

Components of the BusPlus™ System

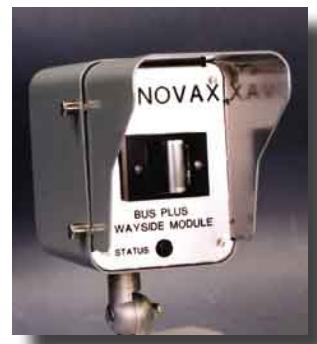
The BusPlus™ Transponder (Tag)

- Consists of an infrared transmitter, modulator and power supply.
- Rugged and waterproof.
- Mounted high as possible on the right or curb-side of the transit vehicle.
- Transmits a coded signal switched by onboard inputs to the wayside unit as the transit vehicle passes by.
- Three levels of priority can be transmitted or if switched off no priority is transmitted.
- Transmission signal is narrow horizontally, establishing vehicle location with great precision. On a vertical basis the signal is wide ensuring proper communication with each wayside unit.



The BusPlus™ Wayside Unit

- Consists of an infrared receiver for highly accurate detection of priority transit vehicles.
- Mounted within a rugged, weatherproof aluminum casing.
- Can be mounted on any pole or bus shelter facing traffic.
 - Relatively small and can be installed with minimal disruption to traffic.
 - Has a built-in alignment gauge.
 - Detects three levels of priority.
 - Comes with an LED light on the front face to allow easy confirmation of system operation when activated by the BusPlus™ Transponder (Tag).
 - Can be set as a check-in or check-out unit.
 - Has an optional radio signal communication capability of up to 340 meters.



The BusPlus™ Master Unit

- The heart of the BusPlus™ system.
- Normally resides in the intersection traffic signal controller cabinet or in a stand-alone cabinet in close proximity to the intersection traffic signal controller cabinet.
- *Multiple Priority Request Management* capability processes priority signals from up to four pairs of BusPlus™ Wayside Units (one check-in and one check-out per direction).
- Decodes and directs the appropriate priority output to the intersection traffic control equipment.
 - Has an LED menu display with keys for simple programming.
 - The time delay to each priority output can be adjusted individually.
 - The individually adjustable Priority Time-out automatically cancels priority operation if the transit vehicle does not reach the intersection within the specified time.
 - Can be hardwired to BusPlus™ Wayside Units or can communicate with the BusPlus™ Wayside Units via an optional radio link.



The Novax 6905 Traffic Controller

- Has the power and flexibility to meet the most demanding signalization requirements.
- Features advanced signal operation, traffic management system communication, time of day and special event outputs, accessible pedestrian safety device operation, emergency-vehicle preemption and transit signal priority.

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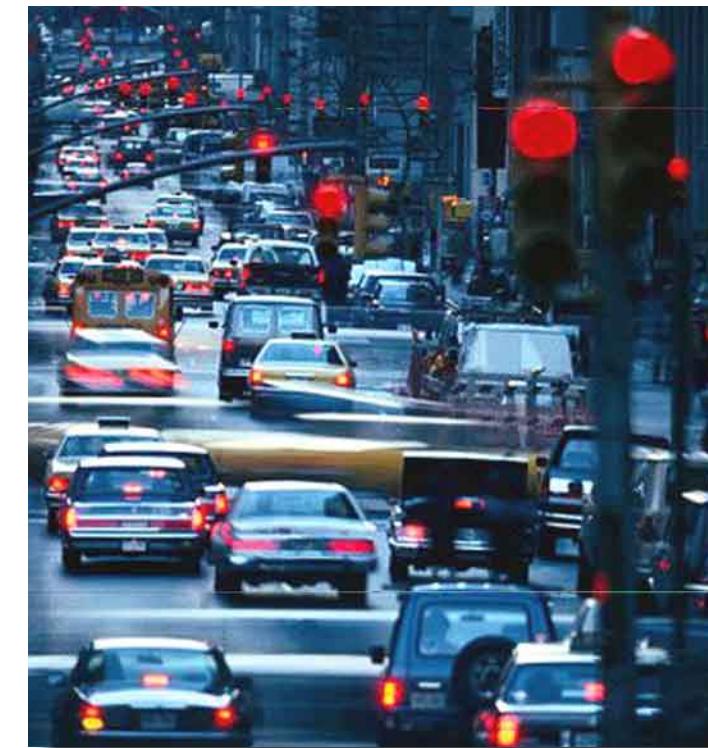
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BusPlus Brochure_11-03



BusPlus™ Proven Transit Signal Priority (TSP) Solution



The Novax BusPlus™ is a multi-level transit priority management solution that can seamlessly interface with almost any local or Intelligent Transportation System (ITS). BusPlus™ reduces operating costs and improves transit service efficiency by improving transit vehicle flow and on-time performance.

BusPlus™

- reduces operating costs
- reduces travel time
- optimizes rolling stock inventory requirements
- improves on-time performance
- improves scheduling reliability
- improves service levels
- increases ridership
- provides accurate vehicle tracking
- provides multi-level priority
- delivers peace-of-mind with proven and reliable off-the-shelf technology
- scalable from one to several hundred intersections
- provides flexible installation options
- compatible with any surface transit vehicle
- compatible with most traffic controllers that have TSP capability
- offers complete TSP/ITS solution combined with Novax's 6905 controller
- compatible with most central ITS systems

Proven Transit Signal (TSP) Priority

Reduces Operating Costs: Real world experience has shown that a properly functioning TSP system reduces operating costs. Productivity improves and transit vehicles can be utilized more efficiently resulting in an overall reduction in direct operating costs such as fuel, energy and labour.* BusPlus™ is a proven, reliable, off-the-shelf technology TSP solution that delivers.

Reduces Travel Time: TSP is a prime component of a complete ITS solution. The Greater Vancouver Transportation Authority (Translink) estimates that the TSP/ITS solution reduces #98 B-Line service travel time by 20%.*

Reduces Fleet Requirements: Real world experience has shown that a properly functioning TSP system reduces the number of vehicles required to provide a given level of service. The BusPlus™ solution alone has been credited with reducing Translink's vehicle requirements by one vehicle on the #98 B-Line Bus Rapid Transit service.* When BusPlus™ and ITS technology are combined the estimated reduction is five vehicles.

Improves On-Time Performance: Multi-level priority allows transit vehicles to be where they should be, when they should be. BusPlus™ multi-level priority provides for selective priority. Late vehicles can be given higher priority than vehicles running on time or ahead of schedule.

Improves Scheduling Reliability: Transit vehicles can be scheduled with greater reliability and accuracy as BusPlus™ keeps them on schedule by giving them priority through all intersections.*

Improves Service Levels: Predictability and reliability are the basic tenets of transit service. BusPlus™ minimizes the negative impact of traffic congestion by providing priority for transit vehicles when they need it.*

Increases Ridership: Increasing customer satisfaction results in an increase in ridership. Customer satisfaction ratings improve in proportion to frequency and trip reliability.*

Provides Accurate Vehicle Tracking: BusPlus™ technology positively verifies the location of a transit vehicle as it approaches a controlled intersection with an accuracy of two metres. BusPlus™ also positively verifies the location of the transit vehicle with the same accuracy as it enters an intersection.

Provides Multi-level Priority: BusPlus™ multi-level priority allows transit systems to tailor priority for routes and changing conditions such as deviations from schedule. As a result a high priority transit vehicle that is behind schedule can be given a higher priority. The traffic controller will then cycle more quickly to expedite the higher priority transit vehicle through an intersection.

Delivers Peace-of-Mind: The purchase of any new system is fraught with unanswered questions about reliability and the ability to deliver performance. BusPlus™ is a proven, reliable, no-surprises, off-the-shelf technology that has been in operation for several years.

Scalable: BusPlus™ is fully scalable. BusPlus™ can provide a TSP solution for one or two key intersections or become the TSP backbone of a large integrated ITS system involving hundreds of intersections.

Provides Flexible Installation Options: BusPlus™ has optional full wireless communication capability to ease installation in areas where hard-wire communication is not practical. In other words no need to tear up roadways or sidewalks to install new conduit.

Compatible With Any Surface Transit Vehicle: BusPlus™ can be utilized with any surface transit vehicle that shares the road with automobiles or is required to cross intersections. BusPlus is equally at home on a bus, trolley, street-car, street level LRT, mini-bus or just about any transit vehicle that rolls with or through traffic.

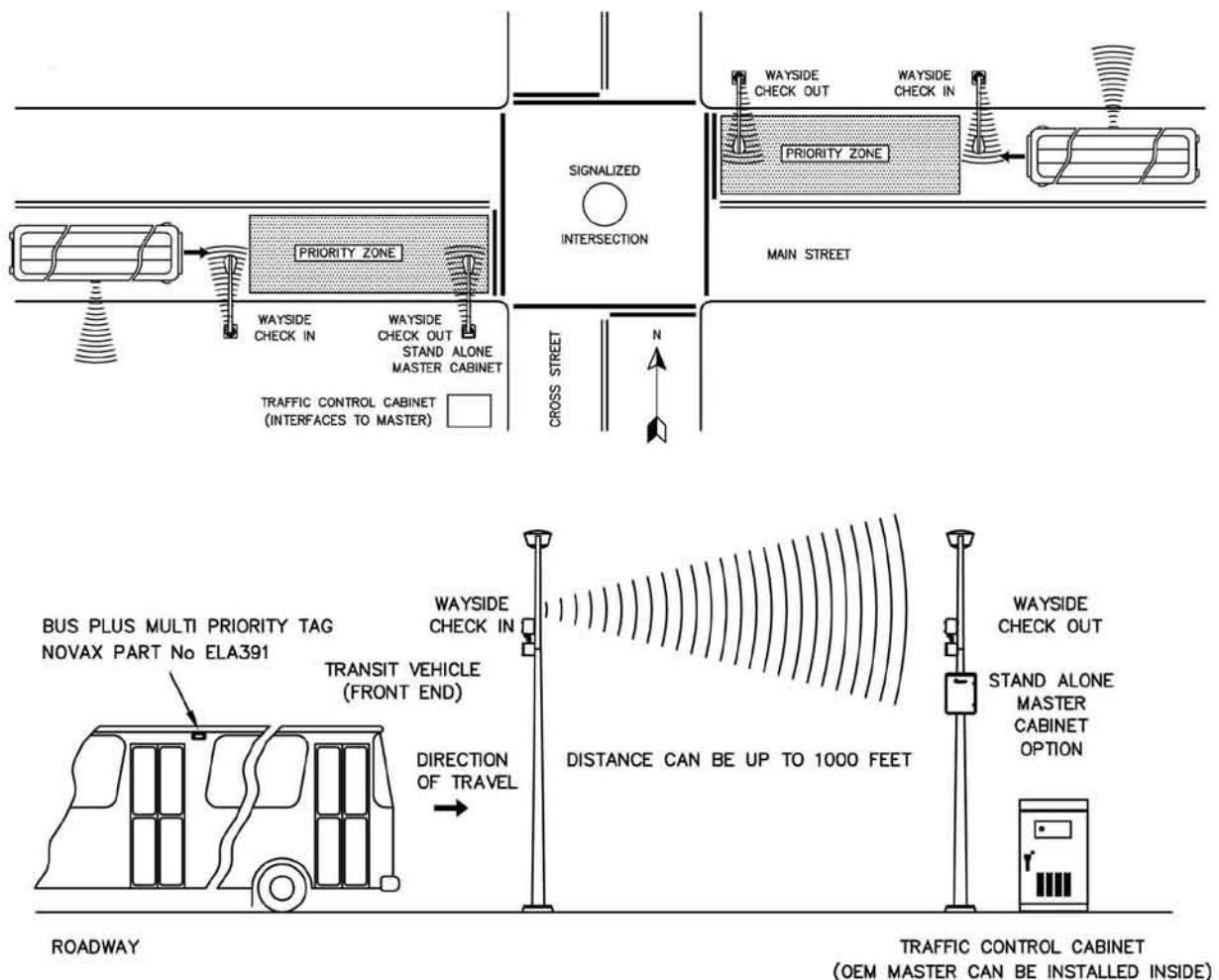
Compatible With Most Traffic Controllers: BusPlus™ will interface with just about any traffic controller that has TSP or advanced detection capability.

Complete TSP/ITS Solution: The ideal BusPlus™ companion is Novax's proven and reliable 6905 controller that has full multi-priority TSP capability as a stand-alone system, or as a part of a centralized traffic management system. The Novax 6905 controller timer unit can also be swapped into many existing control cabinets, instantly upgrading them to full TSP functionality and central system connectivity.

Compatible With Most Central ITS Systems: BusPlus™ and the Novax 6905 controller were designed in keeping with tomorrow's world of ITS and centralized traffic management systems.

* Intelligent Transportation Systems (ITS) #98 B-Line Bus Rapid Transit Evaluation Study – Greater Vancouver Transportation Authority – October 2003.

System Overview



How BusPlus™ Works

- Transit vehicles are equipped with BusPlus™ multi-level priority transponders (also called tags). The tags transmit a continuous coded infrared signal.
- Priority for each transit vehicle can be preprogrammed or updated in real time via the transit system's central information management system as it communicates with the transit vehicle.
- As the transit vehicle approaches a signalized intersection the BusPlus™ Tag transmits the coded infrared signal indicating the required priority level.
- The signal is detected by a BusPlus™ wayside Check-in Unit (it detects or checks-in the transit vehicle).
- The BusPlus™ wayside Check-in Unit communicates with the BusPlus™ Master Unit that resides in or near proximity to the intersection traffic control cabinet.
- This communication is accomplished via a wire line connection or via an optional radio link from the Check-in Unit to the Master Unit.
- The BusPlus™ Master Unit sorts the priority signals it may have received for this and other directions.
- The BusPlus™ Master Unit forwards the information to the intersection traffic controller indicating the presence of each transit vehicle and its associated priority.
- The Master Unit maintains the priority condition(s) within a preprogrammed time frame.
- The TSP capable intersection traffic controller uses the priority information received to either extend a green signal or truncate a red signal to facilitate the transit vehicle through the intersection.
- As the transit vehicle enters the intersection a second BusPlus™ wayside unit called the Check-out Unit detects the coded infrared signal and communicates this information to the BusPlus™ Master Unit via a hard wire connection or by radio.
- The BusPlus™ Master Unit informs the intersection traffic controller that the transit vehicle has entered the intersection and that priority is no longer required.
- The intersection traffic controller returns to its normal programming.
- Novax's 6905 intersection traffic controller has proven TSP capability. It interacts with the BusPlus™ Master Unit as well an adaptive centralized ITS system if there is one in operation.