

# HOW-TO

## APNUS026 How to Get GNSS NMEA Data

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## 1. Glossary

**GPS** : Global Positioning System

GPS is the generic term used to describe the satellite-based timing and positioning system operated by the United States Department of Defense (DoD), Galileo (European), GLONASS (Russian) and Beidou (Chinese).

**NMEA**: National Marine & Electronics Association

**GNSS**: Global Navigation Satellite System

**SNMP**: Simple Network Management Protocol

## 2. Introduction

By installing GPS devices as Acksys router on fleet vehicles or buses, fleet managers can track their trucks or buses' locations and statuses, as well as get important insights about their fleet's efficiency.

Fleet managers use GPS on a daily basis to keep track of their fleets and other assets. They can get information that helps them solve issues such as compliance, efficiency, and safety reason why Commercial fleets often use GPS to monitor their fleet vehicles.

## 3. Scenario details

Some models from the Acksys Router family (RailBox, AirWan, AirBox, etc..) have embedded an internal GPS module. This means that besides Cellular router conventional tasks (giving Internet connectivity to connected devices), they can also perform additional tasks with the GPS location.

First defined by the National Marine Electronics Association, NMEA is currently the most common data format supported by GNSS equipment. It allows connecting different types of hardware and software

## 4. Installation Overview and Prerequisites

Before we begin, let's overview the configuration that we are attempting to achieve and the prerequisites that make it possible in this How-To note :

- GPS Server: One Cellular AirBox router or any type of Acksys Cellular Router
- Connect GPS antenna on the GPS connector
- A valid SIM card from an ISP
- A GPS NMEA frame Receiver Client : WaveManager or any type of GPS received Server
- Laptop to configure the router

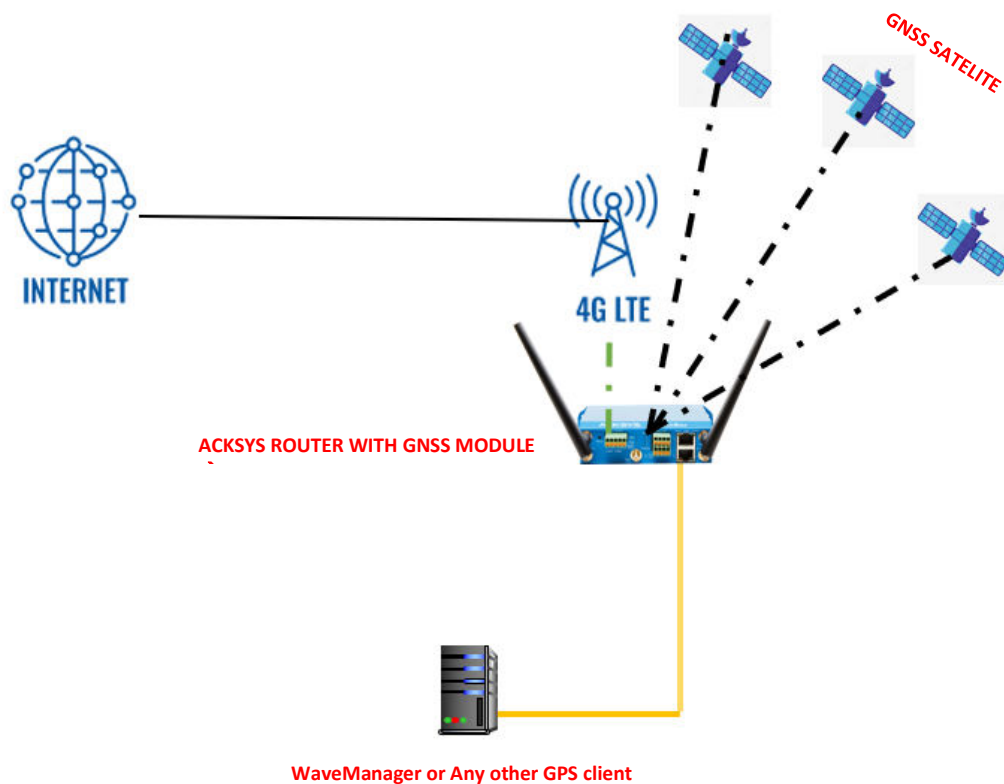
## 5. GNSS System types

There are different type of GNSS system in the world and the GNSS component embedded with Acksys Cellular router automatically can track position of the four existing satellite systems, GPS (American), Galileo (European) GLONASS (Russian), Beidou (Chinese)

The purpose of GNSS system is to provide signals from space and transmit timing and positioning data to the GNSS receivers located on Earth. The receivers further use these data to determine your precise location.

## 6. GNSS Configuration architecture

In this How-To, we will explain in detail how to access directly the Acksys router's internal GPS NMEA data from an external GPS client.





## 7. ACKSYS Router configuration

We may need the Acksys Cellular router to have a server prepared to the event of an external client receiver, so the GPS NMEA data is sent through it. For this configuration it will be enough to specify In this note, the WIFI interface will not be configured but we will use the default LAN setting and configure WAN Cellular interface.

### Configuring WAN Interface

If you have familiarized yourself with the configuration scheme and we can start configuring the router using instructions provided in this section:

in GUI and go to Setup → Physical Interfaces → Enable the WAN Interface.

WAN INTERFACE		
	<b>3G/4G/LTE Cellular radio (Cellular)</b>	
		
	FRIENDLY NAME	ACTIONS
	Cellular	Interface disabled

- Click the "Edit" button located to the right and configure WAN Interface.
  - General Setup
    - Select IPv6 in IP family
    - Check Replace default route
    - Set 0 as routing metric 0 for default gateway
    - Check Use peer DNS in case DNS is on the LAN to use the ISP DNS
    - Save

#### WAN SETTINGS - CELLULAR

On this page you can configure a WAN interface.

CELLULAR	
<div>General Setup   SIM 1   SIM 2   Advanced Settings</div>	
Network description	<input type="text" value="LTE"/> <small>Friendly name for your network</small>
Default SIM card	<input checked="" type="radio"/> SIM 1 <input type="radio"/> SIM 2 <small>SIM slot selected at startup</small>
IP Family	<input type="text" value="IPv4"/>
Protocol	<input type="text" value="Wireless wide area network"/>
Replace default route	<input checked="" type="checkbox"/> Replace the default route to use the cellular interface after successful connect
Default gateway metric	<input type="text" value="0"/> <small>Gateway priority when several default gateways are configured; lowest is chosen. (Used only when a default gateway is defined on this interface)</small>
Use peer DNS	<input checked="" type="checkbox"/> Configure the local DNS server to use the name servers advertised by the cellular peer

- Select the correct SIM slot (in case of dual SIM) and fill out APN with the connection information provided by the ISP (in this case sfr SIM card is used): sl2sfr

- Enable AT transactions logs for better understanding in troubleshoot in case of issue.
- Save and apply the config

- Save and apply the config


To check NMEA frame in CLI, we need to enable Cellular Log Level to Debug for more GNSS information in log.

Go in Tools Logs Setting→ Cellular → Log Setting

- Save and apply the config

## Configuring WIFI Interface

In this note, the WIFI interface will not be enabled or used.

WI-FI INTERFACE						
<div>  <b>Wi-Fi 4 (802.11n) Wireless interface</b> <div></div> </div>						
CHANNEL	802.11 MODE	SSID	ROLE	SECURITY	ACTIONS	
Automatic	802.11b+g+n	acksys	Access Point (infrastructure)	none	Interface disabled	

## Configuring LAN Interface

In this note, we will use the default IP address of the router 192.168.1.253 in this section:

Go in GUI and go to Setup → Physical Interfaces → LAN setting Interface.

### NETWORK - LAN

On this page you can configure the network interfaces. You can bridge several interfaces by ticking the "bridge interfaces" field and tick the names of several network interfaces.

**COMMON CONFIGURATION**

General Setup

Interfaces Settings

Advanced Settings

Enable interface

☒

Network description

LAN

Friendly name for your network

Protocol

static

IPv6-Address

CIDR-Notation: address/prefix

Default IPv6 gateway

Delegated prefix length

60

The assigned prefix(es) size for this interface

Allowed prefix classes

all

IPv4-Address

192.168.1.253

IPv4-Netmask

255.255.255.0

Default IPv4 gateway

Default gateway metric

0

Gateway priority when several default gateways are configured; lowest is chosen.  
(Used only when a default gateway is defined on this interface)

DNS server(s)

You can specify multiple IPv4 DNS servers here, press enter to add a new entry. Servers entered here will override automatically assigned ones.

### NETWORK - LAN

On this page you can configure the network interfaces. You can bridge several interfaces by ticking the "bridge interfaces" field and tick the names of several network interfaces.

**COMMON CONFIGURATION**

General Setup

Interfaces Settings

Advanced Settings

Bridge interfaces

☒ creates a bridge over specified interface(s)

Enable STP/RSTP

☐ Enables the Spanning Tree Protocol on this bridge

**WARNING: Some cautions must be taken with wireless interfaces, please see user guide**

Enable LLDP forwarding

☐ Enables the LLDP frame forwarding.

bridge VLAN

☐ Enable VLAN management in bridge. You must configure the bridge VLANs before enabling this option (setup->bridging)

Interface

☒ WiFi adapter: WiFi (currently disabled) - acksys (network: lan)  
☒ Ethernet adapter: LAN1 (network: lan)  
☒ Ethernet adapter: LAN2 (network: lan)

MTU

1500

## Configuring GNSS Agent

If you have familiarized yourself with the configuration scheme and have all of the device in order, we can start configuring the router using instructions provided in this section:

- Login to the router's WebUI and go to Setup → Services→GNSS Agent. Do this on the router:

**GLOBAL NAVIGATION SATELLITE SYSTEM**

Activate the embedded GNSS receiver and configure the gpsd server

**GPSD**

<b>Enable</b>	<input checked="" type="checkbox"/> <small>Allows internal services to use the GNSS</small>
<b>Use as time source</b>	<input checked="" type="checkbox"/> <small>Allows to use the GNSS as time source. This source has low precision, use NTP service for more precision</small>
<b>Serve external clients</b>	<input checked="" type="checkbox"/> <small>Allows external users to connect to this gpsd server</small>
<b>Listen port</b>	<input type="text" value="2947"/> <small>Port on which gpsd will listen</small>
<b>Position logging period</b>	<input type="text" value="4"/> <small>Number of seconds between positioning records in the system log (at 'info' level); 0 or empty to disable</small>
<b>URI for map link (Device Info page)</b>	<input type="text" value="OpenStreetMap@ link"/> <small>                     %1 and %2 in the URI are replaced by latitude and longitude in signed dotted-decimal notation, e.g. '-48.000000'                      URI must not contain doublequotes                      Any string missing a column ':' will disable the link                 </small>

### Enable

Allow use of the location service.

### Serve external clients

Allow devices outside of the product to query its position using the gpsd protocol. If disabled, the position can still be queried with SNMP, displayed on the Status→Device Information page, or logged to an external log server.

### Listen port

Change TCP server port for external clients :2947

### Position logging period

Periodically add an entry in the system log indicating current position:4

### URI for map link

The current position that appears on the Status→Device Information page is embedded in a web link, allowing for example to display a map using external services. Here you can choose among renown public services, or set up a link to your preferred web server. To disable the link entirely, choose **custom** and enter a dash or a hash mark (anything but a column). If the string **%1** appears in the link, it will be replaced with the latitude, and **%2** will be replaced with the longitude.



It is also possible to retrieve NMEA Data in local or on a remote GNSS Client as receiver if you want to read NMEA DATA on another device.

Login to the router's WebUI and go to Setup → Services → Statistic. Do this on the router:

- Enable GPS statistic
- GPS server IP address :127.0.0.1
- GPS server port: 2947
- Save and apply

The screenshot shows two configuration panels in the ACKSYS WebUI. The top panel, 'ACKSYS TELEMETRY', has a sidebar with 'SSH', 'STATISTICS', 'VRRP', 'INITSCRIPTS', and 'WIFI'. The main content area has a blue header 'ACKSYS TELEMETRY' and a sub-header 'Allow to send information to WaveManager'. It contains three settings: 'Enable telemetry' (checked), 'Acksys telemetry server port' (8628), and 'Output interval' (5). The bottom panel, 'GPS STATISTIC', also has a blue header and a sub-header 'Allow to send GPS information to WaveManager'. It contains three settings: 'Enable GPS statistics' (checked), 'GPS server ip address' (127.0.0.1), and 'GPS server port' (2947).

**NOTE:**

GPS Server IP address 127.0.0.1 because the Acksys cellular router provides GPS service and the Telemetry service is used in order to send logs to WaveManager Server in this note.

## Configuring WaveManager to access GNSS POSITION via Telemetry

In this note, we will also use WaveManager Server to receive GNSS position therefore we will enable Telemetry service. To enable Telemetry service on WaveManager in Setting→ Data Collect → Operational→ enable Data Collect →Save

The screenshot shows the WaveManager WebUI 'SETTINGS' page. The left sidebar has a 'Settings' button. The main content area has a blue header 'SETTINGS' and a sub-header 'Data collect'. It contains three settings: 'Enable data collect' (checked), 'Data acquisition every' (5 second(s)), and 'Keep data for' (2 day(s)). The bottom section, 'Telemetry', contains three settings: 'Enable telemetry' (checked), 'Telemetry port' (8628), and 'Data transfer every' (1 acquisition(s)).

## 8. STATUS

If you've followed all the steps presented above, your configuration should be finished and let have an overview on status of the Cellular and GNSS.

### WAN Router Wireless: Status

In GUI and go to **Status → Cellular**

#### CELLULAR STATUS

Warning: scanning will break established connections which use that radio.


##### Cellular interfaces

RADIO	MODEM INFORMATIONS	ATTACHED	OPERATOR MCC/MNC	BASE STATION LAC/CID	ACCESS TECHNOLOGY	INFRASTRUCTURE BAND CHANNELS	RSSI	BER	SCAN
Cellular	Password accepted  <b>IMSI:</b> 208101188844640 <b>IMEI:</b> 866758042299632 <b>model:</b> EC25 rev A6.3 EMEA <b>band:</b> LTEFDD: B1/B3/B5/B7/B8/B20 LTETDD: B38/B40/B41 WCDMA: B1/B5/B8 GSM: B3/B8	home	F SFR 208/10	46506 / 159942403	gsm FDD LTE	LTE LTE BAND 3 ARFCN: 1501	-67	0	<a href="#">Scan</a>

### WAN Router: Network Status

To verify the connection, click in Status>Network as shown in the screenshot below where the WAN interface receive Internet IP address.

In GUI and go to **Status → Network**

LTE						
IP CONFIGURATION						
IPv4 Stack						
IPv4: 100.104.156.203 Netmask: 29 MTU: 1500						
IPv6 Stack						
IPv6: fe80::8143:169f:14e2:308a Netmask: 64 Scope: link						
DHCP info: Lease time: 7200s						
DNS server: 172.20.2.39 172.20.2.10						
GRAPH	PHYSICAL INTERFACE	MAC ADDRESS	TX COUNT (IN BYTES)	RX COUNT (IN BYTES)	INTERFACE MODE	MTU
	Cellular	00:00:00:00:00:00	23039	44147	Operator (home): F SFR SIM: Password accepted	1500

## WAN Router: Network Testing

GNSS Agent can show position only if the WAN router get internet therefore we do network connectivity test with ping on google DNS works with success as shown the screenshot below:

```
root@GPS-Agent:~# ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8): 56 data bytes
64 bytes from 8.8.8.8: seq=0 ttl=115 time=55.917 ms
64 bytes from 8.8.8.8: seq=1 ttl=115 time=656.157 ms
64 bytes from 8.8.8.8: seq=2 ttl=115 time=474.894 ms
64 bytes from 8.8.8.8: seq=3 ttl=115 time=378.489 ms
64 bytes from 8.8.8.8: seq=4 ttl=115 time=311.806 ms
64 bytes from 8.8.8.8: seq=5 ttl=115 time=285.724 ms
64 bytes from 8.8.8.8: seq=6 ttl=115 time=72.721 ms
64 bytes from 8.8.8.8: seq=7 ttl=115 time=484.698 ms
64 bytes from 8.8.8.8: seq=8 ttl=115 time=300.996 ms
64 bytes from 8.8.8.8: seq=9 ttl=115 time=110.102 ms
64 bytes from 8.8.8.8: seq=10 ttl=115 time=311.840 ms
64 bytes from 8.8.8.8: seq=11 ttl=115 time=258.432 ms
64 bytes from 8.8.8.8: seq=12 ttl=115 time=364.148 ms

--- 8.8.8.8 ping statistics ---
13 packets transmitted, 13 packets received, 0% packet loss
round-trip min/avg/max = 55.917/312.763/656.157 ms
```

## 9. GNSS DATA COLLECT

### WAN Router: CLI GNSS

To verify the NMEA data, we can enable SSH service in Tools→ Service→ enable SSH with the command logfile after enable GNSS log level to Debug.

Once you have configured the router, if you connect in CLI on the AirBox router IP, we will get the NMEA data in real time, 1 data per 4 second according to my configuration as shown in the screenshot below:

```
root@Acksys:~# logread -f | grep "2:3"
Fri Mar 31 14:40:20 2023 user.info : 2:3:20230331:144020.000:48.799547:2.351979:101.700000:0.000000:3.100000
Fri Mar 31 14:40:24 2023 user.info : 2:3:20230331:144024.000:48.799547:2.351979:101.600000:0.000000:3.100000
Fri Mar 31 14:40:28 2023 user.info : 2:3:20230331:144028.000:48.799547:2.351980:101.600000:0.000000:3.100000
Fri Mar 31 14:40:32 2023 user.info : 2:3:20230331:144032.000:48.799547:2.351980:101.600000:0.000000:3.100000
Fri Mar 31 14:40:36 2023 user.info : 2:3:20230331:144036.000:48.799542:2.352016:101.200000:0.000000:309.700000
Fri Mar 31 14:40:40 2023 user.info : 2:3:20230331:144040.000:48.799598:2.351893:101.100000:0.000000:309.700000
Fri Mar 31 14:40:44 2023 user.info : 2:3:20230331:144044.000:48.799594:2.351930:102.400000:0.000000:309.700000
Fri Mar 31 14:40:48 2023 user.info : 2:3:20230331:144048.000:48.799588:2.351942:102.000000:0.000000:309.700000
Fri Mar 31 14:40:52 2023 user.info : 2:3:20230331:144052.000:48.799563:2.352001:100.900000:0.000000:309.700000
Fri Mar 31 14:40:56 2023 user.info : 2:3:20230331:144056.000:48.799571:2.351981:101.300000:0.000000:309.700000
Fri Mar 31 14:41:00 2023 user.info : 2:3:20230331:144100.000:48.799571:2.351982:101.300000:0.000000:309.700000
Fri Mar 31 14:41:04 2023 user.info : 2:3:20230331:144102.000:48.799571:2.351981:101.300000:0.000000:309.700000
```

## Configuring MIB Browser to access GNSS NMEA Data via SNMP

Positioning information can also be read directly via SNMP on any MIB Browser and on any remote Management system by using OIDs from Acksys MIB from the `gnss-current-position` table as shown in the screenshot below.

Name/OID	Value	Type	IP Port
gnssAllPositions.0	2:3:20230403:104425.000:48.817157:2:007729:122.800000:0	OctetString	192.168...
firmwareEdsts.0	false (1)	Integer	192.168...
firmwareInfo.0		OctetString	192.168...
sysupgradeMissed.0	false (1)	Integer	192.168...
configHttpServer.0	disable (1)	Integer	192.168...
configHttpServerPort.0	0	Integer	192.168...
configHttpsServer.0	disable (1)	Integer	192.168...
configHttpsPort.0	0	Integer	192.168...
configHttpsCertificate.0	1	OctetString	192.168...
configDhcpSubnet.3.108.97.110	lan	OctetString	192.168...
configNtp.0	0	Integer	192.168...
configDnsRebindProtection.0	enable (2)	Integer	192.168...
configDnsRebindLocalhost.0	enable (2)	Integer	192.168...
configCollectdEnable.0	enable (2)	Integer	192.168...
configCollectdSamplingInterval.0	5	Integer	192.168...
configCollectdGPSEnable.0	enable (2)	Integer	192.168...
configCollectdGPSServerAddr.0	127.0.0.1	IpAddress	192.168...
configCollectdGPSServerPort.0	2947	Integer	192.168...
configCollectdGPSConnTimeout.0	5	Integer	192.168...
configCollectdGPSReqInterval.0	5	Integer	192.168...
configCollectdWirelessScanResult.0	disable (1)	Integer	192.168...
configCollectdWinInfo.0	enable (2)	Integer	192.168...
configAcksysTelemetryEnable.0	enable (2)	Integer	192.168...
configAcksysTelemetryServerPort.0	8628	Integer	192.168...
configAcksysTelemetryOutputInterval.0	5	Integer	192.168...
configAcksysTelemetryMaxBufferSize.0	102400	Integer	192.168...
configAsyncUpgradeDoUpgrade.0	0	Integer	192.168...
configAsyncUpgradeTimerEnable.0	disable (1)	Integer	192.168...
configAsyncUpgradeTimerEnable.0		Null	192.168...
positionValid.0	true (2)	Integer	192.168...
fixdate.0	20230403	OctetString	192.168...
fixtime.0	104449.000	OctetString	192.168...
latitude.0	48.817157	OctetString	192.168...
longitude.0	2.007729	OctetString	192.168...
altitude.0	122.800000	OctetString	192.168...
speeddim.0	0.000000	OctetString	192.168...

The string displayed in the system log and the string obtained through the 'gnssAllPositions' SNMP OID have the same format. It consists in a series of column-separated values in the following order:

Valid flag	1 if position is undefined, 2 if the following data is valid
Dimension	2 if only latitude/longitude are known, 3 if elevation (altitude) is also valid, 0 or 1 if position unknown
Date	Last fix date. YYMMDD (year, month, day) or empty if invalid
Time	Last fix time. If time is available: HHMMSS.ddd (hour, minute, second, dot, milliseconds).  If time is unavailable: sssssssss (integer number of seconds since 1/1/1970) as known to the product. Always greater than 1000000.
Latitude	±DD.dddddd degrees from equator, 6 decimal places, a minus sign means south of equator
Longitude	±DD.dddddd degrees from Greenwich, 6 decimal places, a minus sign means west of Greenwich
Altitude	HHH.hhhhhh Height above mean sea level, in meters

Speed	kkk.vvvvvv Horizontal displacement speed in kilometers per hour, 6 decimal places
Direction	DDD.dddddd degrees from true north, 6 decimal places, DDD ranges from 0 to 359

## WAN Router: GNSS Status

You can retrieve the current position Via GUI in on “Device Information” page as shown in the screenshot below Status

### DEVICE INFORMATION

#### FIRMWARE INFORMATION

WaveOs version:	4.21.0.3-V4.22.0.1-V4.18.0.1-63-ge7f3cd96e4 (BETA version)
Boot loader version:	3.4.1.1
Firmware ID:	E2148.AC.1
SSH access:	enabled (by configuration)

#### DEVICE INFORMATION

Host name:	GPS Agent
Model:	AirBox/14
Product version:	V1
Motherboard ID:	000019029fa8
GNSS info:	<a href="#">latitude: 48.81715815°</a> <a href="#">longitude: 2.0077294°</a> speed: 0 km/h direction: motionless

## WaveManager: GNSS Status

We can retrieve the current position Via WaveManager on “Device Information” page (Latitude and Longitude) as shown in the screenshot below where.

The screenshot displays the WaveManager web interface. On the left, a sidebar contains navigation options: Products view, Dashboards, Ref. configurations, Dist. discovery, and Settings. The main area shows a list of devices under the 'New configuration' state. One device, 'AirBox/14', is selected. A detailed view of this device is shown on the right, with a 'DESCRIPTION' tab. This tab lists various parameters including Discovery date, Last connection, IP Address, Mask, Gateway, Group, Product Id, Firmware, Version, Latitude, and Longitude. The Latitude and Longitude values are highlighted with a red rectangular box. Below the description, there is a 'ROLES LIST' section.

Email : [support@acksys.fr](mailto:support@acksys.fr)