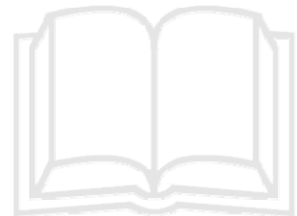


SeeGull[®] MX Scanning Receiver Hardware Reference Manual

**Document Number: 100070-00
Revision F**

June 2012





COMMENT ON DEFECTS AND OTHER ERRATA

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1. Preface

1.1. Purpose

This document is a user's manual for the SeeGull MX Scanning Receiver. It describes the main features and options available for the SeeGull MX and provides instructions related to setup, operation, and maintenance of the scanners. This document may be supplemented by other documentation for the SeeGull MX or related PCTEL products and applications.

1.2. Applicability

The SeeGull MX Scanning Receiver conducts drive test and site-specific measurements of mobile networks around the world to optimize wireless network performance, survey tower sites, monitor base stations, demodulate RF signals and analyze wireless market data.

The SeeGull MX Scanning Receiver is a software-defined receiver, capable of supporting multiple protocols and up to 8 frequency ranges. It can be configured for TD-LTE, LTE-FDD, WCDMA, CDMA, EV-DO and GSM technologies. The following bands are supported for LTE-FDD with a subset of these bands supported for WCDMA, CDMA, EV-DO and GSM:

- E-UTRA 12 (Lower 700 MHz A/B/C)
- E-UTRA 17 (Lower 700 MHz B/C)
- E-UTRA 13 (Upper 700 MHz C)
- E-UTRA 18 (Lower 800 MHz Japan)
- E-UTRA 19 (Upper 800 MHz Japan)
- E-UTRA 20 (800 MHz EU)
- E-UTRA 5 (850 MHz)
- E-UTRA 26 (Upper Ext 850 MHz)
- E-UTRA 27 (Lower Ext 850 MHz)
- E-UTRA 8 (900 MHz UMTS)
- E-UTRA 11 (1500 MHz Japan)
- E-UTRA 21 (1510 MHz Japan)
- E-UTRA 9 (1700 MHz Japan)
- E-UTRA 3 (1800 MHz)
- E-UTRA 2 (1900 MHz)

- E-UTRA 25 (1990 MHz [Ext. 1900])
- E-UTRA 4 (2100 MHz AWS)
- E-UTRA 1 (2100 MHz UMTS)
- E-UTRA 7 (2600 MHz IMT)

The following bands are supported for TD-LTE:

- E-UTRA 38 (IMT Extension 2.5G)
- E-UTRA 39 (1.8 TDD)
- E-UTRA 40 (2.3 TDD)
- E-UTRA L41 (Lower 41 2.5G)

For more information about the SeeGull MX, please contact your sales or marketing representative (contact information provided in *Section 8.1*).

Features

- Fast scanning speeds
- High dynamic range
- Low false detection rate
- Scans multiple bands without performance degradation
- Concurrent measurements in:
 - LTE/WCDMA/GSM
 - LTE/CDMA/EV-DO
- Built-in GPS
- LTE Measurement Averaging
- Outdoor and Indoor Modes
- USB Interface
- Plug-and-play capabilities
- Compatibility with industry-leading drive test, data analysis, and RF planning tools
- Modular architecture for easy upgrades
- Ignition sense
- Sleek, durable design

Supported Measurements

LTE (FDD and TDD)

- Top N and Top N Reference Signal Scan
- P-SCH/S-SCH
- RSRP, RSRQ
- CINR
- Cyclic Prefix
- Time Offset
- Multi-Path Delay Spread
- Averaging Modes

TD-LTE Specific

- Uplink/Downlink Configuration #
- DwPTS Symbol

GSM

- BSIC Decoding Scan
- RSSI Channel Scan
- C/I (Co-Channel Interference)

WCDMA

- Top N Scan
- P-SCH/S-SCH Scan
- Ec
- Ec/Io and Aggregate Ec/Io
- Signal to Interference Ratio (SIR)
- Rake Finger Count
- RSSI Channel Scan

CDMA

- Top N Scan
- Ec
- Ec/Io and Aggregate Ec/Io
- Pilot Delay and Delay
- RSSI Channel Scan

EV-DO

- Top N Scan
- Ec
- Ec/Io and Aggregate Ec/Io
- Pilot Delay and Delay
- RSSI Channel Scan

MULTI-TECHNOLOGY

- Aggregate Power Measurement (RSSI, EPS or Spectrum Analysis)

- Delay and Signal Strength of neighboring cells
- Peak Preamble Power measurement
- RSSI Channel Scans
- Spectrum Analyzer Measurements
- High Performance GPS Receiver

For more information please visit www.pctel.com.

WARNING: These devices have no protection against lightning. Please turn off the scanning receiver during a thunderstorm and, if applicable, take antennas inside the vehicle before a thunderstorm approaches. The scanning receiver itself is not intended for “in weather” outdoor use.

NOTICE: There are no user serviceable parts inside the SeeGull MX Scanning Receivers.

1.3. Compliance

CE Safety Compliance

PCTEL SeeGull MX Scanning Receivers are compliant to EN 60950 Information Technology Equipment-Safety- Part 1: General Requirements.



EMC Compliance

PCTEL SeeGull MX Scanning Receivers are compliant to EN 301 489-1 Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common Technical Requirements.

RoHS Compliance

PCTEL SeeGull MX Scanning Receivers delivered to participating European nations are compliant to EU Directive 2002/95/EC (RoHS).

PCTEL SeeGull MX Scanning Receivers are compliant to "Administrative Measure on the Control of Pollution Caused by Electronic Information Products" ("China RoHS").



ISO Compliance

RF Solutions Quality Management System has been certified to be compliant with ISO 9001:2008.

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2. Overview and System Requirements

This section describes the SeeGull MX Scanning Receiver, including the applicable system configuration and software requirements.

2.1. General Description

The SeeGull MX Scanning Receiver (*Figure 1*) is a tool for signal strength and modulation measurement, engineered for the rigors of mobile network testing during planning, installation, and maintenance of wireless networks. It supports LTE/WCDMA/GSM or LTE/CDMA/EV-DO protocols with either 4 or 8 band-designated receive antenna (RX) ports.



Figure 1. SeeGull MX Scanning Receiver

The USB communication link allows the host to control the operation of the scanner and to receive measurement results. (Refer to *Section 4* for more details).

Initial Inspection

Upon receipt of the scanning receiver, inspect the shipping container and verify that the contents are complete and match the packing list. The receiver should look similar to the picture in *Figure 1*. If the

contents are incomplete or the SeeGull MX Scanning Receiver appears damaged, please call the Technical Support line at (240) 460-8833.

2.2. Measurement Options

Optional multi-technology measurements available for the SeeGull MX are described below. These options can be installed at the time of purchase or later on as a field upgradeable option. Please contact your PCTEL sales or marketing representative for pricing and delivery information.

Enhanced Power Scan (EPS™) Option (OP514)

EPS Mode provides customizable power measurements, improving flexibility and precision over RSSI and Spectrum Analyzer measurements for highly-tuned analysis of individual parts of the RF signal. EPS features include:

- Absolute Time Stamp
- Auto and Immediate Measurement Modes
- Ability to set both Time and Frequency parameters
- Measure Frequency Spans from 7.5 kHz to 20 MHz user selectable in multiples of 2.5 kHz
- Measures Time Periods from 1 chip (50 μ s) to 20,000 chips (1sec)

Spectrum Analyzer Option (OP513)

The built-in Spectrum Analyzer feature provides an effective means to detect and troubleshoot frequency-related problems. The Spectrum Analyzer shows a wealth of information about the signal spectrum that is not obtainable from the standard channel power measurement.

The Spectrum Analyzer measures and reports power spectral density using frequency domain techniques (a segmented FFT approach that ensures various resolution bandwidths and fast update rates), whereas RSSI measurements use analog and digital filters to select the right frequency band and subsequently measure total power.

One advantage of this approach is that the Spectrum Analyzer can analyze the fast-changing spectrum of an unstable transmitter. The RSSI measurement in this case will most often show a normal smooth picture, as it averages a limited set of data over time. The Spectrum Analyzer, however, if used with an appropriate resolution bandwidth, will reveal erratic signal behavior due to its fast update rate and unaveraged data.

The user may set the resolution bandwidth to 5, 10, 20, 40 or 80 kHz. Output data may be set to an average of 1, 2, 4, 8, or 16 sweeps.

Blind Scan Options

(OP521 All Blind Scan Technologies)

(OP521-GSM)

(OP521-WCDMA)

(OP521-FD-LTE)

(OP521-TD-LTE)

Blind Scan is available for LTE-FDD, TD-LTE, WCDMA and GSM technologies. This feature scans the selected band and provides the active channel numbers. Blind Scan is useful for conducting a full band network search where prior knowledge about active channels is incomplete or unknown. It is also beneficial for network benchmarking to obtain a first-glance view of the RF infrastructure density and configuration.

LTE Power Analysis (OP516)

LTE Power Analysis is available for TD-LTE and provides power of the resource block and slot of the TD-LTE frame. This enables users to identify interference that is time (slots) or frequency (RBs)-selective, to obtain a snapshot of overall traffic levels, and to determine whether base station is properly using the available resources.

Layer 3 Options

(OP522 All Layer 3 Options)

(OP522-GSM)

(OP522-TD-LTE)

(OP522-WCDMA)

Layer 3 decoding is available for GSM, TD-LTE, and WCDMA technologies. This option, provides decoding for:

- GSM BCCH (Broadcast Control Channel) messages
- WCDMA BCH (Broadcast Control Channel) Type 3 messages
- TD-BCH (Broadcast Control Channel)

In the GSM BCCH, types 1, 2, 3, 4, 9, and type 13 messages are supported. In the WCDMA BCH, the Master Information Block (MIB) and the System Information Blocks (SIBs) 1, 2, 3, 5, 7, 11 and 19 are supported. In the GSM BCCH and the WCDMA BCH, these messages contain the Cell Identity and Local Area Identification information broadcast by the network infrastructure. This information includes the:

- MCC (Mobile Country Code),
- MNC (Mobile Network Code),
- LAC (Location Area Code)
- RAC

These messages also contain significant information on the configuration, activity and performance of the network. This includes information concerning:

- Neighbor list
- Mobility management (handovers, etc.)
- Group and broadcast call control
- GPRS mobility management, transparent transport and session management
- Radio resource management
- SMS messages
- Location services
- Uplink Interference parameters (WCDMA only).

TD-LTE BCH layer 3 messages convey system information about the cell. These messages contain the cell identity, channel bandwidth, mobility management (handovers), neighbor lists, barred cells, intra-frequency selection, public safety messages, etc. It supports decoding of the MIB and SIBs 1-13.

The SeeGull MX supports scanning of numerous GSM BCCH and WCDMA/TD-LTE BCCH channels during the same test.

2.3. System Requirements

This section describes the system requirements for the SeeGull MX Scanning Receiver.

Typical System

Various hardware and software components may be used in the scanning system along with the SeeGull MX Scanning Receiver. However, a typical configuration will include a host PC running the user's application software with a USB cable connection to the scanner.

Antenna Requirements

Use a 50 Ohm impedance antenna with an SMA male connector at the end of the cable. Refer to PCTEL's product offering matrix in *Section 9* for part number information.

Note: Outdoor antennas, including those used by other devices, should be placed a minimum of 6 in. (15 cm) apart, with a recommended distance of 34 in. (86 cm). Refer to the Instructional Guide: **SeeGull Antennas for MIMO and MISO Antenna Schemes** for further details.

Power Source Requirements

The SeeGull MX Scanning Receiver uses 8 to 16 VDC using the cigarette lighter cable and 10 to 16 VDC for the 12 foot battery/fuse box cable (measured at the battery connector) and draws 6.0 amps (nominal) @ 12 VDC. The maximum current rating is 10 amps. The scanner can be powered by a vehicle battery, a 12-volt battery, or an AC/DC adapter. The power source must be capable of supplying the receiver with the voltage and current levels as above. PCTEL HIGHLY recommends that the power supply voltage not exceed the working range of the SeeGull MX Scanning Receiver. Applying excessive voltage to the receiver will void the unit's warranty.

The scanning receiver must be powered through the power cable provided by PCTEL. The power cable is equipped with an additional tab to sense the voltage drain of the vehicle's battery or if the vehicle's ignition is turned off. This feature is called **Ignition Sense Feature** and is very useful to prevent the vehicle's battery from discharging if the scanner is left on when the vehicle is turned off. In order to prevent the scanner from draining the vehicle's battery, the ignition sense wire turns off the

scanner when it senses the vehicle ignition has been off for 30 minutes or the available power drops below the usable voltage. The wire connects to any fuse socket on the vehicle that has power when the vehicle's ignition is turned on.

Use of another power cord will void any warranties and may result in an unsafe condition. Refer to Section 7.1 for further details on power cord troubleshooting.

Software Requirements

Option 1:

SeeHawk

PCTEL's SeeHawk (Figure 2), a data collection software package, allows for

control of PCTEL's receivers and data acquisition without the need for users to develop their own software. Contact your PCTEL sales representative for more information.

Option 2:

Windows Based Control

For users planning to develop proprietary software to control the SeeGull MX Scanning Receiver using the Windows OS, PCTEL can provide the SeeGull MX Scanning Receiver Applications Programmers Interface (API) and Reference or ASN.1 Reference documents.

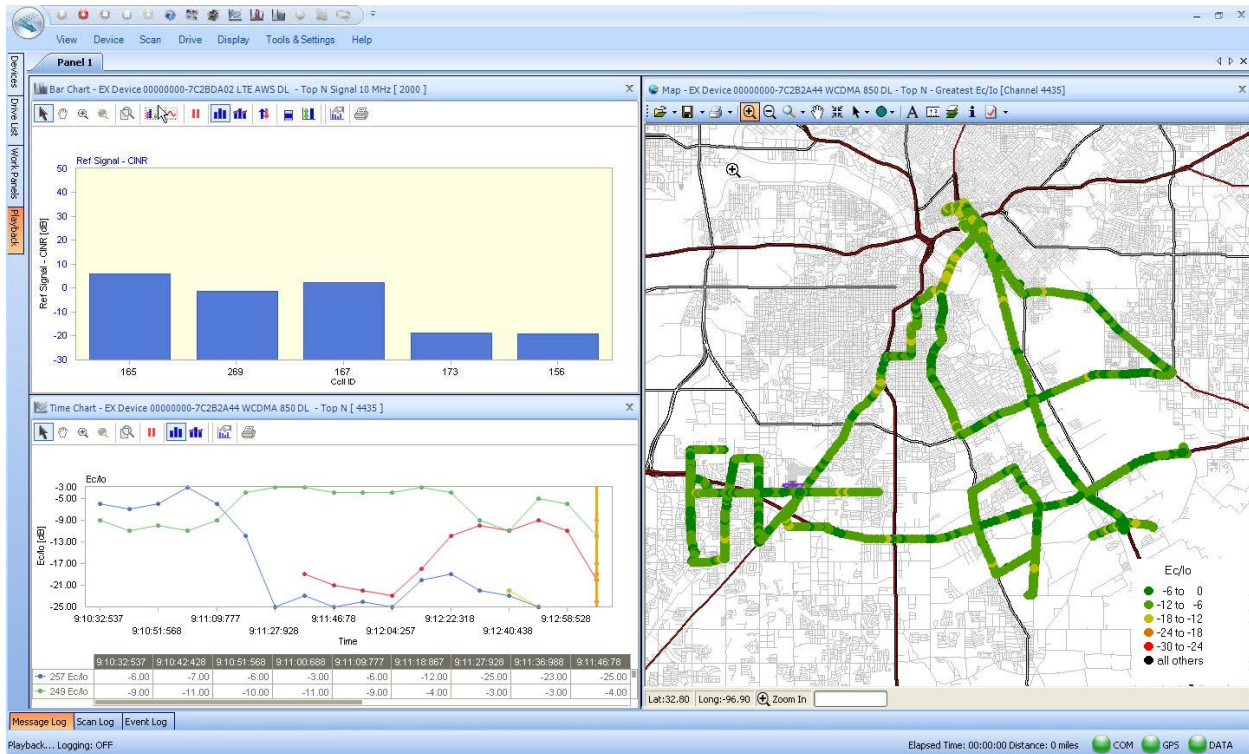


Figure 2. Display from SeeHawk, SeeGull's Optional Drive Test Software Suite

3. Installation

This section describes how to set up the SeeGull MX Scanning Receiver.

3.1. Integration

There are four (4) mounting holes (4-40 screw) on the chassis of the unit that are used for mounting in the user's enclosure/rack.

Avoid obstructing airways when mounting this unit in a system enclosure, rack, or case. Unobstructed convection airflow is recommended.

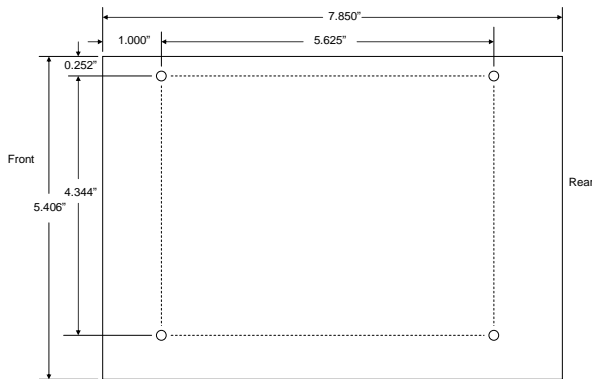


Figure 3. SeeGull MX Scanning Receiver Bottom View

Note: Do not obstruct air intakes or exhaust on unit. Do not place the unit intakes next to the exhaust of another heat source.

Airway intakes are located on the right, and airway exhaust is located on the left, as shown in Figure 4 and Figure 5.

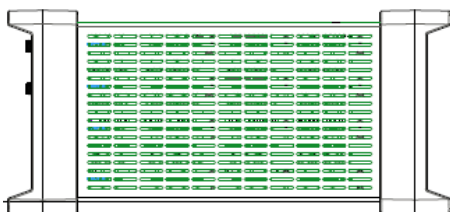


Figure 4. SeeGull MX Scanning Receiver Air Intake (Right Side View)

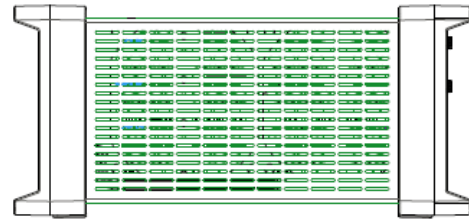


Figure 5. SeeGull MX Scanning Receiver Air Exhaust (Left Side View)

3.2. Setup

Follow the steps below to connect the unit to the host PC and power source before collecting data. See Figure 7 for the locations of connections and switches on the front of the SeeGull MX.

1. Connect the antennas to the SMA RF connectors on the unit. The antenna ports RF1 to RF4 (or RF1 to RF6 or RF8 for MIMO-enabled units) on the label (in Figure 6) show the frequencies supported on each RF port. The frequency range of the antenna must include the frequency band of the RF port to which it is connected. For example, the "RF4" box on the label in Figure 6 lists 850 and L 700 ABC bands (where "L" stands for Lower). Therefore, connect PCTEL's 698-2300 MHz low band antenna to this port (for outdoor use).

Note: Refer to the Instructional Guide: **SeeGull Antennas for MIMO and MISO Antenna Schemes** for further detail on connecting the proper antenna type to the correct antenna port.

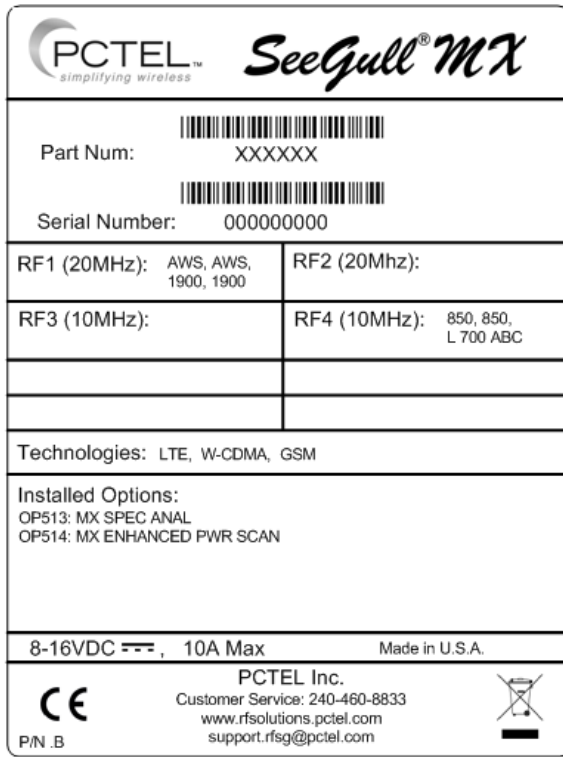


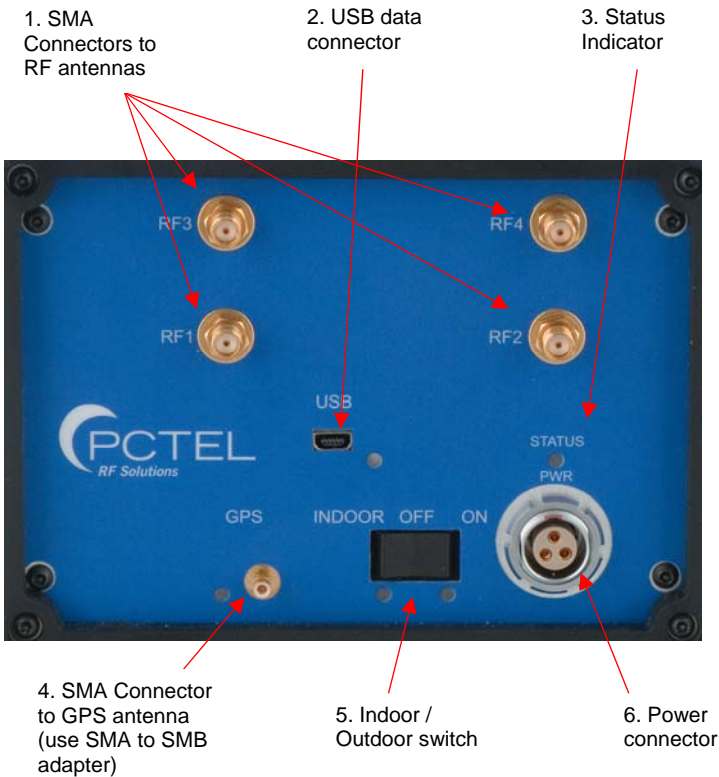
Figure 6. Label Identifying Antenna Locations

2. Connect the GPS antenna (or input) to the GPS SMA connector (4). An SMA to SMB adapter is shipped in a bag labeled OP225 with the SeeGull MX to allow the OP034H SMB connector on the GPS antenna to mate with the SeeGull MX GPS port.
3. Connect the USB data connector (2) to a PC USB port with the USB cable.
4. Connect the power cable to the scanner's power connector (6) and to the vehicle's cigarette lighter adapter. Make sure to line up the red dots on the cable and the power connector.
5. Optionally, connect the ignition sense wire, a wire on the power cable which can be used to sense power to your ignition. Refer Section 2.3 for further details of the ignitions sense feature.

The scanner will operate normally whether or not the ignition sense wire is used.

6. Turn the SeeGull MX scanner on by moving the Indoor/Outdoor switch (5) from the OFF position to the INDOOR or ON position. ON mode is used for normal outdoor operation. INDOOR mode reduces the fan noise emanating from the scanner for indoor operation. Future plans include reducing power consumption for indoor mode.

- **Note:** The GPS LED colors indicate the following states:
- Green: GPS module locked to GPS signal
- Amber: GPS module unlocked
Flashing Amber: Lost GPS lock within past 5 seconds
- Red: System Error
- Purple: GPS not trained (may take up to 20 minutes and will only occur after a software upgrade from early software versions)



7. During power-up, the status LED (3) is amber for up to several **minutes**. After initialization is complete the status LED turns green. If the LED turns dark red, the unit has failed the power-up test. Please contact Technical Support.
8. Install and start your PC drive test program. If you are using SeeHawk, refer to the SeeHawk User Manual for specific instructions.
9. The system is ready for use. Afterwards, please turn the Indoor/Outdoor switch (5) to OFF and disconnect all cables.

Figure 7. Connections and Switches for SeeGull MX



Figure 8. Connections and Switches for SeeGull MX Setup with 8 MIMO ports

4. Operation

This section discusses calibration, software upgrades, and integration of the SeeGull MX Scanning Receiver into the user's test system.

4.1. Calibration

SeeGull MX Scanning Receivers are calibrated at the factory. Recalibration is recommended every two years in order to maintain specified accuracy levels. The date of the last calibration is listed on a label attached to the SeeGull MX. Please refer to the Calibration Notice in Section 8.3 for more information. Re-calibration is available as an optional service from PCTEL.

Note: PCTEL recommends having the SeeGull MX Scanning Receiver recalibrated every 2 years.

4.2. Software Upgrades

The SeeGull MX Scanning Receiver stores the application program in internal, non-volatile memory, enabling software-based upgrades to the scanner. Upgrades may be needed to incorporate new features or bug fixes. Please note that some upgrades can only be performed at PCTEL's factory.

4.3. Controlling the Scanner and Acquiring Data

Once the SeeGull MX has been set up (see *Section 3*), software such as PCTEL's SeeHawk may be used to control the scanner and acquire data.

A unit is controlled and the measurement data are received, via the USB communication link.

- If the user incorporates the scanner into a test system that runs on Windows Vista,

Windows XP, or Windows 7 use PCTEL's Application Programming Interface (API).

- If the user has a system that runs on an operating system other than Windows, use the description of the USB interface and messages found in the SeeGull MX Product Reference.

5. RF Antenna Information

This section discusses antennas that are used with the SeeGull Scanning Receiver system.

5.1. Antenna Verification

Verify that all the necessary antennas are included in the shipment and that each is marked. Each antenna comes in a bag labeled by the antenna's model and its corresponding frequency range, while the antenna itself is labeled by frequency range only.

5.2. Cellular Antennas

PCTEL offers four antennas that are industry superior antennas supporting low-loss cable, extended temperature ranges and a frequency range wide enough to cover PCTEL's SeeGull MX scanning receiver.

The OP078H is a High Performance antenna supporting a wide frequency range from 698 MHz to 2.3 GHz as shown in *Figure 9*. It supports 850, 900, 1800, 1900 and 2100 MHz band scanning receivers and provides a gain¹ of >2 dBi @ 698 - 1990 MHz and >1 dBi @ 1990 - 2300 MHz. The antenna comes standard with a magnetic mount base and a male SMA connector for the RF.



Figure 9. OP078H & OP216

The OP216, is a high performance multi-mode antenna that supports upper frequency bands, including the 1700, 1800, 1900, 2500 and 2600 MHz band scanning receivers. It provides a gain² of 4 dBi across the entire spectrum. The antenna comes standard with a magnetic mounting base and a male SMA connector for the RF, as shown in *Figure 9*.

The OP079H, as shown in *Figure 10*, has a built-in High Performance GPS base and a High Performance antenna which supports a wide frequency range from 698 MHz to 2.3 GHz. It supports 850, 900, 1800, 1900 and 2100 MHz band scanning receivers and provides a gain¹ of >2 dBi @ 698 - 1990 MHz and >1 dBi @ 1990 - 2300 MHz. The antenna comes standard with a male SMA connector for the RF and an SMB (push-on/pull-off) adapter for the GPS.

The OP217H, as shown in *Figure 10*, has a built-in High Performance GPS base and a high performance multi-mode antenna. It supports upper frequency bands for the 1700, 1800, 1900, 2500 and 2600 MHz band scanning receivers. It provides a gain² of 4dBi across the entire spectrum. The antenna comes standard with a male SMA connector for the RF and an SMB (push-on/pull-off) adapter for the GPS.

¹ dBi gain includes both base and cable losses

² dBi gain DOES NOT include base or cable losses



Figure 10. OP079H & OP217H

Note: The SeeGull MX Receiver typically requires multiple antennas.

5.3. GPS Antenna Information

In addition to the built-in GPS antennas described in the previous section, PCTEL offers a separate GPS antenna, as shown in *Figure 11*. The OP034H is a High Gain GPS standalone antenna which comes standard with a magnetic mounting base and an SMB connector, as well as an SMA to SMB adapter to connect the GPS plug to the scanning receiver.

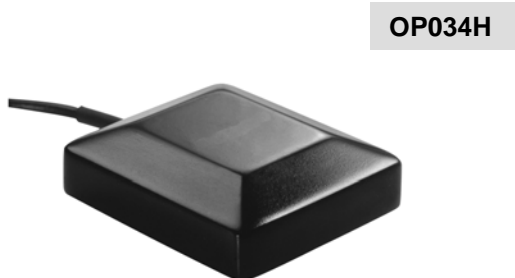


Figure 11. OP034H

6. Indoor Kit Information

Deployment of wireless data services is resulting in further increases in indoor traffic and coverage requirements. The measurement, enhancement and optimization of indoor coverage are now an increasingly important aspect of wireless engineering.

The PCTEL SeeHawk Indoor Kit comprises a complete set of accessories that enable the indoor use of the PCTEL SeeGull scanning receivers. The Indoor Kit provides a cost effective solution for evaluating existing in-building coverage and for planning, deploying and testing indoor coverage systems.

The PCTEL Indoor Kit provides the right solution for indoor “Walk Testing” that enables wireless engineers to address the three key steps of indoor coverage assessment and planning:

- Evaluating Indoor Coverage from Outside Networks
- Planning New In-Building Networks
- Coverage Validation for New or Existing In-Building Networks

6.1. Indoor Kits

The indoor kit for the SeeGull MX consists of a backpack (shown in *Figure 12*) and related accessories for convenient indoor measurements using the SeeGull scanning receiver for indoor measurements. Battery life is approximately 4 hours. The OP153 Indoor Kit consists of

- Backpack
- Battery with integrated charger
- MX USB data cable
- MX Power cord
- AC power cord
- EU adapter for AC power cord

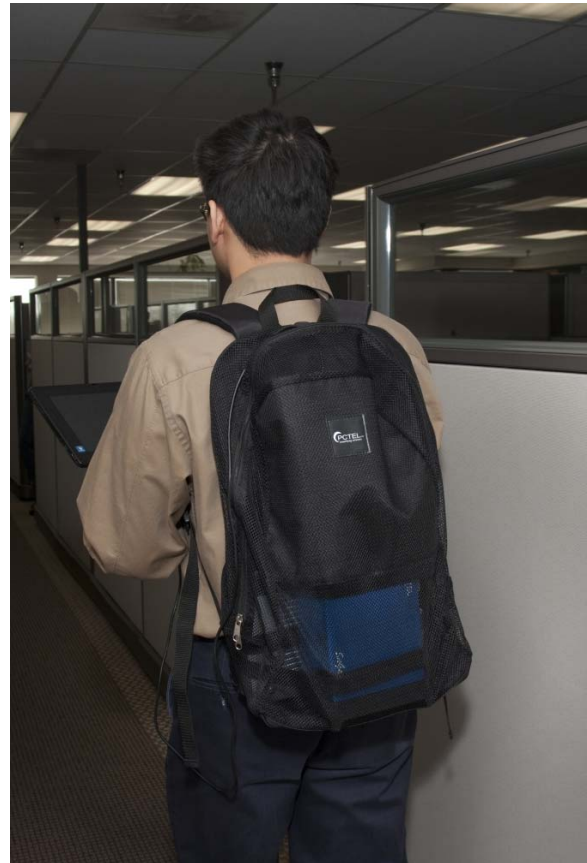


Figure 12. MX Indoor Kit

6.2. RF Indoor Antenna Information

PCTEL offers wideband rubber duck style antennas for indoor use. There are two models depending on the frequency required.

- OP228: Indoor Ant. 700-1050 MHZ, 1550-2300 MHZ
- OP229: Indoor Ant., 2300-2700 MHZ

7. Troubleshooting

This section includes suggested procedures for addressing potential user-serviceable problems with SeeGull MX operation.

7.1. No Power: Receiver LED not Illuminated

When the scanning receiver is turned on and receiving power, the Status Indicator LED located on the face of the scanner lights up. If the scanner is not receiving power, follow these steps:

1. Check the connection to the power source.
2. If the connection is secure, check the fuse, which is located in the cigarette lighter end of the power cord. Remove the cigarette lighter plug end from the power source. Refer to *Figure 13* for an illustration of the power plug.

Note: Check The Fuse in the Cigarette Lighter Plug Before Sending the Scanner for Service

The fuse can be “blown” by a surge in the portable or mobile battery system. A temporarily shorted wire can also cause other problems.

The fuse is the first line of defense should any short circuit, large spike, or other problems occur within the power wiring circuitry. If the fuse is not operating normally, it will open up, thereby disconnecting the input power from the SeeGull MX Scanning Receiver. When the fuse “blows”, there will be no power to the receiver.

3. Loosen the fuse-holding finger nut by turning it counter-clockwise until the plug comes apart. The fuse is inside the power plug housing and can be removed.

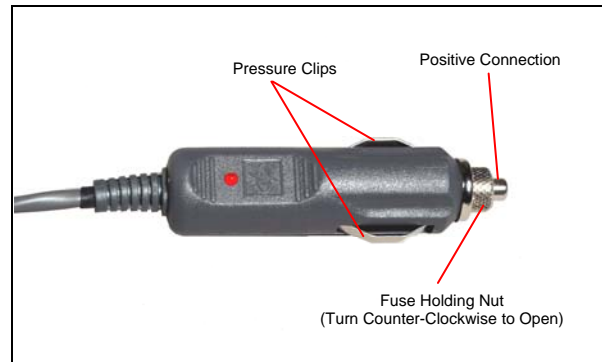


Figure 13. SeeGull MX Scanning Receiver Power

4. Replace the fuse with an identical 12-amp fast blow fuse.

Note: Only use a 12-amp fast blow fuse; any other fuse value may cause severe problems with the unit and void the warranty. In order not to violate the safety approval of the receiver, the fuse must be safety approved.

5. Insert the new fuse in the housing and re-assemble the plug by turning the knurled finger nut in a clockwise direction. Tighten this nut as tight as you can with your fingers.

Note: Do Not Use Tools to Tighten

7.2. Received Signal Strength Appears Low

A received signal strength that appears to be lower than expected is likely caused by one of the following problems:

1. an incorrect antenna is being used
2. an antenna is not properly connected
3. the antenna or antenna cable is damaged.

Check that the antenna is properly connected to the scanner, and that the antenna is of the correct frequency.

8. Support

This section provides support information, including PCTEL contacts, warranty information, calibration notice, and technical specifications.

8.1. Contact Information

For more information, visit <http://rfsolutions.pctel.com>.

Phone Numbers	
Departments	Contact Information
MARKETING/PRODUCT FEEDBACK	+1-301-444-2006
CUSTOMER SUPPORT / RMA REQUESTS	+1-240-460-8833
QUALITY MANAGER	+1-301-444-2045
SALES	+1-301-515-0036

Table 1: Phone Numbers

Email Addresses	
Departments	Contact Information
PRODUCT FEEDBACK	PRODUCTFEEDBACK@PCTEL.COM
CUSTOMER SUPPORT / RMA REQUESTS	SUPPORT.RFSG@PCTEL.COM
QUALITY MANAGER	QUALITY.RFSG@PCTEL.COM
SALES	RFS.SALES@PCTEL.COM

Table 2: Email Addresses

8.2. Warranty Information

WARRANTY

PCTEL warrants that the SeeGull MX will be free from defects in material and workmanship for a period of three (3) years from the date of shipment under normal use and operation. PCTEL's sole and exclusive obligation under the foregoing warranty shall be, at its option, to repair or replace any defective Product which fails during the warranty period, provided that PCTEL receives written notice of the defect during the warranty period. The expense of removal and reinstallation of any item(s) of equipment is not included in this warranty. This warranty shall only apply to the Product purchased or licensed and shall not apply to any other equipment and its removal and reinstallation. **THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** Repair or replacement in the manner provided above shall be the sole and exclusive remedy of Buyer for breach of warranty and shall constitute fulfillment of all liabilities of PCTEL with respect to the quality and performance of the Products. PCTEL shall have no obligation to make repairs or replacement necessitated by catastrophe, fault, negligence, misuse, abuse or accident of Buyer or other users. **IN NO EVENT SHALL PCTEL BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES TO BUYER OR ANY THIRD PARTY ARISING OUT OF THESE TERMS AND CONDITIONS OR ANY DEFECTIVE PRODUCT WHETHER THE DEFECT IS WARRANTED AGAINST OR NOT, WHETHER THE CLAIM IS BASED UPON CONTRACT, TORT, STRICT LIABILITY**

OR OTHERWISE, NOR SHALL PCTEL BE LIABLE TO BUYER FOR ANY AMOUNT EXCEEDING THE PURCHASE PRICE OF THE PRODUCT.

Warranty Procedures

See Return Material Authorization (RMA) Process further below.

8.3. Calibration Notice

Note: PCTEL recommends having the SeeGull MX Scanning Receiver recalibrated every 2 years.

SeeGull MX Scanning Receivers are calibrated at the factory as an optional service from PCTEL. PCTEL recommends recalibration every 2 years in order to maintain specified accuracy levels.

SeeGull Scanning Receivers are calibrated for several sources of variations, including amplitude levels, ambient temperature, input frequency, and internal noise levels for narrow and wide channel bandwidths. Automated test and calibration stations use proprietary software which performs the calibration process with minimum human intervention. Calibration is followed by a fully automated production test. The test results are stored in a central quality database and then extracted and used for periodic quality audits.

Every unit that passes the calibration and test process successfully receives a Certificate of Calibration. This Certificate is shipped back with the unit.

The complexity of the calibration process precludes field calibration. PCTEL recommends returning scanning receivers to the factory biennially to maintain the units' exceptional measurement capability.

8.4. Return Material Authorization Procedure for the SeeGull MX Scanning Receivers

NOTICE: There are no user serviceable parts inside the SeeGull Receiver. *Any tampering with the components within the unit will void any applicable warranties.*

All repairs must be performed by PCTEL in accordance with the procedure outlined below:

1. Complete the RMA form on the website at:

http://rfsolutions.pctel.com/rfs_rma_form.cgi

Alternatively, send the information (your name and contact information, the company's name and address, the serial number and protocol of the unit, and a description of the problem) via email to "support.rfsg@pctel.com".

2. A response including an RMA number and in-warranty or out-of-warranty information will be provided within 24 hours, or the next working day.
3. Please ship the unit to:

PCTEL, Inc.
RF Solutions
Attn: RMA Coordinator
20410 Observation Drive
Suite 200
Germantown, MD 20876
+1 240.460.8833

4. Reference PCTEL's RMA number on all shipping documentation.

Note: Units returned to PCTEL without an RMA number cannot be processed.

9. Accessories and Service Options

9.1. Accessories

SeeGull MX Scanning Receiver Accessories	
Cables	
Part Number	Description
OP152	MX POWER CABLE, BATTERY KIT - 12 FEET (3.7 METERS)
OP157	MX POWER CABLE, BATTERY KIT - 8 FEET (2.4 METERS)
OP223	MX POWER CABLE, VEHICLE LIGHTER - 9 FEET (2.75 METERS)
OP224	MX USB A-MINI DATA CABLE - 6 FEET (1.8 METERS)
OP225	ADAPTER, SMA PLUG TO SMB JACK

Table 3: SeeGull MX Cables and Connectors

Antennas	
Part Number	Description
OP034H	ANT, GPS HIGH GAIN
OP078H	ANT, 698-2300 MHZ MULTI-BAND MAG. MOUNT, HIGH PERFORMANCE
OP079H	ANT, 698-2300 MHZ MULTI-BAND MAG. MOUNT W/ GPS, HIGH PERFORMANCE
OP216	ANT, 1700-2700 MHZ MULTI-BAND MAG MOUNT
OP217H	ANT, 1700-2700 MHZ MULTI-BAND MAG MOUNT W/ GPS
OP228	INDOOR ANTENNA 700-1050, 1550-2300 MHZ
OP229	INDOOR ANTENNA 2300-2700 MHZ

Table 4: SeeGull MX Antennas

Indoor Kits, Battery Packs	
Part Number	Description
OP154	UNIV INPUT AC/12VDC ADPT.
OP153	INDOOR KIT - MX INCLUDES BACKPACK, BATTERY KIT AND PC TO SCANNING RECEIVER CABLE; MUST PURCHASE INDOOR ANTENNA SEPARATELY
OP156	BATTERY KIT - MX INCLUDES BATTERY WITH INTEGRATED CHARGER, BATTERY CABLE, US POWER CORD AND ADAPTER FOR EU
OP158	SPARE BATTERY/CHARGER CABLE- MX

Table 5: SeeGull MX Indoor Kit Accessories

9.2. Service Options

SeeGull MX Service Option	
Calibration Services	
Part Number	Description
OPS103	CALIBRATION CHECK: SEEGULL MX 4 BAND RECEIVER
OPS92	CALIBRATION CHECK: SEEGULL MX 8 BAND RECEIVER
OPS104	FULL CALIBRATION FOLLOW-ON: SEEGULL MX 4 BAND RECEIVER
OPS93	FULL CALIBRATION FOLLOW-ON: SEEGULL MX 8 BAND RECEIVER
OPS105	FULL CALIBRATION: SEEGULL MX 4 BAND RECEIVER
OPS94	FULL CALIBRATION: SEEGULL MX 8 BAND RECEIVER
OPS106	EXTENDED CALIBRATION REPORT: SEEGULL MX 4 BAND RECEIVER
OPS95	EXTENDED CALIBRATION REPORT: SEEGULL MX 8 BAND RECEIVER

Table 6: SeeGull MX Calibration Service

Fixed Cost Repair Service	
Part Number	Description
OPR05	RMA EVALUATION FEE: QUOTED TO CUSTOMERS WITH UNITS OUTSIDE OF WARRANTY WHO SEND UNITS IN FOR EVALUATION. ONLY CHARGED IF UNIT DOES NOT NEED REPAIR. IF REPAIR IS NEEDED, THE CUSTOMER PAYS THE FIXED COST REPAIR PRICE. THE EVALUATION FEE IS CREDITED TOWARDS THE REPAIR.
OPR29	FIXED COST REPAIR: SEEGULL MX 4 BAND RECEIVER
OPR24	FIXED COST REPAIR: SEEGULL MX 8 BAND RECEIVER

Table 7: SeeGull MX Repair Service

Warranty Extensions	
Part Number	Description
OPS107	1 YR EXTENDED WARRANTY: SEEGULL MX 4 BAND RECEIVER
OPS96	1 YR EXTENDED WARRANTY: SEEGULL MX 8 BAND RECEIVER

Table 8: SeeGull MX Warranty Options

For further information please contact your PCTEL sales or marketing representative.

About PCTEL RF Solutions

PCTEL, Inc. is a recognized leader in high performance RF data collection components and systems used worldwide by leading drive test system OEMs, network operators, and engineering services companies to measure, monitor and optimize wireless networks. Its SeeGull® line of multi-standard demodulating Scanning Receivers, CLARIFY® Interference Management System, SeeHawk™ Wireless Drive Test Suite, and InSite® Data Collection software provide a diverse set of tools that allow RF engineers to measure and optimize Radio Access Networks for all leading wireless technologies. PCTEL RF Solutions Quality Management System has been certified to be compliant with ISO 9001:2008.

PCTEL offers its RF Solutions products directly and through leading drive test tool vendors.

For more information, go to:
www.rfsolutions.pctel.com.

PCTEL RF Solutions products are protected under the following U.S. patents:
7,272,126; 7,236,746;
7,050,755; 7,013,113;
6,950,665; 6,931,235;
6,917,609; 6,816,709;



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