

- **Save Config, Downlink 14 bytes, Port 2:**

BYTE	SIZE	DESCRIPTION
1	1	Save Config command ID = 0x01
2	1	LED on/off and Auto Power Save enable/disable Bit6 = 0 – LED off, Bit6 = 1 – LED on Bit5-1 = 0-23 – LED on hours, Bit0 = 0 – 00 minutes, 1 – 30 minutes Bit7 = 1 – Auto Power Save enable, = 0 – Auto Power Save disable
3	1	Location mode 0x01 – Battery saving (1 GNSS fix per day at 12-00, 4 uplinks per day) 0x02 – Optimal (4 GNSS fix per day, 6 hours period, 4 uplinks per day) 0x03 – High accuracy (8 GNSS fix per day, 3 hours period, 8 uplinks per day)
4-7	4	Bit16-0 = HHHHHMMMMMMSSSSSS – Uplink Initial time Bit27-17 = HHHHHMMMMMM – GNSS Fix Time TGNSS Initial time Hours 0-23, minutes 0-59, seconds 0-59. Bit28 = 0 – GNSS fix according to Uplinks schedule Bit28 = 1 – GNSS fix according to TGNSS schedule Example: 0x00001EFB – Uplinks schedule start 1:59:59, period according to Location mode
8	1	Type of report Bit7 = 0, Bit6-0 > 0 – Activity Profile 1, Normal activity events per hour Bit6-0 – Normal activity threshold (range 0,1...12,7g): 0x01*0,1 = 0,1g, 0x02*0,1 = 0,2g ...0x7F*0,1 = 12,7g Bit7-0 = 0x00 – Activity Profile 2 (reserved) Bit7-0 = 0x80 – Activity Profile 3 (reserved)
9	1	Alert Uplinks Profile Bit0 = 0 – no GNSS fix before alert uplink Bit0 = 1 – GNSS fix before alert uplink Bit7-1 – enable/disable alerts, = 1 – enable, = 0 – disable Bit1 – Alert1 Motionless (ID=1) Bit2 – Alert2 Low activity (ID=2) Bit3 – Alert3 Hyperactivity (ID=3) Bit4 – Alert4 Reboot (ID=4) Bit5 – change Location mode to High accuracy at Motionless alert . Bit6 – change Location mode to High accuracy at Low activity alert . Bit7 – change Location mode to High accuracy at Hyperactivity alert .
10	1	Motionless Alert threshold in minutes, range 1-240
11	1	Low activity Alert threshold in minutes, range 1-240
12	1	Bit6-0 – Hyperactivity threshold: 0x01*0,1 = 0,1g...0x7F*0,1 = 12,7g
13	1	Heat stress Alert (ID=5) threshold range -40...+60°C, 0,5°C resolution -40.0 = 0, -39.5 = 1...+60.0 = 200, disable = 0xFF
14	1	Alert Flags and HW Reset 0x00 – no reset. Bit1 = 1 – Reset Alert1 counter Bit2 = 1 – Reset Alert2 counter Bit3 = 1 – Reset Alert3 counter Bit4 = 1 – Reset Alert4 counter Bit5 = 1 – reserved Bit6 = 1 – reserved Bit7 = 1 – HW reset

Observações:

- Horas, minutos e segundos começam em 0: horas 0-23, Minutos 0-59, Segundos 0-59.
- No Byte 2 “LED on/off and Auto Power Save enable/disable” os Bits 5-1 “LED on hours” referem-se a qual Horário do Dia o Led irá ligar e Bit0 refere-se a metade de uma hora, assim podemos configurar o horário em múltiplos de 30min. Ex.: 15:00 nos bits 0-5 -> 101010, 15:30 nos bits 0-5 -> 101011.

Exemplo payload Save Config:

- **Byte 1:** 0x01
Command ID Save Config.
- **Byte 2:** 0x6B
Led ON, Led Time 21:30, Auto PowerSave disable.
- **Byte 3:** 0x02
Location mode Optimal 4 GNSS, 4 LoRa per Day.
- **Byte 4-7:** 0x05BC F000
Uplink Initial Timer 15:00:00.
GNSS Fix Time TGNSS initial time 11:30.
GNSS fix according to Uplinks schedule.
- **Byte 8:** 0x14
Activity profile 1, Threshold 2g.
- **Byte 9:** 0x16
No GNSS fix before alerts, enable alerts ID 1, 2 e 4.
- **Byte 10:** 0x6F
Motionless 111min.
- **Byte 11:** 0x25
Low activity 37min.
- **Byte 12:** 0x32
Hyperactivity 5g.
- **Byte 13:** 0x99 -> $((\text{Valor} * 0.5) - 40)$
Heat Stress 36.5°C.
- **Byte 14:** 0x1A
Reset alert counters 1, 3, 4.
- **Payload Completo:**
0x016B0205BCF00014166F2532991A.

- **Read Config, Downlink 1 byte, Port 2:**

BYTE	SIZE	DESCRIPTION
1	1	Read Config command ID = 0x02

- **Payload Completo:**

0x02

- **Read Config, Uplink 14 bytes, Port 3:**

BYTE	SIZE	DESCRIPTION
1	1	Read Config command ID = 0x02
2	1	LED on/off and Auto Power Save enable/disable <u>Bit6</u> = 0 – LED off, Bit6 = 1 – LED on <u>Bit5-1</u> = 0-23 – LED on hours, <u>Bit0</u> = 0 – 00 minutes, 1 – 30 minutes <u>Bit7</u> = 1 – Auto Power Save enable, = 0 – Auto Power Save disable
3	1	Location mode 0x01 – Battery saving (1 GNSS fix per day at 12-00, 4 uplinks per day) 0x02 – Optimal (4 GNSS fix per day, 6 hours period, 4 uplinks per day) 0x03 – High accuracy (8 GNSS fix per day, 3 hours period, 8 uplinks per day)
4-7	4	<u>Bit16-0</u> = HHHHHMMMMMMMMSSSSSS – Uplink Initial time <u>Bit27-17</u> = HHHHHMMMMMMM – GNSS Fix Time TGNSS Initial time Hours 0-23, minutes 0-59, seconds 0-59. Bit28 = 0 – GNSS fix according to Uplinks schedule <u>Bit28</u> = 1 – GNSS fix according to TGNSS schedule Example: 0x00001EFB – Uplinks schedule start 1:59:59, period according to Location mode
8	1	Type of report Bit7 = 0, Bit6-0 > 0 – Activity Profile 1, Normal activity events per hour Bit6-0 – Normal activity threshold (range 0,1...12,7g): 0x01*0,1 = 0,1g, 0x02*0,1 = 0,2g ...0x7F*0,1 = 12,7g Bit7-0 = 0x00 – Activity Profile 2 (reserved) Bit7-0 = 0x80 – Activity Profile 3 (reserved)
9	1	Alert Uplinks Profile Bit0 = 0 – no GNSS fix before alert uplink Bit0 = 1 – GNSS fix before alert uplink Bit7-1 – enable/disable alerts, = 1 – enable, = 0 – disable Bit1 – Alert1 Motionless (ID=1) Bit2 – Alert2 Low activity (ID=2) Bit3 – Alert3 Hyperactivity (ID=3) Bit4 – Alert4 Reboot (ID=4) Bit5 – change Location mode to High accuracy at Motionless alert . Bit6 – change Location mode to High accuracy at Low activity alert . Bit7 – change Location mode to High accuracy at Hyperactivity alert .
10	1	Motionless Alert threshold in minutes, range 1-240
11	1	Low activity Alert threshold in minutes, range 1-240
12	1	Bit6-0 – Hyperactivity threshold: 0x01*0,1 = 0,1g...0x7F*0,1 = 12,7g
13	1	Heat stress Alert (ID=5) threshold range -40...+60°C, 0,5°C resolution -40.0 = 0, -39.5 = 1...+60.0 = 200, disable = 0xFF
14	1	HW and FW versions Bit3-0 = HW version bit7-4 = SW version

Exemplo payload Read Config:

- **Byte 1:** 0x02
Command ID Read config
- **Byte 2:** 0x6B
Led ON, Led Time 21:30, Auto PowerSave disable.
- **Byte 3:** 0x02
Location mode Optimal 4 GNSS, 4 LoRa per Day.
- **Byte 4-7:** 0x05BC F000
Uplink Initial Timer 15:00:00.
GNSS Fix Time TGNSS initial time 11:30.
GNSS fix according to Uplinks schedule.
- **Byte 8:** 0x14
Activity profile 1, Threshold 2g.
- **Byte 9:** 0x16
No GNSS fix before alerts, enable alerts ID 1, 2 e 4.
- **Byte 10:** 0x6F
Motionless 111min.
- **Byte 11:** 0x25
Low activity 37min.
- **Byte 12:** 0x32
Hyperactivity 5g.
- **Byte 13:** 0x99 -> $((\text{Valor} * 0.5) - 40)$
Heat Stress 36.5°C.
- **Byte 14:** 0x11
HW And FW Versions: HW = 1, FW = 1
- **Payload Completo:**
0x026B0205BCF00014166F25329911

- **Save Time, Downlink 6 bytes, Port 4:**

BYTE	SIZE	DESCRIPTION
1	1	Save Time command ID = 0x03
2-5	4	Unix time
6	1	Time zone int8 (-128 ... +127)

Observações:

- **Unix Time** (bytes 2-5) de ser referente ao horário local em **Time Zone 0 (GMT 0)**, **Time Zone** (Byte 6) deve ser referente ao Time Zone do local de comissionamento do dispositivo.
- Data Hora no formato Unix time 32bits em **Time Zone 0**. Ex.: 2023-09-01 11:52:26 -> 0x 64F1 D07A.
- Time Zone no do estado de São Paulo (GMT -3): 0xFD.
- Aguarda Save Time Uplink como confirmação se o dispositivo estiver no modo **OPERATION**.
- **Payload Completo:**

0x0364F1D07AFD -> 2023-06-26 08:40:00 (GMT-3)

- **Save Time, UpLink 6 bytes, Port 5:**

BYTE	SIZE	DESCRIPTION
1	1	Save Time command ID = 0x03
2-5	4	Unix time
6	1	Time zone int8 (-128 ... +127)

Observações:

- **Unix Time** (bytes 2-5) de ser referente ao horário no local de comissionamento.
- Uplink Data Hora no formato Unix time 32bits. Ex.: 2023-07-26 08:40:00 -> 0x64C0 DBE0.
- Time Zone no estado de São Paulo (GMT -3) 0xFD.
- Enviar Save Time como confirmação a Save Time Downlink quando no modo **OPERATION**.
- **Payload Completo:**

0x0364994EE0FD -> 2023-06-26 08:40:00

- **Time Correction, Downlink 6 bytes, Port 4:**

BYTE	SIZE	DESCRIPTION
1	1	Time Correction command ID = 0x04
2	1	Seconds part1 int8 (-128 ... +127), small time correction (part1+part2)
3-6	4	Seconds part2 int32 (-2 147 483 648 ... +2 147 483 647), large time correction (part1+part2)

Observações:

- Part1(small times) e Part2(large times) Ambos em segundos, o tempo total é dado por Part1 + Part2.
- O valor deve ser salvo em part1, caso for maior 127 ou menor que -128, deve-se enviar o restante em Part2.
- Ex.: Ajusta em +56027 Segundos: Part1(+127) = 0x7F, Part2(+55900) = 0x0000DA5C.
- Aguarda Time Correction Uplink como confirmação.
- **Payload Completo:**

0x047F0000DA5C.

- **Time Correction, UpLink 5 bytes, Port 5:**

BYTE	SIZE	DESCRIPTION
1	1	Time Correction command ID = 0x04
2-5	4	Unix time

Observações:

- Uplink Data Hora no formato Unix time 32bits. Ex.: 2023-07-26 08:40:00 -> 0x64C0 DBE0.
- Enviar Save Time como confirmação a Time Correction Downlink.
- **Payload Completo:**

0x0464994EE0 -> 2023-06-26 08:40:00

- **Storage, Downlink 1 byte, Port 6:**

BYTE	SIZE	DESCRIPTION
1	1	Storage mode command ID = 0x05

Observações:

- Comando requisita alteração do modo operação para Storage.
- Aguarda Storage Uplink como confirmação.
- **Payload Completo:**

0x05

- **Storage, Uplink 1 byte, Port 7:**

BYTE	SIZE	DESCRIPTION
1	1	Storage mode command ID = 0x05

Observações:

- Enviar Storage Uplink como confirmação a Storage Downlink.
- **Payload Completo:**

0x05

- **Activity profile 1, Uplink 51 bytes, Port 9:**

BYTE	SIZE	DESCRIPTION
1	1	Activity profile 1 ID = 0x06
2	1	Status Bit2-0 Hardware error ID: = 1 – error, = 0 – no error Bit0 – GNSS receiver status Bit1 – Accelerometer status Bit2 – Reboot Bit5-3 Last Alert ID: = 0 – no alerts, = 1-7 – Alerts ID Bit6 HDOP status: = 0 – normal, = 1 – poor GNSS accuracy Bit7 Battery level: = 0 – normal, = 1 – less than 5%
3-5	3	Latitude (Bit22-0 Latitude x 10000), (Bit 23 – Sinal: 1-Negativo, 0-Positivo)
6-8	3	Longitude (Bit22-0 Latitude x 10000), (Bit 23 – Sinal: 1-Negativo, 0-Positivo)
9-13	5	Last GNSS fix Date and Time – 20 bits Last Alert Date and Time – 20 bits (0 – no alerts) Month – 4 bits, Day – 5 bits, Hour – 5 bits, Minutes – 6 bits
14	1	Temperature , range -40...+60°C, 0,5°C resolution, error = 0xFF -40.0 = 0, -39.5 = 1...+60.0 = 200
15-50	36	Normal activity events per hour counter last 24 hours Range 0x000-0xE10 (3600), 0xFFE (overflow status) if counter > 0xE10 (3600), 0xFFFF – no data Last 24 hours (24 * 12 bit = 288 bits = 36 bytes)
51	1	Bit6-0 – Normal activity threshold: 0x01*0,1 = 0,1g...0x7F*0,1 = 12,7g

Observações:

- No Byte 2 “**Status**” os bits 5-3 “Last Alert ID” Representam o ID do último Alerta ocorrido, este ID permanecerá até ser Substituído por um novo alerta de ID diferente.
- Nos Bytes 3-5 e 6-8, referentes a latitude e longitude, o Bit23 é referente ao sinal do valor (1-Negativo, 0-Positivo), os Bits 0-22 representam o valor multiplicado por 10000, com isso para encontrarmos o valor real, devemos dividir por 10000 e ajustar o sinal conforme indicado pelo bit 23.

Exe.: Latitude(**bytes3-5**) 0x838430 = 0b100000111000010000110000.

Verificamos o Bit 23 = 1 (Valor negativo).

Obtemos o valor Bits 22-0 = 0b00000111000010000110000 = 230448.

Dividimos o valor por 10000 = 230448/10000 = 23.0448.

Ajustamos o Sinal Conforme o Bit23 = - 23.0448.

- Nos bytes 9-13 “**Last Alert Date and Time**” corresponde ao último alerta, e permanece até ser substituído.

Exe.: Para conversão de **Last GNSS fix Date and Time** e **Last Alert Date and Time** devemos pegar os 5 bytes de payload e dividir em duas partes de 20 Bits, sendo a primeira parte **Last GNSS fix** e a segunda parte **Last Alert**.

Ex.: 0x80a188099e -> 1000 0000 1010 0001 1000 1000 0000 1001 1001 1110

Date and Time	Month	Day	Hour	Minutes
Last GNSS fix	1000	00001	01000	011000
Last Alert	1000	00001	00110	011110

Exemplo payload Activity profile 1:

- [illegible]

- **Alert Message, Uplink 18 bytes, Port 11:**

BYTE	SIZE	DESCRIPTION
1	1	Alert Message ID = 0x07
2	1	Status Bit2-0 Hardware error ID: = 1 – error, = 0 – no error Bit0 – GNSS receiver status Bit1 – Accelerometer status Bit2 – Reboot Bit5-3 Last Alert ID: = 0 – no alerts, = 1-7 – Alerts ID Bit6 HDOP status: = 0 – normal, = 1 – poor GNSS accuracy Bit7 Battery level: = 0 – normal, = 1 – less than 5%
3-5	3	Latitude (Bit22-0 Latitude x 10000), (Bit 23 – Sinal: 1-Negativo, 0-Positivo)
6-8	3	Longitude (Bit22-0 Latitude x 10000), (Bit 23 – Sinal: 1-Negativo, 0-Positivo)
9-13	5	Last GNSS fix Date and Time – 20 bits Last Alert Date and Time – 20 bits (0 – no alerts) Month – 4 bits, Day – 5 bits, Hour – 5 bits, Minutes – 6 bits
14	1	Temperature , range -40...+60°C, 0,5°C resolution, error = 0xFF -40.0 = 0, -39.5 = 1...+60.0 = 200
15	1	Motionless Alert threshold in minutes, range 1-240
16	1	Low activity Alert threshold in minutes, range 1-240
17	1	Bit6-0 – Hyperactivity threshold: 0x01*0,1 = 0,1g...0x7F*0,1 = 12,7g
18	1	Heat stress Alert threshold range -40...+60°C, 0,5°C resolution -40.0 = 0, -39.5 = 1...+60.0 = 200, disable = 0xFF

Observações:

- No Byte 2 “**Status**” os bits 5-3 “**Last Alert ID**” Representam o ID do último Alerta ocorrido, este ID permanecerá até ser Substituído por um novo alerta de ID diferente.
- Nos Bytes 3-5 e 6-8, referentes a latitude e longitude, o Bit23 é referente ao sinal do valor (1-Negativo, 0-Positivo), os Bits 0-22 representam o valor multiplicado por 10000, com isso para encontrarmos o valor real, devemos dividir por 10000 e ajustar o sinal conforme indicado pelo bit 23.

Exe.: Latitude(**bytes3-5**) 0x838430 = 0b100000111000010000110000.

Verificamos o Bit 23 = 1 (Valor negativo).

Obtemos o valor Bits 22-0 = 0b00000111000010000110000 = 230448.

Dividimos o valor por 10000 = 230448/10000 = 23.0448.

Ajustamos o Sinal Conforme o Bit23 = - 23.0448.

Exe.: Para conversão de **Last GNSS fix Date and Time** e **Last Alert Date and Time** devemos pegar os 5 bytes de payload e dividir em duas partes de 20 Bits, sendo a primeira parte **Last GNSS fix** e a segunda parte **Last Alert**.

Ex.: 0x80a188099e - > 1000 0000 1010 0001 1000 1000 0000 1001 1001 1110

Date and Time	Month	Day	Hour	Minutes
Last GNSS fix	1000	00001	01000	011000
Last Alert	1000	00001	00110	011110

Exemplo payload Alert Message:

- **Byte1:** 0x07
Command ID Alert Message
- **Byte2:** 0x08
Status: Alert1 Motionless
- **Byte3-5:** 0x838430
Latitude = -23.0448
- **Byte6-8:** 0x 871f50
Longitude = -46.6767
- **Byte9-13:** 0x80a188099e
Last GNSS fix Date and Time = 8M-1D-8H-24min
Last Alert Date and Time = 8M-1D-6h-30min
- **Byte14:** 0xff
Temperature ERROR
- **Byte15:** 0x78
Motionless Alert = 120min
- **Byte16:** 0x23
Low Activity Alert = 35min
- **Byte17:** 0x64
Hiperactivity = 10g
- **Byte18:** 0x5d -> ((Valor * 0.5) - 40)
Heat Stress Alert 6.5°C
- **Payload Completo:**
0x0708838430871f508095c8099eff7823645d

- **Commissioning, Uplink 2 bytes, Port 13:**

BYTE	SIZE	DESCRIPTION
1	1	Commissioning mode command ID = 0x08
2	1	Uplinks counter , range 0...254, 0xFF (overflow status) if counter > 254

Observações:

- Envia Uplink Counter em determinados intervalos até receber Save Time Downlink.
- Envia até receber Save Time Downlink para confirmação do comissionamento.
- **Payload Completo:**

0x0841 -> Uplinks Counter = 0x41

Observações para o MVP TagVis V2 de agosto de 2023:

- O processamento dos alertas "Low activity Alert", "Hiperactivity Alert" e "Heat Stress Alert" não estará disponível, apenas o alerta "Motionless Alert" estará ativo.
- Quando o dispositivo estiver no modo comissionamento, ele aguarda o downlink SAVE TIME para entrar no modo OPERATION.
- Em **location mode** somente os modos "Battery saving" e "Optimal" estarão implementados.
- O recurso "GNSS fix according to TGNSS schedule" não estará disponível.