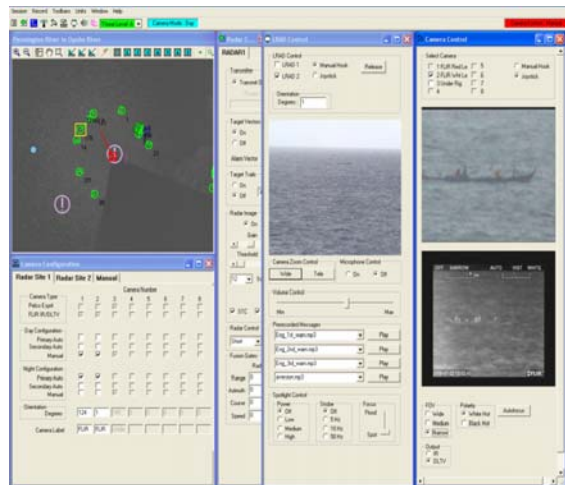
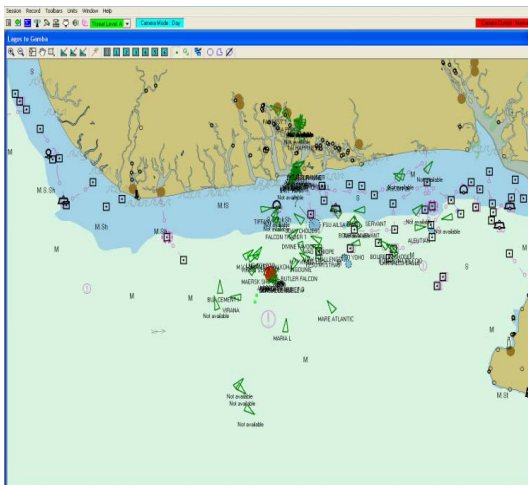




# HarborGuard-Pro

## Integrated Maritime Security & Surveillance System



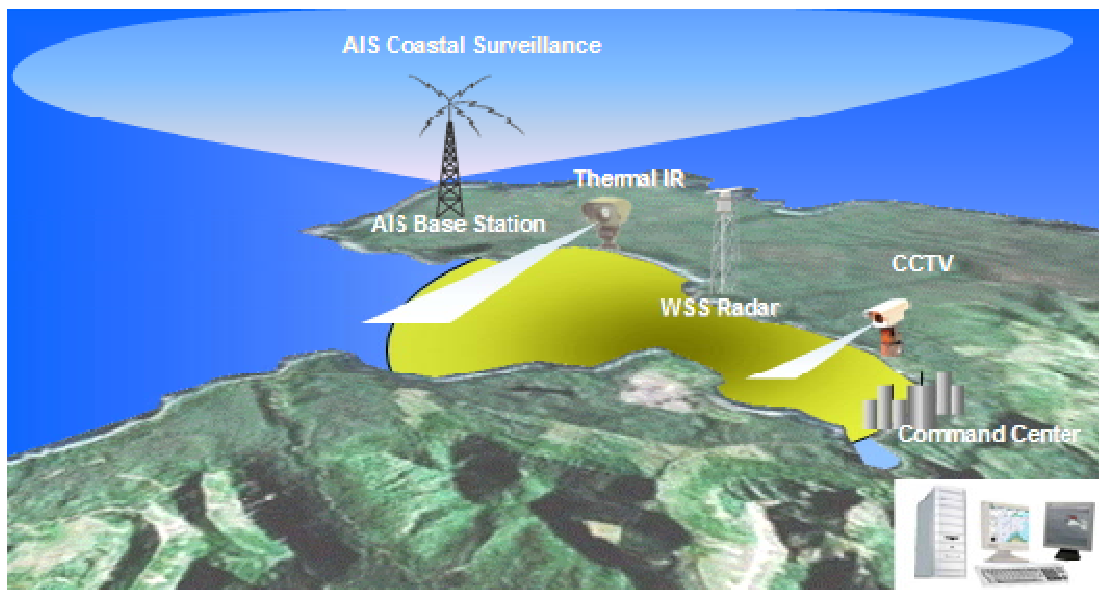
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This technical data and software is considered as Technology Software Publicly Available (TSPA) as defined in Export Administration Regulations (EAR) Part 734.7-11.7

## **Introduction**

Klein Marine Systems' HarborGuard®-Pro Integrated Waterside Security and Surveillance System is a multi-layered Maritime Security and Surveillance system for the protection of critical waterside facilities, infrastructure or assets. HarborGuard-Pro is a proven, high performance, cost effective solution for real-time monitoring of coastal areas, ports and waterfront facilities. The modular design of HarborGuard-Pro® hardware and software components provides a flexible solution which can be scaled and customized to fit any waterside security application.

HarborGuard-Pro technology has been implemented by both commercial and government customers to support security and surveillance applications in ports, harbor, offshore platforms, dams, and bridges. The system is designed to detect, monitor, track and identify very small targets and the detection ability of the system has been tested and verified against small boats (such as jet skis, rubber rafts, kayaks, and canoes), surface swimmers, floating mines and other simulated water-borne improvised explosive devices (WBIED). The system can be configured to automatically detect and classify all targets within the security zone. The detected targets can be classified using user-defined rule sets, and the system can alert the watch stander and automatically assign a camera to lock-on and track the target. Searchlights and loud hailers can also directed at the target to provide an automated deterrent capability HarborGuard-Pro can also integrate with thermal imaging devices, diver detection sonar sensors and automatic identification system (AIS) to ensure complete maritime situational awareness.



**Figure 1 - Waterside Security & Surveillance Concept**

HarborGuard-Pro is a flexible and scalable solution which can use several types of sensor suites to support a broad range of maritime security applications such as:

- Coastal Surveillance
- Maritime Border Surveillance
- Ports and Harbor Facilities
- Waterside Industrial Complex
- Nuclear Power Plants

- Dams, locks and bridges
- Military facilities security (Waterside bases, offshore ranges, mobile/forward deployed assets)

The system provides multiple layers of surveillance and protection against waterborne threats and intruders. The layered approach utilizes several sensor technologies offer a complete maritime picture in all visibility and weather conditions in a single operator console. This layered approach also enables the system to automatically detect and classify the targets and alert the user to potential threats. The sensor technologies supported include:

- Small Target Detection Radar for continuous surveillance of waterway approaches
- Small Target detection Radar to detect/track small targets (swimmers, small craft, floating mines)
- AIS receiver for interrogation and reporting of all AIS equipped vessels
- EO/IR Imagers integrated with target tracker to provide continuous visual tracking/recording
- Swimmer detection sonar to detect divers within the coverage area
- Loud Hailers to direct audible deterrence messages to tracked targets

## **System Overview**

The HarborGuard-Pro system is an open-architecture, IP-based sensor network system which fuses data from a wide range of sensors within an intuitive graphical user interface. A powerful and key feature of HarborGuard-Pro is the ability to define rule sets to define how a target can be automatically classified to set off response actions such as:

- Track the target via integrated camera
- Activate Acoustic and/or Visual deterrence systems
- Alert operator with visual and/or audible alarm based on target threat level
- Automatically record threatening targets

The target classification rule sets can include parameters such as:

- Vessel speed exceeds speed limit
- Vessel track changes abruptly
- Vessel is enters/about-to-enter security zone
- Vessel does not alter course when directed to do so

The system integrates the following sensor feeds:

- Maritime Surveillance Radar
- Automatic Identification System (AIS) receiver or transceiver system
- Integrated Thermal IR and/or visible light pan/tilt camera which can automatically lock-on and track targets.
- Acoustic Deterrent System

The system's open protocol also allows for integration with 3rd part command/control, video management, and physical security information management systems. This also allows for integration with 3<sup>rd</sup> party sensors which may already be resident at the site.



### Technical Description

The complete HarborGuard-Pro system may be comprised of one or more of the following major components in any combination:

#### Command Center Workstation

- HarborGuard-Pro Software
- Operators Console

#### Remote Radar/AIS Site

- Series 2000 Small Target Detection Radar or other 3<sup>rd</sup> party Maritime Surveillance Radar System
- AIS Base Station or Receiver
- High resolution plot extractor and image processor
- Target Tracker (1000 Track Capacity)

### **Camera Site**

- EO/IR Camera
- Pan/Tilt/Zoom Mechanism

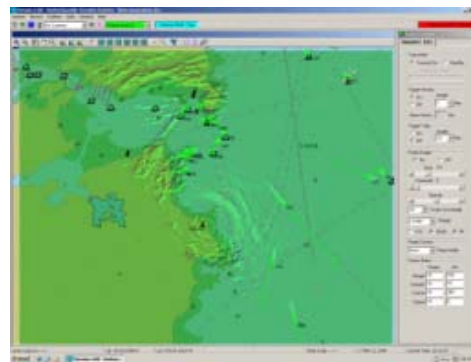
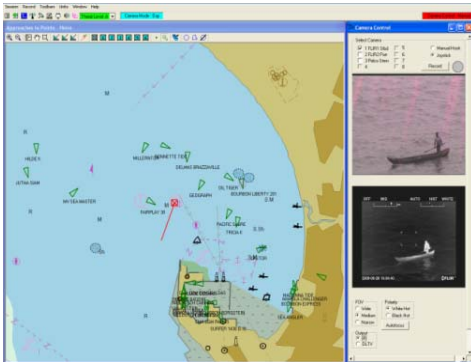
### **Acoustic Hailer Site**

- Acoustic Hailer System
- Pan/Tilt Mechanism
- Integrated Camera (Optional)
- Integrated Spotlight (Optional)

### **HarborGuard-Pro Workstation**

The HarborGuard-Pro workstation hosts Klein Marine Systems' HarborGuard-Pro application software. The workstation is a PC based platform using Windows operating system. The baseline HarborGuard-Pro system includes a detailed digital nautical chart as the geographic background display. Optionally, a high-resolution overhead satellite image of the area of interest is available as the background geographic image. Logically arranged and easy to use menu lists and icons provide the operator access to all operational features. Graphical control panels provide the operator access to control functions for radars, cameras and AIS.

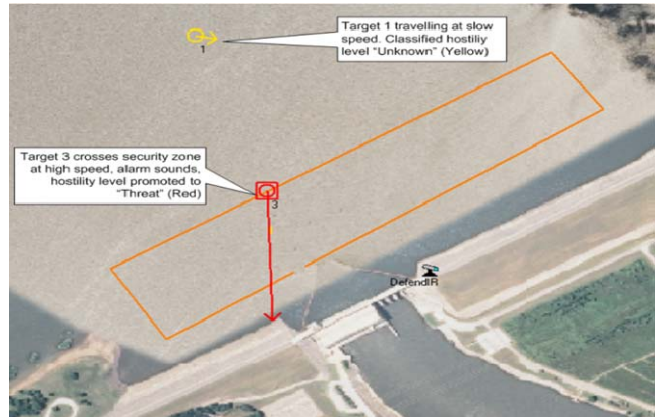
Each HarborGuard-Pro workstation connects to remote radar site sensors via the IP network. Real-time radar target data from all connected radars are processed for display on the HarborGuard-Pro map display. Each radar transmits track reports (all targets being tracked) once every antenna scan, providing unmatched, real-time presentation of data. In addition, AIS transponder reports from all AIS equipped vessels within the coverage area are processed and displayed on the HarborGuard-Pro map.



Radar target symbols include a displayed vector, which provides the operator with a quick visual assessment of the location, direction of movement and speed of all targets. With mouse double-click action the operator can roll over any individual radar target to open up the detailed information window which displays the numeric values of range and bearing (from the radar sensor), Lat/Long, speed and course, as well as hostility level. This radar information window also includes text fields where the operator can annotate the target data that is then saved with the radar track log data.

Radar target symbols are color-coded based on the HarborGuard-Pro Hostility Level criteria. Initially, a yellow "Unknown Target" symbol indicates newly detected radar targets. The hostility level definitions are as follows:

- Yellow ( Unknown) - Initial detection state
- Green (Neutral) - User defined classification rule
- Red ( Hostile) - Security perimeter violation as defined by user
- Blue (Friendly)- Known security assets or cleared vessels

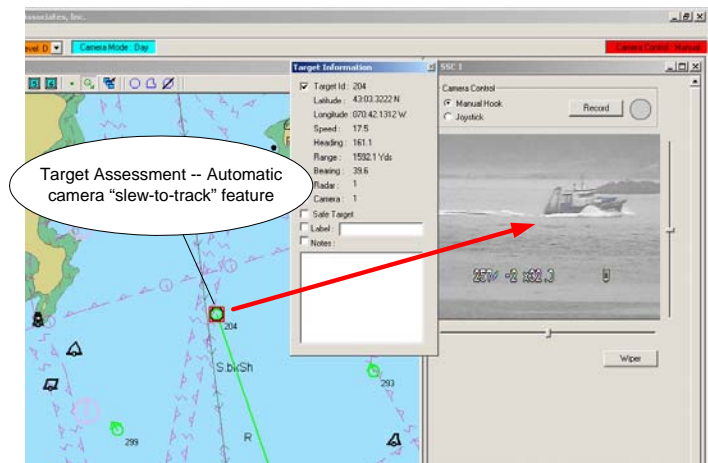


AIS targets are presented on the HarborGuard-Pro display using the international standard AIS track symbol (triangle). The AIS symbol also includes the identity tag, which will show the vessel's name. The operator, using mouse roll-over and double-click, can query the AIS symbol to open the AIS information window which will show all vessel data including; MMSI, Name, vessel type, speed, course, heading, nationality, navigation status, destination, ETA and many other parameters.

The HarborGuard-Pro track management processing analyzes and compares all radar and AIS targets to determine those targets that correlate as one track. This assures that the same vessel reported separately by a radar and the AIS receiver are fused on the HarborGuard-Pro display as one target track symbol, identified as a fused Radar/AIS track. In addition, where multiple remote radar sites have coverage overlaps, target reports from multiple radars are compared, and where the fuse gate parameters match, a single track symbol is presented on the HarborGuard-Pro screen. The fuse gate parameters measure several track features including position, course and speed.

### Target Assessment and Classification

HarborGuard-Pro solution can include a dedicated Thermal IR or Visual Light camera located at each remote radar site. The cameras are connected to HarborGuard-Pro through an Ethernet (TCP/IP) connection such that the operator can "point and click" on an acquired target track and lock the camera onto the target by sending commands to the pan-tilt-zoom mechanism. The camera viewing window will "pop-up" automatically and HarborGuard-Pro will automatically slew the camera pan/tilt to keep the target in the field of view. It is not necessary for the operator to follow the target with a joystick.



A powerful and important function of the HarborGuard-Pro system is the ability to create geographic zones that can be associated with configurable rules. The user can create and save an unlimited number of zone polygons using simple onscreen drawing tools or by entering a list of polygon point latitude and longitude values.

Each zone created in the HarborGuard-Pro system can be associated with one or more rules. The rule defines a specific behavior that is monitored, and an action is defined based on the rule being satisfied. Examples of the types of rules that can be defined:



**Target Entry** Target crosses the zone perimeter boundary

**Target Exit** Target leaves a zone

**Target Approach** Target is within a predicted time-to-go before entering a zone

**Target Speed** Target's speed exceeds the pre-set value

**Target Course** Target deviates from a pre-set channel course

The following properties and actions can be assigned to any of the above example rules:

- Assign date-time parameters to alerts i.e. weekend only, time-of-day, calendar date, etc...
- Associate this rule with MARSEC Level
- Associate the rule with target hostility level i.e. friendly (known) target or hostile (unknown) target

Actions that can be triggered for each alert:

- Sound audible alert
- pop-up configurable text instructions
- automatically assign the nearest camera to the violating target

## **Datalogging and Recording**

The HarborGuard-Pro system provides automatic recording of critical system data for 30 days or more. The recorded data includes:

**Track Log** CSV track logfile of track data records 15 minute intervals of: Datetime, Radar ID, Track ID, Camera ID, Position, Course, Speed, threat level, and user notes.

**Event Log** CSV diagnostics logfile of target alerts, system alarms, user actions and error messages.

**Recording/Playback** All radar tracks are recorded in a proprietary format to support the HarborGuard-Pro visual radar play-back operation. Any previous event can be played back on the HarborGuard-Pro map display. This provides a useful visual play-back of prior situations for post event analysis or for training purposes.

## **XML Support**

The HarborGuard-Pro system provides an XML data port where external systems can subscribe to HarborGuard-Pro track and event data in real-time. This XML server feature provides a means to integrate to other external security applications.

## **Built-in Test and Diagnostics**

The HarborGuard-Pro system incorporates a number of automatic and manual test features for fault detection, troubleshooting and health monitoring. The HarborGuard-Pro Operator Workstation computers and the RadarPro Advanced Radar Processor computers include a remote access capability using the Famatech RAdmin remote desktop access products. With proper firewall permissions,

credentialed external users can access each computer desktop with full privileges. The RAdmin features test or voice-chat session features that provide real-time communications between local operators and the Klein Marine Systems remote help desk. With the RAdmin feature, the remote technician can also download log and error files for offline analysis. The RadarPro Advanced Radar Processor also includes a radar health monitoring utility that runs in the background. This utility continually monitors radar power levels, receiver performance, power supply voltages, internal temperatures and communication link quality. Out of tolerance readings are logged and a fault warning is activated which can be queried remotely by the operator or by the Klein Marine Systems remote help desk.

## **Contact Information:**

Please contact the following for more information regarding the HarborGuard-Pro system:

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