

## Vessel Traffic Service system for Coastal Surveillance

### نظام لتنظيم وتتبع حركة السفن في خليج العقبة

## Jordan Maritime Commission is Vessel Traffic Service system Specifications

### Objectives of VTS System

- IALA INTERNATIONAL ASSOCIATION OF MARINE AIDS IALA V – 128 ( X/S/BAND ) 20K COVERGE AREA .
- SOLAS CH ANX 16.

Radar, AIS, CCTV, Meteo-Hydro sensors support and control

- Multi-radar tracking integration
- Multi-sensor (Radar and AIS) tracking integration
- Manual or automatic target acquisition and drop
- Manual or automatic target identification
- Radar video presentation
- AIS dynamic and static data presentation
- Target simulation (creation, modification, tracking)
- Route management (creation of route lines, routes, route targets mode - associated alarms generation, route point ETA calculation, Route Profile tool)
- Target pairs mutual calculations/operations (target pairs table, target pairs operations)
- Target manoeuvre prediction (radar tracking in 'shadow areas')
- Zones configuration e.g. traffic, guard, auto-acquisition, responsibility etc.
- Comprehensive configurable Alarms management including
- Navigation and Sensor alarms
- Record and Playback
- Chart editing
- VTS servers and workstation equipment and sensors diagnostics

تنوي الهيئة البحرية الأردنية شراء نظام تنظيم حركة السفن لخليج العقبة (محطه ارضيه)

وبالمواصفات الرئيسية التاليه :-

### Objectives of VTS System

- IALA INTERNATIONAL ASSOCIATION OF MARINE AIDS IALA V – 128 ( X/S/BAND ) 20K COVERGE AREA .
- SOLAS CH ANX 16. ( CAST STATION )

مزود برادار بحري ومستقبل نظام التعريف الاوتوماتيكي ومحطة تتبع وتحكم لمراقبة حركة السفن في المنطقة الساحلية للعقبة / الأردن ويكون موصول على حساسات الرادار ونظام التعرف الأتوماتيكي على السفن.

يجب على النظام الخاص المشغل لتتبع حركة السفن أن يحوي على جهاز كمبيوتر ذو مواصفات عالية وموصل على شاشتين قياس 27 انش.

يجب على النظام أن يكون قادراً على تخزين المعلومات من الحساسات المطلوبة لفترة زمنية لا تقل عن 6 أشهر في ذاكرة من نوع RAID1.

يجب على النظام المطلوب أن يكون قادراً على التطوير في المستقبل على توصيل شاشات وكاميرات مراقبة، حساسات للأرصاد الجوية والبحرية، إمكانية تسجيل جميع الاتصالات VHF وإضافة رادارات وأجهزة التعرف الأتوماتيكي ومحطات تتبع تصل الى عدد 10، قاعدة بيانات VTS، إمكانية وصل النظام على الانترنت، إمكانية توصيل كمبيوتر مركزي إضافي خاص بتنظيم حركة المرور.

لمزيد من التفاصيل عن متطلبات والمواصفات الفنية للأجهزة والنظام المطلوب يرجى مراجعة الهيئة البحرية الأردنية واستلام نسخة المواصفات. او زياره الموقع الالكتروني للهيئة .

- Multi-operator concept — define workspace configuration independently for each operator on watch
- Secure system configuration — operators accounts are protected by name/password

## VTS Operator Workstation

Main essential functions of the Operator Workstation should be:

- Electronic navigational charts presentation with chart editing functionality
- Raw radar picture presentation as a separate layer over the electronic charts. Overlapping or mosaic radar picture presentation
- Target data presentation in data tables and on the chart
- Static data of acquired target input manually, by automatic of invoking database or from AIS data
- Synchronous playback VTS and audio recorded data.
- Target and Navigational Aids alarms and warnings generation for whole responsibility area
- Target and Navigational Aids alarms and warnings generation for pre-set zones.
- Pre-set zones (traffic and guard) creation in form of polygons, circles or polygons with arcs by using of embedded editing tool
- Route creation, traffic management on route, special route alarms set in case of traffic rules violation
- System alarms and warning generation
- Meteo data presentation
- AIS data presentation and management
- System configuration administration
- Ships data (static and dynamic data) presentation
- AIS data management (sending/receiving of AIS telegrams, targets report rate control etc.)

At least the following navigational chart formats are supported:

1. S-57 electronic charts (IHO S-52 standard presentation) converted to

internal .cd8 format using Chart Assistant utility

2. GeoTIFF files (i.e. satellite images)
3. ERSI Shapefile (i.e. data from Geodetic Informational Systems)

Before start of work in the Operator Workstation the operator should logon into the system, using its own unique name and password. Logging of operator should be recorded to system and in order to make possible to determine operator, being on watch in any time period.

It should be possible to restrict the access to essential system features for shift operators:

- Chart editing
- Access level editing
- Parameters of VTS sensors connection
- Navigational zones adding, changing or deleting
- Default alarms settings
- Logging control

The following operation modes are available on Operator Workstation:

a) Demo mode

This mode is used for replay of the recorded log files (no sensor connections)

b) Standby mode

This mode is used maintenance purpose and sensor/ workplace configurations (no sensor connections)

c) Function mode

This is mode for normal operation (connections to all sensors)

The VTS should automatically provide following dynamic data to operator, which can be displayed in operator request:

- Coordinates, Speed, Course
- CPA/TCPA between two targets or target and selected arbitrary point

- Route data (for the targets assigned to the route)
- XTE (deviation from axis) and XTE trend
- DTE (distance to edge) and DTE trend
- Target ETA table to the Route Reference Points
- Distance to next Reference Points
- Rate of turn
- Navigational Status

Also the following information should displayed for Operator

- Special attention symbol
- Identity unconfirmed symbol
- Free text
- Track ID
- Identity unconfirmed indication

For targets in a route mode system should provide following features:

- Corresponding alarms generation in case of traffic rules violation
- Tracked target assignment on route with associated monitoring
- Graphical display of all targets progress along the route in range/time co-ordinates
- Target movement forecasting and simulation
- Specific route segments display (meeting prohibited, route reference point, etc.)
- Display target ETA schedule at the route reference points
- Display route reference point ETA schedule for all passing targets.

Following alarms should be supported:

- alarm status (on \ off)
- alarm type (alarm or warning)
- numeric threshold value
- sounds
- for predicted alarms - time from the alarm generation moment until the predicted event occurrence.
- Supported alarms:
- Domain breach: Collision danger
- CPA/TCPA
- Target acquired
- Target lost
- Prohibited zone approach
- Leaving anchor zone

- Entering anchor zone
- Entering restricted zone
- Enter/leave reporting zone
- Speed limit breach in traffic zone
- Unauthorised bearing in traffic zone
- Sudden turn
- Emergency (Mayday)
- Low position accuracy
- Crossing reporting line
- Loss on sensor
- Enter/leave route line
- Nav. status changed
- Anchor dragging
- Anchor domain violation (other target in anchor domain)
- Domain breach: overtaking on route
- Domain breach: meeting on route
- Domain breach: meeting on turn point
- Out of XTE (deviation from the channel axis)
- Dangerous DTE
- Course deviation on route
- Speed limit breach on route
- Turn point approach (route reference point or waypoint)
- Moorage exit
- Aids to navigation off its position
- Aids to navigation lost

From Operator Workstation an operator has access for all data provided by sensors:

- Radar and radar processors: radar picture and tracked target presentation;
- AIS tracked targets presentation;
- RDF bearing presentation
- Current CCTV positions, orientations and angle of view on the electronic chart.
- Weather station: Meteorological data presentation;

Following CCTV camera controls should be provided:

- One touch camera focusing on selected target
- One touch camera focusing on arbitrary chart object
- Capability to follow the target. In the follow mode selected target will be permanently on the Video display
- Graphic presentation of current CCTV camera position orientation and angle of view on the electronic chart
- Manual control of zoom, focus, pan and tilt position

- Auto focus functionality
- Control of camera Wiper/Washer

Following functions related to meteorological station should be provided:

- Presentation of weather/hydro data with calculation of average values and trends.
- Graphical control for presentation of wind speed and direction.
- Displaying of diagrams for monitored parameters with adjustable time interval.

## Radar

Radar are most common sensors designed primarily for land-based applications in vessel traffic management and coastal surveillance systems.

### Transmitter Characteristics

- **Magnetron Nominal Peak Power 25kW**
- **Magnetron Frequency 9410MHz**
- **Pulse Length/PRF**
  - 0.05µs/1760Hz Nominal
  - 0.25µs/1760Hz Nominal
  - 0.75µs/785Hz Nominal
- **Pulse Generator: Solid State with pulse forming network driving a magnetron**

### Receiver Characteristics

- **Logarithmic**
- **Low noise at front end**
- Automatic or manual Tuning
- IF centered at 60MHz
- IF bandwidth 20MHz (Short pulse) nom

- IF bandwidth 20MHz (Medium pulse) nom
- IF bandwidth 3MHz (Long pulse) nom
- Noise factor 5dB nominal

#### Antenna system

- Aperture Size:  $\geq 8$
- Horizontal Beam Width, 3dB (minimum):  $\leq 1,05$  degree
- Vertical Beam Width, 3dB (nominal):  $\leq 25$  degrees
- Sidelobes within 10 degrees of Beam (minimum): - 23dB
- Sidelobes outside 10 degrees of Beam (minimum): - 30dB
- Gain (nominal):  $\geq 30$ dB
- Polarization: Horizontal
- Limiting Relative Wind Speed: 99kt

### Radar Processor

Main functions of the Radar Processor are:

- radar video conversion to digital form;
- target detection in a Radar Video signal (extraction);
- target tracking, measurement of position and dynamic parameters;
- signal compression, thereby reducing the requirement for a high bandwidth data link;
- providing radar remote radar control

Radar adjustment and control functions provided by Radar Tracker should be the following:

- Radar transceivers on/off/standby
- Function of antenna starting and stopping
- Selection of the pulse length
- Selection of the pulse repetition frequency
- Blank sector of transceiver on/off
- continuous display of monitoring parameters like magnetron current, modulator voltage etc
- (password protected) manual/automatic rain/sea/gain control and remote setup (receiver frequency tuning, AFC, etc)

Following proprietary filtering should be applied:

- HF and LF adjustable digital video filtering
- CFAR
- Sweep-to-sweep correlation

- Spontaneous impulses and white noise suppression
- Clutter suppression

Following is the radar processing performance specification:

- IALA V-128 Advanced, or better

## AIS Receiver System

The Automatic Identification System (AIS) is designed for enhancing safety of navigation in the open sea and coastal waters through the automatic exchange of navigational, static and voyage information, as well as safety related information between the ships and coastal stations.

Automatic Identification System (AIS) is a maritime VHF-based transponder system that provides high-speed automated communication from ship-to-ship and ship-to-shore, of vessel, voyage and safety related data.

AIS Receiver get teh AIS navigation data from AIS-equipped vessels nearby and improves navigation safety. AIS Receiver is designed to inter-operate with AIS Class A, Class B transponders, AIS SART, AIS MOB, and any other AIS station operating on the AIS VHF data link.

The AIS Receiver is built with monitoring the default marine VHF AIS channels, i.e.161.975 and 162.025 MHz with optimized sensitivity.

AIS Receiver monitors the status of the vessels in the surrounding area, but also receive the dynamic information (position, speed, SOG, etc.), static information (ship name, MMSI, call sign, etc.), and voyage related information (cargo type, destination, etc.) from any vessels nearby that are equipped with AIS transponders. The receivers are equipped with standard USB and NMEA0183,



the AIS Receiver allows connectivity to most available peripherals.

Each transponder-equipped ship automatically reports information such as identity, call sign, position, speed and heading in few-second intervals to all other transponder-equipped vessels and shore stations within VHF radio coverage. Additional static and voyage-related information such as ship MMSI and IMO number, ship size, category of ship, cargo and ETA, are also included in the messages.

## VHF antenna

The minimal specification of VHF antenna

- Type: Dipole Antenna;
- Frequency: 156MHz to 163 MHz (Maritime band)
- VSWR: 1,5:1 or less
- Gain: 2dBi (0dBd)
- Surge protector

## List of Abbreviations

ABK	Addressed and binary broa
ABM, BBM	Addressed, Broadcast bina
AIR	AIS Interrogation Request
AIS	Automatic Identification Sy
Alias (Label)	Symbol identifier assigned identification among other t
Anchored Target	Target corresponding to determined position.
Appr Sp	Speed of mutual approach
ATD	Actual Time of Departure
Aton	Aids to Navigation.

BER	Bit Error Rate	
Brg	Bearing	
BS	base station	
COG	Course Over the Ground	
CPA	Closest Point of Approach	
CPA/TCPA Object	Target or any point object selected in a Chart Window for obtaining detailed numerical information on its mutual approach with the Reference Target.	
CSS	Coastal Surveillance System	
Crs	Course	
DB	Database.	
DGNSS	Differential Global Navigation Satellite System	
Dist	Distance	
DTE	Distance to Edge	
ECDIS	Electronic Chart Display and Information System	
ENC	Electronic Navigational Chart	
ERBL	Electronic Range and Bearing Line	
ETA	Estimated Time of Arrival	
FATDMA	Fixed Access Time Division Multiple Access	
Free Target	Target corresponding to the ship which does not observe any definite motion rules.	
GIS	Geographic Information system	
GMDSS	Global Maritime Distress and Safety System	
GNSS	Global Navigation Satellite System	
GPS	Global Positioning System	
IALA	International Association of Lighthouse Authorities	
ID	Identifier	
IHO	International Hydrographic Organization	
IMD	IMDG (International Maritime Dangerous Goods) Code	
IMO	International maritime Organization	

ITU	International Telecommunications Union	
MAC	Medium Access Control	
MMSI	Maritime Mobile Service Identity	
MOB	Man, Over Board	
ODU	Operator Display Unit	
Ref	Reference	
Reference Pair	Pair of targets: Reference Target – CPA/TCPA object (a target).	
Reference Target	Target selected in a Chart Window for obtaining detailed numerical information and/or fast input of commands via the menu.	
Route Target	Target corresponding to a vessel which must proceed along the previously determined route.	
RP	Reference Point	
RP Dist	Distance to the route's next Reference Point	
RP ETA	Estimated Time of Arrival in Route Reference Point	
RSSI	Receiver input signal strength	
SC	System Controller.	
Sensor	Source of information.	
SOG	Speed Over the Ground	
SVG	Scalable Vector Graphics standard	
SW	Software.	
SW	software	
TCPA	Time to Closest Point of Approach	
TDMA	Time-division multiple access	
TrAN	AIS Network.	
UN Number	UN numbers are four-digit numbers that identify dangerous goods. UN numbers range from UN0001 to about UN3500 and are assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods	
UTC	Universal Time Coordinated	
VDL	VHF Data Link	
VHF	Very High Frequency	

VTS	Vessel Traffic System	
WGS-84	World Geodesic System –84	
WP	Way Point	
XTE	Cross Track Error	
Z-order	Order of chart succession over each other in forming a composite image of an area.	