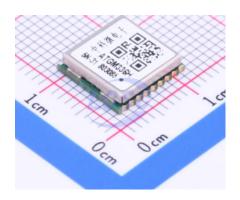
ATGM336H-5N31 GPS

(<u>link</u>) LCSC part page (C90770) - \$3.74 (<u>link</u>) Spec



Basically Ublox compatible.

9.7 x 10.1 mm (small) AT6558 Chip 2.7-3.6v operation (1.5-3.6v battery backup)

Cold start TTFF - 35s Hot start TTFF - 1s

Defaults to using GPS+BDS constellations

Runs avg 21mA at 3.3v (peak inrush

Tuning satellite systems (eg GPS only vs GPS+BDS) saves ~1mA

Wiring the GPS module up, and using it the right way critical

This GPS sucks power even when disabled unless you take care

Supports being configured via UBX and CASIC commands

groups.io forum says high-altitude mode not required to be enabled for operation UBX message gets NAK whereas Ublox models ACK. CASIC command influence unknown.

Time pulse (1PPS = 1 pulse per second) looks exact to Ublox

NMEA Message Support

```
(link) NMEA Messages
(link) Beidou Messages
```

Basics

GPS receivers emit NMEA messages over serial, frequently with:

- 9600 baud
- A default list of message types

An example message type might be "GPGGA," where "GGA" refers to the message format, and "GP" refers to the USA GPS system as the origin of the data.

Now that more than just the USA has a GPS system, the NMEA message types have been expanded.

What in some modules might previously have been a message type of "GPGGA" might now be seen as GNGGA, where GN refers to "GNSS," meaning "all the satellites got you this data."

Prefix list:

- GP for GPS-QZSS-SBAS USA
- BD for BEIDOU-only China
- GL for GLONASS-only Russia
- GI for INSAT-only India
- GA for GALILEO-only EU
- GN is for GNSS, combination of different global position satellite systems

See appendix for NMEA message format.

Default NMEA Message Types

Rate of 1 sec for the following messages. Green are the ones I want.

Message Type	Meaning	GP Strings (GPS/USA)	GN Strings (GNSS/mixed source)	BD Strings (BEIDOU/China)
GSA	Satellite ID list	GPGSA		BDGSA
GGA	Time, Lat/Lng, Altitude		GNGGA	
GLL	Time, Lat/Lng		GNGLL	
GSV	Satellite position (multi-message)	GPGSV		BDGSV
RMC	Time, Lat/Lng, Speed, Course		GNRMC	
VTG	Speed, Course		GNVTG	
ZDA	Time, Timezone		GNZDA	
TXT	Mfr specific text	GPTXT		

EG when locked

```
$GNGGA,160755.000,4044.51805,N,07401.96538,W,6,04,7.3,115.8,M,0.0,M,,*64

$GNGLL,4044.51805,N,07401.96538,W,160755.000,A,E*5F

$GPGSA,A,3,04,07,08,09,,,,,,,13.7,7.3,11.6*37

$BDGSA,A,3,,,,,,,,,,,13.7,7.3,11.6*24

$GPGSV,2,1,08,04,16,194,27,07,67,304,16,08,79,069,24,09,31,227,35*7B

$GPGSV,2,2,08,14,10,274,23,16,25,073,,27,,,17,30,29,310,*48

$BDGSV,1,1,03,11,52,179,30,34,68,148,29,43,28,200,29*5B

$GNRMC,160755.000,A,4044.51805,N,07401.96538,W,0.21,165.84,200323,,,E*65

$GNVTG,165.84,T,,M,0.21,N,0.40,K,E*2E

$GNZDA,160755.000,20,03,2023,00,00*4A

$GPTXT,01,01,01,ANTENNA OPEN*25
```

Do I want the Beidou GSV?

Yes, because those contribute to the GGA/RMC messages, so if I'm tracking satellites, track those too.

UBX Message Support

```
(link) Spec (from UBLOX 6)
(link) Spec (from some other Chinese module, but works(?))
```

Basics

GPS modules can be configured by sending them messages (eg tell them what NMEA message types you want to receive).

One message format to configure the GPS is UBX. It is defined in the UBLOX spec. It is a binary message structure (as opposed to ASCII NMEA messages).

Issuing a UBX message to the GPS module will result in the receiver replying back with an ACK or NAK message, answering whether your message was understood and followed.

Sending a UBX message to the GPS module is no particular issue.

Receiving/understanding the response can be challenging, as the response is interleaved along with regular ASCII NMEA messages. Ignoring the response is an option, just be careful to not mis-parse the UBX reply as part of a NMEA message.

Supports High Altitude Mode? - No

(The Ublox Neo 6 does, though, for same message).

```
UBX CFG-NAV5 GET/SET - 0x0624

Bitmask: 0b00000000 0b000000001

DynModel: Airborne < 1g Accel

0x00000000: B5 62 06 24 24 00 01 00 | .b.$$...

0x00000008: 06 00 00 00 00 00 00 | ......

0x00000010: 00 00 00 00 00 00 00 | ......

0x00000018: 00 00 00 00 00 00 00 | ......

0x00000020: 00 00 00 00 00 00 00 | ......

0x00000028: 00 00 55 B4 | ..U.

UBX Msg found -- 0x0500

NAK from 0x0624
```

Supports Device Reset? - Yes

Supports Message Selection and Rate? - Yes

Disabled the ones I don't want, and set the ones I do to a 2 second interval.

```
Setting configuration for GSA (satellite id list)
UBX CFG-MSG - 0x0601
  Set NMEA ClassId F002 to rate of 0 per sec
0x00000000: B5 62 06 01 03 00 F0 02 | .b.....
0x00000008: 00 FC 13
Setting configuration for GGA (time, lat/lng, altitude)
UBX CFG-MSG - 0x0601
 Set NMEA ClassId F000 to rate of 2 per sec
0x00000000: B5 62 06 01 03 00 F0 00 | .b.....
0x00000008: 02 FC 11
Setting configuration for GLL (time, lat/lng)
UBX CFG-MSG - 0x0601
  Set NMEA ClassId F001 to rate of 0 per sec
0x00000000: B5 62 06 01 03 00 F0 01 | .b.....
0x00000008: 00 FB 11
Setting configuration for GSV (satellite locations)
UBX CFG-MSG - 0x0601
  Set NMEA ClassId F003 to rate of 2 per sec
0x00000000: B5 62 06 01 03 00 F0 03 | .b.....
0x00000008: 02 FF 17
Setting configuration for RMC (time, lat/lng, speed, course)
UBX CFG-MSG - 0x0601
  Set NMEA ClassId F004 to rate of 2 per sec
0x00000000: B5 62 06 01 03 00 F0 04 | .b.....
0x00000008: 02 00 19
Setting configuration for VTG (speed, course)
UBX CFG-MSG - 0x0601
 Set NMEA ClassId F005 to rate of 0 per sec
0x00000000: B5 62 06 01 03 00 F0 05 | .b.....
0x00000008: 00 FF 19
Setting configuration for ZDA (time, timezone)
UBX CFG-MSG - 0x0601
  Set NMEA ClassId F008 to rate of 0 per sec
0x00000000: B5 62 06 01 03 00 F0 08 | .b.....
0x00000008: 00 02 1F
```

Setting configuration for TXT (text transmission) UBX CFG-MSG - 0x0601 Set NMEA ClassId F041 to rate of 0 per sec 0x00000000: B5 62 06 01 03 00 F0 41 | .b....A 0x00000008: 00 3B 91 | .;. UBX Msg found -- 0x0501 ACK from 0x0601 UBX Msg found -- 0x0501 ACK from 0x0601

NMEA Before

```
$GNGGA,,,,,,0,00,25.5,,,,,,*64
$GNGLL,,,,,,V,M*79
$GPGSA,A,1,,,,,,,,,25.5,25.5,25.5*02
$BDGSA,A,1,,,,,,,,,25.5,25.5,25.5*13
$GPGSV,1,1,02,01,,,35,17,,,31*78
$BDGSV,1,1,00*68
$GNRMC,,V,,,,,,,M*4E
$GNVTG,,,,,,,,M*2D
$GNZDA,,,,,*56
$GPTXT,01,01,01,ANTENNA OPEN*25
$GNGGA,,,,,,0,00,25.5,,,,,*64
$GNGLL,,,,,,V,M*79
$GPGSA,A,1,,,,,,,,,25.5,25.5,25.5*02
$BDGSA,A,1,,,,,,,,,25.5,25.5,25.5*13
$GPGSV,1,1,02,01,,,35,17,,,31*78
$BDGSV,1,1,00*68
$GNRMC,,V,,,,,,,,M*4E
$GNVTG,,,,,,,,M*2D
$GNZDA,,,,,*56
$GPTXT,01,01,01,ANTENNA OPEN*25
```

NMEA After, only messages I want, at 2 sec interval

Supports Reset to Factory Settings? - Yes

Told it to pull all default settings into use

```
UBX CFG-CFG - 0x0609
    Factory Reset
0x00000000: B5 62 06 09 0D 00 FF FF | .b.....
0x00000008: FF FF 00 00 00 00 00 | .......
0x000000010: 00 00 FF 17 8A | .....

UBX Msg found -- 0x0501
ACK from 0x0609
```

```
Before - only the messages I wanted, at my rate, were arriving After - all the default messages came back at 1 sec interval
```

Supports Save Settings? - Yes

```
SendModuleSaveConfiguration

UBX CFG-CFG - 0x0609

Save Configuration to battery-backed RAM

0x00000000: B5 62 06 09 0D 00 00 00 | .b.....

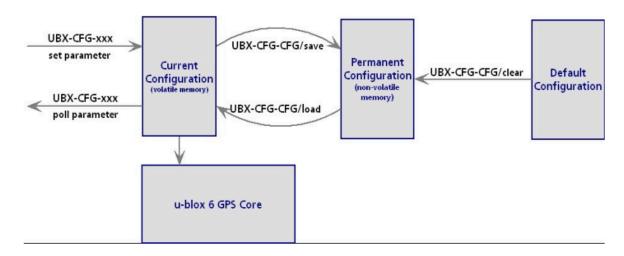
0x00000008: 00 00 FF FF FF FF 00 00 | ......

0x00000010: 00 00 FF 17 9A | .....

UBX Msg found -- 0x0501

ACK from 0x0609
```

Configuration Saving / Loading Scheme



Supports Time Pulse Configuration? - No

On Ublox, you can request the time pulse to be active even without a GPS lock, giving you access to the GPS high-res clock. This Ublox-working message below is not working on ATGM336H.

Attempted to poll the device hoping to learn if it simply didn't like the params, but no, it doesn't care about this message class seemingly.

```
SendModulePulsePoll
UBX CFG-TP5 Poll - 0x0631
Data good
```

0x00000000: B5 62 06 31 00 00 37 AB | .b.1..7.

UBX Msg found -- 0x0500

NAK from 0x0631

Attempted to poll the device for a legacy time pulse configuration method, also failure

SendModuleLegacyPulsePoll

UBX CFG-TP Poll - 0x0607

Data good

0x00000000: B5 62 06 07 00 00 0D 2D | .b....-

UBX Msg found -- 0x0500

NAK from 0x0607

CASIC Message Support

(link) Spec for AT3340 (BDS, GPS board) with CASIC messages
 (link) Found here
(link) Spec for G2 and G7A with CASIC messages

Basics

GPS modules can be configured by sending them messages (eg tell them what NMEA message types you want to receive).

The CASIC configuration/command messages here are NMEA-message-formatted (see appendix) strings.

I believe the point of these message types is simplicity over the UBX messages.

I can't find an original document describing CASIC

I believe NMEA allows for "custom extensions" of the NMEA protocol, and that's what this is.

Should I expect a reply?

Seemingly not, even when I can see a change in behavior I see no messages

I include the CAS string to send below for any working examples.

Don't forget to follow that string with "\r\n" as mandated by the spec.

Information Survey

Looked at the specs, and comments made in groups.io to figure out what is what. Noted 'x' where I saw a reference to a specific CASIC message.

Message	ATT340	G2/G7A	groups.io	Meaning	Supported?
CAS00	х	х		Save the current configuration information to FLASH	Yes
CAS01	х	х		Set the baud rate of serial communication	Don't want, didn't try
CAS02	х	х		Set positioning update rate	Unclear

CAS03	x	x		Sets the NMEA statement that requires the output or stops the output (Configure which NMEA messages types are sent to you)	Yes
CAS04	х	х	х	Configuration working system (Configure which satellite system(s) are used)	Yes
CAS05		х		Set NMEA protocol type Multi-GNSS receivers support different protocols and the data format protocols are also various.	Don't want, didn't try
CAS06	х			Query module information	Yes
CAS10	х	х	х	Receiver restart	Yes
CAS11	х		х	Set up the dynamic model of the current navigation platform. (eg high altitude mode)	Unclear

Supports CAS00? - Yes

\$PCAS00*01

Changes persisted across entire system abrupt power off/on.

Supports CAS01? - Don't want, didn't try

Supports CAS02? - Unclear meaning

Not sure the meaning of this parameter

Supports CAS03? - Yes

\$PCAS03,2,0,0,0,2,2,0,0,0*1C

\$GNGGA,175549.000,4044.57140,N,07401.95776,W,1,06,2.0,-83.2,M,0.0,M,,*70 \$GNRMC,175549.000,A,4044.57140,N,07401.95776,W,0.00,0.00,230323,,,A*61 \$GNVTG,0.00,T,,M,0.00,N,0.00,K,A*23

Support CAS04? - Yes

What	CAS String
1 = GPS only	\$PCAS04,1*18
2 = BDS only	\$PCAS04,2*1B
3 = GPS + BDS	\$PCAS04,3*1A
4 = GLONASS	\$PCAS04,4*1D
5 = GPS + GLONASS	\$PCAS04,5*1C
6 = BDS + GLONASS	\$PCAS04,6*1F
7 = GPS + BDS + GLONASS	\$PCAS04,7*1E

\$PCAS04,1*18

```
$GPGGA,153348.000,,,,0,00,25.5,,,,,*6C

$GPGLL,,,,,153348.000,V,N*72

$GPGSA,A,1,,,,,,,,,,25.5,25.5,25.5*02

$GPGSV,1,1,00*79

$GPRMC,153348.000,V,,,,,,,,,,N*45

$GPVTG,,,,,,,,N*30

$GPZDA,153348.000,,,,,*5E

$GPTXT,01,01,01,ANTENNA OPEN*25
```

\$PCAS04,2*1B

```
$BDGGA,153258.000,,,,0,00,25.5,,,,,*7D

$BDGLL,,,,,153258.000,V,N*63

$BDGSA,A,1,,,,,,,,,25.5,25.5,25.5*13

$BDGSV,1,1,00*68

$BDRMC,153258.000,V,,,,,,,,,,N*54

$BDVTG,,,,,,,,,N*21

$BDZDA,153258.000,,,,,*4F

$GPTXT,01,01,01,ANTENNA OPEN*25
```

\$PCAS04,3*1A

```
$GNGGA,153420.000,,,,0,00,25.5,,,,,*7B

$GNGLL,,,,153420.000,V,N*65

$GPGSA,A,1,,,,,,,,,25.5,25.5,25.5*02

$BDGSA,A,1,,,,,,,,25.5,25.5,25.5*13

$GPGSV,1,1,04,04,,,28,08,,,21,09,,,29,27,,,29*74

$BDGSV,1,1,00*68

$GNRMC,153420.000,V,,,,,,,,,N*52

$GNVTG,,,,,,,,N*2E

$GNZDA,153420.000,,,,,*49

$GPTXT,01,01,01,ANTENNA OPEN*25
```

\$PCAS04,4*1D

```
$GLGGA,153542.000,,,,,0,00,25.5,,,,,*7C

$GLGLL,,,,,153542.000,V,N*62

$GLGSA,A,1,,,,,,,,,25.5,25.5*1E

$GLGSV,1,1,00*65

$GLRMC,153542.000,V,,,,,,230323,,,N*56

$GLVTG,,,,,,,,N*2C

$GLZDA,153542.000,23,03,2023,00,00*4F

$GPTXT,01,01,01,ANTENNA OPEN*25
```

\$PCAS04,5*1C

```
$GNGGA,153626.000,,,,0,00,25.5,,,,,*7F

$GNGLL,,,,153626.000,V,N*61

$GPGSA,A,1,,,,,,,,,25.5,25.5,25.5*02

$GLGSA,A,1,,,,,,,,25.5,25.5,25.5*1E

$GPGSV,1,1,01,27,,,28*77

$GLGSV,1,1,01,88,,,24*62

$GNRMC,153626.000,V,,,,,,230323,,,N*55

$GNVTG,,,,,,,N*2E

$GNZDA,153626.000,23,03,2023,00,00*4C

$GPTXT,01,01,01,ANTENNA OPEN*25
```

\$PCAS04,6*1F

```
$GNGGA,153700.000,,,,0,00,25.5,,,,,***7A

$GNGLL,,,,153700.000,V,N*64

$BDGSA,A,1,,,,,,,,25.5,25.5,25.5*13

$GLGSA,A,1,,,,,,,,25.5,25.5,25.5*1E

$BDGSV,1,1,00*68

$GLGSV,1,1,01,88,,,23*65

$GNRMC,153700.000,V,,,,,,230323,,,N*50

$GNVTG,,,,,,,,N*2E

$GNZDA,153700.000,23,03,2023,00,00*49

$GPTXT,01,01,01,ANTENNA OPEN*25
```

\$PCAS04,7*1E

```
$GNGGA,153743.000,,,,0,00,25.5,,,,,*7D

$GNGLL,,,,,153743.000,V,N*63

$GPGSA,A,1,,,,,,,,25.5,25.5,25.5*02

$BDGSA,A,1,,,,,,,,,25.5,25.5*13

$GLGSA,A,1,,,,,,,,,,25.5,25.5*1E

$GPGSV,1,1,00*79

$BDGSV,1,1,00*68

$GLGSV,1,1,01,88,,,27*61

$GNRMC,153743.000,V,,,,,,230323,,,N*57

$GNVTG,,,,,,,,,,N*2E

$GNZDA,153743.000,23,03,2023,00,00*4E

$GPTXT,01,01,01,ANTENNA OPEN*25
```

Support CAS05? - Don't want, didn't try

Support CAS06? - Yes

\$PCAS06,1*1A

\$GPTXT,01,01,02,HW=ATGM336H,0001230439775*19

Supports CAS10? - Yes

What	CAS String
0 = Hot start: Without initialization information, all data in the backup store are valid.	\$PCAS10,0*1C
1 = Warm start: Without initialization information, clear ephemeris.	\$PCAS10,1*1D
2 = Cold start: Without initialization information ,and clear all data except configuration in the backup store.	\$PCAS10,2*1E
3 = Clear memory of all data, and reset the receiver to the factory default configuration.	\$PCAS10,3*1F

Support CAS11? - Unknown

No visible indication of change. Not sure how to tell.

What	CAS String	
0 = Portable Mode	\$PCAS11,0*1D	
1 = Static Mode	\$PCAS11,1*1C	
2 = Walking Mode	\$PCAS11,2*1F	
3 = Vehicle Mode	\$PCAS11,3*1E	
4 = Voyage Mode	\$PCAS11,4*19	
5 = Aviation < 1g	\$PCAS11,5*18	
6 = Aviation < 2g	\$PCAS11,6*1B	
7 = Aviation < 4g	\$PCAS11,7*1A	

Time Pulse

Ublox NEO-6M PPS Specification

(<u>link</u>) module spec

(<u>link</u>) receiver spec

Basically the GPS kicks out a pulse per second if you look at the right pin.

Compared to an assumed-good Ublox NEO-6M, it's spot on.

Excerpts from the Ublox Spec

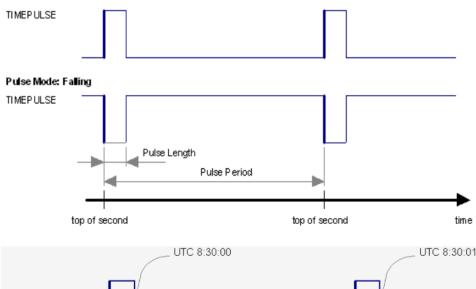
Accuracy for Timepulse signal	RMS	30 ns
	99%	<60 ns
	Granularity	21 ns
	Compensated ⁹	15 ns

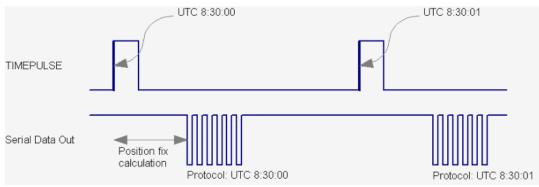
1.7.2 Timepulse and frequency reference

NEO-6T comes with a timepulse output which can be configured from 0.25 Hz up to 10 MHz. The timepulse can either be used for time synchronization (i.e. 1 pulse per second) or as a reference frequency in the MHz range. A timepulse in the MHz range provides excellent long-term frequency accuracy and stability.

TIMEPULSE (1Hz Nav)	1 pulse per second, synchronized	1 pulse per second, synchronized at rising edge, pulse length 100ms		
Configurable Timepulse frequency range		NEO-6G/Q/M/P/V	NEO-6T	
		0.25 Hz to 1 kHz	0.25 Hz to 10 MHz	

Pulse Mode: Rising

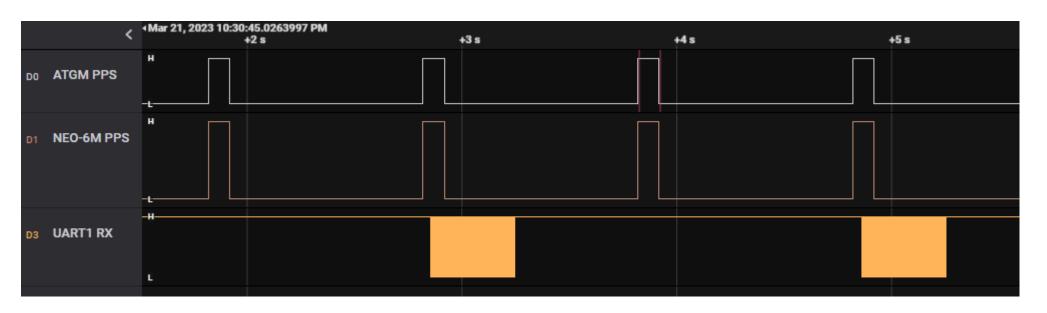


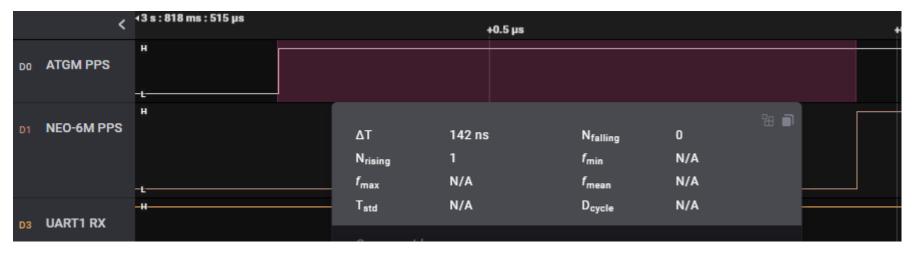


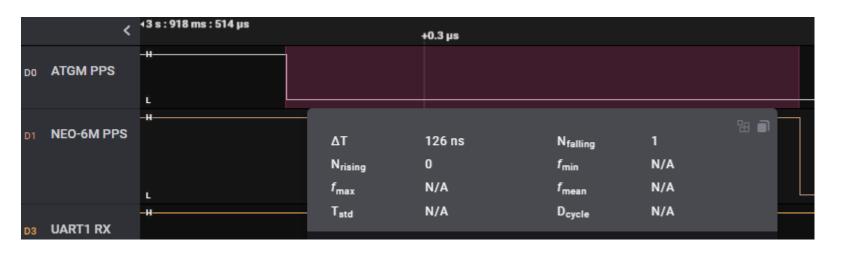
ATGM336 vs Ublox NEO-6M - Start vs End

(<u>link</u>) Saleae capture of side-by-side ATGM336H vs UBLOX NEO-6M timepulse and serial output (<u>link</u>) Saleae capture of side-by-side ATGM336H vs UBLOX NEO-6M timepulse and serial output (GGA and RMC only for ATGM336H)

ATGM is 142ns early to start (and 126ns early to end, but who cares)



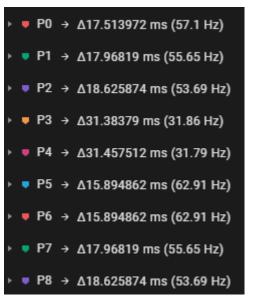




Compared to start of serial data

Default Messages

Kind of a wide spread, but you see in the range of 15ms - 30ms delay after the time pulse before the first serial data arrives.



Limited to GGA and RMC

A spread also, but longer than default. Not sure the implications.

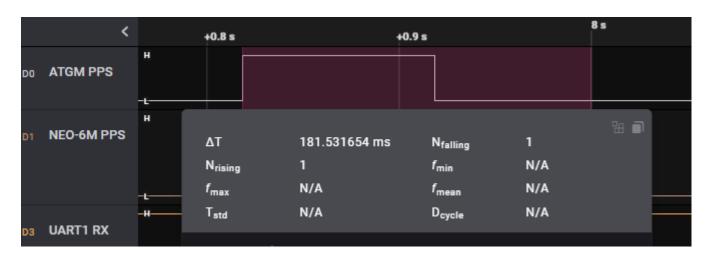
Ranges between 33ms - 56ms, average 44ms for this set.

▶ ■ P0 → Δ33.216666 ms (30.11 Hz) P1 → Δ35.496946 ms (28.17 Hz) P2 → Δ55.292146 ms (18.09 Hz) P4 → Δ35.496946 ms (28.17 Hz) P5 → Δ31.802994 ms (31.44 Hz) P6 → Δ50.646708 ms (19.74 Hz) P7 → Δ52.032974 ms (19.22 Hz) ▶ ■ P8 → ∆52.529106 ms (19.04 Hz) P9 → Δ56.017718 ms (17.85 Hz) P10 → Δ42.01558 ms (23.8 Hz) P11 → Δ46.333356 ms (21.58 Hz) P12 → Δ46.333356 ms (21.58 Hz) P13 → Δ42.01021 ms (23.8 Hz) P14 → Δ43.939526 ms (22.76 Hz)

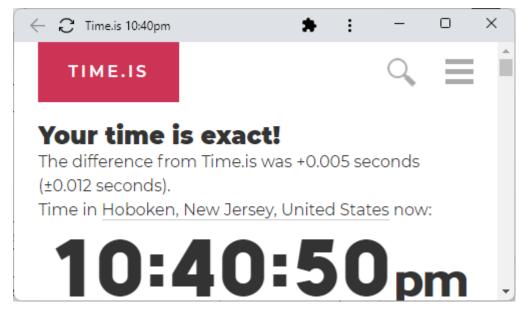
Compared to PC time

Shows my clock as slow by 181ms, which is a lot.

... Not sure what to think about that. I guess trust the GPS? But why is the PC off by that much? That's huge.

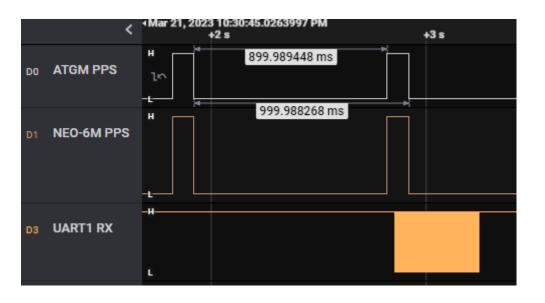


Doesn't match time.is



ATGM336 vs Ublox NEO-6M vs Saleae

Saleae is measuring the period of the 1PPS to be ~12us shorter than 1 second. I have emailed them about this.



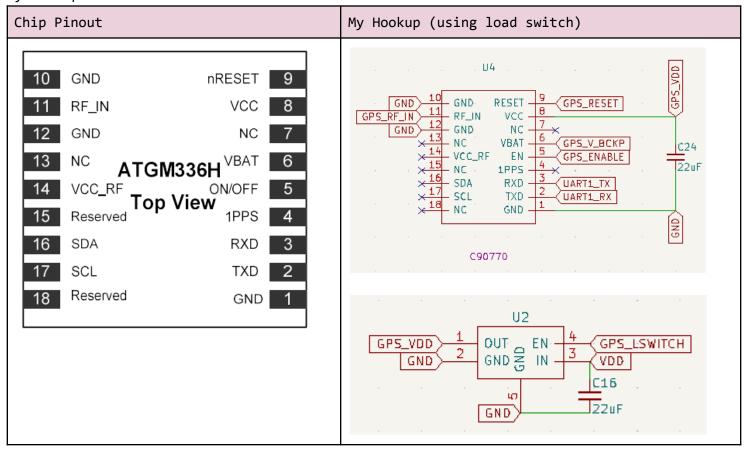
Electrical Hookup

I've seen parasitic draw from this device when hooked up to the UART output of uc.

It also has numerous pins which control its operation.

What is the right way to operate this chip, electrically?

My hookup as follows:



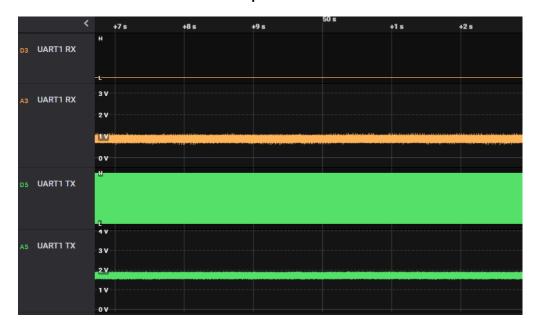
GPS Pin	Function
Load Switch	Provide VDD to chip on/off

Battery	Provide battery backup on/off		
ON/OFF	Enable/Disable I would think		
nRESET	Pull low to reset, high to resume		
MCU Pin	Function		
UART TX	TX		
UART RX	RX		

My configuration (tested for repeatability and lowest power consumption):

- MCU allocate pins for:
 - O UART TX
 - UART RX
 - o GPS Power, shared between two downstream functions
 - Used on load switch
 - Used on GPS ON/OFF pin
 - o GPS Reset
 - GPS Battery
- At runtime
 - When turning the device on
 - GPS Power on (load switch and GPS ON/OFF)
 - Reset low, pause, high (just in case device in weird state)
 - UART TX, RX re-enabled
 - When turning the device off
 - GPS Power off (load switch and GPS ON/OFF)
 - UART TX, RX set to output low
 - o On Error
 - Disconnect Battery
 - Reset low, pause, high
 - PowerOff
 - PowerOn
- At MCU startup
 - $\circ\$ Init GPS Reset pin HIGH and leave it there
 - o Init GPS Battery pin HIGH and leave it there
 - Perform PowerOff sequence

Bad electrical hookup observations



Vampire power drain by the device when the load switch is disabled.

To prevent the GPS from draining power:

- put UART TX in output low state
- put UART RX in output low state
- put ON/OFF pin in output low state

Pulling RST low does suspend the operation of the module but power is still consumed, just less than usual (~5mA less)

The ON/OFF pin seems to behave oddly

- If set off, then GPS power on, device operates as normal (not suspended)
- If set on, then GPS power on, device operates as normal (not suspended)
- If set on, then GPS power on, but no lock yet, then set low, device operates as normal (not suspended)
- If set on, then GPS power on, then lock, then set low, device stops updating and uses very low power

This makes the ON/OFF pin unreliable as far as I'm concerned, harder to come up with a scheme to ensure it's working than simply cutting power to the whole module.

Power Consumption

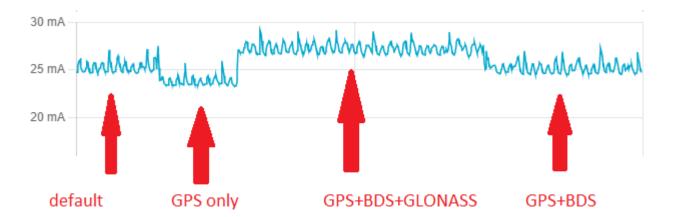
Observations

Baseline MCU ~= 9mA

Average GPS on: 28mA (all messages, 1Hz, GPS/BD)

So call usage ~20mA

Can tweak with some configuration, but barely.



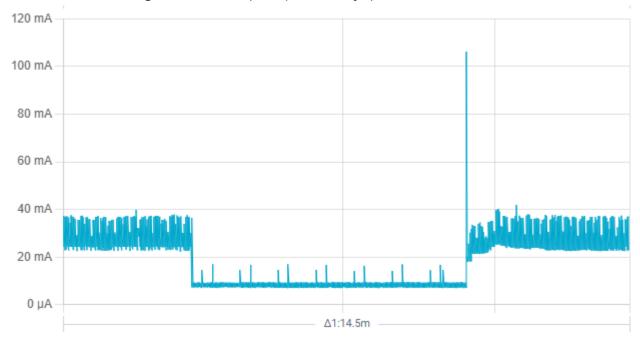
Higher-res monitoring with 3D lock



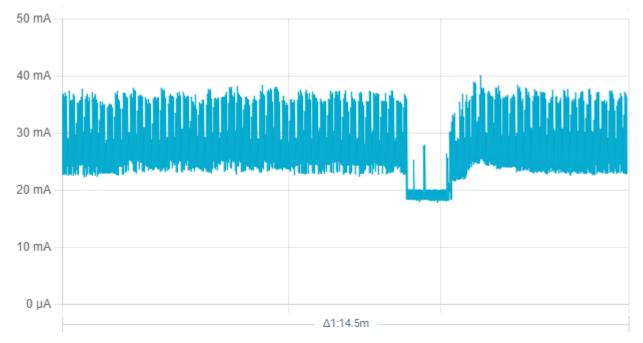
Brief startup inrush during 1ms period



The effect of using the ON/OFF pin (basically power off, doesn't seem to save inrush on re-enable)



Effect of reset



Specs

GPS&BD Typical power	< <mark>25mA</mark> @3.3V
consumption	

Parameters	Symbol	Minimum	Typical	Maximum	Unit
		value	value	value	
Power supply voltage	Vcc	2.7	3.3	3.6	V
Vcc Peak Current (not	Ipeak			100	mA
including antenna)					
Backup power supply	Vbat	1.5	3.0	3.6	V
Backup power supply	lbat		10		uA
(Vbat) current					
Input Pin	Vil			0.2*Vcc	V
	Vih	0.7*Vcc			V
Output Pin	Vol			0.4	V
	lo=-12mA			0.4	V
	Voh	Vcc-0.5			V
	lo=12mA	VCC-0.5			V
Active antenna output	VCC_RF		3.3		V
voltage			3.3		V

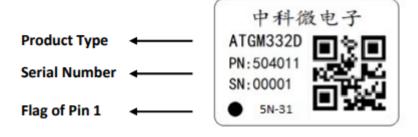
Appendix

ATGM336H-5N Variants

GPS and BDS positioning

	GPS	BDS	GLONASS	2.7V~3.6V	1.65V~3.6V	UARTI	UART2	Flash	TCXO	Antenna Detection	Antenna Over Current Protection	Pre-SAW	External LNA
ATGM336H-5N-1X							•		•	•	•	•	
ATGM336H-5N-2X		•		•			•	•	•	•	•	•	•
ATGM336H-5N-3X	•	•		•			•	•	•	•	•	•	•
ATGM336H-5N-5X	•		•	•		•	•	•	•	•	•	•	•
ATGM336H-5N-7X	•	•	•	•		•	•	•	•	•	•	•	•

Identification

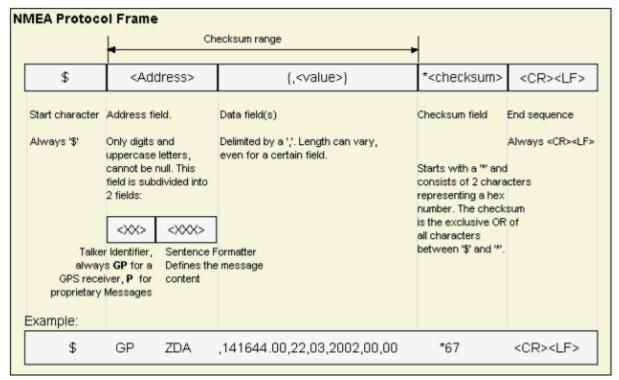


\$GPTXT,01,01,01,ANTENNA OPEN*25 \$GPTXT,01,01,02,MA=CASIC*27 \$GPTXT,01,01,02,HW=ATGM336H,0001230439775*19 \$GPTXT,01,01,02,IC=AT6558-5N-31-0C510800,BMH6CKJ-D3-033236*25 \$GPTXT,01,01,02,SW=URANUS5,V5.3.0.0*1D \$GPTXT,01,01,02,TB=2020-04-28,13:43:10*40 \$GPTXT,01,01,02,MO=GB*77 \$GPTXT,01,01,02,BS=SOC_BootLoader,V6.2.0.2*34 \$GPTXT,01,01,02,FI=00856014*71

(from related, but different, spec)

Sentence	Instruction					
\$GPTXT,01,01,02,MA=CASIC*27	Module vendor information					
\$GPTXT,01,01,02,HW=ATGM330B,003201110130	Module type and serial					
4*18	number					
\$GPTXT,01,01,02,IC=ATGB03+HZG10V2*72	Main chip information of					
	module					
\$GPTXT,01,01,02,SW=URANUS2,V2.0.6.0*18	Software version of the					
	module (Note1)					
\$GPTXT,01,01,02,MO=GB*77	Module working mode					
	(Note2)					
\$GPTXT,01,01,02,CI=03*79	Customer ID information					
\$GPTXT,01,01,01,ANTENNA OPEN*25	Open antenna tip					
\$GPTXT,01,01,01,ANTENNA OK*35	Antenna connection good tip					
\$GPTXT,01,01,01,ANTENNA SHORT*63	Antenna short tip					

NMEA Message Format



The checksum is calculated over <MsgType>,<data>

To calculate the checksum:

```
string lineData = GetLine(line); // a string of everything <MsgType>,<data>

uint8_t checksum = 0;
for (char c : lineData)
{
    checksum = checksum ^ c;
}

retVal = Format::ToHex(checksum); // convert the integer number to a 2-character hex value (eg sprintf format %02X)
```

NMEA messages from cold start to lock

(newlines and ellipses added to see repeating groups more easily)

```
$GPTXT,01,01,02,MA=CASIC*27
$GPTXT,01,01,02,HW=ATGM336H,0001230439775*19
$GPTXT,01,01,02,IC=AT6558-5N-31-0C510800,BMH6CKJ-D3-033236*25
$GPTXT,01,01,02,SW=URANUS5,V5.3.0.0*1D
$GPTXT,01,01,02,TB=2020-04-28,13:43:10*40
$GPTXT,01,01,02,MO=GB*77
$GPTXT,01,01,02,BS=SOC BootLoader,V6.2.0.2*34
$GPTXT,01,01,02,FI=00856014*71
$GNGGA,160134.856,,,,0,00,25.5,,,,,*70
$GNGLL,,,,,160134.856,V,N*6E
$GPGSA,A,1,,,,,,,,,25.5,25.5,25.5*02
$BDGSA,A,1,,,,,,,,,25.5,25.5,25.5*13
$GPGSV,1,1,01,09,,,35*77
$BDGSV,1,1,00*68
$GNRMC,160134.856,V,,,,,,200323,,,N*59
$GNVTG,,,,,,,,N*2E
$GNZDA,160134.856,20,03,2023,00,00*40
$GNGGA,160136.000,,,,0,00,25.5,,,,,*79
$GNGLL,,,,,160136.000,V,N*67
$GPGSA,A,1,,,,,,,,,25.5,25.5,25.5*02
$BDGSA,A,1,,,,,,,,25.5,25.5,25.5*13
$GPGSV,1,1,01,09,,,35*77
$BDGSV,1,1,00*68
$GNRMC,160136.000,V,,,,,,200323,,,N*50
$GNVTG,,,,,,,,N*2E
$GNZDA,160136.000,20,03,2023,00,00*49
$GPTXT,01,01,01,ANTENNA OPEN*25
. . .
$GNGGA,160706.002,4044.53888,N,07401.97085,W,1,04,6.9,75.8,M,0.0,M,,*5E
$GNGLL,4044.53888,N,07401.97085,W,160706.002,A,A*5A
$GPGSA,A,3,04,07,08,09,,,,,,13.1,6.9,11.2*3E
$BDGSA,A,3,,,,,,,,,13.1,6.9,11.2*2D
$GPGSV,2,1,07,04,16,194,27,07,67,304,26,08,79,071,19,09,31,227,36*73
$GPGSV,2,2,07,14,10,273,,27,,,22,30,29,310,*73
$BDGSV,1,1,00*68
$GNRMC,160706.002,A,4044.53888,N,07401.97085,W,1.98,88.03,200323,,,A*5E
```

```
$GNVTG,88.03,T,,M,1.98,N,3.67,K,A*12
$GNZDA,160706.002,20,03,2023,00,00*4E
$GPTXT,01,01,01,ANTENNA OPEN*25
$GNGGA,160707.000,4044.53886,N,07401.97007,W,1,04,6.9,75.8,M,0.0,M,,*59
$GNGLL,4044.53886,N,07401.97007,W,160707.000,A,A*5D
$GPGSA,A,3,04,07,08,09,,,,,,13.1,6.9,11.2*3E
$BDGSA,A,3,,,,,,,,13.1,6.9,11.2*2D
$GPGSV,2,1,07,04,16,194,27,07,67,304,26,08,79,071,13,09,31,227,36*79
$GPGSV,2,2,07,14,10,273,,27,,,22,30,29,310,*73
$BDGSV,1,1,00*68
$GNRMC,160707.000,A,4044.53886,N,07401.97007,W,2.14,94.40,200323,,,A*54
$GNVTG,94.40,T,,M,2.14,N,3.96,K,A*11
$GNZDA,160707.000,20,03,2023,00,00*4D
$GPTXT,01,01,01,ANTENNA OPEN*25
$GNGGA,160754.000,4044.51809,N,07401.96540,W,6,04,7.3,115.8,M,0.0,M,,*66
$GNGLL,4044.51809,N,07401.96540,W,160754.000,A,E*5D
$GPGSA,A,3,04,07,08,09,,,,,,13.7,7.3,11.6*37
$BDGSA,A,3,,,,,,,,13.7,7.3,11.6*24
$GPGSV,2,1,08,04,16,194,27,07,67,304,16,08,79,069,24,09,31,227,35*7B
$GPGSV,2,2,08,14,10,274,23,16,25,073,,27,,,17,30,29,310,*48
$BDGSV,1,1,00*68
$GNRMC,160754.000,A,4044.51809,N,07401.96540,W,0.59,165.84,200323,,,E*68
$GNVTG,165.84,T,,M,0.59,N,1.10,K,E*25
$GNZDA,160754.000,20,03,2023,00,00*4B
$GPTXT,01,01,01,ANTENNA OPEN*25
$GNGGA,160755.000,4044.51805,N,07401.96538,W,6,04,7.3,115.8,M,0.0,M,,*64
$GNGLL,4044.51805,N,07401.96538,W,160755.000,A,E*5F
$GPGSA,A,3,04,07,08,09,,,,,,13.7,7.3,11.6*37
$BDGSA,A,3,,,,,,,,,13.7,7.3,11.6*24
$GPGSV,2,1,08,04,16,194,27,07,67,304,16,08,79,069,24,09,31,227,35*7B
$GPGSV,2,2,08,14,10,274,23,16,25,073,,27,,,17,30,29,310,*48
$BDGSV,1,1,00*68
$GNRMC,160755.000,A,4044.51805,N,07401.96538,W,0.21,165.84,200323,,,E*65
$GNVTG,165.84,T,,M,0.21,N,0.40,K,E*2E
$GNZDA,160755.000,20,03,2023,00,00*4A
$GPTXT,01,01,01,ANTENNA OPEN*25
```

CASIC Research

https://groups.io/g/picoballoon/topic/77690157#2668

(link) translated doc referred to (hard to read)

In an ideal world, I agree, but as you say very little documentation about the ATGM336N. Software wise it uses the CASIC command set, but the best version of the software command manual I can find is still only partially translated, and doesn't include any power saving commands:

https://docs.google.com/document/d/e/2PACX-1vQaEH6gbVeQds5AOQ7c2dJoNef1o6vCL4SeDRDB9YNtRzI1

MKUYzDqS9clEdwL_RdI9TpjErreM-wiM/pub?fbclid=IwAR23Httzw9-5dcKluRAVFwL3J1btW-haHOdrVTI9lKTePqVMI8nd86zYDPE

The two useful commands I have tested and seem to work are:

Airborne Mode:

Serial.println(F("\$PCAS11,5*18"));

Full GPS Reset:

Serial.println(F("\$PCAS10,3*1F"));

I recall finding somewhere that the ATGM336 modules use the PMTK command set but I can not find my reference at the moment.

https://groups.io/g/picoballoon/topic/97694496#7576

There is no flightmode limitations on the AGM336 module, have been tested to 33000m and worked fine all the way up.

The only string I use is to set it at gp only mode and disable Beydou system to save a few mA \$PCAS04,1*18 Single GPS working mode Serial.write("\$PCAS04,1*18\r\n");

Here is the strings for the ATGM I have found, where the ones we use (bought on Aliexpress) only have Beydou and gps , hense the GLONASS string have no effect

```
**PCAS10,0*1C hot start Serial.write("$PCAS10,0*1C\r\n"); $PCAS10,1*1D warm start $PCAS10,2*1E cold start Serial.write("$PCAS10,2*1E\r\n"); $PCAS10,3*1F factory start Serial.write("$PCAS10,3*1F\r\n"); $PCAS10,8*14 Turn off Serial.write("$PCAS10,8*14\r\n"); $PCAS10,9*15 Turn on Serial.write("$PCAS10,9*15\r\n");
```

```
Start mode configuration.
0=hot start. Do not use initialization information, back up all The data is valid.
1=Warm start. Clear the ephemeris without using the initialization information.
2=Cold start. Do not use the initialization information, clear the backup storage except All data outside the configuration.
3=Factory start. Clear all data in the memory and reset the receiver To the factory default configuration.
8=Turn off - the serial port output and radio frequency part to respond to the serial port configuration.
9=Enable - serial port output and RF part. Corresponds to 8.
$PCAS04,1*18 Single GPS working mode Serial.write("$PCAS04,1*18\r\n");
$PCAS04,2*1B Single Beidou working mode
$PCAS04,3*1A Beidou and GPS dual mode
$PCAS04,7*1E All system online
Serial.write("$PCAS04,1*18\r\n");
1=GPS
2=BDS
3=GPS+BDS
4=GLONASS
5=GPS+GLONASS
6=BDS+GLONASS
7=GPS+BDS+GLONASS
```

https://groups.io/g/picoballoon/topic/92097874#6127

```
My notes of the ATGM module
----- ATGM336 -----
$PCAS10,0*1C hot start Serial.write("$PCAS10,0*1C\r\n");
$PCAS10.1*1D warm start
$PCAS10,2*1E cold start Serial.write("$PCAS10,2*1E\r\n");
$PCAS10,3*1F factory start Serial.write("$PCAS10,3*1F\r\n");
$PCAS10,8*14 Turn off Serial.write("$PCAS10,8*14\r\n");
$PCAS10,9*15 Turn on
                           Serial.write("$PCAS10,9*15\r\n");
Start mode configuration.
0=hot start. Do not use initialization information, back up all The data is valid.
1=Warm start. Clear the ephemeris without using the initialization information.
2=Cold start. Do not use the initialization information, clear the backup storage except All data outside the configuration.
3=Factory start. Clear all data in the memory and reset the receiver To the factory default configuration.
8=Turn off - the serial port output and radio frequency part to respond to the serial port configuration.
9=Enable - serial port output and RF part. Corresponds to 8.
```

\$PCAS04,1*18 Single GPS working mode Serial.write("\$PCAS04,1*18\r\n"); \$PCAS04,2*1B Single Beidou working mode \$PCAS04,3*1A Beidou and GPS dual mode

https://github.com/Xinyuan-LilyGO/TTGO_TWatch_Library/issues/187

(link) spec for PCAS commands