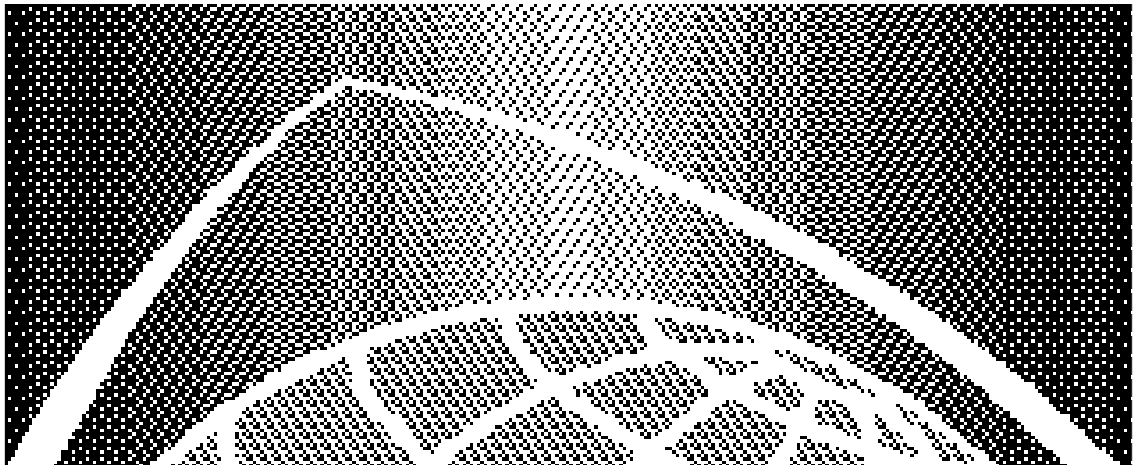


# Globalstar™



**Globalstar Portable  
User Terminal Car Kit  
FCC Part 25  
Certification Report  
FCC ID: J9CGSCK1**

**80-98832-1 X1**

**QUALCOMM Proprietary:** *Restricted  
Distribution (This document contains critical  
information about QUALCOMM products and may  
not be distributed to anyone that is not an  
employee of Qualcomm without the approval of  
Configuration Management)*



QUALCOMM Incorporated  
6455 Lusk Blvd.  
San Diego, CA, 92121-2779  
U.S.A.

Copyright © QUALCOMM, Incorporated, 1999.  
All rights reserved. Printed in the United States of America.

All data and information contained in or disclosed by this document are confidential and proprietary information of QUALCOMM Incorporated and all rights therein are expressly reserved. By accepting this material the recipient agrees that this material and the information contained therein are held in confidence and in trust and will not be used, copied, reproduced in whole or in part, nor its contents revealed in any manner to others without the express written permission of QUALCOMM Incorporated.

This technology is controlled by the United States Government. Diversion contrary to U.S. law prohibited.

---

*QUALCOMM Proprietary : Restricted Distribution (This document contains critical information about QUALCOMM products and may not be distributed to anyone that is not an employee of Qualcomm without the approval of Configuration Management)*

---

Globalstar™ is a trademark of Loral Qualcomm Satellite Services, Inc.

Globalstar Portable User Terminal Car Kit FCC Part 25 Certification Report  
FCC ID: J9CGSCK1

80-98832-1 X1

July 16, 1999

## **MANUFACTURER**

Qualcomm Incorporated

6455 Lusk Boulevard,

San Diego, CA 92121-2779

Tel: 619-587-1121

Copyright © 1998 QUALCOMM Incorporated. All rights reserved

Printed in the United States of America

## **REGULATORY ENGINEERING MANAGER**

Jay Moulton

Director of Engineering,

Regulatory

Location: Qualcomm Building V, Office V-265I

Tel: 619-658-3428

Fax: 619-651-xxxx

e-mail: jmoulton@qualcomm.com

## **REGULATORY ENGINEERING SPECIALIST**

Paul Guckian

Staff/Manager

EMC & Regulatory: Gateway Project

Location: Qualcomm Inc. Building R office R-202L.

Tel: 619-651-1547

Fax: 619-651-1988

e-mail: pguckian@qualcomm.com

## Document Amendment Record

| DATE    | DETAILS OF CHANGE<br>(affected pages, etc.) | ISSUE<br>STATUS | MANUFACTURER<br>APPROVAL |
|---------|---------------------------------------------|-----------------|--------------------------|
| 7/15/99 | Initial Document Release                    | 1               | William Moyer            |
|         |                                             |                 |                          |
|         |                                             |                 |                          |
|         |                                             |                 |                          |
|         |                                             |                 |                          |
|         |                                             |                 |                          |
|         |                                             |                 |                          |
|         |                                             |                 |                          |
|         |                                             |                 |                          |
|         |                                             |                 |                          |
|         |                                             |                 |                          |
|         |                                             |                 |                          |
|         |                                             |                 |                          |
|         |                                             |                 |                          |
|         |                                             |                 |                          |
|         |                                             |                 |                          |
|         |                                             |                 |                          |
|         |                                             |                 |                          |

July 7, 1999

Federal Communications Commission  
Office of engineering and Technology

Re: Application for Certification of Globalstar Portable User Terminal Car Kit,  
  
FCC ID No. J9CGSCK1

Gentlepeople:

Enclosed please find the following documentation for your review:

1. FCC Form 731, including the fee processing form, for the Globalstar Gateway RF Subsystem.
2. A letter for Request for confidentiality.
3. Notification of separate fee payment submittal in the form of a check (\$610.00) #19xxxx and accompanying executed Form 159.
4. All test data and support documentation as required for certification under Part 2 and Part 25 of Title 47 of the Code of Federal Regulations Ch. 1 (10-1-98 Edition).

If any further information is required please contact myself or Paul Guckian. You may contact me directly by phone at 619-658-3542, by fax at 619-651-1982, or by e-mail at [wmoyer@qualcomm.com](mailto:wmoyer@qualcomm.com). You may contact Paul Guckian directly by phone at 619-651-1547, by fax at 619-651-1988, or by e-mail at [pguckian@qualcomm.com](mailto:pguckian@qualcomm.com).

Please inform us when the Request for Confidentiality has been accepted and also when certification has been granted.

Very truly yours,

William E. Moyer  
Sr. Engineer, EMC & Regulatory

**Applicant: QUALCOMM**

**FCC ID: J9CGSCK1**

**FCC Form 731 for Portable User Terminal Car Kit**

FCC Form 731 for Portable User Terminal Portable User Terminal Car Kit (p. 2)



Federal Communications Commission

Reference: FCC ID: J9CGSCK1

Request for Confidentiality

Pursuant to Sections 0.457 and 0.459 of the Commission's rules, Qualcomm Incorporated hereby requests confidentiality for certain aspects of the information accompanying this Application for Certification as specifically identified below:

1. Exhibit 3, Globalstar Compliance Lab Reverse Link Test Procedure  
(File: E.3 80-98735-1\_x1.pdf)
2. Exhibit 4, Globalstar Compliance Lab Out-of-Band and In-Band Noise and Spurious Emissions Test Data  
(Files: E.4a CK obn&s data.pdf, E.4b CK ibn&s data.pdf, and E.4c GS Ant Gain.pdf )
3. Exhibit 5, Globalstar CK EMC Test Plan  
(File: E.5 GS CK EMC TP.pdf)
4. Exhibit 6, Globalstar CK EMC Test Report  
(Files: E.6 CK c photo-001 ext.pdf, E.6 EMC Lab c photo-002.pdf, ... E.6 EMC Lab c photo-010.pdf and E.6. TUV CK EMC TR.pdf)
5. Exhibit 7, CAR KIT Maximum Permissible Exposure Analysis  
(File: E.7 CK MPE Analysis.pdf)
6. Exhibit 8, Frequency Stability Data (File: E.8 CK Freq. Stability.pdf)
7. Exhibit 10, Description of the Globalstar System  
(File: E.10 Description of GS.pdf)
8. Exhibit 12, GS Car Kit Outdoor Unit Drawings  
(Files: E.12a 20-81130\_X8.pdf, E.12b LD20-81130\_X8.pdf, E.12c PL20-81130-1X14.pdf, E.12d CK RF TX Block.pdf, and E.12e CK ODU Cover.pdf)
9. Exhibit 13, GS Car Kit Electronic Module (GEM) Drawings  
(Files: E.13a 20-81527\_X2.pdf, E.13b LD20-81527\_X2.pdf, E.13c PL20-81527-1x7.pdf, and E.13d 10-81100\_X2.pdf)
10. Exhibit 14, GS Car Kit Cradle Drawings  
(Files: E.14a 20-81525\_X3.pdf, E.14b LD20-81525\_X3.pdf, and E.14c PL20-81525-1X3.pdf)
11. Exhibit 15, Portable Antenna Assembly Drawings  
(Files: E.15a CV90-70766\_X7.pdf and E.15b 80-70813-1\_X4.pdf)
12. Exhibit 16, Car Kit Accessories Drawings  
(Files: E.16a CV90-81218\_X1.pdf, E.16b CV90-46361\_B.pdf, E.16c CV90-46349.pdf, E.16d PL65-66369-1X1.pdf, and E.16e CK Access Dwgs.pdf)

All items contain trade secrets and other proprietary information not customarily released to the general public. Public disclosure of this information would be harmful to Qualcomm Incorporated at this time, and would provide unjustified benefits to our competitors. These materials contain proprietary intellectual property, and Qualcomm is in the process of filing for patent protection on many of these items. Qualcomm understands that, pursuant to Rule 0.457, disclosure of any information contained in this application will not be made before the date of grant.

Very truly yours,

William E. Moyer

Sr. EMC & Regulatory Engineer

**List of Exhibits**

| <u>Exhibit</u> | <u>Description</u>                                                                       | <u>FCC Reference</u>  |
|----------------|------------------------------------------------------------------------------------------|-----------------------|
| 1              | General Information                                                                      | 2.1033 (c)            |
| 2              | Certification of Test Data                                                               | 2.911                 |
| 3              | Globalstar Compliance Lab Reverse Link Test Procedures                                   | 2.947, 2.1051         |
| 4              | Globalstar Compliance Lab Out-of-Band and In-Band Noise and Spurious Emissions Test Data | 2.1051, 2.1049        |
| 5              | Globalstar CK EMC Test Plan                                                              | 2.947, 2.1053         |
| 6              | Globalstar CK EMC Test Report & EMC Test Lab Color Photos                                | 2.1053                |
| 7              | Fixed UT Maximum Permissible Exposure Analysis                                           | 1.1310, 2.1091        |
| 8              | CK Frequency Stability Data                                                              | 2.1055                |
| 9              | CK Identification Label                                                                  | 2.1033 (c) (11)       |
| 10             | Description of the Globalstar System                                                     | 2.1033 (c) (6), (13)  |
| 11             | GS Hands-Free Car Kit Installation/User Guide                                            | 2.1033 (c) (3)        |
| 12             | Car Kit Outdoor Unit (ODU) Drawings                                                      | 2.1033 (c) (12)       |
| 13             | GS Car Kit Electronic Module (GEM) Drawings                                              | 2.1033 (c) (10), (12) |
| 14             | GS Car Kit Cradle Drawings                                                               | 2.1033 (c) (12)       |
| 15             | Portable Antenna Assembly Drawings                                                       | 2.1033 (c) (12)       |
| 16             | CK Accessories Drawings                                                                  | 2.1033 (c) (12)       |

## **EXHIBIT 1 GENERAL INFORMATION**

### **1.0 Introduction**

This document comprises the Type Approval Support Documentation for Certification of Qualcomm's Globalstar (GS) Portable User Terminal (UT) Car Kit (CK).

It provides the data required by the FCC for certification (formerly type acceptance) of intentional transmitters, to the requirements defined in 47 CFR Chapter 1 (10-1-98 Edition), Part 2, Sections 2.1033, 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, and 2.1055 and Part 25, Sections 25.202 (f), 25.204, and 25.213 (b), and (per Report and Order FCC 98-338, adopted 12-17-98) Section 25.200 (c).

Measured data provided was taken using measurement procedures in accordance with Part 2 Sections 2.1041 and 2.1057. The governing regulations are those applicable in the United States of America. Much of the content of the technical description called for in the Section 2.1033 (c) rules resides in the existing, separately published, internal Qualcomm or Globalstar documents furnished in Exhibits to this application. Please note that the information provided in all Exhibits, except Exhibits 1, 2, 9, and 11, is considered proprietary, as discussed in the aforementioned Request for Confidentiality, and is not to be freely distributed.

### **2.0 Equipment Description**

As described in Exhibits 10 and 11, the Car Kit provides the ability for a portable UT to operate within a closed vehicle, operating in a hands-free mode when installed in the dashboard-mounted Car Kit Cradle, and utilizing external antennas mounted on the vehicle exterior. In Globalstar mode, the RF signal from the UT is amplified in the Car Kit Outdoor Unit (ODU) and transmitted to overhead Globalstar satellites by the ODU's antenna. The UT communicates with overhead Globalstar satellites through the ODU and via those satellites to the nearest Globalstar Gateway and through the Gateway to the rest of the network. For terrestrial cellular mode communications using a Tri-Mode UT in a Car Kit, the Car Kit provides a passive coaxial cable interconnect to a 3<sup>rd</sup> party vehicle mounted cellular phone antenna.

Physically the Car kit is comprised of an externally-mounted Outdoor Unit (ODU), a Globalstar CK Electronic Module (GEM), the CK Cradle, and the Car kit I/O interconnect cables which tie the system together. The ODU contains an RF power amplifier (PA), a DC power regulator, digital control circuitry. The GEM provides the primary power interface and regulated power for the Car kit and UT, the optional hands-free microphone and loudspeaker interfaces, the optional privacy handset interface, and the main digital control circuitry for the Car kit. The Cradle physically holds the UT in and provides the electrical power, signal, and control interfaces to the UT. (See Exhibit 12 and the test setup drawing in Exhibit 5 .

### **3.0 Summary Technical Description**

The following table provides a quick summary of the technical information included in the executed FCC form 731 and discussed further in the following Sections of this Exhibit, and provides a roadmap to the more detailed descriptions of the Analog Fixed UT and the specific test data which are discussed or presented in this and subsequent Exhibits.

#### **3.1 Operational Frequencies**

Each Globalstar UT is capable of transmitting on any one of the frequency channels defined between 1610 and 1626.5 MHz, as described in Section 3 of Exhibit 10. In the US and other countries where one or more TDMA mobile satellite service (MSS) low earth orbit (LEO) systems are authorized to operate, Globalstar UT's transmit (and are authorized to transmit) in only the lower 9 of the 13 channels listed in Exhibit 10, operating in the frequency range from 1610 to 1621.35 MHz. Depending on local Globalstar traffic conditions, a given UT may be assigned to operate on any of the authorized channels for a given call. Multiple access and efficient frequency re-use is provided by means of code division multiple access (CDMA) technology.

#### **3.2 CDMA Modulation Technology**

The Globalstar Air Interface uses a modified form of IS-95 to support Code Division Multiple Access. CDMA was selected for Globalstar because it represents a proven technology that can provide efficient modulation scheme for satellite communications. It is relatively interference tolerant, both from a standpoint of generation of interference to other services and tolerating outside interference. As a bonus, there is a level of security inherent in the modulation scheme. It is difficult to listen into conversations or to pirate services from the system. CDMA is able to provide good voice quality while operating at relatively low RF power levels. The Globalstar CDMA is based on the existing QUALCOMM CDMA product line used for terrestrial cellular communications.

For a detailed description of the CDMA technology, see Section 4 of Exhibit 10, Description Of The Globalstar System.

#### **3.3 Operating Power Levels**

Active power control is employed in the Globalstar system to minimize collateral interference between proximate Globalstar subscribers, since as is true of any multiple access spread spectrum system, other users signals represent noise to a given users signal. Thus all signals are automatically reduced to minimum power levels by the system, transparently to the user. As defined in the Globalstar Air Interface (GAI) Specification (80-25118-1), the effective isotropic radiated power (EIRP) of a fixed UT operating at maximum power output ranges from 1 to 4 Watts, with 3 Watts being typical.

**Table 1. General Information Required for Type Acceptance**

In Accordance with FCC Rules and Regulations, 47 CFR Ch. 1 (10-01-98 Edition)  
Part2, Sections 2.1046 - 2.1055, Test measurements per Sections 2.1041 and 2.1057

| Section                           | Information Category                                                                                         |                                  |                                                                                                                                                                                                   |                                 |                           |                       |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|---------------------------|-----------------------|
| 2.1033 (c) (1)                    | <b>Name and Address of Applicant:</b><br>Qualcomm Incorporated<br>6455 Lusk Boulevard<br>San Diego, CA 92064 |                                  |                                                                                                                                                                                                   |                                 |                           |                       |
| 2.1033 (c) (2)                    | <b>FCC Identification Number:</b><br>J9CGSCK1 GLocalstar Portable User Terminal Car Kit                      |                                  |                                                                                                                                                                                                   |                                 |                           |                       |
|                                   | <b>Planned Production Quantity</b><br>Multiple                                                               |                                  |                                                                                                                                                                                                   |                                 |                           |                       |
|                                   | <b>Technical Description</b>                                                                                 |                                  |                                                                                                                                                                                                   |                                 |                           |                       |
| 2.1033 (c) (4), (5), (6), and (7) | Emission Type                                                                                                | Frequency Range and Polarization | Maximum / Nominal Power ERP (dBW)                                                                                                                                                                 | Maximum EIRP Density (dBW/4kHz) | Description of Modulation | Referenced Exhibits   |
|                                   | 1M25G1W                                                                                                      | Tx: 1610-1621.35 MHz LHCP        | 4 / 1                                                                                                                                                                                             | -18.9                           | - See Waveform -          | Exhibits 1 and 10     |
|                                   | 1M25G1W                                                                                                      | Rx: 2483.5-2500 MHz LHCP         |                                                                                                                                                                                                   |                                 | - See Waveform -          |                       |
| 25.xxx                            | <b>Maximum EIRP toward Horizon:</b>                                                                          |                                  | -29 dBW/4 kHz                                                                                                                                                                                     |                                 |                           | Exhibits 1 and 15     |
| 2.1033 (c) (13)                   | <b>Waveform:</b>                                                                                             |                                  | Waveform consists of multiple direct-sequence spread-spectrum channels whose carriers are uniformly spaced. Each CDMA channel is 1.23 MHz. Each CDMA RF waveform is QPSK.                         |                                 |                           | Exhibit 10, Section 4 |
| 2.1033 (c) (8)                    | <b>DC Voltages and Currents into Final RF Amplifier</b>                                                      |                                  | 7.3 VDC nominal, 1.5 A into ODU, stepped down from 12 VDC vehicle battery voltage. PA is isolated by multiple regulator stages from power input fluctuations                                      |                                 |                           | Exhibits 1 and 12     |
| 2.1033 (c) (3) and (9)            | <b>Instruction Books and Tune Up Procedure</b>                                                               |                                  | System is self regulating, no user tune up procedures are necessary or possible.                                                                                                                  |                                 |                           | Exhibits 1 and 11     |
| 2.1033 (c) (10)                   | <b>Description of all Circuitry and Devices which Determine and Stabilize Frequency</b>                      |                                  | Frequency stability of 10 ppm is completely determined by characteristics of portable UT. Car kit contains no synthesizer or LO's and provides only amplification of modulated RF signal from UT. |                                 |                           | Exhibits 1, 8, and 12 |
| 2.1033 (c) (10)                   | <b>Description of Circuits/Devices used to Suppress Spurious Radiation, Limit Modulation, or Limit Power</b> |                                  | System utilizes extensive filtering and open and closed loop power control.                                                                                                                       |                                 |                           | Exhibits 1 and 12     |
| 2.1033 (c) (11)                   | <b>Drawing of Equipment Identification Labels</b>                                                            |                                  | 3 Labels: Located on Bottom of ODU Chassis, Back of GEM box, and Back of Cradle                                                                                                                   |                                 |                           | Exhibit 9             |
| 2.1033 (c) (12)                   | <b>Photographs of Equipment showing Equipment Construction and Layout</b>                                    |                                  | Included in EMC Test Report, Exhibit 6                                                                                                                                                            |                                 |                           | Exhibit 6             |

### 3.4 Occupied Bandwidth and Out-of-Band Emissions (OOBE)

Conducted antenna port occupied bandwidth and out of band emissions measurements for low, mid, and high frequency transmit channels are presented in Exhibit 4, which consists of the Compliance Lab Out-of-Band Noise and Spurious Emissions Test Data, the Compliance Lab In-Band Noise and Spurious Emissions Test Data, and also the Maximum antenna gain data. The latter provides the means to estimate an upper bound on antenna radiated emissions levels using the conducted antenna port data. Direct radiated out-of-band and spurious emissions test results are presented in Exhibit 6, where the emissions were compared against and show compliance with the more stringent Part 15 radiated emissions limits, which apply to the digital control and receiver functions of the Car Kit.

### 3.5 DC Supply Voltage and Current

The Car Kit is powered by the vehicle's DC (battery) power distribution, which provides a nominal 12 VDC (10-18 VDC range) at 0.3 to 3 Amperes current draw, 30 Watts maximum load. The Vehicle DC power is stepped down by the GEM power supply to a nominal 8.4 VDC and that DC voltage is routed to the Cradle and UT, and over the special interconnecting coaxial cable to the ODU, which draws up to 1.5 Amperes when transmitting at full power. The power to the ODU power amplifier (PA) passes through multiple switching and analog power regulator stages, and the PA never "sees" any changes in the Car Kit supply voltage. It is thus virtually immune to any effects of voltage fluctuation within the defined DC power voltage input range of the Car kit. Outside that range the Car Kit simply shuts down.

### 3.6 Transmitter Adjustment and Tune-Up Procedure.

All frequency adjustments are made at the factory and no frequency adjustments are made by the user.

### 3.7 Frequency Stability

The Car Kit contains no synthesizer or local oscillators and cannot directly affect the frequency stability of the transmitted RF signal; it only provides amplification of the modulated RF signal from the UT. The frequency stability of the ODU transmit signal is thus determined by the frequency stability of the UT to which it is connected.

All UT RF oscillators are phase-lock loop locked to the output signal of a voltage controlled temperature compensated crystal oscillator (TCXO), the master oscillator of the system. It is specified to provide frequency accuracy to better than 10 parts per million over the UT's 5 year design life, with 5 ppm allocated to TCXO aging.

The UT's frequency stability could in-principle be adversely affected by variations in the supply voltage provided to the UT by the Car Kit. But as discussed in Exhibit 8, the voltage variation of the Car Kit power supply output with temperature and input Car Kit voltage variations is within the range required by the UT to maintain its inherent frequency stability.

### 3.8 Circuitry for Suppression of Spurious Radiation

Multiple stages of filtering are employed in the transmit chain from baseband through intermediate frequency (IF) to the RF transmitter output to the antenna, as can be seen in the ODU RF Board schematic, block diagram, and parts list in Exhibit 12. Multiple SAW filters are employed in the transmitter (TX) IF and Upconverter stages.

### 3.9 Maximum Permissible Electromagnetic Field Exposure

Since the Analog Fixed UT transmitting antenna is used at distances greater than 20 cm (8 inches) from the user's body (generally at much greater distances) specific absorption rate (SAR) testing is not required. An analysis of ODU antenna EM emissions levels, to conservatively determine the minimum safe approach distance with respect to the FCC uncontrolled environment exposure limits specified in 47 CFR Ch.1 (10-01-98 Edition) Section 1.1310, is presented in Exhibit 7.

**Exhibit 2 Certification of Test Data**

The data, data evaluation, and equipment configuration presented herein are a true and accurate representation of the measurements of the sample's radio frequency interference emissions characteristics as of the dates and at the times of the tests under the test conditions specified herein. This applies to all tests that were performed that did not require an Open Area Test /Site (OATS). Tests that required an OATS were performed by TUV Product Services, a Competent Body Laboratory located in the United Kingdom, as indicated in Exhibit 6.

Equipment Tested: CK RAU model GSP2400P, S/N: N1065T4DR

Dates of Test: June 7, 1999

Test Performed by:

Lab. Tech. Donald Gosnell  
Engineer: Vince Butsumyo

---

**Exhibit 3 Globalstar Compliance Lab Reverse Link Test  
Procedures**

**Exhibit 4 Globalstar Compliance Lab Out-of-Band and In-Band Noise and Spurious Emissions Test Data**

## **Exhibit 5 Globalstar Car Kit EMC Test Plan**

**Exhibit 6 Globalstar Car Kit EMC Test Report and EMC  
Lab Color Photos (Internal and External)**

## **Exhibit 7 Car Kit Maximum Permissible Exposure Analysis**

## **Exhibit 8 Car Kit Frequency Stability Data**

## **Exhibit 9 Car Kit FCC Identification Labels**

## **Exhibit 10 Description of the Globalstar System**

## **Exhibit 11 Hands-Free Car Kit Installation/User Guide**

## **Exhibit 12 Car Kit Outdoor Unit (ODU) Drawings**

## **Exhibit 13 GS Car Kit Electronic Module (GEM) Drawings**

## **Exhibit 14 Car Kit Cradle Drawings**

## **Exhibit 15 Portable Antenna Assembly Drawings**

## **Exhibit 16 Car Kit Accessories Drawings**