

HOLUX GM-200

GPS Mouse (GPS Receiver)

User's Guide

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TABLE OF CONTENTS

1. Introduction	3
1.1 Overview	3
1.2 Features	3
1.3 Technical Specifications	3
2. Operational Characteristics	4
2.1 Initialization	4
2.2 Navigation	4
3. Hardware Interface	4
3.1 Dimension	4
3.2 Interface	4
3.3 Connector	5
3.4 Magnet Pad	6
3.5 Optional Cigarette Adapter	6
4. Software Interface	6
4.1 NMEA Transmitted Sentences	6
4.2 RTCM Received Data	8
5. Earth Datums	8
5.1 Earth Datums	8
5.2 Setting Syntax	10
6. Ordering Information	10
6.1 Product Options	10
6.2 Accessories	11
6.3 Other Products	11
7. Warranty	11

1. Introduction

1.1 Overview

The **Holux GM-200 Smart GPS Receiver** is a total solution GPS receiver, designed based on SiRF Architecture. This positioning application meets strict needs such as car navigation, mapping, surveying, agriculture and so on. Only clear view of sky and certain power supply are necessary to the unit. It communicates with other electronic utilities via compatible dual-channel RS-232 and saves critical satellite data by built-in memory backup. With low power consumption, the **GM-200** tracks up to 12 satellites at a time, re-acquires satellite signals in 100 ms and updates position data every second. Trickle-Power allows the unit operates a fraction of the time and Push-to-Fix permits user to have a quick position fix even though the receiver usually stays off.

1.2 Features

The GM-200 provides a host of features that make it easy for integration and use.

1. Full navigation accuracy provided by Standard Positioning Service (SPS).
2. Compact design ideal for applications with minimal space.
3. High performance receiver tracks up to 12 satellites while providing first fast fix and low power consumption.
4. Differential capability utilizes real-time RTCM corrections producing 3-10 meter position accuracy.
5. A rechargeable battery sustains internal clock and memory. The battery is recharged during normal operation.
6. User initialization is not required.
7. Dual communication channels and user selectable baud rates allow maximum interface capability and flexibility.
8. FLASH based program memory: New software revisions upgradeable through serial interface.
9. LED display status: 4 LEDs provide users visible positioning status. LED "ON" when power connected and "BLINKING" when GM-200 got positioned. No more extra device needed.

1.3 Technology specifications.

1.3.1 Physical Dimension

- 1) Single construction integrated antenna/receiver.
Size: 105.8(W) x 65.7(D) x 31.8(H) (cm)
4.17"(W) x 2.60"(D) x 1.23"(H).

1.3.2 Environmental Characteristics

- 1) Operating temperature: 0°C to +70°C(internal temperature).
- 2) Storage temperature: -40°C to +100°C.

1.3.3 Electrical Characteristics

- 1) Input voltage: +4.75 ~ 5.5 VDC for GM-200.
+6 ~ 40VDC for GM-200-99
- 2) Backup power: 3V Rechargeable Lithium cell battery, up to 1400 hours (57.5 days) discharge.

1.3.4 Performance

- 1) Tracks up to 12 satellites.
- 2) Update rate: 1 second.
- 3) Acquisition time

Reacquisition	0.1 sec., averaged
Hot start	8 sec., averaged
Warm start	38 sec., averaged
Cold start	45 sec. averaged
- 4) Position accuracy:
 - A) Non DGPS (Differential GPS)
Position 5-25 meter CEP without SA

Velocity	0.1 meters/second, without SA
Time	1 microsecond synchronized GPS time
B) DGPS (Differential GPS)	
Position	1 to 5 meter, typical
Velocity	0.05 meters/second, typical

5) Dynamic Conditions:

Altitude	18,000 meters(60,000 feet) max
Velocity	515 meters/second (1000 knots) max
Acceleration	4 G, max
Jerk	20 meters/second, max

1.3.5 Interfaces

- 1) Dual channel RS-232 compatible level, with user selectable baud rate (4800-Default, 9600,19200,38400).
- 2) NMEA 0183 Version 2.0 ASCII output (GPGGA, GPGLL, GPGSV, GPRMC, GPVTG).
- 3) Real-time Differential Correction input (RTCM SC-104 message types 1,2 and 9).

2. Operational characteristics

2.1 Initialization.

As soon as the initial self-test is complete, the GM-200 begins the process of satellite acquisition and tracking automatically. Under normal circumstances, it takes approximately 60 seconds to achieve a position fix, 38 seconds if ephemeris data is known. After a position fix has been calculated, information about valid position, velocity and time is transmitted over the output channel.

The GM-200 utilizes initial data, such as last stored position, date, time and satellite orbital data, to achieve maximum acquisition performance. If significant inaccuracy exists in the initial data, or the orbital data is obsolete, it may take more time to achieve a navigation solution. The GM-200 Auto-locate feature is capable of automatically determining a navigation solution without intervention from the host system. However, acquisition performance can be improved as the host system initializes the GM-200 in the following situation:

- 1) Moving further than 500 kilometers.
- 2) Failure of data storage due to the inactive internal memory battery.

2.2 Navigation.

After the acquisition process is complete, the GM-200 sends valid navigation information over output channels. These data include:

- 1) Latitude/longitude/altitude
- 2) Velocity
- 3) Date/time
- 4) Error estimates
- 5) Satellite and receiver status

The GM-200 sets the default of auto-searching for real-time differential corrections in RTCM SC-104 standard format, with the message types 1,2, or 9. It accomplishes the satellite data to generate a differential (DGPS) solution. The host system, at its option, may also command the GM-200 to output a position whenever a differential solution is available.

3. Hardware interface

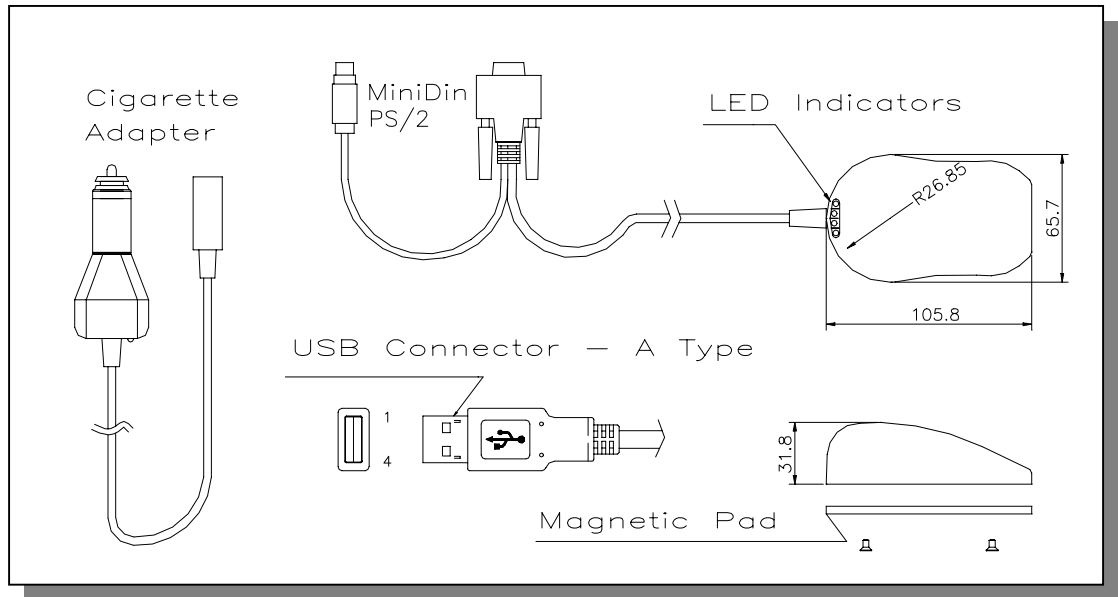
3.1 Dimension

105.8(L) x 65.7(W) x 31.8(H) mm
4.17(L) x 2.60(W) x 1.23(H) Inc

3.2 Hardware Interface

The GM-200 includes an antenna in a unique style waterproof gadget. Simply connect serial port to your notebook PC or PDA and PS-2 connector to the cigarette adapter. Optional color, input voltage and output

connector are listed and described below:

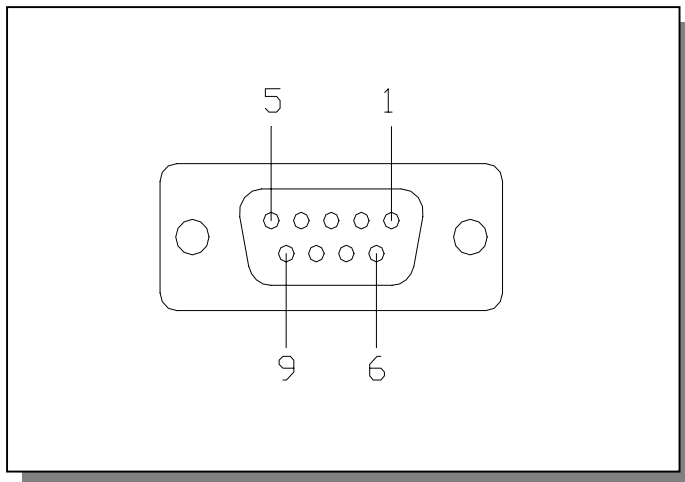


3.3 Connector

The GM-200 is equipped with optional connectors.

3.3.1 Mini Din-DB9 Female connector and PS/2 composite connectors

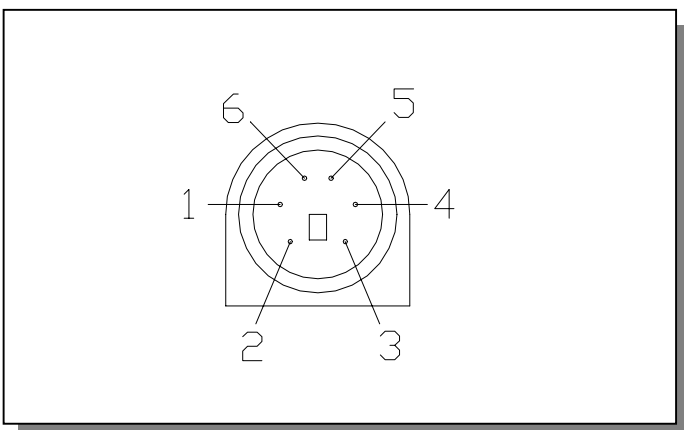
3.3.1.1 Mini Din Female connector function definition:



Pin	Signal Name
1	N.C
2	TD
3	RD
4	N.C
5	Ground
6	N.C
7	N.C
8	N.C
9	DGPS in

N.C = No connection

3.3.1.2 PS2 composite connector function definition:

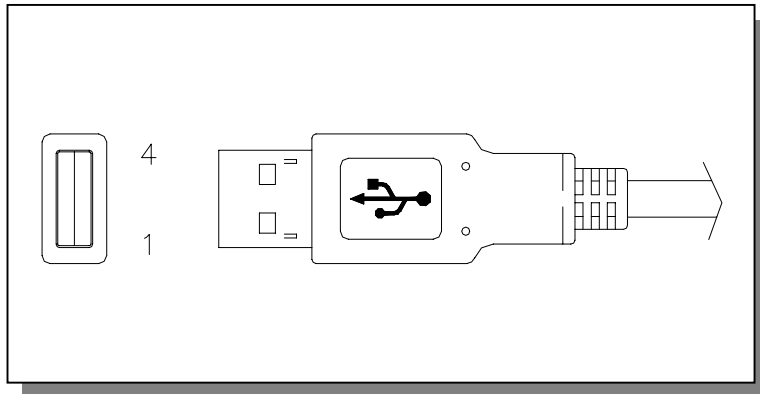


Pin	Signal Name
1	+5V
2	N.C
3	N.C
4	Ground
5	N.C
6	N.C

N.C = No connection

3.3.2 USB connector

The USB A Type is equipped with GM-200. The function definition is as follows:



Pin	Signal Name
1	+5V
2	D +
3	D -
4	Ground

3.4 Magnetic Pad

The GM-200 is also equipped with a magnetic pad for putting on top of the car or a plan surface. The GM-200 may be mounted on a bracket without magnetic pad.

3.5 Optional Cigarette Adapter

The optional cigarette adapter is with 2-meter cable, P/No.: A-20005
Input voltage: DC12V - 26V

4. Software Interface

The GM-200 interface protocol is based on the National Marine Electronics Association's NMEA 0183 ASC II interface specification, which is defined in NMEA 0183, Version 2.0 and the Radio Technical Commission for Maritime Services (RTCM Recommended Standards For Differential Navstar GPS Service, Version 2.1, RTCM Special Committee No.104).

4.1 NMEA Transmitted Messages.

The GM-200 supported by SiRF Technology Inc. also outputs data in NMEA-0183 format as defined by the National Marine Electronics Association (NMEA), Standard.

The default communication parameters for NMEA output are 4800 baud, 8 data bits, stop bit, and no parity.

Table 4-1 NMEA-0183 Output Messages

NMEA Record	Description
GGA	Global positioning system fixed data
GLL	Geographic position- latitude/longitude
GSA	GNSS DOP and active satellites
GSV	GNSS satellites in view
RMC	Recommended minimum specific GNSS data
VTG	Course over ground and ground speed

4.1.1 Global Positioning System Fix Data (GGA)

\$GPGGA,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>,M,<11>,<12>,<13><CR><LF>

- 1) UTC time of position fix, hhmmss.sss format
- 2) Latitude, ddmn.mmmm format.

- 3) Latitude hemisphere, N or S.
- 4) Longitude, dddmm.mmmm format.
- 5) Longitude hemisphere, E or W.
- 6) Position Fix Indicator,
 - 0 = fix not available, or invalid.
 - 1 = GPS SPS Mode, fix valid.
 - 2 = Differential GPS, SPS Mode, fix valid.
 - 3 = GPS PPS Mode, fix valid.
- 7) Number of satellites in use, 00 to 12.
- 8) Horizontal Dilution of Precision, 0.5 to 99.9.
- 9) MSL Altitude, -9999.9 to 99999.9 meters.
- 10) Geoidal height, -999.9 to 9999.9 meters.
- 11) Differential GPS (RTCM SC-104) data age, number of seconds since last valid RTCM transmission (null if non-DGPS).
- 12) Differential Reference Station ID, 0000 to 1023. (null if non-DGPS)
- 13) Checksum.

4.1.2 Geographic Position with Latitude/Longitude

\$GPGLL,<1>,<2>,<3>,<4>,<5>,<6>,<7><CR><LF>

- 1) Latitude, ddmT.mmmT format.
- 2) Latitude hemisphere, N or S.
- 3) Longitude, dddmT1.mmmT format.
- 4) Longitude hemisphere, E or W.
- 5) UTC time of position fix, hhmmss format.
- 6) Status, A = data valid or V = data not valid.
- 7) Checksum.

4.1.3 GNSS DOP and Active Satellites (GSA)

\$GPGSA,<1>,<2>,<3>,<3>,,,,,<3>,<3>,<3>,<4>,<5>,<6>,<7><CR><LF>

- 1) Mode 1, Fix type, 1 = not available, 2 = 2D, 3 = 3D.
- 2) Mode 2, M = manual, A = automatic.
- 3) PRN number, 01 to 32, of satellite used in solution, up to 12 transmitted.
- 4) PDOP-Position dilution of precision, 0.5 to 99.9.
- 5) HDOP-Horizontal dilution of precision, 0.5 to 99.9.
- 6) VDOP-Vertical dilution of precision, 0.5 to 99.9.
- 7) Checksum.

4.1.4 GNSS Satellites in View (GSV)

\$GPGSV,<1>,<2>,<3>,<4>,<5>,<6>,<7>,...<4>,<5>,<6>,<7>,<8><CR><LF>

- 1) Total number of GSV sentences to be transmitted.
- 2) Number of message.
- 3) Total number of satellites in view, 00 to 12.
- 4) Satellite PRN number, 01 to 32.
- 5) Satellite elevation, 00 to 90 degrees.
- 6) Satellite azimuth, 000 to 359 degrees, true.
- 7) Signal to noise ratio (C/No) 00 to 99 dB, null when not tracking.

NOTE: Items <4>,<5>,<6> and <7> repeat for each satellite in view to a maximum of four (4) satellites per sentence. Additional satellites in view information must be sent in subsequent sentences. These fields will be null if unused.

- 8) Checksum.

4.1.5 Recommended Minimum Specific GNSS Data (RMC)

\$GPRMC,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>,<10>,<11><CR><LF>

- 1) UTC time of position fix, hhmmss.sss format.
- 2) Status, A = data valid, V = data not valid.
- 3) Latitude, ddmm.mmmm format.
- 4) Latitude hemisphere, N or S.
- 5) Longitude, dddmmm.mmmm format.
- 6) Longitude hemisphere, E or W.
- 7) Speed over ground, 0.0 to 1851.8 knots.
- 8) Course over ground, 000.0 to 359.9 degrees, true.
- 9) Date, ddmmyy format.
- 10) Magnetic variation, 000.0 to 180.0.
- 11) Degrees
- 12) Checksum.

4.1.6 Course Over Ground and Ground Speed

\$GPVTG,<1>,T,<2>,M,<3>,N,<4>,K,<5><CR><LF>

- 1) True course over ground, 000 to 359 degrees.
- 2) Magnetic course over ground, 000 to 359 degrees.
- 3) Speed over ground, 00.0 to 999.9 knots.
- 4) Speed over ground, 00.0 to 1851.8 ko/hr.
- 5) Checksum.

4.2. RTCM Received Data

The default communication parameters for DGPS Input are 9600 baud, 8 data bits, stop bit, and no parity.

Position accuracy of less than 5 meters can be achieved with the GM-200 by using Differential GPS (DGPS) real-time pseudo-range correction data in RTCM SC-104 format, with message types 1,2, or 9. As using DGPS receiver with different communication parameters, GM-200 may decode the data correctly to generate accurate messages and save them in battery-back SRAM for later computing.

5. Earth Datums

5.1 Erth Datums

The following is a list of the GM-200 earth datum index and the corresponding earth datum name:

Item	Datum	Reference Ellipsoid	Data name
1	Adindan - Ethiopia	Clarke 1880	Data1.dat
2	Afgooye - Somalia	Krassovsky	Data2.dat
3	Alaska, Conus – North American 1983	GRS 1980	Data3.dat
4	Albania – S-42(Pulkovo 1942)	Krassovsky 1940	Data63.dat
5	Argentina	South American 1969	Data4.dat
6	Australia	Australian – National	Data70.dat
7	Bahrain – Ain el ABD 1970	International	Data5.dat
8	Bangladesh	Everest 1830	Data6.dat
9	Bolivia	South American 1969	Data8.dat
10	Botswana – ARC 1950	Clarke 1880	Data7.dat
11	Brazil	South American 1969	Data9.dat
12	Brunel, East Malaysia	Everest (Sabah & Sarawak)	Data37.dat
13	Canada – North American 1983	GRS 1980	Data10.dat
14	Chile	South American 1969	Data13.dat
15	Colombia	South American 1969	Data12.dat

16	Colombia – Provisional American 1956	International	Data11.dat
17	Czechoslovakia – S-42(Pulkovo 1942)	Krassovsky 1940	Data64.dat
18	Ecuador	South American 1969	Data14.dat
19	European 1950 – Central Regional Mean	International	Data29.dat
20	European 1950 - Cyprus	International	Data15.dat
21	European 1950 – Eastern Regional Mean	International	Data16.dat
22	European 1950 – Egypt	International	Data17.dat
23	European 1950 – Finland, Norway	International	Data18.dat
24	European 1950 – Greece	International	Data19.dat
25	European 1950 - Iran	International	Data20.dat
26	European 1950 – Italy (Sardinia)	International	Data21.dat
27	European 1950 – Italy (Sicily)	International	Data22.dat
28	European 1950 – Malta	International	Data23.dat
29	European 1950 – Northern Regional Mean	International	Data24.dat
30	European 1950 – Portugal, Spain	International	Data25.dat
31	European 1950 – Southern Regional Mean	International	Data26.dat
32	European 1950 – Tunisia	International	Data27.dat
33	European 1950 – Western Regional mean	International	Data28.dat
34	Guyana - South American 1969	South American 1969	Data30.dat
35	Hawaii-North American 1983	GRS1980	Data32.dat
36	Hong Kong	International	Data31.dat
37	Hu_Tsu_Shan Taiwan	International	Data33.dat
38	Hungary – S-42(Pulkovo 1942)	Krassovsky 1940	Data65.dat
39	Indian 1960	Everest 1830	Data34.dat
40	Ireland - 1965	Modified Airy	Data35.dat
41	Kazakhstan – S-42(Pulkovo 1942)	Krassovsky 1940	Data65.dat
42	Kenya, Tanzania- ARC 1960	Clarke 1880	Data53.dat
43	Latvia – S-42(Pulkovo 1942)	Krassovsky 1940	Data67.dat
44	Liberia - 1964	Clarke 1880	Data36.dat
45	Mexcio, central America	GRS1980	Data38.dat
46	OMAN	Clarke 1880	Data39.dat
47	Pakistan	Everest 1830	Data40.dat
48	Paraguay - South American 1969	South American 1969	Data42.dat
49	Peru1 - South American 1969	South American 1969	Data41.dat
50	Philippines	Clarke 1866	Data43.dat
51	Poland – S-42(Pulkovo 1942)	Krassovsky 1940	Data68.dat
52	Potsdam	Bessel 1841	Data71.dat
53	Puerto Rico – Virgin Islands	Clarke 1866	Data44.dat
54	Qatar national	International	Data45.dat
55	Qornog – Greenland (SOUTH)	International	Data46.dat
56	Regional Mean	South American 1969	Data48.dat
57	Reunion – Mascarene Islands	International	Data47.dat
58	Romania – S-42(Pulkovo 1942)	Krassovsky 1940	Data69.dat
59	Rome 1940 – Italy	International	Data49.dat
60	Saudi Arabia- Ain el Abd 1970	International	Data50.dat
61	Singapore	Modified Fischer 1960	Data51.dat
62	South Africa	Clarke 1880	Data52.dat
63	Thailand 1975	Everest 1830	Data54.dat
64	Tokyo Japan	Bessel 1841	Data60.dat
65	Tokyo_Korea	Bessel 1841	Data61.dat
66	Tokyo_Mean	Bessel 1841	Data59.dat
67	Tokyo_Okinawa	Bessel 1841	Data62.dat
68	Trinidad, Tobago	South American 1969	Data55.dat
69	Venezuela	South American 1969	Data57.dat
70	Venezuela – Provisional American 1956	International	Data56.dat
71	WGS84	WGS84	Data58.dat

5.2 Setting Syntax

5.2.1 Manufacturing Default:

Datum: WGS84.
 Baud Rate: 4800.
 Output: GGA, GSA, GSV, RMC.

5.2.2 Datum change syntax:

```
>DOS\Sirfprog /Fdataxx.dat -Px -Bx -Csh1
```

-Px: x is com port, 1= COM1 2 = COM2
 -Bx: Baud rate, 4800, 9600, 19200 or 38400

Example:
 Change Datum to WGS84,
 Sirfprog /Fdata58.dat -P1 -B4800 -Csh1 <Entry>

After changing datum, the new datum will keep in SRAM. If no power supplied to GM-200 for more than 30 days, user must re-set datum when power on.

6. Ordering Information

6.1 Product Options:

6.1.1 OutPut Connector

COMport: GM-200
 USB: GM-200-U
 Open Wire: GM-200-W

6.1.2 Input Voltage

5VDC (4.5 ~ 5.5V)
 6 ~ 30 VDC

6.1.3 Color Option

BK Black
 WT White
 TB Translucent Blue
 RD Red
 Other color by Demand

6.1.4 Products List

	Model No.	Input Voltage	Color	OutPut Connector
1	GM-200-BK	5VDC	Black	COMPort & PS/2
2	GM-200-WT	5VDC	White	COMPort & PS/2
3	GM-200-TB	5VDC	Translucent Blue	COMPort & PS/2
4	GM-200-RD	5VDC	Red	COMPort & PS/2
5	GM-200-BKW	5VDC	Black	Open Wire
6	GM-200-WTW	5VDC	White	Open Wire
7	GM-200-TBW	5VDC	Translucent Blue	Open Wire
8	GM-200-RDW	5VDC	Red	Open Wire
9	GM-200-BKU	5VDC	Black	USB
10	GM-200-WTU	5VDC	White	USB
11	GM-200-TBU	5VDC	Translucent Blue	USB
12	GM-200-RDU	5VDC	Red	USB
13	GM-200-99-BK	6~30VDC	Black	COMPort & PS/2
14	GM-200-99-WT	6~30VDC	White	COMPort & PS/2
15	GM-200-99-TB	6~30VDC	Translucent Blue	COMPort & PS/2
16	GM-200-99-RD	6~30VDC	Red	COMPort & PS/2
17	GM-200-99-BKJ	6~30VDC	Black	4-Pin Phone Jack, Serial Port

18	GM-200-99-WTJ	6~30VDC	White	4-Pin Phone Jack, Serial Port
19	GM-200-99-TBJ	6~30VDC	Translucent Blue	4-Pin Phone Jack, Serial Port
20	GM-200-99-RDJ	6~30VDC	Red	4-Pin Phone Jack, Serial Port

6.2 Accessories

A-20005 Cigarette Adapter 12 ~ 26 VDC.

6.3 Other Products

Handheld GPS: GM-100/GM-305.

Palm Vx GPS Receiver.

GPS Engine: GM-80 & its series models.

7. Warranty

The GM-200 is warranted to be free from defects in material and functions for one year from the date of purchase. Any failure of this product within this period under normal conditions will be replaced at no charge to the customers.