5 DESCRIPTION OF SENTENCE FORMAT

The following provides a summary explanation of the approved sentence structure according to IEC 61162:

$AACCC, C---C*HH<CR><LF>

ASCII	HEX	Description
"$"	24	Start of sentence: starting delimiter
aaccc		Address field: alphanumeric characters identifying type of talker, and sentence formatter. The first two characters identify the talker. The last three are the sentence formatter mnemonic code identifying the data type and the string format of the successive fields. Mnemonics will be used as far as possible to facilitate read-outs by users.
","	2C	Field delimiter: starts each field except address and checksum fields. If it is followed by a null field, it is all that remains to indicate no data in a field.
c---c		Data sentence block: follows address field and is a series of data fields containing all of the data to be transmitted. Data field sequence is fixed and identified by the third and subsequent characters of the address field (the sentence formatter). Data fields may be of variable length and are preceded by delimiters ",".
"*"	2A	checksum delimiter: follows last data field of the sentence. It indicates that the following two alpha-numeric characters show the HEX value of the checksum.
hh		Checksum field: the absolute value calculated by exclusive-OR'ing the eight data bits (no start bits or stop bits) of each character in the sentence between, but excluding, "$" and "*". The hexadecimal value of the most significant and least significant four bits of the result are converted to two ASCII characters (0-9, A-F) for transmission. The most significant character is transmitted first. The checksum field is required in all cases.
<CR><LF>	0D 0A	End of sentence: sentence terminating delimiter.

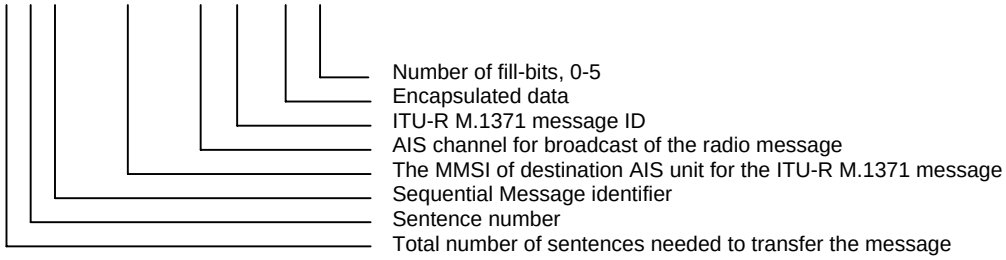
5.1 Input

ABM	Addressed Binary and safety related Message
ACA	AIS Regional Channel Assignment Message
ACK	Acknowledge Alarm
ACM	Preparation and initiation of a broadcast of Addressed msg 22
AIR	AIS Interrogation Request
ASN	Preparation and initiation of a broadcast of Assigned msg 16
BCF	Base Station Configuration
CAB	Control AIS Base Station
CBM	Configure Base Station Message Reporting Rates
DLM	Data Link Management slot allocations for base station and mobiles
BBM	Broadcast Binary Message
VDM	VHF Data – link Message
DTM	Datum reference
GBS	GNSS satellite fault detection
GGA	Global positioning system (GPS) fix data
GLL	Geographic position latitude/longitude
GNS	GNSS fix data
RMC	Recommended minimum specific GNSS data
Query messages:	
PJTR	30, 34
PJTR	210, 211, 212

5.1.1 ABM - Addressed Binary and safety related Message

Support for ITU-R M.1371 messages 6 & 12.
Provides an external application with a means to exchange data using an AIS.

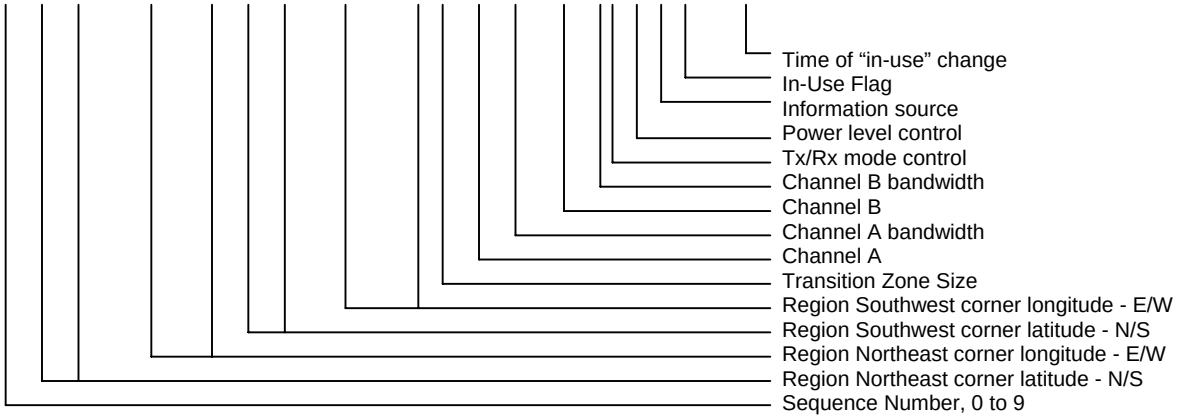
!--ABM,x,x,x,xxxxxxxxx,x,x.x,s--s,x*hh<CR><LF>



5.1.2 ACA - AIS Regional Channel Assignment Message

This sentence is used to both enter and obtain channel management information.

$--ACA,x,llll.ll,a,yyyyy.yy,a,llll.ll,a,yyyyy.yy,a,x,xxxx,x,xxxx,x,x,x,a,x,hhmmss.ss*hh<CR><LF>



5.1.3 ACK - Acknowledge alarm

This sentence is used to acknowledge an alarm condition reported by a device.

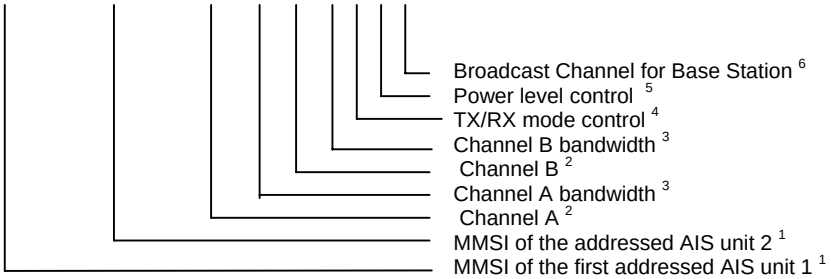
$--ACK,xxx,*hh<CR><LF>

Identification number of alarm source

5.1.4 ACM - Addressed Channel Management

Support for ITU-R M.1371 message 22.
Provides an AIS base station with information it uses to broadcast an “adressed VDL message 22”.

$--ACM,xxxxxxxxx,xxxxxxxxx,xxxx,x,xxxx,x,x,x,x*hh<CR><LF>



1. Identifies the distant addressed AIS unit(s) intended to receive the ITU-R M.1371 message 22. The first MMSI field (field 1) identifies the first AIS unit. The second MMSI field (field 2) identifies the second AIS unit, and may be set to null if only one AIS unit is being addressed.

2. VHF channel number, see ITU-R M.1084, Annex 4.

3. Value of 0, bandwidth is specified by channel number, see ITU-R M.1084, Annex 4
   Value of 1, bandwidth is 12.5 kHz

4. Value of 0, transmit on channels A and B, receive on channels A and B
   Value of 1, transmit on channel A, receive on channels A and B
   Value of 2, transmit on channel B, receive on channels A and B

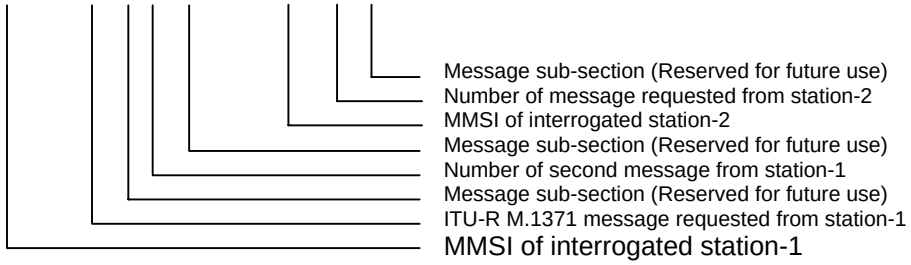
5. Value of 0, high power
   Value of 1, low power

6. The field identifies the channel that the base station should use to broadcast the ITU-R M.1371 message 22. A null value in this field indicates no change from previous received value when this sentence is sent to a base station and indicates unknown when this sentence is received from a base station. The values and their meanings are:
   Value 0 = No broadcast channel preference
   Value 1 = broadcast on AIS channel A
   Value 2 = broadcast on AIS channel B
   Value 3 = broadcast on both AIS channel A and AIS channel B

5.1.5 AIR - AIS Interrogation Request

This sentence supports ITU-R M.1371 message 15. It provides an external application with the means to initiate a request for specific ITU-R M.1371 messages from distant mobile or base AIS stations.

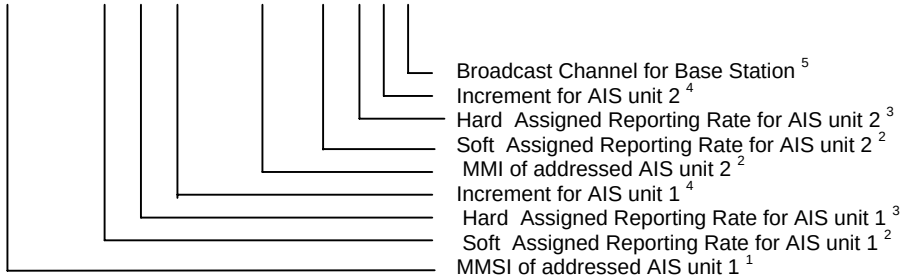
$--AIR,xxxxxxxxx,x.x,x,x.x,x,xxxxxxxxx,x.x,x*hh<CR><LF>



5.1.6 ASN - Assignment VDL Message 16

Support for ITU-R M.1371 message 16.
Provides an AIS base station with information it uses to broadcast an “assignment VDL message 22”.

$--ASN,xxxxxxxxx,x.x,x.x,x,xxxxxxxx,x.x,x.x,x,x*hh<CR><LF>



1. Identifies the distant addressed AIS unit(s) for the VDL assignment. The first set of four fields apply to a single AIS unit, while the second set of four fields (fields 5 - 8) apply to a second AIS unit. When only one AIS unit's assignment schedule is being provided, the second set of four fields (fields 5 - 8) may be set to null.

2. This field corresponds to the ITU-R M.1371 Message 16 Offset field. The base station will only use this field if the "Increment for AIS" field (fields 4 and 8 of this sentence) for the same AIS unit is set to zero. The range of values for this field consists of multiples of 20, between and including 20 to 600. Values that are less then 600 but are not multiples of 20 will be interpreted as the next higher multiple of 20. Values above 600 will be interpreted as 600. This field shall be set to null when the "Increment for AIS" field (fields 4 and 8 of this sentence) for the same AIS unit is set to a non-zero value.

3. This field corresponds to the ITU-R M.1371 Message 16 Offset field. The base station will only use this field if the "Increment for AIS" field (fields 4 and 8 of this sentence) for the same AIS unit is set to a non-zero value. The range of values for this field consists 0 to 2249 in units of slots. This field shall be set to null when the "Increment for AIS" field (fields 4 and 8 of this sentence) for the same AIS unit is set to a zero value.

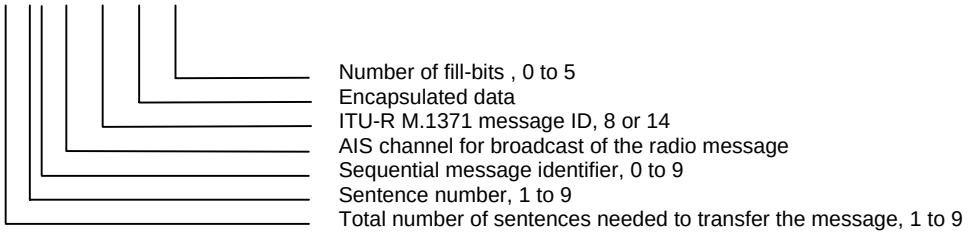
4. This field identifies the increment parameter in units of slots for the associated values of this field. The range of values are from 0 to 6. Note that a value of zero does not provide an increment, see note 2 above. This field shall not be set to null, unless the entire four field set for this AIS unit is not provided, because the base station may invoke two distinctly different assignment methods based on a zero or non-zero value. The values and their meanings are:
   Value 0 = Reporting rate is based upon the “ Soft Assigned Reporting Rate for same AIS unit " (fields 2 and 6) / 10 minutes.
   Value 1 = 1125 slots
   Value 2 = 375 slots
   Value 3 = 225 slots
   Value 4 = 125 slots
   Value 5 = 75 slots
   Value 6 = 45 slots

5. The field identifies the channel that the base station should use to broadcast the ITU-R M.1371 message 16. A null value in this field indicates no change from previous received value when this sentence is sent to a base station and indicates unknown when this sentence is received from a base station. The values and their meanings for this are:
   Value 0 = No broadcast channel preference
   Value 1 = broadcast on AIS channel A
   Value 2 = broadcast on AIS channel B

5.1.7 BBM - Broadcast Binary Message

This sentence supports generation of an ITU-R M.1371 Binary Broadcast Message (message 8) or Safety Related Broadcast Message (message 14). It provides an external application with a means to broadcast data, as defined by the application only - not the AIS.

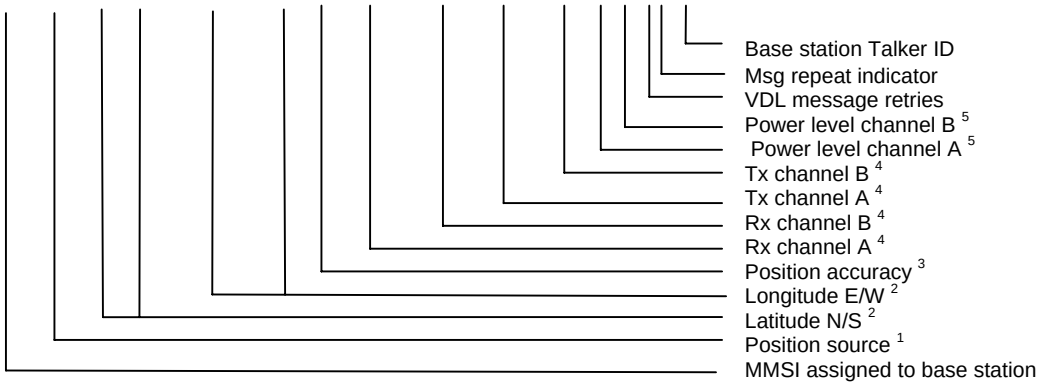
!--BBM,x,x,x,x,x.x,s--s,x*hh<CR><LF>



5.1.8 BCF - Base Station Configuration

Configure Base station parameters, when initially installed.

$--BCF, xxxxxxxxx,x, llll.ll, a, yyyyy.yy, a, x, xxxx, xxxx, xxxx,xxxx,x,x,x,x,cc*hh<CR><LF>



Notes:

1. Identifies the source of the position.
   Value 0 = surveyed position
   Value 1 = internal source
   Value 2 = external source

2. Surveyed position of the base station. The position is only applicable to fixed base stations. Within the base station, the "electronic position fixing device" parameter is set to a value of 7 indicating a surveyed position. Mobile or non-fixed base stations receive their position information by another means.

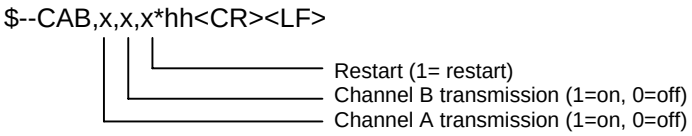
3. 0 = low > 10m.
   1 = high < 10m ; differential mode of DGNSS.

4. VHF channel number, see ITU-R M.1084, Annex 4.

5. Value of 0, high power
   Value of 1, low power

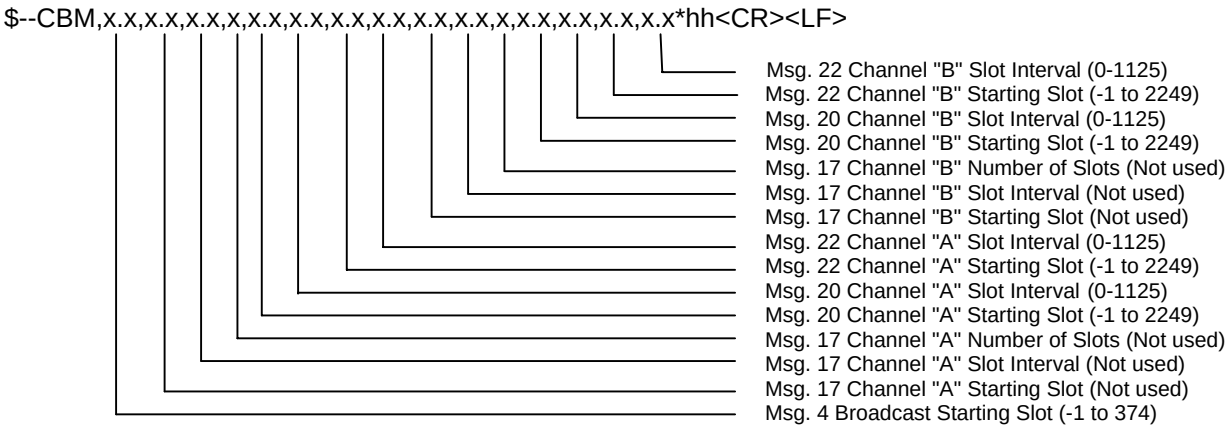
5.1.9 CAB - Control AIS Base Station

Turn on or off transmission on channel A and B in AIS base station.



5.1.10 CBM Configure Base Station Message Reporting Rates

This sentence configures the broadcast schedule of ITU-R M.1371 messages 4, 17, 20 and 22 that are to be broadcast from an AIS Base Station.



5.1.11 DLM Data Link Management slot allocations for base station and mobiles

This sentence provides the base station with the slot allocations to be reserved for FATDMA base station broadcasts. This sentence provides the base station with the information necessary to broadcast an ITU-R M.1371 Message 20 Data link management message, which informs mobile AIS units about the reserved FATDMA slots.

The shore station is responsible for filtering out slot reservation conflicts that may exist. These conflicts in the shore station network must be resolved separately from entering the data. The base station is not responsible for detecting these conflicts. The AIS Base Station, upon receipt of a Query for this sentence, will generate a message consisting of multiple DLM sentences containing all the defined FATDMA reserved slots to the requestor.

$--DLM,x,a,a,x.x,x,x,x.x,a,x.x,x,x,x.x,a,x.x,x,x,x.x,a,x.x,x,x,x.x*hh<CR><LF>

- Increment for reservation 4 (0-1125)
- Time out for reservation 4 (0-7)
- Number of slots for reservation 4 (1-5)
- Start slot for reservation 4 (0-2249)
- Ownership for reservation 4 (L,R or C)
- Increment for reservation 3 (0-1125)
- Time out for reservation 3 (0-7)
- Number of slots for reservation 3 (1-5)
- Start slot for reservation 3 (0-2249)
- Ownership for reservation 3 (L,R or C)
- Increment for reservation 2 (0-1125)
- Time out for reservation 2 (0-7)
- Number of slots for reservation 2 (1-5)
- Start slot for reservation 2 (0-2249)
- Ownership for reservation 2 (L,R or C)
- Increment for reservation 1 (0-1125)
- Time out for reservation 1 (0-7)
- Number of slots for reservation 1 (1-5)
- Start slot for reservation 1 (0-2249)
- Ownership for reservation 1(L,R or C)
- AIS Channel (A or B)
- Sequence Number (0- 9)

5.1.12 DTM Datum reference

Local geodetic datum and datum offsets from a reference datum

$--DTM,ccc,a,x.x,a,x.x,a, x.x,ccc*hh<CR><LF>

- Reference datum [1]
- Altitude offset, (meter) (Not used)
- Longitude offset, min, E/W (Not used)
- Lat offset, min, N/S (Not used)
- Local datum subdivision code [2] (Not used)
- Local datum [1]

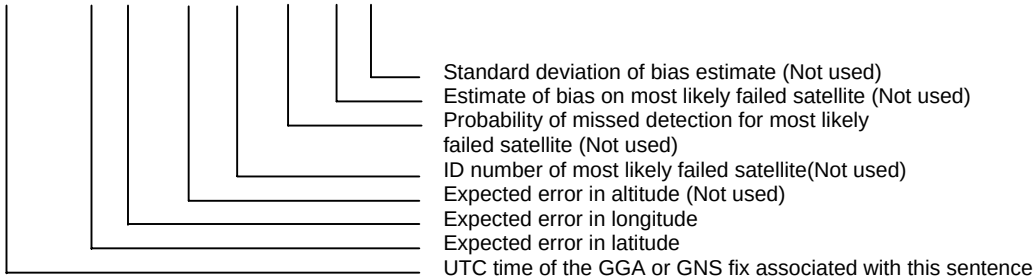
Note 1: WGS84 =W84
WGS72 = W72
SGS85 = S85
PE90 = P90
User defined =999 (only available for “Local datum”)
IHO datum code

Note 2: One character subdivision datum code when available or user defined reference character for user defined datums, null field otherwise. Subdivision character from IHO Publication S-60, Appendices B and C.

5.1.13 GBS - GNSS satellite fault detection

This message is used to support receiver autonomous integrity monitoring (RAIM). Given that a GNSS receiver is tracking enough satellites to perform integrity checks of the positioning quality of the position solution, a message is needed to report the output of this process to other systems to advise the system user. With the RAIM in the GNSS receiver, the receiver can isolate faults to individual satellites and not use them in its position and velocity calculations. Also, the GNSS receiver can still track the satellite and easily judge when it is back within tolerance.
This message shall be used for reporting this RAIM information. To perform this integrity function, the GPS receiver must have at least two observables in addition to the minimum required for navigation. Normally these observables take the form of additional redundant satellites.

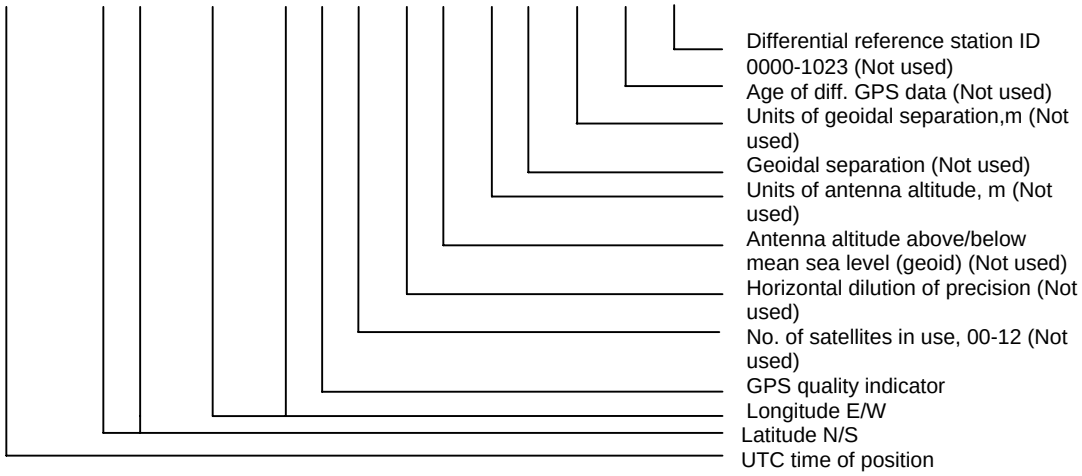
$--GBS, hhmmss.ss, x.x, x.x, x.x, xx, x.x, x.x, x.x *hh <CR><LF>



5.1.14 GGA - Global positioning system (GPS) fix data

Time, position and fix-related data for a GPS receiver.

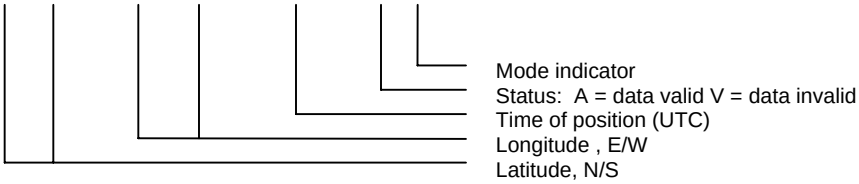
$--GGA, hhmmss.ss, llll.ll, a, yyyyy.yy, a, x, xx, x.x, x.x, M, x.x, M, x.x, xxxx*hh<CR><LF>



5.1.15 GLL - Geographic position - latitude/longitude

Latitude and longitude of vessel position, time of position fix and status.

$--GLL, llll.ll, a, yyyyy.yy, a, hhmmss.ss, A, a *hh<CR><LF>



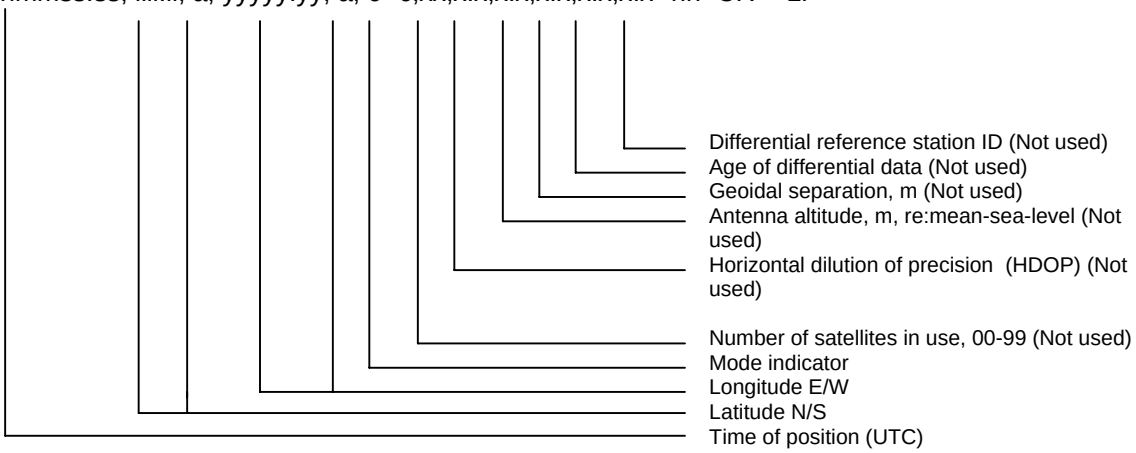
Note: Positioning system Mode indicator:

A = Autonomous
D = Differential
E = Estimated (dead reckoning)
M = Manual input
S = Simulator
N = Data not valid

5.1.16 GNS - GNSS fix data

Fix data for single or combined satellite navigation systems (GNSS). This sentence provides fix data for GPS, GLONASS, possible future satellite systems and systems combining these.

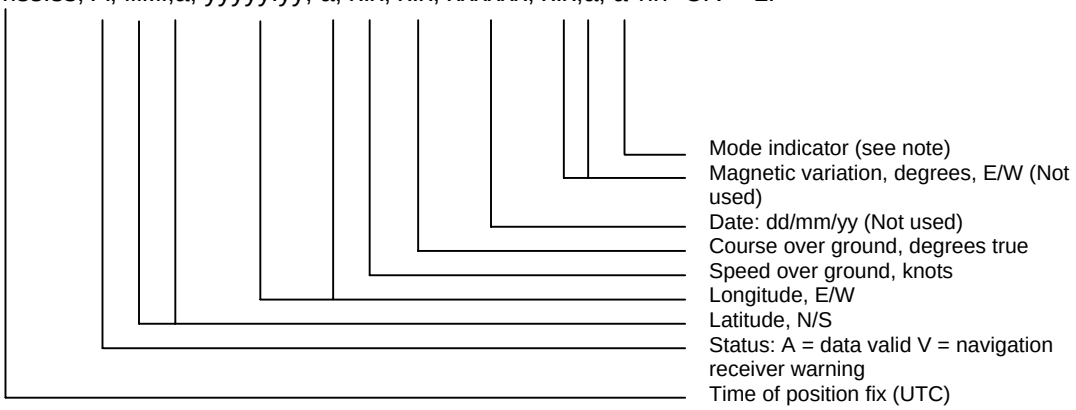
$-- GNS, hhmmss.ss, llll.ll, a, yyyyy.yy, a, c--c,xx,x.x,x.x,x.x,x.x,x.x,x.x *hh<CR><LF>



5.1.17 RMC Recommended minimum specific GNSS data

Time, date, position, course and speed data provided by a GNSS navigation receiver. This sentence is transmitted at intervals not exceeding 2 s. All data fields must be provided, null fields used only when
data is temporarily unavailable.

$--RMC, hhmmss.ss, A, llll.ll,a, yyyyy.yy, a, x.x, x.x, xxxxxx, x.x,a, a*hh<CR><LF>

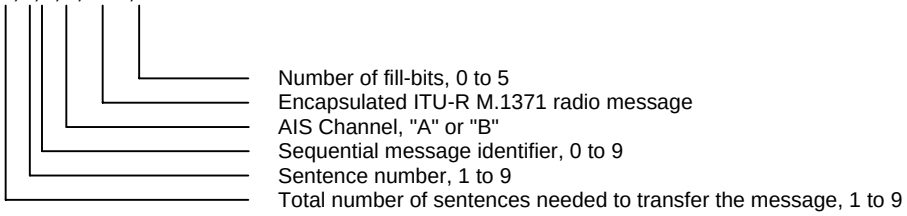


Note: Positioning system Mode indicator:
A = Autonomous mode
D = Differential mode
E = Estimated (dead reckoning) mode
M = Manual input mode
S = Simulator mode
N = Data not valid

5.1.18 VDM - VHF Data-link Message

This sentence is used to transfer the entire contents of a received AIS message packet, as defined in ITU-R M.1371 and to be sent on the VHF Data Link (VDL), using the "6-bit" field type.

!--VDM,x,x,x,a,s--s,x*hh<CR><LF>



5.2 Output

All sentences starts with a delimiter that can be “$” or “!”. followed by the talker identifier indicated by “- -“. The talker identifier is BS for Base station.

ABK	Addressed and binary broadcast acnowledgement
VDO	VHF Data – link Own-vessel message
VDM	VHF Data – link Message
TXT	Text transmission
ALR	Set Alarm state
Answer on query:	ACM, ACA, DLM, BCF, CBM, CAB, TXT
PJTR	34
PJTR	211, 212

ACM see paragraph 5.1.4

ACA see paragraph 5.1.2

DLM see paragraph 5.1.11

BCF see paragraph 5.1.8

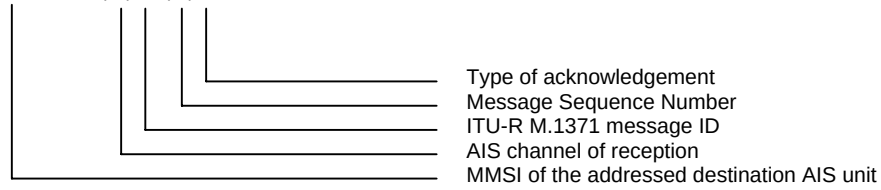
CBM see paragraph 5.1.10

CAB see paragraph 5.1.9

5.2.1 ABK - Addressed and binary broadcast acknowledgement

The ABK-sentence is generated when a transaction, initiated by reception of an ABM, AIR, or BBM sentence, is completed or terminated.

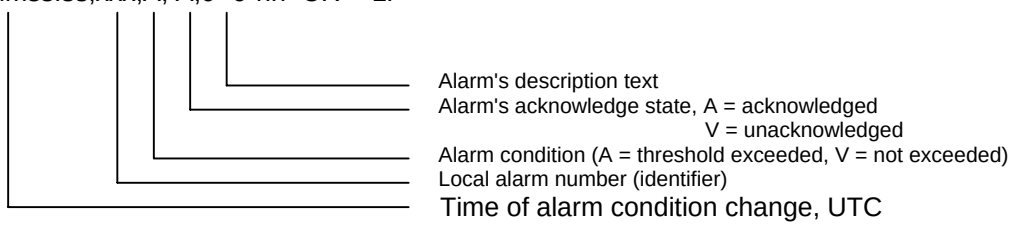
$--ABK,xxxxxxxxx,a,x.x,x,x*hh<CR><LF>



5.2.2 ALR - Set alarm state.

Local alarm condition and status. This sentence is used to report an alarm condition on a device and its current state of acknowledgement.

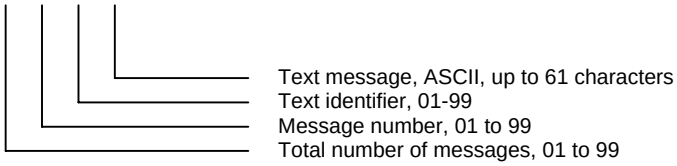
$--ALR,hhmmss.ss,xxx,A, A,c--c*hh<CR><LF>



5.2.3 TXT - Text transmission

For the transmission of short text messages. Longer text messages may be transmitted by using multiple sentences.

$--TXT,xx,xx,xx,c--c*hh<CR><LF>

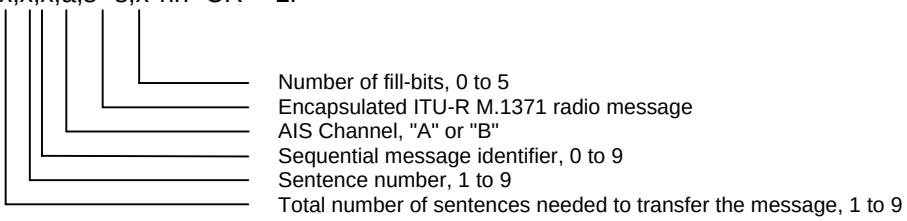


5.2.4 VDM

See “Input “section (4.1.18)

This sentence is used to transfer the entire contents of a received AIS message packet, as defined in ITU-R M.1371 and as received on the VHF Data Link (VDL), using the "6-bit" field type.

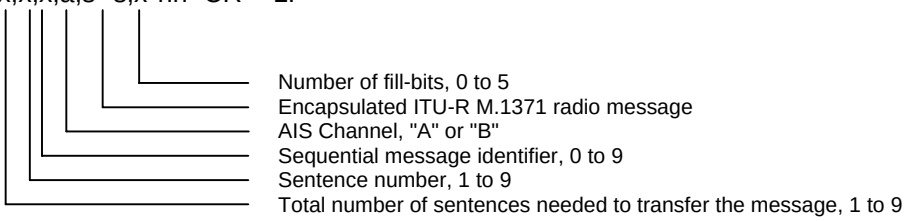
!--VDM,x,x,x,a,s--s,x*hh<CR><LF>



5.2.5 VDO - VHF Data-link Own-vessel message

This sentence is used to provide the information assembled for broadcast by the AIS. It uses the six-bit field type for encapsulation. The sentence uses the same structure as the VDM sentence formatter.

!--VDO,x,x,x,a,s--s,x*hh<CR><LF>



5.3 Proprietary sentences

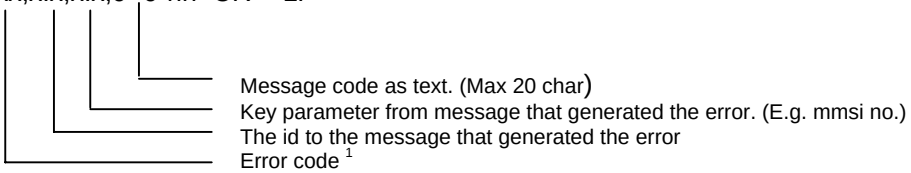
All proprietary sentence shall start with *$P<mnemonic>*
Jotrons mnemonic code is *"JTR"*.
This makes our proprietary sentence like:
$PJTR[,Msg id][,data] "*"<checksum field><CR><LF>
Checksum is required in proprietary sentence.

5.3.1 Proprietary sentence overview

Msg id	
00	*Error message (see 1.3)* $PJTR,00,error code,msg.id,key,text*hh<CR><LF>
3x:	**Own Data**
30:	*Request AIS info* $PJTR,30,datatype*hh<CR><LF>
34:	*AIS Lan request* $PJTR,34,c,c--c,x.x*hh<CR><LF>
4x	**Software version**
40:	*Request Version* $PJTR,40,Func,Idx*hh<CR><LF>
41:	*Version information* $PJTR,41,Module Release,Date Time,no,total*hh<CR><LF>

5.3.2 PJTR,00 - Error message

$PJTR,00,xx,x.x,x.x,c--c*hh<CR><LF>



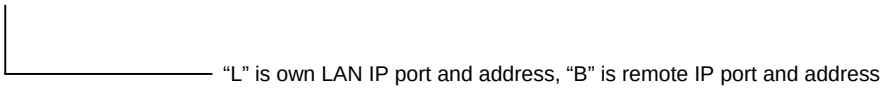
Note:

00	Undefined error
01	Not found
02	Missing data
03	No answer

5.3.3 PJTR,30 - Request info

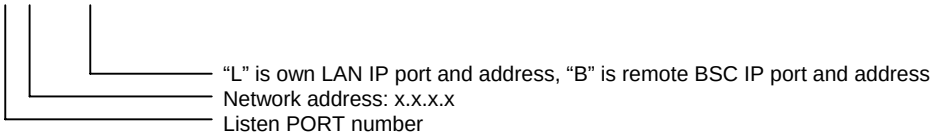
Request info about own unit, answer is in "PJTR,34"

$PJTR,30,c*hh<CR><LF>



5.3.4 PJTR,34 - Answer LAN request

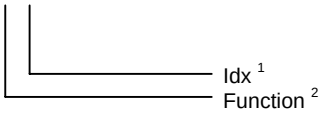
$PJTR,34,c,c--c,x.x*hh<CR><LF>



5.3.5 PJTR,40 - Request Version

Request hardware and software versions from the different modules in TR-2600. Answer in "PJTR,41"

$PJTR,40,c,x.x*hh<CR><LF>



Note 1: Idx

Identifier of version element. Must be used if "Function" is "N", "P" or "R", but has no meaning if "H" or "T"

Note 2: Functions:

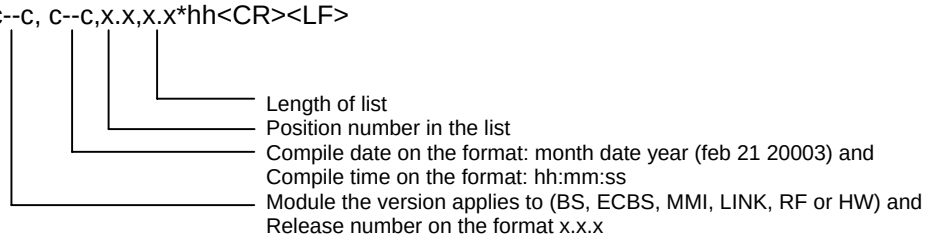
H	Head. First element
T	Tail. Last element
N	Next. Get the next element
P	Previous. Get the previous element
R	Refresh current element

These functions will list successive SW versions from the different modules. In the current version, there are 6 modules, named BS, ECBS, MMI, LINK, RF or HW

5.3.6 PJTR,41 - Answer on requested version

Request hardware and software versions from the different modules in TR-2600. Request in "PJTR,40"

$PJTR,41,c--c, c--c,x.x,x.x*hh<CR><LF>



5.3.7 PJTR,210 - Request system configuration parameters

Request system parameters from TR-2600.

$PJTR,210,c*hh<CR><LF>

Which data to request

Note:
value = L: LAN connection request.
value = A: Request msg4 handling after restart.

5.3.8 PJTR,211 - LAN connection modus

Configure type of LAN connections for the Presentation Interface. System must be restarted after configuration. Request in “PJTR,210”

$PJTR,211,x*hh<CR><LF>

Set requested data

Note 1:
value = 0: No LAN connection.
value = 1: TCP connection.
value = 2: UDP connection

Note 2: TCP connection is a TCP server for one client only.

5.3.9 PJTR,212 - How to send msg4 after restart

How to send msg4 after restart. Request in “PJTR,210”

$PJTR,212,x*hh<CR><LF>

How to start sending of msg4

Note:
value = 0: Never start to send msg4 atomatically
value = 1: Start to send msg4 automatically as defined by CBM
value = 2: Start to send msg4 automatically with random select start slot.