

Technical Bulletin: PCAP Firmware Tuning

The purpose of this document is to describe the differences between projected capacitive firmware and drivers and explain the importance of firmware tuning in the end application for projected capacitive technology.

The projected capacitive touch system typically includes a Touch Screen and Controller Board or, in the case of Chip on Flex solutions, a Touch Screen only which includes an attached FPC circuit to which the controller chips are mounted. In some cases, USB or RS232 interface cables may be included as well. Beyond the controller hardware, there is also software which includes the PCAP firmware and drivers.

The driver is the software that provides an interface between the controller hardware and the operating system. The driver in this case communicates with the touch screen controller and interfaces with the customer's operating system to control the position of the cursor(s) and provide selection and gesture commands. Drivers reside as a file on the end unit's hard drive or other permanent storage device. Dawar offers drivers for the following operating systems: Win 7, Windows Vista, Windows XP, Windows CE, Windows Embedded, Linux, MAC and QNX.

Firmware is the software that acts as the control program for the microprocessor on the touch controller chip. Firmware contains the program code and operating parameter data important to the touch screen function. The firmware also controls the format of the data that is transmitted from the controller to the host. For touch screen function, tuning is completed to ensure proper touch function in the customer's application. Firmware will be customized to the customers' requirements and variables in the final system integration. Drivers do not generally change unless there is a change to the operating system used in the end application.

Dawar offers 2 point, 4 point, and 5 point standard firmware for each of the PCAP standard touch screen products. Standard firmware is developed with a base sensor with no cover lens and operates with bare finger touch. This firmware is functional with USB and I2C protocol. This firmware is meant to provide basic functionality for initial bench top evaluation of the system. In general, firmware will be customized to the end

customer's application as part of the development process described below prior to mass production.

Firmware can be provided for other protocols like RS232, but this firmware is considered custom. Dawar firmware is identified and controlled by an FWXXXXX-X number where the -X is the revision. If the customer is using a controller board solution, custom firmware also creates a custom controller board part number noted as CTXXXXX-X where the -X is the revision. Custom firmware and custom controller part numbers are revision controlled through a controller drawing or, in the case of a chip on flex controller, through the Dawar touch screen drawing. If the firmware is changed to the next revision, this is noted on the controller drawing or chip on flex touch screen drawing.

During the estimating phase of a project, Dawar creates or identifies a custom controller board part number for controller board solution and provides this information on the quote to the customer. At the customer approval stage of a projected capacitive project, Dawar Engineering submits a tuning questionnaire along with a drawing to the customer for approval. Part of the approval process with the customer requires a customer submission of a completed tuning questionnaire document to Dawar. The tuning questionnaire has important tuning firmware attributes. Answers on the tuning questionnaire will drive the firmware tuning once the product has been manufactured. Input device, orientation, and number of touch points are important attributes requested in the tuning questionnaire. Other firmware characteristics like sensitivity and threshold are important as well.

During a new project engineering creates a firmware number specific to the product being designed. The physical firmware is not created until the first touch screens are manufactured and prior to completion of the 100% electrical test. The firmware is prepared on a standard desktop computer with the touch panel and controller laid flat on a table.

Dawar offers a second firmware tuning service at no charge once the touch screen product has been integrated into a chassis/end customer product. This requires the customer to send the unit to Dawar for analysis and operation. Dawar has a specific firmware tuning procedure which is guided through Dawar using its RMA process. A second firmware tuning is highly recommended by Dawar to ensure proper touch function of the system in the device's final application. A myriad of factors outside of the control of the sensor's construction and original firmware can occur during integration of the final system which can impact the performance of the projected capacitive touch screen's function. Some of these factors are EMI shielding, metal chassis, system grounding, cover lens application by a third party, bonding, or noise from peripheral electronic components. During the second firmware tuning, engineering will review the signal to noise ratio, identify any adverse variables and optimize the performance of the touch system. Retuning of the firmware optimizes touch performance and minimizes phantom touch conditions.