

YP703 Overview

CDR Croteau, April 2023

Outline

- General Information
- Systems
- Alarm, Control & Monitoring System
- PLC Specifics



General Information

Builder: C&G Boat Works Inc. (YP 703 through YP 708)

Propulsion: 2x715 bhp (2x448kw) Cat C-18 diesel engines at 2,100 RPM, 2 fixed pitch propellers

Length: Overall: 119 feet (36.3 meters); Waterline Length: 109 feet (33.2 meters)

Beam: 27.9 feet (8.51 meters)

Displacement: 227.6 Metric Tonnes (223.9 long tons)

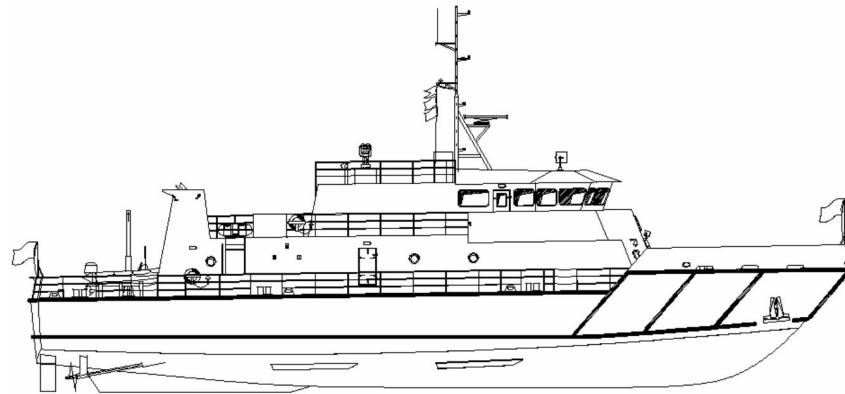
Draft: 7.5 feet (2.27 meters)

Speed: 12.6 knots (23.3 kilometers per hour)

Range: 1,680 nautical miles at 10 knots (3,485.5 kilometers)

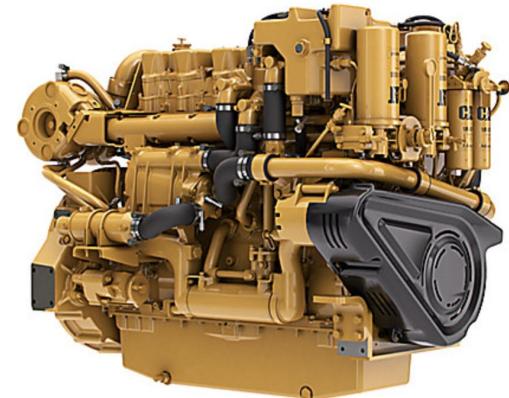
Crew: Officers: 4 Crew: 6 Midshipmen: 30

Ships: (YP 703-708), United States Naval Academy, Annapolis, Maryland



Systems

- Main Engine (x2) **CAT** C18 ACERT Marine Diesel
 - Power Range 454-715 bhp (339-533 kW)
 - Speed Range 1800-2100 rpm
 - Displacement 1106 in³
 - Configuration In-line 6, 4-Stroke-Cycle Diesel
- Diesel Generators (x2) CAT
 - 480V, 99 KW, 3-phase AC
- Emergency Generator
 - 480V, 45 KW, 3-phase AC



Alarm and Monitoring System Overview

The integrated (AMS) Alarm, Control & Monitoring System "MAX II" has been developed to be as user friendly as possible. All screens have been developed to minimize the amount of training required to operate the system.

The system design is based on intelligent distributed I/O modules grouped inside local units. Each unit is able to accommodate up to eight (8) I/O modules.

Data from each local unit is available through high speed data bus. This data can then be received by a central processor (Alarm, Control & Monitoring PLC). The Alarm, Control & Monitoring PLC's main purpose is to centralize the hardwired data which can then be sent to operator workstations.

MAX II Sections

The Alarm, Control & Monitoring System is divided into four (4) principal sections:

- Local input/output units
- Programmable logic controllers
- PC units
- User interfaces
- Auxiliary alarm units

Other Section Descriptions

1.1 LOCAL INPUT/OUTPUT UNITS

These units are responsible for the collection of information relative to the state of different principal and auxiliary equipment on the vessel, and where required, they also control output for control purpose. All the machinery requiring constant surveillance interfaces with the Central Alarm, Control & Monitoring System at this point. These units are located close to the vessel's main machinery. They have the possibility to support digital and analog signals.

1.3 PC UNITS

The two (2) PC units have the responsibility of managing the alarm database and interfacing with the operator. Each PC unit also has a set of programs working full time to operate the logic necessary for the redundancy. All this is integrated in the MAX II software installed on the PC units.

1.4 USER INTERFACES

User interfaces are accessible via 6 monitors where the operator can interact with MAX II software to get the status of his machinery state and alarms.

1.5 AUXILIARY ALARM UNITS

These units, located at strategic points on the vessel, are composed of a silence push button, and depending on the station, an audible and/or a visual alarm (Group alarm). The units that are not crucial to the safe operation of the ship can be enabled or disabled from the « Configuration» screen.

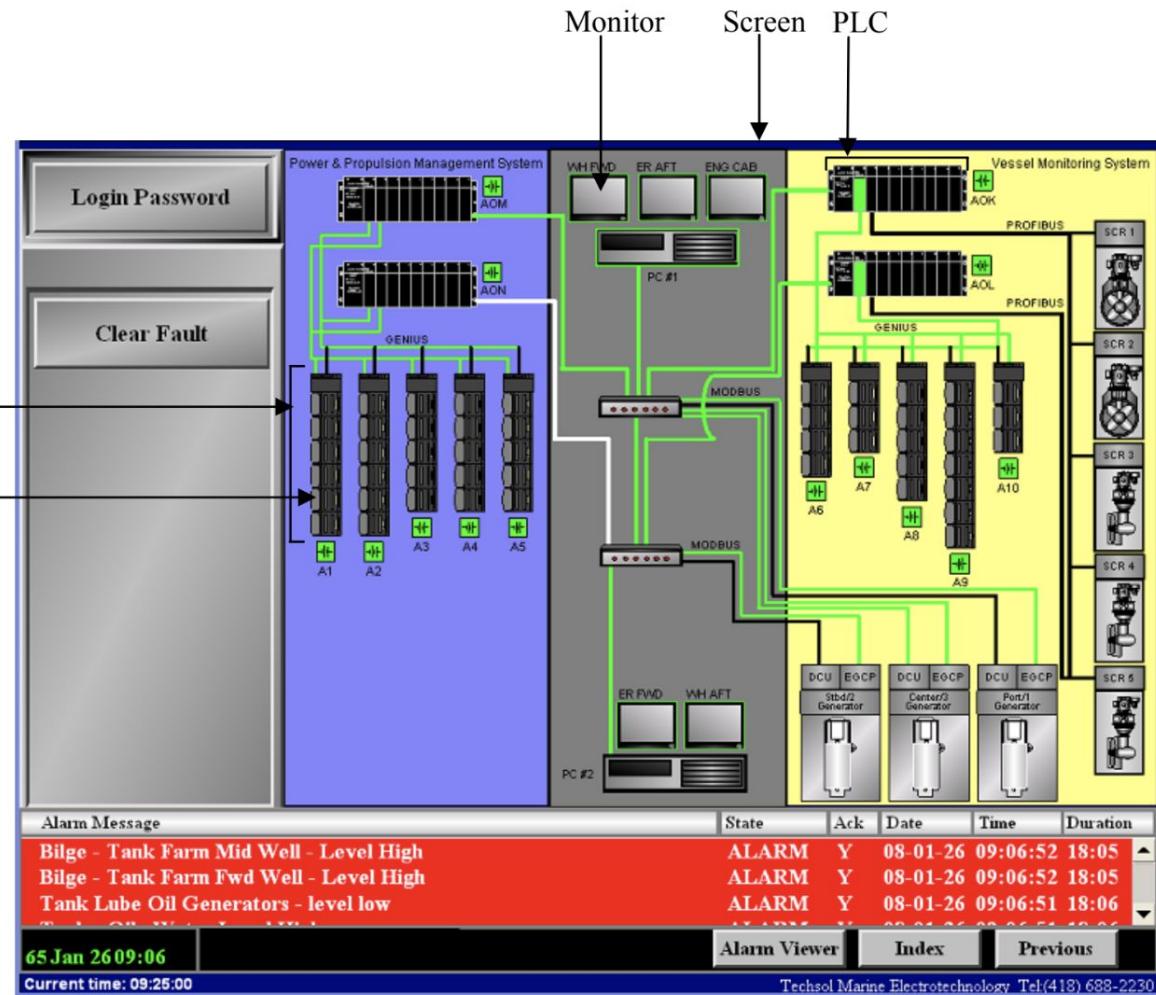
The « System Admin » screen gives the operator an overview of all the data links onboard and their status.

GREEN – Currently exchanging data & functional

BLACK – Currently not exchanging data & functional status is unknown

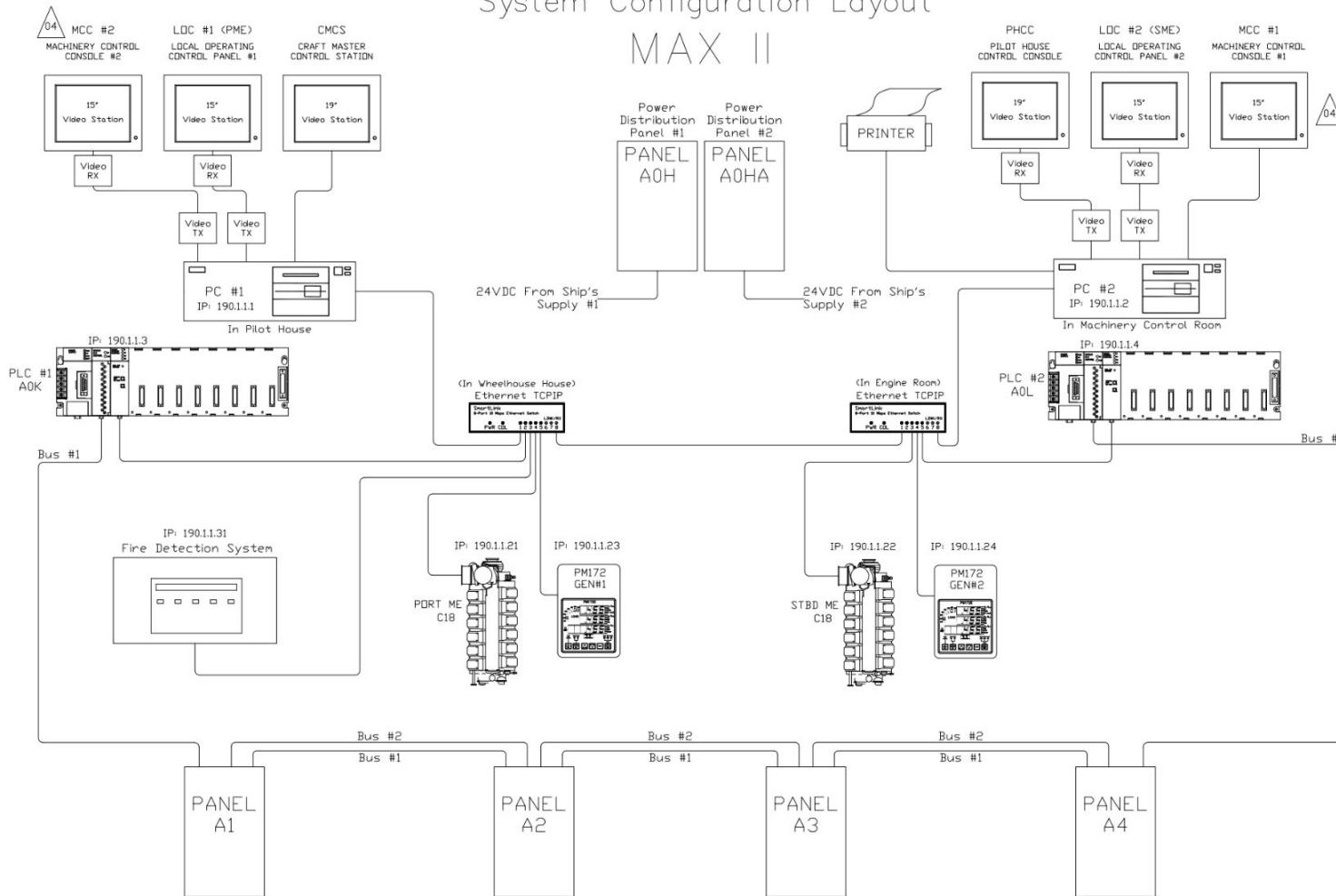
WHITE – Currently not exchanging data & functional (in standby)

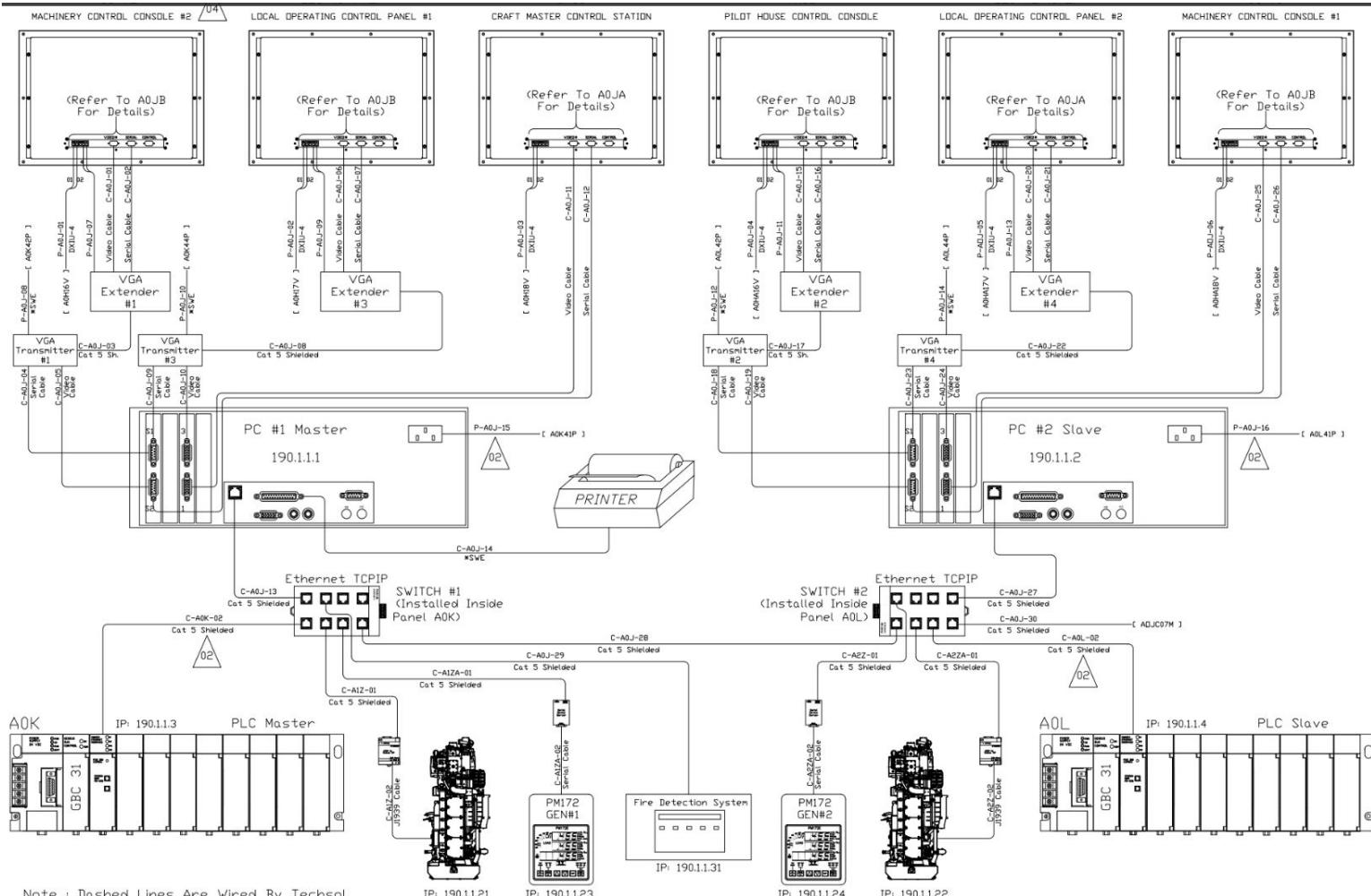
I/O Panel
I/O Module



System Configuration Layout

MAX II





Note : Dashed Lines Are Wired By Techsol.
*Swe : Supplied with equipment

PLC Intro

The two (2) programmable logic controllers have the responsibility to centralize all information received from the different equipments. They act as a link between the user interfaces and the system's input/outputs. They gather, in a central data base, information received by both the equipment and the operator through one of the touch screens. Based on the information received, they will take the appropriate action based on the assigned instruction (program). The two (2) PLCs work in redundancy. In normal operation, all user interfaces are logged to the PLC connected to the first PC on line. Should this PLC fail for any reason, the other PLC will take over and keep full control and monitoring of the vessel. In this mode of operation, all user interfaces will be logged to this PLC.

In the Alarm, Control & Monitoring application, the programmable logic controller's main duties are:

- Generation of audible and visual alarms
- Report of system faults

GE Fanuc VersaMax PLC

2 Serial Ports: RS-232/RS485

1285 K, User Configurable Memory

10 mBit Ethernet Port

Supports EGD & SRTP

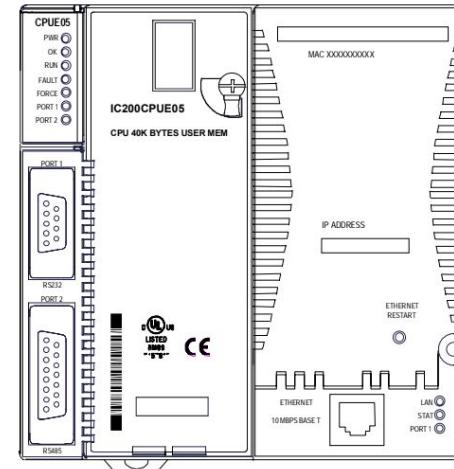
650 mA, Backplane Current

Requires 3.3 Volt DC Power Supply

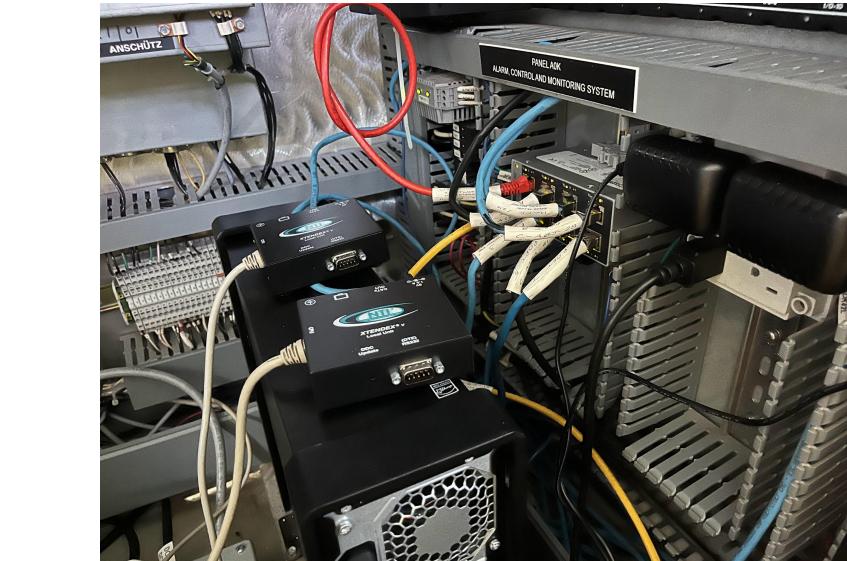
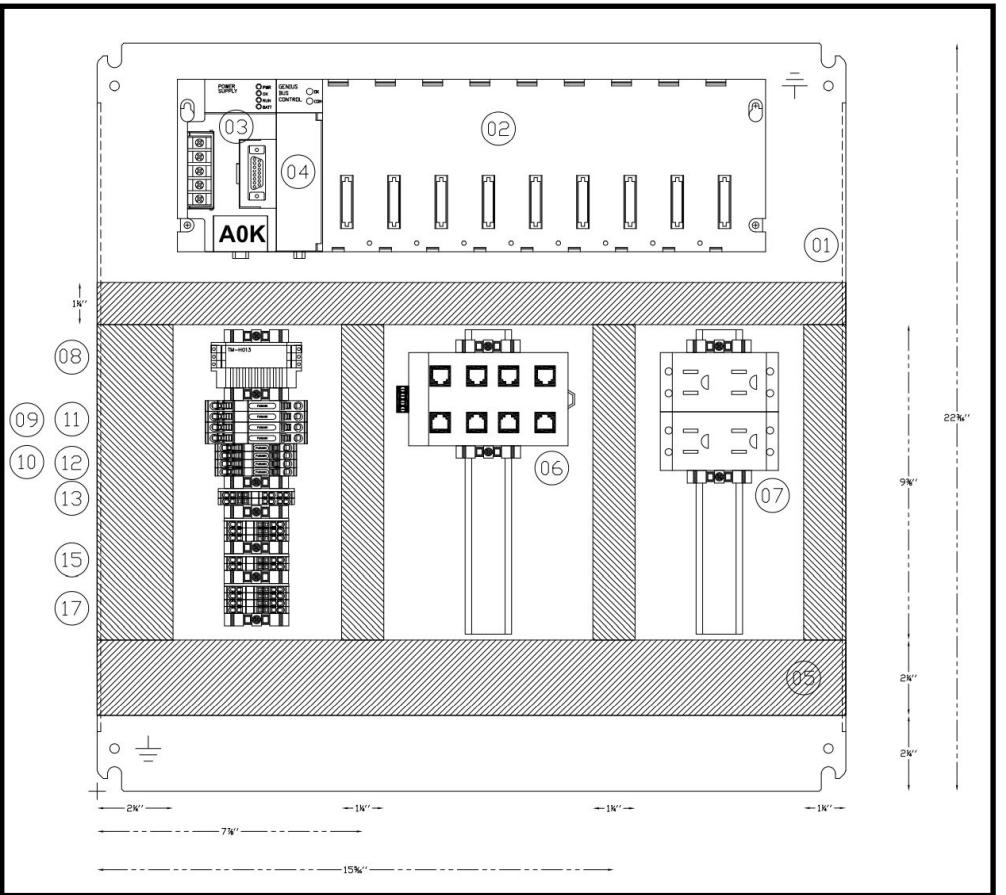
IC200CPUE05: CPU with Two Serial Ports, Embedded Ethernet Interface, and 64K Configurable Memory

VersaMax® PLC CPU IC200CPUE05 shares the basic features of the other VersaMax PLC CPUs. It provides powerful PLC functionality in a small, versatile system. CPUE05 can serve as the system controller for up to 64 modules with up to 2048 I/O points. Two serial ports provide RS-232 and RS-485 interfaces for serial communications. CPUE05 also provides a built-in Ethernet Interface. The RS-232 serial port can be configured for Local Station manager operation to provide access to diagnostic information about the Ethernet interface. CPUE05 has 64kB of configurable memory.

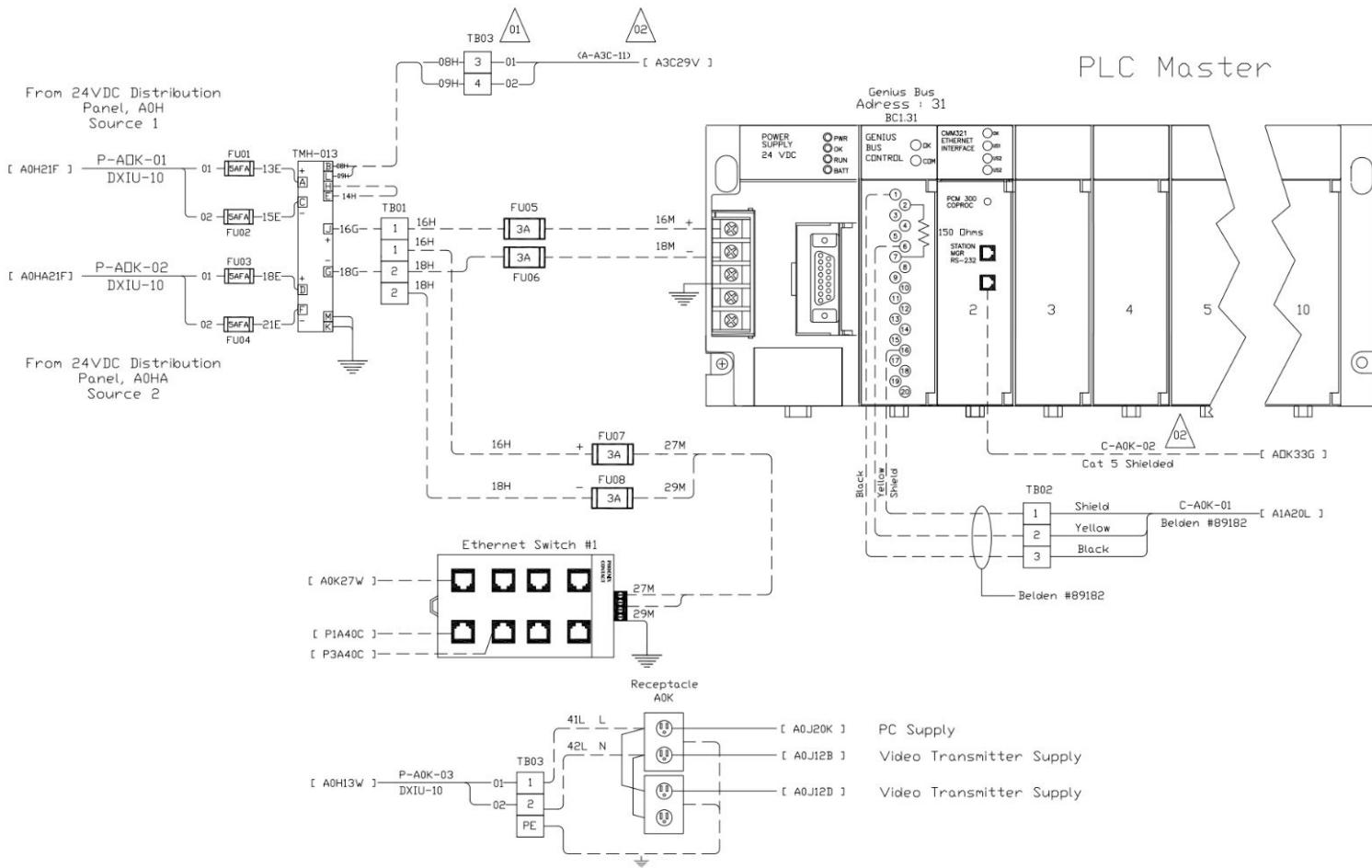
In addition, CPUE05 is compatible with the EZ Program Store device, which can be used to write, read, update, and verify programs, configuration, and reference tables data without a programmer or programming software.



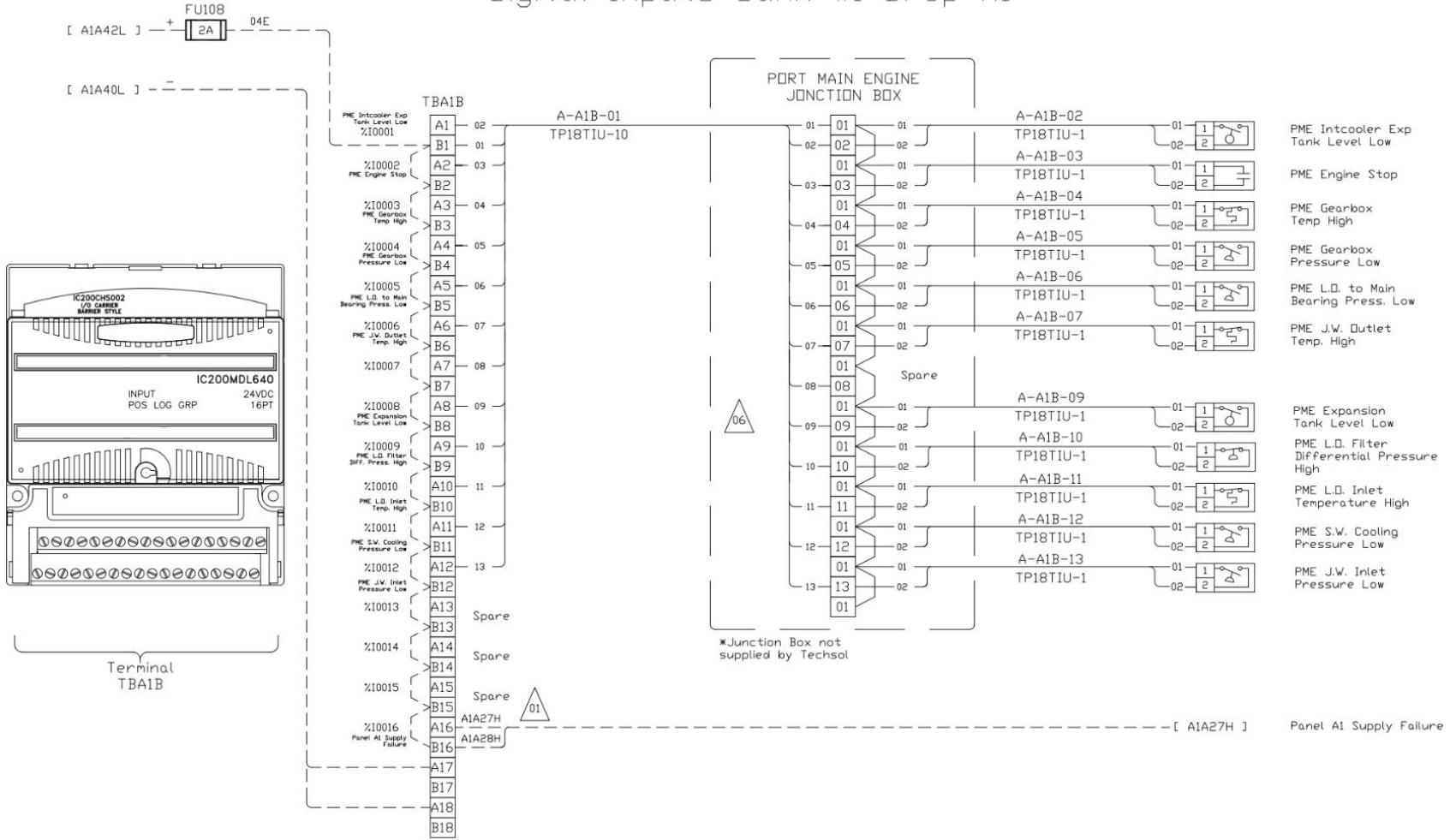
https://www.youtube.com/watch?v=WD_A7DUGdXw



PLC Master

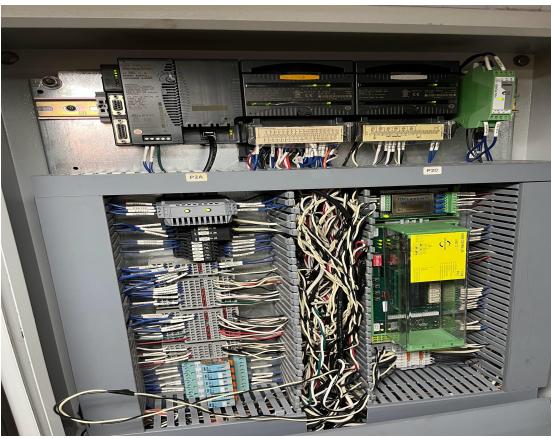
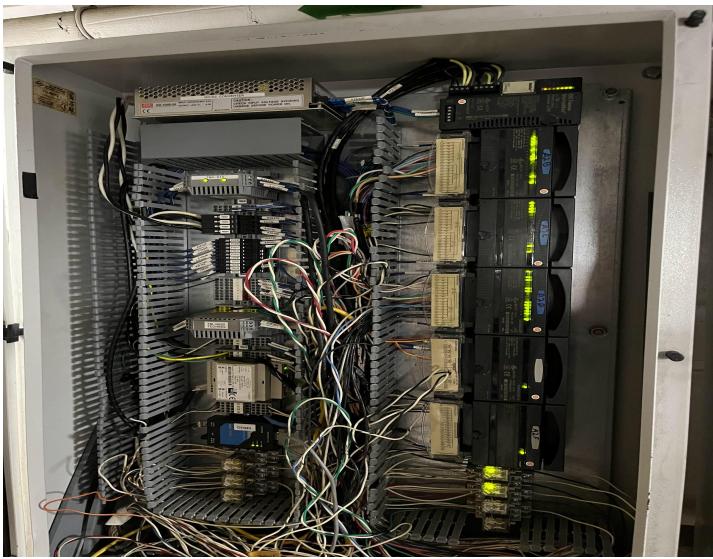


Digital Inputs Bank #1 Drop A1



Equipment: **MAX II**

<i>Description</i>	<i>Type</i>	<i>I/O</i>	<i>Low Alarm</i>	<i>Low Warning</i>	<i>Hi Warning</i>	<i>Hi Alarm</i>	<i>Time Delay (Sec.)</i>	<i>Unit</i>	<i>Sensor supply by</i>	<i>Remark</i>
A1B										
PME Intercooler Expansion Tank Level Low	DI-SRC	%I001		1=ok 0=alarm			10		CAT	
PME Engine Stop	DI-SRC	%I002		1=ok 0=alarm			1		CAT	
PME Gearbox Temp High	DI-SRC	%I003		1=ok 0=alarm	239F		1		CAT	
PME Gearbox Pressure Low	DI-SRC	%I004	25	1=ok 0=alarm			5		CAT	
PME L.O to Main Bearing Pressure Low	DI-SRC	%I005	20	1=ok 0=alarm			5		CAT	
PME J.W. Outlet Temp. High	DI-SRC	%I006	210F	1=ok 0=alarm			1		CAT	
	Spare	DI-SRC	%I007							
PME Expansion Tank Level Low	DI-SRC	%I008		1=ok 0=alarm			10			
PME L.O. Filter Differential Pressure High	DI-SRC	%I009		1=ok 0=alarm	15		10		CAT	
PME L.O. Inlet Temperature High	DI-SRC	%I010		1=ok 0=alarm	239F		1		CAT	
PME S.W. Cooling Pressure Low	DI-SRC	%I011	5	1=ok 0=alarm			15		CAT	
PME J.W. Inlet Pressure Low	DI-SRC	%I012	13.1	1=ok 0=alarm			15		CAT	
	Spare	DI-SRC	%I013							
	Spare	DI-SRC	%I014							
	Spare	DI-SRC	%I015							
Panel A1 Supply Failure	DI-SRC	%I016		1=ok 0=alarm			1	Techsol	Interposing Relay	



GE PLC Communications

VersaMax gives you the freedom to connect to a wide variety of host controllers, including PLC, DCS and PC-based control systems by way of PROFINET (remote I/O only), Modbus/TCP, and other Ethernet networks as well as Genius, DeviceNet, Profibus-DP. VersaMax also fully supports the power and open architecture of Emerson's PC Control solutions

Many PLC manufacturers have proprietary protocols. Others can operate over a range of standard protocols allowing ease of interoperability among a variety of vendors. GE developed such proprietary protocols, and they remain in use with their current and legacy PLCs today.

Genius was developed as a mode of communication across GE PLCs of different series. It utilized the [**Genius Bus**](#) and allowed seamless communication between GE controllers of various types.