



Elo Touch Solutions Projected Capacitive Integration Guide

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Chapter 1: Introduction

About This Manual

This document guides the user through the successful implementation of an Elo Projected Capacitive (PCAP) touchscreen into a monitor, touchcomputer, or other electronic device. The intention of the guide is to make integration straightforward while optimizing touch functionality.

Chapter 1 explains the technology behind a PCAP touchscreen. Chapter 2 describes how to design and integrate PCAP touchscreens into monitor systems with proper sealing. In Chapter 3, various troubleshooting tactics are covered. After reading through this guide, if you still have questions or need help getting your system up and running, please contact an Elo Touch Solutions Sales Representative.

Introducing PCAP

The Elo Touch Solutions PCAP touchscreen technology is a projected capacitance (PCAP) system that delivers a sensitive, accurate multi-touch interactive experience. Using a proprietary glass-on-glass lamination configuration, it responds to light touches in a seamless, zero-bezel design. The pure-glass surface is nearly impossible to physically "wear out" and is easy to clean. Projected capacitive touchscreens combine high resolution with excellent transparency and sleek glass-to-edge aesthetics. It consistently delivers a fast, accurate, drift-free touch response.

PCAP features:

- Multi-touch up to 10 points (with Windows 7 and 8 operating systems)
- Responds to a light touch to activate response
- Best in class optical clarity
- Long term stable, no-drift performance - no calibration required
- Recognizes touch from a finger or Latex gloved hands
- Can meet NEMA 4/4x/12 and IP65 standards upon integration

PCAP Touchscreens

Elo PCAP projected capacitive touchscreens consist of two glass panels with a sensor grid of thin conductive electrodes. These electrodes are composed of a transparent, conductive ceramic indium tin-oxide (ITO). The exposed touch surface is a front glass layer that is hard and durable. The composition of a projected capacitive screen is detailed in Figure 1-1.

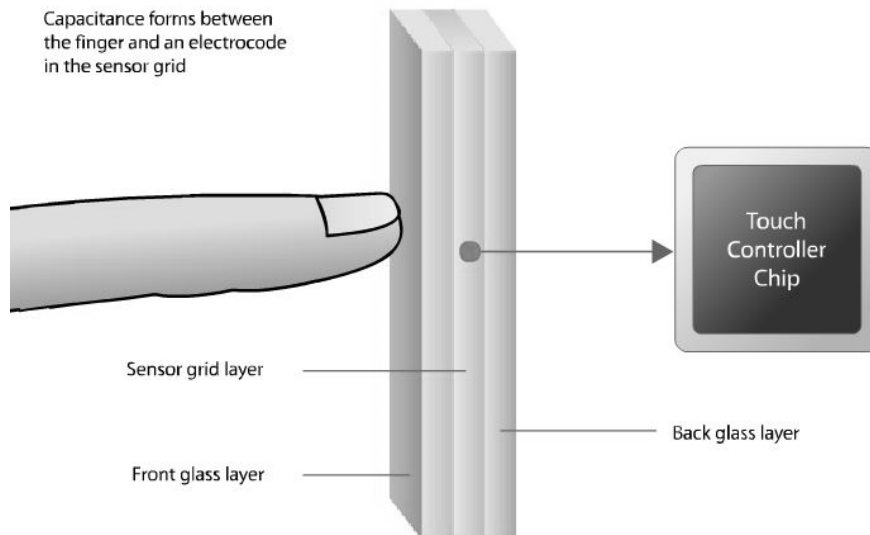


Figure 1-1. Composition of a PCAP Touchscreen

When the screen is touched, the finger alters the capacitance between pairs of orthogonal electrodes in the sensor grid. The touch location is calculated from the changing electrical characteristics of the sensor grid. The result is a sensitive, durable, and reliable touchscreen that offers drift-free operation. A deeper explanation of PCAP operating principles is given in Elo's PCAP white paper.

PCAP Controllers

PCAP controllers are available with a USB interface. Spatial resolution of the PCAP system is defined by the controller resolution of 4098 x 4098. Controller documentation is available from an Elo Sales Representative. More details are provided in Chapter 2.

Driver Software

The driver is a software program that enables the touch system to interact with the computer system. It accepts data from the controller and calculates cursor position on the display in response to a touch. The driver also filters incoming touch data for errors, controls calibration, and offers diagnostic and troubleshooting tools.

All PCAP controllers are human interface devices (HID), eliminating the need for drivers on most systems. PCAP controllers will not require a driver for most operating systems. Drivers may be required for some operating systems. All drivers are available on the Elo website at <http://www.elotouch.com/Support/Downloads/dnld.asp>.

Help with driver installation and calibration can be found in the Driver Read-Me document that comes with the driver software.

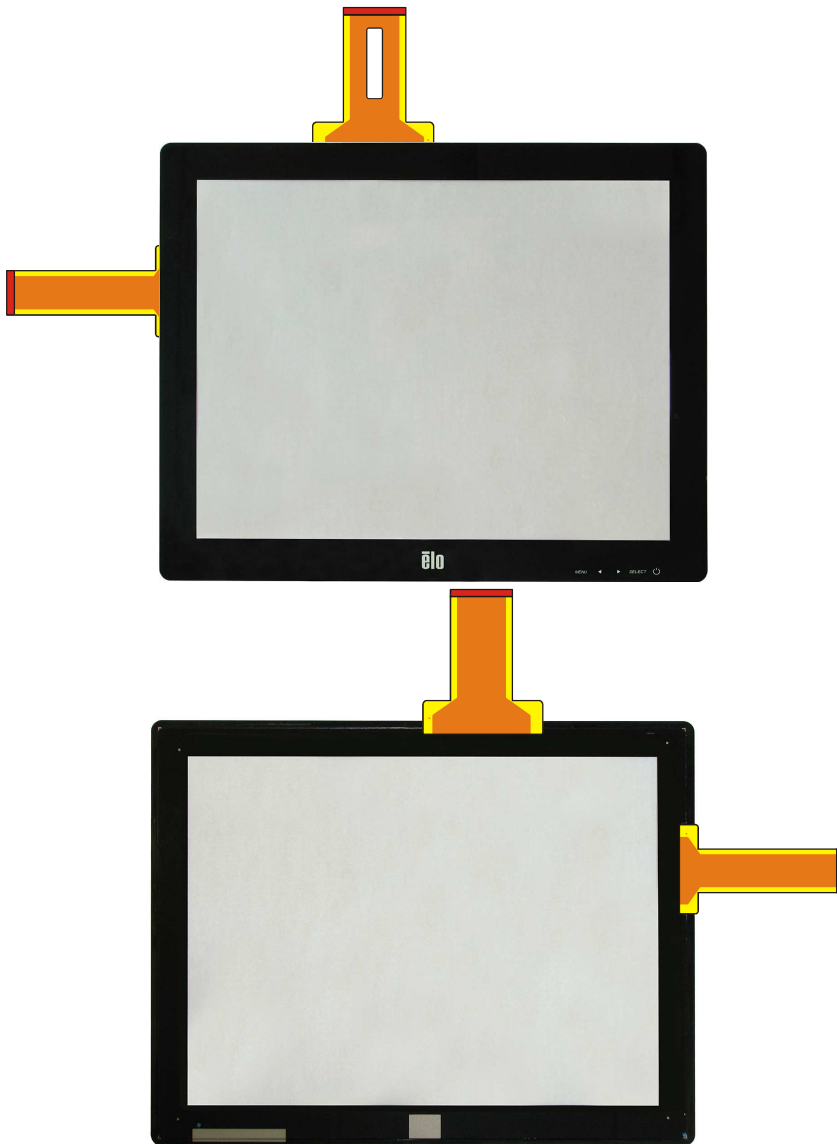
Chapter 2: Integration Design Guide

This section of the manual is intended to help design your monitor, touchcomputer, or other electronic device with an Elo Touch Solutions touchscreen. Details are given on designing and sealing the touchscreen, routing cables, and connecting the controller.

Definition of Terms

- **VIEWABLE AREA:** The area of a screen where images can be seen.
- **ACTIVE AREA (AA):** The area of a screen which is responsive to touch.
- **BORDER AREA:** The area surrounding the Viewable Area.
- **SYSTEM:** Touch monitor, computer, or other electronic device being integrated with the touch screen.
- **CHASSIS:** The supporting frame of a system.
- **HOUSING OR ENCLOSURE OR CASE:** The molded plastic cabinet of the system. The housing normally covers the sides, back, and bottom of the system.
- **BEZEL:** Depending on the industrial design, the part of the enclosure that may cover the Border Area. PCAP touchscreens do not require a traditional bezel, but rather may use a sub-bezel to avoid covering the Border Area.
- **SUB-BEZEL:** A sub-bezel is a plastic fixture that attaches to the backside of a touchscreen. The sub-bezel attaches to a rear housing.
- **ZERO-BEZEL:** Zero-bezel is a touch screen overlay method which is comprised of a fully flat front surface, and no associated front surface protrusions. A zero bezel can include an edge perimeter bezel which can protect the edge of the touch overlay.
- **LCD:** Liquid Crystal Display is a flat panel display that uses liquid crystals to modulate the light.
- **DISPLAY:** Typically, a Liquid Crystal Display. Also referred to as a panel.
- **CONTROLLER:** The electronic device that converts analog touch signals into digital touch information that is communicated to a Host Computer.
- **HOST COMPUTER:** The computer system in communication with the controller and in communication with the display, often running an operating system and application programs that make use of touch information.
- **IP65:** Ingress protection rating that covers system protection against dust and water projected by a nozzle (6.3 mm) from any direction for at least 3 minutes.
- **NEMA 4:** Watertight enclosure standard. Must exclude at least 65 GPM of water from 1-in. nozzle delivered from a distance not less than 10 feet for 5 min. Used outdoors. The 4X model has corrosion resistance.
- **NEMA 12:** General purpose enclosure standard. Intended for indoor use, provides some protection against dust, falling dirt, and dripping noncorrosive liquids. Meets drip, dust, and rust resistance tests.

- **MOUNTING TAPE:** Double-sided tape used to attach the touchscreen to a surface.
- **SEALING FOAM:** Foam applied around the edges of the touchscreen to keep spills or dust build-up from affecting system performance. The allowable sealing area is shown in Figure 2-1.
- **HID:** Human Interface Device. Standardized protocol that eliminates the need for a specialized driver.



*Figure 2-1. (Top) Front View of a PerformanceTouch Touchscreen
(Bottom) Rear View of a PerformanceTouch Touchscreen*

Integration Design

Several options exist in the design and integration of the screen. The cross-sections of reference integration designs for a PCAP touchscreen are illustrated in Figures 2-2 and 2-3. Important elements of the integration are described in the sections that follow.

The standard PCAP design matches the edge of the coversheet with the edge of the glass with a tolerance of 0.3mm.

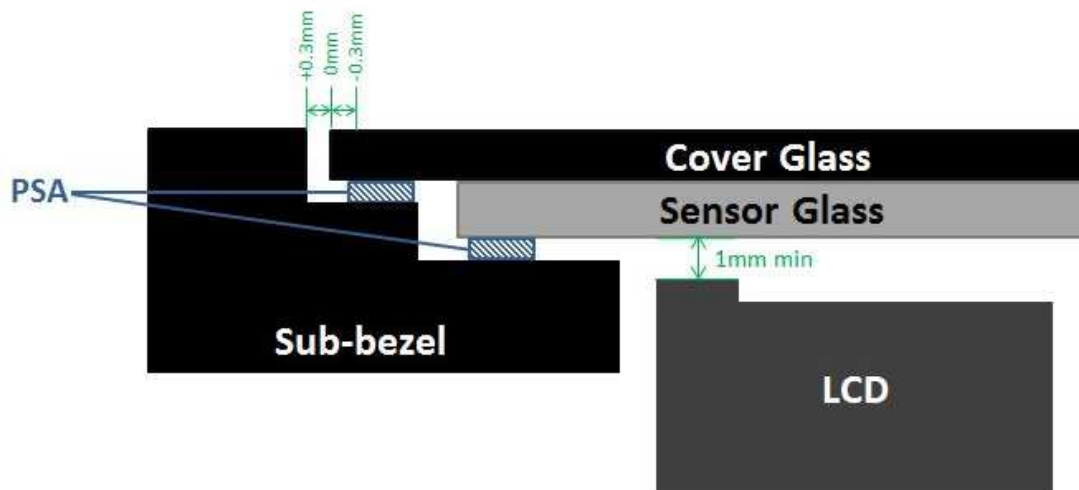


Figure 2-2. Standard Integration of a PCAP Touchscreen (not to scale)

PCAP touchscreens can be sealed by placing sealing material outside of the cable to prevent moisture and other materials from wicking into the screen. The sub-bezel may be designed to accommodate the exiting cable as shown in Figure 2-3 below.

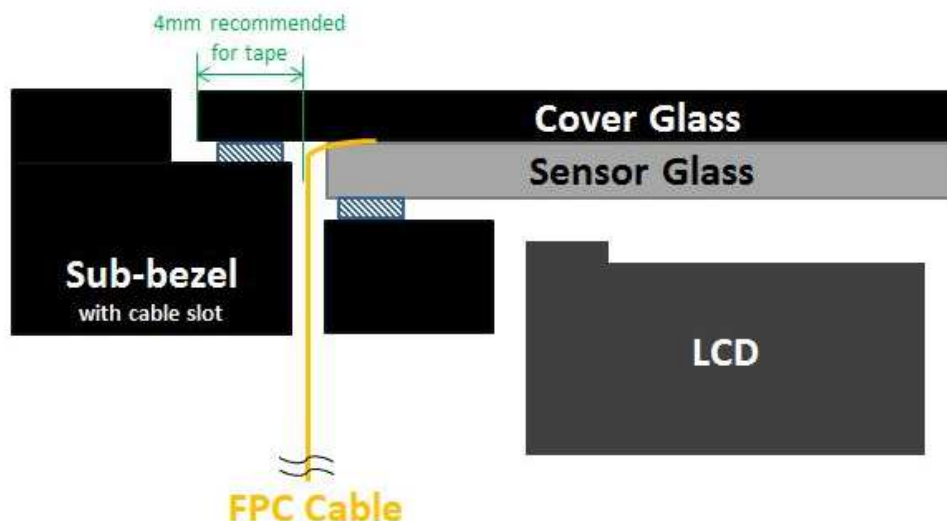


Figure 2-3. Standard Integration with Slotted Sub-bezel (not to scale)

Design Considerations

The following design considerations are based on the integrated design in Figure 2-2.

Glass

Standard PCAP screens are constructed with two layers of soda lime glass. The thickness of the glass and width of the border are dependent on the dimensions of the touchscreen and active area.

Connector

PCAP touchscreens connect to the controller via flexible printed circuit (FPC) cables. The cables fit into the SMT ZIF connectors on the controller.

Cable Routing

Cable routing is important for proper screen function and should be determined prior to integration. PCAP touchscreens use flexible printed circuit (FPC) cables. The cables are attached to the glass using anisotropic film to eliminate the cable bump caused by soldering. Each cable is routed into a connector that interfaces with the controller. The cables may not be creased. Separate cables should not be allowed to overlap.

Housing

The integrated design (Figure 2-2) has a sub-bezel that surrounds the edge of the screen and lies flush with the screen face. This protects the edges and functionality of the touchscreen, but requires strict attention to tolerances between the glass and the sub-bezel.

Mounting

PCAP touchscreens will need double-sided VHB tape or equivalent for mounting the touchscreen to the LCD or sub-bezel. The mounting tape should be placed on the back of the screen without making contact with the active area. Elo recommends mounting PCAP touchscreens onto a plastic sub-bezel. Plastic sub-bezels make the units easier to replace in the field, but good adhesion is harder to achieve than with the metal of an LCD. VHB does not bond readily to plastic, so if you are interested in mounting the touchscreen to a sub-bezel, a primer will be needed. The primer should be applied to the screen and the sub-bezel for proper adhesion. Elo suggests 3M Tape Primer 94 or equivalent with curing step.

Sealing

Dust and watertight seals can be achieved with proper integration of PCAP touchscreens. Seals that meet NEMA 4 and 12, and IP65 standards may be accommodated based on integration.

When only dirt and dust seals are necessary, open cell foam material can be applied between the touchscreen and bezel. The seal must not contact the active area of the touchscreen. It is important to use non-conductive materials for sealing.

A watertight seal is achievable by applying a gasket around the inactive border region of the cover glass. The gasket must be applied in the inactive border to prevent unwanted touches caused by the gasket pressing on the active area. Elastomer gaskets of almost any type may be used to make a seal between the touchscreen and bezel in this region. Open-cell or closed-cell foam gaskets manufactured without sulfur vulcanized elastomers are recommended. Cell foam gaskets manufactured with sulfur can attack the silver electrode pattern of the touchscreen. Recommended elastomers include silicones, polyurethanes, and saturated polyolefins, which are cross-linked using high energy irradiation, peroxide, or other chemical cross-linking reactions.

Please contact your Elo Touch Solutions representative with additional questions on designing a PCAP touchsystem.

Installation Notes

Cables can be strained and damaged during installation. Damaged cables are a common cause of functionality failures, so it is important to protect them. The cables should be routed away from the LCD panel inverter, lamps, and power module. The cables should never be creased or crimped. Cables can be bent with a radius of 6 mm or greater. Most importantly, cables must not be used as handles for picking up the touchscreen.

Installation considerations are as follows:

- Cables must not be used as handles for picking up the touchscreen.
- A fixture to help align the touchscreen with the LCD is recommended.
- Before mounting the touchscreen, clean the face of the display and the back of the touchscreen within the viewable area with household glass cleaner applied first to a disposable wipe. Never apply cleaners directly to the touchscreen. Be sure to remove all fingerprints. A compressed air nozzle with clean, dry air may be used to remove the dust on the sensor and on the monitor. The space between the touchscreen and the display face must be clean and free of any foreign objects.
- A drawing program may be used to confirm functionality of the touchscreen after installation.

Controller Considerations

Elo will recommend the best controller for your screen and application. The touchscreen has FPC cables that connect to the controller. The connection between the controller and computing system has a USB interface.

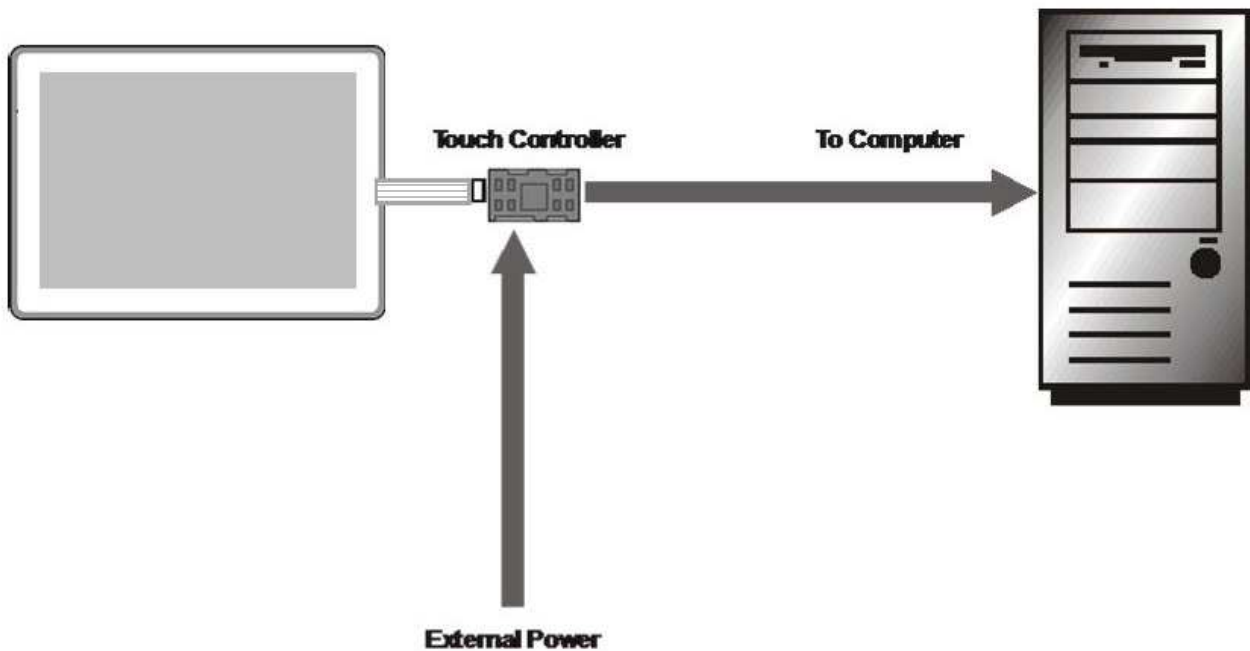


Figure 2-4. Basic system overview

PCAP controllers should be securely mounted to a metal bracket with good grounding and mechanical support. The controller should also be mounted at least 100 mm away from sources of electrical noise.

It is recommended that the power for the controller be linked with the display power to prevent accidental computer inputs in the event that the controller is powered, but the display is off.

Chapter 3: Troubleshooting

If your integrated system is having functionality problems, there are several ways in which you can troubleshoot the components.

Troubleshooting the touchscreen

The first suggested course of action is to reconnect the touchscreen. Problems with functionality are often caused by poor attachment of the cables. Ensure that the pins of the screen align with the contacts in the connector. The gold side of the cable should face down when inserted into the connector.

If the screen is still not responding, try replacing the screen with another. Substitution is the fastest way to determine the source of the problem. If screen substitution does not resolve the issue, please continue by troubleshooting the controller.

Troubleshooting the controller

The first step in troubleshooting the controller is verifying that it is powered properly. Most Elo controllers operate on a 5 V-dc power source. Please double check the specific requirements for the controller you are using to ensure you are within the specified range.

The second step is to verify proper controller grounding, which is essential for controller functionality. Grounding allows the controller to deal with electrical noise and other environmental issues. PCAP controllers are designed with Plated Through Holes (PTH) for Earth grounding of the system. Ensure that one or more of the PTH is used, and that the PTH is connected to Earth to prevent undesired controller operation. In systems where direct mounting to an Earth chassis is not possible, Elo recommends the implementation of a grounding strap to connect one PTH to Earth.

Substitution can also be used to verify a failure with the controller. Please contact Elo Technical Support for additional help with PCAP controllers.

Troubleshooting the driver

Elo driver software provides a consistent software interface among Elo touchscreens and controllers. PCAP systems are HID-compliant with most operating systems and should be functional without a driver. If the screen and controller are determined to be functional on one operating system and do not function on another, a driver may be required. The driver software helps the touchscreen controller report touch location as a function of the screen coordinates. The driver also performs other operations as directed by the application.

Install the driver for the operating system to be used from the support page at www.elotouch.com. A video alignment program runs automatically at the end of the installation process. The alignment program may be run at any time from the Control Panel or a Desktop shortcut. The standard calibration program requires the touch and release of three “targets.” A test screen shows confirmation of correct alignment. More precise alignment routines may be available upon request.

Connectivity to a touch device can be verified using the Device Manager in Windows operating systems. The touch device should show up under “Mice and other pointing devices.” After auto-detection, with no driver installed, it should report as a HID-compliant mouse. After successful driver installation it should report as a specific Elo Touch Solutions device.

Hardware functionality can be verified by touching the screen after auto-detection; even without any driver installed, there should be response to touch by virtue of the touch system being a HID-compliant device. Touch response may be radically misaligned with the video, but any sort of cursor movement on touch confirms basic hardware functionality.

There is very little troubleshooting to be done for the driver itself, other than verifying that the correct driver has been installed. If several incorrect drivers have been installed, it may be necessary to do a manual uninstall to “clean up” the operating system. In such a case, see the Manual Driver Removal instructions in the Support section of www.elotouch.com.

Chapter 4: Frequently Asked Questions

This section covers the most common questions concerning PCAP components.

1. *What type of glass is used?*

Standard PCAP screens are available with soda lime glass. The nominal screen thickness of standard screens is between 2.2 and 2.8mm.

2. *What finishes are available on PCAP touchscreens?*

Elo PCAP screens can be designed with a clear or anti-glare finish.

3. *Will mounting tape or sealing materials be prepared by Elo?*

Mounting and sealing is typically completed by the customer. Elo Touch Solutions can apply mounting tape or design a sealing gasket for you upon request. See Chapter 2 for more details.

4. *How can I test functionality after integration?*

The functionality will depend on the applications and operating system used for the device. In general, a drawing program is helpful for ensuring that the system works properly after integration.

5. *Can I customize my PCAP touchscreen?*

Elo takes pride in our ability to work with customers to generate specialized touchscreen solutions for every application. For help with customizing your PCAP touchscreen, please contact your Elo Touch Solutions Representative.

6. *Where can I find more information if my questions aren't answered in the PCAP Integration Guide?*

Contact Elo Touch Solutions Customer Sales and Support for help with any further questions about your PCAP application.

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