INTELLIGENT PARKING BAY COUNT – TECHNICAL DESCRIPTION

Overview

Intelligent Parking can receive bay count information from a variety of sources. These include receiving the data from the Parking Payment System, loop counters, as well as individual bay monitors. This document describes the individual bay count system.

Individual bay count sensors are provided for each bay. The technical description of these sensors is elsewhere. The sensors communicate with the IDI 1301 controller, which serves as a data aggregation device for each Bay Zone. Each bay Zone is a logical group of bays that form the destination of a Guidance Display. Each Zone can be made up of Bays, and Zones. In this way the system can be configured to aggregate data from bay zones, to make a floor Zone, and floor Zones can be aggregated to make a Garage Zone, and so on. The level of nesting is not restricted.

The signs that guide to an individual bay Zone are controlled directly by the IDI 1301 controller, based on the bays available in that Zone. This display continues to run correctly, independent of support from the central server. This provides a sub-second response time, as well as failure tolerance (communication and central server failure) where the parking guidance displays continue to function.

Communication Principles

Intelligent Parking is part of the Intelligent Control suite of applications, and is based on the NTCIP (National Transportation for Intelligent Transportation Systems Communication Protocol) standards. These open standards form the basis of the communication to the existing sign systems.

Built into these standards are support for signs, sensors and many other traffic devices. Also built into these standards is the support for the extension of these standards in systems such as parking. The addition of additional objects in support of features such as individual bay counts maintains the open standards basis of all Intelligent Parking communication.

Intelligent Parking supports the high speed STMP communications. This high efficiency communication allows for the status of all bays to be retrieved once per second, and displayed on the system maps.

Individual Bay Count Features

The detail of the communication objects required to achieve individual bay counts are fully specified in the attached MIB *IDIPark.mib*. This ANS.1 MIB, on which all NTCIP and SNMP communication is based, is the machine readable form of the following technical description. A list of these objects can be seen in the attached *IDIPark MIB.xls* Excel spreadsheet.

The Bay Table

A table of parameters of each bay that is connected to the Bay Controller is provided. A maximum of 60 bay sensors can be connected to one Bay Controller. The following fields are provided for each Bay:

1. Vacant/Occupied: These read only parameters indicate whether the bay is occupied by a vehicle or not.
2. Last Status Change Time: This parameter indicates the last time a vehicle entered, or left, the bay. This time is used by the Bay Controller to calculate whether a vehicle has overstayed the reservation time, or if it has not been moved for a selected maximum stay time (say 30 days).
3. Reserved, Reserved Start Time, Reserved End Time: These parameters manage the reservation status of the bay, so that the Bay Controller can autonomously set the LED indicators for the Bay.
4. Disabled: Parameters can be set to indicate if the Bay is for Disabled Parking.
5. Overstay: This parameter indicates whether the Bay Controller has determined that the vehicle has stayed beyond the Overstay Time (the maximum parking time – typically 30 days)
6. Reservation Expired. This parameter indicates that the vehicle has stayed beyond the end of the reservation period.
7. Sensor Failure, Communication Failure: These parameters reflect the status of health of the sensor sub-system.
8. Bay Description: A text field for a user defined information on the bay

The Bay Status Group Table

In order to provide efficient communication of bay status information, the bay status is aggregated in the Bay Controller, where the status is reflected as a single bit. These bits are then combined into objects for communication, to enable second-by-second status to be retrieved by the server. Status Group objects are provided for Vacant, Occupied, Reserved, Disabled, Overstay, Reservation Expired, Sensor Failure and Communication Failure.

Bay Controller Parameters

The bay controller includes parameters for the following functionality

1. Controller Error: This parameter indicates a variety of errors in the controller, or if the system is running without errors.
2. Configuration: A table of parameters to configure how many physical sensors are connected to the controller, and their physical address.
3. Summary Counts: Summary counts are retained in the controller of how many bays are configured, occupied, vacant, reserved, disabled, overstayed, or reservation expired.
4. Entry Count, Exit Count and Calibration: The Bay Controller can also function with loop detectors, instead of individual bay counts. This uses parameters for counting vehicles, and increments when vehicles enter a Zone, and decrements when vehicles leave a Zone. The Calibration object allows these values to be reset, and adjusted as errors occur.
5. Description: A user definable text field for the description of the Bay Controller/Zone.

LED Operation

The LED indicators that are located above each Bay operate in accordance with a truth table driven by the status of the bay, as follows:

GREEN: Vacant (not Occupied), not Disabled, not Reserved, not Sensor Failure
RED: Occupied (not Vacant), not Sensor Failure
AMBER: Vacant (not Occupied), Reserved, not Sensor Failure
BLUE: Vacant (not Occupied), Disabled, not Reserved
RED Flashing: Occupied (not Vacant), Overstay Violation
AMBER Flashing: Reserved, Reservation Overstay Violation.
DARK (No LED on): Sensor or Communication failure.

Reporting In Intelligent Parking
All the Intelligent Control Suite of applications run on a Microsoft SQL Server Database. Microsoft Access is used as a report writer as standard, but any report writer (like Crystal Reports) can be used. A comprehensive list of standard reports are provided, and augmented as required during the system commissioning process.

The Access Report Writer includes support for the Microsoft Chart object. This is the graphing utility used in all Microsoft Office products like Excel. It means that the data in any report can be graphed, to reflect trends over time.

Reports are dived into two sections: System Reports and Parking Reports.

System Reports:
These reports reflect the status and health of the system over time, and include the following reports as standard:

- Communication Statistics Summary by Date By Device (this key performance indicator indicates the overall health of the communication system)
- Communications Statistics By Date By Device
- Operator Activity by Date (an operator audit trail report)
- Current Operators
- Offline History by Device By Date
- Sensor Errors by Device By Date

Parking Reports
These reports reflect the current and historical parking activity. Current reports can be viewed and printed for violation enforcement. Historical reports can be used for trend analysis.

- Current Parking Utilization By Zone
- Parking Utilization Summary by Zone By Date
- Parking Utilization Detail By Zone By Date
- Current Overstay Violations By Zone
- Overstay Violation By Zone By Date
- Current Reservations By Zone
- Current Reservation Overstay Violation By Zone