

Librascope's Advanced Color Work Station (ACWS)

The Librascope Advanced Color Work Station (ACWS) is a militarized, multifunction processor and display console which provides color graphics, digital optronics, and controls for shipboard applications.



Librascope

Librascope's Advanced Color Work Station (ACWS) is a fully militarized, multifunction processor and display console which provides demonstrated very high speed color graphics and digital television images. The ACWS is designed for use in varied stand-alone applications or integrated system environments. Application areas include: sonar, optronics, radar, C³I, navigation, and weapon control. ACWS is a standard next generation display console modularly constructed for adaptability to all naval shipboard and shorebased display and control requirements.

CAPABILITIES/FEATURES

The demonstrated performance capability of Librascope's ACWS for unrestricted display of system data (including graphic data, gray scale data, and television images) significantly advances work stations technology. Internal processors are coupled with a proprietary graphics engine to provide the computational and display list processing resources for real-time, high resolution graphic applications. With the capability to update multiple, independent, flicker-free display surfaces at the rate of one million transformations per second or the processing of 27 million pixels per second, the ACWS excels in both symbol-oriented and pixel-oriented display applications.

Complex graphical presentations containing multiple display windows of geometrical forms, symbols and alphanumeric characters can be interactively updated in their entirety in less than one-tenth of a second. Gray scale displays of signal strength outputs from modern sonars and radars have been demonstrated at real time sensor data rates. Further, entire gray scale presentations of passive sonar data comprised of hundreds of raster lines can be interactively enhanced at a less than one second rate.

Up to three separate analog video inputs can be digitized within the ACWS for display of color video data or for overlay on existing screens. Television images from optronic sensors can be displayed in combination with gray scale and graphic data.

APPLICATION AREAS

The advanced capability of the ACWS provides the power to solve processing and display problems for many applications. Some of the application areas include:

- Sensor Control
- Communications and ESM
- Navigation
- Command and Information
- Weapons Control

HARDWARE DESCRIPTION

Architecture — The open system architecture of the ACWS, shown in Figure 1, a Graphics Engine, Display/Application Processors, and a Man-Machine Interface Processor, utilize an IEEE standard 32-bit VME bus and reside within a single electronics unit. The monitors and operator panel are separate modular units. This basic system is easily expanded with additional processors to support feature enhancements. Growth options include VME compatible components.

Display/Application Processor — The Display Processor performs the control and executive functions of the ACWS. In addition, applications data may be generated within the processor although pre-wired card slots will support a separate Application Processor. Each Display/Application Processor provides 2 MIPS, 100 KFLOPS processing capacity, and 4 Mbytes memory.

Graphics Engine — The high performance Graphics Engine utilizes state-of-the-art technology in design and development of high density Application Specific Integrated Chips (ASICs) on fully militarized boardsets. A single graphic engine provides:

- 1 million (10 pixel) 2D GKS vectors per second
- 27 million pixels per second
- 50,000 flat shaded polygons per second
- 150 μ sec full screen erase
- 24 frames per second supporting pan, zoom and scroll
- 60,000 5 x 7 characters per second

Man Machine Interface Processor — The Man-Machine Interface (MMI) Processor controls an operator panel which provides the operator with access to the console through multiple interactive devices (shown in Figure 2).

An adaptable operator panel provides user definable access to the console through multiple interactive devices. These devices may be selected and organized to best serve the specific application of the console. Optional MMI devices include: (1) a typewriter style keyboard, (2) numeric entry keypad, (3) fixed function keys, (4) track marbles with LED function readouts, (5) audio controls, and (6) an

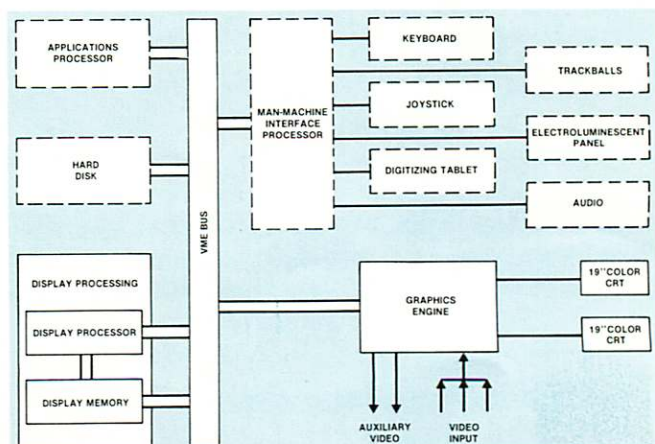


Figure 1. ACWS Architecture Diagram

KEY FEATURES

- **Fully Militarized Units:**
Modular Construction
MIL-E-16400 including MIL-S-901C
MIL-S-2167A, Software
MIL-STD-1472, Human Factors
DOD-STD-1399, Section 70, Part 1,
DC Magnetic Field
- **Expandable Open Architecture:**
32-bit VME bus
MC 68020 Display Processor
MC 68020 Man-Machine Interface
Processor (option)
MC 68020 Application Processor (option)
Optical or Hard Disk (option)
Real-Time Relational Data Base
Processors (option)
High Speed Array Processors (option)
- **Standardized Interface Options**
- **Adaptable Operator Panel**
- **High Resolution Color Display Monitors:**
19-inch High Resolution
1280 X 1024 Display Format
60Hz Non-interlaced
Touch Screen Capability (option)
- **High Level Software Interface:**
Ada [™]-Based Applications Code
C-based Industry Standard GKS with
Microcode Enhancements
- **High Performance Graphics Engine:**
Vector Draw Rate of 1 million 2D
GSK/sec
Pixel Draw Rate of 27,000,000/sec
Processing Capacity of 12 MIPS,
20 MFLOPS
- **Performance Monitoring/Fault
Localization:**
On-line Performance Monitoring
Fault Localization to LRU

electroluminescent panel with an infrared touch panel. Additional interactive devices such as a joystick and digitizing tablet can be easily added.

SOFTWARE DESCRIPTION

The console's Display/Application/MMI processing, and Virtual Display System Interface (VDSI) are coded in Ada [™] to provide modular, maintainable, and readable code. The software is organized to allow tailoring for specific user applications.

The Display Processor handles the console executive and display control functions and executes the display interface in Ada[™]. The VDSI, based on the industry standard GKS graphic package, provides a high-level interface between programmers and the hardware display primitives. The Graphics

Engine is controlled by C-based graphics display code supplemented by customized microcode to optimize display list processing. The portion of the VDSI resident in the Graphics Engine, may be tailored by microcoded extensions for each possible application of the console. It is designed to take full advantage of the Graphic Engine's high performance.

FEATURE ENHANCEMENTS

Optional capabilities include: (1) Optical or Hard Disk, (2) Real-time Relational Data Base Management and (3) Array Processing.

Optical/Hard Disk — This capability will provide sufficient capacity to: (1) provide additional stand-alone processing capability, and (2) store all source code and data.

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Figure 2. ACWS Operator Panel

Real-time Relational Data Base Management —

This capability will provide sufficient capacity to: (1) store large global system data bases and (2) provide unrestricted real-time access (1 second worst case) to any logical subset of the data base.

Array Processing — This capability will provide sufficient capacity for: (1) display of active sonar data (expanding gray scale circles) and radar data (rotating gray scale spokes), (2) enhancement of active sonar, radar and optronic/television images, and (3) generation of three-dimensional presentations of acoustic environmental assessment data, mine field navigation aids, and weapon control trajectories.

MODULARITY

The ACWS is modularly constructed for adaptability to fit a multitude of unique customer needs (Figure 3). The ACWS can be configured as a personal operator work station, can be interfaced as a node in a distributed environment, or can be linked point-to-point to a centralized processor. The modular construction and packaging allows for use of single or multiple CRT monitors embedded in the ACWS or remotely located from the display electronics. The electronics section is separately packaged as is the operator panel containing user specified interactive controls. Embedded high speed optical/hard disks, array processors, and a real-time relational data base capability are available as growth options.

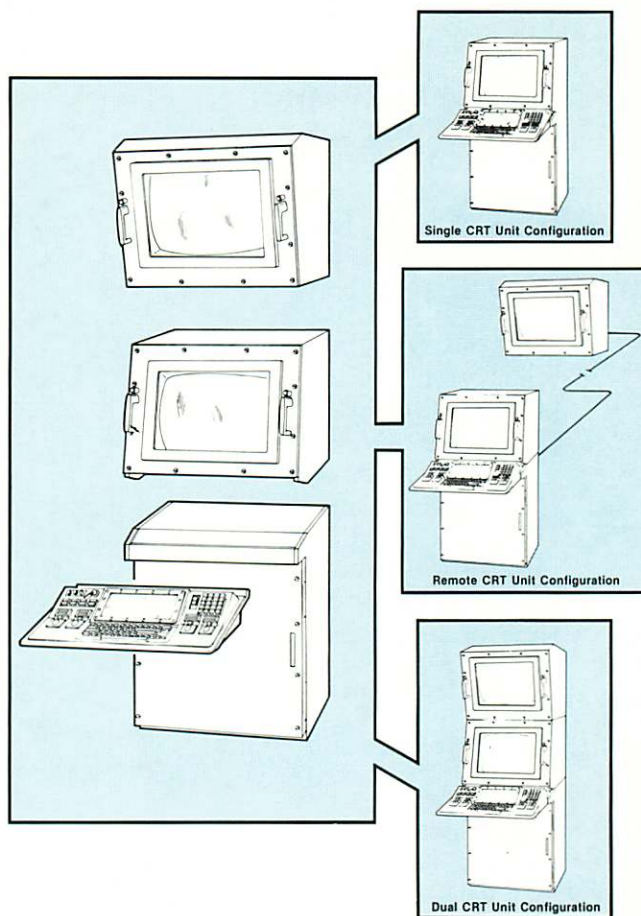


Figure 3. ACWS Hardware Modularity

SPECIFICATIONS

Display Processor System

- 32-bit VME bus
- Display Processor, MC 68020 tm @ 16 MHz, up to 2
- Man-Machine Interface Processor, MC 68020 tm @ 16 MHz
- Applications Processor, MC 68020 tm @ 16 MHz
- DRAM 4 Mbyte Dual Ported, up to 24 Mbyte
- Audio
- Interface Selections:
 - NTDS Fast
 - Ethernet tm TCP/IP
 - DR-11W DMA
 - MIL-STD-1553B
 - Other standards and LANS (on request)
- Feature Enhancements:
 - Optical or Hard Disk
 - Real Time Relational Data Base Management
 - High Speed Array Processors

Graphics Engine System

- I/O Processor, MC 68020 tm @ 16 MHz
- Display List Memory, up to 4 Mbytes
- Display List Processor, 12 MIPS
- Array Processor, 20 MFLOPS (IEEE Standard)
- Image Generator, High Speed ASIC Processor
- Dual RGB Video Output Channels:
 - Up to 12 Bit Planes per channel (includes overlay)
 - Up to 4096 Color Palette
- Shading Processor (option)
- Frame Grabber, RS170 RGB or NTSC Composite
- RGB Video Bus

- Radar Sweep Conversion (option)
- Sonar Sweep Conversion (option)
- Other Sweep Formats (on request)

Color Display Monitor

- Up to 2 Independently Driven Monitors
- 19" High Resolution PIL Tube
- P22 Phosphor
- 1280x1024 Sweep Format
- 60 Hz Non-Interlaced Refresh
- Coated Anti-reflective Bonded EMI Faceplate
- Touch Screen Overlay (infrared)

Operator Interactive Facilities (User Defined Options)

- 4x8 inch Electroluminescent Panel with
- Infrared Touch Entry
- Track Marble, LED A/N Display (8x2), and Hook SW sets (4)
- Fixed Function Keys
- QWERTY Keyboard
- Numeric Entry Keypad
- Audio Controls

General Characteristics

- Environmental:
 - MIL-E-16400
 - MIL-S-901C
 - MIL-STD-461
- Power (2 monitors):
 - + 155 VDC, 1500 W(max)
 - 115 V 60 or 400 Hz (option)
 - Water Cooling, (standard), Air (option)
- Temperature: 0 to 50 C, Operating