The return of no point rather than a point in error is considered preferable. By way of further example, reflections from panel edges may generate additional peaks in a dispersion corrected correlation function. These may give rise to ambiguity and a number of candidate points. These ambiguities may readily be resolved using an impulse reconstruction and contact location verification methodology of the present invention.

[**0117**] In another example, lowering a threshold for triggering the location determination calculation may give rise to spurious points due to transients in the background noise, such as airborne acoustic, structural acoustic, or electrical noise, for example. These noise related spurious points may be rejected by use of impulse reconstruction, allowing a lower threshold to be set and achieving greater sensitivity to light touches.

[**0118**] The following illustrative example involves a touch on the LCD bezel. In this case, a touch to the bezel couples energy into the touch sensitive panel, triggering the location determination calculation. A point may be reported within the body of the touch sensitive plate that requires verification using impulse reconstruction. **FIG. 21** shows the point (represented by a cross) reported by a touch to the LCD bezel.

[**0119**] **FIG. 22** shows the pickup signal traces resulting from the tap to the LCD bezel. These signal traces show different arrival times and dispersed shapes. Given the traces shown in **FIG. 22**, it is not immediately obvious whether these traces resulted from a bezel touch or a valid contact to the touch sensitive panel. **FIG. 23**, however, shows the result of impulse reconstruction applied to the traces of **FIG. 22**. It is clear from the traces in **FIG. 23** that the reconstructed impulse shapes do not correspond to a valid point. As such, this erroneous point may be readily rejected.

[**0120**] **FIGS. 24**, **25**, and **26** show the contact location, pickup signals, and reconstructed impulses resulting from a touch event with a stylus. It can be readily seen from the traces shown in **FIG. 26** that the impulse reconstruction worked very well. The impulse shape generated by use of a stylus is quite different from that generated by a figure contact. Such differences may be used to detect the nature of the contact type, e.g., finger vs. stylus vs. gloved finger, etc.

[**0121**] Impulse reconstruction as applied to contact location confirmation has been well described above, with examples showing how similar reconstructed impulses may be obtained from each sensor. The process of confirming contact point validity involves a measure of the similarity, both in time of arrival and shape, of each of the reconstructed impulses. A number of techniques may be implemented for this purpose, including measures of correlation between the different reconstructed impulses. The method described below with reference to FIGS. **27**(*a*)-(*d*) represents one of several techniques that performs well and is computationally efficient.

[**0122**] **FIG. 27**(*a*) shows the reconstructed impulses as originally shown in **FIG. 18** for sensors **14**. **FIG. 27**(*b*) shows the average of these impulses. Taking the average of the reconstructed impulses serves to emphasize the desired similar feature in each trace, that the rise time and shape are similar for the four sensors. It is noted that the later energy results from reflections within the touch sensitive plate and is not corrected for dispersion by the impulse reconstruction process. In this regard, the impulse reconstruction process only attempts to correct for one distance, that being the first arrival distance. As a result, the later energy differs between the four traces and is therefore reduced by the averaging process. The trace shown in **FIG. 27**(*b*) therefore combines the information in the four traces in a beneficial manner.

[**0123**] In order to further emphasize the sharp change that is clearly visible in **FIG. 27**(*b*), a scaling factor can be usefully applied. Such a scaling factor is shown in **FIG. 27**(*c*), which is derived from the cumulative sum of the absolute value of the impulse response. This is calculated for each sensor and averaged to give the trace shown in **FIG. 27**(*c*). The resulting trace is low when the signal is quiet but progressively increases as time increases through the non-quite portion of the impulse. This approach may be used to emphasize the first arrival as shown in **FIG. 27**(*d*).

[**0124**] **FIG. 27**(*d*) shows the average impulse response divided by the average cumulative sum, i.e., the trace of **FIG. 27**(*b*) divided by the trace of **FIG. 27**(*c*). This scaling serves to normalize the trace and emphasize the start of the impulse close to sample **40**. The initial **20** samples of the response show some noise that results from the large value of the scaling function. However, after the first 20 samples are discarded, the measure may be used as an indicator of impulse synchronicity. Also shown on the graph of **FIG. 27**(*d*) is a threshold level of 0.2, above which the impulses are considered synchronous and the point valid.

[**0125**] A measure of synchronicity has been shown with reference to **FIG. 27** that emphasizes similar shapes of impulses all starting sharply around the same time. This measure may be used to confirm valid points and reject erroneous points.

[**0126**] In order for a given synchronicity measure to be valid, it should reject "bad" points. Two examples of such measures will now be discussed. The first, shown in **FIG. 28**, shows the results for the inaccurate data example, originally shown in **FIG. 20**. The second, shown in **FIG. 29**, shows the results for the LCD bezel touch data, originally shown in **FIG. 22**. Both "bad" point examples do not cross the threshold in the region of interest (e.g., after 20 samples), which demonstrates the efficacy of the synchronicity measure approach described above.

[**0127**] The method of impulse reconstruction as described above relies on the fact that the original contact does in fact produce a reasonable impulse. This is the case for most contacts and the method works well with application of the inverse phase factor associated with the first arrival distance to each sensor. However, there is the additional possibility of a constant phase factor in the measurement.

[**0128**] This may be caused by a number of different sources, including: (1) Bending waves in touch sensitive plates take the form of both propagating waves and exponentially decaying near fields. These near fields do not propagate from the contact point to the sensor, however they do influence the response at the contact point and may be out of phase with the propagating wave. With an impulse input at the contact point, the response of the plate may also be impulse-like, however the phase of the propagating wave may be shifted; (2) The contact may be compliant, introducing a phase factor in the force generated; (3) The phase