GPS (Global Positioning System)

Teldat Dm 812-I

Legal Notice

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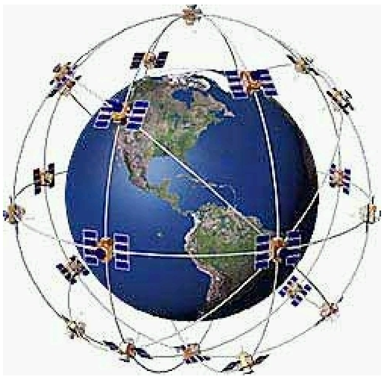
Chapter 1 Introduction

1.1 GPS Receiver

GPS (**Global Positioning System**) is a satellite-based global navigation system (GNNS) that provides geolocation data and enables positions to be fixed with a precision of only a few centimeters (when using differential GPS) or a few meters.



GPS operates through a network of 32 satellites (28 operational and 4 backups) in orbit around the globe, at 23,200 km, with synchronized paths to cover the entire surface of the Earth. To determine a position, at least three satellites (in the network) locate the receiver, which receives indication identification and clock time for each. Based on these signals, the apparatus synchronizes the GPS clock and calculates how much time the signals take to reach the device. This way, the distance to the satellite is measured through *triangulation* (inverse trilateral method). Once the distances are known, the relative position with respect to the three satellites can be easily determined. In addition, if you know the coordinates, or the position of each of these through the signals they broadcast, you can get an accurate position from the measuring point. Precise accuracy is achieved thanks to the GPS clock, which is similar to the atomic clocks on board the satellites.

Operational:

- The receiver can predetermine the location of the satellites using information from the Almanac, which are parameters the satellites transmit. Almanac data collection (from the whole constellation) is executed every 12 – 20 minutes and saved in the GPS receiver.
- The GPS receiver uses information (ephemeris) to determine its position. Each satellite broadcasts its own ephemeris, which includes its status (if it is being considered to take the position), position in space, atomic time, doppler information, etc.
- The GPS receiver uses the information sent by the satellites (time in which the signals were broadcast, location of the satellites) and tries to synchronize its internal clock with the atomic clocks on board the satellites. This synchronization is a trial and error process that a portable receiver performs every second. Once the clock is synchronized, it can determine its distance from the satellites and thus calculate its position on Earth.
- Each satellite locates the signal that hits the receiver and narrows down the possible locations to the surface of a sphere that is centered on the satellite and has the total distance to the receiver as radius.
- When we obtain information from two satellites, we find the receiver is located on the circle that appears when both spheres intersect.
- If the same information is gathered from a third satellite, the position is narrowed down even further (to the two points where the new sphere cuts through the circle that's the intersection of the first two spheres). Since one of the two points is usually ridiculous, it can be ignored and we would have the 3-D position. However, given that the clock found in the GPS receivers is not synchronized with the atomic clocks on board the satellites, the two locations provided are inaccurate.
- Due to a lack of synchronization between the GPS receiver clocks and the satellite clocks, we get information from a fourth satellite. At this point the GPS receiver can determine a precise 3-D position (latitude, longitude and altitude). If the clocks (between the receiver and satellites) aren't synchronized, the intersection from the four spheres is a volume instead of a point. By adjusting the receiver time, said volume transforms into a point.

The Almanac is a set of values or parameters that approximately predict the orbit and position of all satellites. Each satellite individually sends the corresponding data. This Almanac data is not very precise and is considered valid for up to several months.

Ephemeris data is also transmitted by the satellite and received by the GPS. This data tells the GPS the precise position of the satellites. The GPS uses the ephemeris data from several satellites at the same time to calculate (triangulate) and correct complex calculations so it can determine its real position on Earth. This data is far more complete and detailed than the Almanac data.

Each satellite only broadcasts its own ephemeris. The validity of this data depends on each particular satellite and may be valid for a period of time that varies between 30 minutes and 6 hours. Digital information blocks containing ephemeris data are continuously streamed and take 30 seconds to reach the GPS receiver.

When the GPS is turned on, the first thing to consider is the Almanac data and the time of its internal clock. This helps predict which satellites are available in the sky above. The GPS then tries to detect only available satellites to get their ephemeris data. This saves time when getting a lock on a position since, if there is no Almanac data available, the user would have to search the satellites one by one and some of them could be on the other side of the planet (i.e., inaccessible).

Switching off the receiver and waiting for a few moments before switching it on again means that the ephemeris data is so recent that the GPS can get a lock on its position in a very short period of time. This is because the GPS only needs to receive one of the 3 parts that make up a block of ephemeris to realize the data is very recent. This is known as a warm start. Even though ephemeris data can be valid for several hours, a given satellite can enter an area of low elevation (low reception quality), or even disappear from the hemisphere (no reception), in as little as half an hour. This depends on the satellite's initial location. In these cases, you won't get a warm start as the information from this satellite isn't available for the receiver and the GPS has to look for another one.

If, when you switch it on, the receiver doesn't have recent ephemeris data corresponding to (at least) 3 satellites, a cold start occurs. Here, the receiver gathers information from various satellites (to complete the 4) before locking its 3-D position. This cold start locking needs a minimum of 30 seconds more than a warm start.

The 3 packets that make up a block of ephemeris data are recognized thanks to the presence of broadcast identification signals (Issue of Data or IOD), which are specific for each satellite and ephemeris at a given moment. The GPS checks the IOD and ensures all parts being received come from the same packet and, therefore, the same satellite. This means that, in order to obtain a complete ephemeris data cycle, there is no need to wait for a new one to be sent and that just a few seconds are enough to get a new lock in a warm start. Said information also allows the GPSs to unite 3 data packets in poor coverage situations (where only part of this information is received in different blocks). This enables locking to occur as quickly as possible under difficult conditions.

When a GPS receiver is moving fast, it can take much longer to lock its position. Momentary blocking due to trees, making a turn, speed, multiple signals rebounding off buildings etc., all cause the GPS to fail. To regain the correct lock, it has to start over with data collection. Having very sensitive antennas is not a good idea, as the weak signs from the rebounds also cause GPS errors. A receiver with a less sensitive antenna will ignore these secondary signals.

Ephemeris data isn't valid if the GPS has moved more than a few hundred kilometers from the last position where it was switched on, or when it doesn't have an accurate internal clock time. Also the data from the almanac might not be valid either as the positions of the satellites are estimated taking into account the last position acquired by the GPS. If it changes hemisphere or moves to the other side of the planet, the predicted satellites may not be there.

You won't have an almanac (or its data will be invalid) if the receiver has been switched off for various months (obsolete almanac), or if it has reset or its battery has run out (deleted almanac).

To maintain an accurate lock, GPS receivers collect ephemeris data in the background as often as they need to. If you block the antenna, or if you're in a low coverage area, the GPS cannot do this.

With this information, the following is defined:

- Search the sky. This occurs when the Time, Position, Almanac and Ephemeris are all unknown. If reset has executed, or if the device is ex-factory and has been switched off for several months, the GPS begins to search for satellites one by one to get a lock. This can take 10/15 minutes.
- Autolocate. This occurs when Time and Ephemeris are unknown but part, or all, of the data from the Almanac is known and has noticeably varied, or doesn't show the position (e.g., undergoing a long journey). Instead of checking all satellites, the GPS can search for satellites in the sky (meaning an accurate lock can be obtained in a few minutes). For this to work, data must be collected from at least 4 complete ephemeris.
- Cold start. This is when Time and Position are known within reason, but the Almanac belonging to at least one of the 4 satellites needed to get an accurate lock is known and the Ephemeris is unknown. Since the receiver needs full ephemeris information from one or various satellites, it takes at least 30 seconds more than in a warm start to get a lock. This can take as long as an Autolocate operation.
- Warm start. This is when the Time and Position variables are known within reason, the Almanac is known, and the data from the ephemeris is both recent and known by the receiver. The GPS only needs to get a partial block from the ephemeris data coming from the 4 satellites (10 to 15 seconds) to ensure the data and the lock have not changed.

To correctly receive the GPS satellite signals, you need to connect an antenna to the router that fulfills the specifications for a GPS antenna.

- When the GPS receiver is associated with an existing cellular interface, the GPS antenna must be installed in the router's *diversity* connector. Remember that cellular and GPS antennas are not compatible. Consequently, you must install the appropriate antenna to connect to the *diversity* connector.

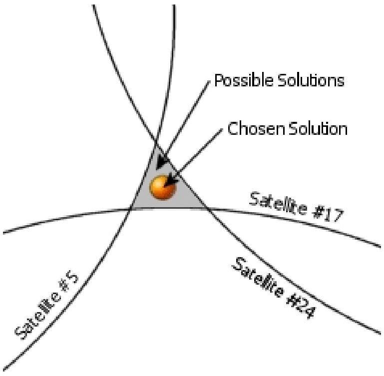
While the GPS is active, devices cannot use antenna diversity (as this is already being used as a GPS receiver antenna).

- When the GPS receiver is independent, the GPS antenna must be installed in the relevant GPS connector.

Please ask our technical service for information on the antenna models that can be used in GPS applications. We recommend you install GPS antennas from their catalog.

1.2 Horizontal Dilution Of Position (HDOP)

GPS devices calculate your position using a technique called *3-D multilateration.* This is the process of figuring out where several spheres intersect. For GPS, each sphere has a satellite at its center; the radius of the sphere is the calculated distance from the satellite to the GPS device. Ideally, these spheres would intersect at exactly one point so there's only one possible solution to the current location. In reality, however, the intersection forms more of an oddly-shaped area. The device could be located anywhere within that area, forcing devices to choose from multiple possibilities. The following figure shows an area created from three satellites.



The current location could be any point within the gray-colored area. Precision is said to be *diluted* when the area grows larger. The monitoring and control of *dilution of precision* (DOP) is the key to writing high-precision applications.

DOP values are reported in three types of measurements: horizontal, vertical, and mean. Horizontal DOP (HDOP) measures DOP as it relates to latitude and longitude. Vertical DOP (VDOP) measures precision as it relates to altitude. Mean DOP, also known as Position DOP (PDOP), gives an overall rating of precision for latitude, longitude and altitude. Each DOP value represents the mean position precision and gives ideal accuracy.

The parameters most commonly used to value the accuracy of the lock over the Earth's surface are HDOP.

Generally speaking, an HDOP value of six or less is recommended for any application that makes suggestions to the user based on the current location (for example, in-car navigation programs).

1.3 Applications

Our routers incorporate GPS receivers that carry out a series of operations with the information provided:

(1) Obtain lock coordinates from the console.

(2) Periodically update the clock in real time, based on the time information received by the GPS.

(3) Remote connection via Telnet to the router's GPS port, obtaining real time GPS information in NMEA (*National Marine Electronics Association*) message format.

(4) Local connection via the asynchronous serial port to the router's GPS data, getting the GPS information in real time in NMEA (*National Marine Electronics Association*) message format.

(5) GPS advisor. Lets you define different geographical areas where you can set different behaviors for the router. As a result, the router's configuration automatically changes when it enters or exits the pre-configured zones.

This manual describes how to configure and monitor this feature.

Chapter 2 Configuration

2.1 List of tasks needed to configure GPS

Our routers may have several GPS-related elements that are available and configurable.

These elements are:

- Independent GPS receiver interface.
- GPS receiver associated with the cellular interface.
- GPS features:

  Time synchronization.

  Access to GPS data via TCP.

  GPS advisors.

  GPS FIX transfer.
- GPS-DATA interface to access GPS data via an asynchronous serial line.

To configure the GPS, execute the following tasks:

- Configure the GPS interface. The interface can be:

  An independent GPS interface or,

  A GPS associated with a cellular interface.
- Configure the GPS feature parameters.
- Configure asynchronous serial interface to enable it as GPS-DATA.

2.1.1 Configuring the GPS interface

2.1.1.1 Independent GPS Interface

To access the GPS interface configuration menu, first access the general configuration menu. From there, access the GPS interface.

```
Config>list device
Interface           Connector     Type of interface
ethernet0/0         EXP/SWITCH    Marvell Fast Ethernet Switch
gps0/0              GPS           GPS Interface
x25-node            ---           Router->Node
cellular10/0        SLOT1         AT COM
cellular11/0        SLOT1         AT COM
cellular10/1        SLOT1         USBNIC Interface
cellular11/1        SLOT1         USBNIC Interface
wlan2/0             SLOT2         Wireless LAN Interface
direct-ip1          ---           Generic DirectIP encapsulation
direct-ip2          ---           Generic DirectIP encapsulation
bvi0                ---           Bridge Virtual Interface
wlan2/0.1           ---           Wireless LAN subinterface
Config>
```

In this example, the GPS interface appears as gps0/0, therefore:

```
Config>network gps0/0
-- Interface GPS Configuration  --
gps0/0 config>
```

Note

The independent GPS receiver feature is only available in some of our devices and must be enabled with a license. Please contact our Technical Service to get a list of devices that support this feature.

2.1.1.2 GPS associated with a cellular interface

Access the GPS associated with a cellular interface configuration menu from the general configuration menu. From there, access the base interface (cellularx/0) for the cellular interface where you want to enable the GPS.

```
Config>list device
Interface          Connector     Type of interface
ethernet0/0        GE0/FE0/LAN1  Fast Ethernet interface
ethernet0/1        GE1/FE1/LAN2  Fast Ethernet interface
serial0/0          SERIAL0/WAN1  Auto Install Interface
bri0/0             BRI/ISDN1     ISDN Basic Rate Int
x25-node           ---           Router->Node
cellular1/0        SLOT1         AT COM
cellular1/1        SLOT1         AT COM
ppp1               ---           Generic PPP
Config>
```

In this example, the base cellular interface appears as cellular1/0, therefore:

```
Config>network cellular1/0
-- Interface AT. Configuration  --
cellular1/0 AT config>
```

Note

The associated GPS receiver feature is not supported in all cellular interfaces. It is only available in some of our devices and depends on the type of WWAN module incorporated. Please contact our Technical Service to get a list of devices that support this feature.

2.1.2 Configuring the GPS parameters

Enter the GPS configuration commands at the configuration menu associated with the GPS (*GPS-Apps Cfg>*). To access said menu, use the **feature gps-applications** command at the general configuration menu (*Config>*).

```
Config>feature gps-applications
-- GPS Applications Configuration --
GPS-Apps Cfg>
```

2.2 Configuration Commands: Independent GPS Interface

This section describes the independent GPS interface configuration commands.

Certain commands are common for all device interfaces. These commands are explained in manual *Teldat-Dm772-I “Common Configuration Interfaces”*.

The specific programming commands for this interface are as follows:

Command	Function
?(HELP)	Lists the available commands or their options.
ENABLE	Enables the GPS receiver in this interface.
NO	Lets you configure the default values or negate a command.

2.2.1 ? (HELP)

Lists the commands available at the level where the router is configured. This command can also be used after a specific command to list the available options.

Syntax:

```
gps0/0 config>?
```

Example:

```
gps0/0 config>?
  description    Enter interface description
  enable         Enable GPS reception
  no             Negate a command or set its defaults
```

```
  shutdown       Change state to administratively down
  update         Update a level indicator
  exit           Return to previous menu
```

2.2.2 ENABLE

Enables NMEA message reception in this interface. This allows you to monitor the position of the router through the local console or a TCP connection.

Syntax:

```
gps0/0 config>enable
```

2.2.3 NO

Configures default values or negates a command.

Syntax:

```
gps0/0 config>no ?
  description    Enter interface description
  enable         Enable GPS reception
  shutdown       Change state to administratively down
  update         Update a level indicator
```

2.2.3.1 NO ENABLE

Disables NMEA message reception in this interface.

Syntax:

```
cellular1/0 AT config>no enable
```

2.3 Configuration Commands: GPS associated with a cellular interface

This section describes the configuration commands for a GPS associated with a cellular interface.

There are certain commands that are common for all interfaces in the device. These commands are explained in manual *Teldat-Dm772-I “Common Configuration Interfaces”* .

The cellular interface has a specific set of operating commands. These commands are described in the cellular interface configuration manual (*Teldat-Dm781-I "Cellular Interface"*).

The specific programming commands for the GPS in this interface are as follows:

Command	**Function**
GPS	Configures GPS options in this interface.
NO	Lets you configure default values or negate a command.

2.3.1 GPS

Configures GPS options in this interface.

Syntax:

```
cellular1/0 AT config>gps ?
  enable    Enable GPS reception
```

2.3.1.1 ENABLE

Enables NMEA message reception. This allows you to monitor the position of the router through the local console or a TCP connection.

Syntax:

```
cellular1/0 AT config>gps enable
```

2.3.2 NO

Lets you configure default values or negate a command.

Syntax:

```
cellular1/0 AT config>no ?
  enable          Enable GPS reception
```

2.3.2.1 NO ENABLE

Disables NMEA message reception in this interface.

Syntax:

```
cellular1/0 AT config>no gps enable
```

Example:

```
gps0/0 config>no enable
```

2.4 Configuration Commands for the GPS Feature

Enter the GPS Feature configuration commands in the configuration menu associated with the GPS (*GPS-Apps Cfg*>). Access this menu using **feature GPS** at the general configuration menu (*Config*>).

```
Config>feature GPS
-- GPS Applications Configuration --
GPS-Apps Cfg>
```

Once you have accessed the GPS configuration menu, you can enter the following commands:

```
GPS-Apps Cfg>?
  fix-transfer      Allows FIX transfer to a remote server
  gps-advisor       Enter to GPS advisor menu
  gps-ifc-source    Configure GPS source interface
  no                Negate a command or set its defaults
  sync-clock        Enables system clock synchronization with GPS
  tcp-enable        Enable tcp remote connection
  tcp-in-data       Enable sends TCP input data to GPS receiver
  tcp-max-ses       Configure max tcpsessions
  tcp-port          Configure listen tcp port
  exit              Exit to parent menu
GPS-Apps Cfg>
```

Command	Function
FIX-TRANSFER	Sends GPS FIX to a remote host in a certain format.
GPS-ADVISOR	Enters the GPS advisors configuration menu.
GPS-IFC-SOURCE	Lets you select the interface where the GPS is installed.
NO	Clears a configuration parameter or sets its default value.
SYNC-CLOCK	Synchronizes the system's clock with the one received via GPS. You can enter a synchronization period or nothing in which case synchronization will occur as soon as the valid data is received.
TCP-ENABLE	Allows TCP connections to obtain NMEA sentences from the GPS.
TCP-IN-DATA	Enables the sending of data received through the TCP connection to the GPS receiver.
TCP-MAX-SES	Specifies the maximum TCP sessions able to be used.
TCP-PORT	Specifies the TCP port to use for the connections.
EXIT	Exits the GPS configuration menu.

2.4.1 FIX-TRANSFER

This feature lets you transfer the GPS fix to a HTTP server.

The fix data is sent in XML format. Time between the fix samples can be configured (frequency). Said information is sent to the HTTP server through POST (method). Fix samples are stored for each time period defined by frequency and are periodically sent to the HTTP server. Time to send stored samples can also be configured.

Each transfer can include 1 or more fix samples, depending on the samples storage frequency and the send time configured. Care must be taken to ensure coherence between the two timers. The send timer must be equal or higher than the frequency timer.

The XML data has following format:

```
<gps id="GPS_FIX_SAMPLES">
  <coordinates>
    <coordinate>
      <fix>1</fix>
      <time>1488556520</time>
      <latitude>40.591536</latitude>
      <longitude>-3.708000</longitude>
      <altitude>782.3</altitude>
      <climb>-0.0</climb>
      <speed>0.0</speed>
      <separation>53.0</separation>
      <track>173.9</track>
      <satellites>7</satellites>
    </coordinate>
  <coordinate>
      <fix>1</fix>
      <time>1488556522</time>
      <latitude>40.591536</latitude>
      <longitude>-3.708000</longitude>
      <altitude>782.3</altitude>
      <climb>-0.0</climb>
      <speed>0.0</speed>
      <separation>53.0</separation>
      <track>173.9</track>
      <satellites>8</satellites>
    </coordinate>
  </coordinates>
</gps>
```

The previous example includes information from two samples.The meaning for each field in the transferred XML data is as follows:

- **id:** includes the configured hostname on the device. If the hostname is not configured, the default value is: GPS_FIX_SAMPLES.
- **fix:** fix quality: indicates the fix type and whether the sample is valid or not:

  0 = invalid

  1 = GPS fix (SPS)

  2 = DGPS fix

  3 = PPS fix

  4 = Real Time Kinematic

  5 = Float RTK

  6 = estimated (dead reckoning)

  7 = Manual input mode

  8 = Simulation mode
- **time:** sample time and date. Represents the seconds elapsed from 1970-01-01 00:00:00 UTC.
- **latitude:** latitude coordinate.
- **longitude:** longitude coordinate.
- **altitude:** altitude, in meters, above mean sea level.
- **climb:** is not supported and always returns a 0.0 value.
- **speed:** speed over the ground in knots (nautical mile (1.852 km) per hour).
- **separation:** geoidal separation. Geoid height (mean sea level) above the WGS84 ellipsoid.

- **track:** track angle in degrees *True*.
- **satellites:** number of satellites being tracked.

fix-transfer commands help configure the parameters to allow GPS fix to be transferred to an HTTP server. The following commands are supported:

Syntax:

```
GPS-Apps Cfg>fix-transfer ?
  enable           Enables FIX transfer
  disable          Disables FIX transfer
  local-address    Local IP address
  mode             Select transfer mode
  frequency        Time between FIX samples
  time-send        Time to send samples
  url              Server URL
```

Command history:

Release	Modification
11.01.02	New command added.

2.4.1.1 ENABLE

Enables the GPS fix transfer feature. To disable this feature, use the **disable** command.

It is disabled by default.

Syntax:

```
GPS-Apps Cfg>fix-transfer enable ?
  <cr>
```

Example:

This example shows how to configure this option:

```
GPS-Apps Cfg>fix-transfer enable
GPS-Apps Cfg>
```

Command history:

Release	Modification
11.01.02	New command added.

2.4.1.2 DISABLE

Disables the GPS fix transfer feature. To enable this feature, use the **enable** command.

It is disabled by default.

Syntax:

```
GPS-Apps Cfg>fix-transfer disable ?
  <cr>
```

Example:

This example shows how to configure this option:

```
GPS-Apps Cfg>fix-transfer disable
GPS-Apps Cfg>
```

Command history:

Release	Modification
11.01.02	New command added.

2.4.1.3 LOCAL-ADDRESS

This parameter helps to configure the local IP address. When the HTTP POST connection is established, this value is sent as the local IP address on the outgoing TCP sessions.

Value 0.0.0.0 indicates that this parameter is not used. The router automatically assigns the IP address used for outgoing sessions.

The default value is: 0.0.0.0.

Syntax:

```
GPS-Apps Config>fix-transfer local-address ?
  <a.b.c.d>    Ipv4 format
```

Example:

This example shows how to configure this option:

```
GPS-Apps Cfg>fix-transfer local-address 192.168.0.32
GPS-Apps Cfg>
```

Note

- The local IP Address must be one of the addresses configured in the router for any addressable interface (i.e., Ethernet, PPP, loopback, etc.)

Command history:

Release	Modification
11.01.02	New command added.

2.4.1.4 MODE

Allows the transfer mode to be selected.

The default mode is HTTP.

Syntax:

```
GPS-Apps Config>fix-transfer mode ?
  http    HTTP mode
```

Example:

This example shows how to configure this option:

```
GPS-Apps Cfg>fix-transfer mode http
GPS-Apps Cfg>
```

Command history:

Release	Modification
11.01.02	New command added.

2.4.1.5 FREQUENCY

Sets the time between FIX samples. This parameter defines the time between each sample collection. Samples are stored in the device and sent to the server when the timer defined in the time-sent command expires. To ensure coherence between the frequency and time-send timers, the send-timer must be equal to, or greater than, the frequency.

Valid values range between 1 and 30 seconds. The default value is 2 seconds.

Syntax:

```
GPS-Apps Config>fix-transfer frequency ?
  <1..30>    Time in seconds
```

Example:

This example shows how to configure this option:

```
GPS-Apps Cfg>fix-transfer frequency 2
GPS-Apps Cfg>
```

Command history:

Release	Modification
11.01.02	New command added.

2.4.1.6 TIME-SEND

Sets the time between two consecutive transfers. The fix samples stored are sent periodically and this parameter defines the time between sending attempts. The fix samples stored are sent to the remote server when the timer configured in this command expires. All fix samples stored since the last transfer are included in the data transfer. To ensure coherence between the frequency and time-send timers, the send-timer must be equal to, or greater than, the frequency.

The number of samples included in a transfer is approximately the value of the time-send parameter divided by the frequency value (i.e., time-send=6, frequency=2, samples=3).

Valid values range between 1 and 120 seconds. The default value is 6 seconds.

Syntax:

```
GPS-Apps Config>fix-transfer time-send ?
  <1..120>    Time in seconds
```

Example:

This example shows how to configure this option:

```
GPS-Apps Cfg>fix-transfer time-send 6
GPS-Apps Cfg>
```

Command history:

Release	Modification
11.01.02	New command added.

2.4.1.7 URL

Configures the URL connection to access the remote server. This command allows the following server parameters to be set:

- HOST: host name or IP address

- PORT: remote TCP port

- RESOURCE: remote server resource where data must be stored

Only the host name is mandatory when accessing a remote server. The port number and server resource are optional.

Syntax:

```
GPS-Apps Config>fix-transfer url ?
  <1..128 chars>    Format: http://<host>[:<port>][/<resource>]
  <cr>              URL clear
```

Examples:

This example shows how to configure the URL with host name only:

```
GPS-Apps Cfg>fix-transfer url http://myhost.com
GPS-Apps Cfg>
```

This example shows how to configure the URL with host IP address only:

```
GPS-Apps Cfg>fix-transfer url http://10.32.4.33
GPS-Apps Cfg>
```

This example shows how to configure the URL with host name and server port:

```
GPS-Apps Cfg>fix-transfer url http://myhost.com:80
GPS-Apps Cfg>
```

This example shows how to configure the URL with host name and server resource:

```
GPS-Apps Cfg>fix-transfer url http://myhost.com/mygpsinfo
GPS-Apps Cfg>
```

This example shows how to configure the URL with host name, server port and server resource:

```
GPS-Apps Cfg>fix-transfer url http://myhost.com:80/mygpsinfo
GPS-Apps Cfg>
```

Command history:

Release	Modification
11.01.02	New command added.

2.4.2 GPS-ADVISOR

Lets you access the *GPS ADVISOR* configuration menu.

The **gps-advisor** feature (associated with GPS locking) lets you define polls based on one or several areas defined through geographical coordinates.

For the **gps-advisor** to operate correctly, GPS must be enabled in an interface and associated with said feature (**gps-ifc-source** command).

Syntax:

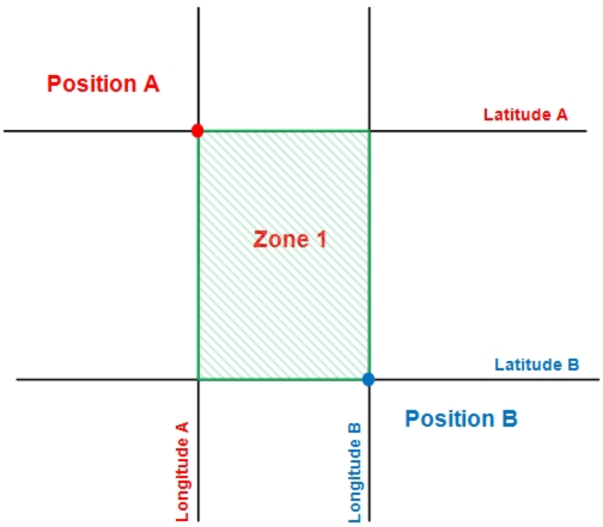
```
GPS-Apps Cfg>gps-advisor
```

Example:

```
GPS-Apps Cfg>gps-advisor
-- GPS Applications Configuration --
GPS-Apps Advisor Cfg>
```

The GPS-advisor simply defines the conditions needed for the GPS to obtain a TRUE or FALSE position, depending on the associated zones and the logical association. The GPS-advisor doesn't execute any action, but links itself to another router feature. Based on the advisor's periodic evaluation on the device's GPS lock, the associated feature executes the actions set in the configuration.

The GPS-advisor scope is a geographical area (**zone)** delimited by two coordinate-defined points. This lets you define zones delimited by two latitude and two longitude values (similar to a rectangle):



The following is an example of geographical coordinates:

A	Longitude: 3° 43,5120” W	B	Longitude: 3° 43,4168” W
	Latitude: 40° 35,1712” N		Latitude: 40° 35,3478” N

An advisor is made up of a list of zones that can be concatenated or negated to achieve more complex forms.

An advisor periodically verifies the device's geographic position, evaluating how it finds each associated zone with respect to its current geographical position. The result is always true or false, depending on what's obtained after executing an AND operation on all associated zones. For an advisor to be true, all entries to its zone must be true. When you configure the advisor entries, you can configure a negative zone to ensure a small zone is excluded from a larger one if the result gathered from evaluating the zone is false.

The advisors and associated zones are created here. Certain protocols or features can associate commands to advisors created in said menu. The advisors can use these features (or protocols) and depending on the results (true/false), act in consequence.

An advisor can only be invoked from a protocol or a feature, i.e., the same advisor can only be used once in the configuration.

The following commands can be entered once the GPS advisor menu is accessed:

2.4.2.1 ? (HELP)

Lists all the commands available at the layer where the router is configured. This command can also be used after a specific command to list its options.

Command	Function
ZONE	Creates and modifies a zone.
ADVISOR	Creates and modifies a GPS advisor.
NO	Eliminates an advisor or a zone.
EXIT	Returns to the previous menu.

Syntax:

```
GPS-Apps Advisor Cfg>?
  advisor    Configure GPS advisor
  no         Negate a command or set its defaults
  zone       Configure GPS zone options
  exit       Return to previous menu
GPS-Apps Advisor Cfg>
```

2.4.2.2 ZONE

This command creates delimiting zones that can be used by one or various advisors. A zone is a geographical area delimited by two coordinate-defined points. This lets you define zones delimited by two latitude and two longitude values. This command also allows you to configure parameters to determine the return state for the zone, e.g., timer to validate any changes in state, quality of the valid GPS signal, etc.

Depending on the zone configurations, the GPS can operate abnormally (for instance, due to lack of coverage or a pre-existing condition before getting a signal).

The function of the zones is to determine the behavior of the advisors they refer to. The state of the zones is evaluated periodically on the basis of the current geographical situation. Depending on the state returned by the zone, the relevant advisor(s) return a certain state.

To create a zone, execute some of the commands available with a new zone identifier:

Syntax:

```
GPS-Apps Advisor Cfg>zone <ZONE>  [params…]
```

You can configure up to 10 different zones, numbered 1 to 10.

A zone lets you configure a series of parameters that can be viewed using the ‘?’ command:

Syntax:

```
GPS-Apps Advisor Cfg>zone <zone> ?
```

Example:

```
GPS-Apps Advisor Cfg>zone 1 ?
```

```
  coverage-fail-state         Configure state on coverage failure
  coverage-fail-state-time    Configure state timer on coverage failure
  initial-state               Configure initial state at power ON
  initial-state-time          Configure initial state timer
  latitude                    Configure latitude range of the zone
  longitude                   Configure longitude range of the zone
  time-to-true                Configure time to validate IN of zone
  time-to-false               Configure time to validate OUT of zone
  hdop                        Configure horizontal dilution of precision
GPS-Apps Advisor Cfg>
```

2.4.2.2.1 coverage-fail-state

Configures the state the zone should take when the GPS receiver loses coverage or doesn't have enough to calculate its geographical position accurately.

The states the zone takes, should it lose coverage, can be any of the following:

Command	Function
TRUE	Returns TRUE, i.e., indicates that it's *inside* the zone.
FALSE	Returns FALSE, i.e., indicates that it's *outside* the zone.
TRUE-TIME-FALSE	Immediately returns TRUE, i.e., indicates that it's *inside* the zone. If the timeout programmed through the **coverage-fail-state-time** command times out and there isn't any coverage, the zone progresses to a FALSE state, i.e., it's *outside* the zone.
FALSE-TIME-TRUE	Immediately returns FALSE, i.e., indicates that it's *outside* the zone. If the timeout programmed through the **coverage-fail-state-time** command times out, without coverage, the zone progresses to a TRUE state, i.e., it's *inside* the zone.
LAST-STATE	Returns the same state as it had before requesting coverage.
LAST-TIME-FALSE	Returns the same state as it had before losing coverage. However if the timeout programmed through the **coverage-fail-state-time** command times out and there isn't any coverage, the zone progresses to a FALSE state, i.e., it's *outside* the zone.
LAST-TIME-TRUE	Returns the same state it had before losing coverage. However, if the timeout programmed through the **coverage-fail-state-time** command times out and there isn't any coverage, the zone progresses to a TRUE state, i.e., it's *inside* the zone.

Default is LAST-TIME-FALSE.

Syntax:

```
GPS-Apps Advisor Cfg>zone <ZONE> coverage-fail-state ?
  true               Coverage failure state is IN of zone
  false              Coverage failure state is OUT of zone
  true-time-false    After a time, state change from IN to OUT
  false-time-true    After a time, state change from OUT to IN
  last-state         Coverage fail state is the last state
  last-time-false    After a time, state change from last-state to OUT
  last-time-true     After a time, state change from last-state to IN
```

Example:

```
GPS-Apps Advisor Cfg>zone 1 coverage-fail-state last-time-false
```

2.4.2.2.2 coverage-fail-state-time

Configures the time for a change of state when GPS coverage fails. It is associated with the **coverage-fail-state** command.

Default is 00:02:00

If you enter a whole number, its value is taken in seconds; i.e., 00:02:00 is the same as 120.

Syntax:

```
GPS-Apps Advisor Cfg>zone <ZONE> coverage-fail-state-time ?
  <00:01:00..01:00:00>    Timeout for a change of coverage fail state
                          (HH:MM:SS)
```

Example:

```
GPS-Apps Advisor Cfg>zone 1 coverage-fail-state-time 00:3:30
```

2.4.2.2.3 initial-state

Configures the state the zone must take when the device is switched on and there is no GPS information as yet.

The states the zone can reach when the device is switched on are as follows:

Command	Function
TRUE	Returns TRUE, i.e., indicates that it's *inside* the zone.
FALSE	Returns FALSE, i.e., indicates that it's *outside* the zone.
TRUE-TIME-FALSE	Immediately returns TRUE, i.e., indicates that it's *inside* the zone. If the timeout programmed through the **initial-state-time** command times out without GPS information, the zone progresses to a FALSE state, i.e., it's *outside* the zone.
FALSE-TIME-TRUE	Immediately returns FALSE, i.e., indicates that it's *outside* the zone. If the timeout programmed through the **initial-state-time** command times out without GPS information, the zone progresses to a TRUE state, i.e., it's *inside* the zone.

Default is FALSE.

Syntax:

```
GPS-Apps Advisor Cfg>zone <ZONE> initial-state ?
  true              Initial state is IN of zone
  false             Initial state is OUT of zone
  true-time-false   After a time, state change from IN to OUT
  false-time-true   After a time, state change from OUT to IN
```

Example:

```
GPS-Apps Advisor Cfg>zone 1 initial-state true-time-false
```

2.4.2.2.4 initial-state-time

Configures the time for state transition when the device is switched on and no GPS information is associated with the **initial-state** command as yet.

Default is 00:02:00

If you enter a whole number, its value is taken in seconds; i.e., 00:02:00 is the same as 120.

Syntax:

```
GPS-Apps Advisor Cfg>zone <ZONE> initial-state-time ?
  <00:01:00..01:00:00>    Timeout for a change of state (HH:MM:SS)
```

Example:

```
GPS-Apps Advisor Cfg>zone 1 initial-state-time 00:2:30
```

2.4.2.2.5 latitude

Configures the two latitude values of the geographical coordinates that help delimit the zone. As opposed to the previous graph, where a delimited zone is defined by points A and B, the values that must be entered in this command correspond to *latitude A* and *latitude B*.

Parameters:

<degX>	Degrees for the position. This can range between 0 and 90.
<min_intX>	Overall minutes. This can range between 0 and 60.
<min_decX>	Decimal part of the minutes. This can range between 0 and 9999. Since this parameter represents a decimal value, you must enter all four digits.
<cadrX>	Represents the cardinal point associated with the latitude where the point is found. This can take values N (North) or S (South).

Syntax:

```
GPS-Apps Advisor Cfg> zone <ZONE> latitude <degA> <min_intA> <min_decA> <cardA> to
<degB> <min_intB> <min_decB> <cardB>
```

Example:

Configuring latitudes:

A: 40° 35.1712' N

B: 40° 35.3478' N

```
GPS-Apps Advisor Cfg>zone 1 latitude ?
  <0..90>    Latitude degrees
GPS-Apps Advisor Cfg>zone 1 latitude 40 ?
  <0..60>    Latitude minutes
GPS-Apps Advisor Cfg>zone 1 latitude 40 35 ?
  <4 digits>    Longitude decimal minutes
GPS-Apps Advisor Cfg>zone 1 latitude 40 35 1712 ?
  N    Northern hemisphere
  S    Southern hemisphere
GPS-Apps Advisor Cfg>zone 1 latitude 40 35 1712 N to ?
  <0..90>    Latitude degrees
GPS-Apps Advisor Cfg>zone 1 latitude 40 35 1712 N to 40 ?
  <0..60>    Latitude minutes
GPS-Apps Advisor Cfg>zone 1 latitude 40 35 1712 N to 40 35 ?
  <4 digits>    Longitude decimal minutes
GPS-Apps Advisor Cfg>zone 1 latitude 40 35 1712 N to 40 35 3478 ?
  N    Northern hemisphere
  S    Southern hemisphere
GPS-Apps Advisor Cfg>zone 1 latitude 40 35 1712 N to 40 35 3478 N
```

2.4.2.2.6 longitude

Configures the two longitudinal values of the geographical coordinates that delimit the zone. As opposed to the previous graph, where a delimited zone is defined by points A and B, the values that must be entered in this command correspond to *longitude A* and *longitude B.*

Parameters:

<degX>	Degrees for the position. This can range between 0 and 179.
<min_intX>	Overall minutes. This can range between 0 and 60.
<min_decX>	Decimal part of the minutes. This can range between 0 and 9999. Since this parameter represents a decimal value, you must enter all four digits.
<cadrX>	Represents the cardinal point associated with the longitude where the point is found. This can take values E (East) or W (West).

Syntax:

```
GPS-Apps Advisor Cfg> zone <ZONE> longitude <degA> <min_intA> <min_decA> <cardA> to
<degB> <min_intB> <min_decB> <cardB>
```

Example:

Configuring the longitudes:

A: 3° 42.5120' W

B: 3° 42.4168' W

```
GPS-Apps Advisor Cfg> zone 1 longitude ?
  <0..179>    Longitude degrees
GPS-Apps Advisor Cfg> zone 1 longitude 3 ?
  <0..60>    Longitude minutes
GPS-Apps Advisor Cfg> zone 1 longitude 3 42 ?
  <4 digits>    Longitude decimal minutes
GPS-Apps Advisor Cfg> zone 1 longitude 3 42 5120 ?
  E    Eastern area
  W    Western area
GPS-Apps Advisor Cfg> zone 1 longitude 3 42 5120 W ?
  to    Configure second point of the area
GPS-Apps Advisor Cfg> zone 1 longitude 3 42 5120 W to ?
  <0..179>    Longitude degrees
GPS-Apps Advisor Cfg> zone 1 longitude 3 42 5120 W to 3 ?
  <0..60>    Longitude minutes
```

```
GPS-Apps Advisor Cfg> zone 1 longitude 3 42 5120 W to 3 42 ?
  <4 digits>    Longitude decimal minutes
GPS-Apps Advisor Cfg> zone 1 longitude 3 42 5120 W to 3 42 4168 ?
  E    Eastern area
  W    Western area
GPS-Apps Advisor Cfg> zone 1 longitude 3 42 5120 W to 3 42 4168 W
```

2.4.2.2.7 time-to-true

Configures the waiting time for the zone's state to switch from FALSE to TRUE when the device has good GPS coverage. This transition is triggered when the GPS receiver falls *inside* the zone. This parameter is used to prevent FALSE detections (if the GPS receiver is circulating near the zone). It's also useful if you want to enter the zone for a short period of time without triggering a change of state.

Default is 00:02:00

If you enter a whole number, its value is taken in seconds; i.e., 00:02:00 is the same as 120.

Syntax:

```
GPS-Apps Advisor Cfg>zone <ZONE> time-to-true ?
  <00:01:00..01:00:00>    Configure time to validate IN of zone
```

Example:

```
GPS-Apps Advisor Cfg>zone 1 time-to-true 00:2:30
```

2.4.2.2.8 time-to-false

Configures the waiting time for the zone's state to switch from TRUE to FALSE when the device has good GPS coverage. This transition is triggered when the GPS receiver falls *outside* the zone. This parameter is used to prevent occasional detections.

Default is 00:02:00

If you enter a whole number, its value is taken in seconds; i.e., 00:02:00 is the same as 120.

Syntax:

```
GPS-Apps Advisor Cfg>zone <ZONE> time-to-false ?
  <00:01:00..01:00:00>    Configure time to validate IN of zone
```

Example:

```
GPS-Apps Advisor Cfg>zone 1 time-to- false 00:2:30
```

2.4.2.2.9 hdop

Configures the HDOP limit value for the GPS information to be considered valid. When the HDOP calculated by the GPS receiver exceeds the value configured, the locking information is discarded and NO SIGNAL is shown (as if there were no GPS signal).

HDOP (Horizontal Dilution Of Position) is the most commonly used parameter to evaluate the locking accuracy over the Earth's surface of all those offered by a GPS receiver.

As a general rule, we recommend a maximum HDOP value of six for applications that need a lesser accurate location knowledge (e.g., for vehicle navigation applications).

Default for this parameter is 6.

Syntax:

```
GPS-Apps Advisor Cfg>zone <ZONE> hdop ?
  <2..20>    Value in the specified range
```

Example:

```
GPS-Apps Advisor Cfg>zone 1 hdop 4
```

2.4.2.3 ADVISOR

Creates advisors associated with one or various zones. Here, you can define areas over the Earth's surface with simple or more complex forms.

Advisors can be triggered by configuration parameters belonging to other menus or features. The goal is to condition behavior for a specific protocol or for the whole device (depending on its geographical position).

An advisor always returns a TRUE or FALSE state, depending on the results obtained from evaluating the geographical position with respect to their associated zones.

Advisors return their state after executing an AND operation with all associated zones.

When including a zone in an advisor, this can be *negated* by placing **not** before said zone. Thus, when evaluating the zone, the advisor takes the opposite value of what is displayed as an exit value (i.e., if the zone returns TRUE, the advisor takes it as FALSE). This is useful when you want to exclude a small area from a larger one.

To create an advisor, execute the command and include a zone.

To associate a zone with an advisor, create an entry with the identifiers for both the advisor and the zone. To associate various zones with the same advisor, execute the **advisor** command (with its identifier) as many times as the number of zones you wish to associate.

You can configure up to 10 different advisors, numbered 1 to 10.

The **advisor** command also allows the following modifiers:

NO	Eliminates a zone from the advisor.
NOT	Negates the zone that is entered next. Reverses the zone's exit value.
ZONE	Zone number associated with the advisor.

Advisor command options:

Syntax:

```
GPS-Apps Advisor Cfg>advisor <ADVISOR>  ?
  no      Negate a command or set its defaults
  not     Add a denied zone to the advisor
  zone    Add an existing zone to the advisor
```

To configure an advisor, execute the following syntax:

Syntax:

```
GPS-Apps Advisor Cfg>advisor <ADVISOR> [not] zone <ZONE>
```

Example:

An advisor created with two zones, one of them is negated.

```
GPS-Apps Advisor Cfg>advisor 1 not zone 2
GPS-Apps Advisor Cfg>advisor 1 zone 3
```

To eliminate a zone from an advisor, enter the whole sequence, i.e., if it has a *not* modifier, this must also be included:

Syntax:

```
GPS-Apps Advisor Cfg> advisor <ADVISOR> no [not] zone <ZONE>
```

Example:

An advisor is created with two zones, one of them is negated.

```
GPS-Apps Advisor Cfg>advisor 1 no not zone 2
```

2.4.2.4 NO ADVISOR/ZONE

Eliminates both advisors and zones.

Syntax:

```
GPS-Apps Advisor Cfg> no <advisor/zone> <ADVISOR/ZONE>
GPS-Apps Advisor Cfg> no ?
  advisor    Configure GPS advisor
  zone       Configure GPS zone options
```

Example:

An advisor is created with two zones, one of them is negated.

```
GPS-Apps Advisor Cfg>no zone 1
GPS-Apps Advisor Cfg>no advisor 3
```

2.4.3 GPS-IFC-SOURCE

Allows you to select the source interface for the GPS data for the features provided by the device.

Syntax:

```
GPS-Apps Cfg>gps-ifc-source ?
  <interface>    Interface name
```

Note

- When you select the GPS from a cellular interface, this must always be referenced to the base interface (cellularX/0).
- If none of the interfaces has the GPS enabled (command **enable**) then none of the available features in the device will be available, even if you can configure them.

Examples:

Select the device's independent GPS interface as the GPS data source.

```
GPS-Apps Cfg>gps-ifc-source gps0/0
```

Select the cellular interface's GPS interface as the GPS data source.

```
GPS-Apps Cfg>gps-ifc-source cellular1/0
```

2.4.4 NO

Configures the default values.

Syntax:

```
GPS-Apps Cfg>no <command>
```

Example:

```
GPS-Apps Cfg>no ?
  sync-clock     Enables system clock synchronization with GPS
  tcp-enable     Enable tcp remote connection
  tcp-in-data    Enable sends TCP input data to GPS receiver
  tcp-max-ses    Configure max tcpsessions
  tcp-port       Configure listen tcp port
```

2.4.5 SYNC-CLOCK

Synchronizes the system's clock with the one received by GPS. You can enter a synchronization period or nothing, in which case synchronization will occur as soon as the valid data is received.

Syntax:

```
GPS-Apps Cfg>sync-clock ?
  <00:01:00..23:59:00>    Periodically (HH:MM:SS)
  <cr>                    At the beginning
```

Example:

Synchronizing the router clock with the GPS clock at the start.

```
GPS-Apps Cfg>sync-clock
```

2.4.6 TCP-ENABLE

Allows TCP connections to remotely obtain GPS data.

> **Note**
>
> When allowing TCP connections, configure a visible port when there is a NAPT firewall configured.

Syntax:

```
GPS-Apps Cfg>tcp-enable
```

In the port nat menu, configure a port that was preconfigured for gps or the default port, and the router's IP address.

Syntax:

```
NAPT config>VISIBLE-PORT <external port> RULE <rule id> IP <new IP host address>
```

2.4.7 TCP-IN-DATA

Enables data sending (received through the TCP connection) to the GPS receiver.

> **Note**
>
> • Not all GPS receivers support incoming data.

Syntax:

```
GPS-Apps Cfg>tcp-in-data
```

2.4.8 TCP-MAX-SES

Specifies the maximum number of TCP sessions from which to obtain GPS data.

By default, there are unlimited sessions.

Syntax:

```
GPS-Apps Cfg>tcp-max-ses ?
  <1..65535>     TCP max sessions value
```

Example:

Specifies a maximum of 5 TCP connections.

```
GPS-Apps Cfg>tcp-max-ses 5
```

Command history:

Release	Modification
11.01.09	The "*tcp-max-ses*" command was introduced as of version 11.01.09

2.4.9 TCP-PORT

Specifies which TCP port to use for remote connections in order to obtain GPS data in NMEA format.

The default port is 21200.

Syntax:

```
GPS-Apps Cfg>tcp-port ?
  <1000..65535>     TCP port value
```

Example:

Specifies Port 9090 as the TCP connections port.

```
GPS-Apps Cfg>tcp-port 9090
```

2.5 Configuring a GPS-DATA Interface

GPS-DATA interfaces allow our devices to connect to devices that use an asynchronous serial port to obtain GPS positioning information.

To configure a **GPS-DATA** interface, first select the serial line interfaces (net) associated with this type of data.

GPS-DATA interfaces over a serial line (in our devices) are always RS-232. This is not implemented over any other kind of interface.

To enter the configuration process, follow the steps given below:

(1) At the (*) prompt, enter **process 4** or **P 4**. This takes you to the *Config>* configuration prompt.

```
*P 4
Config>
```

(2) Enter **list devices**. This gives you a list of all interfaces the devices have assigned as **GPS-DATA** .

```
Config>list devices
Interface            Connector     Type of interface
ethernet0/0          EXP/SWITCH    Marvell Fast Ethernet Switch
gps0/0               GPS           GPS Interface
uart0/0              CONF          GPS-DATA Interface
x25-node             ---           Router->Node
cellular10/0         SLOT1         AT COM
cellular10/1         SLOT1         AT COM
cellular11/0         SLOT1         AT COM
cellular11/1         SLOT1         AT COM
Config>
```

(3) Interfaces that can be configured in GPS-DATA mode all support asynchronous mode. Interfaces where you can configure GPS-DATA mode are SERIAL (listed as serialX/X) and UART (uartX/X). On startup, you might not have all the interfaces you want configured as GPS-DATA. To configure them, enter **set data-link** as shown below:

```
Config>list devices
Interface            Connector     Type of interface
ethernet0/0          EXP/SWITCH    Marvell Fast Ethernet Switch
gps0/0               GPS           GPS Interface
uart0/0              CONF          Asynchronous Serial Line
x25-node             ---           Router->Node
cellular10/0         SLOT1         AT COM
cellular10/1         SLOT1         AT COM
cellular11/0         SLOT1         AT COM
cellular11/1         SLOT1         AT COM
Config>
Config>set data-link gps-data uart0/0
Config>list devices
Interface            Connector     Type of interface
ethernet0/0          EXP/SWITCH    Marvell Fast Ethernet Switch
gps0/0               GPS           GPS Interface
uart0/0              CONF          GPS-DATA Interface
x25-node             ---           Router->Node
cellular10/0         SLOT1         AT COM
cellular10/1         SLOT1         AT COM
cellular11/0         SLOT1         AT COM
cellular11/1         SLOT1         AT COM
Config>
```

Note

Depending on the device's license and hardware, you may find that not all UART or SERIAL interfaces support GPS-DATA. Please contact our Technical Service for further information.

(4) Afterwards, enter **network** and the name of the GPS-DATA interface you want to configure. The indicated GPS-DATA interface configuration menu will open. In the generic examples, we have used the # character to indicate the name.

```
Config>NETWORK #
```

```
-- GPS-DATA Interface Configuration --
GPS-DATA-# Cfg>
```

If, for example, the interface was serial0/0, the configuration would be:

```
Config>network uart0/0
-- GPS-DATA Interface Configuration --
GPS-DATA-uart0/0 Cfg>
```

> **Note**
>
> You can only configure one asynchronous serial interface as GPS-DATA. Where more than one interface has been configured (as GPS-DATA), only one will be operative, the rest will remain unused.

Certain commands are common for all device interfaces. These commands and their descriptions can be found in the *Teldat-Dm 772-I Common Configuration Interfaces* manual.

> **Note**
>
> The CONF port in some devices can be defined as an ASYNCHRONOUS serial port. The CLI configuration port is used by default. To change the operating mode, please see the **set console** configuration command in manual *Teldat-Dm 704-I Configuration and Monitoring* .

All configuration commands for the GPS-DATA net are enumerated and described in this section. All GPS-DATA configuration commands must be entered at the GPS-DATA prompt (GPS-DATA -# Cfg>).

```
Config>network uart0/0
-- GPS-DATA Interface Configuration --
GPS-DATA-uart0/0 Cfg>
```

Once you have accessed the GPS-DATA net configuration menu, you can enter the commands described below:

```
GPS-DATA-uart0/0 Cfg>?
  data-bits       Set number of bits per character
  description     Enter interface description
  flow-control    Set flow control mode
  list            List configuration
  no              Negate a command or set its defaults
  parity          Set character parity
  shutdown        Change state to administratively down
  speed           Set speed
  stop-bits       Set number of stop bits per character
  update          Update a level indicator
  exit
GPS-DATA-uart0/0 Cfg>
```

Command	Function
?(HELP)	Lists the configuration commands or the list of options within a command.
DATA-BITS	Lets you configure the number of data bits per asynchronous character.
FLOW-CONTROL	Lets you configure the type of flow control.
LIST	Lists the configuration.
NO	Eliminates a configuration parameter or sets its default value.
PARITY	Lets you configure the type of parity for the asynchronous characters.
SPEED	Lets you configure the speed (bps) for the asynchronous serial interface.
STOP-BITS	Lets you configure the number of stop bits per asynchronous character.
EXIT	Exits the GPS-DATA configuration menu.

2.5.1 DATA-BITS

Configures the number of data bits per asynchronous character.

Default is 8.

Syntax:

```
GPS-DATA-uartX/X Cfg>data-bits ?
  7
  8
```

Example:

```
GPS-DATA-uart0/0 Cfg>data-bits 8
```

2.5.2 FLOW-CONTROL

Enables flow control and selects the type to use in the serial interface.

Default is NONE.

Note

Some asynchronous serial interfaces do not support hardware flow control. You cannot configure this option in these devices, nor will it appear in the list of options.

Syntax:

```
GPS-DATA-uartX/X Cfg>flow-control ?
  all         Hardware and software flow control
  hardware    Hardware flow control
  xon-xoff    Software flow control
  none        No flow control
```

Example:

```
GPS-DATA-uart0/0 Cfg> flow-control none
```

2.5.3 LIST

Lists the GPS-DATA interface configuration.

Syntax:

```
GPS-DATA-uartX/X Cfg>list
```

Example:

```
GPS-DATA-uart0/0 Cfg> GPS-DATA-uart0/0 Cfg>list
Serial parameters
-----------------
Link speed.: 9600 (bit/sec)
Data bits..: 8
Stop bits..: 1
Parity.....: NONE
Interface parameters
--------------------
Flow control type.....: None
```

2.5.4 PARITY

Enables parity and selects the type to use in the serial interface.

Default is NONE.

Note

Some asynchronous serial interfaces do not support all parity modes. You cannot configure this option in these devices, nor will it appear in the list of options.

Syntax:

```
GPS-DATA-uartX/X Cfg>parity ?
```

```
  even
  none
  odd
```

Example:

```
GPS-DATA-uart0/0 Cfg> parity none
```

2.5.5 SPEED

Configures the baud speed (bps) for the serial interface.

Default is 9600.

Syntax:

```
GPS-DATA-uart0/0 Cfg>speed ?
  <300..115200>    Value in the specified range
```

Example:

```
GPS-DATA-uart0/0 Cfg>speed 9600
```

2.5.6 STOP-BITS

Configures the number of stop bits per asynchronous character.

Default is 1.

Syntax:

```
GPS-DATA-uart0/0 Cfg>speed ?
  <300..115200>    Value in the specified range
```

Example:

```
GPS-DATA-uart0/0 Cfg>speed 9600
```

Chapter 3 Monitoring

3.1 GPS Monitoring

3.1.1 Monitoring the GPS Interface

3.1.1.1 Independent GPS Interface

To access the GPS interface monitoring menu, first access the general monitoring menu and then the GPS interface.

Use the **configuration** command to obtain a list of available interfaces (among others).

```
+configuration
Teldat's Router, H1 Auto.+ GPS IPSec SNA VoIP T+ 29 12  S/N: 777/000125
P.C.B.=19  Mask=0c10  Microcode=00e1  CLK=393216 KHz  BUSCLK=98304 KHz PCICLK=32768 KHz
ID: TH1A+-16F64R L29.12

Boot ROM release:
 BIOS CODE VERSION: 04.03-B  Feb 27 2012 18:35:11
  gzip  Apr  6 2011 10:27:24
  io1  Feb 27 2012 18:35:04
  io2  Feb 27 2012 18:35:04
  io3  Feb 27 2012 18:35:05
 START FROM FLASH L0
Watchdog timer Enabled

Software release: 10.08.32-MR Mar 14 2012 10:56:55
Compiled by    bgarcia on orion.id.teldat.com
Loaded from primary partition

Hostname:                    Active user:
Date: Wednesday, 03/14/12    Time: 11:53:07
Router uptime: 45m51s

Num  Name     Protocol
0    IP       DOD-IP
3    ARP      Address Resolution Protocol
4    H323     H323
6    DHCP     Dynamic Host Configuration Protocol
11   SNMP     SNMP
12   OSPF     Open SPF-Based Routing Protocol
13   RIP      Route Information Protocol
17   SIP      SIP
23   ASRT     Adaptive Source Routing Transparent Enhanced Bridge
28   PPPoE    Point-to-Point Protocol Over Ethernet
30   dot1X    Extensible Authentication Protocol Over LAN
31   Preauth  WLAN Preauthentication
32   NOE      UA/NOE
33   BFD      Bidirectional Forwarding Detection
35   EOAM     Ethernet OAM

12 interfaces:
Connector     Interface          MAC/Data-Link       Status
EXP/SWITCH    ethernet0/0        Ethernet/IEEE 802.3  Up
GPS           gps0/0             GPS interface       Up
---           x25-node           internal            Up
SLOT1         cellular10/0       Async serial line   Up
SLOT1         cellular11/0       Async serial line   Down
SLOT1         cellular10/1       NIC interface       Up
SLOT1         cellular11/1       NIC interface       Down
SLOT2         wlan2/0            WLAN                Disabled
---           direct-ip1         DirectIP interface  Testing
---           direct-ip2         DirectIP interface  Disabled
```

```
---          bvi0                 Bridge Virtual Int   Up
---          wlan2/0.1            WLAN                 Up

SNMP OperStatus:
Interface           OperStatus
ethernet0/0         Up
gps0/0              Up
x25-node            Up
cellular10/0        Up
cellular11/0        Down
cellular10/1        Up
cellular11/1        Down
wlan2/0             Down
direct-ip1          Down
direct-ip2          Down
bvi0                Up
wlan2/0.1           Up

Encryption Engines:
    Hardware: SEC-8272 Revision: 0xA, block 0x0
```

The GPS interface appears as gps0/0 in this example, therefore:

```
+network gps0/0
--  GPS Console --
gps0/0+
```

3.1.1.2 GPS associated with a cellular interface

To access the cellular monitoring menu, first access the general monitoring menu and then go to the cellular interface required.

```
+configuration

Teldat's Router, ATLAS150 7 96  S/N: 106/00375
P.C.B.=89  Mask=0c10  Microcode=00e1  CLK=262144 KHz  BUSCLK=65536 KHz PCICLK=65536 KHz
ID: AT150-16F128R L7.96

Boot ROM release:
 BIOS CODE VERSION: 01.10  Oct 30 2006 17:17:43
  gzip  Oct 30 2006 17:08:44
  io1  Oct 30 2006 17:17:36
  io2  Oct 30 2006 17:08:20
  io3  Oct 30 2006 17:17:36
 START FROM FLASH L1    Watchdog timer Enabled

Software release: 10.7.4 Mar 15 2007 10:39:27
Compiled by    INTEGRATOR on    INTEGRATOR2000
Loaded from primary partition

Hostname:                     Active user:
Date:  Thursday, 03/15/07     Time: 17:41:32
Router uptime: 18m40s

Num  Name     Protocol
0    IP       DOD-IP
3    ARP      Address Resolution Protocol
4    H323     H323
6    DHCP     Dynamic Host Configuration Protocol
11   SNMP     SNMP
13   RIP      Route Information Protocol
17   SIP      SIP
30   EAPOL    Extensible Authentication Protocol Over LAN
31   Preauth  WLAN Preauthentication
33   BFD      Bidirectional Forwarding Detection

11 interfaces:
Connector     Interface            MAC/Data-Link        Status
```

```
GE0/FE0/LAN1  ethernet0/0          Ethernet/IEEE 802.3  Up
GE1/FE1/LAN2  ethernet0/1          Ethernet/IEEE 802.3  Testing
SERIAL0/WAN1  serial0/0            Auto Install         Down
BRI/ISDN1     bri0/0               BRI Net              Testing
---           x25-node             internal             Up
SLOT1         cellular1/0          Async serial line    Up
SLOT1         cellular1/1          Async serial line    Up
---           ppp1                 PPP                  Up

SNMP OperStatus:
Interface       OperStatus
ethernet0/0     Up
ethernet0/1     Down
serial0/0       Down
bri0/0          Down
x25-node        Up
cellular1/0     Up
cellular1/1     Up
ppp1            Dormant (Up)

Encryption Engines:
    Hardware: SEC-8272 Revision: 0xA, block 0x0
```

The interface GPS monitoring is executed over is the base interface. In this example, this appears as cellular1/0, therefore:

```
+net cellular1/0
--  AT Console --
cellular1/0 AT+
```

3.1.2 Monitoring the GPS Features

Enter the GPS Feature monitoring commands in the monitoring menu associated with GPS (*GPS Apps+*). Access this menu through **feature gps-application** (from the general monitoring menu +).

```
+feature gps-applications
-- GPS Applications user console --
GPS Apps+
```

3.1.3 Monitoring the GPS Interface

To access the GPS-DATA interface Monitoring menu, first access the general monitoring menu and from there access the GPS interface.

Use the **configuration** command to obtain the list of available interfaces (among others).

```
Teldat's Router, H1 Auto.+ 2M LTE GPS WLAN IPSec SNA VoIP T+ 29 12  S/N: 777/000119
P.C.B.=18  Mask=0c10  Microcode=00e1  CLK=400000 KHz  BUSCLK=100000 KHz PCICLK=33333 KHz
ID: TH1A+-16F64R L29.12

Boot ROM release:
 BIOS CODE VERSION: 04.05  Apr 27 2012 15:51:42
  gzip  Apr 27 2012 15:36:43
  io1  Apr 27 2012 15:51:37
  io2  Apr 27 2012 15:51:37
  io3  Apr 27 2012 15:51:37
 START FROM FLASH L1
Watchdog timer Enabled

Software release: 10.08.32.01.00-MR May 31 2012 15:56:45
Compiled by    bgarcia on orion.id.teldat.com
Loaded from primary partition

Hostname:                     Active user:
Date:  Thursday, 05/31/12     Time: 11:22:20
Router uptime: 1h26m38s

Num  Name     Protocol
```

```
0    IP       DOD-IP
3    ARP      Address Resolution Protocol
4    H323     H323
6    DHCP     Dynamic Host Configuration Protocol
11   SNMP     SNMP
12   OSPF     Open SPF-Based Routing Protocol
13   RIP      Route Information Protocol
17   SIP      SIP
28   PPPoE    Point-to-Point Protocol Over Ethernet
30   dot1X    Extensible Authentication Protocol Over LAN
31   Preauth  WLAN Preauthentication
32   NOE      UA/NOE
33   BFD      Bidirectional Forwarding Detection
35   EOAM     Ethernet OAM

8 interfaces:
Connector     Interface            MAC/Data-Link        Status
EXP/SWITCH    ethernet0/0          Ethernet/IEEE 802.3  Up
GPS           gps0/0               GPS interface        Up
CONF          uart0/0              GPS-DATA interface   Up
---           x25-node             internal             Up
SLOT1         cellular10/0         Async serial line    Down
SLOT1         cellular10/1         Async serial line    Down
SLOT1         cellular11/0         Async serial line    Down
SLOT1         cellular11/1         Async serial line    Down

SNMP OperStatus:
Interface           OperStatus
ethernet0/0         Up
gps0/0              Up
uart0/0             Up
x25-node            Up
cellular10/0        Down
cellular10/1        Down
cellular11/0        Down
cellular11/1        Down

Encryption Engines:
    Hardware: SEC-8272 Revision: 0xA, block 0x0
+
```

The GPS-DATA interface appears as uart0/0 in this example, therefore:

```
+ net uart0/0
-- GPS-DATA Console --
GPS-DATA-uart0/0+
```

3.2 Independent GPS Monitoring

This section describes the monitoring commands for the independent GPS interface.

The specific monitoring commands for this interface are as follows:

Command	Function
LIST	Displays monitoring information.
MODULE-CTRL	GPS module ON/OFF control.
RESET	GPS module hardware reset.

3.2.1 LIST

Displays monitoring information.

Example:

```
gps0/0+list
GPS enable:.................YES
GPS application registered:..YES
```

```
GPS device detected:.........YES
GPS device Rx enabled:.......YES

Statistics data:
Rx byte:.........849024
Tx byte:.........0
gps0/0+
```

3.2.2 MODULE-CTRL

GPS module ON/OFF control.

Syntax:

```
gps0/0+module-ctrl <option> [yes]
ON
OFF
```

- optional parameter **yes** allows the device to run an operation without prompting the user to confirm first. If this parameter is set to **yes**, no such confirmation is required. If not, the device prompts the user for confirmation.

Command history:

Release	Modification
11.01.06	The "[yes]" option was added as of version 11.01.06

3.2.3 RESET

GPS module hardware reset.

Syntax:

```
gps0/0+reset [yes]
```

- optional parameter **yes** allows the device to run an operation without prompting the user to confirm first. If this parameter is set to **yes**, no such confirmation is required. If not, the device prompts the user for confirmation.

Command history:

Release	Modification
11.01.06	The "[yes]" option was added as of version 11.01.06

3.3 GPS Monitoring associated with a cellular interface

The cellular interface is a set of specific monitoring commands. These commands are described in the cellular interface configuration manual (*Teldat-Dm781-I Cellular Interface Configuration*).

The specific GPS monitoring commands for this interface are as follows:

Command	Function
LIST	Displays monitoring information.
MODULE-CTRL	GPS module ON/OFF control.
RESET	GPS module hardware reset.

3.3.1 LIST

Displays monitoring information.

Example:

```
cellular1/0 AT+list
GPS enable:.................YES
GPS application registered:..YES
GPS device detected:.........YES
GPS device Rx enabled:.......YES

Statistics data:
```

```
Rx byte:.........849024
Tx byte:.........0
cellular1/0 AT+
```

3.3.2 MODULE-CTRL

GPS module ON/OFF control.

Syntax:

```
cellular1/0 AT+module-ctrl <option> [yes]
ON
OFF
```

- optional parameter **yes** allows the device to run an operation without prompting the user to confirm first. If this parameter is set to **yes**, no such confirmation is required. If not, the device prompts the user for confirmation.

Command history:

Release	Modification
11.01.06	The "[yes]" option was added as of version 11.01.06

3.3.3 RESET

GPS module hardware reset.

Syntax:

```
cellular1/0 AT+reset [yes]
```

- optional parameter **yes** allows the device to run an operation without prompting the user to confirm first. If this parameter is set to **yes**, no such confirmation is required. If not, the device prompts the user for confirmation.

Command history:

Release	Modification
11.01.06	The "[yes]" option was added as of version 11.01.06

3.4 Monitoring GPS Features

This section describes the monitoring commands for the GPS Feature.

The monitoring commands are as follows:

Command	Function
FIX-TRANSFER	Displays GPS fix transfer statistics.
POSITION	Displays the current position.
STATUS	Displays information on the status of the different GPS applications.
EXIT	Returns to the previous menu.

3.4.1 POSITION

Displays the positioning data.

Syntax:

```
GPS Apps+position
```

Example:

```
GPS Apps+position
        Process ends OK                                                  GPS location:
        -------------
        Time (UTC+1): 12:18:12
        Latitude: 40° 35.4694' N
        Longitude: 3° 42.4746' W
        Type of signal: 1 (GPS fix (SPS))
```

```
       Number of satellites: 4
       Altitude above mean sea level: 767.2 m

GPS Apps+
```

3.4.2 STATUS

This command allows you monitor the status of various GPS services:

- Remote TCP connection for the GPS information (NMEA).
- GPS ADVISORS.
- Clock updating for the router through the GPS clock signal.

This command presents three different blocks containing information related to each of the above points. If some of the above functions are not enabled, then the information on these blocks may not be shown.

Syntax:

```
GPS Apps+position
```

Example:

```
GPS Apps+status
 Registered to GPS interface: gps0/0
 GPS Remote TCP information:
 ---------------------------
  Remote GPS state: CLOSED
  TCP state : DISCONNECTED      port 21200

 GPS ADVISOR information:
 ------------------------
  GPS polling state: GETTING POSITION
  Position success:  6
  Position failures: 5
  Position timeouts: 1
  Last GPS position:
      Valid:     YES
      HDOP:      1
      Latitude:  40°35.4749'-N
      Longitude: 003°42.4807'-W

  Advisor    State   Changes  Registered
  -------    -----   -------  ----------
     1       TRUE        1       NO

  Zone State   P1 Lati.      P1 Long.     P2 Lati.      P2 Long.    Chan.
  ---- ----- ------------ ------------- ------------ -------------  -----
    2  FALSE 40°35.4200'N 003°43.5308'W 40°35.4806'N 003°43.4806'W      0
    1  TRUE  40°35.1712'N 003°42.5120'W 40°35.5000'N 003°42.0000'W      1

 GPS CLOCK Synchronization information:
 --------------------------------------
  Status:..RUNNING
  last:....10/21/10 14:44:52
  Correct:.1
  Fails:...1

 Serial Line GPS-DATA information:
 ---------------------------------
  Serial line interface:  uart0/0
  Serial line registered: YES
GPS Apps+
```

3.4.3 FIX-TRANSFER

Allows you monitor the status of the GPS fix transfer.

This command displays the information blocks: one shows the active configuration and the other the transfer statistics.

Syntax:

```
GPS Apps+fix-transfer
```

Example:

```
GPS Apps+fix-transfer

 FIX transfer configuration:
 ---------------------------
  Fix transfer state...: enabled
  Server URL..........: http://192.168.212.33:80
  Local IP address.....: 192.168.213.159
  Transfer mode........: HTTP POST
  FIX sample frequency.: 2
  Samples time send....: 6

 FIX transfer statistics:
 ------------------------
  Num. transfers OK........: 52492
  Num. transfers ERROR.....: 0
  Last transfer state......: success
  Last trans. Error cause..: 0 [No error]
  Number trans. congestion.: 2

GPS Apps+
```

Release	Modification
11.01.02	New command added.

3.5 Monitoring the GPS-DATA Interface

This section describes the monitoring commands for the GPS-DATA interface.

The monitoring commands are as follows:

```
GPS-DATA-uart0/0+?
  clear    Reset monitoring counters
  list     Display monitoring information
  exit
```

Command	Function
CLEAR	Resets the statistics counters.
LIST	Displays the interface statistics.
EXIT	Returns to the previous menu.

3.5.1 CLEAR

Sets the statistics counters back to zero. These statistics are displayed through the **list** command.

Syntax:

```
GPS-DATA-uartX/X+clear
```

Example:

```
GPS-DATA-uart0/0+clear
```

3.5.2 LIST

Lists the interface statistics.

Syntax:

```
GPS-DATA-uart0/0+list
```

Example:

```
GPS-DATA-uart0/0+list
Interface statistics:
---------------------
Bytes sent to serial device..................: 10443
Congestion packets to serial device..........: 0
Data packets send to serial device...........: 5979
Queue packet length to serial device..........: 1
Bytes received from serial device............: 0
GPS-DATA-uart0/0+
```

Chapter 4 Examples

4.1 GPS Advisor in cellular interface associated with Automatic Configuration Control

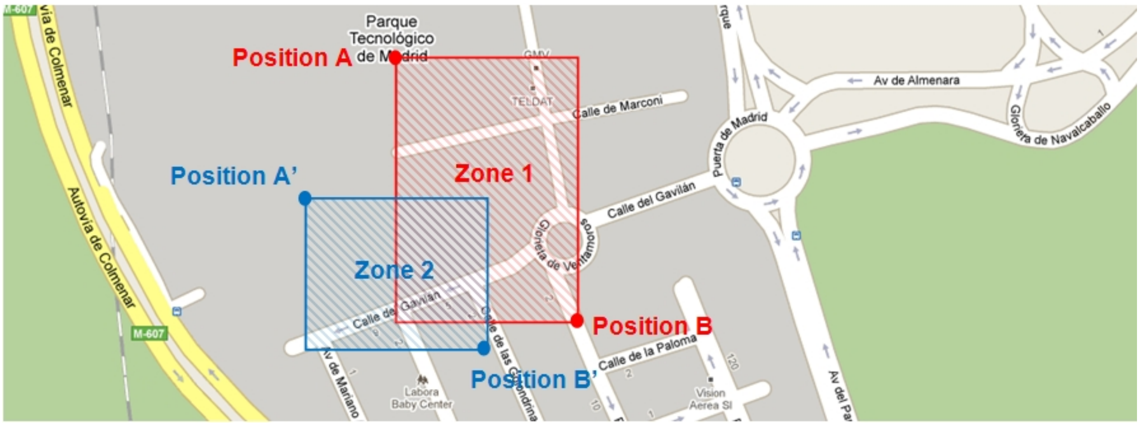
In this example, a configuration example for a GPS advisor is shown, associated with the Automatic Configuration Control (autoset-cfg) feature.

To obtain the coordinates for the points defining the zones, use the following two methods:

(1) Access the required points through the GPS receiver and gather information on the coordinates.

(2) Through cartography plans, both on paper and obtained via information tools.

The following example has taken out the coordinates needed to define 2 zones from a well-known cartography program found online.



A	40° 35‘ 28,54” N 3° 43’ 30,72” O	B	40° 35‘ 20,87” N 3° 43’ 25,01” O
A’	40° 35‘ 25,20” N 3° 43’ 31,85” O	B’	40° 35‘ 20,55” N 3° 43’ 28,84” O

Two zones are configured in this example: 1 and 2. These zones are delimited by points A and B, and A’ and B’ (respectively). Points are defined by their geographic coordinates.

When configuring the zones, enter the coordinates with the following format:

a) Latitude:

DD° MM.mmmm’

b) Longitude:

DD° MMM.mmmm’

There are many applications that offer coordinates in a different format:

a) Latitude:

DD° MM’ SS,sss”

b) Longitude:

DD° MMM’ SS.sss”

Where:

DD refers to DEGREES.

MM refers to the whole time representation for minutes.

mmm refers to the decimal part of minutes.

SS refers to the whole time representation for seconds.

sss refers to the decimal part of seconds.

In this case, this is transformed into the notification used in the router configuration:

A	40° 35‘ 28,54” N # 40° 35,1712’ N 3° 43’ 30,72” O # 3° 43,5120’ O	B	40° 35‘ 20,87” N # 40° 35,3478’ N 3° 43’ 25,01” O # 3° 43,4168’ O
A’	40° 35‘ 25,20” N # 40° 35,4200’ N 3° 43’ 31,85” O # 3° 43,5308’ O	B’	40° 35‘ 20,55” N # 40° 35,3425’ N 3° 43’ 28,84” O # 3° 43,4806’ O

The following shows you how to convert one type of notation into another:

Passing notation: DD° MM’ SS.sss” to DD° MM.mmmm’

40° 35‘ 28,608” N

Seconds become minutes:

28,608”:60 = 0,4768’

The whole minutes are added:

35 + 0,4768’ = 35,4768

Coordinates in NMEA format become:

40° 35‘28,608”N # 40° 35,4768’ N

Passing notation: DD° MM.mmmm’ to DD° MM’ SS.sss:”

40° 35,4768’ N

The whole time representation for minutes is separated from the decimal part:

35,4768 – 35 = 0,4768

The decimal part is converted to seconds:

0,4768’ x 60 = 28,608”

Coordinates in GoogleMaps format become:

40° 35,4768’ N # 40° 35‘28,608”N

A configuration is generated for this example. When the device is in the area over zones 1 and 2, the following configuration activates: *cfg_in.cfg;* When the device is outside this area, the *cfg_out.cfg*configuration activates.

This means the device can have different configurations depending on the area it’s in. To obtain homogeneous behavior, and based on this premise, both configurations (*cgf_in.cfg* and *cfg_out.cfg*) must have a certain coherency with respect to the zones and the GPS advisor configuration.

For the purposes of a practical example, let's assume a bus has one configuration for when it enters the parking area (when out of service) and a different one for when it’s circulating.

Let's assume the bus park (where the bus is) falls within zones A and B (shown on the map at the beginning of this section). The configuration for this zone is *cfg_in.* This must be configured so that when the bus leaves the bus park, the configuration switches to *cfg_out* (configuration outside the area). Obviously, the second configuration must switch back to *cfg_in* when the bus returns to the bus park.

This is achieved through the GPS advisor and the *autoset-cfg* feature.

For the *cfg_in* configuration, an advisor is created to detect when the bus leaves the bus park, at which point the *autoset-cfg* feature switches configurations and restarts the router.

The advisor returns a TRUE message when the bus leaves. As configuration negates both zones, the bus must be out of said zones for the advisor to return TRUE.

In the *autoset-cfg* rule, the trigger is set to 1 (TRUE). As a result, when the advisor switches to TRUE, the device restarts and activates *cfg_out*.

```
log-command-errors
   no configuration
   add device ppp 1
   set data-link at cellular1/0
   set data-link at cellular1/1
```

```
  global-profiles dial
; -- Dial Profiles Configuration --
     profile OPERATOR default
     profile OPERATOR dialout
     profile OPERATOR 3gpp-apn operatorH.es
     profile OPERATOR idle-time 120
;
  exit
;

;
  network ethernet0/0
; -- Ethernet Interface User Configuration --
     ip address 192.168.213.155 255.255.254.0
;
;
  exit
;
;
;
  network cellular1/0
; -- Interface AT. Configuration  --
     coverage-timer 10
     gps enable
;
     pin ciphered 0xAF47DC59C598C655
;
     sim-select internal-socket-2
;
     network mode automatic
     network domain cs+ps
  exit
;
;
  network cellular1/1
; -- Interface AT. Configuration  --
     ppp lcp-options acfc
     ppp lcp-options pfc
     ppp lcp-options accm a0000
  exit
;
;
;
;
;
;
;
  network ppp1
; -- Generic PPP User Configuration --
     ip address unnumbered
;
;
     ppp
; -- PPP Configuration --
        authentication sent-user OPER_USR password OPER_PASS
        ipcp local address assigned
        no ipcp peer-route
        lcp echo-req off
     exit
;
     base-interface
; -- Base Interface Configuration --
        base-interface cellular1/1 link
        base-interface cellular1/1 profile OPERATOR
;
     exit
;
```

```
   exit
;
   event
;
   protocol ip
; -- Internet protocol user configuration --
      route 0.0.0.0 0.0.0.0 ppp1
;
      rule 1 local-ip ppp1 remote-ip any
      rule 1 napt translation
      rule 1 napt firewall
;
      classless
;
   exit
;
;
   feature autoset-cfg

; -- Autosetcfg Configuration --
      rule 1 gps-advisor 1 trigger 1 set file "cfg_out" priority 5
;
   exit
;
;
   feature gps-applications
; -- GPS Applications Configuration --
      gps-ifc-source cellular1/0
;
      gps-advisor
; -- GPS Advisor Configuration --
         zone 1 longitude 3 43 5120 W to 3 43 4168 W
         zone 1 latitude 40 35 1712 N to 40 35 3472 N
         zone 1 initial-state true
         zone 1 hdop 4
;
         zone 2 longitude 3 43 5308 W to 3 43 4806 W
         zone 2 latitude 40 35 4200 N to 40 35 3425 N
         zone 2 initial-state true
         zone 2 hdop 4
;
         advisor 1 not zone 1
;
         advisor 1 not zone 2
;
;
      exit
;
   exit
;

   dump-command-errors
   end
```

The *cfg_out* configuration does not need modifying. The advisor returns FALSE when the bus reenters the bus park.

In the autoset-cfg rule, the trigger is set to 0 (FALSE). This way, when the advisor switches to FALSE, the device resets and activates *cfg_in*.

```
   log-command-errors
   no configuration
   add device ppp 1
   set data-link at cellular1/0
   set data-link at cellular1/1
   global-profiles dial
; -- Dial Profiles Configuration --
      profile OPERATOR default
      profile OPERATOR dialout
```

```
      profile OPERATOR 3gpp-apn operatorH.es
      profile OPERATOR idle-time 120
;
   exit
;
;
   network ethernet0/0
; -- Ethernet Interface User Configuration --
      ip address 192.168.213.155 255.255.254.0
;
;
   exit
;
;
   network cellular1/0
; -- Interface AT. Configuration  --
      coverage-timer 10
      gps enable
;
      pin ciphered 0xAF47DC59C598C655
;
      sim-select internal-socket-2
;
      network mode automatic
      network domain cs+ps
   exit
;
   network cellular1/1
; -- Interface AT. Configuration  --
      ppp lcp-options acfc
      ppp lcp-options pfc
      ppp lcp-options accm a0000
   exit
;
;
   network ppp1
; -- Generic PPP User Configuration --
      ip address unnumbered
;

;
      ppp
; -- PPP Configuration --
         authentication sent-user OPER_USR password OPER_PASS
         ipcp local address assigned
         no ipcp peer-route
         lcp echo-req off
      exit
;
      base-interface
; -- Base Interface Configuration --
         base-interface cellular1/1 link
         base-interface cellular1/1 profile OPERATOR
;
      exit
;
   exit
;
   event
;
   protocol ip
; -- Internet protocol user configuration --
      route 0.0.0.0 0.0.0.0 ppp1
;
      rule 1 local-ip ppp1 remote-ip any
      rule 1 napt translation
      rule 1 napt firewall
```

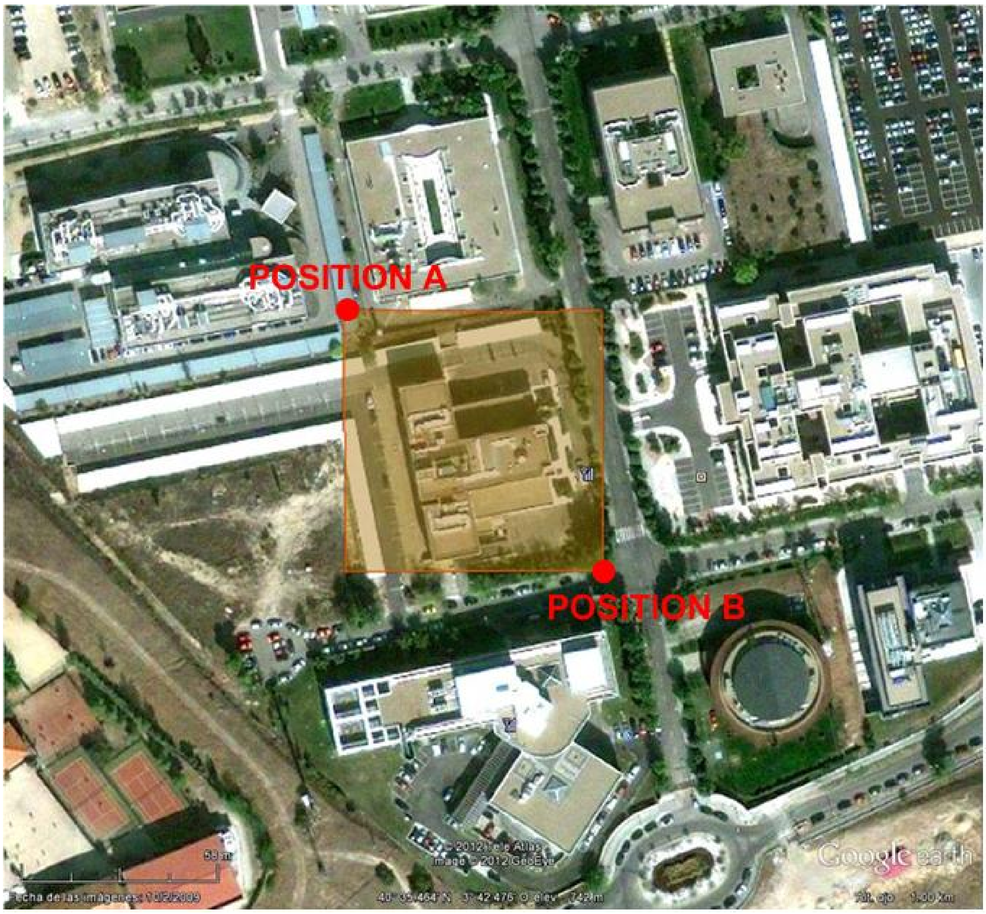
```
;
      classless
;
   exit
;
;
   feature autoset-cfg
; -- Autosetcfg Configuration --
      rule 1 gps-advisor 1 trigger 0 set file "cfg_in" priority 5
;
   exit
;
   feature gps-applications
; -- GPS Applications Configuration --
      gps-ifc-source cellular1/0
;
      gps-advisor
; -- GPS Advisor Configuration –
         zone 1 longitude 3 43 5120 W to 3 43 4168 W
         zone 1 latitude 40 35 1712 N to 40 35 3472 N
         zone 1 initial-state false
         zone 1 hdop 4
;
         zone 2 longitude 3 43 5308 W to 3 43 4806 W
         zone 2 latitude 40 35 4200 N to 40 35 3425 N
         zone 2 initial-state false
         zone 2 hdop 4
;
         advisor 1 not zone 1
;

         advisor 1 not zone 2
;
;
      exit
;
   exit
;
   dump-command-errors
   end
```

4.2 GPS Advisor in GPS interface associated with a change in mode in a WLAN interface

The following example defines a zone where the device's WLAN interface is going to behave in *station* mode to connect to a network in a building (BSS “H1APLUS_TDLT”). Outside the defined zone, the WLAN interface behaves as an *access-point* to provide Internet access to passengers on board.

The zone defined is as follows:



Coordinates are obtained via the same service and are converted to the router's configuration format as per the previous example.

A	40° 35,4890' N	B	40° 35,4450' N
	3° 42,4520' O		3° 42,5080' O

These values allow us to program the zone in the router's configuration.

```
         zone 1 longitude 3 42 4520 W to 3 42 5080 W
         zone 1 latitude 40 35 4890 N to 40 35 4450 N
```

The vehicle provides an IP address to on-board terminals that connect through DHCP.

A remotely accessible IP camera is installed in port 80 with a fixed IP address.

Likewise, the TCP service is configured in port 9090, so the vehicle can be remotely located.

As the IP address assigned is dynamic (to allow remote access), the device has a *dns-updater* feature configured to access a mnemonic registered in a domain (h1a-teldat.no-ip.org).

The resulting configuration is:

```
; Showing Menu and Submenus Configuration for access-level 15 ...
; H1 Auto.+ GPS IPSec SNA VoIP T+ Router 29 12 Version 10.08.32-MR

   log-command-errors
   no configuration
   add device direct-ip 1
   add device bvi 0
   add device wlan-subinterface wlan2/0 1
   set data-link at cellular10/0
   set data-link nic cellular10/1
   global-profiles dial
; -- Dial Profiles Configuration --
      profile OPER1 default
      profile OPER1 dialout
      profile OPER1 3gpp-apn apn_oper1
;
   exit
```

```
;
  network ethernet0/0
; -- Ethernet Interface User Configuration --
     input-buffers 256
  exit
;
  network gps0/0
; -- Interface GPS Configuration  --
     enable
;
  exit
;
  network cellular10/0
; -- Interface AT. Configuration  --
     coverage-timer 10
     no register-denied-reset
     pin plain 0000
;
     network mode automatic
  exit
;
;
  network wlan2/0
; -- Wireless LAN Interface. Configuration --
     ip address dhcp-negotiated
;
     country ES
     bss "H1APLUS_TDLT"
        opmode station
        privacy-invoked
        rsn wpa2
        cipher aes-ccmp
        akm-suite psk
        wpa-psk passphrase ciphered 0x375D4853D0DB236C2406FB6115B5D13D
     exit
;
     shutdown
  exit
;
;
  network direct-ip1
; -- Generic Direct IP Encapsulation User Configuration --
     ip address dhcp-negotiated
;
     base-interface
; -- Base Interface Configuration --
        base-interface cellular10/1 link
        base-interface cellular10/1 profile OPER1
;
     exit
;
     direct-ip
; -- Direct IP encapsulator user configuration --
        address dhcp
        authentication sent-user USER1 password PASSWORD1
     exit
;
  exit
;
;
  network bvi0
; -- Bridge Virtual Interface configuration --
     ip address 192.168.213.150 255.255.254.0
     ip address 192.168.0.1 255.255.255.0 secondary
;
     ip mtu 1200
     ip tcp adjust-mss 1100
```

```
   exit
;
   network wlan2/0.1
; -- Wireless LAN Subinterface. Configuration --
      bss "RUTA"
         privacy-invoked
         rsn wpa
         rsn wpa2
         cipher tkip
         cipher aes-ccmp
         akm-suite psk
         wpa-psk passphrase ciphered 0x78825BD65269A47CAA295EBB774C44F6
      exit
;
   exit
;
   event
; -- ELS Config --
      enable trace subsystem WLAN ALL
      disable trace event WLAN.010
      ev-buffer 1000 200
;
      enable filter
      filter 1 default
      filter 1 text "UMTS"
      filter 1 action green
      filter 2 default
      filter 2 text "HS"
      filter 2 action magent
      filter 3 default
      filter 3 text "GPRS"
      filter 3 action red
      filter 4 default
      filter 4 text "RX level (dBm):"
      filter 4 action yellow
   exit
;
   protocol asrt
; -- ASRT Bridge user configuration --
      bridge
      irb
      port ethernet0/0 1
      port wlan2/0.1 2
      no stp
      route-protocol ip
   exit
;
;
   protocol ip
; -- Internet protocol user configuration --
      route 0.0.0.0 0.0.0.0 direct-ip1
;
      rule 1 local-ip direct-ip1 remote-ip any
      rule 1 napt translation
;
      classless
      no icmp-redirects
      nat pat
; -- NAPT configuration --
         visible-port 80 rule 1 ip 192.168.0.178 port 80
         visible-port 8080 rule 1 ip 192.168.0.178 port 8080
;
      exit
;
   exit
;
   protocol dhcp
```

```
; -- DHCP Configuration --
      server
; -- DHCP Server Configuration --
         enable
;
;
         shared 1
;
         subnet local 1 network 192.168.212.0 255.255.254.0
         subnet local 1 range 192.168.213.148 192.168.213.149
         subnet local 1 dns-server 192.168.213.150
         subnet local 1 router 192.168.213.150
;
      exit
;
   exit
;
   feature dns
; -- DNS resolver user configuration --
      server 8.8.8.8
      server 4.2.2.2
   exit
;
   feature nsm
; -- Network Service Monitor configuration --
      operation 1
; -- NSM Operation configuration --
         description "ping de mantenimiento"
         type echo ipicmp 8.8.8.8
         frequency 20
      exit
;
      schedule 1 life forever
      schedule 1 start-time after 2m
   exit
;
   feature dns-updater
; -- DNS UPDATER configuration --
      enable
;
      entry 1 protocol DynDNS system dynamic
      entry 1 interface direct-ip1
      entry 1 hostname h1a-teldat.no-ip.org
      entry 1 servername dynupdate.no-ip.com
      entry 1 user xxxxx@gmail.com password xxxxxxxxxxxxxxxx
;
   exit
;
   feature autoset-cfg
; -- Autosetcfg Configuration --
      rule 2 gps-advisor 2 trigger 0 set shutdown-ifc wlan2/0 priority 1
      rule 1 gps-advisor 1 trigger 1 set shutdown-ifc wlan2/0.1 priority 1
;
   exit
;
   feature gps-applications
; -- GPS Applications Configuration --
      gps-ifc-source gps0/0
;
      tcp-enable
      tcp-port 9090
;
      gps-advisor
; -- GPS Applications Configuration --
         zone 1 longitude 3 42 4520 W to 3 42 5080 W
         zone 1 latitude 40 35 4890 N to 40 35 4450 N
         zone 1 initial-state true
```

```
        zone 1 hdop 4
;
        advisor 1 zone 1
;
        advisor 2 zone 1
;
     exit
;
  exit
;
  dump-command-errors
  end
```

4.3 Configuring the CONF port as an asynchronous serial port for the GPS-DATA interface

By default, a CONF port does not behave as a UART serial port. When you list the available interfaces, this does not appear:

```
Config>list devices

Interface           Connector     Type of interface
ethernet0/0         EXP/SWITCH    Marvell Fast Ethernet Switch
gps0/0              GPS           GPS Interface
x25-node            ---           Router->Node
cellular10/0        SLOT1         AT COM
cellular10/1        SLOT1         AT COM
cellular11/0        SLOT1         AT COM
cellular11/1        SLOT1         AT COM
Config>
```

For a CONF port to behave as a UART port, execute the following sequence of commands:

```
*p 4

Config>set console
-- Console configuration --
Con config>function set async-serial-line
Con config>
```

You don't need to save the configuration, but you do need to restart the device so the configuration activates. After reboot, you will see the CONF port now appears as UART:

```
Config>list devices

Interface           Connector     Type of interface
ethernet0/0         EXP/SWITCH    Marvell Fast Ethernet Switch
gps0/0              GPS           GPS Interface
uart0/0             CONF          GPS-DATA Interface
x25-node            ---           Router->Node
cellular10/0        SLOT1         AT COM
cellular10/1        SLOT1         AT COM
cellular11/0        SLOT1         AT COM
cellular11/1        SLOT1         AT COM
Config>
```

Note

The associated GPS configuration is not supported in all of our devices. Please contact our Technical Service to get a list of devices that support this configuration.