

DEVELOPMENT OF AN ASSESSMENT PROTOCOL FOR AFTER-MARKET SPEED LIMIT ADVISORY DEVICES

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Paper Number 13-0393

ABSTRACT

Advisory Intelligent Speed Assist (ISA) systems are those that integrate data about vehicle location with information about the speed limit of the current section of road and direction of travel, and which will alert the driver if the speed limit is exceeded.

We examine the potential of after-market portable navigation devices (e.g., smartphones and portable satellite navigation devices) to inform drivers about posted speed limits and to assist them to travel within the speed limits. Data sources include ISA effectiveness studies, manufacturer's product specifications, GNSS signal and device positioning theory, information related to performance characteristics and method of operation of GNSS signal emulators, digital speed limit maps provided with ISA-related software and human factors research associated with in-vehicle alerts.

At the time of the research project there were no standards or assessment protocols directly relevant to assessing after-market ISA devices therefore a draft assessment protocol was developed. It was found that it is feasible to assess and rate the performance of after-market ISA devices in an objective and repeatable manner. It is estimated that the better performing devices could reduce fatal and serious crashes by around 19% assuming widespread fleet penetration. An analysis of various implementations scenarios shows that a modest uptake in advisory ISA enabled PNDs is required to break even on implementation costs.

INTRODUCTION

This paper examines the potential of after-market portable navigation devices ("PNDs", e.g., smartphones and satellite navigation devices, commonly known as 'Sat Navs') to inform drivers about road speed limits and to assist them to travel within the speed limits. While the primary functionality of PNDs is wayfinding, many devices incorporate additional functions such as points-of-interest (POIs) and speed limit information.

Intelligent Speed Assist is any system that constantly monitors vehicle speed and the local speed limit on a road and implements an action when the vehicle is detected to be exceeding the speed limit. Advisory ISA systems are those that integrate data about vehicle location with information about the speed limit of the current section of road and direction of travel, and provide an alert to the driver if the speed limit is exceeded. Feedback may be an audible alarm, a visual signal, haptic feedback such as a vibrating throttle pedal, or a combination of these.

This paper is based on a research project conducted for the New South Wales Centre for Road Safety. The scope of the research was limited to portable advisory ISA systems available for retail purchase that include a database of road speed limit zones. OEM devices, customised products, prototype devices or products for other vehicle types or non-road environments were out of scope.

BACKGROUND

Advisory ISA devices that provide information to drivers about the posted speed limit have been available for more than 5 years in Australia. Many models of PND include a display of the current speed limit for a road section. Most models on the market provide the option to indicate to the driver (via an audible or visual signal) when the vehicle exceeds the displayed speed limit.

Several applications for 'smartphones' are available that also display the speed limit and generally will provide an alert to the driver if the speed limit is exceeded by a specified amount.

It is apparent that there are varying degrees of performance between different products on the market. These variations can be due to the capabilities of the hardware, the coverage or accuracy of the speed zone information, the design of the software or a combination of these.

Unfortunately, it is very difficult for consumers to differentiate between the performance of different

products on the market as technical information for these systems is not readily available.

It is postulated that a consumer scheme, which assesses and compares the performance of devices on the market then provides the assessment results to consumers, would allow consumers to make a more informed purchase. The scheme may also motivate manufacturers to improve their products by subjecting the performance of their products to public scrutiny in direct comparison to their competitors. The scheme would also provide a mechanism for objective feedback to manufacturers in specific areas in which their products could readily improve to be of most benefit to consumers.

The scheme may also increase uptake of advisory ISA devices as customers who would have otherwise not purchased an ISA product may become aware of the capabilities and benefits of ISA products.

STATE OF ADVISORY ISA MARKET IN AUSTRALIA

Retail environment

There are numerous PNDs (including smartphone devices with navigation applications) on the Australian market with the potential for ISA and these are identified to consumers at the point of sale through packaging and marketing material using terminology such as 'Speed Assist', 'Speed Alert', 'Speed Warnings' or 'Speed Sign Alert' and pictorial information such as the commonly recognized speed sign pictogram for Australian roads (black text on white background inside a red annulus).

Some products include statements such as

- 'Never drive too fast again' (Navigon)
- 'Alerts you when you're speeding, even if you're not in navigation mode' (TomTom GO 1050)
- 'Speed Sign Alerts will make sure you're driving at the right speed to avoid trouble' (Navman Ezy30)
- 'Knows the exact speed limit where you are. Knows how fast you are traveling. Alerts you when you are speeding' (SpeedAlert)

Some manufacturers provide video demonstrations or explanations of how devices work at point of sale (on a screen or on the device itself).

Retail staff knowledge of ISA products was found to be poor, with incorrect claims made about several products, poor knowledge of coverage and an inability to differentiate between poorer or better

performing devices (based on coverage, alert type and accuracy of zones).

The variety and inconsistency of marketing terminology along with paucity of technical information on how the systems work and poor sales support means that the market is currently confusing for consumers.

While some models retail for several hundreds of dollars many models were available below AU\$200. This pricing is much less than is common for the cost of factory fitted vehicle navigation systems.

Device types and functions

Most devices on the market had a compatible cradle or dock in which the device could be mounted for use in a vehicle. The most common mounting method was the use of a suction cup and bracket, however some systems used vehicle cigarette sockets for mounting (and also for power supply). These mounting methods were designed for installation without tools by the consumer.

All ISA devices on the market use both audible and visual alerts to indicate when the vehicle is travelling above the legal posted speed limit. Often the user can select to disable these alerts. In most cases devices used an image of black text on a white background inside a red annulus to display the current speed limit, however some devices used different visual indicators for the speed limit. Intensity of alert, duration of alert, volume of audible alerts and size of visual alerts vary from device to device. There are more than 12 brands currently on the market with at least three major suppliers of speed zone data (Whereis, Metroview and Navten).

Each device identified on the market had the capability to receive updated speed limit data, either by CD (available from the manufacturer) or via file download from the Internet.

DEVELOPMENT OF A RATING SYSTEM FOR ISA DEVICES

The purpose of the rating system is to clearly and concisely convey to consumers information about how devices perform as advisory ISA devices.

Possible rating methods include descriptive ratings (e.g. 'Good', 'Marginal', 'Poor'), numeric ratings (e.g. a score or a percentage), a star rating (e.g. 4 out of 5 stars) or an endorsement (e.g. Pass/fail, tick of approval).

Principles for selection of a rating system

An ISA device *rating system* should:

- Clearly discriminate between good and poor performers
- Spread the field so that marginally performing products can be differentiated from the good performers
- Be credible and easily recognized as associated with road safety
- Be associated with ISA stakeholders
- Be simple and easily understood by the target audience
- Be familiar to consumers
- Allow consumers to obtain further information if they wish
- Be easy to reproduce results consistently across various media (i.e., results can be reproduced consistently in brochures, websites print and television advertising)
- Be attractive for journalists and others to use
- Be a single credible source of the information
- Be relevant and viable in the long-term (future proof)
- Use a method that has been proven to be effective
- Meet community expectations

DEVELOPMENT OF AN ISA ASSESSMENT SYSTEM

Principles for the assessment system

The following principles have been identified to guide the development of the assessment system.

- Devices which lack fundamental features or minimum performance should be prevented from achieving high scores
- Test methods should test one aspect of the device's performance only
- Tests should be quick as possible to conduct
- Tests should be fair, repeatable, objective and relevant
- The same test method should apply to all devices
- Tests should not advantage/disadvantage any device (i.e. there should be a 'level playing field')
- Tests should be performance based where possible
- Criteria should allow for discrimination between products available on the market
- Tests should be robust and be free from any 'loopholes' that manufacturers may exploit to improve a score

- The tests program should be efficient and allow quick turnaround as the product lifetime of PNDs is relatively short (it is important to get information to consumers while the device is still a current product)

Furthermore, the following operating procedures are recommended.

- That if any aspect of performance or use which may compromise safety becomes apparent, then relevant information be reported to consumers
- That devices be tested in their default state (i.e., 'out of the box') unless the assessment requires the changing of a default parameter
- That any ISA functionality that engages at greater than 10km/h over the posted speed limit not be assessed (i.e., the maximum speed over the posted limit for testing is 10km/h).
- Where devices allow the threshold to be customisable and set by the driver, the factory default settings will be used.

Assessment options, issues and benefits

Testing of ISA devices has the potential to be complex, resource intensive and time consuming. ISA devices may have many features and settings therefore the testing should allow all options to be evaluated in a way that provides an accurate assessment of real world performance.

Simply testing ISA devices on public roads is one means of assessment, however it is resource intensive, may be affected by environmental conditions and carries some safety risk to the assessors. Furthermore, the issue of how to test on-road without exceeding the speed limit must be adequately addressed.

An alternative identified method to test ISA devices in a laboratory environment involves the use of a Global Navigation Satellite System (GNSS) simulator that is able to record and replay location data collected during actual road trips. The use of this device has the following advantages over on-road testing:

- Less susceptible to environmental effects
- Testing is highly repeatable with each device subjected to exactly the same test scenario
- Lower resource and labour requirements
- Reduced OHS risks
- Tests can be conducted in a shorter timeframe
- If a test must be redone it is possible to recreate the scenario easily

- The ability to record test conditions and results with great detail and accuracy
- Ability to simulate exceeding the speed limit using software
- Testing can be carried out far from the geographic region of interest

GNSS simulation allows the capture of GNSS satellite transmissions (e.g., GPS satellite transmissions) by capturing the exact signal a GNSS device receiver would receive and recording the signal for later playback (in the laboratory). The signal is captured by driving a route of interest, so that a real world GNSS signal is obtained and downloaded via laptop into a memory storage device (e.g., an external USB hard disk). An advantage of a GNSS simulator is that it can be used to modify the captured data (acquired at legal speeds) to include episodes of speeding. This enables the alerting functions of the device to be tested in the laboratory. Since the captured signal is stored each device being assessed can receive exactly the same test signal, allowing objective comparison between results. If necessary the exact signal can be replayed if an assessment item needs to be rechecked and the same signal can be reused for later assessment phases.

Tests that could be conducted using a GNSS simulator include:

- GNSS receiver sensitivity
- Minimum time to GNSS fix (warm start, cold start)
- Alert triggering and lag
- Alert types and settings
- Map completeness and accuracy
- Positioning accuracy
- Out of area functionality
- Error detection (frequency and duration)

Performance based assessment method

It is envisaged that one outcome of an ISA assessment program is that manufacturers are encouraged to develop improved products in the future.

Since future advances in location and human-machine interface technology are likely it is preferable that motivation for the development of ISA devices (which are fundamentally a location based human-machine interface) is not constrained by current technology or popular design characteristics. How a device performs its function is more critical than meeting specific definitions or conditions. As such a performance based assessment method is recommended so that new and better ideas can emerge without being constrained to meet limiting definitions.

AUSTRALIAN ISA FEASIBILITY STUDIES AND COST BENEFIT ANALYSES

Paine (2009) included a review of earlier studies of ISA effectiveness. Since that time a trial of ISA advisory systems has been completed by the NSW Centre for Road Safety in the Illawarra region south of Sydney (NSW Centre for Road Safety 2010).

This trial involved 104 vehicles fitted with an advisory ISA system. Analysis of data collected during the trial found that 89% of drivers of vehicles fitted with the ISA device reduced the amount of time they previously spent exceeding the speed limit. Reduction in speeding in all speed limits was observed, as was a reduction in mean and median speeds. It was estimated that there would be an 8.4% reduction in fatalities and a 5.9% reduction in injuries for the region in which the trial was conducted if all vehicles were fitted with advisory ISA. The estimated saving to the community was between AU\$39 million and AU\$63 million.

Subsequently, the University of Adelaide Centre for Automotive Safety Research (CASR) published a cost benefit analysis (CBA) of advisory, supportive and limiting ISA systems (Doecke and Woolley 2011). For advisory ISA systems a reduction in all crashes of 7.7% was estimated, equating to an estimated saving of over AU\$1.2 billion per year.

Even with the most conservative discounting rate applied (8%) an advisory ISA system on the Australian retail market returned a benefit cost ratio of 1.92 with a payback period of 4.3 years and a break even price of AU\$511. Since this time a free smartphone ISA application from the same developer of the above system has become available in Australia.

In 2011, CASR (Doecke, et al, 2011) also published an economic analysis of four advisory ISA systems including two dedicated ISA devices (i.e., the devices have no other functionality) a portable navaid system with ISA functionality and an OEM installed in-vehicle multimedia system with ISA functionality. The estimated crash savings for the analysis were based on the results of the Illawarra trial (above) and the Kloeden risk curve for travel speed (Kloeden et al 2002). The study concluded that advisory ISA has the potential to reduce casualty crashes in government fleets by 20% in each Australian state (the two Australian territories were not included in the analysis).

Further analysis of the NSW ISA Trial results by

CASR determined that if all Australian vehicles were fitted with an advisory ISA device then serious injuries could be reduced by 19.3% and fatalities reduced by 18.9% (Creef, et al. 2011)

Benefit Cost Analysis

It is not possible to predict the total number of devices that might be used through a successful ISA rating program. However the costs and benefits derived above can be used to estimate the minimum number of devices that will need to be used in order for the ISA rating program to break even. That is, the number of devices that will produce societal crash cost savings which match the discounted costs of the ISA rating program. This number was derived by entering present-value data in an Excel spread sheet and using the Goal-seek function of Excel to calculate the number of devices needed to produce a benefit-cost ratio of one.

Benefit-cost ratio = Present value of net annual savings / Initial cost of scheme

It was estimated that the scheme would cost AU\$180,000 to implement. Annual costs depend, in part, on the marketing effort that is put into promoting the scheme, while annual savings depend, in part, on the effectiveness of the recommended devices. Various scenarios were evaluated as shown in Table 1.

Using a five year evaluation period and a 4% discount rate (Doecke & Woolley 2011), the net annual savings (NAS) need to be at least AU\$40,433 for the scheme to break even (PV of AU\$40,433 = AU\$180,000 = initial costs).

It is evident that a very small proportion of the total PND market needs to be influenced by the rating program in order for the scheme to break even. Annual sales for PNDs alone are estimated at more than 800,000 across Australia (Gallagher, 2010). NSW sales are roughly 250,000 so the 1,552 devices needed for Scenario A to break even represent just 0.6% of annual sales.

The numbers of devices needed for the scheme to break even remain relatively low even if some of the assumptions are varied, as shown in Table 1. Based on this analysis the prospects of the rating program having a very high benefit/cost outcome are excellent. For example, the B/C would increase to 10 if, under Scenario A, 5543 devices were put into use instead of the break even number of 1552. This is considered feasible as the main purpose of an ISA rating program is to influence buyer choice - not to convince them outlay money for an expensive device. The prospective buyers have usually already made a decision to buy a PND and it seems likely that devices/applications with a good rating will cost no more than poorer performing devices.

TRIAL ASSESSMENT OF SAMPLE ISA DEVICES

A trial assessment of four ISA devices (currently available on the Australian market) against selected assessment criteria was carried out.

The purposes of the trial assessment were to demonstrate the feasibility of the scoring system and to identify practical issues that may arise during assessments. The trial assessments were designed to determine if the assessments are repeatable, relevant and objective.

Four devices were assessed against twenty selected criteria. There was one smartphone based ISA application (Device A) and three PND based ISA products (Devices B, C and D).

Trial Assessment Method

Devices were tested on-road in a scenario similar to how the devices would be commonly used. Functionality was observed in use and where necessary settings were checked via the device menus.

Trial Assessment Criteria

For selection of the trial assessment criteria the following principles were followed:

Table 1. Break even calculation for several scenarios (in AU\$)

Scenario	Set-up cost	Annual cost	No. in use for break even	Est. annual crash savings	Net Annual Sav & PV	B/C
A. Low marketing (\$30K/year)	\$180,000	\$101,000	1552	\$141,433	\$40,433 \$180,000	1
B. High marketing (\$100K/year)	\$180,000	\$171,000	2319	\$211,433	\$40,433 \$180,000	1
C. Low (1/3rd) effectiveness, low marketing	\$180,000	\$101,000	4638	\$141,433	\$40,433 \$180,000	1
D. Low marketing, 3 year eval period	\$180,000	\$101,000	1820	\$141,433	\$40,433 \$180,000	1
E. Low marketing, 6% discount rate	\$180,000	\$101,000	1577	\$143,731	\$42,731 \$180,000	1

- Criteria were selected to include assessment of key parameters but with consideration of the ease and repeatability of testing (noting that the purpose of the trial assessments was to demonstrate the feasibility of the test method and had certain limitations).
- Assessments where environmental conditions could significantly affect results were avoided.
- Criteria were not chosen to provide differentiation between devices (i.e., criteria were not selected to show that any device performs better or worse than any other and was not designed to highlight or penalise any particular feature).

Furthermore, some of the selected criteria related individually to the performance of the device hardware, speed limit data or software performance. This was to examine whether it was feasible to assess hardware, data and software performance separately as it is possible that software and/or data may be compatible with multiple hardware devices in future.

The 20 criteria selected for the trial assessment are included in Appendix A1.

Trial Assessment Scoring (Rating)

For each criterion devices were scored in accordance with the observed performance and obtained 3 points for a good result, 2 points for an acceptable result, 1 point for a marginal result and 0 points for a poor result. If an item could not be assessed the device was awarded a default score of 3. (For Device A it was not possible to travel through an active school zone during the test).

All points awarded were summed to provide a final score for each device.

For the trial assessment the numeric score for each device was used to differentiate performance and provide a rating. A higher score represented better performance and a better rating. The maximum possible score achievable was 60 and the lowest score achievable was zero.

Trial Assessment Results

Table 2 shows the results of the trial assessments. Note that for the purpose of the assessments it is not necessary to compare the devices scores in detail as the trial assessment criteria only represent a partial list of the potential assessment criteria (if a more complete set of criteria were applied the scores could vary significantly).

Table 2. Trial Assessment Results

Criteria Description	DEVICE			
	A	B	C	D
Must include school zones*	Green	Green	Green	Green
Must display current time	Green	Green	Green	Green
Displays vehicle speed	Green	Green	Green	Green
Displays current speed limit	Green	Green	Green	Green
Displays correct speed limit for school zones when zone is active	Blue	Green	Green	Red
Provides driver with alert when speed limit is exceeded	Green	Green	Green	Green
School zones enabled as default	Green	Green	Green	Red
Audible Alert volume	Green	Yellow	Green	Green
Redundant/back up location system	Orange	Orange	Orange	Orange
School zones - correct time/day of operation	Blue	Orange	Orange	Red
Electronic variable signs	Red	Red	Green	Red
New speed zone alert	Green	Red	Green	Red
Default application	Green	Green	Green	Red
Alerts are enabled as default	Green	Green	Green	Red
Default tolerance of alerts	Red	Red	Red	Red
Minimum alert tolerance	Yellow	Green	Green	Red
Maximum alert tolerance	Red	Orange	Red	Red
Unit can only fit into limited number of vehicle models	Green	Green	Green	Green
School zones can not be disabled	Green	Red	Green	Red
Driver interaction required	Yellow	Green	Green	Green
Score (max possible score 60, min possible score 0)	47	41	50	25

* Temporal speed limits apply in some Australian states.

Key to results

Green	(3) Good
Yellow	(2) Acceptable
Orange	(1) Marginal
Red	(0) Poor
Blue	(3) Not Assessed

Discussion of the Trial Assessment

Subject to the limitations of the trial assessments as stated previously it is evident that there is variation between the selected devices. In several criteria there are substantial differences and therefore scope for improvement. A consumer education program that uses the assessment method outlined above does have the potential to encourage manufacturers to improve devices.

Furthermore, in many criteria where a device has achieved less than a 'Good' result, another device has achieved a better rating, which suggests that improvement in these areas is technically possible.

In a practical sense, the assessments appeared repeatable, relevant and objective.

Investigation as to whether the on road tests could be replaced by a laboratory based method concluded that each of the criteria could be assessed in a laboratory using a GNSS emulator system. Furthermore it was apparent that resource requirements, particularly the time to carry out assessments would significantly decrease for laboratory based assessments. It was concluded that the trial assessment outcomes would not have been altered using a laboratory based assessment.

While selected assessment criteria were used for the trial assessment a more complete set of assessment criteria are required for a consumer rating program.

It was possible to assess aspects of the systems hardware, software or speed data performance independent of each other and it seemed feasible that, if desirable, sub-ratings for each of these could be generated. This would allow for the rating of software packages compatible with multiple hardware devices (e.g. a smartphone application that can be used on several different models of phone). The trial assessment scoring was not weighted at all. If priority areas of assessment were identified a weighting could be applied to related criteria (e.g. as a method to encourage good performance in this area).

While a simple numerical score was used in this case to rate the devices it may be desirable to use a different method for a consumer rating program. One rating method that appears appropriate is a star rating system as used by New Car Assessment Programs (NCAPs) and for rating the quality of hotels. This system appears a good fit as it is

- widely recognised
- capable of differentiation between poor and good performers
- simple to understand

- already has an association with safety due to the use of star ratings for NCAP

CONCLUSIONS

It is feasible to assess and rate the performance of after-market ISA devices in an objective, relevant and repeatable manner.

The assessment process can be structured to assess hardware performance, speed-limit map performance and software performance separately.

It appears technically possible that all of the assessed devices could improve performance in some areas.

It is estimated that based on an advisory ISA system that performs well that fatal and serious crashes could be reduced by more than 19% assuming widespread fleet penetration.

The cost of many devices is comparatively low (when compared to factory fitted navigation systems or comparable electronics) and as such are very affordable. The relatively low cost, and minimal installation requirements mean that these systems can be taken up by consumers very quickly.

Furthermore, these devices are available on the market and speed limit data can be readily updated.

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APPENDIX A1. TRIAL ASSESSMENT CRITERIA

Table A.1 Trial Assessment Criteria

Criteria Description	Good	Acceptable	Marginal	Poor
Must include school zones	Includes School Zones	NA	NA	Does not include School Zones
Must display current time	Displays current time	NA	NA	Does not display current time
Displays vehicle speed	Displays Vehicle speed	NA	NA	Does not display Vehicle speed
Displays current speed limit	Displays current speed limit	NA	NA	Does not display current speed limit
Displays correct speed limit for school zones when zone is active	Displays correct speed limit for school zones when zone is active	NA	NA	Does not display correct speed limit for school zones when zone is active
Provides driver with alert (audible/visual/haptic or combination) when speed limit is exceeded	Provides driver with alert when speed limit exceeded	NA	NA	Does not provide driver with alert when speed limit exceeded
School zones enabled as default	School zones enabled as default	NA	NA	School zones not enabled as default
Audible Alert volume	Easy to hear alerts over loud vehicle/traffic noise on default setting	Alerts sometimes difficult to hear over loud vehicle/traffic noise on default setting	Alerts sometimes difficult to hear over normal vehicle/traffic noise on default setting	Constantly difficult to hear alerts over normal vehicle/traffic noise on default setting
Redundant/back up location system	System has back up location system that requires no infrastructure	System has back up location system that requires infrastructure	System has no back up location system	
School zones - correct time/day of operation	Enables school zones at correct school time only on school days and differentiates school zones from other speed zones audibly	Enables school zones at correct school time only on school days	Enables school zones at correct school time OR only on school days but (but not both)	School zones enabled permanently (irrespective of time of day or date) or does not differentiate school zones audibly from other speed zones

Criteria Description	Good	Acceptable	Marginal	Poor
Electronic variable signs	Detects variable zones and informs driver of default speed	NA	Detects variable zones but does not inform driver of default speed limit	Does not detect variable zones
New speed zone alert	Audible alert distinguishable from other alerts and visual alert	Audible alert not distinguishable from other alerts (select if only one type of alert)	Visual alert only	No alert
Default application	ISA is the default (or only) application on the device (select for smartphone ISA applications where ISA is enabled as default for the application)	ISA is not default but can be selected in one simple action (no need to refer to instructions) except for smartphones (see 'Good')	ISA is not default but can be selected in two simple actions (no need to refer to instructions)	ISA is not default and is selected in more than two steps or steps are not simple (need to refer to instructions)
Alerts are enabled as default	Alerts are enabled as default	NA	NA	Alerts are not enabled as default
Default tolerance of alerts	0km/h tolerance as default	1km/h tolerance as default	2km/h tolerance as default	>2km/h tolerance as default
Minimum alert tolerance	0km/h	1km/h	2km/h t	>2km/h t
Maximum alert tolerance	2km/h	5km/h	10km/h	>10km/h
Unit can only fit into limited number of vehicle models	Device can likely be fitted to all models of vehicle	Device can likely be fitted to most models of vehicle with some exceptions	Device can be fitted to limited models of vehicle (greater than 50 current models)	Device can be fitted to limited models of vehicle less than 50 current models)
School zones can not be disabled	School zones can not be disabled	NA	NA	School zones can be disabled
Driver interaction required	Driver does not need to interact with device at all during use	Driver may need to interact with device, single touch, ISA functions still run	Driver may need to interact with device, single touch, ISA functions temporarily disabled	Driver may need to interact with device, multiple touch