

IALA Recommendation V-125

On

The use and presentation of symbology at a VTS Centre (including AIS)

Edition 2

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Display of AIS and other Information
at a VTS Centre, Dec. 2003)**



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Document Revisions

Revisions to the IALA Document are to be noted in the table prior to the issue of a revised document.

Date	Page / Section Revised	Requirement for Revision
Sept. 2004	General Revision, including name change	Work underway an IMO and IEC (WG13) on the harmonization of symbols and terminology.

Recommendation on the use and presentation of symbology at a VTS Centre (including AIS)

(Recommendation V-125)

THE COUNCIL:

RECALLING the function of IALA with respect to Safety of Navigation, the efficiency of maritime transport and the protection of the environment;

RECALLING ALSO that the 1974 Convention on the Safety of Life at Sea, as amended, has mandated the carriage of AIS equipment on ships subject to the Convention;

RECOGNISING that IALA has recommended National Members and other appropriate Authorities to provide shore based AIS services (Recommendation A-123);

RECOGNISING ALSO that the arrangement for the integration and display of AIS and other information in a VTS Centre is important for ensuring the effectiveness of the service;

RECOGNISING FURTHER the Draft Performance Standards for the Presentations of Navigation-Related Information (as presented at IMO NAV50);

NOTING that the introduction of AIS at a VTS Centre has:

1. had substantial impact on the development and display of the vessel traffic image; and,
2. influenced the workload and training needs of VTS personnel;

CONSIDERING the report on the Workshop on the Training of VTS Personnel for the AIS World (3 -7 February 2003) and the VTS Committee on the display of data in a VTS Centre;

ADOPTS the principles for the use and presentation of Information at a VTS Centre (including AIS) as set out in the Annex to this Recommendation; and,

RECOMMENDS that National Members, and other appropriate VTS Authorities, take into account the Annex to this Recommendation when integrating the display and other information from different sensors at VTS Centres.

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Annex

The use and presentation of symbology at a VTS Centre (including AIS)

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1 Introduction

The presentation of information is critical to meeting SOLAS regulations, relevant IMO resolutions and IALA recommendations. Although there are many compelling reasons for the international standardisation of methods of display of data from electronic sensors, including AIS, on board vessels, there may be differing or additional requirements for the display of information at VTS Centres that are port, coastal states or area specific.

The compilation of an accurate traffic image in the VTS Centre, thus allowing the evaluation of situations more accurately and decisions to be made more readily, is substantially dependent on the manner in which the data is presented. The display of on-board symbology for ECDIS is defined in IHO S52 Appendix 2. The display of on-board AIS symbology is further developed in IEC Standard 62288.

2 General Principles

The general principles for the presentation of all symbology on a VTS Display are:

- the international on-board symbology standard for ECDIS should be used as far as possible;
- symbology already identified for existing on-board use should not be assigned a different meaning for VTS purposes, however these symbols may be adapted to suit VTS requirements;
- any adaptations to symbology must not modify the agreed standard for data transfer;
- the clarity of the presentation and operator workload should be carefully considered.

3 Symbology elements

In translating the practical considerations into equipment specifications for local or national requirements, symbology can be considered within the two elements of the background chart and the traffic image that is overlaid upon it.

3.1 *Charting*

Many VTS system providers have traditionally provided a mapping background of varying accuracy and detail. Based on operator preference, this has in many cases been in the form of yellow land masses with the sea in varying shades of blue; the greater the depth, the darker the shade.

The increasing capacity of VTS hardware and software together with development in the commercial field of electronic charts now offer the potential for VTS backgrounds to be based on an accurate electronic presentation. Standards have been specified for electronic charting for on-board use. S57 specifies how the data should be structured and transferred and S52,m Annex 2, specifies how it should be presented. A limited number of colour palettes for day, dusk and night time use have also been identified to provide the officer of the watch at sea with

a range of choices dependent on ambient night levels and the need to retain night vision as appropriate.

In accordance with the principles stated at paragraph 2 above, it is recommended that the use of the on-board standard should be used as far as possible for VTS purposes. It is probable that these standards will prove too limiting for VTS purposes, equipment providers should, however, be able to provide the flexibility to adjust the S52 standard to meet the individual needs of VTS and to take full advantage of the technical capabilities of the VTS system. For example, VTS should be able to define own colour palettes, geographical information and symbology.

There is a difference between changes to the presentation of data provided within the ENC and the addition of further data, which is not featured in the baseline ENC. Additional uncharted information should be done within additional layers upon the original ENC delivered through hydrographic offices. This way, electronic updates will not effect or even nullify the additional information.

The S52 standard is limited and therefore reduces some of the flexibility needed in a VTS Centre. For example, there may be a requirement to differentiate between the type of vessel or its cargo or whether it carries a pilot through the use of variations in colour, shape or other attributes.

The capability of a VTS Operator to carry out a particular task can be reduced if the symbology available does not correspond to the requirement and therefore presents the VTS Operator with a suitable tool to enable the task to be completed satisfactorily.

For example the standard scale on the symbology may be in conflict with the scale on the map or/and the need for use of zooming a picture. The size of an AIS target symbol may cause difficulties in areas of high traffic density due to the sheer number and size of these targets. However, without specialist software there is no means of suppressing the constant display of these targets.

In the S52 standard the presentation of map (land and sea) is restricted in terms of the choice of colours available for differentiating between land and sea, as well as in the choice of colours available for the combination of sea and land. VTS Operators may prefer a dark background with lighter colour symbols. However, in the standard there is a lack of contrast between the various backgrounds.

The human/machine interface in the VTS environment is different than that required for navigational purposes on-board and therefore may also result in different needs. For example, the VTS Operator is working in an “office type” environment where there is a need to look at a computer screen for many hours in the watch. The colours available in the S52 standard have not necessarily been designed with this in mind. The ability to change the colours on the screen can considerably help to reduce VTS Operator fatigue.

For applications that include S52 presentation, it is likely that all variations of the on-board options will be available. S52 also enables the adjustment of the colour palette to replicate the traditional presentation of earlier mapping backgrounds preferred by many operators but this can now include the greater accuracy that electronic charting brings. The charting details can be broken down into “layers” of information that make up specific parts of the overall chart such as the inclusion of aids to navigation and the inclusion of depth soundings and/or depth contours. Careful consideration should, therefore, be given to the options for the background chart. Whilst S52 offers considerable choice to the operator, the benefits of standardisation with some restrictions on the number of options available to operators should also be

recognised. It is recommended that the following more general considerations should form part of the fundamental assessment in selecting charting options to meet individual local needs:

- What level of charting detail is required? Too much detail could be a distraction to operators. It could also slow the system down to unacceptable levels.
- Are all the on-board palette options necessary? If night vision is not an issue, then some of the night time options may be irrelevant. A reduction in choice of presentation may reduce the chance of human error.
- Is the system to be used by VTS qualified staff only? Would the inclusion of the traditional presentation be appropriate? Would use by mariners, specifically pilots, make the addition of one of the standard on-board presentation pallets desirable?
- What is the likely traffic density and is the level of detail compatible with the superimposition of the traffic image?

It should also be noted that the form of presentation of information will have an influence on the training of VTS personnel.

3.2 VTS Traffic Display

The VTS traffic display should take into account the operational requirements at the VTS Centre concerned. Human-machine interface aspects should optimise the performance of VTS, thus ensuring that the traffic image is enhanced by the acquisition of accurate information. This will enable full evaluation of traffic situations and facilitate decision-making. All tactical information relating to the traffic image should be presented on one suitable set of displays covering the area, sub-area or sector as appropriate.

There are a number of issues that may need to be taken into account when considering the presentation of information in a VTS. These include Data Filtering and Track Labelling, Correlation, and the presentation of Safety Related Messages.

Data Filtering and Track Labelling

VTS Centres should consider carefully the number and arrangement of displays for the presentation of the VTS traffic image and how much information on individual tracks is presented. Whilst it may be valuable to have detailed information on-screen, equally it may tend to clutter the screen. Technical solutions that may include pop-up displays or other means of displaying the details of individual tracks may need to be introduced. When developing such technical solutions, consideration should be given to the density of traffic, the VTS area, sub-area or sector concerned and the amount of detail needed to be displayed directly on the screen or available through pop – up menus/data fields.

For general safety purposes the VTS Authority may authorize transmission of track data to users. Any track data selected for transmission should be clearly identified on the display.

Track Fusion and Correlation.

Correlation between sensor information needs to be considered. Systems may be capable of automating the correlation process and it may be appropriate to indicate on, or adjacent to, the display the source(s) of information being presented. Signals may be lost and consideration

should be given to the presentation of the elapsed time since the loss occurred and any automatic change between sensors.

Where a VTS has the ability to integrate data from AIS with one or more other sources of information for tracking a participating vessel, means should be provided to enable the track sources to be correlated or de-correlated as necessary.

Presentation of Safety Related Messages.

AIS specifies the provision of short safety related messages, and it is important that a method is identified to draw the attention of the VTS operator to the receipt of such a message. Experience has yet to be gained on the use of this feature but there is no provision to limit its use by mariners. In considering how these messages may be displayed, a balance may need to be made between drawing attention to the presence of a safety related message and overloading or distracting VTS operators. The advantages and disadvantages of superimposing safety related messages and alerts on the traffic image or presenting them on a separate display should be considered.

3.2.1 General Presentation

Information superimposed on the VTS traffic image display should never obscure or cause any confusion with the display of vessel targets. With the amount of information available, there is a risk of information overload. The VTS authority should determine the information that is important to the type of service offered by a particular VTS.

When considering the display of information relating to the traffic image, the following matters should be taken into account:

- Target Identification - must clearly distinguish between the sensor device used (eg. radar, AIS, dead-reckoned source, or other data input.);
- Operation and status of any information filter should be clearly indicated to the operator;
- The operator should be aware of any information layer that has been applied;
- Vessel Data - display of vessel data must not obscure critical operational information or clutter the traffic image;
- Terminology – all displayed information should be clearly defined;
- Communication - presentation of target data should not lead to any misunderstanding in communication between VTS Centres and vessels.

3.2.2 Operational Warnings and Alarms

All warnings and alarms should be highlighted by means of an audible and/or visual alarm. These may include:

- Loss of track or transmission;
- Operational alarms (e.g. off-track, anchor-watch,etc.)

- Inconsistency of data;
- Loss of correlation between sensors and/or sensor and sources;
- Any other system failure.

3.2.3 Considerations concerning AIS

The introduction of AIS is impacting substantially on the development and display of the vessel traffic image. It may also influence the workload and training needs of VTS personnel.

The use of AIS in VTS operations assists in the development and maintenance of a traffic image, particularly with respect to the:

- identification of vessels;
- tracking of vessels;
- simplification of information exchange; and,
- provision of additional information to assist in vessel traffic management.

The contribution of AIS to VTS and the overall traffic image should be kept in context.

Potential benefits, however, that may be realised at an early stage could include:

- Greater confidence in accurate identification;
- Greater system reliability that will minimise “lost targets” and “target swap”;
- Greater positional accuracy.

AIS, on its own, cannot be relied upon to provide a complete picture of the actual traffic image in a VTS area as some ships may not have the system installed, and others may not have their equipment operating properly. In addition, the limitations of the AIS system should also be taken into account, including the possibility that the shore based AIS system may fail to receive information from a ship. (i.e. the transmission or reception medium may fail through radio interference, obstructions, etc).

In developing a traffic image and maintaining situational awareness, the limitations of AIS, when used without the input from other sensor devices, should be taken into consideration. However, whilst AIS data should normally be integrated with data from other sources, in some cases - such as monitoring of coastal and inland waterways - AIS may be the only source of positional data available. The degree of accuracy required may vary depending on the service for which the AIS data is being provided. When assessing the degree of reliance that can be placed on the information displayed, it is important to take into consideration the level of validation that can be obtained from other sensors.

In many circumstances AIS, as an additional sensor device in a VTS, may provide redundancy of some data. Information from different sources should be analysed to ensure, as far as practicable, that the data used in the traffic image is the most accurate available. Where redundant sources of information of a particular vessel are available - such as position, speed and destination - means to select the preferred source of data should be provided.

It should be borne in mind that:

- Unless there are additional national requirements, only vessels to which the 1974 SOLAS Convention (as amended) apply will be required to fit AIS;
- Currently, a Minimum Keyboard Display (MKD) only is required to be provided on board vessels,
- Shipborne personnel on vessels provided with operational AIS may not be familiar with the entry of variable voyage related data.
- Transmitted AIS-positions are based upon the actual positioning system used on-board. When integrating AIS with existing tracking systems care should be taken in the selection of geodetic datum and reference points.

3.2.4 Traffic Symbology

The VTS Authority, while implementing AIS, should consider how much information from the available data needs to be presented on the VTS traffic image display. The amount of information should not overload VTS Operators or cause confusion.

A VTS traffic image display using Radar and/or AIS should have the ability to default to a pre-set standard using integrated Radar and AIS information as new targets are acquired. It should be possible to select AIS or Radar targets separately, or to select a display using minimal symbology (i.e. radar target), e.g. in areas of extreme congestion.

Identical, or similar, symbols may be used for different purposes depending on the individual port or area and their specific operations. While these should not be restricted, the objective in any symbology should be to keep it as simple as possible in order to produce clearly defined display of vessel data without causing overload or confusion.

The following are some of the matters that should be taken into consideration:

- Track Labelling – This may be achieved either through the symbology itself or textual tagging, which may be split up into a short label and additional drop-down window for more detailed information. The level of detail must be carefully considered (see paragraph 3.2./data filtering and track labelling).
- Vectors – when used, graphical presentation of symbols should unambiguously display the course over ground (COG)/speed over ground (SOG) and/or actual heading if both or either are displayed. If the actual heading vector is displayed, the COG vector should always be simultaneously displayed;
- Track – if the symbol used to identify the track of a vessel is in the shape of a ship, it should accurately display the vessel's dimensions, position and orientation.

The VTS Authority should determine all information required by a VTS (including AIS). VTS operators, however, may require different levels of information to maintain effective traffic management. The traffic image display software should be sufficiently flexible to allow for selection of information needed for the particular sectors or operational consoles.

As an interim measure for the presentation of AIS, an independent display for AIS data may be necessary until integration of the data can be programmed into the existing VTS system. While

VTS personnel use both RADAR and AIS systems, the independent display must be adjacent to the VTS operator's existing display.

The composing, sending and receiving of AIS messages should not interfere with the VTS traffic image display.

4 Detailed Symbology Considerations

The following broad issues may need to be considered:

- Operational;
- Geographical;
- Environmental;
- Commercial;

Whilst the actual method of display and symbology used will be decided by the Authority, the following checklist is provided to assist VTS authorities in developing their requirements for the identification of specific attributes for which awareness in the VTS Centre may be aided through the provision of appropriate display equipment and symbology. Not all of these are directly related to AIS, nor are the lists all-inclusive. Where symbology is linked to other charting standards, such as IHO, care should be taken to ensure that any symbols selected solely for use in VTS are compatible with those that have already been specified under other standards.

Operational

- Pilot on board – symbology may be used to indicate the status and requirements of vessels having a pilot onboard;
- Pilot Exemptions – symbology may be used to define the status and area of authorisation for individual Pilot Exemption Certificate (PEC) holders;
- Size of vessel – restrictions dictated by the geography of the port or surveillance area should be considered in deciding whether additional attributes are required to the Symbology dependent on the size of vessels operating in the area or passing in or through a channel.;
- Scaling - careful consideration should be made to the need for the scaling of particular symbols
- Type of Vessel/ Vessel Characteristics – symbology may be used to provide a clear indication of specialist vessels or those for which special operational considerations may be appropriate.

For example:

- Dangerous Cargoes/Goods – Ports may have their own regulations that may determine the requirement for the subdivision of vessel or cargo types through the colour or shape of the target image;
- Harbour Authority Vessels (harbour launch, pilot vessel, survey vessel, salvage etc)
- Vessels restricted in their ability to manoeuvre;
- Vessels constrained by draught;

- Quality of Survey/Background Charting and Display - symbology may be used in the form of an overlay or area designation to indicate the accuracy of survey information being displayed on the background chart in use;
- Security – symbology could be used to provide visual cues to VTS operators in support of evolving security considerations;
- Non- standard targets – it may be appropriate to develop a symbol to indicate the existence of hazards such as floating or semi-submerged obstructions;
- Defects or Deficiencies – symbology could be utilised to indicate vessels with defects or deficiencies;
- Emergency situations – symbology may be utilised to indicate the status, duties or tasking of assets involved in emergency situations, such as Search and Rescue (SAR);
- Port State Control – identification of vessels of special interest or non-compliance under Port State Control may be indicated through symbology;
- Aids to Navigation – the status of such Aids may be indicated through appropriate symbology. (It should be noted that electronic charting offers the flexibility of removing charting details to simplify presentation, if required).

Geographical

- Port access – the number and design of approach channels should be taken into account when deciding display presentation and the size/scale of symbology used;
- Berth locations – adjacent berths may dictate the need to reduce scale/size and amount of VTS information displayed;
- Temporary Danger Areas – areas that temporarily become dangerous and should be avoided by ships may be displayed using appropriate symbology;
- Naval Exercises Areas – appropriate symbology may be required to indicate naval activities that may impact on the control of vessel traffic through the area;
- Recreational Areas – symbology may be required to indicate areas where recreational activities are taking place;
- Sites of Special Scientific Interest (SSSIs)/Fish farms/Ecological – symbology may be developed to indicate the existence of sites where environmental considerations may require some form of traffic restriction, regulation or control;
- Mobile sea bed/sandbanks – areas subject to changes in seabed structure may require to be identified (see “quality of survey” above);
- Oil fields/Oil and Energy Installations (OEs);
- Location of pipelines – the existence and presence of pipelines may be indicated by Symbology if not already disseminated through chart amendments.

Environmental

- Hydrological – tide, current;
- Meteorological – wind, visibility, sea-state;
- Ice – ports that experience the seasonal phenomenon of sea ice may require developing symbology to identify the areas affected.

Commercial

- Prioritisation – symbology may be utilised to indicate movement priorities;
- Information sharing – a need to exchange/share the presentation of the traffic image with other parties or users may dictate the choice/development of specific symbology.

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