![Terasaki logo] **TERASAKI**

# MEGA-GUARD *E series*

## MACHINERY CONTROL & MONITORING SYSTEM



Mega-Guard MCMS Workstation

CONTROL, ALARM
AND MONITORING

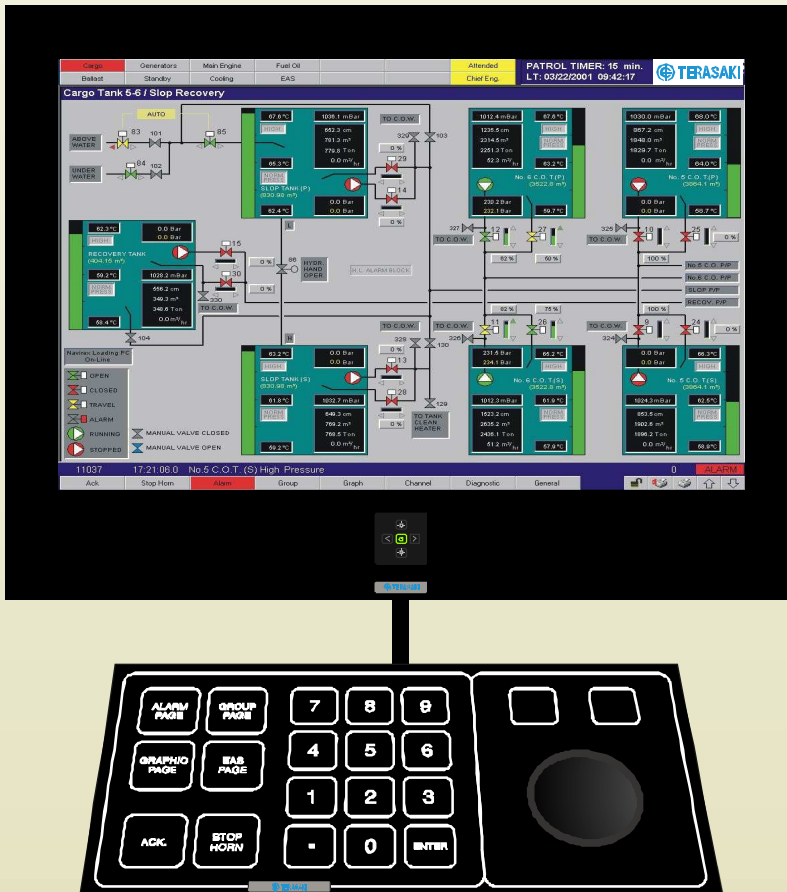EXTENSION ALARM SYSTEM

EASY TO USE AND
RELIABLE WORKSTATION

DISTRIBUTED PROCESSING
UNITS INSTALLED IN E.R.,
C.R. AND/OR CARGO ROOM

STANDARD AND
REDUNDANT ETHERNET
NETWORKING

CLASS TYPE APPROVED

# THE BEST ROUTE TO SHIP AUTOMATION AND NAVIGATION!

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## MCMS Features



Operator Workstation with Color Graphic Screen and
user-friendly Operator Keyboard with Trackball

### Functions:

The Mega-Guard Machinery Monitoring and Control System is the perfect automation solution for medium to large size vessels. It can be used as a stand-alone Machinery Control and Monitoring System or the Mega-Guard can be extended with Power Management, Cargo Control, Propulsion Control, Integrated Navigation and Dynamic Positioning functions.

The Mega-Guard Ship Automation System is the most reliable and field proven automation system as can be found on the market because of the following facts:

- Operator Workstations built-up with Marine Personal Computers under Windows XP embedded operating system and redundant Ethernet link. Solid state disk is applied instead of hard disk. Main and Back-up Workstation to further ensure safety and reliability
- Distributed Processing Units built-up with Control Processors equipped with I/O Module and redundant Ethernet link. Each I/O Modules has its own isolated sensor supply and earth fault detector.
- Extension Alarm System is built-up with EAS Operator Panels equipped with a graphic LCD display and 12 illuminated pushbuttons with redundant Ethernet link.

- Whole system inter-connected by redundant Ethernet link. Cabling with Star topology or Ring topology or a combination of Star and Ring topology.
- Whole system operating directly on 19-32VDC power supply and all components have low power consumption.
- Uninterruptable Power Supply providing fail safe 24VDC output.
- Programming in accordance with international PLC programming standard IEC61131-3 (ST).
- Type approved by all major class classification societies.

### Operator Workstations:

An Operator Workstation consists out of a TFT colour graphic screen, Operator Keyboard with Trackball, Marine Personal Computer and optional Printer. The Operator Workstation provides a reliable and user-friendly operator interface to ensure safe operation. The Operator Workstations are connected to each other via the redundant Ethernet link based upon UTP cabling. Two Operator Workstations, called the Main Server and the Back-up Server, are communicating via the redundant Ethernet link with the Control Processor with I/O Modules (Distributed Processing Units) and to the Extension Alarm System. This ensures a full redundant lay-out. Client Operator Workstations communicate with either the Main Server or Back-up Server Operator Workstation via the redundant Ethernet link. The On Duty Selection and Engineer Calling functions are fully redundant as upon failure of an Operator Workstation, the extension alarm system functions are automatically transferred to a back-up Operator Workstation.

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# I/O Modules & Extension Alarm

## Distributed Processing Units:

Control Processors with I/O Modules (also called DPU) are mounted on a DIN rail; close to sensors and actuators to minimize cabling. The Control Processor is connected to the redundant Ethernet link for communication with the Main and Back-up Server Operator Workstations and for communication with other Control Processors. Each I/O channel on an I/O Module has a LED indication and a channel identification text window. This can be used for back-up and local read-out of alarms and status. Each I/O Module is equipped with an isolated sensor supply in order to feed sensors. In addition, the I/O Module contains an earth fault detector. A Control Processor with I/O Modules fully executes control, alarm and monitoring functions even when no Operator Workstation is connected. Programming of control functions is done via the programming language PAL1131 which is in accordance with international PLC standard IEC61131-3 (ST).
Sensors and actuators are directly wired to the detachable terminal strips on the I/O Modules.

The Machinery Monitoring and Control System executes the following functions:

- Alarm and monitoring
- Exhaust gas monitoring
- Tank gauging
- Master / Stand-by pump control
- Motor / Pump starter
- Compressor control , Master / follower
- Valve Control and monitoring
- Temperature Control (PID)
- etc.

The following I/O Modules are available:

- 36 channel Digital Input I/O Module
- 18 channel Digital Input and 18 Relay Output I/O Module
- 24 channel Analog Input I/O Module
- 24 channel Mixed I/O Module with 4 Analog Outputs and 20 configurable Inputs and/or Outputs (AI, AO, DI, DO, PI)
- 31 channel PMS I/O Module

A Control Processor supports up to 8 I/O Modules and supports up to 4 Serial links to external devices. Serial interface links will be connected via the Modbus RTU or NMEA protocol (other protocols optional). The Control Processors and I/O Modules and Serial link interfaces are installed in DPU Cabinets or inside a console on a DPU DIN rail.
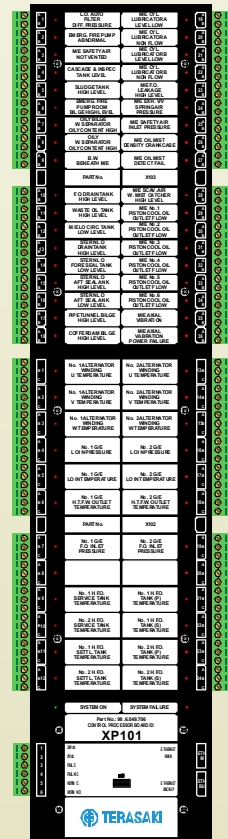

Control Processor with
2 I/O Modules
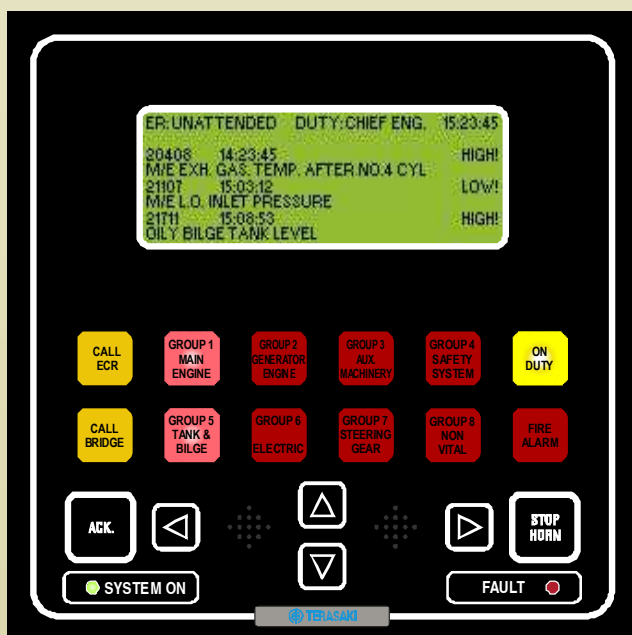

EAS Operator Panel

## Extension Alarm System

The Extension Alarm System is a highly reliable engineer calling system, which extends the Mega-Guard Ship Automation System for unmanned machinery space operation. On Duty Selection and Engineer Calling functions are executed on a dedicated mimic on the Operator Workstation.
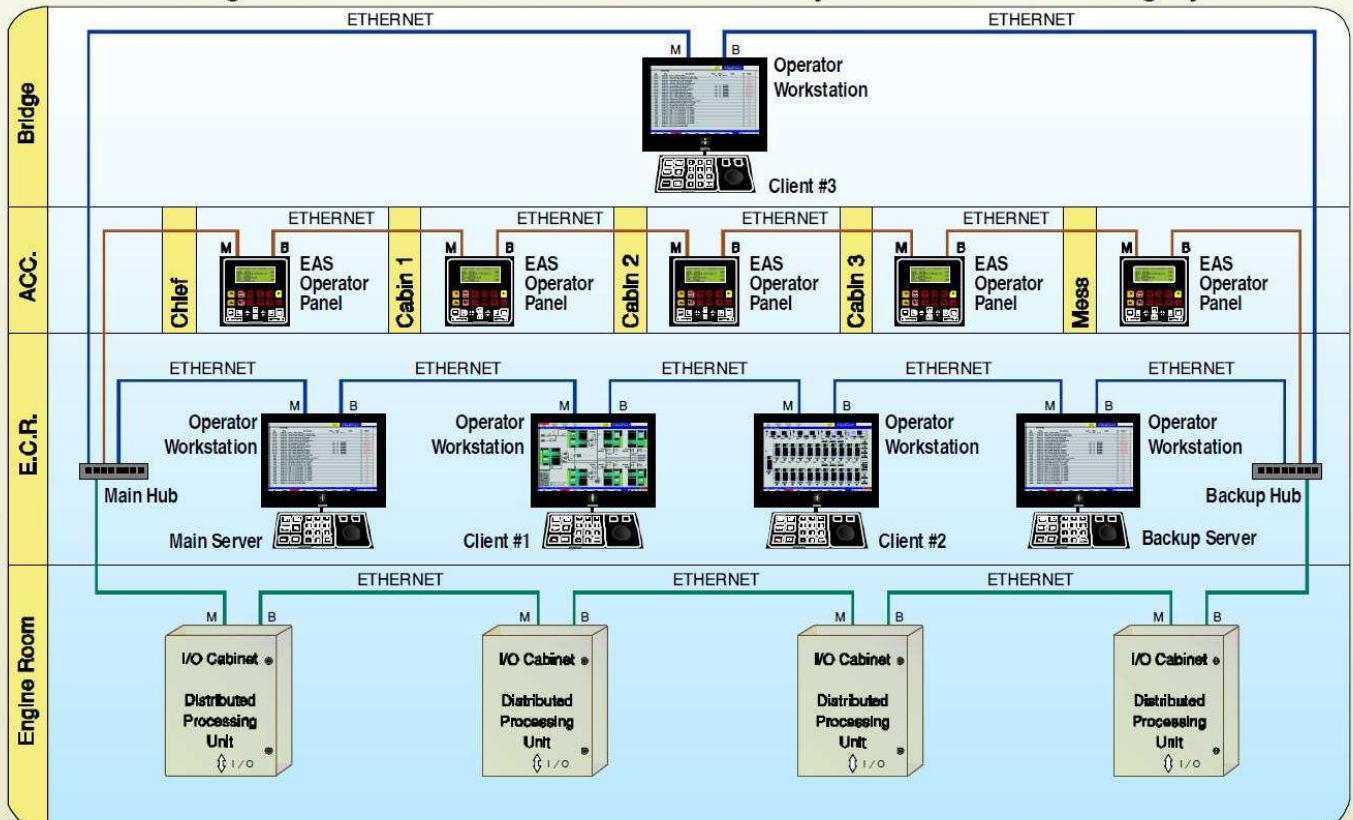
The dedicated mimic display on the Operator Workstation contains the following fields:

- On duty selection
- Attended / unattended (manned / unmanned) engine room
- Engineer calling,
- Patrol timer / engineer safety system (dead man timer)

EAS Operator Panels are installed in Bridge and Accommodation areas. The EAS Operator Panels are equipped with the following:

- 8 line / 40 character display displaying individual alarms
- On Duty lamp
- 8x Group Alarm lamp & buzzer
- Fire Alarm lamp with buzzer
- Call ECR / Call Bridge pushbutton / lamp
- Accept / Stop Horn pushbutton
- Dimming pushbuttons (Arrow Left / Right)

# Block Diagram MEGA-GUARD E series Machinery Control & Monitoring System



**Bridge**

ETHERNET — ETHERNET

Operator Workstation
Client #3

**ACC.**

Chief — ETHERNET — EAS Operator Panel
Cabin 1 — ETHERNET — EAS Operator Panel
Cabin 2 — ETHERNET — EAS Operator Panel
Cabin 3 — ETHERNET — EAS Operator Panel
Mess — ETHERNET — EAS Operator Panel

**E.C.R.**

ETHERNET — ETHERNET — ETHERNET — ETHERNET — ETHERNET

Operator Workstation — Operator Workstation — Operator Workstation — Operator Workstation

Main Hub
Main Server — Client #1 — Client #2 — Backup Server
Backup Hub

**Engine Room**

ETHERNET — ETHERNET — ETHERNET

I/O Cabinet — Distributed Processing Unit — I/O
I/O Cabinet — Distributed Processing Unit — I/O
I/O Cabinet — Distributed Processing Unit — I/O
I/O Cabinet — Distributed Processing Unit — I/O

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## Overview of the MEGA-GUARD E series Ship Automation and Navigation System



Integrated Navigation System

Propulsion Control System

Dynamic Positioning System

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Generator Control and Power Management System

Machinery Control and Monitoring System

Cargo Control and Monitoring System

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