Cadence™ Cabin Management System
Cadence™ Switch Series (CSS)

The following document defines the scope of work realized by ALTO's Cadence™ Cabin Management System, comprising the Cadence™ Switch Series (CSS).

The purpose of the CSS is to provide a low-cost fit replacement option primarily targeted for obsolete MicroNet systems as well as other legacy switches including Baker, Audio International, Pacific Systems, Airshow, Rockwell Collins, Lufthansa Technik, etc. The goal is to preserve existing woodwork to reduce the overall cost of the installation. The CSS is well suited for new, stand-alone CMS/IFE systems as well.


The foundation for CSS is pre-engineered discrete modules called Cadence Switch Modules, or CSMs. These modules come in sizes from 1 through 6 positions, pre-defined headphone and other accessory modules including USB charging (USB-A and USB-C/PD), HDMI port, Bluetooth interface and ordinance signage. The CSS also features pre-defined harness configurations and universal overlay options. Dual/Quad LED status placement allows for vertical and horizontal orientations within the same assembly.

ALTO continues to expand its CSM offerings to implement new functions and features as required. The following panels represent just a small sample of the current offerings of CSMs. The commonality of parts allow spares kits to be used to support the sytem in the rare event of a failure. One CSM module will support any location of a like CSM in the cabin despite the overlay graphic.

A final configured switch panel may consist of several different modules placed together in the same bezel.
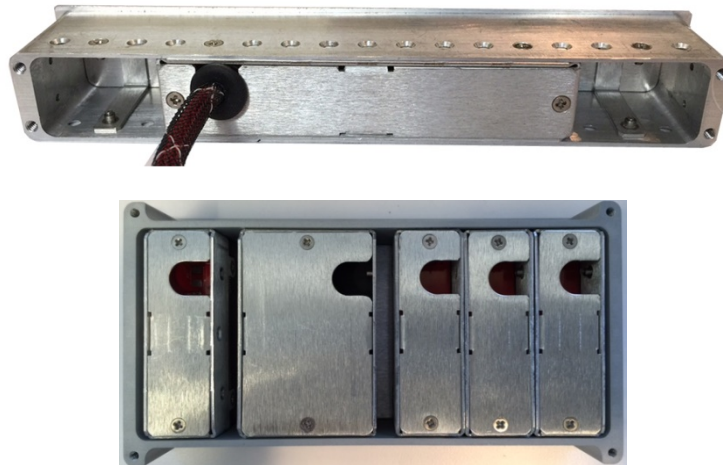

The CSS is a discrete only solution. Each panel button features a momentary ground switch contact and status LED, if required. All load functionality must be connected through an associated controller. No internal load control is available.
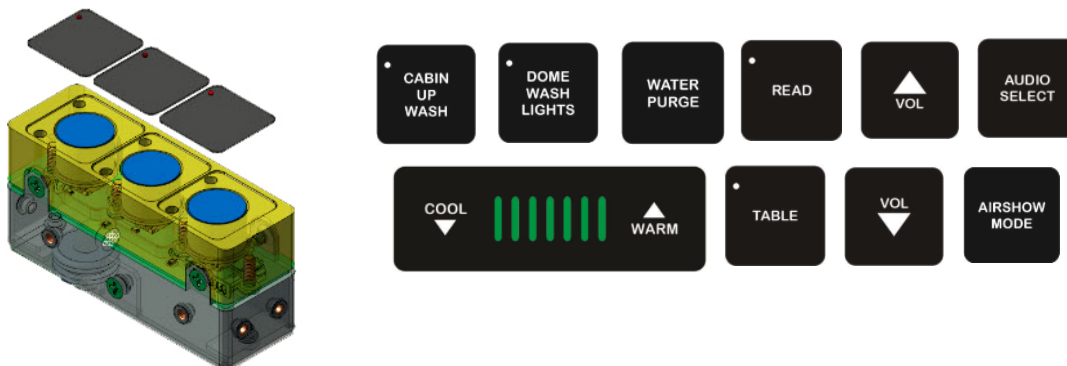
CSM Supports Horizontal and Vertical Formats within the same Module

Since the overlay is defined independently of the switch module, the switch can be designed for a variety of applications. The overlays may be rotated for vertical or horizontal placement. The trim plate conceals the transitions between the overlays and defines the final switch orientation.
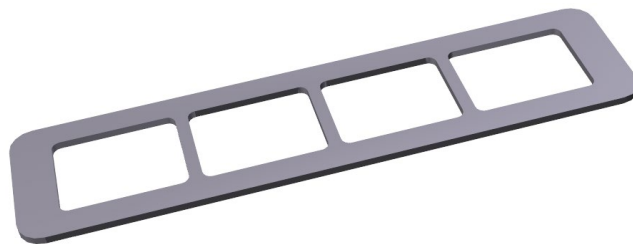
A bezel accepts the CSM module with overlays and the trim plate and is secured together with screws. The bezel allows different style profiles to be accommodated. One of the inherent features of the CSS is its ability to be fit compatible with former CMS/IFE switch offerings. By defining a bezel that fits an existing cutout, ALTO may be able to provide a CMS/IFE upgrade solution without changing the woodwork.

The basic system does not feature software. The entire system is comprised of configured subsystems, such as relay controllers, temperature controllers, headphone controllers and cabin amplifiers as optional.

Specific to the Pacific Systems/Airshow MicroNet series, the CSS does not replace every module in the series. The ALTO 107800 8 Channel Relay Controller was designed to replace the Pacific Systems 1054-1-1 controller verbatim. This is the only controller that is a form, fit and function replacement to the former series. The ALTO 107810-1060-000010 is size and functional equivalent to the Pacific Systems 1060-1-1 controller. All other controllers will need to be updated by an equivalent function of the 107800 Controller. For example, the 1061-1-1 Call controller will be replaced by equivalent functionality of the 107800-1061-00010 Controller. Some modules cannot be replaced such as galley interphone modules or some oven timers. During the preliminary design phase of each project, each controller will be identified and how its functionality will be replaced.

The existing IFE backbone typically is removed and replaced. For headphone control, ALTO HA-006/312 series controllers will be used for distribution. For cabin audio, AC or DC amps are available with or without PA. The final amp selection will be based on the architecture and power requirements. For video control, internal selection through Rosen monitors or external selection though the Innovative Advantage (IA) AVDS node are recommended. ALTO will connect to the Rosen monitors or IA AVDS node through momentary switches for local or bulkhead video switching. The AVDS node may support HD or SD distribution as required by the application. In some applications, it may be possible to use Rosen monitors with built in video selection capability. This arrangement eliminates the need for the AVDS node. These variables will be defined in advance.

The pre-engineered modular switch approach allows ALTO to customize a new system based on the desired functions the customer wishes to add or delete. For example, if a customer wishes to employ a Wi-Fi PED streaming media based entertainment system, the ALTO architecture allows the headphone functions to be removed from the system and either filled by a blanking plate or the space filled with local functions already associated with that position, such as read and table lighting or even add USB charging. In some cases, it may be easy to move the separated read and table lighting control into the former headphone panel location. If personal video monitors are being removed from the aircraft, then the corresponding video button may be removed from the new ALTO switch panel.

CSS Cosmetics and Styling
ALTO will replicate the look of the MicroNet panels with fit compatible switches. ALTO switches will fit into the same wood cutouts. No wood rework is planned. There may be rare instances where some woodwork may be performed and would be identified in advance on a case by case basis. Often in menu driven replacements, more buttons may be required to achieve the same functionality, resulting in a slightly larger panel. Any size deviations will be identified in advance of the project.

The MicroNet series has several different switch panel variants. ALTO's goal is to replicate each of these variants to insure fit compatibility in the aircraft. By changing the bezel and trim plates, ALTO can customize its offerings to match the current style and size in the aircraft and still maintain TSO status of its subassembly.

MicroNet switch variants with the raised, oval button (legacy Pac Sys and Airshow 80/2501 Series panels and/or equivalent) will not replicated in button style. The buttons will be converted to flat Lexan membrane buttons.
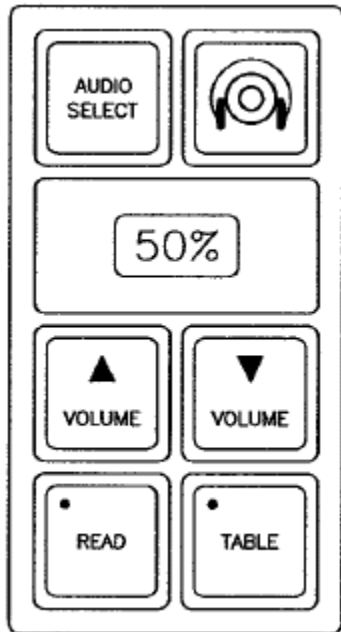
ALTO may also replace former Audio International SPS switches as well. ALTO has developed fit compatible switches for AI round and square cover bezels. It has also developed fit compatible switches for the standard bezel.

Audio International SPS Panel   **Replacement ALTO CSS Panel**

ALTO has also developed replacement for Baker legacy panels as well. ALTO has created replacements for the following styles.

Contact ALTO for the latest new styles in our replacement offerings. At the time of this publication, ALTO has over 26+ different designed styles.

Internal switch functional partitions, as identified in galley panels, VIP or credenza panels may or may not be transferred to new ALTO panel layouts.

CSS does not feature digital displays.

Bezels and trim plates can be plated to customer specification.

Text will feature white LED backlighting for low light illumination. Status LEDs are in the upper left-hand corner and are green.

CSS buttons will consist of black Lexan matte finished polycarbonate with white text. There is a limit to the amount of text that can be placed on a single button. The backlighting is encapsulated by a translucent centered plunger that is 7/16" in diameter. All text must fit in this area to be backlit. Current text format is limited to 3 rows: 6 characters on the top row, 7 characters in the middle and 6 characters on the bottom row.

Even if you are starting a new CMS from scratch, ALTO may use any existing style panel to achieve the desired control in the aircraft. The CSS is a great stand-alone solution for CMS/IFE systems.

CSS Pre-Configured Switch Series
To help define and support off the shelf switch options for common panel types, ALTO has developed well over 34+ different panel variations with in-stock options. By leveraging existing engineered designs, ALTO can support quick lead times, often in 2 weeks or less. Clear or black anodized finishes are available at no additional charge. Please contact ALTO for a complete list of available switches.

CMS Functionality of System
The following descriptions define the functionality of the CSS Cabin Management System.

All load control will be via relays. The relays in the 8 CH Relay Controllers are rated at 5A 250VAC/30DC. The relays in the In-Line Relay Controllers at rated at 2A 250VAC/30DC.

| **8 CH Relay Controller** | **In-Line Relay Controller** |

ALTO will mimic all the switch panel functionality unless stated.

No integrated load control will be used. All former integrated on/off control will be transferred to relay controllers.

ALTO offers a water level tank indication CSM. This module accepts ground logic from the sensors and displays. Typically, these sensors provide ground outputs to light status LEDs. The ALTO CSM is designed to trigger the EMPTY LED whenever the ¼ through FULL LEDS extinguish. The external water service panel may be retained or upgraded with ALTO switches.

Bright/Dim lighting will be controlled through discrete relays and defined as two states. No RS-485 lighting commands are available. Variable lighting may be achieved through momentary contacts to a lighting controller. A variable voltage option is available in an ALTO controller.

The Cadence™ Cabin Management System may control RS-485 databus products for non-ALTO devices. Specialized software may be required. A System Master controller, SM-1070, is available so please contact ALTO for information regarding RS-485 controlled products.

Remote control is available with the CSS. A Wi-Fi PED option is available for remote control of CSS functions. Remote control of transport source functions will be through vendor specific remote devices but may be emulated by ALTO through the SM-1070. Please contact ALTO for information on IR/RS-485 remote control of devices.

For the Airshow Series MicroNet oval button switch panels, replacement of dual rocker functions in a single button will be simulated by relay action. Unless there is room to separate the up and down functions into separate buttons, a single button for up and down with depicting graphics will be proposed. The relay will transfer this action to the load via an alternate action scheme. Press once for up and release. Press again for down and release.

For typical Gulfstream applications, the galley interphone switch panel may be retained if the original controller is maintained. If this controller is to be eliminated, a switch blank may be used. It may be possible to use an ALTO switch panel with the existing controller.

Cabin temperature will be through a high wattage potentiometer and can be defined as partial or full range control. The ALTO controller has flexibility in range to fulfill any resistance pot simulation. The controller may simulate a single or dual pot design for multiple aircraft systems support. Depending upon the configuration, you may require 2 separate controllers for fwd and aft temperature controls. Cabin temp may be removed from the system to simplify operation.

Switch Hot Cup Timer functionality will be integrated into the 107800-1054-00010 Relay Controller. The ability to define a set time for hot cup operation will be available but without a digital display. Typically, this is replicated with a 3 min and 6 min button selection.

There are several legacy MicroNet controllers in the field. Again, ALTO will not replace each one but the functionality of each one will be updated with an equivalent function through the ALTO 107800 Relay Controller and 107810 Cabin Temp Controller.

ALTO has also developed a 1, 2 and 3 CH In-Line Relay controller for local loads. This is a simple switch panel harness connected unit that allows local control of lighting, typically for Read, Table, Read situations. This unit allows direct load control at the switch panel. The 3 CH Local relay controller will not feature discrete set/reset capability but will have serial control options for future upgrades. Configuration for this unit is defined by user accessible DIP switches to set Momentary/Toggle or Master/Slave operation. The unit may also be used as a standalone discrete controller for simple, local relay control. This is ideal for table locations and using one controller to operate Read, Table and Read functions.

ALTO offers various styles of USB configurations. One configuration is called the 1x1 CSM. This 1x1 fits small profile switch panels with a 24" tethered harness to a remote USB supply on a mounting bracket. ALTO offers this 1x1 in two different styles, USB-A and USB-C and utilizes the True Blue Power TSO Approved TA-202/360 with these configurations.

A second configuration is an integrated USB supply that is housed directly in the switch bezel. This method does not require an external mounting bracket but requires more space in the panel. This integrated supply takes approximately 2.5 button spaces so there must be adequate space to use this USB version. USB-A and USB-C/PD versions are available, including the new Power Delivery USB supply TA-360 from True Blue Power.

IFE Summary

Airshow mouse controllers may be retained or removed but not replaced by ALTO. ALTO can define a fill bezel if the controller is to be removed from the aircraft.

All headphone circuitry will be defined with ALTO controllers, the HA-006 or HA-312. 4 sources of headphone audio may be accommodated if the headphone audio is muted during PA announcements. If PA audio is desired, it will take one of the sources so you can have 3 stereo + PA. By muting the headphone circuits, an extra audio input source, 4 sources, is achieved.

Cabin audio control will be derived from the CA-003 Cabin Audio Selector for AC or DC powered amps. One, two or three of the audio outputs will be dedicated to cabin audio. This will be defined by how many zones are being controlled. This audio output may drive existing amplifiers or new ALTO amplifiers. If DC amps are preferred, DX Series amps may be considered for selection and control. ALTO systems may control up to 4 sources of cabin audio.

Airshow binary control may be preserved but no indication of the mode will be available.

Speaker on/off logic may be controlled directly in the CA-003 controller or via a separate relay. If a relay is used, status indication is possible. If speaker on/off is performed in the CA-003 or DX amp, no status is available.

All video support will be via internal Rosen monitor selection or Innovative Advantage AVDS node through the channel tracker card. ALTO video selection will be via momentary ground logic. All video

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configurations will be handled through IA. Direct source selection in Rosen monitors may also be supported.

ALTO offers a Media Input Panel (MIP) through Rosen Aviation to input HDMI connections into the IFE system. This MIP is accompanied with an ALTO CSS panel with HDMI port and an HDMI extension harness. The MIP is only compatible with Rosen monitors unless it is distributed through an Innovative Advantage AVDS node.

Bluetooth audio is available via an ALTO BT Receiver. This unit is well suited for connecting PEDs to the audio system wirelessly. A CSS option for pairing indication is available. A transmitter is also available if wireless headsets are desired. CSS options for headphone audio select and pairing are available.

Wireless PED Based Control Options

ALTO is now positioned to offer wireless PED and touch screen options for CMS. A System Master Controller (SM-1070) is required for this interface along with specific wiring configurations. This new controller is fully compatible with the Cadence™ Cabin Management System. Please contact ALTO for specific information regarding this option.

The System Master Controller is defined by the following:

- 2 CAN Bus interfaces
- Dedicated RJ45 port for ALTO MultiNET Maintenance connection
- 5 RS-485/422 Ports
- 1 digitally isolated RS-232 port
- 8 GPIO pins can be independently configured for either an input or an output. The GPIO's are open collectors pulled up to +5VDC. When used as an output, they can drive a load of 500mA @ 5VDC.
- Optional ARINC 429 Line Receiver uses a galvanically isolated buffer IC to read data from the ARINC bus. The IC is fully isolated from the bus and is rated for DO-160G section 22, level 3 lightning protection. The IC does not write to or load the ARINC bus.
- The IR input accepts IR remote eyes, such as the Rosen PN 0500-006, IR Receiver. The SMC can learn commands from the external IR remote controller and assign a functionality to it.
- The SMC features an analog input and an analog output. The analog input is 16 bit, high accuracy, and features isolated power and data. The input channel accepts -10V to +10V signals. The analog output is 10 bit, capable of +10V, and 65mA of maximum current.
- The SMC contains a +5VDC output with a maximum load of 500mA. This output can be used for powering certain keypads or USB devices.
- The SMC incorporates a 10/100 Ethernet MAC and PHY with IEEE 1588 PTP hardware support. The SMC is designed to connect directly to an existing Ethernet network using RJ45 style connectors.

An IOS and Android based App is available for download. The App gets its configuration from the System Master based on the aircraft requirements.

The following illustrations depict the initial development of the ALTO App. Product enhancements are expected as the product offering matures. Final graphics will be pending per project.
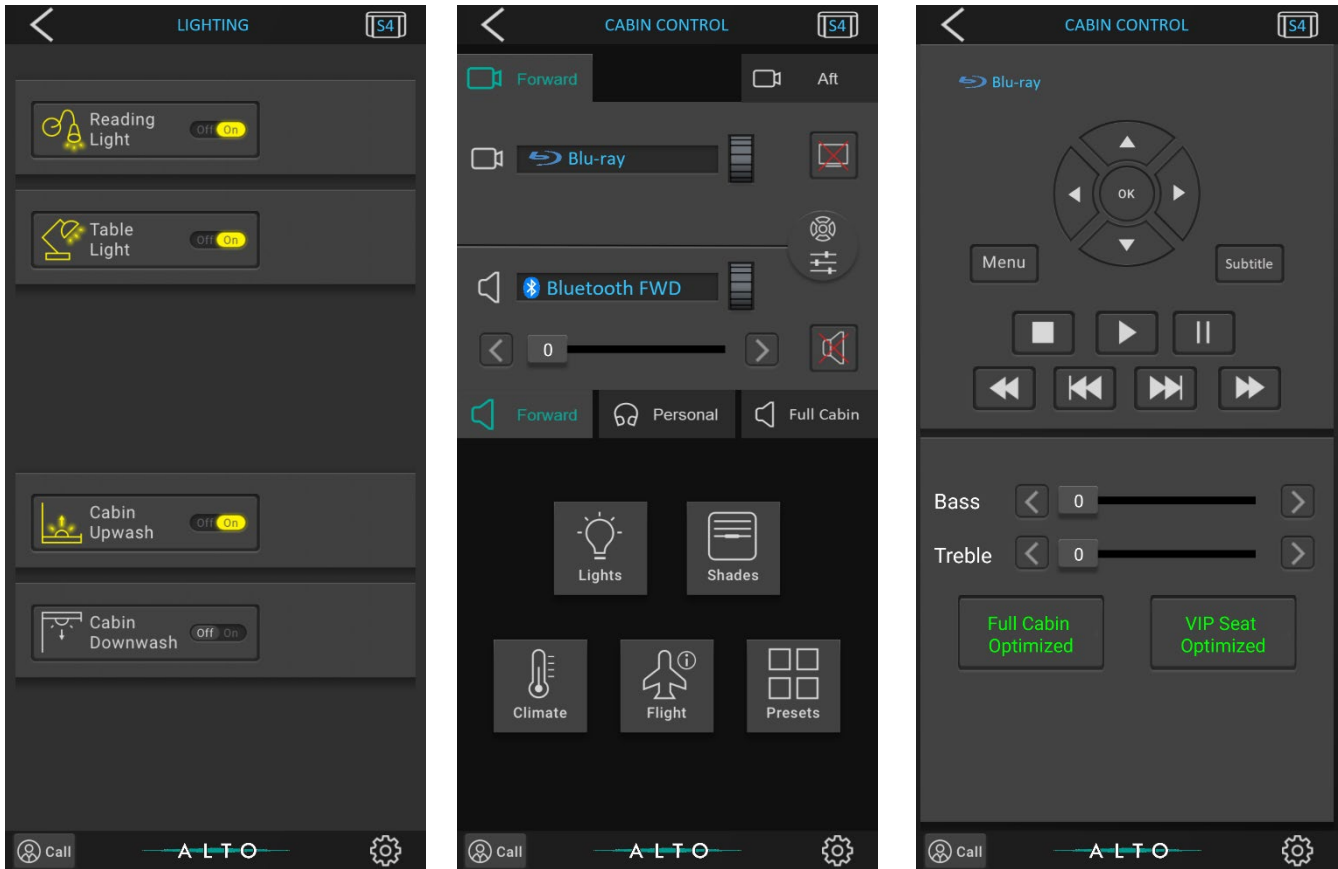
Examples of ALTO Wireless PED App
(Subject to updates)

Touch Screen Options
ALTO is now positioned to offer touch screen devices for its Cadence™ CMS. In partnership with Rosen, the 4.7" PCU and 10.1" Touch Screen may be used for passenger interface. Depending on the quantity and the number of ethernet ports in the system, a 8 Port Ethernet Switch ES-800, 107825-0800-00010, may be needed to expand the number of ports as this is the preferred method for connections. This will be defined at the point of quotation.

The Touch Screens allow for a variety of functional control all within the purview of a GUI based presentation. The graphics are defined per application and may vary from what is shown above.

CSS Delivery
The ALTO switches are identified as configurations with an associated configuration number, CSS. A CSS number will be assigned to each unique assembly. The CSS designation will also include the aircraft model and SN. Finally, the last 4 digits of the number will represent the next sequential number in the series.

All panels will be fully assembled from ALTO and delivered to the customer fully turnkey. ALTO will handle all plating directly with your vendor of choice on your customer PO. Bezels may be sent raw

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upon request. Standard finishes such as clear or black anodized may be available for certain ALTO series of panels at no additional charge.

Upon placement of PO, a configuration document will be generated and approved by the customer approximately 3 weeks from receipt of PO. This configuration document will detail all the panels being configured and included BOM for each assembly, including bezel, trim plate and overlays.
An interface document will be generated to capture the entire relay and temp controller assignments. This document will list all the functions and the special features required from the controllers. Typically, this information is due 3 weeks prior to delivery of the controllers.

If the final plated switches have a long lead time, we offer test panels to provide a preliminary ring out of the system. In this way, the system interfaces can be validated in the field prior to the arrival of the panels.

At the time of this publication, we are requesting a 12-week lead time for new CSS switches. For repeat orders with common bezels, we may be able to expedite to 8 or less weeks. All lead times we require advance approval.

CSS Certification
All switch module assemblies, PN's CSM-0xxx, are FAA TSO'd approved through an ALTO project with the FAA. ALTO has conducted DO-160G testing on one common subassembly. Similarity is applied to all remaining CSMs. All switches, including ordinance signage, will have TSO approval. Please reference the ALTO CSS Product Manual for DO-160 test categories.

Flammability to FAR 25.853 has been verified and established though an outside certified vendor. The following tests were conducted: Vertical, 12 second burn test and 60 degree burn test, 30 seconds.

The remaining CSS controllers, inclusive of the 107800 Relay Controller and 107810 Cabin Temperature Controller and 107830 In-Line Controllers have been DO-160 qualified and are FAA TSO approved.

The ALTO CSS switch contacts are rated for IP67. They are protected from dust and capable of withstanding water immersion between 15cm and 1 meter for 30 minutes.

No environmental tests were performed for salt and dust. ALTO does not claim waterproofness for the complete CSS panel but does claim fluid susceptibility to Category F, Section 11.

A fully enclosed ALTO Cadence switch is well suited for harsh environments that may be subject to spray and occasional clean up.

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