South Africa

COTO

Committee of Transport Officials

TMH 14

South African Standard Automatic Traffic Data Collection Format

Version 3.00
November 2013

Committee of Transport Officials

TECHNICAL METHODS
FOR HIGHWAYS

TMH 14

South African Standard Automatic Traffic Data Collection Format

Version 3.00
November 2013

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Technical Methods for Highways:

The Technical Methods for Highways consists of a series of publication that is used to either prescribe or to provide guidelines on various aspects related to highway engineering. The documents are primarily aimed at ensuring the use of uniform methods throughout South Africa.

Users of the documents must ensure that the latest editions or versions of the document are used. When a document is referred to in other documents, the reference should be to the latest edition or version of the document.

Any comments on the document will be welcomed and should be forwarded to the author of the document. When appropriate, such comments may be incorporated in future editions of the document.

Synopsis:

This document specifies the South African Standard Data Collection Format according to which traffic data collected by means of electronic equipment (data loggers) must be collected. Manufacturers or agents of data loggers as well as data service provides must be able to supply data loggers and/or software that can translate their logger data format to the standard data format.

The document contains specifications for aspects such as:

- Traffic data file names, file structures and the comma delimited format;
- Site / Station definitions;
- Vehicle parameters;
- Vehicle classification systems; and
- Data records.

Table of Contents

Version Control

Version 1.00 issue 1994/09/20 (proposal)

First release of the Vehicle Data Collection Format.

Version 1.00 issue 1994/09/29 (proposal)

1. The Vehicle Data Record 10 was changed. The Vehicle Class Code was changed from 2 to 6 characters.
2. The Header Records where re-labelled and one new record added.
3. A summary traffic data type 20 record was added with a new Data Description Record (D2).

Version 1.00 issue 1994/10/27 (proposal)

1. The Lane Description Record L1 was changed to include a full reverse-log assignment.
2. Individual Vehicle Data Types were expanded.
3. Data records for instrument calibration/set-up and error reporting added.

Version 1.00 issue 1994/12/16 (proposal)

1. The Lane Description Record L1 was changed.
2. The Data Translation Software Version Field was increased in record H4.
3. A START of HEADER RECORD (H0) was added with Version Codes.
4. An END of HEADER RECORD (H9) was added.
5. A D00 Data Log Summary Record was added.
6. The D1x Data Description Record was changed to include a unit field (Metric or Imperial) and a site length field.
7. The D20 Data Description Record was modified.
8. A C3 Status Report Comment Record was added.

Version 1.00 issue 1995/05/12 (proposal)

1. All Record Identification Codes are now only two characters.
2. The direction codes in the L1 record were changed.
3. The Data Collection Record H2 was changed.
4. The Header Data Type Description records D1x and D20 were renamed to 1x and 20 and the contents were changed.
5. A L0 Lane configuration record that only has the number of logical lanes as information was added.
6. The labelling of the Log Summary record was changed from D00 to H8.
7. The chassis height labelling convention in the 1x data records was changed.
8. The Header Data Type 20 Description record was modified.

Version 1.00 issue 1996/02/01 (proposal)

1 A Units and Road Convention Header Record (H6) has been added.
2 The L1 Lane Configuration record has been changed.
3 The E0 Converter Error Reporting Record has been added.
4 The 10-14 Data records have been re-defined and a dual weigh sensor per lane configuration added.

Version 1.00 issue 1996/09/16 (proposal)

Version 1.00 Issue 1997/05/01 (Pre-final)

Major changes to the organisation of the data have been made. Individual records have undergone minor changes here and there.

Version 1.00 issue 1996/05/18

Corrected errors in the specification of the 21 record.

Version 1.01 issue 1999/04/06

1 A Y2K compliant Date & Time record (D3) was added.
2 Additional vehicle classification schemes were added.

Version 1.02 issue 2000/03/21

1 Speed Summary records for heavy vehicles (23) only were added.
2 Headway, Gap and occupancy summaries (50-52) were added.
3 Length Summaries (60) were added.
4 A Secondary Classification Summary Type (31) was added.

Version 1.02 issue 2000/05/04

Updated the RSA Light/Heavy and Extended Light/Heavy Classification Method

Version 1.02 issue 2000/07/17

Added the Logger Specific Error and Status Comment Records C4, C5 and C6.

Version 1.02 issue 2001/03/11

Reorganised contents and updated index

Version 1.03 issue 2001/05/09

Added the Fully Weighed Vehicle to the L1 Lane Description Vehicle Code. (See Appendix A)

Version 1.03 issue 2001/10/09

Some changes were made to the text in Appendix A.

Version 1.04 issue 2003/10/09

Added the Hungarian Classification Scheme

Version 1.05 issue 2003/10/17

Added the C8 Logger Specific Calibration Records

Version 1.05 issue 2004/10/01

Added the C5-Axle Tracking Information

Version 1.06 Issue 2005/01/04 (not released)

Added RSA70 Data Format
In the RSA1x data the Following Property is missing.

Version 2.00 issue 2005/04/27 (preliminary)

1 The 1x records were changed:
Added Vehicle Following property to 1x records
Added Bumper-to-1st Axle distance property to 1x records
Added 2nd Classification property to 1x records
2 RELEASED FOR COMMENT

Version 2.00 issue 2005/05/02 (preliminary)

1 Fixed the column numbers for “Header – Vehicle Data Description Record (10-14)
2 RELEASED FOR COMMENT

Version 2.00 issue 2005/05/15 (preliminary)

1 Added information on units used to RSA70 Data Format
2 RELEASED FOR COMMENT

Version 2.00 issue 2005/07/18 (preliminary)

1 All manufacture specific Cx information has temporally been removed to be replaced by manufacture specified records.
2 RELEASED FOR COMMENT

Version 2.00 issue 2005/07/19

1 The definition of Scheme 01 and 05 was widened to cater for non-loop based loggers.

2 Manufacture specific Mx records were added for calibration, status and error information.
3 Mikros Systems specific Mx records were added.
4 The “Filler Data” option to the Edit Code was added.
5 Appendix A was removed as the information is inherent to Version 2.00.

Version 2.00 issue 2005/09/27

1 Added Indian Loop Classification Scheme (Scheme 11)
2 A number of issues and questions raised since the previous release have been clarified
3 Header S0 Record. The question regarding a Site Identifier and a Site Number has been updated and clarified.
4 Data 30 Record. The sum of all vehicle classes MUST match the volume of vehicles detected on the lane, even if they could not be classified.
5 Scheme 08 Vehicle Classes (RSA Vehicle). The rule regarding Class 0 and Class 2 vehicles is clarified in the section on Vehicle Classification Schemes.
6 L1 Record Code 3. The Code 3 (If individual vehicles are recorded, then only fully weighed heavy vehicles will be recorded for this lane) has been redefined or relaxed to (Some individual Vehicles may have been recorded)

Version 2.00 issue 2006/02/16

Data Interval in Summary Records. The duration of a data summary at the start of a data file may be less than the default summary interval. This was not previously made clear by the documentation. Refer to SUMMARY DURATION of SUMMARY RECORDS.

Version 2.00 issue 2006/03/13

The definition of the vehicle following property of a vehicle was changed. Note that this change was introduced without any indication that this change is in effect.

Version 2.00 issue 2006/04/10

The L1 Record Mass Code 2 was added. This had already been implemented in Version 1.05 but was not documented.

Version 2.00 issue 2006/05/05

An explanation for START and END TIME CLOCK conventions was included.

Version 2.00 issue 2007/07/18

Fixed some editing mistakes

Version 2.00 issue 2007/08/17

Added Classification Scheme “Indian Axle Classification 1”

Version 2.00 issue 2007/11/10

Added Classification Scheme “Indian Axle Classification 2”

Version 2.00 issue 2007/11/25

A serious oversight was made by not defining a NUL classification scheme. The result is that a user has to determine from the header whether a scheme 00 is a volumetric/counting scheme (i.e. it has 1 class) or a NUL scheme with 0 classes). The difference comes in when generating classification summaries. Class Scheme 00 with 1 class can have class summaries while a NUL scheme (also Scheme 00) cannot.

Version 2.00 issue 2008/04/23

Added to the ME (Sensor Error) and MS (Sensor Status) of Mikros Systems

Version 2.00 issue 2008/12/19

Expanded upon the Vehicle Failure Codes

Version 3.00 issue 2013/11/01

Redrafted as a COTO document
Changed format to a comma delimited version
Added the Counting Station Definition File
Added a Vehicle Category for the categorisation of vehicles
Implemented a range of new records and other changes

Terms and Abbreviations

CTO	Comprehensive Traffic Observations This was a long-term traffic monitoring program launched by the South African Department of Transport circa 1980. The functions and responsibilities for the program were later taken over by the SANRAL.
DOT	South African Department of Transport
COTO	Committee of Transport Officials
FHWA	Federal Highway Administration (United States of America)
SANRAL	South Africa National Road Agency Limited

1 INTRODUCTION

1.1 Background

Traffic data is used for many applications ranging from engineering design to economic decisions. Data typically consists of traffic counts, but may include various other parameters such as weight-in-motion (WIM) and operating speeds.

Automatic traffic data is mostly undertaken by means of electronic equipment (called data loggers) although data may be collected by other means (e.g. pneumatic counters). There is a range of data loggers available from different manufacturers (local and international) in South Africa, each with a different native data output format. These formats vary between the different types and makes of data loggers. This makes it difficult and costly for users when data must be obtained by means of different loggers since data processing software will have to be developed for each type of logger.

This document specifies a South African Automatic Standard Data Collection Format to which all data loggers or software must comply. Manufacturers or agents of data loggers as well as data service providers must be able to supply loggers and/or software that can translate their logger data format to the standard data format.

1.2 Scope of document

The scope of this document is limited to aspects related to the format of collected traffic data. In order to specify the data format, it is also necessary to provide definitions of the data items (traffic parameters). However, no specifications are provided of data items or traffic parameters that must be collected and these must be separately specified by the data user.

The scope of the document also includes a specification for the format according to which data on the counting station (observation site) must be provided. Such data must normally be made available when traffic data is collected at a particular site.

1.3 Data user specifications

This document can only be used to specify the format in which data must be provided and the data user must provide additional specifications for the collection of data. Such specifications would cover aspects such as the type and size of equipment to be used, accuracy requirements for the equipment, site requirements, etc.

The data user must also specifically provide specifications on aspects such as the following:

a) Data or traffic parameters that must be collected (e.g. traffic counts, speeds, masses, etc.).
b) Vehicle classification scheme to be used for the classification of vehicles.
c) Which traffic data records must be provided (e.g. individual vehicles, summary data, etc.).
d) Whether the counting station data file as defined in these standards must be provided.

1.4 Version 1

Version 1 of this document was developed by the National Department of Transport in 1994 and was used until 2005 when Version 2 was introduced. The original version was based on a fixed ASCII text format.

1.5 Version 2

A number of new vehicle properties were developed that required a significant change to the original version of the data format. These included the properties “Following Vehicle”, “Bumper-to-1st Axle Distance” and “Inverse of Speed”. This meant that the individual vehicle data had to be expanded upon, thus forcing a significant change in the data format. However, traffic data supplied in Version 2 can always be downgraded to Version 1, with the loss of some details.

Another reason for introducing Version 2 was the need to include information based on two different vehicle classification schemes (Scheme 8 and Scheme 5). The Version 1 format only supported one vehicle classification field which meant that classification according to Schemes 01 and 05 was implicit to the individual vehicle data. Version 2 introduced the requirement that both classifications must be included in the individual vehicle data when two different schemes are used.

1.6 Version 3

Further developments in the field of traffic observations identified additional vehicle properties for which provision had to be made. These include properties such as individual wheel masses, single/double tyres, etc.

There was also an increased interest in the collection of individual vehicle data that significantly increased the size of the data files. A more flexible and more compact data format was required.

Two alternative formats were evaluated, namely the XML and comma delimited format. The XML format was the most flexible format available at the time the format was developed, but it would have significantly increased the size of data files.

The *comma delimited format* was therefore selected for Version 3, primarily because of the need to reduce the size of data files when collecting individual vehicle data.

Version 3 represents a significant deviation from previous versions. It is, however, possible to convert data between the different formats, although there could be some loss of details when converting data to earlier versions.

In Version 3 the fixed column format of the previous version was changed to a comma delimited format. New features were also added and some of the un-used data types dropped from the standard. All logger specific information has been removed e.g. status and error information. On the other hand, a new instrumentation record was introduced and this is no longer an optional record.

2 TRAFFIC FILE AND DATA FORMAT

2.1 Introduction'

Specifications are provided in this chapter on the traffic file and data format. The specifications cover aspects such as traffic data file names, data file structures, data types and the comma delimited data format.

The requirements of this chapter are compulsory and must be fully complied with.

2.2 Traffic data file names

The names of traffic data files depend on the duration over which the data are provide, as described below.

Provision is made for the following two data file types:

1 File type RSA is used to indicate data collected according to Versions 1 and 2 of the data format.
2 File type RSV is used to indicate data collected according to the comma delimited format of Version 3.

File names for data to be provided in full years

In situations where traffic data are provided for full years, the data must be provided in files with the following file names:

SiteId-YYYY.RSA	(Versions 1 and 2)
SiteId-YYYY.RSV	(Version 3)

In which:

SiteId	= Site Identifier
YYYY	= Last year for which data are provided

A file must contain at least data for one full year, but data may be provided for more than one year. Data for one year may not be provided over more than one data file.

File names for data to be provided in full days

In situations where traffic data are provided for full days, the data must be provided in files with the following file names:

SiteId-YYYYMMDD.RSA	(Versions 1 and 2)
SiteId-YYYYMMDD.RSV	(Version 3)

In which:

SiteId = Site Identifier
YYYYMMDD = Last date of data

A file must contain at least data for one full day, but data may be provided for more than one day. Data for one day must not be provided over more than one data file.

File names for data to be provided in full seconds

In situations where traffic data are provided for full seconds, the data must be provided in files with the following file names:

SiteId-YYYYMMDD-hhmmss.RSA (Versions 1 and 2)
SiteId-YYYYMMDD-hhmmss.RSV (Version 3)

In which:

SiteId = Site Identifier
YYYYMMDD = Last date of data
hhmmss = Last second of data

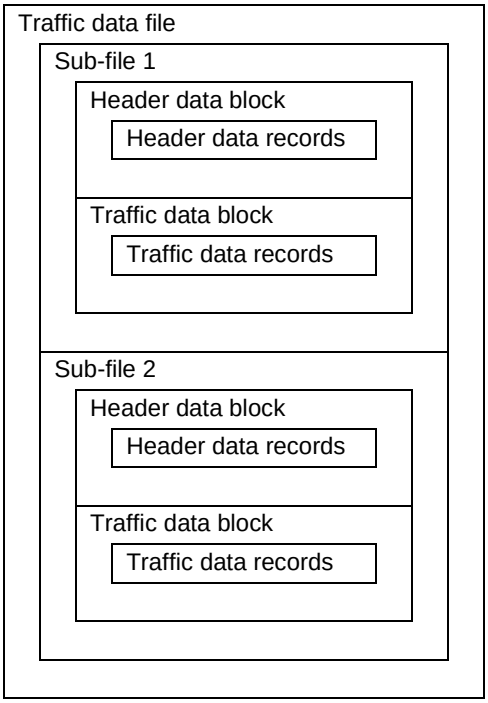
A file must contain at least data for one full second, but data may be provided for more than one second. Data for one second must not be provided over more than one data file.

2.3 Traffic data file structure

A diagrammatical presentation of the required traffic data file structure is given in the diagram below. Provision is made for the following data elements:

1 A data file may consist of one or more “sub-files” (e.g. sub-files 1 and 2 in the diagram).
2 Each “sub-file” may consist of two data blocks, namely:
   a) Header data block; and
   b) Traffic data block.
3 Each data block may consist of one or more data records (lines of data).
4 Each data record may consist of one or more data items of fields (not shown in the diagram).

If multiple sub-files are present in a data file, they must be sorted in time i.e. the latest data must be at the end of a file and the data must belong to the same site and lane configuration although different types of data may be present.



A data record must have at least two non-blank characters. If the data record is blank or contains only one character, it must be ignored.

The first two characters in a data record describe the type of data to follow in the record. These two characters are referred to as the Data Type and are case sensitive (see *Field Types*).

After the first two characters in a data line there may be a comma indicating that more data is to follow. All data is separated by commas i.e. the data is comma delimited. Each comma represents a new data field.

A Header data block starts with the H0 Start of Header record and ends with the H9 End of Header Record. Any information between the H0 and H9 record is considered to be part of the header. No similar records are used to demarcate Traffic data blocks and any subsequent data lines are considered to be traffic data until another H0 is encountered or the end of the file is reached.

2.4 Comma delimited format

Version 3 of the traffic data format requires that data must be provided in a comma delimited format. The comma delimited data file format is an ASCII Text file format in which data is provided on a on a line by line basis and the different data items are separated by commas. Only the following ASCII characters are allowed in the data file:

1 The data must be provided in the printable ASCII characters 32 to 127, which includes the blank character (ASCII 32).
2 The end of a line must be represented by the Carriage Return (ASCII 13) and Line Feed Characters (ASCII 10).

The following characters may be present, but must be ignored:

1 Empty or blank lines.
2 End of File Character.

The length of the file must be established from its file size.

Should any other character, including the Null (ASCII 0) and Tab (ASCII 9) Characters be encountered, then this must be treated as an *error*.

The length of a data line is variable but limited to a maximum length of 65536 characters including the Carriage Return (ASCII 13) and Line Feed Characters (ASCII 10).

Each data item or field must be separated by a comma and no data item may contain a comma, unless it is provided as text data that is delimited with the double apostrophe.

As a general rule, where data or information is not available, data items or field must be left empty and not indicated by zeroes. This means that when two commas that follow each other without any intervening characters (blanks may be allowed) are encountered, the default value for that field must be used.

2.5 Field types

Data items or fields are presented in any of the following forms or types:

Data type (Case sensitive)

Data Types are two characters that describe the data type and the following data on the record. They are always the first two non-blank characters in a data record i.e. in the 1st column. The data type is case sensitive.

Sub-data type (Case sensitive)

Sub-data Types are used to start a sub-section of a data record. These sub-data types consist of two alpha-numeric characters, the first of which is always an alpha character (see Vehicle data: axle spacing as an example). The sub-data type is case sensitive.

Code Type (Case sensitive)

A Code Type is a case sensitive alpha-numeric field that references a fixed set of information.

Integer Type

The Integer Type is a whole number and may be both positive and negative depending on the context. A minus character (-) must be used to indicate a negative number. The positive character (+) may not be used.

Format: [-]d where d is one or more digits between 0 and 9.

Real Type

The Real Type is a real number using a decimal point (ASCII 46) to express fractions of a whole number. A decimal comma may not be used. A minus character (-) must be used to indicate a negative number. The positive character (+) may not be used. Furthermore, if the fractional part is zero, then the decimal point should not be used. This will conserve space and reduce the overall file size.

Format: [-]d[.d] where d is one or more digits between 0 and 9.

String Type [n]

The String Type is a string of alpha-numeric characters. It may contain any characters other than a comma (,). The [n], where specified, indicates the maximum number of characters allowed.

Text Type [n]

The Text Type is a string of ASCII characters. If the filed contains a comma (,), the string must be delimited with double apostrophes (“).The [n], where specified, indicates the maximum number of characters allowed.

Date Type

A Date is given by YYMMDD where:

YY is the year with YY<50 is 2000+YY and YY>50 is 1900+YY
MM is the month and
DD is the day of the month.

The date must always contain exactly six digits. So a date of 2 September 2001 is coded as 010902.

Time Type

A Time is given as hhmm[ss[d[[d[d]]]] where:

hh is the hour,
mm is the minutes,
ss the seconds,
d is the fraction of a second.

A *Time Type* must always contain at least four digits indicating the hours and minutes, but may also optionally contain seconds and fractions of a second without a decimal point. If the seconds are present the field must contain at least six digits.

Fractions of a second less than a millisecond may usually be ignored. Since the first part of the time (hhmmss) is a field of fixed size the decimal point for the fraction of seconds is not required (with the purpose of saving file space).

A time of 2 minutes past 9 am could be coded as:

0902 or 090200 or 0902000 or 09020000 or 090200000

Whereas a time of 2 minutes and 30 seconds past 9 am could be coded as:

090230 or 0902300 or 09023000 or 090230000

Time Interval Type

Time intervals are used for indicating periods of time that do not exceed 99 minutes. Time intervals are given as mm[ss[d[d[d]]]] where:

mm the minutes (maximum 99);
ss the seconds, and
d[d[d]] the fraction of a second.

A time interval must always contain at least two digits indicating the minutes, but may also optionally contain seconds and fractions of a second *without* a decimal point. If the seconds are present the field must contain at least four digits. Fractions of a second less than a millisecond may usually be ignored. Since the first part of the time interval (mmss) is a field of fixed size the decimal point for the fraction of seconds has been dropped to save file space.

A time interval of 2 minutes could be coded as

02 or 0200 or 02000 or 020000 or 0200000

Whereas a time interval of 2 minutes and 30 seconds could be coded only as

0230 or 02300 or 023000 or 0230000

Duration Type

Time durations are used for indicating short periods of time. These are expressed in *milliseconds*. Fractions of a millisecond are not allowed and the value must be rounded to the nearest millisecond.

GPS Coordinate Type

GPS coordinates must be based on the World Geodetic System Version WGS84. The coordinates must be expressed as degrees and fractions of a degree using a decimal point to separate the degrees from the fractions. The plus (+) (optional) sign must be used to indicate North and East while the minus (-) sign must be used to indicate South and West.

2.6 Clock and time conventions

All times must be recorded in the Standard Time applicable to the locale of the site. The time must thus be continuous and not change over the day-light saving period as may be applicable in some countries in the world.

Traffic loggers may be recording times to resolutions other than those required in this document and such recording times must therefore be rounded off to the required

resolution. In general, time must be rounded either up or down to the nearest time resolution required by this document, For example, if the required time resolution is 1/100th of a second, then times between 0.000 and 0.005 (excluded) must be rounded down while times between 0.005 (included) and 0.010 must be rounded up.

The above rounding off applies to all times except at midnight where different conventions are followed depending on whether a recording is made of a time instance or a start or end time, as follows:

Time Instance Clock Convention

For time instances, the time 24:00:00:00 may not be used and all such times must be converted to 00:00:00:00.

Start Time Clock Convention for Intervals

For the start times of intervals, the time 24:00:00:00 may not be used and all such times must be converted to 00:00:00:00. This is the same convention than for Time Instances.

End Time Clock Convention for Intervals

For end times of intervals, the time 00:00:00:00 may not be used an all such times must be converted to 24:00:00:00.

2.7 Summary intervals

Provision is made for the summarising of collected data in summary intervals of 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30 or 60 minutes.

The time intervals must be even division of the hour of the day. A sequence of time intervals that have duration of one hour must start and end on an even time of the day. For example, a sequence of 15-minute intervals may start at 08:00 and continue in intervals of 08:15, 08:30, 08:45 until the next hour 09:00 is reached. That is, a sequence of 15-minute intervals must start and end at an even 15-minute time of the day.

The first summary record may be a partial record if the data log period was started at a time not synchronized with the summary interval. So, for example, if the data log started at 06:51:35 and the interval duration is 60 minutes, then the first interval will contain data for an interval of 8 minutes and 25 seconds.

3 COUNTING STATION DEFINITION

3.1 Site Identifiers

Stations are identified by means of a Site Identifier (station number).

Once a Site Identifier has been allocation to a specific site, no definition data may be changed. Should there be a need to change any of the site definition data (such as additional lanes) a new Site Identifier must be assigned to a site. The old site must then be marked as “discontinued”, in which case the Site Identifier may never again be used at the particular or any other location.

Site Identifiers in South Africa are managed by SANRAL. Any person or authorities that undertake traffic counts should approach SANRAL to have a range of site identification numbers assigned for their exclusive use.

3.2 Traffic streams

A Traffic Stream consists of a group of traffic lanes travelling on a road or carriageway in one direction. A two-lane road, for example, will consist of two Traffic Streams, one for each direction of travel. At an interchange (or where there are on- or off- ramps), additional Traffic Streams may be defined.

Traffic Streams must be numbered starting from 1 up to the total number of Traffic Streams. Each stream must be given a direction code that specifies the normal direction of travel in the stream. The direction codes used for this specification follow a similar convention as described in the U.S. Traffic Monitoring Guide (FHWA, 1995). Two Traffic Streams may have the same direction code; that is, there may be multiple Traffic Streams in the same direction.

The concept of Traffic Streams was introduced in Version 3.

Number of Traffic Streams

The Number of Traffic Streams is the number of Traffic Streams at a site.

This document makes provision for a maximum of 8 Traffic Streams per site.

The Number of Traffic Streams is an *Integer Type*.

Traffic Stream Number

The Traffic Stream Number is the index number of a particular Traffic Stream at a site. These are labelled sequentially starting with one (1).

Traffic Streams must be labelled as follows:

1. Select a primary direction from which Traffic Streams are numbered. If the road has multiple streams, then the primary direction must be the one going north. If none goes north, then the primary direction is the one going east. This Traffic Stream must be the first (1).
2. For countries using the left-side drive convention, the streams must be labelled left-to-right (anti-clock wise) starting with the primary stream.

   For countries using the right-side drive convention, the streams must be labelled right-to-left (clock wise) starting with the primary stream.
3. For a road with two directions of travel, stream 1 would be located in a northern or eastern direction, while stream 2 would be located in the opposite direction.
4. For more complex interchanges other definitions of the Traffic Streams may be used, provided each stream contains at least one assigned lane.

The Traffic Stream Number is an *Integer Type*.

Direction Code

Each Traffic Stream is associated with a travel direction. Direction Codes are used to indicate the direction of travel. These codes are defined below. If vehicles normally travel in both directions on the same lane, then codes 8 or 9 should be used where the forward direction must be considered to be North (North-East) and East (South-East) respectively.

Dir Code	Description
0	North
1	North-East
2	East
3	South-East
4	South
5	South-West
6	West
7	North-West
8	North + South (or North-East + South-West) combined
9	East + West (or South-East + North-West) combined

The Direction Code is a *Code Type*.

Traffic Stream Lane Position

The Traffic Stream Lane Position describes the position of the physical lane within a given Traffic Stream. The labelling of lane positions starts with 1 for the slow lane, 2 for the next adjacent lane and so on for each Traffic Stream. For each Traffic Stream, there is a set of positions starting with lane position 1. The lane position of a virtual lane is set to zero and its position must be deduced from its associated physical lane.

Note that the Traffic Stream Lane Position numbering system differs from the lane numbering system described in the next section. In the lane numbering system, all lanes are numbered sequentially and there are no duplicate numbers. This is different from the Traffic Stream Lane Position which defines the position of lanes relative to a Traffic Stream.

The Traffic Stream Lane Position is an *Integer Type*.

3.3 Traffic lanes

The method according to which traffic lanes must be handled is described in this section. Although no essential change in the handling of lanes was introduced in Version 3, the way in which the lanes are described was changed substantially.

Note that the traffic lane numbering system described in this section differs from the Traffic Stream Lane Position described in the previous section. Traffic lanes are numbered sequentially from one without duplicate numbers, while Traffic Stream Lane Positions are numbered from one for each Traffic Stream.

Physical Lane

The Physical Lane Number is the lane on which a vehicle is physically detected irrespective of the direction or Traffic Stream in which the vehicle was moving.

For roads using the Left-Side drive convention:

1 Physical lanes must be labelled starting from the left-most lane in the primary direction and continue from left to right (anti-clock-wise) over all lanes. The Traffic Stream Lane Position will indicate where the lane is located within a Traffic Stream.
2 For a two-direction road, Lane 1 would be the slow lane in the primary direction and the last lane also the slow lane in the opposite direction if present.
3 Note that the labels continue over all the Traffic Streams. No label may be duplicated.

For roads using the Right-Side drive convention, the reference to “left” must be substituted with “right” (and visa-versa) and “anti-clock-wise” with “clock-wise”.

It is imperative that the first set of lane labels contain all physical lanes. In other words, if a site has 6 physical lanes then these must be labelled 1 to 6. This restriction was not required in Versions 1 and 2, but it was general practice and was enforced from Version 3.

A Physical Lane Number is an *Integer Type*.

Reverse Flow

A traffic lane normally carries traffic in the forward direction but sometimes a vehicle is recorded travelling in the reverse direction. This may happen when a vehicle actually reverses in a lane, or when a vehicle overtakes another on a two-

lane road. The traffic loggers must be able to record and handle such events (except where required otherwise by the data user).

A vehicle that is recorded in the forward direction must always be recorded in the physical lane. The vehicle travelling in the reverse direction may be recorded in the same physical lane, but it can also be assigned to another physical or virtual lane or not recorded at all. By default, the vehicle is recorded in the same physical lane, but it must be possible to specify whether the vehicle is assigned to another physical or virtual lane or not to record the vehicle at all.

Virtual Lane

Virtual lanes are lanes that do not exist but which may be used to record vehicles in a reverse direction. These lanes must be labelled from a number which is one higher than the number of physical lanes (with no skipped labels). For example, if a site has 6 physical lanes, labelled from 1 to 6, and 2 virtual lanes, then the virtual lanes must be labelled 7 and 8.

The Number of Virtual Lanes can never exceed the number of physical lanes.

The direction of travel associated with a virtual lane is the opposing direction of the associated physical lane.

A Virtual Lane Number is an *Integer Type*.

Assigned Lane

An assigned lane can be either a physical or a virtual lane. It is the lane associated with a given physical lane after the direction of travel (Forward/Reverse) has been taken into consideration. Where a vehicle is moving in the forward direction, the assigned lane must always be the physical lane. When a vehicle is moving in a reverse direction the vehicle may be ignored or assigned to another lane; this other lane may be a physical or virtual lane.

An Assigned Lane Number is an *Integer Type*.

Number of Physical Lanes

The number of physical lanes is the number of physical lanes instrumented on the road. It equals the highest physical lane number defined for the site.

The Number of Physical Lanes may not exceed a maximum of 32.

The Number of Physical Lanes is an *Integer Type*.

Number of Virtual Lanes

The number of virtual lanes is the number of virtual lanes defined for the site. It excludes the physical lanes.

The Number of Virtual Lanes may not exceed a maximum of 32.

The Number of Virtual Lanes is an *Integer Type*.

Number of Lanes

The Number of Lanes is the sum of the number of physical and virtual lanes i.e. the total number of assigned lanes. It equals the highest virtual lane number if virtual lanes are defined or the highest physical lane number if no virtual lanes are defined.

The Number of Lanes may not exceed a maximum of 64.

The Number of Lanes is an *Integer Type*.

4 TRAFFIC PARAMETERS

4.1 Introduction

Traffic loggers measure traffic parameters such as counts, speed, vehicle lengths etc. The type of parameter that can be measured depends on the sensor type and configuration used at a counting station.

The specific traffic data or parameters that must be collected is not specified in this standard and must be separately specified by the data user. Definitions are, however, provided for the different traffic data parameters that are included for in the format specifications.

4.2 Parameters not measured

Where a specific traffic parameter is not measured, then the specified field must be left empty. The value zero shall specifically not be used for indicating such parameters (a zero value has a different meaning than an empty field).

4.3 Resolutions and accuracies

The resolution is the smallest value (fineness) to which a given parameter can be measured or recorded by a logger. Resolution is sometimes referred to as the “step” or “increment” size of measurements or recordings. The resolution does not indicate the accuracy with which a measurement is undertaken. A high resolution does not imply that the equipment is accurate nor does a low resolution imply that the equipment is inaccurate.

Differentiation is made between “recording resolutions” and “measurement resolutions”. The recording resolution is the resolution to which data must be recorded and reported while the measurement resolution is the resolution to which measurements are actually undertaken.

The recording resolutions required in this document are sometimes much higher than that can be achieved by equipment. For example, this specification requires that mass measurements must be recorded to the nearest 1 kg, while such a resolution cannot be achieved by most equipment. The high recording resolution is required to obtain more accurate binning of data when histograms or frequency distributions of data are required.

This specification does not specify any measurement resolutions or accuracies, but recording resolutions are specified. The measurement resolutions and accuracies required from equipment must be specified separately by the data user. The actual measurement resolutions, however, must be provided as part of the data. Provision is made in several data records for the provision of these resolutions.

4.4 Ranges

The range of a traffic parameter (such as the vehicle length) is the minimum and maximum value that such a parameter can have.

This specification makes provision for wide ranges over which traffic parameters can be recorded, but this does not imply that the loggers/instruments must be able to measure these parameters over the entire possible range.

The actual ranges required for any given parameter will have to be specified separately by the data user.

4.5 Weight and mass

In this document, the term mass is used when it is actually the weight or load that is measured. The measured load normally consists of two components, namely the weight of the vehicle plus a dynamic component due to the movement of the vehicle. The measured loads are converted to equivalent masses and reported in mass units (e.g. kg).

4.6 Traffic parameter definitions

Departure Line

The Departure Line is the physical point or line on a site at which the vehicle departs from the site i.e. from the last sensor(s). It must, however, be realized that in practice this departure point or line is not fixed but may shift slightly backward and forwards depending on the height of the vehicle and the sensor type.

Departure Time

The Departure Time is the date and time at which the ***back*** of a vehicle crossed the Departure Line. (If a vehicle is reversing, then this would be the ***front*** of the vehicle.)

The departure time is recorded with a resolution of a 10th of a second.

The departure time consists of a *Date* and *Time Type* and uses the Time Instance clock convention.

Arrival Time

The Arrival Time is the time at which the vehicle arrives at Departure Line. It is important to note that the arrival time is not necessarily the time when the first sensors detected the vehicle, particularly if the distance between the first sensors and last sensors is substantial. The arrival time is calculated by subtracting the Occupancy Time from the Departure Time.

The arrival time is normally recorded with a resolution of a 10th of a second.

The arrival time consists of a *Date* and *Time Type* and uses the Time Instance clock convention.

Note: Although the arrival time is defined in this document, no provision is made for the recording of such times.

Site Arrival Time

The Site Arrival Time is the time at which the vehicle arrived at the site i.e. when detected by the first sensors. It is important to note that the time difference between the Site Arrival Time and Departure Time includes the time spent travelling over the physical width of the site i.e. from the start of the site to the end of the site. For the purpose of this definition it is allowed to calculate the Site Arrival Time by subtracting the Site Occupancy Time from the Departure Time.

The site arrival time is normally recorded with a resolution of a 10th of a second.

The site arrival time consists of a *Date* and *Time Type* and uses the Time Instance clock convention.

Note: Although the site arrival time is defined in this document, no provision is made for the recording of such times.

Forward / Reverse Code

The Forward / Reverse code indicates whether a vehicle was travelling in the forward or reverse direction to the normal traffic flow as defined for the physical lane on which the vehicle was detected. The codes used are:

Code	Description
Empty or 0	Direction not recorded by the equipment. (Default)
1	Forward
2	Reverse

The forward / reverse Code is a *Code Type*.

Vehicle Length

The length of a vehicle is defined as the bumper to bumper length of the vehicle in cm (or inch). This length is usually measured using the magnetic influence of the vehicle on loops and is therefore not very accurate. The accuracy is usually also dependent on the height of the vehicle chassis.

The vehicle length is recorded to the nearest cm (or inch). The range is 0 to 10000 cm (i.e. 100 meter). The default resolution is 10 cm.

The vehicle length is a *Real Type*.

Vehicle Speed

Normally the vehicle speed is measured at the front bumper or front axle. Note that the speed of a vehicle may vary as the vehicle moves over the measurement site.

The vehicle speed is recorded to the nearest km/h (or mph). The range is 0 to 250 km/h.

The vehicle speed is a *Real Type*.

Occupancy Time

The Occupancy Time is defined as the time that the vehicle takes to pass the Departure Line. Because a site has a physical dimension, the occupancy time may not simply be the difference between the Site Arrival Time and Departure Time. The formal relation between occupancy time, length and speed is given by:

Occupancy Time = Constant * Length / Speed

The occupancy time is measured in milliseconds with a possible range of 0 to 86 400 000 ms (i.e. 1 day). The resolution accuracy for the range 0 to 60 seconds is milliseconds; the resolution of longer durations is a 10th of a second.

The occupancy time is defined as a *Duration Type*.

Note: Although the occupancy time is defined in this document, no provision is made for the recording of such times. Provision is only made for the recording of site occupancy times.

Site Occupancy Time

When traffic is in a stop/start state, vehicle speeds and lengths can often not be measured accurately and cannot be used to calculate the occupancy time. Under such conditions the time a vehicle occupies a given space (usually the loop) is used to calculate traffic parameters. The time includes the time it takes to traverse the site or loop. The formal relation between the length, speed and loop width can then be expressed as:

Site Occupancy Time = Constant * (Length + Loop Width) / Speed

The site occupancy time is measured in milliseconds with a possible range of 0 to 86 400 000 ms (i.e. 1 day). The resolution accuracy for the range 0 to 60 seconds is milliseconds; the resolution of longer durations is a 10th of a second.

The site occupancy time is defined as a *Duration Type*.

Inverse of Speed

The Inverse of Speed is defined by the following relationship:

Inverse of Speed = Constant / Speed

The inverse of speed is measured in millisecond / meter in the metric system.

The inverse of speed is a *Real Type*.

Chassis Code

When using loops to detect vehicles, some loggers have the ability to determine the height of the vehicle chassis from the magnetic field strength (see Vehicle Classification for Schemes 01 and 05 for a detailed description).

Code	Description
Empty or 0	No Height Code recorded. (Default)
1	High Chassis Height
2	Medium Chassis Height
3	Low Chassis Height

The chassis code is a *Code Type*.

Vehicle Category

The Vehicle Category is a two-digit code that describes the category of vehicle detected. For more details refer the section on Vehicle Category and Classification.

The Vehicle Category is a Code Type.

Vehicle Classification Scheme

The Vehicle Classification Scheme is a two-digit number that specifies which classification scheme is used to classify vehicles i.e. how vehicles are categorized into groups of vehicles. For more detail refer to the chapter on Vehicle Classification.

The vehicle classification scheme is a *Code Type*.

Vehicle Class

For each Vehicle Classification Scheme a particular vehicle is categorized into a group which is called its Vehicle Class. For more detail refer to the chapter on Vehicle Classification.

The vehicle class is a *Code Type*.

Trailer Count (Number of Trailers)

The Trailer Count is the number of trailers towed by a vehicle. The count is zero when not no trailers are towed. Provision must be made for a count up to a maximum of 15.

The trailer count is an *Integer Type*.

Axle Count (Number of Axles)

The Axle Count is the number of axles on the vehicle that touch the road surface. Axles that do not touch the road surface are not included in the count.

Provision must be made for a count up to a maximum of 30 axles. Previously (in South Africa), the norm has been to limit the maximum number of axles to 15.

The axle count is an *Integer Type*.

Axle Spacing

The Axle Spacing is the spacing between individual axles, expressed in cm (or inch). The accuracy with which the axle spacings are determined depends on the methodology used to determine/calculate the axle spacings.

The axle spacing is recorded to the nearest cm (or inch). To allow for erroneous measurements (e.g. missed axles) the range is 0 to +10000 cm (i.e. 100 meter).

The axle spacing is a *Real Type*.

Bumper-to-1st Axle Spacing

The Bumper-to-1st Axle Spacing is the distance between the bumper and the first axle normally expressed in cm (or inch). This spacing is usually measured using the magnetic influence of the vehicle on loops to detect the bumper and an axle sensor to detect the axle. The detection of the bumper is not very accurate and the accuracy is also dependent on the type of vehicle.

The Bumper-to-1st Axle Spacing is recorded to the nearest cm (or inch). To allow for erroneous measurements (e.g. missed first axle) the allowed range is -1000 to +1000 cm (i.e. 10 meter).

The Bumper-to-1st Axle Spacing is a *Real Type*.

Bumper-to-Last Axle Spacing

The Bumper-to-Last Axle Spacing is the distance between the last axle and the bumper normally expressed in cm (or inch). This spacing is usually measured using the magnetic influence of the vehicle on loops to detect the bumper and an axle sensor to detect the axle. The detection of the bumper is not very accurate and the accuracy is also dependent on the type of vehicle. The Bumper-to-Last Axle Spacing is calculated as follows

Bumper-to-Last Axle Spacing = Length –
(Bumper-1st Axle Spacing) – Total Axle Spacing

The Bumper-to-Last Axle Spacing is recorded to the nearest cm (or inch). To allow for erroneous measurements (e.g. missed first axle) the allowed range is -1000 to +1000 cm (i.e. 10 meter).

The Bumper-to-Last Axle Spacing is a *Real Type*.

Note: Although the Bumper-to-Last Axle Spacing is defined in this document, no provision is made for the recording of such spacing.

Axle Mass

Axle Masses are the loads of each axle as determined by a weighing sensor. The Axle Mass is the sum of the masses of the all sets of wheels on the axle.

The axle masses are recorded to the nearest kg (or lb) for metric and imperial unit systems respectively.

The axle mass is a *Real Type*.

Wheel mass

Wheel masses are the loads of each wheel set (left or right) as determined by a weighing sensor where wheel masses are individually weighed.

The wheel masses are recorded to the nearest kg (or lb).

The wheel mass is a *Real Type*.

Note: Even when wheel masses are recorded, the mass is always presented as an axle mass; that is the recorded mass is always twice the actual wheel mass.

Axle Groups

Axles that are spaced closer than a specified distance, called the Axle Group Spacing, (200 to 250 cm on a truck) are considered to belong to a group. Static weigh bridges in South Africa can generally only weigh axle groups, so that static to dynamic mass comparisons can only be undertaken using axle groups and the Gross Vehicle Mass (GVM).

Group Count

The Group Count is the number of axle groups that are on a vehicle.

The group count is an *Integer Type*.

Group Axle Count

The Group Axle Count is the number of axles that a given group has.

The group axle count is an *Integer Type*.

Group Configuration

The Group Configuration is the set of Axle Group Counts starting from the front of the vehicle. Each value is separated from the next by a blank. So if the truck has 6 axles, with 3 groups, the first group having 1 axle and the second 2 and the last 3 axles then the configuration is given by 1 2 3 where the individual group axle counts are separated by a blank character.

The group configuration is a *String Type*.

Group Mass

The Group Mass is the total axle mass of a given group.

The group mass is given to the nearest kg (or lb) with a range of 0 to 100 000 kg.

The group mass is a *Real Type*.

GVM (Gross Vehicle Mass)

The Gross Vehicle Mass (GVM) is determined as the sum of all individual Axle Masses.

The GVM is given to the nearest in kg (or lb) with a range of 0 to 1 000 000 kg.

The GVM is a *Real Type*.

Note: Although the GVM is defined in this document, no provision is made for the recording of such GVM.

WIM Offset sensor detection code

This field specifies whether off-scale detection has occurred during weighing. The following codes may be used:

Code	Description
Empty or 0	No off-scale detection devices present.
1	No off-scale detected.
2	Off-Scale detection has occurred
3	Off-scale detection on the left side of the WIM sensor
4	Off-scale detection on the right side of the WIM sensor
5	Off-scale detection on both left and right side of the WIM sensor

Tyre Type Code

The Tyre Type Code defines the type of wheel i.e. whether single or dual.

Code	**Description**
Empty or 0	No tyre type determined/unknown
1	Single tyre
2	Dual (or wide) tyre

The Tyre Type Code is a *Code Type*.

Vehicle Tag Code

Some traffic loggers have the facility to dynamically tag or mark a vehicle in the data. This is an ability that can be used to mark special calibration vehicles in the traffic stream.

Code	**Description**
Empty or 0	Normal vehicles
1	Special tagged vehicle

The Vehicle Tag Code is a *Code Type*.

Rear-to-Rear Headway

Rear-to-Rear Headway is the *time gap* between the rear of the previous vehicle and the rear of the current vehicle travelling on the same assigned lane. That is, the Rear-to-Rear Headway is the Departure Time difference between two consecutive vehicles travelling on the same assigned lane, whether physical or virtual lane.

Note that because the reference is to the assigned lane the arrival time differences can be negative. If the difference is negative it must be recorded as zero. If the headway is out of range, then an empty field must be recorded.

The Rear-to-Rear Headway is recorded in milliseconds. Refer to Occupancy Time for resolutions and ranges.

The Rear-to-Rear Headway is a *Duration Type*.

Front-to-Front Headway

Front-to-Front Headway is the differences in Arrival Times between the front of the previous vehicle and the front of the current vehicle travelling on the same assigned lane. That is, Front-to-Front Headway is the arrival time difference between two consecutive vehicles travelling on the same assigned lane, whether physical or virtual lane.

Note that because the reference is to the assigned lane the arrival time differences can be negative. If the headway (rear) is negative it must be recorded as zero. If the headway is out of range, then an empty field must be recorded.

The Front-to-Front Headway is recorded in milliseconds. Refer to Occupancy Time for resolutions and ranges.

The Front-to-Front Headway is a *Duration Type*.

Note: Although the Front-to-Front Headway is defined in this document, no provision is made for the recording of such headways. However, in some cases in the past, the headways calculated for RSA Data Summaries 21 and 22 were calculated as Front-to-Front Headways,

Gap Time

Gap Time is the time difference between the Departure Time of the previous vehicle and the Arrival Time of the current vehicle traveling on the same assigned lane. If the Gap Time is less than zero then it must be recorded as zero.

The Gap Time is recorded in milliseconds. Refer to Occupancy Time for resolutions and ranges.

The Gap Time is a *Duration Type*.

Vehicle Following

A vehicle is defined as a Following Vehicle if the Gap Time is less than a set limit (e.g. 3 seconds) and the Speed Differential between the previous and current

vehicle is less than a set positive difference (e.g. $V_{PREVIOUS} – V_{CURRENT} < 20$ km/h). A Free Flowing Vehicle is a vehicle that is not a Following Vehicle. The first vehicle in a platoon of vehicles is thus always a free flowing vehicle. A vehicle can thus be defined as either Free or Following. Both vehicles are from the same assigned lane.

The Vehicle Following Code is defined as

Code	Description
Empty or 0	Not recorded. (Default)
1	Free Flowing Vehicle
2	Following Vehicle

The Vehicle Following Code is a *Code Type*.

4.7 General parameters

The following are a number of general parameters used to for various purposes.

Data Source Code

Not all data provided in a RSA data file is provided by a logger and some data may be provided manually or by means of post-processing software. A strict rule is introduced in this version of the specifications that no logger data may be changed and if changes are required, then the original data must be provided together with the adjusted data. In order to identify the source of the data, the following codes are used:

Code	Description
0	Unknown data source
1	Data provided by logger (original data with no changes)
2	Data provided or changed by the data collection organisation
3	Data provided or changed by an agent of the owner of the data
4	Data provided or changed by the owner of the data

The Data Source Code is a *Code Type*.

Where data are provided from different sources, then Code 4 data must first be provided before Code 3 data, which may then be followed by Code 2 and then by Code 1 data. Code 0 data must be given last.

Edit Code

The Edit Code is used in most data records. It is used to define the status of the specific record. The edit code is only provided for backward compatibility with previous versions of these specifications and may not be used in future.

Code	Description
0	Normal Data (default)
1	Edited Data (data are valid)
2	Invalid (or Bad) Data (data must be ignored)

In previous versions of these specifications, data were allowed to be edited or changed. In situations where individual vehicle data were edited, the subsequent data summaries were also edited accordingly. In this version, a strict requirement is introduced according to which the original data must be provided and any changed data provided separately.

The Edit Code is a *Code Type*.

Measurement Unit System Code

The Measurement Unit System Code defines the units used in the data file.

Code	Description
M	The Metric units system is used. (Default)
E	The Imperial units system is used.

The Measurement Unit System Code is a *Code Type*.

Drive Convention Code

The Drive Convention Code specifies the road driving convention. By left-side drive we mean that vehicles keep to the left and overtake on the right.

Code	Description
L	Left-side drive (UK, RSA) (Default)
R	Right-side drive (USA, Europe)

The Drive Convention Code is a *Code Type*.

Logger Instrument Code

The Logger Instrument Code is used to include logger manufacturer specific information in the traffic data. A five-digit code is assigned to each specific logger. These codes may be obtained from SANRAL.

The following information is to be supplied when requesting codes from SANRAL:

1. Manufacturer
2. Equipment Model Number
3. Method used to detect vehicles (A short description)
4. Sensor types supported
5. Any other relevant specifications that may affect data quality, such as firmware upgrades etc.

The following codes have already been assigned by SANRAL:

Code	Description
00000	Instrument not registered with SANRAL
00001	Instruments used prior to the registration requirement.
00011	Mikros Systems – RAKTEL 8000 family
00012	Mikros Systems – RAKTEL 8010 family

The Logger Instrument Code is new to Version 3.

5 VEHICLE CATEGORY AND CLASS

5.1 Introduction

In previous versions of this document, vehicle classes and vehicle classification schemes were used for vehicle classification. A number of vehicle classification schemes were defined and the user could specify the specific vehicle classifications schemes for the classification of vehicles.

Each vehicle classification scheme was numbered and the user could specify up to two classification schemes for the classification of vehicles (the primary and secondary classification schemes).

The vehicle classification method has been retained in Version 3 of the document but a vehicle parameter “vehicle category” has been added. This parameter can be used in conjunction with other traffic parameters to create a range of different user-definable vehicle classes.

The vehicle classification schemes are described in the following sections while a section is provided at the end of the chapter in which the vehicle category parameter is described.

5.2 Vehicle classification schemes

Provision is currently made in this document for the Vehicle Classification Schemes listed below. Additional classifications schemes can be added to the list.

Code	Description
00	Vehicles not classified. (Volumetric or NUL) (0 Class)
01	RSA Light/Heavy Vehicle Classification Scheme (2 Classes)
02	FHWA 2-digit 13 Class Vehicle Classification Scheme.
03	AustRoad 13-Class Vehicle Classification Scheme.
04	UK (25-Classes) Vehicle Classification Scheme.
05	RSA Extended Light/Heavy Classification Scheme (4 Classes)
06	FHWA 2-digit 15 Class Vehicle Classification Scheme
07	Euro 13 Class Vehicle Classification Scheme
08	RSA 17 Class Vehicle Classification Scheme
09	RSA Toll 4 Class Vehicle Classification Scheme
10	Hungarian 15 Class Vehicle Classification Scheme
11	Indian Loop Classification
12	Indian Axle Classification 1
13	Indian Axle Classification 2
99	Other/Unknown scheme

In South Africa, vehicles were previously classified according to Schemes 05 and 08. The toll class Scheme 09 were not implemented during traffic monitoring but it was possible to convert Scheme 08 to Scheme 09.

5.3 Vehicle Classes

In each Vehicle Classification Scheme, there are one or more Vehicle Classes. Each Vehicle Class is designated by a 2-digit alpha-numerical code representing a particular class of vehicle.

In all of the Vehicle Classification Schemes, provision has been made for a Vehicle Class 00 (zero class) which must be used when it is not possible to classify a vehicle. This zero class would in most cases only include heavy vehicles.

5.4 Scheme 00 Unclassified

The number of classes for the Unclassified Scheme is 1 (one). This means that vehicles are counted but not classified. In previous specifications this scheme was referred to as the "Volumetric Scheme".

Class	Vehicle
0	Count

5.5 Scheme 01 Vehicle Classes (South African Light/Heavy)

Group	Class	Vehicle
	0	Error Class
Light	1	Light Vehicle
Heavy	2	Heavy Vehicle

More information on the classification scheme is provided under Scheme 05.

5.6 Scheme 02 Vehicle Classes (FHWA 13)

Group	Class	Vehicle
	00	Error Class (added to FHWA specifications)
Light	01	Motorcycle
	02	Passenger Cars
	03	Two axle, 4 tyre single units (Pick-up)
Heavy	04	Busses
	05	Two axle, 6 tyre single units
	06	Three axle single units
	07	Four or more axle single units
	08	Four or less axle single trailers
	09	Five axle single trailers
	10	Six or more axle single trailers
	11	Five or less axle multi trailers
	12	Six axle multi trailers
	13	Seven or more axle multi trailers

5.7 Scheme 03 Vehicle Classes (AustRoad)

Group	Class	Vehicle
	00	Error Class (added)
Light	01	Short Vehicle
	02	Short Vehicle Towing
Heavy	03	Two axle Truck
	04	Three Axle Truck
	05	Four Axle Truck
	06	Three Axle Articulated Vehicle
	07	Four Axle Articulated Vehicle
	08	Five Axle Articulated Vehicle
	09	Six Axle Articulated Vehicle
	10	B Double Vehicle or Heavy Truck and Trailer
	11	Double Road Train or Heavy Truck and two trailers
	12	Triple Road Train or Heavy Truck and three trailers
	13	Other

5.8 Scheme 04 Vehicle Classes (UK)

Group	Class	Vehicle
	0N	Error Class (added)
Light	0	Bicycle, moppet, motorcycle etc.
	1	Car, light van, taxi
	2	Light goods vehicle
	21	Car/light goods vehicle plus 1 or 2 axle caravan or trailer
Heavy	31	Rigid 2 axle heavy goods vehicle
	32	Rigid 3 axle heavy goods vehicle
	33	Rigid 4 axle heavy goods vehicle
	41	Rigid 2 axle HGV plus 1 or 2 axle drawbar trailer
	42	Rigid 2 axle HGV plus 3 axle drawbar trailer
	43	Rigid 3 axle HGV plus 2 axle drawbar trailer
	44	Rigid 3 axle HGV plus 3 axle drawbar trailer
	51	Articulated 2 axle tractor plus 1 axle semi-trailer
	52	Articulated 2 axle tractor plus 2 axle semi-trailer
	53	Articulated 3 axle tractor plus 1 axle semi-trailer
	54	Articulated 3 axle tractor plus 2 axle semi-trailer
	55	Articulated 2 axle tractor plus 3 axle semi-trailer
	56	Articulated 3 axle tractor plus 3 axle semi-trailer
	61	2 or 3 Axle bus or coach
	7	Vehicles with 7 or more axles
	1N	Vehicles with 1 axle counted
	2N	2 axle vehicle not otherwise classified
	3N	3 axle vehicle not otherwise classified
	4N	4 axle vehicle not otherwise classified
	5N	5 axle vehicle not otherwise classified
	6N	6 axle vehicle not otherwise classified

5.9 Scheme 05 Vehicle Classes (South African Extended Light/Heavy)

Group	Class	Vehicle
	0	Error Class
Light	1	Light Vehicle
Heavy	2	Short Heavy Vehicle
	3	Medium Heavy Vehicle
	4	Long Heavy Vehicle

Vehicle Classification Scheme 05 (as well as Scheme 01) is only based on the following observations undertaken by means of inductive loops:

1 Chassis Height
2 Vehicle Length
3 Vehicle Speed

Under no circumstances SHALL any other observations by means of other types of sensors, including mass measuring sensors, be used to determine the vehicle class.

The normalized chassis height is derived from the peak magnetic response measure on a loop. The mean peak response for light passenger vehicles (excluding light delivery vehicles (bakkies), SUVs, 2x4 or 4x4 vehicles, etc.) is measured and normalized to 100%. The peak magnetic response of from other vehicles is then normalized with the same factor and a value smaller than 100 typically indicates a higher chassis and a higher value a lower chassis.

Various versions of the classification scheme have been used to classify vehicles according to the scheme. The version depends on the date the observations were undertaken. Only the latest is presented here which has been in use since 2000.

The classification of vehicles into Light, Short Truck, Medium Truck and Long Truck in Versions 1 and 2 since 2000 was done according to the following table.

Versions 1 and 2 (Since 2000) Classification Scheme				
Vehicle length	Speed ≤ 140 km/h			Speed > 140 km/h
	High Chassis 1	Med Chassis 2	Low Chassis 3	
L ≤ 4.9 m	Light	Light	Light	Light
4.9 < L ≤ 10.0 m	Short Heavy	Light	Light	Light
10.0 < L ≤ 10.8 m	Medium heavy	Light	Light	Light
10.8 < L ≤ 16.8 m	Medium heavy	Medium Heavy	Medium Heavy	Light
L < 16.8 m	Long Heavy	Long Heavy	Long Heavy	Light

The Chassis Code Classes are defined as follows:

High Chassis (1) Normalised chassis height of less than 45.
Medium Chassis (2) Normalised chassis height of between 45 and 80.
Low Chassis (3) Normalised chassis height greater or equal to 80

5.10 Scheme 06 Vehicle Classes (FHWA 15)

Group	Class	Vehicle
	00	Error Class (added to FHWA specifications)
Light	01	Motorcycle
	02	Passenger Cars
	03	Two axle, 4 tyre single units (Pick-up)
Heavy	04	Busses
	05	Two axle, 6 tyre single units
	06	Three axle single units
	07	Four or more axle single units
	08	Four or less axle single trailers
	09	Five axle single trailers
	10	Six or more axle single trailers
	11	Five or less axle multi trailers
	12	Six axle multi trailers
	13	Seven or more axle multi trailers
	14	Definition not known
	15	Unclassified

5.11 Scheme 07 Vehicle Classes (Euro)

Group	Class	Vehicle
	00	Error Class (added to specifications)
Light	01	Car, mini bus or either with trailer
Heavy	02	2 axle truck
	03	3 axle truck
	04	4 axle truck
	05	2 axle truck with 1, 2, 3 axle trailer
	06	3 axle truck with 2, 3 axle trailer
	07	2+1 axle inter-link
	08	2+2 axle inter-link
	09	2+3 axle inter-link
	10	3+1 or 3+2 axle inter-link
	11	3+3 axle inter-link
	12	2 or 3 (joint) axle bus
	13	Other vehicles

5.12 Scheme 08 Vehicle Classes (South Africa)

Group	Toll	Class	Vehicle
		00	Unknown Vehicle
Light	Group 1	01	Motorcycle
		02	Light Motor Vehicles
		03	Light Motor Vehicles Towing
Heavy	Group 2	04	Two axle busses
		05	Two axle, 6 tyre single units
	Group 3	06	Busses with 3 or 4 axles
		07	Two axle 6 tyre single unit with light trailer (4 axles max)
		08	Three axle single unit including single axle light trailer
		09	Four or Less axle including a single trailer
	Group 4	10	Busses with 5 or more axles
		11	Three axle single unit and light trailer (more than 4 axles)
		12	Five axle single trailer
		13	Six axle single trailer
		14	Five or less axle multi-trailer
		15	Six axle multi-trailer
		16	Seven axle multi-trailer
		17	Eight or more axle multi-trailer

Where it is not possible to classify a vehicle, then the vehicle must be assigned to Class 00. However, if it is possible to differentiate between light and heavy vehicles, light vehicles must be assigned to Class 02 but heavy vehicles must still be assigned to Class 00. In this way, Class 00 will mostly contain heavy vehicles which could not further be classified.

5.13 Scheme 09 Vehicle Classes (South African Toll)

Group	Class	Vehicle
	00	Error Class (added to specifications)
Light	01	All light vehicles
Heavy	02	2 axle heavy vehicles
	03	3 or 4 axle heavy vehicles
	04	5 or more axle heavy vehicles

5.14 Scheme 10 Vehicle Classes (Hungarian)

Group	Class	Vehicle
	{ 00	Error Class -> Rerouted to Class 15 }
Light	01	(A1) Cars (all small vehicles with or without trailers)
	02	(A2) Small 2 axle truck {GVM<3.5T}
Heavy	03	(B1) Single Bus
	04	(B2) Jointed Bus
	05	(C1k) Medium 2 axle truck {GVM 3.5T–7.5T}
	06	(C1n) Big 2 axle truck {GVM>7.5}

	07	(C2) Single Truck (>2 axles)
	08	(D1) 2 Axle Truck + trailer
	09	(D2) >2 axle Truck + trailer
	10	(E1) Truck + semi-trailer 2+1 & 2+2
	11	(E2) Truck + semi-trailer 2+3
	12	(E3) Truck + semi-trailer 3+1 & 3+2
	13	(E4) Truck + semi-trailer 3+3
	14	(F) All other trucks
{Normally Heavy}	15	(?) Non-recognizable vehicles

5.15 Scheme 11 Vehicle Classes (Indian Loop Classification)

Group	**Class**	**Vehicle**
	0	Error Class
Light	1	Two wheeler
	2	LCV-1 Light Vehicle
	3	LCV-2 Long Light Vehicle
Heavy	4	Heavy-1 Short Heavy Vehicle
	5	Heavy-2 Medium Heavy Vehicle
	6	Heavy-3 Long Heavy Vehicle

5.16 Scheme 12 Vehicle Classes (Indian Axle Classification 1)

Group	Class	Vehicle
	0	Error Class
Light	1	Light
	2	LCV (Light Commercial Vehicle)
Heavy	3	Bus
	4	Truck
	5	MAV (Multi-Axle Vehicle)

5.17 Scheme 13 Vehicle Classes (Indian Axle Classification 2)

Group	**Class**	**Vehicle**
	0	Error Class
Light	1	Motorcycle
	2	3 Wheeler
	3	LMV
	4	LCV (Light Commercial Vehicle)
Heavy	5	Truck – 2 Axle
	6	Bus
	7	Truck – 3 or 4 axles
	8	MAV (Multi-Axle Vehicle)

5.18 Vehicle category parameters

Vehicle categories are defined as follows:

a) *Any vehicle*. Any vehicle which could not be categorised into one of the following light or heavy vehicle categories. Where it is possible to identify a vehicle as light or heavy, the vehicle must be categorised accordingly.

b) Light vehicle: Any vehicle that has not been fitted with tyres of a size (bead seat diameter) greater than 406.4 millimetres (16 inches) and which does not have a wheel fitted with two more tyres. Motorcycles and tricycles, however, are categorised as light irrespective of the tyre size and number of tyres. The light vehicle sub-categories are as follows:

   i) Any light vehicle. Any light vehicle which could not be categorised into one of the following light vehicle sub-categories.
   ii) Motorcycle. A motorcycle is a light vehicle which has two wheels, with or without a side-car.
   iii) Tricycle. A light vehicle which is similar to a motorcycle but which has three wheels. The controls are similar to those of a motorcycle.
   iv) Motor vehicle. A light vehicle that is predominantly used for conveyance of persons but which is not a minibus or a bus. Includes passenger cars, sport utility vehicles and bakkies.
   v) Minibus. A light vehicle that is used for public transport and which carry up to 16 persons (including the driver).
   vi) Light commercial vehicle. A light vehicle that is predominantly used for the conveyance of freight.

c) Heavy vehicle. A vehicle which is not a light vehicle. The heavy vehicle sub-categories are as follows:

   i) Any heavy vehicle. Any heavy vehicle which could not be categorised into one of the following heavy vehicle categories.
   ii) Midi-bus. A heavy vehicle that is predominantly used for public transport and which carry between 17 and 35 persons (including the driver).
   iii) Bus. A heavy vehicle that is predominantly used for public transport and which carry more than 35 persons (including the driver).
   iv) Rigid (Single-Unit) truck. A heavy vehicle in which the towing vehicle also carries freight. The vehicle may tow one or more trailers. Differentiation is made between the following rigid trucks:
      - Rigid 2-axle trucks. Trucks with 2 axles (excluding trailer axles)
      - Rigid 3-axle trucks. Trucks with 3 axles (excluding trailer axles)
      - Rigid 4+-axle trucks. Trucks with 4 or more axles (excl. trailers)
   v) Articulated truck. A heavy vehicle in which the tractor does not carry freight. The vehicle may tow one or more trailers. Differentiation is made between the following articulated trucks:
      - Articulated truck with 2-axle tractor
      - Articulated truck with 3-axle tractor
      - Articulated truck with 4+-axle tractor

The issuing committee may at any time add additional vehicle types. The first digit of the vehicle type indicates whether a vehicle has been identified as a “Light” or “Heavy”

vehicle, or could not be identified as either (“Any”). The second digit provides detail on the vehicle chassis and or purpose. If software reading the data file is unaware of a specified vehicle type (i.e. the 2nd digit) then it shall replace the 2nd digit with ZERO (0) and treat the information as appropriate to the first digit.

GroupCategory		**Vehicle**
	00	Any vehicle (Including unknown class)
Light	10	Any light vehicle
	11	Motorcycle or Tricycle
	12	Motor vehicles (cars, SUVs, bakkies, etc)
	13	Minibus (up to 16 persons)
	14	Light commercial vehicle
Heavy	20	Any heavy vehicle
	21	Midi-bus (17 to 35 persons)
	22	Bus (more than 35 persons)
	23	Rigid 2-axle truck (Single-Unit), excluding trailer axles
	24	Rigid 3-axle truck (Single-Unit), excluding trailer axles
	25	Rigid truck with 4 or more axles, excluding trailer axles
	26	Articulate truck with 2-axle tractor
	27	Articulate truck with 3-axle tractor
	28	Articulate truck with tractor with 4 or more axles

The user may further refine the above classification scheme by combining the classes with any of the recorded traffic data, such as vehicle length, number of axles and number of trailers. For example, by combining the above classes with the vehicle length measurement, it is possible to derive the Scheme 05 vehicle classes as follows:

Scheme 05 Class	**Vehicle Category**	**Vehicle length**
1 Light vehicles	Category 10	N/A
2 Short heavy vehicle	Category 20	Length ≤ 10.8 m
3 Medium heavy vehicle	Category 20	10.8 < Length ≤ 16.8 m
4 Long heavy vehicle	Category 20	Length > 16.8 m

6 DATA RECORDS

6.1 Introduction

A traffic data file consists of “sub-files”, each of which is subdivided into a Header data block and a Traffic data block. These data blocks, in turn, are further subdivided into data records. Each data record is identified by means of a Data Type provided as the first two characters in a record.

An overview of the available data types is provided in this chapter. More details with regard to the structure of each data record are provided in subsequent chapters of this document.

6.2 Comment data type

Comment records may be provided at any location in a data file and may thus form part of both the Header and Traffic data blocks (more information is given in Chapter 7):

Code	Description
C0	General Comment Record (Optional)

6.3 Header data types

Provision is made for the following header data types (more information is given in Chapter 8):

Code	Description
H0	Header - Start of Header and Version Identifier
H9	Header - End of Header
S0	Header - Site Identification Record
S1	Header - Site Description Record
D0	Header - Data Conventions Record (Optional)
D1	Header - Data Time Record
L0	Header - Lane Configuration Record
L1	Header - Lane Configuration Record
1x	Header – Individual Vehicle data
10	Header – Vehicle Data Description Record
2x	Header – Speed Related Summaries
20	Header – Speed Summary Description Record
21	Header – Speed Summary Description Record
22	Header – Speed Summary Description Record

3x	Header – Class Related Summaries
30	Header – Class Summary Description Record
31	Header – Secondary Class Summary Description Record
4x	Header – Mass Related Summaries (Discontinued)
5x	Header – Time Related Summaries (Discontinued)
6x	Header – Vehicle Length Related Summaries (Discontinued)
61	Header – Length Summary (Discontinued)
7x	Header – Special Summaries
70	Header – Traffic Flow Data

6.4 Traffic data types

The following general approach is followed in the definition of traffic data types (more information is given in Chapters 9 and 11):

Code	Usage
1X	Individual Vehicles
2X	Vehicle Speed Distribution Summaries
3X	Vehicle Classification Distribution Summaries
4X	Vehicle Mass Distribution Summaries (Discontinued)
5X	Time Related Summaries (Discontinued)
6X	Vehicle Length Related Summaries (Discontinued)
7X	Special Summaries

Provision is made for the following traffic data types

Code	Description
1x	Individual Vehicle Data Records
10	Individual Vehicle Data Record
2x	Speed Related Summary Records
20	Vehicle Speed Summary Record
21	Vehicle Speed Summary Record (CTO Program 20)
22	Vehicle Speed Summary Record (CTO Program 23)
3x	Vehicle Class Related Summary Records
30	Vehicle Class Summary Record
31	Secondary Vehicle Class Summary Record
4x	Vehicle Mass Related Summaries (Discontinued)
5x	Time Related Summaries (Discontinued)
6x	Vehicle Length Related Summaries (Discontinued)
61	Vehicle Length Summary (Discontinued)

7x	Special Summaries
70	Traffic Flow Summary

6.5 Additional data types

The additional data records may be provided at any location in the traffic data block (but not in the header data block). These records are used to provide additional data related to the traffic data.

The following data record types are used:

Code	Description
QF	Sensor failure record
QC	Weight calibration record
QW	Weight sensor change record
QD	Day classification record

7 COMMENT DATA RECORDS

7.1 Introduction

Comment data records can be provided anywhere in the traffic data file and can thus form part of header and Traffic data blocks. The comment data type is descripted in this chapter.

7.2 Comment data type C0 – Comment

The Type C0 Comment data record is optional and may appear anywhere in the header or Traffic data blocks. These comments can be used for any purpose, such as providing reasons why data has been edited during a data verification phase.

Item No	Description
1	C0 Data Type Code
2	Data source code
3	Comment

Comment: *Text Type*

The comment is provided as a Text Type.

Data Source Code: Code *Type*

Indicate the source of the comment (See Data Source Code).

Example

Assume that during the data verification phase, it was found that dates were wrongly recorded and that the dates must be shifted by one day. Amended data may be provided, but a comment can be provided to explain the need for the shift.

```
C0,1,"Following dates must be shifted by one day."
```

8 Header data records

8.1 Introduction

Details on the records (identified by Data types) that may form part of a Header data block are provided in this chapter. Some of these records are compulsory and must be provided (even in cases where the data has previously been provided as part of another Header data block).

8.2 Header Type H0 - Start of header

The Type H0 Start of header (version identification) record indicates the start of a Header data block. If any other header records appear before this record then these should be considered as an error. The record also specifies the version of the data collection format, as well as a version downward compatibility code.

Item No	Description
1	H0 - Start of Header
2	Data source code
3	Data Format Version (300)
4	Data Compatibility (3)
5	Description

Data Source Code: Code *Type*

Indicate the source of this and all other header records in the header data block (See Data Source Code). In situations where more than one source of data are provided, the header records must follow each other without intermediate data. The header records with the highest source code must be given first.

Data Format Version: *Integer Type*

The data format version is a 3-digit number that indicates the version of the Vehicle Data Collection Format used (300 for Version 3.00). The version numbers may increase as new data formats are added to the format. Software written for older versions may still be able to read files with newer versions although it may not be able to translate all the data.

Data Compatibility: *Integer Type*

If the format of an existing record is changed (which in principle should not happen, but in practice does) then the Data Compatibility is changed. Software reading a data file must check that it can read/translate data for the specified compatibility code. If not then the software should abort.

Description (Optional): *Text Type*

An optional description of the data format version.

Example

```
H0,300,3,RSA Standard Data Format Version 3.00
```

8.3 Header Type S0 - Site identification record

The Type S0 Site identification header record is compulsory and must be provided. The record provides information on the site (counting station).

Item No	Description
1	S0 - Site Identification
2	Site Identifier
3	Site Number
4	Site Name
5	GPS Coordinate (Latitude)
6	GPS Coordinate (Longitude)

Site Identifier: *String Type* [8]

The site identification may be non-case sensitive alpha-numerical field up to 8 characters long. The Site Identification is a number issued by SANRAL and must be included in the record.

Site Number (Optional): *String Type* [12]

The site number may be a 12 character non-case sensitive alpha-numerical field. This field is made available for users that wish to use their own numbering system.

Site Name (Optional): *String Type* [20]

The site name as a string type with a maximum length of 20 characters.

GPS Coordinate (Latitude): *GPS Coordinate Type*

This field gives the latitude at which the station is located. This normally is measure at the position of the 1st lane. The field is compulsory.

GPS Coordinate (Longitude): *GPS Coordinate Type*

This field gives the longitude at which the station is located. This normally is measure at the position of the 1st lane. The field is compulsory.

Examples

```
S0,DOT011,011,Halfway House,-25.965471,28.131001
S0,DOT011,,,-25.965471,28.131001
```

8.4 Header Type I0 - Instrumentation description record

The Type I0 Instrument description header record is compulsory and must be provided. The record provides information on the type of logger used. All loggers should be registered with SANRAL who will issue a five digit code that will be assigned to a given logger.

Note that the characters I0 consists of the letter I followed by a zero (0).

Item No	Description
1	I0 – Instrumentation Record
2	Logger Instrument Code
3	Description

Instrument Code: *Code Type*

SANRAL assigned instrument code

Description (Optional): *Text Type*

An optional description of the equipment

Example

```
I0,00010,Mikros Systems RAKTEL 8000 Family
```

8.5 Header Type D0 - Data conventions record

The Type D0 Data conventions header record is optional. The record specifies the units and road drive convention used in the data. If this record is not present then by default the units are metric and left-side drive i.e. vehicles keep to the left and overtake on the right.

Item No	Description
1	D0 – Data conventions
2	Measurement Unit System
3	Road Drive Convention

Where

Measurement Unit System: *Code Type*

The Measurement Unit System Code defines the measurement units used in the data file.

Drive Convention: *Code Type*

The Drive Convention Code specifies the road driving convention.

Example

```
D0,M,L
```

8.6 Header Type D1 - Data date and time record

The Type D1 Data date and time header record is compulsory and must be provided. The record gives the actual start and end dates and times of the data in the file. It also gives the date and time at which the current continuous data set was started.

Item No	Description
1	D1 - Data date and time
2	Starting Date
3	Starting Time

4	End Date
5	End Time
6	Setup Date
7	Setup Time

Starting Date: *Date Type* (Start Time Clock Convention)

Starting Time: *Time Type* (Start Time Clock Convention)

This is the starting date and time of the data to follow (see notes below).

End Date: *Date Type* (End Time Clock Convention)

End Time: *Time Type* (End Time Clock Convention)

This is the end date and time of the data to follow (see notes below).

Setup Date: *Date Type* (Start Time Clock Convention)

Setup Time: *Time Type* (Start Time Clock Convention)

The date and time at which the logger was setup, i.e. the date at which the logger last started logging a continuous data set at this site.

Example

```
D1,020920,0920317,020921,140300,020712,103205
```

Notes:

A particular data set may start at any time say at 09:20:31.7 on the 20th September 2002. If the data set is part of a continuous set started previously at 10:32:05 on the 12th July 2002 (as specified by the Setup date and time) then one can assume that the first summary (if recorded every 15 minutes say) must have started at 09:15:00 i.e. the first summary must have a full 15 minutes of data.

Where a logger does not record the initial setup time i.e. the start time of the first continuous record, then the setup time must be encoded in such a way that the current data set reflects a full set. In our example, the setup time will thus have to be coded as 2002/09/20 at 09:15:00.

The End Date and Time states that the logger was still operational until that time. It does not necessarily mean that any data may be found for this time.

8.7 Header Type L0 - Lane definition record

The Type L0 Lane definition header record is compulsory and must be provided. The record specifies the number of lanes on the road.

Item No	Description
1	L0 - Lane definition
2	Number of assigned lanes
3	Number of physical lanes
4	Number of Traffic Streams (directions)

Number of Assigned Lanes: *Integer Type*

This field specifies the total number of lanes (both physical and virtual).

Number of Physical Lanes: *Integer Type*

This field specifies the total number of physical lanes on the road.

Number of Traffic Streams: *Integer Type*

This data field specifies the number of Traffic Streams for which traffic is being monitored. If the number of streams is unknown, the data field should be left empty. This field is new to Version 3.00.

Example

```
L0,4,2,2
```

8.8 Header Type L1 - Lane configuration record

The Type L1 Lane configuration header records are required and must be provided. The record defines each lane on a lane by lane basis. *There must be a L1 record for each physical and virtual lane*.

Item No	Description
All Lanes	
1	L1 - Lane configuration
2	Lane Number
3	Direction Code (Forward)
4	Lane Type Code
5	Traffic Stream Number
Physical Lanes	
6	Traffic Stream Lane Position
7	Reverse Direction Lane Number
8	Vehicle Code
9	Time Code
10	Length Code
11	Speed Code
12	Occupancy Time Code
13	Vehicle following code
14	Trailer code
15	Axle Code
16	Mass Code
17	Tyre Type Code

Data items for all lanes

The following 4 fields are applicable to all lanes.

Lane Number: *Integer Type*

See the definition of a Lane/Lane Number.

Direction Code: *Code Type*

The Direction Code field specifies the forward direction of travel for the lane (See Direction Code).

Lane Type Code: *Code Type*

The lane type code states whether a lane is a physical lane or a virtual lane.

Code	Description
P	Physical Lane
V	Virtual Lane

Traffic Stream Number: *Integer Type*

The number of the Traffic Stream in which the lane is located. This field may be left empty when converting older versions of data to Version 3.

Data items for physical lanes

The following fields are applicable only to the physical lanes and are not required for virtual lanes.

Traffic Stream Lane Position: *Integer Type*

This field gives the position of the lane in the specified Traffic Stream (See Traffic Stream Lane Position previously defined). This field may be left empty when converting older versions of data to Version 3.

Reverse Direction Lane Number: *Integer Type*

This field specifies under which lane a vehicle that is travelling in the opposite direction to the normal traffic flow is saved. This may be either a physical or virtual lane. A value of zero (0) may also be used, indicating that reverse travelling vehicles are not recorded i.e. such vehicles are ignored.

Vehicle Code: *Code Type*

This field specifies the following:

Code	Description
0	If individual vehicles are recorded then these are suppressed for the particular lane.
1	If individual vehicles are recorded then ALL vehicles will be recorded for the particular lane.
2	If individual vehicles are recorded then ALL heavy vehicles will be recorded for the particular lane where a heavy is defined to be a heavy according to the primary classification scheme. (This option is provided for backward compatibility only.)
3	Some vehicles may have been recorded for this lane.
4	If individual vehicles are recorded then ALL heavy vehicles will be recorded for the particular lane where a heavy is defined to be a heavy according to either the primary classification scheme and/or the secondary classification scheme.

Time Code: *Code Type*

Provision has been made for vehicle arrival/Departure Times to an accuracy of 1000th of a second. If a logger is not capable of this accuracy the accuracy must be specified (new definition in RSA 3).

Code	Description
0	100th of a second
1	10th of a second
2	second
3	minute
4	hour
5	1000th of a second

Length Code: *Code Type*

This field specifies the following (new definition in RSA 3)

Code	Description
0	No vehicle length is recorded.
1	Length recorded

Speed Code: *Code Type*

This field specifies the following (new definition in RSA 3)

Code	Description
0	No speed recorded
1	Speed recorded

Occupancy Time Code: *Code Type*

This field specifies the following (new definition in RSA 3)

Code	Description
0	No occupancy time recorded
1	Occupancy Time (Loop) recorded

Vehicle following code: *Code Type*

This field specified the following (new definition in RSA 3)

Code	Description
0	No vehicle following recorded
1	Vehicle following recorded

Trailer Code: *Code Type*

This field specifies the following (new definition in RSA 3)

Code	Description
0	Number of trailers not recorded
1	Number of trailers recorded

Axle Sensor/Spacing Code: *Code Type*

This field specifies the following (new definition in RSA 3)

Code	Description
0	No axle sensors (or no axle spacing data)

1	Axle spacings recorded (by means of axle sensors)
2	Axle count only recorded (no spacings)

Mass Code: *Code Type*

This field specifies the following (new definition in RSA 3)

Code	Description
0	No mass data recorded
1	Mass recorded
2	Mass & Off-scale data recorded

Tyre Type Code: *Code Type*

This field specifies the following (new definition in Version 3)

Code	Description
0	No tyre type recorded
1	Tyre type (Single/Dual) recorded

8.9 Header Type 10 – Individual vehicle data description record

The Type 10 Individual vehicle data description header record must be provided when individual vehicle data is required. The record describes the type of data collected for individual vehicles and provided in Type 10 Traffic data records.

Item No	Description
1	10 – Individual vehicle data description
2	Vehicle Classification Scheme (Primary)
3	Vehicle Classification Scheme (Secondary)
4	Maximum Gap (Follower Vehicle)
5	Maximum Differential Speed (Follower Vehicle)

Vehicle Classification Scheme I & II: *Code Type*

These classification schemes specify which Vehicle Classification Schemes are used to classify vehicles. If no second classification scheme is available or the feature is not supported, then the scheme code must be zero (0).

Maximum Gap Time: *Duration Type*

This field specifies the Back-To-Front Gap Time (in milliseconds) used to classify a vehicle as a follower (See Vehicle Following Property). If the Vehicle Following feature is not supported then the field must be left empty. The gap time must be given in milliseconds.

Maximum Differential Speed: *Real Type*

This field specifies the maximum differential speed that two vehicles may have to still be classified as a follower (See Following Vehicle Property). If the Vehicle Following feature is not supported then there must be no value i.e. the field must be empty. The differential speed must be given in units of km/h or mph.

Example

Assuming individual vehicles were logged using the RSA Vehicle Classification as primary scheme and the RSA Light/Heavy dual loop Vehicle Classification Scheme as a secondary scheme.

```
10,08,01,3000,20
10,8,1,3000,20
```

8.10 Header Type 20 – Speed summary description record

The Type 20 Speed summary description header record must be provided when Type 20 speed summary data is required. These summary records allows for speed summaries for all vehicles and does not differentiate between different vehicle classes regarding their speed except for the summary data fields Total Heavy Vehicles and Sum of Speeds of Heavy vehicles.

Item No	Description
1	20 – Speed summary description
2	Summary Interval in minutes
3	Classification Scheme
4	Speed Bin Code
5	Number of Speed Bins (n)
6	Speed Bin Boundary 1
7	Speed Bin Boundary 2
8	Speed Bin Boundary 3
.	
n+4	Speed Bin Boundary n-1

Summary Interval: ***Time Interval Type***

This specifies the summary interval found in the data in minutes. Summary Intervals must be whole number factors of 60. That is 1,2,3,4,5,6,10,12,15,20,30 and 60 minute intervals are allowed. In previous versions, this interval would usually have been entered as the “smallest summary interval”.

Speed Bin Code: ***Code Type***

Code	Description
0	Vehicles for which no speed could be determined are logged in Bin 1 (This option is provided for backward compatibility only)
1	Vehicles for which no speed could be determined are logged in Bin 0 (applicable to Version 3)
2	Vehicles for which no speed could be determined are NOT logged (This option is provided for compatibility reasons only)

In Version 2 all data was recorded using option 0. From Version 3, all data must be logged using Option 1.

Classification Scheme: *Code Type*

The format records the total number of heavy vehicles and also the sum of speeds of heavy vehicles. The Light/Heavy vehicle discrimination is done according to the specified classification scheme.

Number of Speed Bins: *Integer Type*

This field specifies the number of speed bins (n). There will accordingly be one less speed bin boundary than the number of speed bins. The number of bins may range from 1 to 20 and does NOT include bin 0 (zero) which is reserved for vehicles for which no speed could be determined.

Speed Bin Boundaries: *Real Type*

The speed bins are defined by these boundaries given in km/h or mph. The first speed bin is defined for vehicles with speeds less than or equal to the first boundary (inclusive), the second bin for vehicles with speeds larger than the first boundary but less than and equal to the second bin boundary and so on. The n^{th} bin is for vehicles whose speed exceed the $(n-1)^{th}$ boundary.

Example

```
20,60,09,0,10,60,70,80,90,100,110,120,130,140
```

8.11 Header Type 21 – Program 2.0 speed summary description record

The Type 21 Speed Summary description header record must be provided when Type 21 speed summary data is required. These records also allows for speed summaries for all vehicles but provide additional information on vehicle counts (refer to the Type 21 traffic data records for more detail).

This specialised data format is based on the CTO Program 2.0 Raw File Data Format. The light/heavy classification of a vehicle is always according to the RSA Light/Heavy or the extended South African Light/Heavy classification.

Item No	Description
1	21 – Program 2.0 speed summary description
2	Summary Interval in minutes
3	Speed Bin Code
4	Programmable Rear-to-Rear Headway Bin
5	Speed Bin Boundary 1
6	Speed Bin Boundary 2
7	Speed Bin Boundary 3
8	Speed Bin Boundary 4
9	Speed Bin Boundary 5
10	Speed Bin Boundary 6
11	Speed Bin Boundary 7
12	Speed Bin Boundary 8
13	Speed Bin Boundary 9

Summary Interval: ***Time Interval Type***

This specifies the summary interval found in the data in minutes. Summary Intervals must be whole number factors of 60. That is 1,2,3,4,5,6,10,12,15,20,30 and 60 minute intervals are allowed. In previous versions, this interval would usually have been entered as the "smallest summary interval".

Speed Bin Code: ***Code Type***

Code	Description
0	Vehicles for which no speed could be determined are logged in Bin 1 (This option is provided for backward compatibility only)
1	Vehicles for which no speed could be determined are logged in Bin 0 (applicable to Version 3).
2	Vehicles for which no speed could be determined are NOT logged (This option is provided for compatibility reasons only)

In Version 2 all data was recorded using option 0. From Version 3, all data must be logged using Option 1.

Programmable Rear-to-Rear Headway Bin: ***Duration Type***

This field gives the upper bin boundary of the programmable headway bin in milliseconds. That is, all vehicles with a headway less than this boundary must be counted. If the field has no value i.e. is empty or it has a value of zero (0), then no vehicles are counted. The default value used to date is 3 seconds (i.e. 3000 milliseconds).

Speed Bin Boundaries: ***Real Type***

Ten (10) speed bins are defined by these boundaries given in km/h or mph. The first speed bin is defined for vehicles with speeds less than or equal to the first boundary (inclusive), the second bin for vehicles with speeds larger than the first boundary but less than and equal to the second bin boundary and so on. The tenth bin is for vehicles whose speed exceeds the 9th boundary.

Example

```
21,60,0,3500,60,70,80,90,100,110,120,130,140
```

8.12 Header Type 22 – Program 2.3 speed summary description record

The Type 22 speed summary description header record must be provided when Type 22 speed summary data is required. These summary records differentiate between light and heavy vehicles and provides speed summaries for the two vehicle types (refer to the Type 22 traffic data records for more detail).

This specialised data format is based on the CTO Program 2.3 Raw File Data Format. The light/heavy classification of a vehicle is always according to the RSA Light/Heavy or the extended South African Light/Heavy classification.

Item No	Description
1	22 – Program 2.3 speed summary description
2	Summary Interval in minutes

3	Speed Bin Code
4	Speed Bin Boundary 1
5	Speed Bin Boundary 2
6	Speed Bin Boundary 3
7	Speed Bin Boundary 4
8	Speed Bin Boundary 5
9	Speed Bin Boundary 6
10	Speed Bin Boundary 7
11	Speed Bin Boundary 8
12	Speed Bin Boundary 9

Summary Interval: *Time Interval Type*

This field specifies the summary interval found in the data in minutes. Summary Intervals must be whole number factors of 60. That is 1,2,3,4,5,6,10,12,15,20,30 and 60 minute intervals are allowed. In previous versions, this interval would usually have been entered as the "smallest summary interval".

Speed Bin Code: *Code Type*

Code	Description
0	Vehicles for which no speed could be determined are logged in Bin 1 (This option is provided for backward compatibility only)
1	Vehicles for which no speed could be determined are logged in Bin 0 (applicable to Version 3).
2	Vehicles for which no speed could be determined are NOT logged (This option is provided for compatibility reasons only)

In Version 2 all data was recorded using option 0. From Version 3, all data must be logged using Option 1.

Speed Bin Boundaries: *Real Type*

Ten (10) speed bins are defined by these boundaries given in km/h. The first speed bin is defined for vehicles with speeds less than or equal to the first boundary (inclusive), the second bin for vehicles with speeds larger than the first boundary but less than and equal to the second bin boundary and so on. The tenth bin is for vehicles whose speed exceeds the 9th boundary.

Example

```
22,60,0,60,70,80,90,100,110,120,130,140
```

8.13 Header Type 30 – Classification summary description record

This Type 30 Classification summary description header record must be provided when Type 30 vehicle classification summary data is required. These summary records consist of vehicle counts per lane for a given time interval grouped into vehicle classes according to the specified scheme, normally the primary classification scheme (refer to Type 30 traffic data records for more detail).

Item No	Description
1	30 – Classification summary description
2	Summary Interval in minutes
3	Vehicle Classification Scheme

Summary Interval: *Time Interval Type*

This field specifies the summary interval found in the data in minutes. Summary Intervals must be whole number factors of 60. That is 1,2,3,4,5,6,10,12,15,20,30 and 60 minute intervals are allowed. In previous versions, this interval would usually have been entered as the “smallest summary interval”.

Vehicle Classification Scheme: *Code Type*

This field specifies which Vehicle Classification Scheme is used to classify the vehicles. Refer to Classification Schemes elsewhere in this document.

Example

```
30,60,8
```

8.14 Header Type 31 – Secondary class summary description record

The Type 31 Secondary class summary description header record must be provided when Type 31 vehicle classification summary data is required. These summary records consists of vehicle counts per lane for a given time interval grouped into vehicle classes according to the scheme specified, normally the secondary classification scheme (refer to the Type 31 traffic data records for more detail).

This summary is identical to Type 30 and is used for back-up purposes in cases where more sophisticated classifications (Type 30) have failed due to sensor failures.

Item No	Description
1	31 – Secondary class summary description
2	Summary Interval in minutes
3	Secondary Vehicle Classification Scheme

Summary Interval: *Time Interval Type*

This field specifies the summary interval found in the data in minutes. Summary Intervals must be whole number factors of 60. That is 1,2,3,4,5,6,10,12,15,20,30 and 60 minute intervals are allowed. In previous versions, this interval would usually have been entered as the “smallest summary interval”.

Vehicle Classification Scheme: *Code Type*

This field specifies which secondary Vehicle Classification Scheme is used to classify the vehicles. Refer to Classification Schemes elsewhere in this document.

Example

```
31,60,02
```

8.15 Header Type 60 – Length summary description record

The Type 60 Length summary description header record must be provided when Type 60 vehicle length summary data is required. These summary records consists of vehicle counts per lane for a given time interval falling into a particular vehicle length group (refer to the Type 60 traffic data records for more detail.

This Type 60 record is provided for backward compatibility only. It is no longer required in Version 3.

Item No	Description
1	60 – Length summary description
2	Summary Interval in minutes
3	Length Bin Code
4	Number of Length Bins (n)
5	LENGTH Bin Boundary 1
6	LENGTH Bin Boundary 2
7	LENGTH Bin Boundary 3
.	
n+3	LENGTH Bin Boundary n-1

Summary Interval: ***Time Interval Type***

This specifies the summary interval found in the data in minutes. Summary Intervals must be whole number factors of 60. That is 1,2,3,4,5,6,10,12,15,20,30 and 60 minute intervals are allowed. In previous versions, this interval would usually have been entered as the "smallest summary interval".

Length Bin Code: ***Code Type***

Code	Description
0	Vehicles for which no length could be determined are logged in Bin 1 (This option is provided for backward compatibility only)
1	Vehicles for which no length could be determined are logged in Bin 0
2	Vehicles for which no length could be determined are NOT logged (This option is provided for compatibility reasons only)

Number of Length Bins: ***Integer Type***

This field specifies the number of Length bins (n) excluding the bin 0 for vehicles with no length. There will accordingly be one less Length bin boundaries. The number of bins may range from 1 to 20.

Length Bin Boundaries: ***Real Type***

The Length bins are defined by these boundaries given in cm (or inch). The first Length bin is defined for a vehicles with a Length less than or equal to the first boundary (inclusive), the second bin for vehicles with a Length larger than the first boundary but less than and equal to the second bin boundary and so on. The n^{th} bin is for vehicles whose Length exceeds the $(n-1)^{th}$ boundary.

Example

```
60,60,0,10,200,400,600,800,1000,1200,1500,2000,2500
```

8.16 Header Type 70 – Traffic flow summary description record

The Type 70 Traffic flow summary description header record must be provided when Type 70 traffic flow summary data is required. These summary records provide vehicle counts per lane for a given time interval grouped into light and heavy vehicle classes. It also differentiates between following and non-following vehicles. It also provides information which can be used for deriving averages and standard deviations of speeds.

Item No	Description
1	70 – Traffic flow summary description
2	Summary Interval in minutes
3	Vehicle Classification Scheme
4	Maximum Gap (Follow Vehicle)
5	Maximum Differential Speed (Follow Vehicle)

Summary Interval: *Time Interval Type*

This specifies the summary interval found in the data in minutes. Summary Intervals must be whole number factors of 60. That is 1,2,3,4,5,6,10,12,15,20,30 and 60 minute intervals are allowed. In previous versions, this interval would usually have been entered as the “smallest summary interval”.

Vehicle Classification Scheme: *Code Type*

This field specifies which Vehicle Classification Scheme is used to classify the vehicles into Light and Heavy Vehicle classes. Refer to Classification Schemes elsewhere in this document.

Maximum Gap Time: *Duration Type*

This field specifies the vehicle gap in milliseconds. It is the Back-To-Front gap time used to classify a vehicle as a follower (See Following Vehicle Property).

Maximum Differential Speed: *Real Type*

This field specifies the maximum differential speed in km/h or mph that two vehicles may have to still be classified as a follower (See Following Vehicle Property).

Example

```
70,60,8,3000,20
```

8.17 Header Type H9 - End of header record

The Type H9 End of Header Record indicates the end of a Header data block. If any other header records appear after this record and before the next Start of Header H0 record, then these must be reported as an error.

Item No.	Description
1	H9 – End of header
2	Comment (Optional)

Comment: ***Text Type***

Optional comment.

Example

```
H9
H9,End of Header
```

9 INDIVIDUAL VEHICLE TRAFFIC DATA RECORDS

9.1 Introduction

Details on the data records (identified by Data types) that may form part of a Traffic data block are provided in this and the following chapters. In this chapter, details are provided on individual vehicle traffic data records while details on other types of traffic data records are provided in the other chapters. All of these traffic data records are optional and are only provided when measurements are actually undertaken.

9.2 Traffic Data Type 10 – Individual vehicle data record

The Type 10 Individual vehicle data record contains data on an individual vehicle logged on a particular lane. The data for each vehicle is provided on a single data record and the record therefore supports sub-data types.

Each record starts with certain basic vehicle parameters and additional vehicle parameters such as axle spacing, axle mass etc. are then added using sub-data types to identify the data types. The basic record structure is as follows:

Type	Description
10	Basic Vehicle Data
Vx	Vehicle identification data and images
Sx	Axle Spacing
Ax	Axle Mass
Wx	Wheel Mass
Gx	Axle Group Mass
Tx	Single/dual tyre
Cx	Axle group configuration

The different data types are defined below. Note that, except for the basic vehicle data, the sub-data types may occur in any sequence in the record. The sub-data types are also optional and it is not necessary to include all types in the record.

9.3 Individual Vehicle Data Type 10 – Basic vehicle data

The Type 10 Individual vehicle data record starts with the basic vehicle parameters as listed below. The first item consists of the type code which is then followed by a number (Z) which gives the number of basic vehicle parameters that are provided by the record. The basic vehicle parameters are as follows:

Item No	Z	Description
1		10 - Traffic Data Type Code
2		Number of fields associated with the basic vehicle data (Z)
3	1	Data source code

4	2	Edit Code
5	3	Departure Date
6	4	Departure Time
7	5	Assigned Lane Number (physical or virtual)
8	6	Physical Lane Number
9	7	Forward/Reverse Code
10	8	Vehicle Category
11	9	Vehicle Class Code - Primary Scheme
12	10	Vehicle Class Code - Secondary Scheme
13	11	Vehicle Speed
14	12	Vehicle Length
15	13	Site Occupancy Time
16	14	Chassis Height Code
17	15	Vehicle Following Code
18	16	Vehicle Tag Code
19	17	Trailer count (Number of trailers)
20	18	Axle Count (Number of Axles)
21	19	Bumper-to-1st Axle spacing
22	20	Tyre Type (Single/Dual)

Further basic vehicle parameters may be added in future. If this is done, then these will follow the “vehicle registration number” field and the Z number will increase. For example, if all above fields are included then the Z value would be 20.

Data Source Code: Code *Type*

Indicate the source of data record (See Data Source Code). In situations where more than one source of data are provided, the records must follow each other without intermediate data. The records with the highest code must be given first.

Edit Code: *Code Type*

The Edit Code is a numeric character used to describe whether the data that follows has been edited or has been marked as being invalid (See Edit Code). This item provides for backward compatibility with previous versions of this software and may not be used in future.

Departure Date: *Date Type* (Start Time Clock Convention)

This specifies the date on which the vehicle left the site.

Departure Time: *Time Type* (Start Time Clock Convention)

The Departure Time is the time at which the vehicle left the site.

Assigned Lane Number: *Integer Type*

The lane number, as referred to in the lane configuration record L1, is the lane number to which the vehicle was assigned and is either a physical or virtual lane.

Physical Lane Number: *Integer Type*

The physical lane number, as referred to in the lane configuration record L1, is the lane on which the vehicle was detected.

Forward/Reverse Code: *Code Type*

The Forward / Reverse Code indicates whether a vehicle was travelling in the forward or reverse direction to the normal traffic flow on the physical lane (See Forward / Reverse Code).

Vehicle Category Code: *Code Type*

This field defines the vehicle category (See Vehicle Category Codes).

Vehicle Class Code - Primary Scheme: *Code Type*

This field defines the primary vehicle classification scheme.

Vehicle Class Code - Secondary Scheme: *Code Type*

This field defines the secondary vehicle classifications scheme. If no secondary scheme is used, then this field must be left empty. Note that the classification into light and heavy vehicles does NOT necessarily correspond between the primary and secondary schemes. Thus vehicles may be classified as heavy in one scheme and light in the other.

Vehicle Speed: *Real Type*

The speed of the vehicle. If the speed is not known or could not be measured then the field is left empty.

Vehicle Length: *Real Type*

The length of the vehicle. If the length is not known or could not be measured then the field is left empty.

Site Occupancy Time: *Duration Type*

The time that the site/loop was occupied in milliseconds. If the occupancy time is not known or could not be measured then the field is left empty.

Chassis Height Code: *Code Type*

When using loops to detect vehicles, some loggers have the ability to determine the “height” of the vehicle chassis from the magnetic field strength (See Chassis Height Code).

Vehicle Following Code: *Code Type*

This code indicates whether a vehicle is a following vehicle or not (See Vehicle Following Code).

Vehicle Tag Code: *Code Type*

Some traffic loggers have the facility to dynamically tag or mark a vehicle in the data. This is an ability that can be used to mark special calibration vehicles in the data (See Vehicle Tag Code).

Trailer Count (Number of Trailers): *Integer Type*

This field specifies the number of trailers counted. If no trailers are recorded, then this field is zero. If the logger does not have the capability to detect the number of trailers, the field is empty to indicate that there is no trailer count available.

Axle Count (Number of Axles): *Integer Type*

This field specifies the number of axles counted. If no axles are recorded, then this field is zero. If the logger has no axle or wheel sensor on the lane, the field is empty to indicate that there is no axle count available. The axle count from individual sensors may differ from the axle count given here (there may be fewer or more axles). The axle count here represents the axle count used by the logger to determine the vehicle classification etc.

Bumper-to-1st Axle Spacing: *Real Type*

This field is the spacing from the bumper to the 1st axle of the vehicle. If the value is not known or could not be measured then the field is left empty.

Tyre Type (Single/Dual): *Code Type*

This specifies whether a single or dual tyre was detected by any of the single/dual tyre detectors, if present.

Code	Description
Empty or 0	No Single/Dual Tyre sensors present
1	Sensor present but result unknown (e.g. sensors not triggered)
2	Only single tyres detected
3	One or more dual tyres detected

9.4 Individual Vehicle Sub-Data Type Vx – Vehicle identification data

The Sub-Data types Vx and vx are used for the provision of any data that is used for the identification of the particular vehicle.

In the current specification only V0 is defined, as follows

Item No+	Description
1	Sub-data type code V0
2	Vehicle registration number
3	Number of images n
4	Image name 1
5	Image name 2
.	
.	
n+3	Image name n

Vehicle registration number*: String type*

This field, if present, specifies the vehicle registration number of the vehicle (front of vehicle).

Number of images: *Integer type*

This field, if present, specifies the number of images of the vehicle if provided.

Image names (with types)*: String type*

This field, if present, specifies the names of images of the vehicle if provided. One or more images may be provided.

9.5 Individual Vehicle Sub-Data Type Sx – Axle Spacing (Axle sensors)

Axle spacings can originate from axle sensors or WIM sensors. WIM sensors often have a minimum weight detection threshold that is higher than that of light axles and they may thus miss an axle. This document provides for both types of measurements.

The Sub-Data types Sx and sx are used for axle spacing data.

Item No+	Description
1	Sub-Data Type code - Axle Spacing
2	Number of axles spacings (n)
3	Axle Spacing 1
4	Axle Spacing 2
.	
.	
n+2	Axle Spacing n

Sub-Data Type code: ***Data Type***

One of the following Sub-Data Type codes must be used:

Type	Description
S0	Axle Spacing – Average/Default (Origin unknown)
SA	Axle Spacing – Average/Default from Axle Sensor(s)
S1	Axle Spacing – Axle Sensor 1 in the particular lane
S2	Axle Spacing – Axle Sensor 2 in the particular lane
S3	Axle Spacing – Axle Sensor 3 in the particular lane
S4	Axle Spacing – Axle Sensor 4 in the particular lane
sA	Axle Spacing – Average/Default from WIM Sensor(s)
s1	Axle Spacing – WIM Sensor 1 in the particular lane
s2	Axle Spacing – WIM Sensor 2 in the particular lane
s3	Axle Spacing – WIM Sensor 3 in the particular lane
s4	Axle Spacing – WIM Sensor 4 in the particular lane
SS	Actual Axle Spacing as measured with a tape measure.

The sx spacing code is reserved exclusively for WIM sensors, while the Sx spacing code may originate from any sensor, including WIM sensors and Single/Dual tyre sensors. The specification makes provision for a maximum of 4 axle sensors (including Single/Dual Tire sensors) and 4 WIM sensors. For multiple WIM sensors the convention applicable to the numbering is the same as used for the WIM data.

Number of axle spacings (n): ***Integer Type***

This field specifies the number of axles spacings counted. If no axle spacings are recorded, then either the sub-data type should not be provided or a zero value can be provided. If the logger has no axle spacing sensors, the sub-data type must not be provided.

Axle spacing (n): *Real Type*

These fields provide the spacing between individual axles, expressed in cm (or inch). Note that axle spacing is a *Real Type*.

9.6 Individual Vehicle Sub-Data Type Wx – Wheel Mass

The Wx Wheel Mass Sub-Data Type is used when a WIM measures either the left or right wheel track only i.e. the sensor extends only half-way across the lane.

Important note: The mass recorded must be double the actual mass weighed i.e. it is recorded as an "equivalent axle mass".

Item No+	Description
1	Sub-Data type code - Wheel Mass
2	Number of wheel masses (n)
3	Offset sensor detection code
4	Mass Measurement Resolution
5	Wheel Mass for wheel 1
6	Wheel Mass for wheel 2
.	
.	
n+4	Wheel Mass for wheel n

Sub-Data Type code: *Data Type*

One of the following Sub-Data Type codes must be used:

Type	Description
WL	Wheel Mass – Average/Default : Left
WR	Wheel Mass – Average/Default : Right
W1	Wheel Mass – Sensor 1 – Left (Right for Right-Side drive)
W2	Wheel Mass – Sensor 2 – Right (Left for Right-Side drive)
W3	Wheel Mass – Sensor 3 – Left (Right for Right-Side drive)
W4	Wheel Mass – Sensor 4 – Right (Left for Right-Side drive)
wl	Actual Wheel Mass from a static scale/LSWIM: Left (Right)
wr	Actual Wheel Mass from a static scale/LSWIM: Right (Left)

For countries with a left-side drive convention, sensors 1 and 3 are on the left hand side while sensors 2 and 4 are on the right hand side. For countries with a right-side drive convention the sensor assignment is reversed.

Note that the if both axle and wheel WIM mass sensors are installed at a site then the first sensors (1) shall always be the wheel mass sensors (see example given for the Ax sub-type).

Number of wheel masses (n): *Integer Type*

This field specifies the number of wheel masses. If no wheel masses are recorded, then either the sub-data type should not be provided or a zero value can be provided. If the logger has no wheel mass sensors, the sub-data type must not be provided.

Offset Sensor Detection Code: *Code type*

This field specifies whether off-scale detection has occurred during weighing. (see Offset Sensor Detection Code).

Mass Measurement Resolution: *Real Type*

This field specifies the approximate mass resolution (in kg) with which the masses are measured. If not known the field is left empty. The resolution enables data processing software to dither the wheel masses when creating histograms or distributions.

Wheel mass [n]: *Real Type*

These fields provide the unadjusted individual wheel masses. Adjusted masses may be obtained by multiplying the wheel masses by the calibration factor.

9.7 Individual Vehicle Sub-Data Type Ax – Axle Mass

The Ax Axle mass Sub-Data Type is used when a WIM sensor measures both the left and right wheel track simultaneously i.e. the sensor extends across the lane. It is NOT used for the capturing of individual wheel masses.

Item No+	Description
1	Sub-Data type code - Axle Mass
2	Number of axle masses (n)
3	Offset sensor detection code
4	Mass Measurement Resolution
5	Axle Mass for axle 1
6	Axle Mass for axle 2
.	
.	
n+4	Axle Mass for axle n

Sub-Data Type code: *Data Type*

One of the following Sub-Data Type codes must be used:

Type	Description
A0	Axle Mass – Average/Default
A1	Axle Mass – Sensor 1 in the particular lane
A2	Axle Mass – Sensor 2 in the particular lane
A3	Axle Mass – Sensor 3 in the particular lane
A4	Axle Mass – Sensor 4 in the particular lane
as	Actual Axle Mass from a static scale

Number of axle masses (n): *Integer Type*

This field specifies the number of axle masses. If no axle masses are recorded, then either the sub-data type should not be provided or a zero value can be provided. If the logger has no axle mass sensors, the sub-data type must not be provided.

Offset Sensor Detection Code: *Code type*

This field specifies whether off-scale detection has occurred during weighing. (See Offset Sensor Detection Code).

Mass Measurement Resolution: *Real Type*

This field specifies the approximate mass resolution (in kg) with which the masses are measured. If not known the field is left empty. The resolution enables data processing software to dither the axle masses when creating histograms or distributions.

Axle mass (n): *Real Type*

These fields provide the unadjusted individual wheel masses. Adjusted masses may be obtained by multiplying the wheel masses by the calibration factor.

Where wheel and axle WIM sensors are combined on a given lane then the wheel WIM sensor numbering shall be the first sensors starting at 1. So if there are two Wheel WIM sensors and one Axle WIM sensor then one would have the sub-types W1, W2 and A3.

9.8 Individual Vehicle Sub-Data Type Gx – Axle Group Mass

The Gx Axle Group Mass Sub-Data Type is used when axle group mass data is collected (e.g. at a weighbridge) and all axles in an axle group are weighted simultaneously.

Item No+	Description
1	Sub-Data type code - Group Mass
2	Number of group masses (n)
3	Offset Sensor detection code
4	Mass Measurement Resolution
5	Group Mass for axle group 1
6	Group Mass for axle group 2
.	
.	
n+4	Group Mass for axle group n

Sub-Data Type code: *Data Type*

One of the following Sub-Data Type codes must be used:

Type	Description
G1	Group Mass – Sensor 1 in the particular lane
G2	Group Mass – Sensor 2 in the particular lane
G3	Group Mass – Sensor 3 in the particular lane
G4	Group Mass – Sensor 4 in the particular lane
gs	Actual Group Mass from a static scale

Number of group masses (n): *Integer Type*

This field specifies the number of group masses measured. If no group masses are recorded, then either the sub-data type should not be provided or a zero value can be provided.

Offset Sensor Detection Code: *Code type*

This field specifies whether off-scale detection has occurred during weighing. (see Offset Sensor Detection Code).

Mass Measurement Resolution: *Real Type*

This field specifies the approximate mass resolution (in kg) with which the masses are measured. If not known the field is left empty. The resolution enables data processing software to dither the axle masses when creating histograms or distributions.

Group mass (n): *Real Type*

These fields provide the unadjusted individual group masses. Adjusted masses may be obtained by multiplying the wheel masses by the calibration factor.

9.9 Individual Vehicle Sub-Data Type Tx – Single/dual tyre

The Tx Single/Dual Tyre Sub-Data Type is used when single/dual tyre data are collected.

Item No+	Description
1	Tx - Sub-Data type code (Single/dual tyre)
2	Number of Tyre s (n)
3	Single/dual tyre code for Wheel 1
4	Single/dual tyre code for Wheel 2
.	
.	
n+2	Single/dual tyre code for Wheel n

Sub-Data Type code: *Data Type*

One of the following Sub-Data Type codes must be used:

Type	Description
T0	Tyre Type – Any/Average
TL	Tyre Type – Left tyre sensor in the particular lane
TR	Tyre Type – Right tyre sensor in the particular lane
tl	Actual observed Type – Left
tr	Actual observed Tyre Type – Right

Number of tyres (n): *Integer Type*

This field specifies the number of tyres that were measured. If no tyres were measured, then either the sub-data type should not be provided or a zero value can be provided. If the logger has no Single/dual tyre sensors, the sub-data type must not be provided.

Single/Dual Tyre Code: *Code type*

These fields provide the single/dual tyre codes for individual tyres (See Single/Dual Tyre Code),

9.10 Individual Vehicle Sub-Data Type Cx – Axle Group Configuration

The Cx Axle Group Sub-Data Type is used for defining the axle group configuration of a vehicle.

Item No+	Description
1	Cx - Sub-Data type code (Axle Group Configuration)
2	Number of axle groups (n)
3	Group Axle Count for the 1st group
4	Group Axle Count for the 2nd group
.	
.	
n+2	Group Axle Count for the nth group

Sub-Data Type code: *Data Type*

One of the following Sub-Data Type codes must be used:

Type	Description
C0	Configuration from any source
CL	Configuration (Left wheel path)
CR	Configuration (right wheel path)
c0	Actual observed axle group configuration (left or right)
cL	Actual observed (Left)
cR	Actual observed (Right)

Number of axle groups (n): *Integer Type*

This field specifies the number of axle groups that were measured or observed.

Group Axle Count Code: *Integer Type*

These fields provide the number of axles with a given group.

10 ADDITIONAL DATA RECORDS

10.1 Introduction

Additional data records may be provided as part of the traffic data block to provide additional data. The data may be provided either by traffic loggers or by means of post processing software.

The additional data records must appear in chronological sequence in the data. Some of the records may overwrite records that have previously been provided and will stay in effect until cancelled. The provision of header records will NOT result in the cancellation of these records.

10.2 Additional Data Type QF – Failure record

The Type QF data failure record is used to indicate failures due to equipment or other reasons. Such failures may result in incorrect, erratic or missing observations. Should such failures occur, then none of the data corresponding with these failures must be used in applications.

The Type QF record marks the start date and time from which the failure record applies. Subsequent records may change or add to a previous Type QF record. A Type QF record must also be provided when failures have been cleared.

If a given failure code for a given physical lane was raised, then the specific failure remains in effect for the entire data file unless it is explicitly cleared. A Header automatically clears ALL failure codes; so if a header is inserted and a failure code was raised, the failure must be explicitly re-raised after the header before any data is presented. A new start date and time must be specified falling in the range specified by the header.

Item No	Description
1	QF - Sensor Failure Record
2	Data source code
3	Start date
4	Start time
5	Failure code
6	Physical lane number
7	The number of given reasons for the failure (n)
8	Reason 1 Failure Type Code
9	Reason 2 Failure Type Code
…	
7+n	Reason n Failure Type Code

Data Source Code: Code *Type*

Indicate the source of the data (See the definition of the data source code).

Start date: *Date Type*

The date from which the failure is in effect.

Time: *Time Type*

The time from which the failure is in effect.

Failure code: Code type

A code indicating whether a failure has started or has been cleared.

Number	Description
0	The failure has been cleared
1	Data is bad due to a sensor failure
2	Uncertain data. Data is bad to reasons other than sensor failure.
3	No data collected due to sensor or equipment failure
4	Suspect Data. Requires further investigation

Physical Lane Number: *Integer Type*

The physical lane on which the sensor failure has occurred. A zero (0) indicates that failure has occurred in all lanes.

Number of given reasons for the failure: *Integer number*

The number of sensors that have failed.

Sensor type code: Code Type

Code	Description
X	All vehicle data is suspect/bad and should be ignored.
N	Vehicle detection has been affected
D	Date recording has been affected
T	Time recording has been affected
R	Forward/reverse code has been affected
C	The vehicle category has been affected
P	The primary vehicle classification has been affected
S	The secondary vehicle classification has been affected
V	The speed measurement has been affected
L	The vehicle length measurement has been affected
O	The occupancy time has been affected
H	The chassis height code has been affected
F	The vehicle following code has been affected
K	The trailer count has been affected
A	The axle count has been affected
B	The bumper-to-1st axle spacing has been affected
S	The axle spacing has been affected (at any of the sensors)
M	The weight information has been affected (at any of the sensors)
W	The single/dual tyre information has been affected (any sensor)

10.3 Additional Data Type QC – Weight calibration record

The Type QC WIM calibration records are used to provide calibration factors for weight measurements. A calibration factor must be provided for each weight sensor.

The Type QC record marks the start date and time from which the calibration factors apply. A subsequent record will change or add to a previously provided Type QC record.

Item No	Description
1	QC - Weight calibration record
2	Data source code
3	Start date
4	Start time
5	Physical lane number
6	The number of sensors for which calibration factors are provided
7	Weight sensor 1 type and number
8	Weight sensor 1 calibration factor
…	
5+2n	Weight sensor 1 type and number
6+2n	Weight sensor 1 calibration factor

Data Source Code: Code *Type*

Indicate the source of the data (See the definition of the data source code).

Start date: *Date Type*

The date from which the calibration factors are in effect.

Time: *Time Type*

The time from which the calibration factors are in effect.

Physical Lane Number: *Integer Type*

The physical lane to which the calibration factors apply.

Number of sensors n: Integer number

The number of sensors for which calibration factors are provided.

Sensor types and numbers: Code Type

Code	Description
W1 – W4	Wheel weight sensors
A1 – A4	Axle weight sensors
G1 – G4	Axle group sensors

Calibration factors: Real type

The calibration factor that applies to a particular weight sensor. The factor (K) is defined to as a multiplicative factor that corrects the weight or mass to their “true” values as follows

CALIBRATED = K * DATA

The factor is greater than 1 if the weight or mass data must be increased and less than 1 if it must be reduced.

10.4 Additional Data Type QW – Weight sensor change record

The Type QW WIM calibration records are used to indicate a weight sensor has been changed in the field and a recalibration of the sensor is required. The Type QW record marks the date and time on which the change has occurred.

Item No	Description
1	QW - Weight sensor change record
2	Data source code
3	Date of change
4	Time of change
5	Physical lane number
6	The number of sensors which have changed
7	Weight sensor 1 type and number
…	
6+n	Weight sensor 1 type and number

Data Source Code: Code *Type*

Indicate the source of the data (See the definition of the data source code).

Date: *Date Type*

The date on which the change has occurred.

Time: *Time Type*

The time at which the change has occurred.

Physical Lane Number: *Integer Type*

The physical lane in which the change has occurred.

Number of sensors n: Integer number

The number of sensors that have changed.

Sensor types and numbers: Code Type

Code	Description
W1 – W4	Wheel weight sensors
A1 – A4	Axle weight sensors
G1 – G4	Axle group sensors

10.5 Additional Data Type QD – Day classification

The Type QD day classification record contains classification data that are applicable to a specific date of observations. The classification record applies to all observations on the day and one record must be provided for each day of traffic data provided in the file.

Item No	Description
1	QD - Day classification record
2	Data source code
3	Date

4 Day classification code 1
5 Day classification code 2

Data Source Code: Code *Type*

Indicate the source of the data (See the definition of the data source code).

Date: *Date Type*

The date for which the classification is provided.

Day classification code 1: Code *Type*

Code	Description
0	Unknown code (could not be determined)
1	Non-holiday
2	Holiday
3	Day influenced by holiday

The following definitions apply to the above codes:

A non-holiday is a day which not a holiday or a day influenced by a holiday
A holiday is a public or school holiday.
An influenced day is a day which is influenced by a holiday.

Day classification code 2: Code *Type*

Code	Description
0	Unknown code (could not determine code)
1	Normal pattern
2	Abnormal pattern
3	Exceptional but acceptable pattern
4	Exceptional and unacceptable pattern
5	Affected but acceptable pattern
6	Affected but unacceptable pattern
7	Erroneous pattern

The following definitions apply to the above codes:

a) A normal pattern is typical of those that occur on non-holidays. Such patterns normal occur on non-holidays but can also occur on holidays.
b) An abnormal pattern is typical of those that occur on holidays. Such patterns can only occur on holidays and not on non-holidays.
c) An exceptional pattern is one in which traffic demand is higher than normal due to unusual events that do not occur regularly. Observed traffic flows should be used in applications unless a pattern has been marked as unacceptable.
d) An affected pattern is one in which traffic flow on the road was affected by some factor or event that had an impact on the capacity of the road. Observed traffic flows should only be used in applications when the pattern has been marked as acceptable.
e) An erroneous pattern is one in which an error has occurred. Observed traffic flows should not be used in applications.

11 SUMMARY TRAFFIC DATA RECORDS

11.1 Introduction

In this chapter, various summary data records are described. These summary records are used to provide summaries of individual data that was collected. These records are optional and can be reproduced from individual vehicle data provided that if all vehicles were recorded by the logger.

11.2 Summary Data Type 20 - Vehicle speed summary record

The Vehicle Speed Summary Record Type 20 is used to provide the number of vehicles counted on a time interval basis per lane grouped according to vehicle speeds. Refer to the Header Data Type Description Record 20 for information concerning the speed bin boundaries. There must be as many data lines as there are assigned lanes.

Item No	Description
1	Summary Data Record ID Code (20)
2	Data Source Code
3	Edit Code
4	End Date
5	End Time
6	Duration of the summary
7	Lane Number
8	Number of Vehicles in Speed Bin 0
9	Number of Vehicles in Speed Bin 1
10	Number of Vehicles in Speed Bin 2
11	Number of Vehicles in Speed Bin 3
.	
.	
n+8	Number of Vehicles in Speed Bin n
n+9	Total Heavy Vehicles
n+10	Sum of speeds of all heavy vehicles

Data Source Code: Code *Type*

Indicate the source of data record (See Data Source Code).

Edit Code: *Code Type*

The Edit Code is an alpha-numeric character used to describe whether the data that follows has been edited or must be considered invalid (see Edit Code).

End Date: *Date Type* (End Time Clock Convention)

The End Date is the date at which the summary ended.

End Time: *Time Type* (End Time Clock Convention)

The End Time is time at which the summary ended. Note that to save space, the time should be given as hhmm only.

Summary Interval: *Time Interval Type*

The Summary Interval field specifies the duration of the summary record.

Lane Number: *Integer Type*

The Lane Number is the Assigned Lane Number, as referred to in the lane configuration record L1. The lane number may either be a physical lane or a virtual lane.

Speed Bins: *Integer Type*

These n fields represent the total number of vehicles counted in the Summary Interval, sorted into n vehicle speed groups. The speed bin boundaries are defined in the Header Data Type 20 record. If the speed of a vehicle could not be determined, the vehicle must be counted in Bin 0. (Bin 0 is new to Version 3.)

Total Heavy Vehicles: *Integer Type*

This field gives the total number of heavy vehicles counted. If the logger is not capable of classifying vehicles into light and heavy vehicles, then this field should be left empty. Vehicles recorded in Speed Bin 0 must not be counted in this bin.

Sum of Heavy Vehicle Speeds: *Real Type*

This field gives the sum of speeds of all heavy vehicles. If the logger is not capable of classifying vehicles into light and heavy vehicles, then this field should be left empty. Vehicles recorded in Speed Bin 0 must not be counted / summed in this bin.

IMPORTANT NOTE: If any of the counts provided above overflowed in the logger, then the fields must be left empty indicating that the value is not available.

11.3 Summary Data Type 21 – Program 20 vehicle speed summary record

The Vehicle Data Summary Record 21 is used to provide summary information on a time interval basis. This specialised data format is based on the CTO Program 2.0 Raw File Data Format. Refer to the Header Data Type Description Record 21 for information concerning the speed bin boundaries. There must be as many data lines as there are lanes.

Item No	Description
1	Summary Data Record ID Code (21)
2	Data Source Code
3	Edit Code
4	End Date
5	End Time
6	Duration of the summary
7	Lane Number
8	Number of Vehicles in Speed Bin 0

9	Number of Vehicles in Speed Bin 1
10	Number of Vehicles in Speed Bin 2
11	Number of Vehicles in Speed Bin 3
12	Number of Vehicles in Speed Bin 4
13	Number of Vehicles in Speed Bin 5
14	Number of Vehicles in Speed Bin 6
15	Number of Vehicles in Speed Bin 7
16	Number of Vehicles in Speed Bin 8
17	Number of Vehicles in Speed Bin 9
18	Number of Vehicles in Speed Bin 10
19	Sum of heavy vehicle speeds
20	Number of short heavy vehicles
21	Number of medium heavy vehicles
22	Number of long heavy vehicles
23	Number of Rear-to-Rear Headway shorter than 2 seconds

Data Source Code: Code *Type*

Indicate the source of data record (See definition of the Data Source Code).

Edit Code: *Code Type*

The Edit Code is an alpha-numeric character used to describe whether the data that follows has been edited or must be considered invalid (see Edit Code).

End Date: *Date Type* (End Time Clock Convention)

The End Date is the date at which the summary ended.

End Time: *Time Type* (End Time Clock Convention)

The End Time is time at which the summary ended. Note that to save space, the time should be given as hhmm only.

Summary Interval: *Time Interval Type*

The Summary Interval field specifies the duration of the summary record.

Lane Number: *Integer Type*

The Lane Number is the Assigned Lane Number, as referred to in the lane configuration record L1. The lane number may either be a physical lane or a virtual lane.

Speed Bins 0 – 10: *Integer Type*

These ten fields represent the total number of vehicles counted in the Summary Interval, binned into 10 vehicle speed groups. The speed bin boundaries are defined in the header record. If the speed of a vehicle could not be determined, the vehicle must be counted in Bin 0. (Bin 0 is new to Version 3.)

Sum of heavy vehicle speeds: *Real Type*

This represents the sum of the speeds of all heavy vehicles. Vehicles recorded in Speed Bin 0 must not be counted / summed in this bin.

Number of short, medium and long vehicles: *Integer Type*

These three fields represent the number of short, medium and long trucks counted in the summary period. See classification scheme 05. Vehicles recorded in Speed Bin 0 must not be counted in these bins.

Number of Rear-to-Rear Headways shorter than 2 seconds: *Integer Type*

This field gives the number of headways shorter than 2 seconds. Vehicles recorded in Speed Bin 0 must be counted in this bin.

Number of Rear-to-Rear Headways shorter than programmed time: *Integer Type*

This field gives the number of headways shorter than the programmed seconds. In general, this bin has never been used by the CTO. It is given only for backward compatibility. Vehicles recorded in Speed Bin 0 must be counted in this bin.

IMPORTANT NOTE: If any of the counts provided above overflowed in the logger, then the field must be left empty indicating that the value is not available.

11.4 Summary Data Type 22 – Program 23 vehicle speed summary record

The Vehicle Data Summary Record 22 is used to provide speed summary information on a time interval basis. This specialised data format is based on the CTO Program 2.3 RAW FILE DATA FORMAT. Refer to the Header Data Type Description Record 22 for information concerning the speed bin boundaries. There must be as many data lines as there are lanes.

Item No	Description
1	Summary Data Record ID Code (22)
2	Data Source Code
3	Edit Code
4	End Date
5	End Time
6	Duration of the summary
7	Lane Number
8	Number of Vehicles in Speed Bin 0
9	Number of Light Vehicles in Speed Bin 1
10	Number of Light Vehicles in Speed Bin 2
11	Number of Light Vehicles in Speed Bin 3
12	Number of Light Vehicles in Speed Bin 4
13	Number of Light Vehicles in Speed Bin 5
14	Number of Light Vehicles in Speed Bin 6
15	Number of Light Vehicles in Speed Bin 7
16	Number of Light Vehicles in Speed Bin 8
17	Number of Light Vehicles in Speed Bin 9
18	Number of Light Vehicles in Speed Bin 10
19	Number of Heavy Vehicles in Speed Bin 1
20	Number of Heavy Vehicles in Speed Bin 2
21	Number of Heavy Vehicles in Speed Bin 3
22	Number of Heavy Vehicles in Speed Bin 4

23 Number of Heavy Vehicles in Speed Bin 5
24 Number of Heavy Vehicles in Speed Bin 6
25 Number of Heavy Vehicles in Speed Bin 7
26 Number of Heavy Vehicles in Speed Bin 8
27 Number of Heavy Vehicles in Speed Bin 9
28 Number of Heavy Vehicles in Speed Bin 10
29 Number of medium heavy vehicles
30 Number of long heavy vehicles
31 Number of Rear-to-Rear Headway shorter than 2 seconds

Data Source Code: Code *Type*

Indicate the source of data record (See definition of the Data Source Code).

Edit Code: *Code Type*

The Edit Code is an alpha-numeric character used to describe whether the data that follows has been edited or must be considered invalid (see Edit Code).

End Date: *Date Type* (End Time Clock Convention)

The End Date is the date at which the summary ended.

End Time: *Time Type* (End Time Clock Convention)

The End Time is time at which the summary ended. Note that to save space, the time should be given as hhmm only.

Summary Interval: *Time Interval Type*

The Summary Interval field specifies the duration of the summary record.

Lane Number: *Integer Type*

The Lane Number is the Assigned Lane Number, as referred to in the lane configuration record L1. The lane number may either be a physical lane or a virtual lane.

Vehicle Speed Bin 0: *Integer Type*

This field counts the number of vehicles for which no speed could be determined.

Light Vehicle Speed Bins 1 – 10: *Integer Type*

These ten fields represent the total number of light vehicles counted in the Summary Interval, binned into 10 vehicle speed groups. The speed bin boundaries are defined in the header. Vehicles recorded in Speed Bin 0 must not be counted in these bins.

Heavy Vehicle Speed Bins 1 – 10: *Integer Type*

These ten fields represent the total number of heavy vehicles counted in the Summary Interval, binned into 10 vehicle speed groups. The speed bin boundaries are defined in the header. Vehicles recorded in Speed Bin 0 must not be counted in these bins.

Number of medium and long vehicles: *Integer Type*

These two fields represent the number of medium and long trucks counted in the summary period. See classification scheme 05. Vehicles recorded in Speed Bin 0 must not be counted in these bins.

Number of Rear-to-Rear Headways shorter than 2 seconds: *Integer Type*

This field gives the number headways shorter than 2 seconds. Vehicles recorded in Speed Bin 0 must be counted in this bin.

IMPORTANT NOTE: If any of the counts provided above overflowed in the logger, then the field must be left empty indicating that the value is not available.

11.5 Summary Data Type 30 - Classification summary record

The Classification Data Summary Record 30 is used to provide vehicle classification summary information on a time interval basis per lane. Refer to the Header Data Type Description Record 30 for information concerning the classification bins. There must be as many data lines as there are lanes.

Item No	Description
1	30 Data Type Code
2	Data Source Code
3	Edit Code
4	End Date
5	End Time
6	Duration of the summary
7	Lane Number
8	Number of Vehicles in Class 0 (Error Class)
9	Number of Vehicles in Class 1
10	Number of Vehicles in Class 2
11	Number of Vehicles in Class 3
.	
n+8	Number of Vehicles in Class n

Data Source Code: Code *Type*

Indicate the source of data record (See definition of the Data Source Code).

Edit Code: *Code Type*

The Edit Code is an alpha-numeric character used to describe whether the data that follows has been edited or must be considered invalid (see Edit Code).

End Date: *Date Type* (End Time Clock Convention)

The End Date is the date at which the summary ended.

End Time: *Time Type* (End Time Clock Convention)

The End Time is time at which the summary ended. Note that to save space, the time should be given as hhmm only.

Summary Interval: *Time Interval Type*

The Summary Interval field specifies the duration of the summary record.

Lane Number: *Integer Type*

The Lane Number is the Assigned Lane Number, as referred to in the lane configuration record L1. The lane number may either be a physical lane or a virtual lane.

Class Bins: *Integer Type*

These fields represent the total number of vehicles counted in the Summary Interval for the given classes. The sum of all classes MUST match the total volume of vehicles counted.

IMPORTANT NOTE: If any of the counts provided above overflowed in the logger, then the field must be left empty indicating that the value is not available.

11.6 Summary Data Type 31 – secondary classification summary record

The Secondary Classification Data Summary Record 31 is used to provide vehicle classification summary information on a time interval basis per lane. Refer to the Header Data Type Description Record 31 for information concerning the classification bins. This summary is identical to 30 and is used for back-up purposes in cases where more sophisticated classifications (30) have failed due to sensor failures. There must be as many data lines as there are lanes.

Item No	Description
1	31 Data Type Code
2	Data Source Code
3	Edit Code
4	End Date
5	End Time
6	Duration of the summary
7	Lane Number
8	Number of Vehicles in Class 0 (Error Class)
9	Number of Vehicles in Class 1
10	Number of Vehicles in Class 2
11	Number of Vehicles in Class 3
.	
n+8	Number of Vehicles in Class n

Data Source Code: Code *Type*

Indicate the source of data record (See definition of the Data Source Code).

Edit Code: *Code Type*

The Edit Code is an alpha-numeric character used to describe whether the data that follows has been edited or must be considered invalid (see Edit Code).

End Date: *Date Type* (End Time Clock Convention)

The End Date is the date at which the summary ended.

End Time: *Time Type* (End Time Clock Convention)

The End Time is time at which the summary ended. Note that to save space, the time should be given as hhmm only.

Summary Interval: *Time Interval Type*

The Summary Interval field specifies the duration of the summary record.

Lane Number: *Integer Type*

The Lane Number is the Assigned Lane Number, as referred to in the lane configuration record L1. The lane number may either be a physical lane or a virtual lane.

Class Bins: *Integer Type*

These fields represent the total number of vehicles counted in the Summary Interval for the given classes. The sum of all classes MUST match the total volume of vehicles counted.

IMPORTANT NOTE: If any of the counts provided above overflowed in the logger, then the field must be left empty indicating that the value is not available.

11.7 Summary Data Type 60 - Length summary record

The Vehicle Length Summary Record 60 is used to provide length summary information on a time interval basis. Refer to the Header Data Type Description Record 60 for information concerning the Length bin boundaries. There must be as many data lines as there are lanes.

This record is provided for backward compatibility only. It needs not to be supported anymore.

Item No	Description
1	60 Data Type Code
2	Data Source Code
3	Edit Code
4	End Date
5	End Time
6	Duration of the summary
7	Lane Number
8	Number of Vehicles in Length Bin 0 (Error Bin)
9	Number of Vehicles in Length Bin 1
10	Number of Vehicles in Length Bin 2
11	Number of Vehicles in Length Bin 3
.	
n+8	Number of Vehicles in Length Bin n

Data Source Code: Code *Type*

Indicate the source of data record (See definition of the Data Source Code).

Edit Code: *Code Type*

The Edit Code is an alpha-numeric character used to describe whether the data that follows has been edited or must be considered invalid (see Edit Code).

End Date: *Date Type* (End Time Clock Convention)

The End Date is the date at which the summary ended.

End Time: *Time Type* (End Time Clock Convention)

The End Time is time at which the summary ended. Note that to save space, the time should be given as hhmm only.

Summary Interval: *Time Interval Type*

The Summary Interval field specifies the duration of the summary record.

Lane Number: *Integer Type*

The Lane Number is the Assigned Lane Number, as referred to in the lane configuration record L1. The lane number may either be a physical lane or a virtual lane.

Length Bins: *Integer Type*

These n fields represent the total number of vehicles counted in the Summary Interval, binned into n vehicle Length groups. The Length bin boundaries are defined in the header. Bin 0 counts vehicles for which no length could be determined. (New to Version 3)

IMPORTANT NOTE: If any of the counts provided above overflowed in the logger, then the field must be left empty indicating that the value is not available.

11.8 Summary Data Type 70 - Flow summary record

The Vehicle Flow Summary Record 70 is used to provide traffic flow summary information on a time interval basis per lane. Refer to the Header Data Type Description Record 70 for information concerning the definition of a following and free flowing vehicle. There must be as many data lines as there are lanes.

Item No	Description
1	70 Data Type Code
2	Data Source Code
3	Edit Code
4	End Date
5	End Time
6	Duration of the summary
7	Lane Number
8	Number of Error Vehicles
9	Total Free Flowing Light Vehicles
10	Total Following Light Vehicles
11	Total Free Flowing Heavy Vehicles
12	Total Following Heavy Vehicles
13	Sum of Inverse of Speeds for Free Flowing Lights

14 Sum of Inverse of Speeds for Following Lights
15 Sum of Inverse of Speeds for Free Flowing Heavies
16 Sum of Inverse of Speeds for Following Heavies
17 Sum of Speeds for Free Flowing Lights
18 Sum of Speeds for Following Lights
19 Sum of Speeds for Free Flowing Heavies
20 Sum of Speeds for Following Heavies
21 Sum of squared speeds of Free Flowing Lights
22 Sum of squared speeds for Following Lights
23 Sum of squared speeds of Free Flowing Heavies
24 Sum of squared speeds for Following Heavies

Data Source Code: Code *Type*

Indicate the source of data record (See definition of the Data Source Code).

Edit Code: *Code Type*

The Edit Code is an alpha-numeric character used to describe whether the data that follows has been edited or must be considered invalid (see Edit Code).

End Date: *Date Type* (End Time Clock Convention)

The End Date is the date at which the summary ended.

End Time: *Time Type* (End Time Clock Convention)

The End Time is time at which the summary ended. Note that to save space, the time should be given as hhmm only.

Summary Interval: *Time Interval Type*

The Summary Interval field specifies the duration of the summary record.

Lane Number: *Integer Type*

The Lane Number is the Assigned Lane Number, as referred to in the lane configuration record L1. The lane number may either be a physical lane or a virtual lane.

Number of Error Vehicles: *Integer Type*

This is the total number of vehicles for which it was not possible to measure a speed, vehicle class or flow property. These vehicles may not be counted in any of the remaining fields.

Total Free Flowing Light Vehicles: *Integer Type*

This is the total number of free flowing light vehicles detected for the assigned lane in the specified interval.

Total Following Light Vehicles: *Integer Type*

This is the total number of following light vehicles detected for the assigned lane in the specified interval.

Total Free Flowing Heavy Vehicles: *Integer Type*

This is the total number of free flowing heavy vehicles detected for the assigned lane in the specified interval.

Total Following Heavy Vehicles: *Integer Type*

This is the total number of following heavy vehicles detected for the assigned lane in the specified interval.

Sum of Inverse of Speeds for Free Flowing Light Vehicles: *Real Type*

This is the sum of Inverse of Speeds for all free flowing light vehicles detected for the assigned lane in the specified interval.

Sum of Inverse of Speeds for Following Light Vehicles: *Real Type*

This is the sum of Inverse of Speeds for all following light vehicles detected for the assigned lane in the specified interval.

Sum of Inverse of Speeds for Free Flowing Heavy Vehicles: *Real Type*

This is the sum of Inverse of Speeds for all free flowing heavy vehicles detected for the assigned lane in the specified interval.

Sum of Inverse of Speeds for Following Heavy Vehicles: *Real Type*

This is the sum of Inverse of Speeds for all following heavy vehicles detected for the assigned lane in the specified interval.

Sum of Speeds for Free Flowing Light Vehicles: *Real Type*

This is the sum of speeds for all free flowing light vehicles detected for the assigned lane in the specified interval.

Sum of Speeds for Following Light Vehicles: *Real Type*

This is the sum of speeds for all following light vehicles detected for the assigned lane in the specified interval.

Sum of Speeds for Free Flowing Heavy Vehicles: *Real Type*

This is the sum of speeds for all free flowing heavy vehicles detected for the assigned lane in the specified interval.

Sum of Speeds for Following Heavy Vehicles: *Real Type*

This is the sum of speeds for all following heavy vehicles detected for the assigned lane in the specified interval.

Sum of Speeds Squared for Free Flowing Light Vehicles: *Real Type*

This is the sum of the square of the speeds for all free flowing light vehicles detected for the logical lane in the specified interval.

Sum of Speeds Squared for Following Light Vehicles: *Real Type*

This is the sum of the square of the speeds for all following light vehicles detected for the assigned lane in the specified interval.

Sum of Speeds Squared for Free Flowing Heavy Vehicles: *Real Type*

This is the sum of the square of the speeds for all free flowing heavy vehicles detected for the assigned lane in the specified interval.

Sum of Speeds Squared for Following Heavy Vehicles: *Real Type*

This is the sum of the square of speeds for all following heavy vehicles detected for the assigned lane in the specified interval.

If metric units are used then the units for Inverse of Speed are µS/cm and for speed km/h. If imperial units are used then these are µS/inch and mph respectively.

IMPORTANT NOTE: If any of the counts provided above overflowed in the logger, then the field must be left empty indicating that the value is not available.

12 COUNTING STATION DEFINITION DATA

12.1 Introduction

In this chapter, a specification is given for the provision of counting station definition data. This data is not supplied as part of the traffic data file but must be supplied in a separate counting station definition data file. This data file must be provided when required by the data user.

The definition data is provided in a comma delimited format. Each line of the file contains all definition data for a counting station. The first line may contain column headings as defined below or may be empty; it is ignored by data processing software.

The data is provided in a single file with the following name and type:

Filename.RSS

where “filename” can be any name. The default name is “STATION”.

12.2 Site Identifiers

Stations are identified by means of a Site Identifiers (station numbers). Once a Site Identifier has been allocation to a specific site, no definition data may be changed. Should there be a need to change any of the site definition data (such as additional lanes) a NEW Site Identifier must be assigned to a site. The old site must then be marked as “discontinued”, in which case the Site Identifier may never again be used at the particular or any other location.

Site Identifiers in South Africa are managed by SANRAL. Any person or authorities that undertake traffic counts should approach SANRAL to have a range of site identification numbers assigned for their exclusive use.

12.3 Counting station definition data

The counting station definition data file must contain the following data:

Column	Data Type	Column Contents
1	*Integer Type*	Version Number
2	*String Type* [8]	Site Identifier
3	*Code Type*	Site Type (Full, Partial or Combination site)
4	*Code Type*	Station Status (In Use or Discontinued)
5	*Date Type*	Date Installed
6	*Date Type*	Date Discontinued
7	*String Type* [20]	Site Name
8	*Text Type* [20]	Owner Name
9	*Text Type* [50]	Location Description

10	*Text Type* [40]	Municipal Area Description
11	*Text Type* [40]	Region Description
12	*Text Type* [10]	Route number
13	*Text Type* [10]	Section number
14	*Real Type*	Route Kilometre distance
15	*Text Type* [10]	Road number
16	*Integer Type*	Speed limit at site
17	*GPS Type*	Longitude
18	*GPS Type*	Latitude
19	*Code Type*	Count Classification
20	*Code Type*	Count Type
21	*String Type* [20]	Cluster Name
22	*Integer Type*	Number of Traffic Streams
23	*Integer Type*	Number of Physical Lanes
24	*Integer Type*	Number of Virtual Lanes

For each Traffic Stream (d) the following information is given:

Column	Data Type	Column Contents
24+(d-1)+1	*Integer Type*	Traffic Stream Number
24+(d-1)+2	*Code Type*	Direction Code
24+(d-1)+3	*Text Type* [40]	Stream Description

For each physical and virtual lane i.e. for each assigned lane the following information must be given:

Column	Data Type	Column Contents
Z+1	*Integer Type*	Lane Number
Z+2	*Text Type* [40]	Lane Description
Z+3	*Code Type*	Lane Type Code
Z+4	*Integer Type*	Traffic Stream Number
Z+5	*Integer Type*	Traffic Stream Lane Position
Z+6	*Integer Type*	Reverse Direction Lane Number
Z+7	*String Type* [8]	Reference Site Identifier
Z+8	*Integer Type*	Reference Site Lane Number

In which Z=24+D*3 + (L-1)*8 with D being the number of Traffic Streams and L the lane number.

12.4 Counting station definitions

Version number: *Integer Type*

The version number describes the version of the data to follow. The current version is 1. If new information is added or the information is changed this version number will change and this document will then describe the new version (and all previous versions).

Site identification: *String Type* [8]

The site identification may be non-case sensitive alpha-numerical field up to 8 characters long. The Site Identification is a number issued by SANRAL and must be included in the record.

Station type: *Code Type*

Differentiation is made between the following three types of sites:

Code	Description
F	Full Site
P	Partial Site
C	Combination Site

A Full Site is one at which all lanes or Traffic Streams have been counted. A Partial Site, on the other hand, is one at which only a subset of lanes or Traffic Streams have been counted. Two or more traffic loggers are used at such sites to count all lanes.

A Combination Site is one which combines different Partial Sites into one counting site. The use of this type of site is restricted to situations where two or more traffic loggers are required to undertake a traffic count.

A Station Type is a *Code Type*.

Station status: *Code Type*

The Station Status differentiates between stations that are still in use and those that have been permanently discontinued.

Code	Description
U	In Use
D	Discontinued

Date installed: *Date Type*

Specifies the date the station was installed.

Date discontinued: *Date Type*

Specifies the date the station was discontinued. If the station is still in use, then the field is left empty.

Site name: *String Type* [20]

The 20 character field associates a name with the site.

Owner name: *Text Type* [20]

The 20 character field specifies who owns the site.

Location description: *Text Type* [50]

The 50 character field is sued to describe the location of the site.

Municipality area description: *Text Type* [40]

The 40 character field describes the municipality in which the station is located.

Region description: *Text Type* [40]

The 40 character field describes the region in which the station is located.

Route number: *Text Type* [10]

The 10 character field specifies the route number on which the site is located.

Section number: *Text Type* [10]

The 10 character field specifies the section number of the route on which the site is located.

Route kilometre distance: *Real Type*

This field gives the kilometre position of the station relative to the section number.

Road number: *Text Type* [10]

The 10 character field specifies the road number on which the site is located.

Speed limit: *Integer Type*

This field gives the speed limit applicable at the site.

Longitude & latitude: *GPS type*

These fields specify the GPS coordinates of the station.

Count classification: *Code Type*

The *Code Type* field specifies how the station is currently being operated.

Code	Description
P	Permanent – The station is operated on a permanent basis.
S	Secondary – The station has been built but is operated on an ad-hock basis
T	Temporary – The station uses temporary sensors and is operated on an ad-hock basis.

Count type: *Code Type*

The *Code Type* field describes the current purpose/use of the station.

Code	Description
C	Normal Traffic Counting Station
T	A Toll monitoring Station
W	A WIM station

Cluster name: *String Type* [20]

This field specifies the cluster name with which this station/site is associated. If the station is not associated with a cluster the field must be empty.

Number of Traffic Streams: *Integer Type*

This field specifies the number of Traffic Streams defined for the site.

Number of Physical Lanes: *Integer Type*

This field specifies the number of physical lanes defined at the site.

Number of Virtual Lanes: *Integer Type*

This field specifies the number of virtual lanes defined at the site.

Traffic Stream Number: *Integer Type*

The (sequence) number of the Traffic Stream (i.e. 1, 2, 3 etc.).

Direction Code: *Code Type*

This field specifies the direction code for the Traffic Stream (see Direction Code).

Traffic Stream description: *Text Type* [40]

This field provides a description of the Traffic Stream (e.g. Towards Pretoria).

Lane Number: *Integer Type*

See the definition of a Lane/Lane Number.

Lane description: *Text Type* [40]

This field provides a description for the lane e.g. Fast to Pretoria.

Lane Type Code: *Code Type*

The lane type code states whether a lane is a physical lane or a virtual lane (see Lane Type Code previously defined and repeated here).

Code	Description
P	Physical Lane
V	Virtual lane

Lane Traffic Stream Number: *Integer Type*

This field gives the Traffic Stream Number in which the lane is located.

Traffic Stream Lane Position: *Integer Type*

This field gives the position of the lane in the specified Traffic Stream (previously defined). The lane position of a virtual lane is zero (0).

Reverse Direction Lane Number: *Integer Type*

This field specifies under which lane a vehicle that is travelling in the opposite direction to the normal traffic flow is saved. This may be either a physical or virtual lane. A value of zero (0) may also be used, indicating that reverse travelling vehicles are not recorded i.e. such vehicles are ignored.

Reference *Site Identifier*: *String Type* [8]

If the site is a combination site, then this field refers to the Site Identifier of a partial site from which the combination site is constructed.

Alternatively, if a historic site was discontinued because the Number of Lanes was changed and a new site was constructed at the same or similar location, then this field refers to the historic Site Identifier.

The field is left empty if there is no reference to another site.

Reference site lane number: *Integer Type*

If the lane has a Reference Site Identifier associated with it, the lane number of the reference site associated with this lane must be specified. If none, the field is left empty.

13 REFERENCES

Federal Highway Administration (FHWA), 1995, Traffic monitoring guide, Report No FHWA-PL-95-031, Washington D.C.

South African Standard Traffic Data Collection Format, Versions 1.00 to 1.06.

South African Standard Traffic Data Collection Format, Version 2 (various issues).