DriveSync Data Exchange Specifications
Release 4.x

Revision 2.5.2

Revision History

Revision & Date	Revised By	Comments
1.3 - May 20, 2010	IMS	Initial Release
1.5 - July 19, 2010	IMS	Clarification of GPS heading measurement and specific data value formats.
1.6 - July 23, 2010	IMS	Re-ordered event descriptions to avoid any confusion between bullet numbers and event types.
1.7 – Oct 12, 2010	IMS	Positional_Quality added to trip points feed, clarifications to Events feed and Trip summary feeds.
2.0 – Jan 13, 2011	IMS	Clarifications included: • Reconciliation report removed since it is never required. Data feeds are based on upload times, not on driving times. • Clarification of empty / non-empty fields • Additional event type described: VIN mismatch • Event_Timezone_Offset included
2.1 – June 20, 2011	IMS	IMEI column added to Trip Summary
2.2 – June 29, 2011	IMS	Updated to include accelerometer fields.
2.2.2 – Oct 18, 2011	IMS	3-axis accelerometer column headings corrected: Accel_Longitudinal is the first accelerometer column
2.4 – Jan 25, 2012	IMS	Optional support for **event-based accelerometer information included**
2.5 – June 6, 2012	IMS	**Updated to also include heartbeat events.**
2.5.2 – **July 4, 2012**	**IMS**	**Updated to reflect expanded cumulative totals feed**

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1 INTRODUCTION

This document describes available DriveSync data feeds, including their syntax, data types, delivery mechanism, and relationships to vehicle and sensor data sources.

Section 2 describes data feeds available to authorized system users, and Section 3 describes the secure data delivery mechanism.

1.1 Standard Data Feeds

The DriveSync Data Exchange includes three standard data feeds:

1- Trip Points feed, providing high frequency information, capturing detailed records of driving behavior throughout each trip,
2- Trip Summary feed, summarizing key elements in a single data record per trip, and
3- Events feed, providing an aggregation of the events generated by DriveSync.

1.2 Format

Data feeds are made available in a universal text format to ensure they can be manipulated, imported, and used effectively with minimal integration effort. Files contain comma separated values (CSV) with one descriptive header in each file.

1.3 Units

Data is available in either metric or US units. The native format of all data elements is in metric units, including raw data collected from the vehicle itself, and internal storage within DriveSync systems. If US units are desired, the conversion from metric to US units is performed during the generation of the data feed files to eliminate any cumulative rounding errors.

2   DATA FEED DEFINITIONS

This section describes the syntax and details to help manage and import available data feeds.

2.1   Trip Points Feed

The trip points feed includes high frequency information, up to one data point per second when the vehicle engine is on. The frequency of additional data points varies depending on their application and volatility. Each record can be uniquely identified using the combination of Trip_Number and Position_Timestamp.

Field (Trip Points)	Description	Syntax
Trip_Number	A globally unique identifier for each trip, associating data records from this data feed to a record in the trip summary feed. Multiple records in the trip points feed typically share the same Trip_Number. Note: Mandatory field (never empty)	XXXXXXXXXXXXXXXXXXXXXXXXXX Twenty-six digit number (fixed length) Sample: 95724129992693091272814081
Position_Timestamp	UTC date and time corresponding to the current record. Note: Mandatory field (never empty)	YYYY-MM-DD HH:MM:SS Sample: 2011-01-03 05:06:03
GPS_Latitude	Latitude of the vehicle in decimal degrees. Positive values in the northern hemisphere, negative values in the southern hemisphere. Note: A valid GPS fix is required. This field is empty if a GPS fix is not available.	-XX.XXXXX Two digit decimal degrees (no leading zeroes) with five decimal place precision (included if zero and no truncation) Sample: 43.46667
GPS_Longitude	Longitude of the vehicle in decimal degrees. Positive values in the eastern hemisphere, negative values in the western hemisphere. Note: A valid GPS fix is required. This field is empty if a GPS fix is not available.	-XXX.XXXXX Three digit decimal degrees (no leading zeroes) with five decimal place precision (included if zero and trailing zeroes not truncated) Sample: -80.51667

Field (Trip Points)	Description	Syntax
GPS_Heading	The direction the vehicle is currently following in degrees. 0 = North (true), 180 = South. Note: Both a valid GPS fix and recent vehicle motion is required. This field is empty if either is missing.	XXX Three digit number without leading zeroes Sample: 36
VSS_Speed	The speed of the vehicle as measured by the internal vehicle speed sensor (OBD-II). Metric units: km/h, US units: mph Note: In certain scenarios when the OBD-II interface or vehicle is busy handling higher priority tasks, this field may not be available. In these rare scenarios, the VSS_Speed field will be empty.	XXX.X Three digit decimal number (no leading zeroes) with one decimal place precision (included if zero and trailing zeroes not truncated) Sample: 115.0
VSS_Acceleration	The rate of change in speed, derived from VSS_Speed. Metric units: m/s/s, US units: ft/s/s. Note: This field is empty if VSS_Speed is not available to derive acceleration.	+/-XX.XX Two digit decimal number (no leading zeroes) with two decimal place precision (included if zero and trailing zeroes not truncated) Sample: -3.60
Engine_RPM	Vehicle engine's revolutions-per-minute as collected from OBD-II. Note: This field is empty if not reported from the vehicle at the given timestamp.	XXXX Four digit integer without leading zeroes. Value rounded to the nearest 100 RPM Sample: 800
Positional_Quality	An indicator of the quality of the positional information obtained via the GPS receiver. Lower values indicate better quality. Values of 3 or lower are very high quality. Note: A value of 99.99 indicates no GPS fix. An empty value indicates an absence of GPS information.	XX.XX Two digit decimal number (no leading zeroes) with two decimal place precision (included if zero and trailing zeroes not truncated) Sample: 3.70

Field (Trip Points)	Description	Syntax
Coolant_Temperature	Temperature of the engine coolant. Metric units: Degrees C, US units: Degrees F. Note: This field is empty when not available at the given timestamp.	+/-XXX Three digit number (no leading zeroes) Sample: 75
Accel_Longitudinal	Vehicle acceleration as derived from the internal 3-axis accelerometer. Metric units: m/s/s, US units: ft/s/s. Positive values indicate acceleration forward, negative values indicate acceleration in reverse	+/-XX.X Two digit decimal number (no leading zeroes) with one decimal place precision (included if zero and trailing zeroes not truncated) Sample: 2.5
Accel_Lateral	Vehicle acceleration as derived from the internal 3-axis accelerometer. Metric units: m/s/s, US units: ft/s/s. Positive values indicate acceleration to the left, negative values indicate acceleration to the right	+/-XX.X Two digit decimal number (no leading zeroes) with one decimal place precision (included if zero and trailing zeroes not truncated) Sample: -2.5
Accel_Vertical	Vehicle acceleration as derived from the internal 3-axis accelerometer. Metric units: m/s/s, US units: ft/s/s. Positive values indicate acceleration up, negative values indicate acceleration down	+/-XX.X Two digit decimal number (no leading zeroes) with one decimal place precision (included if zero and trailing zeroes not truncated) Sample: -9.8

2.2   Trip Summary Feed

Each trip is represented by a single record in the trip summary feed, and can be uniquely identified using Trip_Number.

Field (Trip Summary)	Description	Syntax
Trip_Number	A globally unique identifier for each trip. Note: Mandatory field (never empty)	XXXXXXXXXXXXXXXXXXXXXXXXXX Twenty-six digit number (fixed length)

Field (Trip Summary)	Description	Syntax
		Sample: 9572412999269309127281408l
Device_Serial_Number	A globally unique identifier for the in-vehicle telematics equipment associated with the given trip. Note: Mandatory field (never empty)	XXXXXXXXXXXXXXXX Sixteen-character alphanumeric Sample: 0000009013001943
Enrolled_VIN	The vehicle identification number as provided during the enrollment process. This VIN is not read from the vehicle.	XXXXXXXXXXXXXXXXX Seventeen-character alphanumeric Sample: 1HGCM56455A814690
Detected_VIN	The vehicle identification number as read from the vehicle (OBD-II). Note: VIN may not be available on all older model vehicles. This field is empty when the vehicle does not report its VIN via OBD-II.	XXXXXXXXXXXXXXXXX Seventeen-character alphanumeric Sample: 1HGCM56455A814690
Trip_Start	Date and time at the start of the trip (UTC) Note: Mandatory field (never empty)	YYYY-MM-DD HH:MM:SS Sample: 2011-01-03 05:06:03
Trip_End	Date and time at the end of the trip (UTC) Note: Mandatory field (never empty)	YYYY-MM-DD HH:MM:SS Sample: 2011-01-03 05:06:03
Trip_Timezone_Offset	Offset from UTC to local time for the given trip. Note: The timezone offset may be determined from local wireless sources. In rare scenarios, it is possible for a small number of initial trips to occur without a timezone offset. In this scenario, the field will be empty.	+/-HHMM Four digit number with leading zeroes Sample: -0500
VSS_Distance	Total trip distance. Metric units: km, US units: miles. Note: Mandatory field (never empty)	XXXXX.X Five digit decimal number (no leading zeroes) with one decimal place precision (included if zero and trailing zeroes not truncated). Sample: 345.0
VSS_Average_Speed	Average trip speed. Metric units: km/h, US units: mph. Note: Mandatory field (never empty)	XXX.X Three digit decimal number (no leading zeroes) with one decimal place precision (included if zero) Sample: 71.4

Field (Trip Summary)	Description	Syntax
VSS_Maximum_Speed	Maximum trip speed. Metric units: km/h, US units: mph. Note: Mandatory field (never empty)	XXX.X Three digit decimal number (no leading zeroes) with one decimal place precision (included if zero) Sample: 123.4
Fuel_Consumption	Total fuel consumed during the trip. Metric units: L, US units: US Gallons. Note: This field is empty for vehicles that do not expose the necessary information to determine fuel consumption.	XXXX.XX Four digit decimal number (no leading zeroes) with one decimal place precision (included if zero) Sample: 2.14
MIL_Status	Malfunction Indicator Lamp status. Note: In rare scenarios, it is possible for a trip to occur without obtaining the MIL status. In these scenarios, the MIL_Status field will be empty.	X Single digit: 0 = MIL off, 1 = MIL on at any point during the trip
Idle_Time	Total seconds the vehicle was stationary with the engine running during the trip. Note: Mandatory field (never empty)	SSSSSS Six digit number without leading zeroes Sample: 319
Trip_Positional_Quality	An indicator of the overall quality of the positional information obtained via the GPS receiver throughout the trip. Lower values indicate better quality. Values of 3 or lower are very high quality. Note: An empty value indicates an absence of GPS information in the trip.	XX.XX Two digit decimal number (no leading zeroes) with two decimal place precision (included if zero and trailing zeroes not truncated) Sample: 3.70
Accel_Quality	An indicator of the overall quality of the accelerometer information.	X Single digit: 1 = calibrated, 0 = calibration not complete
Device_IMEI	The unique equipment identifier associated with GSM-based in-vehicle equipment. (IMEI = "Internaltional Mobile Equipment Identity") This field may be empty for devices that are not GSM-based.	XXXXXXXXXXXXXXX Fifteen-digit numeric (14 digits + check digit) Sample: 357174045757822

2.3   Events Data Feed

The Events data feed reports all events triggered by DriveSync due to:

A) The existence of a user-configured alert threshold set via the End User Portal Notifications interface:

- Over-Speed (1): Over-Speed events are derived on the server using available vehicle speed information. The over-speed thresholds are configured by individual users and are maintained independently per-vehicle. One event is generated per trip when the first vehicle speed sample exceeds the user-configured threshold.
- Time-of-Day Violation (2): These events are derived on the server using timestamps associated with each trip. The time thresholds are configured by individual users and are maintained independently per-vehicle. One event is generated per trip when a trip or a portion of a trip falls within the user-configured time exclusion range.
- GeoFence Violation Events (3): These events are derived on the server using available positional information from the vehicle. GeoFences are created by individual users using the End-User Portal and are maintained independently per-vehicle. One event is generated when two consecutive data points are on different sides of the user-configured GeoFence boundary for that vehicle.

B) A system-wide threshold:

- Hard Acceleration (4): Hard acceleration events are derived on the server using available vehicle speed information. The fast acceleration threshold is defined on a system-wide basis (i.e., not configured for individual users). One event is generated when the change in speed is larger than the hard acceleration threshold.
- Hard Braking (5): Hard braking events are derived on the server using available vehicle speed information. The hard braking threshold is defined on a system-wide basis (i.e., not configured for individual users). One event is generated when the change in speed is less than the hard braking threshold (i.e. a large negative number).
- Acceleration Burst (10): A snapshot of acceleration seconds before and after exceeding a predefined system-wide acceleration threshold. Note: Devices configured to provide an acceleration burst, will have empty acceleration fields in the Trip Points Feed.

C) A vehicle-triggered activity:

- Device Connected/Disconnected (6, 7): These events are reported by the device after the device is reconnected to the vehicle's OBD II interface and GSM/GPRS network coverage is available. Location information for these events is not available. Note: These events may not be associated with a specific trip since they may occur at any time. The Trip_Number value may not correspond to any record in the trip summary feed.
- VIN Mismatch (8): The VIN mismatch event occurs when the device is connected to a vehicle that reports a VIN that differs from the previously enrolled VIN.

- Heartbeat (9): A heartbeat event occurs in each device that has not delivered event or trip information for an extended duration of time.

Each event can be uniquely identified using a combination of (Trip_Number, Event_Timestamp, Event_Type).

Field (Event Feed)	Description	Syntax
Trip_Number	A globally unique identifier for each trip, associating data records from this data feed to a record in the trip summary feed. Multiple records in the trip points feed typically share the same Trip_Number. Note: Mandatory field (never empty)	XXXXXXXXXXXXXXXXXXXXXXXXXX Twenty-six digit number (fixed length) Sample: 95724129992693091272814081
Enrolled_VIN	The vehicle identification number as provided during the enrollment process. This VIN is not read from the vehicle.	XXXXXXXXXXXXXXXXX Seventeen-character alphanumeric Sample: 1HGCM56455A814690
Detected_VIN	The vehicle identification number as read from the vehicle (OBD-II). Note: VIN may not be available on all older model vehicles. This field is empty when the vehicle does not report its VIN via OBD-II.	XXXXXXXXXXXXXXXXX Seventeen-character alphanumeric Sample: 1HGCM56455A814690
Event_Timestamp	UTC date and time corresponding to the current event. Note: Mandatory field (never empty)	YYYY-MM-DD HH:MM:SS Sample: 2011-01-03 05:06:03
Event_Timezone_Offset	Offset from UTC to local time for the given event. Note: The timezone offset may be determined from local wireless sources. In rare scenarios, it is possible for a small number of initial events to occur without a timezone offset. In this scenario, the field will be empty.	+/-HHMM Four digit number with leading zeroes Sample: -0500
GPS_Latitude	Latitude of the vehicle in decimal degrees. Positive values in the northern hemisphere, negative values in the southern hemisphere. Note: A valid GPS fix is required. This field is empty if a GPS fix is not available.	-XX.XXXXXX Two digit decimal degrees (no leading zeroes) with six decimal place precision (included if zero and no truncation) Sample: 43.466667

Field (Event Feed)	Description	Syntax
GPS_Longitude	Longitude of the vehicle in decimal degrees. Positive values in the eastern hemisphere, negative values in the western hemisphere. Note: A valid GPS fix is required. This field is empty if a GPS fix is not available.	-XXX.XXXXXX Three digit decimal degrees (no leading zeroes) with six decimal place precision (included if zero and trailing zeroes not truncated) Sample: -80.516667
Event_Type	The type of event: (1 = Over-Speed; 2 = Time-of-Day Violation; 3 = GeoFence Crossing; 4 = Hard Acceleration; 5= Hard Braking; 6 = Device Connected; 7 = Device Disconnected; 8 = VIN Mismatch; 9 = Heartbeat; 10 = accelerometer burst) Note: Mandatory field (never empty)	XX Two digit number without leading zeroes Sample: 8
Event_Reference_Value	Additional event-specific information, including relevant thresholds or details: Over-Speed (1): User specified speed: XXX.X (Metric units: km/h, US units: mph) Time-of-Day (2): Excluded time range, defined by the start and end times separated by a semicolon: HH:MM:SS;HH:MM:SS Geofence Crossing (3): Co-ordinates (latitude, longitude) of the two corners of the geofence, separated by a semicolon: "-XX.XXXXXX,-XXX.XXXXXX;-XX.XXXXXX,-XXX.XXXXXX" Hard Acceleration (4) and Hard Braking (5): The system-wide threshold at the time the event was triggered: +/-XXX.XX (Metric units: m/s/s, US units: ft/s/s) Device Connected (6), Disconnected (7), and VIN Mismatch (8), and Heartbeat (9) do not need any additional event-specific information and leave this field empty. The accelerometer burst (10) includes the frequency in Hz followed by normalized accelerometer triplets (longitudinal, lateral, vertical) for up to 2 seconds before and 2 seconds after an event was triggered. The timestamp of the event corresponds to the first sample of the sequence, not necessarily the trigger event in the sequence. Example: "4,0.096,0.1,1,0.096,0.1,1, 0.096,0.1,1,0.096,0.1,1,…"	Varies based on event type. Please refer to description.

DRIVESYNC.

2.1 Cumulative Totals Feed

The cumulative totals feed provides a listing of all deployed in-vehicle equipment (including those that are no longer installed in a vehicle as well as those that have not reported data during the feed interval), along with cumulative totals of key parameters. This feed provides sufficient information to validate that a whole set of data transfers are complete and comprehensive by comparing the cumulative totals with all previously received data. Please note that the totals are calculated based on the unique combination of device serial number, enrolled VIN, and detected VIN. A separate feed is available for each program running a supported version of DriveSync.

Field (Cumulative Totals)	Description	Syntax
Device_Serial_Number	A globally unique identifier for the in-vehicle equipment associated with the given trip. Note: Mandatory field (never empty)	XXXXXXXXXXXXXXXX Sixteen-character alphanumeric Sample: 0000009013001943
Enrolled_VIN	The vehicle identification number as provided during the enrollment process. This VIN is not read from the vehicle.	XXXXXXXXXXXXXXXXX Seventeen-character alphanumeric Sample: 1HGCM56455A814690
Detected_VIN	The vehicle identification number as reported by the vehicle.	XXXXXXXXXXXXXXXXX Seventeen-character alphanumeric Sample: 1HGCM56455A814690
Cumulative_Trips	The number of trips collected over the unique combination of device, enrolled VIN, and detected VIN, up to the time of processing.	XXXXX Five digit number (no leading zeroes) Sample: 1152
Cumulative_Distance	Total trip distance for all trips with the same device, enrolled, and detected VIN. Metric units: km, US units: miles.	XXXXXXX.X Seven digit decimal number (no leading zeroes) with one decimal place precision (included if zero and trailing zeroes not truncated). Sample: 12345.0
Cumulative_Engine_On_Time	Total number of seconds recorded in a vehicle engine on state for the given device, enrolled, and detected VIN combination. Equivalent to the sum of all trip durations (Trip_End − Trip_Start) recorded by the (device, enrolled VIN, detected VIN) combination. Expressed in seconds.	SSSSSSSSSS Ten digit number without leading zeroes Sample: 123319

First_Trip_Start	Date and time of the start of the very first trip reported (UTC)	YYYY-MM-DD HH:MM:SS Sample: 2011-01-03 05:06:03
Last_Trip_End	Date and time of the end of the very last trip reported (UTC)	YYYY-MM-DD HH:MM:SS Sample: 2011-01-03 05:06:03
Last_Processing_Time	Date and time that the last uploaded trip was processed (UTC)	YYYY-MM-DD HH:MM:SS Sample: 2011-01-03 05:06:03

3 DELIVERY MECHANISM

All data feeds are securely transferred for further analysis and processing.

3.1 File Access

All files are made available on a secure FTP server managed by IMS. Security credentials must be exchanged between IMS and the insurance carrier before the first data reporting period. It is expected that the credentials will remain unchanged unless deemed necessary by both parties.

3.2 Reporting Period

Files are placed on the FTP server weekly or on a predetermined interval (i.e. monthly), and include data feeds generated from data uploaded from vehicles since the prior reporting period.

Any trips that have not completely uploaded, or are still pending upload from the vehicle at the reporting period delineation will be included in a subsequent reporting period. It should be noted that regardless of implementation, it is possible that a vehicle may not be able to upload driving data that occurred during a reporting period until after the given reporting period. The fact that reporting periods are based on upload times ensures all received information is safely and completely transferred in regular data feeds.

Reporting periods typically end at 23:59:59 UTC on the last day of the reporting period and start at 00:00:00 UTC on the first day of the next reporting period.

3.3 Transfer Timing

The data files will be available on the secure FTP server no later than the third calendar day after the end of a reporting period at 12:00:00 UTC. For example, if the reporting period ended

on June 30th, the data files will be available on the secure FTP server no later than 12:00:00 UTC on July 3rd.

3.4   *File Format and Units of Measure*

The generated files are in Comma Separated Value (CSV) format. Each element is separated by a comma while the record is terminated with a carriage return and line-feed (CRLF). If a comma is part of the data within a field, that field is enclosed in double quotes (").

A header record is included in each of the data feeds. All data elements are listed in the same order as specified in this document.

3.5   *Encryption and Compression*

All enterprise data report files are encrypted and compressed using GNU Privacy Guard (GPG) defined in RFC 4880. GPG version 1.4.10 or newer is used for this application. Shared keys are arranged during system integration and will not change unless necessary during product deployment.

3.6 File Naming Convention

All enterprise data report files use the following naming convention:

PRF_<FILE_TYPE>_<FILE_TIMESTAMP>.DAT

Where,

- PRF indicates a predefined prefix for the deployment (in the case of multiple deployments sharing the same feed)
- **<FILE_TYPE>** indicates a specific data feed as identified in Table 1,
- And **<FILE_TIMESTAMP>** represents the start date of the reporting period in the format YYYYMMDD using the definition in Table 2.

Table 1.

File Type Identifier	Associated File Type
TPR	Trip Point Data Feed
TSR	Trip Summary Data Feed
EVT	User Events Data Feed
CTR	Cumulative Totals Feed

Table 2.

Date Identifier	Range
YYYY	Year identification, i.e., 2008, 2009, 2010, …
MM	Month identification between 01 (January), 02 (February), … and 12 (December)
DD	Day of the month identification between 01, 02, … and 31

3.7 File Integrity Handling

The Message-Digest algorithm 5 (MD5) algorithm defined in RFC 1321 is applied to the report files for managing integrity. The MD5 128 bit hash value generated for each report file is contained in separate files ending in the extension 'MD5'. The file names associated with the 'MD5' file type are the same as those used for the individual files.

The MD5 hash value can be used to verify with high confidence that the entire file contents have been accurately received.

3.8   File Format Versioning

The enterprise data exchange files do not contain version information.