9602-LP Quick Start Guide

Version A

April 15, 2022
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### Revision History

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<th>Date</th>
<th>Description</th>
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### Reference Documents

The latest revisions of the NAL documents are available from the NAL Research website at [https://www.nalresearch.com/support/documentation-downloads/](https://www.nalresearch.com/support/documentation-downloads/).

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
<th>Revision/Date</th>
</tr>
</thead>
</table>
# TABLE OF CONTENTS

1. Introduction .................................................................................................................. 6
2. Device Description ......................................................................................................... 7
   2.1 Multi-interface Connector ......................................................................................... 7
   2.2 Emergency Button .................................................................................................... 9
   2.3 LED Settings ............................................................................................................. 9
3. Antennas .......................................................................................................................... 11
   3.1 Iridium Antenna Connector ..................................................................................... 11
   3.2 GPS Antenna Connector .......................................................................................... 12
4. Configuring the 9602-LP .............................................................................................. 13
5. Technical Support .......................................................................................................... 15

# TABLE OF FIGURES

Figure 1: 9602-LP Mountable Tracker ................................................................................. 6
Figure 2: Multi-Interface Connector ................................................................................... 7
Figure 3: Model HRC-24-12 Data/Power Cable Assembly .................................................. 8
Figure 4: Emergency Button ............................................................................................... 9
Figure 5: LED Status .......................................................................................................... 9
Figure 6: SMA Female 50-ohm Antenna Connector (Iridium) ............................................. 11
Figure 7: Model SYN7391-C Antenna ............................................................................... 11
Figure 8: SMA Female 50-ohm Antenna Connector (GPS) .................................................. 12
Figure 9: Model SAF7352-IG Antenna .............................................................................. 12

# TABLE OF TABLES

Table 1: Pin Assignments for the 9602-LP Multi-Interface Connector ................................. 7
Table 2: Description of LED States ..................................................................................... 10
AC ........................................... alternating current
AT ........................................... Two-letter sequence starting a string of terminal commands. The AT is intended to get the terminal's attention prior to executing a command.
dB ........................................... decibel
DC ........................................... direct current
DoD ........................................... Department of Defense
EMSS ........................................ Enhanced Mobile Satellite Services
GPS ........................................... Global Positioning System
kbps ........................................... kilobits per second
LED ........................................... light-emitting diode
SatTerm ...................................... satellite terminal emulator software
SBD ........................................... short burst data
SIM ........................................... subscriber identification module
1 INTRODUCTION

The 9602-LP is a pocket-size, low-cost, satellite tracker designed to operate with the Iridium low-Earth orbit satellite network (see Figure 1).

Note: For immediate information on how to configure the 9602-LP device, refer to section 4.

Figure 1: 9602-LP Mountable Tracker

The 9602-LP comprises an Iridium 9602 transceiver module; a built-in, 50-channel Global Positioning System (GPS) receiver; and low-power microcontrollers. The 9602-LP allows only Short Burst Data (SBD) connectivity to the Iridium satellite network. It does not support voice, circuit switched data, or Short Message Service (SMS). It can transmit messages in NAL Research’s defined formats compatible with models 9601-DGS and 9601-DGS-LP. The 9602-LP can also transmit in PECOS Message Structure (PMS). The 9602-LP supports 256-bit AES encryption algorithm. NAL Research can enable the 9602-LP to utilize the Department of Defense (DoD) Enhanced Mobile Satellite Services (EMSS) gateway when requested by an authorized user. When a Data Terminal Equipment (DTE) is connected to the 9602-LP with SatTerm software installed (or any terminal emulator software), the DTE can be used to set up the operating parameters of the 9602-LP via a serial connection. A DTE can be a desktop computer, a laptop computer, or a tablet.
2 DEVICE DESCRIPTION

2.1 MULTI-INTERFACE CONNECTOR

The multi-interface connector on model 9602-LP is a standard male 15-pin miniature D-Sub type (DB-15) connector, as shown in Figure 1.

![Image of Multi-Interface Connector]

Figure 2: Multi-Interface Connector

The connector comprises four interfaces with the pin assignments shown in Table 1. These interfaces include:

- External DC power input
- 3-wire RS232 serial data interface
- TTL/CMOS I/Os
- Reserved RS232 serial data interface

Table 1: Pin Assignments for the 9602-LP Multi-Interface Connector

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Signal</th>
<th>Description</th>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EXT_PWR</td>
<td>External power input (+3.6 VDC to +5.3 VDC)</td>
<td>DC Power (+)</td>
</tr>
<tr>
<td>2</td>
<td>EXT_GND</td>
<td>External power input (GND)</td>
<td>DC Power (GND)</td>
</tr>
<tr>
<td>3</td>
<td>Tx1</td>
<td>RS232 Input</td>
<td>RS232 Data</td>
</tr>
</tbody>
</table>
Table 1: Pin Assignments for the 9602-LP Multi-Interface Connector

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Signal</th>
<th>Description</th>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Rx1</td>
<td>RS232 Output</td>
<td>RS232 Data</td>
</tr>
<tr>
<td>5</td>
<td>Signal_GND</td>
<td>Signal Ground, 0 V signal reference and return</td>
<td>RS232 GND</td>
</tr>
<tr>
<td>6</td>
<td>EMERGENCY</td>
<td>External TTL/CMOS Input S0</td>
<td>0–5 V TTL</td>
</tr>
<tr>
<td>7</td>
<td>TTL</td>
<td>TTL/CMOS Output 0</td>
<td>0–5 V TTL</td>
</tr>
<tr>
<td>8</td>
<td>TTL</td>
<td>TTL/CMOS Output 1</td>
<td>0–5 V TTL</td>
</tr>
<tr>
<td>9</td>
<td>EXT_PWR</td>
<td>External power input (+6.0 VDC to +32.0 VDC)</td>
<td>DC Power (+)</td>
</tr>
<tr>
<td>10</td>
<td>Rx2</td>
<td>Reserved</td>
<td>RS232 Data</td>
</tr>
<tr>
<td>11</td>
<td>Tx2</td>
<td>Reserved</td>
<td>RS232 Data</td>
</tr>
<tr>
<td>12</td>
<td>TEST</td>
<td>External TTL/CMOS Input S1</td>
<td>0–5 V TTL</td>
</tr>
<tr>
<td>13</td>
<td>TTL</td>
<td>External TTL/CMOS Input S3</td>
<td>0–5 V TTL</td>
</tr>
<tr>
<td>14</td>
<td>TTL</td>
<td>External TTL/CMOS Input S2</td>
<td>0–5 V TTL</td>
</tr>
<tr>
<td>15</td>
<td>TTL</td>
<td>TTL/CMOS Output 2</td>
<td>0–5 V TTL</td>
</tr>
</tbody>
</table>

Model HRC-24-12 is a data/power cable assembly (see Figure 3) designed to work with the 9602-LP tracker. The HRC-24-12 has a three-foot RS-232 cable for connection onto a computer and three wires for DC power inputs to a 9602-LP. Model HRC-24-12 is available on the NAL website (www.nalresearch.com).

Figure 3: Model HRC-24-12 Data/Power Cable Assembly
2.2 **EMERGENCY BUTTON**

Under the default configuration, you can trigger Emergency Tracking at any time with a quick press and release of the Emergency button (momentary switch). See Figure 4. Once enabled, holding the Emergency button longer than three seconds takes the 9602-LP out of Emergency Tracking. When Emergency Tracking is active, the Emergency LED illuminates. Refer to section 2.3 for information on LEDs status.

![Emergency Button](image-url)

*Figure 4: Emergency Button*

2.3 **LED SETTINGS**

The 9602-LP has five status LEDs. These include Power indicator, Iridium signal strength, GPS availability, SBD transmission status, and Emergency mode alert (see Figure 5).

![LED Status](image-url)

*Figure 5: LED Status*

They provide a quick visual check to ensure proper operations. These LEDs provide the following information during Normal Tracking mode shown in Table 2:
Table 2: Description of LED States

<table>
<thead>
<tr>
<th>Label</th>
<th>Name</th>
<th>LED Off</th>
<th>LED Blinking</th>
<th>LED Solid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>Device is off</td>
<td>N/A</td>
<td>Device is on</td>
<td></td>
</tr>
<tr>
<td>IRIDIUM</td>
<td>Iridium</td>
<td>Off or has no signal</td>
<td>Has 1–2 bars of signal</td>
<td>Has 3–5 bars of signal</td>
</tr>
<tr>
<td>GPS¹</td>
<td>GPS</td>
<td>GPS off or time only</td>
<td>2-D fix or dead reckoning</td>
<td>3-D fix</td>
</tr>
<tr>
<td>STATUS</td>
<td>Message Status</td>
<td>No SBD transmission with a valid GPS fix was sent to the gateway</td>
<td>Last SBD transmission was not successfully sent or did not have a valid GPS fix, but one was sent since the unit was turned on</td>
<td>Last SBD transmission had a valid GPS fix and successfully received it by the gateway</td>
</tr>
<tr>
<td>EMERGENCY</td>
<td>Emergency</td>
<td>Emergency mode not activated</td>
<td>N/A</td>
<td>Emergency button is pressed or the S0 Input is activated</td>
</tr>
</tbody>
</table>

¹ Watch closely for the LED because it can briefly stay on.

The 9602-LP is shipped with all LEDs set to ACTIVE. The LEDs can be disabled to reduce power consumption.
3 ANTENNAS

3.1 IRI DIUM ANTENNA CONNECTOR

The 9602-LP uses a single SMA female 50-ohm antenna connector for both transmission and reception of the Iridium signal, as shown in Figure 6. NAL Research offers several types of antennas for use with the 9602-LP. For low-cost and applications where small form-factor and light weight are required, NAL Research highly recommends model SYN7391-C, as shown in Figure 7.

![SMA Female 50-ohm Antenna Connector (Iridium Antenna)]

*Figure 6: SMA Female 50-ohm Antenna Connector (Iridium)*

![Model SYN7391-C Antenna]

*Figure 7: Model SYN7391-C Antenna*
3.2 GPS Antenna Connector

The 9602-LP tracker uses a SubMiniature Version A (SMA) female connector for the GPS antenna, as shown in Figure 8. For low-cost and applications where small form-factor and light-weight are required, NAL Research highly recommends model SAF7352-IG, as shown in Figure 9.

![SMA Female 50-ohm Antenna Connector (GPS)](image)

**Figure 8: SMA Female 50-ohm Antenna Connector (GPS)**

![Model SAF7352-IG Antenna](image)

**Figure 9: Model SAF7352-IG Antenna**

**IMPORTANT**: DO NOT CONNECT OR DISCONNECT THE GPS ANTENNA WHEN THE 9602-LP IS TURNED ON.
4 CONFIGURING THE 9602-LP

The 9602-LP supports a 3-wire serial data interface to a computer, allowing the computer running SatTerm software (or any terminal emulator software) to configure its operating profile using NAL Research’s defined AT commands. These AT commands can be found in the manual “AT Commands for 9602-LP” [3]. The 9602-LP does not support auto-baud, and the default baud is factory-set at 19.2 kbps but can be changed to other bauds with the +IPR command.

Required hardware and software for the configuration of the 9602-LP include:

- A desktop or laptop computer (not provided).
- A 3-wire RS232 cable (not provided).
- A DC power source (not provided).
- SatTerm software or any terminal emulator software (SatTerm is available on the NAL Research web site).

To configure and initialize the 9602-LP:

1. Connect the power/RS232 cable to the computer and to the 9602-LP.
2. Install the SatTerm software to computer. See the NAL document “SatTerm User Guide” [2] for details.
3. Apply the appropriate DC power to the 9602-LP.
   The 9602-LP defaults to power on when DC power is first applied. It is not necessary to push the ON/OFF button. An NAL Research message appears along with the firmware version to indicate proper serial communications and power input.
4. Use the SatTerm software (or any terminal emulator) installed on the computer to set the 9602-LP’s operating parameters.
5. With the unit turned off, connect an Iridium antenna and a GPS antenna to the 9602-LP antenna ports.
6. Ensure the antennas have a full view of the sky and the cable loss between the tracker and antenna is less than 2 dB.
7. Supply appropriate DC power to the 9602-LP.

   The 9602-LP defaults to “Tracking” mode, and begins tracking.

**IMPORTANT**: EMSS-enabled 9602-LP must first be provisioned (signed up for airtime) with EMSS SBD service before testing or field use. Accessing the DoD EMSS Gateway is not authorized until the 9602-LP is provisioned. Unauthorized attempts to access the DoD EMSS Gateway will result in immediate disabling of the offending device, which must then be returned to NAL Research for repair. See [https://sbd.pac.disa.mil](https://sbd.pac.disa.mil) for more information regarding EMSS service provisioning.

**IMPORTANT**: For detailed information on how to configure the 9602-LP device, refer to the 9602-LP User Guide [1].
5 **TECHNICAL SUPPORT**

For technical support, please contact us at:

**Phone:** 703-392-1136, x203

**Fax:** 703-392-6795

**Email:** support@nalresearch.com

Technical documents are also available to download on NAL Research’s website [www.nalresearch.com](http://www.nalresearch.com) in the Support > Documentation & Downloads section.