

Main Control Room Annunciators

Background

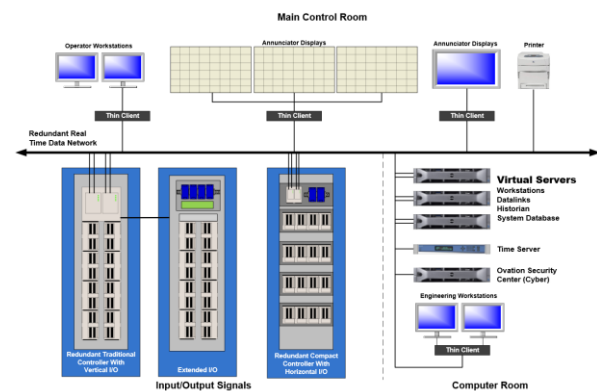
Control Room Annunciators are an integral part of a nuclear plant's main control room that alert operations staff visually and audibly when an abnormal plant condition occurs. Annunciator systems in today's operating fleet are often original plant equipment facing mechanical fatigue (aging), component obsolescence, and limited flexibility to incorporate modern approaches to plant operations.

Westinghouse offers an Ovation-based form, fit, function replacement annunciator system that can retain the spatial awareness and likeness of an existing system, minimizing impacts on operator training and alarm response procedures. A replacement annunciator system is offered with traditional lampboxes window faceplates or with large format computer displays that can reduce hardware I/O and offer an enhanced Operator interface. Operationally, the modern system can completely replicate the alarm management capabilities of an existing annunciator system with respect to alarm flashing/reflashing, acknowledgement, reset, and silence, and can be integrated with existing control board buttons. Alarm windows and lists are unified in the Ovation alarm viewer and can provide advanced capabilities such as alarm suppression, shelving, cutouts, and one-click access to alarm response procedures. Traditional, first-out, and permissive annunciator functionality is supported, as well as sequence-of-events recording. Audible annunciator indications can be provided through PC based workstations or by integration with an external alarm horn.

Description

The Westinghouse annunciator system replaces an existing standalone annunciator system with an Ovation Distributed Control System (DCS) based solution. The system can be standalone or integrated with a new or existing Ovation control or information system. The Ovation DCS infrastructure is comprised of a software developer/engineering workstation, operator workstations, historian, and cyber security

system, with Ovation controllers and I/O to acquire the annunciator inputs and interface to the control board alarm management buttons. Legacy annunciator lampboxes can be replaced with an updated faceplate (windows) driven by Ovation digital outputs, or alternatively, by a "display wall" that mimics the look of lampboxes on large format computer displays that eliminate the need for digital output hardware and wiring. Each tile is replicated to be the same size, font size, and color as the current system. Each lampbox window requires inputs to the annunciator system that are typically from a dedicated hardware input card. When integrated with a new or existing Ovation control system, hardware inputs can be reduced if the annunciator input is already processed by the existing Ovation system. As control and information systems are added in the future, duplicate I/O can be removed and the native control systems points can be used as annunciator inputs.



Example Standalone Annunciator System Architecture

Ovation Control Builder logic is used to calculate the state of each annunciator window. With a software-based rather than hardware-based implementation, new points can be created and combined to develop the alarm signal and quickly evaluated and deployed.

The annunciator system supports replication of traditional annunciator windows, on/off status windows, and first-out annunciator windows. Alarm management can use the hard pushbutton interface, the graphical user interface displays, or

the Ovation base alarm system to acknowledge, reset, and silence alarms.

Each lampbox is replicated via an Ovation display. Each display provides controls to silence and acknowledge the alarms on that display. The set of lampbox displays are continuously shown on the video display wall mounted on the top of the control board. If lampbox faceplates are used as an alternative to a display wall, graphic displays are still available within the system to be viewed on an Ovation operator workstation to allow soft alarm management and provide backup in the event of a failure of a dedicated display on the top of the control board.



Annunciator Replacement in Westinghouse SNUPPS Simulator

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1-EI-CB-21M, 1-EI-CB-21P, & 1-EI-CB-21A												
G	H	A	B	C	D	E	F	G	H	A	B	C
AC LOOP 1A LO 112W CMB 111	AC LOOP 2C LO 112W CMB 111	WES 1A WES 1A CMB 11	WES 1B WES 1B CMB 11	WES 1C WES 1C CMB 11	WES 1D WES 1D CMB 11	WES 1E WES 1E CMB 11	WES 1F WES 1F CMB 11	WES 1G WES 1G CMB 11	WES 1H WES 1H CMB 11	WES 1A WES 1A CMB 11	WES 1B WES 1B CMB 11	WES 1C WES 1C CMB 11
WSP 5A WSP 5A CMB 11	WSP 5B WSP 5B CMB 11	WSP 5C WSP 5C CMB 11	WSP 5D WSP 5D CMB 11	WSP 5E WSP 5E CMB 11	WSP 5F WSP 5F CMB 11	WSP 5G WSP 5G CMB 11	WSP 5H WSP 5H CMB 11	WSP 5A WSP 5A CMB 11	WSP 5B WSP 5B CMB 11	WSP 5C WSP 5C CMB 11	WSP 5D WSP 5D CMB 11	WSP 5E WSP 5E CMB 11
AC LOOP 1B LO 112W CMB 111	AC LOOP 2B LO 112W CMB 111	WES 2A WES 2A CMB 11	WES 2B WES 2B CMB 11	WES 2C WES 2C CMB 11	WES 2D WES 2D CMB 11	WES 2E WES 2E CMB 11	WES 2F WES 2F CMB 11	WES 2G WES 2G CMB 11	WES 2H WES 2H CMB 11	WES 2A WES 2A CMB 11	WES 2B WES 2B CMB 11	WES 2C WES 2C CMB 11
WSP 6A WSP 6A CMB 11	WSP 6B WSP 6B CMB 11	WSP 6C WSP 6C CMB 11	WSP 6D WSP 6D CMB 11	WSP 6E WSP 6E CMB 11	WSP 6F WSP 6F CMB 11	WSP 6G WSP 6G CMB 11	WSP 6H WSP 6H CMB 11	WSP 6A WSP 6A CMB 11	WSP 6B WSP 6B CMB 11	WSP 6C WSP 6C CMB 11	WSP 6D WSP 6D CMB 11	WSP 6E WSP 6E CMB 11
AC LOOP 1C LO 112W CMB 111	AC LOOP 2A LO 112W CMB 111	WES 3A WES 3A CMB 11	WES 3B WES 3B CMB 11	WES 3C WES 3C CMB 11	WES 3D WES 3D CMB 11	WES 3E WES 3E CMB 11	WES 3F WES 3F CMB 11	WES 3G WES 3G CMB 11	WES 3H WES 3H CMB 11	WES 3A WES 3A CMB 11	WES 3B WES 3B CMB 11	WES 3C WES 3C CMB 11
WSP 7A WSP 7A CMB 11	WSP 7B WSP 7B CMB 11	WSP 7C WSP 7C CMB 11	WSP 7D WSP 7D CMB 11	WSP 7E WSP 7E CMB 11	WSP 7F WSP 7F CMB 11	WSP 7G WSP 7G CMB 11	WSP 7H WSP 7H CMB 11	WSP 7A WSP 7A CMB 11	WSP 7B WSP 7B CMB 11	WSP 7C WSP 7C CMB 11	WSP 7D WSP 7D CMB 11	WSP 7E WSP 7E CMB 11
AC LOOP 1D LO 112W CMB 111	AC LOOP 2D LO 112W CMB 111	WES 4A WES 4A CMB 11	WES 4B WES 4B CMB 11	WES 4C WES 4C CMB 11	WES 4D WES 4D CMB 11	WES 4E WES 4E CMB 11	WES 4F WES 4F CMB 11	WES 4G WES 4G CMB 11	WES 4H WES 4H CMB 11	WES 4A WES 4A CMB 11	WES 4B WES 4B CMB 11	WES 4C WES 4C CMB 11
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AC LOOP 1F LO 112W CMB 111	AC LOOP 2F LO 112W CMB 111	WES 6A WES 6A CMB 11	WES 6B WES 6B CMB 11	WES 6C WES 6C CMB 11	WES 6D WES 6D CMB 11	WES 6E WES 6E CMB 11	WES 6F WES 6F CMB 11	WES 6G WES 6G CMB 11	WES 6H WES 6H CMB 11	WES 6A WES 6A CMB 11	WES 6B WES 6B CMB 11	WES 6C WES 6C CMB 11
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AC LOOP 1R LO 112W CMB 111</												