Populations, Activity and Emissions of Diesel Nonroad Equipment in EPA Region 7

PAMs Summary Stats and Data Dictionary Appendix X

Assessment and Standards Division
Office of Transportation and Air Quality
U.S. Environmental Protection Agency

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Equip_ID	Equipment Type	Equipment Manufacturer	Engine Mfr	Install Date	Remove Date	RPM Types	N days in data	N events	Observations with:	N obs of equipment "on" data	N obs of equipment "off" data	Total observations
1437_0399	Skidsteer loader	Bobcat	Deutz	6/7/2007	7/25/2007	Optical and Capelec	13	122		60,487	29,439	89,926
									Both RPM = 0	52	25,176	
									Invalid Dates	0	0	
									Install/Remove Day	0	0	
									ERG Visit Day	3,864	1,184	
1437_1396	Skidsteer loader	Bobcat	Kabota	6/9/2007	7/25/2007	Optical and Capelec	31	296		170,759	570,303	741,062
									Both RPM = 0	45	17,174	
									Invalid Dates	0	6	
									Install/Remove Day	1,383	2,920	
									ERG Visit Day	9,329	87,876	
1688_0216	Horizontal Boring Machine	Vermeer	Catepillar	6/8/2007	7/26/2007	Optical and Capelec	28	125		275,491	104,817	380,308
									Both RPM = 0	8	7,303	
									Invalid Dates	0	0	
									Install/Remove Day	4,698	94	
									ERG Visit Day	15,374	44,281	
1688_1462	Horizontal Boring Machine	Vermeer	Cummins	6/8/2007	7/26/2007	Optical and Capelec	32	164		198,011	892,803	1,090,814
									Both RPM = 0	12,561	496	
									Invalid Dates	0	0	
									Install/Remove Day	0	0	
									ERG Visit Day	17,131	209,875	
1911_9540	Concrete Saw	Core Cut	Deutz	6/19/2007	7/3/2007	Optical and Equipment	13	249		117,615	739,921	857,536
									Both RPM = 0	0	737,855	
									Invalid Dates	367	0	
									Install/Remove Day	0	38,065	
									ERG Visit Day	27,439	140,689	
2208_1918	Backhoe	John Deere	John Deere	6/10/2007	7/25/2007	Optical and Capelec	26	66		111,671	827,277	938,948
									Both RPM = 0	117	237,977	
									Invalid Dates	0	0	
									Install/Remove Day	2	0	
									ERG Visit Day	17,685	67,185	
1911_1916	Tracked Loader	Bobcat	Kubota	6/11/2007	7/3/2007	Optical and Magnetic	14	210		60,331	0	60,331
									Both RPM = 0	0	0	
									Invalid Dates	0	0	
									Install/Remove Day	2,372	0	
									ERG Visit Day	10,965	0	

Equip_ID	Equipment Type	Equipment Manufacturer	Engine Manufacturer	Install Date	Remove Date	RPM Types	Datalogger type	N days in data	N events	Total observations	Observations with:	
2535_2754	Backhoe	Case	Case	10/6/2007	10/29/2007	Optical	Corsa	18	202	117,949		
											Both RPM = 0	N/A
											RPM too High (> 6000)	1,262
											Invalid Dates	0
											Install/Remove Day	8,876
											ERG Visit Day	161
2535_9216	Backhoe	Case	Case	9/17/2007	10/29/2007	Optical	Isaac	21	100	52,081		
											Both RPM = 0	N/A
											RPM too High (> 6000)	1
											Invalid Dates	0
											Install/Remove Day	0
											ERG Visit Day	12,213
3597_095K	Asphalt Roller	Hyster	Unk	9/10/2007	10/27/2007	Optical and Capelec	Corsa	20	210	106,090		
											Both RPM = 0	364
											RPM too High (> 6000)	0
											Invalid Dates	0
											Install/Remove Day	0
											ERG Visit Day	26,223
3702_9726	Fork Truck	Skytrak	Cummins	9/15/2007	10/29/2007	Optical and Capelec	Isaac	39	838	135,289		
											Both RPM = 0	
											RPM too High (> 6000)	0
											Invalid Dates	0
											Install/Remove Day	5,140
											ERG Visit Day	3,239
3854_9162	Forklift	Case	Case	9/12/2007	10/25/2007	Optical	Corsa	10	174	17,763		
											Both RPM = 0	N/A
											RPM too High (> 6000)	15
											Invalid Dates	0
											Install/Remove Day	0
											ERG Visit Day	208
3858_1482	Crawler Dozer	Caterpillar	Caterpillar	9/16/2007	10/25/2007	Optical and Capelec	Isaac	30	209	273,884		
											Both RPM = 0	17,084
											RPM too High (> 6000)	651
											Invalid Dates	0
											Install/Remove Day	443
											ERG Visit Day	37,293
3858_5754	Backhoe	Case	Case	9/15/2007	10/25/2007	Optical	Isaac	35	1100	364,125		
											Both RPM = 0	N/A
											RPM too High (> 6000)	0
											Invalid Dates	0
											Install/Remove Day	0
											ERG Visit Day	31,697
3868_0304	Crane	Grove	Cummins	9/13/2007	10/26/2007	Optical	Corsa	6	16	20,429		
											Both RPM = 0	N/A
											RPM too High (> 6000)	0
											Invalid Dates	0
											Install Day	1
											ERG Visit Day	2,001
3868_8720	Forklift Truck	Ingersoll-Rand	Perkins	9/19/2007	10/26/2007	Optical	Corsa	N/A	307	155,959		
											Both RPM = 0	N/A
											RPM too High (> 6000)	0
											Invalid Dates	155,959
											Install Day	N/A
											ERG Visit Day	N/A
3928_1649	Forklift	Lull	Cummins	9/11/2007	10/29/2007	Optical	Corsa	15	181	96,118		
											Both RPM = 0	N/A
											RPM too High (> 6000)	175
											Invalid Dates	1
											Install Day	6
											ERG Visit Day	358

Equip_ID	Equipment Type	Equipment Manufacturer	Engine Manufacturer	Install Date	Remove Date	RPM Types	Datalogger type	N days in data	N events	Total observations	Observations with:	
0062_0934	Track Dozer	Caterpillar	Caterpillar	8/11/2008	9/16/2008	Optical	Corsa	22	220	293,506		
											Both RPM = 0	N/A
											RPM too High (> 6000)	67
											Invalid Dates	0
											Install/Remove Day	5,723
											ERG Visit Day	0
0062_6976	Backhoe	John Deere	John Deere	8/11/2008	9/16/2008	Optical	Isaac	22	388	162,277		
											Both RPM = 0	N/A
											RPM too High (> 6000)	0
											Invalid Dates	0
											Install/Remove Day	2,232
											ERG Visit Day	0
0229_0045	Backhoe Loader	John Deere	John Deere	7/11/2008	8/8/2008	Optical	Corsa	20	75	60,184		
											Both RPM = 0	N/A
											RPM too High (> 6000)	1
											Invalid Dates	0
											Install/Remove Day	3,391
											ERG Visit Day	5,670
0229_3781	Excavator	Case	Case	7/8/2008	8/8/2008	Optical	Corsa	23	35	22,143		
											Both RPM = 0	N/A
											RPM too High (> 6000)	0
											Invalid Dates	0
											Install/Remove Day	115
											ERG Visit Day	5,379
0349_0567	Excavator	Caterpillar	Caterpillar	8/14/2008	9/16/2008	Optical	Corsa	18	133	94,368		
											Both RPM = 0	N/A
											RPM too High (> 6000)	0
											Invalid Dates	0
											Install/Remove Day	1,278
											ERG Visit Day	0
8542_1271	Compact Track Excavator	Ingersol Rand Bobcat	Kubota	7/10/2008	8/9/2008	Optical	Isaac	10	64	48,033		
											Both RPM = 0	N/A
											RPM too High (> 6000)	0
											Invalid Dates	0
											Install/Remove Day	514
											ERG Visit Day	0
8555_2757	Compact skid steer loader	Ingersol Rand Bobcat	Kubota	7/7/2008	8/7/2008	Optical	Corsa	11	67	39,961		
											Both RPM = 0	N/A
											RPM too High (> 6000)	0
											Invalid Dates	0
											Install/Remove Day	1,197
											ERG Visit Day	14,805
8597_0194	Compact Track Loader	Ingersol Rand Bobcat	Kubota	7/10/2008	8/9/2008	Optical	Corsa	20	233	109,695		
											Both RPM = 0	N/A
											RPM too High (> 6000)	0
											Invalid Dates	0
											Install/Remove Day	569
											ERG Visit Day	0
8597_1096	Compact Track Excavator	Ingersol Rand Bobcat	Kubota	7/9/2008	8/9/2008	Optical	Isaac	32	268	2,671,732	All RPM values are unreliable for this installation (99% have RPM=0).	
											Both RPM = 0	N/A
											RPM too High (> 6000)	47

Equip_ID	Equipment Type	Equipment Manufacturer	Engine Manufacturer	Install Date	Remove Date	RPM Types	Datalogger type	N days in data	N events	Total observations	Observations with:	
											Invalid Dates	0
											Install/Remove Day	80,398
											ERG Visit Day	86,330
9429_0323	Directional Boring Machine	Ditch Witch	Cummins	8/12/2008	9/18/2008	Optical	Isaac	19	329	173,294		
											Both RPM = 0	N/A
											RPM too High (> 6000)	0
											Invalid Dates	0
											Install/Remove Day	10,807
											ERG Visit Day	164
9429_7232	Backhoe	Caterpillar	Caterpillar	8/12/2008	9/16/2008	Optical	Corsa	18	278	162,877		
											Both RPM = 0	N/A
											RPM too High (> 6000)	0
											Invalid Dates	0
											Install/Remove Day	15,903
											ERG Visit Day	6,254
9679_6459	Skid steer loader	New Holland	Ishkawajima Machinery	8/13/2008	9/17/2008	Optical	Isaac	27	438	198,586		
											Both RPM = 0	N/A
											RPM too High (> 6000)	17
											Invalid Dates	0
											Install/Remove Day	8,009
											ERG Visit Day	4,915

PAMS Datalogger Installations
Data Dictionary

Variable Name	Format	Description
equip	Character	This is the unique identifier for the installation. The first four digits are the establishment ID number, and the last four digits are the last four digits of the equipment's serial number. An example value for equip is "3702_9216".
Original Datetime	Character	This is the date and time of the observation (unique row of data in the raw data) as originally read in from the raw data files. For the CORSA dataloggers, this was in a subsecond format, and for some of the data, there is more than one observation in a second.
evnt_datetime	Datetime18.	This is the date and time of the observation collected to the second. When the original_datetime was read in, the value was truncated to the second. (For example, datetimes with the times of 10:15:32.001 and 10:15:32.954 would both be truncated to 10:15:32.).
Hour of day	Numeric 8.	This is the hour of day calculated from the datetime of the observation. Doing a frequency distribution of this variable will show the percentage of time that the equipment was operated at different hours of the day.
ERG_RPM	Numeric 8.	This is the value of the RPM that was collected for the observation. If 2 RPMs were collected, ERG chose the value believed to be closest to the "true" RPM value (based on validity checks described below). If no RPM values appear to be valid, this field was given a null (".") value.
supply_voltage	Numeric 8.	This is the value of the supply voltage from the engine, as measured by the PAMS.
tripnum	Integer	This is the count of the "trip" number for the data file. Trips are incremented by engine off/on episodes, even if two episodes are only a few seconds apart.
ntrip	Integer	This is the observation number within the current "trip".
totintrip	Integer	This number indicates the total number of observations in a "trip".
RPM1	Numeric 8.	This is the value of the first RPM collected.
RPM1_type	Character	This describes the type of RPM that was collected as RPM1. It can be optical RPM, "Capelec" RPM (measured using battery voltage fluctuations), Equipment or OEM RPM (measured directly from electrical wiring harness) or Magnetic RPM.
RPM1_valid	Character	This is a flag indicating whether or not the RPM1 value is considered valid using ERG's algorithm. For example, if the equipment is active (engine is running) but the RPM collected is equal to zero, that RPM is considered invalid, and the value of RPM1_valid would be "N". Note that this field is only used for Phase 1 data, as that is the only phase we used battery voltages and RPM values for on/off decisions.
RPM2	Numeric 8.	This is the value of the second RPM in the dataset.
RPM2_type	Character	This describes the type of RPM that was read in as RPM2. It can be optical RPM, "Capelec" (measured using battery voltage fluctuations), Equipment RPM (measured directly from electrical wiring harness) or Magnetic RPM.
RPM2_valid	Character	This is a flag indicating whether or not the RPM2 value is considered valid using ERG's algorithm. For example, if the equipment is active (engine is running) but the RPM collected is equal to zero, that RPM is considered invalid, and the value of RPM2_valid would be "N". Note that this field is only used for Phase 1 data, as Phase 1 is the only phase we used battery voltages and RPM values for on/off decisions.
optical	Numeric 8.	This is the value of the optical RPM.
optical_rpm_valid	Character	This is a flag indicating whether or not the optical RPM value is considered valid using ERG's algorithm. For example, if the equipment is active (engine is running) but the RPM collected is equal to zero, that RPM is considered invalid, and the value of optical_rpm_valid would be "N". Note that this field is only used for Phase 1 data, as that is the only phase we used battery voltages and RPM values for on/off decisions.
corrected_optical	Numeric 8.	This is the value of the corrected optical RPM. This field will only be included for installations where a correction was applied based on the RPM calibration information.
capelec	Numeric 8.	This is the value of the RPM collected by the Capelec "CAP851X" RPM collection device, if used. This device used voltage fluctuations measured at the battery teminals in order to calculate engine speed. This field will only be included for installations where a Capelec RPM acquisition device was used.

corrected_capelec	Numeric 8.	This is the value of the corrected Capelec RPM. This field will only be included for installations where a correction was applied based on the RPM calibration information.
equip_active	Character	Most dataloggers installed during Phase 1 were configured to collect data when equipment voltage exceeded a certain threshold. As a result, much Phase 1 PAMS data consisted of "null" data (data collected when equipment was not operating). ERG assigned the "equip_active" flag to Phase 1 data to indicate whether the equipment was in operation (engine running) at the time each observation was recorded by the datalogger. Because of "noise" recorded on RPM pickup channels during periods of inactivity, it was necessary for ERG to analyze both battery voltage and recorded RPM values when determining equipment activity status. Note that since datalogger acquisition was based on switched voltage signals after Phase 1, the "equip_active" field is only used on Phase 1 PAMS data.
rpm_too_high	Character	A value of "Y" indicates the recorded engine speed is higher than 6000 RPM. This field is only used for Phase II and later data (since RPM validity fields were used to characterize Phase 1 RPM data).
engine_on	Character	This variable is not included for all PAMs installations. It is included for the installations where there was not a switched power installation for the RPM aquisition unit, and therefore the voltage was used to try to determine when the engine was switched on.
key_on	Character	Phase II and later PAMS activity collection was based on switched power (data was collected when operational voltage was activated). For example, if equipment had an ignition key (or on/off switch), data would be collected if the key (or switch) was in either the "start" or the "on" positions. A value of "Y" for the "key_on" field indicates that the key (or switch) was in the on or start position for the equipment (whether the engine was running or not). The "key_on" field is used for Phase II and onward PAMS data, since "equip_active" was used to characterize Phase 1 operation data).
dtflag	Character	This variable identified dates where ERG visited the site and possible work was done on the datalogger/equipment. Values include "InstallDt", "ERGVisit", and "RemoveDt".