FlipTheFleet Test Black Box Data: Codebook

Exploration of test data

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# Citation

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# About

## Circulation

Report circulation:

* Restricted to: [NZ GREEN Grid](https://www.otago.ac.nz/centre-sustainability/research/energy/otago050285.html) project partners and contractors.

## Purpose

This report is intended to:

* load and test preliminary ‘black box’ EV monitoring data provided for assessment purposes by [FlipTheFleet](http://flipthefleet.org/).

## Requirements:

* test dataset stored at /Volumes/hum-csafe/Research Projects/GREEN Grid/\_RAW DATA/flipTheFleet/

## History

Generally tracked via our git.soton [repo](https://git.soton.ac.uk/ba1e12/nzGREENGrid):

* [history](https://git.soton.ac.uk/ba1e12/nzGREENGrid/commits/master)
* [issues](https://git.soton.ac.uk/ba1e12/nzGREENGrid/issues)

Specific history of this code:

* <https://git.soton.ac.uk/ba1e12/nzGREENGrid/tree/master/analysis/ev>

## Support

This work was supported by:

* The [University of Otago](https://www.otago.ac.nz/);
* The [University of Southampton](https://www.southampton.ac.uk/);
* The New Zealand [Ministry of Business, Innovation and Employment (MBIE)](http://www.mbie.govt.nz/) through the [NZ GREEN Grid](https://www.otago.ac.nz/centre-sustainability/research/energy/otago050285.html) project;
* [SPATIALEC](http://www.energy.soton.ac.uk/tag/spatialec/) - a [Marie Skłodowska-Curie Global Fellowship](http://ec.europa.eu/research/mariecurieactions/about-msca/actions/if/index_en.htm) based at the University of Otago’s [Centre for Sustainability](http://www.otago.ac.nz/centre-sustainability/staff/otago673896.html) (2017-2019) & the University of Southampton’s Sustainable Energy Research Group (2019-202).

We do not ‘support’ the code but if you have a problem check the [issues](https://git.soton.ac.uk/ba1e12/nzGREENGrid/issues) on our [repo](https://git.soton.ac.uk/ba1e12/nzGREENGrid) and if it doesn’t already exist, open one. We might be able to fix it :-)

# Load data files

## EV test data

In this section we load and describe the data files from /Volumes/hum-csafe/Research Projects/GREEN Grid/\_RAW DATA/flipTheFleet/EVBlackBox export 2018-06-10-233146.csv. Note that we remove the following variables before we do so as they are potentially disclosive:

* Reg No
* Latitude
* Longitude
* Course (deg)

## Parsed with column specification:  
## cols(  
## .default = col\_integer(),  
## `Reg No` = col\_character(),  
## `Date (GPS)` = col\_character(),  
## `Time (GPS)` = col\_time(format = ""),  
## Latitude = col\_double(),  
## Longitude = col\_double(),  
## Altitude = col\_double(),  
## `Speed (GPS)` = col\_double(),  
## `Speed (Speedometer)` = col\_double(),  
## `Course (deg)` = col\_double(),  
## SOC = col\_double(),  
## AHr = col\_double(),  
## `Pack volts` = col\_double(),  
## `Pack amps` = col\_double(),  
## `Pack 1 temp (C)` = col\_double(),  
## `Pack 2 temp (C)` = col\_double(),  
## `Pack 3 temp (C)` = col\_double(),  
## `Pack 4 temp (C)` = col\_double(),  
## `12V battery (amps)` = col\_double(),  
## Hx = col\_double(),  
## VIN = col\_character()  
## # ... with 16 more columns  
## )

## See spec(...) for full column specifications.

Create some useful derived variables.

# create derived   
ftfSafeDT <- createDerivedFtF(ftfSafeDT)

## Warning: 1160 failed to parse.

# Codebooks

## Using Hmisc

Describe data to create codebook:

## ftfSafeDT   
##   
## 143 Variables 12487 Observations  
## ---------------------------------------------------------------------------  
## Time after power on (s)   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 5845 1 3778 3908 145.0 292.6   
## .25 .50 .75 .90 .95   
## 784.0 2486.0 6028.5 9269.8 11088.5   
##   
## lowest : 30 31 32 33 34, highest: 16530 16547 16575 16592 16636  
## ---------------------------------------------------------------------------  
## Date (GPS)   
## n missing distinct   
## 11327 1160 39   
##   
## lowest : 01-05-2018 01-06-2018 02-05-2018 02-06-2018 03-05-2018  
## highest: 25-05-2018 28-05-2018 29-05-2018 30-05-2018 31-05-2018  
## ---------------------------------------------------------------------------  
## Time (GPS) [secs]   
## n missing distinct   
## 11327 1160 8903   
##   
## lowest : 00:00:36 00:00:37 00:00:38 00:01:04 00:01:16  
## highest: 23:58:54 23:59:07 23:59:35 23:59:40 23:59:51  
## ---------------------------------------------------------------------------  
## Altitude   
## n missing distinct Info Mean Gmd .05 .10   
## 12475 12 988 0.999 42.41 22.6 0.00 24.50   
## .25 .50 .75 .90 .95   
## 36.00 39.80 44.20 74.36 89.00   
##   
## lowest : -293.5 -4.3 0.0 10.7 10.8, highest: 161.9 163.8 169.6 361.6 395.1  
## ---------------------------------------------------------------------------  
## Speed (GPS)   
## n missing distinct Info Mean Gmd .05 .10   
## 12475 12 57 0.436 10.35 17.97 0.00 0.00   
## .25 .50 .75 .90 .95   
## 0.00 0.00 0.00 53.71 79.64   
##   
## lowest : 0.000 1.852 3.704 5.556 7.408  
## highest: 96.304 98.156 100.008 101.860 103.712  
## ---------------------------------------------------------------------------  
## Speed (Speedometer)   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 2094 0.475 10.43 17.85 0.00 0.00   
## .25 .50 .75 .90 .95   
## 0.00 0.00 0.00 52.62 72.86   
##   
## lowest : 0.00 2.88 2.96 2.97 3.03, highest: 100.80 101.25 101.38 101.45 102.08  
## ---------------------------------------------------------------------------  
## GIDs   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 186 1 119.4 51.14 45 55   
## .25 .50 .75 .90 .95   
## 86 124 156 168 187   
##   
## lowest : 0 18 19 20 21, highest: 198 199 200 201 202  
## ---------------------------------------------------------------------------  
## SOC   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 10582 1 57.55 23.85 22.29 28.61   
## .25 .50 .75 .90 .95   
## 42.41 60.00 74.56 80.14 88.81   
##   
## lowest : 0.0000 12.9227 13.2509 13.2620 13.2688  
## highest: 95.4935 95.5220 95.5221 95.5255 95.5286  
## ---------------------------------------------------------------------------  
## AHr   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 54 0.997 46.92 2.517 47.34 47.36   
## .25 .50 .75 .90 .95   
## 47.38 47.44 47.48 47.50 47.53   
##   
## Value 0.0 47.2 47.4 47.6 47.8 132.0 132.2 132.4 132.6 132.8  
## Frequency 232 8 10299 1600 295 7 8 23 9 6  
## Proportion 0.019 0.001 0.825 0.128 0.024 0.001 0.001 0.002 0.001 0.000  
## ---------------------------------------------------------------------------  
## Pack volts   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 745 1 421.7 108.7 360.7 365.8   
## .25 .50 .75 .90 .95   
## 373.6 382.8 387.2 390.0 393.3   
##   
## lowest : 0.000 269.856 342.144 342.816 343.200  
## highest: 5612.448 5698.464 5735.904 5759.712 5783.520  
## ---------------------------------------------------------------------------  
## Pack amps   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 5914 1 -5.439 8.455 -16.609 -9.750   
## .25 .50 .75 .90 .95   
## -8.906 -8.150 -0.877 2.721 13.639   
##   
## lowest : -32.754 -32.753 -32.717 -32.679 -32.662  
## highest: 32.642 32.722 32.725 32.745 32.747  
## ---------------------------------------------------------------------------  
## max\_cp (mV)   
## n missing distinct Info Mean Gmd .05 .10   
## 12349 138 623 1 4904 1942 3783 3825   
## .25 .50 .75 .90 .95   
## 3906 3997 4042 4072 4106   
##   
## lowest : 3589 3597 3599 3609 3612, highest: 65038 65039 65040 65294 65295  
## ---------------------------------------------------------------------------  
## min\_cp (mV)   
## n missing distinct Info Mean Gmd .05 .10   
## 12349 138 505 1 3917 167.2 3740 3799   
## .25 .50 .75 .90 .95   
## 3874 3975 4024 4047 4075   
##   
## lowest : 0 14 15 16 271, highest: 4099 4100 4101 4102 4103  
## ---------------------------------------------------------------------------  
## avg\_cp (mV)   
## n missing distinct Info Mean Gmd .05 .10   
## 12349 138 744 1 4441 1059 3772 3815   
## .25 .50 .75 .90 .95   
## 3896 3988 4033 4064 4098   
##   
## lowest : 2811 3564 3571 3575 3578, highest: 58463 59359 59749 59997 60245  
## ---------------------------------------------------------------------------  
## cp\_diff (mV)   
## n missing distinct Info Mean Gmd .05 .10   
## 12349 138 289 0.993 987.9 1907 13 14   
## .25 .50 .75 .90 .95   
## 16 18 23 31 39   
##   
## lowest : 8 9 10 11 12, highest: 65024 65025 65280 65281 65295  
## ---------------------------------------------------------------------------  
## Pack 1 temp (C)   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 189 1 19.9 3.776 13.3 15.5   
## .25 .50 .75 .90 .95   
## 17.6 20.2 21.8 24.5 25.4   
##   
## lowest : 8.7 8.9 9.1 9.2 9.5, highest: 28.0 28.1 28.2 28.3 28.4  
## ---------------------------------------------------------------------------  
## Pack 2 temp (C)   
## n missing distinct Info Mean Gmd .05 .10   
## 12319 168 195 1 19.03 3.803 12.5 14.6   
## .25 .50 .75 .90 .95   
## 16.8 19.4 21.1 23.6 24.5   
##   
## lowest : 7.6 7.8 8.0 8.2 8.3, highest: 27.2 27.3 27.4 27.6 27.7  
## ---------------------------------------------------------------------------  
## Pack 3 temp (C)   
## n missing distinct Info Mean Gmd .05 .10   
## 12296 191 181 1 18.61 3.635 12.3 14.5   
## .25 .50 .75 .90 .95   
## 16.4 19.0 20.7 22.8 23.7   
##   
## lowest : 7.7 8.0 8.1 8.3 8.5, highest: 25.8 25.9 26.0 26.1 26.2  
## ---------------------------------------------------------------------------  
## Pack 4 temp (C)   
## n missing distinct Info Mean Gmd .05 .10   
## 12296 191 171 1 17.8 3.568 11.38 13.80   
## .25 .50 .75 .90 .95   
## 15.50 18.20 20.00 21.90 22.60   
##   
## lowest : 7.6 7.7 7.8 7.9 8.1, highest: 24.7 24.8 24.9 25.0 25.1  
## ---------------------------------------------------------------------------  
## cp\_1   
## n missing distinct Info Mean Gmd .05 .10   
## 12349 138 732 1 3175 1505 -4008 3633   
## .25 .50 .75 .90 .95   
## 3848 3973 4032 4055 4078   
##   
## Value -4100 -4000 -3900 -3800 -3700 -3600 3500 3600 3700 3800  
## Frequency 275 580 211 124 28 3 1 25 366 1515  
## Proportion 0.022 0.047 0.017 0.010 0.002 0.000 0.000 0.002 0.030 0.123  
##   
## Value 3900 4000 4100 4300  
## Frequency 2340 5317 1563 1  
## Proportion 0.189 0.431 0.127 0.000  
## ---------------------------------------------------------------------------  
## cp\_2   
## n missing distinct Info Mean Gmd .05 .10   
## 12349 138 638 1 3585 822.4 3652 3777   
## .25 .50 .75 .90 .95   
## 3877 3984 4034 4061 4083   
##   
## Value -4000 -3500 3500 4000 25000  
## Frequency 564 24 432 11328 1  
## Proportion 0.046 0.002 0.035 0.917 0.000  
## ---------------------------------------------------------------------------  
## cp\_3   
## n missing distinct Info Mean Gmd .05 .10   
## 12349 138 745 1 3387 2370 -4010 -3830   
## .25 .50 .75 .90 .95   
## 3841 3971 4034 4061 4089   
##   
## Value -51000 -4000 0 4000 51000  
## Frequency 1 1411 2 10846 89  
## Proportion 0.000 0.114 0.000 0.878 0.007  
## ---------------------------------------------------------------------------  
## cp\_4   
## n missing distinct Info Mean Gmd .05 .10   
## 12349 138 698 1 3211 1445 -3993 3645   
## .25 .50 .75 .90 .95   
## 3846 3974 4032 4057 4080   
##   
## Value -4100 -4000 -3900 -3800 -3700 -3600 -500 0 500 3600  
## Frequency 179 624 195 112 12 1 1 2 89 24  
## Proportion 0.014 0.051 0.016 0.009 0.001 0.000 0.000 0.000 0.007 0.002  
##   
## Value 3700 3800 3900 4000 4100  
## Frequency 376 1548 2342 5221 1623  
## Proportion 0.030 0.125 0.190 0.423 0.131  
## ---------------------------------------------------------------------------  
## cp\_5   
## n missing distinct Info Mean Gmd .05 .10   
## 12349 138 821 1 3226 2282 -4016 -3855   
## .25 .50 .75 .90 .95   
## 3834 3965 4028 4051 4075   
##   
## lowest : -65295 -63247 -57615 -57102 -55055, highest: 60430 60686 60943 62991 65294  
## ---------------------------------------------------------------------------  
## cp\_6   
## n missing distinct Info Mean Gmd .05 .10   
## 12349 138 748 1 3657 1636 -3882 3749   
## .25 .50 .75 .90 .95   
## 3864 3978 4029 4052 4079   
##   
## lowest : -65295 -63503 -57615 -57358 -54031, highest: 61199 63503 64527 64783 65295  
## ---------------------------------------------------------------------------  
## cp\_7   
## n missing distinct Info Mean Gmd .05 .10   
## 12349 138 895 1 2403 3355 -4037 -4005   
## .25 .50 .75 .90 .95   
## 3743 3931 4023 4050 4073   
##   
## lowest : -65039 -57871 -57614 -55567 -49423, highest: 60942 61198 61455 63503 64783  
## ---------------------------------------------------------------------------  
## cp\_8   
## n missing distinct Info Mean Gmd .05 .10   
## 12349 138 794 1 3472 2000 -3967 3664   
## .25 .50 .75 .90 .95   
## 3846 3974 4030 4053 4085   
##   
## lowest : -41487 -4108 -4104 -4103 -4099, highest: 61198 61455 63759 64782 65039  
## ---------------------------------------------------------------------------  
## cp\_9   
## n missing distinct Info Mean Gmd .05 .10   
## 12349 138 775 1 3612 1667 -3901 3745   
## .25 .50 .75 .90 .95   
## 3862 3978 4030 4053 4084   
##   
## lowest : -65039 -63246 -61455 -56591 -55567, highest: 59918 60175 62223 63246 63503  
## ---------------------------------------------------------------------------  
## cp\_10   
## n missing distinct Info Mean Gmd .05 .10   
## 12349 138 676 1 3980 1149 3718 3792   
## .25 .50 .75 .90 .95   
## 3884 3987 4034 4061 4093   
##   
## lowest : -64784 -56591 -51983 -24847 -4112, highest: 60175 61199 63502 63759 64526  
## ---------------------------------------------------------------------------  
## cp\_11   
## n missing distinct Info Mean Gmd .05 .10   
## 12349 138 800 1 3659 1737 -3900 3744   
## .25 .50 .75 .90 .95   
## 3863 3982 4034 4057 4088   
##   
## lowest : -64014 -60943 -57359 -56335 -56078, highest: 60943 61967 64014 64271 65294  
## ---------------------------------------------------------------------------  
## cp\_12   
## n missing distinct Info Mean Gmd .05 .10   
## 12349 138 683 1 4026 1187 3726 3797   
## .25 .50 .75 .90 .95   
## 3887 3983 4030 4057 4090   
##   
## lowest : -65039 -56847 -4108 -4107 -4104, highest: 60175 62735 63502 63759 64782  
## ---------------------------------------------------------------------------  
## cp\_13   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 794 1 3632 1776 -3912 3736   
## .25 .50 .75 .90 .95   
## 3859 3974 4029 4052 4083   
##   
## lowest : -63503 -61455 -60431 -55823 -55310, highest: 62479 63502 63759 64526 65040  
## ---------------------------------------------------------------------------  
## cp\_14   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 761 1 3619 1750 -3915 3737   
## .25 .50 .75 .90 .95   
## 3859 3976 4030 4056 4083   
##   
## lowest : -64783 -61199 -58895 -58638 -55311, highest: 59662 63503 64526 64527 64783  
## ---------------------------------------------------------------------------  
## cp\_15   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 835 1 3229 2366 -4016 -3859   
## .25 .50 .75 .90 .95   
## 3833 3965 4025 4048 4075   
##   
## lowest : -64527 -62479 -61455 -56334 -55567, highest: 59918 60942 62223 64526 64783  
## ---------------------------------------------------------------------------  
## cp\_16   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 760 1 3572 1920 -3983 3706   
## .25 .50 .75 .90 .95   
## 3848 3970 4025 4052 4080   
##   
## lowest : -64782 -61455 -44047 -4107 -4104, highest: 61454 62479 63758 63759 64783  
## ---------------------------------------------------------------------------  
## cp\_17   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 728 1 3872 1364 3679 3782   
## .25 .50 .75 .90 .95   
## 3878 3983 4033 4057 4089   
##   
## lowest : -63246 -54031 -50703 -47375 -43791, highest: 62223 63246 63503 64526 65039  
## ---------------------------------------------------------------------------  
## cp\_18   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 710 1 3948 1270 3708 3786   
## .25 .50 .75 .90 .95   
## 3882 3982 4032 4056 4089   
##   
## lowest : -50703 -47119 -43791 -11791 -4112, highest: 62223 63246 63503 64526 64783  
## ---------------------------------------------------------------------------  
## cp\_19   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 730 1 3866 1371 3673 3782   
## .25 .50 .75 .90 .95   
## 3878 3986 4036 4061 4092   
##   
## lowest : -64526 -54287 -50959 -49679 -46351, highest: 61199 63502 63759 64526 65039  
## ---------------------------------------------------------------------------  
## cp\_20   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 704 1 3947 1277 3701 3785   
## .25 .50 .75 .90 .95   
## 3881 3985 4034 4061 4093   
##   
## lowest : -46095 -42767 -24079 -13327 -4112, highest: 62478 62479 63758 63759 64783  
## ---------------------------------------------------------------------------  
## cp\_21   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 660 1 4124 985 3750 3809   
## .25 .50 .75 .90 .95   
## 3891 3989 4035 4061 4094   
##   
## lowest : -49423 -4108 -4103 -4099 -4098, highest: 62479 63246 64526 64783 65039  
## ---------------------------------------------------------------------------  
## cp\_22   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 639 1 4119 1010 3750 3809   
## .25 .50 .75 .90 .95   
## 3891 3988 4036 4061 4093   
##   
## lowest : -49423 -4103 -4102 -4099 -4098, highest: 62223 63246 63503 64526 64784  
## ---------------------------------------------------------------------------  
## cp\_23   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 664 1 4117 1014 3743 3805   
## .25 .50 .75 .90 .95   
## 3887 3989 4039 4065 4097   
##   
## lowest : -51471 -4107 -4103 -4098 -4097, highest: 63247 63503 64014 64271 65294  
## ---------------------------------------------------------------------------  
## cp\_24   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 652 1 4070 1064 3738 3802   
## .25 .50 .75 .90 .95   
## 3886 3988 4036 4062 4095   
##   
## lowest : -64527 -55567 -51983 -26127 -4112, highest: 60942 61199 63759 64526 64783  
## ---------------------------------------------------------------------------  
## cp\_25   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 693 1 4082 1082 3735 3799   
## .25 .50 .75 .90 .95   
## 3887 3985 4034 4058 4091   
##   
## lowest : -4108 -4103 -4098 -4095 -4094, highest: 61455 63759 64015 64526 64783  
## ---------------------------------------------------------------------------  
## cp\_26   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 683 1 4025 1166 3723 3794   
## .25 .50 .75 .90 .95   
## 3883 3984 4031 4057 4090   
##   
## lowest : -56591 -27151 -4108 -4104 -4103, highest: 63759 64526 64527 64783 64784  
## ---------------------------------------------------------------------------  
## cp\_27   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 712 1 4019 1119 3708 3787   
## .25 .50 .75 .90 .95   
## 3874 3980 4030 4057 4088   
##   
## lowest : -56591 -45071 -29711 -27407 -4103, highest: 60942 62479 63503 64526 65039  
## ---------------------------------------------------------------------------  
## cp\_28   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 686 1 4074 1086 3714 3792   
## .25 .50 .75 .90 .95   
## 3875 3981 4029 4057 4089   
##   
## lowest : -4103 -4099 -4098 -4094 -4093, highest: 61198 61455 63759 64782 65039  
## ---------------------------------------------------------------------------  
## cp\_29   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 775 1 3785 1601 -3847 3761   
## .25 .50 .75 .90 .95   
## 3869 3980 4030 4057 4089   
##   
## lowest : -64526 -48398 -4104 -4099 -4095, highest: 63502 64015 64526 64783 65039  
## ---------------------------------------------------------------------------  
## cp\_30   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 678 1 4034 1141 3728 3796   
## .25 .50 .75 .90 .95   
## 3883 3981 4030 4057 4089   
##   
## lowest : -64782 -47630 -4103 -4099 -4098, highest: 60175 62735 63502 63759 65039  
## ---------------------------------------------------------------------------  
## cp\_31   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 716 1 4056 1201 3719 3794   
## .25 .50 .75 .90 .95   
## 3882 3984 4031 4058 4090   
##   
## lowest : -46094 -4107 -4103 -4099 -4092, highest: 62222 62735 63502 63759 65039  
## ---------------------------------------------------------------------------  
## cp\_32   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 691 1 4042 1178 3722 3793   
## .25 .50 .75 .90 .95   
## 3882 3983 4030 4057 4089   
##   
## lowest : -49679 -46350 -4107 -4104 -4103, highest: 60175 62478 62479 63758 63759  
## ---------------------------------------------------------------------------  
## cp\_33   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 685 1 4105 1118 3739 3798   
## .25 .50 .75 .90 .95   
## 3883 3980 4029 4053 4089   
##   
## lowest : -63502 -50959 -49679 -21775 -8719, highest: 62735 62991 63502 63759 65295  
## ---------------------------------------------------------------------------  
## cp\_34   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 677 1 4083 1101 3731 3797   
## .25 .50 .75 .90 .95   
## 3881 3982 4029 4056 4088   
##   
## lowest : -63502 -59918 -50959 -43791 -21519, highest: 61455 62735 63502 63759 65039  
## ---------------------------------------------------------------------------  
## cp\_35   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 706 1 4287 1512 3734 3795   
## .25 .50 .75 .90 .95   
## 3882 3979 4025 4053 4090   
##   
## lowest : -64526 -60942 -51983 -45071 -21519, highest: 62735 63502 63759 64526 65039  
## ---------------------------------------------------------------------------  
## cp\_36   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 759 1 4049 1970 -3808 3768   
## .25 .50 .75 .90 .95   
## 3869 3979 4030 4057 4094   
##   
## lowest : -62478 -49679 -22799 -12303 -4104, highest: 62990 63758 63759 64782 64783  
## ---------------------------------------------------------------------------  
## cp\_37   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 873 1 3566 2670 -4002 -3743   
## .25 .50 .75 .90 .95   
## 3841 3969 4030 4056 4084   
##   
## lowest : -63502 -62479 -59151 -58127 -56847, highest: 63502 64014 64015 64526 65039  
## ---------------------------------------------------------------------------  
## cp\_38   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 691 1 4265 1576 3729 3795   
## .25 .50 .75 .90 .95   
## 3883 3979 4025 4053 4088   
##   
## lowest : -50703 -36367 -23567 -12047 -5903, highest: 61966 63246 63503 64526 64783  
## ---------------------------------------------------------------------------  
## cp\_39   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 731 1 4238 1566 3727 3792   
## .25 .50 .75 .90 .95   
## 3883 3983 4029 4057 4094   
##   
## lowest : -63502 -49679 -38927 -35599 -24079, highest: 62222 62479 63502 64015 65039  
## ---------------------------------------------------------------------------  
## cp\_40   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 699 1 4268 1570 3730 3794   
## .25 .50 .75 .90 .95   
## 3884 3980 4026 4053 4090   
##   
## lowest : -51983 -50959 -48655 -13583 -7439, highest: 62990 63502 63759 64782 65039  
## ---------------------------------------------------------------------------  
## cp\_41   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 786 1 3977 2037 -3843 3760   
## .25 .50 .75 .90 .95   
## 3869 3980 4030 4057 4094   
##   
## lowest : -64526 -61454 -54287 -53007 -50959, highest: 62223 62479 63502 64526 65039  
## ---------------------------------------------------------------------------  
## cp\_42   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 769 1 3963 2075 -3861 3755   
## .25 .50 .75 .90 .95   
## 3867 3980 4030 4057 4094   
##   
## lowest : -64014 -63502 -52239 -50959 -47375, highest: 61454 62734 63502 63503 64783  
## ---------------------------------------------------------------------------  
## cp\_43   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 743 1 4228 1638 3717 3793   
## .25 .50 .75 .90 .95   
## 3883 3987 4034 4062 4094   
##   
## lowest : -64782 -64270 -55823 -53519 -50703, highest: 62735 63758 64015 64782 65039  
## ---------------------------------------------------------------------------  
## cp\_44   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 778 1 3972 2061 -3851 3758   
## .25 .50 .75 .90 .95   
## 3866 3984 4034 4062 4095   
##   
## lowest : -64526 -62734 -52239 -51215 -47631, highest: 61711 62734 62735 64014 64016  
## ---------------------------------------------------------------------------  
## cp\_45   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 781 1 3988 1944 -3705 3773   
## .25 .50 .75 .90 .95   
## 3873 3983 4034 4058 4093   
##   
## lowest : -62991 -55823 -55822 -53519 -52239, highest: 62734 62990 63502 64015 64782  
## ---------------------------------------------------------------------------  
## cp\_46   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 715 1 4138 1851 3678 3779   
## .25 .50 .75 .90 .95   
## 3878 3984 4030 4057 4095   
##   
## lowest : -43791 -32015 -4109 -4108 -4104, highest: 63502 63759 64782 64783 65039  
## ---------------------------------------------------------------------------  
## cp\_47   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 656 1 4385 1396 3750 3809   
## .25 .50 .75 .90 .95   
## 3889 3988 4034 4061 4094   
##   
## lowest : -43791 -32015 -4108 -4103 -4099, highest: 62478 62479 63502 64526 65039  
## ---------------------------------------------------------------------------  
## cp\_48   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 634 1 4392 1402 3750 3809   
## .25 .50 .75 .90 .95   
## 3890 3989 4036 4061 4094   
##   
## lowest : -45071 -33295 -4107 -4103 -4102, highest: 63502 63759 64782 64783 65039  
## ---------------------------------------------------------------------------  
## cp\_49   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 730 1 4034 1863 3683 3783   
## .25 .50 .75 .90 .95   
## 3886 3982 4033 4056 4089   
##   
## lowest : -65040 -61455 -55823 -55310 -53263, highest: 63758 64014 64015 64526 65039  
## ---------------------------------------------------------------------------  
## cp\_50   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 710 1 4033 1845 3684 3779   
## .25 .50 .75 .90 .95   
## 3883 3980 4025 4052 4087   
##   
## lowest : -63759 -56847 -56846 -54543 -53263, highest: 63759 64014 64782 64783 65039  
## ---------------------------------------------------------------------------  
## cp\_51   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 726 1 4046 1834 3693 3780   
## .25 .50 .75 .90 .95   
## 3883 3979 4026 4053 4089   
##   
## lowest : -62735 -56847 -56590 -54543 -53263, highest: 64014 64015 64526 64527 65039  
## ---------------------------------------------------------------------------  
## cp\_52   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 714 1 4038 1839 3686 3779   
## .25 .50 .75 .90 .95   
## 3883 3979 4026 4053 4088   
##   
## lowest : -63759 -57871 -57614 -54287 -53007, highest: 63502 63759 64015 64526 64783  
## ---------------------------------------------------------------------------  
## cp\_53   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 740 1 3937 2017 -3822 3773   
## .25 .50 .75 .90 .95   
## 3882 3983 4034 4057 4093   
##   
## lowest : -61199 -56591 -56078 -54031 -53007, highest: 62223 63246 63503 64526 64783  
## ---------------------------------------------------------------------------  
## cp\_54   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 742 1 3922 1998 -3823 3772   
## .25 .50 .75 .90 .95   
## 3878 3981 4030 4057 4094   
##   
## lowest : -64783 -61455 -55567 -55566 -53263, highest: 62478 62479 63758 63759 64782  
## ---------------------------------------------------------------------------  
## cp\_55   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 738 1 3929 1985 -3813 3773   
## .25 .50 .75 .90 .95   
## 3881 3979 4030 4057 4093   
##   
## lowest : -65039 -61455 -55567 -55566 -53263, highest: 62478 62735 63502 63759 64782  
## ---------------------------------------------------------------------------  
## cp\_56   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 742 1 3924 2031 -3833 3770   
## .25 .50 .75 .90 .95   
## 3879 3980 4029 4057 4090   
##   
## lowest : -64784 -61199 -55566 -55311 -54543, highest: 61454 62479 62734 63503 64783  
## ---------------------------------------------------------------------------  
## cp\_57   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 770 1 3891 2072 -3865 3765   
## .25 .50 .75 .90 .95   
## 3878 3978 4029 4055 4089   
##   
## lowest : -63759 -57871 -56334 -55567 -54287, highest: 62479 63502 63759 64526 64783  
## ---------------------------------------------------------------------------  
## cp\_58   
## n missing distinct Info Mean Gmd .05 .10   
## 12348 139 734 1 3909 2047 -3850 3769   
## .25 .50 .75 .90 .95   
## 3878 3978 4029 4057 4089   
##   
## lowest : -63759 -56847 -56846 -54543 -53263, highest: 62735 63502 63759 64782 65039  
## ---------------------------------------------------------------------------  
## cp\_59   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 741 1 3908 2088 -3862 3766   
## .25 .50 .75 .90 .95   
## 3877 3982 4033 4056 4093   
##   
## lowest : -63759 -57871 -56591 -56334 -54287, highest: 62479 63502 63759 64526 64783  
## ---------------------------------------------------------------------------  
## cp\_60   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 799 1 3674 2503 -3969 3703   
## .25 .50 .75 .90 .95   
## 3856 3974 4030 4057 4089   
##   
## lowest : -62479 -57871 -56591 -55566 -54287, highest: 62479 63758 63759 64782 64783  
## ---------------------------------------------------------------------------  
## cp\_61   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 754 1 3895 2129 -3886 3766   
## .25 .50 .75 .90 .95   
## 3877 3982 4033 4057 4092   
##   
## lowest : -62479 -56591 -56334 -54287 -53007, highest: 63502 63759 64526 64782 64783  
## ---------------------------------------------------------------------------  
## cp\_62   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 745 1 3870 2108 -3882 3764   
## .25 .50 .75 .90 .95   
## 3874 3976 4025 4052 4089   
##   
## lowest : -62479 -56591 -56334 -54287 -53007, highest: 63502 63759 64526 64527 64783  
## ---------------------------------------------------------------------------  
## cp\_63   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 749 1 3948 2261 -3883 3763   
## .25 .50 .75 .90 .95   
## 3874 3975 4025 4053 4089   
##   
## lowest : -65039 -62223 -57615 -57358 -55311, highest: 62223 63502 63503 64526 64783  
## ---------------------------------------------------------------------------  
## cp\_64   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 743 1 3916 2261 -3883 3761   
## .25 .50 .75 .90 .95   
## 3874 3975 4025 4053 4088   
##   
## lowest : -64015 -62735 -56847 -56846 -54543, highest: 63502 63758 63759 64783 65039  
## ---------------------------------------------------------------------------  
## cp\_65   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 636 1 4408 1537 3761 3810   
## .25 .50 .75 .90 .95   
## 3897 3988 4032 4062 4098   
##   
## lowest : -62223 -51983 -51726 -45839 -41231, highest: 63246 63502 64526 64783 65039  
## ---------------------------------------------------------------------------  
## cp\_66   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 738 1 4022 2138 -3772 3776   
## .25 .50 .75 .90 .95   
## 3883 3984 4031 4057 4095   
##   
## lowest : -65039 -64783 -61455 -55567 -55566, highest: 62479 63758 63759 64782 65038  
## ---------------------------------------------------------------------------  
## cp\_67   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 637 1 4434 1588 3760 3809   
## .25 .50 .75 .90 .95   
## 3897 3988 4034 4061 4099   
##   
## lowest : -61455 -49935 -49934 -42767 -14863, highest: 63759 64015 64782 65038 65039  
## ---------------------------------------------------------------------------  
## cp\_68   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 638 1 4446 1587 3760 3810   
## .25 .50 .75 .90 .95   
## 3897 3985 4034 4061 4098   
##   
## lowest : -61199 -51214 -45071 -15119 -4108, highest: 63504 63758 63760 64782 64783  
## ---------------------------------------------------------------------------  
## cp\_69   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 660 1 4427 1628 3753 3808   
## .25 .50 .75 .90 .95   
## 3892 3984 4033 4061 4094   
##   
## lowest : -57871 -51215 -47375 -46095 -28687, highest: 63502 63758 63759 64782 65040  
## ---------------------------------------------------------------------------  
## cp\_70   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 754 1 4031 2182 -3800 3774   
## .25 .50 .75 .90 .95   
## 3882 3978 4028 4056 4093   
##   
## lowest : -65040 -64016 -62736 -55567 -55566, highest: 63502 63758 64782 64783 65039  
## ---------------------------------------------------------------------------  
## cp\_71   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 749 1 4032 2172 -3808 3772   
## .25 .50 .75 .90 .95   
## 3879 3978 4028 4056 4090   
##   
## lowest : -57871 -57614 -55567 -54287 -50959, highest: 62479 63502 63758 64526 64783  
## ---------------------------------------------------------------------------  
## cp\_72   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 754 1 4024 2183 -3806 3771   
## .25 .50 .75 .90 .95   
## 3878 3979 4027 4053 4090   
##   
## lowest : -65040 -62479 -57871 -56591 -56590, highest: 62479 63758 64014 64782 64783  
## ---------------------------------------------------------------------------  
## cp\_73   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 778 1 3986 2209 -3833 3763   
## .25 .50 .75 .90 .95   
## 3872 3975 4026 4049 4087   
##   
## lowest : -64783 -57615 -57358 -55311 -53007, highest: 63246 63503 64526 64527 64783  
## ---------------------------------------------------------------------------  
## cp\_74   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 757 1 3983 2213 -3829 3764   
## .25 .50 .75 .90 .95   
## 3871 3975 4027 4050 4086   
##   
## lowest : -64784 -63759 -61199 -56591 -55311, highest: 63246 63503 64526 64782 64783  
## ---------------------------------------------------------------------------  
## cp\_75   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 759 1 3997 2206 -3829 3763   
## .25 .50 .75 .90 .95   
## 3872 3977 4027 4055 4088   
##   
## lowest : -65039 -62223 -56591 -56078 -53007, highest: 62223 63246 63502 64526 64783  
## ---------------------------------------------------------------------------  
## cp\_76   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 762 1 3979 2226 -3833 3764   
## .25 .50 .75 .90 .95   
## 3871 3976 4031 4054 4087   
##   
## lowest : -65039 -64015 -62735 -55567 -55566, highest: 61455 63502 63758 63759 64782  
## ---------------------------------------------------------------------------  
## cp\_77   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 703 1 4345 1739 3738 3800   
## .25 .50 .75 .90 .95   
## 3890 3983 4033 4064 4094   
##   
## lowest : -64015 -50190 -48655 -42767 -4111, highest: 62223 62478 63758 64015 65038  
## ---------------------------------------------------------------------------  
## cp\_78   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 687 1 4362 1733 3739 3801   
## .25 .50 .75 .90 .95   
## 3892 3986 4036 4064 4097   
##   
## lowest : -50190 -47887 -41999 -4115 -4110, highest: 62734 62991 63247 64271 65294  
## ---------------------------------------------------------------------------  
## cp\_79   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 777 1 3932 2287 -3875 3761   
## .25 .50 .75 .90 .95   
## 3875 3982 4036 4063 4096   
##   
## lowest : -64272 -63503 -61967 -55055 -54542, highest: 62734 63247 64014 64271 65294  
## ---------------------------------------------------------------------------  
## cp\_80   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 777 1 3975 2276 -3862 3764   
## .25 .50 .75 .90 .95   
## 3875 3981 4033 4059 4096   
##   
## lowest : -62224 -60687 -54799 -54542 -52495, highest: 64014 64015 64271 64527 65295  
## ---------------------------------------------------------------------------  
## cp\_81   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 730 1 4110 2069 3662 3780   
## .25 .50 .75 .90 .95   
## 3882 3983 4031 4057 4094   
##   
## lowest : -63247 -58639 -57359 -56846 -55055, highest: 62734 63247 64014 64272 65294  
## ---------------------------------------------------------------------------  
## cp\_82   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 731 1 4118 2072 3660 3782   
## .25 .50 .75 .90 .95   
## 3883 3984 4034 4061 4097   
##   
## lowest : -64271 -58639 -57870 -56079 -55055, highest: 63246 63247 64014 64272 65294  
## ---------------------------------------------------------------------------  
## cp\_83   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 735 1 4108 2094 3655 3779   
## .25 .50 .75 .90 .95   
## 3882 3983 4030 4057 4093   
##   
## lowest : -64527 -63247 -57103 -56590 -54799, highest: 62478 63247 63502 64782 64783  
## ---------------------------------------------------------------------------  
## cp\_84   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 723 1 4121 2041 3677 3784   
## .25 .50 .75 .90 .95   
## 3884 3984 4034 4062 4095   
##   
## lowest : -64527 -62991 -57359 -56846 -54799, highest: 62991 64014 64271 65294 65295  
## ---------------------------------------------------------------------------  
## cp\_85   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 727 1 4090 2096 3580 3778   
## .25 .50 .75 .90 .95   
## 3880 3977 4028 4054 4087   
##   
## lowest : -65039 -63759 -57871 -56591 -56334, highest: 63502 63758 63759 64527 64784  
## ---------------------------------------------------------------------------  
## cp\_86   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 770 1 3954 2522 -3921 3728   
## .25 .50 .75 .90 .95   
## 3864 3976 4033 4060 4089   
##   
## lowest : -7183 -4106 -4102 -4101 -4097, highest: 63502 63503 64526 64783 65039  
## ---------------------------------------------------------------------------  
## cp\_87   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 619 1 4502 1551 3761 3810   
## .25 .50 .75 .90 .95   
## 3894 3982 4032 4059 4091   
##   
## lowest : -8463 -4105 -4102 -4097 -4092, highest: 63758 63759 64526 64783 65039  
## ---------------------------------------------------------------------------  
## cp\_88   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 791 1 3882 2485 -3912 3741   
## .25 .50 .75 .90 .95   
## 3866 3977 4031 4059 4091   
##   
## lowest : -65295 -63759 -56847 -56846 -55567, highest: 62735 63502 63758 64782 65039  
## ---------------------------------------------------------------------------  
## cp\_89   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 761 1 4040 2161 -3794 3776   
## .25 .50 .75 .90 .95   
## 3884 3981 4032 4059 4092   
##   
## lowest : -64272 -62223 -60687 -59406 -54542, highest: 62991 64014 64271 65294 65295  
## ---------------------------------------------------------------------------  
## cp\_90   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 734 1 4061 2184 -3799 3777   
## .25 .50 .75 .90 .95   
## 3882 3982 4033 4056 4093   
##   
## lowest : -63503 -63247 -60430 -58639 -58126, highest: 62223 62734 64014 64527 65038  
## ---------------------------------------------------------------------------  
## cp\_91   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 749 1 4050 2164 -3782 3776   
## .25 .50 .75 .90 .95   
## 3883 3981 4032 4059 4093   
##   
## lowest : -63503 -61967 -59150 -57359 -56846, highest: 63246 63247 64014 64271 65294  
## ---------------------------------------------------------------------------  
## cp\_92   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 635 1 4474 1648 3761 3810   
## .25 .50 .75 .90 .95   
## 3896 3985 4032 4062 4098   
##   
## lowest : -60430 -51471 -32527 -12559 -4104, highest: 62734 64271 64272 65294 65295  
## ---------------------------------------------------------------------------  
## cp\_93   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 734 1 4190 1991 3709 3787   
## .25 .50 .75 .90 .95   
## 3886 3980 4028 4056 4093   
##   
## lowest : -63247 -62991 -57359 -56846 -54799, highest: 62991 64270 64271 65038 65039  
## ---------------------------------------------------------------------------  
## cp\_94   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 718 1 4207 2019 3709 3787   
## .25 .50 .75 .90 .95   
## 3886 3982 4030 4056 4094   
##   
## lowest : -65039 -62223 -57615 -56591 -56078, highest: 62223 63503 64526 64782 64783  
## ---------------------------------------------------------------------------  
## cp\_95   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 722 1 4219 2023 3708 3786   
## .25 .50 .75 .90 .95   
## 3886 3984 4032 4059 4094   
##   
## lowest : -63248 -61967 -56079 -55822 -53775, highest: 64014 64270 64271 65294 65295  
## ---------------------------------------------------------------------------  
## cp\_96   
## n missing distinct Info Mean Gmd .05 .10   
## 12347 140 764 1 4156 2319 -3788 3762   
## .25 .50 .75 .90 .95   
## 3869 3979 4034 4064 4087   
##   
## lowest : -4066 -4061 -4059 -4055 -4053, highest: 62735 63502 63759 64782 65038  
## ---------------------------------------------------------------------------  
## 12V battery (amps)   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 125 0.984 1.622 1.963 -1.586 -1.586   
## .25 .50 .75 .90 .95   
## 1.113 1.359 2.094 3.078 3.812   
##   
## lowest : -10.910156 -7.718750 -7.226562 -6.984375 -6.492188  
## highest: 29.085938 29.574219 29.820312 39.882812 40.617188  
## ---------------------------------------------------------------------------  
## Hx   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 94 0.996 50.78 4.455 50.33 50.37   
## .25 .50 .75 .90 .95   
## 50.39 50.49 50.53 50.60 50.62   
##   
## lowest : 0.00000 10.49805 12.99805 20.49805 22.99805  
## highest: 605.49805 610.49805 615.49805 620.49805 625.49805  
## ---------------------------------------------------------------------------  
## VIN   
## n missing distinct   
## 12324 163 2   
##   
## Value ZE0-003619 ZE0-003619003619  
## Frequency 12323 1  
## Proportion 1 0  
## ---------------------------------------------------------------------------  
## 12V battery (volts)   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 37 0.468 12.83 0.5522 12.08 12.24   
## .25 .50 .75 .90 .95   
## 12.96 12.96 12.96 12.96 14.32   
##   
## lowest : 0.00 11.68 11.76 11.84 11.92, highest: 14.32 14.40 14.48 14.64 14.72  
## ---------------------------------------------------------------------------  
## 12V battery (dashboard)   
## n missing distinct Info Mean Gmd   
## 12487 0 1 0 0 0   
##   
## Value 0  
## Frequency 12487  
## Proportion 1  
## ---------------------------------------------------------------------------  
## ACC (V)   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 258 0.992 12.74 1.122 11.86 12.04   
## .25 .50 .75 .90 .95   
## 12.82 12.85 12.87 12.91 14.16   
##   
## Value 0.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5 16.0 31.5  
## Frequency 232 182 1245 38 10021 25 424 280 1 1  
## Proportion 0.019 0.015 0.100 0.003 0.803 0.002 0.034 0.022 0.000 0.000  
##   
## Value 34.0 35.0 60.0 63.0 64.0  
## Frequency 1 1 1 1 34  
## Proportion 0.000 0.000 0.000 0.000 0.003  
## ---------------------------------------------------------------------------  
## ODO   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 1684 0.594 14018 20805 0 0   
## .25 .50 .75 .90 .95   
## 0 0 53114 54291 54577   
##   
## Value 0 53000 53500 54000 54500 55000  
## Frequency 9247 346 772 833 1045 244  
## Proportion 0.741 0.028 0.062 0.067 0.084 0.020  
## ---------------------------------------------------------------------------  
## SOH   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 39 0.996 71.5 1.722 72.17 72.20   
## .25 .50 .75 .90 .95   
## 72.22 72.31 72.38 72.41 72.45   
##   
## Value 0.0 72.0 72.2 72.4 72.6 72.8  
## Frequency 141 8 5376 6612 55 295  
## Proportion 0.011 0.001 0.431 0.530 0.004 0.024  
## ---------------------------------------------------------------------------  
## SOH (version 2)   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 61 0.997 68.94 6.562 57.92 72.17   
## .25 .50 .75 .90 .95   
## 72.22 72.31 72.38 72.44 72.53   
##   
## Value 0.0 51.6 51.8 72.0 72.2 72.4 72.6 72.8  
## Frequency 568 22 35 6 4966 6217 378 295  
## Proportion 0.045 0.002 0.003 0.000 0.398 0.498 0.030 0.024  
## ---------------------------------------------------------------------------  
## ambient\_temp\_1   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 20 0.99 13.03 4.273 6 7   
## .25 .50 .75 .90 .95   
## 11 14 16 17 18   
##   
## Value 0 4 5 6 7 8 9 10 11 12  
## Frequency 104 278 24 239 730 414 806 265 985 1057  
## Proportion 0.008 0.022 0.002 0.019 0.058 0.033 0.065 0.021 0.079 0.085  
##   
## Value 13 14 15 16 17 18 19 20 21 22  
## Frequency 687 2145 1011 1231 1516 462 433 53 44 3  
## Proportion 0.055 0.172 0.081 0.099 0.121 0.037 0.035 0.004 0.004 0.000  
## ---------------------------------------------------------------------------  
## cabin\_temp\_1   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 37 0.567 178.6 54.27 66 70   
## .25 .50 .75 .90 .95   
## 214 214 214 214 214   
##   
## lowest : 0 51 52 53 54, highest: 82 83 84 85 214  
## ---------------------------------------------------------------------------  
## cabin\_temp\_2   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 37 0.567 178.6 54.27 66 70   
## .25 .50 .75 .90 .95   
## 214 214 214 214 214   
##   
## lowest : 0 51 52 53 54, highest: 82 83 84 85 214  
## ---------------------------------------------------------------------------  
## QC count   
## n missing distinct Info Mean Gmd   
## 12487 0 9 0.911 169.5 5.754   
##   
## Value 0 168 169 170 171 172 173 174 175  
## Frequency 104 2055 5046 1 370 859 416 357 3279  
## Proportion 0.008 0.165 0.404 0.000 0.030 0.069 0.033 0.029 0.263  
## ---------------------------------------------------------------------------  
## L1/L2 count   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 89 0.999 1937 64.95 1913 1916   
## .25 .50 .75 .90 .95   
## 1924 1950 1979 1994 1999   
##   
## Value 0 1910 1915 1920 1925 1930 1935 1940 1945 1950  
## Frequency 104 429 1174 1060 855 465 712 633 369 614  
## Proportion 0.008 0.034 0.094 0.085 0.068 0.037 0.057 0.051 0.030 0.049  
##   
## Value 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000  
## Frequency 320 560 586 631 773 581 741 337 792 751  
## Proportion 0.026 0.045 0.047 0.051 0.062 0.047 0.059 0.027 0.063 0.060  
## ---------------------------------------------------------------------------  
## Charger (amps)   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 15 0.863 11.77 6.06 0.00 0.00   
## .25 .50 .75 .90 .95   
## 0.00 15.62 15.62 15.62 15.69   
##   
## Value 0.0000 15.5000 15.5625 15.6250 15.6875 15.7500 15.8125 15.8750  
## Frequency 3138 19 2128 6089 835 30 33 98  
## Proportion 0.251 0.002 0.170 0.488 0.067 0.002 0.003 0.008  
##   
## Value 15.9375 16.0000 16.0625 16.1250 16.1875 33.3750 33.4375  
## Frequency 35 6 2 17 2 8 47  
## Proportion 0.003 0.000 0.000 0.001 0.000 0.001 0.004  
## ---------------------------------------------------------------------------  
## Charger (V)   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 144 0.986 153 111.9 1.055 1.055   
## .25 .50 .75 .90 .95   
## 1.055 238.742 241.164 242.539 243.242   
##   
## lowest : 0.000000 1.054688 1.562500 2.250000 3.976562  
## highest: 248.406250 248.585938 249.093750 249.273438 249.445312  
## ---------------------------------------------------------------------------  
## h\_volt\_1   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 3444 1 373.6 25.54 359.5 365.1   
## .25 .50 .75 .90 .95   
## 373.3 382.4 387.0 389.4 392.2   
##   
## Value 0 5 60 80 170 245 335 340 345 350  
## Frequency 232 1 1 1 1 1 1 1 10 48  
## Proportion 0.019 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.001 0.004  
##   
## Value 355 360 365 370 375 380 385 390 395 655  
## Frequency 191 398 864 1185 1458 1902 3605 1996 555 36  
## Proportion 0.015 0.032 0.069 0.095 0.117 0.152 0.289 0.160 0.044 0.003  
## ---------------------------------------------------------------------------  
## Motor temp   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 76 0.999 53.65 24.56 19 22   
## .25 .50 .75 .90 .95   
## 30 64 71 77 80   
##   
## lowest : 0 10 11 12 13, highest: 88 89 90 91 92  
## ---------------------------------------------------------------------------  
## inverter\_2 temp   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 67 0.999 48.67 23.41 15 18   
## .25 .50 .75 .90 .95   
## 25 61 66 70 72   
##   
## lowest : 0 8 9 10 11, highest: 81 82 83 84 86  
## ---------------------------------------------------------------------------  
## inverter\_4 temp   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 65 0.999 49.87 24.15 15 19   
## .25 .50 .75 .90 .95   
## 26 61 67 72 76   
##   
## lowest : 0 6 7 8 9, highest: 78 79 80 81 82  
## ---------------------------------------------------------------------------  
## motor\_amp (1)   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 551 0.491 284.2 526.4 0 0   
## .25 .50 .75 .90 .95   
## 0 0 0 149 4015   
##   
## lowest : 0 1 2 3 4, highest: 4091 4092 4093 4094 4095  
## ---------------------------------------------------------------------------  
## motor\_amp (2)   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 410 0.488 284.1 526.3 0 0   
## .25 .50 .75 .90 .95   
## 0 0 0 149 4045   
##   
## Value 0 50 100 150 200 250 300 350 400 450  
## Frequency 10176 478 433 249 139 73 49 16 14 11  
## Proportion 0.815 0.038 0.035 0.020 0.011 0.006 0.004 0.001 0.001 0.001  
##   
## Value 500 550 600 4000 4050 4100  
## Frequency 11 6 5 5 646 176  
## Proportion 0.001 0.000 0.000 0.000 0.052 0.014  
## ---------------------------------------------------------------------------  
## throttle   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 101 0.365 4.664 8.433 0 0   
## .25 .50 .75 .90 .95   
## 0 0 0 21 38   
##   
## lowest : 0 1 2 3 4, highest: 127 128 133 146 199  
## ---------------------------------------------------------------------------  
## target\_regen\_braking\_1   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 175 0.086 12.11 23.86 0 0   
## .25 .50 .75 .90 .95   
## 0 0 0 0 0   
##   
## lowest : 0 2 6 10 14, highest: 1234 1242 1246 1250 1258  
## ---------------------------------------------------------------------------  
## target\_regen\_braking\_2   
## n missing distinct Info Mean Gmd .05 .10   
## 12487 0 354 0.163 53.24 103.3 0 0   
## .25 .50 .75 .90 .95   
## 0 0 0 0 112   
##   
## lowest : 0 4 8 12 16, highest: 3516 3632 3792 4088 4092  
## ---------------------------------------------------------------------------  
## rDate   
## n missing distinct   
## 11327 1160 39   
##   
## lowest : 2018-05-01 2018-05-02 2018-05-03 2018-05-04 2018-05-05  
## highest: 2018-06-07 2018-06-08 2018-06-09 2018-06-10 2018-06-11  
## ---------------------------------------------------------------------------  
## rTime [secs]   
## n missing distinct   
## 11327 1160 8903   
##   
## lowest : 00:00:36 00:00:37 00:00:38 00:01:04 00:01:16  
## highest: 23:58:54 23:59:07 23:59:35 23:59:40 23:59:51  
## ---------------------------------------------------------------------------  
## rDateTime   
## n missing distinct   
## 11327 1160 10129   
## Info Mean Gmd   
## 1 2018-05-20 04:32:05 1970-01-15 13:45:49   
## .05 .10 .25   
## 2018-05-03 01:07:04 2018-05-04 23:15:22 2018-05-08 03:57:40   
## .50 .75 .90   
## 2018-05-18 02:16:05 2018-06-02 03:58:09 2018-06-08 01:36:18   
## .95   
## 2018-06-09 02:40:57   
##   
## lowest : 2018-05-01 12:42:27 2018-05-01 12:43:08 2018-05-01 12:44:16 2018-05-01 12:44:30 2018-05-01 12:45:53  
## highest: 2018-06-11 09:37:30 2018-06-11 09:38:13 2018-06-11 09:38:56 2018-06-11 09:39:45 2018-06-11 09:40:28  
## ---------------------------------------------------------------------------

## Using codebook

## name data\_type missing complete n empty  
## 1 Time after power on (s) integer 0 12487 12487 <NA>  
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## 3 Time (GPS) difftime 1160 11327 12487 <NA>  
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## 5 Speed (GPS) numeric 12 12475 12487 <NA>  
## 6 Speed (Speedometer) numeric 0 12487 12487 <NA>  
## 7 GIDs integer 0 12487 12487 <NA>  
## 8 SOC numeric 0 12487 12487 <NA>  
## 9 AHr numeric 0 12487 12487 <NA>  
## 10 Pack volts numeric 0 12487 12487 <NA>  
## 11 Pack amps numeric 0 12487 12487 <NA>  
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## 13 min\_cp (mV) integer 138 12349 12487 <NA>  
## 14 avg\_cp (mV) integer 138 12349 12487 <NA>  
## 15 cp\_diff (mV) integer 138 12349 12487 <NA>  
## 16 Pack 1 temp (C) numeric 139 12348 12487 <NA>  
## 17 Pack 2 temp (C) numeric 168 12319 12487 <NA>  
## 18 Pack 3 temp (C) numeric 191 12296 12487 <NA>  
## 19 Pack 4 temp (C) numeric 191 12296 12487 <NA>  
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## 134 inverter\_2 temp integer 0 12487 12487 <NA>  
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## 8 42.41 60 74.56 95.53 ▁▂▃▆▆▇▇▃ NULL  
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# Runtime

Analysis completed in 22.77 seconds ( 0.38 minutes) using [knitr](https://cran.r-project.org/package=knitr) in [RStudio](http://www.rstudio.com) with R version 3.5.0 (2018-04-23) running on x86\_64-apple-darwin15.6.0.

# R environment

R packages used:

* base R - for the basics (R Core Team 2016)
* data.table - for fast (big) data handling (Dowle et al. 2015)
* lubridate - date manipulation (Grolemund and Wickham 2011)
* ggplot2 - for slick graphics (Wickham 2009)
* readr - for csv reading/writing (Wickham, Hester, and Francois 2016)
* skimr - for skim (Arino de la Rubia et al. 2017)
* knitr - to create this document & neat tables (Xie 2016)
* nzGREENGrid - for local NZ GREEN Grid project utilities

Session info:

## R version 3.5.0 (2018-04-23)  
## Platform: x86\_64-apple-darwin15.6.0 (64-bit)  
## Running under: macOS High Sierra 10.13.5  
##   
## Matrix products: default  
## BLAS: /Library/Frameworks/R.framework/Versions/3.5/Resources/lib/libRblas.0.dylib  
## LAPACK: /Library/Frameworks/R.framework/Versions/3.5/Resources/lib/libRlapack.dylib  
##   
## locale:  
## [1] en\_GB.UTF-8/en\_GB.UTF-8/en\_GB.UTF-8/C/en\_GB.UTF-8/en\_GB.UTF-8  
##   
## attached base packages:  
## [1] stats graphics grDevices utils datasets methods base   
##   
## other attached packages:  
## [1] bindrcpp\_0.2.2 knitr\_1.20 skimr\_1.0.3   
## [4] Hmisc\_4.1-1 Formula\_1.2-3 survival\_2.42-3   
## [7] lattice\_0.20-35 readr\_1.1.1 lubridate\_1.7.4   
## [10] ggplot2\_2.2.1 dplyr\_0.7.5 data.table\_1.11.4  
## [13] nzGREENGrid\_0.1.0  
##   
## loaded via a namespace (and not attached):  
## [1] progress\_1.2.0 tidyselect\_0.2.4 xfun\_0.1   
## [4] reshape2\_1.4.3 purrr\_0.2.5 splines\_3.5.0   
## [7] colorspace\_1.3-2 htmltools\_0.3.6 yaml\_2.1.19   
## [10] base64enc\_0.1-3 rlang\_0.2.1 pillar\_1.2.3   
## [13] foreign\_0.8-70 glue\_1.2.0 RColorBrewer\_1.1-2   
## [16] bindr\_0.1.1 plyr\_1.8.4 stringr\_1.3.1   
## [19] munsell\_0.5.0 gtable\_0.2.0 htmlwidgets\_1.2   
## [22] evaluate\_0.10.1 latticeExtra\_0.6-28 htmlTable\_1.12   
## [25] Rcpp\_0.12.17 acepack\_1.4.1 checkmate\_1.8.5   
## [28] backports\_1.1.2 scales\_0.5.0 gridExtra\_2.3   
## [31] hms\_0.4.2 digest\_0.6.15 codebook\_0.5.9   
## [34] stringi\_1.2.3 bookdown\_0.7 grid\_3.5.0   
## [37] rprojroot\_1.3-2 tools\_3.5.0 magrittr\_1.5   
## [40] lazyeval\_0.2.1 tibble\_1.4.2 cluster\_2.0.7-1   
## [43] tidyr\_0.8.1 crayon\_1.3.4 pkgconfig\_2.0.1   
## [46] Matrix\_1.2-14 prettyunits\_1.0.2 assertthat\_0.2.0   
## [49] rmarkdown\_1.10 rstudioapi\_0.7 R6\_2.2.2   
## [52] rpart\_4.1-13 nnet\_7.3-12 compiler\_3.5.0

# References

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Dowle, M, A Srinivasan, T Short, S Lianoglou with contributions from R Saporta, and E Antonyan. 2015. *Data.table: Extension of Data.frame*. <https://CRAN.R-project.org/package=data.table>.

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