

AIS140 PROTOCOL DESCRIPTION



Document History

Version	Date	Author	Description
0.1	1/1/2019		Initial Draft
0.2	1/3/2019		<ul style="list-style-type: none">• Added Missing Packet Types• OTA Ack Packet added• Command Section updated
0.3	4/4/2019		<ul style="list-style-type: none">• Fix typos in multiple places• Added missing commands• Added changes to Emergency packet• Added section for activation and health check message

References

Sr. No.	Name	Author	Remarks
1	AIS-140withAmd1.pdf		AUTOMOTIVE INDUSTRY STANDARD
2	AIS-140_Final_Draft_5Dec2018.pdf		AIS140 Standard Amendment 2

Abbreviations

Item	Description
ITS	Intelligent Transport system
IoT	Internet of Things
APN	Access Point Name
SMS	Short Message Service
IRNSS	Indian Regional Navigation Satellite System
GPS	Global Positioning System
AGPS	Assisted GPS
CEP	Circular Error Probability
DOP	Dilution of precision

Contents

Document History	1
References	1
Abbreviations.....	1
List of Tables	4
Intelligent Tracking System.....	5
Automotive Industry Standard (AIS-140).....	5
AIS-140 Protocol Description	6
Login Packet.....	6
Health Monitoring Packet.....	7
Location Information Packet.....	8
Alert Information Packet	10
Emergency Packet.....	12
OTA Acknowledgement Packet.....	13
Activation Message and Health Check Message Protocol.....	16
Command Description	17
Configuration Keys.....	17
1. PIP	17
2. PPT.....	17
3. EIP.....	17
4. EPT.....	17
5. SIP.....	17
6. SPT.....	18
7. M0	18
8. EO	18
9. ED	18
10. APN.....	18
11. ST.....	18
12. SL.....	18
13. HBT.....	18
14. HAT.....	18
15. RTT	18
16. LBT.....	18

17.	VN.....	18
18.	URS.....	18
19.	PIN.....	18
20.	PIF.....	18
21.	URE.....	19
22.	URH	19
23.	VID.....	19
24.	FV	19
25.	M1.....	19
26.	M2	19
27.	M3	19
28.	PWD	19
29.	SEN	19
30.	TA	19
31.	OEN	19
32.	TBT	19
	Service Commands.....	20
1.	STG	20
2.	TEST.....	20
3.	WHERE.....	20
4.	ACTV.....	21
5.	HCHK	21
6.	OTA.....	21

List of Tables

Table 1: Login Packet	6
Table 2: Health Monitoring Packet	7
Table 3: Location Information Packet.....	8
Table 4: Alert Information Packet.....	10
Table 5: Emergency Packet.....	12
Table 6: OTA ACK Packet.....	13
Table 7: Packet Types.....	15
Table 8: Alert ID List.....	15
Table 9 Response Message Format	16

Intelligent Tracking System

Intelligent Transport Systems (ITS) are globally proven systems to optimize the utilization of existing transport infrastructure and improve transportation systems in terms of efficiency, quality, comfort and safety. Having realized the potential of ITS, Government bodies and other organizations in India are presently working towards implementing various components of ITS across the country.

Automotive Industry Standard (AIS-140)

The Automotive industry standard committee (AISC) prepared standard for ITS defining the requirements for both front end software as well as hardware design and its protocol for data exchange. This standard is titled as AIS-140 (“Intelligent Tracking System – Requirements for Public transport Vehicle Operation”). AIS-140 standard is approved by CMVR Technical standing committee (CTSC) and Automotive research association of India (ARAI), Pune. ARAI being the secretariat of the AIS committee, has also published this standard. The standard has gone through various amendments over time for hardware requirements, most importantly the mandatory requirement of IRNSS.

AIS-140 Protocol Description

ITS talks to hardware device over a TCP socket. This section provides detail information on the various packet formats as described by AIS-140 standard. There are total four types of packets as mentioned below:

1. Login Packet
2. Health Monitoring Packet
3. Location Information Packet
4. Alert Information Packet
5. Emergency Packet for Emergency response system
6. OTA Acknowledge Packet
7. Activation Message and Health Check Message Protocol

All the fields mention in protocol format are comma separated.

Login Packet

A login packet is sent to server whenever there is a new TCP connection made by device to server.

Table 1: Login Packet

Field	Description	Sample Data
Start Character	\$	\$
Header	Fix header specifying login packet	LGN
Device Name	Vehicle Registration number configured by User	
IMEI	Device IMEI 15 bytes	123456789012345
Software Version	Software/Firmware version of device	2.0AIS
Latitude	Last known location latitude	
Latitude Direction	Latitude Direction North or South	N
Longitude	Last known location longitude	
Longitude Direction	Longitude Direction East or West	E

Health Monitoring Packet

This packet defines status or health of device. Following is the packet format.

Table 2: Health Monitoring Packet

Field	Description	Sample Data
Start Character	\$	\$
Header	Fix header specifying health monitoring packet	HLM
Vendor ID	Vendor ID configured by User	
Software Version	Firmware version of device	2.0AIS
IMEI	Device unique IMEI	123456789012345
Battery percentage	Indicates internal battery in %	100
Low Battery Threshold	Indicates value on which low battery alert generated in %	20
Memory percentage	Indicates flash memory % used	0
Data Update Rate – Ignition On	Indicates packet frequency when ignition is on in seconds	60
Data Update Rate – Ignition Off	Indicates packet frequency when ignition is off in seconds	60
Digital Input status	Status of inputs connected	0000
Analog Input Status	Analog Input status	00
End Character	*	*

Location Information Packet

This is a periodic location information packet sent by device to server.

Table 3: Location Information Packet

Field	Description	Sample Data
Start Character	\$	\$
Header	Fix header specifying Normal Packet (Location Information Packet)	NRM
Vendor ID	Vendor ID configured by User	
Software Version	Software/Firmware version of device	2.0AIS
Packet Type	2 Byte information specifying type of packet. See Table 7: Packet Types for more information	NR
Alert ID	2 Byte alert ID indicating type of packet see Table 8: Alert ID List for more information	
Packet Status	Status of packet L = Live Packet H = History Packet	L
IMEI	Device unique IMEI	123456789012345
Vehicle Registration No.	Mapped Vehicle Registration Number	XX12XX1234
GPS Fix	GPS Fix information 1 = GPS Fix 0 = GPS Invalid	1
Date	Date value as per GPS in DDMMYYYY format	01012019
Time	Time value as per GPS in HHMMSS format	000000
Latitude	Latitude value upto 6 decimal places	
Latitude Direction	North or South	N
Longitude	Longitude value upto 6 decimal places	
Longitude Direction	East or West	E
Speed	Speed of vehicle upto 1 decimal place in km/h	25.1
Heading	Course over ground in degrees upto 2 decimal places	123.45
No. of Satellites	No. of satellite in view for location fix	10
Altitude	Altitude of device in meters	123.4
PDOP	Positional dilution of precision	
HDOP	Horizontal dilution of precision	
Operator Name	Name of network operator	Airtel

Ignition	Status of Ignition 1 – Ignition On 0 – Ignition Off	1
Main Power Status	0 – Vehicle Battery Disconnected 1 – Vehicle Battery Connected	1
Main Input Voltage	Indicator showing source voltage in Volts (Upto 1 decimal place)	12.4
Internal Battery Voltage	Indicator of battery charge in volts (upto 1 decimal place)	4.2
Emergency Status	0 – Emergency Off 1 – Emergency On	0
Temper Alert	O – Box open C – Box Closed	C
GSM Strength	Value range from 0 – 31	31
MCC	Mobile Country Code	404
MNC	Mobile Network Code	98
LAC	Location Area Code	XXXX
Cell ID	GSM Cell ID	
NMR (Network Measurement Report)	Cell ID, LAC and Signal Strength of 4 Neighboring cells	(24,XXXX,XXXX)*4 times
Digital Input Status	Status of 4 Digital Inputs 0 – Off, 1 – On	0000
Digital Output Status	Status of 2 Digital Outputs 0 – Off, 1 – on	00
Frame Number	Sequence number of packet (from 000001 to 999999)	000005
Odometer¹	Odometer value in Km (float)	123.456
Checksum	Packet checksum (CRC32)	ABCDABCD
End Character	*	*

¹ Disabled by default. OEN Command must be sent to enable it

Alert Information Packet

When an alert is generated following packet is sent to server indicating which event has occurred.

Table 4: Alert Information Packet

Field	Description	Sample Data
Start Character	\$	\$
Header	Fix header specifying Normal Packet (Location Information Packet)	ALT
Vendor ID	Vendor ID configured by User	
Software Version	Software version of device	2.0AIS
Packet Type	2 Byte information specifying type of packet. See Table 7: Packet Types for more information	OS
Alert ID	2 Byte alert ID indicating type of packet see Table 8: Alert ID List for more information	
Packet Status	Status of packet L = Live Packet H = History Packet	L
IMEI	Device unique IMEI	123456789012345
Vehicle Registration No.	Vehicle Registration Number	XX12XX1234
GPS Fix	GPS Fix information 1 = GPS Fix 0 = GPS Invalid	1
Date	Date value as per GPS in DDMMYYYY format	01012019
Time	Time value as per GPS in HHMMSS format	000000
Latitude	Latitude upto 6 decimal places	
Latitude Direction	North or South	N
Longitude	Longitude upto 6 decimal places	
Longitude Direction	East or West	E
Speed	Speed of vehicle upto 1 decimal place in km/h	25.1
Heading	Course over ground in degrees upto 2 decimal places	123.45
No. of Satellites	No. of satellite in view for fix	10
Altitude	Altitude of device in meters	123.4
PDOP	Positional dilution of precision	
HDOP	Horizontal dilution of precision	
Operator Name	Name of network operator	Airtel
Ignition	Status of Ignition 1 – Ignition On 0 – Ignition Off	1
Main Power Status	0 – Vehicle Battery Disconnected 1 – Vehicle Battery Connected	1
Main Input Voltage	Indicator showing source voltage in Volts (Upto 1 decimal place)	12.4

Internal Battery Voltage	Indicator of battery charge in volts (upto 1 decimal place)	4.2
Emergency Status	0 – Emergency Off 1 – Emergency On	0
Temper Alert	O – Box open C – Box Closed	C
GSM Strength	Value range from 0 – 31	31
MCC	Mobile Country Code	404
MNC	Mobile Network Code	98
LAC	Location Area Code	XXXX
Cell ID	GSM Cell ID	
NMR (Network Measurement Report)	Cell ID, LAC and Signal Strength of 4 Neighboring cells	(24,XXXX,XXXX)*4 times
Digital Input Status	Status of 4 Digital Inputs 0 – Off, 1 – On	0000
Digital Output Status	Status of 2 Digital Outputs 0 – Off, 1 – on	00
Frame Number	Sequence number of packet (from 000001 to 999999)	000005
Odometer²	Odometer value in Km (float)	123.123
Checksum	Packet checksum (CRC32)	ABCDABCD
End Character	*	*

² Disabled by default. OEN Command must be sent to enable it

Emergency Packet

When SOS button is pressed, device send following emergency packet to ITS application as well as emergency server IP simultaneously.

Table 5: Emergency Packet

Field	Description	Sample Data
Start Character	\$	\$
Header	Fix header specifying Emergency packet	EPB
Packet Type	Emergency Packet type EMR – Emergency Message SEM – Stop Message	EMR
IMEI	Device unique IMEI	123456789012345
Packet Status	Status of packet NM = Normal Packet SP = Stored Packet	NP
Date	Date value as per GPS in DDMMYYYY format	01012019
Time	Time value as per GPS in HHMMSS format	000000
GPS Fix	GPS Fix information A = GPS Fix V = GPS Invalid	A
Latitude	Latitude value upto 6 decimal places	
Latitude Direction	North or South	N
Longitude	Longitude value upto 6 decimal places	
Longitude Direction	East or West	E
Altitude	Altitude of device in meters	123.4
Speed	Speed of vehicle upto 1 decimal place in km/h	25.1
Distance	Distance calculated from previous GPS data	
Provider	G – Fine GPS N – Coarse GPS or data from NW	G
Vehicle Registration No.	Vehicle Registration Number	XX12XX1234
Reply Number		0
MCC	Mobile Country Code	404
MNC	Mobile Network Code	98
LAC	Location Area Code	XXXX
Cell ID	GSM Cell ID	XXXX
End Character	*	*
Checksum	Packet checksum (CRC32)	ABCDAECD

OTA Acknowledgement Packet

When configuration commands (SET, GET, CLR) are sent to device, an acknowledgement packet is generated and sent to server indicating which parameter is changed or requested. As per AIS-140, this packet should also include mode of configuration and source from where command was sent. This is also included in this packet. Format of the packet is given below.

Table 6: OTA ACK Packet

Field	Description	Sample Data
Start Character	\$	\$
Header	Fix header specifying Normal Packet (Location Information Packet)	ALT
Vendor ID	Vendor ID configured by User	
Software Version	Software version of device	2.0AIS
Packet Type	2 Byte information specifying type of packet. See Table 7: Packet Types for more information	OA
Alert ID	2 Byte alert ID indicating type of packet see Table 8: Alert ID List for more information	
Packet Status	Status of packet L = Live Packet H = History Packet	L
IMEI	Device unique IMEI	123456789012345
Vehicle Registration No.	Vehicle Registration Number	XX12XX1234
GPS Fix	GPS Fix information 1 = GPS Fix 0 = GPS Invalid	1
Date	Date value as per GPS in DDMMYYYY format	01012019
Time	Time value as per GPS in HHMMSS format	000000
Latitude	Latitude upto 6 decimal places	
Latitude Direction	North or South	N
Longitude	Longitude upto 6 decimal places	
Longitude Direction	East or West	E
Speed	Speed of vehicle upto 1 decimal place in km/h	25.1
Heading	Course over ground in degrees upto 2 decimal places	123.45
No. of Satellites	No. of satellite in view for fix	10
Altitude	Altitude of device in meters	123.4
PDOP	Positional dilution of precision	
HDOP	Horizontal dilution of precision	
Operator Name	Name of network operator	Airtel
Ignition	Status of Ignition 1 – Ignition On 0 – Ignition Off	1

Main Power Status	0 – Vehicle Battery Disconnected 1 – Vehicle Battery Connected	1
Main Input Voltage	Indicator showing source voltage in Volts (Upto 1 decimal place)	12.4
Internal Battery Voltage	Indicator of battery charge in volts (upto 1 decimal place)	4.2
Emergency Status	0 – Emergency Off 1 – Emergency On	0
Temper Alert	O – Box open C – Box Closed	C
GSM Strength	Value range from 0 – 31	31
MCC	Mobile Country Code	404
MNC	Mobile Network Code	98
LAC	Location Area Code	XXXX
Cell ID	GSM Cell ID	
NMR (Network Measurement Report)	Cell ID, LAC and Signal Strength of 4 Neighboring cells	(24,XXXX,XXXX)*4 times
Digital Input Status	Status of 4 Digital Inputs 0 – Off, 1 – On	0000
Digital Output Status	Status of 2 Digital Outputs 0 – Off, 1 – on	00
Frame Number	Sequence number of packet (from 000001 to 999999)	000005
OTA Info	OTA information for indication of change or request in following format: [TYPE]:[SRC]:[SRC_VAL] [CMD]:[VAL] [TYPE] can be GET, SET or CLR based on what command was sent [SRC] can be SRV, SMS, CON for server, SMS and console respectively [SRC_VAL] is the IP address or Cell number from where command was sent [CMD] is command key of command sent to device [VAL] is parameter value	SET:SMS:+919800000000 PIN:60
Checksum	Packet checksum (CRC32)	ABCDAECD
End Character	*	*

Table 7: Packet Types

Type	Description
NR	Normal Packet
EA	Emergency Alert
TA	Temper Alert
HP	Health Packet
IN	Ignition On
IF	Ignition Off
BD	Vehicle Battery Disconnected
BR	Vehicle Battery Reconnected
BL	Internal Battery Low
HB	Harsh Breaking
HA	Harsh Acceleration
RT	Rash Turning
TI	Tilt Alert
WD	SOS/Emergency Button Wire Disconnect
OS	Overspeed Alert
OA	OTA Acknowledgement

Table 8: Alert ID List

Alert ID	Name	Description
1	Location Update	Default Message from device
2	Location Update (History)	If GPRS is not available at time of sending message
3	Mains off	When device is disconnected from vehicle battery
4	Low Battery	Device internal battery low alert
5	Low Battery removed	Device internal battery ok
6	Mains On	Device is reconnected to vehicle battery
7	Ignition On	Vehicle ignition on alert
8	Ignition Off	Vehicle Ignition off alert
9	Temper Alert	Device box open
10	Emergency On	Emergency on alert
11	Emergency Off	Emergency off alert
12	OTA Alert	Parameter change/query alert packet
13	Harsh Breaking	Alert indication a hash break
14	Harsh Acceleration	Alert indicating harsh acceleration
15	Rash Turning	Alert indicating rash turn
16	Wire Disconnect	SOS/Emergency button wire disconnect alert
17	Overspeed	Alert indicating overspeed
22	Tilt Alert	Vehicle/Device tilted

Activation Message and Health Check Message Protocol

This packet is sent from device to backend server reply number. All fields are separated by comma.

Table 9 Response Message Format

Field Name	Characters (max size)	Activation Example	Health Check Example
Header	5	ACTVR	HCHKR
Random Code	6	123456	123456
Vendor ID	4		
Firmware Version	6	2.0AIS	2.0AIS
IMEI	15	123456789012345	123456789012345
Alert ID	2	1	1
Latitude	12	12.345678	12.345678
Latitude Direction	1	N	N
Longitude	12	123.456789	123.456789
Longitude Direction	1	E	E
GPS Fix (0/1)	1	1	1
Date Time	15	DDMMYYYY HHMMSS	DDMMYYYY HHMMSS
Heading	6	123.45	123.45
Speed	4	12.3	12.3
GSM Strength	2	12	12
MCC	3	404	404
MNC	4	4	4
LAC	4	XXXX	XXXX
Main Power (0/1)	1	1	1
Ignition Status	1	1	1
Battery Voltage	4	12.3	12.3
Frame Number	6	000001	000001
Mode³	2	0	0

³ This field is currently not defined in document, it will be sent as 0

Command Description

Device supports configuration that can be done from either server or via SMS. As per AIS-140 standard device must support commands to SET, GET and CLR for setting, getting and clearing a device configuration.

Command format for setting parameter is

[SET]<space>[Key:Value]

To get parameter value:

[GET]<space>[Key]

To clear parameter:

[CLR]<space>[Key]

You can operate on multiple keys e.g.

[SET]<space>[Key1:value],[Key2:value]

Similarly,

[CLR]<space>[Key1],[Key2]

Commands sent via SMS are sent with passwords as shown:

password,[SET]<space>[Key:Value]

password,[GET]<space>[Key1],[Key2]

password,[CLR]<space>[Key1],[Key2]

Default password is “rpointais”. So, if user has not changed any password then, commands can be sent as:

rpointais, [SET]<space>[Key:Value]

rpointais, [GET]<space>[Key1],[Key2]

rpointais, [CLR]<space>[Key1][Key2]

Supported keys are explained further in this section.

Configuration Keys

1. PIP

Set Primary server IP for sending data

2. PPT

Set primary server port

3. EIP

Set emergency server IP

4. EPT

Set emergency server port

5. SIP

Set secondary server IP

6. SPT

Set secondary server port

7. MO

Emergency/Backend server SMS Number

8. FO

Emergency OFF or stop emergency message

9. FD

Emergency timeout duration in minutes. Default is 30 minutes

10. APN

Set network access point name, default automatic

11. ST

Time (in minutes) after which device goes in sleep mode. Default 3 minutes

12. SL

Set Speed limit in km/h. Default 70km/h

13. HBT

Harsh break limit in g (m/s²). Default 0.55g

14. HAT

Harsh acceleration limit in g (m/s²). Default 0.43g

15. RTT

Rash turning threshold in km/h. Default 30km/h

16. LBT

Low battery threshold in percentage. Default 20

17. VN

Vehicle registration number

18. URS

Update duration/data rate in minutes when vehicle is in sleep mode. Default 60 minutes.

19. PIN

Update duration/data rate in seconds when Ignition is ON. Default 60 seconds.

20. PIF

Update duration/data rate in seconds when Ignition is OFF. Default 60 seconds.

21. URE

Update duration or data rate in seconds for emergency packet. Default 60 seconds.

22. URH

Update duration or data rate in minutes for health monitoring packet. Default 60 minutes.

23. VID

Set vendor ID as per AIS-140. Default ROADRPA

24. FV

Get firmware version

25. M1

Set SMS number 1

26. M2

Set SMS number 2

27. M3

Set SMS number 3

28. PWD

Set SMS/Console password. Default “rpointais”.

29. SEN

SMS response enable

30. TA

Set minimum Tilt Angle (in degrees) for generating alert. Default 45 degree

31. OEN

Enable or disable odometer in packet. Default disable.

32. TBT

Enable turn by turn packet, useful when data rate is longer. Default off.

Service Commands

Service commands can be sent directly to the device in order to get information about current status and settings.

1. STG

It's a service level command which can be shared with installation person without issue. This command is used to verify current device setting and get software information. This command is only allowed over SMS.

Response format:

U: <factory unitid>

IM: <IMEI>

SIG: <Signal strength>

CON: <Server connectivity status>

APN: <Current APN in use>

PIP: <Primary server IP/URL>

PPT: <Primary server port> (unused in HTTP)

SIP: <Secondary server IP/URL>

SPT: <Secondary server port> (unused in HTTP)

EIP: <Emergency server IP/URL>

EPT: <Emergency server port> (unused in HTTP)

SW: <Software version>

HW: <Hardware version>

2. TEST

This command is used to get device runtime information. Values of parameters vary from version to version, but response is kept same for consistency purpose. Unused fields will have a zero or no value. This command is only allowed over SMS and requires no password.

Response Format:

U: <Unit ID>

IM: <IMEI>

SW: <Software Version>

GP: <GPS Status>

MV: <Main power status>

BT: <Battery voltage>

GSM: <GSM Registration status>

<latitude, longitude>: <Current location>

SIG: <signal strength>

CON: <Connectivity status>

BX: <Device open/close>

IO: <GPI or GPO value>

AD1: <Analog 1 value>

IGN: <Ignition status>

3. WHERE

To get current device location information. Only applicable via SMS.

4. ACTV

Activation Message Request Format from the Backend System to the Device

Format: ACTV,[Random Code],[SMS Reply Number]

For response format, please check **Activation Message and Health Check Message Protocol**.

5. HCHK

Health Check Message Request Format from the Backend System to the Device

Format: HCHK,[Random Generated ID],[SMS Reply Number]

For response format, please check **Activation Message and Health Check Message Protocol**.

6. OTA

This command is used for Over the air firmware upgrade. This command is allowed via SMS and TCP.

Password is mandatory for this command to work over SMS.

Usage:

ota=<firmware_filename>

Please contact support team to get right firmware filename for the device.



Installing a wrong firmware might cause permanent damage to the device and will void warranty.