Interface	RS-232 (modem optional)
Control	Gain, Channel frequency, Auto Level Control, and Tracking Offset
Cooling	Convection
Temperature	Operating: -10 to +45 C Storage: -40 to +85 C
Size	12" x 16" x 3"
Weight	19 lbs
Weather Resistance	NEMA 12

Connectors
 	
    RF
    Control
    AC Power
	
	Type N
	9 pin Dsub Female
	NEMA Type 5-ISP

Table 1-2. R1920 Specification

DESCRIPTION	SPECIFICATION
Frequency	Band AD, BE, or FC
Output Power	6 Watts CDMA 15 Watts TDMA 20 Watts GSM-1900
Filter Bandwidth	1.25 MHz CDMA 300 kHz TDMA 200 kHz GSM-1900
Noise Figure	4 dB Typical
Maximum Input without damage	-10 dBm
Input Impedance	50 ohms
Gain Range	55 dB to 95 dB, with a 30dB range
Gain Steps	2 dB
Signal Delay	6 usec max
Power	110/220 VAC, 50/60 Hz
Alarms & Status	Synthesizer, Amplifiers, Power Amplifier, Output Power, Oscillation
Interface	RS-232 and modem
Control	Gain, Channel frequency, Auto Level Control, and Tracking Offset
Cooling	Convection
Temperature	Operating: -40 to +55 C Storage: -40 to +85 C
Size	14.5" x 16" x 7"
Weight	45 lbs
Weather Resistance	NEMA 4

Connectors
    RF
    Control
    AC Power
	
	Type N
	9 pin D-sub
	Conduit (terminal block)

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 armful 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, may 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.

CAUTION:

Changes or modifications not expressly approved by the manufacturer responsible for compliance could void user's authority to operate the equipment.

1-3   SAFETY CONSIDERATIONS

WARNING

To prevent personal injury, observe all safety precautions and warnings stated on the instrument and in this manual.

Specific warnings, cautions, and instructions are placed wherever applicable throughout this manual. These precautions must be observed during all phases of operation, service, and repair of this unit. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standard of design, manufacture, and intended use of this instrument.

1-4   DESCRIPTION

The WJ-R19X0 Repeaters are used to extend the coverage of a PCS basestation. For example, inside buildings that do not allow sufficient signal strength from the basestation there exists a hole in the coverage for wireless service. The WJ-R1910 is designed to solve that problem.

Likewise, tall buildings in a metroplitan area, or mountains in a more rual area, can reduce basestation signal strength such that pockets of unuseable areas develop. The WJ-R1920 is designed to solve these problems.

The repeater receives the basestation signal via an external antenna see Figure 1-4. This signal is amplified and filtered by the repeater and ultimately retransmitted via a second antenna. The entire process is duplicated for the reverse path where the handset signal is amplified and filtered

and retransmitted to the basestation. This technique provides PCS coverage inside buildings or in outside areas that previously did not have sufficient signal strength.
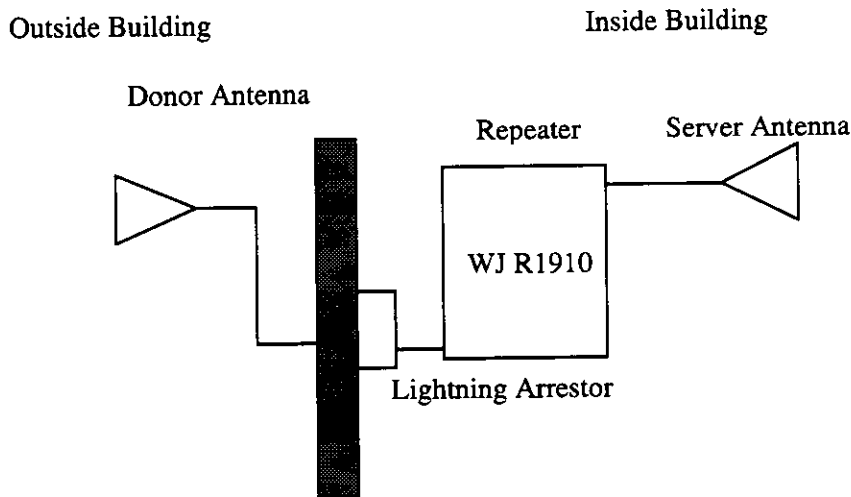
Outside Building   Inside Building

Donor Antenna

Figure 1-3. Typical Usage

1-4.1   Remote Control

Remote control and status reporting of the repeater is provided either through an RS-232 serial interface or via modem using a standard POTS line. Either interface permits the control of channel frequency and gain, and can provide unit alarm status.

1-4.2   Prime Power

The unit is equipped with a power supply with an input of 110 VAC at 60 Hz. Power consumption of the R1910 is approximately 65 Watts, while the R1920 is approximately 200 Watts.

1-5   MECHANICAL

The R1910 is a 12 x 16 x 3 wall mount unit. Four mounting brackets are provided for installation. The unit is designed to withstand a NEMA 12 type environment.

The R1920 is a 12 x 16 x 3 pole mount unit. Four mounting brackets are provided for installation. The unit is designed to withstand a NEMA 4 type environment.

1-6   ENVIRONMENTAL CONDITIONS

1-6.1   Non-operating Environmental Conditions

The R19X0 will survive strains, jars, vibrations, or other conditions incident to normal maintenance, transportation, and handling. Temperature ranges can vary between -40°C and +85°C with humidity up to 95% non-condensing.

1-6.2   Operating Environmental Conditions

The R1910 can be installed and operated in a commercial environment with temperatures varying between -10°C and 45°C.

The R1920 can be installed and operated in an outdoor environment with temperatures varying between -40°C and 55°C.

1-6.3   Transportability

The R19X0 can be transported by commercial land carriers or pressurized commercial air carriers without special handling provisions.

CHAPTER 2

INSTALLATION

2-1 INTRODUCTION

This chapter provides information for the installation, setup and alignment of the R19X0 PCS Repeater. The information consists of procedures for unpacking and inspection, preparation for reshipment or storage, and description of unit connectors. It also provides initial start-up instructions and installation verification tests.

2-2 UNPACKING AND INSPECTION

Examine the shipping carton for damage before unpacking the unit. If the shipping carton is damaged, try to have the carrier's agent present when the equipment is unpacked. If carrier's agent is not available, retain the shipping cartons and padding material for the carrier's inspection if damage to the equipment is evident after it has been unpacked.

Verify that the equipment is complete, as listed on the packing slip. Contact Watkins-Johnson Company, Palo Alto, California, or your local Watkins-Johnson representative with details of any shortage.

The unit was thoroughly inspected and factory adjusted for optimum performance prior to shipment. Thus, it is ready for use upon receipt. After unpacking and checking contents against the packing slip, visually inspect all exterior surfaces for dents and scratches. If external damage is visible, contact Watkins-Johnson Company.

2-3 PREPARATION FOR USE

2-3.1 Power Requirements

The R1910 is equipped with a power supply that accepts 110 VAC, at 60 Hz single phase. Power consumption of the R1910 is approximately 65 Watts. The R1920 is equipped with a power supply that accepts 110/220 @ 50/60 Hz. And has a power consumption of approximately 230 Watts.

WARNING

Removing or defeating the ground prong on the power cord may present a lethal shock hazard. Do not use an ac two-to-three wire adapter plug with this unit.

The R1910 power cord has a 3-conductor grounded plug complying with the National Electric Code (NEMA Type 5-15P) for 110 VAC operation. For the R1920, or for operation at other voltages, contact Watkins-Johnson Company or a qualified service technician.

2-3.2   Software Installation

The repeater control application, provided on 3.5" floppy disks, runs on any Personal Computer (PC) running Microsoft Windows 95 or NT. The computer must also have one of two serial communications ports available for use, COM 1 or COM 2. To install the application, insert disk 1 into floppy disk drive A: and from the Start menu select Run and enter "a:\setup" in the text box of the Run window. Click the OK button and follow the instructions given.

2-3.3   Operating Environment

Environmental conditions during operation should normally be limited as follows:

R1910:

a.   Maximum humidity: 95%

b.   Temperature range: -10°C to +45°C.

R1920:

a.   Temperature range: -40°C to +55°C.

2-4   PRE-INSTALLATION INFORMATION

2-4.1 R1910

You will need to know some basic information before beginning the R1910 installation. Write this information down, you will need it later on.

1.   Base station location and Channel number to be repeated.
2.   Reverse Tracking offset in dB(Optional).
3.   Location where the Donor antenna is to be installed.
4.   Location where the Server antenna is to be installed.
5.   Phone number of modem line. (Optional)
6.   Location where the R1910 is to be installed.

2-4.2 R1920

You will need to know some basic information before beginning the R1920 installation. Write this information down, you will need it later on.

1.   Base station location and Channel number to be repeated.
2.   Reverse Tracking offset in dB(Optional).
3.   Location where the Donor antenna is to be installed.
4.   Location where the Server antenna is to be installed.
5   Phone number of modem line.
5.   Location where the R1920 is to be installed.

2-5   INSTALLATION INFORMATION

2-5.1   Donor Antenna Installation

The Donor antenna will be mounted outside most of the time. The antenna should be installed so that it is in line-of-sight of the base station and is pointed directly at it. If there is an arrow or polarity marking indicated on the antenna ensure that it is pointing up. Be sure that the antenna or mast is properly grounded with a grounding strap.

Determine where the RF cable will enter building and drill hole if necessary. If using a lightning suppresser, install suppresser inside building where cable entry is. Attach grounding strap to lightning suppresser. Measure distance between antenna connection and lightning suppresser, add some length for drip loop and cut cable. When routing cable be careful not to kink, cut or damage cable. Install connectors on cable using the appropriate tool and connect to antenna and lightning suppresser connector labeled Surge.

2-5.2   Server Antenna Installation

The Server antenna should be located in an open area free from metallic obstruction if possible. Mount antenna and route cable from antenna to R1910 location. When routing cable be careful not to kink, cut or damage cable. No lightning suppression is needed if the antenna is indoors or under an overhang. Install connector using the appropriate tool and connect to antenna.

2-5.3   R1910 Installation

Ambient temperature in the area where the unit is installed should not exceed 45 °C. Be sure that unit is positioned upright to permit adequate air flow and that nearby equipment does not discharge hot air directly on the unit. The installation should allow a free flow of air around the outer surfaces of the chassis. Access to the bottom should be allowed so that input and output connections can be conveniently made or changed if desired. The unit weighs nominally 19 pounds and may safely be carried and installed by a single person.

The preferred mounting of the R1910 is on 16" center studs. See mounting bracket installation at end of manual. If mounting to other surfaces be sure to use appropriate hardware able to withstand 19 lbs. Before mounting to wall verify AC power outlet is within 10 feet. Attach the mounting brackets to the repeater. Screw in the bottom two ¼" X 1 1/2" bolts into studs. Slide in repeater and mark top two bolt locations. Remove repeater and install remaining two bolts. Slide in repeater and tighten bolts. Route cable between repeater and lightning suppresser. When routing cable be careful not to kink, cut or damage cable. Install connectors using the appropriate tool and connect to lightning suppresser connector labeled Protected and repeater connector J3 Donor. Install connector on cable from Server antenna and connect to repeater connector J4 Server. Connect power cord.

2-5.4   R1920 Installation

TBD

2-6   R1910 INITIAL TURN-ON PROCEDURE

There are no special instructions for the initial turn-on or operation of the R1910. Simply turn on
the switch J1 located at the bottom of the unit and verify PWR led is illuminated green as well as
the AMP and OSC LED's

2-6.1   R1920 Installation

TBD

2-7   SETUP

2-7.1   SERIAL INTERFACE

For the R1910, connect a 9 pin cable between connector J2 Control. For the R1920, connect the Tx,
Rx, and GND, lines to the serial port terminal block inside the repeater. Connect the other end of
the serial cable to the serial COM port on a PC

Serial Port settings:

Baud	9600
Data Bits	8
Stop Bits	1
Parity	None
Flow Control	Off

Verify software has been installed on PC. On PC click "WJ Repeater Controller" icon. Choose
the COM port the cable is attached to. After the Repeater window opens, all the parameters
should begin appearing. If not, the wrong COM port may have been selected. If the ALC or Rev
Tracking Offset box is enabled *, disable them. Set the correct Channel #. For more detail on a
specific function see the section 3 Operations.

*NOTE: If ALC is to be used, you must have greater than 75 dB antenna isolation.

2-7.1   MODEM INTERFACE

For the R1910, connect a 9 pin to phone jack adapter to the J2 Control connector. Plug the phone
line into the phone jack of the adapter. For the R1920, connect the Tip and Ring lines of a POTS
line to the Tip and Ring terminal block inside the repeater.

Modem settings:

Baud	2400
Data Bits	8
Stop Bits	1
Parity	None
Flow Control	Off

Connect a modem phone line to the modem of a PC. Verify software has been installed on the PC. On the PC, click the "WJ Repeater Controller" icon on the Desktop or in the Start menu and follow these steps to establish a connection to the repeater.

1. Choose "Modem" from the interface selection window and press "Ok".
2. Enter the phone number of the repeater when prompted, and press "Ok".
3. When the main window appears, click "File" on the menu bar. Then select "Connect" from the menu.
4. When the Dialer window appears press the "Dial" button to call the repeater.

When a connection is established the Dialer window will disappear and, after several seconds, the repeater's parameters will be downloaded. If the ALC or Rev Tracking Offset box is enabled *, disable them. Set the correct Channel #. For more detail on a specific function see section 3, Operations.

*NOTE: If ALC is to be used, you must have greater than 75 dB antenna isolation.

2-7   CONNECTORS

Figure 2-7.1 shows the connectors and Table 2-1 provides a description of each connector on the R1910 unit.

Table 2-1. R1910 Connectors

| Reference Designator	Label	Description
J1	AC PWR IN	This POWER connector is a multipin connector cabling a user-supplied ac power source (110 VAC,60 Hz) to the power supply in this unit.
J2	RS-232	This 9 pin D-sub female connector is provided for RS-232 communications between the R1910 and a PC.
J3	SERVER	Receives Handsets RF, Transmits Base Stations RF
J4	DONOR	Receives Base Stations RF, Transmits Handsets RF
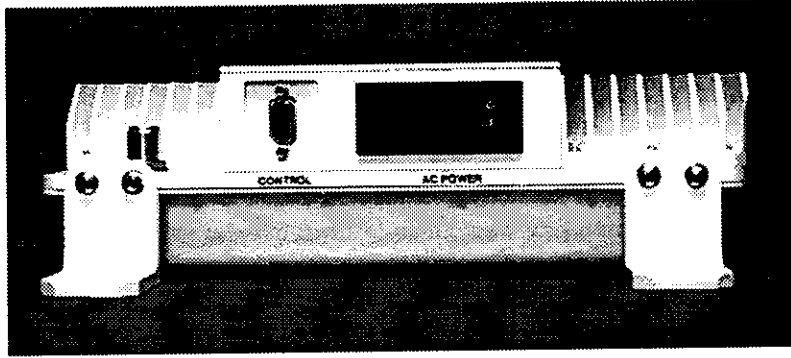
Figure 2-7.1 R1910 I/O Connections

2-8 ALIGNMENT PROCEDURE

After completing the installation, turn-on procedure, and setup you must align and verify proper operation of the R19X0.

a. Connect a PC to the repeater via the selected interface and start the repeater control application by double clicking its icon.

b. If the repeater is operational the application will fill in the Window with the current settings of the repeater.

c. Adjust FWD gain until signal is present on RSSI.

d. Adjust Donor Antenna for maximum signal deflection on RSSI.

e. Set FWD gain to desired level.

c. When ready, click the "Osc Test" button on the windows control software.

d. After test complete, verify no Alarms are illuminated red. If yes(no alarms red), skip to step "f". If no (alarms illuminated red) go to "e".

e. Reposition the Donor or Server antennas to improve isolation, or lower FWD or REV gain settings by 4dB, clear alarms and repeat step "c".

f. If using ALC *, enter ALC Level and enable. Repeat step "c". If not go to "g".

g. If using the serial interface, remove cable from J2, RS-232 on R1910.

h   Test is complete.

2-9   STORAGE

Environmental conditions during storage and shipment should normally be limited as follows:

    a. Maximum humidity: 95% (no condensation)

    b. Temperature range: -40°C to +85°C

2-10   PACKING FOR RESHIPMENT OR STORAGE

If the R19X0 must be prepared for reshipment or storage, use the original packing and shipping materials, if possible. Otherwise, the following general instructions should be used for repackaging with commercially available materials:

    a. Wrap unit in heavy paper or plastic.

    b. Use a strong shipping container. A double-wall carton made of 350-pound test material is adequate.

    c. Use a layer of shock-absorbing material 70 to 100 mm (3 to 4 inch) thick around all sides of the instrument to provide firm cushioning and prevent movement inside container. Protect rear panel connectors with cardboard.

    d. Seal shipping container securely.

    e. Mark shipping container FRAGILE to ensure careful handling.

    f. In any correspondence, refer to instrument by model number and full serial number.

CHAPTER 3

OPERATION

3-1   INTRODUCTION

This chapter provides information for operating the PCS Repeater. The R1910 is designed to work in an indoor environment only, while the R1920 is designed to work in an outdoor environment.

The R1910 and R1920 are fully compliant with FCC part 24. For the R1910, there are no panel controls other than the power switch. For the R1920, there are no external controls or indicators. Access to A/C power connects and interface connections are via an access panel.

The operator must be familiar with the control software being used and the operation and functional capabilities of the R19X0.

3-2   OPERATING INSTRUCTIONS

The following paragraphs provide a description of the control functions and operation of the R19X0 PCS Repeater.

3-2.1   Power-up Sequence

For the R1910, to turn on the unit, push the "1" side of the power switch rocker arm to the depressed position. For the R1920, remove the access panel and push the power switch.

The unit will go through an initialization which includes restoring the unit to its last powered-up state and checking the alarms status.

Table 3-1. Initial Parameter Status

Parameter	R1910 Initial Value	R1920 Initial Value
Band	AD,BE,FC	AD,BE,FC
Channel	1-1199 CDMA 1-1999 TDMA 512-810 PCS-1900 (GSM)	1-1199 CDMA 1-1999 TDMA 512-810 PCS-1900 (GSM)
FWD RF	1930-1990MHz	1930-1990MHz
FWD Gain	40-70dB	55-95dB
FWD Power Out	0 to +30dBm	+15 to +45dBm
REV RF	1850-1910MHz	1850-1910MHz
REV Gain	40-70dB	55-85dB
REV Power Out	0 to +30dBm	+15 to +45dBm

FWD RSS	> -70dBm	>-70dBm
Alarms	Green	Green

3-2.2   WJ Repeater Control Application

The repeater is controlled via either a standard RS-232 interface or via modem interface using a POTS line with the, Windows 95/NT based, Watkins-Johnson Company Repeater Control application. Figure 3-1 shows the control panel of the application.

At the top of the panel is a menu bar with two menu items, File and Help. The File menu item provides a means of changing interfaces, connecting or disconnecting from a modem, closing the application, and also has a maintenance feature used by the factory. The Help menu item contains a copyright notice and software version information.
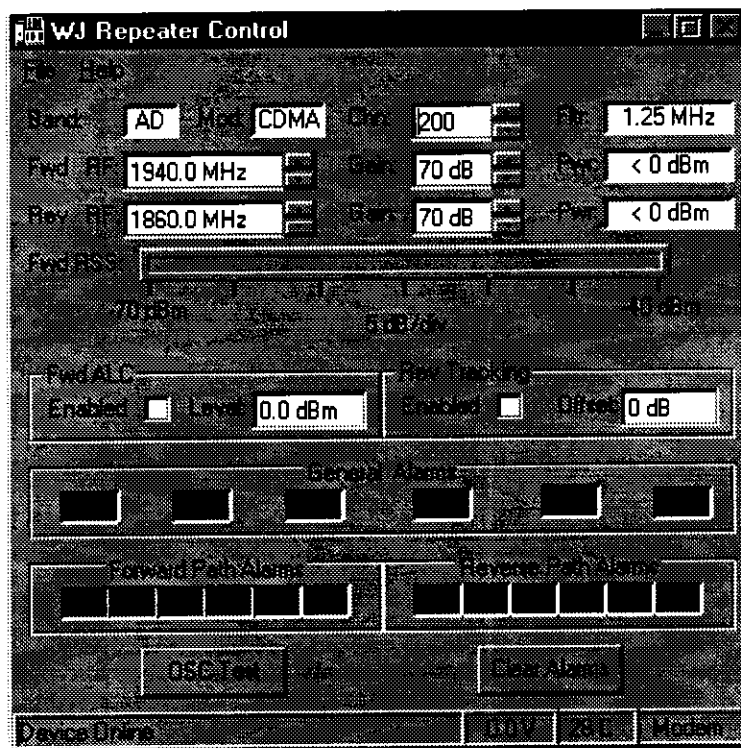
Figure 3-1.   Repeater Control Panel

3-2.2.1   Starting Control Software

With the left mouse button, double-click the phone icon labeled "WJ Repeater Control." The application will launch and request which interface to use for communicating with the repeater. Select the either one of two Com ports or the modem to use and press the OK button, or press Cancel to quit the application. The repeater must be equipped with the modem option in order to use the modem interface.

When the application is running and using the serial interface, it is able to detect the presence of a repeater on the selected serial Com port. When a repeater is detected, the application reads its current configuration and settings and displays them in the application window. See figure 3.1. When no repeater is detected the application clears the window.

3-2.2.3   Band, Modulation and Bandwidth Parameters

The band, modulation and bandwidth parameters are status indicators only. The "Band" parameter is the PCS band setting of the repeater. There are 9 possible PCS bands combined into 3 dual band selections, AD, BE, and FC. Bands AD, BE, and FC are wide band options that give the repeater the ability to operate in two bands. The modulation parameter displays which modulation type the repeater is configured for, CDMA, TDMA, or GSM. The bandwidth parameter is the customer requested saw filter bandwidth of the repeater.

3-2.2.4   Channel Number and RF Frequency Parameters

The channel and frequency parameters (Fwd RF and Rev RF), are user configurable parameters. The channel number displays and changes the current channel setting of the repeater, and the "Fwd RF" and "Rev RF" parameters display the forward and reverse frequencies of the repeater for the channel number selected.

The repeater can be set to any allowable frequency channel in the band of the repeater by changing the channel number. The channel can be changed by either clicking the Up/Down arrow next to the channel, or by placing the cursor in the channel number box and typing in a new channel number. Don't forget to press the <Enter> key when typing in a channel number. When the channel number is changed the forward and reverse frequencies for that channel are computed and displayed in the "Fwd RF" and the "Rev RF" windows.

The repeater can also be tuned by changing either the "Fwd RF" or "Rev RF" frequency. This is done by either clicking the Up/Down arrow next to the desired parameter, or by placing the cursor in the window and entering the frequency via the keyboard. The frequency must be entered in Megahertz. Once a frequency is entered, the channel number for that frequency is placed in the channel number display and the other RF frequency is updated. A frequency entered that is not centered in a valid channel is adjusted to the closest valid channel. A frequency outside the band of the repeater is rejected and the previous frequency is restored.

3-2.2.5   Forward and Reverse Gain Parameters

The gain values for the corresponding RF paths can be changed by either clicking the Up/Down arrow next to the parameter, or by placing the cursor in the desired parameter window and typing in the value. The ability to change the forward gain parameter is disabled when the Auto-Leveling Control (ALC) feature is enabled. Also, the ability to change the reverse gain parameter is disabled when the Reverse Tracking (Rev Tracking) feature is enabled.

3-2.2.6   RF Power Out Parameters

The "Power Out" parameters are status information only. They display the measured RF power out of the repeater, in dBm.

3-2.2.7   Auto-Leveling Control

The Auto-Leveling Control (ALC), when enabled, commands the repeater to maintain the forward path RF output power level indicated in the Level box, +/-2dB, by automatically adjusting the forward gain as appropriate. The valid range for ALC is 0 to 30dBm for the R1910, and 15 to 45dBm for the R1920. When ALC is enabled, control of the forward path gain is no longer allowed. The forward gain display box will turn into a status indicator displaying the current gain setting, as controlled by the repeater.

3-2.2.8   Reverse Tracking Control

The Reverse Tracking, when enabled, commands the repeater to keep the reverse path gain at the "Offset" level from the forward path gain. For example, suppose that the forward gain had been set to 68dB, and the Reverse Tracking level set to -4dB. When Reverse Tracking is enabled, the reverse gain would be automatically set to 64dB.

3-2.2.9   Received Signal Strength (RSS)

The "Fwd RSS" parameter is a graphical display of the received (input) signal strength in the forward RF path.

3-2.2.10   Repeater Alarms

In the center of the panel is the repeater's alarm information. There are a group of six General Alarms and a group of alarms for each RF path. When an alarm condition is detected, the alarm parameter on the panel will turn red, and stay red as long as the alarm is present. With the exception of an oscillation alarm and a Forward Power Amp alarm, the repeater maintains operation as much as it is able. However, if an oscillation alarm or Forward Power Amp alarm occurs, the repeater automatically shuts down the RF chains and ceases to function. Once this occurs, the only way to clear the alarm is either to cycle AC power on repeater, or click the "Clear Alarms" button on the control panel. After clearing, the unit will continue to shut down as long as the oscillation alarm is present.

3-2.2.11   Oscillation Test

The "OSC Test" button, when pressed, initiates the oscillation test function. The application disables ALC and Tracking, if enabled, and raises the gain of each RF path by approximately 14dB, and monitors the oscillation alarm. The test takes approximately 15 seconds. When the test is complete, the gain settings and ALC and Tracking settings are restored to their original settings. If an oscillation alarm occurred the "Clear Alarms" button must be pressed to clear it.

3-2.2.11   Status Bar

At the bottom of the panel is a status bar, that displays four pieces of information. Beginning in the left most, and largest box, is basic status information about the operation of the application. The second box from the left display the voltage level of the backup battery if one is installed. The next box displays the internal temperature of the repeater in degrees centigrade. The right most box displays the currently selected interface that the application is using to communicate with the repeater.

When using the serial RS-232 interface, the application is able to detect the presence of a repeater. When one is not detected the panel clears all the data fields and disables all parameter input fields, and displays a status message on the status bar of "No Device." When a repeater is connected to the serial port and turned on, the application will detect its presence and download and display its configuration. It will also change the status bar to indicate a device was found and re-enable all parameter entry fields.

CHAPTER 4

SCHEDULED MAINTENANCE

4-1 INTRODUCTION

The WJ PCS Repeaters are designed to operate for extended periods of time with minimum routine maintenance. Inspection and performance tests should be conducted at regular intervals consistent with the facility's normal scheduling and after troubleshooting. No routine adjustments are required. Troubleshooting and performance tests can be most effectively carried out if the technician first familiarizes himself with the operating instructions and circuit descriptions. Parts lists and component location diagrams are included in this chapter.

4-2 SCHEDULED MAINTENANCE ACTION INDEX

The scheduled maintenance action index is provided in Table 4-1. It lists the maintenance action to be taken, gives the paragraph reference for detailed instruction, and specifies the maximum time intervals between equipment cleaning, inspection, and performance checks.

WARNING

Whenever possible, all preventive maintenance should be
performed with the power cord disconnected from prime power
source.

4-3 EQUIPMENT REQUIRED

No special tools or test equipment are required for performing routine preventive maintenance.

4-4 PREVENTIVE MAINTENANCE PROCEDURES

The R1910 is designed to operate for extended periods of time with minimum maintenance. Normally, the only preventive maintenance tasks to consider are:

    a.   Cleaning the unit.

    b.   Inspecting the outside of the unit for physically worn, damaged, loose, or overheated parts.

    c.   Performing a performance check of the unit.

If the equipment is used in an environment where a great deal of dust, high temperature, or high humidity is present, the frequency of the checks should be increased.

Table 4-1. Scheduled Maintenance Action Index

PM Action	Paragraph Reference	Schedule
Cleaning outside of equipment	4-4.1	Every 12 months or when dust is seen on the surface of the equipment.
Inspecting for damage or wear	4-4.2	When the unit is not operating properly.

4-4.1 Exterior Cleaning

Remove loose dirt accumulated on the outside of the unit with a moist paper towel, cloth, or brush. The brush is good for removing dirt on and around the connectors. Dirt and grease which is not removed can be cleaned off with a paper towel or cloth made moist with a detergent and water solution. Do not use an abrasive cleaner.

4-4.2 Inspection For Damage or Wear

Many potential or existing troubles can be detected by making a visual inspection of the unit. For this reason, a complete visual inspection should be made on a regular basis and whenever the unit is inoperative. Damage due to overheating may be the result of other less apparent troubles in the unit. Mechanical parts such as pin connectors and power switch be inspected for excessive wear, looseness, misalignment, corrosion, and other signs of deterioration.

4-5 GENERAL MAINTENANCE

A complete inspection of the unit should be made during the cleaning operation for signs of mechanical and electrical failures. Mechanical parts, including connectors, should be checked for wear, loose connections, bad alignment, or other possible causes of defective operation. Worn parts should be replaced and loose connectors tightened. Check for loose cable connections, and tighten those connectors. Remove the fuse and check for corrosion or damage, replace when either occurs.

After a repair has been made, alignment should be carried out, if necessary, and appropriate performance tests should be used to verify proper operation.

4-6 ALIGNMENT

This unit requires that the gain be set correctly for both server and donor paths, to avoid oscillation.

4-7 REPAIR

All repairs to WJ PCS repeaters should be performed by a Watkins-Johnson authorized technician. Any unauthorized repair could void the warranty.

APPENDIX A

PCS REPEATER INTERFACE

A-1 INTERFACE PROTOCOL

The interface to the Repeater is via a standard RS-232. The data protocol is ASCII, 8 data bits, 1 stop bit, no parity, 9600 baud.

The structure of a command string is as follows:

<cmd>[[<space><parameter>] [<;><checksum>]]<CR>

Elements within angle brackets (<,>)are required whereas elements within brackets ([,]) are optional, depending on the command being sent and on whether checksum checking is enabled (see CHK command).

cmd   = ASCII command string as defined in the command set below.

space   = ASCII space character (20h).

parameter   = Any ASCII parameter string required with the command.

semicolon   = Semicolon character to separate checksum from command string.

checksum   = A 2 digit ASCII Hex value. Checksum = 256 - (sum of the string)

CR   = Carriage return character (0Dh) terminates the string.

Upon receiving the command string, the Repeater will respond with a status value (0 - 255), followed by a <CR>. There will be no checksum in a status message. If the command was a request for data, the status message will be sent first followed by the requested data string. If the status returned is not good, no data will be returned.

The response to a request for data command is to return the original command followed by the data requested, a semi-colon, then a checksum for the entire string.

Only one command string can be sent at a time. Once the controlling computer receives status and any requested data from a sent command, then another command can be sent.

Examples:

Command string:	APN 12345.678;F4<CR>	Sets the Part number
Response:	0<CR>	Responds with good status
Command string:	APN? ;87<CR>	Requests the Part number

Status Response: 0<CR>   Good Status

Response: APN 12345.678;F4<CR>   Responds with Part number

A-2 COMMAND SET

ADC?   Request Date Code. Returns: ADC dd/mm/yyyy

ALC   Enable Auto-Level Control for Forward Path.

ALC/   Disable Auto-Level Control for Forward Path.

ALC?   Request Auto-Level Control status.

ALCL f   Set Auto-Leveling level in dBm. f = 0 - 45 db, in .5 dB steps.

ALCO f   Set Reverse gain Tracking offset level in dB. f = +/-10 db, in 2 dB steps.

ALCO?   Request Reverse Tracking level in dB.

ALRM?   Request General Alarms. (see below).

ALRM1?   Request Channel Converter Alarms. (see below)

ALCLR   Clear Alarms.

APN?   Request Assembly Part number.

ASN?   Request Serial number. Returns: ASN s (20 char string max)

ATPH i   Set High Temperature Alarm value in degrees centigrade.

ATPH?   Request High Temperature Alarm setting in degrees centigrade.

ATPL i   Set Low Temperature Alarm value in degrees centigrade.

ATPL?   Request Low Temperature Alarm setting in degrees centigrade.

BBE   Enable backup battery monitoring.

BBE   Disable backup battery monitoring.

BBE?   Request backup battery monitoring status.

BLVL?   Request backup battery level.

BND?   Request Band Setting.

CHK   Enable Checksum Checking on received command strings.

CHK/	Disable Checksum Checking on received command strings.
CHK?	Request Checksum Checking status. Returns "CHK" or CHK/".
CHN i	Set channel number. i = 0 - 3500
CHN?	Request channel number.
CHSZ?	Request Channel Spacing in kHz.
FCA i	Set Forward Coarse attenuation. i = 0 to 30 dB, even numbers only.
FCA?	Request Forward Coarse attenuation.
FLB?	Request SAW Filter Bandwidth in MHz.
FPO?	Request Forward RF power-out in dBm.
HBE	Enable Heartbeat function.
HBE/	Disable Heartbeat function.
HBE?	Request Heartbeat function status.
HBT i	Set Heartbeat time in hours. i = 0 - 255 hours
HBT?	Request Heartbeat time setting.
HWR?	Request Hardware Revision.
LGIN s	Login command. s = password string, 12 characters max.
LGIN/	Logout command.
MFN?	Get Manufacturer's name.
PEN	Enable outgoing phone calls. (only with modem installed)
PEN/	Disable outgoing phone calls.
PEN?	Request outgoing phone call status
PHN s	Set phone number for outgoing phone calls. (only with modem installed)
PHN?	Request phone number for outgoing calls.
PO?	Request RF Power Output levels of both paths. Returns: PO fwd rev (dBm)
PSW s	Set user Login password. 12 characters max.
PSW?	Request user Login password.

RCA i	Set Reverse Coarse attenuation. i = 0 to 30dB, even numbers only.
RCA?	Request Reverse Coarse attenuation in dB.
RPO?	Request RF Power Output level in dBm of Reverse path.
RTMP?	Request Ambient temperature in degrees centigrade.
STBY	Go to Standby mode. Turns off both RF paths.
STBY/	Go to On-line mode. Turns on both RF paths.
STBY?	Request operation mode. Returns: "STBY" or "STBY/"
SWR?	Request Repeater Software Revision.
TRK	Enable Reverse Path Tracking. (see ALCO)
TRK/	Disable Reverse Path Tracking.
TRK?	Request Tracking status. Returns: "TRK" or "TRK/"
UGN?	Request unit gain in dB. (i.e., max gain of either RF path)

Note: The default user password as shipped from the factory: WJWireless

A-3 RESPONSE STATUS VALUES

0   No Error.

1   Range error. A parameter is out of range.

2   Unknown Command.

3   Not Enough parameters.

4   Bad checksum.

5   Not Writable.

6   Length Error. String is to long.

7   General Error.

8   Password not correct.

9   Initialization Not Complete.

10   Not Logged In

11   RF Converter Module(s) communications error.

12   Not logged in as administrator.

A-4 BIT MAP OF ALARM RESPONSES

There are two alarm commands, a General Alarm command, and a Converter Alarm command. The Alarm status response for a particular alarm request consists of the original command string and one or two bytes of alarm information encoded as decimal numbers in ASCII format. The alarm information is bit encoded in each alarm byte. A set bit indicates an active alarm.

The returned alarm strings are as follows:

ALRM 255;XX

Where:

ALRM = The original command for the General alarms.

255   = General Alarm Byte.

XX   = ASCII Hex Checksum

ALRM1 255 255;XX

Where:

ALRM1	– The original command for Converter alarms.
1st 255	– Forward Converter Alarm Byte.
2nd 255	– Reverse Converter Alarm Byte.
XX	= ASCII Hex Checksum

General Alarm Byte:

Bit	Alarm
0	Forward Power Amp Fail
1	AC Power Fail
2	Forward Power Amp VSWR Fault
3	Not Used
4	Battery Low
5	Temperature Alarm
6	Not Used
7	Converter Alarm

Forward Path Converter Alarm Byte:

Bit	Alarm
0	LNA Failure
1	RF Input Power
2	DC Power Fail
3	Lock Failure
4	Power Amp Fail
5	Oscillation Fault

6	Not Used
7	Not Used

Reverse Path Converter Alarm Byte:

Bit	Alarm
0	LNA Failure
1	Max RF Input Power
2	Converter DC Power Fail
3	Lock Failure
4	Power Amp Fail
5	Oscillation Fault
6	Not Used
7	Not Used

Note that either an Oscillation Fault or a Forward Power Amp fault in the general alarm will cause power to be shut off to the Converter modules and power amp. Either an "ALCLR" command or cycling AC power to the unit is required to restore power to the modules.

A-5 BAND SETTING MAP

The Band setting defines the PCS modulation type and the band within the PCS RF spectrum where the unit is operating. The format of the modulation/band information is a numeric followed by the band letter, with no white space in between. For example, "1A" would indicate modulation type 1 and band A.

Modulation Number	Modulation
1	CDMA
2	TDMA
3	GSM

PCS Band Assignments:

Band	Frequency Allocation
A	1850 - 1865 Mhz, Reverse Path
	1930 - 1945 Mhz, Forward Path
B	1870 - 1885 Mhz, Reverse Path
	1950 - 1965 Mhz, Forward Path
C	1895 - 1910 Mhz, Reverse Path
	1975 - 1990 Mhz, Forward Path
D	1865 - 1870 Mhz, Reverse Path
	1945 - 1950 Mhz, Forward Path
E	1885 - 1890 Mhz, Reverse Path
	1965 - 1970 Mhz, Forward Path
F	1890 - 1895 Mhz, Reverse Path
	1970 - 1975 Mhz, Forward Path

PCS Channel Assignments for CDMA Modulation:

Band	Channel Assignments
A	0 - 299
B	400 - 699
C	900 - 1199
D	300 - 399
E	700 - 799
F	800 - 899

To compute the frequency of a particular channel:

Forward Path Channel Freq. = Channel# * 50kHz + 1930 MHz

Reverse Path Channel Freq. = Channel# * 50kHz + 1850 MHz

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PCS Channel Assignments for TDMA Modulation:

Band	Channel Assignments
A	1-499
B	688-1165
C	1501-1999
D	501-665
E	1168-1332
F	1335-1499

To compute the frequency of a particular channel:

Forward Path Channel Freq. = Channel# * 30kHz + 1929.990MHz

Reverse Path Channel Freq. = Channel# * 30kHz + 1850.010MHz

PCS Channel Assignments for GSM Modulation:

Band	Channel Assignments
A	512 - 585
B	611 - 685
C	736 - 810
D	586 - 610
E	686 - 710
F	711 - 735

To compute the frequency of a particular channel:

Forward Path Channel Freq. = (Channel# - 511) * 200kHz + 1930MHz

Reverse Path Channel Freq. = (Channel# - 511) * 200kHz + 1850MHz

Note: The channel number sent is: Channel# - 511

Example:

To read the current band assignment:

      BND?<CR>   Command to request the band info.

      0<CR>   Good status response from unit.

      BND 1A;XX<CR>   Response from unit to BND command.

Also, certain bands can be combined to provide a wide band unit. Bands A and D can be combined into band AD, bands B and E can be combined into band BE, and bands F and C can be combined to form band FC. If a CDMA unit is set to band FC, for example, the allowable channels would be 800 to 1199, the concatenation of the channels for bands F and C.

R19XX

Example:

To read the current band assignment:

BND?<CR>   Command to request the band info.

0<CR>   Good status response from unit.

BND 1A;XX<CR>   Response from unit to BND command.

Also, certain bands can be combined to provide a wide band unit. Bands A and D can be combined into band AD, bands B and E can be combined into band BE, and bands F and C can be combined to form band FC. If a CDMA unit is set to band FC, for example, the allowable channels would be 800 to 1199, the concatenation of the channels for bands F and C.