

# Content Developer Kit

## GEN5 Mechanical Labor

V1.3



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# 1 Glossary

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**Content Control Matrix (CCM):** Report indicating the current coverage status of each VCdb Base Vehicle and MOTOR Standard Operation instance.

**Estimated Work Time (EWT):** The estimated time in hours and tenths of an hour to perform an Operation under normal circumstances.

**Footnote:** Footnotes are notes attached to an operation to that communicates important information to the end user about the specific application such as operations that are included in the EWT, operations that are not included and other important information. Footnotes are not used to distinguish between two or more applications.

**Included Operations:** Included Operations are operations that are performed in the course of completing the main operation.

**MOTOR Operations:** MOTOR's list of standardized operation names. These operation names are organized into a taxonomy classification by vehicle systems and assemblies. These names are used whenever an operation name is required.

**MOTOR Qualifier:** MOTOR Qualifiers are notes attached to operations that are used to distinguish between two or more applications that apply to the same vehicle, operation name, and operation position. MOTOR Qualifiers are standardized and organized into a three tier categorization.

**Optional Operations:** Optional Operations are that can be performed along with the main operation. The labor times in the Optional Operations are labor times required in addition to the labor times for the main operation.

**Overlap:** Overlap occurs when, at a given service visit, two or more required operations share the same Included Operations. The repeated EWT in the Included Operation is referred to as overlap.

## 2 Business Rules

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- 1) **Business Rule: (MOTOR\_EWT.XML)** Each App record will contain 0 or one of each VCdb vehicle attribute set. If, for example, a vehicle has three sub models available and a labor time applies to two of the sub models; that labor time will be repeated in two different app records, one for each sub model.
  - **Validation:** Enforced by authoring environment
- 2) **Business Rule: (MOTOR\_EWT.XML)** MOTOR Operations to PCdb parts relationships will be created and maintained on a global level and exploded to each app record. Operation to parts relationships can be adjusted at the app record level only in response to feedback received and on a case by case basis.
- 3) **Business Rule: (MOTOR\_EWT.XML)** ReplacementParts records (child of MOTOR\_Operation) include parts that are related to the IncludedOperations. Optional\_ReplacementParts only includes parts required for OptionalOperation, and not those required for IncludedOperation and MOTOR\_Operation.
- 4) **Business Rule: (MOTOR\_EWT.XML)** The standard for the global Operations to ReplacementParts mapping is that each MOTOR Operation is mapped to the parts that are required to be replaced each time the given operation is performed for most vehicles. These are essentially the parts required for an upfront estimate. The technician may find that additional parts require replacement when performing the operation.

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- 5) **Business Rule: (MOTOR\_EWT.XML)** If more than one note (MOTOR Qualifier) record is present within an app record, then each of the notes must be true for the app to be considered a valid application. The same is true of IncludedOperation records that include more than one IncludedOperation\_Note and OptionalOperation records that include more than one OptionalOperation\_Note. NOTE: Most GUI applications may require that multiple note records be concatenated into single strings for the end user to select.
- 6) **Business Rule: (MOTOR\_EWT.XML)** Each MOTOR\_Operation record will contain a Base\_MOTOR\_EWT.
  - **Validation:** Enforced by authoring environment
- 7) **Business Rule: (MOTOR\_EWT.XML)** No “Warranty Time” can exist without a corresponding “MOTOR\_EWT”.
  - **Validation:** Enforced by authoring environment
- 8) **Business Rule: (MOTOR\_EWT.XML)** No “Warranty Time” or “MOTOR EWT” can exist as an “Add” or “ALL” record without a corresponding “Additional Description” record.
  - **Validation:** Enforced by authoring environment
- 9) **Business Rule: (MOTOR\_Qualifier.xml)** Each Qualifier description will be unique.
  - **Validation:** Enforced by data model.
- 10) **Business Rule: (MOTOR\_Qualifier.xml)** If an end user indicates that a Qualifier record with a QualifierType of “Vehicle Attribute” is applicable to the vehicle that is context, than any data related to a Qualifier record with the same QualifierType and Qualifier Value values as the selected Qualifier can be declared not applicable for the vehicle in context. For example, if the Qualifier “With Air Conditioning” is selected, any labor attached to the Qualifier “Without Air Conditioning” can be eliminated from consideration for the end user as both Qualifiers are of the Qualifier Vehicle Type and share the same Qualifier Family value.
- 11) **Business Rule: (MOTOR\_OperationTaxonomy.xml)** Each LiteralName value is unique and can be used to represent the entire of the given taxonomy path.
  - **Validation:** Enforced by data model.
- 12) **Business Rule: (MOTOR\_EWT.xml)** “All” labor times do not usually equal the sum of the “Base” labor time and the logical number of “Add” instances. The “All” labor time is often referred to as a cap time in the industry.
- 13) **Business Rule: (MOTOR\_EWT.XML)** Each app record, each OptionalOperation, and each IncludedOperation will have position values. If the position does not matter in the given operation, the position value of “N/A” will be used.
  - **Validation:** Enforced by data model.
- 14) **Business Rule:** <Note> elements with an attribute value of vehicleattribute="yes" pertain to the whole <app> element, including all Included Operations and Optional Operations within the app. These are qualifiers that help to describe the vehicle.
- 15) **Business Rule:** <Note> elements with an attribute value of vehicleattribute="no" only pertain the main MOTOR Operation record in the app, not the Included Operations and Optional Operations within the app. These are considered Operations Qualifiers. For example, the main operation may be for a 3” diameter hose with another hose listed as an Optional Operation. The <note> value of “3 inch diameter” will not apply to the optional hose listed. The <OptionalOperation\_Note> will provide the qualifier for the listed Optional Operation.
- 16) **Business Rule:** The <OptionalOperation\_Note> and <IncludedOperation\_Note> elements should always have a value of vehicleattribute="no".

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- **Validation:** Enforced by authoring environment and QC report that looks for Optional Operations or Included Operations assigned to a Qualifier with a Qualifier Type value of "1".
- 17) **Business Rule:** Each "additional description" value must be reviewed and validated by GEN5 admin before exported to xml.
- **Validation:** Export process halts when "additional descriptions" that have not been approved are present.
- 18) **Business Rule:** Each footnote value must be reviewed and validated by GEN5 admin before exported to xml.
- **Validation:** Export process halts when footnotes that have not been approved are present.
- 19) **Business Rule:** Each MOTOR Qualifier value must be reviewed and validated by GEN5 admin before exported to xml.
- **Validation:** Export process halts when MOTOR Qualifiers that have not been approved are present.
- 20) **Business Rule:** MOTOR Extended Operations marked as deleted cannot be exported to xml.
- **Validation:** QC reports check for any data that uses MOTOR Extended Operations marked as deleted. The export process filters out any data attached to these Operations as well.
- 21) **Business Rule:** Positions marked as deleted cannot be exported to xml.
- **Validation:** QC reports check for any data that uses Positions marked as deleted. The export process filters out any data attached to these Positions as well.
- 22) **Business Rule:** MOTOR Qualifiers marked as deleted cannot be exported to xml.
- **Validation:** QC reports check for any data that uses MOTOR Qualifiers marked as deleted. The export process filters out any data attached to these MOTOR Qualifiers as well.
- 23) **Business Rule:** Required Skill Codes marked as deleted cannot be exported to xml.
- **Validation:** QC reports check for any data that uses Required Skill Codes marked as deleted. The export process filters out any data attached to these Required Skill Codes as well.
- 24) **Business Rule:** VCdb Base Vehicles marked as deleted cannot be exported to xml.
- **Validation:** QC reports check for any data that uses VCdb Base Vehicles marked as deleted. The export process filters out any data attached to these VCdb Base Vehicles as well.
- 25) **Business Rule:** All VCdb Base Vehicles in the ACES VCdb database needs to be accounted for either in the MOTOR EWT data xml files or in the CCM xml files.
- **Validation:** Authoring environment contains Base Vehicle management module which report which Base Vehicles have not been assigned for authoring.
- 26) **Business Rule:** With the exception of pre-described cases, if a VCdb attribute is applied to a combination of Base Vehicle, MOTOR Operation, Position, and set of MOTOR Qualifier, then another record with a the same combination of Base Vehicle, MOTOR Operation, Position, and set of MOTOR Qualifier but a different VCdb attribute value from the same attribute type as the first must exist.
- **Validation:** QA and QC data explosion and comparison processes check for this condition.
- 27) **Business Rule:** Each app must have a unique combination of Base Vehicle, VCdb Attributes, MOTOR Operation, Position, and set of MOTOR Qualifiers.
- **Validation:** QA and QC data explosion and comparison processes check for this condition.
- 28) **Business Rule:** If each app where exploded against VCdb VehicleConfig table; with the exception of pre-described cases, if a Position other than N/A is applied to a combination of VehicleConfigID, MOTOR Operation, and set of MOTOR Qualifiers, then another record with a the same combination of VehicleConfigID, MOTOR Operation, and set of MOTOR Qualifier but with a different Position (other than N/A) from the first must exist.

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- **Validation:** QA and QC data explosion and comparison processes check for this condition.
- 29) **Business Rule:** With the exception of pre-described cases, if a MOTOR Qualifier is applied to a combination of Base Vehicle, MOTOR Operation, and Position, then another record with a the same combination of Base Vehicle, MOTOR Operation, and Position but with a different MOTOR Qualifier from the same Qualifier Family as the first must exist.
- **Validation:** QA and QC data explosion and comparison processes check for this condition.
- 30) **Business Rule:** A situation cannot exist wherein a combination of Base Vehicle, MOTOR Operation, Position and set of MOTOR Qualifiers exists without any VCdb attributes attached and there is another instance where the same combination Base Vehicle, MOTOR Operation, Position and set of MOTOR Qualifiers exists with one or more VCdb attributes attached.
- **Validation:** QA and QC data explosion and comparison processes check for this condition.
- 31) **Business Rule:** If each app where exploded against VCdb VehicleConfig table; a situation cannot exist wherein a combination of VehicleConfigID, MOTOR Operation, and Position exists without any MOTOR Qualifiers attached and there is another instance where the same combination VehicleConfigID, MOTOR Operation, and Position exists with one or more MOTOR Qualifiers attached.
- **Validation:** QA and QC data explosion and comparison processes check for this condition.
- 32) **Business Rule:** Prior to each data delivery, EWT labor time values that fall outside of 2 standard deviations from the average (Based on Operation, Position, and Additional Description) requires an additional manual QC check.
- **Validation:** Authoring environment has a module that reports this data for review by QC editor.
- 33) **Business Rule:** Each MOTOR Operation must be developed in accordance to a template designed for the Operation.
- **Validation:** A custom QC report must be created for each rule described in the Operation templates and reviewed prior to delivery.
- 34) **Business Rule:** As of September 10, 2008, the following table represents the current legal combinations of Base Additional Description, Add Additional Description, and All Additional Description. These legal combinations should be accounted for when producing a GUI with quantity functionality.
- **Validation:** QC reports prior to delivery to ensure legal combinations.

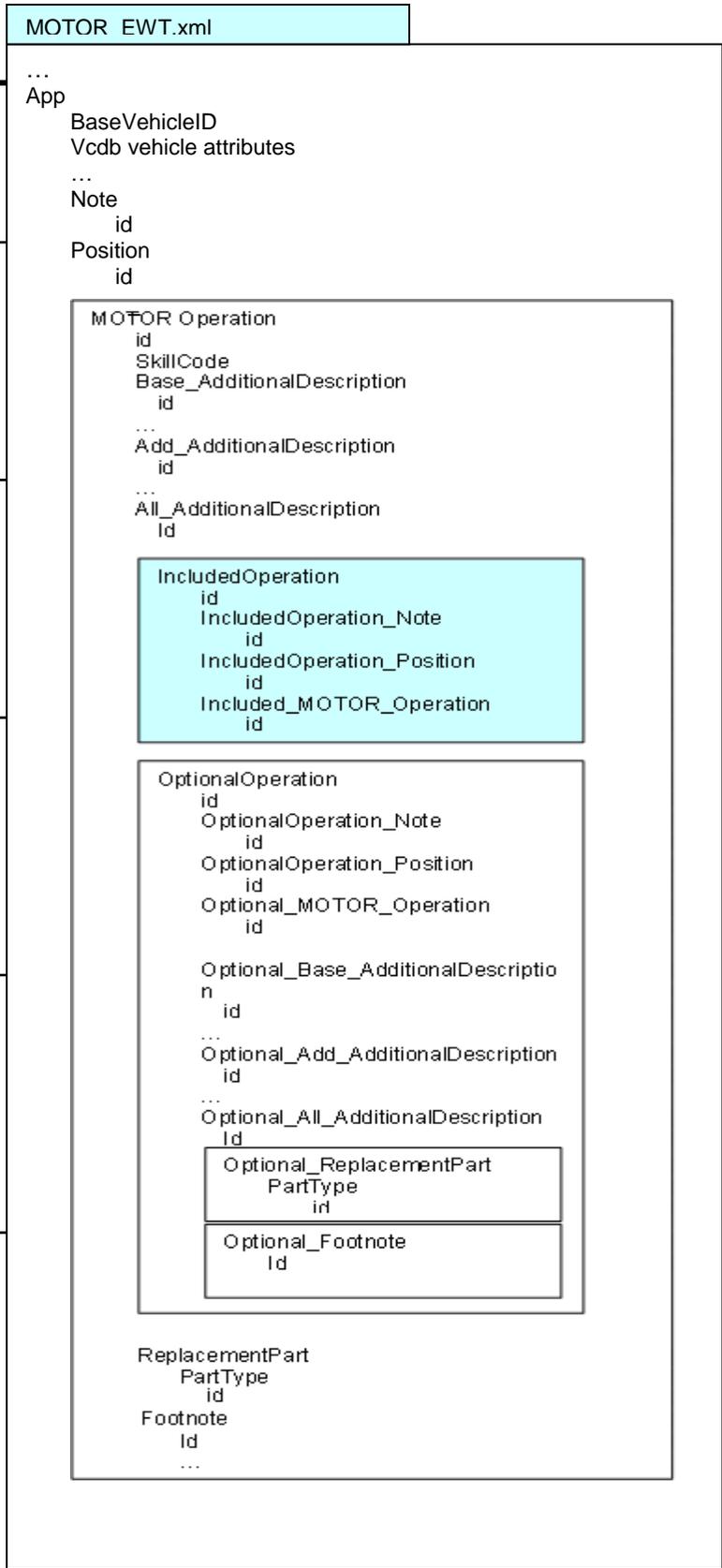
Base Description	Add Description	All Description
"One"		"All"
"One Side"		"Both Sides"
"Each"		
"One"		"Both"
"All"		
"One"	"Each Additional"	"All"
"Both Sides"		
"One Axle"		"Both Axles"
"Both"		
"One"	"Each Additional"	
"One Side"		
"One"		
"One Axle"		

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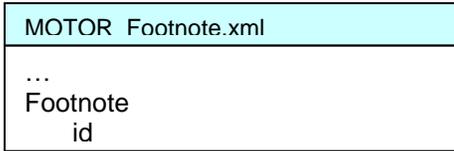
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Note: These are the current legal combinations as of March 2009. It is possible that some combinations outside of those listed could exist in rare instances. Base Description is only required when there are Add or All labor times present, else it is optional. Add Description is required anytime there are add labor times present. All Description is required anytime there are all labor times present.

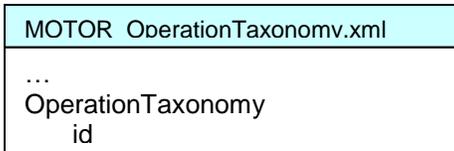
# 3 Data Model



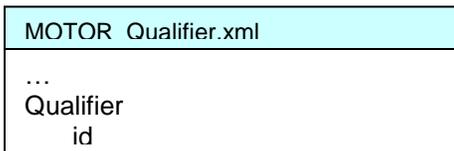
\*AdditionalDesc  
ription.id



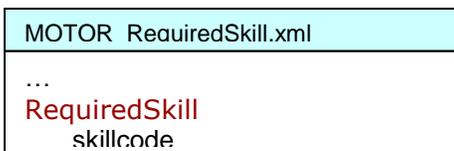
\*Footnote.id



\*MOTOR\_Oper  
ation.id



\*Note.id



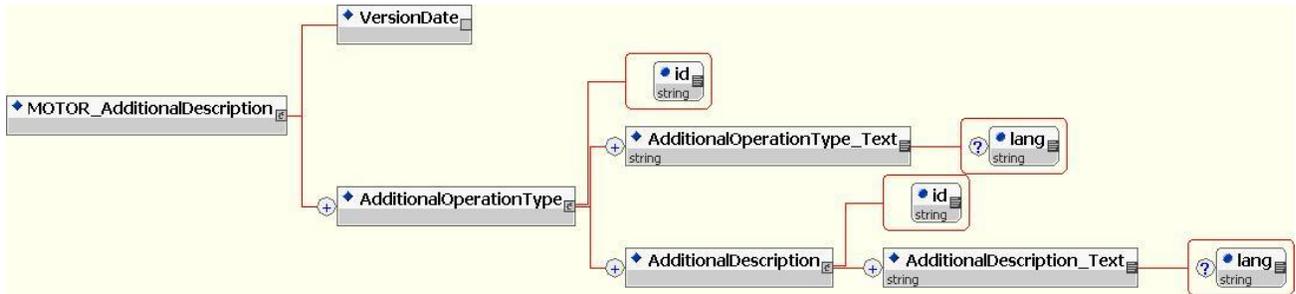
SkillCode



## 4 XML Schema

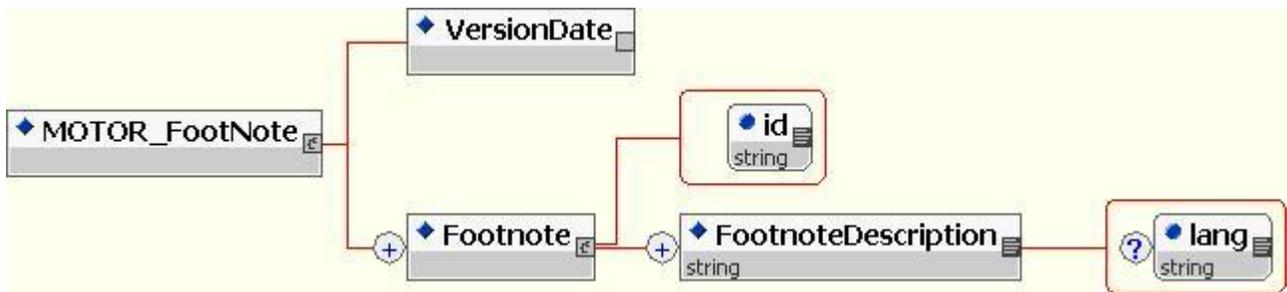
### 4.1 MOTOR Additional Description

Schema filename: MOTOR\_AdditionalDescription.xsd



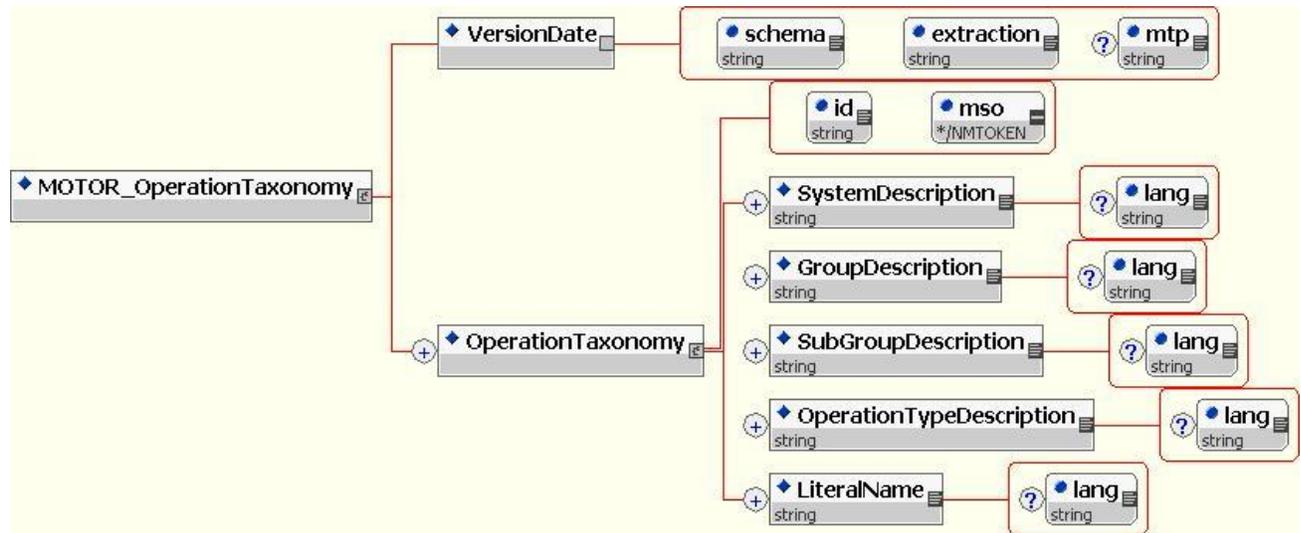
### 4.2 MOTOR Footnote

Schema filename: MOTOR\_Footnote.xsd



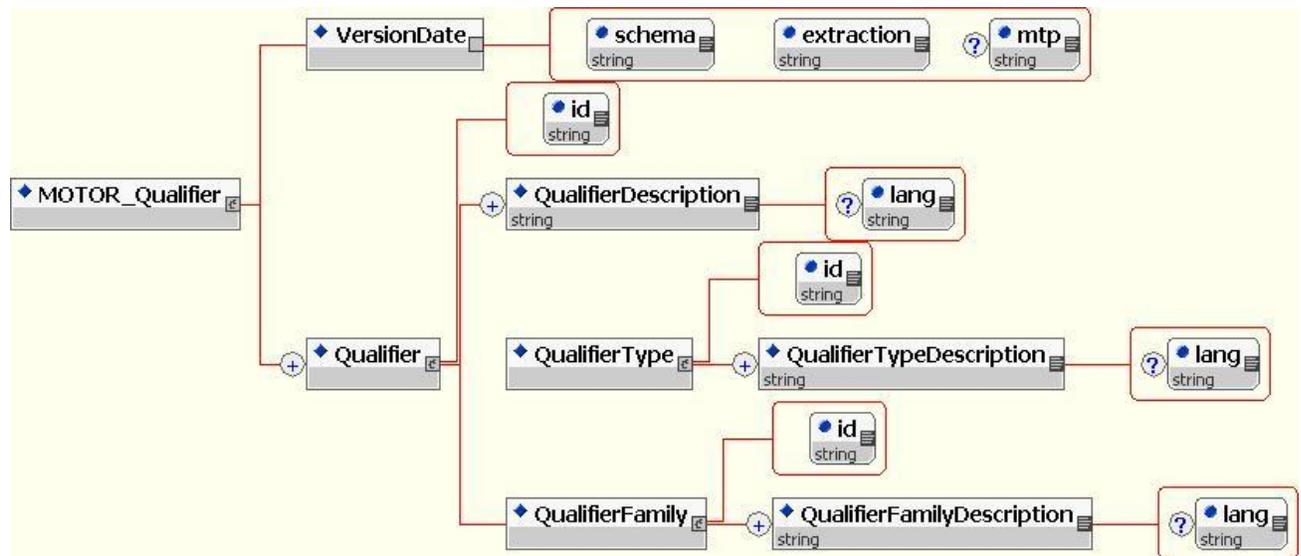
### 4.3 MOTOR Operation Taxonomy

Schema filename: MOTOR\_OperationTaxonomy.xsd



### 4.4 MOTOR Qualifier

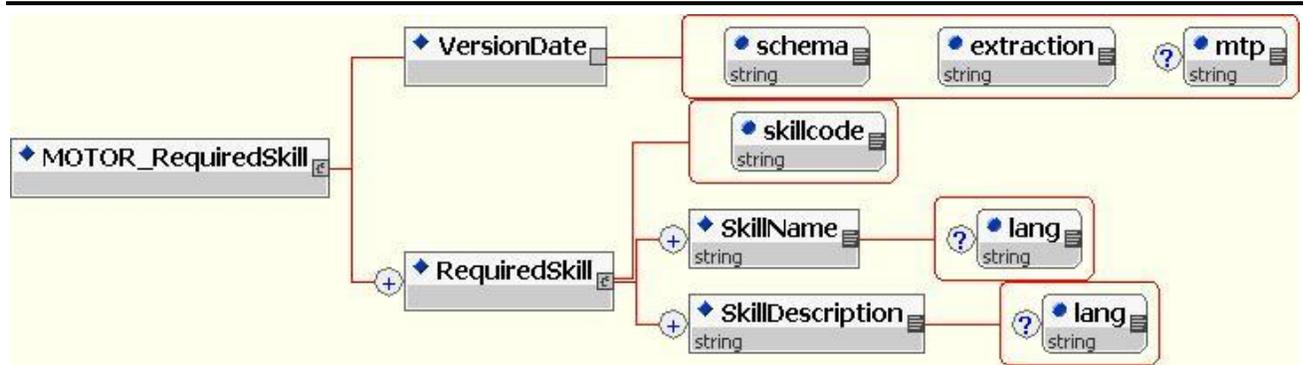
Schema filename: MOTOR\_Qualifier.xsd



### 4.5 MOTOR Required Skill

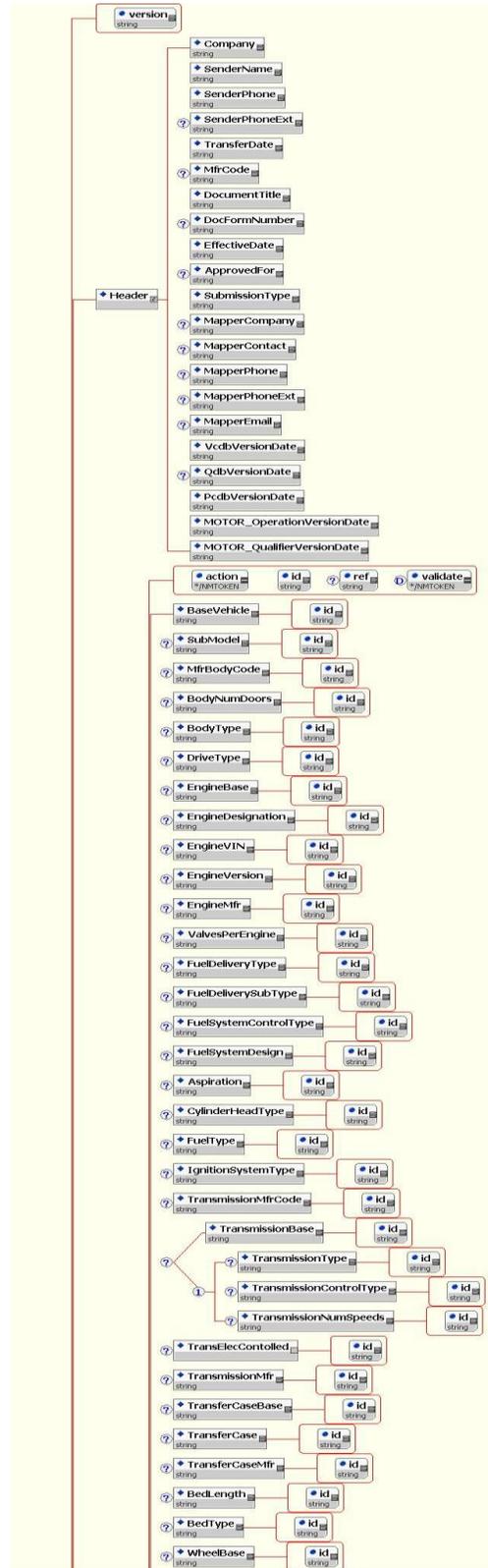
Schema filename: MOTOR\_RequiredSkill.xsd

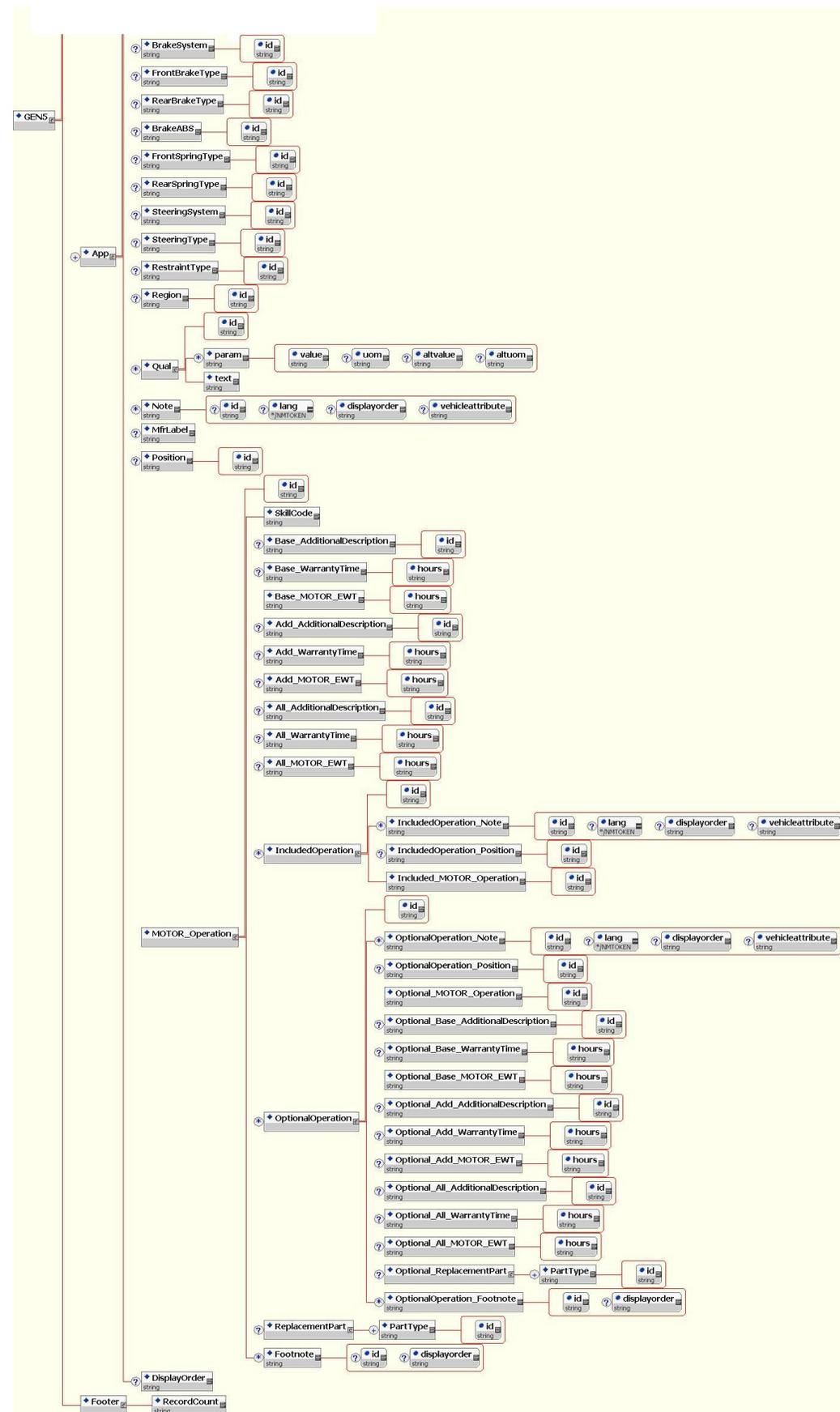
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# 4.6 MOTOR EWT

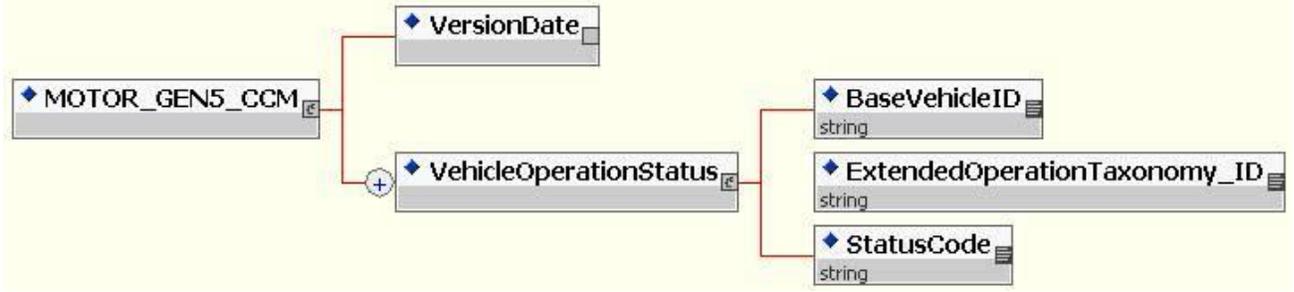
Schema filename: MOTOR\_EWT.xsd





## 4.7 MOTOR GEN5 CCM

Schema filename: MOTOR\_GEN5\_CCM



## 5 Data Dictionary

### 5.1 XML File: MOTOR\_AdditionalDescription.xml

Additional operation types and descriptions, such as "one side", "each", "each additional" etc. are described

#	Element name	Content Type	Content Model	Attributes	Element Reqd.	Attribute Reqd.	Description
1	MOTOR_AdditionalDescription	Elements	(VersionDate , AdditionalOperationType+)		Yes		Root element
2	VersionDate	EMPTY		schema	Yes	Yes	Attribute “ <b>schema</b> ” indicates the schema version date (see date format note below)
				extraction		Yes	Attribute “ <b>extraction</b> ” indicates the extraction date (see date format note below)
				mtp		No	Attribute “ <b>mtp</b> ” indicates the MOTOR taxonomy version date, if applicable (see date format note below)
3	AdditionalOperationType	Elements	(AdditionalOperationType_Text+ , AdditionalDescription+)	id	Yes	Yes	Additional operation type with unique “ <b>id</b> ”
4	AdditionalOperationType_Text	Type	String	lang	Yes	No	Additional operation type description. The attribute “ <b>lang</b> ” indicates the language for the description, default language is English. Descriptions can be multiple, each with different “ <b>lang</b> ” attribute
5	AdditionalDescription	Elements	(AdditionalDescription_Text+)	id	Yes	Yes	Additional description with unique id. This id is referenced in

							MOTOR_EWT as: Base_AdditionalDescription, Add_AdditionalDescription, All_AdditionalDescription, Optional_Base_AdditionalDescription, Optional_Add_AdditionalDescription, Optional_All_AdditionalDescription
6	AdditionalDescription_Text	Type	String	lang	Yes	No	Additional description The attribute "lang" indicates the language for the description, default language is English. Descriptions can be multiple, each with different "lang" attribute

## 5.2 XML File: Footnote.xml

MOTOR Footnote description definitions. Footnotes describe operations that are included or important operations that are not included. They may also contain important descriptive information.

#	Element name	Content Type	Content Model	Attributes	Element Req.	Attribute Req.	Description
1	MOTOR_FootNote	Elements	(VersionDate , Footnote+)		Yes		MOTOR Footnote root element
2	VersionDate	EMPTY		schema	Yes	Yes	Attribute "schema" indicates the schema version date (see date format note below)
				extraction		Yes	Attribute "extraction" indicates the extraction date (see date format note below)

				mtp		No	Attribute “ <b>mtp</b> ” indicates the MOTOR taxonomy version date, if applicable (see date format note below)
3	Footnote	Elements	(FootnoteDescription+)	id	Yes	Yes	The attribute “ <b>id</b> ” is unique, this id is referenced in <b>MOTOR_EWT.xml</b> as Footnote and <b>OptionalOperation_Footnote id</b>
4	FootnoteDescription	Elements	string	lang	Yes	No	MOTOR footnote description. The attribute “ <b>lang</b> ” indicates the language for the description, default language is English. Descriptions can be multiple, each with different “ <b>lang</b> ” attribute

### 5.3 XML File: MOTOR\_OperationTaxonomy.xml

Standard MOTOR Operation taxonomy definitions

#	Element name	Content Type	Content Model	Attributes	Element Req.	Attribute Req.	Description
1	MOTOR_OperationTaxonomy	Elements	(VersionDate , OperationTaxonomy+)		Yes		MOTOR Master Operation Taxonomy root element
2	VersionDate	EMPTY		schema	Yes	Yes	Attribute “ <b>schema</b> ” indicates the schema version date (see date format note below)
				extraction		Yes	Attribute “ <b>extraction</b> ” indicates the extraction date (see date format note below)
				mtp		No	Attribute “ <b>mtp</b> ” indicates

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							the MOTOR taxonomy version date, if applicable (see date format note below)
3	OperationTaxonomy	Elements	(SystemDescription , GroupDescription , SubGroupDescription , OperationTypeDescription , LiteralName)	id	Yes	Yes	The attribute “id” is unique and represents MOTOR Operation taxonomy path description, this id is referenced in MOTOR_EWT.xml as MOTOR_Operation id
				mso			Yes/No flag to indicate if this taxonomy is MOTOR Standard Operation Taxonomy
4	SystemDescription	Type	String	lang	Yes	No	MOTOR Standard System description The attribute “lang” indicates the language for the description, default language is English. Descriptions can be multiple, each with different “lang” attribute
5	GroupDescription	Type	String	lang	Yes	No	MOTOR Standard Group description The attribute “lang” indicates the language for the description, default language is English. Descriptions can be multiple, each with different “lang” attribute
6	SubGroupDescription	Type	String	lang	Yes	No	MOTOR Standard SubGroup description The attribute “lang” indicates the language for the description, default language is English. Descriptions can be

							multiple, each with different <b>“lang”</b> attribute
7	OperationTypeDescription	Type	String	Lang	Yes	No	MOTOR Standard Operation type description The attribute “lang” indicates the language for the description, default language is English. Descriptions can be multiple, each with different <b>“lang”</b> attribute
8	LiteralName	Type	String	lang	Yes	No	MOTOR Standard Operation description The attribute “lang” indicates the language for the description, default language is English. Descriptions can be multiple, each with different <b>“lang”</b> attribute

### 5.4 XML File: MOTOR\_Qualifier.xml

MOTOR Qualifier description definition, when there are more than one MOTOR EWT for the same MOTOR operation description on base vehicle with vehicle attributes, the operation will be qualified with appropriate description, which is not covered by VCDB attributes. For example: With Air condition and Without Air condition.

#	Element name	Content Type	Content Model	Attributes	Element Reqd.	Attribute Reqd.	Description
1	MOTOR_Qualifier	Elements	(VersionDate , Qualifier+)		Yes		MOTOR Qualifier root element
2	VersionDate	EMPTY		schema	Yes	Yes	Attribute <b>“schema”</b> indicates the schema version date (see date format note below)
				extraction		Yes	Attribute <b>“extraction”</b> indicates the extraction date (see date format

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				mtp		No	note below) Attribute “ <b>mtp</b> ” indicates the MOTOR taxonomy version date, if applicable (see date format note below)
3	Qualifier	Elements	(QualifierDescription+ , QualifierType , QualifierFamily)	id	Yes	Yes	Attribute “ <b>id</b> ” is unique for each MOTOR qualifier description, this <b>id</b> is referenced in MOTOR_EWT.xml as Note id and OptionalOperation_Note id
4	QualifierDescription	Elements	string	lang	Yes	No	MOTOR Qualifier description The attribute “ <b>lang</b> ” indicates the language for the description, default language is English. Descriptions can be multiple, each with different “ <b>lang</b> ” attribute
5	QualifierType	Elements	(QualifierTypeDescription+)	id	Yes	Yes	MOTOR Qualifier type
6	QualifierTypeDescription	Elements	string	lang	Yes	No	MOTOR Qualifier type description The attribute “ <b>lang</b> ” indicates the language for the description, default language is English. Descriptions can be multiple, each with different “ <b>lang</b> ” attribute
7	QualifierFamily	Elements	(QualifierFamilyDescription+)	id	Yes	Yes	MOTOR Qualifier Family
8	QualifierFamilyDescription	Elements	string	lang	Yes	No	MOTOR Qualifier family description The attribute “ <b>lang</b> ” indicates the language for the description, default language is English. Descriptions can be

							multiple, each with different "lang" attribute
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## 5.5 XML File: RequiredSkill.xml

Skill Code definition table, these defines the minimum skills required to perform the standard MOTOR operation.

#	Element name	Content Type	Content Model	Attributes	Element Req.	Attribute Req.	Description
1	MOTOR_RequiredSkill	Elements	(VersionDate , Footnote+)		Yes		MOTOR Required Skill root element
2	VersionDate	EMPTY		schema	Yes	Yes	Attribute "schema" indicates the schema version date (see date format note below)
				extraction		Yes	Attribute "extraction" indicates the extraction date (see date format note below)
				mtp		No	Attribute "mtp" indicates the MOTOR taxonomy version date, if applicable (see date format note below)
3	RequiredSkill	Elements	SkillName+ , SkillDescription+)	skillcode	Yes	Yes	Unique code for each skill name and description. The attribute "skillcode" is referenced in <b>MOTOR_EWT.xml as SkillCode</b>
4	SkillName	Elements	string	lang	Yes	No	MOTOR skill name The attribute "lang" indicates the language for the description, default language is English. Descriptions can be multiple, each with different "lang" attribute
5	SkillDescription	Elements	string	lang	Yes	No	MOTOR skill description

							The attribute “ <b>lang</b> ” indicates the language for the description, default language is English. Descriptions can be multiple, each with different “ <b>lang</b> ” attribute
--	--	--	--	--	--	--	--

## 5.6 XML File: MOTOR\_EWT.xml

The core Operation labor time table

#	Element name	Content Type	Content Model	Attributes	Element Req.	Attribute Req.	Description
1	<b>GEN5</b>	Elements	(Header , App+ , Footer)	version	Yes	Yes	MOTOR EWT root element, attribute version indicates the GEN5 specification version number
2	<b>Header</b>	Elements	(Company , SenderName , SenderPhone , SenderPhoneExt? , TransferDate , MfrCode? , DocumentTitle , DocFormNumber? , EffectiveDate , ApprovedFor? , SubmissionType , MapperCompany? , MapperContact? , MapperPhone? , MapperPhoneExt? , MapperEmail? , VcdbVersionDate , QdbVersionDate? , PcdbVersionDate , MOTOR_OperationVersionDate , MOTOR_QualifierVersionDate)		Yes		Header section describes data file information such as supplier, effective date, various data elements version dates etc.
3	Company	Type	String		Yes	N/A	Data supplier company

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							name, MOTOR Information Systems
4	SenderName	Type	String		Yes	N/A	Data supplier contact person name
5	SenderPhone	Type	String		Yes	N/A	Data supplier contact person phone number
6	SenderPhoneExt	Type	String		No	N/A	Data supplier contact person extension phone number
7	TransferDate	Type	String		Yes	N/A	Data file create date, formatted as "CCYY-MM-DD", where "CC" is represents century, "YY" represents two digit year and "MM" represents two digit month and "DD" represents two digit day.
8	MfrCode	Type	String		No	N/A	Vehicle manufacturer code
9	DocumentTitle	Type	String		Yes	N/A	Brief description of the contents in the document
10	DocFormNumber	Type	String		No	N/A	Data supplier's document number, if available
11	EffectiveDate	Type	String		Yes	N/A	Date on which the data contents in the file are effective from. Formatted as "CCYY-MM-DD", where "CC" is represents century, "YY" represents two digit year and "MM" represents two digit month and "DD" represents two digit day.
12	ApprovedFor	Type	String		No	N/A	ISO country code for which the data is approved for. For US market the code is "US" and for Canada it is "CA"
13	SubmissionType	Type	String		Yes	N/A	Data submission type, TEST, FULL or UPDATE. If the submission type is

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							TEST or FULL, all applications in the file must have "action" attribute "A" to indicate "add" records. If the submission type is UPDATE, the "action" attribute can be either "A" for "add" records or "D" for "deleted" records. For the updated records, there will be two applications one with action attribute "D" and other with action attribute "A". By default, MOTOR Information Systems will deliver data in FULL.
14	MapperCompany	Type	String		No	N/A	Name of the company that mapped the data to AAIA standard data
15	MapperContact	Type	String		No	N/A	Contact person from the mapping
16	MapperPhone	Type	String		No	N/A	Mapping contact person's phone number
17	MapperPhoneExt	Type	String		No	N/A	Mapping contact person's extension phone number
18	MapperEmail	Type	String		No	N/A	Mapping contact person's e-mail address
19	VcdbVersionDate	Type	String		Yes	N/A	Version date from Vcdb database. Formatted as "CCYY-MM-DD", where "CC" is represents century, "YY" represents two digit year and "MM" represents two digit month and "DD" represents two digit day.
20	QdbVersionDate	Type	String		No	N/A	Version date from Qdb database, if it is used in this data deliverable.

							Formatted as "CCYY-MM-DD", where "CC" is represents century, "YY" represents two digit year and "MM" represents two digit month and "DD" represents two digit day.
21	PcdbVersionDate	Type	String		Yes	N/A	Version date from Pcdb database. Formatted as "CCYY-MM-DD", where "CC" is represents century, "YY" represents two digit year and "MM" represents two digit month and "DD" represents two digit day.
22	MOTOR_OperationVersionDate	Type	String		Yes	N/A	MOTOR Operation Taxonomy version date. Formatted as "CCYY-MM-DD", where "CC" is represents century, "YY" represents two digit year and "MM" represents two digit month and "DD" represents two digit day.
22	MOTOR_QualifierVersionDate	Type	String		Yes	N/A	MOTOR Qualifiers version date. Formatted as "CCYY-MM-DD", where "CC" is represents century, "YY" represents two digit year and "MM" represents two digit month and "DD" represents two digit day.
23	<b>App</b>	Elements	(BaseVehicle , SubModel? , MfrBodyCode? , BodyNumDoors? , BodyType? , DriveType? , EngineBase? , EngineDesignation? , EngineVIN? , EngineVersion? , EngineMfr? , ValvesPerEngine? ,	action id ref validate	Yes	Yes Yes No No	Groups MOTOR Operation data as an application. The values attribute " <b>action</b> " are "A" for "add" and "D" for "delete" applications. The attribute " <b>id</b> " uniquely identifies the application

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			<p>FuelDeliveryType? ,          FuelDeliverySubType? ,          FuelSystemControlType? ,          FuelSystemDesign? ,          Aspiration? ,          CylinderHeadType? ,          FuelType? ,          IgnitionSystemType? ,          TransmissionMfrCode? ,          (TransmissionBase            (TransmissionType? ,          TransmissionControlType? ,          TransmissionNumSpeeds?))? ,          TransElecControlled? ,          TransmissionMfr? ,          TransferCaseBase? ,          TransferCase? ,          TransferCaseMfr? ,          BedLength? , BedType? ,          WheelBase? , BrakeSystem? ,          FrontBrakeType? ,          RearBrakeType? , BrakeABS? ,          FrontSpringType? ,          RearSpringType? ,          SteeringSystem? ,          SteeringType? ,          RestraintType? , Region? ,          Qual* , Note* , MfrLabel? ,          Position? , MOTOR_Operation          , DisplayOrder?)?</p>				<p>including base vehicle, vehicle attributes, MOTOR Operation and applicable MOTOR Qualifiers.</p> <p>The optional “<b>ref</b>” attribute references the source data.</p> <p>The optional “<b>validate</b>” attribute indicates if the application must be validated against Vcdb data. Possible values “yes” and “no”.</p>
	BaseVehicle	Type	String	id	Yes	Yes	References the Base Vehicle table in Vcdb database. The attribute “ <b>id</b> ” indicates the BaseVehicleID
	SubModel	Type	String	id	No	Yes	References the SubModel table in Vcdb database. The attribute “ <b>id</b> ” indicates the SubModelID.
	MfrBodyCode	Type	String	id	No	Yes	References the MfrBodyCode table. The

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							attribute "id" indicates the MfrBodyCodeID
	BodyNumDoors	Type	String	id	No	Yes	References the BodyNumDoors table. The attribute "id" indicates the BodyNumDoorsID
	BodyType	Type	String	id	No	Yes	References the BodyType table. The attribute "id" indicates the BodyTypeID
	DriveType	Type	String	id	No	Yes	References the DriveType table. The attribute "id" indicates the DriveTypeID
	EngineBase	Type	String	id	No	Yes	References the EngineBase table. The attribute "id" indicates the EngineBaseID
	EngineDesignation	Type	String	id	No	Yes	References the EngineDesignation table. The attribute "id" indicates the EngineDesignationID.
	EngineVIN	Type	String	id	No	Yes	References the EngineVIN table. The attribute "id" indicates the EngineVINID.
	EngineVersion	Type	String	id	No	Yes	References the EngineVersion table. The attribute "id" indicates the EngineVersionID.
	EngineMfr	Type	String	id	No	Yes	The manufacturer that actually built the engine. References the Mfr table. The attribute "id" indicates the MfrID.
	ValvesPerEngine	Type	String	id	No	Yes	References the Valves table. The attribute "id" indicates ValvesID.
	FuelDeliveryType	Type	String	id	No	Yes	References the

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							FuelDeliveryType table. The attribute "id" indicates FuelDeliveryTypeID.
	FuelDeliverySubType	Type	String	id	No	Yes	References the FuelDeliverySubType table. The attribute "id" indicates FuelDeliverySubTypeID
	FuelSystemControlType	Type	String	id	No	Yes	References the FuelSystemControlType table. The attribute "id" indicates FuelSystemControlTypeID
	FuelSystemDesign	Type	String	id	No	Yes	References the FuelSystemDesign table. The attribute "id" indicates FuelSystemDesignID
	Aspiration	Type	String	id	No	Yes	References the Aspiration table. The attribute "id" indicates AspirationID
	CylinderHeadType	Type	String	id	No	Yes	References the CylinderHeadType table. The attribute "id" indicates CylinderHeadTypeID
	FuelType	Type	String	id	No	Yes	References the FuelType table. The attribute "id" indicates FuelTypeID
	IgnitionSystemType	Type	String	id	No	Yes	References the IgnitionSystemType table. The attribute "id" indicates IgnitionSystemTypeID
	TransmissionMfrCode	Type	String	id	No	Yes	References the TransmissionMfrCode table. The attribute "id" indicates TransmissionMfrCodeID

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	TransmissionBase	Type	String	id	No	Yes	References the TransmissionBase table. The attribute "id" indicates TransmissionBaseID
	TransmissionType	Type	String	id	No	Yes	References the TransmissionType table. The attribute "id" indicates TransmissionTypeID
	TransmissionControlType	Type	String	id	No	Yes	References the TransmissionControlType table. The attribute "id" indicates TransmissionControlTypeID
	TransmissionNumSpeeds	Type	String	id	No	Yes	References the TransmissionNumSpeeds table. The attribute "id" indicates TransmissionNumSpeeds ID
	TransElecControlled	Empty		id	No	Yes	References the ElecControlled table. The attribute "id" indicates ElecControlledID
	TransmissionMfr	Type	String	id	No	Yes	The manufacturer that actually built the transmission. References the Mfr table. The attribute "id" indicates MfrID
	TransferCaseBase	Type	String	id	No	Yes	References the TransferCaseBase table. The attribute "id" indicates TransferCaseBaseID
	TransferCase	Type	String	id	No	Yes	References the TransferCase table. The attribute "id" indicates TransferCaseID

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	TransferCaseMfr	Type	String	id	No	Yes	The manufacturer that actually built the Transfer Case. References the Mfr table. The attribute "id" indicates MfrID
	BedLength	Type	String	id	No	Yes	References the BedLength table. The attribute "id" indicates BedLengthID
	BedType	Type	String	id	No	Yes	References the BedType table. The attribute "id" indicates BedTypeID
	WheelBase	Type	String	id	No	Yes	References the WheelBase table. The attribute "id" indicates WheelBaseID
	BrakeSystem	Type	String	id	No	Yes	References the BrakeSystem table. The attribute "id" indicates BrakeSystemID
	FrontBrakeType	Type	String	id	No	Yes	The brake type used on the front wheels. References the BrakeType table. The attribute "id" indicates BrakeTypeID
	RearBrakeType	Type	String	id	No	Yes	The brake type used on the rear wheels. References the BrakeType table. The attribute "id" indicates BrakeTypeID
	BrakeABS	Type	String	id	No	Yes	References BrakeABS table. The attribute "id" indicates BrakeABSID
	FrontSpringType	Type	String	id	No	Yes	The basic suspension type used in the front of the vehicle. References the SpringType table. The attribute "id" indicates SpringTypeID

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	RearSpringType	Type	String	id	No	Yes	The basic suspension type used in the rear of the vehicle. References the SpringType table. The attribute "id" indicates SpringTypeID
	SteeringSystem	Type	String	id	No	Yes	References the SteeringSystem table. The attribute "id" indicates SteeringSystemID
	SteeringType	Type	String	id	No	Yes	References the SteeringType table. The attribute "id" indicates SteeringTypeID
	RestraintType	Type	String	id	No	Yes	References the RestraintType table. The attribute "id" indicates RestraintTypeID
	Region	Type	String	id	No	Yes	Region where sold. References the Region table. The attribute "id" indicates RegionID
	<b>Qual</b>	Elements	(param* , text)	id	No	Yes	Qdb coded qualifier data. The attribute "id" references the Qdb table. Sub-elements include one or more optional "param" tag and a required "text" tag.
	param	Type	String	value	Yes	Yes	param substitutes the value and uofm for Qdb qualifiers
				uom		No	
				altvalue		No	
				altuom		No	
	text	Type	String	id	No	Yes	Additional qualifier text for the coded qualifier
	Note	Type	String	id	No	No	Note element describes MOTOR Qualifiers for the application. The attribute "id" refers to the attribute "Qualifier.id" in
				lang		No	
				displayorder		No	
				vehicleattrib		No	

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				ute			MOTOR_Qualifier.xml file "vehicleattribute" indicates if the MOTOR Qualifier is vehicle attribute not covered by ACES specs
	MfrLabel	Type	String		No	N/A	Manufacturer specific descriptions, if its available.
	Position	Type	String	id	No	Yes	References the AAIA Position table. (Part of the relational PCDB). The attribute "id" indicates PositionID
	<b>MOTOR_Operation</b>	Element	(SkillCode , Base_AdditionalDescription? , Base_WarrantyTime? , Base_MOTOR_EWT , Add_AdditionalDescription? , Add_WarrantyTime? , Add_MOTOR_EWT? , All_AdditionalDescription? , All_WarrantyTime? , All_MOTOR_EWT? , IncludedOperation* , OptionalOperation* , ReplacementPart? , Footnote*)	id	Yes	Yes	Container for MOTOR EWT. The attribute "id" refers to <b>OperationTaxonomy "id"</b> in <b>MOTOR_OperationTaxonomy.xml</b> file
	SkillCode	Type	String	id	Yes	Yes	Skill required to perform the operation referred in the current application. Refers to <b>"RequiredSkill.skillcode"</b> attribute in <b>MOTOR_RequiredSkill.xml</b> file
	Base_AdditionalDescription	Type	String	id	No	Yes	Additional description for base MOTOR operation. Refers to <b>"AdditionalDescription. id"</b> in <b>MOTOR_AdditionalDes</b>

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							cription.xml file
	Base_WarrantyTime	Type	String	hours	No	Yes	Warranty time for base operation. The attribute "hours" indicate the warranty time in hours.
	Base_MOTOR_EWT	Type	String	hours	Yes	Yes	MOTOR estimated work time for the base operation. The attribute "hours" indicate the EWT in hours.
	Add_AdditionalDescription	Type	String	id	No	Yes	Additional description for "add" MOTOR operation. Refers to "AdditionalDescription. id" in MOTOR_AdditionalDescription.xml file
	Add_WarrantyTime	Type	String	hours	No	Yes	Warranty time for "add" operation. The attribute "hours" indicate the warranty time in hours.
	Add_MOTOR_EWT	Type	String	hours	No	Yes	MOTOR estimated work time for the "add" operation. The attribute "hours" indicate the EWT in hours.
	All_AdditionalDescription	Type	String	id	No	Yes	Additional description for "all" MOTOR operation. Refers to "AdditionalDescription. id" in MOTOR_AdditionalDescription.xml file
	All_WarrantyTime	Type	String	hours	No	Yes	Warranty time for "all" operation. The attribute "hours" indicate the warranty time in hours.
	All_MOTOR_EWT	Type	String	hours	No	Yes	MOTOR estimated work time for the "all" operation. The attribute "hours" indicate the EWT

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							in hours.
	<b>IncludedOperation</b>	Elements	(IncludedOperation_Note* , IncludedOperation_Position? , Included_MOTOR_Operation)	id	No	Yes	Container for included operations for the current MOTOR operation. The attribute "id" is a MOTOR internal number
	IncludedOperation_Note	Type	String	id	No	Yes	Included operation Note element describes MOTOR Qualifiers for the included operation. The attribute "id" refers to the attribute "Qualifier.id" in MOTOR_Qualifier.xml file. "lang" attribute may be used for multi-language qualifiers. "displayorder" will be used when the displaying qualifiers in an order is critical. "vehicleattribute" indicates if the MOTOR Qualifier is vehicle attribute not covered by ACES specs
				lang		No	
				displayorder		No	
				vehicleattribute		No	
	IncludedOperation_Position	Type	String	id	No	Yes	References the AAIA Position table. (Part of the relational PCDB). The attribute "id" indicates PositionID
	Included_MOTOR_Operation	Type	String	id	No	Yes	The attribute "id" refers to <b>OperationTaxonomy "id"</b> in <b>MOTOR_OperationTaxonomy.xml</b> file
	<b>OptionalOperation</b>	Type	String	id	No	Yes	Container for Optional operations for the main operation in this application. The attribute "id" is a

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							MOTOR internal number
OptionalOperation_Note	Type	String	id	No	Yes	Optional operation Note element describes MOTOR Qualifiers for the optional operation. The attribute "id" refers to the attribute " <b>Qualifier.id</b> " in MOTOR_Qualifier.xml file. " <b>lang</b> " attribute may be used for multi-language qualifiers. " <b>displayorder</b> " will be used when the displaying qualifiers in an order is critical. "vehicleattribute" indicates if the MOTOR Qualifier is vehicle attribute not covered by ACES specs	
			lang		No		
			displayorder		No		
			vehicleattribute		No		
OptionalOperation_Position	Type	String	id	No	Yes	References the AAIA Position table. (Part of the relational PCDB). The attribute "id" indicates PositionID	
Optional_MOTOR_Operation	Type	String	id	No	Yes	The attribute "id" refers to <b>OperationTaxonomy "id"</b> in <b>MOTOR_OperationTaxonomy.xml</b> file	
Optional_Base_AdditionalDescription	Type	String	id	No	Yes	Additional description for optional base MOTOR operation. Refers to " <b>AdditionalDescription. id</b> " in MOTOR_AdditionalDescription.xml file	
Optional_Base_WarrantyTime	Type	String	hours	No	Yes	Warranty time for optional	



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							base operation. The attribute <b>"hours"</b> indicate the warranty time in hours.
	Optional_Base_MOTOR_EWT	Type	String	hours	No	Yes	MOTOR estimated work time for the optional base operation. The attribute <b>"hours"</b> indicate the EWT in hours.
	Optional_Add_AdditionalDescription	Type	String	id	No	Yes	Additional description for "add" optional operation. Refers to <b>"AdditionalDescription. id"</b> in MOTOR_AdditionalDescription.xml file
	Optional_Add_WarrantyTime	Type	String	hours	No	Yes	Warranty time for "add" optional operation. The attribute <b>"hours"</b> indicate the warranty time in hours.
	Optional_Add_MOTOR_EWT	Type	String	hours	No	Yes	MOTOR estimated work time for the "add" optional operation. The attribute <b>"hours"</b> indicate the EWT in hours.
	Optional_All_AdditionalDescription	Type	String	id	No	Yes	Additional description for "all" optional operation. Refers to <b>"AdditionalDescription. id"</b> in MOTOR_AdditionalDescription.xml file
	Optional_All_WarrantyTime	Type	String	hours	No	Yes	Warranty time for "all" optional operation. The attribute <b>"hours"</b> indicate the warranty time in hours.
	Optional_All_MOTOR_EWT	Type	String	hours	No	Yes	MOTOR estimated work time for the optional "all" operation. The attribute

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							"hours" indicate the EWT in hours.
	Optional_ReplacementPart	Elements	(PartType+)		No	N/A	Container for Parts applicable to the optional operation.
	PartType	Type	String	id	Yes	Yes	Part applicable to operation. The attribute "id" refers to PCDB Part Terminology ID
	OptionalOperation_Footnote	Type	String	id displayorder	No	Yes	Footnotes applicable to optional operations. The attribute "id" refers to "Footnote.id" in <b>MOTOR_Footnote.xml</b> file
	ReplacementPart	Elements	(PartType+)		No	N/A	Container for Parts applicable to the main operation.
	PartType	Type	String	id	Yes	Yes	Part applicable to operation. The attribute "id" refers to PCDB Part Terminology ID
	Operation_Footnote	Type	String	id	No	Yes	Footnotes applicable to main operations. The attribute "id" refers to "Footnote.id" in <b>MOTOR_Footnote.xml</b> file
	DisplayOrder	Type	String		No	Yes	Display order sequence number, when its required to display data in specific order.
	<b>Footer</b>	Type	String		No	N/A	Container for footer tags, current specs calls for Record count, which indicates total number of "App" elements in the file
	RecordCount	Type	String		No	N/A	Indicates the number of (applications) "App" elements in the file

## 5.7 XML File: MOTOR\_GEN5\_CCM.xml

This file indicates current status of Base Vehicle / MSO Operation combinations.

#	Element name	Content Type	Content Model	Attributes	Element Req.	Attribute Req.	Description
1	MOTOR_GEN5_CCM	Elements	(VersionDate , VehicleOperationStatus+)		Yes		MOTOR CCM root element
2	VersionDate	EMPTY		schema	Yes	Yes	Attribute “ <b>schema</b> ” indicates the schema version date (see date format note below)
				extraction		Yes	Attribute “ <b>extraction</b> ” indicates the extraction date (see date format note below)
				mtp		No	Attribute “ <b>mtp</b> ” indicates the MOTOR taxonomy version date, if applicable (see date format note below)
3	VehicleOperationStatus	Elements	(BaseVehicleID, ExtendedOperationTaxonomy_ID, StatusCode)		Yes	N/A	Container for Base Vehicle and MSO status.
4	BaseVehicleID	Type	String		Yes	N/A	VCdb BaseVehicleID
5	ExtendedOperationTaxonomy_ID	Type	String		Yes	N/A	ExtendedOperationTaxonomy_ID of the MSO Operation
6	StatusCode	Type	String		Yes	N/A	Code Indicating current status

The following table is a listing of the current CCM Status Codes and the related Status Description

Status ID	Status Description
MIA	Vehicle Missing, Cause Unknown
N501	Not Included In Data Set: AAIA Vehicle Exceeds Model Year Scope Of Data Set
N502	Not Included In Data Set: Low Census Or Commercial Vehicle

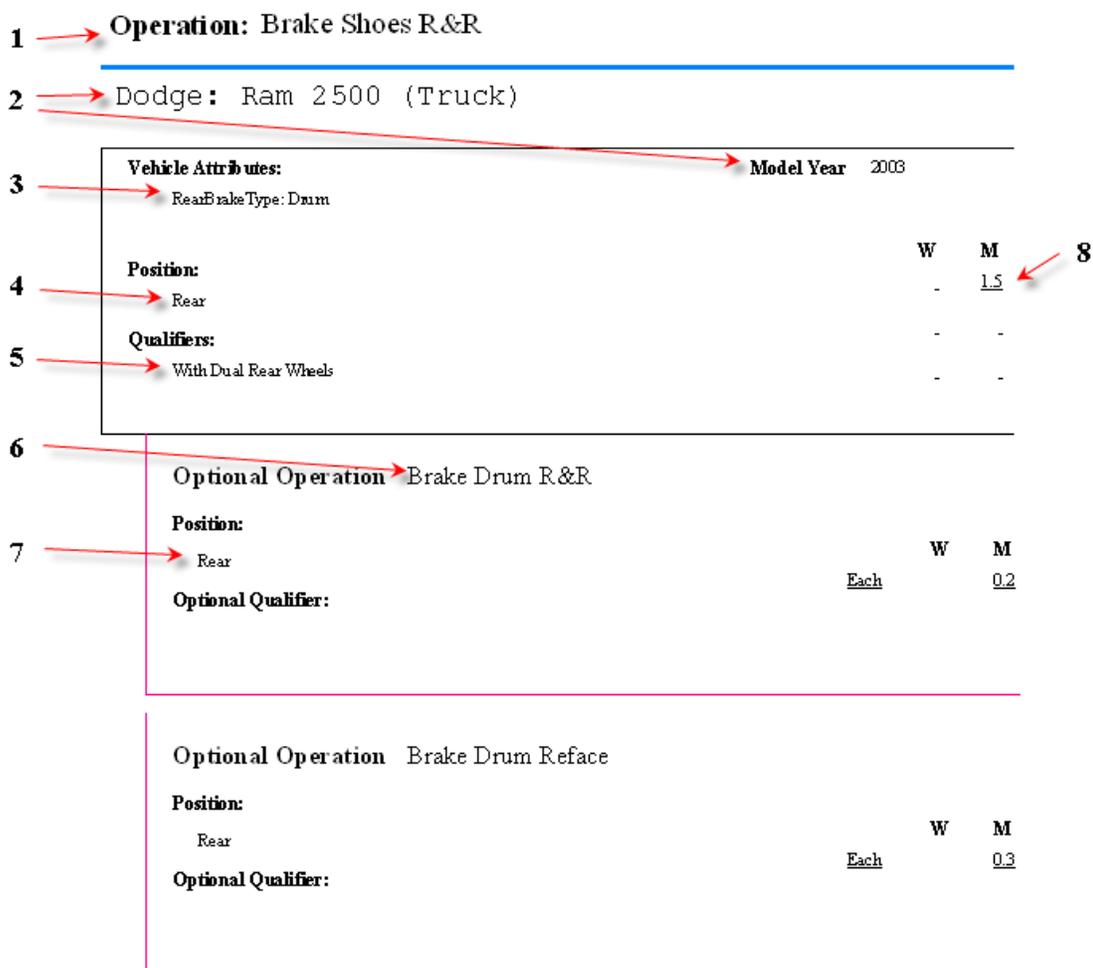
Status ID	Status Description
N503	Not Included In Data Set: AAIA Vehicle Not Yet Propagated Throughout Entire VCdb and/or MOTOR System
N504	Not Included In Data Set: AAIA Vehicle Not Supported In VCmaster ("#" In Vehicle Key Fields)
N505	Not Included In Data Set: AAIA Vehicle Not Required Because Of Vehicle Configuration
N506	Not Included In Data Set: AAIA Vehicle Omitted From Data Set Intentionally (Chek-Chart VehSet = 0)
N507	Not Included In Data Set: VIN Vehicle Not Supported In VINmaster
PYYYYDD	Not Included In Data Set: Planned Coverage. Will Be Added Before Year & Month Indicated
Y	AAIA Vehicle Included In Data Set

**NOTE:** Date is formatted as “CCYY-MM-DD”, where “CC” is represents century, “YY” represents two digit year and “MM” represents two digit month and “DD” represents two digit day.

## 6 Sample Data

The following diagrams attempt to emulate a potential basic end-user view of the data. These diagrams display the data in its basic form and do not represent all of the functionality that may be gleaned from the data structure.

### 6.1 Diagram 1 (Brake Shoes R&R with Two Optional Operations)

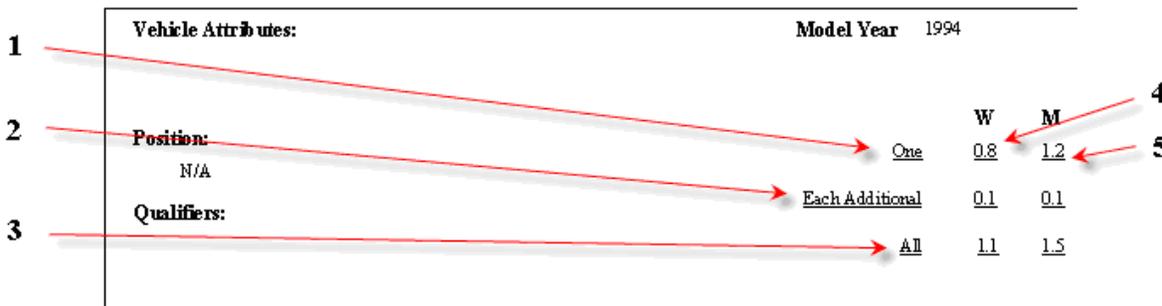


Callout	Field	File	MOTOR_EWT Key
1	LiteralName	MOTOR_OperationTaxonomy.xml	MOTOR Operation ("ID")
2	Base Vehicle (Year, Make, Model, VehicleType)	VCdb	BaseVehicle("ID")
3	VCdb Vehicle Attributes	VCdb	Various
4	Position	PCdb	Position
5	QualifierDescription	MOTOR_Qualifier.xml	Note("ID")
6	LiteralName	MOTOR_OperationTaxonomy.xml	OptionalOperation ("ID")
7	Position	PCdb	OptionalOperation_Position ("ID")
8	Base_MOTOR_EWT	MOTOR_EWT.xml	

## 6.2 Diagram 2 (Fuel Injector R&R with Base, Add and All EWT)

**Operation:** Fuel Injector R&R

Chevrolet: Impala (Car)

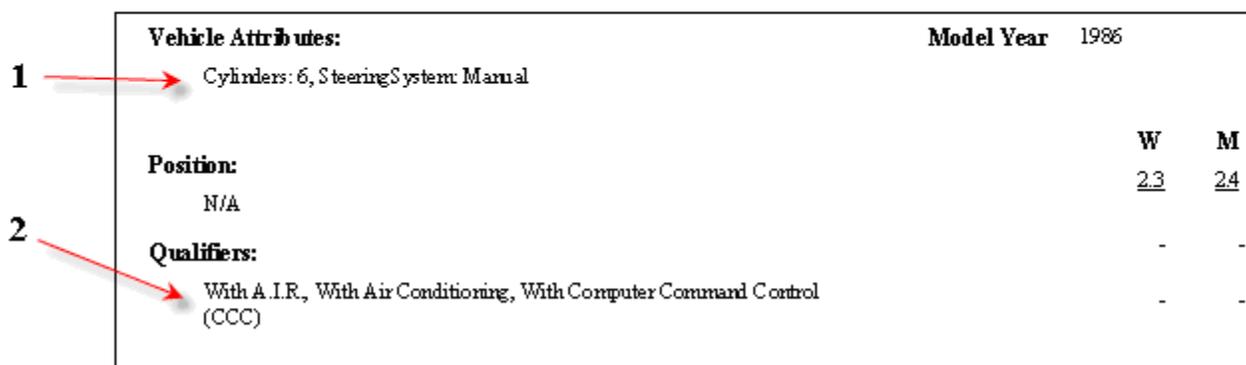


Callout	Field	File	MOTOR_EWT Key
1	MOTOR_AdditionalDescription	MOTOR_AdditionalDescription.xml	Base_AdditionalDescription ("ID")
2	MOTOR_AdditionalDescription	MOTOR_AdditionalDescription.xml	Add_AdditionalDescription ("ID")
3	MOTOR_AdditionalDescription	MOTOR_AdditionalDescription.xml	All_AdditionalDescription ("ID")
4	Base_WarrantyTime	MOTOR_EWT.xml	
5	Base_MOTOR_EWT	MOTOR_EWT.xml	

## 6.3 Diagram 3 (Intake Manifold Gasket R&R with Multiple MOTOR\_Qualifier)

**Operation:** Intake Manifold Gasket R&R

Chevrolet: Caprice (Car)



Callout	Field	File	MOTOR_EWT Key
1	Various VCdb fields concatenated into a single text stream	VCdb	Various
2	QualifierDescription (Multiple concatenated into a single text	MOTOR_Qualifier.xml	Note ("ID") - Multiple

string)		
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## 7 MOTOR Standard Operation

The Mechanical Labor GEN5 database focuses on the Operations relating to the most common components sold in the automotive aftermarket. The following list of MOTOR Standard Operations represents the scope of coverage as of March 2009. This list will grow as the database matures.

### MOTOR Standard Operations

- |   |  |
|---|--|
| 1. ABS Control Module R&R                       | 2. Air Bag Control Module R&R                    |
| 3. Air Conditioning Compressor Clutch R&R       | 4. Air Conditioning Compressor R&R               |
| 5. Air Conditioning Condenser Fan Motor R&R     | 6. Air Conditioning Condenser R&R                |
| 7. Air Conditioning Evaporator Core R&R         | 8. Air Conditioning Expansion Valve R&R          |
|   | 10. Air Conditioning Receiver Drier Assembly R&R |
| 9. Air Conditioning Orifice Tube R&R            | 12. Air Conditioning Refrigerant Recovery        |
| 11. Air Conditioning Refrigerant Line R&R       |  |
| 13. Air Conditioning System Evacuate & Recharge | 14. Alternator R&R                               |
| 15. Ambient Air Temperature Sensor R&R          | 16. Axle Shaft Oil Seal R&R                      |
| 17. Axle Shaft R&R                              | 18. Balance Shaft Belt Tensioner R&R             |
|   | 20. Battery Cable Battery Terminal End Service   |
| 19. Balance Shaft Drive Belt R&R                | 22. Brake Drum R&R                               |
| 21. Battery Cable R&R                           | 24. Brake Hydraulic System Bleed                 |
| 23. Brake Hose R&R                              | 26. Brake Master Cylinder R&R                    |
| 25. Brake Light Switch R&R                      | 28. Brake Power Booster Unit R&R                 |
| 27. Brake Pads R&R                              | 30. Cabin Air Filter R&R                         |
| 29. Brake Shoes R&R                             | 32. Camshaft R&R                                 |
| 31. Camshaft Position Sensor R&R                | 34. Catalytic Converter R&R                      |
| 33. Camshaft Seal R&R                           | 36. Clutch Assembly R&R                          |
| 35. Clutch Assembly Adjust                      | 38. Clutch Hydraulic System Bleed                |
| 37. Clutch Cable R&R                            | 40. Clutch Slave Cylinder R&R                    |
| 39. Clutch Master Cylinder R&R                  | 42. Crankshaft Position Sensor R&R               |
| 41. Crankshaft Oil Seal R&R                     | 44. CV Axle Assembly R&R                         |
| 43. Crankshaft Vibration Damper R&R             | 46. CV Joint R&R                                 |
| 45. CV Joint Boot R&R                           | 48. Cylinder Head Gasket R&R                     |
| 47. Cylinder Head Assembly R&R                  | 50. Decklid Release Actuator R&R                 |
| 49. Cylinder Head R&R                           | 52. Differential Carrier R&R                     |
| 51. Decklid Release Cable R&R                   | 54. Differential Pinion Seal R&R                 |
| 53. Differential Case R&R                       | 56. Distributor Cap R&R                          |
| 55. Distributor Assembly R&R                    | 58. Door Lock Actuator R&R                       |
| 57. Distributor Rotor R&R                       | 60. Drive Axle Assembly Drain & Refill           |
| 59. Door Lock Switch R&R                        | 62. Drive Belt R&R                               |
| 61. Drive Belt Idler Pulley R&R                 | 64. Driveshaft Support Bearing R&R               |
| 63. Drive Belt Tensioner R&R                    | 66. EGR Valve Gasket R&R                         |
| 65. Driveshaft U-Joint R&R                      | 68. Engine Air Filter Element R&R                |
| 67. EGR Valve R&R                               | 70. Engine Assembly. Short Block R&R             |
| 69. Engine Assembly. Long Block R&R             | 72. Engine Assembly R&R                          |
| 71. Engine Assembly R&l                         | 74. Engine Control Module R&R                    |
| 73. Engine Breather Filter R&R                  |  |

**MOTOR Standard Operations**

- |  |   |
|--|---|
| 75. Engine Control Module Relearn            | 76. Engine Control Module Reset             |
| 77. Engine Coolant Expansion Tank R&R        | 78. Engine Coolant Level Sensor R&R         |
| 79. Engine Coolant Outlet Housing Gasket R&R | 80. Engine Coolant System Flush & Refill    |
| 81. Engine Coolant Temperature Sensor R&R    | 82. Engine Coolant Thermostat R&R           |
| 83. Engine Front Cover Gasket R&R            | 84. Engine Mount R&R                        |
| 85. Engine Oil & Filter R&R                  | 86. Engine Oil Cooler R&R                   |
| 87. Engine Oil Pan Gasket R&R                | 88. Engine Oil Pan R&R                      |
| 89. Engine Oil Pump R&R                      | 90. Engine Tune-Up                          |
| 91. Exhaust Manifold Gasket R&R              | 92. Exhaust Manifold R&R                    |
| 93. Exhaust Muffler R&R                      | 94. Exhaust Pipe R&R                        |
| 95. Exhaust System (Complete) R&R            | 96. Exhaust Tail Pipe R&R                   |
| 97. Fuel Evaporative Canister R&R            | 98. Fuel Filter R&R                         |
| 99. Fuel Injector R&R                        | 100. Fuel Level Sending Unit R&R            |
| 101. Fuel Pressure Regulator R&R             | 102. Fuel Pump R&R                          |
| 103. Fuel Tank R&R                           | 104. Glow Plug R&R                          |
| 105. Headlamp Alignment Adjust               | 106. Headlamp Bulb R&R                      |
| 107. Headlamp Dimmer Switch R&R              | 108. Heater Control Valve R&R               |
| 109. Heater Core R&R                         | 110. Heater Hose R&R                        |
| 111. Hood Release Cable R&R                  | 112. Hood Support Strut R&R                 |
| 113. HVAC Blower Motor R&R                   | 114. HVAC Blower Motor Resistor R&R         |
| 115. HVAC Blower Motor Switch R&R            | 116. Ignition Coil R&R                      |
| 117. Ignition Switch R&R                     | 118. Ignition Timing Adjust                 |
| 119. Intake Manifold Gasket R&R              | 120. Intercooler R&R                        |
| 121. Knock Sensor R&R                        | 122. Mass Air Flow Sensor R&R               |
| 123. Multi-Function Switch R&R               | 124. Oil Pressure Sensor R&R                |
| 125. Oxygen Sensor R&R                       | 126. Parking Brake Cable R&R                |
| 127. Parking Brake Shoes R&R                 | 128. Parking Brake System Adjust            |
| 129. PCV Valve R&R                           | 130. Power Steering Hose R&R                |
| 131. Power Steering Pump R&R                 | 132. Power Steering Pump Reservoir Seal R&R |
| 133. Powertrain Control Module R&R           | 134. Powertrain Control Module Relearn      |
| 135. Powertrain Control Module Reset         | 136. Radiator Fan Clutch R&R                |
| 137. Radiator Fan Motor R&R                  | 138. Radiator Hose R&R                      |
| 139. Radiator R&R                            | 140. Range Sensor R&R                       |
| 141. Signal Flasher R&R                      | 142. Spark Plug Wire Set R&R                |
| 143. Spark Plugs R&R                         | 144. Speedometer Cable R&R                  |
| 145. Stabilizer Bar Link Kit R&R             | 146. Starter Motor R&R                      |
| 147. Steering Center Link R&R                | 148. Steering Damper R&R                    |
| 149. Steering Gear Assembly R&R              | 150. Steering Idler Arm R&R                 |
| 151. Steering Inner Tie Rod R&R              | 152. Steering Knuckle R&R                   |
| 153. Steering Outer Tie Rod End R&R          | 154. Steering Pitman Arm R&R                |
| 155. Supercharger Assembly R&R               | 156. Suspension Ball Joint R&R              |
| 157. Suspension Coil Spring R&R              | 158. Suspension Control Arm Bushings R&R    |
| 159. Suspension Control Arm R&R              | 160. Suspension Leaf Spring R&R             |
| 161. Suspension Shock Absorber R&R           | 162. Suspension Strut Assembly R&R          |
| 163. Suspension Strut Cartridge R&R          | 164. Suspension Strut Mount Assembly R&R    |
| 165. Throttle Body Assembly R&R              | 166. Throttle Position Sensor R&R           |
| 167. Timing Belt Idler Pulley R&R            | 168. Timing Belt R&R                        |
| 169. Timing Belt Tensioner Pulley R&R        | 170. Timing Belt Tensioner R&R              |

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171. Timing Chain and Gear Set R&R	172. Timing Chain Tensioner R&R
173. Tire Pressure Monitoring Sensor R&R	174. Tire Pressure Monitoring System Relearn
175. Tire Pressure Monitoring System Reset	176. Trans Assembly R&I
177. Trans Assembly R&R	178. Trans Control Module R&R
179. Trans Control Module Relearn	180. Trans Control Module Reset
181. Trans Fluid & Filter R&R	182. Trans Fluid Drain & Refill
183. Trans Mount R&R	184. Turbocharger Assembly R&R
185. Valve Cover Gasket R&R	186. Valve Stem Oil Seal R&R
187. Vehicle Speed Sensor R&R	188. Water Pump R&R
189. Wheel Alignment Adjust	190. Wheel Bearing R&R
191. Wheel Bearing Seal R&R	192. Wheel Hub And Bearing Assembly R&R
193. Wheel Hub R&R	194. Wheel Speed Sensor R&R
195. Window Regulator Motor R&R	196. Window Regulator R&R
	198. Windshield Washer Fluid Level Sensor R&R
197. Window Switch R&R	200. Windshield Washer Fluid Reservoir R&R
199. Windshield Washer Fluid Pump R&R	
201. Windshield Wiper Motor R&R	

## 8 Data Usage Requirements

### 8.1 Presenting EWT and Warranty Time Fields

All EWT and Warranty Time fields need to be displayed as hours and tenths of an hour. Even when the value is an even number, the tenths digit needs to be displayed. Additionally, it is important not to describe the work hours as “units” or similar descriptive term that may allow the value to be perceived or interpreted as anything other than estimated work times.

## 9 Data Usage Tips

### 9.1 Using MOTOR Qualifiers to Extended Vehicle Definitions

The MOTOR Qualifiers dataset can be used to extend vehicle definitions beyond the ACES VCdb standard. All vehicle definition qualifiers are assigned to the Qualifier Type of “Vehicle Attribute.” These qualifiers are then further qualified by Qualifier Family. The grouping of the Qualifier family is based on the standard that only one Qualifier within a Qualifier Family can be true for a specific physical vehicle at a time. For example, “With Air Conditioning” and “Without Air Conditioning” are in the same family because both cannot be true about the same vehicle at the same time. By attaching declared vehicles attribute qualifiers to a unique physical vehicle, perhaps represented by VIN, an application can then predetermine that an application is not likely to apply to a vehicle if there is a vehicle attribute qualifier attached that belongs to a family wherein another qualifier from that same family has been declared for that vehicle.

### 9.2 Quantity

The concept of calculating labor times based on a specific quantity of physical items being worked on is a little different than when dealing with part number data. In cases where there are potential multiple

parts of the same type being replaced there are generally three ways in which a labor time calculation can be made based on the number of items being replaced.

- In the first scenario, there is a labor time given for a single item and the time for replacing multiple instances is simply a multiple of the labor time. These cases are labeled with the description of “Each” and have only a base labor time.
- In the second scenario, a labor time is given for a singular instance and then an “add” labor time is given for each additional instance. This scenario exists because there is often overhead work involved in exposing a single part that does not need to be repeated for each part.
- In the third instance, a labor time is given for a singular instances, an “add” time is given for each additional instance, and an “all” time is given for all instances. This all labor time will add up to be less than taking the base time and adding a multiple of the add time to account for each item. This is due to the estimating nature of labor time data.
- The legal combinations of additional descriptions described earlier in this document can be used to implement quantity type functionality into the user application.

### 9.3 EWT Overlap Calculations

Often times, the EWT given for an Operation includes the time to perform an important prerequisite operation which could be shared with other operations. If multiple Operations are required that each contain these included operations you can end up with a scenario where the labor time includes the performing of the same tasks multiple times. This is referred to as overlap. The data presents overlap in two ways. First, the footnote attached to the operations will, when necessary, indicate the major operations that are included in the EWT. By reviewing the footnotes of the operations selected the end user can be exposed to this overlap. Second, every application that includes a footnote indicating an included operation will also be tagged with the ID of the Operation’s taxonomy path. The user application can query selected Operations to check for instances where they are attached to the same taxonomy ID. This ID could then be used to fetch any available labor times for the included operation to aid in the overlap calculation.

There is also the potential that an end user may select an Operation with an Additional Operation and then later select an Operation that is the same as the earlier selected Additional Operations. This is also an instance of overlap which can be queried for.

### 9.4 Getting the most of the App “ref” Attribute

Each application is delivered with an attribute of “ref.” This attribute can be utilized to increase performance if parsing the XML output files into a SQL relational database by compressing the data. Each application which share an equivalent ref ID have the same MOTOR Operation Name, set of Notes, set of VCdb Attributes, Position, set of labor times and additional descriptions, and footnote. Additionally, for each Base Vehicle that a ref tag is attached to, each application will have the same set of Operation Operations, Included Operations, and Included Parts attached.

The ref attribute is also a useful tool when communicating feedback back to MOTOR. This ID will allow us to go exactly to go to the piece of data that is concerned.

### 9.5 Replacement Parts Expectations

Replacement parts are called out only when the part is normally replaced as part of the Operation. In most cases, R&R Operations will have replacement parts listed. You will also find replacement parts listed for Overhaul, Drain and Refill, and Evacuate and Recharge Operations. You should not expect to see replacement parts listed for Operations that do not require the replacement of parts such as Inspection and Adjustment Operations.

## 10 Document History

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### Document History

Date	Version	Change Reference
3/25/09	1.0	Draft for new template. Includes Information from earlier document with large portions authored by Rahamath Shaik.
6/3/2010	1.1	Updated headers / footers and MIS logo
4/4/2011	1.2	Added section 9.5 Replacement parts Expectations.
08/2015	1.3	Updated to match new style and format standards