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Objective:

The intent of this document is to provide information that details the steps necessary to configure the Enfora® Mini-MT LED interface.

Supported devices:

- GSM2228 Mini-MT

Equipment Needed:

In this example the requirements are:

- An Enfora GSM2228 Mini-MT modem

- A notebook or desktop computer with any version of Microsoft Windows that has the HyperTerminal communications program. If this hardware is not available, the user could use a DOS terminal emulation program or DUMB ASCII terminal.

References:

- GSM2228UG001 - Enfora Mini-MT User Guide
- GSM2228AT001 - Enfora Mini-MT AT Command Set Reference
- GSM0000AN015 - Event Monitor and Reporting Overview
Procedures:

Please note that the following event commands are examples only. When implementing, use the command AT$EVENT? to query the event table and use the next sequential event group number. Failure to do so could potentially cause unpredictable results.

Some of these examples require that communication is established with a remote server. Read and understand the appropriate Quick Start Guide for your device prior to attempting these examples. Always verify that the local serial connection session is actually established with the Enfora Mini-MT modem.

Please note that the following event commands are examples only. For these events to operate the Mini-MT must be in the wake state or connected to a power source.
1. Mini-MT Mobile Tracker LED Definitions

There are four LED’s used to provide status to the user. They are (from left to right) CALL, ON, GPS, and BAT. The LED functions are defined in the table below.

<table>
<thead>
<tr>
<th>Power Mode</th>
<th>CALL</th>
<th>ON</th>
<th>GPS</th>
<th>BAT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Yellow</strong></td>
<td><strong>Yellow</strong></td>
<td><strong>Yellow</strong></td>
<td><strong>Red</strong></td>
</tr>
<tr>
<td>Hibernate</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>Low Battery, less than 20%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Slow Blink 250mS/10Sec</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Low Battery, less than 5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>OFF</td>
</tr>
<tr>
<td>Active / Battery</td>
<td>Blink when receiving or originating call 500mS/1 Sec</td>
<td>Slow blink 500mS/10Sec</td>
<td>Blink when locked 500mS/2 Sec</td>
<td>Low Battery, less than 20%</td>
</tr>
<tr>
<td></td>
<td>Blink for missed call 2 Sec/2 Sec</td>
<td></td>
<td></td>
<td>Slow Blink 250mS/10Sec</td>
</tr>
<tr>
<td></td>
<td>Solid during call</td>
<td></td>
<td></td>
<td>Low Battery, 5% or less, or turns OFF</td>
</tr>
<tr>
<td>Active / Aux</td>
<td>Blink when receiving or originating call 500mS/1 Sec</td>
<td>ON solid</td>
<td>Blink when locked 500mS/2 Sec</td>
<td>Fast Blink, during charge 500mS/2 Sec</td>
</tr>
<tr>
<td></td>
<td>Blink for missed call 2 Sec/2 Sec</td>
<td></td>
<td></td>
<td>OFF when charged</td>
</tr>
<tr>
<td></td>
<td>Solid during call</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. Max Speed Exceeded Reporting Configuration

Note: The following examples require the Mini-MT device to report to a remote server. If you do not have one configured, refer to the appropriate Quick Start guide to enable communication with Enfora’s test server.

Type the following commands to send a GPS RMC NMEA message OTA when the Mini-MT exceeds 30 Knots.

Maximum Speed = \textbf{30} (knots) (\textbf{30} Knots $\approx$ 35 mph $\approx$ 56 Km/Hr)

\begin{verbatim}
AT$EVENT=11,0,17,30,250

Should always be 250 (max speed)
Max Speed to monitor (0 – 249)
Monitor speed (Input Event Number)
Input transition event
Event group 11

AT$EVENT=11,3,40,7,4230

OTA Message (ASCII RMC NMEA msg)
User Specified number
Send OTA UDP Message
Output event
Event group 11
\end{verbatim}
Results:

Parameter 2 Decode is as follows:

Param2 decode = 4230
Bit 00 > ASCII
Bit 01 > PARAM1 11 bytes ASCII
Bit 02 > MDMID added 22 bytes ASCII
Bit 03 >
Bit 04 >
Bit 05 >
Bit 06 >
Bit 07 > Input Event Number 3 bytes ASCII
Bit 08 >
Bit 09 >
Bit 10 >
Bit 11 >
Bit 12 > RMC NMEA Data max 80 bytes ASCII
Bit 13 >
Bit 14 >
Bit 15 >
Bit 16 >
Bit 17 >
Bit 18 >
Bit 19 >
Bit 20 >
Bit 21 >

A GPS RMC NMEA message will be sent to the IP address (set by AT$FRIEND) and port number (set by AT$UDPAPI) every time the device exceeds speed of 30 Knots. The MT modem has to go below the set speed of 30 Knots in order to trigger the event again.

The output message format is generated based on the number “4230” set in the second AT$EVENT command.

Below is the example output that would be seen if the modem were setup to report to the Enfora test server.
Described below is the data package that should be received by the server.

- Row 1 indicates the Byte number.

  **Note:** Bytes 0 through 27 are part of IPV4 header. Bytes 28 and greater are the actual packet Payload. Bytes 32 and greater are controlled by the Parameter 2 value.

- Row 2 displays the data in HEX format, and
- Row 3 and/or 4 describe each block of the message.

<table>
<thead>
<tr>
<th>Byte 0</th>
<th>Byte 1</th>
<th>Byte 2</th>
<th>Byte 3</th>
<th>Byte 4</th>
<th>Byte 5</th>
<th>Byte 6</th>
<th>Byte 7</th>
<th>Byte 8</th>
<th>Byte 9</th>
<th>Byte 10</th>
<th>Byte 11</th>
<th>Byte 12</th>
<th>Byte 13</th>
<th>Byte 14</th>
<th>Byte 15</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IP Header data</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td>IP Header</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Byte 16</td>
<td>Byte 17</td>
<td>Byte 18</td>
<td>Byte 19</td>
<td>Byte 20</td>
<td>Byte 21</td>
<td>Byte 22</td>
<td>Byte 23</td>
<td>Byte 24</td>
<td>Byte 25</td>
<td>Byte 26</td>
<td>Byte 27</td>
<td></td>
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<td>UDP Header data</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>UDP-API Header</td>
</tr>
</tbody>
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### Mini-MT Cookbook
Revision 1.01

<table>
<thead>
<tr>
<th>Byte</th>
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<th>60</th>
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<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
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<td>4D</td>
<td>54</td>
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<td>54</td>
<td>65</td>
<td>73</td>
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<th>64</th>
<th>65</th>
<th>66</th>
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<th>68</th>
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<th>70</th>
<th>71</th>
<th>72</th>
<th>73</th>
<th>74</th>
<th>75</th>
<th>76</th>
<th>77</th>
<th>78</th>
<th>79</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>66</td>
<td>39</td>
<td>2C</td>
<td>20</td>
<td>36</td>
<td>2C</td>
<td>20</td>
<td>31</td>
<td>37</td>
<td>34</td>
<td>38</td>
<td>20</td>
<td>31</td>
<td>37</td>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Modem ID continued</th>
<th>Mask</th>
<th>commu</th>
<th>Data space</th>
<th>GPIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/D 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A/D 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
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<tr>
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<th>81</th>
<th>82</th>
<th>83</th>
<th>84</th>
<th>85</th>
<th>86</th>
<th>87</th>
<th>88</th>
<th>89</th>
<th>90</th>
<th>91</th>
<th>92</th>
<th>93</th>
<th>94</th>
<th>95</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>20</td>
<td>31</td>
<td>37</td>
<td>20</td>
<td>24</td>
<td>47</td>
<td>50</td>
<td>52</td>
<td>4D</td>
<td>43</td>
<td>2C</td>
<td>31</td>
<td>39</td>
<td>32</td>
<td>35</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A/D 2 continued</th>
<th>Input Event Number</th>
<th>ASCII NMEA RMC message continued…</th>
</tr>
</thead>
<tbody>
<tr>
<td>(17)</td>
<td>(SGPRMC,193612.00,A,3259,819460,N,09642.849539,W,0,0,0,040208,,,A*40)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Byte</th>
<th>96</th>
<th>97</th>
<th>98</th>
<th>99</th>
<th>100</th>
<th>101</th>
<th>102</th>
<th>103</th>
<th>104</th>
<th>105</th>
<th>106</th>
<th>107</th>
<th>108</th>
<th>109</th>
<th>110</th>
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</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>31</td>
<td>2E</td>
<td>38</td>
<td>38</td>
<td>2C</td>
<td>41</td>
<td>2C</td>
<td>33</td>
<td>33</td>
<td>30</td>
<td>31</td>
<td>2E</td>
<td>35</td>
<td>32</td>
<td>39</td>
<td></td>
</tr>
</tbody>
</table>

ASCII NMEA RMC message continued…

<table>
<thead>
<tr>
<th>Byte</th>
<th>112</th>
<th>113</th>
<th>114</th>
<th>115</th>
<th>116</th>
<th>117</th>
<th>118</th>
<th>119</th>
<th>120</th>
<th>121</th>
<th>122</th>
<th>123</th>
<th>124</th>
<th>125</th>
<th>126</th>
<th>127</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>2C</td>
<td>4E</td>
<td>2C</td>
<td>30</td>
<td>39</td>
<td>36</td>
<td>34</td>
<td>32</td>
<td>2E</td>
<td>35</td>
<td>36</td>
<td>37</td>
<td>35</td>
<td>2C</td>
<td>57</td>
<td></td>
</tr>
</tbody>
</table>

ASCII NMEA RMC message continued…

<table>
<thead>
<tr>
<th>Byte</th>
<th>128</th>
<th>129</th>
<th>130</th>
<th>131</th>
<th>132</th>
<th>133</th>
<th>134</th>
<th>135</th>
<th>136</th>
<th>137</th>
<th>138</th>
<th>139</th>
<th>140</th>
<th>141</th>
<th>142</th>
<th>143</th>
</tr>
</thead>
<tbody>
<tr>
<td>2C</td>
<td>33</td>
<td>31</td>
<td>2E</td>
<td>38</td>
<td>2C</td>
<td>30</td>
<td>30</td>
<td>36</td>
<td>2E</td>
<td>31</td>
<td>2C</td>
<td>32</td>
<td>31</td>
<td>30</td>
<td>37</td>
<td></td>
</tr>
</tbody>
</table>

ASCII NMEA RMC message continued…

<table>
<thead>
<tr>
<th>Byte</th>
<th>144</th>
<th>145</th>
<th>146</th>
<th>147</th>
<th>148</th>
<th>149</th>
<th>150</th>
<th>151</th>
<th>152</th>
<th>153</th>
<th>154</th>
<th>155</th>
<th>156</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>34</td>
<td>2C</td>
<td>30</td>
<td>35</td>
<td>2C</td>
<td>45</td>
<td>2A</td>
<td>35</td>
<td>33</td>
<td>0D</td>
<td>0A</td>
<td>00</td>
<td></td>
</tr>
</tbody>
</table>

ASCII NMEA RMC message continued…
3. Time-Distance Reporting Configuration

Type the following commands to send a GPS RMC NMEA message OTA to a remote Server when time and/or distance settings are violated. Users must use Event Timer 1 ($EVTIM1) for minimum time and Event Timer 2 ($EVTIM2) for maximum time when setting up for this feature. The time and/or distance feature is designed as described in the example table below:

<table>
<thead>
<tr>
<th>Minimum Time (seconds)</th>
<th>Maximum Time (seconds)</th>
<th>Distance (meters)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>FEATURE DISABLED</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>100</td>
<td>GPS message sent every 100 meters</td>
</tr>
<tr>
<td>0</td>
<td>60</td>
<td>0</td>
<td>GPS message sent every 60 seconds</td>
</tr>
<tr>
<td>0</td>
<td>60</td>
<td>100</td>
<td>GPS message sent every 60 seconds if the vehicle has not moved 100 meters. GPS messages will be sent every 100 meters if the vehicle is moving and traveling the distance of 100 meters in less than 60 seconds. In short, message is sent upon expiration of time or moving of distance – whichever occurs first.</td>
</tr>
<tr>
<td>30</td>
<td>x</td>
<td>0</td>
<td>GPS message sent every 30 seconds (x = don’t care)</td>
</tr>
<tr>
<td>30</td>
<td>0</td>
<td>100</td>
<td>GPS message sent when the vehicle has moved 100 meters and 30 seconds have elapsed.</td>
</tr>
<tr>
<td>30</td>
<td>60</td>
<td>100</td>
<td>GPS message sent every 60 seconds if the vehicle is idle and not moving or moving slowly. If the vehicle is moving, then GPS message will be sent when 30 seconds have expired and 100 meters have been moved.</td>
</tr>
</tbody>
</table>

Choose only one option, from options 1 – 6 below, using section as a reference.

Before attempting another option delete the existing events by issuing the following commands:

```
AT$EVDEL=12
AT$EVDEL=13
```

The following AT command settings provide examples of the use of event processing to configure the Time and/or Distance feature.
a. Send GPS message when a predefined distance is moved.

Minimum Time = 0
Maximum Time = 0
Distance = \( z \) (\( z = 0 – 1000000 \) meters)

\[
\text{AT$EVENT=12,0,16,z,1000000$}
\]

- Should always be 1000000 (max distance)
- Replace \( z \) with actual distance to monitor
- Monitor Distance displaced value
- Input transition event
- Event group 12

\[
\text{AT$EVENT=12,3,40,8,4230$}
\]

- OTA Message (ASCII RMC NMEA msg)
- User Specified number
- Send OTA UDP Message
- Output event
- Event group 12

**Results:** A GPS RMC NMEA message will be sent to a remote user at every \( z \) meters. The output message is described under Section 7, Results.

b. Send GPS message when Maximum Time expires.

Minimum time = 0
Maximum time = \( y \) (\( y = 0 – 604800 \) seconds)
Distance = 0

\[
\text{AT$EVTIM2=y (y = 0 – 604800 \text{ seconds})$}
\]

\[
\text{AT$EVENT=12,1,13,1,1$}
\]

- Ending range of 1 (high)
- Starting range of 1 (high)
- Activate Timer 2 ($EVTIM2$)
- Input occurrence event
- Event group 12

\[
\text{AT$EVENT=12,3,40,8,4230$}
\]

- OTA Message (ASCII RMC NMEA msg)
- User Specified number
- Send OTA UDP Message
- Output event
- Event group 12
Results: A GPS RMC NMEA message will be sent to a remote user at every $y$ time interval. The output message is described under Section 7, Results.

c. Send GPS message when Minimum Time expires.

Minimum time = $x$ ($x = 0 – 604800$ seconds)  
Maximum time = 0  
Distance = 0

AT$\$EVTIM1=x$  
($x = 0 – 604800$ seconds)

AT$\$EVENT=12,1,12,1,1$  
Ending range of 1 (high)  
Starting range of 1 (high)  
Activate Timer 2 ($EVTIM1$)  
Input occurrence event  
Event group 12

AT$\$EVENT=12,3,40,8,4230$  
OTA Message (ASCII RMC NMEA msg)  
User Specified number  
Send OTA UDP Message  
Output event  
Event group 12

Results: A GPS RMC NMEA message will be sent to a remote user at every $x$ time interval. The output message is described under Section 7, Results.
d. Send GPS message when Time OR Distance has elapsed.

Minimum time = 0
Maximum time = \( y \) \((y = 0 – 604800\) seconds\)
Distance = \( z \) \((z = 0 – 1000000\) meters\)

\[ \text{AT$EVTIM2}=y \quad (y = 0 – 604800\) seconds\) \]

- \[ \text{ATSEVENT}=12,1,13,1,1 \]
  - Ending range of 1 (high)
  - Starting range of 1 (high)
  - Activate Timer 2 (SEVTIM2)
  - Input occurrence event
  - Event group 12

- \[ \text{ATSEVENT}=12,3,43,2,0 \]
  - Reserved
  - Reset Timer 2
  - Reset/Restart Timer
  - Output event
  - Event group 12

- \[ \text{ATSEVENT}=12,3,40,8,4230 \]
  - OTA Message (ASCII RMC NMEA msg)
  - User Specified number
  - Send OTA UDP Message
  - Output event
  - Event group 12

- \[ \text{ATSEVENT}=13,0,16,z,1000000 \]
  - Should always be 1000000 (max distance)
  - Replace z with actual distance to monitor
  - Monitor Distance displaced value
  - Input transition event
  - Event group 13

- \[ \text{ATSEVENT}=13,3,43,2,0 \]
  - Reserved
  - Reset Timer 2
  - Reset/Restart Timer
  - Output event
  - Event group 13

- \[ \text{ATSEVENT}=13,3,40,9,4230 \]
  - OTA Message (ASCII RMC NMEA msg)
  - User Specified number
  - Send OTA UDP Message
  - Output event
  - Event group 13
Results: A GPS RMC NMEA message will be sent to a remote user every time the device travels z distance or y time interval has elapsed. The output message is described under Section 7, Results.

c. Send GPS message based on Time AND Distance.

In this instance, a GPS message will not be sent to the remote user until the device travels specified distance and time has expired.

Minimum time = x (x = 0 – 604800 seconds)
Maximum time = 0
Distance = z (z = 0 – 1000000 meters)

\[\text{AT$EVTIM1}=x\] \quad (x = 0 – 604800 \text{ seconds})

\[\text{AT$EVENT}=12,1,12,1,1\]
- Ending range of 1 (high)
- Starting range of 1 (high)
- Activate Timer 2 ($EVTIM1$)
- Input occurrence event
- Event group 12

\[\text{AT$EVENT}=12,0,16,z,1000000\]
- Should always be 1000000 (max distance)
- Replace z with actual distance to monitor
- Monitor Distance displaced value
- Input transition event
- Event group 12

\[\text{AT$EVENT}=12,3,43,1,0\]
- Reserved
- Reset Timer 1
- Reset/Restart Timer
- Output event
- Event group 12

\[\text{AT$EVENT}=12,3,40,8,4230\]
- OTA Message (ASCII RMC NMEA msg)
- User Specified number
- Send OTA UDP Message
- Output event
- Event group 12
**Results:** A GPS RMC NMEA message will be sent to a remote user every time the device travels $z$ distance and $x$ time interval has elapsed. The output message is described under Section 7, Results.

**f. Send GPS message based on Minimum Time AND Distance OR when Maximum Time has elapsed.**

In this instance, a GPS message will not be sent to the remote user until the device travels specified distance and minimum time has expired or distance has not been traveled and maximum time has expired.

**Note:** Maximum Time has to be greater than Minimum Time.

Minimum time = $x$ ($x = 0 – 604800$ seconds)
Maximum time = $y$ ($y = 0 – 604800$ seconds)
Distance = $z$ ($z = 0 – 1000000$ meters)

$AT$EVTIM1 = $x$ ($x = 0 – 604800$ seconds)

$AT$EVTIM2 = $y$ ($y = 0 – 604800$ seconds)

$AT$EVENT = 12,1,12,1,1

Ending range of 1 (high)
Starting range of 1 (high)
Activate Timer 2 ($EVTIM1$)
Input occurrence event
Event group 12

$AT$EVENT = 12,0,16,z,1000000

Should always be 1000000 (max distance)
Replace $z$ with actual distance to monitor
Monitor Distance displaced value
Input transition event
Event group 12

$AT$EVENT = 12,3,43,1,0

Reserved
Reset Timer 1
Reset/Restart Timer
Output event
Event group 12
AT$EVENT=12,3,43,2,0
Reserved
Reset Timer 2
Reset/Restart Timer
Output event
Event group 12

AT$EVENT=12,3,40,8,4230
OTA Message (ASCII RMC NMEA msg)
User Specified number
Send OTA UDP Message
Output event
Event group 12

AT$EVENT=13,1,13,1,1
Ending range of 1 (high)
Starting range of 1 (high)
Activate Timer 2 ($EVTIM2)
Input occurrence event
Event group 13

AT$EVENT=13,3,43,1,0
Reserved
Reset Timer 1
Reset/Restart Timer
Output event
Event group 13

AT$EVENT=13,3,43,2,0
Reserved
Reset Timer 2
Reset/Restart Timer
Output event
Event group 13

AT$EVENT=13,3,40,9,4230
OTA Message (ASCII RMC NMEA msg)
User Specified number
Send OTA UDP Message
Output event
Event group 13

Results: A GPS RMC NMEA message will be sent to a remote user every time the device travels \( z \) distance and \( x \) time interval has elapsed OR \( y \) time interval has elapsed. The output message is described under Section 7, Results.
g. Results:

A GPS RMC NMEA message will be sent to the IP address (set by \texttt{ATSFRIEND}) and port number (set by \texttt{ATSUDPAPI}).

The output message format is generated based on the number “4230” set in section a above with the \texttt{ATSEVENT} command.

The output message format is generated based on the number “4230” set in the second \texttt{ATSEVENT} command.

Below is the example output that would be seen if the modem were setup to report to the Enfora test server based on example A-3.

Bytes 32 – 42 and 81 – 83 will change depending on which option (1 – 6) was selected during section a.
Described below is the data package that should be received by the Server.

- Row 1 indicates the Byte number.
  **Note:** Bytes 0 through 27 are part of IPV4 header. Bytes 28 and greater are the actual packet Payload. Bytes 32 and greater are controlled by the Parameter 2 value.

- Row 2 displays the data in HEX format, and
- Row 3 and/or 4 describe each block of the message.

<table>
<thead>
<tr>
<th>Byte 0</th>
<th>Byte 1</th>
<th>Byte 2</th>
<th>Byte 3</th>
<th>Byte 4</th>
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<td>ASCII NMEA RMC message (SGPRMC,191319.00,A,3259.809572,N,09642.853881,W,0.0,0.0,0.040208,,A*43)</td>
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<th>Byte 125</th>
<th>Byte 126</th>
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ASCII NMEA RMC message continued...

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<td>32</td>
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ASCII NMEA RMC message continued...

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<th>Byte</th>
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<td>2c</td>
<td>45</td>
<td>2a</td>
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<td>46</td>
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<td>0a</td>
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</tbody>
</table>
4. Geo-Fencing Configuration

The Enfora Mini-MT allows a user to configure maximum of 25 circular shape geo-fences. Enfora Mini-MT can be configured to send GPS messages to a remote user (server) whenever a device enters or exits a geo-fenced area. The geo-fence feature has to be configured with two commands: \texttt{AT$GEOFNC} and \texttt{AT$EVENT}. To configure sending messages when a device enters or exits the geo-fenced area, follow the example below:

\textbf{NOTE:}

- NMEA messages provide Latitude and Longitude information in “Degrees Minute.Minute” format.
- To obtain the decimal value for Degrees, take \textit{Minute.Minute} of the actual Latitude or Longitude and divide it by 60.
- Latitude value should be between −90.0 to +90.0 Degrees
- Longitude value should be between −180.0 to +180.0 Degrees.
- Latitude North of Equator line should always be positive Value.
- Latitude South of the Equator line should always be negative value.
- Longitude East of the GMT line should always be positive.
- Longitude West of the GMT line should always be negative

![Figure 1. Map of World Displaying Latitude and Longitude](image)

\textbf{Ex:} Send a NMEA RMC GPS message when the Mini-MT moves in/out of the geo-fence area 1. Geo fence 1 is a 100 meter radius from the center point defined by Latitude = 33 01.5023 (North) and Longitude = 096 42.3853 (West). According to figure 6 above, Latitude of 33 01.5023 (North) would be a positive value (since its above the Equator line) but Longitude of 96 42.3853 (West) would be a negative value since it is west of the GMT line.
Verify each AT command sent to the modem returns **OK**.

Radius: **100** meters

Latitude: **33 01.5023 North** = 33 + 01.5023/60 = **33.02503833**

Longitude: **096 42.3853 West** = -96 + 42.3853/60 = **-96.70642167**

**AT$GEOFNC=1,100,33.02503833,-96.70642167**

a. Send a GPS message when the unit leaves geo-fence 1

```
AT$EVENT=14,0,21,0,0
```

Transition OUT of geo-fence area
Transition OUT of geo-fence area
Geo-Fence 1
Input transition event
Event group 14

```
AT$EVENT=14,3,40,14,4230
```

OTA Message (ASCII RMC NMEA msg)
User Specified number
Send OTA UDP Message
Output event
Event group 14

b. Send a GPS message when the unit enters geo-fence 1

```
AT$EVENT=15,0,21,1,1
```

Transition IN the geo-fence area
Transition IN the geo-fence area
Geo-Fence 1
Input transition event
Event group 15

```
AT$EVENT=15,3,40,15,4230
```

OTA Message (ASCII RMC NMEA msg)
User Specified number
Send OTA UDP Message
Output event
Event group 15

**Results:** A GPS RMC NMEA message will be sent to a remote user every time the device enters or exits the geo fence area. The output message is described under **Section B, Results.**
To add Geo-Fence 2, send the following commands to the Mini-MT and verify that an OK is returned.

\[
\text{ATSGEOFNC}=2,100,34.02503833,-97.70642167 \\
\text{ATSEVENT}=16,0,22,0,0 \\
\text{ATSEVENT}=16,3,40,16,4230 \\
\text{ATSEVENT}=17,0,22,1,1 \\
\text{ATSEVENT}=17,3,40,17,4230
\]

For additional Geofences, repeat the 5 commands below by changing the GeoFence (index) number (A), radius (100), latitude (34.02503833), and longitude (-97.70642167) information for ATSGEOFNC command. And, increment the Event group numbers (B, C), Input Event (D), and User Specified Number (E, F) for ATSEVENT command.

Use the following table for the relationship between the numbers

\[
\text{ATSGEOFNC}=A,100,34.02503833,-97.70642167 \\
\text{ATSEVENT}=B,0,D,0,0 \\
\text{ATSEVENT}=B,3,40,E,4230 \\
\text{ATSEVENT}=C,0,D,1,1 \\
\text{ATSEVENT}=C,3,40,F,4230
\]
## GeoFence Input Trigger

<table>
<thead>
<tr>
<th>GeoFence</th>
<th>Input Trigger</th>
<th>Leave GeoFence</th>
<th>Enter GeoFence</th>
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<tr>
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</tr>
</tbody>
</table>

### Results:

A GPS RMC NMEA message will be sent to the IP address (set by `AT$FRIEND`) and port number (set by `AT$UDPAPI`) when it enters or exits a defined geo fence.

The output message format is generated based on the number “4230” set in above example with the `AT$EVENT` command.
Bytes 32 – 42 will change depending on what is programmed in the “user specified field”. Bytes 81 – 83 will change with geo-fence number.
Described below is the data package that should be received by the Server when the modem exits GeoFence 1.

- Row 1 indicates the Byte number.
  
  **Note:** Bytes 0 through 27 are part of IPV4 header. Bytes 28 and greater are the actual packet Payload. Bytes 32 and greater are controlled by the Parameter 2 value.

- Row 2 displays the data in HEX format, and
- Row 3 and/or 4 describe each block of the message.

<table>
<thead>
<tr>
<th>Byte 0</th>
<th>Byte 1</th>
<th>Byte 2</th>
<th>Byte 3</th>
<th>Byte 4</th>
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<th>Byte 11</th>
<th>Byte 12</th>
<th>Byte 13</th>
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User Specified Number (14)

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<th>Byte 37</th>
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Modem ID

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GPIO

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A/D 2 continued

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ASCII NMEA RMC message continued…

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ASCII NMEA RMC message continued…

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ASCII NMEA RMC message continued…

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</table>
5. GPS Idle Trigger

The Enfora Mini-MT maintains GPS Idle count. The Idle count is incremented every second that the unit has not moved and is stationary in one position. The user can elect to receive a GPS message when the Idle count is exceeded. Idle count is measured in seconds.

**Note:** A GPS Idle Trigger message will only be sent once when the timer expires. The message will not be repeated if the device/vehicle has not moved.

**a.** To send a GPS message when the device/vehicle stays idle for 2 minutes (120 seconds), configure as follows:

```
AT$EVENT=68,0,30,120,1000000
```

- **Max timeout value**
- **Idle time in seconds (120 seconds)**
- **GPS Idle Trigger Input Event**
- **Input transition event**
- **Event group 68**

```
AT$EVENT=68,3,40,68,4230
```

- **OTA Message (ASCII RMC NMEA msg)**
- **User Specified number**
- **Send OTA UDP Message**
- **Output event**
- **Event group 68**

**b.** Query the EVENT table:

```
AT$EVENT?
```

The table should reflect the following:

```
$EVENT:   evgp evtyp evcat    p1    p2
68A    0    30        120    1000000
68B    3    40        68       4230
```
6. GPS Invisible Trigger

The Enfora Mini-MT maintains GPS Invisible count. The Invisible count is incremented every second when the unit does not have valid GPS data. The user can elect to receive a message when the Invisible count exceeds a set period. Invisible count is measured in seconds.

Note: A GPS Invisible Trigger message will only be sent once when the timer expires. The message will not be repeated if the device/vehicle has not acquired valid GPS data.

a. To send a message when the GPS has not locked for 1 minute (60 seconds), configure as follows:

\[
\text{ATSEVENT} = 69,0,29,60,1000000
\]

Max timeout value
Idle time in seconds (60 seconds)
GPS Invisible Trigger Input Event
Input transition event
Event group 69

\[
\text{ATSEVENT} = 69,3,40,69,4230
\]

OTA Message (ASCII RMC NMEA msg)
User Specified number
Send OTA UDP Message
Output event
Event group 69

b. Query the EVENT table:

\[\text{ATSEVENT}\?\]

The table should reflect the following:

\[
\begin{array}{cccccc}
\text{SEVENT:} & \text{evgp} & \text{evtyp} & \text{evcat} & \text{p1} & \text{p2} \\
69A & 0 & 29 & 60 & 1000000 \\
69B & 3 & 40 & 69 & 4230 \\
\end{array}
\]
7. Set geo-fence with button press (This is the default condition)

The following procedure will configure the Mini-MT to set a geo-fence when the “ʼ” button is pressed.

Configure the EVENT engine for the following events:

- `AT$EVENT=40,1,58,0,0`
  - Geo-fence key
  - Geo-fence key
  - Key press event
  - Input occurrence event
  - Event group 40

- `AT$EVENT=40, 3, 49, 1, 805`
  - Geo-fence radius
  - Fence number 1
  - Set Geo-fence
  - Output event
  - Event group 40
8. Send a SMS message at a preset battery level percent

The following procedure will configure the Mini-MT to set a SMS to a defined user when the battery level is between 21 to 19 percent.

a. Enter the following “Stored AT Command”

   AT$STOATEV=1,AT$MSGSND=1,”LOW BATTERY”

b. Configure the telephone number and or email address to send the SMS to.

   AT$SMSDA=1,”somebody@nowhere.com”,"0000"
   AT$SMSDA=2,"555-555-1212"

c. Configure the EVENT engine for the following events:

   AT$EVENT=35, 0, 59, 19, 21
   21 Percent
   19 Percent
   Battery Level event
   Input transition event
   Event group 35

   AT$EVENT=35, 2, 9, 1, 1
   State 1 (Home Network)
   State 1 (Home Network)
   +CREG
   Input AND event
   Event group 35

   AT$EVENT=35, 3, 44, 1, 0
   N/A
   Slot 1
   Execute Stored AT-Command
   Event group 35

   AT$EVENT=36, 0, 59, 19, 21
   21 Percent
   19 Percent
   Battery Level event
   Input transition event
   Event group 36
AT$EVENT=36, 2, 9, 5, 5

State 5 (Roaming)
State 5 (Roaming)
+CREG
Input AND event
Event group 36

AT$EVENT=36, 3, 44, 1, 0

N/A
Slot 1
Execute Stored AT-Command
Output event
Event group 36
9. Configure the user button “<” to send a UDP message

The following procedure will configure the Mini-MT to set a UDP message to a server defined in the friends list.

a. Enter the following AT Commands:

   Note: The following settings assume the user is using the Enfora test UDP server.

   ATSFRIEND=1,1,”apitest.enfora.com”,1721,3
   AT$UDPAPI=,1721
   AT$MDMID=“TEST-MINIMT”
   AT$WAKEUP=1,1
   ATSAREG=2

b. Configure the EVENT engine for the following events:

   AT$EVENT=20,1,58,1,1

   User Defined key
   User Defined key
   Key press event
   Input occurrence event
   Event group 20

   AT$EVENT=20, 3, 40, 123, 4102

   ASCII $GPRMC
   PARAM1 = Message Identifier
   Set Geo-fence
   Output event
   Event group 20
10. Configure the Mini-MT to emit a tone on wakeup

The following procedure will configure the Mini-MT to emit a tone on wakeup.

a. Enter the following AT Commands:

   AT$STOATEV=2, AT+STTONE=1,7,1000

b. Configure the EVENT engine for the following events:

   AT$EVENT=80,0,8,1,1

   User Defined key
   User Defined key
   Power Up
   Input transition event
   Event group 20

   AT$EVENT=80, 3, 44, 2, 0

   N/A
   Slot 2
   Execute Stored AT-Command
   Output event
   Event group 20
## Revision History

<table>
<thead>
<tr>
<th>Date</th>
<th>Rev</th>
<th>Author</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/13/06</td>
<td>1.00</td>
<td>MCook</td>
<td>Initial Release.</td>
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<tr>
<td>03/21/08</td>
<td>1.01</td>
<td>DONeil</td>
<td>Edited Param2 value from 4350 to 4230</td>
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<td></td>
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<td></td>
<td>Cleared BIT information for BITs 03, 04, 05 and 06</td>
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<td></td>
<td>Added new screen shots and edited ASCII NMEA RMS messages</td>
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<td>Corrected the description in chapter 11</td>
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<td>Removed “stay awake while moving” section</td>
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