Comparing Weigh Station Bypass Technologies

PrePass®

PrePass Safety Alliance introduced the concept of electronic weigh station bypassing more than 25 years ago. Since then, trucks from qualified fleets have been pre-cleared to continue past weigh stations at highway speeds when overhead readers query their in-cab transponders. The PrePass bypass process verifies that the fleet's safety record and credentials meet federal and state standards, and the vehicle is operating within legal weight limits as shown by weigh-in-motion (WIM) readings. Truckers benefit by saving time, fuel, and money by not stopping. And commercial vehicle enforcement agencies benefit by gaining time to better focus on carriers that need more attention.

PrePass relies on two types of transponders to facilitate weigh station bypass; a Radio Frequency Identification (RFID) transponder and an app for connected phones, tables, and telematics devices.

RFID transponders use radio frequencies to transmit data between the truck and weigh station and set the standard in reliability for bypassing. In fact, the USDOT and many other players in the connected and autonomous vehicles industry rely on RFID technology because it is extremely fast, accurate and dependable, all critical components of crash prevention technologies.

For a successful electronic bypass, the system must attribute the right safety rating, the right credentials, and the right WIM readings to the right truck in a split second, all at highway speeds in the midst of other traffic. RFID transponders do that very well. For example, a recent university study shows that RFID transponders, used exclusively in the PrePass bypass system, operate at 99.99% accuracy. Good news for truckers who rely on PrePass to save them time and money.

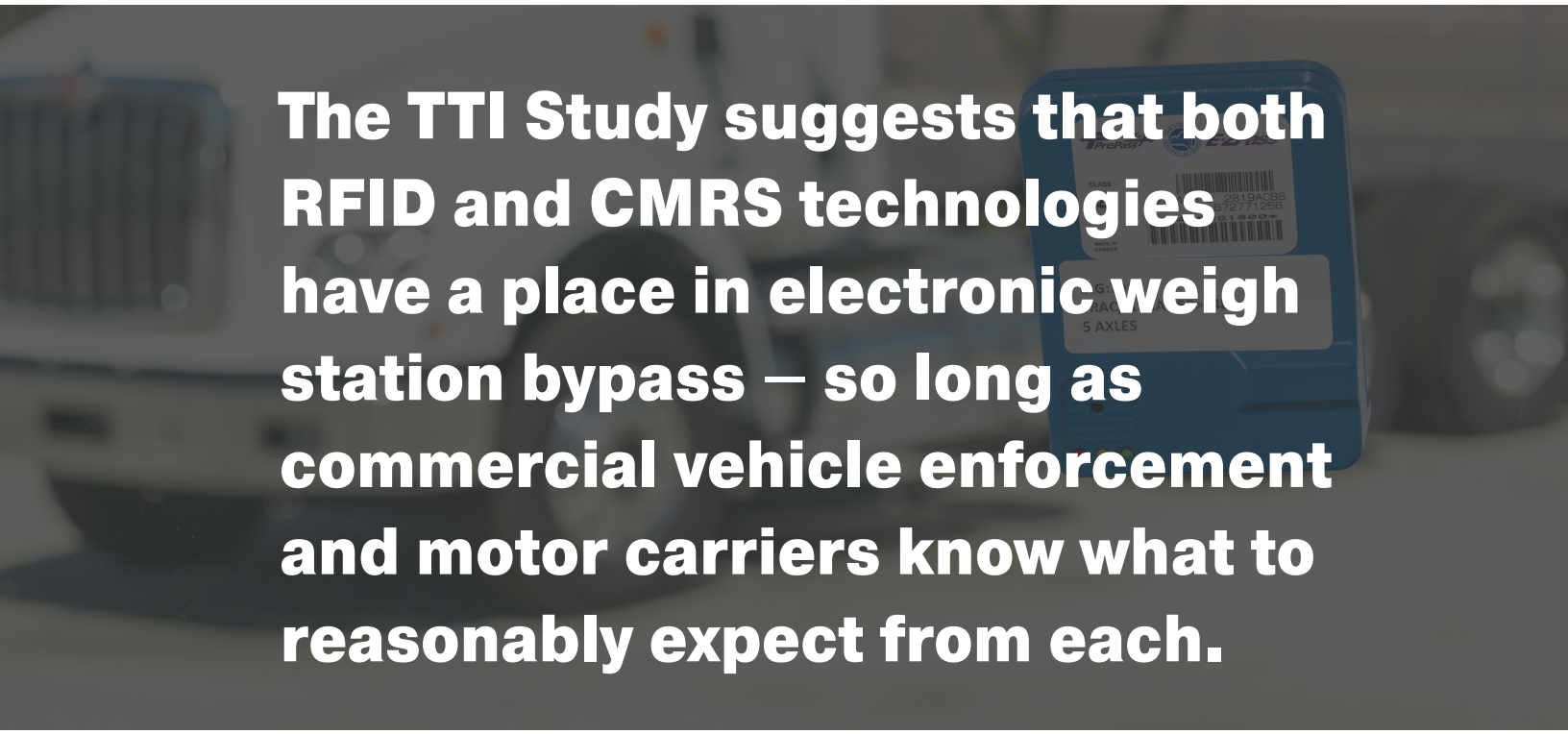
Today, electronic bypass is also possible using CMRS technology – Commercial Mobile Radio Services.

In today's world, technology evolves rapidly. Taking advantage of improvements in wireless speed and coverage, PrePass developed new technology for electronic bypass using CMRS – Commercial Mobile Radio Services. You know it better as cellular technology. CMRS is flexible... it can be an "app" on a smart phone, a tablet, or as part of an on-board computer platform (telematics device) in a truck. CMRS communicates with GPS defined "geo-fences" near weigh stations. That flexibility also allows jurisdictions to "geo-fence" roadside inspection areas and even agricultural inspection sites without the poles and overhead readers RFID would require. For qualified carriers, that means more opportunities to bypass.

On the other hand, while dropped calls and slow data speeds have become rare, those who rely on cellular technology to stay connected know that CMRS has not yet reached the 99.99% reliability of RFID systems. That is why the USDOT documented concerns about the use of CMRS in connected and autonomous vehicle technology.

So, how do RFID or CMRS compare to one another? Thanks to research by the Texas A&M Transportation Institute (TTI), we have some answers.

The PrePass Safety Alliance Board of Directors commissioned TTI, a renowned scientific research institute, to determine the accuracy of a CMRS mobile application when applied to the weigh station bypass process. Specifically, researchers set out to find if a mobile app could identify and match a truck with its weight and credentials fast enough to allow a weigh station bypass at highway speeds.



The TTI Study suggests that both RFID and CMRS technologies have a place in electronic weigh station bypass — so long as commercial vehicle enforcement and motor carriers know what to reasonably expect from each.

TTI engaged in extensive background research and verified testing methods before testing a CMRS bypass app on smartphones and tablets under controlled conditions and in real-world highway operations. Testing different wireless providers and devices allowed TTI to assess the impact of signal strength, while on-board GPS provided a comparison to the vehicle location identified by the app. Test runs with the app on board used different speeds and distances between test vehicles and even analyzed a variety of geo-fence locations and diameters.

The study found that CMRS apps for weigh station bypass require a second geo-fence near the WIM scale to achieve acceptable results. The first geo-fence identifies the carrier's safety rating and transmits credential data, and the second geo-fence adds the results from the WIM scale. Researchers also determined that the size and location of the WIM geo-fence are critical components of data transmission accuracy.

Unlike electronic bypass with RFID transponders, CMRS technology can have difficulty differentiating vehicles traveling close together (a distance the TTI researchers call "headway"). Headway affects the accuracy of CMRS at weigh facilities with WIM scales by limiting the system's ability to attribute the right safety, credentials, and weight to the right vehicle. Researchers term a failure in this area "miscorrelation". As with RFID bypass systems, the result of any miscorrelation in a CMRS system should result in a "red light", directing the trucker to pull in.

The study found that the bypass app performed best at headways greater than three seconds.

Two factors affect headway: vehicle speed and traffic volumes. At higher speeds, vehicles naturally travel farther apart. Heavy traffic volumes tend to slow speeds, resulting in less space between vehicles. The study found that the bypass app performed best at headways greater than three (3) seconds. That suggests CMRS technology is more useful at sites where "free flow" traffic conditions exist.

CMRS technology can perform in areas with weak cell signals so long as the app can maintain the connection and "calls" are not dropped. When using CMRS technology for bypassing, users should remain aware of the wireless signal connectivity. To reach these findings, TTI tracked the accuracy of CMRS technology at different headways at a WIM-equipped site with strong cellular connectivity and optimal geo-fence placement.

The TTI Study suggests that both RFID and CMRS technologies have a place in electronic weigh station bypass — so long as commercial vehicle enforcement and motor carriers know what to reasonably expect from each:

- CMRS technology is flexible. Mobile apps can be installed on smart devices and on-board computer platforms already in the truck.
- CMRS permits geo-fencing of "virtual" inspection sites or weigh stations in locations where wireless signal connectivity is strong.
- CMRS technology does not perform as well as RFID technology. There are more "red lights" with CMRS - even when the carrier's credentials should allow them to bypass.
- RFID transponders also function for electronic toll payment, something that will not be available on CMRS platforms for the foreseeable future. Many carriers use the same transponder for both weigh station bypass and electronic tolling.
- When approaching a weigh station that accepts both RFIS and CMRS technologies, the CMRS app automatically defers to the RFID transponder, with a "follow the in-cab transponder" message onscreen. This ensures that a driver will not be confused by a "red light" from one device and a "green light" from the other.
- Fleets and enforcement agencies can help mitigate some of the headway issues which affect CMRS accuracy: fleets can train drivers to keep adequate following distance when approaching a weigh station. Jurisdictions can also post advisory signs to the same effect.

In conclusion, both CMRS apps and RFID transponders offer many benefits when used for weigh station bypass. CMRS apps can meet the needs of users who prefer mobile applications for convenience, provided they understand their pull-in rates may be higher. The TTI study referenced in this paper tested the PrePass bypass application within a controlled environment. The accuracy of CMRS depends on the bypass provider, mobile device model, cellular data provider, connectivity, and headway. The optimal solution is to use a CMRS app alongside an RFID transponder to leverage the reliability of a transponder for bypass and electronic toll payment. This gives enhanced functionality and coverage afforded by a mobile application at non-RFID sites.

Maximize Bypass Opportunities with PrePass

PrePass is the most reliable, widely utilized weigh station bypass system in North America. Through PrePass, over a half million commercial vehicles from qualified fleets are electronically pre-screened for compliance with federal and state safety and credential requirements. Within seconds of approaching a PrePass-equipped inspection facility, PrePass' electronic pre-screening quickly lets drivers know if they're cleared to stay on the road and bypass the truck scales at highway speed, or if they need to pull in. As part of the weigh station bypass service, PrePass offers carriers technology options. The PrePass transponder is 99.99% reliable and provides the additional benefit of electronic toll payment services. In addition or as an alternative to the transponder, PrePass offers a mobile application.

Compare Our Solutions

	TRANSPONDER ONLY	PREPASS APP ONLY	TRANSPONDER AND APP
Technology	Transponder on windshield	App on mobile or telematics device	Mobile app with transponder
Connectivity	Radio Frequency Identification (RFID)	Commercial Mobile Radio Services (CMRS)	RFID and CMRS
Locations	Available at PrePass and third party sites** with readers	Available at all PrePass sites*	Available at all PrePass and third-party sites
Benefits	• **Includes 3rd Party bypass locations** • **Integration of toll payment services** • **Nearly 100% transmission reliability**	• **Integration with leading ELDs** • **Greater location coverage** • **Includes driver mobile ALERTS**	• **No additional subscription cost** • **All benefits of transponder and app** • **Easy pairing for quick installation**

*Excluding Iowa **NORPASS, Oregon Green Light and Weigh2GoBC

For a weigh station bypass self-assessment, visit https://prepass.com/bypass-technology-decision, or contact PrePass today for a personalized consultation.

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